STATE FAUNA SERIES 5

FAUNA OF ANDHRA PRADESH

PART - 5
Invertebrates

ZOOLOGICAL SURVEY OF INDIA

State Fauna Series 5

FAUNA OF ANDHRA PRADESH

(PART–5)

Invertebrates

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Kolkata

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STATE FAUNA SERIES

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TREMATODES OF BIRDS AND MAMMALS

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INTRODUCTION

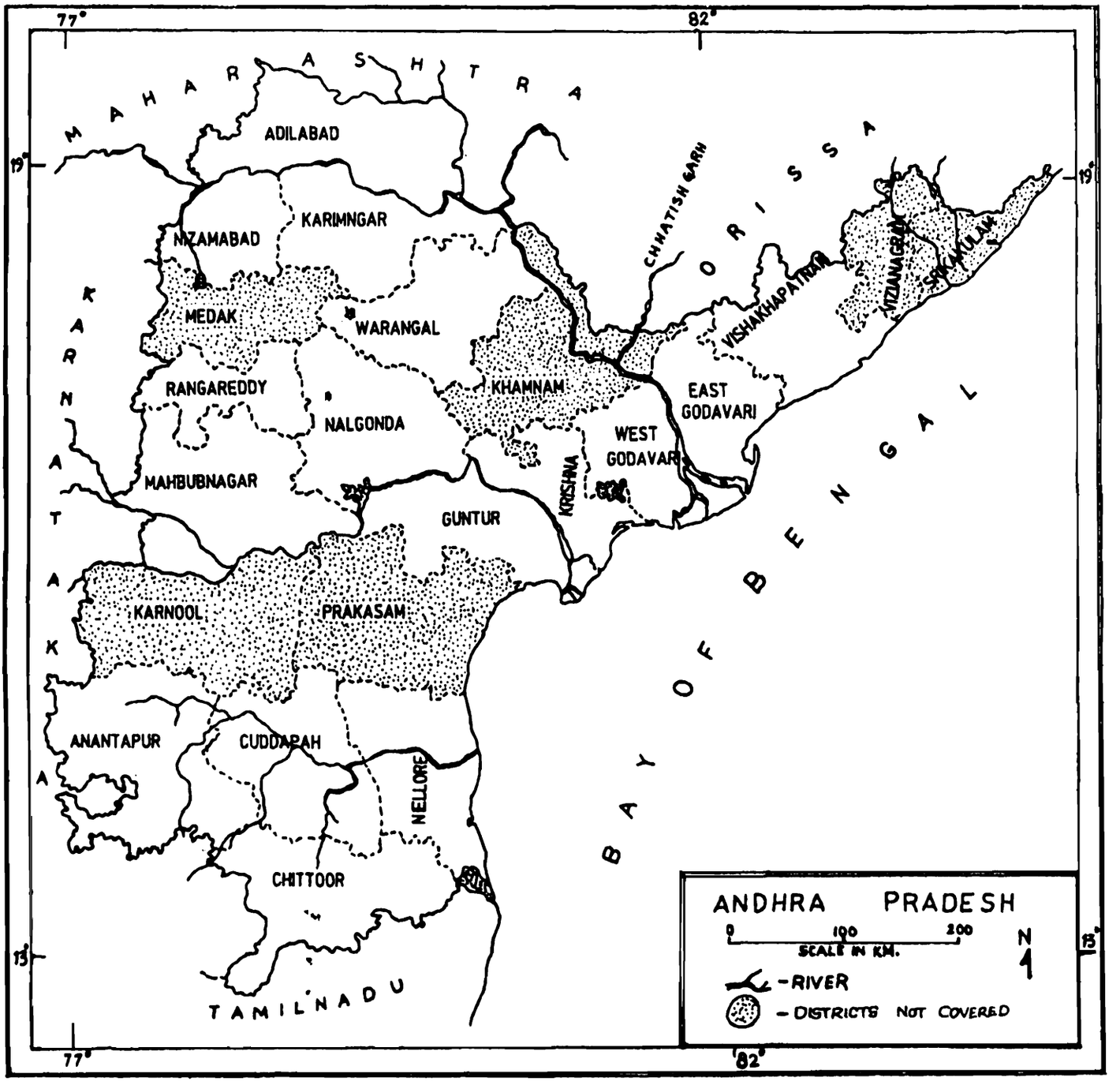
Andhra Pradesh is the fifth state in terms of geographical dimension and population. The state is unique in having rich livestock and poultry and with good population of birds.

Geographically, Andhra Pradesh is situated between latitude 12° 14' and 19° 54' N and longitudes 76° 50' and 86° 50' N. It lies on the Eastern Sea board of the peninsula and South-Eastern part of Indian sub-continent. The total land area of the state is 2,76,814 Square kilometers bounded on the north by Madhya Pradesh and Orissa, on the west by Maharashtra and Karnataka, on the south by Tamil Nadu, on the east by Bay of Bengal. It has a coast line of 1000 kilometers. The lakes and tanks cover area of 8,00,000 hectares and the river system of the state is more than 1,500 kilometers. There are two major river systems, viz. Godavari & Krishna, both the river systems originate from the Western Ghat and flow ultimately to meet the Bay of Bengal.

The state is having three mountain ranges *viz.* (1) Eastern Ghats fringing the east coast-line, leaving in some places very narrow coastal places. (2) The Deca plateau with Sahyadri range of Adilabad Disrict at the north border of the state. (3) The Horseley and the other hills of the Chittoor and Anantapur Districts at the South border. The Eastern Ghats and their southern continuation taken by the Nellamallies run through the entire state.

Evergreen, semi-evergreen and moist deciduous forest are found in the state and occupy about 23.8% of the total area of the state. Palm plantation is of common occurrence throughout the state. Swampy are (C.250 sq. km.) known as Kolleru Lake which is regarded as one of the largest wetland in India, is situated partially in the coastal districts, namely Krishna & Godavari.

The state is warm and humid region under tropical climate, is ideal place for survival and propagation of helminth parasites have not been studied in the state proportionate to their importance to public health, livestock, poultry, fishery and wild life. Ghosh & Srivastava (1984) estimated that 70–80% trematode parasites are still to be discovered and recorded



Map 1 : The drainage systems of Andhra Pradesh are shown in this map indicating – The courses of rivers, and districts which are not been surveyed.

from India. Position as regards studies on helminth parasites in Andhra Pradesh are even much more negligible.

Though "Fauna of India and Adjacent countries – Vol. I. Platyhelmeinthes : Trematoda" by Mehra, 1980 followed by its supplement by Srivastava, 1982, no other comprehensive work has been made so far on Trematodes of India. Dr. Hanumantha Rao (1970–1990) & Dr. R. Madhvi (1975–2001) have made their series of reports on tremetode parasites from Andhra Pradesh specially from fish hosts. Simha (1958–1973) have reported a good number of tremetode parasites from reptile hosts.

Five faunistic filed surveys were conducted during the period 1996 – 2001, covering all the important live-stock and dairy landing areas of 16 districts out of the 23, (Map-I) of the present day of Andhra Pradesh. Seven districts viz. Khammam, Vizianagaram, Srikakulam, Karimnagar, Medak, Karnool & Prakasam have not been covered. This work comprises 71 species under 47 genera and 20 families, out of which 15 species actually been collected from the above region by the various survey parties of Zoological Survey of India, which are also new record from the state as well as rest 56 species are early record by different scientists from the state.

Helminth causes deadly diseases in the human being. Almost all other animals are associated with them such as cattle, goat, sheep, horse, mule, elephant, dog, cat, fish poultry bird, etc., also harbour helminth parasites. Burt (1970) opined that there are more number of parasites than free living forms, both in number and variety. Various diseases caused to man and animals or their utility by the helminth parasites, impair their efficiency and utility to a varying degree. In case of animals, meats become spoiled, bones become brittle, leathers become useless, milk yeilding and egg laying capacity are lost etc. Ghosh and Chauhan (1975) opined that the damage caused by the helminth diseases are even more than those by viral or bacterial diseases and devastating for a sudden period but normally not of regular or frequent occurrence and remain limited to a geographical area. Helminth parasites are found throughout the Globe and may be present for the whole life, in the animals and impair their efficiency for a much greater period. In India, according to Bhalerao (1935) *Fasciola gigantica* Cobbold, 1855, alone caused more damage to cattle than any other bacterial or viral diseases.

Leaving aside the record of helminth parasites of medical importance, only very few records are also available in literature about the parasites of pig, cattle, mule, horse, elephant etc. but no consolidated account or any comprehensive work on parasitic helminths are available from Andhra Pradesh, particularly those of wild vertebrates. The aim of the present study is also to make a consolidated account of Trematode Parasite of Birds & Mammals of Andhra Pradesh.

The present communication deals with the effort of a consolidated account of Trematode parasites of Birds and Mammals from Andhra Pradesh. All records of helminth parasites from Andhra Pradesh are very much meager, the present studies is expected will laid to foundation for further work. The species under genera and families have been included in the present

work. Diagnostic characters of all the species alongwith the keys for easy identification of families and genera, they belong, have been provided. Text figures of most of the species have also been included.

The chapter "Host-Parasite List alongwith the feeding habit of the host" have been included mainly to depict the picture of host-specificity of parasite and to infer the chance of infection by the intake of food by host.

MATERIAL AND METHOD

Materials were collected by dissecting the host and were collected in normal saline solution firstly, then were killed by 70% alcohol and pressed. Pressing depends upon the thickness of the specimen, when the specimen is thin, pressing should be done by cover slip to cover slip, then by cover slip to slide and slide to slide when the thickness gradually increases. Specimens were preserved in 70% alcohol and stained with Broax Carmine and dehydrated for preparing the permanent slide, mounted in Canada balsum. Drawings were made with camera lucida and measurements are used in this communication, all are in mm. For details, Fauna of Meghalaya Ghosh and Chakrabarti, 1999 may be consulted.

SYSTEMATIC INDEX

TREMATODES OF BIRDS

Family I STRAGIDAE Railliet, 1919

Sub-family I STRAGINAE Raillet, 1919

Genus 1 ***Apharyngostrigea*** Ciurea, 1927

1. *A. ramai* (Verma, 1937) Vidyarthi, 1937

Genus 2 ***Strigea*** Abildgaard, 1790

2. *S. fulconis mcgregori* Tubangui, 1932
3. *S. orientalis* Vidyarthi, 1937

Family II DIPLOSTOMIDAE Poirier, 1886

Subfamily II DIPLOSTOMINAE Monticelli, 1892

Genus 3 ***Diplostomum*** Von Nordmann, 1832

4. *D. spathaceum* (Rudolphi, 1819) Olsson, 1876

Genus 4 ***Neodiplostomum*** Railliet, 1919

5. *N. mehranium* Vidyarthi, 1938
6. *N. migrans* Dubois et Richard, 1964

Genus 5 ***Prosthodiplostomum*** Dubois, 1936

7. *P. rayii* Verma, 1936

Family III CLINOSTOMATIDAE Luhe, 1901

Subfamily III CHINOSTOMINAE Pratt, 1902

Genus 6 ***Clinostomum*** Leidy, 1859

8. *C. complanatum* (Rud. 1814) Braun, 1899

Family IV CYCLOCOELIDAE Kossak, 1911

Subfamily IV CYCLOCOELINAE Stossich, 1902

Genus 7 ***Cyclocoelium*** Brandes, 1892

9. *C. elongatum* Harrah, 1921

Genus 8. ***Haematotrephus*** Stossich, 1902

10. *H. lancoelatumn* (Wedl. 1858) Stossich, 1902

Family V ECHINOSTOMATIDAE Poche, 1926

Subfamily V ECHINOCHASMINAE Odhner, 1910

Genus 9 ***Echinochasmus*** Deitz, 1910

11. *E. bagulai* Verma, 1936

Subfamily VI ECHINOSTOMATINAE (Looss, 1899) Faust, 1929

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12. *E. revolutum* (Froelich, 1802) Looss, 1899

Genus 11 ***Nephrostomum*** Deitz, 1909

13. *N. ramosum* (Sons. 1895) Deitz, 1909

Genus 12. ***Parallelotestis*** Bolpolskaya, 1954

14. *P. egretti* (Srivastava, 1960) Gupta et Gupta 1964

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Genus 13. ***Pegosomum*** Ratz. 1957

15. *P. egretti* Srivastava, 1957

Family VI PHILOPHTHALMIDAE Travassos, 1918

Subfamily VIII PHILOPHTHALMINAE Loss, 1899

Genus 14. ***Philophthalmus*** Looss, 1907

16. *P. offleoxrius* Mamaev, 1969

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Subfamily IX DICROCOELIINAE Looss, 1899

Genus 15. ***Brachylecithum*** Shtrom, 1940

18. *B. stunkardi* (Pande, 1930) Denton et Byrd, 1951

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19. *L. skrjabini* Jaiswal, 1957

Genus 17. ***Zoonorchis*** Travassos, 1904.

20. *Z. travassosi* Jaiswal, 1957.

Family VIII EUMEGACETIDAE Travassos, 1922

Subfamily X EUMEGACETINAE Mehra, 1935

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21. *E. medioximus* Braun, 1901
22. *E. triangularis* Looss. 1900
23. *E. hirundiosus* Jaiswal et. Vasudev, 1960
24. *E. megacetabulus* Jaiswal et. Vasudev, 1960
25. *E. hyderabadensis* Jaiswal et. Vasudev, 1960
26. *E. centrotropius* Jaiswal et. Humayun, 1973
27. *E. longicirratus* Jaiswal et. Vasudev, 1960
28. *E. indicus* Jaiswal et. Vasudev, 1960
29. *E. singhi* Jaiswal, 1957
30. *E. vishakhaptnamensis* Gandhi, 1978

Family IX MICROPHALLIDAE Travassos, 1921

Subfamily XI MICROPHALLINAE Ward, 1901

Genus 19. ***Microphallus*** (Ward, 1901) Baer, 1943

31. *M. primas* (Jaegerskicold, 1908) Stunkard, 1951

Family X PLAGIORCHIIDAE Luhe, 1901

Subfamily XII PLAGIORCIINAE Pratt, 1902

Genus 20 ***Plagiorchis*** Luhe, 1899

32. *P. elegans* (Rud., 1802) Braun, 1902

Family XI PROSTHOGONIMIDAE Nicoll, 1924

Genus 21 ***Prosthogonimus*** Luhe, 1899

33. *P. cuneatus* (Rud. 1809) Braun, 1902

Family XII STOMYLOTREMATIDAE (Travassos, 1922) Poche, 1926

Genus 22 ***Stomylotrema*** Looss, 1900

34. *S. vicarium* Braun, 1901

Family XIII HETEROPHYIDAE (Leiper, 1909) Odhner, 1914

Subfamily XIII GALACTOSOMINAE Ciurea, 1933

Genus 23 ***Glactosomum*** Looss, 1899

35. *G. puffini* Yamaguti, 1941

Subfamily XIV HAPLORCHIINAE Looss, 1899

Genus 24 ***Haplorchis*** Looss, 1899

36. *H. taichui* (Nishigori, 1924) Chen, 1936
37. *H. yokogawai* (Katsuta, 1932) Chen, 1936

Subfamily XV HETEROPHYINAE Leiper, 1909

Genus 25 ***Heterophyes*** Cobbold, 1886

38. *H. heterophyes* (Seibold, 1853) Stiles et Hassal, 1900

Genus 26 ***Heterophyopsis*** Tubangui et Africa, 1938

29. *H. continua major* (Yamaguti, 1939) Yamaguti, 1971

Subfamily XVI STICTODORINAE Yamaguti, 1958

Genus 27 ***Stictodora*** Looss, 1899

40. *S. swakinensis* Looss, 1899

Family XIV LEUCOCHLORIDIIDAE (Poche, 1907) Dolffus, 1934

Subfamily XVII Leucochloridiinae Poche, 1907

Genus 28 ***Leucochloridium*** Carus, 1835

41. *L. macrostoma* (Rud.1803) Poche, 1907

Family XV LECITHODENDRIIDAE Odhner, 1911

Subfamily XVIII GANEONINAE Yamaguti, 1958

Genus 29 ***Ganeo*** Klein, 1905

42. *G. tigrinum* Mehra et Negi, 1928

TREMATODES OF MAMMALS

Family XVI DICROCOELIIDAE Odhner, 1910

Subfamily XIX EUPARADISTOMINAE Yamaguti, 1958

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43. *E. buckleyi* Singh, 1958

Family XVII LECITHODENDRIIDAE Odhener, 1911

Subfamily XX LECITHODENDRIINAE Looss, 1902

Genus 31 ***Pycnoporus*** Looss,1899

44. *P. loossii* Pande, 1935

Genus 32 ***Paralecithodendrium*** Odhner, 1911

45. *P. ovimagnosum* Bhalerao, 1926

Genus 33 ***Prosthodendrium*** Dollfus, 1931

46. *P. longiforme* Bhalerao, 1926

47. *P. mehrai* Pande, 1935
48. *P. ovatum* Simha, 1958

Genus 34 ***Lecithodendrium*** Looss, 1896

49. *L. (L.) hirsutum* Looss, 1896
50. *L. (L.) modlingeri* Pande, 1935

Subfamily XXI ANCHITREMINAE Mehra, 1935

Genus 35 ***Anchitrema*** Looss, 1899

51. *A. sanguineum* (Sons. 1894) Looss, 1899

Family XVII PLAGIORCHIIDAE Ward, 1917

Subfamily XXII PLAGIORCHINAE Pratt, 1902

Genus 36 ***Plagiorchis*** Luhe, 1899

52. *P. vespertilionis* (Muller, 1784) Braun, 1900

Subfamily XXIII OMPHALOMETRINAE Looss, 1899

Genus 37 ***Neoglyphe*** (Shaldybin, 1954) Yamaguti, 1958

53. *N. hinoi* (Ozaki, 1931) Yamaguti, 1958

Family XIX ECHINOSTOMATIDAE Deitz, 1909

Subfamily XXIV ECHINOSTOMATINAE Odhner, 1911

Genus 38 ***Echinochasmus*** Deitz, 1909

54. *E. perfoliatus* (Ratz., 1908) Deitz, 1909
55. *E. vidhianae* Vasudev, 1973
56. *E. megaderni*, Salem, 1973

Family XX FASCIOLIDAE Railliet, 1895

Subfamily XXV FASCIOLOPSINAE Odhner, 1910

Genus 39 ***Fasciolopsis*** Looss, 1899

57. *F. buski* (Lakester, 1857) Stiles, 1901

Subfamily XXVI Fasciolinae Stiles et Hassal, 1898

Genus 40 ***Fasciola*** Linnaeus, 1758

58. *F. gigantica* Cobbold, 1855
59. *F. hepatica* Linneaus, 1758

Family XXI PARAMPHISTOMIDAE Fischoeder, 1901

Subfamily XXVII PARAMPHISTOMINAE Fischoeder, 1901

Genus 41 ***Gygantocotyle*** Nasmark, 1937

60. *G. explanatum* (Creplin, 1847) Nasmark, 1937

Genus 42 ***Paramphistomum*** Fischoeder, 1900

61. *P. ichikawai* Fukui, 1922
62. *P. cervi* (Zeder, 1790) Fischoeder, 1901
63. *P. epiclitum* Fischoeder, 1904

Genus 43 ***Cotylophoron*** Stiles et Goldberger, 1910

64. *C. cotylophorum* (Fischoeder) Stiles et Goldberger, 1910

Genus 44 ***Ceylonocotyle*** Nasmark, 1937

65. *C. scoliocoelium* (Fischoeder, 1904) Nasmark, 1937
66. *C. dawesi* Gupta, 1959

Subfamily XXVIII GASTRODISCINAE Monticelli, 1892

Genus 45 ***Gastrodiscus*** Leukart, 1877

67. *G. aegypticus* (Cobbold, 1876) Railliet, 1893

Subfamily XXIX GASTROTHYLACINAE Stiles et Goldberger, 1910

Genus 46 ***Gastrothylax*** Piorier, 1883

68. *G. crumenifer* (Creplin, 1847) Piorier, 1883
69. *G. indicus* Dutt, 1978
70. *G. glandiformis* Yamaguti, 1930

Genus 47 ***Fischoederius*** Stiles et Goldberger, 1910

71. *F. elongatus* (Poirier, 1883) Stiles et Goldberger, 1910

SYSTEMATIC ACCOUNT

TREMATODES OF BIRDS

Class DIGENEA

Order TREMATODA

Family I. STRIGIDAE Railliet, 1919

Subfamily I. STRAGINAE Railliet, 1919

Key to the genus

1. Vitelline follicles extending into tribocytic organ as well as into the wall of the bursa ..... ***Apharyngostrigea***

   Vitelline follicle distribution otherwise 2

2. Vitellaria extending upto the forebody ..... ***Strigea***

Genus 1 ***Apharyngostrigea*** Ciurea, 1927

1. ***Apharyngostrigea ramai*** (Verma, 1936) Vidyarthi, 1937
(Fig. 1)

1936. *A. ramai* Verma *Pt. I Allahabad Univ. Stud.* **12** : 147-188.

1937. *A. ramai* Vidyarthi *Proc. Nat. Acad. Sci. India* 7(2-3) : 193-201.

Fig. 1 : *Apharyngostrigea ramai* (Verma, 1936) Vidyarthi, 1937.

Materia : Host : *Bubulcus ibis coromandus* (Intestine); Loc. : Waltair, Andhra Pradesh.

Diagnosis : Length 2.04, fore body 1.12 × 0.88, hind body 0.92 × 0.496; oral sucker 0.16 and acetabulum 0.24 in diameter; tribocytic organ 0.32 × 0.35, testes 0.3 × 0.336 and 0.27 × 0.32; Ovary 0.16 × 0.28 and eggs 96 × 64 μ.

Distribution : India : Andhra Pradesh.

Elsewhere : Azarbaidzhan, China, Europe.

Genus 2 ***Strigea*** Abildgaard, 1970

Key to the species

1. Oviduct considerably long, sinuous and distended with spermatozoa .... *S. fulconis mcgregori*

2. Size of oviduct moderate, narrow ..... *S. orientalis*

2. ***Strigea fulconis mcgregori*** Tubangui, 1932
(Fig. 2)

1932. *Strigea fulconis mcgregori Tubangui Philip. J. Sc.* **47** (3) : 369-404.

Material : Host : *Milvus migrans govinda* (Sykes) Intestine; Loc. : Dairy farm stream area, Vishakhapatnam, A. P. 3 exs.

Fig. 2 : *Strigea fulconis mcgregori* Tubangui, 1932.

Diagnosis : Body 3.95-4.56, anterior part 1.6 × 1.68-2 and posterior part 1.4 – 1.56 in maximum width; oral sucker 0.19 – 0.24 × 0.16 – 0.19; acetabulum 0.32 in diameter; pharynx 0.12 – 0.16 × 0.12 – 0.16; anterior testis 0.32 – 0.4 × 0.64 – 1.04 and posterior testis 0.4 × 0.72; ovary 0.24 – 0.4 × 0.48 – 0.83; eggs 98 – 128 × 80 – 96 μ, oviduct considerably long, sinuous and distended with spermatozoa, recepticulum seminis absent. Laurer's canal well-developed. Mehli's gland diffused, spermatozoa stored in proximal coils of uterus.

Distribution : India : Andhra Pradesh, Uttar Pradesh.

Elsewhere : Phillippines.

3. ***Strigea orientalis*** Vidyarthi, 1937
(Fig. 3)

1937. *S. orientalis* Vidyarthi *Proc. Nat. Acad. Sc. India* **7** (2-3) : 193-201.

Material : Host : *Milvus migrans govinda* (Sykes), Intestine; Loc. : Dairy farm stream area, Vishakhapatnam, A. P. 2 exs.

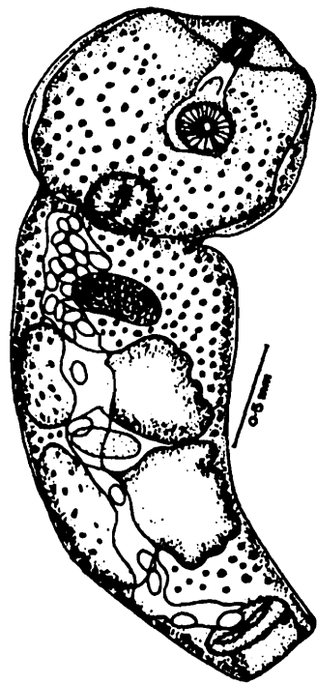


Fig. 3 : *Strigea orientalis* Vidyarthi, 1937.

Diagnosis : Body 2.16 – 3.36, forebody 0.65 – 1.232 in length, 1.24 in maximum width at forebody; 1.04 in maximum width at hind body; oral sucker 0.06 – 0.12 × 0.12; pharynx 0.09 – 0.11 × 0.09 – 0.11, acetabulum 0.16 – 0.22 × 0.22 – 0.25; testes 0.32 – 0.4 × 0.51 – 0.81 and 0.32 – 0.44 × 0.59 – 0.84; ovary 0.16 – 0.22 × 0.42 – 0.41 and eggs 96 × 64 μ.

Distribution : India : Andhra Pradesh.

Elsewhere : North America, Mexico.

Family II DIPLOSTOMIDAE Poirier, 1886.

Subfamily II DIPLOSTOMINAE Monticelli, 1892.

Key to the Genus

1. Testes asymmetrical, winding ..... *Diplostomum*
2. Testes symmetrical and not winding ..... *Neodiplostomum*

Genus 3 ***Diplostomum*** Von Nordmann, 1832.

4. ***Diplostomum spathaceum*** (Rud. 1819) Olsson, 1876.
(Fig. 4)

1819. *D. spathaceum* Rudolphi Berol. : **81**.

1876. *D. spathaceum* Olsson *Kongl. Sv. Vet. Akad. Handl.* **14** (1) : 35.

Material : Host : *Larus brunnicephalus* (Intentine); Loc. : Waltair coast. 1 ex.

Diagnosis : Length 2.34 with 0.94 foliacious forebody and 1.29 hind body; width 0.65 at the level of acetabulum; oral sucker 0.06 × 0.08; pharynx 0.04 × 0.04; acetabulum 0.09;

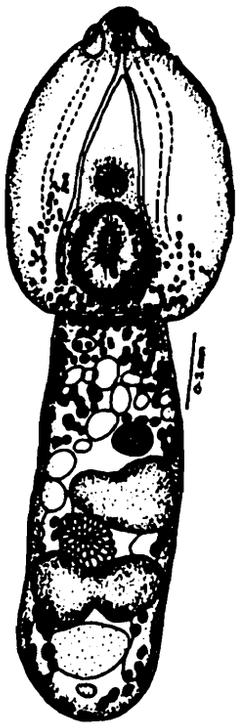


Fig. 4 : *Diplostomum spathaceum* (Rudolphi, 1819) Olsson, 1876.

forebody from anterior tip to acetabulum, 0.48; tribocytic organ 0.19 × 0.20; ovary 0.11; post ovarian space 0.89; testes 0.24 × 0.32 and 0.19 × 0.36 respectively and eggs 86 × 109μ.

Distribution : India : Andhra Pradesh

Elsewhere : Europe, Africa, Siberia.

Genus 4 ***Neodiplostomum*** Railliet, 1919

Key to species

1. Presence of spermatozoa containing bulb like oviducal sac ..... *N. migrans.*
2. Oviducal sac absent ..... *N. mehranium.*

5. ***Neodiplostomum mehranium*** Vidyarthi, 1938
(Fig. 5)

1938. *N. mehranium* Vidyarthi *Proc. Nat. Acad. Sci. India* **8** (3) : 76-84.

Material : Host : *Milvus migrans govinda*, Sykes (Intestine); Loc.: Dairy farm stream area, Visakahapatnam, Andhra Pradesh. 40 exs.

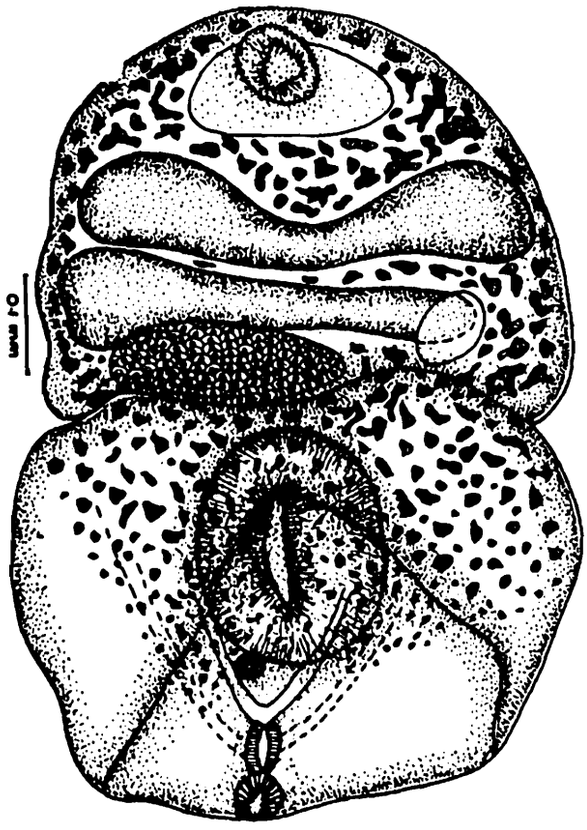


Fig. 5 : *Neodiplostomum mehranium* Vidyarthi, 1938.

Diagnosis : 1.04 – 1.29, long anterior foliaceous forebody 0.48 – 0.65 and cylindrical hind body, 0.55 – 0.64; width 0.56 – 0.72; oral sucker 0.05 – 0.07 × 0.05 – 0.06; pharynx 0.03 – 0.62 × 0.03 – 0.04; tribocytic organ 0.25 – 0.30 × 0.204 – 0.27; ovary 0.08 – 0.14 × 0.22 – 0.32; post ovarian space 0.38 – 0.48; testes 0.06 – 0.08 × 0.4 – 0.51 and 0.06 × 0.4 – 0.54 respectively, eggs 86 × 59 μ.

Distribution : India : Andhra Pradesh, Uttar Pradesh.

6. ***Neodiplostomum migrans*** Dubois et. Richard, 1964
(Fig. 6)

1964. *N. migrans* Dubois et. Richard *Bull. Mus. Nat. d'Hist. Nat. 2s* **36** (4) : 523-531.

Material : Host : *Milvus migrans govinda*, Sykes (Intestine); Loc. : Dairy Farm stream area, Vishakhapatnam, Andhra Pradesh. 12 exs.

Diagnosis : 2.16 – 3.36 long, forebody 0.65 – 1.23; width 1.26 – 1.04; oral sucker 0.06 – 0.12; pharynx 0.09 – 0.11 × 0.09 – 0.11; acetabulum 0.16 – 0.22 × 0.22 – 0.25; tribocytic

organ 0.32; testes 0.32 – 0.4 × 0.51 – 0.84 and 0.32 – 0.44 × 0.59 – 0.84; ovary 0.16 – 0.22 × 0.41 – 0.43 and eggs 96 × 64 μ; Oviduct short, cellular and it contains a bulb like dilatation,

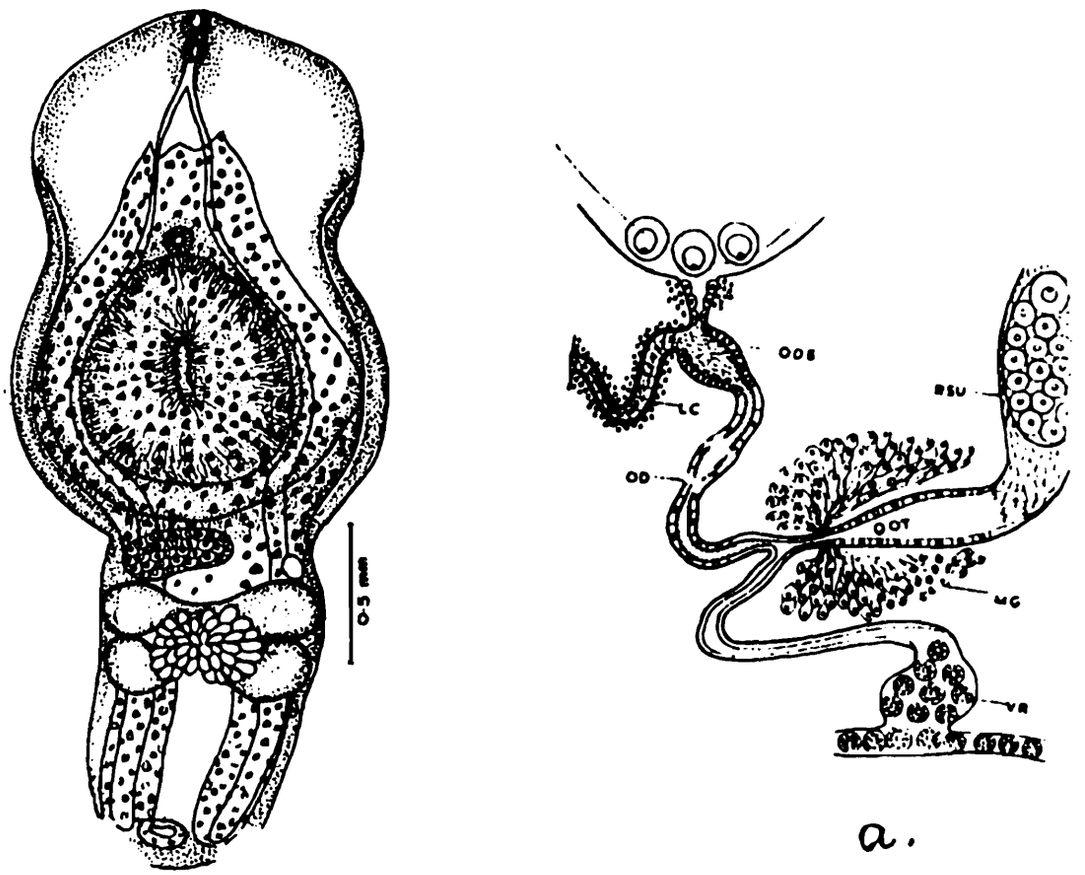


Fig. 6 : *Neodiplostomum migrans* Dubois et Richard, 1964; *Neodiplostomum migrans* Showing the genita organ.

oviducal sac containing spermatozoa; Laurer's canal short; Mehlis gland small and compact.

Distribution : India : Andhra Pradesh.

Genus 5 ***Prothodiplostomum*** Dubois, 1936

7. ***Prosthodiplostomum rayii*** Verma, 1936
(Fig. 41)

1936. *P. rayii* Verma *All. Univ. Stud.* **12** : 147-188.

Maerial : Host : *Ardeola grayii* (Sukes); Intestine; Locality : Vishakhapatnam, Andhra Pradesh.

Diagnosis : 4.88 long; forebody 2.24 × 0.755; hind body 2.64 × 0.34.

Distribution : India : Andhra Pradesh.

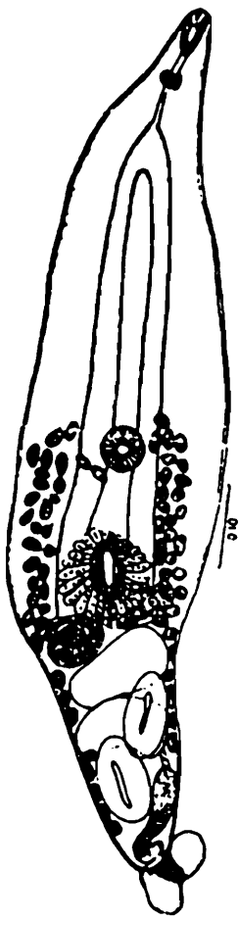


Fig. 41 : *Prosthodiplostomum raayii* Verma, 1936.

Family III CLINOSTOMATIDAE Luhe, 1901

Subfamily III CLINOSTOMINAE Pratt, 1902

Genus 6 ***Clinostomum*** Leidy, 1859

8. ***Clinostomum complanatum*** (Rud. 1814) Braun, 1899
(Fig. 7)

1899. *C. complanatum* Braun *Bull. Mus. Zool ed. Ant. Comp. Univ., Torino*, **14** : 1-3.

Material : Host : *Ardeola grayii* (Intestine); Loc : Bhimli, 5 exs.

Diagnosis : Body 3.766 – 5.056 in length and 0.75 – 1.07 in width at the level of acetabulum and 1.28 – 1.76 at the testicular level; oral sucker 0.12 – 0.25 × 0.22 – 0.38; acetabulum 0.52 – 0.67 × 0.44 – 0.59; testes 0.33 – 0.64 × 0.44 – 0.67 and 0.308 – 0.35 × 0.51 – 0.72; ovary 0.19 – 0.25 × 0.17; post ovarian space 1.29 – 1.44 and eggs 117 – 125 × 71 – 78 μ.

Distribution : India : Andhra Pradesh.

Elsewhere : Berlin, Cosmopoliton.

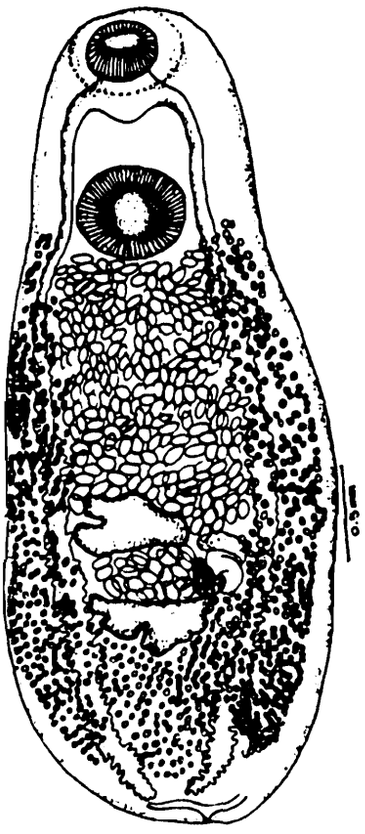


Fig. 7 : *Clinostomum complanatum* (Rudolphi, 1814) Braun, 1899

Family IV CYCLOCOELIDAE Kossak, 1991

Subfamily IV CYCLOCOELINAE Stossich, 1902

Key to the Genus

1. Uterine coils not extending beyond outer margin of caeca; testes separated one from the other by several uterine coils ..... ***Cyclocoelium***
2. Uterine coils extending laterally beyond vitellaria and reaching to lateral margins of body embracing or encircling two testes ..... ***Haematotrephus***

Genus 7 ***Cyclocoelium*** Brandes, 1892

9. ***Cyclocoelium elongatum*** Harrah, 1921
(Fig. 8)

1921. *C. elongatum* Harrah *J. Par.* 7 (4) : 162-165.

Material : Host : *Dicrurus adsimilis macrocercus* Vieillot; *Tringa glareola* (Lin.) (Location : Airsac), Locality : Waltair coast; 2 exs.

Diagnosis : length 10.19 – 26.08; width 1.68 – 5.6; Pharynx 0.27 × 0.27 – 0.27 × 0.28; genital pore ventral to posterior end of pharynx, anterior testis 0.41 × 0.33 – 1.36 × 1.71 and

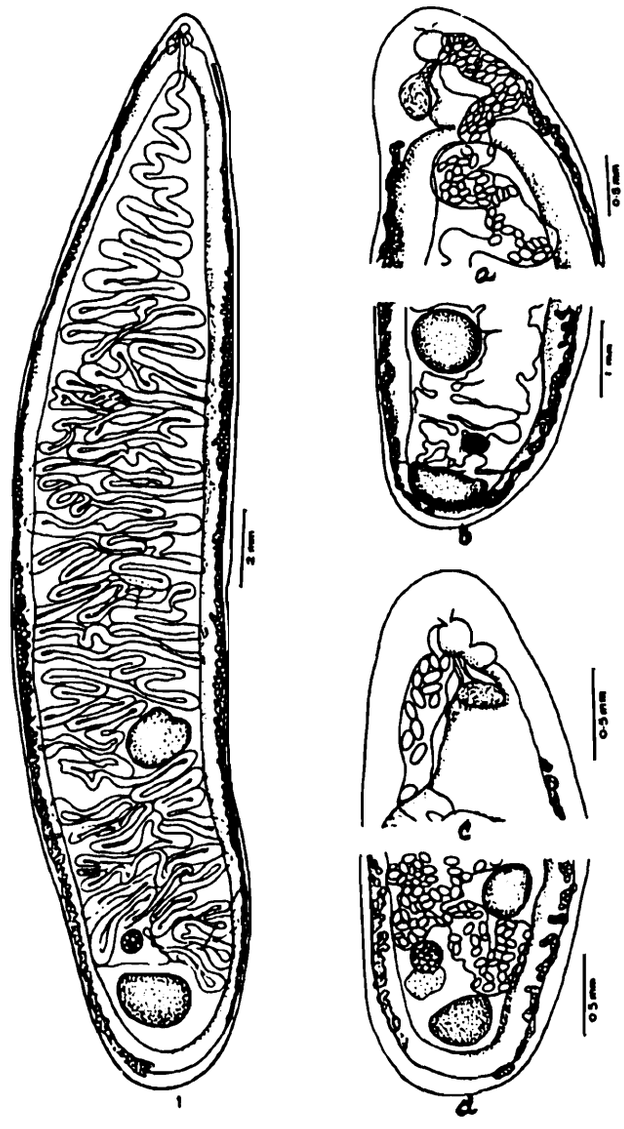


Fig. 8 : *Cyclocoelium elongatum* Harrah, 1921. a) *C. elongatum* showing anterior end. b) *C. elongatum* showing posterior end. c) *C. elongatum* showing anterior end. d) *C. elongatum* showing posterior end.

posterior testis 0.38 × 0.43 – 1.32 × 1.92; ovary 0.24 × 0.25 – 0.54 × 0.54; Eggs 11 × 78 – 140 × 94 μ.

Distribution : India : Andhra Pradesh.

Elsewhere : China, S. America.

Genus 8 ***Haematotrephus*** Stossich, 1902

10. ***Haematotrephus lancoelatum*** (Wedl., 1858) Stossich, 1902
(Fig. 9)

1902. *H. lancoelatum* Stossich *Zool. Ctbl.* **9** (13) : 406-407.

Material : Host : *Vanellus indicus indicus* (Location : Air sacs); Locality Waltair coast, 6 exs.

Diagnosis : Body 10.104 – 10.63 in length and 2 – 2.46 in maximum width; pharynx well-developed and is 0.33 – 0.44 × 0.35 – 0.46; genital pore on the ventral side at the base of pharynx; caeca without diverticles; testes non-contiguous, not separated by uterus, diagonal and lie inside caecal arch, 0.49 – 0.88 × 0.04 and 0.67 – 0.8 × 0.56 – 0.75 respectively; ovary anterodextral to anterior testis, at apex of unequitorial triangle and is 0.25 – 0.33 × 0.24 – 0.48; vitellaria lateral to caeca, may not unite posteriorly; uterine coils reaching to lateral margins of body; posterior most coil extending posterior to testes, encircling two testes; eggs numerous, 137 × 62μ when inside the uterus.

Distribution : India : Andhra Pradesh.

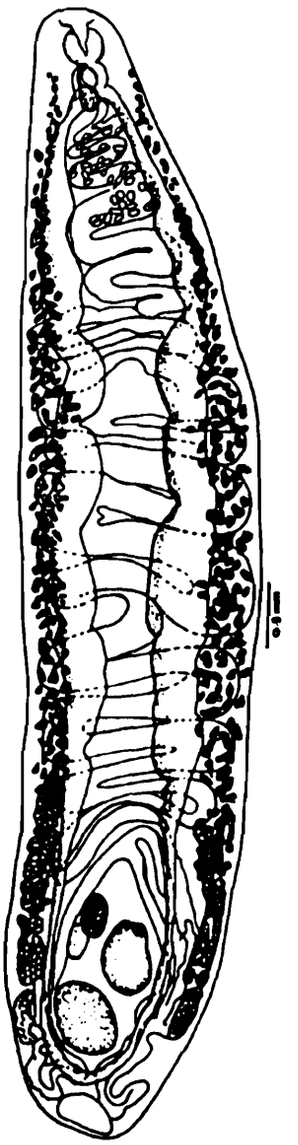


Fig. 9 : *Haematotrephus lancoelatum* (Wedl. 1858) Stossich, 1902.

Family V ECHINOSTOMATIDAE Poche, 1926

Subfamily V ECHINOCHASMINAE Odhner, 1910

Genus 9 *Echinochasmus* Dietz, 1909

Key to the subfamilies

1. Body lancoelate, markedly attenuated toward both extremities; oral sucker completely reduced; caeca undulating; vitellaria extending in lateral fields of hind body and occupying post of forebody around oesophagus and anterior portion of caeca; parasitic in bile-ducts; head collars reniform with single crown of spines ..... PEGOSOMINAE

   Collar spines otherwise ..... 2.

2. Collar spines interrupted dorsally, usually in single row; collar spines not extending posterior to testes; uterus short; eggs not numerous ..... ECHINOCHASMINAE

   Collar spines otherwise ..... 3.

3. Collar spines not interrupted dorsally. Usually in double row .... ECHINOSTOMATINAE

11. ***Echinochasmus bagulai*** Verma, 1935
(Fig. 10)

1935. *E. bagulai Proc. Ind. Acad. Sc.* **1** (2) : 837 – 856.

Material : Host : Ardeola grayii (Intestine), Locality : Vishakapatnam.

Diagnosis : Length 1.28 – 1.68; width 0.36 – 0.46 at the level of the acetabulum, oral sucker 0.04 – 0.64 in diameter; pharynx 0.08 – 0.09 × 0.06 – 0.09; acetabulum 0.208 – 0.24

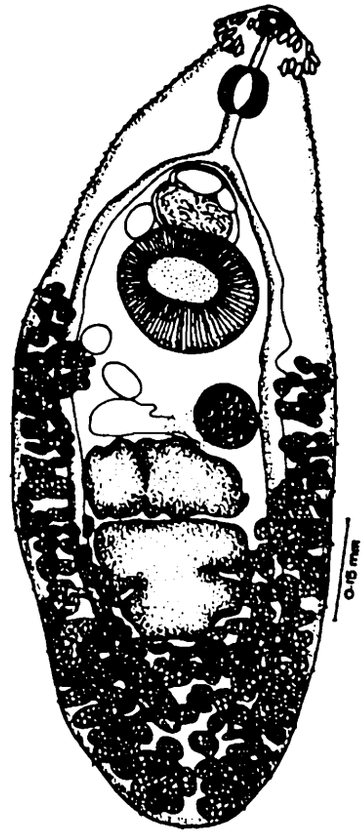


Fig. 10 : *Echinochasmus bagulai* Verma, 1936.

× 0.19 – 0.22; ovary 0.06 – 0.12 × 0.09; testes 0.09 – 0.14 × 0.24 – 0.27 and 0.24 – 0.27 × 0.16 – 0.44 × 0.22 – 0.25; cirrus sac 0.416 – 0.66 in length; post ovarian space 0.41 – 0.64; eggs 80 × 40 μ.

Distribution : India : Andhra Pradesh, Meghalaya, Uttar Pradesh.

Subfamily VI ECHINOSTOMATINAE (Looss, 1988) Faust, 1929.

Key to the Genus

1. Head collar with double corwn of spines; vitellaria usually reaching to near to aceatabulum ..... ***Echinostoma***

2. Head collar prominent with shallow dorsal incision and single corwn of spines; dorsal spines very small, acetabulum produced backward, very close to anterior extremity ..... ***Nephrostomum***

   Head collar otherwise 3

3. Head collar well developed, collar spines in two alternate rows dorsally, testes juxtaposed ..... ***Parallelotestis***

Genus 10 ***Echinostoma*** Rud., 1809

12. ***Echinostoma revolutum*** (Froelich, 1802) Looss, 1899
(Fig. 11)

1899. *E. revolutum* Looss *Zool. Jahrb. Syst.* **12** : 521-754.

Material : Host : *Corvus splendens*, Loc : Hyderabad.

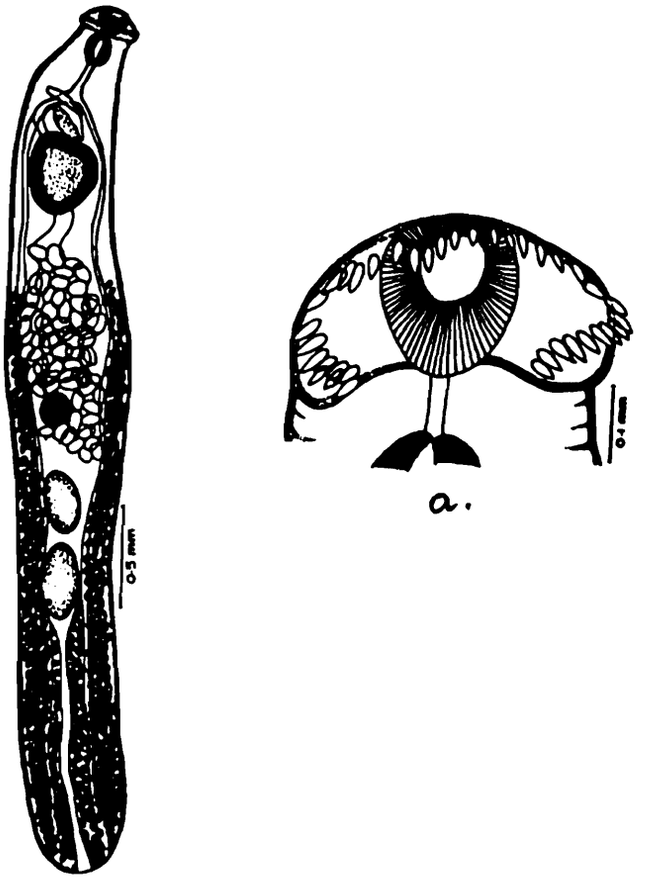


Fig. 11 : *Echinostoma revolutum* (Forelich, 1802) Looss, 1899; *Echinostoma revolutum* showing head collar with spines.

Diagnosis : Body length 3.28 – 4.46; width 0.44 – 0.72 at the level of the acetabalum and 0.56 – 0.88, just above the level of ovary; oral sucker 0.12 – 0.20 × 0.11 – 0.17; pharynx 0.12 – 0.20 × 0.11 – 0.17; acetabulum 0.44 – 0.52 × 0.35 – 0.52; forebody from anterior tip to acetabulum 0.67 – 1.04; ovary 0.19 – 0.208 × 0.12 – 0.28; testes 0.24 – 0.32 × 0.17 – 0.35 and 0.32 – 0.38 × 0.19 – 0.32 respectively; post ovarian space 1.31 – 2.28 and eggs 95 – 125 × 5.9 – 62 μ.

Remarks : The female reproductive system has been described in detail by Hanumantha Rao (1966) and Madhavi et. Hanumantha Rao (1972). An interesting feature here is the occurrence of a valve like structure in the form a narrow constriction between ootype and uterus.

Distribution : India : Andhra Pradesh, Meghalaya.

Elsewhere : Azarbaidzan.

Genus 11 ***Nephrostromum*** Deitz, 1909

13. ***Nephrostomum ramosum*** (Sonsino, 1895) Deitz, 1909
(Fig. 12)

1895. *N. ramosum* Sonsino *Bull. Soc. Med. Pisana* **1** (3-4) : 44-50.

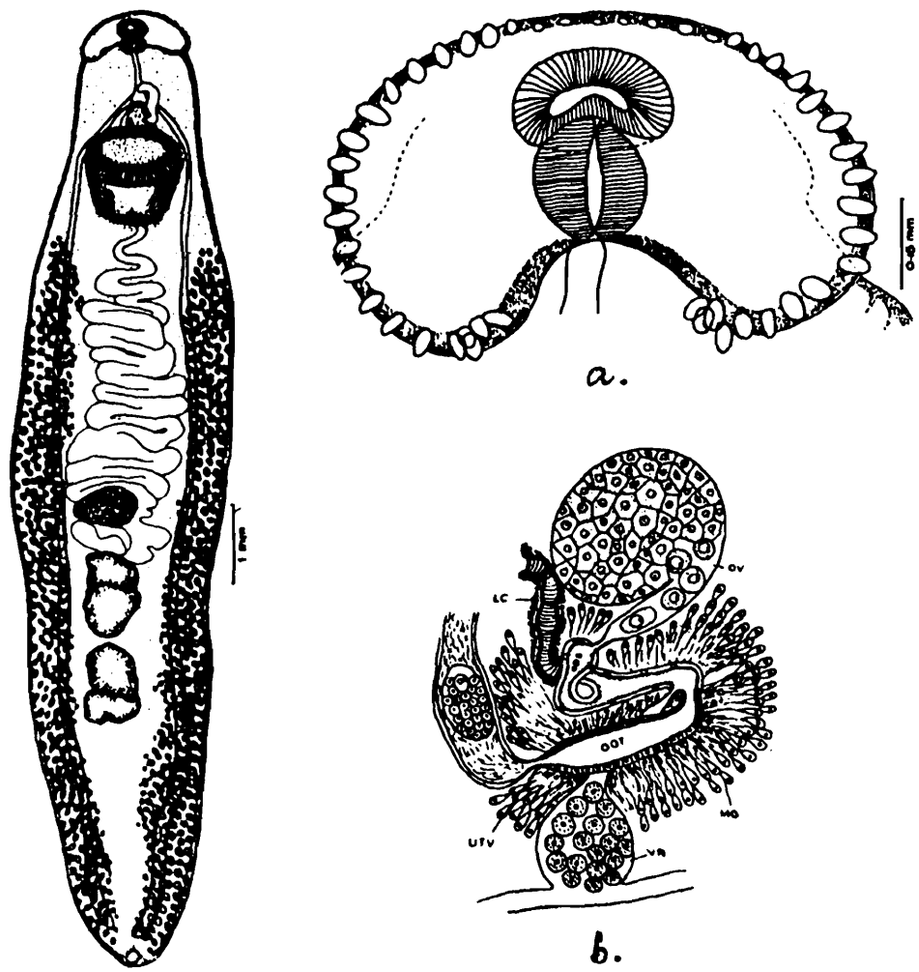


Fig. 12 : *Nephrostomum ramosum* (Sons. 1985) Deitz, 1909; *Nephrostomum ramosum* showing head collar with spines; *Nephrostomum* showing female reproductive system.

1909. *N. ramosum* Dietz *Vogel. Zool. Anz.* **23** (6) : 180-192.

Material : Host : *Bubulcus ibis coromandus* Boddaert (Intestine); Locality : Kondakarla, Vishakhapatnam; 12 exs.

Diagnosis : Length 9.44 – 9.6; width 1.232 – 1.92 at the level of the acetabulum and 1.792 – 2.88, just above the level of the ovary; oral sucker 0.17 – 0.25 × 0.25 – 0.48; pharynx 0.25 – 0.32 × 0.19 – 0.25; acetabulum 0.97 – 1.36 × 0.05 – 1.45; forebody 1.008 – 1.76; ovary 0.32 – 0.59 × 0.48 – 0.88; testes 0.91 – 1.31 × 0.59 – 0.72 and 0.91 – 1.37 × 0.51 – 0.68; post ovarian space 4.11 – 7.44 and eggs 98 – 117 × 59 – 66 μ.

Disribution : India : Andhra Pradesh.

Genus 12 ***Parallelotestis*** Bolopolskaya, 1954

14. ***Parallelotestis egretti*** (Srivastava, 1960) Gupta, 1964
(Fig. 13)

1964. *P. egretti* Gupta *Proc. Nat. Acad: Sci. Ind. Sect. B* **34** (4) : 459-462.

Material : Host : *Bubulcus ibis coromandus* (Boddaert) (Location : Liver); Locality : Shantiashram aream, Vishakhapatnam.

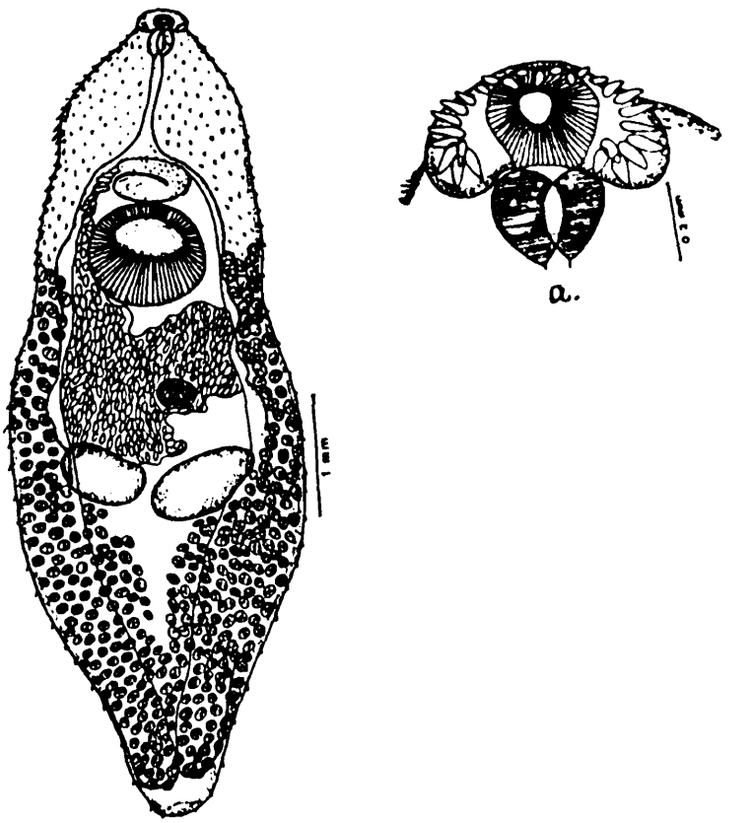


Fig. 13 : *Parallelotestis egretti* (Srivastava, 1960) Gupta et Gupta, 1964.; *Parallelotestis egretti* showing head collar with spines.

Diagnosis : Length 7.64 – 11.96; width 2.672 – 3.569 at acetabular level; oral sucker 0.12 – 0.16 × 0.17 – 0.24; pharynx 0.09 – 0.24 × 0.09 – 0.24; acetabulum 0.79 – 1.12 × 1.008 – 1.28; forebody 1.89 – × 0.64 – 0.8; left testis 0.48 – 0.89 × 0.64 – 0.8; right testis 0.608 – 0.89 × 0.62 – 0.8; ovary 0.24 – 0.44 × 0.28 – 0.51; post ovarian space 3.96 – 6.08; eggs 86 – 98 × 51 – 62 μ.

Distribution : India : Andhra Pradesh.

Elsewhere : Russia, Rhodensia.

Subfamily VII PEGOSOMINAE Mendheim, 1940

Genus 13 ***Pegosomum*** Ratz, 1903

15. ***Pegosomum egretti*** Srivastava, 1957
(Fig. 14)

1957. *P. egretti* Srivastava *Proc. Nat. Acad. Sci. India sB* **27** (3) : 129-134.

Material : Host : *Bubulcus ibis coromandus*, Buddaert (Location : Gall bladder, Liver); Locality : Shantiasram area of Vishakhapatnam; 12 exs.

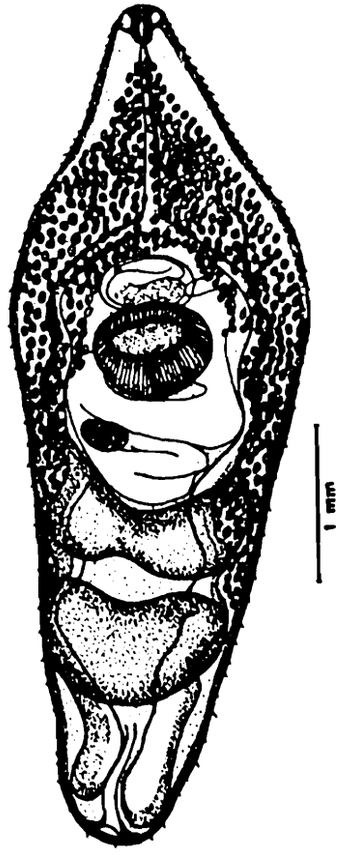


Fig. 14 : *Pegosomum egretti* Srivastava, 1957.

Diagnosis : Length 4.96 – 7.52; width 2.24 – 2.75 at the level of acetabulum; oral sucker 0.08 – 0.12 × 0.08 – 0.11; pharynx 0.16 – 0.19 × 0.11 – 0.42; acetabulum 0.8 – 0.8 × 0.8 – 0.96; forebody 2-2.48; ovary 0.32 – 0.4 × 0.32 – 0.48; testes 0.672 – 0.912 × 1.632 – 2.112

and 0.864 – 1.28 × 1.194 – 1.44; post ovarian space 2.48 – 3.28 and eggs 105 – 125 × 74 – 86 μ.

Distribution : India : Andhra Pradesh, North India, South India.

Family VI PHILOPHTHALMIDAE Travassos 1918

Subfamily VIII PHILOPHTHALMINAE Looss, 1899

Genus 14 ***Philophthalmus*** Looss, 1899

Key to species

1. Post ovarian space 1.12 – 1.162; eggs 78 × 32 μ ..... *P. offlexorius.*
2. Post ovarian space 0.912 – 0.96; eggs 86 – 89 × 39 μ ..... *P. nocturnus.*

15. ***Philophthalmus offlexorius*** Mamaev, 1059
(Fig. 15)

1959. *P. offlexorius* Mamaev *Trudi Gel. Lab. Akad. Nauk. SSSR.*, **9** : 160-174.

Material : Host : *Milvus migrans govinda* Sykes (Location : Orbital cavity) Locality : Yarada, Andhra Pradesh.

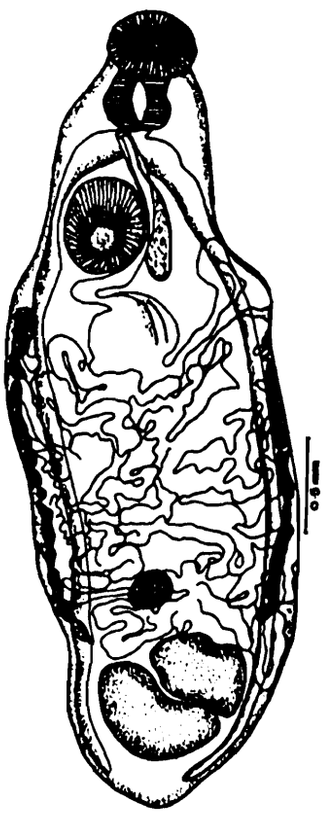


Fig. 15 : *Philophthalmus offlexorius* Mamaev, 1969.

Diagnosis : Length 4.72 – 4.8; width 1.36 – 1.52 at the middle region; oral sucker 0.24 – 0.25 × 0.11; acetabulum 1.04 – 1.05 × 0.64 from anterior extremity and is 0.51 – 0.51 × 0.48; pharynx 0.22 – 0.25 × 0.36; testes 0.49 – 0.52 × 0.54 and 0.43 – 0.65 × 0.64 – 0.72 respectively; cirrus sac 0.72 – 1.2 in length; ovary 0.27 – 0.32 × 0.256; post ovarian space 1.12 – 1.162; eggs 78 × 32 μ.

Distribution : India : Andhra Pradesh.

Elsewhere : E. Siberia.

17. ***Philophthalmus nocturnus*** Looss, 1907
(Fig. 16)

1907. *P. nocturnus* Looss *Zool. Anz.* **31** (19 – 20) : 585-620.

Material : Host : *Acridotheres tristis* (L.). (Location : Orbital cavity); Locality : Andhra University Campus and Waltair Coast.

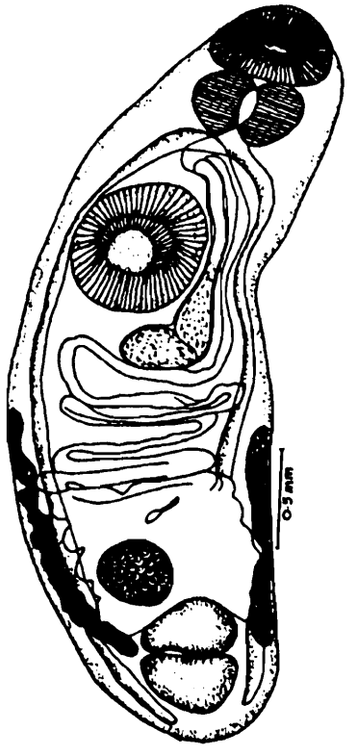


Fig. 16 : *Philophthalmus nocturnus* Looss, 1907.

Diagnosis : Length 5.31 – 5.45; width 1.36– 1.37; Oral sucker 0.28 – 0.36 × 0.54; pharynx 0.304 – 0.33 × 0.44 – 0.46; acetabulum 0.62 – 0.65 × 0.59; cirrus 1.68 – 1.76; anterior testis 0.24 – 0.27 × 0.56 – 0.57; posterior one 0.27 × 0.49 – 0.54; ovary 0.28 × 0.33 – 0.35; post ovarian space 0.91 – 0.96; forebody 1.37 – 1.45 and eggs 89– 86 × 39 μ.

Distribution : India : Andhra Pradesh and widely distributed

Elsewhere : Europe, Africa, America.

Family VIII DICROCOELIIDAE Odhner, 1910

Subfamily IX DICROCOELIINAE Looss, 1899

Key to the Genus

1. Testes and ovary separated by uterus ..... ***Brachylecithum***

   Separation of testes and uterus otherwise 2

2. Testes in post acetabular zone, ovary post-testicular; cirrus pouch claviform and largely prebifurcal ..... ***Lyperosomum***

3. Genital pore usually prebifurcal or post pharyngeal ..... ***Zoonorchis***

Genus 15 ***Brachylecithum*** Shtrom, 1940

18. ***Brochylecithum stunkardi*** (Pande, 1930) Denton et. Byrd, 1951 (Fig. 17)

1930. *B. stunkardi* Pande *Proc. Wash.* Ac. Sci. Ind. **9**(1) : 15-21.

1951. *B. stunkardi* Denton et. Byrd Proc., *U. S. Nat. Mus.* **102** (3274) : 157-202.

Fig. 17 : *Brachylecithum stunkardi* (Pande, 1930) Denton et Byrd, 1951; *Brachylecithum stunkardi* showing terminal genitalia.

Material : Host : *Starnus pagoderum* (Gmelin) (Location : Gall bladder); Location : Dairy farm fish area, Guntur; 6 exs.

Diagnosis : Length 3.24 – 4.64 in length; 0.4 – 0.57 at maximum width attained at the middle of the body; forebody 0.32 – 0.54; oral sucker 0.14 – 0.16 × 0.12 – 0.14; pharynx 0.06 in diameter, acetabulum 0.24 – 0.28 × 0.24 0.28; testes 0.16 – 0.208 × 0.19 – 0.24 and 0.16 – 0.208 × 0.208 – 0.35; cirrus sac 0.19 – 0.24 × 0.08; ovary 0.11 – 0.16 × 0.16; post ovarian space 2-3.12; eggs 39-45 × 23 – 25 μ.

Distribution : India : Andhra Pradesh.

Elsewhere : U. S. A.

Genus 16. ***Lyperosomum*** Looss, 1899

19. ***Lyperosomum skrjabini*** Jaiswal, 1957

1957. *L. skrjabini* Jaiswal *Zool. Jahrb. Syst.* **85** (1-2) : 1-72.

Material : Host : *Corvus splendens* (Location : Liver). Locality : Hyderabad, Andhra Pradesh, 2 exs.

Diagnosis : Length 4.26 – 5.54, width 0.35 – 0.38; oral sucker 0.15 – 0.16 × 0.15 – 0.18; ventral sucker 0.23 – 0.28 × 0.24 – 0.26; pharynx 0.09 – 0.09 × 0.06 – 0.07, anterior testis 0.14 – 0.18 × 0.17 – 0.19, posterior testis 0.16 – 0.16 × 0.15 – 0.19; ovary 0.12 – 0.14 × 0.16 – 0.18, eggs 0.02 – 0.04 × 0.02 – 0.02.

Remarks : Author collected 2 examples from the liver of Indian crow, *Corvus splendens*, from Hyderabad. The fluke after detail examination was proved to be identical with *L. skrjabini* Jaiswal, 1957 but with slight variations in the dimensions of the body, which may be due to different degrees of contraction and growth changes.

Distribution : India : Hyderabad; Andhra Pradesh.

Genus 17 ***Zoonorchis*** Travassos, 1944

20. ***Zoonorchis travassosi*** Jaiswal, 1957
(Fig. 40)

1957. *Z. travassosi* Jaiswal *Zool. Jahrb. Syst.* **85** (1-2) : 1-72.

Material : Host : *Sexicoloides fulicata cambalensis* (Bush Bird) (Location : Liver); Locality : Hyderabad, Andhra Pradesh, 1 ex.

Diagnosis : Length 1.3, width 0.74, oral sucker 0.14 × 0.12. pharynx 0.04 × 0.05, ventral sucker 0.17 × 0.18; oesophagus 0.07, left testis 0.08 – 0.19, right testis 0.08 – 0.09, ovary 0.08 × 0.09; eggs 0.007 – 0. 007 × 0.011 – 0.015 μ.

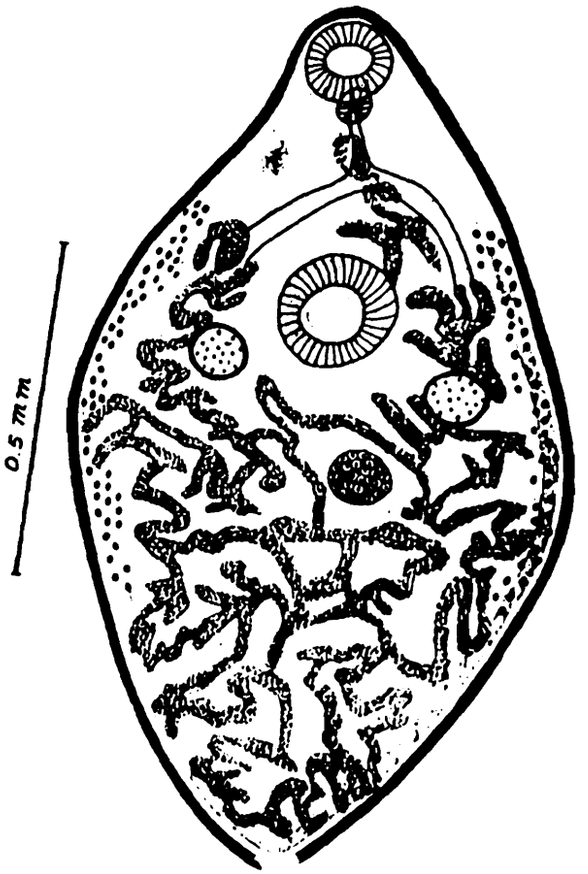


Fig. 40 : *Zoonorchis travassosi* Jaiswal, 1957

Distribution : India : Hyderabad, Andhra Pradesh.

Family VIII EUMEGACETIDAE Travassos, 1992

Subfamily X EUMEGACETINAE Mehra, 1935

Genus 18 ***Eumegacetes*** Looss, 1900

Key to the species

1. Suckers are of unequal size 2

   Suckers are of equal size 6

2. Position of testes clearly above acetabular zone 3

   Position of testes otherwise 5

3. Position of testes not in pharyngeal zone ..... *E. longicirratus*

   Position of testes otherwise 4

4. Oral sucker smaller than acetabulum. Position of testes clearly above the acetabular zone ..... *E. hyderabadensis*

Oral sucker smaller than the ventral sucker; testes spherical ..... *E. singhii*

5. Testes oval, immediately above acetabulum and with epidydimoids ..... *E. indicus*

Testes equatorial in position, ovary immediately behind ventral sucker, genital pore at the anterior level of pharynx ..... *E. megacetabulus*

6. Testes immediately above acetabulum, ovary behind ventral sucker..... *E. medioximus.*

Vitellaria confined to the anterior half of the body 7

7. Excretory vesicle 'Y' shaped, vitelline follicles reach upto anterior margin of testes... ..... *E. triangularis*

Excretory vesicle 'Y' shaped 8

8. Length of body 1.67 and width 0.75 ..... *E. hirundiosus*

Length of body 4.26 – 2.36 width 2.28 – 2.53 ..... *E. centropius*

21. ***Eumegacetes medioximus*** Braun, 1901
(Fig. 18)

1901. *E. medioximus* Braun *Ctbl. Bakt. I.* **29** : 12-19.

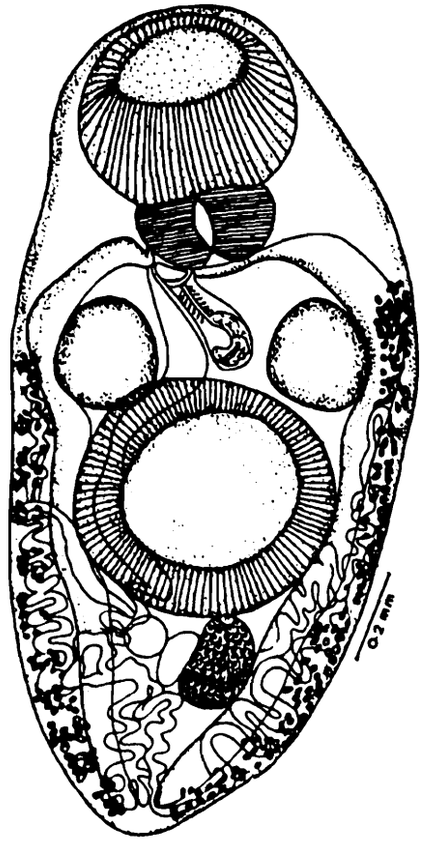


Fig. 18 : *Eumegacetes medioximus* Braun, 1901.

Material : Host : *Acridotheres tristis* (L.) (Location : Posterior part of intestine and rectum); Locality : Vishakhapatnam; 2 exs.

Diagnosis : Body smooth, length 2.06 – 2.27; width 1.04 – 1.05; oral sucker 0.52 – 0.54 × 0.57 – 0.62; pharynx 0.19 – 0.208 × 0.304; acetabulum 0.57 – 0.64 × 0.64; caeca globular and reaching upto caecal end; testes 0.24 – 0.304 × 0.24 – 0.27 and 0.27 – 0.32 × 0.19 – 0.27; cirrus sac 0.38 × 0.16; ovary 0.24 × 0.16 – 0.17; vitellaria follicular, reaching upto anterior margin of testes, eggs 27 x16 μ, excretory vesicle 'V' shaped.

Distribution : India : Andhra Pradesh.

22. ***Eumegecetes triangularis*** Looss, 1900
(Fig. 19)

1900. *E. triangularis* Looss *Zool. Anz.* **23** : 601-608.

Material : Host : *Dicrurus adsimilis macrocercus* Vielliot (Location : Intestine); Locality : Chittivalasa, Andhra Pradesh; 1 ex.

Diagnosis : Body smooth, length 2.704, width 1.36; oral sucker 0.64 × 0.67; acetabulum 0.704; pharynx reaching upto the posterior end; testes 0. 208 × 1.25 and 0.34 × 0.22; cirrus sac 0.4 × 0.16; ovary 0.22 × 0.17, vitelline follicle reaching upto the anterior margin of testes; eggs 23 – 27μ, excretory bladder 'V' shaped.

Distribution : India : Andhra Pradesh.

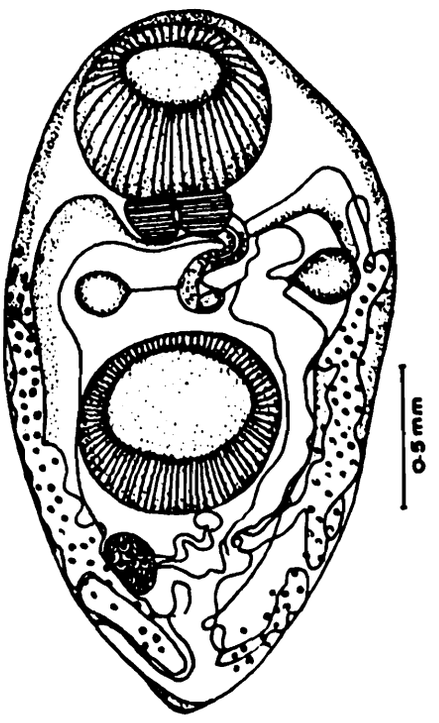


Fig. 19 : *Eumegacetes triangularis* Looss, 1900.

23. ***Eumegacetes hirundiosus*** Jaiswal et. Vasudev, 1960
(Fig. 20)

Material : Host : *Hirudo rostica rostica*, Common Swallow (Location : Intestine); Locality : Hyderabad, Andhra Pradesh.

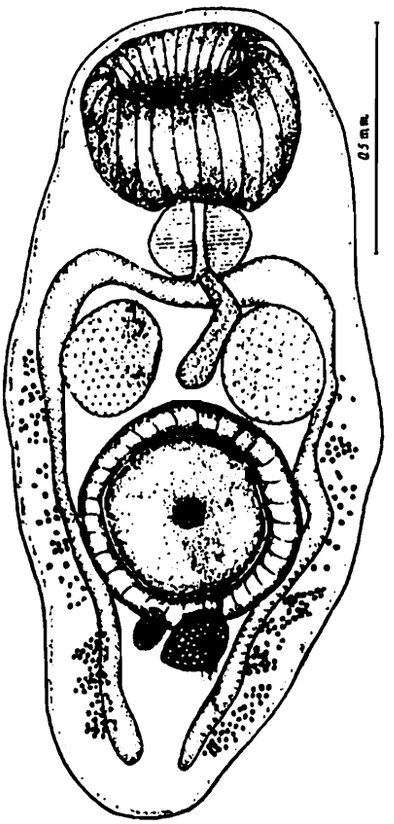


Fig. 20 : *Eumegacetes hirundiosus* Jaiswal et Vasudev, 1960.

Diagnosis : Body elongate-oval in shape, with a broadly anterior end and a narrow pointed posterior end increasing 1.67 in length and 0.75 in widest portion of the body. The oral sucker measures 0.45 – 0.41 and the ventral sucker 0.48 – 0.47; pharynx 0. 20 – 0.16, caeca terminate in the sub-caudal region, testes elongate-oval, the right testis measures 0.19 – 0.22 and the left one 0.19 – 0.23; ovary 0.26 – 0.2.

Distribution : India : Hyderabad, Andhra Pradesh.

24. ***Eumegacetes megacetabulus*** Jaiswal et. Vasudev, 1960
(Fig. 21)

1960. *E. megacetabulus* Jaiswal et. Vasudev *Z. Par.* **20** : 175-190.

Material : Host : *Halcyon fusca fusca* (Location : Intestine); Locality : Hyderabad, Andhra Pradesh, India.

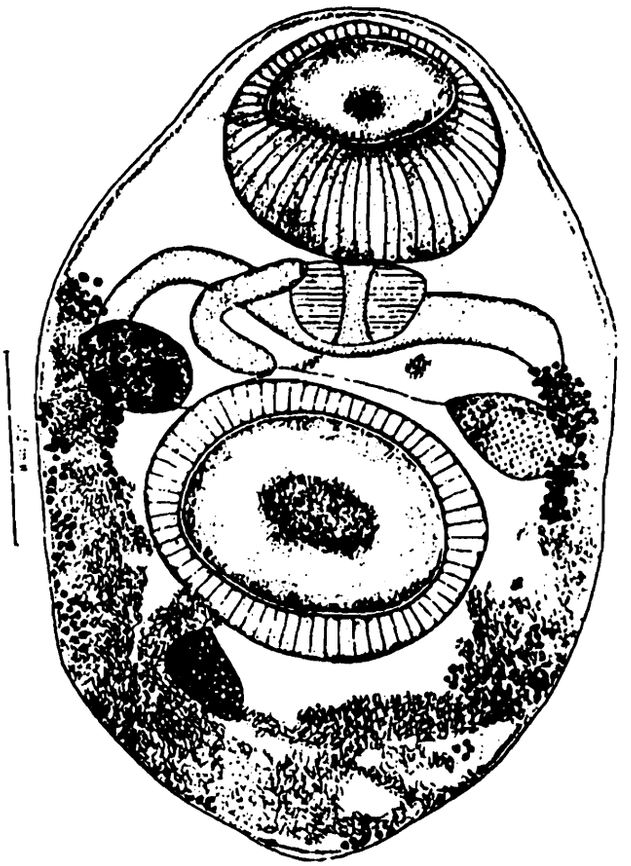


Fig. 21 : *Eumegacetes megacetabulus* Jaiswal et Vasudev 1960.

Diagnosis : Body ovoid with a round anterior and broad posterior end measuring 2.17 – 2.34 × 1.32 – 1.47; oral sucker 0.70 – 0.71 × 0.60 – 0.64 and the acetabulum 0.70 – 0.83 × 0.72 – 0.73; pharynx 0.35 – 0.36 × 0.17 – 0.20; testes 0.25 – 0.34 × 0.19 – 0.22 and 0.28 – 0.30 × 0.22, ovary elongate-oval, 0.17 – 0.22 × 0.11 – 01, vitellaria extend far beyond the anterior boarder of testes, reaching upto the level of the pharynx.

Distribution : India : Andhra Pradesh.

25. ***Eumegacetes hyderabadensis*** Jaiswal et. Vasudev, 1960
(Fig. 25)

1960. *E. hyderabadensis* Jaiswal et. *Vasudev Z. Par.* **20** : 175-190.

Material : Host : *Lanius excubator lahtora*, Indian Grey Shrike (Location : Intestine); Locality : Visakhapatnam.

Diagnosis : Body elongate oval, length 2.83, oral sucker terminal, measuring 0.54 – 0.45; ventral sucker bigger than the oral sucker, 0.58 – 0.56, pharynx 0.28 – 0.17, right testis 0. 32 – 0.37 and the left one 0.26 – 0.32; ovary 0.20 – 0.24; eggs 25 – 30 μ × 8 – 12 μ.

Distribution : India : Andhra Pradesh.

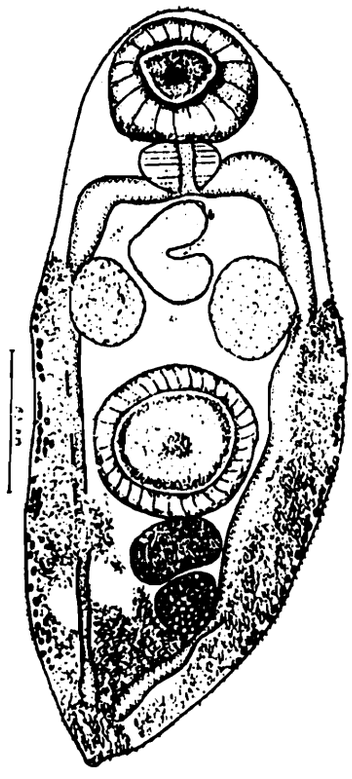


Fig. 25 : *Eumegacetes hyderabadensis* Jaiswal et. Vasudev, 1960.

26. ***Eumegacetes centropius*** Jaiswal et. Humayun, 1973
(Fig. 22)

1973. *E. centropius* Jaiswal et. Humayun. *Proc. Helm. Soc. Wash* **40** (1); 52-56.

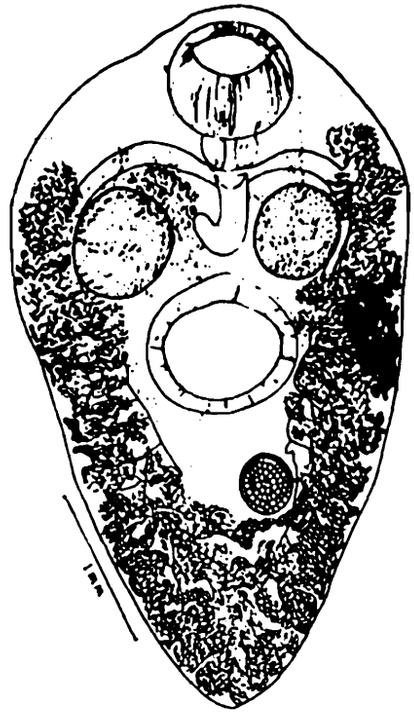


Fig. 22 : *Eumegacetes centrotropius* Jaiswal et Humayun, 1973.

Material : Host : *Centropius sinensis,* Crow-pheasant (Location : Kidney); Locality : Hyderabad, Andhra Pradesh.

Diagnosis : Body broader anteriorly and narrower posteriorly; 4.26 – 4.36, width 2.28 – 2.53 at the maximum level. Acetabulum slightly bigger than the oral sucker, 0.84 – 0.88 × 0.91 – 0.96. oral sucker measuring 0.73 – 0.76 × 0.71 – 0.79, sub-terminal and opens into muscular pharynx. Excretory bladder 'V' shaped with long cornua. Genital pore median, opens above the caeca. Testes symmetrical, oval. Right testis 0.64 – 0.68 × 0.44 – 0.64 and the left one 0.58 – 0.6 × 0.5 × 0.55. Ovary rounded, 0.38 – 0.44 × 0.34 – 0.35. Vitellaria small, irregular, lateral, mostly extra-caecal, curved by the uterus. Eggs thin shelled, 18 – 23 × 8 – 11μ.

Distribution : India : Andhra Pradesh.

27. ***Eumegacetes longicirratus*** Jaiswal et. Vasudev, 1960
(Fig. 23)

1960. *E. longicirratus* Jaiswal et. Vasudev *Z. f. Par* **20** : 175-190.

Material : Host : *Hirundo smithii filifera* (Location : Cloaca); Locality : Hyderabad, Andhra Pradesh.

Diagnosis : Body oval with a blunt anterior and a slightly pointed posterior end, 1.85 – 2.89 and 1.12 – 1.89 at the maximum width. Oral sucker sub terminal, 0.44 – 0.65 × 0.45 – 0.68. Acetabulum 0.38 – 0.60 × 0.41 – 0.62. Intestinal caeca fairly long and terminate at

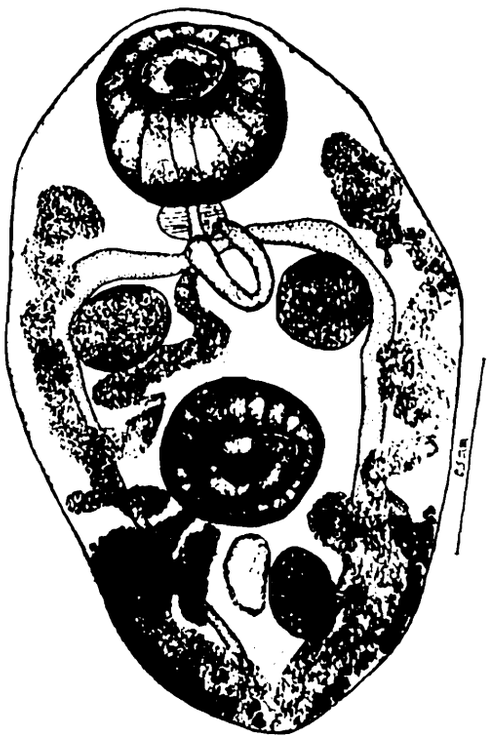


Fig. 23 : *Eumegacetes longicirratus* Jaiswal et Vasudev, 1960.

about the level of the ovary. Excretory vesicle 'V' shaped. Right testis 0.19 – 0.37 × 0.20 – 0.25 and the left one 0.22 – 0.32 × 0.19 – 0.25. Cirrus sac much elongated and is placed to the left. Seminal vesicle coiled, the genital opening is median immediately behind the pharynx.

Distribution : India : Andhra Pradesh.

28. ***Eumegacetes indicus*** Jaiswal et. Vasudev, 1960
(Fig. 24)

1960. *E. indicus* Jaiswal et. Vasudev. *Z. f. Par.* **20** : 175-190.

Material : Host : *Temenuchus pegodrum* (Black – headed myna) (Location : Intestine); Locality : Hyderabad, Andhra Pradesh.

Diagnosis : Body spined, elongate-oval, 3.62 × 1 – 3.7 in maximum width, oral sucker strongly muscular, 0.58 × 0.70; acetabulum slightly larger than the oral sucker, placed at about the equatorial plane of the body, 0.74 × 0.84. Ceaca extend posteriorly far beyond the ovary into the sub-caudal region, excretory bladder 'V' shaped, testes oval, lying above the acetabulum, 0.35 × 0.27 and 0.42 × 0. 29, with a prominent structure, the epidydimoid at the inner and outer testicular margins; ovary pear-shaped, 0.24 – 0.13, placed midway between the tips of the caeca and the acetabulum. Vitellaria placed laterally much above the level of the testes; eggs 29 × 11 μ.

Distribution : India : Andhra Pradesh, West Bengal.

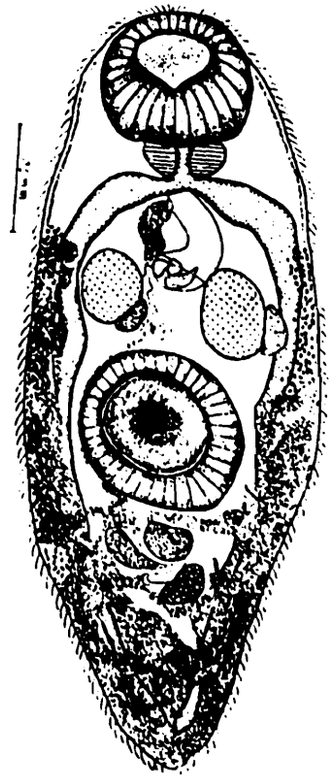


Fig. 24 : *Eumegacetes indicus* Jaiswal et. Vasudev, 1960.

29. *E. singhi* Jaiswal., 1957

1957. *E. singhi* Jaiswal *Zool. Jahrb. Syst.* **85** (1-2) : 1-72.

Material : Host : *Centropius sinensis* (Location : Intestine); Locality : Hyderabad, India.

Diagnosis : Body smooth, 4.3 in long and 1.78 at maximum width, acetabulum at immediately posterior to the equatorial level of the body. Vitellaria extend anteriorly slightly beyond the testicular level; ovary bean-shaped, lies in the caudal region at about the terminal ends of the caeca; eggs 20 – 28 × 8 - 11 μ.

Distribution : India : Andhra Pradesh.

30. *Eumegacetes vishakhapatnamensis* Gandhi, 1978
(Fig. 26)

1978. *E. vishakhapatnamensis* Gandhi *Unpublished thesis* : 109-111

Material : *Merops phillippinus phillippinus* (Location : Intestine).

Diagnosis : Body elongate-oval, 3.04 – 5.28; maximum width 0.96 – 1.488. Oral sucker strongly muscular, sub-terminal, ventral, 0.304 – 0.48 × 0.36 – 0.54. Acetabulum 0.4 – 0.56 × 0.38 – 0.59. Pharynx 0.12 – 0.38 × 0.17 – 0.35. Testes rounded, entire. Right testis 0.36 – 0.52 × 0.32 – 0.43 and the left one 0.33 – 0.49 × 0.33 – 0.44. Ovary oval, 0.32 – 0.4 ×

Fig. 26 : *Eumegacetes vishakhapatnamensis* Gandhi, 1978.

0.28 – 0.38, uterus saccular, eggs small, 23 – 27μ. Excretory system 'Y' shaped, excretory pore terminal.

Distribution : India : Vishakhapatnam, Andhra Pradesh.

Family IX MACROPHALIIDAE Travassos, 1921

Subfamily XI MACROPHALIINAE Ward, 1901

Genus 19. ***Macrophallus*** (Ward, 1901) Baer, 1943

31. ***Microphallus primas*** (Jaegerskioeld, 1908) Stunkard, 1951
(Fig. 27)

1908. *M. primas* Jaegerskioeld *Ctbl. Bakt. I.* **48** (3) : 302-317.

1951. *M. primas* Stunkard *J. Par* **39** (3) : 225.

Material : Host : *Larus argentitus mongolicus* Sushkin (Location : Intestine) Locality : Waltair coast, Andhra Pradesh; 4 exs.

Diagnosis : Body 0.6, oral sucker, 0.05; pharynx 0.03 × 0. 02; acetabulum 0.05; male muscular papilla having greater diameter than that of the acetabulum and is 0.06 long, 0.08 – 0.04 in diameter at the base and 0.05 – 0. 06 at the distal extremity. Metraterm is not well developed and is 0.03 – 0.04 long (approximately). Eggs small and are 14 – 15μ.

Distribution : India : Waltair; Andhra Pradesh.

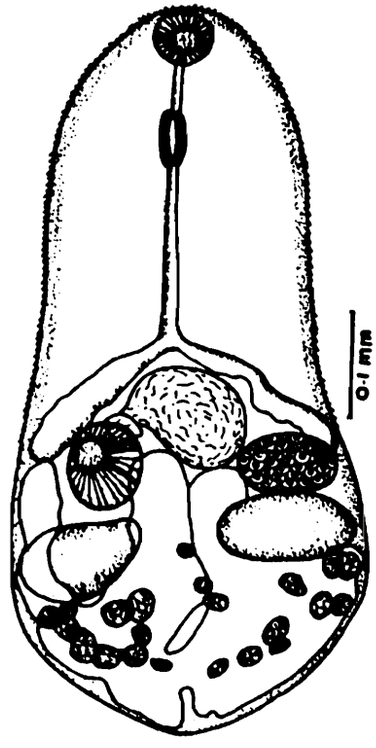


Fig. 27 : *Microphallus primas* (Jaegerskicold, 1908) Stunkard, 1951.

Family X PLAGIORCHIIDAE Lühe, 1901

Subfamily XII PLAGIORCHIINAE Pratt, 1902

Genus 20 *Plagiorchis* Lühe, 1899

32. *Plagiorchis elegans* (Rudolphi, 1892) Braun, 1902
(Fig. 28)

1802. *P. elegans* Rudulphi *Ent. Sci. vermium. Int. His. Nat.* I *Ams* : 5-27.

1902. *P. elegans* Braun *Zool. Jahrb,* **16** : 162.

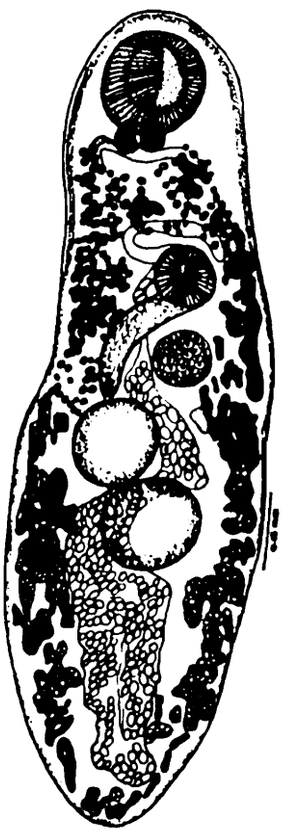


Fig. 28 *Plagiorchis elegans* (Rud.1802) Braun, 1902

Material : Host : *Larus argentitus mongolicus* Sushkin (Location : Intestine); Locality : Waltair Coast, Andhra Pradesh; 4 exs.

Diagnosis : Length 1.85 – 2.19; 0.43 – 0.5 in width at the level of the acetabulum and 0.52 in maximum width attained at the level of the testes; cuticle spinose anteriorly, oral sucker 0.22 – 0.24 × 0.22; pharynx 0.08 – 0.09 × 0.09 – 0.11; acetabulum 0.16 × 0.14 – 0.16; forebody 0.52 – 0.64, testes 0.22 – 0.24 × 0. 208 – 0.22 and 0.24 × 0.19 – 0.208; ovary 0.14 × 0. 12 – 0.14 and eggs 35 × 25μ, when they are inside the uterus.

Distribution : India : Waltair, Andhra Pradesh.

Elsewhere : Europe, Russia (including East Siberia), North America.

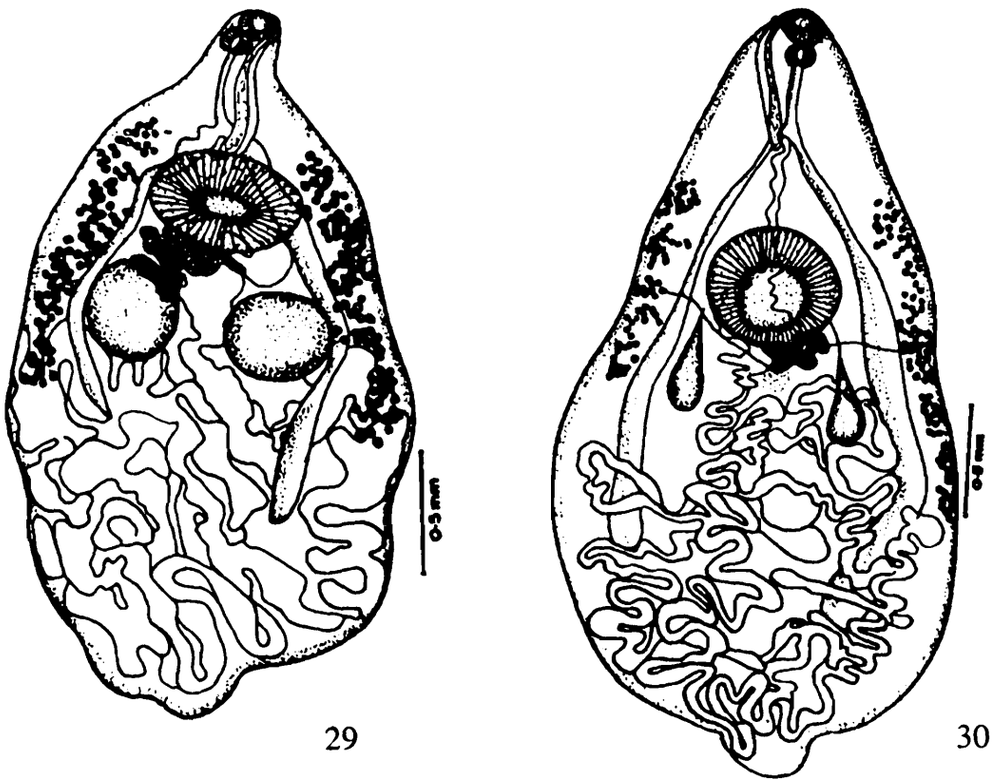
Family XI PROSTHOGONIMIDAE Nicoll, 1924

Genus 21 ***Prosthogonimus*** Lühe, 1899

33. ***Prosthogonimus cuneatus*** (Rudolphi, 1809), Braun, 1901
(Fig. 29 & 30)

1809. *P. cuneatus* Rudolphi *Ent. Sive Verma int. hist. nat.* **I.** *Ams.* : 527.

1901. P. *cuneatus* Braun *Ctbl. Bakt. I.*, **29** : 12–19.



29 30

Fig. 29-30 : 29. *Prosthogonimus cuneatus* (Rud., 1809) Braun, 1901 from *Ardeola grayii;* 30. *Prothogonimus cuneatus* (Rud., 1809) Braun, 1901 from *Acridotheres tristis.*

Material : Host : *Larus argentitus mongolicus* Sushkin, *Ardeola grayii* Sykes, *Acridotheres tristis* (L.) (Location : Bursa fabrici); Locality : Vishakahpatnam, Andhra Pradesh.

Diagnosis : Length 5.28 – 5.52; width 2 – 2.058 × 2.67 (at the level of the acetabulum), oral sucker 0.208 – 0.21; pharynx 0.12 × 0.14; acetabulum 0.608 – 0.73; forebody 1.32 – 1.39; ovary 0.56 – 0.76; anterior testis 0.8 – 1.03 and the posterior testis 0.8 – 1.03; post-ovarian space 2.84 – 3.28; eggs 23 × 16μ.

Distribution : India : Andhra Pradesh.

Elsewhere : U. S. A., Mexico.

Family XII STOMYLOTREMATIDAE (Travassos, 1922) Poche, 1926

Genus 22 *Stomylotrema* Looss, 1900

34. *Stomylotrema vicarium* Braun, 1901
(Fig. 31)

1901. *S. vicarium* Braun *Mitt. Zool. Mus. Berlin* **2** : 1-58.

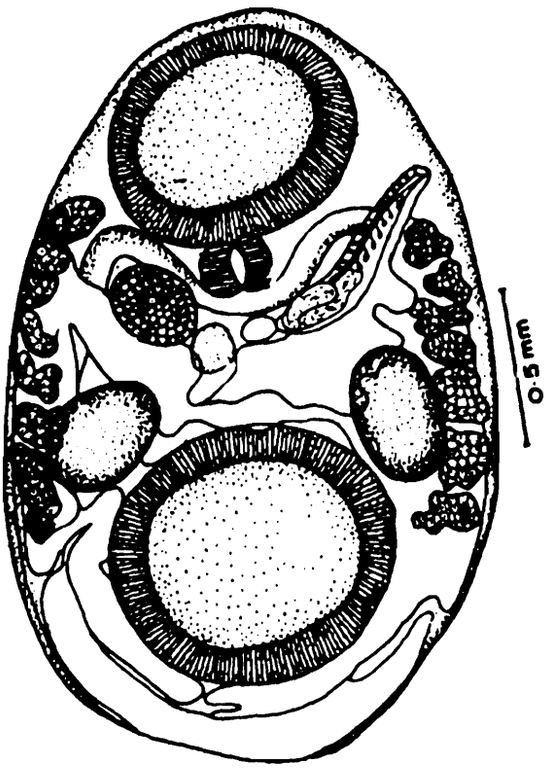


Fig. 31 : *Stomylotrema vicarium* Braun, 1901

Material : Host : *Bubulcus ibis coromandus*, *Pediceps ruficollis capensis* (Location : Cloaca and bursa fabricii); Locality : Kondakarla, Andhra Pradesh, 2 exs.

Diagnosis : Length 2.49; width 1.31; oral sucker 0.68 × 0.67; acetabulum 0.68 × 0.65; pharynx 0.16 × 0.25; testes 0.36 × 0.33 and 0.35 × 0.35, cirrus sac 0.8 × 0.16; ovary 0.27 × 0.25 and eggs 35 × 23μ.

Distribution : India : Andhra Pradesh.

Elsewhere : Brazil, Argentina.

Family XIII HETEROPHYIDAE (Leiper, 1909) Odhner, 1914

Key to the subfamilies

1. Common genital sucker present ..... HETEROPHYINAE
– Common genital sucker absent 2

2. Uterus reaching to posterior extremity ..... GALACTOSOMINAE

– Uterus not reaching to posterior extremity 3

3. Testes single, near posterior extremity ..... HAPLORCHIINAE

– Testes usually assymmetrical, more or less widely separated from posterior extremity.. ..... STICTODORINAE

Subfamily XIII GALACTOSOMINAE Ciurea, 1899

Genus 23 *Galactosomum* Looss, 1899

35. *Galactosomum puffini* Yamaguti, 1941
(Fig.32)

1941. *G. puffini* Yamaguti *Nat. Trans. Biogeograph Soc. Japan* **3** (4) : 329-398.

Material : Host : *Larus argentatus mongolicus* Sushkin (Location : Intestine); Locality : Waltair Coast, Andhra Pradesh, 16 exs.

Diagnosis : Length 2.12 – 2.59; width 0.38 – 0.48; fore body 0.48 – 0.73; oral sucker 0.08 in diameter, acetabulum 0.08 in diameter, eggs 31 – 35 × 20 – 23 μ.

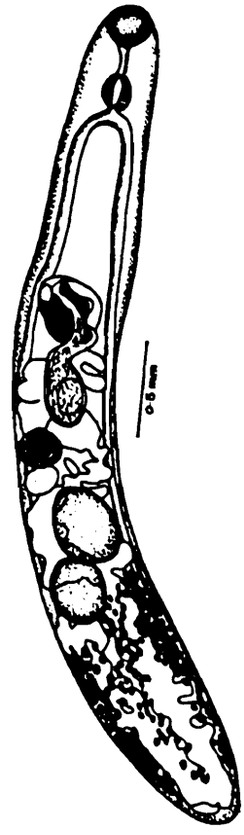


Fig. 32 : *Galactosomum puffini* Yamaguti, 1941.

The female reproductive system of the species discernible, recepticulum seminis and Laurer's canal present. Mehli's gland is small and compact.

Distribution : India : Andhra Pradesh.

Elsewhere : Japan, Panama, Poerto Rico, Russia, Mexico.

Subfamily XIV HAPLORCHIINAE Looss, 1899

Genus 24 *Haplorchis* Looss, 1899

Key to Species

1. Maximum width of the body at the acetabular region, 0.35–0.49 .... *H.taichui* (Nishigori, 1924) Chen, 1936

– Maximum width of the body not at the acetabular zone 2

2. Maximum width of the body at the testicular region, measuring 0.12–0.28 .... *H. yokogowai* (Katsuta, 1932) Chen, 1936

36. *Haplorchis taichui* (Nishigori, 1924) Chen, 1936
(Fig. 33)

1924. *Monorchotrema taichui* Nishigori *Taiwan Igkkai Zazzhi* **237** : 569-570.

1936. *H. taichui* Chen *Parasit.* **28** : 35-40.

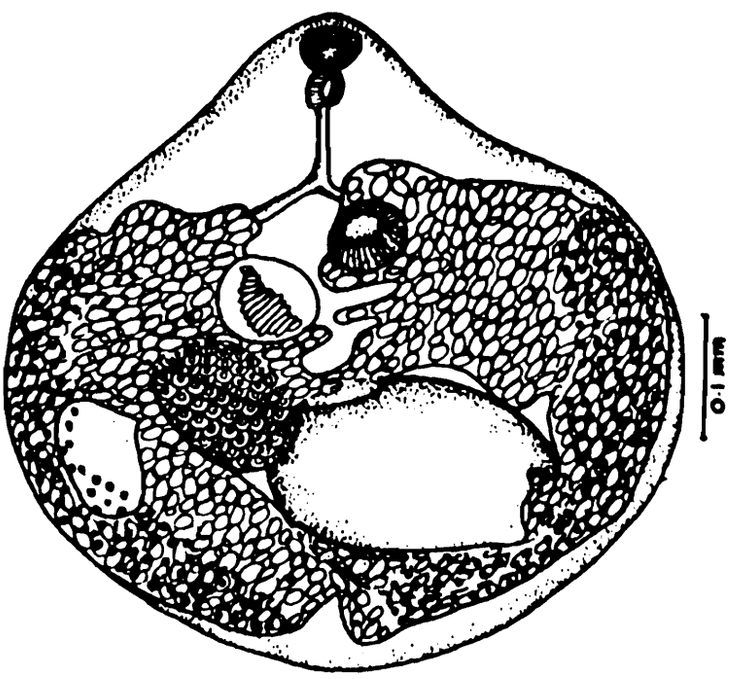


Fig. 33 : *Haplorchis taichui* (Nishigori, 1924) Chen, 1936.

Material : Host : *Milvus migrans govinda* Sykes (Location : Intestine). Locality : Dairy farm stream area, Vishakahpatnam, 40 exs.

Diagnosis : Body pear shaped and 0.43 – 0.65 in length and 0.35 – 0.49 at maximum width at the level of the acetabulum; oral sucker 0.04 – 0.06 × 0.46 – 0.62; testes globular or sub-globular, dextral and are 0.14 – 0.28 × 0.15 – 0.21; ovary 0.07 – 0.11 × 0.08 – 0.109; eggs 31 – 36 × 16 – 20μ.

Distribution : India : Andhra Pradesh.

Elsewhere : Egypt.

37. ***Haplorchis yokogawai*** (Katsuta, 1932) Chen, 1936
(Fig. 34)

1932. *Monorchotrema yokogawai* Katsuta *Taiwan Zazzhi* **31** (3) : 253-270.

1936. *Haplorchis yokogowai* Chen *Parasit.* **28** : 40-55.

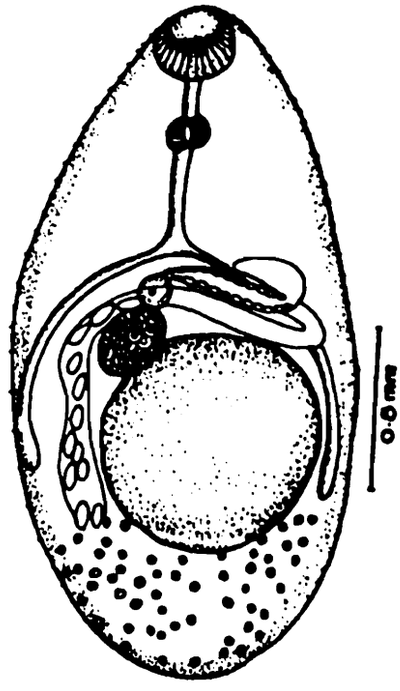


Fig. 34 : *Haplorchis yokogowai* (Katsuta, 1932) Chen, 1936.

Material : Host : *Corvus splendens splendens* Vielliot (Location : Intestine); Locality : Dairy farm stream area, Vishakhapatnam; 48 exs.

Diagnosis : Body 0.16 – 0.52 in length and 0.12 – 0.28 in width at the testicular region; oral sucker 0. 01 – 0.05 × 0.01 – 0.05, pharynx 0.03 in diameter; testes 0.04 – 0.13 × 0.58 – 0.15; ovary 0.01 – 0.16 × 0.01 – 0.06 and eggs 23 – 24 × 12 – 16μ.

Distribution : India : Andhra Pradesh.

Subfamily XV HETEROPHYINAE Leiper, 1909

Key to genus of HETEROPHYINAE Leiper, 1909

1. Maximum width of the body at the acetabular region, measuring 0.24-0.52 × 0.32-0.64 ..... ***Heterophyes*** Cobbold, 1886

– Maximum width attained at the testicular region, measuring 0.44 – 0.51 .... ***Heterophyopsis*** (Yamaguti, 1939) Yamaguti, 1971

Genus 25 *Heterophyes* Cobbold, 1886

38. *Heterophyes heterophyes* (Stiles et. Hassal, 1900) (Fig. 35)

1900. *H. heterophyes* Stiles et. Hasal *Ann. Rep. Bur. Anim. Ind.* 1899 Notes on parasiting 50-52.

Material : Host : *Larus argentatus mongolicus* Sushkin & *Larus brunnicephalus* Jerdon (Intestine); Locality : Waltair Coast; 2 exs.

Diagnosis : Length 1.26 – 1.12 × 1.71 – 1.52, width at the level of the acetabulum in maximum, 0.24 – 0.52 × 0.32 – 0.64; oral sucker 0.08 – 0.08 × 0.08 – 0.08, pharynx 0.03 × 0.03; acetabulum 0.11 0.16 anterior testis 0.09 – 0.14 × 0.11 – 0.14 and the posterior testis

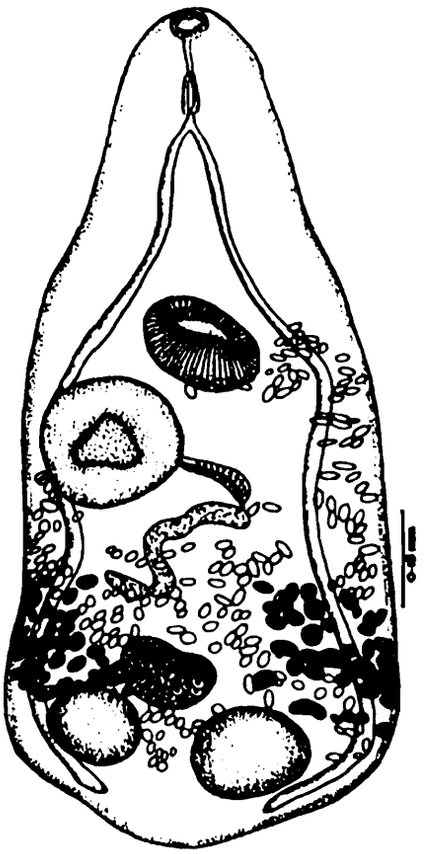


Fig. 35 : *Heterophyes heterophyes* (Seibold, 1886) Stiles et. Hassal, 1900.

0.09 – 0.16 × 0.12 – 0.16; ovary 0.08 – 0.09 × 0.06 – 0.16; eggs 20 – 23 × 12 μ.

Distribution : India : Andhra Pradesh.

Elsewhere : Egypt, Japan, Russia.

Genus 26 ***Heterophyposis*** Tubangui et. Africa, 1938

39. ***Heterophyopsis continua major*** (Yamaguti, 1939) Yamaguti, 1971
(Fig. 36)

1939. *H. continua major* Yamaguti *V. Jap. J. Zool.* 26 (IV) **8** : 129-210.

1971. *H. continua major* Yamaguti *Syn. Digenetic Trem. Ver. I.* 1-1074.

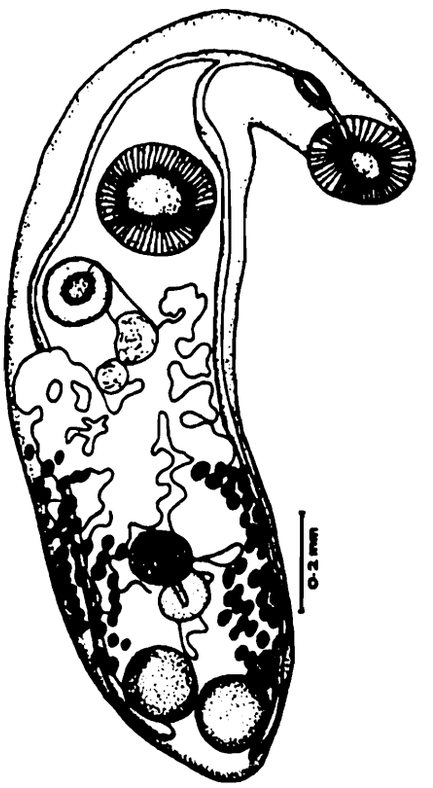


Fig. 36 : *Heterophyopsis continua major* (Yamaguti, 1938) Yamaguti, 1971.

Material : Host : *Larus argentatus mongolicus* Sushkin & *Bubulcus ibis coromandus* Boddaert (Location : Intestine); Localily : Waltair & Bhimli, 2 exs.

Diagnosis : Length 2-2.64; width 0.38 – 0.46 at the level of the testes, oral sucker 0.16 – 0.19 × 0.16 – 0.208; acetabulum 0.19 – 0.27 × 0.192 – 0.27; forebody 0.68 – 0.88; testes 0.12 – 0.17 × 0.12 – 0.208 and 0.11 – 0.14; post ovarian space 0.4 – 0.51 and eggs 23 – 27 × 18 – 20μ.

Distribution : India : Andhra Pradesh.

Elsewhere : Japan.

Subfamily XVI Stictodorinae Yamaguti, 1958

Genus 27 ***Stictodora*** Looss, 1899

40. ***Stictodora sawakinensis*** Looss, 1899
(Fig. 37)

1899. *S. sawakinensis* Looss. *Jahrb. Syst.* **12** : 521-784.

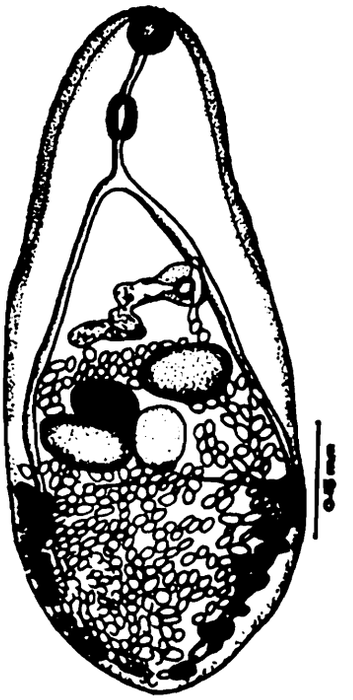


Fig. 37 : *Stictodora sawakinensis* Looss, 1899.

Material : Host : *Larus brunnicephalus* Jerdon (Location : Intestine); Locality : Waltair Coast; 1 ex.

Diagnosis : Length 1.04 – 1.58, width 0.4 – 0.52; oral sucker subterminal, 0.08 × 0.08, pharynx 0.08 × 0.04 – 0.06; acetabulum 0.06 – 0.06; testes 0.08 - 0.112 × 0.12 – 0.16 and 0.08 – 0.12 × 0.12 – 0.16; ovary 0.08 – 0.11 × 0.11 – 0.16 and eggs 27 – 35 × 16 – 20μ. Excretory vesicle 'Y' shaped.

Distribution : India : Andhra Pradesh.

Elsewhere : Europe, Greece.

FAMILY XIV LEUCOCHLORIDIIDAE (Poche, 1907) Dollfus, 1934

Subfamily XVII LEUCOCHLORIDIINAE Poche, 1907

Genus 28 ***Leucochloridium*** Carus, 1835

41. ***Loucochloridium macrostoma*** (Rud., 1803) Poche, 1907
(Fig. 38)

1907. *L. macrostoma* Poche, *Zool. Anz.* **31** : 124-126.

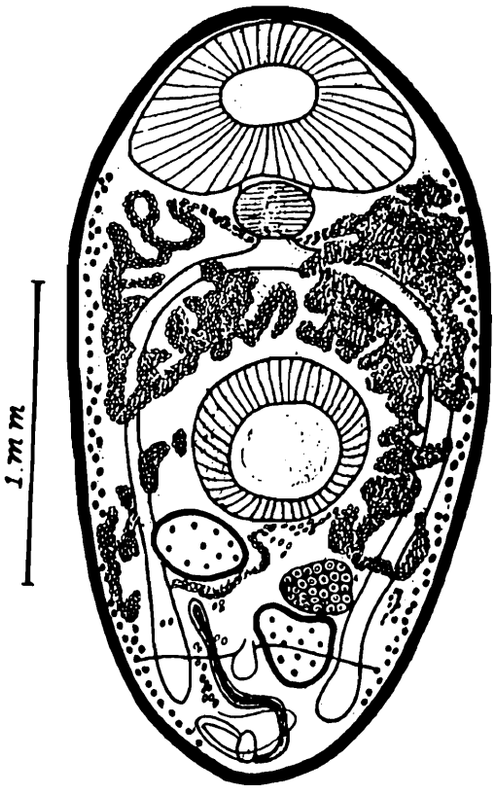


Fig. 38 : *Leucochloridium macrostoma* (Rud.1803) Poche, 1907.

Material : Host : *Anas boschus domesticus* (water duck); Intestine; Loc. : Hyderabad; 5 exs.

Diagnosis : Length 2.5 – 2.8; width 1.32 – 1.55; oral sucker 0.52 – 0.66 × 0.69 – 0.83; ventral sucker 0.52 – 0.72 × 0.58 – 0.74; pharynx 0.13 – 0.19 × 0.23 – 0.25; left testis 0.16 – 0.23 × 0.19 – 0.31; right one 0.12 – 0.22 × 0.12 – 0.29; ovary 0.15 – 0.18 × 0. 22 – 0.29; eggs 0.04 – 0.06 × 0.02 – 0.04.

Distribution : India : (Andhra Pradesh).

Elsewhere : Europe, Siberia.

FAMILY XV LECITHODENDRIIDAE Odhner, 1911

Subfamily XVIII GANEONINAE Yamaguti, 1958

Genus 29 *Ganeo* Klein, 1905

42. *Ganeo tigrinum.* Mehra et Negi, 1928
(Fig. 39)

1928. *Ganeo tigrinum.* Mehra et Negi *Allahabad Univ.* Stud., **4** : 63-118.

Material : Host : *Neophoron percopnterus*, Vuture (Intestine), Loc : Hyderabad. 1 ex.

Diagnosis : Length 2.78 – 2.99, width 1.11 – 1.25; Oral sucker 0.12 – 0.13 × 0.12 – 0.14; ventral sucker 0.14 – 0.16 × 0.16 – 0.16; pharynx 0.09 – 0.11 × 0.08 – 0.08; oesophagus

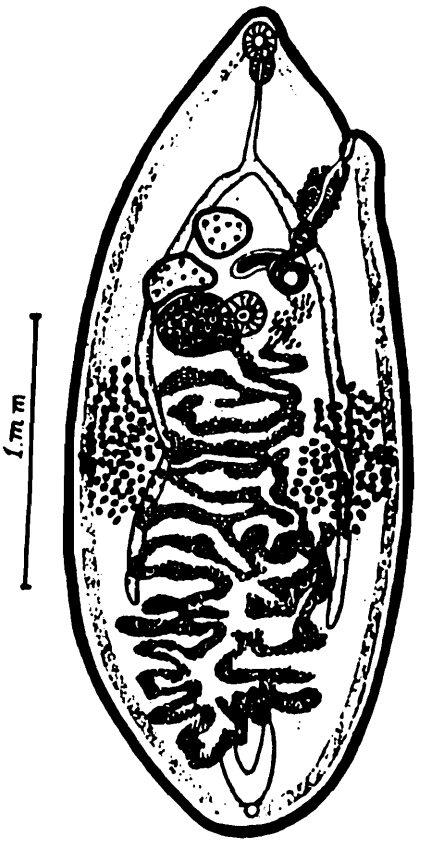


Fig. 39 : *Ganeo tigrinum* Mehra et Negi, 1928.

0.28 – 0.34; anterior testis 0.16 – 0.19 × 0.22 – 0.23; posterior testis 0.14 – 0.15 × 0.21 – 0.26; ovary 0.19 – 0.23 × 0.19 – 0.31; eggs 0.04 – 0.06 × 0.01 – 0.03μ.

Discussion : The parasite from the intestine of the Vulture, *Neophoron percopnterus*, differs from the *Ganeo tigrinum* in position of gonads. It also shows variations in the extent of vitellaria. The writer is of the opinion that these are of little taxonomic importance and the infection appears to be acquired by the vulture by eating the frog.

Distribution : India : Andhra Pradesh, West Bengal, Meghalaya, Uttar Pradesh, Jammu & Kashmir, Maharashtra, Tripura.

Elsewhere : Bangladesh.

TREMATODES OF MAMMALS

Family XVI DICROCOELIIDAE Odhner, 1910

Subfamily XIX EUPARADISTOMINAE Yamaguti, 1958

Genus 30 ***Euparadistomum*** Tubangui, 1931

43. ***Euparadistomum buckleyi*** Singh, 1958
(Fig. 42)

1958. *E. buckleyi* Singh *Ind. J. Helminth.* **37** (4) : 233-235.

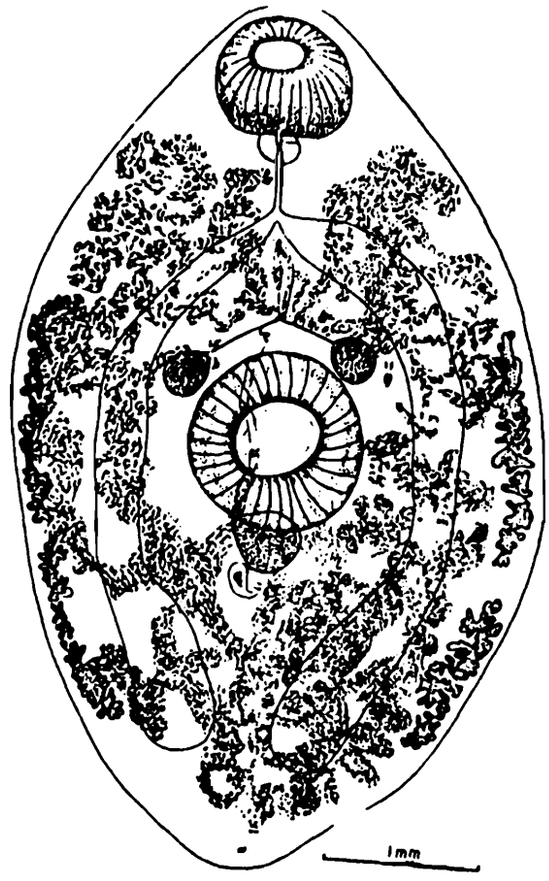


Fig. 42 : *Euparadistomum buckleyi* Singh, 1958.

Material : Host : *Vulpex alopex* (Fox); Location : Gall bladder. Locality : Hyderabad, India; 9 exs.

Diagnosis : Body flattened and pyriform with broadly rounded anterior and posterior end, measures 4.3 – 5.9 in length with a maximum width of 2.3 – 3.8 attained at about the equatorial level of the body. The cuticle covering the general body surface is smooth and devoid of spines and papillae. The oral sucker sub-terminal with the mouth directed ventrally; it measures 0.58 × 0.6 to 0.76 × 0.88. The pharynx lying immediately behind the oral sucker, 0.16 × 0.23 – 0.22 × 0.28 and is followed by a slender oesophagus about 0.24 – 0.29 long. The intestinal bifurcation is at the level of the junction of the first and second quarters of the body. The caeca are simple and present a swollen appearance terminating blindly in the sub-caudal region of the body. The ventral sucker is located about the centre of the body and is longer than the oral sucker, 0.8 × 0.35 – 1.13 × 1.14.

The excretory pore is sub-terminal and opens to the outside on the ventral surface. It leads into a Y-shape bladder which is difficult to observe in gravid specimens as the uterus occupies most of the available space in the post acetabular zone of the body ; but in young adults which have fewer uterine coils, the outlines of the bladder are visible and its median stem can be seen reaching into the vicinity of the ovary from where the dividend limbs proceed outwards and forwards.

The testes are symmetrically placed in front of the anterolateral borders of the ventral sucker. They are smooth and rounded in outline, 0.11 × 0.2 – 0.28 × 0.35. The vasa efferentia are short but distinctly visible; they converge towards the median line to with into a common vas deferens which is immediately enters the cirrus sac, 0.51; enclosed within the sac are a seminal vescile, pars prostatica and the terminal cirrus, the latter is often found extruding through the male genital pore which lies in the median line at some distance behind the intestinal bifurcation. The ovary is longer than the testes, 0.22 × 0.16 – 0.48 × 0.4. It lies in the median plane or slightly shifted laterally and is partly overlapped by the ventral sucker. The oviduct runs backwards from the ovary and is joined by the duct of the elongated sack-like recepticulum seminis lying behind the ovary. A Laurer's canal is present. The vitellaria are follicular and lies close to the lateral margins of the body forming two isolated groups on either side. Anteriorly they extend to the level of the front borders of the side, whilst posteriorly they reach into the hind qtr. of the body.

The two vitelline ducts from the respective groups of vitellaria on each side unite to form a transverse duct which in turn meets with its fellow from the opposite side to form a short median vitelline duct. The latter opens, into the oviduct near the ootype. The Mehli's gland is poorly developed. The uterus, at first, descending from the ootype forms several complex coils filling in the post acetabular zone of the body, then it ascends as a median duct into the preacetabular zone, where again it is thrown into a complex network of coils extending to the level of the lined border of the oral sucker, finally the metraterm emerges as narrow median duct opening anteriorly by the side of the genital pore. Buckley and Yeh (1958) have successfully elucidated in *E. heischi* the course of the uterus in its entire extent and it appears than in essential respects of the same course is followed by the uterus in other species of the genus. The eggs measuring 32 – 50μ long × 20 – 25μ wide; They are undergoing segmentation at the time of oviposition; this is evident from their contents in the uterine loops lying close to the female genital pore.

Discussion : The genus *Euparadistomum* Tubangui, 1931 comprises six species. *E. varaui* Tubangui, 1931; *E. cerivoulae* Gogate, 1938; *E. pipistrelli* (Sanground, 1937) Travassos, 1944; *E. zonori* (Malan, 1939) Travassos, 1944; *E. paraeuse* (Jansew, 1941) Travassos, 1944; E. *upupai* (Chatterjee, 1951); Buckley and Yeh, 1958; and E. *heischi* Buckley and Yeh, 1958. The author is in complete agreement with their views in regard to the validity of the genus *Euparadistomum* Tubangui which was also recognized earlier by Travassos (1944) but later disputed by Chatterjee (1952). Chaterjee's argument for considering *Euparadispomum* as a synonym of *Platynotrema* Nicoll, 1914, is based on the assumption that the pre-acetabular extension of uterine coils is not a distinguishing feature of generic value. The importance of this character can not be minimised since its value in the systematic of Digenetic trematodes is recognized fact. Ben Dawes (1946) uses this character even in grouping and differentiating some of the families. Buckley and Yeh (1958) are justified in creating the subfamily *Euparadistominae* on the basis of this important

character which brings together under it the genera *Euparadistomum* Tubangui, 1931 and *Stromytrema* Skrjabin and Evrauova, 1944.

The parasite described above resembles *Euparadistomum parasense* (Jansen, 1914) Travassos, 1944, parasite in the Philander Oppossum, in the general disposition of the grounds and the extent of the vitellaria, but it readily distinguishable from it by the shape of the body. *E. parasense* is strikingly spherical, whereas the new species has a pyriform body with rounded extremity. The species is further differentiated owing to the presence of a comparatively small oral sucker. A closer comparison of *E. heischi*, described in an earlier issue of this journal with the new species is desirable since both of the gall bladder of carnivores. The most striking difference is concerned with the size of the testes which assume huge proportion in *E heischi* being considerably larger than the ventral sucker and the ovary. The suckers are small and sub-equal in *E. heischi*, whereas in *E. buckleyi* they are large and unequal, the ventral sucker being larger than the oral sucker. The intestinal caeca of *E. heischi* are very slender whilst those of the new species are swollen and extended most posteriorly towards the caudal end. The two species also differ in the shape and various measurements of the body. It is, therefore, concluded that owing to its distinguishing features the parasite described herein is new to science. It is proposed to name its *Euparadistomum buckleyi* n.s. after J. J. C. Buckley

Distribution : India : Hyderabad, Andhra Pradesh.

Family XVII LECITHODENDRIIDAE (Lühe, 1901) Odhner,1911

Key to the subfamilies

1. Genital pore median, pre-acetabular ..... ANCHITREMATINAE
2. Vitellaria post testicular ..... LECITHODENDRIINAE

Subfamily XX. LECITHODENDRIINAE Looss, 1902

Key to the genus

1. Length 0.69 – 1.02 and width 0.39 – 0.69 ..... ***Pycnoporus***
– Length & width otherwise 2
2. Length 1.06 – 1.53 and width 0.84 – 1.22 ..... ***Paralecithodendrium***
– Length & width otherwise 3
3. Length 1.42 – 3.64 and width 0.68 – 1.28, genital atrium spined & papillated ..... ***Prosthodendrium***
4. Genital atrium neither spined, nor papillated ..... ***Lecithodendrium***

Genus 31 ***Pycnoporus*** Looss, 1899

44. ***Pycnoporus loossi*** Pande, 1935
(Fig. 43)

1935. *P. loossi* Pande *Proc. Acad. Sc. U. P. Agra Oudh* **4** (4) : 371-380.

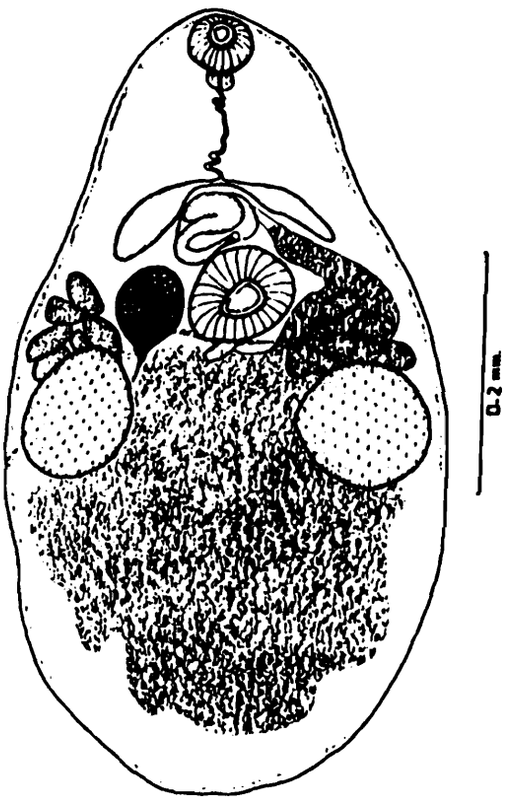


Fig. 43 : *Pynhoporus loossii* Pande, 1935.

Material : Host : *Hipposideros speoris* (Intestine); Locality : Hyderabad, Andhra Pradesh. India.

Diagnosis : Length, 0.69 – 1.02; width 0.39 – 0.69; oral sucker 0. 04 – 0.05 × 0.04 – 0.06; ventral sucker, 0.08 – 0.13 × 0.11 – 0.12, pharynx 0.01 × 0.01 – 0.02; oesophagus 0.12 – 0.16, testes 0.11 – 0.14 × 0.08 × 0.12; pseudo – cirrus sac 0.06 – 0.105 × 0.105 – 0.2, ovary 0.09 – 0.14 × 0.08 – 0.1; caeca 0.12 – 0.16 long; eggs 0.01 – 0.01 × 0.007 – 0.009μ.

Distribution : India : Andhra Pradesh.

Genus 32 ***Paralecithodendrium*** *Striaght*, 1911

45. ***Paralecithodendrium ovimagnosum*** Bhalerao, 1926
(Fig. 44)

1926. *P. ovimagnosum* Bhalerao *J. Burma Res. Soc.* **15** (3) : 181-195.

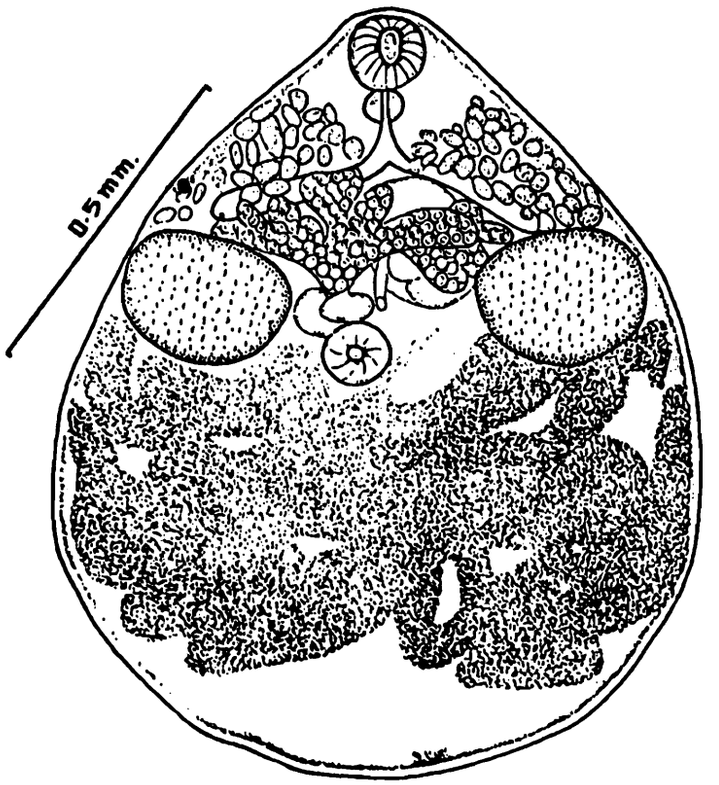


Fig. 44 : *Paralecithodendrium ovimagnosum* Bhalerao, 1926.

Material : Host : *Tadarida aegyptica & Taphozous longimanus* (Intestine); Locality : Hyderabad, Andhra Pradesh, India ; 15 exs.

Diagnosis : Length 1.06 – 1.53 and width 0.84 – 1.22; oral sucker 0.1 – 0.14 × 0. 11 – 0.15; acetabulum 0.09 – 0.15 × 0.1 – 0.11; pharynx 0.04 – 0.05 × 0.05 – 0.08; oesophagus 0.06 – 0.08; testes 0.11 – 0.34 × 0.19 – 0.41; pseudo cirrus sac 0.16 – 0.31 × 0. 19 – 0.22; ovary stretching across a distance of 0.41 – 0.41, eggs 0.01 – 0.01 × 0. 005 – 0.008.

Distribution : India : Andhra Pradesh.

Elsewhere : Myanmar.

Genus 33 ***Prosthodendrium*** Dollfus, 1931

Key to species

1. Acetabulum 0.14 – 0.41 × 0.16 – 0.37 ..... *P. longiforme*

   Size of acetabulum otherwise 2

2. Acetabulum 0.09 × 0.08; testes 0.24 – 0.26 × 0.17 – 0.33 ..... *P. mehrai*

   Size of the testes otherwise 3

3. Testes 0.19 – 0.34 × 0.12 – 0.33 ..... *P. ovatum*

46. ***Prosthodendrium longiforme*** (Bhalerao, 1926) Dubois (1960) (Fig. 45)

1926. *P. longiforme* Bhalerao *J. Burma Res. Soc.* **15**(3) : 181-195.

1960. *P. longiforme* Dubois, 1960 *Rev. Suiss. Zool.* **67** (1) : 1-80.

Material : Host : *Tadarda aegyptica* (Intestine); Locality : Hyderabad, Andhra Pradesh.

Diagnosis : Length 1.43 × 3.64; width 0.68 – 1.28, oral sucker 0.18 – 0.54 × 0.18 – 0.45; acetabulum 0.14 – 0.41 × 0.16 – 0.37; pharynx 0.06 – 0.13 × 0. 09 – 0.16; oesophagus 0.01 – 0.11; testes 0. 13 – 0. 4 × 0. 14 – 0. 3; pseudo cirrus sac 0.1 – 0.3 × 0.13 – 0.386; ovary 0.14 – 0.28 × 0.09 – 0.27, eggs 0.027 – 0.037 × 0.009 – 0.019.

Distribution : India : Hyderabad, Andhra Pradesh.

Elsewhere : Myanmar.

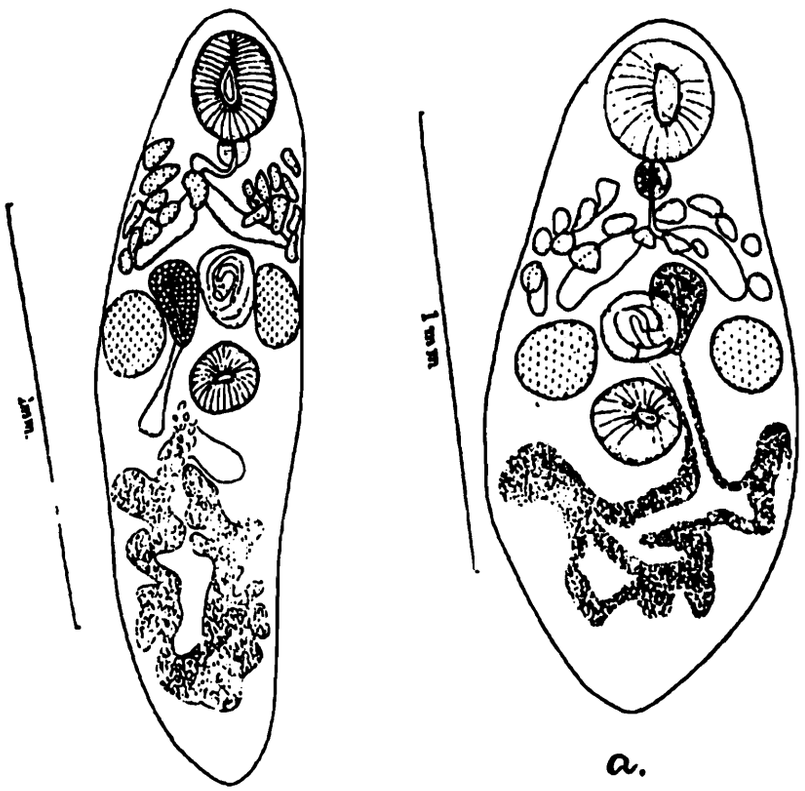


Fig. 45 : *Prosthodendrium longiforme* Bhalerao, 1926; *Prosthodendrium longiforme* Bhalerao, 1926 (ventral view).

47. ***Prosthodendrium mehrai*** (Pande, 1935) Bhalerao, 1936 (Fig. 46)

1935. *P mehrai* Pande *Proc. Acad. Sc. U. P. Agra Oudh.* **4**(4) : 371-380.

1936. *P. mehrai* Bhalerao *I. J. Helm* **14**(3) : 163-180.

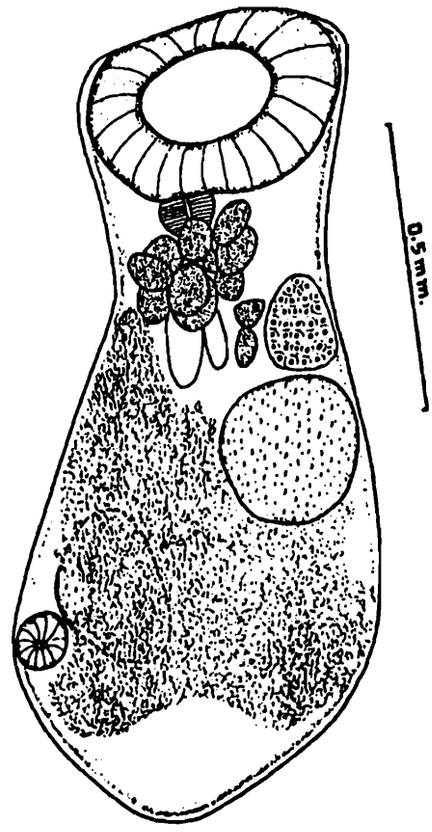


Fig. 46 : *Prosthodendrium mehrai* Pande, 1935.

Material : Host : *Pipistrellus ceylonicus* Ogate, 1939 (Intestine); Locality : Hyderabad, Andhra Pradesh; 1 ex.

Diagnosis : Length 1.37; width 0.62; oral sucker 0.29 × 0.44; acetabulum 0.09 × 0.08; pharynx 0.05 × 0.09; testes 0.24 – 0.26 × 0.17 – 0.33; ovary 0.15 – 0.11; caeca 0.22 – 0.25; eggs 0.01 – 0.02 × 0.01 – 0.11μ.

Distribution : India : Andhra Pradesh.

48. ***Prosthodendrium ovatum*** Simha, 1958
(Fig. 47)

1958. *P. ovatum J. par.* **18** : 161-218.

Material : Host : *Pipistrellus ceylonicus* Ogate, 1939 (intestine); Hyderabad, Andhra Pradesh.

Diagnosis : Length 1.95 – 3.81; width 0.75 – 1.0; oral sucker 0.35 – 0.56 × 0.28 – 0.45; acetabulum 0.26 – 0.33 × 0m. 22 – 0.33; pharynx 0.06 – 0.11 × 0.08 – 0.11; oesophagus 0.06 – 0.26; testes 0.19 – 0.34 × 0.12 – 0.33, pseudo cirrus sac 0.19 – 0.23 × 0.23 – 0.35, ovary 0.19 – 0.302 × 0.15 – 0.21, eggs 0.02 – 0.03 × 0.01 – 0.01.

Distribution : India : Hyderabad, Andhra Pradesh.

Fig. 47 : *Prosthodendrium ovatum* Simha, 1958; a) *Prosthodendrium ovatum* Simha, 1958 (ventral view). b) *Prsothodendrium ovatum* Simha, 1958 (ventral view).

Genus 24 ***Lecithodendrium*** Looss, 1896

Key to the species

1. Length 0.42 – 1.52 and width 0.28 – 0.99 ..... *L. (L.) hirustum*

   Length and width otherwise 2

2. Length 0.76 – 1.2 and width 0.33 – 0.4 ..... *L. (L.) modlingeri*

49. ***Lecithodendrilum (L) hirustum*** Looss, 1896
(Fig. 48)

1896. *L. (.L) hirustum* Looss *Ctbl. Bakt.* **21** (24-25) : 913-916.

Material : Host : *Megaderma lyra* (intestine) : Locality : Hyderabad.

Diagnosis : Length 0.42 – 1.52; width 0.28 – 0.99; oral sucker 0.03 – 0.07 × 0.05 – 0.08; acetabulum 0.02 – 0.06 × 0.03 – 0.05; pharynx 0.01 – 0.02 × 0.01 – 0.03; oesophagus 0.09 – 0.27; testes 0.09 – 0.28 × 0.04 – 0.25, pseudo-cirrus sac 0.03 – 0.15 × 0.02 – 0.14; ovary 0.04 – 0.16 × 0.04 – 0.13, ceaca 0.08 – 0.29, eggs 0.01 – 0.02 × 0.00 – 0.01 μ. No. of vitelline follicles in each lateral cluster is 5 – 9.

Distribution : India : Hyderabad, Andhra Pradesh.

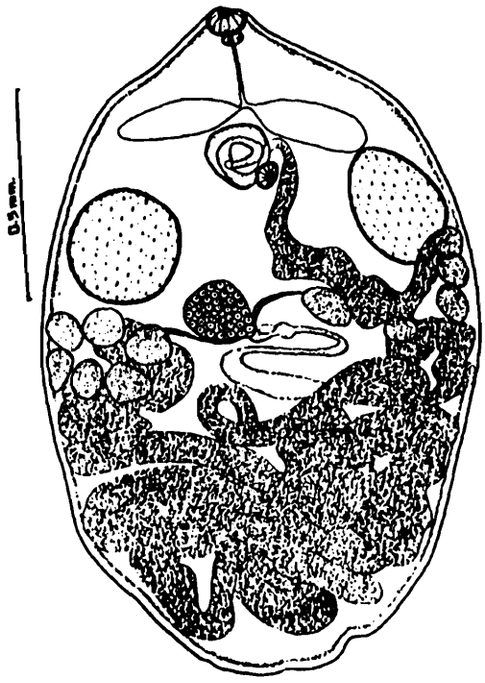


Fig. 48 : *Lecithodendrium (L) hirustum* Looss, 1896.

50. ***Lecithodendrium (L) modlingeri*** Pande, 1935
(Fig.49)

1935. *L. (L.) modlingeri* Pande *Proc. Acad. Sc. U.P Agra Oudh.* **5**(1) : 86-98.

Material : Host : *Megaderma lyra* (Intestine); Locality : Hyderabad, Andhra Pradesh; 4 exs.

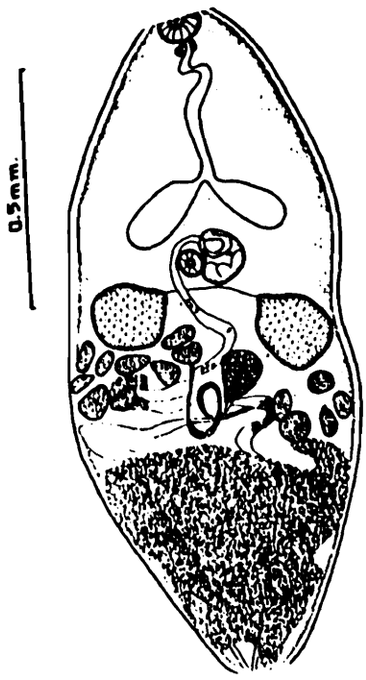


Fig. 49 : *Lecithodendrium (L) modlingeri* Pande, 1935.

Diagnosis : Length 0.76 – 1.2 and width 0.33 – 0.4 at maximum attained at the level of the acetabulum, oral sucker sub-terminal, 0.043 – 0.067; acetabulum post-equatorial, 0.05 – 0.07; muscular pharynx 0.02 – 0.04 × 0.02 – 0.03, oesophagus 0.21 – 0.41. Testes 0.08 – 0.13 × 0.08 – 0.13. Genital pore median at some distance anterior to acetabulum. Ovary pyriform 0.105 – 0.110 × 0.06 – 0.105. Eggs 0.009 – 0.014 × 0.006 – 0.007.

Distribution : India : Andhra Pradesh.

Subfamily : XXI. ANCHITREMINAE Mehra, 1935

Genus 35 ***Anchitrema*** Looss, 1899

51. ***Anchitrema sanguineum*** (Sonsino, 1894) Looss, 1899

1894. *Distomum sanguineum* Sonsino *Proc. Zool. Soc. London* 496-500.

1899. *A. sanguineum* Looss *Zool. Jahrb. Syst.* **12** : 521-784.

Material : Host : *Tadarida aegyptica* and *Megaderma lyra* ; Locality : Hyderabad (A.P.), 20 exs.

Diagnosis : Length 3.36 – 5.30; breadth 0.86 – 0.96; oral sucker 0.25 – 0.35 × 0.25 – 0.33, ventral sucker 0.22 – 0.28 × 0.19 – 0.21; pharynx 0.08 – 0.14 × 0.14 – 0.15; oesophagus 0.21; testes 0.42 – 0.57 × 0.18 – 0.28; pseudo-cirrus sac 0.24 – 0.25 × 0.19 – 0.34, ovary 0.24 – 0.26 × 0.22 – 0.27; eggs 0.017 – 0.022 × 0.009 – 0.014 μ.

Distribution : India : Andhra Pradesh, Meghalaya.

Elsewhere : Tunisia.

Family XVIII PLAGIORCHIIDAE Ward, 1917

Key to the subfamilies

1. Vitelline glands extending in the lateral fields of hindbody ..... PLAGIORCHIINAE
2. Vitelline glands are confined in the forebody ..... OMPHALOMETRINAE

Subfamily XXII PLAGIORCHIINAE Pratt, 1902

Genus 36 ***Plagiorchis*** Lühe, 1899

52. ***Plagiorchis vespertiliouis*** (Mueller, 1784) Braun., 1900

(Fig. 50)

1784. *Distomum vespertiliouis* Mueller *Arch. Naturg.*. 63. Jahrg. **1** (1) : 1-26.

1900. *Plagiorchis vespertiliouis* Braun *Ann. K. K. Naturh Hofmus* **15** (3-4) : 217-236.

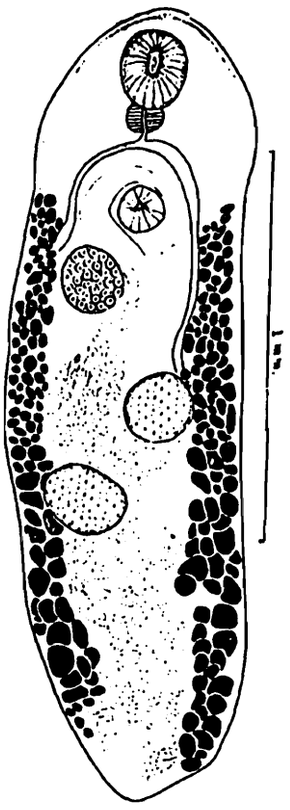


Fig. 50 : *Plagiorchis vespertilionsis* (Muller, 1784) Braun, 1900.

Material : Host : Tadarida aegyptica, Pipistrellus ceylonicus & Megaderma lyra (Intestine); 20 exs.

Diagnosis : Body length 0.81 – 2.91; breadth 0.48 – 0.62; oral sucker 0.14 – 0.19 in diameter; ventral sucker 0.06 – 0.14 × 0.1 – 0.12, pharynx 0.04 – 0.06 × 0.06 – 0.1; oesophagus 0.04 – 0.24; anterior testis 0.06 – 0.21 × 0.1 – 0.22, posterior testis 0.067 – 0.208 × 0. 11 – 0.21; cirrus sac 0.25 – 0.05 × 0.04 – 0.76; ovary 0.08 – 0.18 × 0.13 – 0.18 eggs 0.027 – 0.036 × 0.012 × 0.018μ.

Distribution : India : Andhra Pradesh.

Elsewhere : Europe, Manchuria, Korea, Transcaucasia, Canada, USA, Mexico, Turkey, Egypt, Madagascar.

Subfamily XXIII OMPHALOMETRINAE Looss, 1899

Genus 37 *Neoglyphe* (Shaldybin, 1954) Yamaguti, 1958

53. *Neoglyphe hinoi* (Ozaki, 1931) Yamaguti, 1958
(Fig. 51)

1931. *Opisthioglyphe hinoi* Ozaki *Zool. Mag. (Dobutsugaku Zasshi)* **36** : 173-201.

1958. *Neoglyphe hinoi* Yamaguti *Systema Helminthum* Vol. 1. The digenetic trematodes of vertebrates Inter science, New York 1575 pp.

Material : Host : *Tadarida aegyptica* (Intestine). Locality : Hyderabad, Andhra Pradesh; 20 exs.

Diagnosis : Length 1.61 – 1.85, breadth 0.55 – 0.72; oral sucker 0.18 – 0.24 × 0.19 – 0.23; ventral sucker 0.208 – 0.23 × 0.21 – 0.22; pharynx 0.07 – 0.11 × 0.12 – 0.13; oesophagus

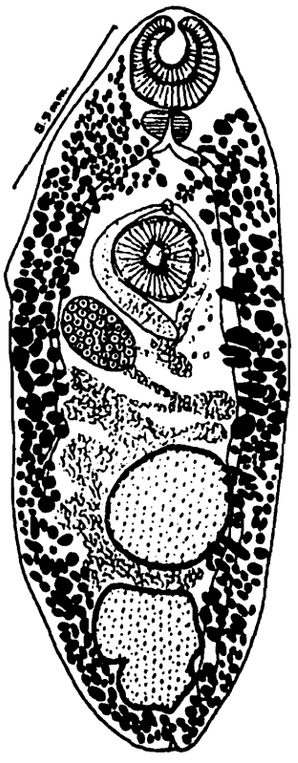


Fig. 51 : *Neoglyphe hinoi* (Ozaki, 1931) Yamaguti, 1958.

0.06 – 0.09; anterior testis 0.208 – 0.36 × 0. 18 – 0.33, posterior testis 0.25 – 0.403 × 0.166 – 0.33; cirrus sac 0. 403 – 0.49 × 0.04 – 0.067; ovary 0.13 – 0.22 × 0.12 – 0.13, eggs 0.02 – 0.03 × 0.01 – 0.01.

Distribution : India : Hyderabad, Andhra Pradesh.

Elsewhere : Japan.

Family XIX ECHINOSTOMATIDAE Deitz, 1909

Subfamily XXIV ECHINOSTOMATINAE Odhner, 1911

Genus 38 *Echinochasmus* Deitz. 1909

Key to species

1. Number of collar spines, 24 ..... *E. perfoliatus*

   Number of collar spines, 22 2

2. Oral sucker terminal ..... *E. vidhianae*

Oral sucker sub-terminal ..... *E. megadermi*

54. ***Echinochasmus perfoliatus*** (Ratz, 1908) Deitz, 1909

1909. *E. perfoliatus* Deitz. *Zool. Anz.*, **34** (6) : 180-192.

Material : Host : *Megaderma lyra* (Intestine); Locality : Hyderabad, Andhra Pradesh (India); 2 exs.

Diagnosis : Body length 1.04 – 2.87, width 0.,03 – 0.53; collar width 0.16 – 0.31; number of spines on the collar, 24; oral sucker 0.072 – 0.1 in diameter; ventral sucker 0.11 – 0.26 × 0.11 – 0.22, prepharynx 0.03 – 0.1; pharynx 0.05 – 0.09 × 0.05 – 0.11; oesophagus 0.05 – 0.27; anterior testis 0.12 – 0.302 × 0.14 – 0.31; posterior testis 0.12 – 0.31 × 0.14 – 0.24, pseudo – cirrus sac 0.13 – 0.24 × 0.05 – 0.14, ovary 0.07 – 0.14 × 0.08 – 0.16; eggs 0.07 – 0.05.

Distribution : India : Andhra Pradesh.

Elsewhere : Europe, Turkey.

55. ***Echinochasmus vidhianae*** Vasudev, 1973

1973. *E. vindhianae* Vasudev *Folia Parasit* : Praha. **20** : 175-177.

Material : Host : Indian towny eagle, *Aquila rapax vidhiana* (Location : Intestine); Locality : Warangal, Andhra Pradesh.

Diagnosis : Body elongate with truncated anterior and broadly rounded posterior extremities, 1.82 – 1.92 × 0.38 – 0.48; head collar with 22 spines in a single dorsally interrupted row; oral sucker terminal, 0.06 in diameter. Acetabulum in anterior third of body, 0.28 – 0.37 × 0.24 – 0.26. Pre-pharynx short, 0.02 – 0.02 in length; pharynx muscular 0.09 – 0.10 × 0.06 – 0.07; oesophagus 0.12 – 0.20 long; caeca reach posterior extremity. Testes smooth, in middle third of body, contiguous, 0.1 – 0.22 × 0.26 – 0.30 and 0.25 – 0.33 × 0.38 respectively; cirrus sac anterodorsal to acetabulum, post bilfurcal, 0.16 –0.18 × 0.07 – 0.09, encloses vesicula seminalis. Genital pore median, preacetabular, postbifurcal; ovary pre-testicular, round, 0.09 × 0.09 – 0.12. Uterine coils few, pretesticular; eggs few, operculate, 0.06 × 0.04. Vitelline follicles small, extending from midacetabular to posterior extremity in lateral fields, contiguous in post-testicular zone.

Distribution : India : Warangal, Andhra Pradesh.

56. ***Echinochasmus megadermi*** Salem, 1975

1975. *E. megadermi* Salem Unpubl. Thesis.

Material : Host : *Megaderma lyra*, bat (Location : Intestine); Locality : Hyderabad, Andhra Pradesh.

Diagnosis : Body oval, spinulate, 0.54 – 0.61 × 0.31 – 0.32, head collar beset with 22 collar spines arranged in single dorsally interrupted row. Oral sucker sub-terminal, 0.03 – 0.05 × 0.04 – 0.04; prepharynx short; pharynx 0.04 – 0.04 × 0.03 – 0.04; oesophagus 0. 03 – 0.06 long; caeca reach posterior extremity. Acetabulum almost equatorial, larger than oral sucker, 0.07 – 0.08 × 0.08 – 0.105. Testes laterally elongated, tandem, 0.05 – 0.09 × 0.09 – 0.15. Cirrus sac (pseudocirrus sac vide Salem) extends from caecal bifurcation to anterolateral margin of acetabulum, 0.05 – 0.07 × 0.12 – 0.14, encloses coiled vesicula seminalis, ductus egaculatorius. Genital pore anterolateral to acetabulum. Ovary pyriform, pre-testicular, post-acetabular, sub-median, 0.07 – 0.09 × 0.04 – 0.05; uterine coils short, pre-testicular; eggs 0.05 – 0.09. Vitellaria in lateral bands, extend from acetabular region to posterior end of body where they do not become contiguous.

Distribution : India : Hyderabad, Andhra Pradesh.

Family XX FASCIOLIDAE Railliet, 1895

Key to Subfamilies

1. Intestinal caeca dendritic, acetabulum small, cirrus sac anterodorsal to acetabulum ..... FASCIOLINAE
– Intestinal caeca simple 2
2. Acetabulum much larger than the oral sucker, cirrus sac long, extending far behind to acetabulum ..... FASCIOLOPSINAE

Subfamily XXV Fasciolopsinae Odhner, 1910

Genus 39 *Fasciolopsis* Looss, 1899

57. *Fasciolopsis buski* (Lankester, 1857) Stiles, 1901

Reg. No. : W8780/1 (Fig. 52)

1857. *Distoma buski* Lankester *Animal parasite belonging to the group Entozoa* 433-437, London.

1899. *Fasciolopsis buski* Looss, *Zool Jahrb. Syst.* **12** : 521-784.

Material : Host : Pig (Intestine); Locality : Karnool, Andhra Pradesh, 2 exs. Coll. : S. Chakrabarti. Date : 18.ix.99.

Diagnosis : Body elongate, elliptical, posterior end rounded, cuticle spined, length 2.0 – 8.5 × 8.30, broad, oral sucker 0.5 – 0.9 in diameter. Prepharynx small; pharynx 0.24 – 0.65, globular. Oesophagus either absent or very small, caeca simple, extending to posterior end

Fig. 52 : *Fasciolopsis buski* (Lankester, 1857) Stiles, 1901.

in zig-zag manner. Acetabulum globular, 2-4 in diameter. Testes much branched, tandem, post-ovarian. Cirrus sac sinous, long, 8.5 × 0.07. Genital pore immediately pre-acetabular. Ovary branched, pretesticular. Vitelline follicles small, lateral, mostly extra caecal, extending from acetabular level to posterior extremity, uterus intercaecal, pre-ovarian. Eggs large, 06.12 – 0.18 × 0.08 – 0.15.

Distribution : India : Andhra Pradesh, Meghalaya, Assam, Bihar, West Bengal, Uttar Pradesh.

Elsewhere : Myanmar, Japan.

Subfamily : XXVI FASCIOLINAE Stiles et Hassal, 1898

Genus 40 ***Fasciola*** Linnaeus, 1758

Key to Species

1. Shoulders not prominent, intestinal diverticles not having internal branching .... *Fasciola gigantica*

– Shoulders prominent 2

2. Caeca profusely branched on outer side ..... *F. hepatica*

58. ***Fasciola gigntica*** Cobbold, 1855
Reg. No. W8781/1 (Fig. 53)

1855. *Fasciola gigantica* Cobbold *E dib. N. Phil J. n. s.* **2** (2) : 262-266.

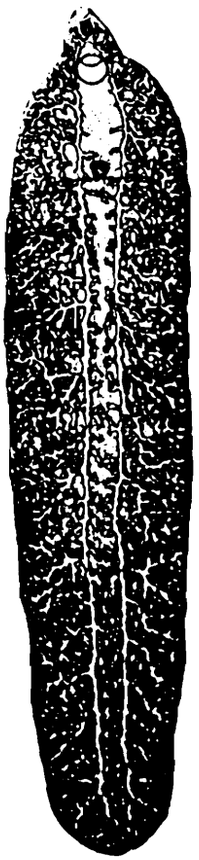


Fig. 53 : *Fasciola gigantica* Cobbold, 1855.

Material : Cow, Buffalo (Intestine); Locality : Nellore, Anadrha Pradesh; 9 exs. Coll. : S. Chakraborti Date : 21.iv.2000.

Diagnosis : Body elongate, 20 – 95, breadth 3-15, cephalic cone not prominent. Cuticle with spiny scales. Oral sucker 1 – 2.5, subterminal, prepharynx small, pharynx conspicuous, oesophagus very short. Caeca long, reaching posterior extremity, branched internally and externally. Acetabulum larger than oral sucker, 1.5 – 3.2. Testes branched, cirrus sac in between caecal bifurcation and acetabulum. Genital pore median, ovary more branched, pretesticular vitellaria extensive, filling up all available space between caecal branching; uterus with rosette like coils between ovary and acetabulum. Eggs 0.12 – 0.19 × 0.06 – 0.12.

Distribution : Andhra Pradesh, Meghalaya and widely distributed.

Elsewhere : Cosmopolitan.

• 59. ***Fasciola hepatica*** Linnaeus, 1758
Reg. No. W8782/1

1758. *Distomum hepaticum* Linnaeus *Systema naturalis perseguataria* : 277.

Material : Host : Pig (Stomach); Locality : Eluru, Andhra Pradesh; 4 exs. Coll. : S. Chakraborti Date : 06.iii.2001.

Diagnosis : Body oval or foliate, flattened with conical cephalic cone, shoulders distinct. Length 14 – 80. Breadth 4 – 13, cephalic cone 3 – 5 long, marked off from the body by prominent shoulders; curved with scales. Caeca profusely branched only externally, no internal branching. Acetabulum larger than oral sucker, 1.6; oral sucker 1.0. Genital pore median, midway between intestinal bifurcation and acetabulum. Testes much branched. Cirrus sac thin walled. Ovary profusely branched on right side, pretesticular. Vitellaria filling up all available space between caecal remifications laterally. Uterus with ascending limb, forming a rosette-like cluster of coils between ovary and acetabulum. Eggs 0.13 – 0.15 × 0.06 – 0.09.

Distribution : Andhra Pradesh, Meghalaya and widely distributed in India

Elsewhere : Burma, Sri Lanka.

Family XXI PARAMPHISTOMIDAE Fischoeder, 1901

Key to subfamilies

1. Body divided into two portions ..... GASTRODISCINAE
– Body not divided into two portions 2
2. Ventral pouch present ..... GASTROTHYLACINAE
– Ventral pouch absent 3
3. Oral diverticula absent, testes two, no genital sucker ..... PARAMPHISTOMINAE

Subfamily XXVII PARAMPHISTOMINAE Fischoeder, 1901

Key to Genus

1. Genital sucker strongly developed ..... ***Cotylophoron***
– Genital sucker absent 2
2. Laurer's canal crossing excretory vesicles, pars musculosa not strongly developed ..... ***Paramphistomum***
– Laurer's canal not crossing excretory vesicle 3
3. Pars musculosa strongly developed, ratio of diameter between acetabulum and body 1 : 6-7 ..... ***Ceylonocotyle***

– Ratio of diameter between acetabulum and body otherwise 4

4. Ratio of diameter between acetabulum and body is 1 : 2 – 2.5 ..... ***Gygantocotyle***

Genus 41 ***Gygantocotyle*** Nasmark, 1973

•60. ***Gygantocotyle explanatum*** (Creplin, 1847) Nasmark, 1937
Reg. No.W8783/1 (Fig. 54)

1847. *Amphistomum explanatum* Creplin *Arch. F. Nat. Cesh. Jahrg.* **13**(1) : 30-35.

1936. *Gygantocotyle explanatum* Nasmark 1937. *Zool. Bidr. Uppsala* **16** : 301-565.

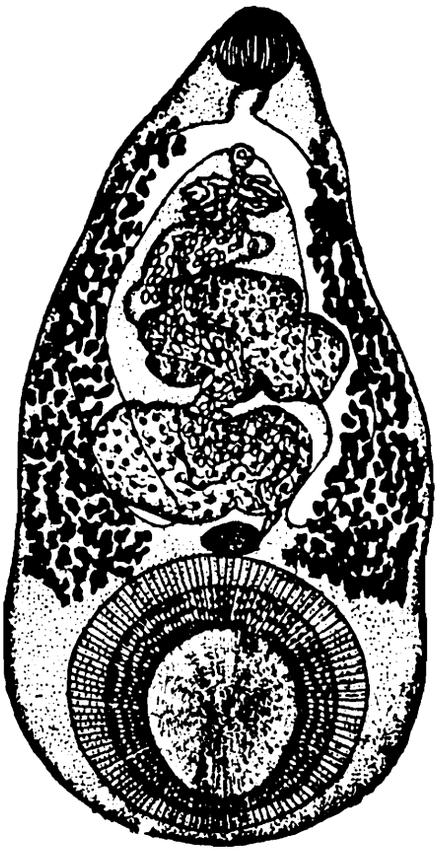


Fig. 54 : *Gigantocotyle explanatum* (Creplin, 1847) Nasmank, 1937.

Material : Host : *Bos indicus* (Intestine); Locality : Nellore, Andhra Pradesh; 3 exs. Coll. : S. Chakrabarti. Date : 21.iv.2000.

Diagnosis : Body pyriform to conical, 8 – 18 × 4.8, pharynx 0.92 – 1.1 in length. Acetabulum 3.5 – 4.8 in diameter. Oesophagus 0.51 – 0.83 long. Caeca straight and wavy, terminate at preacetabular level. Testes slightly lobed, diagonally tandem, 1.2 – 1.6 in diameter. Genital pore at or just below caecal bifurcation. Ovary post testicular, 0.5 – 0.56 × 0.45 – 0.5; Laurer's canal crosses the excretory vesicle. Vitellaria small to large, follicles from oesophageal bifurcation to anterior margin of acetabulum. Eggs 0.12 – 0.14 × 0.07 – 0.08.

Distribution : India : Andhra Pradesh, Meghalaya and widely distributed in other states.

Elsewhere : Vietnam, Sri Lanka, Myanmar, Manila.

Genus 42 ***Paramphistomum*** Fischoeder, 1900

Key to species

1. Intestinal caeca wavy, papillae on the mouth present ..... *P. cervi*
- No papillae on the mouth 2
2. Intestinal caeca sinuous, terminating at midlevel of acetabulum ..... *P. ichikawai*
- Intestinal caeca larger 3
3. Caeca terminating at posterior end of the acetabulum ..... *P. epiclitum*

•61. ***Paramphistomum ichikawai*** Fukui, 1922
Reg. No. : W8784/1 (Fig. 55)

1922. *Paramphistomum ichikawai* Fukui *Zool. Mag.* **34** : 19-27.

Material : Host : Bos indicus (Intestine); Locality : Nellore, Andhra Pradesh; 2 exs. Coll. : S. Chakraborti. Date : 21.IV.2000.

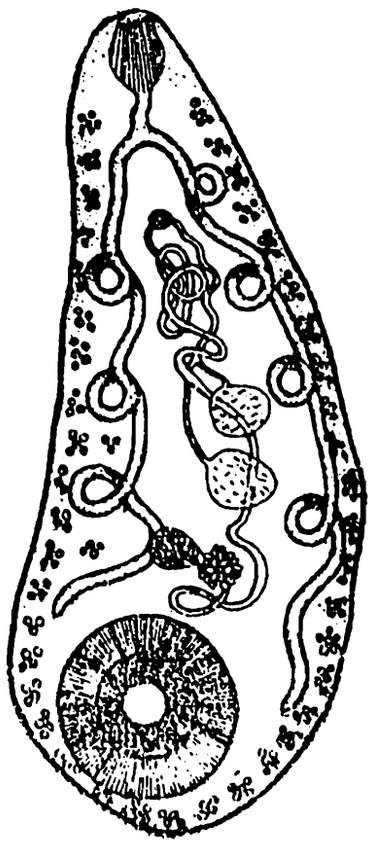


Fig. 55 : *Paramphistomum ichikawai* Fukui, 1922.

Diagnosis : Body elongated, 7.7 – 10.2; with rounded posterior end. Maximum width 2.7 – 3.2. Acetabulum 1.5 – 2.7 in diameter, ratio in relation to body length 1.4 : 1.7; pharynx 0.6 – 0.8 in length. Oesophagus 0.4 – 0.6. Intestinal caeca coiled with 3/4 loops. Testes lobed, tandem; anterior testis 0.15 – 0.8, almost round, posterior one 0.6 – 0.8, genital pore much below to caecal bifurcation. Ovary 0.31 – 0.5 × 0.32 – 0.58. Laurer's canal acorsses the excretory vesicle. Vitelline follicles extend from the level of intestinal bifurcation to caecal ends. Genital atrium with papilla.

Distribution : India : Andhra Pradesh, Meghalaya, Uttar Pradesh.

Elsewhere : Australia, Taiwan, Manchuria.

•62. ***Paramphistomum cervi*** (Zeder, 1790) Fischoeder, 1901.
Reg. No. : W8785/1 (Fig. 56)

1790. *Distoma cervi* Zeder *Schr. de. Geo. Naturfrsch. Freunde* 1065-1072.

1901. *Paramphistomum cervi* Fischoeder *Zool. Anz. Bd.* **25** (646) : 367-375.

Material : Host : Goat (Stomach); Locality : Kavali, Andhra Pradesh; 2 exs. Coll. : S. Chakrabarti. Date 5.ii.2002.

Diagnosis : Body length 6.1 – 8.6 ; pharnyx 0.7 – 1.5 in length, oesophagus 0.75 – 1.2. Intestinal caeca reaching upto acetabulum. Ventral sucker 1 – 3.2 in diameter. Testes lobed, oval, obliquely tandem, upto 1 – 2 in length. Genital pore below caecal bifurcation, ovary

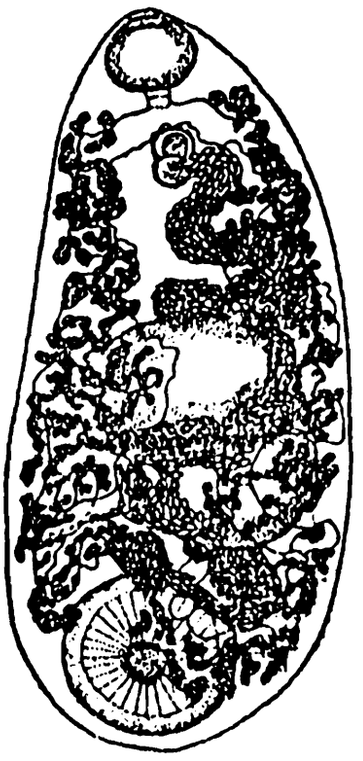


Fig. 56 : *Paramphistomum cervi* (Zeder, 1790) Fischoeder, 1901.

post testicular, vitelline glands extending from intestinal bifurcation to posterior end of acetabulum. Eggs 0.14 – 0.15 × 0.07 × 0.08.

Distribution : India : Andhra Pradesh, Meghalaya and widely distributed.

Elsewhere : Myanmar, Italy, West Germany, England, Sweden.

•63. ***Paramphistomum epiclitum*** Fischoeder, 1904
Reg. No. W8786/1 (Fig. 57)

1904. *Paramphistomum epiclitum* Fischoeder *Ctbl. Bl. Bakt. U. Par.* **35** : 598-601.

Material : *Bubalus bubalis* (Rumen); Locality : Eluru, Andhra Pradesh; 1 ex. Coll.: S. Chakrabarti. Date: 6.iii.2001.

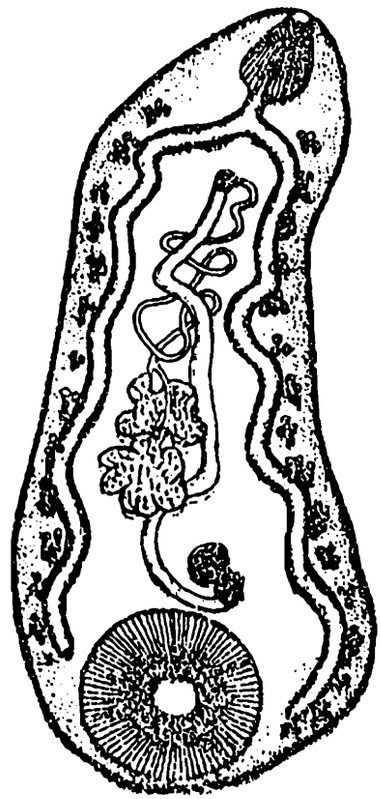


Fig. 57 : *Paramphistomum epiclitum* Fischoeder, 1904.

Diagnosis : Body elongated with blunt ends 7.48 – 9.52 in length, 2. 63 – 3.23 in breadth, pharynx 0.59 – 0.76 in length, ratio in relation to body length 1:8.6; oesopuagus 0.4 – 0.46 in length, intestinal caeca coiled, number of coils 3 – 4, caeca terminating at about the level of middle of acetabulum. Excretory canal prevesicular. Testes lobed, tandem, anterior testis 0.52 – 1.36 × 0.59 – 1.02, posterior testis 0.5 – 1.02 × 0.59 – 1.02; ovary 0.34 – 0.51 × 0.34 – 0.44. Laurer's canal crosses the excretory canal; vitelline glands extend from pharyngeal region to the anterior level of acetabulum, genital atrium with prominent genital papillae. Eggs 0.12 – 0.14 × 0.05 – 0.06.

Distribution : India : Andhra Pradesh, Meghalaya.

Elsewhere : Pakistan, Saigon.

Genus 42 ***Cotylophoron*** Stiles et Goldberger, 1910

•64. ***Cotylophoron cotylophorum*** (Fischoeder, 1901) Stliles et. Goldberger, 1910
Reg. No. : W8787/1 (Fig. 58)

1901. *Paramphistomum cotylophorum* Fishchoeder *Zool. Anz. Bol.* **25** (646) : 367-375

1910. *Cotylophoron cotylophorum* Stiles et. Goldberger 1910 *Boll.* **60**. *Hyg. Lab. U. S. Publ. Heal Mar. Hosp. Washington* 1-259.

Material : Host : Goat (Rumen); Locality : Nellore, Andhra Pradesh. 3 exs. Coll. : S. Chakrabarti. Date : 21.IV.2000.

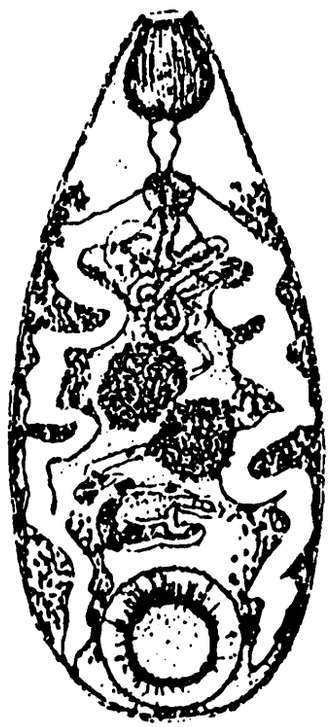


Fig. 58 : *Cotylophoron cotylophorum* (Fischoeder, 1901) Stiles et Glodberger, 1910

Diagnosis : Body conical or ovoidal, slightly curved ventrally or depressed, 4.3 – 6.12 in length, 1.5 – 3.6 in width. Acetabulum 1.53 – 1.61 in diameter. Ratio in relation to body length 1.3 - 1.5 : 4.78, pharynx 0.6 – 1.0 in length, relation to body length 1 : 8.0 – 10.00; oesophagus 0.42 – 0.62 provided with conspicuous oesophageal bulb. Intestinal caeca coiled with 6 – 7 loops extending upto midlevel of acetabulum. Testes much lobed, diagonally placed, size variable 0.59 – 0.85 × 0.73 – 0.85, genital pore post – bifurcal, surrounded by genital sucker. Ovary 0.34 – 0.42 × 0.25 at the level of the posterior testis or post-testicular. Eggs 0.12 – 0.14 × 0.05 – 0.06.

Distribution : India : Andhra Pradesh and widely distributed.

Elsewhere : Africa, Phillipines, Indo China.

Genus 44 ***Ceylonocotyle*** Nasmark, 1937

Key to species

1. Strongly developed oesophageal bulb and lip sphincter present. Genital atrium without genital sphincter ..... *C. scoliocoelium*

   Genital atrium otherwise 2

2. Strongly developed lip sphincter ..... *C. dawesi*

•65. ***Ceylonocotyle scoliocoelium*** (Fischoeder, 1904) Nasmark, 1937
Reg. No. : W8788/1 (Fig. 59)

1904. *Paramphistomum scoliocoelium* Fischoeder *Zool. Jahrb. Jena. Abt. Syst.* **20** (5) : 453-470.

1937. *Ceylonocotyle scoliocoelium* Nasmark *Zool. Bid. Frol. Uppsala* **16** : 301-565.

Material : Host : Goat; Cattle (Rumen); Locality : Hyderabad, Anantapur & Eluru (A. P.); 9 exs. Coll. : S. Chakrabarti. Date: 7.xi.2000, 15.xi.2000 & 6.iii.2001.

Diagnosis : Body elongate, with anterior end pointed, 4.0 – 7.2 × 1.8 – 2.1, anteriorly cuticular papilla may be present. Acetabulum sub-terminal or ventral, 0.75 – 1.9 in diameter. Ratio in relation to body length 1 : 6.2 – 6.5, pharynx 0.35 – 5.1 in length, oesophagus 0.35 – 1.2 in length with oesophageal bulb, caeca straight, extend upto the level of the ovary

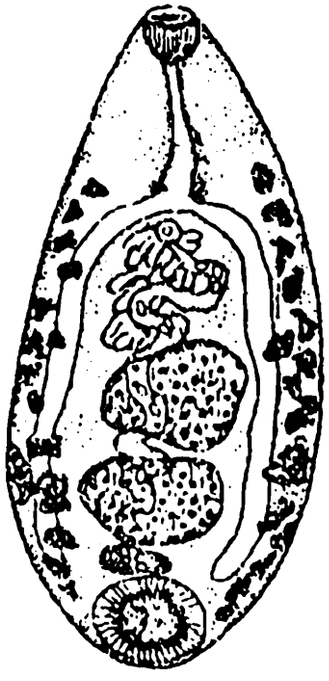


Fig. 59 : *Ceyloncotyle scoliocoelium* (Fischoeder, 1901) Nasmank, 1937.

laterally. Testes tandem, anterior one 0.8 – 1.9 × 0.91 – 1.38, posterior one 0.75 – 1.2 × 0.91 – 1.35. genital pore at post caecal bifurcation. Ovary post testicular, 0.21 – 0.35 × 0.21 – 0.36. Laurer's canal not crossing the excretory vesicle. Vetellaria large, coarsely lobed, extending from caecal bifurcation upto acetabular zone, laterally overlapping caeca dorsally in sone places, asymmetrical in few cases. Eggs 0.12 – 0.17 × 0.06 – 1.08.

Distribution : India : Andhra Pradesh, Uttar Pradesh, Kerala, West Bengal, Punjab.

Elsewhere : Vietnam.

•66. *Ceylonocotyle dawesi* Gupta, 1959
Reg. No. : W8789/1 (Fig. 60)

1959. *Ceylonocotyle dawesi* Gupta *Res. Bull. Punjab Univ. Sci.* **140** : 62–73.

Material : Host : *Bos indicus* (Rumen); Locality : Vishakhapatnam, Andhra Pradesh; 3 exs. Coll. : S. Chakrabarti. Date : 16.ii.2002.

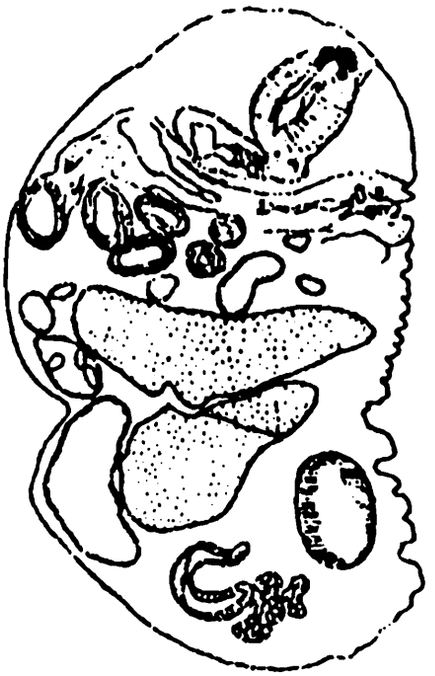


Fig. 60 : *Ceylonocotyle dawesi* Gupta, 1959.

Diagnosis : Body elongate or oval, blunt at both ends, 2.8 – 8.1 × 1.5 – 3.3. Acetabulum 0.38 – 1.15 in diameter. Ratio in relation to body length 1 : 5.4 – 6.4 surrounded by prominent muscular ridges. Pharynx 0.25 – 9.1. Ratio with body length varies from 1 : 4.6 – 7.3. Oesophagus 0.45 – 1.1, curved without oesophageal bulb, caeca straight reaching upto middle of acetabulum, testes tandem. Genital pore 0.6 – 1.04, behind anterior end. Pars musculosa muscular. Laurer's canal do not cross excretory canal. Ovary post testicular 0.18 – 4.2 × 0.25 – 0.61. Vitelline follicles extend laterally from caecal bifurcation to caecal end. Eggs 0.09 – 0.13 × 0.05 – 0.07.

Remarks : Mukherjee and Chauhan (1965), Yamaguti (1971) Gupta (1953), held the species as valid one while Mehra (1980) listed the species as synonym of *C. scoliocoelium.* We consider the species as a valid one.

Distribution : India : Andhra Pradesh, Kerala, Tamil Nadu, Meghalaya.

Subfamily XXIX GASTRODISCINAE Monticelli, 1892

Genus 45 *Gastrodiscus* Leukart, 1877

•67. *Gastrodiscus aegypticus* (Cobbold, 1876).

Reg. No. : W8790/1 (Fig. 61)

1876. *Diplostoma aegypticus* Cobbold *J. Linn. Zool.* **65** (15) : 35-46.

1893. *Gastrodiscus aegypticus* Railliet *C. R. Soc. Biol.* **26** : 633-634.

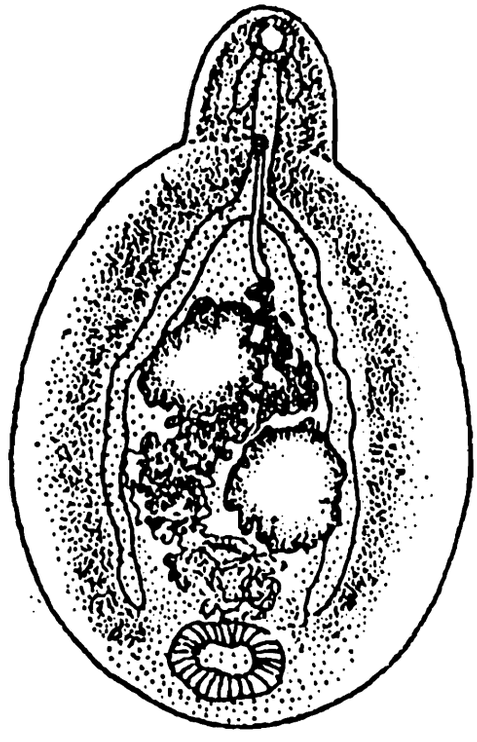


Fig. 61 : *Gastrodiscoides aegypticus* (Cobbold, 1877) Railliet, 1893

Material : Host : Horse, Mule (Intestine); Locality : Hyderabad & Vishakhapatnam (A.P.); 6 exs. Coll. : S. Chakrabarti. Date : 12.iv.2000 & 7.xi.2000.

Diagnosis : Body divided into small cylindrical anterior part, 4 – 6 × 2.5 – 3 and a large ventrally papillated posterior portion, 8.5 – 9.7 × 1.9 – 2.7. Acetabulum comparatively small on elevated in margins. Pharynx with bulb and paired pouch. Oesophagus with muscular thickening. Caeca straight, extend upto acetabular zone. Testes diagonal, lobed in middle third of body. Ovary post testicular, round on acetabular level, mostly extracaecal may intrude

in intracaecal zone, uterus in between testes, runs upto genital pore, immediately behind cephalic cone. Eggs 0.17 – 0.01 × 0.11 – 0.12.

Distribution : India : Andhra Pradesh, Assam, Meghalaya, West Bengal.

Subfamily GASTROTHYLACINAE Stiles et Goldberger, 1910

Key to Genus

1. Uterus crossing one side of body to the other at equatorial zone and testes juxtaposed ..... ***Gastrothylax***
– Testes otherwise 2
2. Testes tandem, equatorial, either coinciding or overlapping ..... ***Fischoederius***

Genus 46 ***Gastrothylax*** Poirier 1883

Key to Species

1. Body 12 – 17, cylindrical, may be curved ventrally ..... *G. crumenifer*
– Body smaller, without curvature 2
2. Body narrow, 10 – 15 long, ventral pouch wide ..... *G. indicus*
– Body and ventral pouch otherwise 3
3. Body 4 – 8, broad, ventral pouch narrow ..... *G. glandiformis*

•68. ***Gastrthylax crumenifer*** Poirier, 1883
Regd. No. : W8791/1 (Fig. 62)

1847. *Amphistoma crumenifer* Creplin *Arch. Naturg.* **13** (1) : 30-35.

1883. *Gastrothylax crumenifer* Poirier *Bull. De. La Soc. Philomath*, 73-80.

Material : Host : Goat, cattle (Rumen); Locality : Hyderabad, Vishakhapatnam, Eluru, Anantapur (Andhra Pradesh); 11 exs. Coll. : S. Chakrabarti; Date : 12.iv.2000, 7.xi.2000, 6.iii.2001 & 15.i.2002.

Diagnosis : Body elongate, cylindrical, 8 – 19 × 2.5 – 6.5; pharynx 0.4 – 0.7 × 0.4 – 0.6. Oesophagus straight or curved, 0.08 – 1.2. Intestinal caeca wavy, extend upto testes or more. Acetabulum 1.8 – 3.5 × 0.9 – 1.8; Ratio between diameter to body length 1:5-6. Testes lobed, symmetrical; left testis 0.9 – 2.4 × 1.95 – 1.98 and right one 1.2 – 1.5 × 1.5 – 2.5; ovary intertesticular 0.3 – 0.5 × 0.21 – 0.55, uterus crossing to other side at equatorial level. Genital pore pre-bifurcal, vitellaria follicular may be distributed throughout body or lateral, extending from caecal bifurcation to acetabulum. Eggs 0.11 – 0.14 × 0.06 – 0.07.

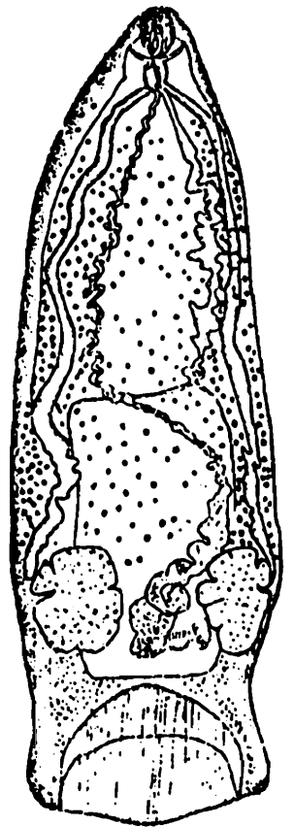


Fig. 62 : *Gastrothylax crumenifer* (Creplin, 1847) Poirier, 1883.

Distribution : India : Andhra Pradish (Widely distributed).

Elsewhere : Africa, China, Sri Lanka.

•69. *Gastrothylax indicus* Dutt, 1978
Reg. No. : W8792/1 (Fig. 63)

1978. *Gastrothylax* indicus Dutt *J. Parasit* **2** : 39-41.

Material : Host : Sheep, cattle, buffalo (Intestine); Locality : Vishakhapatnam, Hyderabad (Andhra Pradesh); 5 exs. Coll.: S. Chakrabarti; Date : 7.iv.2000 & 12.iv.2000.

Diagnosis : Body shape elongated, cylindrical with pointed anterior end, papillated at both the extremities, 10 – 15 × 2.2 – 4.1, ventral pouch with vertex and directed dorsally. Acetabulum terminal, 0.75 – 1.3 × 1.4 – 2.5. Pharynx 0.7 – 0.82 × 0.5 – 0.81. Oesophagus 0.6 – 1.3 long. Caeca long, wavy, extending upto testes. Testes deeply lobed, symmetrical, vesicula seminalis convoluted, pars musculosa and pars prostatica prominent. Ovary intra-testicular, oval, 0. 4 – 0.65 × 0.29 – 0.75. Laurer's canal not crossing excretory vesicle. Uterus crossing over opposite side at midregion of body. Vitellaria follicular in lateral and ventral field extends from post oesophageal level to preacetabular zone. Genital pore opening in ventral pouch at the level of caecal bifurcation. Genital spincter present. Eggs 0.11 – 0.12 × 0.06 – 0.06.

Fig. 63 : *Gastrothylax indicus* Dutt, 1978.

Distribution : India : Andhra Pradesh, M. P., Gujarat, Jammu & Kashmir, Assam, Meghalaya.

•70. *Gastrothylax glandiformis* Yamaguti, 1939

Reg. No. : W8793/1 (Fig. 64)

1939. *Gastrothylax glandiformis* Yamaguti *Jap. J. Zool.* **8** : 129-210.

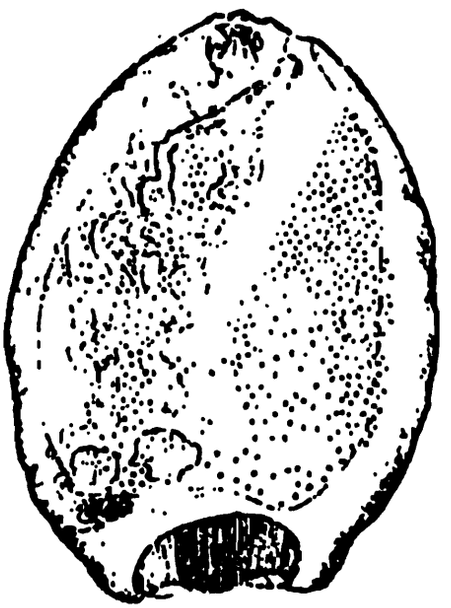


Fig. 64 : *Gastrothylax glandiformis* Yamaguti, 1938.

Material : Host : Sheep, goat (Rumen); Locality : Hyderabad (Andhra Pradesh); 2 exs. Coll. : S. Chakrabarti; Date : 12.iv.2002.

Diagnosis : Body cylindrical, pointed anteriorly, papillated, 4.1 – 7.5 × 1.5 – 3.5, pharynx 0.5 – 0.7 × 0.35 – 0.55, its cavity with minute papillae. Acetabulum terminal, 0.7 – 0. 12 × 0. 11 – 1.8. Oesophagus 0.25 – 0.55 long. Caeca extending upto pretesticular level, slightly wavy. Testes close together, symmetrical, lobed, 0.75 – 1.35 in diameter. Pars musculosa with several loops; pars prostatica 0.7 – 1.2 × 0.11 – 0.21. Ovary posterodorsal to uterus, intertesticular, 0.2 – 0.3 × 0.2 – 0.4, multilobed uterus crossing to other side at equatorial zone. Vitelline follicles lateral, inter or extracaecal, extending from post oesophageal to acetabular level. Genital pore post bifurcal, opening into ventral pouch, 0.1 – 0.13 from anterior end, genital atrium narrow. Genital spincter present with papillae, eggs 0.12 – 0.14 × 0.86 – 0.06.

Distribution : India : Andhra Pradesh, Punjab, Jammu & Kashmir, Assam, Meghalaya.

Elsewhere : Japan.

Genus 47 ***Fischoederius*** Stiles et Goldberger, 1910

•71. ***Fischoederius elongatus*** (Poirier, 1883) Stiles et Goldberger, 1910

Reg. No. : W8793/1 (Fig. 65)

1883. *Gastrothylax elongatus*. Poirier *Bull.* De la Philmath 73-80.

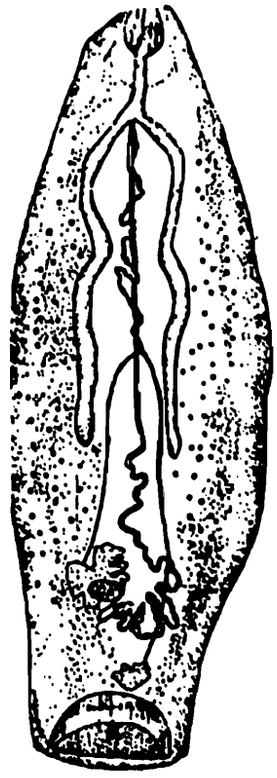


Fig. 65 : *Fischoederius elongatus* (Poirier, 1883) Stiles et. Goldberger, 1910.

1910. *Fischoederius elongatus* Stiles et Goldberger *Hyg. Lab. Bull.* No. **60** : 250.

Material : Host : Sheep (Intestine); Locality : Eluru, Andhra Pradesh; 3 exs. Coll.: S. Chakrabarti; Date : 6.iii.2001.

Diagnosis : Body elongate, 7.5 – 15.5 × 2.5 – 4.2, constricted slightly at testicular zone, ventral pouch present, extending upto testicular zone. Pharynx 0.4 – 0.8 × 0.3 – 0.6. Acetabulum terminal, 1.2 – 1.4 × 0.7 – 1.2. Ratio between dorso ventral diameter and body length 1:4.5 – 4.9, oesophagus 0.42 – 0.81, straight or wavy extending upto equatorial zone of body length. Testes almost tandem; irregularly lobed, ovary compact, intertesticular, 0.15 – 0.34 × 0.35 – 0.58, uterus extends along vas deferens upto genital opening at mid level of oesophagus in ventral pouch, vitelline glands follicular from caecal bifurcation to testicular level. Eggs 0.11 – 0.12 × 0.06 – 0.07.

Distribution : India : Andhra Pradesh, West Bengal, Uttar Pradesh, Tamil Nadu, Punjab, Meghalaya.

Elsewhere : Sri Lanka.

SUMMARY

The present work is an account of all the species of Digenetic trematodes of Birds and Mammals recorded and studied so far from Andhra Pradesh. Diagnostic characters, material and method and keys for the families, genera and species, dealt in the present work, have been provided mainly for the workers in this group. Diagnostic characters and geographical distribution of all the species recorded from Andhra Pradesh have been furnished. Only newly proposed synonymies of some species have been included, omitting detail discussions, which is beyond the scope of present treatise. Diagrams of most of the species have been provided for easy identification.

In all 71 species under 43 genera and 20 families have been included in the present work, of which 423species under 29 genera are recorded from bird host and rest 28 species under 14 genera are examined and recorded from the mammal host.

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• Examined the specimens and registered in National Zoological Collection, accordingly.

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Host parasite relationship along with the feeding habit of the host Trematodes from Birds

Sl. No.	Name of the parasite	Host		Location of the parasite in the Host	Feeding habit of the Host
		Scientific Name	Common Name		
01.	*Apharyngostrigea ramai* (Verma, 1936) Vidyarthi, 1937	*Bubulcus ibis coromandus* Buddaert	Cattle Egrete	Intestine	Carnivours
02.	*Strigea fulconis mcgregori* Tubangui, 1932.	*Milvus migrans govinda* Sykes	Pariah Kite or Black Kite	-do-	Carnivorous
03.	*Strigea orientalis* Vidyarthi, 1937	-do-	-do-	-do-	-do-
04.	*Diplostomum spathaceum* (Rud. 1819) Olsson, 1876.	*Larus brunnicephglus* Jerdon	Brown headed Gull	-do-	Carnivorous/ Piscivorous.
05.	*Neodiplostomum mehranium* Vidyarthi, 1938.	*Milvus migrans govinda* Sykes	Pariah Kite or Black Kite	-do-	Carnivorous
06.	*Neodiplostomum migrans* Dubois et Richard, 1964.	-do-	-do-	-do-	-do-
07.	*Prosthodiplostomum rayii* Verma, 1936.	*Ardeola grayii* Sykes	Paddy Bird or Pond Heron	-do-	Piscivorous.
08.	*Clinostomum complanatum* (Rud.1814) Braun, 1899.	-do-	-do-	-do-	-do-
09.	*Cyclocoelium elongatum* Harrah, 1921	*Dicruras adsimiles macrocercus.* Vieillot *Tringa glareola*	South Indian black Drongo or King Crow Wood or spotted sand piper.	Air Sac -do-	Insectivorous -do-
10.	*Haematotrephus lancoelatum* (Wedl. 1858)	*Vanellus indicus indicus*, Boddaert	Red tailed lapwing	Air Sac	Insectivorous

Sl. No.	Name of the parasite	Host		Location of the parasite in the Host	Feeding habit of the Host
		Scientific Name	Common Name		
	Stossich, 1902.				
11.	*Echinochasmus bugalai* Verma, 1935.	*Ardeola grayii* Sykes	Pond Heron or Paddy Bird	Intestine	Piscivorous
12.	*Echinostoma revolutum* (Froelich, 1802) Looss, 1899.	*Acridotheres tristis* Linnaeus	Common moina	Intestine	Insectivorous
13.	*Nephrostomum ramosum* (Sonsino, 1895) Deitz, 1909.	*Bubulcus ibis coromondus* Buddaert.	Cattle Egret	Intestine	-do-
14.	*Parallelotestis egretti* (Srivastava, 1960) Gupta et Gupta, 1964.	-do-	-do-	-do-	-do-
15.	*Pegosomum egretti* Srivastava, 1957	*Bubulcus ibis coromondus* Buddaert.	Cattle Egret	Intestine	Insectivorous
16.	*Philopnthalmus offlexorius* Mamaev, 1957.	*Milvus migrans govinda* Sykes.	Pariah kite or Black kite	Orbital cavity	Carnivorous
17.	*Philophthalmus nocturnus* Loos, 1907	*Acridotheres tristis* Linnaeus	Common moina	Orbital cavity	Insectivorous
18.	*Brachylecithum stunkardi* (Pande, 1939) Denton et Byrd, 1951	*Sturnus pagodarum* (Gmelin)	Brahmine Myna	Gall bladder	Insectivorous
19.	*Lyperosomum skrijabini* Jaiswal, 1957.	*Corvus splendens* Vieillot	Indian House Crow.	Liver	Omnivorous
20.	*Zoonorchis travassosi* Jaiswal, 1957.	*Saxicoloides fulicata cambaiensis* (Latham)	Indian Robin	-do-	Insectivorous
21.	*Eumegacetes medioximus* Braun, 1901	*Acridotheres tristis* (Linn.)	Common myna	Posterior part of intestine	Insectivorous

Sl. No.	Name of the parasite	Host		Location of the parasite in the Host	Feeding habit of the Host
		Scientific Name	Common Name		
22.	*Eumegacetes tringularis* Looss, 1990	*Dicrurus adsimilis macrocercus* Vieillot	South Indian Black drongo or King crow black drongo or king crow	Intestine	-do-
23.	*Eumegacetes hirundiosus* Jaiswal et Vasudev, 1960.	*Hirudo rostica rostica* (Linnaeus)	Common Swallow	Intestine	Insectivorous
24.	*Eumegacetes megacetabulus* Jaiswal et Vasudev, 1960.	*Halcyon fusca fusca*	White breasted King Fisher	-do-	-do-
25.	*Eumegacetes hyderabadensis* Jaiswal et Vasudev 1960.	*Lanius excubator lahtora* (Limmaeus)	Indian gray shrike	-do-	-do-
26.	*Eumegacetes centropius* Jiawal et Humayun, 1973.	*Centropius sinensis* (Stephers)	Greater Coucal	Kidney	Insectivorus
27.	*Eumegacetes longicirratus* Jaiswal et Vasudev, 1960.	*Hirundo smithii filifera*	Wire tailed swallow	Cloaca	Insectivorous
28.	*Eumegacetes indicus* Jaiswal et Vasudev, 1960.	*Temenuchus pegodrum* (Stephers)	Black headed myna.	Intestine	-do-
29.	*Eumegacetes singhii* Jaiswal, 1957.	*Centropius sinesis* (Stephers)	Greater Coucal	-do-	-do-
30.	*Eumegacetes vishakhapatnamensis*, Gandhi, 1978	*Merops phillippinus Phillippinus* (Linn.)	Blue tailed Bee-eater	-do-	-do-
31.	*Macrophallus primas* (Jagerskicold, 1908) Stunkard, 1951.	*Larus argentitus mongolicus* Sushkin	Pink legged Herring Gull	Intestine	Carnivorous
32.	*Plagiorchis elegans* (Rud. 1802) Braun, 1902.	*Larus argentitus mongolicus* Sushkin	-do-	Intestine	Carnivorous

Sl. No.	Name of the parasite	Host		Location of the parasite in the Host	Feeding habit of the Host
		Scientific Name	Common Name		
33.	*Prosthogonimus cuneatus* (Rud.1809) Braun, 1902.	*Larus argentitus mongolicus* Sushkin	-do-	Intestine	Carnivorous
		Ardeola grayii Sykes	Pond Heron	-do-	Piscivorous
		Acridotheres tristis (Linn.)	Common myna	-do-	Insectivorous
34.	*Stomylotrema vicarium* Braun, 1901	*Podiceps ruficollis capensis* Salvadori	Little greebe	Cloaca	Omnivorous
		Bubulcus ibis coromondus	Cattle Egret	Bursa fabricae	Insectivorous
35.	*Galactostomum puffini* Yamaguti,1941	*Larus argentitus mongolicies* Sushkinm	Pink legged Herring Gull	Intestine	Carnivorous
		Larus brunnicephalus Jerdon	Brown headed Gull	-do-	-do-
36.	*Haplorchis taichui* Nishigori, 1924	*Milvus migrans goninda* Sykes	Pariah Kite or Black Kite	Intestine	Carnivorous
37.	*Haplorchis yokogawai* (Katsuta, 1932), Cheng, 1936.	*Corvus splendens splendens* Vielliot	Indian House Crow	Intestine	Omnivorous
38.	*Heterophyes heterophyes* (Seibold, 1853) Stiles et Hassal, 1900.	*Larus argentitus Sushkin*	Pink legged Herring Gull	Intestine	Carnivorous
		Larus brunnicephalus Jerdon	Brown headed Gull.	Intestine	Carnivorous
39.	*Heterophyes continua major* (Yamaguti, 1939) Yamaguti, 1971.	*Larus argentitus mongolicus* Sushkin	Pink legged Herring Gull	Intestine	Carnivorous
40.	*Stictodora sawakinensis* Looss, 1899.	*Larus brunnicephalus* Jerdon	Brown headed Gull.	-do-	Carnivorous

Sl. No.	Name of the parasite	Host		Location of the parasite in the Host	Feeding habit of the Host
		Scientific Name	Common Name		
41.	*Leucochlordium macrostoma* (Rud. 1803) Poche, 1907.	*Anas boschas domesticus*	Domestic duck	-do-	
42.	*Ganeo tigrinum* Mehra et Negi, 1928	*Neophoron percnoperus*	Egyptian Vulture	Intestine	Carnivorous
	Trematodes from Mammals				
43.	*Euparadistomum buckleyi* Singh, 1958	*Vulpex alopex* (Linn.)	Common Red Fox	Gall bladder	Carnivorous
44.	*Pycnoporus loossi* Pande, 1935	*Hippsideros speoris* (Schneider)	Schneider's leaf-nosed bat	Intestine	Insectivorous
45.	*Paralecithodendrium ovimagnosum* Bhalerao, 1926.	*Tadarida aegyptiaca* (E. Geoffroy)	Wrinkl liped bat	Intestine	Insectivorous
		Taphozous longimanus Hardaricke	Tomb-bat	-do-	-do-
46.	*Prosthodendrium longiforme* Bhalerao, 1926.	*Tadarida aegyptica* (E. Geoffroy)	Wrinkle lipped bat	-do-	-do-
47.	*Prosthodendrium mehrai* Pande, 1935.	*Pipistrellus ceylonicus* (Kelaart)	Kelaart's Pipistrelle	-do-	-do-
48.	*Prothodendrium ovatum* Simha, 1958.	-do-	-do-	-do-	-do-
49.	*Lecithodendrium (L.) hirustum* Looss, 1896.	*Pipistrellus ceylonicus* (Kelaarb)	Kelaart's pipistrelle	Intestine	Insectivorous
50.	*Lecithodendrium (L.)* modilingeri Pande, 1935.	*Megaderma lyra* (Geoffroy)	Indian false vampire	-do-	Insectivorous
51.	*Auchitrema sanguineum* (Sonsino, 1894) Looss, 1899.	*Tadarida aegyptiaca* (Geoffroy)	Free tailed bat	-do-	Insectivorous

Sl. No.	Name of the parasite	Host		Location of the parasite in the Host	Feeding habit of the Host
		Scientific Name	Common Name		
52.	*Plagiorchis vespertiliouis* (Mueller, 1784) Braun, 1900.	*Tadarida aegyptiaca* (Geoffroy)	Free tailed bat	-do-	Carnivorous
		Pipistrellus ceylonicus (Kelaart)	Kellart's pipistrelle	-do-	Insectivorous
		Megaderma lyra (Geoffroy)	Indian false vampire	-do-	Carnivorous
53.	*Neoglyphe hinoi* (Ozaki, 1931) Yamaguti, 1958.	*Tadarida aegyptica* (Geoffroy)	Free tailed bat	-do-	Insectivorous
54.	*Echinochasmus perfoliatus* (Ratz, 1980) Deitz, 1909.	*Megaderma lyra* (Geoffroy)	Indian false vampire	Intestine	Carnivorous
55.	*Echinochasmus vidhianae* Vasudev, 1973.	*Aquila rapax vidhiana*	Indian towny eagle	-do-	-do-
56.	*Echinochasmus megadermi* Salem, 1975	*Megaderma lyra* (Geoffroy)	Indian false vampire	-do-	-do-
57.	*Fasciolopsis buski* (Lankester, 1857) Stiles, 1901.	*Sus Scrofa*	Pig/wild boar	-do-	Omnivorous
58.	*Fasciola gigantica* Cobbold 1855 W8781/1	*Bos indicus* *Bubalus bubalis*	Cow Water Buffalo	Rumen Intestine	Herbivorous
59.	*Fasciola hepatica* Linnaeus, 1758 W8782/1	Sus Scrofa	Pig/wild boar	Liver	Omnivorous
60.	*Gigantocotyle explanatum* (Creplin, 1847) Nasmark, 1937. W8783/1.	*Bos sp.*	Domestic Cow	Rumen	Herbivorous
61.	*Paramphistomum ichikawai* Fukui, 1922. W8784/1.	*Bos sp.*	Domestic Cow	Rumen	Herbivorous
62.	*Paramphistomum cervi* (Zeder, 1790) Fischoeder, 1901. W8785/1	*Capra sp.*	Domestic Goat	Rumen	-do-

Sl. No.	Name of the parasite	Host		Location of the parasite in the Host	Feeding habit of the Host
		Scientific Name	Common Name		
63.	*Paramphistomum epiclitum* Fischoeder, 1904. W8786/1	*Bubalus bubalis*	Water Buffalo	-do-	-do-
64.	*Cotylophoron cotylophorum* (Fischoededr) Stiles et Goldberger, 1910 W8787/1	*Capra sp.*	Domestic Goat	Rumen	Herbivorous
65.	*Ceylonocotyle scoliocoelium* (Fischoeder, 1904)	*Capra sp.*	Domestic Goat	-do-	-do-
	Nasmark, 1937 W8788/1	*Bos sp.*	Domestic Cow	-do-	-do-
66.	*Ceylonocotyle dawesi* Gupta, 1959 W8789/1	-do-	-do-	-do-	-do-
67.	*Gastrodiscus aegypticus* (Cobbold, 1876)	*Equs sp.*	Domestic Horse	-do-	-do-
	Railliet,1893. W8791/1	*Asinus sp.*	Domestic Mule	-do-	-do-
69.	*Gastrothylax indicus* Dutt., 1978 W8792/1	*Ovis sp.*	Domestic Sheep	-do-	-do-
		Bos sp.	Domestic Cow	-do-	-do-
		Bubalus bubalis	Water Buffalo	-do-	-do-
70.	*Gastrothylax glandiformis* Yamaguti, 1930 W8793/1	*Ovis sp.*	Domestic Sheep	-do-	-do-
		Capra sp.	Domestic Goat	-do-	-do-
71.	*Fischoederius elongatus* (Poirier, 1883) Stiles et Goldberger, 1910 W8794/1	*Ovis sp.*	Domestic Sheep	-do-	-do-

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CESTODA

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INTRODUCTION

Cestode or tape worms are internal parasites mostly found in the intestine of vertebrate animals. They cause various diseases among all wild and domesticated animals and man. These diseases are known from premative days. These worms have modified their all body organs and physiology for successful parasitic existence.

Cestodes are broadly divided in two group Monozoic with single segments and are generally known as Caryophyllied cestode. Cestode with more than one segments or proglottids are Polyzoic cestode. Size of the Polyzoic cestodes are extremely variable both in number of proglottids and total length. Vertebrate intenstine are choosen as their favourable habitat during their adult stage. The larval forms have been found in different body organ preferably liver, lungs, kidney and even body muscle in cystic form.

Due to parasitic mode of life their digestive respiratory and circulatory organs are of no use and discarted as superflous and every essential is provided by the host it self. As their life cycle is not completed in one host, they face serious difficulties or hazards to find out a suitable host for their progeny as such they have developed ability to reproduce both sexually and asexually. *Taenia saginata* a cestode parasite of human body can produce more than 4000,000 eggs per day and can live in human intestine for more than 10 years. Lawson (1939) recorded a case where *Echinococcus* cyst was alive for fifty six years. Fortunatly most of the cestode parasities die in larval stages before being established in final host. Not even one in one million ultimately can survives.

The report is based on the previous records in literature and studies on the collections made by Zoological Survey of India.

Diagnostic characters of all the species dealt with in the present work have been included. General morphology and taxonomy, method of preservation collection have been enlightened.

MATERIAL AND METHOD

Cestodes of adult stages are generally found in the intenstine of vertebrate animals, larval cestodes are found in invertebrate animals like mites, crustaceans, ants etc. Life history of cestodes are completed in fish, amphibia, mammals and birds.

For study and collection of cestode material first of all entire alimentary canal of the host is removed by dissecting the host animal and kept on clean tray and submerged in water. With the help of scissors entire intestine is cut open very carefully so that the cestode worm is not damaged then by using a sable hair brush very slowly the worm is removed from the open intestine. In some cases the scolex of spiny headed worm is embaded in intestinal wall by penetrating the intestinal mucosa. Due to change environment the worm get relax to some extent and come out intact that is with all proglottids and scolex. In most of the cases the cestode parasities can not be removed from the intestine in toto as the scolex portion get penetrated in the intestinal wall, in that case the specimen along with the host intestine to be allowed to be submerged in normal saline for more or less 20 minutes. Mild teasing may require to remove the scolex from intestinal wall so that the entire worm with scolex come out in its own way. Smaller cestodes are detected under magnifying lens or binocular. To stretch the smaller specimens they are shaked in tube useing normal saline. Lungs, Kidney, Liver etc. are separately examined keeping on separate petri-dish. All the worms are separately kept in normal saline with temporary labels, scolex or head portion of the worm are seperately preserved so that these are easily traceable and not damaged. 70% alcohol may be used as preservatives. A Bigger specimens are flattened on slide under cover glases and slight pressure is applied to flattened the worm so that all the organs are visible under microscope. A.F.A. or alcohol to be used drop by drop to kill the worm. To avoid sliping of the worm from between slide and cover slip it is fasted by fine thread and kept in alcohol for fixation and after about an hour it is transferred to 70% alcohol. Some time living specimens are fixed in hot water or 4% hot formalin. 4-5% formalin with few drops of glycerine is good preservative for cestode. Best stain for preparation of parmanent slides are Acitic Acid. Alam carmine and Delafield's Haematoxylin are recomended, for small specimens, Borax carmine gives good result.

MORPHOLOGY AND TERMINOLOGY

Cestodes are dorsoventrally flat, rarely cylindrical, tape-like; length variable from a millimetre to several meters. At the anterior end, an organ of attachment that is head *(Scolex)* armed with suckers, hooks or both are present. In monozoic cestode the head is said to be absent, except in some where a sucking organ or *pseudoscolex* develops. Structure of head is very important taxonomically. Order and in most cases family are easily distinguishable by head characters. The main six orders or polyzoic cestode have following characters. Cyclophyllidea bears four suckers, in Pseudophyllidea two sucking grooves or bothria are

present. Trypanorhyncha head have four protrusible proboscides armed with spines. In tetraphyllidea four ear like lappets are present. Diphyllidea have two spoon shaped bothridia and spathebothridea having scolex with no suckers, bothridia, tentacles etc. Several other variation and intermediate forms of head structure are also found in cestodes, necessiating erection of several other order, superfamily etc., by different authors.

Neck is the unsegmented portion of cestode between head and starting of segmentation. It is of various shape and size, present or absent; in some case dilated to form accessory holdfast organ.

Strobila or the body part is made of *proglottids* or segments which is one in the class cestodaria or monozoic cestode and two to many in the class Eucestoda or polyzoic cestodes. Outer segmentation usually correspond with that of internal segmentation. Segmentation may be parallel, convex or trapezoidel. The posterior border or proglottids normally covers the anterior border of posterior proglottids and they are called *craspedote,* in the opposite case they are called *acraspedote.* The proglottid increase in length and breadth progressively towards gravid ones but only the terminal ones decrease in breadth.

Digestive, respiratory and *circulatory* systems are absent in cestodes.

Muscular system – Usually consist of longitudinal, circular and diagonal muscle fibres. In different order of Cestodes a great variety in their arrangement have been observed. Longitudinal muscle fibres may be in two to four layers, having circular muscle fibre, in between. Circular muscle fibre divides the connective tissues in body parenchyma in two zones, namely *medullary* and *cortical.* Genital organs remain normally confined in cortical layer and excretory vessels, nerves and longitudinal muscles are mudullary in position. Diagonal fibres are not very conspicuous in most cases. Muscle fibre becomes weak gradually towards gravid proglottid, which makes it easy for their detachment from the body chain and ultimate rapture of body wall, for liberating eggs. Arrangement of muscle fibres and zonal distribution of body organs in medullary and cortical layers are of taxonomic importance.

Excretory system – Consist of flame cells in parenchyma. They anastomise and form four longitudinal vessels in each proglottid, two running on each lateral side, one dorsal and one ventral. Dorsal almost as a rule, smaller than ventral, by which in most cases, dorsal and ventral side could be determined. The longitudinal vessels run upto the scolex dorsally then turn backwards and descent as ventral vessels upto the last proglottid where they open to the exterior. The longitudinal vessels are connected by transverse vessels at the posterior end of each proglottid. Relative position of genital duct and excretory vessels, is generally constant for a genus in cestodes and as such is very important taxonomically.

Nervous system – Consists of central ganglia in the scolex from which nerve trunks arise. Generally four nerve trunks are present in scolex and two longitudinal nerve trunks run along the border of proglottids. Nerve ganglions are also present scattered in each proglottid to monitor external stimuli.

Male reproductive system – cestodes in general are *proterandraus* or *androgyny,* that is male organs develop earlier, though in some cases they are *protogynous* or *gynandry* in which female organs develop earlier. They are hermaphrodites in general except in few cases where male and female genetalia develop in different proglottids of the same or different individuals. Male genital organs consist of many testes though two or three testes are also present in some families and genera of cestodes. Normally they remain confined and scattered within the excretory vessels in medullary region, rarely extending to cortical region. Number of testes per segment and their arrangement is an important tool for differentiating genera and species in cestodes. Small duct known as *vasa efferentia* arises from each testis and all these ducts unite to form vas *difference* which runs as sperm duct, from about the middle of each mature proglottid, towards genital pore. The terminal muscular protrusible portion of the sperm duct is known as *cirrus* which is male copulatory organ. the non-protrusible portion is termed as *ejaculatory duct.* The sperm duct before entering into cirrus pouch may have dilation which is called the *external seminal vesicle.* If the dilation is inside the cirrus pouch it is termed as *internal seminal vesicle.* Dilation of ejaculatory duct is termed as *pars prostatica.* Seminal vesicle if present, along with ejaculatory duct and pars prostatica are very often enclosed within a sac called *cirrus sac.* This organ may be absent but if present is variously shaped from a minute organ to a size extending across the breadth of the proglottids. *Ductus hermaphroditicus* is also present in certain cestodes, cirrus is armed with spines in some cases. It opens to the *genital sinus, genital cloaca or cirro-vaginal aperture* as per the position of genital organs. The genital pore is usually on a small depression, on the various place on the lateral margin of one or both sides of every mature proglottid or on the ventral or dorsal superficial surface. It may open along with female genital pore. The relative position of genital openings along with shape and size of cirrus pouch is important from taxonomic point of view.

Female reproductive system – Ovary is single, two lobed, lies in the medullary region in most cases. Double ovary and partly or fully cortically placed position of ovaries are also reported in few cases. Ovary is H. ×, fan shaped, lobed, branched or compact, normally lies ventrally and posterior to testes. In some cases it is pretesticular. The lobes of the ovary are joined by a hollow tube called *isthmus* from which fine tubular *oviduct* arises. The eggs pass from ovary to this oviduct which soon divides in two long tubes, namely *vagina* and *uterus.* Vagina proceeds upto genital pore. Uterus of varied characteristic shape and size, in different genera remain loaded with eggs. Vitelline gland is single, compact or branched and remains close to ovary. It may be divided in many follicles which are confined laterally, in medullary or cortical region or encircle the proglottid. They are rarely absent in some cestodes where the germ cells in utcrus is fertilised in situ. Vagina commonly opens to the exterior, through genital atrium along with male aperture. It may open directly on the lateral side, on the ventral flat side or near posterior extremity. The uterus is a straight or coiled tube with or without outgrowths. the uterus in some cases is replaced into eggs capsules containing one or more number of eggs. One or more *paruterine organ* may also develop on the uterus in some cases

for storage of eggs. In the gravid proglottid uterus with eggs, occupies all the available space and practically rest of the organ degenerate except genital pore, cirrus pouch, and genital atrium. Uterine pore is present or absent and open along with or separately from vaginal aperture on marginal or ventral surface. Eggs are discharged to the outside by disintegration or rupture of uterine wall where uterine pore is absent. The most gravid proglottid is detached from the body of cestode and passed out of the host to exterior. If it is one by one it is called *euapolysis,* when detached in groups of two or more proglottids they are called *anapolysis.* In some cases embryo matures only after detachment of the segment from the body, then it is termed as *hyperapolysis.* The eggs are globular or oval, in most cases the ovum is covered with two or three membrane. The embryo normally bears six hooklets, characteristic of polyzoic cestode eggs, though they are absent in some cases. Monozoic cestode egg have 10 hooks. In some cases poles of the egg have two projection called *pyriform apparatus* which may cross each other when fully matured.

Life history – Most of the tapeworm have indirect life cycle. Two or more hosts are required to complete the life history and one of which is usually an invertebrate. The most common hosts are insects, crustacea, ticks, mites annelids, molluses etc. Very few complete life history of cestode species are known. There are still several order of cestodes in which life history has not been studied even on single species.

The larval forms in cestoda are subdivided in various ways. Hexacanth or Onchospheres is the larval forms of most Eucestoda, and is characterised with six small hooks. In cestodaria larval forms when comes out of egg normally bears ten hooks. Procercoid is an elongated larva with posterior bulb the cercomer bearing six hooks. Plerocercoid is next state of procercoid and could develop into adult only in definitive host. The sparganum are plerocercoid larva whose identity is unknown. In pleurocercus a bladder called blastocyst, is present in the posterior end, whose upper portion or the body is portrusible with in this bladder. Solid hexacanth larva or cyclophyllids is known as cysticercoid and they are of varying shape and size. If the body or cysticercoid is having segmentation it is called Strobilocercoid. Cysticercoid with a hollow bladder is designated as Cysticercus. They are of different characteristic shape and size. Simple one with a single protoscolex is known as Coenurus. Single bladder with many protoscolices is strobilocercus. Unilocular hydatids are having many protoscolices formed by endogenous budding. Hydatid cysts having endogenous buddings are known as multilocular or alveolar hydatid, found in *Echinococcus multilocularis.* The *Echinococcus* genus are having largest cystic forms and have many protoscolices formed by exogenous budding which breaks free and settles within cyst as hydatid sand. *General life cycle pattern in some major cestode orders.*

CYCLOPHYLLIDEA – The larva with characteristic six hooks embryo or onchosphere within the egg cell, remain passive till it is infested by the intermediate vertebrate or invertebrate hosts. The onchosphere in case of vertebrate intermediate hosts comes out of the egg cell and penetrates the lining of the intestine and develops into cysticercus. Secretion of

a gland in the onchosphere helps in penetrating the intestinal wall. The cysticercus also known as bladder worm have a thickened portion of the wall which invaginates and develops into a scolex. In the species in which several such scolices are formed they are known as coenours. In some other species scolices which develops as invaginations with in the wall of the intermediate host, further produces scolices by invagination on first generation of cysts. Like wise several other scolices are formed as invagination of second generation. This large cyst is known as hydatid cyst.

The onchospheres in case of invertebrate hosts, which are in most cases arthopods develops into a solid larva known as cysticercoid which lack bladder but posses a inverted scolex at one end. These larva develop into adult after reaching the definitive host by invagination known as excystment which is influenced by several enzymatic and environmental factors.

PROTEOCEPHALA – The onchosphere from hosts are ingested by invertebrate hosts mostly copepods. The onchosphere after encystment penetrates the gut wall of the intermediate host and reach homocoel where it develops into procercoid larvae. The procercoid larvae sometime contain a caudal appendage or cercomer. Further development occurs only after the intermediate host is ingested by definitive host where the procercoid larva develops into Pterocercoid larvae with invaginated scoleces is hepatic, muscular or intestinal epithelium. These larvae develops into adult through metamorphosis after migrating to host's intestine.

PSEUDOPHYLLIDEA – The onchosphere is ciliated and after liberation from egg could swim freely and is known as coracidium. Coracidia is similar with eggs of digenetic trematode and have operculum. After ingested by the intermediate hosts, mostly copepods, they shed the cilia and penetrate upto homocoel where they develop into elongated oval procercoid with six hooks in the caudal appendage. Further Development occurs when the intermediate host is ingested by second intermediate host. Procercoids develop into work like solid form with an invaginated scolex.

SYSTEMATIC INDEX

Order CARYOPHYLLIDEA Van Beneden (in Carus, 1863)

Family LYTOCESTIDAE Hunter, 1927, Wardle and McLeord, 1952

Genus ***Lytocestus*** Cohn, 1908

1. *Lytocestus indicus* (Moghe, 1925)
2. *Lytocestus longicollis* Rama Devi, 1973

Order PSEUDOPHYLLIDEA Carus, 1863

Family BOTHRIOCEPHALIDAE Blanchard, 1849

Genus ***Bothriocephalus*** Rudolphi, 1808

3. *Bothriocephalus bengalensis* Rama Devi, 1975
4. *Bothriocephalus carangis* Yamaguti, 1969
5. *Bothriocephalus ganapati* Rao, 1954
6. *Bothriocephalus indicus* Ganapathi and Hanumantha Rao, 1955
7. *Bithriocephalus penetrans* Subhapradha, 1955

Genus ***Oncodiscus*** Yamaguti, 1934

8. *Oncodiscus fimmbriatus* Subhapradha, 1955

Genus ***Penetrocephalus*** Rao, 1960

9. *Penetrocephalus ganapati* Hanumantha Rao, 1960
10. *Penetrocephalus plerocercoid*

Family PTYCHOBOTHRIIDAE Luhe, 1902

Genus ***Senga*** Dollfus

11. *Senga visakhapatnamensis* Rama Devi and Rao, 1973

Order DIPHYLLIDEA Ben. in Carus, 1863

Family ECHINOBOTHRIIDAE Perrier, 1897

Genus ***Echinobothrium***

12. *Echinobothrium reesae* Rama Devi, 1969

Order TETRAPHYLLIDEA

Family ONCHOBOTHRIIDAE Braun, 1900

Genus ***Acanthobothrium*** Van Beneden, 1849

13. *Acanthobothrium satayanarayanaraoi* Sarda, Vijaylakshmi and Rao, 1993

Family PHYLLOBOTHRIIDAE BRAUN, 1900

Genus ***Anthobothrium*** Van Beneden, 1850

14. *Anthobothrium loculatum* Lakshmi and Sarada, 1993

Genus ***Echeneibothrium*** Beneden, 1850

15. *Echeneibothrium oligotesticulare* Subramanium, 1940

Order LECANICEPHALIDEA

Family TETRAGONOCEPHALIDAE Yamaguti, 1959

Genus ***Tetragonocephalum*** Shipley et Hornell, 1905

16. *Tetragonocephalum yamaguti* Muralidhar, 1990

Family LECANICEPHALIDAE Braun, 1900

Genus ***Balanobothrium*** Hornell, 1911

17. *Balanobothrium tenax* Hornell, 1912

Genus ***Tylocephalum*** Linton, 1890

18. *Tylocephalum yorkei* Southwell, 1925

Genus ***Hexacanalis*** Perrenoud, 1931

19. *Hexacanalis abruptus* (Southwell)

Genus ***Polypocephalus*** Braun, 1878

20. *Polypocephalus bombayensis* Shinde, Dhule and Jadav, 1992

Order TRYPANORHYNCHA

Family OTOBOTHRIIDAE Dollfus, 1942

Genus ***Poecilancistrum*** Dollfus, 1929

21. *Poecilancistrum caryophyllum* (Dies, 1850)

Family DASYRHYNCHIDAE Dollfus, 1935

Genus ***Callotetrarhynchus*** Pinther, 1931

22. *Callotetrarhynchus gracilis* (Rud. 1819)

Genus ***Dasyrhynchus*** Pintner, 1928

23. *Dasyrhynchus indicus* Chandra and Rao, 1985

Family PTEROBOTHRIIDAE Pintner, 1931

Genus ***Pterobothrium*** Diesing, 1850

24. *Pterobothrium russellii* Chandra and Rao, 1984

Family EUTETRARHYNCHIDAE Guiart, 1927

Genus ***Prochristianella*** Dollfus, 1946

25. *Prochristianella bengalense* Chandra and Rao, 1984

Family LACISTORHYNCHIDAE Guiart, 1927

Genus ***Lacistorhynchus*** Pintner, 1913

26. *Lacistorhynchus tenuis* (Van Beneden, 1858)

Family TETRARHYNCHIDAE (=Gymnorhynchidae)

Genus ***Gymnorhynchus*** Rudolphi, 1819

27. *Gymnorhynchus gigas* (Cuvier, 1817)

28. *Gymnorhynchus axillarisi* Chandra and Rao, 1983

Family TENTACULARIIDAE Poche, 1926

Genus ***Pseudonybelinia*** Dollfus, 1966

29. *Pseudonybelinia dollfusi* Chandra and Rao, 1985

Genus ***Tentacularia*** Bosc, 1787

30. *Tentacularia coryphaenae* Bosc, 1802

Genus ***Nybelinia Poche,*** 1926

31. *Nybelinia gopalai* Chandra and Rao, 1985

Order PROTEOCEPHALIDEA

Family PROTEOCEPHALIDAE La Rue, 1911

Genus ***Proteocephalus*** Weinland, 1858

32. *Proteocephalus atretium* Rama Devi, 1973

33. *Proteocephalus hanumanthai* Rama Devi, 1972

Order CYCLOPHYLLIDEA

Family DAVAINEIDAE Braun, 1900

Genus ***Cotugnia*** Diamare, 1893

34. *Cotugnia bhaleraoi* Madaliar, 1943

Genus ***Raillietina*** Fuhrmann, 1920

35. *Raillietina tetragona* (Molin, 1858)

Family DILEPIDIDAE Raillet et henry, 1909

Genus ***Amoebotaneia*** Cohn, 1900

36. *Amoebotaneia sphenoides* Railliet, 1892

Family TAENIIDAE Ludwig, 1886

Genus ***Taenia*** Linnaeus, 1758

37. *Taenia saginata* Goeze, 1782

38. *Taenia solium* Linnaeus, 1758

Family DIPYLIDIIDAE Stiles, 1876

Genus ***Panuwa*** Burt, 1940

39. *Panuwa indica* Khan, 1984

SYSTIMATIC ACCOUNT

Phylum PLATYHELMINTHES

Class CESTOIDAE Rudolphi, 1808

Subclass CESTODA Carus, 1863

Order CARYOPHYLLIDEA VAN Beneden

Family LYTOCESTIDAE Hunter, 1927, Wardle and McLeord, 1952

1. ***Lytocestus indicus*** (Moghe)

1925. *Caryophyllaesus indicus* Moghe, *Parasitology* **17** : 222

1975. *Lytocestus indicus*, Rama Devi, *J. Helminth.*, **47** (4) : 416

Material : Host-*Clarias batrachus*

Distribution : Andhra Pradesh : Visakhapatnam, Maharashtra ; Nagpur; West Bengal; North and South 24 Pargana, Howrah, Malda, Assam, Guahati, North East India.

Diagnostic characters : Monozoic cestode. Scolex rounded, Genital aperture in the last seventh of the body length. Cirrus sac like a bell with handle. Female genital pore separate. Course of uterus does not extent beyond anterior to cirrus opening. Ovary follicular joind by isthmus. The vitellaria follicular, lies between cortical and medullary layer of longitudinal muscle fibre and behind the ovary it is absent. Testes surrounded by vitellaria, spread from behind most anterior vitellaria to the level of junction of cirrus sac and vas deferens. The eggs measure approximately .08 × .04.

2. ***Lytocestus longicollis*** Rama Devi

1973. *Lytocestus longicollis* Rama Devi, *J. Helminth.*, **47**(4) : 416

Material : Host *Clarias batrachus*

Distribution : Andhra Pradesh : Visakhapatnam, Maharashtra, Nagpur, Assam, Guahati, West Bengal, North 24 Pargana, Malda.

Diagnostic Character : Body measure 14.52 - 32.20 in length and 0.53 - 1.45 in breath. Scolex undifferentiated. Neck 4.62 - 12.08, long slender. Cirrus open separately from common opening of vagina and uterus, vagina straight or slightly convoluted, uterine coils glandular, extending from behind ovarian isthmus to the level of cirrus pore. Ovary H-shaped, follicular connected by ovarian isthmus. Vitellaria cortical, in a ring round testes. Number of testes 213-520, medullary, measure -.06 - 016 × 0.03 - 0.12 Vitelline follicle 0.03 - 0.11 × 0.02 0.07

Order PSEUDOPHYLLIDEA

Family BOTHRIOCEPHALIDAE

Genus ***Bothriocephalus Rudolphi,*** 1808

3. ***Bothriocephalus bengalensis*** Rama Devi

1975. *Bothriocephalus bengalensis* Rama Devi, *Riv. Parasitol.*, Roma, V. 36(4) : 279-286

Material : Host-*Caranx plagiotaenia*

Distribution : Andhra Pradesh : Waltair coast, Bay of Bengal

Bothriocephalus carangis Rama Devi,

1975. *Bothriocephalus carangis* Rama Devi, *Riv. Parasitol.*, Roma, 36(4) : 279-286

Material : Host-*Caranx plagiotaenia*

Distribution : Andhra Pradesh : Waltair coast, Bay of Bengal.

Diagnostic characters : Dibothriate scolex, lacking an apical disc. The posterolateral margins of the proglottids were markedly craspedote. Ganital pore dorsal or sub medial. Testes in dorsal medulla, ovary posterior Vitelline follicles cortical.

4. ***Bothriocephalus indicus*** Ganapathi and Rao, 1955

1955. *Bothriocephalus indicus* Ganapati and Rao, *J. Zool. Soc. India,* 7(2) : 177-181

Material : Host-*Saurida tumbil*

Distribution : Andhra Pradesh : Waltair coast, Bay of Bengal.

Diagnostic characters : The worm measure up to 11.5 cm. Scolex conspicuous with bilobed apical disc measure up to 4.2 mm. Neck absent. Segments craspedote and broader than long. Excretory system usual. Testes 60-70. Cirrus sac spherical. Cirrus devoid of spines. Bilobed ovary at the posterior layer of segment. Vagina opens antero laterial to cirrus sac. Vitelline follicles are lateral. Uterine pore are arranged in a single median row. Eggs are oval and non operculate, 53 × 35.

5. ***Bothriocephalus penetrans*** Subhapradha, 1955

1957. *Bothriocephalus penetrans,* Subhapradha, *Indian. J. Helm.* 7(2), (1955) : 41-132

Material : Host-*Saurida tumbil*

Distribution : Bay of Bengal.

Remark : "Penetrocephalus Rao, 1960 was erected for Bothriocephalus Ganapati a name first used by Rao (1954) without a description and used again in 1960. The same cestode was described by Subhapradha (1955) as B. penetratus Rao (1960) distinguished it by its initially

dibothriate scolex, lacking an apical disc, which penetrated the gut wall of the host to enter the liver subsequently becoming encapsulated and degenerate. Also, the posterolateral margins of the proglottids were markedly craspedote. Protasova (1977) declared *B. ganapatii* Rao, 1954 *a nomen nudum* and retained *B. penetratus* in *Bothriocephalus. Penetrocephalus* is treated here as a synonym of *Bothriocephalus* since, following Protasova (1977), the location of the scolex and the craspedote proglottids are not considered sufficient to justify the genus."

Diagonistic character : Dibothriate scolex, lacking apical disc. Proglottids craspedote. Vitellaria cortical, testes in lateral medulla. Cirrovaginal pore dorsal, posterior to uterine pore. Ovary compact.

6. ***Oncodiscus fimbriatus*** Subhapradha, 1955

1957. *Oncodiscus fimbriatus* Subhapradha, *India J. Helm.* **7**(2), (1955), 41-132

1975. *Oncodiscus fimbriatus,* Rama Devi, *Riv. Parasitol.* Roma, V. **36**(4), 279-286.

Material : Host-Saurida tumbil

Distribution : Andhra Pradesh : Waltair coast, Bay of Bengal and Madras.

Diagnostic characters : Scolex armed, compressed laterally, apical disc armed marginally with numerous tiny hooks. Proglottids craspedote. Genital pore dorsomedian Ovary posterior, transversely elongate, lobed. Vagina open anterior to cirrus sac. Uterine duct coils forward to large uterine sac. uterine pore ventral. Eggs operculate, unembryonated.

7. ***Penetrocephalus ganapatii*** Hanumantha Rao, 1960

1960. *Penetrocephalus ganapatii* Rao, Parasitology, **50** : 155-163.

1975. *Penetrocephalus ganapatii* Rama Devi, *Riv. Parasitol.,* V. **36**(4), 279-286.

Material : Host-*Saurida tumbil, Saurida undosquamis*

Distribution : Andhra Pradesh : Waltair clast, Bay of Bengal.

Remark : Protasova (1977) declared *B. ganapatii* Rao 1954 a nomen nudus and retained *B. Penetrans* in Bithriocephalus. Penetrocephalus is treated here as synonym of Bothriocephalus since, following Protasova (1977), the location of scolex and craspedote proglottids are not considered sufficient to justify the genus.

Family PTYCHOBOTHRIIDAE

Genus ***Senga*** Dllfus, 1934

8. ***Senga visakhapatnamensis*** Rama Devi, and Rao, 1973

1973. *Senga visakhapatnamensis* Rama Devi and Rao *Riv. Parasitol.,* Roma, V. **34**(4), 282-286.

Material : Host-*Ophiocephalus punctatus*

Distribution : Andhra Pradesh : Visakhapatnam Dist.

Order DIPHYLLIDEA Van Beneden In Carus, 1963

Family ECHINOBOTHRIIDAE

Genus ***Echinobothrium*** van Beneden, 1849

9. ***Echinobothrium reesae*** Rama Devi

1969. *Echinobothrium reesae* Rama Devi, *Annales de Parasitologia Humaine et comparee*, **44** : 231-239

Material : Host-*Sting rays*

Distribution : Andhra Pradesh : Waltair coast.

Remark : According to Khalii (1994) this species was described as having no hooks on the cephalic peduncle, as the presence of hooks on the peduncle is one of the main characteristic of the genus The assignment of this species to Echinobothrium requires further investigation.

Order TETRAPHYLLIDEA

Family ONCOBOTHRIIDAE

Genus ***Acanthobothrium*** van Beneden, 1849

10. ***Acanthobothrium satayanarayanaraoi***

1993. *Acanthobothrium satayanarayanaraoi*, Sarada, Vijaya Lakshmi and Rao, *Boletin Chileno de Parasitologica* (1993), **48**(1/2), 15-17.

Material : Host-*Rhinobatus granulatus*

Distribution : Andhra Pradesh : Waltair coast.

Diagnostic characters : Scolex with four bothridia Proglottids craspedote, genital pore unilateral irregularly alternate. Testes numerous. Ovary posterior vagina anterior to cirrus sac. Vitelline follicles lateral.

Family PHYLLOBOTHRIIDAE

Genus ***Anthobothrium*** van Beneden, 1850

11. ***Anthobothrium loculatum*** Lakshmi and Sarada

1993. *Anthobothrium loculatum* Lakshmi and Sarada *Boletin Chileno de Parasitolegica* **48**(1/2), 12-15

Material : Host-*Dasyatis uarnak*

Distribution : Andhra Pradesh : Waltair coast.

Order TETRAPHYLLIDEA

Family PHYLLOBOTHRIIDAE

12. ***Echeneibothrium oligotesticularis*** Subramanium, 1940

1940. *Echeneibothrium oligotesticularis* Subramanium, *Rec. Indian Mus.* **42**(3), 457-464.

Material : Host-*Rhinobatus granulatus*

Diagnostic characters : The head with four bothridia on stalks each being divided into 18-20 loculi. The neck is swollen and is divisible into two regions. Testes roughly oval number 4 to 7. Number of testicular visicle are limited. Vasdeferens thin coiled. Cirrus sac is oval spiny and lies posterior to the transverse portion of vagina. Genital aperture irregularly alternate. Ovary H shaped. Vitelline vesicle arranged in two rows dorsal and ventral on either side of the body.

Order LECANICEPHALIDEA

Family TETRAGONOCEPHALIDAE

Genus ***Tetragonocephalum*** Shipley & Hornell, 1905

13. ***Tetragonocephalum yamaguti*** Muralidhar, 1988

1998. *Tetragonocephalum yamaguti, Rivista di Parasitologia* (1988, publ 1990) **49**(2), 257-260.

Material : Host-*Trygon waiga*

Distribution : East coast of India

Diagnostic characters : Scolex with anterior knob, and posterior cushion bearing four suckers. Nock short, strobila slender, acraspedote. Genital pore lateral, irregularly alternate. Testes anterior many. External and internal seminal vesicle present. Ovary posrerior, bilobed. Vagina posterior to cirrus sac. Vitelline follicle anterior and posterior to ovary.

Order LECANICEPHALIDEA

Family LECANICEPHALIDAE

Genus ***Balanobothrium*** Hornell, 1911

14. ***Balanobothrium tenax*** Hornell

1912. *Balanobothrium tenax* Hornell, *Rec. Indian Mus.*, Calcutta, **7** : 199-201, Pls. 9-11, figs. 4-12.

Material : Host-*Stegostoma tigrinus*

Distribution : Bay of Bengal.

Diagnostic characters : The scolex consists of bulbous sub conical head, encircled at the base by a cup like bothridial collar. No definite neck. Strobila ligulate, long and stout, narrow at anterior end,. Proglottides short, five to six time broader than long in wide region posterior to mid length, ripe proglottides characteristically short and length never greather than breath. Ovaries arranged centrally in a rosette of large pear shaped lobules. Genital pores lateral, irregularly alternate in consecutive series.

Family LECANICEPHALIDAE

Genus ***Tylocephalum Linton,*** 1890

15. ***Tylocephalum yorkei*** Southwell, 1925

1930. *Tylocephalum yorkei* Southwell, *The fauna of British India including Ceylon and Burma* : Cestods vol. 1 pp. 1-329. Taylor and Francis, London.

Material : Host-*Aetobalis narinari*

Distribution : East coast of India

Diagnostic character : Anterior and posterior parts of head more or less subglobular and bears four suckers. The genital pores are irregularly alternate and are situated behind the middle of the lateral margin. Number of testes 26-30. Ovary in the posterior part, small and bilobed. From the pore the vagina runs parrel to the cirrus pouch and at the median extremity of cirrus pouch it runs posteriorly. Receptaculum seminis is large. The vitelline glands laterial extending to the whole length of the segment. Uterus consists of a central stem with lobular walls.

Genus ***Hexacanalis*** Perrenoud, 1931

16. ***Hexacanalis abruptus*** (Southwell, 1911)

Material : Host-*Pteroplatea micrura*

Distribution : Trivandrum coast

Diagnostic characters : Scolex with a circular sucker. Strobila a craspedote, genital pores lateral, irregularly alternating. Testes many, post vaginal testes present on poral side. Ovary posterior, bilobed. Vitelline follicles laterial.

Remark : Hexacanalis has become a synonym of Lecanicephalum Lintin, 1890.

Genus ***Polypocephalus*** Braun, 1878

17. ***Polypocephalus bombayensis*** Shinde, Dhule and Jadav, 1992

1992. *Polypocephalus bombayensis* Shinde, Dhule and Jadav, *Indian Jour. Helminth.* **42**(1) : 77-79.

Material : Host-*Aetobatus flagellum*

Distribution : Andhra Pradesh : Kakinada.

Diagnostic characters : Number of tentacles 8,. Mature segments are broader than long, genital pores submarginal and irregularly alternate.

Order TRYPANORHYNCHA

Family OTOBOTHRIIDAE

Genus ***Poecilancistrum*** Dollfus, 1929

18. ***Poecilancistrum caryophyllum*** (Dies. 1850)

1985. *Posecilancistrum caryophyllum* Chandra, *Indian J. Parasitology,* **9**(2), 135-137

Material : Host-*Pennahia argentata, Johnius aneus, Lates calcarifer*

Distribution : Coast of Andhra Pradesh.

Diagnostic characters : Larval form - anterior and oval posterior long narrow. Strobila acraspedote. Proglottides increasing in length posteriorly. Female organ seen in last few proglottides. Testes many. Cirrus long coiled in cirrus pouch. Genital pore marginal. Ovary bilobed, uterus median. Vagina opening behind cirrus aperture. Bothria two heart shaped. Probosis with two rows of hooks, internal hooks are smaller.

Family DASYRHYNCHIDAE

Genus ***Callotetrarhynchus*** Pintner, 1931

19. ***Callotetrarhynchus gracilis*** (Rud. 1819)

1937. *Callotetrarhynchus gracilis* Subhapradha, *Indian J. Helminth.* **7** : 41-132

1985. *Callotetrarhynchus gracilis* Chandra, *Indian J. Parasitology,* **9**(2), 135-137.

Material : Host-*Scomberomorus guttatus, Cypselurus poecilopterus, Saurida tumbil, S. undosquamis, Euthynnus affinis, Johnius aneus, Pennahia argentata, Lepturacanthus savala, Trichiurus lepturus, Priacanthus hamrur, Leiognathus equulus, Sphyraena acutipinnis. Chirocentrus dorab, Lates calcarifer* and *Nemipterus japonicus.*

Distribution : Coast of Andhra Pradesh and Tamilnadu.

Diagnostic characters : Cystic form Anterior broad, posterior narrow. Bothria two, oblong, notch at the posterior margin. Probosis long cylindrical, armed with recurved hooks. Bulbs elongate, oval.

Genus ***Dasyrhynchus*** Pintner, 1928

20. ***Dasyrhynchus indicus*** Chandra and Rao, 1985

1985. *Dasyrhynchus indicus* Chandra and Rao, *Rivista Di Parasitologia*, Vol. II (XLVI), April, 1985

Material : Host-*Lates calcarifer* (Bloch), *Pomadasys hasta* (Bloch)

Distribution : Waltair coast, Bay of Bengal.

Diagnostic characters : Scolex long provided with four armed protrusible proboscides. Probosis poeciloacanthus with chainette. Bothridia two reverse heart shaped, posterior margin indented. Reproductive organ medullary, vitellaria cortical. Genital pores marginal.

Family PTEROBOTHRIIDAE

Genus ***Pterobothrium*** Diesing, 1850

21. ***Pterobothrium russellii*** Chandra and Rao, 1984

1984. *Pterobothrium russellii* Chandra and Rao, *Rivista Di Parasitologia* Vol. I (XLV), December 1984

Material : Host-*Pterois russelli*

Distribution : Waltair coast, Bay of Bengal

Diagnostic characters : Cyst pear shaped with posterior elongation. Probosis of adult have longitudinal band of small hooks on external surface. Bothridia four in number, each has a short mobile stalk. Strobila acraspedote, apolytic. Segments longer than wide. Genetal pores in posterior half of proglottis margin.

Family EUTETRARHYNCHIDAE

Genus ***Prochristianella*** Dollfus, 1946

22. ***Prochristianella bengalense*** Chandra and Rao

1984. *Prochristianella bengalense* Chandra and Rao, *J. Zool. Soc. India*, **36**(1-2) : 101-105.

Material : Host-*Lactarius lactarius* (Bloch and Schneider)

Distribution : Andhra Pradesh : Waltair coast, Bay of Bengal

Diagnostic characters : Cyst spherical with an elongated tail. Larvae cylindrical, broader anteriorly and narrow posteriorly, margin thick. Proboscis sheath sinuous. Proboscides long,

thin arise from the anterior margin of the bothridia. Armature heteroacanthous, heteromorphous. Basal hooks on the internal face are of different types and arranged irregularly. Some are broad based, thick and curved, others claw shaped, thick and pointed. On the external face the hooks mainly small, spiniform, arranged irregularly.

Order TRYPANORHYNCHA

Family LACISTORHYNCHIDAE

23. ***Lacistorhynchus tenuis*** (Van Beneden, 1858)

1985. *Lacistorhynchus tenuis, Chandra, Indian Jour. Parasitology,* **9** (2), 135-137

Material : Host-*Johnius aneus, Lepturacanthus savala, Saurida tumbel, Saurida undosquamis, Priacanthus hamrur, Priacanthus tayenus*

Distribution : Andhra Pradesh, Bay of Bengal.

Diagnostic characters : Scolex long. Two bothridia notched posteriorly, bulbus oval. Hooks arrangement poecilocanthous with chainette. Testes preovarian. Cirrus pouch pyriform. Genital opening on right or left margin of proglottis. Ovary at posterior end of proglottis.

Order TRYPANORHYNCHA

Family TETRARHYNCHIDAE

Genus ***Gymnorhynchus*** Rudolphi, 1819

24. ***Gymnorhynchus gigas*** (Cuvier, 1817)

1930. *Gymnorhynchus gigas* Southwell, *The fauna of British India.* Cestoda vol. I. Taylor and Francis, London.

1985. *Gymnorhynchus gigas,* Chandra, *Indian Journal of Parasitology,* **9** (2), 135-137.

Material : Host-*Arius thalassinus, Tachysurus tenuispinnis, Lepturacanthus savala, Trichiurus lepturus, Coryphaena hippurus, Saurida tumbil, S. undosquamis, Scomberomorus guttatus, Priacanthus hamrur, P. tayenus, Lates calcarifer, J. Pohnieops sina. Upeneus sulphureus Uroconger lapturus, Sphyraena obtusata, S. acutipinnis, Pomadasys hasta, Triacanthus brevirostris* and *Pterois russelli.*

Distribution : Waltair coast, Bay of Bengal. Delta of Ganges, West Bengal. Pearl Bank, Sri Lanka.

Diagnostic characters : Scolex with pairs of bothridia. Proboscis with a double chainette on external surface. Strobila acraspedote. In larval form hooks arise in a cluster of five on each side, one being situated mid way between two sets of five on the other side. Genital pores are lateral and alternative. Testes 100, well developed arranged in two groups on each side of median longitudinal axis. Ovary bilobed near posterior extremity.

Order TRYPANORHYNCHA

Family GYMNORHYNCHIDAE

25. ***Gymnorhyncus axillarisi*** Chandra and Rao, 1983

1993. *Gumnorhyneus axillarisi* Chandra and Rao, *J. Zool. Soc. India,* 35(1-2) 1983, 17-20.

Material : Host-*Kathala axillaris* (Cuvier)

Distribution : Waltair coast, East coast of India.

Diagnostic characters : Cyst 8.0 - 11.0 and Larvae 2.88 - 3.39 in length. Bothria measure 0.46 - 0.49 ear like, mascular with thick margin. Four proboscides protrude from the lip of each bothridium. Proboscis hooks are few in number. The basal armature is characterised by the stout curved hooks on the lateral side of the proboscis measure 0.039 in length. On the other lateal side two falciform hooks, abruptly recurved at the tip measure. 0.027. The mid region of the external surface between those hooks occupied by a group of small hooks which are 0.017 in length. Internal metabasal face consists of two stout broad based, recurved, falciform diagonally arranged hooks. The external face of the metabasal region armed with falciform hooks.

Order TRYPANORHYNCHA

Family TENTACULARIIDAE

26. ***Pseudonybelinida dollfusi*** Chandra and Rao, 1985

1985. *Pseudonybelina dollfusi* Chandra and Rao, *Rivista Di Parasitologia* Vol. II (XLVI) N. 3 December, 1985, 439-443.

Material : Host-*Rhonciscus furcatus* (Schneider) (Stomach wall)

Distribution : Waltair coast, Bay of Bengal.

Diagnostic characters : Bothridia two, patelliform, length and breath equal. Proboscis bulbs oval, proboscis sheath longer than bulb. Hooks are solid and diagonally arranged. (Larval form)

Order TRYPANORHYNSHA

Family TENTACULARIIDAE

27. ***Tentacularia coryphaenae*** Bosc, 1802

1802. *Tentacularia coryphaenae* Bosc, *Histoire naturelle desveus coutenaut leur description et leure moeurs,* V. 1, 324 pp. V. 2, 300 pp. V. 3, 270.

1985. *Tentacularia coryphaenae* Chandra, *Indian Jour. Parasitology* 9(2), 135-137.

Material : Host-*Scomberomorus guttatus*

Distribution : Andhra coast, Bay of Bengal

Diagnostic characters : Body cylindrical. Scolex long. Four sessile bothridia and proboscis. Testes many, vasdeferens coiled, cirrus pouch mascular. Genital pores irregularly alternate. Ovary × shaped, vitellaria encircling testes. Hooks solid, bulb banana shaped.

Order TRYPANORHYNCHA

Family TENTACULARIIDAE

28. ***Nybelinia gopalai*** Chandra and Rao, 1985

1985. *Nybelinia gopalai* Chandra and Rao, *Rivistia Di Parasitologia,* Vol. II (XLVI-N) 3-December : 439-443.

Material : Host-*Saurida undosquamis* (Richardson) (Stomach wall)

Distribution : Waltair coast, Bay of Bengal.

Diagnostic characters : Scolex short, proboscis hooks solid. Homeoacanthous arrangement in the metabasal and larger basal hooks. Bothridia sessile. Pars bulbosa is about two thirds as long as the pars bothridialis. appendix is almost equal to the velum. Testes many. Cirrus mascular long. Genital pores irregularly alternate. Ovary × shaped in cross section. Vitellaria encircling testes.

Order PROTEOCEPHALIDAE

Family PROTEOCEPHALIDAE La Rue, 1911

29. ***Proteocephalus atretiumi*** Rama Devi, 1973

1973. *Proteocephalus atretiumi* Rama Devi, *British J. Herpet.* **5**(1) : 346-351

Material : Host-*Atretium schistosum* (Gunther)

Distribution : East coast of India.

Order PROTEOCEPHALIDEA Mola, 1928

Family PROTEOCEPHALIDAE La Due, 1911

30. ***Proteocephalus hanumanthai*** Rama Devi, 1972

1972. *Proteocephalus hanumanthai,* Rama Devi, *Ind. Jour. Helminth.* **24**(1) : 47-51

Material : Host-*Rana cyanophlyctis*

Distribution : India.

Diagnostic characters : Scolex with four unarmed suckers, no apical suckers. Scolex slightly wider than neck. Genital pores marginal irregularly alternate. Testes more than hundred (104-114). Vitellaria follicular in lateral field. Cirrus pouch is thin walled pyriform. Cirrus thick walled unarmed tube. Ovary bilobed, wing shaped. 9-14 uterine diverticula. Egg measure 0.02.

Order CYCLOPHYLLIDEA

Family DAVAINEIDAE

31. ***Cotugnia bhaleraoi*** Mudaliar, 1943

1943. *Cotugnia bhaleraoi* Mudaliar, S.V. *Ind. J. Vet. Sc. & Anim. Husb.* **13**(2), 166-167.

Material : Host-*Gallus gallus*

Distribution : Tamilnadu, west coast of India.

Diagnostic characters : Maximum length 110 mm, with 10 mm. Scolex broader than long, absence of neck, segments broader than long. Rostellum smaller than sucker. Rostellum hooks T shaped in 2 rows. Two set of genitalia. Genital pore lateral. Testes 40 spread across width of segment. Ovary follicular arranged symmetrically. Vitellaria consists of two to three pyriform lobes, posterior to the ovary. Cirrus sac long spindle shaped. The common opening of the vagina and cirrus is not demarked by a well developed genital atrium. The uterus is not persistant.

Family DAVAINEIDAE

Genus ***Raillietina*** Fuhrmann, 1920

32. ***Raillietina (R) tetragona*** (Molin, 1858) Fuhrmann, 1920

1920. *Raillietina* (R) *tetragona Festschrigt fur Zschokke,*

1989. *Raillietina tetragona* Hafeez and Rao, *Indian J. Animal Health*, **28** (1) : 71.

Material : Host-*Pea fowl.*

Distribution : Andhra Pradesh.

Diagnostic characters : Length of the worm upto 25 cm. Unilateral genital pore near the centre of the lateral margin of the segments. Scolex large, suckers with 8 to 10 rows of hooks. Testes 20 to 30. Eggs capsules 50 to 100 in each segment. 6 to 12 eggs in each capsule. Size of egg 0.025 to 0,05.

Order CYCLOPHYLLIDEA

Family DILEPIDIDAE

33. ***Amoebotaenia sphenoides*** Mohiuddin and Lone, 1967

1967. *Amoebotaenia sphenoides* Mohiuddin and Lone,

Material : Host-*Duck (small intestine)*

Distribution : Andhra Pradesh : Nylore, Hyderabad

Order CYCLOPHYLLIDEA

Family TAENIIDAE LUDWIG, 1886

34. ***Taenia saginata***

1976. *Taenia saginata* Sing and Christopher, *Livestock Advis,* VI (8), 35-36

Material : Host-*Buffalo (Heart)*

Distribution : Andhra Pradesh

Order CYCLOPHYLLIDEA

Family TAENIIDAE

35. ***Taenia solium*** Linnaeus, 1758

1966. *Reddy, D.J.* and *Murty, V. R.*

Material : Host

Distribution : Andhra Pradesh, S. India

Diagnostic characters : Length of the worm 2 to 4 m. Number of segments 8000-9000. Rotellum with 25-50 hooks, Genital pore irregularly alternate, in the middle of lateral margin of proglottid. Head globular 0.0600 to 1 mm in diameter. Testes are numerous. Ovary with a median stem with 7-10 lateral compound branches on each side. Eggs 0.031-0.036 in diameter.

Family DIPYLIDIINAE

Genus ***Panuwa Burt,*** 1940

36. ***Panus indica*** Khan, 1984

1984. *Panua indica Khan,* Proc. *Indian Acad. Parasitology* (1983) 4(2/2) : 55-57

Material : Host-*Lobipluvia malabarica*

Distribution .: Andhra Pradesh : Hydrabad

Diagnostic characters : Scolex (0.71 × 0.91 mm), Sucker (0.21 to 0.22 × 0.25 to 0.28 mm). Two rows of hooks, anterior measure 0.112 to 0.13 mm long; posterior row 0.09 to 0.11 mm long. Number of testes 30 to 45.

SUMMARY

Cestode fauna of Andhra Pradesh (Coastal districts) has been incorporated in this work. Total 39 species under 29 genera and 20 families have been recorded along with diagnostic characters of each species.

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INTRODUCTION

A significant contribution to the knowledge of digenetic trematodes of marine fish and other vertebrate hosts of the State of Andhra Pradesh has been made by the helminthologists of Andhra University. But the knowledge in other groups of helminth of the State still remains poor. Particularly, occurrence of Acanthocephala in the State has been in obscurity until eightees when few research associates of the Andhra University recorded some species from marine and estuarine fishes.

Andhra Pradesh, owing to its vastness of land, rivers, forests, dams and reservoirs, is rich in vertebrate host species. Therefore, chances of helminth infestation in them is reasonably expected to be high. But very little effort has so far been taken to explore helminth fauna of the State. For this purpose, Zoological Survey of India recently undertook some faunistic survey tours under State Fauna Project. The venture could hardly gather a reasonable amount of collection of Acanthocephala to build up a faunal work. Obviously, certain limitations have affected the venture to amass collection. Wild Life Protection Act has been a great barrier for examination of hosts. Therefore, emphasis has been given on examination of maximum number of fish hosts. But policy of not granting purchase of fish in the field has hindered the progress of collection. On the other hand, insufficient number of tours during the project period to such a vast area of the State has been a deterrant factor for making a good collection. As a matter of fact, so far collection of fish parasite is concerned, season-wise survey for examining hosts in an exhaustive manner is required to obtain a better collection.

However, with the help of available materials and published record of species from the State, the author has tried to provide a convincing number of species in the present work. Examination of few amphibian and reptilian hosts has not resulted any parasite of this group. Hence, acanthocephalans of these two groups of vertebrates remain unrepresented. Taking the total number of collection into account, the work is presented in one volume for coastal and noncoastal districts of Andhra Pradesh. Altogether, 39 species belonging to 20 genera under

14 families have been listed in this work. Outlines of morphology, collection and preservation, classification and a brief list of reference have also been provided with this work.

MORPHOLOGY AND TERMINOLOGY

Acanthocephala being unisexual endoparasites, lack digestive system in all states of development. It absorbs nutrients from host's body particularly from the digestive tract of the host. Life cycle completes through invertebrate hosts viz. beetles, ostracods, myriapods etc. Larval stages comprise of acanthor, preacanthella and acanthella. The morphology of Acanthocephala includes the following

Proboscis : Proboscis being the holdfast help the parasite attach with the body of the host. Proboscis is studded with hooks and spines. Hooks help anchor the proboscis in hosts' tissue. The portion of the hook that remains projected out of proboscis muscle is point and rest that remains inside the muscle is root. Hooks and spines are arranged in definite orders either in circular or in longitudinal rows. Number of hooks, and their types of arrangements on the proboscis are of great taxonomic importance.

Proboscis sheath : The organ is just like a scabbard of a sword. The proboscis is drawn in the sheath as and when required by the worm. Nerve ganglion is located in the organ.

Lemnisci : Generally, a pair of leminisci hang inside the body cavity from the base of the neck as strips of bands along the sides of the proboscis sheath. Movement of the organ helps proboscis draw in and draw out of the proboscis.

Testes : A pair of testes is located inside the body of the worm in tandem or well apart. Shape, size and location of this organ carry an important role in identification of species.

Cement gland : Cement glands always lie adjuscent to the posterior testes. They are of various types viz. syncytial, pyriform, globular etc. Cement secreted by the organ help plugging the genital pore of the female after copulation. Cement is stored in cement reservoir.

Saefftigen's pouch : It is an unique organ found in male copulatory system of acanthocephalan species. The organ is located by the seminal vescicle. It helps bursa to draw in and draw out of the body through genital pore before and after copulation.

Bursa : Bursa is a male genital organ for enveloping the end of female during copulation.

Female reproductive system : This system comprises ovary and oviducal system. Ovaries as ovarian fallicles float in the ligament sac and the body cavity. The oviducal system consists of uterine bell, oviducts, uterus, and vagina. The whole system is held in the body cavity by suspensory ligament. The most complex organ of this system is uterine bell. It is believed that sorting out of mature eggs takes place in this organ which helps passing them to uterus for fertilization.

COLLECTION, FIXATION AND PRESERVATION

Live worms are collected from mucosa of the digestive tract carefully and washed in water of a watch-glass to make them free from foreign bodies. In order to draw out the proboscis from its sheath, the worm is either put in air-tight bottle of distilled water for some hours or the worm is pressed gently between a thin cover glass and a glass slide under a field binocular. After a fully protruded proboscis is ensured, 70% alcohol is dropped between the cover glass and glass slide for some time and then preserved in 70% alcohol. When proboscis is found out of proboscis sheath, the specimen requires pressing between the slide and the cover glass before they are preserved in 70% alcohol. F.A.A. solution is also used as fixative for histological study of specimens. The specimens are preferred to be mounted on slides without stain owing to its poor penetrability through the cuticular body surface of the worm. Sometimes 25%-50% acquous solution of glycerine is used for studying the specimens under microscope.

CLASSIFICATION OF ACANTHOCEPHALA

Acanthocephala has been broadly classified by Amin (1985) into 4 classes (including class Polyacanthocephala by Amin, 1985), 9 orders, 22 families and 24 sub-families to accommodate all the species belonging to the Phylum. The classification outlined by Amin in the light of Meyer – Van Cleave concept has been followed in the present work.

LIST OF SPECIES

Class PALAEACANTHOCEPHALA MEYER, 1931

Order ECHINORHYNCHIDA

I. Family HETERACANTHOCEPHALIDAE Petrotschenko, 1956

Subfamily ASPERSENTINAE Golvan, 1960

Genus 1 ***Bullockrhynchus*** Chandra *et al.*, 1985

1. *Bullockrhynchus indicus* Chandra *et al.*, 1985

II. Family ILLIOSENTIDAE Golvan, 1960

Genus 2 ***Indorhynchus*** Golvan, 1969

2. *Indorhynchus indicus* (Tripathi, 1959) Golvan, 1969

III. Family ARHYTHMACANTHIDAE Yamaguti, 1935

Subfamily ARHYTHMACANTHINAE Yamaguti, 1935

Genus 3 ***Arhythmacamthus*** Yamaguti, 1935

3. *A. septacanthus* Sita Anantharaman, 1949

Genus 4 ***Gorgorhynchoides*** Cable & Linderoth, 1963

4. *G. indicus* Bhattacharya, 200

Subfamily PARACANTHOCEPHALOIDINAE Golvan, 1969

5. *P. tripathi* nom. nov. Golvan, 1969.

Genus 5 ***Paracanthocephaloides*** Golvan, 1969

6. *P. golvani* Chandra *et al.,* 1984

Family ECHINORHYNCHIDAE Cobbold, 1876

Subfamily ECHINORHYNCHINAE Cobbold, 1876

Genus 6 ***Echinorhynchus*** Muller, 1776

7. *E. indicus* Chandra, 1982

V Family RHADINORHYNCHIDAE Travassos, 1923

Subfamily RHADINORHYNCHINAE Luhe, 1912

Genus 7 ***Raorhynchus*** Tripathi, 1959

8. *R. polynemi* Tripathi, 1959
9. *R. ganapatii Chandra et al.,* 1985

Subfamily GORGORHYNCHINAE Van Cleave et Lincicome, 1940

Genus 8 ***Cleaveius*** Subramaniam, 1927

10. *C. secundus* (Tripathi,1959) Golvan, 1969

Genus 9 ***Hanumantharaorhynchus*** Chandra, 1983

11. *H. hemirhamphi* Chandra, 1983

Subfamily SERRASENTINAE Petrotschenko, 1956

Genus 10 ***Serrasentis*** Van Cleave, 1923

12. *S. sagittifer* (Linton, 1889)
13. *S. indicus* Singh et al, 1998

Order POLYMORPHIDA

VI. Family POLYMORPHIDAE Meyer, 1931

Genus ***Southwellina*** Witenberg, 1932

14. *S. hispida* (Van Cleave, 1925) Witenberg, 1932

VII. Family CENTRORHYNCHIDAE Van Cleave, 1916

Genus 12 ***Centrorhynchus*** Luhe, 1911

15. *C. lancea* (Westrumb, 1821) Skrjabin, 1913
16. *C. milvus Ward,* 1956
17. *C. globocaudatus* (Zeder, 1800)

18. *C. spilornae* Schmidt & Kuntz, 1969
19. *C. giganteus* Travassos, 1921

VIII Family PLAGIORHYNCHIDAE Golvan, 1960
Subfamily PORRORCHINAE
Genus 13 ***Porrorchis*** Fukui, 1929

20. *P. indicus* (Das, 1957) Schmidt & Kuntz, 1967

Class ARCHIACANTHOCEPHALA Meyer, 1931
Order APORORHYNCHIDA (Thapar, 1927)
IX. Family APORORHYNCHIDAE Shipley, 1900
Genus 14 ***Apororhynchus*** Shipley, 1900

21. *A. chauhani* Sen, 1975

Order MONILIFORMIDA
X. Family MONILIFORMIDAE Van Cleave, 1924
Genus 15 ***Moniliformis*** Travassos, 1915

22. *M.(m) momiliformis* Meyer, 1933
23. *M. dubius* Meyer, 1933

Order OLIGACANTHORHYNCHIDA Petrotschenko, 1956
Genus 16 ***Prosthenorchis*** Travassos, 1915

24. *Prosthenorchis* sp.

XII. Family GIGANTORHYNCHIDAE Hamann, 1892
Genus 17 ***Mediorhynchus*** Van Cleave, 1916

25. *M. gallinarum* (Bhalerao, 1937) Van Cleave, 1947
26. *M. orientalis* Belopolskja, 1953
27. *M. robustus* Van Cleave, 1916
28. *M. taeniatus* (Linstow, 1901) Dolfus, 1936

Class EOCANTHOCEPHALA
Order NEOECHINORHYNCHIDA
XIII. Family NEOECHINORHYNCHIDAE Van Cleave, 1919
Subfamily NEOECHINORHYNCHINAE Travassos, 1926
Genus 18 ***Neoechinorhynchus*** Hamann, 1892

29. *N. ruttili* (Muller, 1780) Hamann, 1892
30. *N. nematolosi* Tripathi, 1959

31. *N. chilkaensis,* Podder, 1937
32. *N. elongatus* Tripathi, 1959
33. *N. agilis* (Rudolphi, 1819) Petrotschenko, 1956
34. *N. argentatus* Chandra *et al.,* 1987
35. *N. topseyi* Podder, 1937

Order GYRACANTHOCEPHALA Van Cleave, 1936

XIV. Family QUADRIGYRIDAE Van Cleave, 1920

Subfamily QUADRIGYRINAE

Genus 19 ***Acanthosentis*** Verma *et al.*, 1929

36. *A. antispimus* Verma *et al.*, 1929

Subfamily PALLISENTINAE

Genus 20 ***Pallisentis*** Van Cleave, 1928

37. *P. ophiocephali* (Thapar, 1930)
38. *P. colisai Sarkar,* 1954
39. *P. nagpurensis* Bhalerao, 1931

SYSTEMATIC ACCOUNT

Phylum ACANTHOCEPHALA Rudolphi, 1808

Key to the classes of Phylum ACANTHOCEPHALA Rudolphi, 1808

1. Main longitudinal lacunar canals lateral. Lemnisci, cement gland and hypodermic muclei fragmented. Ligament sac in female single, not persistent. Proboscis receptacle double walled. Parasites of fish, amphibians, reptiles, birds and mammals ..... Class-PALAEACANTHOCEPHALA Meyer, 1931

   Main longitudinal lacunar canals dorsal and ventral or dorsal. Lemnisci, cement gland and/or hypodermal muclei not fragmented, usually giant. Ligament sacs in female double, persistent. Proboscis receptacle single walled, complex or absent 2

2. Trunk not spined. Protonephridia may be present. Proboscis receptacle absent or single Walled. Cement glands separate, pyriform. Eggs usually oval, thick walled. Parasites of birds and mammals ..... Class-ARCHIACANTHOCEPHALA Meyer, 1931.

   Trunk may be spined. Proboscis usually small with few radially arranged hooks. Cement glands single, syncytial. Eggs variable shaped but not like above. Parasites of fishes and occasionally amphibians and reptiles ..... Class-EOACANTHOCEPHALA Van Cleave, 1936

PALAEACANTHOCEPHALA MEYER, 1931

Key to the Orders of PALAEACANTHOCEPHALA Meyer, 1931

1. Parasites of fishes and amphibia- ..... Order ECHINORHYNCHIDA

   Parasites of other vertebrates 2

2. Parasites of reptiles (rare), birds and Mammals ..... Order POLYMORPHIDA

Order POLYMORPHIDA

Key to the families of POLYMORPHIDA

1. Trunk spinose, parasites of vertebrates, especially aquatic birds and mammals .... Family POLYMORPHIDAE

   Trunk unarmed 2

2. Proboscis divided by the insersion of its receptacle into two regions. Parasites of terrestrial birds and mammals (juvenile forms in amphibians and reptilians also) .... Family CENTRORHYNCHIDAE

   Proboscis not divided. Receptacle inserted at base of proboscis .... Family PLAGIORHYNCHIDAE

Order ECHINORHYNCHIDA

Key to the families of ECHINORHYNCHIDA

1. Ventral proboscis hooks considerably larger than dorsal, Parasites of fresh water and marine fishes ..... Family HETERACANTHOCEPHALIDAE

   Ventral proboscis hooks not significantly different from dorsal 2

2. Proboscis with 2 or 3 distinct types of hooks; transition abrupt. Parasites of marine fishes ..... Family ARHTHMACANTHIDAE

   Proboscis armature not as above 3

3. Trunk usually unarmed, armed individuals with anterior minute cuticular spines. Proboscis cylindrical with many hooks or spheroid with few hooks. Cement glands 6 or 8, usually pyriform to spherical and compact. Parasites of fresh water and marine fishes and occasionally in amphibians ..... Family ECHINORHYNCHIDAE

   Trunk spined 4

4. Trunk spined in one undivided region anteriorly and at posterior extremities, cement

gland 8. elongate pyriform. Parasites of marine and fresh water fishes ..... Family-ILLIOSENTIDAE

Trunk usually spined differently 5

5. Trunk rarely unspined. Cement glands 4-6, elongate and tubular or short and pyriform, 6-8 in some unspined species. Parasites of marine ande fresh water fishes ..... Family-RHADINORHYNCHIDAE

Class PALAEACANTHOCEPHALA Meyer, 1931

Order ECHINORHYNCHIDA

Family HETERACANTHOCEPHALIDAE Petrotshenko, 1956

Subfamily ASPERSENTINAE Golvan, 1960

Genus ***Bullockrhynchus*** Chandra *et al.*, 1985

1. ***Bullockrhynchus indicus*** Chandra *et al.*, 1985

1985. *Revista Iberica de Parasitologia.* 45(4) ; pp. 293-302.

Host : *Leiognathus equalis*

Location : Intestine

Locality : Coast of Andhra Pradesh.

Remarks : Chandra et al described *B. indicus* n.g.n.sp.from marine fish host of Andhra coast. Due to non-availability of literature no description of species could be given.

Family ILLIOSENTIDAE Golvan, 1960

Genus ***Indorhynchus*** Golvan, 1969

2. ***Indorhynchus indicus*** (Tripathi, 1959) Golvan, 1969
Syn. : *Rhadinorhynchus indicus* Tripathi, 1959

1959. *Records Indian Museum.* Vol. 54 ; part : 1-2, pp. 61-99.

1969. *Memmoires Du Mus. National D' Historire Naturelle*; p.40.

Host : Cat fish

Location : Intestine

Locality : Waltair, Andhra Pradesh.

Reg. No. : W8680/1

Materials Examined : Several males and females.

Diagnosis : Male : Body 4.067 long and 0.664 wide. Trunk spines in 10-12 rows with 20-22 spines in each row. Proboscis 0.65 long and 0.15 wide. Proboscis hooks in 18-20 rows with 14-16 hooks in each row. Hooks : 1st -10th – 0.10 long. Hooks : 12th 13th –0.07 long. 14th hooks of each row – 0.10 long. Neck 0.10 long and 0.12 wide. Proboscis sheath 1.00 long and 0.20 wide. Testes at posterior half, testes oval, overlapping, T_1 - 0.40 long and 0.20 wide. T_2-0.35 long and 0.20 wide. Cement gland 8, pyriform, Seminal vesicle 0.30 long and wide. Male genital aperture subterminal. Female : Body longer than male. Trunk spines 10-12 rows of 36-38 in each Row. Genital aperture subterminal.

Remarks : Tripathi (1959) described the species *I. indicus* from *Tachysurus jello* from Puri and Chilka. He also reported the species from *Osteogeneiosus militaris* from Chilka. Golvan (1969) erected the genus *Indorhynchus* with the type species. *I. indicus* under the family Illiosentidae. The species is reported here from a marine siluroid fish at Waltair.

Family ARHYTHMACANTHIDAE Yamaguti, 1935

Key to the subfamilies of ARHYTHMACANTHIDAE Yamaguti, 1935

1. Trunk spinose at least anterioly, Proboscis globular to spheroid or claviform with large anterior rooted hooks and posterior small rootless spines with an additional set of small apical rootless spines.. ..... ARHYTHMACANTHINAE

2. Trunk unarmed ..... PARACANTHOCEPHALOIDINAE

Key to the genera of ARHYTHMACANTHINAE

1. Trunk fusiform, Proboscis hooks of three types, apical small, sub-apical large, basal very small ..... ARHYTHMACANTHUS

   Trunk long, Proboscis hooks apical large and rooted, middle very small, basal small ..... GORGORHYNCHOIDES

3. ***Arhythmacanthus septacanthus*** Sita Anantharaman, 1949

1969. Golvan : *Memoires Du Mus. National. D Historire Naturelle pp.* 175-177.

Host : *Plotosus canius*

Location : Intestine

Locality : Pulicut Lake, Andhra Pradesh.

Diagnosis : Body fusiform, anterior trunk spinose. Proboscis .216 long and 0.124 wide. Apical crown of hooks 3 rows with 6 hooks each, sub-apical hooks long, 2 rows with 6 each,

basal hooks 13-14 rows of 3-4 hooks. Apical hooks 0.036, sub-apical 0.056-0.060, basal 0.016 long. Proboscis sheath double walled, 0.495 long and 0.120 wide, Lemnisci longer than proboscis sheath, 0.345 long and 0.03 wide,. Lemnisci longer than proboscis sheath, 0.345 long 0.03 wide. Testes in posterior half, T_1-0.255 long, T_2- 0.270 long, tandem. Cement glands 6, pyriform, 0.12 long and 0.06 wide. Egg 0.108 and 0.056 wide.

Remarks : Sita Anantharaman (1949) described the species in her thesis. Golvan (1969) recognized the species and published it under the authorship of Sita A.

4. ***Gorgorhynchoides indicus*** Bhattacharya *et al.*, 2003

2003. *Rec. zool. Surv. India* (part 3-4) : pp. 49-54

Host : *Psettodes erumei; Lutjanus fulbiflama; Polynemus tetraductylus; Gerres abreviatus; Triacamthus trigitifer; Therapon jarbua; Plectorhynchus cuveri*

Location : Intestine

Locality : Waltair, Kakinada, Vijaiwada of Andhra Pradesh.

Reg. No. : W8733-49/1

Materials examined : Several juvenile females from above mentioned hosts.

Diagnosis : Body 4.248-7.304 long and 0.468-0.8632 wide, only one sub-adult specimen Bears a little trunk swelling at antero-dorsal region. Proboscis clavate, 0.962-1.00 long and 0.04-0.045 wide., armed with 28-30 rows with 14-18 hook in each row. Anterior 4 rows with rooted hooks, 5th row abruptly decrease in size, 6th row onward increase and again decrease in size near base. 1st row 0.10 long and 0.01 wide; 2nd—0.13 long and 0.03 wide; 3rd—0.09 long and 0.05 wide, 4th—0.09 long and 0.05 wide; 5th—0.04 long and 0.02 wide.; 6th—0.07 long and 0.01; 8th—0.09 long; basal hooks 0.05-0.07 long. Pr. sheath 2.40 long and 0.30 wide. Lemnisci long, coiled nucleated. Trunk spines above the trunk swelling, dorsal trunk spines more in ventral than dorsal, ventral 25-28 spines in each circle, dorsal spines 20 spines in each circle.

Remarks : Cable and Linderoth (1963) erected the genus *Gorgorhynchoides* with *G. elongatus* as type species from carangeid fish hosts. Bhattacharya *et al.* (2003) described *Gorgorhynchoides indicus* from some carangeid fish hosts of India. After careful studies of materials from above hosts, it is opined that all are juveniles of *Gorgorhynchoides indicus* occurring in non-carangeid fish hosts of Indian marine waters. Hence, it can be inferred that definitive host of the species is carangeid fish as stated by Cable and Linderoth (1963) and Cable & Mafarchisi (1970).

Subfamily PARACANTHOCEPHALOIDINAE

Genus ***Paracanthocephaloides*** Golvan, 1969

Key to the species of Paracanthocephaloides.

1. 10-12 rows of proboscis hooks with 6 hooks each ..... *P. tripathi nom. nov.* *(= Heterosentis plotosi sensu T., 1959)*

   Number of rows on proboscis more 2

2. Anterior proboscis hooks in 12-14 Rows of 5-7 each. Posterior hooks in 10-12 rows of 12-14 hooks each ..... *P. golvani* Chandra et al, 1984

Genus 5 ***Paracanthocephaloides*** Golvan, 1969

5. ***Paracanthocephaloides tripathi*** nom. nov.
(=Heterosentis plotosi sensu Tripathi, 1959), Golvan, 1969

1959. Tripathi : *Record Ind. Mus.* Vol. 54; part : 1-2; pp. 61-99.

1969. Golvan : *Mem. Du Mus. Nat. D Hist. Naturelle*; pp. 175-178.

Host : Cat fish and *Mugil cephalus.*

Location : Intestine

Locality : Pulicut lake, Andhra Pradesh.

Reg No. W8677-79/1

Materials examined : One male (pr. retracted) and 6 females.

Diagnosis : Female : Body 3.569-5.81 long and 0.4-0.5 wide, aspinose, Proboscis 0.18-0.28 long and 0.12-0.08 wide, armed with 12-14 longitudinal rows of 6 hooks each, anterior 3 hooks per row rooted and large, posterior 3 spines per row without root and very small. Anterior points of hooks 0.04-0.045 long and roots 0.04-0.05 long; middle points 0.075-0.09 long and roots 0.07-0.08 long, posterior rootless spines 0.015-0.02 long. Neck 0.02 long and 0.18 wide. Proboscis sheath 0.05 long and 0.09 wide. Lemnisci 0.06 long and 0.04 wide. Male : body 2.80 long (without proboscis) and 0.45 wide. Testes at posterior half. T -0.35 long and 0.20 wide, T_2-0.35 long and 0.20 wide. Cement Glands 6.

Remarks : Golvan (1969) synonymised the genus *Heterosentis* with *Aspersentis* Van Cleave, 1929 with the type species *A. megarhynchus* (Linstow, 1892) Golvan, 1960. But he transferred *Hetersentis plotosi* Yamaguti, 1935 to the genus *Paracanthocephaloides* owing to the absence of trunk spines in *H. plotosi.* Thus, *H. plotosi* reported by Tripathi (1959) from India has been renamed by Golvan (1969) as *P. tripathi* nom. nov *(= Heterosentis plotosi* sensu Tripathi, 1959). The species under report is similar to *P. tripathi* in respect of number and size of proboscis hooks. Therefore, the species is reported here with a new locality record.

6. ***Paracanthocephaloides golvani*** Chandra et al, 1984

1984. *Revista Iberica de Parasitologia* (1) ; pp. 347-352.

Host : *Saurida tumbil, S. undosquamis, Trachinocephalus myops, Herpodon nehereus, Johnius aneus, Peterotolithus maculatus, Pennahia argentata, Kathala axillaris, Upeneus vittatus.*

Location : Juveniles in intestines and cysts on the walls of intestine and mesentery.

Locality : Coasts of Andhra Pradesh.

Diagnosis : (After Chandra K.J.) : Male : Body curved, slightly swollen at middle, 5.256-5.580 long and 0.660-0.732 wide. Females 6.012-6.132 long and 0.708-0.720 wide. Trunk armed with 28-32 long. Rows with 18-22 hooks per row. Proboscis claviform 0.840-0.972 and 0.384-0.54 wide anterioly, armed with two types of hooks, hooks in 12-14 spiral rows of 5-7 hooks each anteriorly, 10-12 spiral rows with 12-14 hooks each posteriorly. Anterior hooks 0.60-0.144 long and gradually decrease in length posteriorly, posterior hooks 0.03-0.036 long. Proboscis receptacle 2.040-2.268 long and 0.384-0.420 wide, nerve ganglion at mid proboscis. Lemnisci unequal and coiled. Testes ovoid, one behind the other, T_1-0.090-0.144 long and 0.066-0.108 wide. Cement gland, Saefftigen's pouch not developed due to its state of being juvenile.

Remarks : Chandra et al (1984) described *P. golvani* from a number of marine fish hosts at the coasts of Andhra Pradesh. Diagnostic features of the species are very much akin to that of the genus *Gorgorhynchoides.* Therefore, I refer the species to the genus *Gorgorhynchoides* Cable & Linderoth, 1963 for the following reaseasons. 1. Members of *Paracanthocephaloides* do not bear trunk spines as mentioned by Golvan (1969) and Amin (1985).2. Number of proboscis hooks in *Paracanthocephaloides* is lesser than what is shown in *P. golvani.*3. Posterior proboscis hooks reduce abruptly at the base and basal hooks are small and spiniform whereas in *P. golvani* reduction in size of hooks is gradual. In addition to the above observation, the number of proboscis hooks, their size and arrangement as shown in the figure of *P. golvani* are identical with that of *Gorgorhynchoides indicus.* In the present work I have listed a good number of juvenile forms of *G. indicus* which show close proximity with that of *P. golvani* in respect of types of proboscis hooks and their arrangements, trunk spines and its anterior swelling etc. Therefore, I consider *P. golvani* as juvenile of *G.indicus* Bhattacharya *et al,* 2003. The definitive host of *G. indicus* is carangeid fish.

IV. Family ECHINORHYNCHIDAE Cobbold, 1876

Subfamily ECHINORHYNCHINAE Cobbold, 1876

Genus 6 ***Echinorhynchus*** Muller, 1776

7. ***Echinorhynchus indicus*** Chandra, 1982

1982. *Indian Journal of Parasitology,* **6** (2) : pp. 255-257

Host : *Pomadasys maculatus*

Location : Intesine

Locality : Coast of Andhra Pradesh

Diagnosis : Body medium, 3.504 long and 0.780 wide. Aspinose. Proboscis curved, 0.660 long and 0.093 diametre, armed with 12 longitudinal rows with 16 hooks, ventral hooks curved and thicker than dorsal hooks, anterior hooks 0.048 long and 0.192 in diameter. Neck 0.144 long. Proboscis sheath elliptical 0.132 long and 0.060 wide. Lemnisci 0.924 long and 0.096 wide. T_1-0.744 long and 0.300 wide, T_2-0.552 long and 0.168 wide. Cement glands 6, spherical, 0.252-0.264 long and wide. Saefftigen's pouch 0.900 long and 0.132 wide.

Remakrs : The only species of the genus *Echinorhynchus* is recorded from the State. The specimen is deposited in the department of Zoology, Andhra University.

V. Family RHADINORHYNCHIDAE Travassos, 1923

Key to the Subfamilies of RHADINORHYNCHIDAE

1. Trunk with combs of spines ..... SERRASENTINAE Petrotschenko, 1956

   Trunk with spines not arranged in combs 2

2. Proboscis long with numerous hooks, Trunk anteriorly spined in 1 region or in 2, separated by an unarmed zone. Cement glands 4, elongate to tubular ..... RHADINORHYNCHINAE Luhe, 1912.

   Proboscis short, fusiform, anteriorly enlarged, sub-cylindrical. Cement glands 4-6, elongate to tubular or short and pyriform, 8 in unspined genera ..... GORGORHYNCHINAE Van Cleave et Lincicome, 1940

Subfamily RHADINORHYNCHINAE Luhe, 1912

Genus 7 ***Raorhynchus*** Tripathi, 1959

8. ***Raorhynchus polynemi*** Tripathi, 1959

1959. *Rec. Ind. Mus.* vol. **54**; part, 1-2; pp. 61-99.

Host : *Polynemus sp. Alectis indicus.*

Location : Intestine

Locality : Machhlipatnam, Andhra Pradesh.

Reg No. : W8683/1

Material examined : One male and one female.

Diagnosis : Male : Body 6.75 long and 0.375 wide. Trunk spines in 10-12 rows with 20-

22 spines each. Proboscis 0.9 long and 0.1 wide. Proboscis hooks 10-12 rows with 22-24 hooks each. Hooks on dorsal side smaller, thicker and more curved than slender hooks in ventral side. Apical hooks long, gradually become smaller towards base. Hooks of the last row of proboscis larger than those of the penultimate row. Anterior hooks 0.0498 long, middle–0.033 long near base, penultimate row-0.016 long, last row-0.033 long. Neck–0.25 long and 0.2 wide. Pr. Sheath–1.875 long and 0.25 wide. Lemnisci- 1.45 long 0.125 wide. Testes equatoral, T_1–0.625 long and 0.325 wide. T_2–0.625 long and 0.325 wide. Cement glands 4, genital aperture subterminal. Female : body 12.25 long and 0.675 wide. Proboscis 1.125 long and 0.1 wide. Genital aperture subterminal. Eggs–0.03-0.05 long.

Remarks : The species is reported to have occurred in some marine fishes of India. This is reported for the first time from the State with new host record.

9. ***Rhadinorhynchus ganapati*** Chandra *et al.*, 1985

1985. *Revista Iberica de Parasitologia* **45**(4) ; pp. 293-302.

Hosts : *Euthynnus affinis; Scomboerides commersonianus; Scomberomorus guttatus; Lepturacanthus savala.*

Location : Intestine.

Locality : Coast of Andhra Pradesh.

Diagnosis : Male : Body 4.764-6.320 long and 0.372-0.608 wide. Proboscis 0.963-1.164 long and 0.138-1.175 wide, armed with 16-18 rows with 23-25 hooks per row. Pr. Sheath 1.920-3.560 long and 0.078-0.240 wide, ganglion at posterior end, 0.144-0.175 long and 0.128-0.144 long. Lemnisci 2.100-3.600 long and 0.180-0.208 wide. Testes tandem, T_1-0.696-1.128 long and 0.300-0.432 wide, T_2-0.456-0.480 long and 0.276-0.320 wide. Cement gland 4. Saefftigen's pouch present. Female : body 10.720-15.424 long and 0.512-0.640 wide. Genital pore Subterminal. Eggs- 0.042-0.054 long and 0.011 wide.

Remarkms : The specimens are deposited in the Department of Zoology, Andhra University.

Subfamily GORGORHYNCHINAE Van Cleave et Linciome, 1940

Genus 8 ***Cleaveius*** Subramaniam, 1927

10. ***Cleaveius secundus*** (Tripathi, 1959) Golvan, 1969

Synonym : *Mehrarhynchus secundus* Tripathi, 1959

1959. Tripathi : *Rec. Ind. Mus.* Vol-**54**; parts-1&2; pp. 61-99

1969. Golvan : *Mem. Du Mus. Nat. D' Hist. Naturelle*; pp. 175-177

Host : *Plotosus canius*

Location : Intestine

Locality : Godavari estuary, Kakinada, Andhra Pradesh.

Reg. No. : W8682/1 ; W8695/1

Materials examined : One female

Diagnosis : Body 2.49 long and 0.4 wide. Proboscis club shaped, anteriorly broad, flexed at an angle with the body, armed with 20-22 longitudinal rows with 15-16 hooks per row, no difference in size of dorsal and ventral proboscis hooks, hooks 0.0375-0.045 long, basal hooks 0.045 long. Trunk spines 8-10 rows at anterior region, spines extend to middle of proboscis sheath, neck 0.16 long and 0.24 wide. Proboscis sheath 1.35 long and 0.15 wide. L_1-1.85 long, L_2-1.90 long.

Remasrks : Tripathi (1959) described the species from *Plotosus canius, Pama pama* and *Osteogeneiosus militaris* from Chilka Lake and Matla River of Canning, West Bengal. The speciesis obtained from an unidentified cat fish from the Godavari estuary at Kakinada. Subramaniam (1927) erected the genus *Cleaveius* with the type species *C. circumspinifer* obtained from an undetermined fish of Rangoon. Golvan (1969) transferred *Mehrarhynchus secundus* Tripathi 1959 and *M. prashadi* Datta, 1940 to the genus *Cleaveius.* This transfer is justified. Hence, the species is reported here as *C. secundus* with a new locality record.

Genus 9 ***Hanumantharaorhychus hemiramphi*** Chandra, 1983

11. ***Hanumantharaorhynchus hemiramphi*** Chandra, 1983

Ref. 1983 : *Revista Iberica de Parasitologia* Vol. **43**; fasc. 2. pp. 119-124.

Host : *Hemiramphus marginatus* (Forskal)

Location : Intestine.

Locality : Waltair coast, Andhra Pradesh.

Diagnosis : Male : 3.56-3.96 long and 0.53-0.55. Proboscis short, 0.280-0.300 long and 0.128-0.132, armed with 6 spiral rows with 10-11 hooks in each row. Anterior hooks -.534-0.063. Posterior hooks 0.012-.036 long. Neck 0.142-0.146. Anterior trunk spines in 10 circles with 18-24 hooks each. Proboscis sheath double walled, 0.800-0.816 long and 0.096-0.996 wide. Testes at anterior half, T_1-0.460-0.480 long and 0.264 wide. T_2-0.472-0.480 long and 0.264 wide. Cement gland 4, pyriform, 0.300-0.360 long and 0.096-0.132 wide. Cement reservoir two, claviform, 0.336-0.384 long and 0.120-0.156 wide. Seminal vesicle elongate, 0.168-0.180 long nd 0.076-0.084 wide. Genital pore sub-terminal dorsally.

Remarks : Holotype and paratype (male) are deposited in the Department of Zoology, Andhra University. Author placed the species under the family Micracanthidae which was suppressed by Golvan (1969).

Subfamily SERRASENTINAE Petrotschenko, 1956

Genus ***Serrasentis*** Van Cleave, 1923

Key to the species of *Serrasentis* Van cleave, 1923

1. 22-26 longitudinal rows of proboscis hooks with 14-18 in each row .... *Serrasentis sagittifer* (Linton, 1889) Linton, 1932

   Longitudinal rows of hooks less 2

2. 18-22 longitudinal rows of hooks, sub-equal lemnisci, unequal testes .... *Serrasentis indicus* Singh *et al.*, 1998.

12. ***Serrasentis sagittifer*** (Linton, 1889) Linton, 1932

Syn : *Echinorhynchus socialis* Leidy, 1851, *Echinorhynchus sagittifer* Linton, 1889, *Serrasentis socialis* (Leidy, 1851) Van Cleave, 1924

1932. *Science*, LXXVI, 193.

Host : *Exocoetus volitans, Synaptura cornuta, Otolithus maculatus, Psettodes erumei, Rachycentron canadus.*

Location : Intestine and body cavity.

Locality : Along the coastal belt of Andhra Pradesh.

Reg No. : W8724-32/1

Materials examined : Two adult male and 3 adult female and many juveniles.

Diagnosis : Adult body long, cylindrical, juveniles 4.05-6.29 long. Proboscis club-like or claviform Proboscis hooks 22-26 rows of 14-17 hooks per row. Collar spines 7-10 rows each with 18-20 spines per row. Ventral trunk with 18-23 circular combs studded with 8-20 spines. Combs extend to ¾th of the body.

Remarks : Definitive hosts of *Serrasentis sagittifer* is *Rachycentron canadus* and few carangeid fish hosts. Juvenile forms of the species occurring in marine fishes of India have been described by many authors under different names. Soota & Bhattacharya (1983) synonymised a number of Indian species with *S. sagittifer.*

13. ***Serrasentis indicus*** Single et al, 1998

1998. *Journal of Parasitology and Applied Animal Biology.* 7(2) pp. 73-81.

Host : *Elops saurus*

Location : Intestine and body cavity.

Locality : Waltair, A.P.

Diagnosis : Proboscis hooks 18-20 longitudinal rows, sub-equal lemnisci, cement glands, unequal testes.

Remarks : The specimens appear to be juvenile. The author has compared *S. indicus* with *S. fotedari* and *S. ciaenus* which are also juveniles. Sub-equal lemnisci, cement glands, testes etc. cannot be considered as important characteristics for erecting a new species. Therefore, I suggest it to be a synonyn of *S. sagitifer.*

Key to the families of POLYMORPHIDA Petrotschenko, 1959

1. Trunk spinose, parasites of vertebrates especially aquatic birds and mammals .... POLYMORPHIDAE, Meyer, 1931

   Trunk aspinose 2

2. Proboscis divided by the insertion of its rceptacle into 2 regions. Parasites of terrestrial birds and mammals (juvenile forms in amphibians, and reptilians also) .... CENTRORHYNCHIDAE Van Cleave, 1916

   Proboscis not divided. Receptacle inserted at the base of proboscis .... PLAGIORHYNCHIDAE Golvan, 1960

VI. Family POLYMORPHIDAE Meyer, 1931

Genus 11 ***Southwellina*** Witenberg, 1932

14. ***Southwellina hispida*** (Van Cleave, 1925) Witenberg, 1932
(Plage-1; Fig 1 & 2)
Syn. *Arhythmorhynchus fuscus* Harada, 1929, *A. duocinctus* Chandler, 1935, *A. tigrinus* Moghe et Das, 1953, *Polymorphus ardeae* Belopolskaja, 1958, *Hemiechinostoma poniticum* Petrotschenko et Smogor. 1962

1932. *Bol. Zool. Napoli,* **3** : pp. 153-266.

Host : *Lates calcarifer*

Location : Body cavity.

Locality : Pulicut Lake, A.P.

Reg No. : W8681/1

Material examined : One female (Juvenile)

Diagnosis : Body fusiform, 2.573 long, and 0.2822 broad, middle-0.6972, post.-0.249. Body spines restricted to anterior part. Spines in two zones, 1st band 0.332 long. with 4-5 rows of spines. Space between the bands 0.1162 long. 2nd Band with 6-7 rows of spines. Proboscis 0.5810 long. Ant. 0.1494 broad, middle–0.1992 broad, post.–0.1660. Proboscis

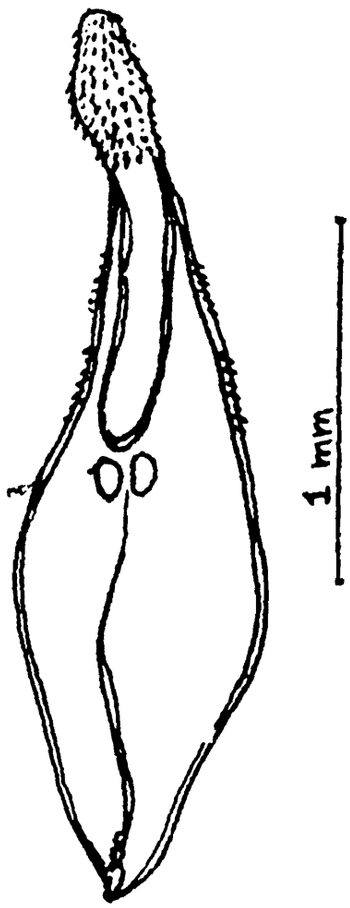

Fig. 1

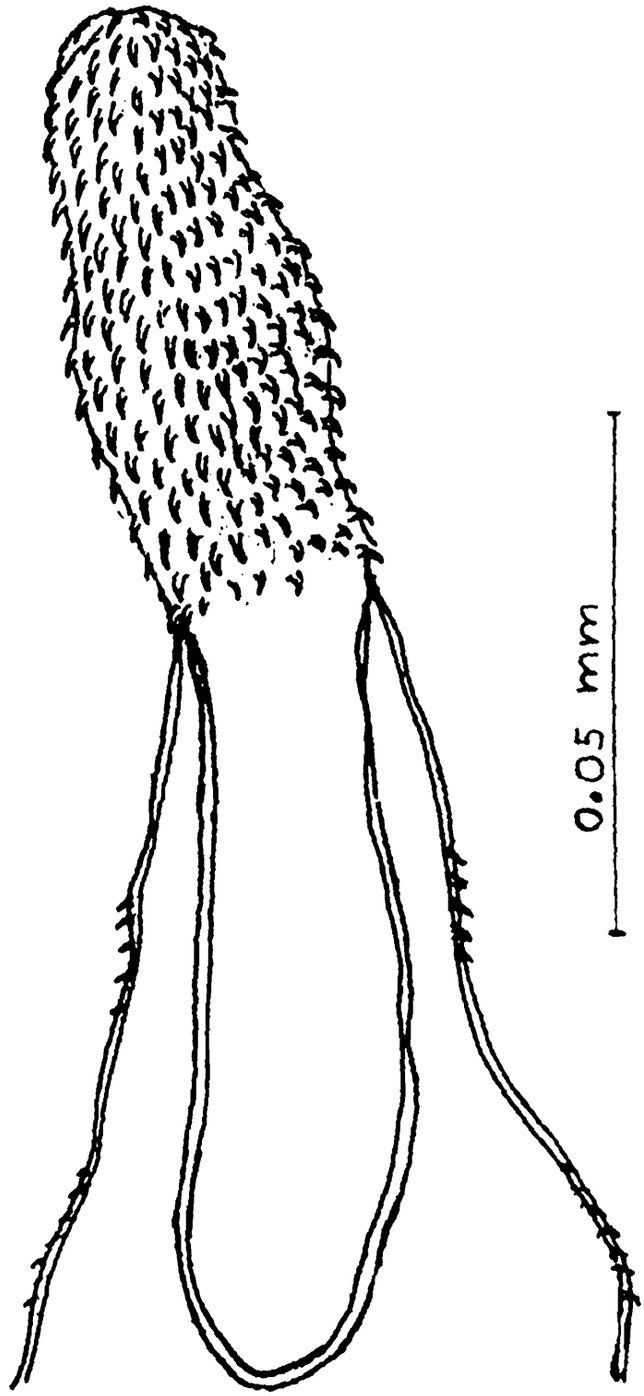

Fig. 2

Fig. 1 & 2 : Juvenile of *Southwellina hispida* (Vancleave, 1925) Witenberg, 1932

Sheath 0.7968 long and 0.1660 wide. Proboscis armed with 18-20 rows of 14-15 each. Proboscis hooks 1st–5th-0.03-0.035 long (3-4 hooks per row). 6th-9th–0.035-0.045 long (hooks broad and stout). 10th–15th–0.025-0.03; Lemnisci–0.9960 long and 0.1328 wide. Equal, leaf-like. Longer than proboscis sheath. Eggs not developed.

Remarks : Van Cleave (1925) reported a juvenile of *Arhythmorhynchus hispidus* in frogs of Japan. Witenberg (1932) proposed a new genus *Southwellina* with *S. hispida* (Van Cleave, 1925) as type. Golvan (1956), Petrotschenko (1958), Yamaguti (1963) rejected the genus *Southwellina* and revalidated *A. hispidus*. Schmidt (1973) resurrected the genus and re-established *H. hispida*. The present form resembles juvenile of *S. hispida* described by Van Cleave (1925). Bhattacharya (2002) reported *S. hispida* in ichthiophagus bird, *Nycticorax nycticorax* from Chilka. The juvenile of the species is obtained from *Lates calcarifer* from Pulicut Lake. Thus, it forms a new locality and host record.

7. Family CENTRORHYNCHIDAE Van Cleave, 1916

Genus 12 ***Centrorhynchus*** Luhe 1911

Key to the species of the *Centrorhynchus*

1 Body short, spindle shaped Proboscis hooks 30-32 longitudinal rows with 11-12 hooks in each row (1st–7th hooks per row rooted) ..... *Centrorhynchus lancea* (westrumb, 1821) Skrjabin, 1913

Body long, cylindrical 2

2. Proboscis hooks 26-34 longitudinal rows with 22-24 hooks per row (8-10 rooted hooks per row anteriorly ..... *Centrorhynchus milvus* Ward, 1956

Hooks in more than 35 rows 3

3. Proboscis in 36-38 rows of 18-22 hooks per row (rooted hooks not more than 7-8) per row ..... *Centrorhynchus globocaudatus* (Zeder, 1800)

Rows less but number of hooks per row more 4

4. Proboscis hooks in 32-36 rows of 34-40 hooks per row (7-8 rooted hooks per row anteriorly ..... *Centrorhynchus spilornae* Schmidt & Kuntz, 1967

Proboscis hooks in 20-24 rows of 24-26 hooks per row (anterior rooted hooks, 14-16) per row ..... *Centrorhynchus giganteus* Travassos, 1921

15. ***Centrorhynchus lancea*** (Westrumb, 1821) Skrjabin, 1913

Syn : *Echinorhychus vanelli* Goeze, 1782, *E. morinelli* Rudolphi, 1819, *E. oedicnenii* Rudolphi, 1891, nom.nud., *E. lancea* Westrumb, 1821

1913. *Zool. Zahrb, Abt. Syst. Bd. 35, Buch.* 14; Taf. 2.

1986. *Res. Bull. Punjab, Univ.* (Science) **37** (3-4) ; pp. 25-31

Host : Perriah kite.

Location : Intestine

Locality : Sreekakulum. A.P.

Reg. No. : W8719-20/1

Material examined : One male and three females.

Diagnosis : Male : Body 5.478 long and 1.245 wide, spindle shaped. Anterior proboscis 0.4648 long and 0.3320 wide. Posterior proboscis 0.2490 long and 0.4150 wide. Proboscis hooks in 30-32 longitudinal rows with 11-12 hooks per row. 6-7 rooted hooks per row in anterior proboscis, posterior proboscis hooks without roots and smaller than the anterior ones. Points of posterior proboscis 0.075-0.04 long. Proboscis sheath 0.913 long and 0.4648 wide. Lemnisci long, L_1–1.195 long, L_2–1.1952 long, Testes anterior, one testis ruptured. Cement glands, 2 or 3, 1.162 long. Female : Juveniles : 7.47 long and 1.49 wide. Ovarian balls scattered in the body cavity. Genital pore terminal. Eggs not developed.

Remarks : Duggal et al (1986) reported the species in *Acridotheris tristris* and *Dendrocitta vagabonda* from Punjab. Bhattacharya (2003) reported it in *Turdus albocinctus* from Sikkim. Perriah kite in Andhra Pradesh forms a new host and locality record for the species.

16. ***Centrorhynchus milvus*** Ward, 1956

1956. *J. Parasit.* **42** (1); pp. 39-41.

Host : Black kite, Baz, kite.

Location : Intestine

Locality : Sreesailum, Rajamundri, Kurnool, A.P.

Reg. No. : W8716-18/1

Materials examined : Male : (from kite of Rajamundri) : Body long, 12.782 (incomplete) long and 1.66 wide. Proboscis 1.079 long and 0.3320 wide, mid-Proboscis wider. Proboscis armed with 32-34 longitudinal rows with 22-24 hooks per row. Anterior proboscis with 8-10 rooted hooks, posterior proboscis with rootless hooks. Points of apical hooks 0.0375-0.045 long, roots-0.0375-0.045 long, basal hooks 0.03-0.0375 long. Proboscis sheath-1.66 long and 0.1992 wide, ganglion at base. Lemnisci leaf-like, as long as proboscis sheath. Testes at anterior end., large, tandem, T_1–1.328 long and 0.083 wide. T_2–1.41 long and 0.78 wide. cement glands 2-4, long, tubular. Female : (Juv, from Baz) 5.16 long and 0.53 wide. (Adult) 30.71-40.67 long and 0.498 wide. Anterior proboscis 0.747 long and 0.2490 wide. Posterior proboscis 0.3320 long and 0.332 wide, armed with 26-30 longitudinal rows with 22-24 hooks per row. Genital pore sub-terminal. Eggs not developed.

Remarks : Gupta & Lata (1996) reported a juvenile form of the species in *Accipiter badius* from Hoshiarpur, Punjab. Later, Nama & Rathore reported the species in *Corvus splendens* from Rajasthan. Bhattacharya (2000) reported it in *Milvus migrans govinda* from Meghalaya. Now the species claims a new locality record in Andhra Pradesh.

17. ***Centrorhynchus globocaudatus*** (Zeder, 1800)

2000 : Bhattacharya, S.B. : *State Fauna Series* 7 : *Fauna of Meghalaya* part-4.

Host : *Outs backemoena*

Location : Intestine

Locality : Kurnool, A. P.

Reg. No. : W8711-13/1

Materials examined : Three female specimens (broken)

Diagnosis : Female : Body long, 28.22-33.20 long and 0.830-0.913 wide. Proboscis 1.328 long with 36-38 longitudinal rows of 18-22 hooks per row. Anterior 7-8 hooks per row rooted. Points of anterior hooks 0.025-0.03 long, roots 0.04-0.06 long. Points of posterior hooks 0.015-0.03 long. Posterior end of females broad, tip pointed. Eggs 0.035-0.04 long and 0.015 wide.

Remarks : Gupta & Gupta (1974) reported the species in *Milvus migrans* at Chandigarh. Bhattacharya (2001) reported it in *Ottus* sp. from Tripura. The species is reported here in *Ottus* sp. from Tripura. The species is reported here with a few locality record.

18. ***Centrorhynchus spilornae*** Schmidt & Kuntz, 1969

1969. *J. Parasit.* Vol. **52**(2) : pp. 329-331.

Host : Crested eagle.

Location : Intestine.

Locality : Kurnool, Andhra Pradesh.

Reg. No. : W8714/1

Materials examined : Three female specimens with some broken parts.

Diagnosis : Body cylindrical, 39.34 long and 0.4980 wide. Anterior proboscis 0.464 long and 0.332 wide, posterior probscis 0.664 long and 0.3984 wide. Proboscis hooks in 32-36 longitudinal rows of 34-40 hooks per row; 7-8 rooted hooks in anterior proboscis. Apical hooks 0.020-0.022 long, middle hooks 0.0225-0.025 long, basal hooks 0.025-0.03 long. Proboscis sheath 1.411 long and 0.332 wide. Lemnisi longer than proboscis sheath,posterior extremely broad and conical. Genital pore subterminal. Eggs 0.025-0.0375 long and 0.0125 wide.

Remarks : Zafar and Farooqi (1981) reported *C. spilornae* in serpent eagle from Allahabad. They considered *C. andamanensis* Soota and Consul 1972 as a synonym of *C. spilornae.* Bhattacharya (2002) reported the species in owlet from Tripura. The species is reported here with a new locality record.

19. ***Centrorhynchus giganteum*** Travassos, 1921

1921. *Folha Medica,* **2**(6); pp. 42-43.

Host : Shikra

Location : Intestine

Locality : Punamvally, Andhra Pradesh.

Reg. No. : W8715/1

Materials examined : Two males

Diagnosis : Body 24.50 long and 0.75 wide. Proboscis 0.85 long, armed with 22-24 longitudinal rows of hooks with 24-26 hooks per row. 14-16 anterior hooks rooted. Maximum size of point of hooks 0.0325, maximum size of root 0.05. Testes at anterior region. T_1-1.00 long and 0.35 wide, T_2-1.10 long and 0.25 wide.

Remarks : Travassos (1921) described *C. giganteum* from a bird of the family Falconidae. The species under report is obtained from shikra which is also a bird of prey. Rows of proboscis hooks and the number of hooks per row conforms with *C. giganteum* especially with the number of rooted hooks of the anterior proboscis. Probably, the species is reported here for the first time from India.

VIII. Family PLAGIORHYNCHIDAE Golvan, 1960

Subfamily PORRORCHINAE

Genus 13 ***Porrorchis*** Fukui, 1929

20. ***Porrorchis indicus*** (Das, 1957) Schmidt & Kuntz, 1967

1957. *J. Parasit.* **43** (6) : pp. 659-663.

Host : *Centropus sinensis*

Location : Sreesailum, A. P.

Reg. No. : W8722/1

Materials examined : One male and two female.

Diagnosis : Male : Body 19.92 long and 0.9960 wide (broad anterior part), Proboscis hooks 1st-3rd–0.075-0.08 long and 0.0075-0.04 wide, basal hooks 0.025-0.03 long. Proboscis

sheath 1.079 long and 0.365 wide. Neck 0.166 long and 0.0249 wide. Testes at anterior broad part, tandem, T_1-0.05810 long and 0.415 wide, T_2-0.664 long and 0.332 wide. Cement gland long, tubular, extend to posterior end. Female : Body 31.54 long and 1.079 wide, posterior end broad conical and genital pore subterminal. Eggs 0.05-0.055 long and 0.02-0.022 wide.

Remarks : Schmidt & Kuntz(1967) synonymised the genus *Pseudoporrorchis* with *Porrorchis*. Thus, *Pseudoporrorshis indicus* Das, 1957 became *Porrorchis indicus* (Das, 1957) S&K, 1967. Gupta & Jain (1975) reported an adult form of *G. indicus* in *Centropus* sp. from Chandigarh. Bhattacharya (1999) reported it in *Centropus sinensis* from Garo Hills of Meghalaya. The species is reported here with a new locality record.

Class ARCHIACANTHOCEPHALA Meyer, 1931

Key to the Order of ARCHIACANTHOCEPHALA Meyer, 1931

1. Probosics unretractable, large, globular with numerous deeply set, spirally arranged rootless spines usually not reaching the surface, or with none. Trunk short, conical, Neck absent or reduced. Proboscis receptacle absent. Parasites of birds ..... APORORHYNCHIDA (Thapar, 1927)

   Proboscis retractable with longitudinal or nearly spiral rows of rooted hooks. Neck and proboscis receptacle present 2

2. Proboscis with nearly spiral rows of a few hooks each. Protonephridia present. Eggs oval with a compact granular or radially striated outer shell. Parasites of mammals or rarely birds ..... OLIGACANTHORHYNCHIDA (Petrotschenko, 1956)

   Proboscis cylindrical or truncate, cone-shaped with nearly longitudinal rows of hooks. Protonephridia absent. Eggs oval with concentric membranes 3

3. Proboscis truncate, cone-shaped with anterior hooks and posterior spines. Parasites of birds and mammals (reptiles occasionally) ..... GIGANTORHYNCHIDA Southwell & Mcfie, 1925

   Proboscis cylindrical with long rows of hooks, proboscis retractor muscles pierce postero-ventral or posterior end of receptacle. Parasites of mammals and occasionally birds ... MONILIFORMIDA

Order APORORHYNCHIDA

IX. Family APORHYNCHIDAE SHIPLEY, 1900

Genus 14 *Apororhynchus* Shipley, 1900

21. *Apororhynchus chauhani* Sen, 1975

1975. *B.S. Chauhan Comm.* Vol.

Host : *Athene brama*

Location : Intestine.

Locality : Kurnool, Andhra Pradesh

Z.S.I. Reg. No. ; N/85

Materials examined : One female.

Diagnosis : Body plump, 4.70 long and 1.70 wide. Lacunar system in dorsal and ventral main longitudinal vessels with transverse anastomoses, hypodermic nuclei large and amoeboid. Proboscis not retractile. 1.11 long and 1.68 wide. Spines finger like, minute, embedded in proboscis, anterior 5 rows, rest sparsely distributed. Proboscis sheath absent. Lemnisci very long reaching upto uterine bell at posterior end. Ovarian balls 0.07-0.17. Immature eggs 0.03-0.04 long and 0.01 wide.

Remarks : Das (1952) described *A. bivolucrus* from *Nephron percnopterus* from India. The species has been considered as a strigeid trematode. *A. Chauhani* is the only representative of the genus in India.

Order MONILIFORMIDA

X. Family MONILIFORMIS

Genus 15 ***Moniliformis***

Key to the species of *Moniliformis*

12 longitudinal rows of proboscis hooks with 8 hooks in each row .... *Moniliformis m. moniliformis* Meyer, 1933

12 longitudinal rows with 10 hooks in each row ..... *Moniliformis dubius* Meyer, 1931

22. ***Moniliformes moniliformis moniliformis*** Meyer, 1933

1933. Acanthocephala (concluded) Bronn's Klass. U Ordn. d. Tierreich V. 4. abt. 2. Buch. 2. Lief. 2, 333-82. Akedenische, *Verlagsgesellus. Chaft. Leipzig.*

Host : *Bandicoota bengalensis*

Location : Intestine

Locality : Sreesailam, A.P.

ZSI Reg No. : W8721/1

Materials examined : 4 females and 2 males.

Diagnosis : Male : body 8.7-8.96 long and 0.49-0.58 wide. Proboscis 0.398-0.4316 long

and 0.166-0.1820 wide. Proboscis hooks in 12 longitudinal rows with 8 hooks each, proboscis hooks 0.0175-0.02 long, root 0.03-0.035 long. Female : body 5.18.69 long and 0.5810.

Remarks : The species is widely distributed in the country but it is reported for the first time from A.P.

23. ***Moniliformis dubius*** Meyer, 1931

Ref. : Susheela, G. 1991 : Geobios, New reports. 10(1) ; pp. 81-84 Susheela et Rao, 1992 : *Bioved.* 3(1) : pp. 39-42.

Host : *Bandicoota bengalensis & Rattus rattus rufescens*

Location : Hyderabad, Andhra Pradesh.

Remarks : Studies on influence of seasons and density on helminth infection in three rat species of the State, indicate the abundance of occurrence of *M. dubius.*

Order OLIGACANTHORHYNCHIDA

XI. Family OLIGACANTHORHYNCHIDAE Southwell et Macfie, 1925

Genus 15 ***Prosthenorchis*** Travassos, 1915

24. ***Prosthenorchis*** sp.

1993 : Srinivasa R.B. *Agricultural and Biological Research* 9(1); pp. 6-10.

Host : *Perdicula asiatica*

Location : Intestine

Locality : Nalgonda and Ranga Reddy Dist, A.P.

Remarks : *Prosthenorchis sp.* has been reported from *Perdicula asiatica* for the first time from India.

Order GIGANTORHYNCHIDA

XII. Family GIGANTORHYNCHIDAE Southwell et Macfie, 1925

Genus 16 ***Mediorhynchus***

Key to the species of genus Mediorhynchus

1. Number of hooks less than number of spines on proboscis 2

   Number of hooks and spines on proboscis equal 4

2. 22-28 rows with 4-5 spines ..... *M. gallinarum* (Bhalerao 1937) Van Cleave, 1947

   Number of rows of spines less 3

3. Spines on proboscis 20-24 rows of 4 each ..... *M. orientalis* Belopolskaja, 1953
4. 28-30 rows of hooks and spines on proboscis ..... *M. robustus* Van Cleave, 1916

25. ***Mediorhynchus gallinarum*** (Bhalerao, 1937) Van Cleave, 1947

Syn. *Mediorhynchus selengensis* Harris,
Leiperacanthus gallinarum Bhalerao, 1937.

1937. *Proc. Zool. Soc. London*, S.B. **107**(2), pp. 199-203.

Host : *Gallus gallus domesticus*

Location : Intestine

Locality : Kurnool, A.P.

Z.S.I. Reg. No. : W8705/1

Materials examined : 6 females.

Diagnosis : Body 8.30-9.13 long and 0.4980 wide. Proboscis truncate, 0.6308-0.7304 long and 0.7968-0.8632 wide. Anterior proboscis hooks 18-20 rows with 5 rooted hooks in each, posterior proboscis in 22-28 rows with 4-5 spines in each row. Proboscis sheath 0.5312-0.5810 long and 0.2490-0.2988 wide. Lemnisci 2.7390-2.822 long.

Remarks : The species was first described by Bhalerao from Mukteswar, India under the genus Leiperacanthus. Later, Pande & Nath (1963) reported in domestic fowl from India. The species is reported here from Kurnool district of Andhra Pradesh.

26. ***Mediorhynchus orientalis*** Belopolskja, 1953

1953. *Meskva Izdatel'stvo* AN SSSR.

Host : *Pomatorhinus horsfieldei* (Slaty headed Schmetre Babler)

Location : Intestine.

Locality : Kurnool, A.P.

ZSI Reg. No. : W8704/1

Materials examined : One female.

Diagnosis : Body 16.5 long and 2.125 wide. Proboscis 0.868 long and 0.248 wide. Anterior proboscis hooks 16-18 rows with 6-7 rooted hooks in each row. Posterior hooks 20-24 rows with 4 spines in each row. Points of hooks 0.02-0.03 long and 0.1 wide, roots 0.045-0.05 long. Spines 0.024-0.026 long. Genital pore terminal.

Remarks : The species is reported for the first time from Andhra Pradesh in a new host.

27. ***Mediorhynchus robustus*** Van cleave, 1916.

1916. *Tr. Amer. Micr. Soc.* **35**, pp. 221-232.

Host : Drongo and racket tail drongol.

Location : Intestine

Locality : Kurnool, A.P.

ZSI Reg. No. : W8706/1

Materials examined : Two females.

Diagnosis : Body 6.30-10.62 long and 0.664-0.667 wide. Proboscis 0.6640-0.913 long and 0.332-0.664 wide. Anterior proboscis hooks 28-30 rows with 4-5 hooks in each row, posteriorhooks 28-30 rows of spines with 4-5 hooks in each row. Points of anterior hooks, 0.025 long, roots 0.04-0.045 long. Spines 0.015-0.0375 long. Proboscis sheath 0.913-0.995 long and 0.166-0.249 wide. Lemnisci long, 2.90-3.486 long. Genital pore terminal. Eggs not developed.

Remarks : The species is reported for the first time from Andhra Pradesh.

28. ***Mediorhynchus taeniatus*** (Linstow, 1910) Dollfus, 1936

1994. C.B. Srivastava comm. Vol. pp. 81-84.

Remarks : Rao B.S. (1994) reported *M. taeniattus* in *Turnix suscilator* from Andhra Pradesh while studying relative density of helminth parasites in the host species. He also observed very low rate of infestation of the species which ranges 0.23%-0.92% in ist. annual cycle and 0.29%-1.80% in 2nd. annual cycle as compared to other groups of helminth in the same host species. The occurrence of *M. taeniatus* in A.P. is probably the first record in India. Its inclusion in key to spp. is avoided.

Class EOACANTHOCEPHALA

Key to the orders of EOACANTHOCEPHALA

1. Trunk entirely or anteriorly spined. Parasites of marine and freshwater Fishes ..... GYRACANTHOCEPHALA

   Trunk unarmed ..... NEOECHINORHYNCHIDA

XIII. Family NEOECHINORHYNCHIDAE Van Cleave, 1919

Subfamily NEOECHINORHYNCHINAE Travassos, 1926

Genus 17 ***Neoechinorhynchus*** Hamann, 1892

Key to the species of the genus *Neoechinorhynchus*

1. Body 1.99 long, anterior hooks 0.045 long ..... *N. ruttili* (Muller, 1780) Hamann, 1892

   Body more than 2mm long but less than 4mm 2

2. Body 2.15 long, anterior 0.075. Body nuclei 4 dorsal and 2 Ventral ..... *N. nematolosi* Tripathi, 1959.

   Body 2.60-3.72 long; anterior hooks 0.05-0.06 long ..... *N. chilkaensis* Podder, 1937.

3. Body more than 4mm ..... 4.

   Body longer ..... 5.

4. Body 4.31 long, Proboscis 0.066 long; ant. Hooks 0.05-0.06 long ..... *N. elongatus* Tripathi, 1959.

   Body 6.64-7.138 long, body nuclei 5-6 dorsal and 1-2 ventral ..... *N. agilis* (Rudolphi, 1819) Petrotshenko, 1956

5. Body 19.2 long, ant. hooks 0.096 long ..... *N. argentatus* Chandra et al, 1987

   Body 28.22 long, ant. Hooks 0.08 long and post. Hooks 0.02-0.025 long ..... *N. topseyi* Podder, 1937

29. ***Neochinorhynchus ruttili*** (Muller, 1780) Hamann, 1892

Syn. : Echinorhynchus ruttili Muller, 1780

1892. Das system der Acánthocephalan. *Zool. Anz.* 15, Jg. Nr. **392**; pp. 195-197.

Host : *Mystus gulio*

Location : Intestine

Locality : Waltair

ZSI Reg No. : W8752/1

Materials examined : One male and 3 females.

Diagnosis : Male : body bent ventrad, 1.992 long and 0.415 wide. Proboscis 0.1-00.12 long and 0.06 wide. 1st circle of proboscis hooks 0.-45 long, 2nd circle, 0.04, 3rd circle 0.035 long. Proboscis sheath 0.14 long and 0.06 wide. Testes tandem, overlapping, at posterior half T_1-0.15 long and 0.15 wide. T_2-0.12 long and 0.15 wide Cement glands syncytial 0.08 long and 0.04 wide. Cement reservoir 0.04 long and 0.04 wide. Females are larger in size.

Remarks : The species shows conformity with *N. ruttili* in respect of body size, size of anterior hooks and body nuclei. Therefore, it is reported as *N. ruttli* with a new locality record.

30. ***Neoechinorhynchus nematolosi*** Tripathi, 1959

1959 : *Rec. Ind. Mus.* **54**(1-2); pp. 61-98.

Host : *Scatophagus argus*

Location : Intestine

Locality : Kakinada, A.P.

ZSI. Reg No. : W8701/1

Materials examined : Five male specimens

Diagnosis : Male : body 2.158 long and 0.747 wide, hypodermic nuclei 4 dorsal 2 ventral proboscis 0.0498 long and 0.083 wide. Apical proboscis hooks largest, 0.075 long, middle hooks 0.025 long. Proboscis sheath 0.1328 long and 0.0664. Lemnisci 0.166 long. Testes 2, T1-0.215 long and 0.0996 wide. T2-0.2158 long and 0.0996 wide. Cement gland 0.1328 long.

Remarks : Tripathi (1959) described the species from *Nematolosa nasus* at Chilka. The species is reported for the first time from *S. argus.*

31. ***Neochinorhynchus chikaensis*** Podder, 1937

1937. *Rec. Ind. Mus.* **39**(2) : pp. 129-131.

1987. *Revista de Parasitologia.* **1/45** (1) : pp. 49-52

Host : *Mugil cephalus; Liza macrolepis.*

Location : Intestine

Locality : Bhimunipatnan estuary, P.

Materials : 2 males females

Diagnosis : (After Chandra et al, 1987), Male : Body lanceolate, 2.608-3.720 long and 0.304-0.580 wide. Proboscis short, globose, 0.272-0.420 long and 0.080-0.400 wide, armed with 3 circles of 6 hooks each, anterior row 0.050-0.062 long, middle row 0.023-0.027 long, posterior row 0.019 long. Proboscis sheath 0.272-0.336 long and 0.080-0.128 wide. Lemnisci with nuclei, 1.280-2.800 long and 0.080-0.140 wide. Testes ovoid at mid-body, T1-0.560-0.800 long and 0.176-0.210. T_2-0.192- 0.280 long and 0.144-0.180, cement gland 0.720-0.980 long and 0.380-0.480 wide, syncytial. Saefftigen's pouch present. Female : 3.800-6.280 long and 0.360-0.680 wide. Eggs not found.

Remarks : Chandra et al, (1987) reported the species in *Mugil cephalus*, and *Liza macrolepis* at A.P. The specimens are probably deposited in the Dept. of Zoology, Andhra University.

32. ***Neoechinorhynchus elongatus*** Tripathi, 1959

1959. *Rec. Ind. Mus.* **54**(1-2) : pp. 61-99.

Host : *Mugil sp.*

Location : Intestine

Locality : Machhlipatnam

ZSI. Reg. No. : W 8702/1

Materials examined : 2 males

Diagnosis : Male : Body 4.3160 long and 0.4980 wide. Proboscis 0.0664 long and 0.0996 wide with 3 circles of 6 hooks each. 1st circle of proboscis hooks 0.05-0.625 long and 0.0125 wide. 2nd Circle 0.0250-0.0375 long and 0.005 wide. 3rd circle 0.0175-0.020 long and 0.0025 wide. Neck 0.0830 long and 0.0830 wide. Proboscis sheath 0.3818 long and 0.1162 wide with nerve ganglion at the bottom. Lemnisci equal, long, extend to 1st testis. Testes tandem, T_1-0.7470 long and 0.5312 wide. T_2-.7968 long and 0.4980 wide, cement gland syncytial, 0.7470 long and 0.3320 wide with few large nuclei. Cement reservoir 0.5810 long and 0.2158 wide.

Remarks : The species was described by Tripathi (1959) from *Mugil subviridis* and *M. dussumieri* at Chilka and madras respectively. The species is reported here from *Mugil* sp. of Machlipatnam, A.P. with new locality and host record.

33. ***Neoechinorhynchus agilis*** (Rudolphi, 1819) Petrotschenko, 1956

1956. Petrotschenko : Acanthocephala of domestic and wild animals, Vol.-**I,** pp. 192-193.

Host : *Liza Persia, Mugil cephalus*

Location : Intestine

Locality : Machhlipatnam, A.P.

ZSI, Reg.No. : W8750/1 & W 8708-09/1

Materials examined : 2 males and 3 females

Dignosis : Male : body small, 7.138 long and 0.913 wide. hypodermic nuclei dorsal 5-6 and ventral 1 or 2. Proboscis hooks in 3 circles with 6 hooks each, apical hooks largest. 1st circle of 0.0875-0.095 long and 0.0125 wide. 2nd circle, 0.0625-0.07 long and 0.0125 wide. 3rd circle, 0.03-0.075 long and 0.005 wide. Proboscis sheath 0.45 long and 0.20 wide. Lemnisci equal in size, 2.70 long and 0.13 wide. Testes tandem, T_1-0.80 long and 0.60 wide. T_2-0.85 long and 0.60 wide. Cement gland syncytial, 0.90 long and 0.45 wide. Seminal vesicle 1.40 long. Cement reservoir 0.70 long. Saefftigen's pouch, long and 0.35 wide. Females larger than males. Eggs 0.015-0.02 long.

Remarks : The species is reported here with new locality record.

34. ***Neoechinorhynchus argentatus*** Chandra *et al.* 1987

1987. *Revista de Parasitologia.* **1/45** (1); pp. 49-52.

Host : *Pennahia argentata*

Location : Intestine

Locality : Waltair, A.P.

Diagnosis : Female : Body filiform, 19.200 long and 9.312 wide. Proboscis rounded, short neck, 0.123 long and 0.099 wide. Anterior hook, 0.096 long, middle- 0.018, posterior, 0.012 long. Proboscis sheath, 0.210 long and 0.084 wide. Nerve ganglion at posterior end, 0.069 long and 0.039 wide. Lemnisci equal, 1.092 long and 0.036.

Remarks : The specimen is probably deposited in the Deptt. of Zoology, Andhra University.

35. *Neoechinorhynchus topseyi* Podder, 1937

1937. *Rec. Ind. Mus.* **39** (2) : pp. 129-131.

Host : *Polynemus sextarius*

Location : Intestine

Locality ; Godavary estuary, Kakinada, A. P.

ZSI Reg. No. : W8710/1

Material examined : One male.

Diagnosis : Male : Body 28.22 long and 0.215 wide. Proboscis 0.083 long and 0.996. Proboscis armed with 6 spiral rows of 3 hooks, 1st row of hooks 0.08 long, 2nd. row 0.075 long, 3rd row 0.02-0.025. Lemnisci equal, 0.025 long. Proboscis sheath 0.075 long and 0.05 wide. Testes tandem, Cement gland long, syncytial with 8-9 nuclei.

Remarks : The species was described from *Polynemus heptadactylus* by Podder (1937). Later, Tripathi (1959) reported it from *Polynemus paradiseus* and juvenile form in *Cynoglossus lingua* at Matla river, Canning, W.B. The species is reported here in a new host, *Polynemus sextaris* from a new locality.

Order GYRACANTHOCEPHALA

Family QUADRIGYRIDAE, Van Cleave, 1920

Key to the subfamilies of QUADRIGYRIDAE

1. Trunk armed only anteriorly with circles usually incomplete dorsally .... QUADRIGYRINAE

   Trunk armed anteriorly with complete circles of spines in 1 or 2 regions separated by an unarmed zone. Spines in 2nd zone may extent over rest of trunk in circles or in longitudinal rows ..... PALLISENTINAE

Subfamily PALLISENTINAE

Genus 18 *Pallisentis*

Key to the species of *Pallisentis*

1. Transition of size of proboscis hooks abrupt. Hook size ratio 1 : 1.2 : 0.46 : 0. 32 ... . *Pallisentis colisai* Sarkar, 1954

   Transition gradual, size-ratio 1 : 0.68 : 0.48 : 0.40 ..... 2.

2. Anterior hooks curved and broad, 0.09 long and 0.025 wide, collar spines 11-12 circles with 12-16 spines each ..... *P. ophiocephali* (Thapar, 1930)

   Anterior hooks 0.076 long and posterior hooks 0.03 long, collar spines 12-14 circles with 20-24 spines in each ..... *P. nagpurensis* Bhalerao, 1931

36. *Pallisentis colisai* Sarkar, 1954

1956. *Rec. Ind. Mus.* **52** : pp. 349-362

Host : *Channa sp; Heteropneustis fossilis* : *Mystus seenghala.*

Location : Intestine

Locality : Vijaiwada, Rajamundri, Karimnagar, A.P.

ZSI Reg. No. : W 8686 - 88/1 & W 8700/1

Materials examined : Sevral males and females

Diagnosis : (Description based on male specimens obtained from *H. fossilis*) : body 3.32 long and 0.2822. Proboscis 0.166 long and 0.166 wide, globular, tip without hooks. Proboscis hooks in 4 circles with 10 hooks each, transition of hooks abrupt mainly in 2nd and 3rd circles of hooks. H_1-0.045-0.055 ; H_2-0.06-0.062; H_3-0.022-0.025; H_4-0.015-0.0175, hook-size ratio 1 : 1.2 : 0.46 : 0.32. Trunk spines in two distinct regions. Collar spines 10-15 circles with 14-20 spines each. Trunk spines extend upto mid-body. Neck 0.166 long, 0.1328 wide. Proboscis sheath 0.4648 long and 0.0996 wide. L_1-0.581 long and 0.0498 wide. L_2-0.5976 long and 0.0498 wide. Testes at posterior half. T_1-0.298 long and 0.1162 wide. T_2-0.298 long and 0.1162 wide. Cement gland nucleated. Seminal vesicle 0.1992 long and 0.1162. Female : (From *Channa sp*) : Body 8.96-10.45 long and 0.664-0.747 wide. Sexual dimorphism prominent. Eggs 0.045-0.05 long and 0.0175 wide.

Remarks : More than 15 specimens belonging to the species obtained from different hosts have been examined. Their measurements in respect of body size, size of hooks and spines, internal organs etc. vary to a great extent. Therefore, the shape of hooks and size ratio of hooks of four circles have been taken into consideration in preparing the key.

37. ***Pallisentis ophiocephali*** (Thapar, 1920)

Syn. : ***Farzandia ophiocephali*** Thapar, 1930

1933. *J. mar. Bio. N.S.* **18** (2) : pp. 627-634.

1930. Annls. Mag. Nat. Hist. VI : pp. 76-81.

Host : *Channa punctatus; Nandus nandus.*

Location : Intestinc

Locality : Karimnagar, Kakinada, A.P.

ZSI Reg. No. : W 8689-90/1 & W 8696-99/1

Materials examined : 12 specimens comprising male and female.

Diagnosis : (Based on the specimens from *Channa punctatus*) : Male : Body 9.96 long and 0.63 wide, proboscis 0.166 long and 0.1992 wide, proboscis hooks in 4 circles of 10 hooks each. First circle of hooks longest, curved and broad. H_1- 0.09 long and 0.025 wide; H_2-0.07 long 0.02 wide H_3-0.04 long, 0.005 wide, H_4-0.025 long, 0.005 wide. Hook-size ratio 1:0.68 : 0.48 : 0.40. Hooks gradually diminishes towards its base. Neck 0.381 long, 0.232 wide. Proboscis sheath 0.630 - 0.747 long, 0.298 wide. Testes two, elongate, at mid-body. Cement gland long, nucleated, 0.992 long, 0.332 wide with 15 nuclei. Cement reservoir with ducts, seminal vesicle reach the bursa. Female : body 16.26-28.22 long and 0.664-0.91 wide. Sexual dimorphism pronounced. Eggs-0.0175 long and 0.0075 wide.

Remarks : Measurements of all the individuals vary to a great extent. However, they are identified as *P. ophiocephali* on the basis of size-ratio of circles of hooks, size of 1st circle of hooks and collar spines.

38. ***Pallisentis nagpurensis*** Bhalerao, 1931

1931. *Annls. Mag. Nat. Hist.* **10,** Vol. VII; pp. 569-573.

1996. *Curr. Sci (Bangalore)* : **70**(5) ; pp. 350-351.

Remarks : Madhavi (1996) reported the occurrence of *P. nagpurensis* in the fingerlings of Channa spp. used for the treatment of Asthma patients.

Subfamily QUADRIGYRINAE

Genus 19 ***Acanthosentis*** antispines Verma *et* Datta, 1929

39. ***Acanthosentis*** Verma *et* Datta, 1929

1929. *Ann. Trop. Med. Parasit.* Vol. **23** : pp. 483-494.

Host : *Mystus gulio*

Location : Intestine

Locality : Vijaywada

ZSI Reg. No. : W8691-94/1

Material examined : Several males and females.

Diagnosis : Male : 0.925 long and 0.7 wide. Proboscis 0.099 long, 0.083 wide. Proboscis hooks 3 circles of 6 hooks each. Proboscis sheath 0.455 long, 0.083 wide. T_1- 0.455 long, 0.331 wide, cement gland 0.289 long, 0.207 wide, syncytial with 7-8 nuclei. Female : body 0.625 long. Trunk spines at anterior half. Spines in 16 circles of 40-46 in each. Proboscis hooks 1st circle 0.02-0.026 long, root 0.02 long, 2nd 0.03-0.04 long, root 0.02 long.

Remarks : Verma et al (1929) described the species from *Aoria (Macrones) gulio* at Calcutta. Subsequently, the species has been reported from other places of the country.

SUMMARY

Present work is an updated account of acanthocephalan species reported and studied so far from the State of Andhra Pradesh. Diagnostic features of individual species alongwith critical analysis on similarity between the species and in some cases synonymy for species are provided with the work. General morphology and taxonomy, techniques of collection and preservation, modern classification of phylum Acanthocephala with key to the classes, orders, families, subfamilies, genera and species are dealt in this work. Altogether, 39 species belonging to 20 genera under 14 families are included in the present work.

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Zool. Surv. India
State Fauna Series 5 : Fauna of Andhra Pradesh (Part 5) : 159-173, 2005

SIPUNCULA

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INTRODUCTION

The present article deals with a taxonomic account and a list of sipunculan specis so far known from the Andhra Pradesh coast. The study is based on the material collected from various localities along the Andhra Pradesh coast, *viz.*, districts of Srikakulum, Vishakhapatnam, East and West Godavari by the author in 1995 and 1986. Studies of all the material reveal the occurrence of 12 species under 9 genera and 5 families and interestingly enough 8 species are new to the area under study. The habitat includes sandy and muddy bottoms, sand pools, in and under bolders, in clefts or interstices of, and under beach rocks. The paper deals with material and methods along with the key to families and species, and diagnostic character of the species, and their distribution.

MATERIAL AND METHODS

Three surveys have been conducted in 1995 and 1996 at different localities along the Andhra Pradesh coast. Emphasis has been made to collect the sipunculans from diversified habitats, viz., muddy and sandy beds, sand pools, rocky substrata, crevices, fissures, and under stones.

According to the nature of substrata the method of collection varies. For the sand and mud-dwelling forms, the most suitable ways is to dig out the worm with a hand-shovel at low tide. But it is more difficult to collect those intertidal forms which inhabit rocky substrata, in this case the hard substrata are needed to break with a sharp blow of hammer along the fissure. Where it is difficult to dissociate the specimens from the small piece of rock, it is better to place the entire piece along with the worm in a weak solution of formalin which helps to dislodge the specimen from its refuge after sometime.

CLASSIFIED LIST OF SPECIES FROM THE ANDHRA PRADESH COAST

Phylum SIPUNCULA

Class SIPUNCULIDEA

Order A. SIPUNCULIFORMES

Family I. SIPUNCULIDAE

Genus 1. ***Sipunculus*** Linnaeus

*1. *Sipunculus nudus* Linnaeus, 1766.

Genus 2. ***Siphonosoma*** Spengel

2. *Siphonosoma australe* (Keferstein, 1865)

Order 2. GOLFINGIIFORMES

Family II. GOLFINGIIDAE

Genus 3. ***Nephasoma*** Pergament

*3. *Nephasoma pellucidum* (Keferstein, 1865)

Family III. THEMISTIDAE

*4. *Themiste lageniformis* Baird, 1868.

Class B PHASCOLOSOMATIDEA

Order C. PHASCOLOSOMATIFORMES

Family IV. PHASCOLOSOMATIDAE

*5. *Antillesoma antillarum* (Grube and Oersted, 1858)

*6. *Phascolosoma albolineatum* Baird, 1868

*7. *Phasocolosoma arcuatum* (Gray, 1828)

*8. *Phascolosoma nigrescens* Keferstein, 1866

9. *Phascolosoma perlucens* Baird, 1868

10. *Apionsoma trichocephalus* Sluiter, 1902

Order D. ASPIDOSIPHONIFORMES

Family V. ASPIDOSIPHONIDAE

*11. *Aspidosiphon steenstrupii* Diesing, 1859

12. *Cloeosiphon aspergillus* (Quatrefages, 1865)

* indicates new record from the area under sudy.

Key to the families of phylum SIPUNCULA

1. Peripheral circumoral tentacles present 2

– Peripheral circumoral tentacles absent 4

2. Coelomic extensions present in the form of canal saes ..... SIPUNCULIDAE
– Coelomic extensions absent 3
3. Tentacles not on stem-like extensions of oral disk ..... GOLFINGIIDAE
– Tentacles on stem-like extensions of oral disk ..... THEMISTIDAE
4. Anterior trunk hardened to form a horny or calcareous anal shield .....
..... ASPIDOSIPHONIDAE
– Anterior trunk not modified to form anal shield ..... PHASCOLOSOMATIDAE

SYSTEMATIC ACCOUNT

Genus 1. ***Sipunculus*** Linnaeus

1766. *Sipunculus* Linnaeus, *Systema Naturae,* 12th edition : 1078.

1994. *Sipunculus* : Cutler, *The Sipuncula, Cornell University Press,* Ithaca and London : 33

Diagnosis : Nephridia anterior to anus; spindle muscle originating on body wall anterior to anus.

1. ***Sipunculus nudus*** Linnaeus

1766. *Sipunculus nudus* Linnaeus, *Systema Naturae,* 12th edition : 1078.

1994. *Sipunculus nudus* : Cutler, *The Sipuncula, Cornell Univ. Press* : 36–38

Material examined : 1 ex., Bandaruvanipeta, near to Srikakulum, 15.2.1995, D. R. K. Sastry; 1 ex., Yenam, 28 km from Kakinada, 3.1.1996, B. P. Haldar.

Description : Trunk 75 and 96 mm long, pinkish-white in colour with irridescent cuticle, thick-skinned, cylindrical in shape with bulbous posterior end, whole surface dividing into numerous quadratic areas. Introvert one-third the trunk length but much narrower and carrying numerous posteriorly directed papillae. Tentacular membrane divided into 4 lappets, dorsal ones longer than ventrals.

Longitudinal muscle layer divided into 26–30 prominent muscle bands, so also circular muscle layer but in glans region longitudinal muscle bands splitted while circular muscle layer continuous. Retractor muscles two pair, equally strong, spanning over 4–5 muscle bands. Alimentary canal with "post-oesophageal loop" and long, narrow tube-like rectal caecum coiling with intestinal spiral. Spindle muscle arising well ahead of anus. Contractile vessels and racemose glands present. Nephridia medium sized, 15-20% attached to body wall, opening anterior to anus. Brain with a number of tufted digitate processes.

Remarks : Origins of four retractor muscles are connected by thin sheet of muscle and

each retractor originates by 2–3 roots. At posterior end ventral nerve cord is swelling into a bulb-like structure. Although common and well known since Linnaeus, 1766 it is not a "typical" sipunculan (Cutler, 1994).

Distribution : This is a cosmopolitan species found in temperate, subtropical, and tropical waters in all oceans. Most are intertidal to 30 m, but a few records are from 100–900 m.

India : Lakshadweep; Arabian sea; Andamans; Nicobars; Tamil Nadu; West Bengal. This is for the first time reported from the Andhra Pradesh coast.

Elsewhere : Indian Ocean; Pacific Ocean; Atlantic Ocean.

Genus 2. ***Siphonosoma*** Spengel

1912. *Siphonosoma* Spengel, 1912, *Verth. dt. zool. Ges.*, **22** : 264.

1994. *Siphonosoma* : Cutler, 1994, *The Sipuncula, Cornell Univ. Press,* London : 44, 45.

Diagnosis : Introvert much shorter than trunk, with prominent conical papillae and sometimes also hooks arranged in rings; tentacles usually numerous, arranging around mouth; coelomic canals present in the body wall; circular and longitudinal muscle layers dividing into anastomosing, sometimes indistinct bands; retrartor muscles two pair; contractile vessel single and with or without villi; spindle muscle attached posteriorly; nephridia paired.

2. ***Siphonosoma australe australe*** (Keferstein)

1865. *Phascolosoma australe* Keferstein, *Nachr. Ges. Wiss. Gottingen,* No. 7 : 197–198.

1994. *Siphonosoma australe australe* : Cutler, *The Sipuncula, Cornell Univ. Press,* London : 50.

Material examined : 2 exs., Visakhapatnam Harbour, 22.2.1995, D. R. K. Sastry; 1 ex., Gangavaram near Visakhapatnam, 28.10.1996, A. Misra; 1 ex., Goganamathem, 40 km from Narsapur, 12.1.1996, B. P. Haldar.

Description : Trunk 175–210 mm long, thick, opaque skinned, brown coloured, Introvert 70-95 mm long, provided with 38-45 rows of hooks, slightly curved and pointed, dark brown in colour. Tentacles 84–92, long and slender.

Papillae uniformly distributed over the trunk but prominent and dome-shaped at posterior end; on introvert these papillae small, evenly distributed in between hook rows.

Longitudinal muscle bands 14-17, rarely anastomosed; circular muscles gathered into anastomosing bands. Retractor muscles 4 pairs, originating from different levels but united anteriorly, rectum long having a small oblong caecum; anal aperture well ahead of nephridiopores. Nephridis 25% of trunk length and about 10% attached anteriorly to body wall. Spindle muscle originating anteriorly by three roots, one root arising from longitudinal muscle band anterior to nephridiopore. Fixing muscle single. Contractile vessel simple.

Remarks : This species is readily distinguished from other Indian species of this genus by the presence of slightly curved and pointed dark-brown hooks, simple contractile vessel and by the absence of "accessory rectal caeca"

Distribution : This is a warm water but generally shallow water species of the Indian and West Pacific Ocean.

India : Tamil Nadu–Gulf of Mannar and Rameswaram; Andhra Pradesh – Visakhapatnam Harbour; West Bengal–Digha; Andamans–Long Island and Middle Andamans.

Elsewhere : Indian Ocean and Pacific Ocean.

Genus 3. *Nephasoma* Pergament

1940. *Nephasoma* Pergament, 1940, *Results of cruising expedition on Icebreaker G. Sedov* 1937–1940 : 1-3.

1994. *Nephasoma* : Cutler, *The Sipuncula, Cornell Univ. Press,* London, : 77–84.

Diagnosis : Introvert about equal to or shorter than trunk; hooks, when present, scattered; body wall with continous muscle layer; tentacles arranged around mouth but reduced both in size and number; retractor muscles two, partially fused; contractile vessel simple and without villi; spindle muscle not attached posteriorly; nephridia two.

3. *Nephasoma pellucidum pellucidum* (Keferstein)

1865. *Phascolosma pellucidum* Keferstein, 1865, *Z. wiss. Zool.,* **15** : 433, pl. 32, figs.26, 27.

1986. *Nephasoma pellucidum pellucidum* : Cutler & Cutler, 1986, *Proc. Biol. Soc., Wash.,* **99** (4) : 563.

Material examined: 1 ex., Lawson's Bay, 2.11.1996, B. P. Haldar.

Description : Trunk 35 mm long, translucent, creamy coloured and sausage shaped, and posterior end of trunk rounded. Introvert partially retracted and concolourous with trunk. Tentacles short, digitiform and arranging in three rows. Papillae moderately pigmented, crowded at posterior end of trunk and at introvert base but rare in mid-trunk region. Hooks scattered covering a small zone behind tentacular crown.

Muscle layer of body wall continuous. Retractor muscles two, broad and strong, arising from middle-third of trunk. Intestinal coil having large number of spirals; rectal caecum at the beginning of rectum. Spindle muscle originating from rectal wall, well ahead of caecum but not attached posteriorly. Fixing muscles 3 in number. Contractile vessel without villi extending along oesophagus up to intestinal coil. Nephridia short and completely free from body wall.

Remarks : This specimen is very similar to two other specimens from Ganjamcoast (Haldar, 1991). According to Cutler (1994) these specimens may be a separate Indian ocean subspecies due to their large size, and nature of hooks and papillae.

Distribution : A shallow-water species with a few bathyal records from cold water.

India : Ganjam Coast, Orissa. Occurrence of this species in the Andhra Pradesh Coast is an extension of its distributional range south ward.

Elsewhere : *Indian Ocean* : Cape province and India; *Pacific Ocean* : Indonesia, Australia and southern Japan; *Atlantic ocean* : western Atlantic and Caribbean south to Brazil.

Genus 4. ***Themiste*** Gray

1928. *Themiste* Gray, 1828, *Spicilegia Zoologica,* **16** : 8, pl.6, fig.4, 41.

1994. *Themiste* : Cutler, 1994, *The Sipuncula, Cornell Univ. Press;* 141.

Diagnosis : Introvert shorter than trunk; body wall with continuous muscle layer; tentacles basically surrounding the mouth but extending along branching stem-like outgrowths in older specimens; with or without hooks; retractor muscles two; spindle muscle not attached posteriorly; contractile vessel with a few to many villi; nephridia two.

4. ***Themiste lageniformis*** Baird

1868. *Themiste lageniformis* Baird, 1868, *Proc. zool. Soc. Lond.,* **1868** : 98-99, pl. 10, figs. 3, 3c.

1991. *Themiste (Lagenopsis) lageniformis* : Haldar, *Mem. zool. Surv. India,* **17** (4) : 40–42, figs.24, 25.

Material examined : 2 exs., Rushikunda, 15 km from Visakhapatnam, 2.3.1995, D. R. K. Sastry; 3 exs., Yenam, 28 km from Kakinada, 3.1.1996, B. P. Haldar; 4 exs., Kakinada Harbour, 6.1.1996, A Misra; 2 exs., Lawson's Bay, 2.11.1996, B. P. Haldar.

Description : Specimens small, trunk being 16–26 mm long and the extended introvert 5–7 mm long. All the specimens ventrally curved. Tentacles numerous, arising from 4 primary stems, long in comparison to size. Introvert without hooks but bearing dark blue–black band in the mid region. Papillae numerous, small, flat but scattered posteriorly.

Retractors two, originating from posterior half of trunk. Muscle layer continuous. Rectum short, bearing a small caecum. Fixing muscles 3. Nephridia half as long as trunk and completely free from body wall. Contractile vessel with numerous branching and finger-like villi extending up to retractor base along the oesophagus. Though small in size body cavity containing eggs in most of them.

Remarks : The species is differentiated from other congeneric species reported from the Indian region by the presence of numerous branched finger-like villi of the contractile vessel. The number of tentacular stems (primary as reported in the literature is 4–6, 5–6 and 4. Neither of the specimens bear hooks although Awati & Pradhan (1935) found feebly developed hooks in younger stages but they fall off in adults.

Distribution : This species is the commonest and most widely distributed member of the genus.

India : Gujarat; Maharashtra; Lakshadweep; Kerala; Tamil Nadu; Andamans. Occurrence of this species in the Andhra Pradesh coast is an extension towards north.

Elsewhere : Well established in the western Pacific from southern Japan to Australia and Hawaii, and throughout the Indian Ocean. Recorded from South and Southwest Africa, Cuba, and Florida.

Genus 5. ***Antillesoma*** (Stephen and Edmonds)

1972. *Phascolosoma (Antillesoma)* Stephen and Edmonds, 1972, *The phyla Sipuncula and Echiura, Trustees of British Museum (Natural History)*, London : 277.

1987. *Antillesoma* : Gibbs and Cutler, 1987, *Bull. Brit. Mus. (Nat. Hist.), Zoology,* **52** (1) : 55.

Diagnosis : Introvert variable in length, reaching up to three-quarters of trunk length; without hooks; tentacles numerous enclosing nuchal organ; longitudinal muscle layer divided into anastomosing bands; contractile vessel with many villi; retractor muscles four; nephridia two.

5. ***Antillesoma antillarum*** (Grube and Oersted)

1858. *Phascolosoma antillarum* Grube and Oersted, *Vidensk. Meddr. dansk naturh. Foren,* **1858** : 117–118.

1991. *Antillesoma antillarum* : Haldar, *Mem. zool. Surv. India,* **17** (4) : 44–47, figs.26, 27, 98–103.

Material examined : 5 exs., Bandaruvanipeta, 15 km from Srikakulum, 15.2.1995, R. K. Chakraborty; 4 exs., Yenam, 28 km from Visakhapatnam, 25.10.1996, A Misra; 3 exs., Lawson's Bay, 2.11.1996, B. P. Haldar.

Description : Trunk 15-27 mm long and its width 15-20% of its length; Introvert slender and about 20-25% of trunk length in preserved state; without hooks or spines. Papillae distributed over entire trunk, larger at posterior end of trunk than mid-trunk region and largest at introvert base and crowded near anterior end. Tentacles 4--52 in number, digitiform, arranging around dorsal nuchal organ.

Longitudinal muscles gathering into very frequently anastomosing bands, 13-15 in the region of nephridiopores and 27-30 posteriorly. Retractor muscles 4, originating at the level of the beginning of posterior third of trunk; origion of dorsals very close to that of ventrals. Contractile vessel with numerous villi, some larger ones showing ramifications. Rectal caecum present in 70% specimens. Paired nephridia half the length of trunk, entirely (except 3 specimens) fixed to trunk wall and opening just posterior to anus, entirely (except in 3 specimens - partially) fixed to trunk wall and opening just posterior to anus.

Remarks : This is a monotypic species, previously placed under the genus *Phascolosoma*, usually found in crevices or inside coral and soft rock. In general, the ecology and external morphology are very similar to those of several species of *phascolosoma* but differing in

presence of real digitiform contractile vessel villi in this genus whereas bulbous vesicular swellings present in a few *Phascolosoma* species.

Distribution : This is a cosmopolitan species found in tropical and subtropical, intertidal and shallow waters.

India : Off Ganges Delta; Great Nicobars; Middle and South Andamans; Minocoy and Agatti of Lakshadweep. This is for the first time reported from the coastal areas of main land of Andhra Pradesh.

Elsewhere : Western Altantic and Caribbean from Florida to Brazil; eastern Atlantic from Sierra Leone and the Gold coast; Indian Ocean at Durban and Sri Lanka; Indo-West Pacific east to Hawaii; eastern Pacific from Baja California to Panama.

Genus 6. ***Phascolosoma*** Leuckart

1928. *Phascolosoma* Leuckart, *Breves animalium quorandam maxima ex parte marinorum descriptiones,* : 22.

1994. *Phascolosoma* : Cutler, *The sipuncula, Cornell Univ. Press* : 159.

Diagnosis : Introvert variable in length, often equal to trunk, armed with numerous rings of recurved hooks; tentacles arranged in crescent around nuchal organ, peripheral tentacles absent; longitudinal muscle layer of body wall gathered into separate, often anastomoing bands; retractor muscles 4; contractile vessel single, usually lacking villi; spindle muscle attached posteriorly; nephridia two in number.

Key to species of *Phascolosoma* known from the Andhra Pradesh coast

1. With accessory tooth on concave edge of hook 2
– Without accessory tooth on concave edge of hook 3
2. Hook with triangular area alongside of streak ..... *perlucens*
– Hook without triangular area alongside of streak ..... *nigrescens*
3. Apex of hook bending to form an angle to main axis ..... *albolineatum*
– Apex of hook bending to form an obtuse angle to main axis ..... *arcuatum*

6. ***Phascolosoma albolineatum*** Baird

1868. *Phascolosoma albolineatum* Baird, *Proc. zool. Soc. Lond.,* **1868** : 91-92.

1990. *Phascolosoma albolineatum* : Cutler and Cutler, *Proc. Biol. Soc. Wash.,* **103** (3) : 706-707.

Material examined : 1 ex., Nuvula Revu, 15 km. from Palasa, 16.2.1995, D. R. K. Sastry; 5 ex., Yenam, 28 km from Kakinada, 3.1.1996, B. P. Haldar; 3 exs., Lawson's Bay, 2.11.1996.

Description : Trunk 25-45 mm long and 4-7 mm maximum width; introvert about as long as trunk (in preserved specimens). Numerous rows of dark coloured hooks resembling those of *P. scolops* and *P. agassizii* having clear streak running down through centre of hook and a clear triangular area on one side of the streak. Tentacles 26-30, short finger-like, arranged in a ring dorsal to mouth. Papillae at introvert base dark, red, conical and closely packed, particularly on dorsal surface; those on anterior and posterior surface of trunk largest, most prominent, conical or hemispherical and densely packed; papillae may coalesce or run into one another, composed of polygonal plates set closely together.

Longitudinal muscles in 18-23 anastomosing bands, visible externally. Retractor muscles four, arising from posterior half of trunk, stout ventral pair posterior and slender dorsal pair more anteriorly. Rectal caecum absent. Fixing muscle single and wing muscle strong. Contractile vessel simple. Nephridia, about a half the trunk length, partially attached anteriorly and opening at same level as anus.

Remarks : This species is usually found in rock crevices or inside coral and soft rock. The shape of the hooks is a very useful specific character of this species.

Distribution : Wide spread but not common in Indo-West Pacific tropical shallow waters.

India : Gujarat; Lakshadweep; Andamans & Nicobars. This is for the first time recorded from the eastern part of mainland i.e., Andhra Pradesh.

Elsewhere : Western Pacific from Japan to Queensland including Indo-China and Marshall Islands, then through Philippines in the Indian Ocean from south coast of Java and Timor to east coast of Africa up to Diego Garcia.

7. ***Phascolosoma arcuatum*** (Gray)

1828. *Sipunculus arcuatus* Gray, *Spicilegia Zoologica,* London, Wurtz, Treitel and Co., and W. Wood, (1) : 8.

1994. *Phascolosoma arcuatum* : Cutler, *The Sipuncula, Cornell University Press* :, 176-177.

Material examined : 3 ex., Yenam, 28 km from Kakinada, 3.1.1996, B. P. Haldar; 4 exs., Kakinada port, 5.1.1996, R. K. Chakraborty; 2 exs., Lawson's Bay, Visakhapatnam, 2.11.1996, A. Misra.

Description : Trunk stout, almost uniformly cylindrical, 50-90 mm long and 6-8 mm wide, body wall light-brown to brown except at anterior and posterior end of trunk being dark-brown coloured. Introvert varying from half to as long as trunk. Tentacles 8-10 in number, finger-like, arranged in a horseshoe-shape lying dorsal to mouth. Collar white, behind tentacular crown, followed by as many as 50 complete or partially complete rows of dark coloured hooks, with a large expansion basally or clear streak which runs from apex to base. Papillae between hook rows small while those at extremities of trunk prominent and very

dark. Longitudinal muscles in 18-22 broad and stout, less anastomosing bands not visible externally. Circular muscles tending to form fascicles. Retractors four, fixed to body wall in posterior third of trunk—ventral pair strong while dorsal pair very slender, both fused most of their length into one, large flat muscle. Rectum short and without caecum. Spindle muscle fastened anteriorly and posteriorly while fastening muscle absent. Wing muscle strong. Contractile vessel without villi. Nephridia half to three-quarters as long as trunk and fixed for about three-quarters of their length.

Remarks : The species is associated with mangroves and mainly studied for experimental purposes. This species is distinguished from other Indian phascolosomatids by the structure of introvert hooks and arrangement of retractors. This species can stand desication for a long period and is found in brackish water also (Haldar, 1991).

Distribution : This is a common form in the Indo-West Pacific waters.

India : West Bengal; North Adndamans.

Elsewhere : Southern China to Northern Australia, Malaysia, Indonesia and Bangladesh.

8. ***Phascolosoma perlucens*** Baird

1868. *Phascolosoma perlucens* Baird, 1868, *Proc. zool. Soc. Lond.*, **1868** : 90-91, pl. 10. fig. 2.

Material examined : 3 exs., Visakhapatnam Harbour, 22.2.1995, D. R. K. Sastry; 2 exs., Gangavaram near Visakhapatnam, 28.10.1996, A. Misra; 4 exs., Goganamathem, 40 km. from Narsapur, 12.1.1996; 3 exs., Kakinada port, 5.1.1996, R. K. Chakraborty.

Description : Specimens slender and straw-coloured Trunk of largest 45 mm long and 4-5 mm wide; body wall thin and almost transparent in some region; introvert about half to three-fourths as long as trunk with a number of dark-brown bands on dorsal surface, prominent dark-red brown, spine-like papillae on postero-dorsal surface and rows of dark-brown hooks anteriorly - anterior half of hook strongly bent and lying almost parallel to base of hook, central clear area expanded near its middle and clear triangular area present basally. Papillae on posterior part of trunk darker and tend to calw-like. Longitudinal muscles in about 22 anastomosing bands. Retractor muscles four, a ventral pair attached to muscles in mid-third of trunk and a dorsal pair more anteriorly. Contractile vessel slender and without villi. Fastening muscle attached to last spiral of intestine. Nephridia about one-third as long as trunk and fixed about one-third of their length.

Remarks : The species is easily recognised by the large but unequal dark-brown spine-like papillae on postero-dorsal surface of introvert and also the shape of introvert hooks.

Distribution : This is an Indo-Pacific tropical shallow water form relatively uncommon in the Indian Ocean but appears to be circumtropical except one record from South Atlantic.

India : Gujarat; Diu; Lakshadweep; Kerala; Gulf of Mannar; Andhra Pradesh; Andamans and Nicobars.

Elsewhere : Common in the Caribbean (Venezuela to Southern Florida and the western Pacific (Queensland to Vietnam and central Japan), eastern Pacific (off Panama and Northern Mexico) and the Indian Ocean (Madagascar, Mahe, Maldives and Port Victoria of Northern Territory).

9. ***Phascolosoma nigrescens*** Keferstein

1865. *Phascolosoma nigrescens* Keferstein, *Z. wiss. Zool.*, **15** : 424, pl. 31, fig. 2, pl. 21, figs. 14,15.

1994. *Phascolosoma nigrescens* : Cutler, *The Sipuncula, Cornell University Press,* London : 179-181.

Material examined : 1 ex., Nuvula Revu, near Srikakulum, 16.2.1995, B. P. Haldar, 2 exs., Uppada, near Kakinada, 5.1.1996, A. Misra; 2 exs., Visakhapatnam Harbour, 30.10.1996, R. Chakraborty.

Description : Trunk 15-22 mm long, light dirty yellow in colur, thin-skinned. Introvert partially retracted. Tentacles 18-20 in number, short, digitiform, arranged in an incomplete ring dorsal to mouth. Hooks 30-35 complete rings besides some scattered hooks; 45-70 mm tall and clear streak expanded near midpoint of the vertical and the middle of horizontal portions of hook, is unique; secondary tooth present. Papillae uniformly distributed dome-shaped on mid-trunk, conical and flask-shaped on anterior end of trunk.

Longitudinal muscles grouped into bands but frequently ansastomose. Retractor muscles two, ventral pair stout, attached to posterior third of trunk and weak dorsal pair arising from mid-trunk. Rectum short and without rectal caecum. Spindle muscle attached at both ends. Contractile vessel simple and without villi. Nephridia about half as long as trunk and anterior half fixed to body wall.

Remarks : The species is identified largely by the structure of its hook.

Distribution : Very widespread circumtropical species; generally between 30^0 N. and 30^0 S., in shallow waters of the Indian, Pacific and Atlantic Oceans.

India : Lakshadweep; Tamil Nadu; Andamans and Nicobars.

Elsewhere : Tropical waters of the Indian, Pacific and Atlantic Oceans.

Genus 7. ***Apionsoma*** Sluiter

1902. *Apionsoma* Sluiter, *Siboga exped.*, **25** : 42.

1994. *Apionsoma* : Cutler, *The Sipuncula, Cornell University* Press, London : 189-190.

Diagnosis : Tentacles forming a crescent around nuchal organ dorsal to mouth. Contractile vessel without villi. Introvert retractor muscles 4. Introvert much longer than trunk, with rings of recurved hooks (absent in *A. trichocephala)* that have accessory spinelets at the bases. Two bilobed nephridia. Body wall musculature continuous or in separate bands.

10. ***Apionsoma trichocephalus*** Sluiter

1902. *Apionsoma trichocephalus* Sluiter, *Siboga Exped.*, **25** : 42-44.

1994. *Apionsoma trichocephalus* : Cutler, *The Sipuncula, Cornell University* Press, London : 196-197.

Material examined : 2 exs., off Gaganavari Peta, near Srikakulum, 19.2.1995, B. P. Haldar; 4 exs., off Kailasa, Visakhapatnam, 4.11.1996; B. P. Haldar, 3 exs. Off Kakinda Harbour, 6.1.1996, A. Misra.

Description : Trunk sausage-shaped, 7-9 mm in length, fully extended and ventrally curved; semi-transparent skin. Introvert slender, very long, 8-10 times the trunk length, not bearing tentacles and hooks. Body nearly smooth, bearing scattered very small papillae low, round or elliptical in shape at posterior end of trunk.

Genus 8. ***Aspidosiphon*** Diesing

1851. *Aspidosiphon* Diesing, *Systema helminthum*, **2** : 67-68 (restricted).

1996. *Aspidesiphon* Saiz Salinus, *Fauna Iberica, Sipuncula*, **4** : 130-132.

Diagnosis : Introvert longer than trunk with recurved hooks arranged in numerous rings; and shield invariably present and introvert arising from its ventral side; tentacles arranged in a horse shoe-shaped ring enclosing nuchal organ; Longitudinal muscle layer either continuous or gathered into bands; retractor muscles single pair; contractile vessel without villi; spindle muscle attached posteriorly.

11. ***Aspidosiphon steenstrupii*** Diesing

1859. *Aspidosiphon steenstrupii*, Diesing, *Sber. Akad. wiss. Wien*, **37** : 767.

1994. *Aspidosiphon (Paraspidosiphon) steenstrupii* : Cutler, *The Sipuncula, Cornell University* Press, : 225.

Material examined : 3 exs., Bandaruvani peta, near Srikakulum, 15.2.1995, B. P. Haldar; 2 exs., Kakinda Harbour, 16.1.1996; A. Misra; 4 exs., Kailasa, near Vishakhapatnam, 25.10.1996, B. P. Haldar.

Description : Trunk 25-33 mm long, thin-skinned in mid-trunk region. Introvert more than half to two-thirds of trunk length, in most partially retracted. Hooks bidentate, very tall, arranged in rings and unidentate compressed hooks found scattered behind bidentate ones, covering proximal part of introvert. Anal shield clearly marked off from trunk, ungrooved and oval in shape while caudal shield less distinguished, circular or knob-lilke. Longitudinal muscle bands 15-22 anteriorly and 18-26 posteriorly, anastomosing in nature. Retractor muscles two, arising from two-thirds to two-fifths of trunk length. Nephridia one-half to two-thirds of trunk length and anterior half attached to body wall. Rectal caecum present.

Remarks : The species can be distinguished by the presence of bidentate hooks having a tongue-like extension on the internal clear streak.

Distribution : This is a circumtropical shallow water species, fairly common and widely distributed in the Indo-Pacific.

India : Gujarat; Diu; Lakshadweep; Tamil Nadu; Andamans and Nicobars.

Elsewhere : Throughout the western and northern Indian Ocean, from northern Australia to Indonesia, Vietnam and the sourth China sea, to southern tropical Japan and out through the western Pacific Islands to Hawalii; Caribbean sea, Cape Verde Islands and the Gulf of Guinea.

Genus 9. ***Cloeosiphon*** Grube

1865. *Loxosiphon* de Quatrefages, *Histoire naturelle des Anneles marins et d'ear douce*, Paris, **2** : 605.

1868. *Cloeosiphon* Grube, *Jber. Schles. Ges. Vaterl. Kult.*, **45** : 48.

Diagnosis : Introvert longer than trunk, with numerous rings of recurved hooks. Trunk with conspicuous anal shield composed of calcareous plates. Introvert evaginating from centre of anal shield. Tentacles encircling nuchal organ but not mouth. Muscle layer of body wall continuous. Retractor muscles one pair, often almost completely fused. Spindle muscle attached posteriorly.

12. ***Cloeosiphon aspergillus*** (de Quatrefages)

1865. *Loxosiphon aspergillus* de Quatrefages, *Histoire naturelle des Anneles marins et d'eau douce*, Paris, **2** : 605.

1868. *Cloeosiphon aspergillum* : Grube, *Jber. Schles. Ges. Vaterl. Kult.*, **45** : 48-49.

Description : Trunk 30-45 mm long, cylindrical, light brown in colour. Introvert, partially or completely retracted, less than half of trunk length, protruding through the centre of anal shield - distinguishing it from other members of the family bearing many rings of pointed bidentate hooks having transverse bar and warts at bsae. Anal shield rounded or knob-like, made up of white calcareous plates, each with a central pore and arranged like mosaic tiles. Caudal shield absent.

Muscle layer of body will continuous. Retractor muscles single pair, originating by broad base and fusing shortly after their origin. Rectal caecum absent. Spindle muscle attached anteriorly and posteriorly. Nephridia dark brown in colour, very long and completely attached.

Remarks : The species is easily recognised by its unique anal shield and introvert protruding through centre of anal shield.

Distribution : This species is a tropical shallow water coral dwelling from, very difficult to dislodge from its refuge.

India : Lakshadweep; Gujarat, Andamans & Nicobars.

Elsewhere : Indo-West Pacific from East Africa, Madagascar, Sri Lanka, the Maldives, Southeast Asia, Southern Japan, Indonesia, Phillippines, northern Australia, New Hebrides, New Guinea and many other Western Pacific Islands.

SUMMARY

The paper deals with occurrence of 12 species under 9 genera and 5 families from various habitats of the intertidal belts of the Andhra Pradesh coast. Of those, eight species constitutes new locality records from the area under study.

DISCUSSION

Sipuncula comprises 164 species and subspecies under 17 genera and 6 families known from the world oceans (Cutler, 1994) the same of the entire Indian coast represnet 37 species and subspecies under 10 genera and 5 families (Haldar, 1991). Of them only 12 species under 9 genera and 5 families are represented from the Andhra Pradesh coast and interestingly enough 8 of them are new to the area under study. Further, it indicates that sipunculan fauna may be considered rich as it is represented by one-third of the total species so far knwon from the Indian coast. All the species have been described for easy identification. Diagnostic characters for all the genera and key to the families occuring in this coast are provided. Distribution of species in India and elsewhere are dealt with under respective species. In addition, material and method is added.

The habits, which are interestingly variable, include sandy and muddy bottoms, sand pools, in and under boulders, in clefts or interstices of, and under beach rocks, compact substrata and also estuary with or without mangroves.

It is interesting to note that Hyman (1959) stressed on the exclusive occurrence of the sipunculans in the marine habitat. Subsequently, Wesenberg-Lund (1963), Green (1975) and Haldar (1991) reported certain speceis including *Siphonosoma australe* and *Phascolosoma arcuatum* from the estuarine habitat and mangrove belt respectively.

Two monotypic genera, *viz., Antillesoma* and *Cloeosiphon* and *Themiste lageniformis*, are more or less widely distributed in the Indian coast and *Aspidosiphon steenstrupii* stands next to them.

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LAND AND FRESHWATER MOLLUSCS

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INTRODUCTION

The studies on molluscan fauna of Andhra Pradesh is a part of the work on State Fauna Series undertaken by Zoological Survey of India. The present report (Part 1) includes the entire land and freshwater molluscs so far known from the state. The marine and estuarine species will be dealt with in Part II.

The state of Andhra Pradesh lies on the East Coast of the Indian Peninsula and is bordered by the Bay of Bengal in the east, Tamil Nadu in the south, Karnataka and Maharashtra in the west and Maharashtra, Madhya Pradesh and Orissa in the north. It is one of the largest states of India and encompasses 8.4% of the total land area of the country. It has a vast coastline of above 900 kms and includes 23 districts divided into 3 regions – Coastal Andhra pradesh (9 districts), Telengana (10 districts) and Royalseema (4 districts).

The physical feature of Andhra Pradesh consists of Coastal Plain, the Eastern Ghats and the Decan Plateau.

Coastal Plain : This area stretches between the coast of Bay of Bengal and the Eastern Ghat with a width ranging between 20 kms to 200 kms.

The Eastern Ghat : This chain of mountains (broken at some places) extends between the coastal plain in the east and the Decan Plateau in the west, running north to south. The mountains reach an altitude of upto 1500-m in the north between Srikakulam and Vishakhapatnam. The famous Araku Valley lies in this region. Various other hill-ranges extending south of the river Krishna, viz. Nallamallai, Palakonda, Seshachalam, Harsley are also parts of the Eastern Ghats. Streams and rivers originating from the mountain ranges make this region fertile.

Deccan Plateau : An elevated plain with rocks and hills, extending between the districts of Kurnool and Annantapur on the one side and Telengana on the other. Elevation ranges between 300m to 700m; sparsed with small hills, hillocks and valleys with bushy vegetation,

this is essentially a dry zone having less rainfall and red soil. Many small rivers and streams, which overflow in the rainy season, completely dry up in summer.

FRESHWATER RESOURCES

Andhra Pradesh has rich and widespread freshwater resources. The two major and important river systems, Godavari and Krishna originating from the Western Ghat pass through this state. Godavari, the largest river in the Peninsular India enters Andhra Pradesh through Adilabad and the river Krishna enters through Mahboobnagar and both ultimately reach the Bay of Bengal. In addition, criss-cross of a large number of smaller rivers including the tributaries of these two major systems (totaling above 30) keep the major part of the state well–watered. Some of the important smaller rivers are Pennar, Tungabhadra, Manjeera, Vansadhara, Pranahita etc.

Freshwater lakes and tanks : Kolleru, one of the largest freshwater lakes is situated between the deltaic zones of Krishna and Godavari. Quite a few rivers feed this lake. Though the lake has a link with the sea resulting in some salt-water influx, it is basically freshwater in nature. Andhra Pradesh also has above 100 large sized artificial reservoirs like Nagarjuna Sagar, Hussain Sagar, Osman Sagar, Himayat Sagar and so on. Besides, there are many medium to fairly big "Cheruvus" or freshwater tanks well scattered in various parts of the state. Most of these are rainfed.

Rainfall : The state receives both southwest and northeast monsoon rains. The average annual rainfall is 800-900 mm. The Coastal Plain receives maximum rain, around 1000mm per year, followed by Telengana with around 900mm, Royalseema gets the least rainfall around 600mm (because both the monsoon are obstructed by the Western Ghat) and is the driest region.

Forest-types : Tropical thorny in Royalseema (Kurnool and Cuddapah in parts) and some other districts in the lower reaches of mountains. Tropical deciduous (moist and dry) in the rest. Red Sandal trees in parts of Cuddapah are famous. Overall forest cover is around 23%.

Temperature : The temperature in the state varies between 16°C to 20°C in winter and 35°C to 40°C in summer. In some places it soars upto 45°C. Places away from the coast usually have extremities of temperature. Some places, like Chittoor, Araku Valley, Harsley hills have pleasant climate throughout.

Soil : Mostly red/black soil in Royalseema and Telengana. Alluvial/Sandy in the coastal region; marshy at the deltaic zones of Krishna and Godavari.

EARLIER WORKS ON MOLLUSCS

Andhra Pradesh forms a part of Peninsular India, an important zoogeographic zone from the viewpoint of distribution of land and freshwater molluscs. But till date there is no

consolidated report on molluscs occurring in the state. Literature available belong to two different categories; I) majority of works are isolated reports including descriptions of new taxa and ii) major faunistic works in which molluscs of the state have been referred in a general way. The important references are as follows : Annandale (1921), description of a new variety of thiarid; Annandale and Rao (1925) report of *Lymnaea persica* from Secunderabad; Arunakumari (1982), Ph. D work on thiarids of Andhra Pradesh; Beddome (1875), description of new operculate land snails; the Fauna of British India volumes on land molluscs by Blanford and Godwin-Austen (1908) and Gude (1914,1921); Land and freshwater molluscs of India, two volumes by Godwin-Austen (1882-1914); Kobelt (1909), description of a new variety of *Bellamya bengalensis* from Vizag. Janaki Ram and Radhakrishna (1984), report on freshwater molluscs of Guntur districts with description of a new species of *Scaphula;* Preston (1915), Fauna of British India volume on freshwater molluscs; Lakshminarayana and Subba Rao (1965, 1971) and Rao and Ramadoss (1953), brief reports on some molluscan pests; Ray (1961,1967), report on some non-marine molluscs from south India and description of a new species of Lymnaeidae: Rao (1944), on life cycle of *Lymnaea acuminata* and Subba Rao (1989), Handbook on freshwater molluscs of India.

The classification followed is that of Vaught (1989).

New taxa of Land and freshwater molluscs described from Andhra Pradesh

1. *Diplommatina gracilis* Beddome, 1875	Vishakhapatnam
2. *Diplommatina minima* Beddome, 1875	Vishakhapatnam
3. *Opisthostoma distortum* Beddome 1875	Vishakhapatnam
4. *Opisthostoma deccanense* Beddome 1875	Kurnool
5. *Cyathopoma elatum* Beddome, 1875	Vishakhapatnam
6. *Vivipara bengalensis* f. *annandal*ei Kobelt, 1909	Vishakhapatnam
7. *Vivipara bengalensis* f. *colairensis* Annandale, 1921	Krishna
8. *Vivipara bengalensis* f. *eburnea* Annandale, 1921	Nellore
9. *Melanoides virgulata* Ferussac	Cuddapah
10. *Melanoides scabra var. tigiris* Annandale, 1921	Hyderabad
11. *Melanoides peddamunigalensis* Ray & RoyChowdhury, 1969	Nalgonda
12. *Limnaea biacuminata* Annandale & Rao, 1925	Hyderabad
13. *Stagnicola tungabhadraensis* Ray, 1967	Kurnool
14. *Nanina (Ariophanta) kadapaensis* Nevill, 1878	Cuddapah

15. *Xestina albata* Blanford, 1880 — Chittoor
16. *Succinea gravelyi deccanensis* Rao, 1924 — Kurnool
17. *Glessula jeyporensis* Beddome, 1906 — Vishakhapatnam
18. *Glessula subjerdoni* Beddome, 1906 — Vishakhapatnam
19. *Scaphula nagarjunai* Janaki Ram & Radhakrishna, 1984 — Nalgonda

Table -I : Showing the collection Localities

1. ADILABAD	23. HYDERABAD
2. ALAMPUR	24. JALAPURAM
3. ANAKAPALLI	25. JAVADI HILL
4. ANANTAPUR	26. KADIRI
5. ANICUT	27. KAKINADA
6. ARAKU VALLEY	28. KALASAMUDRAM
7. BAHADURPUR ZOOLOGICAL GARDEN	29. KANIGIRI
8. BARRA CAVE	30. KESAPURAM
9. BHADRACHALAM	31. KHAMMAM
10. BHAKARAPET	32. KODUR
11. BHIMUNIPATNAM	33. KOLLERU
12. BUKKAPATNAM	34. KURNOOL
13. CHENNUR	35. MADHAVDHARA
14. CHITTIVALASA	36. MAKADONA
15. CHITTOOR	37. MALANDI
16. CHITRAVATI R.	38. MANJIRA
17. CUDDAPAH	39. MASULIPATNAM
18. DHARMAVARAM	40. MEDAK
19. ELLURU	41. MEDCHAL
20. GUDIWADA	42. MEHBOOBNAGAR
21. HIMAYAT SAGAR	43. MIR ALAM TANK
22. HUSSAIN SAGAR	44. MUTHYALA TANK
	45. NAGABALLI R.

46. NAGARJUNA HILL	61.SADASIVPETA
47. NAGARJUNA SAGAR	62.SANGAREDDY
48. NALLAPALLI	63.SESHACHALAM
49. NANDALUR	64.SRISAILAM
50.NANDUR	65.SIMACHALAM
51.NELLORE	66.SRIKAKULAM
52.NIZAMPATNAM	67.SIDDAVATTAM
53.PALKONDA	68.TUNGABHADRA R.
54.PAPANASSSAM	69.TIRUPATI HILL
55.PATHACUDDAPAH	70.VANTIMITTA
56.PEDDAMUNIGAL	71.VELIGONDA
57.PENNA R.	72.YELLATURU
58.PUTNAM	73.VISHAKHAPATNAM
59.RAJAMPET	74.VITAPALEM
60.RANGAREDDY	75.VIZIANAGARAM

SYSTEMATIC LIST

A. FRESHWATER MOLLUSCA

Class GASTROPODA

Subclass PROSOBRANCHIA

Order ARCHAEOGASTROPODA

Family NERITIDAE

Genus ***Neritina*** Lamarck, 1816

Subgenus ***Dostia*** Gray, 1847

*1. *Neritina (Dostia) violacea* (Gmelin)

Order MESOGASTROPODA

Family VIVIPARIDAE

Subfamily BELLAMYINAE

Genus ***Bellamya*** Joussaeaume, 1896

2. *Bellamya bengalensis* f. *typica* (Lamarck)

f. *annandalei* (Kobelt)

f. *colairensis* (Annandale)

f. *doliaris* (Gould)

f. *eburnea* (Annandale)

3. *Bellamya crassa* (Benson)
4. *Bellamya dissimilis* (Mueller)

Family AMPULLARIIDAE

Genus ***Pila*** Roeding ,1788

*5. *Pila globosa* (Swainson)
6. *Pila virens* (Lamarck)

Family BITHYNIIDAE

Genus ***Bithynia*** Leach, 1818

Subgenus ***Digoniostoma*** Annandale, 1920

7. *Bithynia (Digoniostoma) cerameopoma* (Benson)
8. *Bithynia (Digoniostoma) pulchella* (Benson)

Genus ***Gabbia*** Tryon, 1885

9. *Gabbia orcula* (Frauenfeld)
10. *Gabbia stenothyroides* (Dohrn)
11. *Gabbia travancorica* (Benson)

Genus ***Mysorella*** Annandale, 1919

12. *Mysorella costigera* (Kuester)

Family THIARIDAE

Subfamily THIARINAE

Genus ***Thiara*** Roeding, 1798

13. *Thiara scabra* (Mueller)
*14. *Thiara scabra* var. *tigiris* Annandale

Genus ***Melanoides*** Olivier, 1804

15. *Melanoides peddamunigalensis* Ray & Roy Chowdhury
16. *Melanoides tuberculata* (Mueller)

Genus ***Stenomelania*** Fischer, 1805

17. *Stenomelania torulosa* (Bruguiere)

Genus ***Tarebia*** H. & A. Adams, 1854

18. *Tarebia granifera* (Lamarck)

19. *Tarebia lineata* (Gray)

Family PLEUROCERIDAE

Subfamily MELANATRINAE

Genus ***Brotia*** H. A. Adams, 1866

20. *Brotia costula* (Rafinesque)

Subfamily PALUDOMINAE

Genus ***Paludomus*** Swainson, 1840

21. *Paludomus tanschauricus* (Gmelin)

Subclass PULMONATA

Order BASOMMATOPHORA

Family LYMNAEIDAE

Genus ***Lymnaea*** Lamarck, 1799

Subgenus ***Pseudosuccinea*** Baker, 1908

22. *Lymnaea (Pseudosuccinea) acuminata* f. *typica* Lamarck

" " " f. *gracilior* Martens

" " " f. *rufescens* Gray

*23. *L.(P.) amygdalam* Troschel

24. *L.(P.) biacuminata* Annandale & Rao

25. *L.(P.) luteola* f. *typica* Lamarck

f. *australis* Annandale & Rao

f. *impura* Troschel

f. *ovalis* Gray

*f. *pinguis* Dohrn

*f. *succinea* Deshayes

Genus ***Radix*** Montfort, 1810

26. *Radix persica* Issel

Genus ***Stagnicola*** Leach, 1830

27. *Stagnicola tungabhadraensis* Ray

Family PLANORBIDAE

Genus ***Indoplanorbis*** Annandale & Rao, 1920

28. *Indoplanorbis exustus* (Deshayes)

Genus ***Gyraulus*** Charpentier, 1837

29. *Gyraulus convexiusculus* (Hutton)

30. *Gyraulus labiatus* (Benson)

Class BIVALVIA

Order ARCOIDA

Family ARCIDAE

Genus ***Scaphula*** Benson, 1834

31. *Scaphula nagarjunai* Janaki Ram & Radhakrishna

Order UNIONOIDA

Family UNIONIDAE

Genus ***Lamellidens*** Simpson, 1900

32. *Lamellidens consobrinus* (Lea)

33. *L. corrianus* (Lea)

34. *L. marginalis* (Lamarck)

Family AMBLEMIDAE

Subfamily PARREYSIINAE

Genus ***Parreysia*** Conard, 1853

Subgenus ***Parreysia*** s. str.

35. *Parreysia (Parreysia) corrugata laevirostris* (Benson)

var. *nagpoorensis* (Lea)

36. *Parreysia (Parreysia) favidens deltae* (Benson)

var. *marcens* (Benson)

Subgenus ***Radiatula*** Simpson, 1900

37. *Parreysia (Radiatula) bonneaudi* (Eydoux)

38. *P. (R.) caerulea* (Lea)

39. *P. (R.) pachysoma* (Benson)

Order VENEROIDA

Family CORBICULIDAE

Genus ***Corbicula*** Bruguiere, 1797

40. *Corbicula striatella* Deshayes

Genus ***Polymesoda*** Rafinesque, 1820

Subgenus ***Geloina*** Gray, 1842

41. *Polymesoda (Geloina) erosa* (Solander)

Family PISIDIIDAE

Genus ***Pisidium*** Pfeiffer, 1821

42. *Pisidium clarkeanum* G. & H. Nevill

Genus ***Sphaerium*** Scopoli, 1777

43. *Sphaerium indicum* Deshayes

B. LAND MOLLUSCA

Order MESOGASTROPODA

Family CYCLOPHORIDAE

Subfamily CYCLOPHORINAE

Genus ***Cyclophorus*** Montfort, 1810

44. *Cyclophorus polynema* Pfeiffer

Genus ***Cyathopoma*** Blanford, 1861

45. *Cyathopoma elatum* Beddome

Genus ***Theobaldius*** G. Nevill, 1878

46. *Theobaldius deplanatus* (Pfeiffer)

Subfamily PTEROCYCLINAE

Genus ***Pterocyclus*** Benson, 1832

47. *Pterocyclus comatus* (Mollendorff)

*48. *Pterocyclus cyclophoroides* G. Nevill

Family DIPLOMMATINIDAE

Subfamily DIPLOMMATININAE

Genus ***Diplommatina*** Benson, 1849

*49. *Diplommatina gracilis* Beddome

*50. *Diplommatina minima* Beddome

Genus ***Opisthostoma*** Blanford, 1860

*51. *Opisthostoma deccanense* Beddome

52. *Opisthostoma distortum* Beddome

Family POMATIASIDAE

Subfamily CYCLOTOPSINAE

Genus ***Cyclotopsis*** Blanford, 1884

53. *Cyclotopsis subdiscoidea* (Sowerby)

Order SYSTELLOMMATOPHORA

Family VERONICELLIDAE

Genus ***Filicaulis*** Simroth, 1913

54. *Filicaulis (Eleutherocaulis) alte* (Ferrussac)

Order STYLOMMATOPHORA

Family PUPILLIDAE

Subfamily PUPILLINAE

Genus ***Pupilla*** Leach in Fleming, 1828

55. *Pupilla barrackporensis* Gude

Genus ***Pupoides*** L. Pfeiffer, 1854

56. *Pupoides coenopictus* (Hutton)

Family BULIMINIDAE

Subfamily BULIMININAE

Genus ***Ena*** Leach in Turton, 1831

57. *Ena nilagirica* (Pfeiffer)

Family CERASTUIDAE

Genus ***Rhachis*** Albers, 1850

*58. *Rhachis pulcher* (Gray)

59. *Rhachis punctatus* (Anton)

Genus ***Edouardia*** Gude, 1914

60. *Edouardia orbus* Blanford

Family SUBULINIDAE

Subfamily SUBULININAE

Genus ***Subulina*** Beck, 1837

61. *Subulina octona* (Bruguiere)

Genus ***Glessula*** von Martens, 1860

62. *Glessula brevis* (Pfeiffer)

*63. *Glessula facula* Benson

64. *Glessula filosa* Blanford

*65. *Glessula hebes* Pfeiffer

*66. *Glessula gracilis* Beddome

*67. *Glessula jeyporensis* Beddome

68. *Glessula paupercula* Blanford

*69. *Glessula subfilosa* Beddome

*70. *Glessula subjerdoni* Beddome

71. *Glessula subtornensis* Gude

Genus ***Opeas*** Albers, 1850

72. *Opeas gracile* (Hutton)

Subfamily RUMININAE

Genus ***Zootecus*** Westerlund, 1887

73. *Zootecus insularis* (Ehrenberg)

74. *Zootecus pullus* (Gray)

Family ACHATINIDAE

Genus ***Achatina*** Lamarck, 1799

75. *Achatina fulica fulica* Bowdwich

Family STREPTAXIDAE

Subfamily ENNEINAE

Genus ***Ennea*** H. & A. Adams, 1855

*76. *Ennea planguncula* (Benson)

Genus ***Gulella*** Pfeiffer, 1858

77. *Gulella bicolor* (Hutton)

Family SUCCINEIDAE

Subfamily SUCCINEINAE

Genus ***Succinea*** Draparnaud, 1801

*78. *Succinea godivariana* Gude

Subfamily CATINELLINAE

Genus ***Quickia*** Odhner, 1950

79. *Quickia gravelyi deccanensis* (Rao)

Family HELIXARIONIDAE

Genus ***Kaliella*** Blanford, 1863

80. *Kaliella barrakporensis* (Pfeiffer)

Family ARIOPHANTIDAE

Subfamily MACROCHLAMYDINAE

Genus ***Macrochlamys*** Benson, 1832

*81. *Macrochlamys atoma* Blanford

*82. *M. hebescens* Blanford

*83. *M. indica* Godwin-Austen

*84. *M. pedina* (Benson)

85. *M. perplana* Godwin-Austen

86. *M. perrotteti* (Pfeiffer)

87. *M. tenuicula* H. Adams

Genus ***Ariophanta*** Desmoulins, 1829

88. *Ariophanta interrupta* (Benson)

89. *A. kadapaensis* Nevill

90. *A.laevipes* (Mueller)

91. *A. laidlayana* (Benson)

Genus ***Cryptozona*** Moerch, 1872

92. *Cryptozona albata* (Blanford)

93. *C. belangeri* (Deshayes)

94. *C.bistrialis* (Beck)

95. *C. ligulata* (Ferrussac)

96. *C. maderaspatana* (Gray)

97. *C. semirugata* (Beck)

Genus ***Euplecta*** Semper, 1870

98. *Euplecta bistrialis indica* (Pfeiffer)

99. *E. infausta* (Blanford)

100. *E. subdecussata* (Pfeiffer)

101. *E. travancorica* (Benson)

Subfamily DURGELLINAE

Genus ***Durgella*** Blanford, 1833

*102. *Durgella levicula* (Benson)

Family CAMAENIDAE

Subfamily CAMAENINAE

Genus ***Planispira*** Beck, 1837

103. *Planispira asperalla* (Pfeiffer)

SYSTEMATIC ACCOUNT

A. Freshwater

Key to the families

1. Shell univalve ..... (2)
– Shell with two valves ..... (8)
2. Shell with an operculum ..... (3)
– Shell without an operculum ..... (7)
3. Operculum with spiral growth lines ..... (4)
– Operculum with concentric growth lines ..... (6)
4. Shell below 10 mm in length, ovate, without sculpture, animal without a brood pouch ..... BITHYNIIDAE
– Shell above 10 mm in length, turreted or globose, with sculpture, animal with a brood pouch ..... (5)
5. Shell elongate turreted, columellar callus indistinct. Operculum oblong with a terminal nucleus ..... THIARIDAE
– Shell either roundly ovate or elongate-turreted, columellar callus distinct. Operculum round with usually central or subcentral nucleus ..... PLEUROCERIDAE
6. Operculum calcareous; shell globose; aperture ovate ..... AMPULLARIIDAE
– Operculum horny; shell pyramidal; aperture subcircular ..... VIVIPARIDAE
7. Shell extended and dextrally coiled; columellar axis twisted ..... LYMNAEIDAE
– Shell discoidal; columellar axis not twisted ..... PLANORBIDAE
8. Shell internally nacreous ..... (9)
– Shell internally non-nacreous ..... (10)
9. Beak sculpture radial and well developed; all four gills marsupials ..... AMBLEMIDAE
– Beak sculpture concentric-radial and rudimentary; only two outer gills marsupials ..... UNIONIDAE
10. Shell thick, and strong, with strong and blunt ribbing, above 10mm in length ..... CORBICULIDAE
– Shell thin, and fragile, with fine ribbings, below 10mm in length ..... (11)

11. Shell oval or ovately orbicular, without posterior umbonal carina ..... PISIDIIDAE

– Shell elongate with a strong and sharp posterior umbonal carina ..... ARCIDAE

Family VIVIPARIDAE

Genus ***Bellamya*** Jousseaume, 1886

1886. *Bellamya* Jouseaume, *Bull. Soc. zool. France,* **11** : 478.

Bellamya bengalensis f. ***typica*** (Lamarck)

1822. *Paludina bengalensis* Lamarck, *Hist. Nat. Anim. Sans. Vert.*,**6**(2):174.

1989. *Bellamya bengalensis* f. *typica* : Subba Rao, Handbook Freshwater Molluscs of India, p. 45, fig. 55

Materials : I) 3 exs. Secunderabad, Coll. N. Annandale; ii) 6 exs., Nizam Sagar, Coll. Asstt. Vet. Surgeon, Banswada; iii) 3 exs. Chittivalasa estuary, Bhimlipatnam, 19.2.47; iv) 8 exs., Kurnool, 18.9.73, Coll. K.V. Lakshiminarayana; v) 3 exs. Tungabhadra river, Kurnool, 22.3.99, vi) 1 ex. Chennur, Cuddapah, 31.12.99, Coll. G. Sen and Party; vii) 2 exs. Chirala, 21.4.2000, Coll. S.C. Mitra and S. Barua; viii) 3 exs., Nagaballi river, West of Srikakulam, 28.4.01, ix) 9 exs., Andra Reservoir, Vizianagaram, 3.5.01, x) 1 ex., Wyra Lake, Khammam, 6.5.01, xi) 1 ex., Bhadrachalam, Godavari river, 7.5.01, xii) 3 exs., Manjira Lake, Sangareddy, Medak, 9.5.01 Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
14.00 –33.90	9.78 – 24.00	5.40 – 18.20

Diagnosis : Shell thin, more or less smooth, ovately conoid; bodywhorl as high as spire; whorls tumid, bodywhorl evenly convex in profile, not biangulate; umbilicus narrow; aperture subcircular with a narrow black margin; dark bands variable and irregular with alternating broad and narrow bands.

Distribution : India : Andhra Pradesh (Cuddapah, Hyderabad, Khammam, Kurnool, Medak, Srikakulum, Vizianagaram, Vishakhapatnam). Throughout rest of the country.

Elsewhere : Myanmar.

f. ***annandalei*** (Kobelt)

1909. *Paludina bengalensis* f. *annandalei* Kobelt, *Nachr Malak.Ges.*,**60**:161 (Type locality, Visakhapatnam, Andhra Pradesh).

1989. *Bellamya bengalensis* f. *annandalei*: Subba Rao, Handbook Freshwater Molluscs of India, p. 46, fig. 57

Materials : i) 5 exs. Gudiwada, Krishna Dist., ii) 19 exs., Godavari, iii) 14 exs. Elluru, iv) 14 exs., Nellore, v) 4 exs.Vishakhapatnam, vi) 8 exs. Secunderabad, Coll. N. Annandale;

vii) 1 ex. Najarjuna, Andhra Pradesh, 28.11.99, Coll. P.H. Roy and Party; viii) 2exs. Mehboobnagar, 28.12.99, x) 2 exs., Yellatura, Cuddapah, 31.12.99 Coll. G. Sen and Party, xi) 4 exs., Buckimgham channel, Vitapalem, Prakasam, 21.4.2000, Coll. S.C. Mitra and S. Barua; xii) 3 exs., Nagaballi river, West of Srikakulam, 28.4.01, xiii) 1 ex., Palkonda tank, near RTC Bus stand, Srikakulam, 30.4.01, Coll. S. Barua and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
18.70 – 22.75	15.30 – 17.55	11.00 – 13.00

Diagnosis : Shell thin, whorls gradually increasing; sutures shallow; aperture subrhomboidal and subangulate anterioly.

Distribution: India : Andhra Pradesh (Cuddapah, Hyderabad, Krishna, Kurnool, Nalgonda, Nellore, Prakasam, Srikakulum, Vishakhapatnam); Tamil Nadu, West Bengal.

f. ***colairensis*** (Annandale)

1921. *Vivipara bengalensis f. colairensis* Annandale, *Rec.Indian Mus.*,,**22**:275, pl. 1, figs., 5,6, (Type locality: Sriparptipada, Colair Lake, Andhra Pradesh).

Materials: i) 30 exs. Sriparptipada., Colair Lake, (Syntypes), Reg. No. 11961/2.l.

Measurements (in mm) :

Length	Diameter	Height of the aperture
14.00 –39.50	9.50 – 23.70	8.00 – 20.00

Diagnosis : Shell elongate, thin, with a small subcircular aperture.

Distribution : Restricted to type locality only.

f. ***doliaris*** (Gould)

1843. *Paludina doliaris* Gould, *Proc. Boston Soc. Nat. Hist,* :144.

1989. *Bellamya bengalensis* f. *doliaris*: Subba Rao, Handbook Freshwater Molluscs of India, p. 42.

Materials: i) 1 ex. Singarmala tank, Annantapur, 19.3.99, ix) 1 ex., Atmakur, Kurnool, 26.12.99,

Measurements (in mm) :

Length	Diameter	Height of the aperture
22.35	16.95	13.00

Diagnosis : Shell smaller and more conical, last whorl distinctly biangulate.

Distribution : India : Andhra Pradesh (Annantapur, Kurnool). Maharashtra, West Bengal.

Elsewhere : Myanmar.

f. ***eburnea*** (Annandale)

1921. *Vivipara bengalensis f. eburnea* Annandale, *Rec.Indian Mus.*, **22** : 274, pl. 11, figs.1-2 (Type locality: Kaligiri (Kanigiri) reservoirs, Nellore, Andhra Pradesh).

Materials: i) 32 exs. Hussain Sagar, Secunderbad, ii) 13 exs., Nellore, iii) 21 exs., Hyderabad, iv) 13 exs., Krishna (Colair Lake), v) 2 exs., Godavari.

Measurements (in mm):

Length	Diameter	Height of the aperture
24.10 – 30.00	16.9 – 18.85	13.00 – 14.90

Diagnosis : Shell narrower than in other forms. Whorls flattened below the suture, spiral sculpture strong.

Distribution : India : Andhra Pradesh (Hyderabad, Krishna, Nellore), Madhya Pradesh, Orissa, Tamil Nadu, West Bengal.

Bellamya crassa (Benson)

1836. *Paludina crassa* (Hutton MS) Benson, *J. Asiat. Soc. Beng.* ,**5**:745.

1989. *Bellamya crassa* : Subba Rao, Handbook Freshwater Molluscs of India, p. 48, figs. 61, 62.

Materials : I) 3 exs. Tungabhadra river, Kurnool, 27.3.99 Coll. S.C.Mitra and S. Barua.

Measurrements (in mm) :

Length	Diameter	Height of the aperture
13.20	10. 90	10.00

Diagnosis : Shell thick, globose, olive brown, with fine transverse striations. Spire short, apex blunt; umbilical opening prominent, suture deep, often canaliculate, aperture suboval.

Distribution : India : Andhra Pradesh (Kurnool); Assam, Meghalaya, Orissa, Uttar Pradesh, West Bengal.

Bellamya dissimilis (Mueller)

1774. *Nerita dissimilis Mueller, Hist. Verm. Test.* pt.2: 184.

1989. *Bellamya dissimilis*: Subba Rao, Handbook Freshwater Molluscs of India, p.48, figs.64 – 67.

Materials : i) Many, Masulipatnam Coll. Ramachandra Rao; 11) 2 exs. Mir Alam Tank, Hyderabad, 25.3.99, iii) 6 exs., Tungabhadra river, Kurnool, 27.3.99 iv) 5 exs., Singarmala tank, Annantapur, 29.3.99, v) 4 exs., Dharmavaram tank, Annantapur, vi) 2 exs., Pathacuddapah, 3.4.99, vii) 3 exs., Chirala, 19.4.2000, ix) 2 exs., Vitapalem, 21.4.2000, Coll. S.C. Mitra and S. Barua, x) 6 exs., Wyra Lake, Khammam, 6.5.01, xi) 1 ex., Road side pond at Sadesivpeta,

Sangareddy, 9.5.01, xii) 1 ex., Manjira Lake, Sangareddy, Medak, xiii) 7 exs., Gowda Palli, Rangareddy, 11.5.01, Coll. Ramakrishna and Party.

Measurrements (in mm) :

Length	Diameter	Height of the aperture
31.90 – 25.50	19.80 – 16.80	16.90 – 13.70

Diagnosis : Shell broadly ovate, without band; spire swollen, suture deeply impressed, body whorl indistinctly angulate, greenish with a blackish peristome.

Distribution : India: Andhra Pradesh (Annantapur, Cuddapah, Hyderabad, Khammam, Kurnool, Medak, Rangareddy); Common throughout.

Elsewhere : Bangladesh, Malaysia, Myanmar, Pakistan, Sri Lanka.

Family AMPULLARIIDAE

Genus ***Pila*** Roeding, 1788

1798. *Pila* (*Bolten*) Roeding, *Mus. Bolten.*, pt.**2**, p.145 (in part)

Pila virens (Lamarck)

1822. *Pila virens* Lamarck, *Hist. Nat. Anim. Sans. Vert.* **6**(2) : 179.

1989. *Pila virens* : Subba Rao, Handbook Freshwater Molluscs of India, p. 60, fig. 87.

Materials : i) 3 exs., Lotus pond, Elluru, Krishna district, 4.9.1918,Coll. N. Annandale; ii) 6 exs. Gunyana river, Chivat, Cuddapah, 30.7.1929,iii) 1 ex. Mahanadi, Nallamallai Hills, 15.8.1929, Coll. H.S. Pruthi; iv) 8 exs., Chittivalsa river, Bhimlipatnam, Vishakhapatnam, Feb. 1947, Coll. S.W. Kemp; v) 5 exs., Srikakulam , 4.2. 98, Coll M. Prasad; vi) 1 ex., Penna river, Siddha Vatham, Cuddapah, 2. 4. 1999, vii) 1 ex., Masulipatnam, 16.4.2000, viii) 3 exs., Chivela, Cuddapah, 19.4.2000,ix) 1 ex., Vitapalem, Prakasam, 21.4.2000, Coll. S.C. Mitra and S. Barua; x) 1 ex., Wyra Lake, Khammam, 6.5.01, xi) 1 ex., Nagaballi river, Srikakulam, 30.4.01, Coll. S. Barua and A. Mukherjee.

Measurrements (in mm) :

Length	Diameter	Height of the aperture
44.65 – 20.00	45.70 – 23.00	36.45 – 19.00

Diagnosis : Shell large, globose, imperforate or subperforate,, body whorl highly inflated and shouldered above; spire short, sutures deep and distinctly canaliculate, aperture ovate.

Distribution : India : Andhra Pradesh (Cuddapah, Khammam, Krishna, Prakasam, Srikakkulam, Vishakhapatnam). A common species throughout peninsular India.

Remarks : Some shells particularly those collected from Srikakulam have been identified as *P. virens* because they were nearer to that species, but the shells showed some inclination towards *P. globosa*. Obviously these areas (Orissa and Upper Andhra Pradesh), being in the overlapping zones of the two species; *P. globosa* and *P. virens*, harbour some intermediate forms also.

Family BITHYNIIDAE

Key to the genera

1. Shell not very thick, usually smooth; globose; columellar fold ridge-like; central teeth with a series of latero-basal dentitions on either side ..... (2)

   Shell rather thick with strong spiral ridges; turbinate; columellar fold not ridge like; central teeth without latero-basal dentitions ..... ***Mysorella*** Godwin-Austen

2. Operculum concentric, thick with central or subcentral nucleus,columellar fold prominent, a well developed groove running downwards from the umbilicus ..... ***Bithynia*** Leach

   Operculum with a distinct but paucispiral figure situated near middle, columellar fold not prominent, a groove running from the umbilicus absent ..... ***Gabbia*** Tryon

Genus ***Bithynia*** Leach, 1818

1818. *Bithynia* Leach, in Abel,s *Narrative of Journey into interior of China,* p. 362.

Subgenus ***Digoniostoma*** Annandale, 1920

1920. *Digoniostoma*, Annandale, *Indian J. Med. Res.*, 7:104.

Key to the species

Shell distinctly umbilicate, spire shorter than bodywhorl .... *B. (D.) cerameopoma* (Benson)

Shell imperforate or subperforate, spire ionger than bodywhorl .... *B. (D.) pulchella* (Benson)

Bithynia (Digoniostoma) cerameopoma (Benson)

1830. *Paludina cerameopoma* Benson, *Gleaning in Science, Calcutta*, **2** : 125

1989. *Digoniostoma cerameopoma*: Subba Rao, Handbook Freshwater Molluscs of India, p. 79, fig. 121.

Materials : i) 2 exs., Dharmavaram tank, Annantapur,, 30.9.99, ii) 12 exs. Bukkapatnam tank Annantapur, 30.3.1999, iii) 1 ex. Buckinghum channel, Vitapalem, Prakasam, 21.4.

2000, Coll. S.C. Mitra and S. Barua; iv) 11 exs., Manjira Lake, Sangareddy Medak, 9.5.01, v) 1 ex., Palkonda tank, Srikakulam, 30.4.01, vi) 9 exs., Wyra Lake, Khammam, 6.5.01, Coll. S. Barua and A. Mukherjee; vii) 2 exs., Sadesivpeta, Sangareddy Medak, 9.5.01, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
10.30 – 5.90	6.50 – 4.20	6.00 – 3.75

Diagnosis : Shell ovate, oblong with a blunt apex, deeply umbilicate with distinct oblique channel, lip at the base of columella strongly reflected.

Distribution : India : Andhra Pradesh (Annantapur, Khammam, Medak, Prakasam, Srikakulum); Assam, Bihar, Madhya Pradesh, Meghalaya, Punjab, Rajasthan, West Bengal.

Elsewhere : Pakistan.

Bithynia (Digoniostoma) pulchella (Benson)

1836. *Paludina pulchella* Benson, *J. Asiat. Soc. Beng.*, **5** : 125

1989. *Digoniostoma pulchella* : Subba Rao, Handbook Freshwater Molluscs of India, p. 80, figs. 113, 114, 119, 120.

Materials : i) Many exs., Waltair (Vishakapatnam), 17.1.1921, Coll. H.S. Rao; ii) 2 exs. Chittoor, 5.4.99, Coll. S.C. Mitra and S. Barua.

Measurements (in mm) :

Length	Diameter	Height of the aperture
3.40 – 6.00	2.90 – 4.25	1.50 – 2.60

Diagnosis : Shell small, elongate, subperforate or imperforate, whorls rounded, body whorl shorter than the spire; suture impressed, aperture oval.

Distribution : India : Andhra Pradesh (Chittoor, Vishakhapatnam); Common throughout.

Elsewhere : Malaya Archipelago, Myanmar, Pakistan.

Genus ***Gabbia*** Tryon, 1865

1865. *Gabbia*, Tryon, *Amer. J. Conch.*, 1 : 216.

Key to the species

1. Shell globose, spire proportionately shorter, columellar callus distinct .... *G.stenothyroides* (Dohrn)

Shell fusiform, spire proportionately longer, columellar callus indistinct .....(2)

2. Sutures deep, columellar margin descending at an angle ..... *G. orcula* (Frauenfeld)

Sutures shallow, columellar margin almost straight ..... *G. travancorica* (Benson)

Gabbia orcula (Frauenfeld)

1862. *Bithynia orcula* Frauenfeld, *Verhandl. Zool. Bot. Ges.*, p. 1154.

1989. *Gabbia orcula*: Subba Rao, Handbook Freshwater Molluscs of India, p. 80, figs. 113, 114, 119, 120.

Materials : i) 1 ex., Mir Alam tank , Hyderabad, 25.3.1999, ii) 1 ex Singarmala tank, Annantapur, 29.3.99, iii) 5 exs., Kawal Palli tank, Annantapur, 31.3.99, Coll. S.C. Mitra and S. Barua, iv) 5 exs., Wyra lake, 6.5.01, v) 2 exs., Bahadurpura Zoological Garden, Hyderabad, 13.5.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm) :

Length	Diameter	Height of the aperture
5.55 – 4.15	4.90 – 3.90	3.20 – 3.00

Diagnosis : Shell globosely conic, smooth, imperforate with four whorls, body whorl swollen, slightly rounded; columellar margin a little reflected.

Distribution : India : Andhra Pradesh (Annantapur, Hyderabad, Khammam); Assam, Bihar, Maharashtra, Punjab, Rajasthan, Uttar Pradesh, West Bengal.

Elsewhere : Malaya Archipelago, Myanmar, Pakistan.

Gabbia stenothyroides (Dohrn)

1857 *Bithynia stenothyroides* Dohrn *Proc. zool. Soc. Lond.*, p. 123.

1989. *Gabbia orcula* : Subba Rao, Handbook Freshwater Molluscs of India, p. 77, figs. 143, 144.

Materials : i) 19 exs, Kamal kanta, Hyderabad, 24.3.1982, ii) 13 exs., Singarmala tank, Annantapur, 29.3.99, iii) 21 exs., Kodagiri, Annantapur, 31.3.99, iv) 2 exs., Kalamukkallai, Bukkapatnam, Annantpur, 30.3.1999,v) 3 exs., Kurnool, 29.3.1999, vi) 3 exs., Kalasamudram, Annantapur, 31.1.1999, vii) 7 exs, Itakaratinagar Kodagiri, Annantapur, 31.1.1999, viii)3 exs., Kawal Palli, Annantapur, 31.3.1999, ix) 1 ex., Gudur river, Cuddapah, 2.4.1999, Coll. S.C. Mitra and S. Barua; x) 2 exs., Manjira lake, Sangareddy Medak, 9.5.01, xi) 4 exs., Pond at Sadesivpeta, Sangareddy Medak, 9.5.01, xii) 2 exs., Gowdapalli, Rangareddy, 11.5.01, Coll. Ramakrishna and Party.

Measurrements (in mm) :

Length	Diameter	Height of the aperture
6.10 – 4.65	4.10 – 3.30	3.90 – 3.30

Diagnosis : Shell globose, whorls 4-5, convex, smooth, spire short, body whorl comparatively larger, mouth contracted.

Distribution : India : Andhra Pradesh (Annantapur, Cuddapah, Hyderabad, Kurnool, Medak, Rangareddy); Maharashtra, Tamil Nadu.

Elsewhere : Sri Lanka.

Gabbia travancorica (Benson)

1860. *Bithynia travancorica* Benson, *Ann. Mag. Nat Hist.*, (3) **6** : 259.

1989. *Gabbia travancorica*: Subba Rao, Handbook Freshwater Molluscs of India,p. 78, figs. 145, 146.

Materials : i) 2 exs., Razampet, 500 ft. Cuddapah, 29.7.1929,Coll. H.S. Pruthi ii) 153 exs., Canal irrigating paddy field near Tungabhadra river, Kurnool, 27.3.99, Coll. S.C.Mitra and S. Barua. iii) 5 exs., Nallapalli near Kakinada, East Godavari, 11.4.2000, Coll. Ramakrishna and Party; iv) 6 exs., Palkonda tank, Srikakulam, 30.4.01, v) 14 exs., Andra reservoir, Vizianagaram, 3.5.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm) :

Length	Diameter	Height of the aperture
5.50 – 3.80	3.15 – 2.50	3.00 – 2.00

Diagnosis : Shell globosely conical, typically narrow, whorls 4-5, suture impressed, imperforate, aperture oval, columellar margin ridge like.

Distribution: India : Andhra Pradesh (Cuddapah, Kurnool, East Godavari, Srikakulum, Vishakhapatnam); Kerala,

Genus *Mysorella* Godwin-Austen, 1919

1919. *Mysorella* Godwin-Austen, *Rec. Indian Mus*, **16** : 211.

Mysorella costigera (Kuester)

1852. *Paludina costigera* Kuester in Martinii-Chemnitz, *Syst Conch. Cab.* **1**(21): 33, pl. 7, figs. 17, 18.

1989. *Mysorella costigera*: Subba Rao, Handbook Freshwater Molluscs of India, p. 84, fig.134.

Materials: i) 7 exs, Pond at Kunta, Cuddapah, 2.4. 99, Coll. S.C. Mitra and S. Barua; ii) 2 exs, Freshwater pool, Manjira Bird Sanctuary Medak, 9.5.01, Coll. S. Barua and A. Mukherjee.

Measurrements (in mm):

Length	Diameter	Height of the aperture
6.50 – 3.35	4.85 – 3.40	3.75 – 3.15

Diagnosis : Shell globosely conical, openly perforate, solid with a large rounded bodywhorl; sculptured with five strongly raised spiral ridges and finer and weaker ridges between them; aperture suborbicular and oblique, peristome simple; pale brown colour.

Distribution : India : Andhra Pradesh (Cuddapah, Medak); Karnataka, Pondicherry, Tamil Nadu.

Elsewhere : Sri Lanka. Recorded for the first time from Andhra Pradesh.

Family THIARIDAE

Subfamily THIARINAE

Key to the genera

1. Height of bodywhorl more often exceeding the height of the spire; shell sculptured with conspicuous nodules, granules, axial ridges or spines ..... (2)

   Height of the bodywhorl less than that of the spire; shell sculptured with axial and spiral ridges but never with spines ..... (3)

2. Shell spinous or sharply nodulose; whorls angular between suture and the periphery; spiral whorls descending in step, pagoda like ..... ***Thiara*** Roeding

   Shell granulose or tessellated with nodules; whorls rounded between suture and the periphery; spiral whorls gradually increasing ..... ***Tarebia*** H. and A. Adams

3. Shell slender and elongated; whorls more than 12; sculptured with spiral striae only ..... ***Stenomelania*** Fischer

   Shell neither slender, nor much elongated; whorls upto 12; sculptured with spiral striae crossed by axial striae ..... ***Melanoides*** Olivier

Genus ***Thiara*** Roeding, 1798

1798. *Thiara* Roeding, *Mus. Bolten.*, **2** : 109.

Thiara scabra (Mueller)

1774. *Buccinum scabrum* Mueller, *Hist. Verm. Terr. Fluv.*, **2** : 136.

1989. *Thiara (Thiara) scabra* : Subba Rao, Handbook Freshwater Molluscs of India, p. 96, figs. 185, 186, 189.

Materials : i) 4 exs., Railway ditch, Nellore, 10.8.1918, Coll. N. Annandale; ii) 7 exs., Gazutapatti, Nallamallai Hills, 10.8.1929, iii) 18 exs., Fisheries deptt. tank, Nallamallai Hills, 14.8.1929, iv) 12 exs., Kadur, Cuddapah, 17.6.1929, Coll. H.S. Pruthi; v) 9 exs., Nagarjuna Sagar, 19.9.1964, Coll. B. Nath; vi)) 3 exs., Tungabhadra river, Kurnool, 27.3.99, vii) 3 exs.,

Fisheries tank, Kurnool, 28.3.99, viii) 8 exs., Penna river near Siddha Vattam, Cuddapah, 2.4.99, ix) 1 ex., Vitapalem, Prakasam, 21.4.2000, Coll. S.C. Mitra and S. Barua. x) 1 ex., Chennur, Cuddapah, 31.12.99, Coll. G.C.Sen and Party; xi) 4 exs., Nagaballi river, Srikakulum, 30.4.01, xii) 3 exs., Andra reservoir, Vizianagaram, 3.5.01, xiii) 2 exs., Wyra lake, Khammam, 6.5.01, Coll. S. Barua and A. Mukherjee; xiv) 5 exs., Manjira lake, Sangareddy, 9.5.01, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
16.10 – 10.00	7.70 – 5.50	7.95 – 5.10

Diagnosis : Shell rather short and broad, whorls slightly flattened above and rounded below, regularly increasing in size; rows of spines present on the whorls; spiral striae on the shell surface strong near umbilical region.

Distribution: India : Andhra Pradesh (Cuddapah, Khammam, Kurnool, Medak, Nellore, Srikakulum); Throughout, except Kashmir.

Elsewhere : Zanzibar to New Hebrides, north to the Philippines

Genus ***Melanoides*** Olivier, 1804

1807. *Melanoides* Olivier, *Voyage a l Emp. Ottoman*, **2** : 40.

Key to the species

Sculpture uniformly strong throughout the shell, outer lip curved at upper angle .... *M. peddamunigalensis* Ray and Roy Chowdhury

Sculpture stronger on upper whorls, outer lip not curved at upper angle ....*M. tuberculata* (Mueller)

Melanoides (Melanoides) peddamunigalensis Ray and Roy Chowdhury

1969. *Melanoides(Melanoides) peddamunigalensis* Ray and Roy Chowdhury, *Proc. zool. Soc., Calcutta*, **22** : 48, figs. 12 – 17.

Mateirals : I) 13 exs., Peddamunigal, Nalgonda, Coll. I.N. Maligee (HT & PT, M 18070/3 & M. 18071/3).

Measurements (in mm) :

Length	Diameter	Height of the aperture
29.00 – 20.20	9.00 – 6.75	9.40 – 6.40

Diagnosis : Shell rather narrowly elongate with a long tapering spire, apex pointed, whorls evenly rounded, suture deep, coarsely sculptured with vertical ribs and spiral striae;

vertical ribs more pointed on body whorl; aperture ovate, outer lip strongly arched forming a curve at upper angle.

Remarks : Although *M. peddamunigalensis* was treated as a synonym of *M. tuberculata* by Subba Rao (1989), pending further investigations, we are inclined to retain it as a distinct species. Strongly arched outer lip distinguishes this speices from the latter. Moreover, we have come across one lot of specimens collected from a Lake at Yarcaud, Shevroy Hills which also posses the same characters. Perhaps this gives further credence to the validity of this species.

Distribution : India : Andhra Pradesh (Nalgonda), Tamil Nadu.

Melanoides tuberculata (Mueller)

1774. *Nerita tuberculata* Mueller, *Hist. Verm. Terr. Fluv.*, **2**: 191.

1989. *Thiara (Melanoides) tuberculata* : Subba Rao, Handbook Freshwater Molluscs of India, p. 103, figs. 183, 184.

Materials : i) 6 exs., small pool near Nandur, Javadi hills, 30.6.29, ii) 57 exs., near Balapatti, Seshachalam, Cuddapah, 27.7.29, iii) 17 exs., Gunyana river, Chival, Veliconda, Cuddapah, 30.7.29, iv) 29 exs., Kadur, Cuddapah, 17.6.29, v) 5 exs., Bowi river Guvalucherruvu, 7.8.29, vii) 10 exs., Sagal Eru stream, 5 miles from Diguvametta, Nallamallai hill, 21.8.29, Coll. H.S. Pruthi; viii) 10 exs., Kundur drainage basin, 29.4.73, ix) 1 ex., Kurnool, 10.8.77, Coll. K.V. Lashminarayana; x) 8 exs., Muthyala tank near Kadagiri, Annantapur, 31.3.99, xi) 2 exs., Penna river near Siddha Vattam, Cuddapah, 2.4.99, xii) 2 exs., Gudur, Nandalur, Cuddapah, 2.4.99, Coll. S.C. Mitra and S. Barua. xiii) 15 exs., Pond near Kakinada, East Godavari, 11.4.2000, xiv) 6exs., Nagaballi river, Srikakulam, 28.4.01, xv) 1 ex., Palkonda tank, Srikakulum, 30.4.01, xvi) 9 exs., Andra reservoir, Vizianagaram, 3.5.01, xvii) 2 exs., Wyra lake, Khammam, 6.5.01, Coll. S. Barua and A. Mukherjee xviii) 4 exs., Manjira lake, Sangareddy, 9.5.01, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
30.00 – 17.55	9.20 – 6.10	10.00 – 6.00

Diagnosis : Shell elongated, turreted, with 8 –10 rounded whorls, thick with strong spiral striae and axial ribs; dark red spots and flames present on the surface; aperture pyriform, pointed above and rounded below.

Distribution : India : Andhra Pradesh (Annantapur, Cuddapah, East Godavari Khammam, Kurnool, Nellore, Srikakulum, Vizianagaram);Throughout, except Kashmir.

Elsewhere : North and South Africa.

Genus *Stenomelania* P. Fischer, 1885

1885. *Stenomelania* P. Fischer, *Hist. Nat. des Moll. Viv.Foss. Paris*: **8** vo, fasc viii: p. 701.

Stenomelania torulosa (Bruguiere)

1789. *Bulimus torulosa* Bruguiere, *Encyl.Meth. Vers.*, **1** : 332.

1915. *Thiara (Radina) crenulata* Preston, Fauna British India, Mollusca, (Freshwater Gastropoda and Pelecypoda), p. 11.

1989. *Thiara (Stenomelania) torulosa*: Subba Rao, Handbook Freshwater Molluscs of India, p. 100, fig. 202.

Materials : i) 1 ex, Chirala, 20.4. 2000, ii) 13 exs, Vitapalem, Prakasam, 21.4. 2000, Coll. S.C. Mitra and S. Barua.

Measurements (in mm) :

Length	Diameter	Height of the aperture
68.50 – 67.00	17.15 –16.50	20.00 – 19.55

Diagnosis : Shell elongated turreted, thick; whorls 12 – 14; spiral sculpture crossed by transverse lines forming rectangular nodules; aperture pyriform, rounded below and pointed above, outer lip crenulated.

Distribution : India : Andhra Pradesh (Prakasam, Vishakhapatnam) ; Andaman Islands, Tamil Nadu.

Elsewhere : Malagasy, Malaysia, Philippines, Taiwan and Solomon Islands.

Genus *Tarebia* H. and A. Adams, 1854

1854. *Tarebia* H. and A. Adams, *Genera Recent Moll*, **1**: 304.

Key to the Species

– Shell thicker with a blunt apex and distinct rows of nodules ..... *T. granifera* (Lamarck)

– Shell thinner with a pointed apex and dark spiral lines ..... *T. lineata* (Gray)

Tarebia granifera (Lamarck)

1822. *Melania granifera* Lamarck, *Hist. Nat Anim. Sans. Vert.*, **6(2)**: 167.

1989. *Thiara (Tarebia) granifera*: Subba Rao, Handbook Freshwater Molluscs of India, p. 101, figs. 212 & 213.

Materials : i) 3 exs., Kurnool, 18.9.73, Coll. K.V. Lashminarayana; ii)3 exs., Buckingham Channel, Vitapalem, Prakasam. 21.4.2000 , Coll. S.C. Mitra and S. Barua; iii) 1 ex. Nagaballi river, Srikakulum, 28.4.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm) :

Length	Diameter	Height of the aperture
26.10 – 20.90	11.00 – 9.50	11.50 – 9.30

Diagnosis : Shell elongated conical; sculptured with distinct spiral rows of nodules throughout the shell, spire sharp with a rather blunt apex and flat whorls, height of the bodywhorl more than half of the total length.

Distribution : India : Andhra Pradesh (Prakasam, Kurnool, Srikakulum); Bihar, Madhya Pradesh, West Bengal

Elsewhere : Malagasy, Malaysia, Philippines, Formosa and the Pacific Islands.

Tarebia lineata (Gray)

1828. *Helix lineata* Gray in Wood's *Index Test. Suppl.* p. 24, fig. 68.

1989. *Thiara (Tarebia) lineata*: Subba Rao, Handbook Freshwater Molluscs of India, p.101, fig. 191.

Materials : i) 12 exs, Tungabhadra river, Kurnool, 27.3.99, ii) 4exs., Penna river near Siddha Vattam, Cuddapah, 2.4.99 , iii) 1 ex., Vitapalem, Prakasam, 21.4.2000, Coll. S.C. Mitra and S. Barua; iv) 21 exs., Nagaballi river, Srikakulam, 28.4.01, v) 1 ex., Palkonda tank, Srikakulum, 30.4.01, vi) 2 exs., Wyra lake, 6.5.01, vii) 5 exs., Bhadrachalam, Godavari river, 7.5.01, viii) 1 ex., Manjira lake, Sangaredday, 9.5.01, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
22.65 – 5.00	8.85 – 2.25	8.50 – 2.20

Diagnosis : Shell similar to that of the preceding species but thinner with a more acute apex and dark spiral lines; rows of nodules less distinct and rather obsolete on the lower whorls.

Distribution : India : Andhra Pradesh (Cuddapah, Khammam, Kurnool, Prakasam, Srikakulum); Assam, Bihar, Maharashtra, Madhya Pradesh, Uttar Pradesh, West Bengal.

Elsewhere : Bhutan, Myanmar, Sri Lanka.

Family PLEUROCERIDAE

Subfamily MELANATRINAE

Key to the genera

Shell elongate-turreted, spire longer than body whorl ..... ***Brotia*** H. & A.Adams

Shell globose, spire shorter than body whorl ..... ***Paludomus*** Simpson

Genus ***Brotia*** H. & A. Adams, 1866

1866. *Brotia* H. & A. Adams, *Proc. zool. Soc. Lond.*, p. 150.

Brotia costula (Rafinesque)

1833. *Melania costula* Rafinesque, *Atlantic J.*, **5** : 166.

1989. *Brotia (Antimelania) costula*: Subba Rao, Handbook Freshwater Molluscs of India, p. 108, figs. 192 – 194, 197, 198.

Materials : i) 21 exs., Nallamallai, 13.3.34, Coll. B. Prashad.

Measurements (in mm) :

Length	Diameter	Height of the aperture
44.50 – 21.60	20.85 – 9.50	9.75 – 9.00

Diagnosis : Shell elongated turreted, heavy; whorls 12 – 14, regularly increasing; sculptured with spiral nodulose ridges, axial ribs pointed, often with spines..

Distribution : India : Andhra Pradesh, Manipur, Meghalaya, Mizoram, West Bengal.

Elsewhere : Indonesia, Malaya Archipelago, Myanmar.

Remarks : Shell in this species is highly variable and depending on variations in shell characters a large numbers of varieties and subvarieties were described by different authors.

Subfamily PALUDOMINAE

Genus ***Paludomus*** Swainson, 1840

1840. *Paludomus* Swainson, *Treatise on Malacology*, **1840** : 340.

Paludomus tanschauricus (Gmelin)

1791. *Helix tanschauricus* Gmelin, *Syst. Nat. ed* **13** : 3655, Refer to Chemnitz, *Syst. Conch. Cab.*, **9** : 174, figs. 1246, 1247.

1989. *Paludomus (Paludomus) tanschauricus* : Subba Rao, Handbook Freshwater Molluscs of India, p.118, figs. 221, 252, 253.

Materials : i) 23 exs., Manuja stream near Kuttur, 2100 ft. Yalagiri hill, 10.7.29, Coll. H.S. Pruthi; ii) 1 ex., Penna river near Siddha Vattam, Cuddapah, 2.4.99, iii) 10 exs., Tank at Patha Cuddapah, Cuddapah, 3.4.99, Coll. S.C. Mitra and S. Barua.

Measurements (in mm) :

Length	Diameter	Height of the aperture
17.15 – 12.00	10.00 – 6.75	9.90 – 7.00

Diagnosis : Shell conical, yellowish-brown with dark brown spots running in waves and lines; whorls convex, 6 to 8, first few whorls with keeled spiral ridges.

Distribution : India : Andhra Pradesh (Cuddapah), Kerala, Maharashtra, West Bengal.

Elsewhere : Sri Lanka.

Subclass PULMONATA

Order BASOMMATOPHORA

Family LYMNAEIDAE

Key to the genera

1. Shell elongated turreted, number of whorls 6 ..... ***Stagnicola*** Leach
– Shell ovate, number of whorls 5 ..... (2)
2. Outer lip extending far beyond the body whorl posteriorly, flattened at anterior end, sutures canaliculate; laterals in the radula bicuspid ..... ***Radix*** Montfort
– Outer lip not much extending posteriorly, rounded at anterior end, sutures simple, laterals in the radula tricuspid ..... ***Lymnaea*** Lamarck

Genus ***Lymnaea*** Lamarck, 1799

1799. *Lymnaea* Lamarck, *Prodr. Nouv. Clas. Coq.*, p. 75.

Subgenus ***Pseudosuccinea*** Baker, 1908

Key to the species

1. Spire proportionately long, gradually tapering, outer lip nearly straight and less expanded, sutures transverse ..... *L. luteola* Lamarck
– Spire proportionately short, abruptly pointed, outer lip convex and much expanded, sutures oblique ..... (2)
2. Outer lip pointed below at base ..... *L. biacuminata* Annandale and Rao
– Outer lip broad and rounded at base ..... *L. acuminata* Lamarck

Lymnaea (Pseudosuccinea) acuminata f. typica Lamarck

1799. *Limnaea acuminata* Lamarck, *Hist. Nat. Anim.Sans. Vert.*, **6**(2) : 160.

1989. *Lymnaea (Pseudosuccinea) acuminata f. typica* : Subba Rao, Handbook Freshwater Molluscs of India,p.127.

Materials : *i*) 1 ex. Gunyana river, Chival, 500 ft. Veliconda Hills, Cuddapah, 30.7.29, Coll. H.S. Pruthi; ii) 1 ex., Nagaballi river, Srikakulum, 28.4.01, iii) 3 exs., Andra reservoir, Vizianagaram, 3.5.01, Coll. S. Baura and A. Mukherjee.

Measurements (in mm) :

Length	Diameter	Height of the aperture
20.00	12.85	6.50

Diagnosis : Shell large, ovate with an inflated bodywhorl, spire short and acuminate, outer lip widely expanded.

Distribution : India : Andhra Pradesh (Cuddapah, Srikakulum, Vizianagaram); Throughout.

Elsewhere : Bangladesh, Myanmar, Pakistan.

Lymnaea (Pseudosuccinea) acuminata f. gracilor Martens

1881. *Limnaea acuminata* var. *gracilor* von Martens, *Conch. Mittheil*, **1** : 77.

1989. *Lymnaea (Pseudosuccinea) acuminata f. gracilor* : Subba Rao, Handbook Freshwater Molluscs of India, p.127, figs. 262 & 263

Materials : *i*) 6 exs. Running water canals of Manjira river, Sangareaddy Medak, 9.5.01, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
17.25 – 10.50	6.40 – 4.80	6.80 – 11.85

Diagnosis : Shell similar to f. *rufescens* but much more narrow and linear, spire is proprotionately more produced.

Distribution : India : Andhra Pradesh (Medak); Throughout.

Elsewhere : Myanmar.

Lymnaea (Pseudosuccinea) acuminata f. rufescens Gray

1820. *Limnaea acuminata f. rufescens* Gray in Sowerby, *Genera Rec. Foss. Shells*, **1** : pl. 178, fig. 2.

1989. *Lymnaea (Pseudosuccinea) acuminata f. rufescens* : Subba Rao, Handbook Freshwater Molluscs of India, p.127, figs. 254 & 255

Materials : i) 8 exs., Vishakhapatnam, 8.11.26, Coll. H.A.Vergheese; ii) 19 exs., Ganjam river, Kodur, Cuddapah, 16.6.29, Coll. H.S. Pruthi; iii)2 exs., Tungabhadra river bed, Kurnool, 27.3.99, iv) 17 exs., Mir Alam tank, Hyderabad, 25.3.99, v) 3 exs., Putnam, near Kalasamudram, Annantapur, 31.3.99, vi) 1 ex., Kadagiri, Annantapur, 31.3.99, vii) 2 exs., Vitapalem, Prakasam, 21.4.2000, Coll. S.C. Mitra and S. Barua; viii) 8 exs., Wyra Lake, Khammam, 6.5.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm) :

Length	Diameter	Height of the aperture
34.90 – 24.50	17.40 – 13.10	25.00 – 18.00

Diagnosis : Differs from the typical form in having a proportionately long, acuminate spire and the outer lip being uniformly less expanded.

Distribution : India : Andhra Pradesh (Annantapur, Cuddapah, Hyderabad, Khammam, Prakasam, Vishakhapatnam); Throughout.

Elsewhere : Bangladesh, Myanmar, Pakistan.

Lymnaea biacuminata Anandale and Rao

1925. *Limnaea (Pseudosuccinea) biacuminata* Annandale and Rao, *Rec. Indian Mus.*, **27**: 182, fig. III-2..

1989. *Lymnaea(Pseudosuccinea) biacuminata* : Subba Rao, Handbook Freshwater Molluscs of India,p.128, figs. 277 & 278

Materials : i) 2 exs., Hussain Sagar, Secunderabad, Hyderabad, ZSI Reg. No, M12465/2 (Types).

Measurements (in mm) :

Length	Diameter	Height of the aperture
18.05	9.10	14.50

Diagnosis : This species differs from *L. acuminata* in having the outer lip pointed below resulting in the shell being spindle shaped or acuminate at both ends.

Remarks : This species is known by its type and may actually be a synonym of *L. acuminata* f. *rufescens* with a little variation.

Distribution : India : Andhra Pradesh (Hyderabad); Uttar Pradesh.

Lymnaea (Pseudosuccinea) luteola f. typica Lamarck

1822. *Limnaea luteola* Lamarck, *Hist. Nat. Anim. Sans. Vert.*, **6(2)** : 160.

1989. *Lymnaea (Pseudosuccinea) luteola f. typica* : Subba Rao, Handbook Freshwater Molluscs of India, p. 129, figs. 275 & 276.

Materials : i) 4 exs., Gunyana river at Chiral, 500ft.Veliconda hills, Cuddapah, 16.6.29, Coll. H.S. Pruthi; ii)2 exs., Tungabhadra river bed, Kurnool, 27.3.99, iii) 2 exs., Fisheries tank, Kurnool, 28.3.99, iv) 2 exs., Singarmala tank, Annantapur, 29.3.99, v) 1 ex., Chitravati river, Kasapuram, Annatapur, 303.99, vi) 2 exs., Muthyala tank near Kadiri, Annantapur, 31.3.99, vii) 2 exs., Guddur river, Cuddapah, 2.4.99, Coll. S.C. Mitra and S. Barua, ix) 1 ex., Nagaballi river, Srikakulum, 28.4.01, x) 3 exs., Bahadurpura Zoological Garden, Hyderabad, 13.5.01, Coll. S. Barua and A. Mukherjee; xi) 10 exs., Gowdapally, Rangareddy, 11.5.01, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
24.25 – 16.75	14.80 – 10.60	16.75 – 11.60

Diagnosis : Shell less inflated, thin, glossy, spire gradually tapering and more produced, bodywhorl laterally slightly compressed; aperture rather narrow..

Distribution : India : Andhra Pradesh (Annantapur, Cuddapah, Kurnool, Rangareddy, Srikakulum); Throughout.

Elsewhere : Bangladesh, Myanmar, Nepal, Pakistan.

f. australis Anandale and Rao

1925. *Limnaea (Pseudosuccinea) luteola f. australis* Annandale and Rao, *Rec.Indian Mus.*, **27** : 184, fig. V-3.

1989. *Lymnaea (Pseudosuccinea) luteola f. australis* : Subba Rao, Handbook Freshwater Molluscs of India,p.129, figs. 279, 280.

Materials : i) 33 exs.,Krishna river, Sri Sailam, Kurnool, 29.9.73, Coll. K.V. Lashminarayana; ii) 4 exs., Tank in front of state Bus stand, Chittoor, 3.4.99, Coll. S.C. Mitra and S. Barua; iii) 7 exs., Pond at Sadesivpeta, Sangareddy, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
13.90 – 9.00	8.80 – 5.00	10.70 – 6.15

Diagnosis : Shell comparatively small, spire a little longer than in f. *typica*, bodywhorl rounded, sutures shallow.

Distribution : India : Andhra Pradesh (Chittoor, Kurnool, Medak); Common throughout rest of India.

Elsewhere : Bangladesh, Myanmar, Pakistan, Sri Lanka.

f. impura Troschel

1822. *Limnaea luteola f. impura* Troschel, *Arch.Naturgesch.*, **3** : 172.

1989. *Lymnaea(Pseudosuccinea) luteola f. impura* : Subba Rao, Handbook Freshwater Molluscs of India, p. 129, figs. 281, 282.

Materials : i) 14 exs., Rayguda, Vishakhapatnam, 30.3.26, Coll. H.S. Rao and G. Vargheese ii) 1 ex., Ganjam river Kodur, Cuddapah, 17.6.29, Coll. H.S.Pruthi; iii) 15 exs., Hanumanthan Vanka, Vishakhapatnam, 20.12.40, Coll., H.A. Hafiz; iv) 3 exs., Chennur, Cuddapah, 31.12.99, Coll. G.C. Sen and Party; v) 4 exs., Andra reservoir, Vizianagaram, 7.5.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm) :

Length	Diameter	Height of the aperture
15.85 – 11.00	8.50 – 6.30	10.95 – 8.80

Diagnosis : A narrower form with an elongated spire, perforate, columella distinctly reflected over the perforation.

Distribution : India : Andhra Pradesh (Cuddapah, Hyderabad, Vishakhapatnam, Vizianagaram); Common throughout rest of India.

Elsewhere : Myanmar, Sri Lanka.

f. ovalis Gray

1822. *Limnaea luteola f. ovalis* Gray in Sowerby, *Genera Rec. Foss. Shells*, **1** : pl. 178, fig. 4.

1989. *Lymnaea (Pseudosuccinea) luteola f. ovalis* : Subba Rao, Handbook Freshwater Molluscs of India, p. 129, figs. 266, 267, 283 & 284.

Materials : i) 7 exs., Mir Alam tank, Hyderabad, 26.3.99, Coll., S.C. Mitra and S. Barua.

Measurements (in mm) :

Length	Diameter	Height of the aperture
18.80 – 10.80	12.90 – 7.40	14.25 – 8.00

Diagnosis : Shell subglobose, body whorl roundly inflated, without any compression; spire short and sharp.

Distribution : India : Andhra Pradesh (Hyderabad); Common throughout.

Elsewhere : Myanmar, Sri Lanka.

Genus ***Radix*** Montfort, 1810

1810. *Radix* Montfort, *Conch.Syst*, **2** : 266.

1911. *Radix*: Baker, *Chicago Acad. Sci., Spl. Pub.* **III** : 178.

Following Vaught (1989) *Radix* has been treated as a separate genus.

Radix persica (Issel)

1865. *Limnaea auricularia* var. *persica* Issel, *Moll. Miss. Ital., Persia* (Torino), p. 47.

1989. *Lymnaea (Radix) persica* : Subba Rao, Handbook Freshwater Molluscs of India, p. 133, figs. 304, 305.

Materials : i) 3 exs., Hussain Sagar tank, Secunderabad, 19. 11. 1918, Coll., N. Annandale.

Measurements (in mm):

Length	Diameter	Height of the aperture
10.60 – 10.00	6.00 – 5.80	8.00 – 7.25

Diagnosis : Shell not much large, bodywhorl inflated, spire short, pointed and slightly oblique, sutures deep, canaliculate, a thin columellar callous present. Outer lip well expanded, extends beyond the body whorl posteriorly; columella distinctly reflected and twisted.

Distribution : India : Andhra Pradesh (Hyderabad), Himachal Pradesh, Jammu and Kashmir, Uttar Pradesh.

Elsewhere : Baluchisthan, South Africa.

Remarks : This species is included on the basis of three shells from Hussain Sagar, Secunderabad, present in the National Zoological Collections. As the name of this species suggests *R. persica* is originally from Persia and belongs to a small group of Lymnaeids, which are basically Palaearctic in distribution, also occurring in Northwest India.Occurrence of this species in Andhra Pradesh is as remarked by Annandale and Rao (1925) very 'unusual' But the shells from Secunderabad perfectly agree with the species and moreover since the material was determined by none other than Annandale and Rao, there can not be any reservation regarding the authenticity of the identification.

Genus ***Stagnicola*** Leach, 1830

1830. *Stagnicola* Leach, *Syn. Brit. Moll.*, p. 142.

Though *Stagnicola* was treated as a subgenus under *Lymnaea* by Subba Rao (1989), following Vaught (1989) it is given a generic status.

Stagnicola tungabhadraensis Ray

1967. *Stagnicola (Stagnicola) tungabhadraensis* Ray, *J. Conch.*, **104(1)** : 4, fig. 1.

1989. *Lymnaea (Stagnicola) tungabhadraensis*: Subba Rao, Handbook Freshwater Molluscs India, p. 136, figs. 296, 297.

Materials : i) 1 ex., Canal at Makdona village, Tungabhadra Project area, Kurnool, Coll. Dr. Zaheer Ahmed, ZSI Reg. No. M 17602/3 (Holotype).

Measurements (in mm) :

Length	Diameter	Height of the aperture
18.70	7.95	10.40

Diagnosis : Shell elongate–turreted, perforate, whorls six, rounded, rapidly increasing in size, body whorl large, a little more than half of total length in width, sutures deep; aperture large, outer lip thin and curved, coluemlla twisted and strongly reflected over the perforation.

Distribution : India : Andhra Pradesh (Kurnool).

Remarks : This species is known by its holotype only. As Subba Rao observed occurrence of the Genus *Stagnicola* in Andhra Pradesh is intriguing.

Family PLANORBIDAE

Key to the genera

Shell large (above 5mm in diameter), whorls rounded at the periphery ..... ***Indoplanorbis*** Annandale & Prashad

Shell large (upto 5 mm in diameter), whorls angular or carinate at the periphery ..... ***Gyraulus*** Charpentier

Genus ***Indoplanorbis*** Annandale and Rao, 1921

1921. *Indoplanorbis* Annandale and Rao, *Rec. Indian Mus.*, **22**: 578.

Indoplanorbis exustus (Deshayes)

1834. *Planorbis exustus* Deshayes in Balanger, *Voy Index Orientales*, p.417, pl.1, figs. 11–13.

1989. *Indoplanorbis exustus* : Subba Rao, Handbook Freshwater Molluscs of India,p.142, figs. 326,327.

Materials : i) Many exs., pool near Balapalli, 1000 ft. Seshachalam, Cuddapah, 6.6.29, ii) 2 exs., small stream near Rajampet, Cuddapah, 29.3.29, iii) 22 exs., Gunyana river, Chival, 500 ft. Veliconda hill, Cuddapah, 30.3.29, Coll. H.S. Pruthi; iv) 3 exs., Kondakallia, Anakapalli, Vishakhapatnam, 15.1.41, Coll. H.A. Hafiz; v) 9 exs., Chittivalsa, Bhimlipatnam, Feb. 47, Coll. H.S. Rao and G. Varghees; vi) 2 exs., Kottapalam, Nizampatnam, 28.6.63, Coll. A. Danial; vii) 5 exs., Nagarjuna Hill, Cornur, 30.9.69, Coll. B. Nath; viii) 5 exs., Mir Alam tank, Annantapur, 29.3.99, ix) 2 exs., Dharmavaram tank, Annantapur, 30.3.99, x) 5 exs., Vantimitta tank, Cuddapah, 3.4.99, xi) 2 exs., tank in front of Bus stand Chittoor, 5.4.99, xii) 1 ex., Vitapalam, Prakasam, 21.4.2000 Coll. S.C. Mitra and S. Barua. xiii) 1 ex., Kurnool,

26.12.99, xiv) 1 ex. Chennur, Cuddapah, 31.12.99, Coll. G.C.Sen and Party; xv) 1 ex, Nagaballi river, Srikakulum, 30.4.01, xvi) 1 ex., Andra reservoir, Vizianagaram, 3.5.01 xvii) 1 ex., Wyra lake, Khammam, 6.5.01, xviii) 1 ex., Bahadurpura Zoological Garden, Hyderabad, 13.5.01; Coll. S. Barua and A. Mukherjee; xix) 2 exs., Pond at Sadesivpeta, Sangareddy, 9.5.01, xx) 5 exs., Godapalli, Rangareddy, 11.5.01, Coll. Ramakrishna and Party.

Measurements (in mm) :

Thickness	Diameter	Height of the aperture
8.70 – 4.00	10.40 – 6.60	7.30 – 4.80

Diagnosis : Shell sinistral, depressedly coiled, large, thick, suture deeply impressed; aperture ear shaped..

Distribution : India : Andhra, Pradesh (Annantapur, Chittoor, Cuddapah, Hyderabad, Khammam, Prakasam, Kurnool, Rangareddy, Sri Kakulum, Vishakhapatnam, Vizianagaram); Throughout.

Elsewhere : Pakistan, Persia, Celebes, Indo-China, Java, Malaya, Myanmar, Sri Lanka, Thailand.

Genus *Gyraulus* Charpenter, 1837

1837. *Gyraulus* (Agassiz MS) Charpentier, *Neue Denkschr. Allg. Schweiz. Gesell.*, **1**(2) : 21.

Key to the species

Last whorl not much wide and not descending in front of aperture .....
.....*G. convexiusculus* (Hutton)

Last whorl distinctly wide and descending in front of aperture .....
..... *G. labiatus* (Benson)

Gyraulus convexiusculus (Hutton)

1849. *Planorbis convexiusculus* Hutton, *J. Asiat. Soc. Beng.*, **18(2)** : 657.

1989. *Gyraulus convexiusculus* : Subba Rao, Handbook Freshwater Molluscs of India,p.154.

Materials : i) Many exs., Gunyana river, Chival, 500 ft. Veliconda hill, Cuddapah, 30.7.29, Coll. H.S. Pruthi; ii) 4 exs., Tungabhadra river, Kurnool, 27.3.99 , iii) 1 ex., Chittoor, 3.4.99, Coll. S.C. Mitra and S. Barua; iv) 3 exs., Pond near Kakinada, E. Godavari, 11.4.2000, Coll. Ramakrishna and Party; v) 8 exs., Andra reservoir, Vizianagaram, 3.5.01, vi) 9 exs., Manjira lake, Sangareddy, 9.5.01, vii) 5 exs., Bahadurpura Zoological Garden, Hyderabad, 13.5.01, Coll. S. Barua and A. Mukherjee; viii) 2 exs., Pond at Sadesivpeta, Sangareddy, 9.5.01, Coll. Ramakrishna and Party.

Measurements (in mm) :

Thickness	Diameter
1.75 – 1.25	7.25 – 3.30

Diagnosis : Shell small, discoidally flattended; whorls 4-5, last whorl subangulate at the periphery.

Distribution : India : Andhra, Pradesh(Chittoor,Cuddapah,Kurnool, East Godavari, Hyderabad, Medak, Vizianagaram); Throughout.

Elsewhere : Philippines.

Gyraulus labiatus (Benson)

1850. *Planorbis labiatus* Benson, *Ann. Mag. Nat. Hist.*, **(2) 5** : 350.

1989. *Gyraulus labiatus* : Subba Rao, Handbook Freshwater Molluscs of India, p.155, figs. 342-344.

Materials : i) 6 exs., Ganjam river near Kodur, 600 ft. Cuddapah, 17.6.29, ii) 2 exs., Fisheries tank, Prema, 800 ft. Nallamallai, 29.7.29, iii) 24 exs., Pullamudga,1500 ft, Cuddapah, 5.8.29, iv) 35 exs., stream at Mahanadi, 800 ft. of Nallamallai hill, 15.8.29, Coll. H.S. Pruthi; v) 1 ex., Kurnool, 29.9.73,Coll. K.V. Lashminarayana; vi) 1 ex., Tungabhadra river Kurnool, 27.3.99, vii) 1 ex., Itakarati tank Kadiri, Annantapur, 31.3.99, viii) 1 ex., Kallamakkallai tank, Bukkapatnam, Annantapur, 31.3.99, Coll. S.C. Mitra and S. Barua; ix) 3 exs., Gowdapalli, Rangareddy, 11.5.01, Coll. Ramakrishna and Party.

Measurements (in mm) :

Thickness	Diameter	Height of the aperture
5.40 – 5.00	1.50 – 1.45	2.95 – 2.90

Diagnosis : Shell obliquely striated; whorls 3 ½ , suture impressed; aperture oblique, heart shaped, body whorl with remarkable departure from the axis of the previous whorls; whitish rib within the aperture.

Distribution : India : Andhra, Pradesh (Annantapur, Cuddapah, Kurnool, Rangareddy); Madhya Pradesh, Maharashtra, Tamil Nadu, West Bengal.

Elsewhere : Myanmar.

Class BIVALVIA

Order ARCOIDA

Family ARCIDAE

Genus ***Scaphula*** Benson, 1834

1834. *Scaphula* Benson, *Proc. zool. Soc. Lond.*, p. 91.

Scaphula nagarjunai Janaki Ram and Radhakrishna

1984. *Scaphula nagarjunai* Janaki Ram and Radhakrishan, *Hydrobiologia,* **119** : 49-55.

Materials : i) 10 exs., River Godavari at Bhadrachalam, Khammam, 7.5.01, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Width	Thickness
6.30 – 4.55	2.40 – 1.40	2.85 – 1.60

Diagnosis : Shell small elongate, subtrapizoidal, equivalve, with a high and acute posterior umbonal carina, conspicuously sculptured by close longitudinal and radial ribs, a few of the longitudinal ribs are more raised, sculpture finer on lower half of the valves, below the carina, teeth on the hinge numerous.

Distribution : India : Andhra, Pradesh (Guntur, Khammam);

Order UNIONOIDA

Family UNIONIDAE

Genus ***Lamellidens*** Simpson, 1900

1900 *Lamellidens,* Simpson, *Proc. Acad., Nat. Sci. Philad.*, **3** : 331.

Key to the species

1. Shell broad, dorsal margin obliquely truncate at posterior end .... *L. consobrinus* (Lea)

   Shell narrower, dorsal margin gradually sloping at posterior margin .....(2)

2. Umbo prominent, colour brown with a lighter band along the margin .... *L. marginalis* (Lamarck)

   Umbo less prominent, colour uniformly dark ..... *L. corrianus (*Lea)

Lamellidens consobrinus (Lea)

1859. *Unio consobrinus* Lea, *Proc. Acad. Nat. Sci. Philad.*, **3**: 331.

1989. *Lamellidens consobrinus* : Subba Rao, Handbook Freshwater Molluscs of India, p. 164, figs. 364-365.

Materials : *i*) 1 valve, Vitapalam, Prakasam, 21.4.2000, Coll. S. C. Mitra and S. Barua; ii) 5 exs., Wyra lake, Khammam, 6.5.01, iii) 1 valve, Manjira lake, Sangareddy, 9.5.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm) :

Length	Width	Thickness
80.85 – 62.15	44.30 – 31.30	29.75 – 21.70

Diagnosis : Shell thick, rhomboidal, umbones more inflated than *L. marginalis;* dorsal margin curved and obliquely truncate, posterior side obtusely angled, anterior side rounded, left valve with 2 cardinals, anterior larger.

Distribution : India : Andhra, Pradesh (Khammam, Medak, Prakasam); Maharashtra, Pondicherry, Tamil Nadu.

Elsewhere : Bangladesh, China, Sri Lanka.

Recorded for the first time from Andhra Pradesh.

Lamellidens corrianus (Lea)

1834. *Unio corrianus* Lea, *Trans. Amer. Philos Soc.,* **6(2)** : 65, pl. 9, fig. 25.

1989. *Lamellidens corrianus* : Subba Rao, Handbook Freshwater Molluscs of India, p. 165, figs. 386-387.

Materials : i) 8 exs., Muddy pool, Secunderabad, Coll. S. W. Kemp; ii) 1 valve,Tungabhadra river, Kurnool, 30.3.99 , Coll. S. C. Mitra and S. Barua.

Measurements (in mm) :

Length	Width	Thickness
72.90 – 52.590	40.00 – 27.20	23.20 – 16.50

Diagnosis : Shell elliptical, elongate with slightly inflated umbones; dorsal margin almost straight and long; periostracum dark brown, smooth; cardinal teeth two in each valve.

Distribution : India : Andhra, Pradesh (Hyderabad, Kurnool); Common throughout.

Elsewhere : Bangladesh to Myanmar.

Lamellidens marginalis (Lamarck)

1834. *Unio marginalis* Lamarck, *Hist. nat. Anim. Sans. Vert.,* **4** : 79.

1989. *Lamellidens marginalis* : Subba Rao, Handbook Freshwater Molluscs of India, p.168, figs. 404-405.

Material : i) 4 exs., Doulaishueram, Anicut, Godavari, 29.9.1918, Coll. N. Annandale; ii) 1 ex., Muthyala tank near Kodigiri, Annantapur, 30.6.29, Coll. H.S. Pruthi; iii) 15 exs., Indira Sagar and Himayat Sagar, 28.6.98,Coll. N.V.Subba Rao; iv) 1 ex.,Penna river near Sidha Vattam, Cuddapah, 2.4.99, Coll. S. C. Mitra and S. Barua.

Measurements (in mm) :

Length	Width	Thickness
92.50 – 60.00	48.75 – 32.50	31.65 – 19.35

Diagnosis : Shell smooth, oblong-ovate; posterior end broad, roundly angular, produced, wing narrow; dorsal margin little curved; ventral margin slightly contracted; periostracum blackish brown; cardinal teeth two on right valve.

Distribution : India : Andhra, Pradesh (Annantapur, Cuddapah, East Godavari, Hyderabad); Common throughout.

Elsewhere : Bangladesh, Myanmar, Sri Lanka.

Family AMBLEMIDAE

Subfamily PARREYSIINAE

Genus ***Parreysia*** Conrad, 1853

1853 *Parreysia,* Conrad, *Proc. Acad., Nat. Sci. Philad.*, **6** : 267.

Key to the subgenera

Shell oval to elliptical, centre of ventral margin swollen, thick, strong beak sculpture ..... ***Parreysia*** *s.str.*

Shell elongate, with almost straight ventral margin, comparatively thin, sculpture not so strong ..... ***Radiatula*** Simpson

Subgenus ***Parreysia*** *s.str.*

Key to the species

Central teeth very strong, 3 or more in number ..... *P. favidens* (Benson)

Central teeth strong, less than 3 in number ..... *P. corrugata* (Mueller)

Parreysia (Parreysia) corrugata laevirostris (Benson)

1862. *Unio laevirostris* Benson, *Ann. Mag. Nat. Hist.*, (3) **10** : 191.

1989. *Parreysia (Parreysia) corrugata laevirostris* : Subba Rao, Handbook Freshwater Molluscs of India, p. 179, figs. 452-453.

Materials : i) 2 exs., Chitravatti river at Kasapuram, Annantapur, 30.3.99,ii) 1 ex. Tungabhadra river, Kurnool, 30.3.99, iii) 1 ex., Penna river near Siddha Vattam, Cuddapah, 2.4.99, iv) 4 exs., Vitapalem, Prakasam, 21.4.200. Coll. S. C. Mitra and S. Barua; v) 1 valve, Nagaballi, river, Srikakulum, 28.4.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm) :

Length	Width	Thickness
47.80 – 20.80	34.60 – 15.00	23.20 – 9.40

Diagnosis : Shell elliptical, thick, nearly smooth, dorsal margin almost straight, posterior end broadly angulate, anterior end well rounded, cardinal teeth strong.

Distribution : India : Andhra, Pradesh (Annantapur, Cuddapah, Kurnool, Prakasham, Srikakulum); Assam, Bihar.

Elsewhere : Bangladesh.

Parreysia (Parreysia) corrugata nagpoorensis (Lea)

1859. *Unio nagpoorensis* Lea, *Proc. Acad. Nat. Sci. Philad.*, **3** : 331.

1859. *Unio wyngungaensis* Lea, *Proc. Acad. Nat. Sci. Philad.*, **3** : 331.

1989. *Parreysia (Parreysia) corrugata nagpoorensis* : Subba Rao, Handbook Freshwater Molluscs of India, p. 180, figs. 450, 451, 482, 483.

Materials : i) 15 exs., Railway ditch, Nellore, 10.8.18, Coll. N. Annandale; ii) 2 exs. Tungabhadra river, Kurnool, 27.3.99, iii) 2 exs., Chitravati river near Kesapuram, Annantapur, 30.3.99, iv) 2 exs., Vitapalem, Prakasam, 21.4.200. Coll. S. C. Mitra and S. Barua.

Measurements (in mm) :

Length	Width	Thickness
52.00 – 36.80	35.50 – 26.90	23.10 – 18.60

Diagnosis : Shell oval, thick, greenish, sculptured with zig-zag marking arranged in rows, concentrated at umbonal region; dorsal margin evenly sloping, anteriorly rounded, posterior end obtusely pointed.

Distribution : India : Andhra, Pradesh (Annantapur, Kurnool, Nellore, Prakasam); Assam, Gujarat, Maharashtra, Orissa.

Elsewhere : Bangladesh.

Parreysia (Parreysia) favidens deltae (Benson)

1862. *Unio favidens var. deltae* Benson *Ann. Mag. Nat. Hist.*, (3)**10** : 189.

1989. *Parreysia (Parreysia) favidens* sub sp. *deltae* : Subba Rao, Handbook Freshwater Molluscs of India, p. 181, figs. 470, 471.

Materials : i) 8 exs., Nagaballi river, Srikakulum,30.4.01, ii) 1ex. Wyra lake, Khammam, 6.5.01, iii) 1 ex., Bhadrachalam, 7.5.01, Coll. S. Barua and A. Mukherjee

Measurements (in mm) :

Length	Width	Thickness
41.80 – 32.90	28.55 – 24.00	16.35 – 15.00

Diagnosis : Shell less elongate, greenish yellow; posterior margin subangulate, umbonal region strongly sculptured, cardinal teeth narrower.

Distribution : India : Andhra, Pradesh (Khammam, Srikakulum); Uttar Pradesh, West Bengal.

Parreysia (Parreysia) favidens marcens (Benson)

1862. *Unio favidens var. marcens* Benson, *Ann. Mag. Nat. Hist*, (3)**10** : 189.

1992. *Parreysia (Parreysia) favidens var. marcens*: Mitra and Dey, *State Fauna Series 3* : *Fauna of West Bengal*, Part **9** : 31.

Materials : i) 82exs., Nagaballi river, Srikakulum,30.4.01,. ii) 1ex.,2 valves, Wyra lake, Khammam, 6.5.01, Coll. S. Barua and A. Mukherjee

Measurements (in mm) :

Length	Width	Thickness
45.40 – 43.05	28.80 – 26.80	18.80 – 18.70

Diagnosis : Shell larger, more elongate, dark brown, umbonal region weakly sculptured, posterior margin broadly rounded.

Distribution : India : Andhra, Pradesh (Khammam, Srikakulum); Assam, Maharashtra, West Bengal.

Subgenus *Radiatula* Simpson, 1900

1900. *Radiatula* Simpson, *Proc. U. S. nat. Mus.*, **22** : 820.

Key to the species

1. Shell with distinct posterior umbonal carina, dorsal margin almost straight ..... (2)

   Shell without distinct posterior umbonal carina, dorsal margin convex .... *P. bonneaudi* (Eydoux)

2. Shell more inflated, sculpture confined to umbonal region .... *P. pachysoma* (Benson)

   Shell less inflated, sculpture extending beyond umbonal region ..... *P. caerulea* (Lea)

Parreysia (Radiatula) bonneaudi (Eydoux)

1838. *Unio bonneaudi* Eydoux, *Mag. de zool cl.*, **5** : 101, pl.119, fig.1, 1a.

1989. *Parreysia (Radiatula) bonneaudi* : Subba Rao, Handbook Freshwater Molluscs of India, p. 187, figs. 510, 511.

Materials : i) 1 ex., Lalamukh, A.P., 13.2.1934, Coll. B. Prashad; ii) 3 exs., Nagaballi river, Srikakulum, 28.4.01, iii) 1 valve, Wyra lake, Khammam, 6.5.01, Coll. S. Barua and A. Mukherjee; iv) 3 exs., Bhadrachalam, Godavari river, 7.5.01, Coll. Ramakrishna and party.

Measurements (in mm) :

Length	Width	Thickness
36.60 – 35.90	21.25 – 19.90	18.10 – 12.90

Diagnosis : Shell elongate, thick, greenish, tumid, finely sculptured on umbonal region, with vertical marking on the rest of the surface, dorsal margin convex, anterior end short, rounded, posterior end long and sloping.

Distribution : India : Andhra Pradesh (Khammam, Srikakulum) : Assam, Manipur.

Parreysia (Radiatula) caerulea (Lea)

1831. *Unio caerulea* Lea, *Trans. Amer. Phil. Soc.*, **4** : 95, pl.13, fig. 25.

1989. *Parreysia (Radiatula) caerulea* : Subba Rao, Handbook Freshwater Mol!uscs of India, p. 188, figs. 516, 517.

Materials : i) 2 exs., Andhra Pradesh; June, 1926, Coll. H.S. Rao and G. Vergheese; ii) 2 exs. Pendlipakalu, Nagarjuna, 25.8.62, Coll. B. Nath; iii) 2 exs., Vitapalem, Prakasam, 21.4.200. Coll. S. C. Mitra and S. Barua.

Measurements (in mm) :

Length	Width	Thickness
42.80 – 30.00	21.50 – 16.40	13.00 – 11.45

Diagnosis : Shell elongate, variable in shape, sculpture restricted to the upper half of the valves in the adult whereas in the young one the whole shell surface is sculptured, posterior umbonal carina very distinct.

Distribution : India : Andhra, Pradesh (Nalgonda, Prakasam, Godavari); Assam, Bihar, Punjab, Uttar Pradesh, West Bengal.

Parreysia (Radiatula) pachysoma (Benson)

1862. *Unio pachysoma* Benson, *Ann. Mag. Nat. Hist.*, (3)10 : 186.

1989. *Parreysia (Radiatula) pachysoma* : Subba Rao, Handbook Freshwater Molluscs of India, p. 192, figs. 540, 541.

Materials : i) 12 exs., 3 kms East of Eatimera village, 20.12.64, Coll. N.V. Subba Rao; ii) 1 ex., Wyra lake, Khammam, 6.5.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm) :

Length	Width	Thickness
51.50 – 45.80	28.30 – 22.60	18.00 – 16.00

Diagnosis : Shell elongate, inflated; umbones much pronounced, hinge strong; radial sculpture absent on the sides.

Distribution : India : Andhra Pradesh (Khammam); Assam, Orissa, West Bengal.

Elsewhere : Bangladesh, Myanmar.

Order VENEROIDA

Family CORBICULIDAE

Genus *Corbicula* Megerle von Muehlfeld, 1811

1811. *Corbicula* Megerle von Muehlfeld, *Mag. Gesell. Naturf. Berlin*, **5**: 56.

Corbicula striatella Deshayes

1854. *Corbicula striatella* Deshayes, *Proc. zool. Soc. Lond.*, **22** : 344.

1989. *Corbicula striatella* : Subba Rao, Handbook Freshwater Molluscs of India, p. 204, figs. 575, 576.

Materials : i) 2 exs., Madhavaram, Nagarjuna, 11.10.63, Coll. B. Nath: ii) 15 exs., Tungabhadra river bed, Kurnool, 27.3.99, iii) 3 exs., Penna river near Siddha Vattam, Cuddapah, 2.4.99, iv) 2 exs., Buckinghum channel, Vitapalam, Prakasam, 21.4.2000, v) 3 exs., Vitapalem Pakasam. 21.4.2000, Coll. S. C. Mitra and S. Barua; vi) 1 valve, Chennur, Cuddapah, 31.12.99, Coll. G.C. Sen and Party; vii) 5 exs, Nagaballi river, Srikakulum, 28.4.01, vii) 1 ex., Wyra lake, Khammam, 6.5.01, viii) 1 ex., Bhadrachalam, Godavari river, 7.5.01, Coll. S Barua and A. Mukherjee; ix) 4 exs., Bhadrachalam, Godavari river, 7.5.01, x) 4 exs., Manjira lake, Sangareddy, 9.5.01, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Width	Thickness
16.75 – 14.50	13.90 – 11.60	9.50 – 7.60

Diagnosis : Shell triangularly ovate, thick, concentrically ribbed, dorsal margin arched,

umbones very prominent, ventral margin rounded, ligament external, cardinal teeth 3, lateral teeth compressed and finely serrated.

Distribution : India : Andhra Pradesh (Cuddapah, Khammam, Kurnool. Medak, Prakasam, Srikakulum); Common throughout.

Elsewhere : Myanmar, Pakistan.

Genus ***Polymesoda*** Rafinesque, 1820

1820. *Polymesoda* Rafinesque, *Monogr. Biv. (ed. Chenu)*, p. 27.

Subgenus ***Geloina*** Gray, 1842

1842. *Geloina* Gray, *Synopsis Brit. Mus.*, p. 75.

Polymesoda (Geloina) erosa (Solander)

1786. *Venus erosa* Solander, *Portland Catalogue*, pp. 71, 186.

1989. *Geloina erosa* : Subba Rao, Handbook Freshwater Molluscs of India, p.210, figs. 595, 596, 599, 600.

Materials : i) 2 exs., Machlipatnam, Krishna district, 16.4.2000, Coll. S.C.Mitra and S. Barua

Measurements (in mm) :

Length	Width
75.50	71.80

Diagnosis : Shell large, subtrigonal, very thick, with concentric striae, ventral margin convex, umbone central, anterior side short, posterior side obtusely two angled; hinge strong; lateral teeth smooth and short; umbonal cavity deep.

Distribution : India : Andhra Pradesh (Krishna).

Elsewhere : Indo-pacific backwaters.

Family PISIDIIDAE

Key to the genera

Posterior end larger than anterior end; beaks anterior, or if subcentral on the anterior side of the centre ..... ***Sphaerium*** Scopoli

Posterior end shorter than anterior end; beaks posterior, or if subcentral on the posterior side of the centre ..... ***Pisidium*** Pfeiffer

Genus ***Sphaerium*** Scopoli, 1777

1777. *Sphaerium* Scopoli *Introductie ad Historiam Naturalem*, p. 397.

Genus ***Pisidium*** Pfeiffer, 1821

1821. *Pisidium* Pfeiffer, *Nat. Deut. Wass. Molli.* pp. 17, 123, pl. 1, fig. 19.

Pisidium clarkeanum G. H. Nevill

1871. *Pisidium clarkeanum* G.& H. Nevill, *J. Asiat. Soc. Beng.*, **40** : 9, pl. 1, figs. 4, 4a-d.

1989. *Pisidium (Afropisidium) clarkeanum* : Subba Rao, Handbook Freshwater Molluscs of India, p. 218, figs. 615, 616.

Materials : i) 4 exs., Nallamallai hills, 29.7.29, ii) 3 exs., Kangumandugum, Cuddapah, 20.9.29, Coll. H.S. Pruthi.

Measurements (in mm) :

Length	Width	Thickness
3.75	3.30	1.90

Diagnosis : Shell minute, oblong tumid; inequilateral, finely striate, umbo distinctly projecting; dorsal anterior margin sloping, posterior margin short; lateral teeth 2 in both valves.

Distribution : India : Andhra Pradesh (Cuddapah); Bihar, Maharashtra, Manipur, Tamil Nadu, Uttar Pradesh, West Bengal.

Elsewhere : Myanmar, Laos, Thailand.

Recorded for the first time from Andhra pradesh.

Sphaerium indicum Deshayes

1854. *Sphaerium indicum* Deshayes, *Proc. zool. Soc. Lond.*, **22** : 342.

1989. *Sphaerium indicum*: Subba Rao, Handbook Freshwater Molluscs of India, p. 213, figs. 600, 601, 612, 613.

Materials : i) 1 ex., Madhavdhara, Simhachalam hills, Vishakhapatnam 9.1.41.

Measurements (in mm) :

Length	Width	Thickness
3.25	8.00	1.35

Diagnosis : Shell minute, oval, inequilateral, finely striate, a single cardinal in right valve, lateral teeth fairly developed.

Distribution : India : Andhra Pradesh (Vishakhapatnam); Plains of India and Himalayas.

Recorded for the first time from Andhra Pradesh.

B. Land

Key to the families

1. Animal without a shell, tentacles contractile ..... VERONICELLIDAE
– Animal with a shell, tentacles retractile ..... (2)
2. Shell with an operculum ..... (3)
– Shell without an operculum ..... (5)
3. Shell ovoid, very narrowly perforate; aperture sometimes with a lamella or sometimes turned upwards ..... DIPLOMMATINIDAE
– Shell depressed to globosely- turbinate, widely umbilicate, aperture simple ..... (4)
4. Peristome double, thickened and circular ..... CYCLOPHORIDAE
– Peristome simple and angled above ..... POMATIASIDAE
5. Shell with denticulate aperture ..... (6)
– Shell with simple aperture ..... (7)
6. Last whorl laterally compressed, aperture much contracted ..... STREPTAXIDAE
– Last whorl not laterally compressed, aperture not much contracted ..... PUPILLIDAE
7. Shell high, elongate, distinctly longer than braod ..... (10)
– Shell usually low, globosely conoid or turbinate, broader than high, rarely as high as braod ..... (8)
8. Shell pyramidal, as high as broad ..... HELIXARIONIDAE
– Shell broader than high ..... (9)
9. Shell widely umbilicate, peristome well expanded and reflected ..... CAMAENIDAE
– Shell narrowly perforate, peristome simple ..... ARIOPHANTIDAE
10. Spire longer than last whorl ..... (12)
– Spire shorter than last whorl ..... (11)
11. Shell thick, large (above 20mm in length), columella truncate at base ..... ACHATINIDAE
– Shell thin, small (less than 10mm in length), columella rounded at base ..... SUCCINEIDAE

12. Shell imperforate, columella usually arched and truncate below (except in the genera *Opeas* and *Zootecus*) ..... SUBULINIDAE

– Shell perforate, columella reflected and rounded below ..... (13)

13. Shell larger, above 15mm in length ..... BULIMINIDAE *(Ena nilagirica)*

– Shell shorter, upto 10mm in length ..... CERASTUIDAE (*Edouardia orbus, Rhachis punctatus)*

Order MESOGASTROPODA

Family CYCLOPHORIDAE

Subfamily CYCLOPHORINAE

Key to the genera

1. Shell with a wing like projection on the peristome, above the aperture ..... ***Pterocyclus*** Benson

– Shell without a wing like projection ..... (2)

2. Shell larger (seldom below 25 mm in diameter), thicker with a raised spire, peristome usually thickened, expanded or reflected ..... ***Cyclophorus*** Montfort

– Shell smaller (seldom exceeding 25 mm in diameter), thinner with a flat or scarcely raised spire, peristome thin, simple ..... ***Theobaldius*** G. Nevill

Genus ***Cyclophorus*** Montfort, 1810

1810. *Cyclophorus* Montfort, *Conchyl Syst.*, **2** : 290.

Cyclophorus polynema Pfeiffer

1854. *Cyclostoma (Cyclophorus?) polynema* Pfeiffer, *Proc. zool. Soc. Lond.*, p. 126.

1921. *Cyclophorus (Lithostylus) polynema* : Gude, *Fauna British India Mollusca*, **3** : 53.

Materials : i) 11 exs., Base of small hill near Phoolbagh Forest Rest House, Vizianagaram, 2.5.01, ii) 1 ex., Sericulture Office garden, Khammam, 6.5.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm) :

Length	Diameter	Height of the aperture
23.85 – 23.00	30.85 – 22.60	15.00 – 12.40

Diagnosis : Shell of moderate size, thick, narrowly but deeply umbilicate, obliquely striate and also spirally lirate, spiral sculpture sharp above, obsolete below; a dark band on the periphery and brown circular patches just below, also zig-zag marking above, whorls 4½,

body whorl subangulate at the periphery and also around umbilicus; aperture oblique, peristome thickened and expanded.

Distribution : India : Andhra Pradesh (Khammam, Vizianagaram); Bihar, Orissa, West Bengal.

Elsewhere : Malaya Penninsula, Myanmar.

Recorded for the first time from Andhra Pradesh.

Genus ***Theobaldius*** G. Nevill, 1878

1878. *Theobaldius* Nevill, *Hand List, Indian Mus.*, **1** : 275.

1921. *Theobaldius* : Gude, *Fauna British India Mollusca*, **3** : 31.

Theobaldius deplanatus (Pfeiffer)

1854. *Cyclostoma deplanatum (Cyclophorus?)* Pfeiffer, *Proc. zool. Soc. Lond.*, p. 301.

1921. *Theobaldius deplanatus* : Gude, *Fauna British India Mollusca*, **3** : 35.

Materials : i) 2 exs., Madhavdhara ,Simachalam hills, Vishakhapatnam, 5.1.41, Coll. ?: ii) 3 exs., Tirupati hills, Tirupati, 9.4.99, Coll. S.C. Mitra and S. Barua iii) 1 ex., Simachalam, Vishakhapatnam, 11.4.2000, Coll. Ramakrishna and Party; iv) 4 exs., Phoolbagh Forest Office, Vizianagaram, 2.5.01, S. Barua and A. Mukherjee.

Measurements (in mm) :

Height	Diameter	Height of the aperture
5.20 – 3.10	12.25 – 7.10	2.90 – 1.50

Diagnosis : Shell depressed, widely umbilicate, light brown with darker markings; spire slightly raised, suture deep, whorls 5, rounded, the last whorl larger, a little descending in front; aperture oblique, subcircular, peristome continuous, expanded.

Distribution : India : Andhra Pradesh (Chittoor, Vishakhapatnam, Vizianagaram); Kerala, Tamil Nadu.

Subfamily PTEROCYCLINAE

Genus ***Pterocyclus*** Benson, 1832

1832. *Pterocyclus* Benson, *J. Asiat. Soc. Beng.*, **i** : 11.

1921. *Pterocyclus* : Gude, *Fauna British India Mollusca*, **3** : 97.

Pterocyclus comatus Moellendorff

1897. *Pterocyclus comatus* Moellendorff, *Nachr.Deuts. Malak.Ges.*, **29** : 36.

1921. *Pterocyclus comatus* : Gude, *Fauna British India Mollusca*, **3** : 102.

Materials : i) 2 exs., Kunderu, 29.9.73, Coll. K.V.Lakminarayana; ii) 3 exs., Tirupati hills, Tirupati, 9.4.99, Coll. S.C. Mitra and S. Barua iii) 1 ex., Simachalam hills, Vishakhapatnam, 11.4. 2000, Coll. Ramakrishna and Party; iv) 10 exs., Phoolbagh, Vizianagaram, 2.5.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm) :

Height	Diameter	Height of the aperture
16.60 – 14.70	7.50 – 6.90	6.15 – 5.65

Diagnosis : Shell depressed, rather discoidal, widely umbilicate, thick, closely striate, regularly marked by brown zig-zag streaks; with a narrow peripheral band, whorls 5 – 5½, suture deep, subcanaliculate, last whorl descending near the aperture; aperture circular, peristome double, the inner deeply cut into a sinus at the upper left angle, the outer making a wing like expansion spreading on the penultimate whorl.

Distribution : India : Andhra Pradesh (Chittoor, Hyderabad, Vishakhapatnam, Vizianagaram); Orissa, Tamil Nadu.

Family DIPLOMMATINIDAE

Subfamily DIPLOMMATININAE

Genus ***Opisthostoma*** Blanford, 1861

1861. *Opisthostoma* Blanford, *J. Asiat. Soc. Beng*, **29** : 121

1921. *Opisthostoma* : Gude, *Fauna British India*, **3** : 296.

Opisthostoma distortum Beddome

1875. *Opisthostoma distortum* Beddome, *Proc. zool. Soc. Lond.*, p. 445.

1921. *Opisthostoma distortum* : Gude, *Fauna British India Mollusca*, **3** : 297.

Materials : I) 1 ex., Golconda Hill, Vishakhapatnam (Holotype).

Measurements (in mm) :

Length	Diameter
0.90	1.30

Diagnosis : Shell minute, irregular, rhomboidal; whorls 4, excentric, distantly costulate, upper one depressed and minute, other three convex and gradually longer; aperture subangularly circular, pointing upwards; peristome touching the pneultimate whorl; pale colour.

It is a strange-shaped minute species, the bodywhorl is curved upward making the aperture and apex facing the same direction, in moving condition the shell is carried upside down with the apex close to the ground.

Distribution : India : Andhra Pradesh (Vishakhapatnam).

Family POMATIASIDAE

Subfamily CYCLOTPSINAE

Genus ***Cyclotopsis*** Blanford, 1864

1864. *Cyclotopsis* Blanford, *Ann. Mag. Nat. Hist.*, (3)13 : 147.

1921. *Cyclotopsis*: Gude, *Fauna British India Mollusca*, **3** : 352.

Cyclotopsis subdiscoidea (Sowerby)

1850. *Cyclotopsis subdiscoidea* Sowerby, *Thes. Conch.*, **1** : 161.

1921. *Cyclotopsis subdiscoidea*: Gude, *Fauna British India Mollusca*, **3** : 354.

Materials : i) 3 exs., Machchatlu caves, Andhra Pradesh, 18.9.73, ii) 19 exs., Kurnool cave, 19.9.73, Coll. K.V. Laksminarayana; iii) 2 exs., Araku valley, Vishakhapatnam, 7.4.2000, Coll. Ramakrishna and Party.

Measurements (in mm) :

Height	Diameter	Height of the aperture
17.75 – 11.20	10.25 – 5.70	7.60 – 4.65

Diagnosis : Shell sublenticular, discoidal, widely umbilicate, spirally grooved, whitish with a pale brownish zone, whorls 4, rounded, sutures rather channeled; aperture circular, peristome thin, reflected, extending shortly along the last whorl and descending a little.

Distribution : India : Andhra Pradesh (Kurnool, Vishakhapatnam); also other parts of Peninsular India.

Order SYSTELLOMMATOPHORA

Family VERONICELLIDAE

Genus ***Filicaulis*** Simroth, 1913

1913. *Filicaulis* Simroth, Reise in *Ostafrika v.a.Voleltzkaw Stuttgart*, p. 202.

Subgenus ***Eleutherocaulis*** Simroth, 1913

1913. *Eleutherocaulis* Simroth, Reise in *Ostafrika v.a.Voleltzkaw Stuttgart*, p. 202.

Filicaulis (Eleutherocaulis) alte (Ferrussac)

1821. *Vaginulus alte* Ferrussac, *Tabl. Syst. Limaces*, p. 14.

1914. *Vaginulus alte* : Gude, *Fauna British India Mollusca*, **2** : 352.

1991. *Laevicaulis alte* : Subba Rao and Mitra, *Rec. Indian Mus., Occ.Paper*, **126** : 36.

Materials : i) 1 ex., Under stone Forest Range Office Compound, Manjira, Medak, 9.5.01, Coll. S. Barua.

Measurements (in mm) :

Length	Diameter
43.25	17.00

Diagnosis : Animal without a shell, elongate, linear in extended condition, completely covered by mantle, dark brownish, usually with a yellowish band down the middle. A deep furrow around the margin separates the mantle from the foot. Head retractile, with two pairs of tentacles which are contractile, sole of foot tripartite, middle portion with numerous markings.

Distribution : India : Andhra Pradesh (Medak); Common throughout tropical parts of the world.

Order STYLOMMATOPHORA

Family PUPILLIDAE

Subfamily PUPILLINAE

Genus ***Pupilla*** Leach in Fleming, 1828

1828. *Pupilla* (Leach) in Fleming, *Brit. Animals*, p. 268.

1914. *Pupilla* : Gude, *Fauna British India Mollusca*, **3** : 281.

Pupilla barrackporensis Gude

1854. *Pupa indica* Pfeiffer, *Proc. zool. Soc. Lond.*, p. 295 (Preoccupied).

1914. *Pupilla barrackporensis* : Gude, *Fauna British India Mollusca*, **2** : 285.

Materials : i) 32 exs., under dry leaves, University campus, Vishakhapatnam, 13.3.1966, Coll. A.S. Rajagopal.

Measurements (in mm) :

Length	Diameter
2.00 – 1.90	1.00 – 0.90

Diagnosis : Shell minute, cylindrical, perforate, obliquely striate;whorls 5, rounded, body whorl large about $^1/_3$rd the total length ; compressed at base, aperture a little oblique, subcircular, truncated above, with four teeth, one columellar, one parietal and two palatal.

Remarks : Since the original name of this species was preoccupied, the new name *Pupilla barrackporensis* was given by Gude (1914).

Distribution : India : Andhra Pradesh (Vishakhapatnam); West Bengal.

Genus ***Pupoides*** Pfeiffer, 1854

1854. *Pupoides* Pfeiffer, *Malak. Blatt.*, **1** : 192.

1914. *Pupilla* : Gude, *Fauna British India Mollusca*, **2** : 259.

Pupoides coenopictus (Hutton)

1834. No 7, *Pupa* Hutton, *J. Asiat.Soc. Beng., 3* : 85, No 7 *Pupa (mihi) coenopicta? Ibid, tom. Cit.*, p. 93.

1914. *Pupoides coenopictus* : Gude, *Fauna British India Mollusca*, **2** : 259.

Materials : i) 7 exs., under leaves, Fisheries compound, Kurnool, 28.3.99 Coll. S.C. Mitra and S. Barua.

Measurements (in mm) :

Length	Diameter	Height of the aperture
430 – 4.10	1.70 – 1.50	1.10 – 1.00

Diagnosis : Shell cylindro-pyramidal, finely striate, greenish-brown; whorls eight; body whorl slightly swollen, spire rather obtuse; aperture rounded, margin reflected and interrupted by the body whorl, a single blunt tooth on the outer lip.

Distribution : India : Andhra Pradesh (Kurnool); Bihar, Delhi, Jammu and Kashmir, Kerala, Maharashtra, Punjab, Tamil Nadu, Uttar Pradesh.

Elsewhere : Afghanistan, Sri Lanka.

Family BULIMINIDAE

Subfamily BULIMININAE

Genus ***Ena*** (Leach) in Turton, 1831

1831. *Ena* (Leach MS) Turton, *Manual*, p. 80.

1914. *Ena* : Gude, *Fauna British India Mollusca*, **2** : 228.

Ena nilagirica (Pfeiffer)

1846. *Bulimus nilagirica* Pfeiffer, *Proc. zool. Soc. Lond.*, p. 41.

1914. *Ena (Mirus) nilagirica* : Gude, *Fauna British India Mollusca*, **2** : 231.

Materials : i) 3 exs., Nagajurna hill, 29.9.63, Coll. B. Nath.

Measurrements (in mm) :

Length	Diameter	Height of the aperture
18.50	7.80	6.00

Diagnosis : Shell oblong-turreted, narrowly perforate, opaque, finely obliquely striate; marked with irregular oblique whitish streaks, whorls 7-8, convex, a little flattened at base; aperture oval; peristome expanded in adult shell.

Remarks : The three shells studied are immature, aperture lips have not formed fully.

Recorded for the first time from Andhra Pradesh.

Distribution : India : Andhra Pradesh (Nalgonda); Arunachal Pradesh, Kerala, Meghalaya, Tamil Nadu..

Family CERASTUIDAE

Key to the genera

Shell with a narrow; infra-peripheral band and whitish oblique streaks; sub angulated on base around the umbilicus ..... ***Rhachis*** Albers

Shell without infra-peripheral band or whitish oblique streaks; not sub-angulated on base around the umbilicus ..... ***Edouardia*** Gude

Genus ***Rhachis*** Albers

1850. *Rhachis* Albers. *Die Heliceen*, p. 164 (*Rachis* auctt. err.).

Rhachis punctatus (Anton)

1839. *Bulimus punctatus* Anton, *Verz. Conch.*, p. 42.

1914. *Rachisellus punctatus*: Gude, *Fauna British India Mollusca*, **2** : 277.

Materials : i) 21 exs., At the feet of Dolphin's nose, Vishakhapatnam, 23.12.1940, Coll. H.A. Hafiz, ii) 1 ex., on the way of Bara cave, 9.9.73, Coll. K.V.Lakminarayana; iii) 10 exs., under bark of a Tamarind tree, Kalasamudram, Ananntapur, 31.3.99, iv) 1 ex., Garden inside Medical College, Kakinada, 13.4.2000; v) 3 exs., bushes near Bhimunipatnam beach,

Vishakhapatnam, 8.4. 2000, vi) 7 exs., Manjira, 9.5.01, vii) 2 exs., Osmania University Campus, 9.5.01, viii) 7 exs., Falaknama Palace, Hyderabad, 10.5.01, Coll. Ramakrishna and Party; ix) 13 exs., Manasa Fort compound, Vizianagaram, 2.5.01, x) 1 ex., Sericulture Office compound, Wyra, Coll. S. Barua and A. Mukherjee.

Measurrements (in mm) :

Length	Diameter	Height of the aperture
13.25 – 5.80	6.10 – 3.30	6.00 – 3.10

Diagnosis : Shell conically ovate, perforate, whitish with transverse fuscous streaks and a single infra peripheral band; whorls seven; scarcely rounded vertically striate; aperture vertical, ovate; peristome slightly thickened and reflected; columella vertical, reflected.

Distribution : India : Andhra Pradesh (Annantapur, East Godavari, Hyderabad, Khammam, Vishakhapatnam, Vizianagaram); Kerala, Laccadive, Maharashtra, Orissa, Tamil Nadu, West Bengal.

Elsewhere : Africa, Zanzibar, Mocambique.

Genus ***Edouardia*** Gude, 1914

1914. *Edouardia* Gude, *Fauna British India Mollusca*, **2** : 280.

Edouardia orbus (Blanford)

1861. *Bulimus orbus* Blanford, *J.Asiat. Soc. Beng.*, **30** : 361, pl. 1, fig. 14.

1914. *Edouardia orbus* : Gude, *Fauna British India Mollusca*, **2** : 280.

Materials : I) 1 ex. Under litter, inside Coffee nursery, Araku Valley, Vishakhapatnam, 7.4.2000, Coll. Ramakrishna and Party; ii) 1 ex. Bahadurpura Zoological Garden, Hyderabad, 13.5.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm) :

Length	Diameter	Height of the aperture
11.30 9.30	5.00 4.60	4.20 - 3.70

Diagnosis : Shell small, thin, horny, oblong-ovate, subperforate, with a raised conical spire, very finely obliquely striate, whorls 6–7, rounded, sutures impressed; aperture sub-oblique, roundly oval, peristome thin, slightly reflected at the perforation, margins joined by a thin callous, upper margin of peristome runs forward along the penultimate whorl for some distance.

Distribution : India : Andhra Pradesh (Hyderabad, Vishakhapatnam); Maharashtra, Tamil Nadu.

Remarks : This is the only species of the East African genus *Edouardia* occurring in India. The single shell collected from the Araku Valley, is a new addition to the National Zoological Collection.

Family SUBULINIDAE

Subfamily SUBULININAE

Key to the genera

1. Columella truncate below, not continuous with basal lip ..... (2)
– Columella rounded below, continuous with basal lip ..... (3)
2. Columella obliquely truncate, sutures crenulated, outer lip sharp ..... ***Subulina*** Beck
– Columella abruptly truncate, sutures simple, outer lip blunt ..... ***Glessula*** Von Martens
3. Shell striate or decussate, peristome thickened ..... ***Zootecus*** Westerland
– Shell smooth except some weak striae, peirstome thin ..... ***Opeas*** Albers

Genus ***Subulina*** Beck

1837. *Subulina* Beck, *Index Moll.*, p. 36.

1914. *Subulina* : Gude, *Fauna British India Mollusca*, **2** : 341.

Subulina octona (Bruguiere)

1798. *Bulimus octonus* Bruguiere, *Encyl. Meth. Vers.*, **1** : 325.

1914. *Subulina octona* : Gude, *Fauna British India Mollusca*, **2** : 341.

1991. *Subulina octona* : Subba Rao and Mitra, *Rec. zool. Surv. India, Occ. Paper*, **126** : 45, pl. 4, fig. 8.

Materials : i) 9 exs., Bahadurpura Zoological garden, Hyderabad, 13.5.2001, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
14.00 – 9.25	3.95 – 3.80	3.80 – 3.20

Diagnosis : Shell thin, translucent, yellowish, turreted, gradually tapering to an obtuse apex, striate throughout, strongly on lower whorls, whorls 8 – 9 rounded, sutures deep and crenulate, last whorl rounded. Aperture suboblique, ovate, columella arched and obliquely truncate at the base, peristome thin.

Distribution : India : Andhra Pradesh (Hyderabad); Andaman and Nicobar islands, Maharashtra, Tamil Nadu.

Elsewhere : Widely distributed through Europe, West Indies, West Africa, North and South America, Sri Lanka and other islands like, Mauritius, Seychelles, New Caledonia etc.

Recorded for the first time from Andhra Pradesh.

Genus ***Glessula*** Von Martens, 1860

1860. *Glessula* Von Martens, *Die Heliceen*, **2** : 254.

1914. *Glessula* : Gude, *Fauna British India Mollusca*, **2** : 377.

Key to the species

1. Shell proportionately broad, nearly thrice as long as broad ..... (2)
– Shell proportionately narrow, nearly twice as long as broad ..... (3)
2. Shell larger, above 20 mm in length ..... *G. subtornenesis* Gude
– Shell smaller, around 10 mm in length ..... *G. brevis* (Pfeiffer)
3. Shell above 10 mm in length, strongly sculptured, columella more arched ..... *G. filosa* Blanford
– Shell less than 10 mm in length, finely sculptured, columella less arched ..... *G. paupercula* Blanford

Glessula brevis (Pfeiffer)

1861. *Achatina brevis* Pfeiffer, *Proc. zool. Soc. Lond.*, **1861** : 387.

1914. *Glessula brevis* : Gude, *Fauna British India Mollusca*, **2**: 439.

Materials : i) 2 exs, Nallapalli, Kakinada, 11.4.2000, ii) 2 exs., Osmania Unversity campus, 9.5.01, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
9.00	5.20	5.20

Diagnosis : Shell conically ovate, transparent, polished; spire conoid with an obtuse apex; whorls 6 – 6½, finely striate; sutures a little oblique; aperture vertical, sinuated, oval, outer lip thin, simple, columella strongly arched, truncate below.

Distribution : India : Andhra Pradesh (East Godavari, Hyderabad); Maharashtra, Orissa.

Recorded for the first time from Andhra Pradesh.

Glessula filosa Blanford

1861. *Glessula filosa* Blanford, *J. Asiat. Soc. Beng.*, **39** : 19, pl. 3, fig. 16.

1914. *Glessula filosa* : Gude, *Fauna British India Mollusca*, **2** : 440.

Materials : i) 21 exs., Inside forest Guest House Compound, Kalasamudram, Annantapur, 31.3.39, Coll. S.C. Mitra and S. Barua; ii) 12 exs., Manasa Fort compound, Vizianagaram, 2.5.01, Coll. S. Barua and A. Mukherjee; iii) 4 exs., Falaknama Palace, Hyderabad, 10.5.01, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
14.90 – 7.95	6.70 – 4.70	6.00 – 4.35

Diagnosis : Shell elongately turreted, sub-rimate, glossy, rather strongly vertically striate, spire elongate, apex obtuse, whorls 7–8, moderately convex; sutures impressed; aperture vertical, suboval, columella arcuate, obliquely truncate below.

Remarks : Though smaller in size, the material from Annantapur are easily identified as *G. filosa* because of their distinct sculpture and the typical form of columella; probably the shells belong to the variety *exigua* Gude (Gude, 1914)

Distribution : India : Andhra Pradesh (Annantapur, Hyderabad, Vizianagaram); Kerala, Tamil Nadu.

Glessula paupercula Blanford

1861. *Glessula paupercula* Blanford, *J. Asiat. Soc. Beng.*, **30** : 62, pt.1, fig. 16.

1914. *Glessula paupercula* Gude, *Fauna British India Mollusca*, **2** : 431.

Materials : i) 7 exs, Coffee Nursery, Araku valley, Vishakhapatnam, 7.4.2000, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
10.40 – 6.50	3.80 – 2.70	4.35 – 3.00

Diagnosis : Shell narrow, elongately turreted, finely striate vertically, sutures impressed, slightly marginate; whorls 7, convex at sides; aperture pyriform, peristome internally slightly labiate, columella arched and truncate.

Distribution : India : Andhra Pradesh (Kurnool, Vishakhapatnam); Kerala, Tamil Nadu.

Glessula subtornensis Gude

1914. *Glessula subtornensis* Gude, *Fauna British India Mollusca*, **2** : 390 fig. 122.

Materials : i) 1 ex., under stones near Madhavdhara, Simachalam Hills, Vishakhapatnam, 5.1.41, Coll.? ; ii) 4 exs., Vishakhapatnam, Aug. 97, Coll. K. V. Surya Rao; iii) 1 ex., Nallamallai, Srisailam, 25.11.99, Coll. P. H. Ray; iv) 2 exs., Phoolbagh Forest Office, Vizianagaram, 2.5.01, Coll. S. Barua and A. Mukherjee; v) 3 exs., under stone, foot of hill, Simachalam, Vishakhapatnam, 9.4.2000, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
33.35 – 12.00	14.10 –6.85	6.65 – 5.65

Diagnosis : Shell oblong-conoid, rather thin, very finely striate; spire conoid; suture impressed, apex rather prominent; whorls 8, scarcely convex; aperture subvertical, broadly truncated, semi-oval; peristome thickened.

Distribution : India : Andhra Pradesh (Vishakhapatnam, Vizianagaram); Kerala, Tamil Nadu.

Remarks : Four live snails of this species collected from Vishakhapatnam were released in a graden at North Kolkata, West Bengal, during September, 1997. The snails thrived very well and as seen in September, 2000, have attained a population density of 20 – 25 /m^2.

Genus ***Opeas*** Albers, 1850

1850. *Opeas* Albers, *Die Helicen*, p. 175.

1914. *Opeas* : Gude, *Fauna British India Mollusca*, **2** : 339.

Opeas gracile (Hutton)

1834. No. 5, *Bulimus*? (mihi) *gracile* Hutton, *J. Asiat. Soc. Beng.*, **3** : 93.

1914. *Opeas gracile*: Gude, *Fauna British India Mollusca*, **2** : 355.

Materials : i) 31exs., under leaves base of hedge, Fisheries Compound, Kurnool, 28..3.99, ii) 1 ex., Garden inside, Siddha Vatham Forest Rest House Compound, 2.4.99, Coll. S.C. Mitra and S. Barua; iii) 19 exs., Adilabad, 28.11.99, Coll. P.H. Ray; iv) 1 ex., Yellaturu, Cuddapah, 31.12.99, Coll. G.C. Sen and Party; v) 14 exs., Garden inside Medical College Compound, Kakinada, 13.4.2000; vi) 1 ex., Falaknama Palace, Hyderabad, 10.5.01, Coll. Ramakrishna and Party; vii) 5 exs., Manasa Fort compound, Vizianagaram, 2.5.01, viii) 3 exs., Sericulture Office ground, Wyra, 6.5.01, ix) 3 exs., Bahadurpura Zoological Garden, Hyderabad, 13.5.01, Coll. S. Barua and A. Mukherjee; x) 3 exs., Tirupati.

Measurements (in mm) :

Length	Diameter	Height of the aperture
18.00–5.60	3.85–1.95	3.65–2.25

Diagnosis : Shell thin, transparent, elongate, with a gradually tapering spire, feebly striate, imperforate or very narrowly perforate, whorls 10-12,rounded; aperture semi-obvate, columella vertical, slightly reflected, outer lip almost straight, slightly edged.

Distribution : India : Andhra Pradesh (Adilabad, Cuddapah, East Godavari, Hyderabad, Khammam, Kurnool, Tirupati, Vizianagaram); Common throughout.

Subfamily RUMININAE

Genus ***Zootecus*** Westerlund, 1887

1887. *Zootecus* Westerlund, *Fauna Paerct. Binnencochyl.*, **3** : 75.

1914. *Zootecus* : Gude, *Fauna British India Mollusca*, **2** : 366.

Key to the species

Aperture ovate, columella descending obliquely before being vertical .... *Z. insularis* (Ehrenberg)

Aperture subquadrate, columella descending in a curve before being vertical..... .... *Z. pullus* (Gray)

Zootecus insularis (Ehrenberg)

1831. *Pupa insularis* Ehrenberg, *Symb. Phys. Anim. Evert.*, (1) : p. 3

1914. *Zootecus insularis* : Gude, *Fauna British India Mollusca*, **2** : 367.

Materials : i) 6 exs., N. of Fisheries Camp, Vishakhapatnam, Feb. 1926, Coll. H.S. Rao; ii) 20 exs., Nagarjuna hill base, 25.7.62, iii) 69 exs., Nagarjuna-Konda valley, Oct. -Nov., 1963, iv) 3 exs., Madhavaram, Nagarjuna Sagar. 11.10.63, Coll. B. Nath; v) 9 exs., Garden inside, Siddha Vatham Forest Rest House Compound, 2.4.99, Coll. S. C. Mitra and S. Barua; vi) 10 exs., Nagarjuna, 28.11.99, Coll. P. H. Ray.

Measurements (in mm) :

Length	Diameter	Height of the aperture
12.55 – 10.85	5.20 – 4.90	3.80 3.40

Diagnosis : Shell subcylindrical, perforate, whitish with decussating sculpture, whorls 7, sutures impressed, aperture vertical ovate, apex rather obtuse; lip of the aperture thickened and reflected.

Distribution : India : Andhra Pradesh (Annantapur, Cuddapah, Nalgonda, Vishakhapatnam); Bihar, Delhi, Jammu & Kashmir, Maharashtra, Punjab, Rajasthan, Uttar Pradesh.

Elsewhere : Myanmar, Sri Lanka, Red Sea.

Zootecus pullus (Gray)

1834. *Zootecus pullus* Gray, *Proc. zool. Soc. Lond.*, p. 66.

1914. *Zootecus pullus* : Gude, *Fauna British India Mollusca*, **2** : 371.

Materials : i) 4 exs., Nagarjunasagar, Nalgonda, 25.7.62, Coll. B. Nath; ii) 1 ex., Alampur, Andhra Pradesh, 21.9.73, iii) 1 ex., Jalapuram, 22.9.73, Coll. K.V. Lashminarayana; iv) 2 exs., Kallamukullai tank on the way to Bukhapatnam, Annantapur, 30.3.99, Coll. S. C. Mitra and S. Barua.

Measurements (in mm) :

Length	Diameter	Height of the aperture
12.15 – 8.55	5.30 – 3.70	3.80 – 2.80

Diagnosis : The shell differs from the other species in being somewhat wrinkled by coarse wavy striae and also in the form of aperture which is more roundish.

Distribution : India : Andhra Pradesh (Annantapur, Nalgonda), Delhi, Tamil Nadu, Uttar Pardesh.

Family ACHATINIDAE

Genus ***Achatina*** Lamarck, 1799

1799. *Achatina* Lamarck, *Mem. Soc. Hist. Nat. Paris*, **7** : 75.

1914. *Achatina* : Gude, *Fauna British India Mollusca*, **2** : 339.

Achatina fulica fulica Bowdich

1822. *Achatina fulica* Bowdich, *Elements of Conchology*, **1** : pl, 13, fig. 3.

1950. *Achatina (Lissachatina) fulica fulica*: Bequart, *Bull. Mus. Comp. zool. Hard.*, **105(1)** : 1–216, pl. 8.

Materials : i) 6 exs., dried up shallow well, Araku valley, Vishakhapatnam, 7.4.2000 Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
73.30 – 73.00	39.15 – 39.05	40.00 – 39.95

Diagnosis : Shell large, ovately conoid, strongly inflated; whorls 8, rapidly increasing in width, bodywhorl large, suture deep, with short spiral striation just below, distinct in lower whorls; pale yellowish to whitish, with brown streaks all over.

Distribution : India : Andhra Pradesh (Vishakhapatnam); Throughout.

Elsewhere : Malagassy, Scychelles, Zanzibar, Mauritius, Sri Lanka.

Family STREPTAXIDAE

Subfamily ENNEINAE

Genus ***Gulella*** Pfeiffer, 1856

1856. *Gulella* Pfeiffer, *Mal. Blatt.*, **3** : 173.

Gulella bicolor (Hutton)

1884. *Pupa bicolor,* Hutton, *J. Asiat. Soc. Beng.*, **3**: 86 & 93.

1908. *Ennea bicolor* : Blanford and Godwin-Austen, *Fauna British India Mollusca,* (Testacellidae and Zonitidae), p. 19.

Materials : i) 3 exs., Among bushes near Bhimunipatnam beach Vishakhapatnam, 8.10.00, ii) 1 ex., Nallapally, South of Kakinada 11.4.00, iii) 3 exs., Garden inside Medical college campus, Kakinada, 13.4.00, iv) 1 ex., Medchel, Rangareddy, 11.5.01, Coll. Ramakrishna and Party; v) 2 exs., Manasa Fort compound, Vizianagaram, 2.5.01, Coll. S. Barua and A. Mukherjee; vi) 2 exs., Falaknama Palace, Hyderabad, 10.5.01, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
7.75 – 6.50	2.50 – 1.95	1.90 – 1.70

Diagnosis : Shell cylindrically turreted, finely striated, apex obtuse, suture impressed, crenulated; whorls 7 – 8½; aperture vertical, truncated, semioval with four teeth, one parietal fold; peristome white, expanded; shell yellowish white.

Distribution : India : Andhra Pradesh (East Godavari, Hyderabad, Rangareddy, Vishakhapatnam, Vizianagaram); Throughout.

Elsewhere : South-EastAfrica, West Indies.

Family SUCCINEIDAE

Subfamily CATINELLINAE

Genus ***Quickia*** Odhner, 1950

1950. *Quickia* Odhner, *Proc .malac.Soc. Lond.*, **20** : 335.

Quickia gravelyi f. deccanensis (Rao)

1924. *Succinea gravelyi* f. *deccanensis* Rao, *Rec. Indian Mus.*, **26** : 403, pl. 28, fig. 14 (Type locality, Kurnool, types NCZ, ZSI).

Materials : i) 1 ex., Holotype, Kurnool, Coll. B. Sunderaj, M 12387/2; ii) 1 ex, under leaf, base of hedge, Fisheries compound, Kurnool, 28.3.99, Coll. S.C. Mitra and S. Barua.

Measurements (in mm) :

Length	Diameter	Height of the aperture
9.70 – 6.00	5.10 – 3.60	6.45 – 4.20

Diagnosis : Shell narrowly ovate, thin, translucent, finely striate, spire short, conical with a blunt apex; whorls 3, convex; aperture ovate, pointed above, rounded below, columellar fold thin, ridge indistinct

Distribution : India : Andhra Pradesh (Kurnool). Known from the type locality only.

Remarks : It is the first subsequent report of the subspecies after it was described in 1924.

Family HELIXARIONIDAE

Genus ***Kaliella*** Blanford, 1863

1863. *Kaliella,* Blanford, *Ann. Mag. Nat. Hist.*, **(3) 11** : 83

Kaliella barrakporensis (Pfeiffer)

1852. *Helix barrakporensis* Pfeiffer, *Proc. zool. Soc. Lond.*, p. 156.

1908. *Kaliella barrakporensis* : Blanford and Godwin-Austen, *Fauna British India Mollusca,* (Testacellidae and Zonitidae), p. 258.

Materials : i) 3 exs., under Eucalyptus tree, Manjira Bird Sanctuary, 9.5.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm) :

Length	Diameter	Height of the aperture
3.80 – 3.50	3.80 – 3.50	2.50 – 2.80

Diagnosis : Shell small, trochiform, thin, very narrowly perforate, obliquely striate above, with concentric striae on base, whorls 6, slightly convex, last whorl keeled, a little swollen below; aperture oblique, quadrately lunate, peristome thin, straight, columellar margin obliquly reflected.

Distribution : India : Andhra Pradesh (Medak). Very widely distributed in the rest of the country.

Elsewhere : Malagassy, Sri Lanka.

Family ARIOPHANTIDAE

Key to the genera

1. Shell sinistral ..... ***Ariophanta*** Desmoulins
– Shell dextral ..... (2)
2. Shell coarsely striate above, often with coloured band; overhanging lobe of the caudal gland in animal absent or blunt, sole of foot indistinctly divided ..... (3)
– Shell smooth or finely striate above, never with coloured band; over hanging lobe of the caudal gland in animal horn shaped, sole of foot indistinctly divided ..... ***Macrochlamys*** Benson
3. Spiral sculpture less pronounced in adult shell, striae without granules; retractor muscle without muscular band ..... ***Cryptozona*** Moerch
– Spiral sculpture strong, oblique ribs with granules arranged spirally; retractor muscle with muscular band ..... ***Euplecta*** Semper

Subfamily MACROCHLAMYDINAE

Genus *Macrochlamys* Benson, 1832

1832. *Macrochlamys,* Benson, *J. Asiat. Soc. Beng.*, **1** : 1376.

1908. *Macrochlamys* : Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae) : 77.

Key to the species

1. Shell conoid, nearly as high as broad ..... *M. tenuicula* A. Adams
– Shell depressed, twice as broad as high ..... (2)
2. Spire flat, spiral sculpture absent ..... *M. perplana* Godwin-Austen
– Spire raised, spiral sculpture present ..... (3)
3. Basal margin of shell not reflected ..... *M. perrottetti* (Pfeiffer)
– Basal margin of shell reflected ..... *M. indica* Godwin-Austen

Macrochlamys indica Godwin-Austen

1883. *Macrochlamys indica* Godwin-Austen, *Moll. Ind.* **1** : *76,* 97.

1908. *Macrochlamys indica*: Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae) : 95.

Materials : i) 7 exs., Forest Range Office, Compound, Manjira, Medak, 9.5.2001, Coll. Ramakrishna and Party; ii) i) 5 exs., Bahadurpura Zoological Garden, 13.5.01, S. Barua and A. Mukherjee.

Measurements (in mm) :

Length	Diameter	Height of the aperture
9.40 – 7.80	17.55 – 15.30	8.00 – 6.60

Diagnosis : Shell depressed with a little raised spire, narrowly perforate, with microscopic spiral markings, whorls 5-6; last whorl rounded at the periphery; aperture lunate, subvertical, columellar margin obliquely descending, reflected above.

Distribution : India : Andhra Pradesh (Hyderabad, Medak); Common throughout.

Elsewhere : Sri Lanka.

Macrochlamys perplana Godwin-Austen

1883. *Macrochlamys perplana* Nevill MS. Godwin-Austen *Moll. Ind.* **1**: 94.

1908. *Macrochlamys perplana* : Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae) : 99.

Materials : i) 2 exs., Nallapalli, South of Kakinada 11.4.2000, Coll. Ramakrishna and Party; ii) 1 ex., Phoolbagh Forest Office, Vizianagaram, 2.5.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm) :

Length	Diameter	Height of the aperture
7.15 – 3.70	17.25 – 7.30	7.10 – 3.50

Diagnosis : Shell perforate, smooth and shining, depressed; spire flat; whorls 6: the last broad and rounded; aperture broadly lunate, columellar margin oblique and curved, expanded near the perforation.

Distribution : India : Andhra Pradesh (East Godavari, Vizianagaram); Orissa, West Bengal.

Recorded for the first time from Andhra Pradesh.

Remarks : Shell of this species is similar to *M. petrosa*, but more depressed, with a scarecly raised spire, also not excavated around the perforation.

Macrochlamys perrotteti (Pfeiffer)

1883. *Macrochlamys perrotteti* Pfieffer, *Zeist. Moll.*, p. 13.

1908. *Macrochlamys perrotteti* : Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae) p. 136.

Materials : i) 1 ex., Barra cave, Vishakhapatnam, 9.9.93, Coll. K. V. Lakhminarayana; ii) 6 exs., from litters inside Coffee nursury's area, Vishakhapatnam, 7.4.2000; iii) 5 exs., Nallapalli, South of Kakinada 7.4.2000; iv) 2 exs., foothill of Simachalam, Vishakhapatnam, 9.4.2000, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
5.80 – 2.30	10.35 – 5.00	5.15 – 2.20

Diagnosis : Shell thin, smooth, perforate with close microscopic spiral striation; spire very low, suture slightly impressed; whorls 5 ½, rather convex; aperture subvertical, lunate; peristome thin, basal margin oblique and expanded, but not reflected.

Distribution : India : Andhra Pradesh (East Godavari Vishakhapatnam); Tamil Nadu.

Recorded for the first time from Andhra Pradesh.

Macrochlamys tenuicula H. Adams

1868. *Macrochlamys tenuicula* H. Adams, *Proc zool. Soc. Lond.*, p. 14.

1908. *Macrochlamys tenuicula* : Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae) p. 130.

Materials : i) 4 exs., Coffee nursery, Araku valley, Vishakhapatnam, 7.4.2000, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
6.00	5.40	3.60

Diagnosis : Shell thin, perforate, conoid, yellow or fulvous horny, polished, spire slightly convex, apex obtuse, suture slightly impressed; whorls 5–6, flat, last whorl subangulate, upper whorls with fine spiral markings; aperture oblique; peristome thin, columella almost vertical above.

Distribution : India : Andhra Pradesh (Vishakhapatnam); Gujarat, Maharashtra.

Recorded for the first time from Andhra Pradesh.

Genus *Ariophanta* Desmoulins, 1829

1829. *Ariophanta* Desmoulins, *Bull. Soc. Berdeaux*, **3** : 235.

1908. *Ariophanta* : Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae), p. 26.

Key to the species

1. Shell thin, horny, columellar margin thin and simple ..... *A. interrupta* (Benson)

   Shell solid not horny, columellar margin thickened and reflected ..... (2)

2. Shell larger, about 30 mm in diameter, rounded at periphery, with broad white band ..... *A. kadapaensis* Nevill

   Shell smaller, upto 30 mm in diameter, angulate at periphery, with narrow chocolate band or without band ..... (3)

3. ..... Shell more depressed, space around umbilicus and parietal wall of aperture white ..... *A. laevipes* (Mueller)

   Shell less depressed, space around umbilicus and parietal wall with chocolate patch ..... *A. laidlayana* (Benson)

Ariophanta interrupta (Benson)

1834. *Ariophanta interrupta* Benson, *Proc zool. Soc. Lond.*, p. 90.

1908. *Ariophanta interrupta*: Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae), p. 31.

Materials : i) 5 exs., Coffee nursury's area, Araku valley, Vishakhapatnam, 7.4.2000, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
24.80 – 18.50	14.30 – 12.00	12.85 – 9.00

Diagnosis : Shell depressedly convex with a blunt apex, thick, sinistral, coarsely and obliquely plicate, decussated by spiral stirae which often become obsolete; body whorl angulate at periphery, smooth and tumid below; aperture widely crescent shaped; peristome thickened, umbilicus deep narrow.

Distribution : India : Andhra Pradesh (Vishakhapatnam); Bihar, Orissa, West Bengal.

Elsewhere : Bangladesh.

Ariophanta kadapaensis Nevill

1878. *Nanina (Ariophanta) kadapaensis* Nevill, *Hand list Mollusca* **1** : 19.

1908. *Ariophanta kadapaensis*: Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae), p. 30.

Materials : i) 2 exs., way to Kurnool cave 19.9.1977, Coll. K.V.Laskhminarayana; 11) 4 exs., under large boulders on the slopes with thorny bushes, bank of large tank, near Kadiri, Annantapur, 31.3.99, Coll. S.C. Mitra and S. Barua; iii) 5exs., Kurnool, Coll.?

Measurements (in mm) :

Length	Diameter	Height of the aperture
24.80 – 22.50	33.95 – 33.00	17.50 – 16.80

Diagnosis : Shell globosely conoid, sinistral, solid, with close set oblique striae, body whorl perfectly rounded; aperture oblique, roundly lunate; umbilicus deep, narrow, columella partly reflected; chestnut brown; area around umbilicus and inside wall of aperture with chocolate patch..

Distribution : India : Andhra Pradesh (Annantapur, Kurnool).

Ariophanta laevipes (Mueller)

1774. *Helix laevipes* Mueller, *Hist. Ver,* **2** : 22.

1908. *Ariophanta laevipes* : Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae), p.29.

Materials : i)1 ex., near the base of a tree, Araku valley, Vishakhapatnam, 7.4.2000, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
17.95	19.60	10.40

Diagnosis : Shell depressed, perforate, thin, sinistral, obliquely striate, decussated with fine spiral line, whitish, with three chocolate bands, spire low, conoid; whorls five, angulate at the periphery; aperture lunate, thickened, reflected, peristome simple above, thickened and reflected below.

Distribution : India : Andhra Pradesh (Vishakhapatnam); Maharashtra.

Ariophanta laidlayana (Benson)

1856. *Helix laidlayana* Benson, *Ann. Mag. Nat. Hist.*, (**2**) **18** : 253.

1908. *Ariophanta laidlayana*: Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae), p. 30.

Materials : i) 1 ex., From stem of a tree, about one meter above the ground, Araku valley, Vishakhapatnam, 7.4.2000, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
19.40	29.60	15.80

Diagnosis : Shell depressed- conoid, obliquely and rather finely striate; body whorl angulate, angulation disapearing near mouth; aperture lunate, oblique, peristome simple, thickened below, umblicus narrow; whitish with or without one or two chestnut spiral bands; umbilical region and parietal wall of aperture with chocolate patch.

Distribution : India : Andhra Pradesh (Vishakhapatnam); Bihar, Orissa, West Bengal.

Genus ***Cryptozona*** Moerch, 1872

1872. *Cryptozona* Moerch, *J. de Conch.*, **20** : 334.

Key to the species

1. Shell with coarse oblique grooves, without decussating sculpture ..... (2)
– Shell with fine oblique striae, decussating with spiral lines ..... (3)
2. Shell uniformly white, without coloured bands ..... *C. albata* (Blanford)
– Shell with coloured bands, sometimes speckled with brown .... *C. maderaspatana* (Gray)
3. Shell with coloured spiral band ..... (4)
– Shell without coloured spiral band ..... (5)
4. Shell swollen at base, with two close narrow bands on body whorl, columellar margin thin and simple; body whorl rounded not descending in front .... *C. bistrialis* (Beck)
– Shell flatter on base, with a broad coloured band along the suture, columellar margin expanded; body whorl angulate and descending in front ..... *C. ligulata* (Ferrussac)
5. Shell narrowly perforate, globse and inflated, body whorl rounded and descending near aperture ..... *C. semirugata* (Beck)
– Shell openly perforate, depressedly globse, body whorl subangulate, not descending ..... *C. belangeri* (Deshayes)

Cryptozona albata (Benson)

1880. *Xestina albata* Blanford, *J. Asiat. Soc. Beng.*, **2** : 189, pl.3, fig. 3.

1908. *Ariophanta albata* : Blanford and Godwin-Austen, *Fauna British India, Mollusca*, (Testacellidae and Zonitidae), p. 37.

Materials : i) 2 exs., Papanassam, Chittoor, 6.4.99, Coll. S.C. Mitra and S. Barua.

Measurements (in mm) :

Length	Diameter	Height of the aperture
22.00–19.30	31.70–31.45	17.50–16.20

Diagnosis : Shell perforate, depressedly globose, thick, coarsely sculptured with rather irregular oblique impressed grooves; no decussating spiral lines; white; aperture lunate, oblique, columella thickened and reflected.

Distribution : India : Andhra Pradesh (Chittoor).

Known from type locality only.

Cryptozona belangeri (Deshayes)

1834. *Helix belangeri* Deshayes, *Voy. Zool.*, p l, fig. 1-3.

1908. *Cryphoxena belangeri*: Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae), p.36.

Materials : i) 12 exs., Tummalabalia, 2300 ft. Palkonda hill, 24.7.29, ii) 15 exs., Malandi, 800 ft. of Nallamallai hills, 12.8.29, Coll. H.S.Purthi; iii) 4 exs., under large boulders among thorny bushes, on the bank of a large tank near Kadiri, Annantapur, 31.3.99, iv) 1 ex., Garden near Forest Rest House, Bhakrapet, Chittoor, 6.4.99, Coll. S.C. Mitra and S. Barua; v) 1 ex., Yellaturu, Cuddapah, 31.12.99, Coll. G. Sen and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
34.35–30.25	41.70–35.45	21.40–19.00

Diagnosis : Shell openly perforate, depressedly globose, obliquely striate; whorls 5–5½, convex; aperture roundly lunate; peristome thin, basal and columellar margins slightly reflected; purplish or whitish in colour.

Distribution : India : Andhra Pradesh (Annantapur, Chittoor, Cuddapah, Nalgonda); Kerala, Tamil Nadu.

Elsewhere : Maldives.

Cryptozona bistrialis (Beck)

1837. *Nanina bistrialis* Beck, *Ind. Moll.*, 1 : 2.

1908. *Cryphoxona bistrialis* : Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae), p.39.

Materials : i) 7 exs., Garden near Forest Rest House, Bhakrapet, Chittoor, 6.4.99, Coll. S.C. Mitra and S. Barua; ii) 2 exs., Khammam, 6.5.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm) :

Length	Diameter	Height of the aperture
19.60 – 12.50	30.60 – 18.20	15.20 – 9.30

Diagnosis : Shell thin and light, perforate, subglobosely depressed, thin, finely striated; decussated above, smooth below with two close rufous lines encircling the body whorl; spire low, convex; whorls 4½; aperture large oblique, lunately ovate; peristome thin, columellar margin slightly reflected.

Distribution : India : Andhra Pradesh (Chittoor, Khammam); Kerala, Tamil Nadu.

Elsewhere : Sri Lanka.

Cryptozona ligulata (Ferrussac)

1819. *Helix ligulata* Ferrussac *Hist. Nat,*. Pt. 13, fig. 2.

1908. *Ariophanta ligulata* : Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae), p. 38.

Materials : i) 5 exs., Nagarjuna, 5.8.62, Coll. B. Nath; ii) 2 exs., Nambur cotton field, 25.9.73, Coll. K.V. Lakshminarayana; iii) 1 ex., Nagarjuna 28.11.99, Coll. P.H. Roy; iv) 1 ex., vellaturu, Cuddapah, 1.1.2000, Coll. G. Sen and Party; v) 3 exs., Manasa Fort, Vizianagaram, 2.5.01, vi) 4 exs., Chinnapally, Vizianagaram, 2.5.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm) :

Length	Diameter	Height of the aperture
31.15 – 27.35	19.15 – 17.00	15.00 – 14.30

Diagnosis : Shell perforate, subglobose, depressed, thick, finely striate; and decussated above; darker above the periphery, usually with a brown band along the suture; whorls 4 ½, nearly flat; aperture large, oblique,

Distribution : India : Andhra Pradesh (Cuddapah, Godavari, Nalgonda, Vizianagaram); Bihar, Kerala, Orissa, Tamil Nadu.

Cryptozona maderaspatana (Gray)

1819. *Helix maderaspatana* Gray, *Proc. zool. Soc. Lond.*, p. 67.

1908. *Ariophanta maderaspatana* : Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae) p. 45.

Materials : i) 36 exs., Kurnool, Coll. G. Nevill.

Measurements (in mm) :

Length	Diameter	Height of the aperture
20.50 – 13.95	26.90 – 17.50	13.10 – 9.95

Diagnosis : Shell openly perforate, depressedly globose, thin, rugosely obliquely striated, dull brownish; spire depressedly convex; whorls 5½, convex, the last more swollen; aperture oblique; peristome simple, thin, slightly expanded.

Distribution : India : Andhra Pradesh (Kurnool): Tamil Nadu.

Distribution : India : Andhra Pradesh (Hyderabad), Common throughout.

Elsewhere : Myanmar, Sri Lanka.

Cryptozona semirugata (Beck)

1837. *Galaxis semirugata,* Beck, *Ind.*, p. 42.

1908. *Ariophanta semirugata*: Blanford and Godwin-Austen, *Fauna British India Mollusca,* (Testacellidae and Zonitidae), p.35.

Materials : i) 8 exs., Near Kurnool cave, 19.9.73, ii) 3 exs., Jalapuram, 21.9.73,Coll. K.V. Lakshminarayana; iii) 4 exs., Under dry leaf and stones, Siddha Vatham Forest Compound, Cuddapah, 2.4.99, Coll. S.C. Mitra and S. Barua; iv) 9 exs, Falaknama Fort, Hyderabad, 10.5.01, Coll. S. Barua and A. Mukherjee; v) 4 exs., Falaknama Palace, Hyderabad. 10.5.01, Coll. Ramakrishana and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
30.00 – 24.50	34.50 – 28.20	20.60 – 15.30

Diagnosis : Shell perforate, globose, conoid to depressedly globose, suture very little impressed; whorls 5-6, slightly convex; body whorl much inflated, descending near the aperture, aperture roundly or ovately lunate; peristome thin, reflected over the umbilicus.

Distribution : India : Andhra Pradesh (Cuddapah, Hyderabad, Kurnool); Gujarat, Tamil Nadu.

Elsewhere : Northern Sri Lanka.

Genus ***Euplecta*** Semper, 1870

1817. *Euplecta* Semper, *Reise Phil. Wiss.Res.,* **3** : 14.

1908. *Euplecta* : Blanford and Godwin-Austen, *Fauna of British India, Mollusca,* (Testacellidae and Zonitidae), p. 51.

Key to the species

1. Shell without spiral striae on base ..... (2)

   Shell with spiral striae on base ..... (3)

2. Shell extremely thin, transparent, with whitish streaks, margins of aperture joined by a thin callous ..... *E. infausta* (Blanford)

   Shell thin, opaque, without whitish streaks, margins of aperture not joined .... *E. subdecussata* (Pfeiffer)

3. Sprial striae on base limited to subperipheral zone, columellar margin and basal margin of peristome thickened ..... *E. indica* (Pfeiffer)

   Sprial striae on base extend upto umbilical region, columellar margin and basal margin of peristome thin ..... *E. travancorica* (Benson)

Euplecta indica (Pfeiffer)

1846. *Euplecta indica*, Pfeiffer, *Symb.*, **3** : 66.

1908. *Euplecta indica* : Blanford and Godwin-Austen, *Fauna British India, Mollusca*, (Testacellidae and Zonitidae), p. 60.

Materials : i) 2 exs., Foot hill of Simachalam range, Simachalam, Vishakhapatnam, 9.4.2000, ii) 5 exs., Garden inside Medical College compound, Kakinada , 13.4.2000, Coll. Ramakrishna and Party; iii) 11 exs., Palkonda, Srikakulum, 30.4.01, Coll. S. Barua and A. Mukherjee; iv) 3 exs., Medchel, Rangareddy, 11.5.01, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
16.70 – 16.10	9.10 – 9.00	5.80 – 4.90

Diagnosis : Shell perforate, subturbinate lenticular, rather solid; sculptured by arcuate costulations, decussated by spiral lines; spire conoid, with convex sides; whorls 5 ½ -6 slightly convex; the last keeled; aperture oblique, angularly lunate; peristome obtuse, white, columellar margin curved and reflected.

Distribution : India : Andhra Pradesh (East Godavari, Rangareddy, Srikakulum, Vishakhapatnam); Karnataka, Kerala, Maharashtra, Tamil Nadu.

Elsewhere : Maldives, Sri Lanka.

Euplecta infausta (Blanford)

1866. *Nanina (Macrochlamys) infausta*, Blanford, *J. Asiat. Soc. Beng*, **2** : 36.

1908. *Macrochlamys infausta*: Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae), p.133.

1989. *Euplecta infausta*: Subba Rao *et.al., Fauna of Orissa*: *State Fauna Series*, **1(2)** : 270, fig. 6a.

Materials : i) 4 exs., on the way to Bara cave, 9.9.73, Coll. K.V. Lakshinarayana; ii) 1 ex., Among bushes near Bhimunipatnam beach, Vishakhapatnam, 8.4.2000, Coll. Ramakrishna and Party.

Measurements (in mm) :

Length	Diameter	Height of the aperture
12.15 – 12.00	19.90 – 19.70	8.90 – 8.70

Diagnosis : Shell thin, translucent, openly perforate, with distinct decussated sculpture, spire low, conoid, suture impressed; whorls convex; aperture oblique, roundly lunate; margins converging; peristome thin, basal margin subarcuate; brownish tawny.

Distribution : India : Andhra Pradesh (Vishakhapatnam); Orissa, Tamil Nadu.

Recorded for the first time from Andhra Pradesh.

Euplecta subdecussata (Pfeiffer)

1857. *Euplecta subdecussata*, Pfeiffer, *Proc. zool. Soc. Lond.*, p. 107.

1908. *Euplecta subdecussata*: Blanford and Godwin-Austen, *Fauna British India Mollusca*, (Testacellidae and Zonitidae), p. 55.

Materials : i) 1 ex., Dolphin,s nose, Vishakhapatnam, May-June, 1926, Coll. H. S. Rao and G. Vargheese; ii) 2 exs., Hill at Waltair, 27.12.40, Coll. ? iii) 8 exs., Among bushes near Bhimunipatnam beach, Vishakhapatnam, 8.4.2000, Coll. Ramakrishna and Party; iv) 4 exs., Palkonda, Srikakulum, 30.4.01, v) 8 exs., Bahadurpura Zoological Garden, Hyderabad, 13.5.01, Coll. S. Barua and A. Mukherjee.

Measurements (in mm):

Length	Diameter	Height of the aperture
13.15 – 5.00	17.00 – 8.60	8.50 – 4.80

Diagnosis : Shell thin, perforate, with irregular plicate striations, obsoletely decussate by spiral lines above; glossy; spire conical, apex obtuse; whorls 6, slightly convex; peristome simple, straight, margins not joined, columella scarcely reflected.

Distribution : India : Andhra Pradesh (Hyderabad, Srikakulum, Vishakhapatnam); Maharashtra, Orissa, Tamil Nadu.

Recorded for the first time from Andhra Pradesh.

Euplecta travancorica (Benson)

1865. *Helix travancorica,* Benson, *Anim. Sans. Nat. Hist.,*(3) **15** : 13.

1908. *Euplecta travancorica* : Blanford and Godwin-Austen, *Fauna British India Mollusca,* (Testacellidae and Zonitidae), p. 58.

Materials : i) 1 ex., Under stones, base of Tirumalai hill Tirupati, 9.4.99, Coll. S.C. Mitra and S. Barua.

Measurements (in mm) :

Length	Diameter	Height of the aperture
7.00	11.70	6.30

Diagnosis : Shell thin, perforate, turbinately depressed, horny fulvous, with oblique, costulate striation and spirally arranged granules; spire low conoid, distinctly sculptured above, finely sculptured below; whorls 6, convex, regularly increasing, last whorl keeled; aperture oblique, roundly lunate, peristome thin, basal margin regularly curved.

Distribution : India : Andhra Pradesh (Chittoor); Kerala, Tamil Nadu.

Elsewhere : Sri Lanka

Recorded for the first time from Andhra Pradesh.

Family CAMAENIDAE

Subfamily CAMAENINAE

Genus ***Planispira*** Beck, 1837

1837. *Planispira* Beck, *Index Moll.*, **(1838)** p. 29.

1914. *Planispira* Gude, *Fauna of British India, Mollusca,* **2** : 153.

Planispira asperella (Pfeiffer)

1846. *Helix asperella,* Pfeiffer, *Symb., Hist. Helic.,* **3** : 78.

1914 *Planispira asperella* : Gude, *Fauna British India Mollusca,* **2** : 155.

Materials : i) 1 ex., Near hedges, bank of Penna river, Cuddapah, 2.4.99, Coll. S.C. Mitra and S. Barua; ii) 13 exs., among weeds and underneath fallen bricks, Palkonda, Srikakulam, 30.4.01, iii) 5 exs., Manasa Fort Compound, Vizianagaram, 2.5.01, iv) 1 ex., Sericulture Office compound, Wyra, 6.5.01, Coll. S. Barua and Party.

Measurements (in mm) :

Height	Diameter	Height of the aperture
6.15 – 4.20	15.00 – 9.35	5.40 – 3.65

Diagnosis : Shell depressed, deeply umbilicate, pale whitish, finely striated, apex scarcely raised, whorls 4–4½, flattened above, last whorl subangulate at the periphery and descending near the aperture, swollen at the base, angulate around umbilicus; aperture ovately rounded; peristome a little expanded and reflected, margins approaching.

Distribution : India : Andhra Pradesh (Cuddapah, Khammam, Srikakulam, Vizianagaram); Madhya Pradesh, Maharashtra, Rajasthan.

Recorded for the first time from Andhra Pradesh.

SUMMARY

Total number of species of land and freshwater molluscs occurring in Andhra Pradesh is 103; 43 out of which are freshwater representing 23 genera and 13 families. Land forms include 60 species under 26 genera and 13 families. Of these 80 species are physically studied by us, rest are taken from literature records.

The present report records 19 species (3 freshwater and 16 land) for the first time from the state.

The material studied comprises collections made during 1916 (N. Annandale) and 2001 (Ramakrishna). It also includes some of the very early collections of R.H. Beddome (1875). Material collected from the Eastern Ghats (Nallamallai, Javadi, Seshachalam, Palkonda, Veliconda) by H.S. Pruthi in 1929 contained, among others, the two-minute freshwater bivalves, *Pisidium clarkeanum* and *Sphaerium indicum* both being first records from the state.

GENERAL DISCUSSION

Andhra Pradesh is a part of the Peninsular India, one of the most important zoogeographical zones in the Indian sub continent. Its geographical position makes it a bit special in some respects. It serves as an overlapping zone for the distribution of a number of species. For some of the common freshwater molluscs of north India Andhra Pradesh happens to be the southernmost limit of distribution (e.g. *Tarebia granifera, Gabbia orcula, Digoniostoma cerameopoma, Pila globosa, Bellamya crassa, Parreysia (Radiatula) bonneaudi, P. (R.) pachysoma, Pisidium clarkeanum*). As observed by Subba Rao *et al.* (1985), some of the shells of *Pila* collected from Orissa and adjoining Andhra Pradesh (Srikakulam), show intergrading characters of the two species, *Pila globosa* of the north India and *Pila virens* of the Peninsular India.

On the other hand Peninsular Indian species such as *Gabbia stenothyroides, Gabbia travancorica, Pila virens, Mysorella costigera, Stenomelania torulosa, Paludomus tanschauricus, Lamellidens consobrinus* are widely distributed in the state.

The most interesting and also the intriguing feature of the fauna of freshwater molluscs

is perhaps the occurrence of the two lymnaeids, *Radix persica* and *Stagnicola tungabhadraensis*. The former is the only Palaearctic species of freshwater mollusca recorded from this part of India. And regarding the latter, as Subba Rao (1989) remarks the occurrence of a cold water temperate genus *Stagnicola* in Andhra Pradesh is puzzling. Ray (1967) before assigning the new species to the American genus sought opinions from Prof. J.B. Burch (Michigan University), the world renowned molluscan taxonomist and also Prof. B. Hubendick, the world authority on Lymnaeidae. None could however, definitely suggest any other genus for the species. Two species, *Lymnaea biacuminata* (gastropod) and *Scaphula nagarjunai* (bivalve) are endemic to the state.

Isolation of Andhra Pradesh among the south Indian states is more apparent in its fauna of land molluscs. Whereas around 80 species of land operculates are recorded from Peninsular India as a whole, only 10 species are known from Andhra Pradesh. Beddome (1875) alone described above 20 species of land operculates from south India which included 4 from the state of Andhra Pradesh. Of these 10 species mentioned, 4 are Peninsular Indian in distribution, 4 are endemic to Andhra Pradesh and remaining two are distributed in Orissa also. Some of the south Indian prosobranch genera, *Ditropis, Micraulux, Tortulosa, Nicida, Theobaldius,* are totally absent and some others are poorly represented. Since moist, humid conditions are prerequisite for the occurrence of land operculates, comparative dryness may be one of the reasons for this.

Among pulmonate genera, which are basically Peninsular Indian in distribution, *Euplecta* and *Cryptozona* are well represented; the latter includes one endemic species, *C. albata*. Of the 4 species of *Ariophanta* recorded from the state, *A. laevipes* and *A. laidlayana* have Peninsular Indian distribution though the latter also extends to West Bengal through Orissa. *A. kadapaensis* is an endemic species and *A. interrupta* is perhaps the only species of the genus which extends to northern Bengal and Bihar (also Bangladesh) reaching upto Andhra Pradesh in south. The only species of *Planispira* recorded also occurs in Maharashtra and Madhya Pradesh. *Philalanka, Thysanota, Ruthvenia, Cerastua* and *Corilla* are among the genera not represented. Of the major genera with all India distribution, *Glessula* is well represented, most of the 10 species recorded have south Indian distribution. Out of the seven species of *Macrochlamys* recorded, *M. indica* the commonest Indian species was collected from Medak only. Of the two succineids, *Quickia gravelyi deccanensis* is endemic to Kurnool district and *Succinea godivariana* was described from Andhra Pradesh and has a discontinuous distribution, Myanmar, Andhra Pradesh and West Bengal (sub species *vangiya*). Interestingly *Pupoides coenopictus* and two species of *Zootecus*, the arid zone dwellers were collected from Royalseema region (Kurnool and Cuddapah), known for its dryness.

Ubiquitous species like *Opeas gracile, Achatina fulica fulica, Gulella bicolor, Subulina octona, Kaliella barrakporensis, Pupilla barrackporensis* are all present, though some of them are not as commonly distributed as is usual. Slugs are represented by *Filicaulis alte,* the commonest tropical species.

Three species, *Cryptozona albata, Ariophanta kadapaensis and Quickia gravelyi deccanensis* are endemic to the state.

Eastern Ghats, the broken chain of hills running north to south through the state gives shelter to many of the land molluscs species. The high hill ranges (reaching upto 1,500m) of the northern part of the state in particular, together with a number of well fed streams and rivers, make a significant impact on the distribution of species. Vishakhapatnam, as a district has the highest diversity with 35 – 40 species and is also the type locality of a number of species, (*Opisthostoma distortum, Cyathopoma elatum, Diplommatina gracilis, D. minima, Glessula jeypurensis, G. subjerdoni*). Being in the dry zone (rain-shadow area) the Nallamalai range, running a length of 112 kms in the southern part is less productive from molluscan diversity point of view. However, approximately 20 species are recorded from this zone including a few which were described from these areas, e.g. *Cryptozona albata* (Chittoor), *Ariophanta kadapaensis* (Cuddapah), *Succinea gravelyi deccanensis and Opisthostoma deccanense* (Kurnool).

Approximately 20 species occur in Peninsular India as a whole, some of which extend to other areas including the Andaman Islands and Sri Lanka. Of these 20 species at least 16 are common to both Eastern Ghats and Western Ghats and two (*Ena nilagirica* and *Glessula subjerdoni*) reach up to the Himalayas in the north.

Out of 59 species recorded only seven are endemic to the state. This compares very poorly with the over 60% endemicity level recorded in the fauna of land molluscs of Peninsular India and the Western Ghats taken together (Ramakrishna & Mitra 2002). Apparently the proximity of the Western Ghats, known for its high faunal diversity passing through the other three states of south India, makes this difference. Most of the existing microcentres of endemism in the Peninsular India are located in the Western Ghats. Moreover the overlapping nature of the fauna as mentioned earlier may also be one of the reasons for this low endemicity level in the state.

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ANNELIDA : POLYCHAETA

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INTRODUCTION

Polychaetes, commonly known as bristle worms, are one of the major animal communities in the marine, estuarine and brackish water habitats. The abundance of polychaetes in the above habitats is due to their very high tolerance to wide range of salinity. Majority of these worms are benthic, except some of the families like Syllidae, Alciopidae and Tomopteridae which occur as planktonic forms in the estuarine and marine waters. Benthic polychaetes mostly prefer to different ecological habitats, some occur in sandy or muddy substrata, some are found to be comfortable in the crevices of rocks. The most important works on the taxonomy of polychaetes pertaining to Indian waters are those of Fauvel (1932, 1953). However, our knowledge of the polychaete fauna of Andhra Pradesh coast is based on the works of fauvel (1953). Apart from these, some additional records are also available from Rao and Ganapati (1966, 1967), Radha Krishna and Ganapati (1968), Srinivasa Rao (1980) and Srinivasa Rao and Rama Sarma (1981, 1983).

The present paper deals with 87 species of polychaetes indicate by a list so far recorded from the coastal areas of Andhra Pradesh, of which the present authors have recently collected 27 species from the area. The original reference, diagnostic characters, habitats and distribution data are provided for each species. Further, key to genera and species are also included for easy identification.

A LIST OF POLYCHAETES SPECIES HITHERTO KNOWN FROM THE ANDHRA PRADESH COAST

Family POLYNOIDAE

Genus ***Gattyana***

** *Gattyana deludens* Fauvel, 1932

Family POLYODONTIDAE

Genus ***Polyodontes***

* *Polyodontes maxillosus* Ranzani, 1817

** *Polyodontes melanonotus* (Grube, 1876)

Family SIGALIONIDAE

Genus ***Sthenelais***

* *Sthenelais boa* (Johntston 1839)

Family PISIONIDAE

Genus ***Pisione***

** *Pisione complex* Alikunhi, 1947

Genus ***Pisionidens***

** *Pisionidens indica* (Aiyar & Alikunhi, 1940)

Family AMPHIONOMIDAE

Genus ***Chloeia***

** *Chloeia purva* Baird, 1870

Family PHYLLODOCIDAE

Genus ***Eteonides***

** *Eteonides elongata* (Southern, 1914)

Genus ***Mystides***

** *Mystides southersi* Banse, 1954.

Genus ***Phyllodoce***

** *Phyllodoce malmgreni* Graveir, 1900

** *Phyllodoce tenuissima* Grube, 1878

Family HESIONIDAE

Genus ***Hesione***

** *Hesione gohari* Hartman-Schmarda, 1960

** *Hesione splendida* Savigny, 1818

Genus ***Hesionides***

** *Hesionides arenarius* Friedrich, 1937

Genus ***Leocrates***

** *Leocrates claparedi* (Costa, 1868)

Family PILARGIDAE

Genus ***Ancistrosyllis***

** *Ancistrosyllis constricta* Southern, 1921

Family SYLLIDAE

Genus ***Eusyllis***

** *Eusyllis homocirrata* Hartman-Schmarda, 1958

Genus ***Parapionosyllis***

** *Parapionosyllis subterranca* Hartman-Schmarda, 1960.

Genus ***Petitia***

** *Petitia amphophthalma* Siewing, 1955.

Family NEREIDIDAE

Genus ***Ceratonereis***

* *Ceratonereis burmensis* (Monro, 1937)

* *Ceratonereis costea* (Grube, 1840)

** *Ceratonereis erythraensis* Fauvel, 1918

Genus ***Dendronereis***

** *Dendronereis arborifera* Peters, 1854

Genus ***Dendronereides***

** *Dendronereides heteropoda* Southern, 1921

** *Dendronereides zululandica* Day, 1951

Genus ***Namalycastis***

** *Namalycastis indica* (Southern, 1921)

Genus ***Nereis***

** *Nereis glandicinta* Southern, 1921

** *Nereis lamellosa* Ehlers, 1868

** *Nereis indica* Kinberg, 1866

Genus ***Nectoneanthes***

** *Nectoneanthes ijumai* (Ijuki, 1912)

Genus ***Perinereis***

* *Perinereis aibuhitensis* Grube, 1878

* *Perinereis cultrifera* (Grube, 1840)

Genus ***Pseudonereis***

* *Pseudonereis variegata* (Grube, 1857)

Family NEPHTYIDAE

Genus ***Nephtys***

** *Nephtys dibranchis* Grube, 1877

** *Nephtys oligobranchia* Southern, 1921

Family GLYCERIDAE

Genus ***Glycera***

** *Glycera alba* Muller 1788

* *Glycers lancadivae* Schwarda, 1861

** *Glycera longipinnis* Grube, 1878

** *Glycera rauxii* Audouin & Milne-Edward, 1833

Genus ***Glycinde***

** *Glycinde oligodon* Southern, 1921

Family GONIADIDAE

Genus ***Goniada***

** *Goniada emerita* Audouin & Milne-Edward, 1833

Genus ***Goniadide***

** *Goniadide aciculate* Hartman-Scharda, 1960

Family ONUPHIDAE

Genus ***Diopatra***

* *Dioptra neapolitana* Delle-chiaje, 1841

Genus ***Onuphis***

* *Onuphis eremita* Audin & Milne Edwards, 1833

Family EUNICIDAE

Genus ***Eunice***

* *Eunice gracilis* Grube, 1866

* *Eunice siciliensis* Grube, 1840

** *Eunice tentaculata* Quatrefages, 1865

Genus ***Lysidice***

* *Lysidice collaries* Grube, 1870

Genus ***Marphysa***

* *Marphysa macintoshi* Crossland, 1903

* *Marphysa sanguinea* Montagu, 1815

Family LUMBRINEREIDAE

Genus ***Lumbrinereis***

* *Lumbrinereis heteropoda* (Marenzeller, 1879)]

** *Lumbrinereis impatiens* claparede, 1868

** *Lumbrinereis notocirrata* (Fauvel, 1932)

* *Lumbrinereis polydesma* Schmarda, 1921

Family ARABELLIDAE

Genus ***Arabella***

** *Arabella irricolor* Montagu, 1804

Family ORBINIIDAE

Genus ***Nainereis***

* *Nainereis laevigata* (Grube, 1855)

Genus ***Scolopos***

* *Scolopos kergualensis* Mclntosh, 1885

Family SPIONIDAE

Genus ***Malacoceros***

* *Malacoceros indicus* (Fauvel, 1928)

Genus ***Nerine***

** *Nerine bonnieri* Mensil, 1896

** *Nerine cirratulus* delle-chiaje, 1828

Genus ***Polydora***

** *Polydora kempi* Southern, 1921

Genus ***Prinosopio***

* *Prinospio cirrifera* Wiren, 1883

** *Prinospio krusadensis* Fauvel, 1929

* *Prinospio pinnata* Ehlers, 1901

** *Prinospio saldhana* Day, 1961

Family KAGELONIDAE

Genus ***Magalona***

** *Megalona cincta* Ehlers, 1908

Family DISOMIDAE

Genus ***Poecilochaetus***

** *Poecilochaetus johynsoni* Hartman, 1939

** *Peocilochaetus serpens* Allen, 1904

Family CIRRATULLIDAE

Genus ***Cossura***

** *Cossura coasta* Kitamori, 1960

Genus ***Tharyx***

** *Tharyx marioni* (Saint-Joseph, 1894)

Family STERNASPIDAE

Genus ***Sternaspis***

** *Sternaspis scutata* Renier, 1807

Family CAPITELLIDAE

Genus ***Branchiocapitella***

** *Branchiocapitella singularis* Fauvel, 1932

Genus ***Capitella***

** *Capitella capitata* Fabricius, 1780

Genus ***Capitellethus***

** *Capitellethus dispar* Ehlers, 1907

Genus ***Heteromastus***

** *Heteromastus similis* Southern, 1921

Genus ***Paraheteromastus***

* *Paraheteromastus tenuis* Monro, 1957

Genus ***Pullieda***

** *Pullieda armata* Fauvel, 1929

Family MALDANIDAE

Genus ***Euclymene***

** *Euclymene insecta* Ehlers, 1905

** *Euclymene santanderensis* Rioje, 1917

Family OWENIIDAE

Genus ***Owenia***

* *Owenia fusiformis* Delle-chiaje, 1844

Family AMPHARETIDAE

Genus ***Amphicteis***

** *Amphicteis gunneri* Sars, 1835

Genus ***Isolda***

** *Isolda pulchella* Muller, 1858

Genus ***Melinna***

* *Melinna aberrans* Fauvel, 1932

Family TEREBELLIDAE

Genus ***Eupolymnia***

* *Eupolymnia nebulosa* (Montagu, 1818)

Genus ***Nicolea***

* *Nicolea gracilibranchis* (Grube, 1878)

Family SABELLIDAE

Genus ***Dasychone***

* *Dasychone cingulata* Grube, 1846

Genus ***Potamilla***

** *Potamilla leptochaeta* Southern, 1921

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* Available during present investigation.

** Not available during present investigation.

SYSTEMATIC ACCOUNT

Family I POLYODONTIDAE

Genus 1. ***Polyodontes*** Renier, 1832

(1) ***Polyodontes maxillosus*** Ranzani, 1817

1817. *Polyodontes maxillosus* Ranzani, *Isis von oken*, **1** : 1452–56.

Material : 1 ex., Bandaru vani peta, Srikakulam Dist., 17.ii.1995, coll. R. K. Chakraborty.

Diagnosis : Prostomium bilobed with two stalked eyes, pharynx with four chitinus jaws which are denticulate basally. Three tentacles and smooth, first feet short, branchiae present and penicillate setae absent.

Habitat : Common in the soft muddy bottoms of the shore.

Distribution : India-Andhra Pradesh; Andamans.

Elsewhere : Red Sea; Australia; Mediterranean.

Family II SIGALIONIDAE

Genus 2. ***Sthenelais*** Kinberg, 1855

(2) ***Sthenelais boa*** (Johnston, 1839)

1839. *Sigalion Boa* Johnston, *Ann. Mag. nat. Hist.*, **2** : 439.

Material : 1 ex., Nuval Revu, Srikakulam Dist., 16.iii.1995, R.K. Chakraborty.

Diagnosis : Prostomium globular, body much flattened, oval and convex dorsally. Elytra raniform, fimbriated with ventral surface smooth. A few simple serrate numerous minutes digitiform papillae. Setae in the superior part of the neuropodium.

Habitat : Prefer to occur in burrows in sand on the under surface of rocks in the intertidal zone.

Distribution : India : Andhra Pradesh : Gujarat coast : Krusadai Island ; Maharashtra.

Elsewhere : Mozambique ; Madagascar : Persian Gulf ; Atlantic Ocean ; Mediterranean Sea.

Family III NEREIDIDAE

Key to genera

1. Paragnaths of Gr VI either transeverse bars or transeverse row of small cones 2
- Paragnaths of Gr VI, a single transeverse bar only ..... ***Pseudonereis***
2. Chitinous paragnaths present on some or all groups of both the oral and maxillary sings ..... ***Perinereis***
- Chitinous paragnaths present on the maxillary ring only ..... ***Ceratonereis***

3. Geneus CERATONEREIS Kinberg, 1866

Key to species

Prostomium cleft, neuropodial falcigers present throughout ..... *Ceratonereis costea*

- Prostomium not cleft, neuropodial falcigers confined to a short middle region only ..... *Ceratonereis burmensis*

(3) *Ceratonereis burmensis* Monro, 1937

1937. *Nereis (ceratonereis) burmensis* Monro, *Ann. Mag. Nat. Hist. Lond.*, Sr. 10, **19** : 532.

Material : 6 ex., Perupalam, Visakhapatnam Dist., 9.i.1996; 25 ex., Sakhinetipalli, West Godavari Dist., 11.i.1996, coll. R. K. Chakraborty & A. Misra.

Diagnosis : Prostomium without any groove. Paragnaths absent on basal ring. Notopodia with 3 triangular ligules, neuropodia with 3 lobes. Falcigers confined to a short mid-body region.

Habitat : Commonly occur in sandy soil.

Distribution : India : Andhra Pradesh; Gujarat coast; Goa.

Elsewhere : Indian Ocean; Myanmar.

(4) *Ceratonereis costea* (Grube, 1840)

1840. *Nereis costea* Grube, *Actinien Echinodermen und wiirmen des Adriatischen und Mittelmeeres;* 74.

Material : 3 exs., Nagayalanka, East Godavari Dist., 17.i.1996, R.K. Chakraborty & A. Misra.

Diagnosis : Prostomium cleft, Proboscis with Gr = 0; Gr II = two crescentic rows; Gr III = 3 set in a triangle; Gr IV = square clusters. Anterior feet with 3 notopodial lobes, median one shoter and neuropodial lobes. Falcigerous bristle present throughout body.

Habitat : In burrows of muddy beach.

Distribution : India : Andhra Pradesh; Gujarat.

Elsewhere : Tropical Indo-west Pacific; Atlantic; Mediterraneans.

4. Genus ***Perinereis*** kinberg, 1866

Key to species

Two transeverse paragnaths on Gr VI each side ..... *Perinereis aibuhitensis*

– A single transeverse paragnaths on Gr VI each side, dorsal lobe of Posterior feet not expanded ..... *Perinereis cultrifera*

(5) ***Perinereis aibuhitensis*** Grube, 1878

1878. *Perinereis aibuhitensis* Grube, *Mem. Acad. Sci. S. Peterb.*, **25** : 89.

Material : 5 ex., Antervedi, East Godavari Dist., 8.i.1996, coll. R. K. Chakraborty & A. Misra.

Diagnosis : Prostomium with two antennae, paragnath on Gr I = 2 in a line, Gr II & IV = clusters, Gr III = a transeverse cluster of 3 rows on each side transeverse bars and VII & VIII = 3 rows. Heterogomph spinigers present, falcigerous bristle long, straight terminal piece. Dorsal ligule of the posterior feet short.

Habitat : Occur within clay soil.

Distribution : India : Andhra Pradesh ; Orissa; Andamans; Marmugao Bay.

Elsewhere : Balavia; China; Malay Archipelago; Macassar; Philippine.

(6) ***Perinereis cultrifera*** (Grube, 1840)

1840. *Nereis cultrifera* Grube, *Actinien Echinodermen und wiirmendes Adriatischen und Mittelmeeres* : 74.

Material : 2 ex., Bandaru vanipeta, Srikakulam Dist., 17.ii.1995; 3 ex., Jalaripeta, Visakhapatnam Dist., 26.ii.1995; coll. R. K. Chakraborty.

Diagnosis : Prostomium sub-pyriform with dark longitudinal bands of pigments between anterior pair of eyes. Longest tentacular cirri reaching upte setiger 5-6. Phargngeal paragnath arranged as Gr I = 1-3 cones in line, Gr II & IV = cluster of several cones, Gr III = an oval patch, Gr V = a triangular patch of three cones, Gr VI = a transeverse bar on each side, Gr VII & VIII = 2-3 irregular rows of several cones.

Habitat : Prefer to occur in soft mud and medium coralline sand below surface between low and half-tide levels of intertidal zone.

Distribution : India : Andhra Pradesh; Gujarat; coasta of Maharashtra and Goa; Tuticorin; Pamban; Andamans.

Elsewhere : Widely recorded in Indian Ocean.

5. Genus ***Pseudonereis*** kinberg, 1866

(7) ***Pseudonereis variegata*** (Grube, 1857)

1857. *Nereilapas variegata* Grube, *Vidensk Meddel. fra. d. naturhist. Foren.* kobenhavn, Pt 11 : 164.

Material : 2 ex., Bandaru vani peta, Srikakulam Dist., 17.ii.1995; 4 ex., Visakhapatnam, 26.ii.1995, coll. R. K. Chakraborty.

Diagnosis : Proboscis with Gr I = 1, Gr II & III = dense rows of small dots arranged in conule like structure, Gr IV = wedge shaped cluster, Gr V = 1 dot, Gr VI = a single transeverse bar, Gr VII & VIII = 2-3 irregular rows. Notosetae homogomph spinigers and neurosetae falcigers with short blades.

Habitat : Commly occur within crevices and burrows of rocky substratum.

Distribution : India : Andhra Pradesh; Andamans; Marmugao Bay.

Elsewhere : Widely distributed in circumtropical region.

IV. Family GLYCERIDAE

6. Genus ***Glycera*** Savigny, 1818

(8) ***Glycera lancadive*** Schmarda, 1861

1861. *Glycera lancadive* Schmarda, *Wew. wirbellose Thiere,* **I** : 95.

Material : 1 ex., Pudimadaka, Visakhapatnam Dist., 4.iii.1995, coll. R. K. Chakraborty.

Diagnosis : Prostomium pointed, branchiae absent, parapodia with two subequal, pointed presetal lobes and a rounded postsetal one. Proboscis with two type of papillaes one long with pointed end and other broad with a neil like structure.

Habitat : Actively burrows in abundance throughout the sandy beach.

Distribution : India : Andhra Pradesh; Tamil Nadu; Lakshadweep.

Elsewhere : Myanmar; Sri Lanka; Persion Gulf; Maldive Archipelago; North east Australia; New Caledonia; Pacific Ocean.

V. Family ONUPHIDAE

Key to genera

Branchiae spirally, commencing on setiger 4 ..... ***Diopatra***

– Brachiae simple, starting on setiger 1 ..... ***Onuphis***

7. Genus *Diopatra* Audouin & Milne-Edwards, 1833

(9) *Diopatra neapolitana* Delle-chiaje, 1841

Material examined : 1 ex., Antervedi, East Godavari Dist., 8.i.1996, coll. R.K. Chakraborty & A. Misra.

Diagnosis : Branchiae large with spirally inserted filaments from 4 to 5 foot, increasing in size and then gradually decreasing to disapper at about 40 foot. Pseudocompound setae unidentate or bidentate and comb setae with 5 to 10 coarse teeth on and from 10 foot.

Habitat : Occur in membranous tubes, partly buried in sand and most aboundent in the substratum of mixed sand and mud, decorated with mollusca shells.

Distribution : India : Andhra Pradesh; Gulf of Mannar; Maharashtra; Tamil Nadu.

Elsewhere : Pacific Ocean; China Sea; Gulf of Siam; Indian Ocean; Gulf of Oman; Persion Gulf; Atlantic Ocean; Mediterranean Sea; Red Sea.

8. Genus *Onuphis* Audouin & Milne Edwards, 1833

(10) *Onuphis eremita* Audouin & Milne Edwards, 1833

1833. *Onuphis eremita* Audouin & Milne Edwards, *Ann. Sci. Nat.*, **29** : 226.

Material : 3 ex., Bandane vani peta, Srikakulam Dist., 17.ii.1995, coll. R. K. Chakraborty.

Diagnosis : Branchiae simple starting on setiger one, tentacular cirri separated dorsolatarally, anterior hooded pseudocompound hooks with three teeth. Posterior setae with capillaries, comb setae and bidentate acicular setae with guard.

Habitat : Common in sandy beach.

Distribution : India : Andhra Pradesh and Madras.

Elsewhere : Sri Lanka; Indo-China; Madagascar; Suez-Canel; Atlantic Ocean.

VI. Family EUNICIDAE

Key to genera

1. Five antennae, branchiae usually present 2

– Three antennae, branchiae absnt ..... ***Lysidice***

2. Tentacular cirri present ..... ***Eunice***

– Tentacular cirri absent ..... ***Marphysa***

9. Genus ***Eunice*** Cuvier, 1817

Key to species

Branchiae simple with one or two filaments starting very far from the head, comb setae and accicular setae absent ..... *Eunice siciliensis*

Branchiae simple with one or two filaments commencing very far from the head, comb setae and acicular setae present ..... *Eunice gracilis*

(11) ***Eunice gracilis*** (Crossland, 1904)

1904. *Nicidion gracilis* Crossland, *Proc. Zool. Soc. Lond.*, : 327.

Material : 3 ex., Yayada, Visakhapatnam Dist., 28.ii.1995; coll. R. K. Chakraborty; 3 ex., Nagayalanka, East Godavari Dist., 17.i.1996, coll. R. K. Chakraborty & A. Misra.

Diagnosis : Prostomium broad, tentacles faintly annulate. Branchiae simple beginning on seventy segment. comb setae and acicular setae present.

Habitat : Occur in rocky stone.

Distribution : India : Andhra Pradesh; Gujarat.

Elsewhere : Australia; Indo-China; Indian Ocean; Mergui; Zanzibar.

(12) ***Eunice siciliensis*** Grube, 1840

1840. *Eunice siciliensis* Grube, *Actinien. Echinodermen und wiirmen des Adriatischen und Mittelmeeres*, : 83.

Material : 1 ex., Bandaru Vani peta, Srikakulam Dist., 17.ii.1995; 3 ex., Yarada Dolphine nose, Visakhapatnam Dist., 28.ii.1995, coll. R. K. Chakraborty.

Diagnosis : Body elongated, antennae short, tentacular cirri smooth. Branchiae simple commencing fom setiger 55 extending upto end of last setiger. Comb setae and acicular setae absent, acicula stout, dark brown. Parapodia with only capillary and falcigerous setae.

Habitat : Prefer to inhabit in association with living coral.

Distribution : India : Andhra Pradesh; Gujarat, Andamans; Gulf of Mannar; Lakshadweep.

Elsewhere : Widely distributed in tropical Indo-West Pacific, Atlantic; Mediterranean Sea.

10. Genus *Lysidice* Savigny, 1818

(13) *Lysidice collaries* Grube, 1870

1870. *Lysidice collaries* Grube, *Mber. Akad. Wiss. Berlin*, : 495.

Material : 2 ex., Jalaripeta, Visakhapatnam Dist., 26.ii.1995, coll. R.K. Chakraborty.

Diagnosis : Prostomium with three tentacles, peristomial tentacles and branchiae absent. Parapodia with acicular setae, capillary setae, comb setae and falcigers. Second dental plate with 4 teeth.

Habitat : Common increvices of dead corals.

Distribution : India : Andhra Pradesh; Andamans; Kilakarai; Pamban.

Elsewhere : Japan; New-Caledonia; Persian Gulf; Philippine Island; Australia; Indian Ocean; Red Sea.

11. Genus *Marphysa* Quatrefages, 1865

Key to species

Inferior setae compound, knife-shaped, acicular setae unidentate .... *Marphysa macintoshi*

– Inferior setae compound spinigerous only, acicular setae bidentate .... *Marphysa sanguinea*

(14) *Marphysa macintoshi* Crossland, 1903

1903. *Marphysa macintoshi* Crossland, *Proc. Zool. Soc. London*, : 137.

Material examined : 9 ex., Bandaru Vanipeta, Srikakulum Dist., 15.ii.1995, 2 ex., Visakhapatnam, 22.ii.1995; 3 ex., Pudimadaka, Visakhapatam dist., 4.iii.1995, coll. R. K. Chakraborty.

Diagnosis : Prostomium builobed, horse-shoe shaped. Branchiae on setiger eighteen increasing anterior of the body maximum with six filaments and then gradually decreasing posterior part of the body. Notosetae capillary and comb setae, neurostae spinigers with knife-shaped. Acicular setae unidentate.

Habitat : Commonly encountered in borrows of sandy beach at low tide.

Distribution : India : Andhra Pradesh; Lakshadweep.

Elsewhere : Madagascar; Mozambique; Red Sea; South Africa; Zangibar.

(15) ***Marphysa sanguinea*** (Montagu, 1815)

1815. *Nereis sanguinea* Montagu, *Trans. Linn. Soc. London,* **11** : 20.

Material : 9 ex., Bandaru Vani Peta, Srikakulum Dist., 15.ii.1995, 2 ex., Visakhapatnam Dist., 28.ii.1995, coll. R. K. Chakraborty.

Diagnosis : Prostomium bilobed with five smooth occipital tentacles. Prosetal lobes broad and rounded on anterior segments and pestsetal lobes bluntly posterior segments. Branchiae from forteen segments with four filaments upto posteriror end of the body. Compund setae spinigerous only and acicular setae bidentate.

Habitat : Occur in soft mud at low water region.

Distribution : India : Andhra Pradesh; Gulf of Mannar; Krusadai Island; Maharashtra.

Elsewhere : Atlantic Ocean; Mediterranean and Red Sea; Australia; New-Caledonia.

Family VII LUMBRINERIDAE

Genus ***Lumbrinereis*** Blain Villa, 1828

(16) ***Lumbrineris polydesma*** (Southern, 1921)

1921. *Lumbriconereis polydesma* Southern, *Mem. Indian Mus.,* **5** : 622.

Material : 1 ex., Kailasa Hill, Visakhapatnam Dist., 24.ii.1995, coll. R. K. Chakraborty; 5 ex., Antervedi, East Godavari dist., 8.1.1996, coll. R. K. Charkaborty & A. Misra.

Diagnosis : Prostomium bluntly conical without eyes, antennae, parapodia uniramous. Presetal lobes short and rounded, postsetal lobes broad. Setae of limbate and simple hooks on segments thirtysix.

Habitat : Commonly encountered in estuarine and sandy mud.

Distribution : India : Endemic in India.

Family VIII ORBINIIDAE

Key to genera

Prostomium rounded, branchiae from setiger seventh ..... ***Nainereis***

– Prostomium conical, branchiae from setiger fifteen ..... ***Scolopos***

Genus 13. ***Nainereis*** Blainvilla, 1828

(17) ***Nainereis laevigata*** (Grube, 1855)

1855. *Aricia laevigata* Grube, *Vidensk. Meddel fra. d. naturhist. foren.* Kobenhavan, p^3 : 112.

Material : 2 ex., Visakhapatnam, 22.ii.1995, coll. R. K. Chakraborty.

Diagnosis : Prostomium rounded and without tentacles and palps. Proboseis with many large palmate lobs. Thorax flattened and having twenty four segments. Branchiae simple long and commencing from seventh segment. Dorsal ramous with knife-like dorsal cirrus with spring capillary and ventral ramour padlike with many capillary denticulate setae. Ventral cirri absent.

Habitat : Prefer to occur in crevices under corals rocks.

Distribution : India : Andhra Pradesh; Andamans;

Elsewhere : Srilanka; Japan; Indo-China; Persion Gulf; Atlantic Ocean; Mediterranean sea.

Genus 14. ***Scolopos*** Blainvilla, 1828

(18) ***Scolopos kergulalensis*** Mclntosh, 1855

1855. *Scolopos kergulalensis* Mclntosh, *Rep. Scient. Results challanger (zool.)* **12** : 335.

Material : 1 ex., Bandaru Vani peta, Srikakulam Dist., 15.ii.1995, coll. R. K. Chakraborty.

Diagnosis : Prostomium conical and pointed, thorax with 10–12 setigers, branchiae from fifteen segments onwards. Notopodial postsetal lobes on first foot, neuropodial with a single long median foot. Ventral cirrus absent.

Habitat : Actively burrows in sandy mud.

Distribution : India : Andhra Pradesh.

Elsewhere : Kerguelen, Magellon; South Georgia; Western Australia.

Family IX SPIONIDAE

Key to genera

Branchiae continue almost to the posterior end and may be party or completely fused to the notopodian lamellae. ..... ***Malacoceros***

– Branchiae absent from posterior segments, never fused to the notopodial lamellae..... ..... ***Prionospio***

Genus 15. ***Malacoceros*** Quaterefages, 1843

(19) ***Malacoceros indicus*** (Fauvel, 1928)

1928. *Scolelepis indica* Fauvel, *Bull. Mus. Hist. nat. Paris*, **34** : 4.

Material : 5 ex., Visakhapatnam, 22.ii.1995, coll. R. K. Chakraborty.

Diagnosis : Prostomium with lateral peaks tapering posteriorly. Branchiae cirriform long

appearing on segment one and continue upto end of the body. Notosetae are capillaries throughout, neurosetae are capillaries in anterior segments and hooded hooks posteriorly.

Habitat : Burrows in the mud filled crevices between stones.

Distribution : India : Andhra Pradesh; Gulf of Mannar; Lakshadweep.

Elsewhere : Mozambique; New Caledonia; South Africa.

Genus 16. ***Prionospio*** Malmgren, 1867

Key to Species

Gills start on setiger 2, always exced four pairs and then decrease, none pinnate .... *Prionospio cirrifera*

– Gills start on setiger, 1, never exced four pairs, at least on pinnate .... *Prionospio pinnata.*

(20) ***Prionospio cirrifera*** Wiren, 1883

1883. *Prionospio cirrifera* Wiren, *Vega-exped. Vetensk lakttag,* **2** : 409.

Material : 4 ex., Perupalam, 9.i.1996, coll. R. K. Chakraborty & A. Misra.

Diagnosis : Prostomium bluntly pointed in frant with a keel posteriorly which reaches setiger 2. Branchiae free from the notopodial lamellae and restricted to a few anterior segments 2, and 10 pairs all are cirriform. Winged capillaries present in both rami of the parapodia anteriorly but are partly replaced by hooded hooks in both rami posteriorly.

Habitat : Occur in soft silty mud.

Distribution : India : Andhra Pradesh.

Elsewhere : North Atlantic from Greenland; North and South America; North pacific to south California; Portugal; Sweden.

(21) ***Prinospio pinnata*** Ehlers, 1901.

1901. *Prinospio pinnata* Ehlers, *In. Festchr. K. Ges. Wiss Gohingen, Berlin* : 163.

Material : 3 exs., Perupalam, 9.i.1996, coll. R. K. Chakraborty & A. Misra.

Diagnosis : Prostomium bluntly pointed, first setiger well developed, three pairs of large pinnate branchiae on setiger 1. Notopodia large and pointed on the first firve setigers. Neuropodial lamellae prominent pointed anteriorly and rounded posteriorly. Hooded hooks apper in neuropodia on setiger 9. Individual hooks with four pairs of teeth above the main fang.

Habitat : Very common in sandy muds.

Distribution : India : Andhra Pradesh; Tamil Nadu; Maharashtra.

Elsewhere : Maldivae Archipelago; Pacific Ocean; Indian Ocean; Atlantic Ocean.

Family X. CAPITELLIDAE

Genus 17. ***Paraheteromastus*** Monro, 1937

(22) ***Paraheteromastus tenuis*** Monro, 1937

1937. *Paraheteromastus tenuis* Monro, *Ann. Mag. nat. Hist.*, (Ser.10) **19** : 536.

Material : 1 ex., Perupalam, 11.i.1996, coll. R. K. Chakraborty & A. Misra.

Diagnosis : Prostomium bluntly conical without eyes and thread like structure. First segment achaetous with 12 segments, branchiae absent. Anterior segment with short capillaries in both rami and posterior segment with long hooded hooks in both rami.

Habitat : Occur in clay soil of intertidal zone.

Distribution : India : Andhra Pradesh; Orissa.

Elsewhere : Myanmar; Mocambique.

Family XI. OWNIIDAE

Genus 18. ***Owenia*** Delle–chiaje, 1844.

(23) ***Owenia fusiformis*** Delle-chiaje,

1822-30. *Descrizione e notomia degli animali invertebrati della Sicilia cateriore osservari vivi neglianni Naples* : 31.

Material : 2 ex., Antervedi, East Godavari Dist., 8.i.1996, coll. R. K. Chakraborty & A. Misra.

Diagnosis : Tube membranous by imbricating sand grains. Thoracic region having capillary setae, parapodia poorly developed. Notosetae are spinulose capillaries and neurosetae are minute hooks bearing two teeth.

Habitat : Occur in silty sands within tough tube imbricated by sand grains.

Distribution : India : Andhra Pradesh; Orissa; Andamans; Tuticorin.

Elsewhere : Indian Ocean; Pacific and Atlantic Ocean; Mediterranean and Red Sea.

Family XII. AMPHARETIDAE

Genus 19. ***Melinna*** Malmgren, 1857

(24) ***Melinna aberrans*** Fauvel, 1932

1932. *Melinna aberrans* Fauvel, *Mem. Indian Mus.*, **12** : 221.

Material : 5 ex., Perupalam, 9.i.1996, coll. R. K. Chakraborty & A. Misra.

Diagnosis : Prostomium broad with glandular ridges and transverse row of many eye-

spols. Tentacles smooth, four pair of brnachiae. Segments 2 to 5 from a long groove and segments 2,3, and 5 bearing a row of very fine wingless ventral setae. Segments 12 bearing capillary winged setae and uncinigerous tori. Uncini with a single row of 5 teeth.

Habitat : Occur in membranous tubes on the surface of the sand in the intertidal zone.

Distribution : India : Endemic in India.

Family XIII. TEREBELLIDAE

Key to genera

- Notosetae with smooth tips, three pairs of gills. Well developed lateral lobes on the first segments ..... ***Eupolymnia***
- Notosetae with denticulate tips, two pairs of gills. No lateral lobes on the first segments ..... ***Nicolea***

Genus 20. *Eupolymnia* Verill, 1900

(25) *Eupolymnia nebulosa* (Montagu, 1818)

1818. *Terebella nebulosa* Montagu, *Trans, Linn, Soc. London,* **12** : 343.

Material : 8 ex., Visakhapatnam, 4.iii.1995, coll. R. K. Chakraborty.

Diagnosis : Body long with 17 thoracic segments, several small eye-spots. Notosetae winged with smooth tips on segments 4 to 17. Uncini from segment 5, each with two large teeth and 2–3 denticles above the main fang.

Habitat : Burrows under the black hard mud.

Distribution : India : Andhra Pradesh; Gulf of Mannear; Andamans; Pamban.

Elsewhere : South Africa; Madagascar; Persiox Gulf; Maldivea; Japan; Atlantic from Scotland; Mediterranean Sea.

Genus 21. *Nicolea* Malmgren, 1866

(26) *Nicolea gracilibranchis* (Grube, 1878)

1878. *Terebella gracilibranchis* Grube, *Mem. Acad. Sci. S. peterb,* **25** : 230.

Material : 3 ex., Pudimadaka, Visakhapatnak dist., 4.iii.1995, coll. R. K. Chakraborty.

Diagnosis : Body long, branchiae 2 pairs on segment 2 and 3. Eye-spots hidden under caphalic fold. 17 thoracic seligerous segment with capillary notosetae and ventral avicular uncini with bidentata tips.

Habitat : Abundant in silty sands in dense colonies within tough tubes imbricated by sand grains.

Distribution : India : Andhra Pradesh; Gujarat; Gulf of Mannar; Andamans; Lakshadweep; Pamban; Tuticosin.

Elsewhere : Japan; Philippines; Hawail.

Family XIV SABELLIDAE

Genus 22. ***Dasychone*** Sars, 1862

(27) ***Dasychone cingulata*** Grube, 1905.

1905. *Dasychone cingulata* Grube, *Suppli. Rep. Ceylon pearl Oyster Fish,* **4** : 308.

Material : 1 ex., Nagayalanka, East Godavari Dist., 17.i.1996, coll. R. K. Chakraborty & A. Misra.

Diagnosis : Dorsal stylodes long, slender, serrated appearance to the gill filaments. Dark scattered spots on the body. Abdominal dorsal uncini avicular and ventral setae winged.

Habitat : Occur in membranous tubes, partly buried in sand and abundant in a substratum of mixed sand.

Distribution : India : Andhra Pradesh; Tamil Nadu; Gulf of Mannar; Maharashtra; Andaman; Pumban.

Elsewhere : Burma; Mergin; Persian Gulf; Pacific Ocean.

SUMMARY

The present paper deals with 27 species of polychaeta belonging to 22 genera and 14 families collected by the authors from the coastal areas of Andhra Pradesh in 1995 and 1996 although 87 species are so far known from the area of Andhra Pradesh. A list of polychaetes hitherto known from Andhra Pradesh coast is provided along with key to genera and key to species.

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EARTHWORMS
(Coastal Districts)

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INTRODUCTION

Earthworms, the terrestrial annelids, are elongated bilaterally symmetrical coelomate invertebrates possessing external and internal metameric segmentation throughout the body with a few setae on all segments except the first and last ones. Their respiration takes place by the gaseous exchange through the moist skin. They are hermaphrodite and the fertilization of their ova is external in the cocoons formed by the material secreted from the clitellum.

Earthworms are found in various types of soil provided there is sufficient food and moisture. They occur in vegetable gardens, plant nurseries, orchards, cultivated fields, green houses, grasslands, forests, etc. Organic materials like compost, manure, municipal dumps, forest litters, humus and soils wetted with kitchen drainage are very attractive to some species. They are also found under logs and stones, and even at the axils of tree leaves while some are hydrophilous and occur near water bodies.

Long ago, Darwom described the earthworms as 'the nature's ploughman' because of their burrowing habit making the soil porous. They are capable of increasing fertility and reducing toxicity of soil, recycling various kinds of organic wastes, producing vermicompost and providing animal proteins as poultry and fish feed.

Before nineteenth century earthworms were studied by none except Linnaeus who erected the genus *Lumbricus* in 1758. Later, the taxonomy of the earthworm fauna of the world was flourished by the valuable works of so many renouned scientists. The major contributions on the taxonomy of Indian earthworms are available from the studies made by the well known scientists like E. Perrier, F.E. Beddard, D. Rosa, A.G. Bourne, W.B. Benham, S.M. Fdarb, W. Michaelsen, J. Stephenson, G.E. Gates, C.R.N. Rao, K.S.P. Aiyer, L. Cernosvitov, B.G.M. Jamieson, T.D. Soota and J.M. Julka. At present the global earthworm fauna comprises about 3300 species, out of which 378 are so far known from India.

The first new species of the earthworms of Andhra Pradesh is *Octochaetus phillotti*

(= *Octochaetona philloti)* described by Michaelsen in 1907 from Hyderabad. Our knowledge on the taxonomy of the earthworms of the state is confined to the notable constributions of Michaelsen (1907), Stephenson (1921, 1923, 1925), Gates (1931, 1934, 1937, 1945, 1960), Julka (1988) and Subba Rao & Ganapati (1975). But no comprehensive work was so far done on the earthworm fauna of the coastal districts of Andhra Pradesh excepting a few by Stephenson (1921, 1923, 1925), Gates (1931, 1934, 1945) and Subba Rao & Ganapati (1975). Twenty five species of earthworms under 13 genera and five families were known to occur from the state, and out of them eight species under five genera and four families from its coastal districts.

With a view to know the faunal diversity of earthworms in the coastal districts of Andhra Pradesh field surveys were undertaken by several faunistic survey parties of Zoological Survey of India from 1995 to 1998. The material collected during these surveys was worked out and as a result the earthworm fauna of the area is now comprised 17 species under nine genera and five families, and that of the state is increased to 32 species under 16 genera and six families. Seven species, three genera and one family are recorded for the first time from the state while several species from its different coastal districts.

The paper deals with 17 species of earthworms of the coastal districts of Andhra Pradesh. A general account of terminology along with the method of collection, narcotization and preservation of earthworms has been included. The keys fro identification, diagnostic characters and distribution of the orders, families, genera and species of the area have been provided. Moreover, their district-wise distribution has been shown in a table. Each of the genera and species is provided with synonymy, type locality and repository of the type specimens. Economic importance, habitats and castings of as many species as possible have been included also.

TERMINOLOGY

Adiverticulate	: Without any diverticulum.
Ampulla	: An ental sac-like structure of a spermatheca.
Annular	: Extending all round the body.
Astomate	: The state of a nephridium when it is 'closed' if any nephrostome does not persist with it.
Athecal	: Without any spermatheca.
Atrium	: The diverticulum of the spermatheca in two moniligastrid genera, *Drawida* and *Moniligaster.*
Avesiculate	: Without any vesicle or bladder.
Bidiverticulate	: With two diverticula.

Biprostatic : With two prostates.

Bithecal : With two spermathecae.

Calciferous glands : Whitish and highly vascular glands associated with the oesophagus.

Clitellum : A regional tumescence of epidermis, the gland cells of which secrete material to form a cocoon.

Coelom : The body cavity.

Copulatory setae : Setae with copulatory function associated with the spermathecal pores.

Distal : Away from the place of attachment.

Diverticulum : An outgrowth arising from the spermathecal duct.

Dorsal pores : The small external openings in the inter segmental furrows on the mid-dorsal line.

Ectal : Near to or towards the body wall.

Endemic : Indigenous or native.

Ental : Away from the body wall, toward the centre of the body.

Enteronephric : When the nephridial ducts open into the alimentary canal.

Epilobic : A prostomium which is continud by a tongue into the peristomium but without reaching $^{1}/_{2}$.

Equator : The central meridian of latitude of a segment.

Exoic : A nephridium of latitude of a segment.

Exonephric : When the nephridial ducts open to the exterior.

Extramural : Outside the oesophageal wall.

Female pore : The external operture of the female duct.

Genital markings : certain modified areas of the epidermis on the ventral surface of sexually nature worms.

Genital marking glands : The glands internally associated with the external genital markings.

Genital papillae : Genital markings.

Gizzard : A highly muscular sac dilated in certain portion of the alimentary canal.

Hearts : Some of the paired anterior commissural blood vessels enlarged, contractile and provided with valves.

Holandry : The basic arrangement of gonads as two pairs of testes restricted in the segments X and XI.

Holoic : A single pair of large nephridia present in each segment of the body.

Holonephridia : The large nephridia as a single pair present in each segment of the body.

Intersegmental furrow : The boundary between two consecutive segments.

Intestine : The posterior portion of alimentary canal behind oesophagus.

Intestinal caeca : Small tubular outgrowths of the intestinal wall.

Intramural : Within the oesophageal wall.

Invagination : Ingrowth.

Lumbricine : The setal arrangement in which 8 setae in 4 pairs are arranged in a single ring around the periphery of each segment excepting the peristomium and the pygomere.

Male duct : Male gonoduct; sperm duct.

Male funnel : A funnel or a rosette shaped enlargement of the ental end of a sperm duct through which sperms pass into the lumen of the duct.

Male pore : External operture of the male duct.

Manicate : Gloue shaped.

Megameronephridia : The enlarged meronephridias.

Megameronephridia : The large nephridia also called holonephridia present as a single pair in each segment.

Meroic : More than one pair of nephridia present in each segment.

Meronephridia : The nephridia as more than one pair present in each segment.

Metandry : The basic arrangement of gonads as one pair of testes restricted in the segment XI.

Micromeronephridia : The very small meronephridia.

Micromeronephridia : The small nephridia also called meronephridia present as more than one pair in each segment.

Nephridia : The main organs of nitrogenous excretion in earthworms.

Nephridiopore : External openings of nephridia.

Nephropore : Nephridiopore or nephridial pore.

Nephrostome : The ciliated funner-shaped opening of the nephridium into the coelom.

Oesophagus : The region of the alimentary canal between pharynx and intestine.

Oocytes : Ova.

Ovum : A female egg-cell capable of developing into a new individual when fertilized by male sperm.

Ovary : The female reproductive organ which produces ova.

Oviducts : The ducts that carry female gamets.

Penial setae : setae with copulatory function associated with prostatic pores.

Peregrine : Ecotic; foreign.

Perichactine : The setal arrangement in which more than 8 setae are arranged in a single ring around each segment excepting the peristomium and the pygomere, usually with a gap in the mid-dorsal and mid-ventral regions.

Peristomium : The anterior most segment of the body.

Porophore : Any area, protuberance or special structure bearing a pore.

Prolobic : A prostomium demarcated from and without a tongue in the peristomium.

Prostomium : The protuberance of the peristomium.

Prostates : The irregularly shaped glandular body located at the posterior end of vasa deferentia.

Prostatic capsule : The central body of the prostate formed by its middle muscular layer, in the worms belonging to the family Moniligastridae.

Prostatic pore : External aperture of the prostatic duct.

Quadriprostatic : With four prostates.

Quadrithecal : With four spermathecae.

Racemose : Bunch.

Segment : A portion of the body along anteroposterior axix, between two consecutive intersegmental furrows and the associated septa.

Seminal chamber : The reservior at the ental end of the diverticulum.

Seminal grooves : The distinct markings in the epidermis associated with male pores, sometimes with prostatic pores also.

Seminal vesicles : The sacs in which sperms are matured.

Seta : The bristle-like retractile structures borne on follicles.

Sexthecal : With six spermathecae.

Spermatheca : An organ in which sperms received from another individual during copulation are stored.

Sperm duct : The duct that carries sperms from the male funnels to or towards the exterior; vasa deferentia.

Stomate : The state of a nephridium when it is 'open' if a nephrostome persists with it.

Sulcate : Having seminal groove or furrow.

Supra-intestinal glands : Several pairs of glands present on the dorsal wall of the intestine in successive segments at the posterior end of the typhlosole.

Testes : A male reproductive organ in which spermbearing fluid is produced.

Testis sac : Usually a closed off coelomic space which contains one or both testis and male funnels of a segment.

Thecal : Having spermatheca.

Trabeculate : A seminal vesicle having numerous irregular spaces.

Typhlosole : The large dorsal fold that hangs from the internal surface of intestine within its lumen.

Unidiverticulate : The spermatheca having a single diverticulum.

Vesiculate : The nephridium with a vesicle or bladder.

METHOD OF COLLECTION AND PRESERVATION

The best method for the collection of earthworms is by digging the soil with some suitable equipment like shovel or spade. Care should be taken so that the specimens are not damaged. Collections should be made from various ecological niches, such as different types of soil, grass lands, pastures, forests, agriculture fields, gardens, manure heaps, litter, kitchen draingage, margins of freshwater bodies, etc.

The living worms are dropped in a vessel containing 70% alcohol. When the worms stop moving they are removed from alcohol and kept in a straight position on a piece of blotting paper or any other absorbent paper. These straightened specimens along with the absorbent paper, are then transferred to a tray or a flat bottomed container and covered with a thin layer

of cotton. Afterwards, 10-15% formalin is added slowly and kept soaked in it for a period of at least 24 hours. Then the worms are washed in freshwater and preserved in 70% alcohol or 5-10% formalin. The specimens should be preserved in suitable sized bottles along with labels containing all the collection data, such as locality, altitude, habitat, name of collector and date of collection. It may not be possible to follow this method in the fields due to lack of sufficient time.

In that case, the worms may be directly preserved in 4-10% formalin depending upon their size.

Abbreviations

a, = the first seta from mV on each side of a segment.
A, = a meridian of longitude passing anteroposteriorly along *a* setal follicles.
A A, = median space ventrally between two *A* meridians.
A B, = median space ventrally between *A* and *B* meridians.
b, = the second seta from mV on each side of a segment.
B, = a merian of longitude passing anteroposteriorly along *b* setal follicles.
B, C, = median space ventrally between *B* and *c* meridians.
c, = the third seta from mV on each side of a segment.
c, = a meridian of longitude passing anteroposteriorly along *c* setal follicles.
c, = Circumferance.
C D, = median space ventrally between *C* and *D* meridians.
d, = the fourth seta from mV on each side of a segment.
D, = a meridian of longitude passing anteroposteriorly along *d* setal follicles.
D D, = median space dorsally between the two *D* meridians.
e, f, g,etc. the fifth, sixth, seventh seta, etc. respectively from mV on each side of a segment.
eg, = equatorial.
gm., = genital marking.
I, II, III, IV, etc. the first, second, third, fourth segement, etc. respectively.
m = mid.
m *B C,* = at the middle of *B* and *C.*
mD, = mid-dorsal.
mL, = Mid-lateral.
mV, = mid-ventral.
mm, = millimeters.

SYSTEMATIC ACCOUNT

Class OLIGOCHAETA

A. Order HAPLOTAXIDA

Suborder LUMBRICINA

Superfamily MEGASCOLECOIDEA

I. Family ACANTHODRILIDAE

1. Genus ***Pontodrilus***

1. *Pontodrilus bermudensis* Beddard

II. Family OCNERODRILIDAE

2. Genus ***Malabaria***

2. *Malabaria biprostata* Aiyer

3. Genus ***Ocnerodrilus***

3. *Ocnerodrilus occidentalis* Eisen

III. Family MEGASCOLECIDAE

4. Genus ***Lampito***

4. *Lampito mauritii* kinberg

5. Genus ***Perionyx***

5. *Perionyx excavatus* Perrier

IV. Family OCTOCHAETIDAE

6. Genus ***Barogaster***

6. *Barogaster annandalei* (Stephenson)

7. Genus ***Dichogaster***

7. *Dichogaster affinis* (Michaelsen)

8. Genus ***Octochaetona***

8. *Octochaetona barkudensis* (Stephenson)

9. *Octochaetona beatrix* (Beddard)

10. *Octochaetona compta* (Gates)

11. *Octochaetona parva* (Gates)

12. *Octochaetona surensis* (Michaelsen)

B. Order MONILIGASTRIDA

V. Family MONILIGASTRIDAE

9. Genus ***Drawida***

13. *Drawida exilis* Gates
14. *Drawida lennora* Gates
15. *Drawida limella* Gates
16. *Drawida peridiosa* Gate
17. *Drawida willsi* Michaelsen

Key to the Orders

Testes and male funnels interseptal ..... HAPLOTAXIDA

Testes and male funnels intraseptal ..... MONILIGASTRIDA

A. Order HAPLOTAXIDA

Diagnosis : Testes and male funnels interseptal; male funnels at least one segment anterior to that bearing male pores.

Suborder LUMBRICINA

Diagnosis : Male pores at least two segments posterior to testes. Clitellum formed from multiple layers of cells.

Superfamily MEGASCOLECOIDEA

Diagnosis : Ovaries large, fan to rosette-shaped with the oocytes forming several egg strings.

Key to families

1. Last pair of hearts in XI ..... OCNERODRILIDAE

   Last pair of hearts behind XI 2

2. Prostates, racemose, of mesodermal origin Prostates, tubular, of ectodermal origin 3

3. Nephridia, holoic ..... ACANTHODRILIDAE

   Nephridia, meroic ..... OCTOCHAETIDAE

I. Family ACANTHODRILIDAE

Diagnosis : Body cylindrical. Dorsal pores present or absent. Digestive system with an intestinal origin behind XIII. Last pair of hearts behind XI. Nephridia holoic. Spermathecae in pre-testicular segments, diverticulate; male pores posterior to XVI; prostates tubular with central canals.

Distribution : South africa, Madagascar; India, Myanmar, Sri Lanka; U.S.A., Mexico; Central America, South America; Australia, Tasmania, New Caledonia, New Zealand, Auckland, Chatham and subantarctic islands.

Remarks : The family is represented here from the coastal districts of Andhra Pradesh by a single genus *Pontodrilus.*

1. Genus ***Pontodrilus*** Perrier

1874. *Pontodrilus* Perrier, *Compt. Rend. Acad. Sci. Paris,* **78** : 1582. (Type species, *Pontodrilus marionis* Perrier, 1874.)

1872. *Pontodrilus* : Gates, *Trans. Am. phil. Soc.,* **62**(7) : 47.

1987. *Pontodrilus* : Julka & Senapati, *Rec. zool. Surv. India, Occ. Pap.* No. **92** : 7.

Diagnosis : Setae lumbricine. Digestive system with an intestinal origin behind XIII but without calciferous and supra-intestinal gland, intestinal caecum and typhlosole. Male pores (combined with prostatic pores) paired, on XVIII; female pores paired, on XIV. Holonephridia absent in preclitellar segments.

Distribution : Circumglobal, on sea shores in the tropics and warmer parts of the temperate zones in both the hemispheres.

Remarks : The genus is represented here from the coastal districts of Andhra Pradesh by a single species, *P. bermudensis.*

1. ***Pontodrilus bermudensis*** Beddard

1891. *Pontodrilus bermudensis* Beddard, *Ann. Mag. nat. Hist. (ser.* 6), **7** : 96 (Type loc. Bermuda; typus amissus.)

1972. *Pontodrilus bermudensis* : Gates, *Trans. Am. phil. Soc.,* **62**(7) : 47.

1987. *Pontodrilus bermudensis* : Julka & Senapati, *Rec. zool. Surv. India, Occ. Pap.* No. 92 : 7.

Material : 9 exs., Antarvedi, East Godavari dist., 8.i.1955, coll. B.P. Haldar.

Diagnosis : Length 32-120 mm; diameter 2-4 mm. Segments 78-125. Prostomium epilobic, tongue open. Dorsakl pores absent. Clitellum saddle-shapped, XIII-XVII, XVIII. Setae *A B* ∠ *C D, A A = B C* about = *C D, D D* ∠½C. Genital markings unpaired, median, transversely oval across 19/20, occasionally in 12/13, 13/14. Nephropores inconspicuous.

Septa 5/6-12/13 muscular. Gizzard absent; intestinal origin in XVII. Last pair of hearts in XIII. Holandric; seminal vesicles acinuous, in XI and XII. Prostatic ducts 2 mm long, curved into crescent shape. Penial setae, none. Spermathecae paired, long, in VIII and IX; duct shorter than ampulla; unidiverticulate; diverticulum digitiform to club-shaped, arising from ectal end of duct. Genital marking glands absent.

Habitats : Under logs, algae and seaweeds thrown on the sea beach. Mud with high content of organic matter and salt on seashore and margins of estuaries and brackishwater lakes.

Distribution : India : Andhra Pradesh – coastal districts : Srikakulam and Vishakhapatnam; Andaman & Nicobar Islands; Kerala; Laccadive & Maldive Islands; Maharashtra; Orissa; Tamil Nadu.

Elsewhere : Africa, Madagascar; Sri Lanka, Myanmar, Vietnam, Indonesia; U.S.A.; West Indies, South America; Australia, some islands in the Pacific Ocean.

Remarks : The species was recorded for the first time in Andhra Pradesh from Vishakhapatnam coast by Rao & Ganapati (1975).

II. Family OCNERODRILIDAE

Diagnosis : Body cylindrical. Dorsal pores rarely present. Digestive system with a short oesophagus but without intestinal caeca. Spermathecae in pretesticular segments; male pores posterior to XVI; prostates tubular with central canal. Last pair of hearts in XI. Nephridia holoic, avesiculate.

Distribution : Tropical and southern Africa, some Indian Ocean islands, India and nearby areas, tropical America.

Remarks : The family is recorded here for the first time from Andhra Pradesh and is represented by two genera, *Malabaria* and *Ocnerodrilus*.

Key to genera

Exteramural calciferous glands present ..... ***Ocnerodrilus***

Exteramural calciferous glands lacking ..... ***Malabaria***

2. Genus *Malabaria* Stephenson

1924. *Malabaria* Stephenson, *Rec. Indian Mus.*, **26** : 356. (Type species, *Malabaria paludicola* Stephenson, 1924.)

1972. *Malabaria* : Gates, *Trans. Am. phil. Soc.*, **62**(7) : 264.

1987. *Malabaria* : Julka & Senapati, *Rec. zool. Surv. India, Occ. Pap.* No. **92** : 16.

Diagnosis : Setae lumbricine. Dorsal pores absent. Digestive system with an oesophageal gizzard in VII, an intestinal origin in XII but without extramural calciferous gland, typhlosole and supra intestinal gland. Male and prostatic pores on XVII; female pores on XIV.

Distribution : India, Myanmar.

Remarks : The genus is represented here from Andhra Pradesh by a single species, *M.biprostata.*

2. ***Malabaria biprostata*** Aiyer

1929. *Malabaria biprostata* Aiyer, *Rec. Indian Mus.*, **31** : 73. (Type loc. -Kumily, Kerala, India; types in Zoological Survey of India, Calcutta.)

1987. *Malabaria biprostata* : Julka & Senapati, *Rec. zool. Surv. India, occ. Pap.* No. **92** : 16.

Material : 4 exs., Amadalavalasa, Sri Kakulam dist., 18.x.1995; 1 ex., Ragolu, Sri Kakulam dist., 19.x.1995; 1 ex., Kushalapuram, Sri Kakulam dist., 20.x.1995; coll. S.K. Mukhopadhyay.

Diagnosis : Length 67-90 mm; diameter 1.4-1.8 mm. Segments 145-215. Prostomium epilobic, tongue closed. Clitellum annular, XIII-XXI, XXII, XXIII. Setae *A A* = 3.25-3.7 *A B* = 0.76-1.0 *B C* = 3.25-3.7 *C D* = 0.33-0.39 *D D* on XII, *A A* = 5.5 *A B* = *B C* = 5.5 *C D* = 0.38 *D D* on XXIV. Genital markings oval, single, median, in 8/9 or postsetal on VIII, at *A A* or postsetal on XVI at *B B*. Spermathecal pores paired, in 8/9, at *B*. Male and postatic pores, minute, on circular porophores; male genital field rectangular, on XVII. Female pores presetal, at *B*.

Septa 6/7-8/9 muscular. Holandric; testes and male funnels free, in X and XI; seminal vesicles in XI and XII. Prostates long, extending back to XL-LIII. Spermathecae paired, in IX; adiverticulate. Genital marking glands sessile, oval.

Habitats : Clay soil with high organic matter; between the roots of rice plants in paddy fields.

Castings : Castings are piled on soil surface in small heaps of globular pellets.

Distribution : India : Andhra Pradesh-Coastal district : Sri Kakulam; Kerala; Orissa.

Remarks : This endemic species is very rare in India.

3. Genus ***Ocnerodrilus*** Eisen

1878. *Ocnerodrilus* Eisen, *Nova Acta R. Soc. Sci. Upsaliensis, (Ser.* 3), **10**(4) : 1. (Type species, *Ocnerodrilus occidentalis* Eisen, 1878.)

1972. *Ocnerodrilus* : Gates, *Trans. Am. phil. Soc.*, **62**(7) : 273.

1987. *Ocnerodrilus* : Julka & Senapati, *Rec. Zool. Surv. India, Occ. Pap.* No. **92** : 18.

Diagnosis : Setae lumbricine. Dorsal pores absent. Digestive system with a pair of extramural calciferous glands but without any gizzard, typhlosole, intestinal caecum and supra-intestinal gland. Male pores (combined with prostatic pores) one pair, on XVII.

Distribution : Tropical Africa and tropical America. Peregrine species colonized to several parts of the world.

Remarks : The genus is represented here from the coastal districts of Andhra Pradesh by a single species, *O. occidentalis.*

3. ***Ocnerodrilus occidentalis*** Eisen

1878. *Ocnerodrilus occidentalis* Eisen, *Nova Acta R. Soc. Sci. Upsaliensis, (ser.* 3), **10**(4) : 10. (Type loc. California, U.S.A.)

1972. *Ocnerodrilus occidentalis* : Gates, *Trans. Am. phil. Soc.*, **62**(7) : 273.

1987. *Ocnerodrilus occidentalis* : Julka & Senapati, *Rec. zool. Surv. India, Occ. Pap.* No. **92** : 18.

Material : 1 ex., Amadalavalasa, Sri Kakulam dist., 18.x.1995, coll. S. K. Mukhopadhyay.

Diagnosis : Length 12-46 mm; diameter 1-2 mm. Segments 70-84. Prostomium epilobic, tongue usually open. Clitellum annular, XIII, XIV-XIX, XX. Setae *A A = B C, D D* = ½C. Genital markings absent. Spermathecal pores lacking. Male pores (combined with prostatic pores) paired, minute, at centres of withish porophores on XVII, at *B*. Female pores paired, on XIV, at or slightly lateral to *B*. Septa 4/5 7/8-10/11 slightly muscular. Intestinal origin in XII. Holandric; testes and male funnels free, in X and XI; seminal vesicles absent. Prostates paired in XVII, occasionally extending back to XVIII-XXX. Spermatheca absent.

Habitats : Moist alkaline clay loam and sandy loam soil in lowlands and upland pstures, crop fields, compost pits and sewage.

Distribution : India : Andhra Pradesh – coastal district : Sri Kakulam; Andaman Islands; Kerala; Maharashtra; Orissa; Rajasthan, Uttar Pradesh.

Elsewhere : Cape verde Is., Rhodesia, South Africa, Great Comoro Is.; Denmark, Italy, Greece, Palestine, Lebanon, Central Asia, Pakistan, China, Japan; Sri Lanka, Myanmar, Singapore, Philippines; U.S.A., Mexico; New Hebrides, British Solomon Is.

Remarks : The original home of this peregrine species is Central America.

III. Family MEGASCOLECIDAE

Diagnosis : Body cylindrical. Dorsal pores present. Digestive system with an intestinal origin behind ovarian segment. Spermathecae in pre-testicular segments. Prostates racemose without central canals. Male pores posterior to XVI. Last pair of hearts posterior to XI. Nephridia holoic or meroic.

Distribution : Eastern U.S.S.R., Japan, Korea, Southern China to Australasia.

Remarks : The family is represented here from the coastal districts of Andhra Pradesh by two genera, *Lampito* and *Perionyx.*

Key to genera

Holonephric ..... ***Perionyx***

Meronephric ..... ***Lampito***

4. Genus *Lampito* Kinberg

1866. *Lampito* Kinberg, *Ofvers. K. Vetens. – Akad. Forhandl. Stockholm,* **23** : 103. (Type species, *Lampito mauritii* Kinberg, 1866)

1972. *Lampito* : Gates, *Trans. Am. phil. Soc,.* **62**(7) : 133.

1887. *Lampito* : Julka & Senapati, *Rec. zool. Surv. India, Occ. Pap.* No. **92** : 8.

Diagnosis : Setae perichaetine. Digestive system with a single gizzard in V, calciferous lamellae in X-XIII, an intestinal origin in the region XV-XVI and a typhlosole but without intestinal caeca and supra-intestinal glands. Male pores (combined with prostatic pores) paired, on XVIII; female pores paired, on XIV. Meronephric; paired tufts of astomate micromeronephridia on septa V-XIII, XIV; numerous V-shaped astomate exonephric micromeronephridia on the body wall in XV and posteriad segments; paired stomate, enteronephric megameronephridia in XX and posteriad segments.

Distribution : India : Palni and Cardomom Hills in South India. One species, *Lampito mauritii* is widely distributed throughout India and also to several parts of the world probably due to transportation.

Renmarks : The genus is represented here from the coastal districts of Andhra Pradesh by a single species, *L. mauritii.*

4. *Lampito mauritii* kinberg

1866. *Lampito mauritii* Kinberg, *Ofvers. K. Vetens. –Akad. Forhandl. Stockholm,* **23** : 103. (Type loc. Mauritius; types in Naturhistoriska Riksmuseet, Stockholm.)

1833. *Perichaeta armata* Beddard, *Ann. Mag. nat. Hist. (ser.* 5), **12** : 216. (Type loc. – Calcutta, West Bengal, India; typus amissus.)

1887. *Perichaeta divaginata* Bourne, *Proc. zool. Soc. Lond.,* 1886. (Type loc. – Salem, Tamil Nadu, India; typus amissus.)

1891. *Perichaeta madagascariensis* Michaelsen, *Arch. Naturgesch,* **571**(1) : 217. (Type loc. Madagascar ; types in British Museum (Nat. Hist.), London.)

1899. *Megascolex mauritii* : Michaelsen, *ofvers. K. Vetens. Akad. Forhandl. Stockholm,* **56** : 441.

1914. *Lampito trilobata* Stephenson, *Rec. Indian* Mus., **10** : 340. (Type loc. Baroda, Gujarat, India; types in Zoological Survey of India, Calcutta.)

1938. *Lampito mauritii* : Gates, *Rec. Indian Mus.*, **40** : 413.

1972. *Lampito mauritii* : Gates, *Trans. Am. phil. Soc.*, **62**(7) : 133.

1987. *Lampito mauritii* : Julka & Senapati, *Rec. zool. Surv. India, Occ. Pap.* No. **92** : 9.

Material : 1 ex., Gandhi Park, Sri Kakulam dist., 16.x.1995; 3 exs., Palakonda, Sri Kakulam dist., 16.x.1995; 10 exs., Sher Mahammadipuram, Sri Kakulam dist., 17.x.1995; 25 exs., Amadalavalasa, Sri kakulam dist., 18.x.1995; 54 exs., Ragulu, Sri Kakulam dist., 19.x.1995; 3 exs., Kushalapuram, Sri Kakulam dist., 20.x.1995; 20 ex., Simachalam, Vishakhapatnam dist., 23 & 24.x.1995; 12 exs., Madhurwara, Vishakhapatnam dist., 25.x.1995; 16 exs., Thagarapuvalasa, Vishakhapatnam dist., 25.x.1995; 15 exs., Endara, Vishakhapatnam dist., 26.x.1995; coll. S.K. Mukhopadhyay. 6 exs., Gurazanapalli village, East Godavari dist., 2.iv.1997; 6 exs., Chollangi village, East Godavari dist., 2.iv.1997; 9 exs., Ramachandrapuram, East Godavari dist., 3.iv.1997; 2 exs., Acthanpeta village, East Godavari dist., 4.iv.1997; 5 exs., Rayavaripalam village, east Godavari dist., 4.iv.1997; 1 ex., Samalkot, east Godavari dist., 6.iv.1997; 21 exs., sarpavaram, kakinada, east Godavari dist., 7./iv.1997; 2 exs., Mahadevapalli village, West Godavari dist., 9.iv.1997; 2 exs., Bhimavaram, West Godavari dist., 10.iv.1997; 1 ex., Tadepallegudem, west Godavari dist., 11.iv.1997; 2 exs., kamavarapukota, West Godavari dist., 12.iv.1997; 3 exs., Nunna village, Krishna dist., 14.iv.1997; 6 exs., Mailavaram, Krishna dist., 15.iv.1997; 8 exs., Nandigama, Krishna dist., 16.iv.1997; 3 exs., Pamaru, Krishna dist., 17.iv.1997; coll. K. R. Halder. 4 exs., Nellore, Nellore dist., 31.iii.1998; 14 exs., kavur, Nellore dist., 1.iv.1998; 10 exs., solomonpuram, Nellore dist., 4.iv.1998; 5 exs., Footi village, Nellore dist., 6.iv.1998; 6 exs., Santanatalapadu, ongole, Prakasham dist., 9.iv.1998; coll. S.K. Mukhopadhyay.

Diagnosis : Length 95-155 mm; diameter 3-6 mm. Segments 157-201. Prostomium epilobic, tongue closed. First dorsal porse at 10/11 or 11/12 or 12/13. Clitellum annular, XIII, 1/2 XIII-XVII. Setae 26-39 on III, 40-51 on VIII, 38-50 on XII, 30-43 on XX. Genital markings absent. Spermathecal pores paired, in 6/7-8/9. Male pores on slightly raised porophores, at or lateral to *B*. Female pores prestal, within *A A*. Septa 7/8-12/13 muscular. Intestinal origin in XV; typhlosole rudimentary. Lst pair of hearts in XIII. Holandric; seminal vesicles in XI and XII. Prostates confined to XVIII, ducts straight about 2 mm long. Penial setae 1.32-3 mm long, 24-31 u diameter; ornamentation of closely crowded circles of triangular teeth; tip horse-shoe-shaped. Sexthecal; spermathecae paired, in VII-IX; duct barrel-shaped, shorter than ampulla; bidiverticulate; diverticula digitiform one medium and one lateral.

Habitats : Forest, grassland, crop field, compost pit, domestic garbage and sewage system. Usually abundant in soils with high organic matter.

Castings :Casts are deposited on soil surface in the form of small heaps of sheroidal or nearly globular pellets.

Economic Importance : This species may be utilized as waste conditioner, fish bait, poultry and fish feed.

Distribution : India : Andhra Pradesh – coastal districts : Sri Kakulam, Vishakhapatnam, East Godavari, West Godavari, Krishna, Nellore and Prakasham; Andaman & Nicobar Islands; Bihar; Gujarat; Karnataka; Kerala; Laccadive & Minocoy Islands; Madhya Pradesh; Maharashtra; Orissa; Rajasthan; Tamil Nadu; Uttar Pradesh; West Bengal.

Elsewhere : Zanzibar, Comoro Is., Madagascar, Seychelles Is., Mauritius; Pakistan, China; Sri Lanka, Maldivesm Bangla Desh, Myanmar, Thailand, Malay Peninsula, Indonesia, Philippines, Hongkong; New Caledonia.

Remarks : Though the original home of this endemic species is assumed to be peninsular India, it is widely distributed in India and several other countries of the world. This species was known to occur from East and West Godavari, Rangareddy and Chittour districts only in Andhra Pradesh. It is now recorded here for the first time form Sir Kakulam, Vishakhapatnam, Krishna, Nellore and Prakasham districts also.

5. Genus ***Perionyx*** Perrier.

1872. *Perionyx* Perrier, *Nouv. Arch. Mus. Hist. nat. Paris,* **8** : 126. (Type species, *Perionyx excavatus* Perrier, 1872.)

1900. *Perionyx* : Michaelsen, *Tierreich,* **10** : 207.

1972. *Perionyx* : Gates, *Trans. am. phil. Soc.,* **62**(7) : 138.

1987. *Perionyx* : Julka & Senapati, *Rec. zool. Surv. India., Occ. Pap.* No. **92** : 13.

Diagnosis : Setae perichaetine. Dorsal pores present. Digestive system with or without a single, small oesophageal Gizzard, in V or VI but without any discrete calciferous gland, intestinal caecum, supra – intestinal gland and typhlosole. Male pores (combined with prostatic pores) paired, in XVIII: female pore unpaired, median, presetal on XIV. Nephridia holoic.

Distribution : India, Myanmar, possibly Sri Lanka and Malayasia.

Remarks : The genus is recorded here for the first time from Andhra Pradesh and is represented by a single species, *P. excavatus.*

5. ***Perionyx excavatus*** Perrier

1872. *Perionyx excavatus* Perrier, *Nouv. Arch. Mus. Hist. nat. Paris,* **8** : 126. (Type loc. Saigon, Vietnam; types in Museum National d'Histoire Naturelle, Paris.)

1916. *Perionyx fulvus* Stephenson, *Rec. Indian Mus.*, **12** : 322. (Type loc. – Calcutta, West Bengal, India; types in Zoological Survey of India, Calcutta.)

1972. *Perionyx excavatus* : Gates, *Trans. am. phil. Soc.*, **62**(7) : 141.

1987. *Perionyx excavatus* : Julka & Senapati, *Rec. zool. Surv. India, Occ. Pap.* No. **92** : 13.

Material : 27 exs., Kolleru Lake at Pedayelda Gadi, Krishna dist., 9.iv.1997; 18 ex., Kaikaluru, Krishna dist., 9.iv.1997; 16 exs., Bhimavaram, West Godavari dist., 10.iv.1997; 12 exs., Raulpalaem, West Godavari dist., 11.iv.1997; 11 exs., Kamavarapukota, West Godavari dist., 12.iv.1997; coll. K. R. Halder.

Diagnosis : Length 30-180 mm; diameter 3-7 mm. Segments 123-178. Prostonmium epilobic, tongue open. First dorsal pore in region 2/3-5/6. Clitellum annular, XIII-XVII. Setae 46-56 on IX, 47-52 on XII, 46-52 on XX, 4-6 between spermathecal pores. Genital markings absent. Spermathecal pores paired, near mV, in 7/8 and 8/9. Male pores on small papillae, each papilla with 4-9 penisetal follicles. Nephridiopores inconspicuous.

Septa from 4/5. Gizzard absent or weak in V; oesophagus widened and moniliform in XIII; intestinal origin in XV or XVI. Last pair of hearts in XII. Holandric; testes and male funnels free in X and XI; seminal vesicles in XI and XII. Penial setae 0.60–0.69 mm long, 15–25 μ diameter; ornamentation of 6-16 circles of triangular spines; tip buntly rounded or finely pointed or flattened and truncated. Quadrithecal; spermathecae paired, large, in VIII and IX; duct short and stout; often with intramural seminal chambers near ental end of duct.

Habitats : Top soil with high moisture and very high organic materials, manure, compost pits, kitchen wastes, crop fields with raw sewage. Under logs, aquatic vegetation, bricks, rocks at edge of freshwater bodies. Under barks of fallen trees. Debris in axils of plantain leaves and in forks of trees.

Castings : Casts are deposited on soil surface in the form of short threads or rods.

Economic importance : The worms may be utilized as waste conditioner. They may be cultured for poultry and fish feed.

Distribution : India : Andhra Pradesh – coastal districts : West Godavari and Krishna; Andaman Islands; Arunachal Pradesh; Assam; Himachal Pradesh; Maharashtra; Manipur; Orissa; Sikkim; Tamil Nadu; Uttar Pradesh; West Bengal.

Elsewhere : Madagascar and its adjacent islands; Sri Lanka, Myanmar, Thailand, Malay Peninsula, Indonesia, Philippines, Taiwan, Hawaian Islands; West Indies.

Remarks : This endemic species originated from the Himalays is widely distributed in India and colonized in some parts of the world.

III. Family OCTOCHAETIDAE

Diagnosis : Body cylindrical. Dorsal pores present. Clitellum multilayered. Intestinal origin behind XIII. Spermathecal pores in pre-testicular segments; prostates tubular with central canal; male pores posterior to XVI. Last pair of hearts behind XI. Nephridia meroic.

Distribution : Central Africa, Madagascar; India; Myanmar; U.S.A., Mexico; Central America, West Indies; Australia, New Zealand.

Remarks : The family is represented here from the coastal districts of Andhra Pradesh by three genera, *Barogaster, Dichogaster* and *Octochaetona.*

Key to genera

1. Oesophageal gizzard, single ..... ***Octochactona***

   Oesophageal gizzard, doubled 2

2. One pair of discrete extramural calciferous glands present ..... ***Dichogaster***

   Two pairs of discrete extramural calciferous glands present ..... ***Barogaster***

6. Genus *Barogaster* Gates

1920. *Megascolides* : Stephenson, *Mem. Indian. Mus.*, **7** : 202.

1939. *Barogaster* Gates, *Rec. Indian Mus.*, **41** : 54. (Type species, *Eudichogaster barodensis* Stephenson, 1914.)

1988. *Barogaster* : Julka. *The Fauna of India. Megudrile Oligochaeta, Octochaetidae* : 67.

Diagnosis : Setae lumbricine. Digestive system with two oesophageal gizzards in V-VI, two pairs of discrete extramural calciferous glands in XI-XII, supra–intestinal glands, simple lamelliform typhlosole. Male pores (combined with prostatic pores) paired on XVIII, seminal grooves absent.

Distribution : Peninsular India.

Remarks : The genus is represented here from the coastal districts of Andhra Pradesh by a single species, *B. annandalei.*

6. *Barogaster annandalei* (Stephenson)

1921. *Megascolides annandalei* Stephenson, *Rec. Indian Mus.*, **22** : 757. (Type loc. – Dowlaishweram, Godavari district, Andhra Pradesh; types in Zoological Survey of India, Calcutta.)

1940 *Barogaster annandalei* : Gates, *Rec. Indian Mus.*, **42** : 130.

1988. *Barogaster annandalei* : Julka, *The Fauna of India. Megadrile Oligochaeta, Octochaetidae* : 68.

Diagnosis : Length 95-115 mm. Segments 130. Prostomium prolobic. First dorsal pore at

12/13. Clitellum XIII-XVII. Genital markings small, oval, 3–6 in transverse rows at *B B* on XVIII, some times additional single rows presetal on VII, postsetal on VIII and XVII. Spermathecal pores one pair, minute on anterior margin of VII, at or slightly lateral to *B*. Male pores (combined with prostatic pores paired, minute, on oval porophores at *B*. Female pore single, transversely oval, on XIV, just in front of setal zone. Gizzard single in V; two pairs of extramural calciferous glands in XI and XII; supra-intestinal glands with 'grid-like' thickening extends through 6–10 segments; typhlosole in XXVII-XXIX to last 'grid' segment. Last pair of hearts in XII. Holandric; testes and male funnels free in X and XI; seminal vesicles in IX and XII. Prostates closely coiled, tubular; duct narrow short and bent. Penial setae unornamented, 0.58-0.66 mm long, 16-22 μ diameter. Spermathecae one pair, in VIII; ampulla, inverted pear-shaped, annulated; duct shorter than ampulla; diverticulum single, median and flattened at ental end of duct. Genital marking glands absent.

Distribution : India : Andhra Pradesh – Coastal district : East Godavari.

Remarks : It is a very rare endemic species so far known to occur from its type locality dowlaishweram, East Godavari dist., Andhra Pradesh.

7. Genus ***Dichogaster*** Beddard

1888. *Dichogaster* Beddard, *Q. Jl microsc. Sci.*, **29** : 251. (Type species, *Dichogaster damonis* Beddard, 1888.)

1892. *Microdrilus* Beddard, *Proc. zool. Soc. Lond.*, 1892 : 683.

1897. *Balanta* Michaelsen, *Jb. hamb. wiss. Anst.*, **15** : 165.

1923. *Dichogaster* : Stephenson, *Fauna Br. India, Oligochaeta* : 470.

1972. *Dichogaster* : Gates, *Trans. Am. phil. Soc.*, **62**(7) : 227.

1988. *Dichogaster* : Julka, *The Fauna of India. Megadrile Oligochaeta, Octochaetidae* : 98.

Diagnosis : Setae lumbricine. Digestive system with two oesophageal gizzards in front of septum 7/8, a pair of discrete extramural trilobed calciferous glands in XV-XVII, and intestinal origin in XIX, a simple lamelliform typhlosole but without supra-intestinal glands. Spermathecal pores paired, at or close to 7/8-8/9; male pores in seminal grooves, on XVIII or 17/18; prostatic pores two pairs, at the end of seminal grooves, on XVII anjd XIX, or one pair, on XVII; female pores paired, minute, on XIV.

Distribution : Tropical Africa, India, tropical America. Species of *bolaui* group widely transported to several parts of the world.

Remarks : The genus is represented here from the coastal districts of Andhra Pradesh by a single species, *D. affines.*

7. *Dichogaster affinis* (Michaelsen)

1890. *Benhamia affinis* Michaelsen, *Jb. hamb. wise. Anst.*, **7** : 29. (Type loc. – Quilimane, Zanzibar; type in the Hamburg Museum.)

1931. *Dichogaster sinuosus* : Stephenson, *Proc. zool. Soc. Lond.*, 1931 : 74. [Type loc. – Labaw, Mergui dist., Burma; types in the British Museum (Nat. Hist.), London.]

1972. *Dichogaster affinis* : Gates, *Trans. Am. phil. Soc.*, **62**(7) : 278.

1988. *Dichogaster affinis* : Julka, *The Fauna of India. Megadrile Oligochaeta, Octochaetidae* : 100.

Material : 2 exs., Gandhi Park, Sri Kakulam, Sri Kakulam dist., 17\6.x.1995; 5 exs., Nellore, Nellore dist., 31.iii.1998; 2 exs., Solomonopuram, Nellore dist., 4.iv.1998; 4 exs., Kalyan village, Nellore dist., 7.iv.1998; coll. S. K. Mukhopadhyay.

Diagnosis : Length 27–60 mm; diameter 1–2 mm. Segments 105–140. Prostomium epilobic, tongue closed. First dorsal pore at 5/6. Clitellum XIII, XIv-XXI, XXII. Genital markings unpaired, median, on 8/9–9/10, some times on 7/8, 10/11, 11/12. spermathecal pores paired, minute, in 7/8 and 8/9, at or close to *A*. Male pores pairedm minutem in seminal grooves, on eq /XVIII, at *A*; quadriprostatic; prostatic pores paired, minute, at the ends of seminal grooves, on XVII and XIX, at *A;* seminal grooves between setal arcs of XVII and XIX, almost straight or slightly concave. Female pores paired, presetal, at or just lateral to *A*.

Septa 7/8-12/13 slightl7y muscular. Gizzard in VI and VII. Last pair of hearts in XII. Holandric; testes and male funnels in unpaired sacs, in X and XI; seminal vesicles vestigeal, in XI and XII. Prostates two pairs, in XVII and XIX. Penial setae 0.29–0.43 mm long, 4–7 μ diameter; ornamentation of scale-like markings or teeth; tip bluntly rounded, knobbed or truncate. Spermathecae paired, in VIII and IX; duct longer than ampulla; unidiverticulate; diverticulum shortly stalked, ental, with spheroidal to ovoidal seminal chambers. Genital marking glands circular to slightly dome-shaped, concealed in longitudinal muscles.

Habitats : Soil rich with organic matter; in rotten wood; under decaying leaves.

Distribution : India : Andhra Pradesh–Coastal districts : Sri Kakulam, Nellore; Arunachal Pradesh; Gujarat; Karnataka; Kerala; Madhya Pradesh; Maharashtra; Meghalaya; Orissa.

Elsewhere : Cape Verde Island, Southwest Africa, Comoro Is., Madagascar, Zanzibar; Sri Lanka, Myanmar, Thailand; Mexico; El Salvador, French Guiana, West Indies, Brazil; Pacific ocean Islands.

Remarks : This peregrine species was possibly originated from South Africa and was transported to several countries. It is recoreded here for the first time from Andhra Pradesh.

8. Genus *Octochaetona* Gates

1909. *Octochaetus* (in part) : Michaelsen, *Mem. Indian Mus.*, **1** : 203.,

1945. *Octochaetoides* (in part) : Gates, *Jl. R. Asiat. Soc. Beng.*, **11** : 75.

1962. *Octochaetona* Gates, *Ann. Mag. nat. Hist.* (*ser.* 13), **5** : 211. (Type species, *Octochaetus surensis* Michaelsen, 1910.)

1972. *Octochaetona* : Gates, *Trans. Am. phil. Soc.*, **62**(7) : 307.

1988. *Octochaetona* : Julka, *The Fauna of India. Megadrile oligochaeta, octochaetidae* : 264.

Diagnosis : Setae lumbricine. Digestive system with an oesophageal gizzard in VI or in space between septa 4/5 and 7/8 or 8/9 or 9/10, one pair of extramural caliciferous glands, an intestinal origin behind XVI, a ventrally bifid lamelliformj typhlosole but without supra-intestinal glands. Quadriprostatic; pores paired, at the ends of seminal grooves, on XVII and XIX; male pores paired, in seminal grooves, on XVIII. Quadrithecal; pores paired, at or behind 7/8 and 8/9. Clitellum annular, female pore segment included, intersegmental furrows obliterated, dorsal pores occluded, setae retained, always extending beyond XIV. and XVI. Female pores paired, on XIV.

Distribution : Peninsular India, extending to other parts of the country, Pakistan, Nepal, Myanmar, Malay Peninsula and Philippines.

Remarks : The genus is represented here from the coastal districts of Andhra Pradesh by five species, *o. barkudensis, o. beatrix, O. compta, o. parva* and *O. surensis.*

Key to the Species

1. Holandric 2

   Metandric ..... *O. beatrix*

2. Seminal vesicles two pairs, in IX and XII or XI and 3

   Seminal vesicles three pairs, in IX, XI and XII ..... *O. compta*

3. Seminal vesicles in IX and XII 4

   Seminal vesicles in XI and XII ..... *O. parva*

4. Last pair of hearts in XII ..... *O. barkudensis*

   Last pair of hearts in XIII ..... *O. surensis*

8. *Octochaetona barkudensis* (Stephenson)

1916. *Octochaetus barkudensis* Stephenson, *Rec. Indian Mus.*, **12** : 340. (Type loc. – Barkuda Island, Chilka Lake, Orissa, India; types in Zoological Survey of India, Calcutta.)

1962. *Octochaetona barkudensis* : Gates, *Ann. Mag. nat. Hist.* (*ser.* 13), **5** : 213.

1988. *Octochaetona barkudensis* : Julka, *The Fauna of India. Megadrile oligochaeta, Octochaetidae* : 269.

Material : 2 exs., Palakonda, Sri Kakulam dist., 16.x.1995; 13 exs., Gandhi Park, Sri kakulam dist., 16.x.1995; 16 exs., Kushalapuram, Sri Kakulam dist., 20.x.1995; 2 exs., Simachalam, Vishakhapatnam dist., 24.x.1995; coll. S. K. Mukhopadhyay.

Diagnosis : Length 40–91 mm; diameter 1.5–3 mm. Segments 72–149. Prostomium epilobic, tongue open. First dorsal pore at 12/13, sometimes at 11/12. Clitellum annular, XIII-XVI. Genital markings oval to circular; paired, presetal, on XVI, sometimes on XV, XVIII and XIX, at *A B*; sometimes unpaired, median on XX-XXIX, at *A A*. spermathecal pores paired, minute, slightly lateral to *B*. Prostatic pores, minute, slightly median to *B*. Male pores paired, munute, slightly lateral to *B*. Seminal grooves almost straight to slightly concave. Female pores paired, presetal, at *A*. Septa 4/5, 8/9–11/12 muscular, 5/6–7/8 absent. Gizzard between septa 4/5 and 8/9, intestinal origin in XVII, typhlosole in XXII-XXIII to XCVI-XCIX. Last pair of hearts in XII. Holandric; testes and male funnels free in X and XI; seminal vesicles acinuous, in IX and XII. Penial setae 0.58 mm long, 10 μ diameter; ornamentation of large spines; tip pointed. Spermathecae paired, in VIII and IX; duct shorter than ampulla; unidiverticulate; diverticulum shortly stalked, distally broadened, at ental end of duct. Copulatory setae 0.52 mm long, 17 μ diameter; ornamentation of marginal serrations; tip clawshaped. Genital marking glands absent.

Habitats : Sandy loam and clay loam soils.

Distribution : India : Andhra Pradesh – Coastal districts : Vishakhapatnam and Sri Kakulam; Orissa.

Remarks : This is a very rare endemic species so far known to occur from Orissa. It is now recorded here for the first time from Andhra Pradesh.

9. ***Octochaetona beatrix*** (Beddard)

1902. *Octochaetus beatrix* Beddard, *Ann. Mag. nat. Hist.* (*ser.* 7), **9** : 456. [Type loc. – Calcutta, West Bengal, India; types in British Museum (Nat. Hist.), London.]

1907. *Octochaetus fermori* Michaelsen, *Jb. hamb. wiss. Anst.*, **24** : 171. (Type loc. – Raniganj, West Bengal, India; types in Hamburg Museum.)

1907. *Octochaetus hodgarti* Michaelsen, *Jb. hamb. wiss. Anst.*, **24** : 172. (Type loc. – Gowchar, Nepal; types in Zoological Survey of India, Calcutta.)

1910. *Octochaetus pittnyi* Michaelsen, *Abh. Geb. Naturw., Hamburg*, **19** : 86. (Type loc. – Trivandrum, Kerala, India; types in Zoological Survey of India, Calcutta.)

1914. *Octochaetus dasi* Stephenson, *Rec. Indian Mus.*, **10** : 346. (Type loc. – Baroda, Gujarat, India; types in Zoological Survey of India, Calcutta.)

1929. *Octochaetus lunatus* Gates, *Proc. U. S. natn. Mus.*, **75** : 24. [Type loc. – Mandalay, Burma; types in British Museum (Nat. Hist.), London.]

1962. *Octochaetona beatrix* : Gates, *Ann. Mag. nat. Hist.* (*ser.* 13), **5** : 213.

1972. *Octochaetona beatrix* : Gates, *Trans. Am. phil. Soc.*, **62**(7) : 308.

1988. *Octochaetona beatrix* : Julka, *The Fauna of India. Megadrile oligochaeta, Octochaetidae* : 271.

Material : 1 ex., Kushalapuram, Sri Kakulam dist., 20.x.1995; 1 ex., Sri Haripuram, Vishakhapatnam dist., 23.x.1995; coll. S. K. Mukhopadhyay.

Diagnosis : Length 40–134 mm; diameter 2–5 mm. Segments 133–197. Prostomium epilobic, tongue closed. First dorsal pore at 12/13, sometimes at 11/12. Clitellum annular, XIII-XVII, XVIII. Setae *A B ∠C D∠B C∠A A, D D*>½*C, A B* on VIII and IX slightly sigmoid and enlarge. Discreate genital markings absent. Spermathecal pore paired, minute, on or slightly anterior to setal arcs of VIII and IX, median to *A*. Male genital field slightly depressed; male pores paired, minute, at or slightly median to *A*; prostatic pores paired, minute, median to *A*; seminal grooves concave between setal arcs of XVII and XIX. Female pores paired, presetal, within *A* lines. Septa 4/5, 8/9-10/11 muscular, 5/6-7/8 absent. Gizzard between septa 4/5 and 8/9; intestinal origin in XVII; typhlosole in XXV to CIV-CXII. Last pair of hearts in XIII. Metandric; testes and male funnels enclosed in a sub-oesophageal U-shaped sac in XI; seminal vesicles small, in XII. Penial setae 0.5-0.85 mm long, 15-20 μ diameter; ornamentation of sparse triangular teeth; tip pointed. Spermathecae paired, in VIII and IX, small, beneath the gut; duct shorter than ampulla; unidiverticulate; diverticulum ental and shortely stalked, spheroidal, shortly pyriform, oval or flattened and shelf-like. Setae of ventral couples in VIII and IX sigmoid, 0.29-0.32 mm long, 30-35 μ diameter.

Habitats : Sandy loam and clay loam soils in lawns and grass lands, on the edge of ditches.

Distribution : India : Andhra Pradesh– Coastal districts : Sri Kakulam and Vishakhapatnam; Chandigarh; Goa; Gujarat; Himachal Pradesh; Jammu & Kashmir; Karnataka; Kerala; Madhya Pradesh; Maharashtra; Orissa; Punjab; Rajasthan; Uttar Pradesh; West Bengal.

Elsewehre : Pakistan; Nepal, Myanmar, Malay Peninsula, Philippines.

Remarks : This endemic species is recorded here for the first time from Andhra Pradesh.

10. *Octochaetona compta* (Gates)

1945. *Octochaetoides comptus* Gates, *Jl. R. Asiat. Soc. Beng.*, **11** : 80. (Type loc.– Nellore, Andhra Pradesh, India; types in Zoological Survey of India, Calcutta.), **12** : 340. (Type loc.– Barkuda Island, Chilka Lake, Orissa, India; types in Zoological Survey of India, Calcutta.)

1962. *Octochaetona compta* : Gates, *Ann. Mag. nat. Hist.* (*ser.* 13), **5** : 213.

1988. *Octochaetona compta* : Julka, *The Fauna of India. Megadrile oligochaeta, octochaetidae* : 276.

Material : 2 exs., Nellore, Nellore dist., 2.iv.1998, coll. S. K. Mukhopadhyay.

Diagnosis : Length 70-150 mm; diameter 3-7 mm. Segments 131-176. Prostomium epilobic, tongue closed. First dorsal pore at 12/13. Clitellum XIII-XVII. Genital markings

oval, unpaired, median, presetal, on XIII, sometimes on XV, XX-XXV, at *A A* or *B B* or *B C*. Spermathecal pores paired, minute, slightly anterior to setal arcs of VIII and IX, at *A B*, sometimes at *A* or *B*. Male genital field transversely oval, between 16/17 and 19/20; male pores paired, minute, slightly median to *B;* prostatic pores paired, minute, just median to B; seminal grooves straight or irregularly biconcave, between setal arcs of XVII and XIX. Female pores paired. Septa 4/5, 8/9–11/12 muscular, 5/6–6/7 absent. Gizzard between septa 4/5 and 7/8; intestinal origin in XVII; typhlosole in XXIV–XXV to CXIV–CXIII. Last pair of hearts in XIII. Holandric; testes and male funels free, in X and XI; seminal vesicles in IX, XI and XII. Penial setae 0.74–0.85 mm long, 14–16 μ diameter; ornamentation of 15–30 circles of small teeth, tip sharp or rounded, narrowed or widened. Spermathecae paired, in VIII and IX; unidiverticulate; diverticula ectal, dorsoventrally flattened and circular disc-like. Setae on ventral couples on VIII and IX, sigmoid and ornamented with transverse serrations, sometimes the setae on VIII coupulatory.

Distribution : India : Andhra Pradesh – Coastal districts : Nellore, Prakasham, Guntur and West Godavari.

Remarks : This is a very rare endemic species so far known to occur from Andhra Pradesh only.

11. ***Octochaetona parva*** (Gates)

1945. *Octochaetoides parvus* Gates, *Jl. R. Asiat. Soc. Beng.*, **11** : 84. (Type loc.– Nellore, Andhra Pradesh, India; types in Zoological Survey of India, Calcutta.), **12** : 340. (Type loc.– Barkuda Island, Chilka Lake, Orissa, India; types in Zoological Survey of India, Calcutta.)

1962. *Octochaetona parva* : Gates, *Ann. Mag. nat. Hist.* (*ser.*13), **5** : 213.

1988. *Octochaetona parva* : Julka, *The Fauna of India.Megadrile Oligochaeta, Octochaetidae* : 283.

Material : 3 exs., Allipuram, Nellore dist., 3.iv.1998, coll. S. K. Mukhopadhyay.

Diagnosis : Length 70–100 mm; diameter 3–4 mm. Segments 80, prostomium epilobic, tongue open. First dorsal pore at 12/13. Clitellum XIII–XVI, XVIII. Setae on XXX, *A B ∠C D ∠B C∠A A, D D* = or slightly $>^1/_2$C. Genital markings oval, unpaired and median, in 20/21, 21/22, sometimes in 19/20, postsetal on XXI, at *A A*. Spermathecal pores small slits, anterior to VIII and IX, at or close to *A* or *b*. Male genital field slightly depressed in seminal grooves; male pores paired, minute, slightly median to *B*; prostatic pores paired, minute, at *B;* prostatic pores paired, minute, at *B*; seminal grooves almost straight or slightly concave between setal arcs of XVII and XIX. Female pores paired. Septa 4/5, 8/9-11/12 muscular, 5/6–6/7 absent. Gizzard between septa 4/5 and 7/8; intestinal origin in XVII; typholosole begins in XXIV–XXV. Last pair or hearts in XIII. Holandric; seminal vesicles in XI and XII. Penial setae 0.96–1 mm long, 20-25 μ diameter; ornamentation of circles of fine spines; tip sharply pointed to bluntly rounded. Spermathecae paired, in VIII and IX; duct shorter than ampulla; inidiverticulate; diverticulum ectal, flattened disc-like. Copulatory setae 0.88–1.2

mm long, 24–30μ diameter, ornamentation of longitudinal rows of fairly stout and long spines; tip claw-shaped.

Habitats : Sandy loam soil.

Distribution : India : Andhra Pradesh – coastal districts : Nellore and Prakasham.

Remarks : This is a very rare endemic species so far known to occur from two coastal districts of Andhra Pradesh.

12. *Octochaetona surensis* (Michaelsen)

1910. *Octochaetus surensis* Michaelsen, *Abh. Geb. Naturw. Hamburg,* **19**(5) : 88. (Type loc.– Sur Lake, Puri district, Orissa, India; typus amissus.)

1925. *Octochaetus (octochaetoides) birmanicus* Gates, *Ann. Mag. nat. Hist.* (*ser.*9), **16** : 55. (Type loc.– Rangoon, Burma; types in Zological Survey of India, Calcutta.)

1962. *Octochaetona surensis* : Gates, *Ann. Mag. nat. Hist.* (*ser.*13), **5** : 213.

1988. *Octochaetona surensis* : Julka. *The Fauna of India. Megadrile Oligochaeta, Octochaetidae* : 292.

Material : 2 exs., Sher Mahammadipuram, Sri Kakulam dist., 17.x.1995; coll. S. K. Mukhopadhyay. 5 exs., Peddapuram, East Godavari dist., 6.iv.1997; 4 exs., pithapuram, East Godavari dist., 7.iv.1997; coll. K. R. Halder.

Diagnosis : Length 60–140 mm; diameter 2.5–6 mm. Segments 111–180. Prostomium epilobic, tongue closed. First dorsal pore at 12/13. Clitellum annular XIII-XVI, XVII./ Setae *A B∠C D∠B C∠A A, D D*>½C; setae *A B* of VIII and IX copulator. Genital markings oval, paired or unpaired and median; postsetal on some of XVIII–XXII, at *A A* or *B B*.Spermathecal pores paired, minute, on or close to setal arcs of VIII and IX, at *A B*. Male genital field XVI-XX, with deep transverse depression on XVII and XIX; male pores paired, minute, at *B;* prostatic pore paired, minute, at *B;* seminal grooves conves. Female pores paired, presetal within *A* lines.

Septa 4/5, 8/9–10/11 muscular, 5/6-7/8 absent. Gizzard between septa 4/5 and 8/9; intestinal origin in XVII; typhlosole XXII-XXIII to CI-CXV. Last pair of hearts in XIII. Holandric; seminal vesicles in IX and XII. Penial setae 1,2-1.8 mm long, 25-30 μ diameter; ornamentation of a few longitudinal rows of triangular teeth; tip pointed or claw-shaped. Spermathecae paired, in VIII and IX; duct barrel-shaped ectally; inidiverticulate ; diverticulum ental, shortly stalked. Copulatory setae 0.85–1.2 mm long, 20–25 μ diameter; ornamentation of longitudinal rows of spikes or thorn like protuberances; tip claw-shaped. Genital marking glands absent.

Habitats : Sandy loam and clay loam soil in grass lands, compost pits, upland crop fields and around roots of potted plants.

Castings : Casts are deposited on soil surface in the form of globules which often fuse to form irregular pyramidal structures when the soil moisture becomes high.

Distribution : India : Andhra Pradesh – coastal districts : East Godavari and Sri Kakulam; Assam; Madhya Pradesh; Orissa; Uttar Pradesh.

Elsewhere : Myanmar.

Remarks : This endemic species is recorded here for the first time from Andhra Pradesh.

B. Order MONILIGASTRIDA

Diagnosis : Testes and male funnels intraseptal in paired dorsal testis sacs; male pores at or close to intersegmental furrow immediately posterior to the testis sac.

V. Family MONILIGASTRIDAE

Diagnosis : Dorsal pores absent. Digestive system with oesophageal gizzards behind ovarian segments, an intestinal origin behind XVII but without calciferous glands, typhlosole and supra-intestinal glands. Spermathecal pores anterior to male pores. Male pores at or close to 10/11 or 11/12 or 12/13. Ovaries band-shaped, ova large and yolky. Nephridia holoic.

Distribution : Southeast and eastern Asia, from South India to Manchuria, Korea, Philippines, Borneo, sumatra.

Remarks : The family is represented here from the coastal districts of andhra Pradesh by a single genus, *Drawida.*

9. Genus ***Drawida*** Michaelsen

1900. *Drawida* Michaelsen, *Tierreich,* **10** : 114. (Type species, *Moniligaster barwelli* Beddard, 1886.)

1972. *Drawida* : Gates, *Trans. Am. phil. Soc.,* **62**(7) : 244.

1987. *Drawida* : Julka & Senapati, *Rec. zool. Surv. India, Occ. Pap.* No. 92 : 37.

Diagnosis : Setae lumbricine. Digestive system with several gizzards in XII-XXVII but without intestinal caeca and supra-intestinal glands. Clitellum in X-XIII. Spermathecal pores paired, at or close to 7/8. Male pores paired, at or close to 10/11. Female pores paired, at or just posterior to 11/12. Capsular prostates paired. Holongphridia present from III.

Distribution : Siberia, China, Korea, Japan; Nepal, India, Myanmar, Malay Peninsula, Indonesia, Philippines, Borneo, Thailand.

Remarks : The genus is represented here from the coastal districts of Andhra Pradesh by frive species, *D. exilis, D. lennora, D. limella, d. peridiosa* and *D. willsi.*

Key to Species

1. Spermathecal atrium present 2

   Spermathecal atrium absent ..... *D. exilis*

2. Genital markings present 3

   Genital markings absent ..... *D. lennora*

3. Each male pore located on a nipple-like projection at the ventral end of a conical porophore ..... *D. limella*

   Male pores not so located 4

4. Genital markings in 9/10 ..... *D. willsi*

   Genital markings in 7/8 or Vii or VIII, and IX or x. ..... *D. peridiosa*

13. *Drawida exilis* (Gates)

1945. *Drawida exilis* Gats, *Jl. R. Asiat. Soc. Beng.*, **11** : 65. (Type loc.– Nellore district, Andhra Pradesh, India; type in Zoological Survey of India, Calcutta.)

Diagnosis : Length 34 mm; diameter 1.5 mm. Pigmentation blue. Setae on XX, *A B = C D, A A∠B C.* Spermathecal pores small, transverse slits, on posterior margin of VII, at m*B C*. Female pores minute, on or close to *B* lines. Gizzards in XII-XIII. Testis sacs large, in IX and X. Prostates *ca.* 1.25 mm long, widend entally, lumen large. Spermathecal duct passes directly into parietes, atrium absent.

Distribution : India : Andhra Pradesh - coastal district : Nellore.

Remarks : This is a very rare endemic species so far known to occur in India from its type locality Nellore of Andhra Pradesh.

14. *Drawida lennora* Gates

1945. *Drawida lennora* Gates, *Jl. R. Asiat. Soc. Beng.*, **11** : 67. (Type loc.– Kurnool, kurnool district, andhra Pradesh, India; types in Zoological Survey of India, Calcutta.)

Diagnosis : Length 35-44 mm; diameter 2 mm. Pigmentation blue. Setae on XX, *A B = C D, A A∠B C.* Genital markings absent. Spermathecal pores small, transversely crecentic slits, on posterior margin of VII, on *B* lines. Male pores minute, on *B* lines. Gizzard in XII-XIII or XIII-XIV; intestinal origin in XX. Testis sacs in IX and X. Prostates glandular, erect; capsule rather pyriform, widened entally. Spermathecal duct passed into ental end of artium; artium shortly columner, erect in VII.

Distribution : India : Andhra Pradesh – Coastal district : Nellore; noncoastal district : Kurnool.

Remarks : This is a very rare endemic species so far known to occur in India from kurnool and Nellore of Andhra Pradesh.

15. *Drawida limella* Gates

1934. *Drawida limella* Gates, *Rec. Indian Mus.*, **36** : 241. (Type loc.– Amingaon, Assam, India; types in Zoological Survey of India, Calcutta.)

1972. *Drawida limella* : Gates, *Trans. Am. Phil. Soc.*, **62**(7) : 251.

1987. *Drawida limella* : Julka & Senapati, *Res. Zool. Surv. India, Occ. Pap.* No. **92** : 39.

Material : 5 exs., Rayavaripalam village, East Godavari dist., 4.iv.1997; 1 ex., peddapuram, east Godavari dist., 6.iv.1997; 1 ex., Samalkot, East Godavari dist., 6.iv.1997; 1 ex., Mahadevpalli village, West Godavari dist., 9.iv.1997; coll. K. R. Halder, 1 ex., Santanatalapadu, ongole, Prakasham dist., 9.iv.1998; 6 exs., Medejoadu, ongole, Prakasham dist., 10.iv.1988; coll. S.K. Mukhopadhyay.

Diagnosis : Length 43–110 mm; diameter 1.5–3 mm. Segments 92–192. Clitellum annular, ½ IX, X – XIII, XIV. Setae *A A∠B C*. Genital markings paired, circular to oval, each with a munute central pore, at *B C*, in 7/8 or post setal on VII or presetal on VIII, sometimes at *A B*, in VII-VIII. Spermathecal pores minute, in 7/8 or on VII or VIII or on one of the genital markings near 7/8, at m*B C* or slightly lateral to *B* or close to *C* lines. Male pores minute, at *A B* or at *B*, each pore located on a nipple-lipe projection at the ventral end of a conical porophore. Nephridiopores in a single series on each side, at *D* lines. Gizzards 2–4, in XII-XVII. Last pair of hearts in IX. Prostates circular, sessile, glandular; capsule shortly tubular and digitiform. Spermathecal duct short, passing directly to parietes; atrium short, tubular or pear-shaped, sometimes atrium absent. Genital marking glands tubular, erect, longer that prostate.

Distribution : India : Andhra Pradesh – coastal districts : East and West Godavari; Assam; Orissa.

Remarks : This is a rare endemic species recorded here for the first time from East and West Godavari districts of Andhra Pradesh.

16. *Drawida peridiosa* Gates

1934. *Drawida Peridiosa* Gates, *Rec. Indian Mus.*, **36** : 247. (Type loc. – Agarru, West Godavari district, Andhra Pradesh, India; typus amissus.)

Diagnosis : Length 57 mm; diameter 2 m. Colour dorsally, deep bluish; of clitellum, reddish. Setae closely paired, *A B = C D*; behind clitellum, *A A∠B C*. Clitellum annular, IX, X-XIII, XIV. Genital markings paired, transversely oval, presetal, on IX or X; additional markings, paired or unpaired, smaller, in 7/8 or presetal on VIII or post setal on VII. Spermathecal pores, tiny slits, in *B* or slightly lateral to *B*, in 7/8 or on VII or VIII. Male pores

in *B* or slightly lateral to *B*. Female pores in 11/12, about in *B*. Nephridiopores about in line with *D*. Septa 5/6–8/9 muscular. Gizzards 2–3, in region XIII–XVI. Last pair of hearts in IX. Prostates short, cone-like, erect, in X, with softish surface of granular appearence capsule short tubular. Spermathecal atrium short, tubualr, of about twice the thickness of spermathecal duct. Genital marking glands erect, tubular, with bluntly rounded ental end.

Distribution : India : Andhra Pradesh–coastal district : West Godavari.

Remarks : This is a very rare endemic species so far known to occur from its type locality.

17. ***Drawida willsi*** Michaelsen

1907. *Drawida willsi* Mishaelsen, *Mitt. naturh. Mus. Hamb.*, **24** : 145. (Type loc.– Bilashpur, Madhya Pradesh, India; types in Zoological Survey of India, Calcutta.)

1945. *Drawida willsi* : Gates, *Proc. Indian Acad. Sci.*, **21**(B) : 214.

1987. *Drawida willsi* : Julka & Senapati, *Rec. zool. Surv. India, Occ. Pap.* No. **92** : 40.

Material : 13 exs., Gandhi Park, Sri kakulam, Sri kakulam dist., 16.x.1995; 2 exs., Sher Mahammadipuram, Sri kakulam dist., 17.x.1995; 1 ex., Amadalavalasa, Sri Kakulam dist., 18.x.1995; 13 exs., wasabik Vidyalaya compund, Sri kakulam, Sri Kakulam dist., 19.x.1995; 11 exs., Kushalapuram, Sri kakulam dist., 20.x.1995; 14 exs., Simachalam, Vishakhapatnam dist., 24.x.1995; coll. S.K. Mukhopadhyay. 1 ex., chollangi village, East Godavari dist., 2.iv.1997; 4 exs., Ramachandrapuram, East Godavari dist., 3.iv.1997; 4 exs., Acthanpeta village, East Godavari dist., 4.iv.1997; 13 exs., Rajanagaram, East Godavari dist., 5.iv.1997; 3 exs., Sarpavaram, Kakinada, East Godavari dist., 7.uiv.1997; 1 ex., Bhimavaram, West Godavari dist., 10.iv.1997; coll. K.R. Halder.

Diagnosis : Length 55–60 mm; diameter 2.5 mm. Segments 155–160. Prostomium prolobic. Clitellum annular, X-XIII. Setae *A A* = *B C*. Genital markings paired, circular, with minute central pores, on 9/10, on or near *B* lines. Spermathecal pores paired, small, at *A B*. Male pores paired, minute, at or very close to *B* lines; each pore on ventral end of slightly depressed or conically protuberant central area of circular to oval porophore. Gizzards 2–4, in region XII-XVI; intestinal origin in XXI, occfasionally in XXII or XXIII. Prostates glandular, erect; capsule digitiform. Spermatheca paired, in VIII; atrium long, digitiform, in VII, arising from ental end of duct. Genital marking glands digitiform.

Habitats : Soil in crop fields, compost pits and drains.

Castings : Casts are deposited on soil surface in the form of globular pellets.

Economic importance : This species may be selected for vermiculture as it enhances the decomposition of green manure and straw.

Distribution : India : Andhra Pradesh – coastal districts : Vishakhapatnam, Sri kakulam,

East and West Godavari; non coastal districts : Hyderabad, Rangareddy; Madhya Pradesh; Orissal; Uttar Pradesh.

Remarks : This species is recorded here for the first time from the coastal districts of Andhra Pradesh.

SUMMARY

A comprehensive account of the earthworm fauna of the coastal districts of Andhra Pradesh comprising 17 species belonging to nine genera and five families is represented. Diagnostic characters and keys are provided for all the orders, families, genera and species occurring in the area. The informations on type locality and the repositories of type specimens are also added. Moreoever, the distribution of earthworms in the coastal districts of the state has been summarised in a table. A general account of terminology along with the methods of collection and preservation of earthworms is provided also. Seven species, three genera and one family have been recorded here for the first time from Andhra Pradesh while several species from its coastal districts.

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Distribution of earthworms in the Coastal Districts of Andhra Pradesh

Sl. No.	Name of species	DISTRICTS								
		Sri kakulam 1	Vizianag-ram 2	Vishakha-patnam 3	East Godavari 4	Wast Godavar 5	Krishna 6	Guntur 7	Prakasham 8	Nellore 9
1.	*Barogaster annandalei* (Stephenson)				+					
*2.	*Dichogaster affinisi* (Michaelsen)	+								+
3.	*Drawida exilis* Gates									+
4.	*Drawida lennora* Gates								+	
5.	*Drawida limella* Gates				+	+				
6.	*Drawida peridiosa* Gates					+				
7.	*Drawida willsi* Michaelsen	+		+	+	+				
8.	*Lampito mauritii* Kinberg	+		+	+	+	+		+	+
*9.	*Malabaria biprostata* Aiyer	+								
*10.	*Ocnerodrilus occidentalis* Eisen	+								
*11.	*Octochaetona barkudensis* (Stephenson)	+		+						
*12.	*Octochaetona beatrix* (Beddard)	+		+			+			
13.	*Octochaetona compta* (Gates)					+		+	+	+
14.	*Octochaetona parva* (Gates)								+	+
*15.	*Octochaetona surensis* (Michaelsen)	+			+					
*16.	Perionyx excavatus Perrier					+	+			
17.	*Pontodrilus bermudensis* (Beddard)	+		+						

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FRESHWATER OLIGOCHAETA

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INTRODUCTION

Fresh-water oligochaeta is a small group of worm like aquatic invertebrates comprising three families under the phylum Annelida having a very simple organisation of the body. They live in ponds, lakes, streams, ditches and even drains or any marshy area where there is water throughout the year stagnant or flowing. They swim freely, adhere to the surface of the substratum *i.e.* aquatic weeds, brick bats or live in mud under water sometimes forming a tube around their bodies and project their tail ends out of mud for getting atmospheric oxygen utlized for breathing. Many of these have specialised respiratory organs either arranged serially along the sides of their bodies or in a hollow area at their hind end. In sizes they range from microscopic to about 200 mm., usually pale red, whitish or creamy in colour and move by microscopic calcareous structures viz. setae arranged in paired bundles in every segment. A large number of these worms act as food for fishes or other aquatic animals.

The first and only comprehensive systematic account on the group from the State of Andhra Pradesh is that of Naidu (1962-1966) who though confined his studies only on a few districts of the state reported 36 species under 14 genera and 3 families including 7 new species. No other worker on this small invertebrates before or after Naidu including the Fauna of British India reported any species from the area till now.

The present material gives diagnosis, distribution and key for identification of 6 species under 2 families collected from only the coastal districts of Andhra Pradesh. Though none of them is new to the state but show their range of distribution to the different districts of the state. A list of freshwater oligochaetes known hitherto from Andhra Pradesh is also furnished.

GENERAL REMARKS ON THE FRESHWATER HABITAT OF THE STATE

The nine coastal districts of Andhra Pradesh from Srikakulum to Nellore appeared to be the driest part of the state especially during the pre-monsoon period. During monsoon working atmosphere is seldom available due to excessive rains.

After the usual rainy weather ends this State gets a fresh spell of showers during November with cyclonic storms. The winter months provide some opportunities for collecting fresh water invertebrates as the soil reserve a good quantity of moisture and the water bodies settled. Again during March-April the soil becomes dry and water level much low. Moreover, water bodies like, ponds, ditches etc. are very seldom found here. Big water bodies like the PWD Tank at Nellore district, water reservoirs for prawn fishery at Allipuram being devoid of natural vegetation are useless for such purpose. The only best habitat was available at Golamma river bank at Madipadu in Prakasham district, where the bank being sandy and muddy is most favourable for the survival and propagation of the aquatic oligochaetes. Thus the paucity of the number of collection and variety of species is much due to such unfavourable habitat prevailing in the state.

MATERIAL AND METHOD

Collection : The most successful way of collecting the Naids which occur amongst aquatic vegetation, dead leaves, underwater soil or similar objects is by sampling of such matter from water. These are to be shaken immediately afterwards in a flat glass dish with water in the laboratory where by the worms are washed out into the water and removed by a pipette. By this method the smallest specimens are easily found out if good light and dark back ground are used. The process is repeated with change of water. The bigger Tubificids are however collected washing mud samples in white based enamel tray and subsequently collected with pipette or bent needles. The work of collecting specimens is accomplished with great advantage under a low power binocular microscope.

Preservation : The most advantageous way of preservation of the Naids is to put the living worms directly into 4% formalin, as the specimens are apt to die and disintrigate when treated with narcotics. Various narcotics were used but none proved advantageous (Stephenson 1923). The bigger Tubificid worms may however be narcotised with gradually increasing dose of alcohol. Preservation by formalin sometimes bring about some amount of opacity of the outer body wall which are to be overcome during the process of study.

Study : The best method of study is to observe them in living condition under microscope. The specimens are put on a slide with an excess amount of water and covered by a cover slip. As the water dries up the full anatomical details can be studied. Further, instead of allowing the water to evaporate the cover slip may be pressed gently and the superflous water wiped with absorbent cotton. This method helps to study the details of the setae.

In the laboratory the preserved material is studied under microscope after treatment with glycerine which bring out some amount of transparency and make the specimens most suitable for observation and study.

MORPHOLOGY AND TERMINOLOGY

Prostomium : Anterior part of the body above the mouth opening. It may be conical, semicircular, rounded, triangular or sharply or bluntly pointed. It may also extend as a whip like process, the proboscis (*Stylaria, Pristina).*

Setae : Minute, microscopic locomotory structures arranged in dorsal and ventral bundles, one pair mid-dorsally and mid-ventrally per segment. These are of various shapes and play the highest role in taxonomy.

Dorsal bundle : Made up of dorsal setae which are of three different kinds, viz.

Hair : Elongated, slender, look like an individual hair.

Needles : Short, broad with simple or bifid tips or pectinate with multiple tips; usually with a median swelling, the nodulus. The body may be bent in the form of a sickle.

Crotchets : These resemble single or double pointed hooks with equal or unequal ends or teeth. The teeth may again be pointed, blunt, or pectinate.

Ventral bundle : Constituted fully or crotchet setae, double pointed with a nodulus at various position of the body of the shaft. In appearence these resemble the English letter 'f' and usually begin from the 2nd segment.

Gills or branchiae : Specialised organelles for gaseous exchanges. These may be simple extensions of the body arranged serially on the mid-dorsal line each having a loop of blood vessel (*Branchiodrilus, Branchiura*) or leaf like expansions at the hind end of the body in a hollow area, the branchial fossa (*Dero*), sometimes guarded by a pair of lateral extensions or palps (*Aulophorus*).

Pharynx : Dilation of the dorsal part of the foregut, extends from the IInd to Vth segment.

Stomach : A dilatation of the digestive tube behind the oesophagus.

Nephridium : Specialised convoluted tube having external opening for the purpose of excretion of nitrogenous waste. One pair per segment from the VIIth.

Clitellum : A protective band overlying the organ generation situated approximately in Vth to VIIth segment.

Testes : Glandular bodies lying attached to the posterior phase of the septum 4/5 on each side of the ventral nerve cord.

Ovaries : Small structures attached similarly to the sides of the nerve cord and septum in front.

LIST OF FRESHWATER OLIGOCHAETA

Class OLIGOCHAETA

Order HAPLOTAXIDA

I. Family AELOSOMATIDAE

1. Genus ***Aelosoma*** Ehrenberg, 1831.

1. *Aelosoma bengalense* Stephenson, 1911.
2. *A. hemprichii* Ehrenberg, 1831.
3. *A. travancorense* Arjar, 1926.

II. Family NAIDIDAE

Subfamily CHAETOGASTERINAE

2. Genus ***Chaetogaster*** Von Baer, 1827.

4. *Chaetogaster cristallinus* Vejdovsky, 1883.
5. *C. diastrophus* (Gruithuisen, 1828).
6. *C. langi* Bretscher, 1896.

Subfamily NAIDINAE

3. Genus ***Nais*** Muller, 1773.

7. *Nais communis* Piguet, 1906.
8. *N. Menoni* Naidus, 1962.

4. Genus ***Stylaria*** Lamarek, 1816.

9. *Stylaria fossularis* Leidy, 1852

5. Genus ***Branchiodrilus*** Michaelsen. 1900

*10. *Branchiodrilus semperi* (Bourne, 1890)

6. Genus ***Dero*** Oken, 1815

*11. *Dero cooperi* Stepheson, 1932
12. *Dero digitata* (Muller, 1773)
13. *D. dorsalis* Ferronrere, 1899
*14. *D. indica* Naidu, 1962
15. *D. nivea* Aiyar, 1930
16. *D. plumosa* Naidu, 1962
17. *D. Zeylanica* Stephenson, 1913

7. Genus ***Aulophorus*** Schmarda, 1861

*18. *Aulophorus furcatus* (Muller, 1773)

19. *A. hymanae* Naidu, 1963

20. *A. indicus* Naidu, 1963

21. *A. michaelseni* Stephenson, 1923

22. *A. tonkinensis* (Vejodovsky, 1894)

8. Genus ***Allonais*** Sperber, 1948

23. *Allonais gwaliorensis* (Stephenson, 1920)

24. *A. inaequalis* (Stephendson, 1911)

25. *A. rayalaseemensis* Naidu, 1963

Subfamily STEPHENSONIANAE, Naidu

9. Genus ***Stephensoniana*** Cernosvitov, 1938

26. *Stephensoniana trivandrana* (Aiyar, 1926)

Subfamily PRISTININAE, LASTOCKIN, 1924

10. Genus ***Pristina*** Ehrenberg, 1828

27. *Pristina aeguiseta* Bourne, 1819

28. *P. evalinae* Mareus, 1943

29. *P. longiseta longiseta* Ehrenberg, 1828

30. *P. minuta* (Stephenson, 1914)

31. *P. sperberae* Naidu, 1963

32. *P. synclites* Stephenson, 1925

III. Family TUBIFICIDAE

11. Genus ***Aulodrilus*** Bretscher, 1899

33. *Aulodrilus remex* Stephenson, 1921

12. Genus ***Branchiura*** Beddard, 1892

34. *Branchiura sowerbyi* Beddard, 1892

13. Genus ***Bothrioneurum*** Stolo, 1886

*35. *Bothrioneurum iris* Beddard, 1901

14. Genus ***Limnodrilus*** Claparede, 1862

*36. *Limnodrilus hoffmeisteri* Claparede, 1862.

Key to the families

1. Size small, slender, hair setae always present in dorsal bundles; sexual reproduction occurs; Testes in Vth and ovaries in VIth or VIIth segment ..... NAIDIDAE

– Size large, relatively robust, hair setae not always present; sexual reproduction does not occur; testes in Xth and ovaries in XIth segment. ..... TUBIFICIDAE

Family I NAIDIDAE

Diagnosis : Prostomium sometimes prolonged into a proboseis. Dorsal setae sometimes absent, when present begin from II to VIth and consisting of a variable number of hair and needle setae or needle setae only. Ventral setae begin from IInd as a rule and composed of single or double pointed erotchet setae; asexual reproduction occurs by budding or fragmentation.

Distribution : Europe; Pakistan; Tibet; Ceylon; N. and S. America.

Remarks : It is the biggest family of fresh water oligochaeta having 11 genera in India, of which 9 are represented in Andhra Pradesh.

Subfamily NAIDINAE

Diagnosis : Hair setae may or may not be present; needle setae of dorsal bundles are of various kinds. Pharynx with dorsal diverticulum. Pharyngeal and septal glands present. Nephridia open. Testes and spermathecae in IV and ovaries and atria in VI.

Key to the genera

1. Branchiae arranged serially along dorsolateral sides of the body, a pair in each segment ..... ***Branchiodrilus***

– Branchiae present in a hollow area, the branchial fossa at the hind end of the body, foliaceus 2

2. Branchial fossa without palps ..... ***Dero***

– Branchial fossa with paired palps ..... ***Aulophorus***

Genus 1. ***Branchiodrilus*** Michaelsen, 1900

1890. *Chaetobranchus* Bourne, *Quart. J. micro. Sci.*, (N.S.), 31 : 83.

1900. *Branchiodrilus* Michaelsen, *Das Tierreicn*, **10** : 24.

Type species : *Branchiodrilus semperi* (Bourne)

Diagnosis : Prostomium round. Paired branchial processes from VIth onward, dorsolaterally placed on most of the anterior body segments enclosing the dorsal setae of that segment. Dorsal setae composed of hairs and needles, ventrals of bifid crotchets only.

Distribution : Pakistan and India.

Branchiodrilus semperi (Bourne, 1890)

1890. *Chaetobranchus Semperi*, Bourne, *Quart. J. micro. Sci.*, (N.S.), 31 : 83–89, Pl.12.

1900. *Branchiodrilus semperi* (Bourne) Michaelsen, *Das Tierreich*, **10** : 24.

2001. *Branchiodrilus semperi* Mukhopadhyay, State fauna Series 3 : Fauna of West Bengal, Pt. 11

Material : 4 exs., Footi village, Nellore dist., 6.4.98, Coll. S.K. Mukhopadhyay. 11 exs., Madipadu, Prakasham dist., 10.4.98, Coll. S.K. Mukhopadhyay.

Diagnosis : Size moderate, 30-40 mm, segments 70-80. Anterior part of body with transverse chocolate brown pigmented bands. Prostomium bluntly triangular. Gills arranged dorsolaterally, one pair in each of 40-50 segments begining from II; first 5-6 pairs smaller, gradually increasing in length after the 20th segment, decreasing steadily from 30th or so, until they are reduced to mere warts only; largest gill measuring several times the diameter of the body. Gills are hollow projections of the body wall each having a loop of dorsal blood vessel and enclose the dorsal setae of that segment. Dorsal setae composed of hairs and needles, 2 or 3 of each in a bundle. Ventral setae from 2nd, 4-6 per bundle, bifid crotchets, outer prongs of which being twice the length of the inner while in hinder segments the inner being twice the length of the outer. Nephridium begins in XII. Budding Zones apparent.

Habitat : Mud-dwellers, not free swimming. Found along with other species of the genus and species belonging to the genus *Dero*.

Distribution : India : Andhra Pradesh – Cuddapah, Nellore and Prakasham dist., Tripura; West Bengal and Tamil Nadu.

Elsewhere : Ceylon.

Genus ***Dero*** Oken, 1815

1815. *Dero* Oken, *Lehrbuch der Naturgeschichte*, 3, Zoologie 1. *Fleischiose Theire, Leipzig*.

2001. *Dero* : Mukhopadhyay : *State Fauna Series, 3. Fauna of West Bengal*, pt. 11.

Type-species : *Dero digitata* (Muller)

Diagnosis : Dorsal setae start from IV, V, VI onward, consisting of hairs and double pronged pectinate or palmate needles. Ventral setae of II-V different from those of the rest having the distal teeth longer than proximal but equally thick, compared with equally long or shorter and thinner in the later. Anus opening to a ciliated branchial fossa containing gills; angles of posterior border of fossa may project as palps. Mostly tube dwellers.

Distribution : Africa; Europe; China; Palestine; Pakistan; Turkestan; India; Ceylong; N. and S. America and West Indies.

Subgenus ***Dero*** Oken

1948. *Dero (Dero)* Sperber, *Zool. Bidr. Uppsala,* **28** : 162.

Key to the Species of *Dero (Dero)*

1. Dorsal bundle of setae consisting of 1 hair and 1 needle in all segments .... *cooperi*

– Dorsal bundle of setae consisting of 1 hair and 1 needle in posterior segments only. ..... *indica*

Dero (Dero) cooperi Stephenson, 1932

1932. *Dero cooperi* Stephenson, *Proc. Zool. Soc. London,* 1932 (1–2) : 231–233, fig.I, 2–5.

2001. *Dero cooperi* : Mukhopadhyay, *State Fauna Series,* **3** : *Fauna of West Bengal,* Pt. 11.

Material : 18 exs., Kusalapuram, Srikakulum dist., 20.10.95; 1 ex., Simachalam, Visakhapatnam dist., 24.10.95. 5 exs., Santanatalapadu, Prakasham dist., 9.4.98 and 16 exs., Madipadu, Pranasham dist., 10.4.98. coll. S.K. Mukhopadhyay.

Diagnosis : Size small, about 10 mm, reddish. Prostomium with sensory hairs. Dorsal setae from VI having 1 hair and 1 needle in each bundle; hairs bayonet shaped, needles bifid with short teeth, unequal prongs, proximal being thicker and longer than distal. Ventral setae from II, those of II-V having 3-5 per bundle, longer than the rest; nodulus median; distal tooth 1.5 times as long as proximal, the rest 4 per bundle with distal nodulus. Branchial fossa with posterior prolongation; gills 4 pairs; dorsal pair foremost and the smallest; hind most pair leaf like; 2nd and 3rd pair thicker than the rest. Clitellum covers V-VII. Nephridia from VII.

Habitat : Live in tubes with mucus, sand and mud. Swim by spiral movements.

Distribution : India : Andhra Pradesh Cuddapah; Srikakulum; Visakhapatnam and Prakasham districts. Delhi & Karnataka.

Elsewhere : Pakistan; S. America (Argentina).

Dero (Dero) indica Naidu, 1962

1962. *Dero indica* Naidu, *J. Bomb. nat. Hist. Soc.,* **59**(1) : 533-536, fig.14(A.G.).

1980. *Dero indica* : Persia in *Aquatic Oligochaete Biology,* Brinkhurst and Cook (Eds.) : 43.

Material : 5 exs., Sarpavaram, N of Kakinada, E. Godavari dist., 4.4.97. Coll. K.R. Halder. 2 exs., Madipadu, Prakasham dist., 10.4.98; Coll. S.K. Mukhopadhyay.

Diagnosis : Size 15-20 mm; whitish red. Prostomium bluntly triangular with sensory hairs. Dorsal setae from VI, with 2 hairs and 2 needles per bundle in anterior segments, while 1 hair and 1 needle in the posterior ones; hairs bayonet shaped, shorter than body diameter; needles sickle shaped, nodulus towards the distal end, bifid, having the outer prongs longer than inner. Ventral setae all bifid crotchets, 4 per bundle in II-V, longer, straighter and thinner than those of others, prongs equally thick, distal $1^1/_2$ times longer than proximal, nodulus almost at the middle. In other segments ventral setae 3-4 per bundle and nodulus distal, distal prong thicker and slightly longer than proximal. Branchial organs funnel shaped; gills 4 pairs, foliate, Ist pair short, IInd pair broad, IIIrd and Ivth long. Nephridium starts from VII. Budding zones clear.

Habitat : Live in soft mud with other species *of Dero, Branchiodrilus semperi* and *Limnodrilus hoffmeisteri* (Tubificidae).

Distribution : India : Andhra Pradesh Cuddapah and Kakinada districts; West Bengal and Karnataka.

Elsewhere : S. America (Argentina); Malaya.

Subgenus ***Aulophorus*** Schmarda, 1861

Sub generic type ***Aulophorus furcatus*** (Muller 1773)

Diagnosis : Dorsal setae starts from IV, V or VI. Ventral setae of II to V may or may not be different from the following segments. Posterior border of Branchial fossa projecting into two palps. Penial setae usually absent. Asexual reproduction by budding or fragmentation. Live in portable tubes.

Distribution : Africa; India; Sumatra; N. and S. America.

Dero (Aulophorus) furcatus (Muller, 1773)

1773. *Nais furcata* Muller, *Vermium terrestrium et fluviatilium* II. *Hafniae et. Lipsiae* : 23.

1980. *Dero (Aulophorus) furcatus* : Persia in *Aguatie oligochaete Biology*, Brinkhurst and Cook (Eds.) : 93.

Material : 2 exs., Simachalam, Visakhapatnam dist., 24.10.95. 2 exs., Solomonpuram, Nellore dist., 4.4.98., Coll. S.K. Mukhopadhyay.

Diagnosis : Size small, about 10 mm, light brown. Prostomium conical with sentary hairs. Dorsal setae from V, 1 hair and 1 needle per bundle. hairs smooth, slightly curved, needles sickle shaped, bifid with nodulus 1/3rd from the tip; distal prong thinner, shorter but straighter than proximal. Ventral setae 4 per bundle aneriorly, 2-3 posteriorly; those of II-V longer than others; nodulus median and prongs equally thick. Branchial organ funnel shaped with 2 thin leaf like small palps with hairs; gills 3 pairs, leaf like; 1st pair arise from supra anal diverticulum,

IInd pair from inside lateral margin and IIIrd pair from the floor of the fossa; when contracted withdrawn into the fossa and only one pair is visible. Nephridium starts from VII. Clitellum covers ½V-VII. Budding zones apparent.

Habitat : Swim with transverse horoizontal movements.

Distribution : *India*, Andhra Pradesh Cuddapah; Kakinada and Nellore dists. Maharashtra; Tamil Nadu and Kerala.

Elsewhere : Cosmopolitan.

Family TUBIFICIDAE

Diagnosis : Size moderate to large, may be upto 200mm. Pale to deep red. Muscular body. Setae start from II. Dorsal setae bifid or pectinate; setal number varying. No asexual reproduction.

Distribution: Tibet; China; India; Japan; Malaya; N. and S. america.

Key to the genera

1. Length moderate, 25 mm, Prostomium semi-circular; setae 4 in anterior segments, 2-3 in hinder segments ..... ***Bothrioneurum***

– Length greater, 75 mm, Prostomium bluntly conical. Setae 6-7 in anterior, 3-5 in middle and 1-2 in hinder segments ..... ***Limnodrilus***

Genus ***Bothrioneurum*** Stolc, 1888

1980. *Bothrioneurum* Persia, in *Aquatic oligochaete Biology,* Brinkhurst & Cook (Eds.) : 103.

Generic type ***Bothrioneurum iris*** Beddard 1901

Diagnosis : Prostomium with a sensory pit. Ventral and dorsal setae bundle with bifid crotchets, hair setae bundle with bifid crotchets, hair setae and gill absent.

Distribution : Europe; India; Malay; N. and S. America.

Bothrioneurum iris Beddard, 1901

1901. *Bothrioneurum iris* Beddard, *P. Z. S.*, 1, P.81, Text figs. 8-10.

1965. *Bothrioneurum iris* : Naidu, *Hydrobiologia,* **25** (3-4) : 475-477.

Material : 6 exs., Palakonda Road side tank, Srikakulum dist., 16.10.95; 3 exs., ditch Elsewhere Gandhi Park, Srikakulum dist., 16.10.95; 3 exs., ditch Elsewhere Gandhi Park, Srikakulum dist., 16.10.95; 4 exs., Kusalapuram, Srikakulum dist., 10.10.95., 2 exs.,

Tagarpuvalasa, Bisakhapatnam dist., 25.10.95; coll. S. K. Mukhopadhyay. 80 exs., Rajamundry, NW of Kakinada, E. Godavari dist. 9.4.97; 55 exs., Kolleru Lake, Krishna dist., 9.7.97. 15 exs., Tadepallegudum, W. Godavari dist., 11.4.97; 16 exs., Nunna village, NE of Eluru, W. Godavari dist., 14.4.97; coll. K. R. Halder. 15 exs., Allipuram, Nellore dist., 3.4.98; 20 exs., Tangutûru S of ongole, Prakasham dist., 11.4.98; 25 exs., Guntur, Guntur dist., 12.4.98; Coll. S. K. Mukhopadhyay.

Diagnosis : Small, 20-25 mm. Prostomium semicircular. Setae starts from II, composed mostly of 4 bifid crotchet setae; Dorsal crotchets having distal prongs thinner and shorter than proximal while ventral crotchets having distal prongs much thinner and longer in outer but shorter in inner bundles than the proximal prongs. Nephridium starts from VII. Clitellum embraces X-XII.

Habitat : Live in soft mud of ponds and lakes. Coil up readily when disturbed.

Distribution : India : Andra Pradesh; Cuddapah; Srikakulum and Visakhapatnam dists., West Bengal, Tamil Nadu and Kerala.

Elsewhere : China; Malay and S. America.

Genus ***Limnodrilus*** Claparede, 1862

1862. *Limnodrilus* Claparede, *Mem. Soc. Phys. Hist. nat.* Genevae, 16 : 248, pls. I, fig. 1-3, II fig. 2, IV, fig.-6.

1980. *Limnodrilus* : Persia, in *Aquatic oligochaete Biology,* Brinkhurst and Cook (Eds.) : 99.

Type species : *Limnodrilus hoffmeisteri* Claparede

Diagnosis : Both dorsal and ventral bundle of setae consisting of bifid crotchets of the same type. No hair setae. Posterior part of body having a vascular plexus. Testes in X and ovaries in XI.

Distribution : Pakistan; Tibet; Ceylong; India; Japan and N. America.

Limnodrilus hoffmeisteri Claparede, 1862

1862. *Limnodrilus hoffmeisteri* Claparede, *Mem. Soc. Phys. Hist. nat. Genera*·16 : 248-252, pl.I, fig.1-3; P1.II, fig.2; pl.IV, fig.6.

1912. *Limnodrilus socialis* : Stephenson, *Mem. As. Soc. Bengal,* 6 : 93, Pl.IV, fig. 6-7. (In press) *Limnodrilus hoffmeisteri,* Claparede : Mukhopadhyay in *State fauna series, Fauna of West Bengal,* 3 : Pt.II.

Material : 2 exs., Kusalapuram, Srikakulum dist., 20.10.95, Coll. S.K. Mukhopadhyay, 55 exs., Samalkot, N of Kakinada, E. Godavari dist., 4.4.97; 170 exs., Rayavaripalem, NE of Kakinada, E. Godavari dist., 7.4.97; 160 exs., Eleruvaram, 70 km NE of Kakinada, E. Godavari, dist., 7.4.97. Coll. K. R. Halder. 30 exs., Foto Road Tank, Nellore dist., 7.4.98, 40 exs., Madipadu, Prakasham dist., 10.4.98; Coll. S. K. Kukhopadhyay.

Diagnosis : Size large, 90-100 mm. brown anteriorly, lighter posteriorly, tail end almost white. Posterior $^1/_4$th whip like, without setae and respiratory in function. All setae dorsal and ventral start from II; bifid crotchets with equally long teeth. Dorsal budle having 5-7 in anterior, 3-5 in the middle and 1-2 in the hind segments; thinner and shorter than those of the ventral bundles. Nephridium starts between VII-IX. Clitellum embraces XI and XII, opaque white.

Habitat : Live buried in large numbers in soft clay or mud in clear, turbid even foul water and perform wavy movements of the hind end; disappear instantaneously as the water is disturbed.

Distribution : India : Andhra Pradesh : Srikakulum and Cuddapah dists; West Bengal, Meghalaya, Karnataka and Tripura.

Elsewhere : Cosmopolitan.

SUMMARY

The paper deals with diagnosis, distribution and key for identification of 6 species of Fresh water oligochaeta collected from 9 coastal districts of the State of Andhra Pradesh. It also furnishes a list of Fresh water oligochaeta hitherto known from the State.

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Zool. Surv. India
State Fauna Series 5 : Fauna of Andhra Pradesh (Part 5) : 319-338, 2005

ANNELIDA : HIRUDINEA
(Non Costal Districts)

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INTRODUCTION

In the world more than 300 leech species are found. In India about 62 species of leeches are recorded so far. Harding and Moore (1927), Bhatia (1930; 1934; 1939). Chelladurai (1934), Sanjeeva Raj (1951, 1974), Baugh (1960a, 1960b), Julka and Ghosh (1996), Chandra (1983, 1991), Soota and Ghosh (1977), Soos (1996, 1970), Mandal (2004) have done valuable works on leeches of India.

The leech fauna of Andhra Pradesh is very significant. There is considerable variation in the species available from coastal and non-coastal districts. So far, two species are reported from Andhra Pradesh. *Branchelion plicobranchus* (Sanjeeva Raj, 1953) is recorded from coastal district and *Haemadipsa dussumieri* (Blanchard, 1917) from non-coastal district. In the present work, an attempt has been made to provide information about the distribution of leech fauna of the state. some species are only found in non-coastal districts as *Placobdella fulva* Harding 1927, *Placobdella undulata* Harding 1924 and *Glossiphonia annandalei* Oka, 1921.

The present study is based on the material collected by the author as well as available unnamed collections lying in the National Zoological Collections at the Headquarters of the Zoological Survey on India, Kolkata.

216 examples were studied. They belong to 16 species under 10 genera and 5 families. Of these, 3 species are reported for the first time from the areas which are away from the coast.

The diagnostic characters and the key for identification have been provided on the basis of the material studied and also from the literature. Host and habitats, and distribution for all the species have been dealt herewith. The original and latest references along with important synonymies have been citied. The method of collection, narcotization and preservation have also been included.

MORPHOLOGY AND TERMINOLOGY

The body of the leech is dorsoventrally flattened and frequently tapering at the anterior. The body, exclusive of the posterior sucker, is divided by transverse furrows into annuli. A typical midbody segment is made up of five annuli. The total number of segments is always fixed at 34. The segments at both the extremities have been modified to form suckers. The anterior sucker is a depression on the ventral side and the mouth lies in it. The posterior sucker muscular and disk shaped, is clearly marked off from the body and is made up of seven fused segments. During breeding season the glandular clitellum is visible. It is always formed by the segments 1x, x and xi. The anus is a very small aperature in the mid-dorsal line near the junction of the body and the posterior sucker.

Leeches are hermaphroditic and have well defined gonades with ducts opening to the exterior. The gonopores or external genital orifices are very small aperatures in the midventral line. The male pore and female pore, both single, are located in the clitellar region and the former is always found in front of the latter.

There are three principal kinds of sense organs on the surface of the body. Every annulus has receptor organs which may be seen to be raise on papillae. These are the annular receptors. There are also white areas on the middle ring of each segment. These are segmental receptors and are known as sensillae. Finally, there are 1-5 pairs of eyes. They are more light sensitive and appear as black dots on the head.

Leeches are blood sucking ectoparasities. The sucking mechanism takes place in several ways. In one group, there is a muscular proboscis which is forced out of a pore of the anterior sucker and pierce into the tissue of the hosts. In the other major group, the mechanism consists of three muscular ridges in the cavity of the mouth and which can be everted from the mouth and can also be pressed into the skin of the host. The blood is prevented from clotting by the secretion of numerous salivary glands and sucked into the gut by the pumping action of the muscular pharynx. The gut has been modified for the storage of large quantities of blood.

ECONOMIC IMPORTANCE

Though leeches are harmful, they creat a considerable human interest. A large variety of animals prey upon leeches and their egg-cases. Fishes ducks, snipes and some other birds and animals get a considerable portion of food therefrom. Leeches destroy a large number of worms, insect larvae, of which some affect human interest. The use of leeches in medical practise is very ancient process. Hirudin extract is also employed as a haemolytic agent.

MATERIAL AND METHOD

To achieve the purpose of present work collections were made in different seasons from different habitats such as swamps ditches, ponds, streams, rivers and dump bushes.

After making the collection, they were sorted out into two groups, one group of leeches (Rhynchobdellid) were placed in a tray with a small quantity of water and were slowly killed by anaesthetizing then with alcohal in which leeches usually die in an extended condition. Just after narcotization, the leeches were kept in 70% alcohol for permanent preservation to study. The other group of leeches (Arhynchobdellid) were placed in a tray with a small quantity of water and were slowly killed by anaesthetizing them with alcohal till they no longer responded. Before narcotization begins, they were rapidly passed between the fingers to remove the excess mucus and then straightened out and laid extended side by side in a flat dish. The fixing fluid (4% formaldehyde) was gently poured on it and the leeches were kept in it for 24 hours. After fixation the material was washed properly in cold water and kept in 70% alcohal for permanent preservation to study.

SYSTEMATIC ACCOUNT

Phylum ANNELIDA

Class HIRUDINEA

Order RHYNCHOBDELLAE

I. Family PISCICOLIDAE

1. Genus ***Branchellion*** Savigny 1822

1. *B. plicobranchus* Sanjeeva Raj, 1954

II. Family GLOSSIPHONIDAE

2. Genus ***Glossiphonia*** Johnson, 1816

2. **G. annandalei* Oka, 1921

3. *G. weberi* Blanchard, 1897

3. Genus ***Helobdella*** Blanchard, 1896

4. *H nociva* Harding, 1924

4. Genus ***Hemiclepsis*** Vejdovsky, 1883

5. *H. marginata asiatica* Moore 1924

6. *H. marginata marginata* Muller, 1774

5. Genus ***Placobdella*** Blanchard, 1893

7. *P. emydae* Harding, 1920

8. **P. fulva* Harding, 1924

9. **P. undulata* Harding 1924

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* Recorded for the first time from Andhra Pradesh.

Order ARHYNCHOBDELLAE

III. Family ERPOBDELLIDAE

6. Genus ***Barbronia*** Johansson, 1918

10. *B. weberi* (Blanchard, 1897)

7. Genus ***Herpobdelloidea*** Kaburaki, 1921

11. *H. lateroculata* Kaburaki, 1921

8. Genus ***Nematobdella*** Kaburaki, 1921

12. *N. indica* Kaburaki, 1921

IV. Family HIRUDIDAE

9. Genus ***Poecilobdella*** 1893

13. *P. granulosa* (Savigny) 1820

14. *P. manillensis* (Lesson) 1842

15. *Poecilobdella* sp.

V. Family HAEMADIPSIDAE

10. Genus ***Haemadipsa Tennent*** 1859 (1861)

16. *Haemadipsa dussumieri* (Blanchard, 1917)

Key to the Families

1. Body cylindrical or flattened, often divided into two distinct anterior and posterior regions and sometimes with paired lateral branchiae and pulsating vesicles. The anterior sucker is generally and the posterior sucker is always, a permanent cupuliform or discoid organ distinct from the body. Marine and freshwater forms, largely parasitic upon fish. Usually more than three unuli per segment; eyes may be present on head and nec. ..... PISCICOLIDAE

2. Freshwater form, mouth as a small pore on the oval sucker, ovate or flattened body never cylindrical. Head usually much narrower than the body. Anterior sucker ventral and fused with the body. Crop or stomach and intestine with conspicuous paired lateral caeca, the intestine always with four pair. Blood colourless, the young ones attach themselves to the ventral surface of the parent body. ..... GLOSSIPHONIDAE

3. Eyes 3-6 pairs, pharynx long mouth with muscular ridges but without jaws. Body firm and slippery, testes sacs small and numerous, gastric caeca absent. .... ERPOBDELLIDAE

4. The species of this family medium to very large. 45 cm. long when fully extended. Eyes 5 pairs forming lateral crescents; pharynx short, mouth with true jawed or toothed jaws; testes arranged segmentally in pairs, gastric caeca present. ..... HIRUDIDAE

5. Terrestrial leeches only. Size small to medium. Complete somites generally quinquannulate but varying from tri-to septannulate. Third and fourth pairs of eyes usually on contraguous annuli, only exceptionally separated by a more or less developed annulus. Buccal frill and anal appendages usually present. In this family only one genus *Haemadipsa* Tennent has so far been recorded from India. ..... HAEMADIPSIDAE

I. Family PISCICOLIDAE

Diagnosis : Body flattened, often devided into two distinct anterior and posterior region. Posterior sucker is always permanent discoid organ distinct from the body. Marin & freshwater forms. Parasitic upon fish.

Remarks : Only one genus and one species have been recorded from Andhra Pradesh.

Key to the genera and species of the family PISCICOLIDAE

1. Branches more than 20 pairs ..... ***Branchellion plicobranchus***

1. Genus ***Branchellion*** Savigny

1822. *Branchellion*, Savigny, *"Systems des Annelides"* in description de 1 Egypte, paris.

Diagnosis : Marine, parasitic mainly on fishes. Presence of Branchiae (more than twenty pairs). Body is divided into two parts, neck and abdomen. Caudal papillae & pulsating vesicles are the main features of the genus.

1. ***Branchellion plicobranchus*** Sanjeeva Raj

1954. *Branchellion plicobranchus* Sanjeeva Raj, *Rec. Indian Mus.*, **52** : 249-256 (Type-locality : Assumption Island, Bay of Bengal (Tamil Nadu); Type-Deposited : Z.S.I.).

1991. *Branchellion plicobranchus, Chandra, Handbook : Leeches of India, Zoological Survey of India*, 10-12.

Diagnosis : The body is divisible into a narrow anterior neck and a posterior broad branchiate abdomen terminating in a larger posterior sucker. The abdomen is distinctly annulated, more conspicuously so on ventral side. Posterior sucker is larger than the anterior sucker. Anterior sucker is oval shaped. the characteristic caudal papillae are present in the posterior sucker. Total number of anuli 59. Thirty three pairs of branchiae in the abdominal region. The branchiae are frilled at their extremity.

Host and habitat : The species is mainly parasitic on marine fishes.

Distribution : India : Assumption Island, Bay of Bengal and fish market of Madras (Tamil Nadu); Vizagapatam (Andhra Pradesh), Quillon (Kerala) and Bombay (Maharashtra).

II. Family GLOSSIPHONIDAE

Key to the genera and species of the Family

1. Three pairs & eyes on rings 6, 7 & 8 respectively ..... *G. weberi weberi* Blanchard
2. Eyes one pair in righ 3 ..... *Helobdella nociva*
3. Total number of rings 72. Eyes two pairs but the first pair very small. Somite III Uniannulate ..... *Hemiclepsis marginata asiatica*

– Total number of rings 67, Somite III uniannulate eyes two pairs as same size. .... *Hemiclepsis marginata marginata*

4. Eyes on ring 3, Rings 71 ..... *Placobdella* Blanchard

2. Genus *Glossiphonia* Johnson

1816. *Glossiphonia* Johnson, *Treatise on the Medicinal* Leech 8* London.

Diagnosis : Small size, with three or rarely with two pairs of eyes. Complete somita formed of three rings. Crop (stomach) with six or rarely with seven pairs of sub-lobate, lateral caeca, the last and the longest pair reflected posteriorly. Opening within the anterior sucker.

2. *Glossiphonia annandalei* Oka.

1921. *Glossiphonia annandaloi Oka, Rec. Indian Mus.* **24** (4) : (Type-Locality : Inlo Lake, Burma; Type-Deposited : Not known).

1983. *Glossiphonia annandalei* Chandra, *Rec. zool. Surv. India,* **80** : 273.

Material : Nizamabad Dist. : 1 ex., Alisagar, 12.1.2001, Coll. C.K. Mandal. Medak Dist. 2 exs. Narsapur, 9.1.2001; 2 exs. Rayanpally, 6.1.2001, Coll. C.K. Mandal.

Diagnosis : Body elliptic, little flattened lanceolata, head region very slightly dilated. Posterior sucker circular and less in diameter than the greatest width of the body. Total number of rings 68. Three pairs of eyes has a unique position to recognize this species. The two pairs of eyes lie in the posterior part of the ring 4, the smaller pair lies between the large eyes pair. The third pair lies in ring 5 immediately below the large eyes in ring 4.

Host and Habitat : The species is found in lakes and ponds. Ectoparasitic on molluscs and free-living.

Distribution : India : Jaisalmer, Rajasthan, Satara, Kolhapur, Maharashtra, Chilka Lake, Orissa. Alisagar, Nizamabad district, Rayanpally Medak District of Andhra Pradesh, West Bengal.

Remarks : The species is recorded for the first time from Nizamabad and Medak District in Andhra Pradesh.

3. ***Glossiphonia weberi weberi*** Blanchard

1897. *Glossiphonia weberi* Blanchard, *zool. Ergeb. einer Reise in Nieder-land ische Ost-Indian*, Max Weber, **4** : 332. (Type-Locality : Sumatra : Type-Deposited : Not known).

1983. *Glossiphonia weberi weberi*, Chandra, *Rec. zool. Surv. India*, **80** : 274.

Material : Medak Dist. : 1 ex., Pushwalawagu river, Renna matal, 10.1.01, Reg. No. An 3193/1; 1 ex. Coll. C.K. Mandal. Nimabad Dist. : 1 ex. Sriram sagar, 11.1.01, Reg. No. An 3198/1, Coll. C.K. Mandal. Adillabad Dist.: 4exs., Sofinagar, 15.1.01, Reg. No. An 3202/1 Coll. C.K. Mandal. Warangal Dist : Bhadra Kali Pond, Hanamkonde, 1 ex. 20.1.01. Reg. No. 3203/1. Coll. C.K. Mandal. Karim Nagar Dist.; 1 ex., Taptala talab, 17.1.01, Reg. No. An. 3205/1, Coll. C.K. Mandal. 2 exs., Aglunoor, 18.1.01, Reg. No. an3207/1, Coll. C.K. Mandal. Medak Dist.: 2 exs. Nizam Sagar Dam, 7.1.01, Reg. No. An3210/1 Coll. C.K. Mandal. Rangareddy Dist. : 1 ex. Hussain Sagar, 5.1.01, Reg. No. An 3214/1, Coll. C.K. Mandal.

Diagnosis : Translucent body, oate-acuminate, larger form 12mm in length. Total number of rings 70. Three pairs of eyes on rings 6, 7 & 8 disposed in the form of a triangle.

Host and Habitat : They are found in on aquatic plants, submerged articles in ditches and ponds. It is also free living. Ecto parasitic on Gastropods (Lymnea), aquatic beetles and amphibians.

Distribution : India : Andhra Pradesh - Vishakhapatnam, Medak, Nizamabad, Adillabad, Warangal, Karim Nagar, Rangareddy; Assam, Bihar, Karnataka, Kashmir, Manipur, Maharashtra, West Bengal, Orissa, Rajasthan and Uttarpradesh.

Elsewhere : Pakistan, Nepal, Myanmar, Sumatra & Indonesia.

Remarks : The species is recorded for the first time from Medak, Nizamabad, Adillabad, Warangal, Karimnagar, and Rangareddy district of Andhra Pradesh.

3. Genus ***Helobdella*** Blanchard

1896.*Helobdella* Blanchard, *Boll. Mus. Zool. Torino*, xi, No. **263**.

Diagnosis : Size small with one pair of eyes; crop with six pairs of simple lateral caeca; mouth opening within anterior sucker; complete somite formed of three rings.

4. ***Helobdella nociva*** Harding

1924. *Helobdella nociva* Harding, *Ann. mag. nat. Hist., Ser.* 9, **14** : 489 (Type locality & Type-Deposited : Not known).

1983. *Helobdella nociva* Chandra, *Rec. zool. Surv. India*, **80** : 276.

Diagnosis : Body claviform, slender anteriorly with the head region somewhat dilated, without a dorsal scute. Posterior sucker small, loss in width than half the greatest width of

the body. Total number of rings 70. Single pair of eyes in ring 4. The male and female genital orifice is separated by two annuli. The six pairs of crop caeca are somewhat lobed.

Host and Habitat : It is found on under surface of leaves of aquatic plants and also under pieces of bricks and earthenwares and fallen leaves submerged in water. As a fish parasite, it is recorded from *Chana striata.*

Distribution : India : Solan (Himachal Pradesh) : Calcutta (West Bengal); Puri (Orissa); Poonch, Udhampur (Jammu and Kashmir); Kakinada; District Godabari, Vizagapathnam (Andhrapradesh).

4. Genus ***Hemiclepsis*** Vejdovsky

1883. *Hemiclepsis* Vejdovsky, *Sitzb. des konigl. Bohm. Gesel des Wissensch, prag.* : 35-51.

Diagnosis : Two pairs of eyes; complet somite formed of three rings; head region distinct from rest of the body; crop with more than seven pairs of lateral diverticula; mouth opens within anterior sucker.

5. ***Hemiclepsis marginata asiatica*** Moore

1924. *Hemiclepsis marginata asiatica* Moore, *Proc. Acad. nat. Sci. Philad.*, **76** : 353-368. (Type-Locality : Srinagar : Type-Deposited : Z.S.I.).

1983. *Hemiclepsis marginata asiatica,* Chandra, *Rec. zool. Surv. India*, **80** : 278.

Material : Chittor Dist. (Andhrapradesh), 4exs., Kalyani Dam, 9.11.2000 Registration No. An 3170/1, Coll. C.K. Mandal. Mehbubnagar Dist. 1 ex. Devar Kadra, 9.11.2000. Coll. C.K. Mandal. Rangareddi Dist. 3 exs. Asmanpeda, 19.1.2000. Coll. C.K. Mandal. Anantapur Dist. 1 ex., Roydurgam, 28.1.2000. Coll. C.K. Mandal. Mehbubnagar Dist. 3 exs. Baratalab, 19.1.2000. Coll. C.K. Mandal. Kurnool Dist. 2 exs., Venkateswar Villa, 22.1.2000. 5 exs. Venkatapally, 25.1.2000. Coll. C.K. Mandal. Chittor Dist. 3 exs. Pileru, 8.2.2000. Coll. C.K. Mandal. Kurnool Dist. 4 exs. Gemmichattu, 26.1.2000. Coll. C.K. Mandal. Adilabad Dist. 3 exs. Nirmal talab, 14.1.2001. Coll. C. K. Mandal. Nizamabad Dist. 3 exs. Quill jel talab 13.1.2001. Coll. C.K. Mandal Medak Dist. 6 exs. Sangareddi Dam, 8.1.2002; 5 exs. Nizamsagar Dam, 7.1.2001. Coll. C.K. Mandal. Nizamabad Dist. 3 exs. Sriramsagar, 11.1.2002 1 ex. Alisagar, 12.1.2001; Coll. C.K. Mandal. Karim Nagar Dist. 2 exs. Aglunoor 18.1.2001; Coll. C.K. Mandal. Medak Dist. 10 exs. Narsapur, 9.1.2001; 2 exs. Rayanpally, 6.1.2001. Coll. C.K. Mandal. Rangareddy Dist. 2 exs. 5.1.2001. Husain Sagar, Coll. C.K. Mandal.

Diagnosis : First pair of the eyes are closely approximated and so minute that they may easily escape observation. The annulation in asiatica is considerably reduced. The colour in alcohol reddish brown, paler towards the extremeties.

Host and habitat : It is found on under surface of leaves of aquatic plants in ponds and lakes. No host is known so far.

Distribution : India : Srinagar (Jammu and Kashmir), Sirmour (H.R); Purulia, Kolkata, Burdwan, Jalpaiguri and 24-Parganas (W.B). Nellore Dist., Chittor, Mehbubnagar, Anantapur, Rangareddi, Kurnool, Adilabad, Nizamabad, Medak, and Karim Nagar Dist. (Andhra Pradesh).

Elsewhere : Pakistan and Sumatra.

Remarks : In Andhra Pradesh it is recorded for the first time from Chittor, Mehbubnagar, Anantapur, Kurnool, Adilabad, Nizamabad, Medak Karimnagar and Rangareddi District.

6. ***Hemiclepsis marginata marginata*** Muller, 1774.

1774. *Hirudo marginata* Muller, *vermium terrestrium et fluviatilium,* 1, pars 2.4* *Havinae et Lipsiae.*

1927. *Hemiclepsis marginata marginata,* Harding, *Fauna Brit. India, Hirudinea,* 83-86.

1983. *Hemiclepsis marginata marginata,* Chandra, *Rec. zool. Surv. India,* **80** : 279.

Material : Nellore Dist. (Andhra Pradesh), 4 exs. Nellore Tank, 7.iv.1998, Coll. C. K. Mandal.

Diagnosis : Body claviform, attains a length about 5 mm.; ground colour light yellow; lemmon-yellow spots arranged in seven longitudinal rows on dorsal surface; rings 72; eyes two pairs on rings 3 and 4; male and female pores open between rings 29/30 and 31/32 respectively, crop with eleven pairs of branching diverticula.

Host and Habitat : It is found on aquatic plants and various other submerged objects in the freshwater ponds and lakes. It attacks molluscs.

Distribution : India : U.P., W.B., Rajasthan, Maharashtra, A.P., Orissa.

Elsewhere : Europe, Western Asia and Nepal.

5. Genus ***Placobdella*** Blanchard

1893. *Placobdella* Blanchard, *Bull. Soc. Zool. France,* **17** : 93.

Diagnosis : Body flattened with one pair of eyes, anterior sucker imperforate and mouth opens upon its anterior rim; crop with seven pairs of branching diverticula.

7. ***Placobdella emydae*** Harding

1920. *Placobdella emydae* Harding, *Mem. Indian Mus.*, **5** : 510. (Type-Locality and Deposited not known).

1983. *Placobdella emydae,* Chandra, *Rec. zool. Surv. India,* **80** : 277.

Material : District Chittor, 1 ex. Kangandikupar, 10.2.2000; Coll. C.K. Mandal.

Diagnosis : Larger forms attain a length of about 13mm. and a width of about 5 mm. Translucent, elliptic body with head region dilated. Colour greyish-green; three pairs of papillae on dorsal surface, intermediate pair being largest; male and female pores open between rings 26/27 and 28/29 respectively; rings 71; anterior sucker with a shallow anterior cup; mouth opens terminal.

Host and Habitat : It is free-living, attached to submerged articles in lakes, tanks and pools, parasitic on mud turtles.

Distribution : India : S H.P; Bihar, W.B., Orissa, Maharashtra, Krishna Dist. Vijoywada, Kangandikupar of Dist. Chittor Andhra Pradesh.

Remarks : It is recorded for the first time from District Chittor Andhra Pradesh.

8. ***Placobdella fulva*** Harding

1924. *Placobdella fulva* Harding, *Ann. Mag. nat. Hist. Ser.* 9, **14** : 489. (Type-Locality and Type-Deposited : Not known)

1983. *Placobdella fulva,* Chandra, *Rec. zool. Surv. India*, **80** : 227.

Material : District Kurnool, 2 exs. Tungabhadra, 24.1.2000. Coll. C.K. Mandal.

Diagnosis : Body-Clavicular form in extension. Head-Undilated and continuous with the body. Sucker-Posterior sucker small not wider than half of the greatest body width. Rings Total number of rings 67.

Remarks : It is recorded for the first time from District Kurnool, Tungabhadra, Andhra Pradesh.

Distribution : India : Choota Nagpur, Manbhum Bihar, Kathua Jammu and Kashmir, West Bengal, Andhra Pradesh, Rajasthan, Himachal Pradesh, Meghalaya.

9. ***Placobdella undulata*** Harding

1924. *Placobdella undulata* Harding, *Ann Mag. nat. Hist. Ser.* 9, **14** : 489. (Type-Locality and Type-Deposited : Not known).

1983. *Placobdella undulata,* Chandra, *Rec. zool. Surv. India*, **80** : 277.

Diagnostic character : Body- Elliptic lanceolate, Head- Somewhat dilated and distinct from the body. Dorsal surface- Roughend due to papillae numerous in number. Posterior sucker-Circular. Ring- 71 in number. Eyes- Single pair of eyes lie in ring two.

Material : District Kurnool, 1ex. Tungabhadra, 24.1.2000, Coll. C.K. Mandal. Reg. No. An 3173/1. District- Rangareddi, 1ex. Asmanpeda, 19.1.2000, Reg. No. An 3173/1, Coll. C.K. Mandal. District-Mehbubnagar, 1ex. Baratalab, 19.1.2000, Reg. No. An 3176/1, Coll. C.K. Mandal. District-Anantapur, 1ex. Bukrasamudram, 27.1.2000, Reg. No. An 3191/1; Coll. C. K. Mandal.

Distribution : India : Rajasthan, Himachal Pradesh, Jammu & Kashmir, West Bengal, Andhra Pradesh.

Elsewhere : Sri Lanka.

Host and Habitat : It is found in tanks, pools and lakes, parasitic on fish and molluscs.

Remarks : It is recorded for the first time from district Kurnool; Rangareddi, Mehbubnagar, Anantapur Andhra Pradesh.

III. Family ERPOBDELLIDAE

Diagnosis : The worm-leeches are of small or medium size, possessing great powers of extension. Terete or subterete anteriorly, more flattened towards the caudal end. Mouth over-arched by a prominently projecting lip. Caudal sucker also relatively small. Body very muscular, firm and slipery. Eyes three to six pairs. Pharynx long; gastric caeca absent. Clitellum well developed.

Remarks : 3 species under 3 genera of this family have been recorded for the first time from Andhra Pradesh.

Key to the species of the family ERPOBDELLIDAE

1. Eyes three pairs; one or two stiliform teeth ..... *Barbronia weberi*
2. First pair of eyes on somite three; gonopore separated by two to three annuli .... *Herpobdelloidea lateroculata*
3. First pair of eyes on somite four; gonopore separated by five annuli .... *Nematobdella indica*

6. Genus *Barbronia* Johansson

1918. *Barbronia* Johansson, *Zoologie*, **2**(13) : 373-396, pl. XII, 6 text-figs.

Diagnosis : Small sized leeches 25-35 mm long; colour reddish. Eyes normally three pairs, one large pair and two buccals, complete somite quinquannulate. Gonopores nearly separated by full somite.

10. *Barbronia weberi* (Blanchard)

1897. *Dina weberi*, Blanchard, *Zool. Ergeb. Riese* in *Neiderlandisch Ost-India*, **4** : 332-355. Type locality Java : Type-Deposited : Not known).

1918. *Barbronia rouxi* Johansson, Sarasin V. Roux, *Nova Caledonia, Zoologie*, **2**(13) : 373-396.

1983. *Barbronia weberi*, Chandra, *Rec. zool. Surv. India*, **80** : 280.

Material : Dist. Mohbubnagar, 12 exs. Kottapada, 19.1.2000; 11 exs. Devar-Kadra, 9.2.2000, Andhrapradesh, Coll. C. K. Mandal. Dist. Rangareddi, 7 exs, 17.1.2000 Dist. Anantapur, 3 exs., Roydurgam; 27.1.2000; Dist. Karim Nagar, 1ex. Taptala Talab, 17.1.2001, Coll. C. K. Mandal. District West Godabari, 1 ex., Eluru Canal, 12.iv.1997. coll. Shri G.C. Ghosh.

Diagnostic character : Small sized leeches, 25-35 mm long, Eyes three pairs, one large

pair on dorsum of 11, two smaller pairs on sides of anterior annulus of IV. Gonopores separated by four and a half or nearly five annuli. Accessory copulatory pores and areas at X/XI and XIII/XIV are very characteristic.

Host and habitat : The specimens of this species are found attached to stones and other submerged articles in lakes, tanks, pools and small streams. Generally associated with glossophonids.

Distribution : India : Srinagar, Kathua, Udhampur, Poonch, Rajouri (Jammu & Kashmir); Sirmour, Solan, Bilaspur, Shimla (Himachal Pradesh); Hoshangabad (M.P.); Nainital (U.P.); Garo Hills & Khasi Hills districts (Meghalaya), Eluru canal, District West Godabari (Andhra Pradesh), Malda, West Bengal, Dist. Mehbubnagar, Rangareddi, Anantapur & Karimnagar (A.P).

Elsewhere : Afghanistan, Borneo, Celebes, Java, Sumatra, Philippines, Pakistan and Nepal.

Remarks : This species is recorded for second time from Andhra Pradesh.

7. Genus ***Herpobdelloidea*** Kaburaki

1921. *Herpobdelloidea* Kaburaki, *Rec. Indian Mus.*, **22** : 668-719.

Diagnosis : Eyes a single dorsal pair on IV and several smaller submarginal pairs on the sensory annuli of somites IV to VIII, rarely IX inclusive or some of them. Complete somites showing a tendency towards enlargement, a division of the fifth annulus.

11. ***Herpobdelloidea lateroculata*** Kaburaki

1921. *Herpobdelloidea lateroculata* Kaburaki, *Rec. Indian Mus.*, **22** : 689-719, 7 text figs. (Type-Locality : Saugar, M.P.; Type Deposited : Z.S.I.).

1983. *Herpobdelloidea lateroculata*, Chandra, *Rec. zool. Surv. India*, **80** : 281.

Material : Dist. Srikakulam, 2 exs. Lake of Shermohammadpur Andhrapradesh, 17.x.1995. coll. C.K. Mandal. Dist. East Godabari, 7 exs. Bhabanaryan Temple Tank, Sarpabharam, Andhra Pradesh, 7.iv.1997. coll. G.C. Ghosh. Dist. W. Godabari, Eluru, Andhra Pradesh, 1 ex. 12.iv.1997. coll. G.C. Ghosh. Dist. East Godabari, 7 exs. Shymolkot Irrigation canal, Kakinada, Andhrapradesh, 6.iv.1997, coll. G.C. Ghosh. Dist. Krishna, 2 exs. Vijoywada, Andhra Pradesh, 16.iv.1997, coll. G.C. Ghosh. Dist. Nellore, 1 ex. Nellore Tank, Andhra Pradesh, 7.iv.1998, coll. C.K. Mandal.

Diagnostic character : Smaller size and slender. Eyes five or rarely six pairs, the first larger and dorsal on IV, the others ventro-lateral on IV to VII, rarely on IX. Complete somite quinquannulate. Gonopores separated by two and a half to three annuli. Head small, lipless, prolonged and narrow. Clitellum well developed.

Host and Habitat : The species is found in tanks, pools and lakes. They are free-living or attached to submerged articles.

Distribution : India : Jodhpur, Nagaur (Rajasthan); Bushampur, Saugar (M.P.); Satara (Maharashtra); Loktak Lake (Manipur); Kathua, Jammu, Poonch (Jammu & Kashmir); Jaintia & Khasi Hills (Meghalaya); Assam; Uttar Pradesh; West Bengal; Srikakulam Nellore, East & West Godabari, Krishna Districts (Andhra Pradesh).

Remarks : This species has been recorded for the first time from Andhra Pradesh. (from above mentioned places).

8. Genus *Nematobdella* Kaburaki

1921. *Nematobdella* Kaburaki, *Rec. Indian Mus.*, **22** : 689-719.

Diagnostic character : Size small and slender. Eyes six pairs, 1st pair on III and big than other 4 pairs. Complete somites of unequal six annuli.

12. *Nematobdella indica* Kaburaki

1921. *Nematobdella indica* Kaburaki, *Rec. Indian Mus.*, **22** : 689-719. (Type-Locality : Dharampur, Himachal Pradesh; Type-Deposited : Z.S.I.).

1983. *Nematobdella indica,* Chandra, *Rec. zool. Surv. India*, **80** : 281.

Material : Dist. Mahbubnagar, 1ex. Baratalab, 19.1.2000, Coll. C.K. Mandal. Dist. Medak, 2 exs., Renna matal, Andhrapradesh, 10.1.2001. Coll. C.K. Mandal. Dist. Karim Nagar, 2exs. Aglunoor, 18.1.2001, Andhrapradesh. Coll. C.K. Mandal. Reg. No. 3204/1. Dist. Karim Nagar, 1 ex. Tapatala Talab 17.1.2001, Reg. No. An 3209/1, Andhrapradesh, Coll. C.K. Mandal.

Diagnostic character : Slender, uniform most of its length, slightly wider at middle and very slender pointed cephalic end. Head very small. Eyes six pairs.

Host and habitat : They are collected from tanks, pools and lakes; they are free living and attached to submerged articles.

Distribution : India : Nagpur, Jodhpur (Rajasthan); Dharampur (Himachal Pradesh); Madhya Pradesh; Kalka (Haryana); Kathua, Jammu, Udhampur (Jammu & Kashmir); West Bengal, Maharashtra; Nellore, Krishna, West Godabari dist. (Andhra Pradesh). District Mehbub Nagar, Medak & Karim Nagar, Andhra Pradesh.

Remarks : This is the second time, the species has been recorded, from Andhrapradesh.

IV. Family HIRUDIDAE

Diagnostic character : Medium to very large size. Some of them attain a length of 37.5 cm or even 45 cm., width of 2.5 cm when fully extended. True Jawed leeches, five pairs of eyes forming a regular arch. Third and fourth pairs of eyes are separated by an annulus.

Complete somites quinquannulate. Dorsal sensillae in eight and ventral in six series. Live mostly in water and most of these are amphibious more or less. Most members of this family are swamp animals.

Key to the species of family HINIDIDAE

1. Vaginal stalk about equal in length to caecum ..... *Pocilobdella granulosa*
2. Gonopores separated by five annuli ..... *Poecilobdella manillensis*

9. Genus ***Poecilobdella*** Blanchard

1893. *Poecilobdella* Blanchard, *Boll. Musu. zool. Anat. Camp. R. Univ. Toino*, 7(145) : 1-32.

Diagnostic character : Medium to very large size. Colour variable, green, brown or reddish with a very precise pattern of black stripes and metameric spots, which becomes broken and dissipated with age. Eyes large, five pairs, arranged as usual. Gonopores separated by five or seven annuli. Jaws with more than one hundred acute, monostichodont teeth. Strictly sanguivorous as far as known.

13. ***Poecilobdella granulosa*** (Savigny)

1820. *Sanguisuga granulosa* Savigny, *Systene des Annelides, Paris.* (Type-Locality : Pondichery; Type-Deposited : Not known).

1927. *Hirudinaria (Poecilobdella) granulosa,* Moore, *Fauna Brit. India, Hirudinea,* 226-238.

1970. *Poecilobdella granulosa,* Soos, *Opusc. zool. Bpest.*, **10**(2) : 313-324.

1991. *Poecilobdella granulosa,* Mahesh Chandra, *Handbook : Leeches of India.*

Material : Srikakulum Dist. 3 exs. Kushalapuram, Andhra Pradesh. 20.x.1995; 2 exs. 2 km. N/E of Ragula, 19.x.1995. coll. C.K. Mandal. Dist. Cuddapah, 2 exs. Nandalore 1.2.2000, Reg. No. An 3181/1, Coll; C. K. Mandal. Nellore Dist. 1 ex. Nellore Tank, Andhra Pradesh, 7.iv.1998, Coll. C. K. Mandal. East Godabari Dist., 6 exs. Chollangi viii. 8 kms. South of Kakinada, 2.iv.1997; coll. G.C. Ghosh.

Diagnostic character : Large size, robust than other species of the same genus. Colour of dorsum varied shades of olive green, often divided by one or two pairs of yellowish longitudinal stripes and marked by a black pattern consisting of a median constricted or broken line. Four pairs of narrow wavy lines bordering the yellow stripes. Teeth usually about 100.

Host and habitat : The species is found in rivers, marshes, swamps, tanks and pools; attack cattles and human beings. Highest altitudinal record is 3,000 mts. It is strictly Sanguivorous. It is medicinal leech.

Distribution : India : Widely distributed in the states of India. West Bengal; Punjab; Himachal Pradesh; Uttar Pradesh; Gujarat; Madhya Pradesh; Tamil Nadu, Jammu & Kashmir;

Assam; Rajasthan, Andhra Pradesh (Srikakulum, Nellore, East Godabari). andalore, Dist. Cuddapah, Andhra Pradesh.

Elsewhere : Sri Lanka, Nepal and Myanmar.

Remarks : This species is recorded for second time from (Cuddapah Dist.) Andhra Pradesh.

14. ***Poecilobdella manillensis*** (Lesson)

1842. *Hirudo manillensis* Lesson, *Revue Zoologique Societe Cruierieme,* **8**. (Type-Locality : Luzon, Philippines Island : Type-Deposited : Not known).

1970. *Poecilobdella manillensis,* Soos, *Opusc. zool. Bpist.,* **10**(2) : 313-324.

1991. *Poecilobdella manillensis.* Chandra, *Hand book : Leeches of India,* 92-94.

Material : Nellore Dist. 2 exs. Footi village drain (side of Nellore Tank), Andhra Pradesh: 6.iv.1998. Coll. C. K. Mandal. Krishna Dist. 5 exs. Mailavaram, 44 kms N/E of Vijoywada, Andhra Pradesh. 15.iv.1997; 6 exs., Pamarru, 45 kms S/E of Vijoywada, 17.iv.1997; coll. G.C. Ghosh. West Godabari Dist. 7 exs. Vimabharam, 60 kms. S/E of Eluru, Andhra Pradesh, 10.iv.1997; coll. G.C. Ghosh. East Godabari Dist. 3 exs. Rayvaripalam village 8 km. North of Kakinata, Andhra Pradesh; 4.iv.1997. coll. G.C. Ghosh. Dist. Cuddapah, 1ex. Deoncuddapah, 3.2.2000 Reg. No. An 3178/1, Coll. C. K. Mandal.

Diagnostic character : The species is almost like *P. granulosa,* robust, broad headed, circular in buccal region, broadly elliptical elsewhere with sides broadly rounded. Colour pattern and other external characters like *P. granulosa* but ground colour more inclined to brown dorsally and more green ventrally. Teeth numerous, about 150. Caudal sucker smaller than in P. javanica. Length of sucker is 103 mm or so.

Host and habitat : It is the common paddy-field, fuffalo or medicinal leech of India. This species is found in swamps, ponds, tanks and in sluggish streams and springs. They also attack man and found attached to frogs, snakes turtles.

Distribution : India : West Bengal, Landaur (U.P.); Cachar (Assam); Karnataka : Cochin (Kerala), Nellore, Krishna, West and East Godabari, Andhra Pradesh.

Elsewhere : Pakistan, Sri Lanka, Myanmar, Borneo, Malaysia, Philippines and China.

Remarks : This species for second time is recorded from Andhra Pradesh. From Cuddapah district of Andhrapradesh.

15. ***Poecilobdella*** sp.

Material : Dist. Shrikakulam, 2 exs. 2 kms. N.E. of Ragula 19.x.1995, coll. C.K. Mandal.

Remarks : Due to immature condition of the example species characters are not visible.

V. Family HAEMADIPSIDAE

Key to the species of Family

1. Somite VII 4 annulate and VIII 5 annulate ..... *Haemadipsa dussumieri*

10. Genus *Haemadipsa* Tennent

1859 (1861) *Haemadipsa* Tennent, Ceylon. *An account of the Island etc. leeches*, **1** : 301-307.

Diagnostic character: The leeches are of small size; form is slender, colour varies, usually longitudinally striped or mottled. Lip more or less triangular. Eyes large, the first four pairs usually on contiguous annuli, but the third and fourth pair may be separated by a partial or complete annulus. Gonopores separated by five annuli usually. Jaws three, very high and prominent without papillae. Teeth acute, conical, slightly curved, in moderate number.

16. *Haemadipsa dussumieri* Blanchard

1917. *Haemadipsa dussumieri* Blanchard, *Bull. Soc. Path. expt.*, **10** : 640-675 (Type-Locality : South India; Type-Deposited : Paris Museum).

1927. *Haemadipsa dussumieri*, Moore, Fauna Brit. India, Hirudinea, 289-290.

1991. *Haemadipsa dussumieri*, Chandra, A Hand book : Leeches of India.

Diagnostic character : Somites IX-XXIII complete (quinquannulate). Total number of annuli 100. Male and female gonopores separated by five rings. Somite VII quadrannulate, VIII quinquannulate and XXIV-quadrannulate, such constitution of somites are not found in any other species of Haemadipsa. The species needs further detailed studies.

Host and habitat : Not much is known about its bionomics and habitat.

Distribution : South India.

COMPARATIVE STUDY OF THE LEECHES ACCORDING TO COASTAL AND NON COASTAL HABITATS

Three species by turns *Glossiphonia annandalei*, *Placobdella fulva* and *Placobdell undulata* are only found in the Non-coastal Districts of Andhrapradesh. Habitats of these leeches are different from the leeches of Coastal districts. The leeches of coastal districts live in alkaline water where as the leeches of non-coastal districts live in acidic water.

Branchellion plicobranchus are only found in coastal districts because they live only in saline or brakish water. *Harpobdelloidea lateroculata* live in alkaline water.

So the Leeches have also the specific *'Distribution' range* in Coastal and Non-coastal region. The list of the Leeches of two regions of Andhrapradesh are given in two separate sheets. The present account deals with 16 species under 10 genera and 5 families from Non-

Coastal Districts of Andhrapradesh. Out of 16 species, 3 species are reported for the first time from the area. The diagnostic characters and keys for identification of genera and species of leeches of this state have been provided. Economic importance, hosts, habitats and distribution of all the species have been mentioned. A general account of morphology and terminology as well as the method of narcotization and preservation of leeches have been included.

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Distribution of Leeches in Coastal Districts of Andhra Pradesh

Sl. No.	Name of species	DISTRICTS								
		East Godavari	Guntur	Krishna	Nellore	Prakasam	Srikakulam	Visakha patnam	Vizianagram	West Godavari
1.	*Branchellion plicobranchus* Sanjeeva Raj							+		
2.	*Glossiphonia weberi weberi* Blanchard							+		
3.	*Helobdella nociva* Harding	+						+		
4.	*Hemiclepsis marginata asiatica* Moore				+					
5.	*Hemiclepsis marginata marginata* (Muller)				+					
6.	*Placobdella emydae* Harding			+						
7.	*Barbronia weberi* (Blanchard)									+
8.	*Herpobdelloidea lateroculata* Kaburaki	+		+	+		+			+
9.	*Nematobdella indica* Kaburaki			+	+					+
10.	*Poecilobdella granulosa* (Savigny)	+			+		+			
11.	*Poecilobdella manillensis* (Lesson)	+		+	+					+
12.	*Poecilobdella* sp. Blanchard						+			
13.	*Haemadipsa dussumieri* Blanchard									

Distribution of Leeches in Non Coastal Districts of Andhra Pradesh

Sl. No.	Name of the species	DISTRICTS										
		Ranga reddi	Mebub Nagar	Kurnool	Anantapur	Cuddapah	Chittor	Medak	Adilabad	Nizama bad	Karim nagar	Waran-gal
1.	*Branchellion plicobranchus Sanjeeva* Raj							+				
2.	*Glossiphonia annandalai* Oka							+				
3.	*Glossiphonia weberi weberi* Blanchard	+	+					+	+	+	+	+
4.	*Helobdella nociva* Harding											
5.	*Hemiclepsis marginata asia-tica* (Moore)	+	+	+	+		+	+	+	+	+	
6.	*H. marginata marginata* (Muller)											
7.	*Placobdella emydae* Harding											
8.	*Placobdella fulva* Harding			+			+					
9.	*Placobdella undulata* Harding	+		+	+							
10.	*Barbronia weberi* (Blanchard)	+	+		+						+	
11.	*Harpobdelloidea lateroculata* Kaburaki											
12.	*Nematobdella indica* Kaburaki	+						+				
13.	Poecilobdella granulosa (Savigny)					+						
14.	*P. manillensis* (Lesson)					+						
15.	*Poecilobdella* sp.											
16.	*Haemadipsa dussumieri* Blanchard											

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ANNELIDA : HIRUDINEA : LEECHES
(Coastal Districts)

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INTRODUCTION

More than 300 species of leeches are reported from the world of which about 54 species and 8 subspecies have been recorded in Indian region. Our knowledge of leech fauna of India is mainly confined to the works of Harding and Moore (1927). The other workers like Bhatia (1930; 1934; 1939), Chelladurai (1934), Sanjeeva Raj (1951; 1974) and Baugh (1960a; 1960b), Julka and Ghosh (1996), Chandra (1960, 1977, 1980, 1983 and 1991) contributed their mights to the taxonomy.

Little is known about the leech fauna of Andhra Pradesh. Only two species of leech *Branchelion plicobranchus* (Sanjeeva Raj, 1953) and *Haemadipsa dussumieri* (Blanchard, 1917) have been reported from the area. In the present work, an attempt has been made to provide information about the distribution of leech fauna of the state. The present study is based on the material collected mainly by the author as well as available unnamed collections lying at the Head Quarters of the Zoological Survey of India, Calcutta.

A total of 89 examples were studied. They belong to 13 species under 10 genera and 5 families, of these 11 species are reported for the first time from the area.

The diagnostic characters and the keys for identification have been provided on the basis of the material studied and also from the literature. Host and habitats, and distribution of all the species have been dealt herewith. The original and latest references along with important synonymies have been cited. The method of collection, narcotization and preservation have also been included.

MORPHOLOGY AND TERMINOLOGY

The body of the leech is dorsoventrally flattened and frequently tapering at the anterior. The body, exclusive of the posterior sucker, is divided by transverse furrows into annuli. A

typical midbody segment is made up of five annuli. The total number of segments is always fixed at 34. The segments at both the extremities have been modified to form suckers. The anterior sucker is a depression on the ventral side and the mouth lies in it. The posterior sucker muscular and disk shaped, is clearly marked off from the body and is made up of seven fused segments. During breeding season the glandular clitellum is visible. It is always formed by the segments ix, x and xi. The anus is a very small aperature in the mid-dorsal line near the junction of the body and the posterior sucker.

Leeches are hermaphroditic and have well defined gonades with ducts opening to the exterior. The gonopores or external genital orifices are very small aperatures in the midventral line. The male pore and female pore, both single, are located in the clitellar region and the former is always found in front of the latter.

There are three principal kinds of sense organs on the surface of the body. Every annulus has receptor organs which may be seen to be raise on papillae. These are the annular receptors. There are also white areas on the middle ring of each segment. These are segmental receptors and are known as sensillae. Finally, there are 1-5 pairs of eyes. They are more light sensitive and appear as black dots on the head.

Leeches are blood sucking ectoparasites. The sucking mechanism takes place in several ways. In one group, there is a muscular proboscis which is forced out of a pore of the anterior sucker and pierce into the tissue of the hosts. In the other major group, the mechanism consists of three muscular ridges in the cavity of the mouth and which can be everted from the mouth and can also be pressed into the skin of the host. The blood is prevented from clotting by the secretion of numerous salivary glands and sucked into the gut by the pumping action of the muscular pharynx. The gut has been modified for the storage of large quantities of blood.

ECONOMIC RELATION

Though leeches are harmful, the creat a considerable human interests. A large variety of animals prey upon leeches and their egg-cases. Fishes ducks, snipes and some other birds and animals get a considerable portion of food therefrom. Leeches destroy a large number of worms, insect larvae, of which some affect human interest. The use of leeches in medical practise is very ancient process. Hirudin extract is also employed as a haemolytic agent.

MATERIAL AND METHOD

To achieve the purpose of present work collections were made in different seasons from different habitats such as swamps ditches, ponds, streams, rivers and dump bushes.

After making the collection, they were sorted out into two groups, one group of leeches (Rhynchobdellid) were placed in a tray with a small quantity of water and were slowly killed

by anaesthetizing then with alcohal in which leeches usually die in an extended condition. Just after narcotization, the leeches were kept in 70% alcohol for permanent preservation to study. The other group of leeches (Arhynchobdellid) were placed in a tray with a small quantity of water and were slowly killed by anaesthetizing them with alcohal till they no longer responded. Before narcotization begins, they were rapidly passed between the fingers to remove the excess mucus and then straightened out and laid extended side by side in a flat dish. The fixing fluid (4% formaldehyde) was gently poured on it and the leeches were kept in it for 24 hours. After fixation the material was washed properly in cold water and kept in 70% alcohal for permanent preservation to study.

SYSTEMATIC ACCOUNT

Phylum ANNELIDA

Class HIRUDINEA

Order RHYNCHOBDELLAE

I. Family PISCICOLIDAE

1. Genus ***Branchellion*** Savigny 1822.

1. *B. plicobranchus* Sanjeeva Raj, 1954.

II. Family GLOSSIPHONIDAE

2. Genus ***Glossiphonia*** Johnson, 1816.

2. **G. weberi* Blanchard, 1897.

3. Genus ***Helobdella*** Blanchard, 1896

3. **H nociva* Harding, 1924.

4. Genus ***Hemiclepsis*** Vejdovsky, 1883.

4. **H. marginata asiatica* Moore 1924.

5. **H. marginata marginata* Muller, 1774.

5. Genus ***Placobdella*** Blanchard, 1893

6. **P. emydae* Harding, 1920.

Order ARCYNCHOBDELLAE

III. Family ERPOBDELLIDAE

6. Genus ***Barbronia*** Johansson, 1918

7. **B. weberi* (Blanchard, 1897)

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* Recorded for the first time from Andhra Pradesh.

7. Genus ***Herpobdelloidea*** Kaburaki, 1921

8. **H. lateroculata* Kaburaki, 1921.

8. Genus ***Nematobdella*** Kaburaki, 1921

9. **N. indica* Kaburaki, 1921.

IV. Family HIRUDIDAE

9. Genus ***Poecilobdella*** 1893

10. **Poecilobdella granulosa* (Savigny) 1820.

11. **Poecilobdella manillensis* (Lesson) 1842.

12. **Poecilobdella* sp.

V. Family HAEMADIPSIDAE

10. Genus ***Haemadipsa Tennent*** 1859 (1861)

13. *Haemadipsa dussumieri* (Blanchard, 1917)

Key to the Families

1. Body cylindrical or flattened, often divided into two distinct anterior and posterior regions and sometimes with paired lateral branchiae and pulsating vesicles. The anterior sucker is generally and the posterior sucker is always, a permanent cupuliform or discoid organ distinct from the body. Marine and freshwater forms, largely parasitic upon fish. Usually more than three anuli per segment; eyes may be present on head and neck..... PISCICOLIDAE

2. Freshwater form, mouth as a small pore on the oval sucker, ovate or flattened body never cylindrical. Head usually much narrower than the body. Anterior sucker ventral and fused with the body. Crop or stomach and intestine with conspicuous paired lateral caeca, the intestine always with four pair. Blood colourless, the young ones attach themselves to the ventral surface of the parent body. ..... GLOSSIPHONIDAE

3. Eyes 3-6 pairs, pharynx long mouth with muscular ridges but without jaws. Body firm and slippery, testes sacs small and numerous, gastric caeca absent. .... EXPOBDELLIDAE

4. The species of this family medium to very large. 45 cm. long when fully extended. Eyes 5 pairs forming lateral crescents; pharynx short, mouth with true jawed or toothed jaws; testes arranged segmentally in pairs, gastric caeca present. .... HIRUDIDAE

5. Terrestrial leeches only. Size small to medium. Complete somites generally quinquannulate but varying from tri-to septannulate. Third and fourth pairs of eyes usually on contraguous annuli, only exceptionally separated by a more or less developed

annulus. Buccal frill and anal appendages usually present. In this family only one genus ***Haemadipsa*** Tennent has so far been recorded from India. .... HAEMADIPSIDAE

I. Family PISCICOLIDAE

Diagnosis : Body flattened, often devided into two distinct anterior and posterior region. Posterior sucker is always permanent discoid organ distinct from the body. Marin & freshwater forms. Parasitic upon fish.

Remarks : Only one genus and one species have been recorded from Andhra Pradesh.

Key to the genera and species of the family PISCICOLIDAE.

1. Branches more than 20 pairs ..... *Branchellion plicobranchus*

1. Genus ***Branchellion*** Savigny

1822. *Branchellion,* Savigny, *"Systems des Annelides"*, in description de 1 Egypte, paris.

Diagnosis : Marine, parasitic mainly on fishes. Presence of Branchiae (more than twenty pairs). Body is divided into two parts, neck and abdomen. Caudal papillae & pulsating vesicles are the main features of the genus.

1. ***Branchellion plicobranchus*** Sanjeeva Raj.

1954. *Branchellion plicobranchus* Sanjeeva *Raj, Rec. Indian Mus.*, **52** : 249-256 (Type-locality: Assumption Island, Bay of Bengal (Tamil Nadu); Type-Deposited : Z.S.I.).

1991. *Branchellion plicobranchus,* Chandra, *Handbook : Leeches of India, Zoological Survey of India,* 10-12.

Diagnosis : The body is divisible into a narrow anterior neck and a posterior broad branchiate abdomen terminating in a larger posterior sucker. The abdomen is distinctly annulated, more conspicuously so on ventral side. Posterior sucker is larger than the anterior sucker. Anterior sucker is oval shaped. the characteristic caudal papillae are present in the posterior sucker. Total number of anuli 59. Thirty three pairs of branchiae in the abdominal region. The branchiae are frilled at their extremity.

Host and habitat : The species is mainly parasitic on marine fishes.

Distribution : India : Assumption Island, Bay of Bengal and fish market of Madras (Tamil Nadu); Vizagapatam (Andhra Pradesh), Quillon (Kerala) and Bombay (Maharashtra).

II. Family GLOSSIPHONIDAE

Key to the genera and species of the Family

1. Three pairs & eyes on rings 6, 7 & 8 respectively .... *G. weberi weberi* Blanchard
2. Eyes one pair in righ 3 ..... *Helobdella nociva*
3. Total number of rings 72. Eyes two pairs but the first pair very small. Somite III Uniannulate ..... *Hemiclepsis marginata asiatica*

– Total number of rings 67, Somite III uniannulate eyes two pairs as same size. .... *Hemiclipsis marginata marginata*

4. Eyes on ring 3, Rings 71 ..... *Placobdella emydae*

2. Genus ***Glossiphonia*** Johnson

1816. *Glossiphonia* Johnson, *Treatise on the Medicinal Leech.* 8° London.

Diagnosis : Small size, with three or rarely with two pairs of eyes. Complete somita formed of three rings. Crop (or stomach) with six or rarely with seven pairs of sub-lobate, lateral caeca, the last and the longest pair reflected posteriorly. Mouth opening within the anterior sucker.

Remarks : Only one species has been recorded for the first time from Andhra Pradesh.

2. ***Glossiphonia weberi weberi*** Blanchard

1897. *Glossiphonia weberi* Blanchar, *Zool. Ergeb. einer Reise in Nieder-landische Ost-Indian, Max Weber,* **4** : 332. (Type-locality : Sumatra : Type-deposited : Not known).

1983. *Glossiphonia weberi weberi,* Chandra, *Rec. zool. Surv. India,* **80** : 274.

Material : Vishakhapttanam Dist. : 2 exs., Endera, 26.x.95, 3 exs., Madhurawada, 27.x.95; coll. C. K. Mandal.

Diagnosis : Body translucent, ovate-acuminate, larger forms attain a length of about 12 mm.; in contraction nearly triangular, the dorsal surface with roughened appearance due to presence of numerous tubercles transversely upon every ring. Dorsal surface bears a series of prominent metameric papillae forming seven longitudinal rows. In alcohol the general colour is greyish or greenish-white to orange. The posterior sucker smaller than the greatest width of the body, its upper surface bears paired radial stripes of the same dark pigment which occurs upon the body. Total number of rings 70. Three pairs of eyes variable in position but generally occurs on rings 6, 7 & 8 disposed in the form of three points of a triangle.

Host and Habitat : The species is found in on aquatic plants, submerged particles in ditches and ponds. It is also free-living. Ectoparasitic on Gastropods, aquatic beetles and amphibians.

Distribution : India : Widely distributed throughout India, Andhra Pradesh—Vishakhapttanam; Assam; Bihar; Karnataka; Kashmir; Manipur, Maharastra, West Bengal; Orissa; Rajasthan and Uttar Pradesh.

Elsewhere : Pakistan, Nepal, Myanmar, Sumatra & Indonesia.

Remarks : The species is recorded for the first time from Endera, Madhurawada and Vishakhapattanam dist. in Andhra Pradesh.

3. Genus ***Helobdella*** Blanchard

1896. *Helobdella* Blanchard, Boll. Mus. Zool. Torino, XI, No. 263.

Diagnosis : Size small with one pair of eyes; crop with six pairs of simple lateral caeca; mouth opening within anterior sucker; complete somite formed of three rings.

3. ***Helobdella nociva*** Harding

1924. *Helobdella nociva* Harding, *Ann. mag. nat. Hist., Ser.* 9, **14** : 489 (Type locality & Type-Deposited : Not known).

1983. *Helobdella nociva* Chandra, *Rec. zool. Surv. India,* **80** : 276.

Material : Vishaphapattanam Dist. 1 ex. Madhurawada Andhra Praesh, 27.x.1995. coll. C. K. Mandal (S. K. Mukherjee & party). Kakinada Dist. East Godabari, Andhra Pradesh, 1 ex. Bhabanarayan Temple Tank, Sarpavbharam, 7.iv.1997. coll. Shri G. C. Ghosh.

Diagnosis : Body claviform, slender anteriorly with the head region somewhat dilated, without a dorsal scute. Posterior sucker small, loss in width than half the greatest width of the body. Total number of rings 70. Single pair of eyes in ring 4. The male and female genital orifice is separated by two annuli. The six pairs of crop caeca are somewhat lobed.

Host and Habitat : It is found on under surface of leaves of aquatic plants and also under pieces of bricks and earthenwares and fallen leaves submerged in water. As a fish parasite, it is recorded from *Chana striata.*

Distribution : India : Solan (Himachal Pradesh) : Calcutta (West Bengal); Puri (Orissa); Poonch, Udhampur (Jammu and Kashmir); Kakinada, Dist. East Godabari, Vizagapathnam (Andhrapradesh).

4. Genus ***Hemiclepsis*** Vejdovsky

1883. *Hemiclepsis* Vejdovsky, *Sitzb. des konigl. Bohm. Gesel des* Wissensch, prag. : 35-51.

Diagnosis : Two pairs of eyes; complet somite formed of three rings; head region distinct from rest of the body; crop with more than seven pairs of lateral diverticula; mouth opens within anterior sucker.

4. ***Hemiclepsis marginata asiatica*** Moore

1924. *Hemiclepsis marginata asiatica* Moore, *Proc. Acad. nat. Sci. Philad.*, **76** : 353-368. (Type-Locality : Srinagar : Type-Deposited : Z.S.I.).

1983. *Hemiclepsis marginata asiatica*, Chandra, *Rec. zool. Surv. India*, **80** : 278.

Material : Nellore Dist. (Andhra Pradesh), 1 ex., Nellore Tank, 7.iv.1998.

Diagnosis : First pair of the eyes are closely approximated and so minute that they may easily escape observation. The annulation in asiatica is considerably reduced. The colour in alcohol reddish brown, paler towards the extremeties.

Host and habitat : It is found on under surface of leaves of aquatic plants in ponds and lakes. No host is known so far.

Distribution : India : Srinagar (Jammu and Kashmir), Sirmour (Himachal Pradesh); Purulia, Calcutta, Burdwan, Jalpaiguri and 24-Parganas (s) (West Bengal). Nellore Dist., (Andhra Pradesh).

Elsewhere : Pakistan and Sumatra.

Remarks : In Andhra Pradesh it is recorded for the first time from Nellore Tank, Dist. Nellore.

5. ***Hemiclepsis marginata marginata*** (Muller)

1774. *Hirudo marginata* (Muller, *Vermium terrestrium et fluviatilium*, 1, pars 2.4° Havinae et Lipsiae.

1927. *Hemiclepsis marginata marginata*, Harding, *Fauna Brit. India, Hirudinea*, 83-86.

1983. *Hemiclepsis marginata marginata*, Chandra, *Rec. zool. Surv. India*, **80** : 279.

Material : Nellore Dist. (Andhra Pradesh), 4 exs. Nellore Tank, 7.iv.1998, Coll. C.K. Mandal.

Diagnosis : Body claviform, attains a length about 15 mm. and the greatest width of about 5 mm.; ground colour light yellow; lemmon-yellow spots arranged in seven longitudinal rows on dorsal surface; rings 72; eyes two pairs on rings 3 and 4; male and female pores open between rings 29/30 and 31/32 respectively, crop with eleven pairs of branching diverticula.

Host and Habitat : It is found on aquatic plants and various other submerged objects in the freshwater ponds and lakes. It attacks molluscs.

Distribution : India : Kumaon (Utar Pradesh); Murshidabad, Calcutta, etc. (West Bengal); Jodhpur (Rajasthan); Igatpuri, Satara (Maharashtra); Hoshangabad (M.P.); Jammu, Ponch (Jammu and Kashmir), Nellore (Andhra Pradesh, Orissa).

Remarks : In Andhra Pradesh this species is recorded for the first time from Nellore Tank, Dist. Nellore.

5. Genus ***Placobdella*** Blanchard

1893. *Placobdella* Blanchard, *Bull. Soc. Zool. France,* **17** : 93.

Diagnosis : Body flattened with one pair of eyes, anterior sucker imperforate and mouth opens upon its anterior rim; crop with seven pairs of branching diverticula.

6. ***Placobdella emydae*** Harding

1920. *Placobdella emydae* Harding, *Mem. Indian Mus.*, 5 : 510. (Type-Locality and Deposited not known).

1983. *Placobdella emydae,* Chandra, *Rec. zool. Surv.* India, **80** : 277.

Material : District Krishna, 1 ex., Vijoywada 16.iv.1997, coll. G. C. Ghosh. Dist. Krishna, 1 ex. Nonna village. Vijoywada, 14.iv.1997, coll. G. C. Ghosh.

Diagnosis : Larger forms attain a length of about 13mm. and a width of about 5 mm. Translucent, elliptic body with head region dilated. Colour greyish-green; three pairs of papillae on dorsal surface, intermediate pair being largest; male and female pores open between rings 26/27 and 28/29 respectively; rings 71; anterior sucker with a shallow anterior cup; mouth opens terminal.

Host and Habitat : It is free-living, attached to submerged articles in lakes, tanks and pools, parasitic on mud turtles.

Distribution : India : India : Solan (Himachal Pradesh); Choota Nagpur (Bihar); Calcutta, Hooghly (West Bengal); Sambalpur, Satara (Maharashtra), Krishna Dist. Vijoywada, Nonna village of vijoywada (Andhra Pradesh).

Remarks : It is recorded for the first time from District Vijoywada, Andhra Pradesh.

III. Family ERPOBDELLIDAE

Diagnosis : The worm-leeches are of small or medium size, possessing great powers of extension. Terete or subterete anteriorly, more flattened towards the caudal end. Mouth over-arched by a prominently projecting lip. Caudal sucker also relatively small. Body very muscular, firm and slipery. Eyes three to six pairs. Pharynx long; gastric caeca absent. Clitellum well developed.

Remarks : 3 species under 3 genera of this family have been recorded for the first time from Andhra Pradesh.

Key to the species of the family ERPOBDELLIDAE

1. Eyes three pairs; one or two stiliform teeth ..... *Barbronia weberi*
2. First pair of eyes on somite three; gonopore separated by two to three annuli .... *Herpobdelloidea lateroculata*
3. First pair of eyes on somite four; gonopore separated by five annuli .... *Nematobdella indica*

6. Genus ***Barbronia*** Johansson

1918. *Barbronia* Johansson, *Zoologie*, **2**(13) : 373-396, pl. XII, 6 text-figs.

Diagnosis : Small sized leeches 25-35 mm long; colour reddish. Eyes normally three pairs, one large pair and two buccals, complete somite quinquannulate. Gonopores nearly separated by full somite.

7. ***Barbronia weberi*** (Blanchard)

1897. *Dina weberi*, Blanchard, *Zool. Ergeb. Riese* in *Neiderlandisch Ost-India*, **4** : 332-355. Type locality Java : Type-Deposited : Not known).

1918. *Barbronia rouxi* Johansson, *Sarasin V. Roux, Nova Caledonia, Zoologie*, **2(13)** : 373-396.

1983. *Barbronia weberi*, Chandra, *Rec. zool. Surv. India*, **80** : 280.

Material : District West Godabari, 1 ex., Eluru Canal, 12.iv.1997. coll. Shri G. C. Ghosh.

Diagnostic character : Small sized leeches, 25-35 mm long, Eyes three pairs, one large pair on dorsum of 11, two smaller pairs on sides of anterior annulus of IV. Gonopores separated by four and a half or nearly five annuli. Accessory copulatory pores and areas at X/XI and XIII/XIV are very characteristic.

Host and habitat : The specimens of this species are found attached to stones and other submerged articles in lakes, tanks, pools and small streams. Generally associated with glossophonids.

Distribution : India : Srinagar, Kathua, Udhampur, Poonch, Rajouri (Jammu & Kashmir); Sirmour, Solan, Bilaspur, Shimla (Himachal Pradesh); Hoshangabad (M.P.); Nainital (U.P.); Garo Hills & Khasi Hills districts (Meghalaya), Eluru canal, District West Godabari (Andhra Pradesh).

Elsewhere : Afghanistan, Borneo, Celebes, Java, Sumatra, Philippines, Pakistan and Nepal.

Remarks : This species is recorded for second time from Andhra Pradesh.

7. Genus ***Herpobdelloidea*** Kaburaki

1921. *Herpobdelloidea* Kaburaki, *Rec. Indian Mus.*, **22** : 668-719.

Diagnosis : Eyes a single dorsal pair on IV and several smaller submarginal pairs on the sensory annuli of somites IV to VIII, rarely IX inclusive or some of them. Complete somites showing a tendency towards enlargement, a division of the fifth annulus.

8. ***Herpobdelloidea lateroculata*** Kaburaki

1921. *Herpobdelloidea lateroculata* Kaburaki, *Rec. Indian Mus.*, **22** : 689-719, 7 text figs. (Type-Locality : Saugar, M.P.; Type Deposited : Z.S.I.).

1983. *Herpobdelloidea lateroculata,* Chandra, *Rec. zool. Surv.* India, **80** : 281.

Material : Dist. Srikakulam, 2 exs. Lake of Shermohammadpur Andhrapradesh, 17.x.1995. coll. C.K. Mandal. Dist. East Godabari, 7 exs. Bhabanaryan Temple Tank, Sarpabharam, Andhra Pradesh, 7.iv.1997. coll. G.C. Ghosh. Dist. W. Godabari, Eluru, Andhra Pradesh, 1 ex. 12.iv.1997. coll. G.C. Ghosh. Dist. East Godabari, 7 exs. Shymolkot Irrigation canal, Kakinada, Andhrapradesh, 6.iv.1997, coll. G.C. Ghosh. Dist. Krishna, 2 exs. Vijoywada, Andhra Pradesh, 16.iv.1997, coll. G.C. Ghosh. Dist. Nellore, 1 ex. Nellore Tank, Andhra Pradesh, 7.iv.1998, coll. C.K. Mandal.

Diagnostic character : Smaller size and slender. Eyes five or rarely six pairs, the first larger and dorsal on IV, the others ventro-lateral on IV to VII, rarely on IX. Complete somite quinquannulate. Gonopores separated by two and a half to three annuli. Head small, lipless, prolonged and narrow. Clitellum well developed.

Host and Habitat : The species is found in tanks, pools and lakes. They are free-living or attached to submerged articles.

Distribution : India : Jodhpur, Nagaur (Rajasthan); Bushampur, Saugar (M.P.); Satara (Maharashtra); Loktak Lake (Manipur); Kathua, Jammu, Poonch (Jammu & Kashmir); Jaintia & Khasi Hills (Meghalaya); Assam; Uttar Pradesh; West Bengal; Srikakulam Nellore, East & West Godabari, Krishna Districts (Andhra Pradesh).

Remarks : This species has been recorded for the first time from Andhra Pradesh.

8. Genus *Nematobdella* Kaburaki

1921. *Nematobdella* Kaburaki, *Rec. Indian Mus.*, **22** : 689-719.

Diagnostic character : Size small and slender. Eyes six pairs, 1st pair on III and big than other 4 pairs. Complete somites of unequal six annuli.

9. *Nematobdella indica* Kaburaki

1921. *Nematobdella indica* Kaburaki, *Rec. Indian Mus.*, **22** : 689-719. (Type-Locality : Dharampur, Himachal Pradesh; Type-Deposited : Z.S.I.).

1983. *Nematobdella indica,* Chandra, *Rec. zool. Surv.* India, **80** : 281.

Material : Nellore Dist. 5 exs., Nellore Tank, Kavur, Andhra Pradesh, 7.iv.1998. coll. C. K. Mandal. Drishna Dist 7 exs. Kolluru Lake at Pedayedla Gadi, Andhra Pradesh, 9.iv.1997; coll. G. C. Ghosh. West Godabari Dist. 2 exs. Eluru Canal Eluru, Andhra Pradesh, 12.iv.1997; coll. G. C. Ghosh.

Diagnostic character : Slender, uniform most of its length, slightly wider at middle and very slender pointed cephalic end. Head very small. Eyes six pairs.

Host and habitat : They are collected from tanks, pools and lakes; they are free living and attached to submerged articles.

Distribution : India : Nagpur, Jodhpur (Rajasthan); Dharampur (Himachal Pradesh); Madhya Pradesh; Kalka (Haryana); Kathua, Jammu, Udhampur (Jammu & Kashmir); West Bengal; Maharashtra; Nellore, Krishna, West Godabari dist. (Andhra Pradesh).

Remarks : This is the second time, the species has been recorded, from Andhra Pradesh.

IV. Family HIRUDIDAE

Diagnostic character : Medium to very large size. Some of them attain a length of 37.5 cm or even 45 cm., width of 2.5 cm when fully extended. True Jawed leeches, five pairs of eyes forming a regular arch. Third and fourth pairs of eyes are separated by an annulus. Complete somites quinquannulate. Dorsal sensillae in eight and ventral in six series. Live mostly in water and most of these are amphibious more or less. Most members of this family are swamp animals.

Key to the species of family HINIDIDAE

1. Vaginal stalk about equal in length to caecum ..... *Pocilobdella granulosa*
2. Gonopores separated by five annuli ..... *Pocilobdella manillensis*

9. Genus ***Poecilobdella*** Blanchard

1893. *Poecilobdella* Blanchard, *Boll. Musu. zool. Anat. Camp. R. Univ. Toino,* **7**(145) : 1-32.

Diagnostic character : Medium to very large size. Colour variable, green, brown or reddish with a very precise pattern of black stripes and metameric spots, which becomes broken and dissipated with age. Eyes large, five pairs, arranged as usual. Gonopores separated

by five or seven annuli. Jaws with more than hundred acute, monostichodont teeth. Strictly sanguivorous as far as known.

10. ***Poecilobdella granulosa*** (Savigny)

1820. *Sanguisuga granulosa* Savigny, *Systene des Annelides, Paris.* (Type-Locality : Pondichery; Type-Deposited : Not known).

1927. *Hirudinaria (Poecilobdella) granulosa,* Moore, *Fauna Brit. India, Hirudinea,* 226-238.

1970. *Poecilobdella granulosa,* Soos, *Opusc. zool. Bpest.,* **10**(2) : 313-324.

1991. *Poecilobdella granulosa,* Mahesh Chandra, *Handbook : Leeches of India.*

Material : Srikakulum Dist. 3 exs. Kushalapuram, Andhra Pradesh. 20.x.1995; 2 exs. 2 km. N/E of Ragula, 19.x.1995. coll. C.K. Mandal. Nellore Dist. 1 ex. Nellore Tank, Andhra Pradesh, 7.iv.1998, Coll. C. K. Mandal. East Godabari Dist., 6 exs. Chollangi viii. 8 kms. South of Kakinada, 2.iv.1997; coll. G.C. Ghosh.

Diagnostic character : Large size, robust than other species of the same genus. Colour of dorsum varied shades of olive green, often divided by one or two pairs of yellowish longitudinal stripes and marked by a black pattern consisting of a median constricted or broken line. Four pairs of narrow wavy lines bordering the yellow stripes. Teeth usually about 100.

Host and habitat : The species is found in rivers, marshes, swamps, tanks and pools; attack cattles and human beings. Highest altitudinal record is 3,000 mts. It is strictly Sanguivorous. It is medicinal leech.

Distribution : India : Widely distributed in the states of India. West Bengal; Punjab; Himachal Pradesh; Uttar Pradesh; Gujarat; Madhya Pradesh; Tamil Nadu, Jammu & Kashmir; Assam; Rajasthan, Andhra Pradesh (Srikakulum, Nellore, East Godabari).

Elsewhere : Sri Lanka, Nepal and Myanmar.

Remarks : This species is recorded for second time from (Cuddapah Dist.) Andhra Pradesh.

11. ***Poecilobdella manillensis*** (Lesson)

1842. *Hirudo manillensis* Lesson, *Revue Zoologique Societe Cruierieme,* 8. (Type-Locality : Luzon, Philippines Island : Type-Deposited : Not known).

1970. *Poecilobdella manillensis,* Soos, *Opusc. zool. Bpist.,* **10**(2) : 313-324.

1991. *Poecilobdella manillensis.* Chandra, *Hand book : Leeches of India,* 92-94.

Material : Nellore Dist. 2 exs. Footi village drain (side of Nellore Tank), Andhra Pradesh: 6.iv.1998. Coll. C. K. Mandal. Krishna Dist. 5 exs. Mailavaram, 44 kms N/E of Vijoywada, Andhra Pradesh. 15.iv.1997; 6 exs., Pamarru, 45 kms S/E of Vijoywada, 17.iv.1997; coll.

G.C. Ghosh. West Godabari Dist. 7 exs. Vimabharam, 60 kms. S/E of Eluru, Andhra Pradesh, 10.iv.1997; coll. G.C. Ghosh. East Godabari Dist. 3 exs. Rayvaripalam village 8 km. North of Kakinata, Andhra Pradesh; 4.iv.1997. coll. G.C. Ghosh.

Diagnostic character : The species is almost like *P. granulosa,* robust, broad headed, circular in buccal region, broadly elliptical elsewhere with sides broadly rounded. Colour pattern and other external characters like *P. granulosa* but ground colour more inclined to brown dorsally and more green ventrally. Teeth numerous, about 150. Caudal sucker smaller than in P. javanica. Length of sucker is 103 mm or so.

Host and habitat : It is the common paddy-field, fuffalo or medicinal leech of India. This species is found in swamps, ponds, tanks and in sluggish streams and springs. They also attack man and found attached to frogs, snakes turtles.

Distribution : India : West Bengal, Landaur (U.P.); Cachar (Assam); Karnataka : Cochin (Kerala), Nellore, Krishna, West and East Godabari, Andhra Pradesh.

Elsewhere : Pakistan, Srilanka, Myanmar, Borneo, Malaysia, Philippines and China.

Remarks : This species for second time is recorded from Andhra Pradesh.

12. ***Poecilobdella*** sp.

Material : Dist. Shrikakulam, 2 exs. 2 kms. N.E. of Ragula 19.x.1995, coll. C.K. Mandal.

V. Family HAEMADIPSIDAE

Key to the species of Family

1. Somite VII 4 annulate and VIII 5 annulate ..... *Haemadipsa dussumieri*

10. Genus ***Haemadipsa Tennent***

1859 (1861) *Haemadipsa* Tennent, Ceylon. An account of the Island etc. leeches, **1** : 301-307.

Diagnostic character : The leeches are of small size; form is slender, colour varies, usually longitudinally striped or mottled. Lip more or less triangular. Eyes large, the first four pairs usually on contiguous annuli, but the third and fourth pair may be separated by a partial or complete annulus. Gonopores separated by five annuli usually. Jaws three, very high and prominent without papillae. Teeth acute, conical, slightly curved, in moderate number.

13. ***Haemadipsa dussumieri*** Blanchard

1917. *Haemadipsa dussumieri* Blanchard, *Bull. Soc. Path. expt.*, **10** : 640-675 (Type-Locality : South India; Type-Deposited : Paris Museum).

1927. *Haemadipsa dussumieri,* Moore, Fauna Brit. India, Hirudinea, 289-290.

1991. *Haemadipsa dussumieri,* Chandra, The leeches of India, A hand book.

Diagnostic character : Somites IX-XXIII complete (quinquannulate). Total number of annuli 100. Male and female gonopores separated by five rings. Somite VII quadrannulate, VIII quinquannulate and XXIV-quadrannulate, such constitution of somites are not found in any other species of Haemadipsa. The species needs further detailed studies.

Host and habitat : Not much is known about its bionomics and habitat.

Distribution : South India.

SUMMARY

The present account deals with 11 species and 2 subspecies from coastal Andhra Pradesh. 11 species out of 13 are recorded for the first time from the area. The diagnostic characters and keys for identification or genera and species of leeches of this State have been provided. Economic importance, hosts, habitats and distribution of all the species have been mentioned. A general account of morphology and terminology as well as the method of narcotizationand preservation of leeches have been included.

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Distribution of Leeches in Coastal Districts of Andhra Pradesh

Sl. No.	Name of species	DISTRICTS								
		East Godavari	Guntur	Krishna	Nellore	Prakasam	Srikakulam	Visakha patnam	Vizianagram	West Godavari
1.	*Branchellion plicobranchus* Sanjeeva Raj							+		
2.	*Glossiphonia weberi weberi* Blanchard							+		
3.	*Helobdella nociva* Harding	+						+		
4.	*Hemiclepsis marginata asiatica* Moore				+					
5.	*Hemiclepsis marginata marginata* (Muller)				+					
6.	*Placobdella emydae* Harding			+						
7.	*Barbronia weberi* (Blanchard)									+
8.	*Herpobdelloidea lateroculata* Kaburaki	+		+	+		+			+
9.	*Nematobdella indica* Kaburaki			+	+					+
10.	*Poecilobdella granulosa* (Savigny)	+			+		+			
11.	*Poecilobdella manillensis* (Lesson)	+		+	+					+
12.	*Poecilobdella* sp. Blanchard						+			
13.	*Haemadipsa dussumieri* Blanchard									

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MARINE AND ESTUARINE CRABS (CRUSTACEA : DECAPODA : BRACHYURA)

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INTRODUCTION

The state of Andhra Pradesh lies between 12°37′ and 19°54′ N latitude and 76°46′ to 84°46′ E longitude. It is one of the biggest state in the south of India, occupying a geographical area of about 2,75,068 sq. km. It has 23 districts of which 9 are coastal. The coast line is long, stretching to about 960 sq. km. All the coastal areas are endowed with a number of varied habitats supporting a large number of crab species, many of which are widely distributed. Some of these crabs have commercial importance and are exported abroad.

Brachyuran fauna from maritime areas of the state is, however, very poorly documented. As early in 1891, Wood-Mason recorded five species from Godavari coast. These included a new genus and three new species. Subsequently, in a series of publications, Alcock (1896 -1899) added nine more species from the coastal water of the state. Among those, two were new to science. Since then, during the last 100 years very few investigators did systematic research on brachyuran fauna of the state barring two publications by Lalitha Devi (1981, 1986) who recorded three species of pinnotherid crab from Kakinada, West Godavari district. However, recently, Dev Roy and Bhadra (2001) recorded further 14 species under 12 genera from the Godavari estuary.

This paper is based primarily on collections made by Drs. T. Roy (1995) and M. K. Dev Roy (1999). Bulk of the material was, however, collected by the latter. Besides, a small collection of crabs was also made available for study by Dr. J. G. Pattanayak of General Non-chordata Division, Zoological Survey of India, Kolkata and Shri J. Sarkar, ex-Research Scholar, Marine Aquarium Centre, Zoological Survey of India, Digha. In a series of publications, Rajabai (1951-1975) studied breeding biology and early developmental stages of 27 species of brachyuran crabs from Visakhapatnam-Waltair coast. These are also dealt with in this paper. Further, crab species of this state recorded by earlier workers but not collected by the present authors are also included in this work. In addition, materials deposited with the National Zoological Collections (NZC) of Zoologoical Survey of India by various

survey parties were also identified and included in this report. Altogether 831 examples of brachyuran crab from marine, estuarine and mangrove habitats of different coastal districts of the state have been examined for this report. A complete systematic list of the crabs hitherto reported from Andhra Pradesh is presented hereunder.

In the present communication, field data of each species, such as, locality, date of collection, collector's name, sex, no. of examples have been given as far as possible though in a few cases, some of these data are lacking. In the systematic account, original reference of each species has been cited. This is followed by that of Alcock and thereafter, some of the recent important works. Current revisionary work on various groups as well as important opinions published by International Commission on Zoological Nomenclature (ICZN) has been consulted. The deliberations by eminent carcinologists such as Holthuis, Davies and Guinot have also been incorporated in this work. The diagnosis of each species has been given mostly in telegraphic language. Dichotomous key has been provided to facilitate identification, all keys to the species and higher taxa dealt herein are related to concerned taxa from Andhra Pradesh. The family and generic descriptions have been made based on Alcock (1895-1900), Banerjee (1960), Barnard (1950), Barnes (1967), Chiong and Ng (1998), Crane (1975), Davie (1989), Galil and Clark (1994), Griffin (1973), Harminto and Ng (1991), Holthuis and Manning (1990), Laurie (1906), McLay (2000), Sakai (1976), Serène and Soh (1970), Tyndale-Biscoe and George (1962), Wagner (1986) and Wood-Mason (1891) with some modifications. Terminologies adopted in this work are from Dev Roy and Das (2000).

All measurements used in this work are in millimeter and have been taken with the help of a Vernier Calliper. Wherever two or more measurements of a particular crab species are given, the first one is always of the male, the second one of female and the third one of ovigerous female. The following abbreviations have been used in this text :

W = Carapace width	F = Front	L = Carapace length	R = Rostrum
P = Propodus length	D = Dactylar length		
M = Male	F = Female	J = Juvenile	

SYSTEMATIC LIST OF MARINE AND ESTUARINE BRACHYURAN CRABS HITHERTO RECORDED FROM ANDHRA PRADESH

Taxa	District/Locality	References
Phylum & Subphylum Crustacea Pennant,1777		
Class MALACOSTRACA Latreille, 1806		
Subclass EUMALACOSTRACA Grobben,1892		

Order DECAPODA Latreille,1803		
Suborder PLEOCYEMATA Burkenroad,1963		
Infraorder Brachyura Latreille,1803		
Section Dromiacea de Haan,1833		
Superfamily DROMIOIDEA de Haan,1833		
Family **DROMIIDAE** de Haan, 1833		
1. *Lauridromia dehaani* (Rathbun, 1923)	Nellore, Visakhapatnam	Present record
2. *Sphaerodromia kendalli* (Alcock and Anderson,1894)	Nellore	Alcock and Anderson (1894)
Section Oxystomata H. Milne Edwards, 1834		
Superfamily DORIPPOIDEA MacLeay, 1838		
Family **DORIPPIDAE** MacLeay, 1838		
Subfamily DORIPPINAE McLeay, 1838		
3. *Dorippoides facchino* (Herbst, 1785)	Krishna, Nellore, Visakhapatnam	Present record
4. *Neodorippe callida* (Fabricius, 1798)	East Godavari, Guntur	Present record
Superfamily LEUCOSIOIDEA Samouelle, 1819		
Family **CALAPPIDAE** de Haan, 1833		
Subfamily CALAPPINAE de Haan,1835		
5. *Calappa lophos* (Herbst, 1790	East Godavari, Nellore, Prakasam, Visakhapatnam	Rejabai (1959) and the present record
6. *Calappa pustulosa* Alcock, 1896	Prakasam, Visakhapatnam	Present record
Subfamily MATUTINAE de Haan, 1835		
7. *Ashtoret lunaris* (Forskål, 1775)	East Godavari	Dev Roy and Bhadra, (2001)

8. *Ashtoret miersi* (Henderson, 1887)	East Godavari, Srikakulam, Visakhapatnam	Present record
9. *Matuta planipes* Fabricius, 1798	Nellore	Present record
10. *Matuta victor* (Fabricius, 1781)	East Godavari, Guntur, Nellore, Prakasam, Srikakulam, Visakhapatnam	Present record
Family **LEUCOSIIDAE** Samouelle,1819		
Subfamily EBALIINAE Stimpson, 1891		
11. *Ebalia sagittifera* Alcock, 1896	Visakhapatnam	New record to **India**
Subfamily ILIINAE Stimpson, 1871		
12. *Arcania quinquespinosa* Alcock and Anderson, 1894	Visakhapatnam	Alcock and Anderson (1894)
13. *Arcania septemspinosa* (Fabricius,1787)	East Godavari, Krishna, Nellore, Prakasam, Visakhapatnam	Present record
14. *Arcania undecimspinosa* (de Haan, 1841)	Prakasam	Present record
15. *Ixa cylindrus* (Fabricius, 1787)	Visakhapatnam	Rajabai, (1975)
16. *Ixoides cornutus* MacGilchrist, 1905	Prakasam, Visakhapatnam	New record to **India**
17. *Parilia alcocki* Wood-Mason, 1891	Godavari Delta	Wood-Mason (1891)
Subfamily LEUCOSIINAE Samouelle, 1819		
18. *Philyra globosa* (Fabricius, 1787)	Srikakulam	Present record
19. *Philyra globulosa* H.Milne Edwards, 1837	East Godavari, Guntur, Krishna	Present record
20. *Philyra scabriuscula* (Fabricius, 1798)	Visakhapatnam	Rajabai (1975) and also the present record
21. *Philyra sexangula* Alcock, 1896	Godavari coast	Alcock (1896)
22. *Leucosia craniolaris* (Linnaeus, 1758)	East Godavari	Present record

Section OXYRHYNCHA Latreille, 1803		
Superfamily MAJOIDEA Samouelle, 1819		
Family **MAJIDAE** Samouelle, 1819		
Subfamily INACHINAE MacLeay, 1838		
23. *Encephaloides armstrongi* Wood-Mason,1891	Godavari Delta	Wood-Mason (1891)
Subfamily PISINAE Dana,1851		
24. *Doclea ovis* (Fabricius, 1787)	East Godavari, Krishna, Nellore, Visakhapatnam	Wood-Mason (1891) and also the present record
25. *Doclea hybrida* (Fabricius, 1798)	East Godavari, Nellore	Present record
26. *Doclea muricata* (Fabricius, !787)	Srikakulam	Present record
27. *Phalangipus indicus* (Leach, 1815)	Visakhapatnam	Present record
28. *Phalangipus longipes* (Linnaeus, 1758)	Visakhapatnam	Present record
Superfamily PARTHENOPOIDEA MacLeay, 1838		
Family **PARTHENOPIDAE** MacLeay, 1838		
Subfamily PARTHENOPINAE MacLeay, 1838		
29 *Parthenope longimanus* Linnaeus, 1764	West Godavari	Dev Roy and Bhadra (2001)
Subfamily AETHRINAE Dana, 1851		
30. *Cryptopodia angulata* H. Milne Edwards and Lucas, 1841	Prakasam	Present record
Section CANCRIDEA Latreille, 1803		
Superfamily CANCROIDEA Latreille, 1803		
Family **CORYSTIDAE** Samouelle,1819		
31. *Jonas* sp.	Visakhapatnam	Present record
Family **THIIDAE** Dana, 1852		
32. *Nautilocorystes investigatoris* Alcock, 1899	Visakhapatnam	Alcock (1899)

Section BRACHYRHYNCHA Borradaile, 1907

Superfamily PORTUNOIDEA Rafinesque, 1815

Family **PORTUNIDAE** Rafinesque, 1815

Subfamily PORTUNINAE Rafinesque,1815

33. *Scylla serrata* (Forskål, 1775)	East Godavari, Krishna, Nellore, West Godavari, Visakhapatnam	Dev Roy and Bhadra (2001) and also the present record
34. *Scylla tranquebarica* (Fabricius, 1798)	Krishna, Nellore, Visakhapatnam	Present record
35. *Portunus pelagicus* (Linnaeus, 1758)	East Godavari, Guntur, Nellore, West Godavari	Dev Roy and Bhadra (2001) and also the present record
36. *Portunus sanguinolentus* (Herbst, 1790)	Guntur, Krishna, Nellore, Prakasam, Visakhapatnam, West Godavari	Rajabai (1975); Dev Roy and Bhadra (2001) and also the present record
37. *Portunus gladiator* Fabricius, 1798	Visakhapatnam	Present record
38. *Portunus hastatoides* (Fabricius,1798)	Krishna, Nellore, Prakasam	Present record
39. *Portunus spinipes* Miers, 1886	Krishna, Nellore	Present record
40. *Charybdis (Charybdis) affinis* Dana, 1852	Guntur, Krishna, Nellore, Visakhapatnam	Present record
41. *Charybdis (Charybdis) annulata* Fabricius, 1798	Visakhapatnam	Alcock (1900); Rajabai (1975) and also the present record
42. *Charybdis (Charybdis) callianassa* (Herbst, 1801)	East Godavari, Guntur, Krishna, Prakasam, Srikakulam, Visakhapatnam	Rajabai (1975) and also the present record
43. *Charybdis (Charybdis) feriatus* (Linnaeus, 1758)	East Godavari, Guntur, Nellore, Visakhapatnam	Dev Roy and Bhadra (2001) and also the present record

44. *Charybdis (Charybdis) helleri* A. Milne Edwards, 1873	Visakhapatnam	Present record
45. *Charybdis (Charybdis) lucifera* (Fabricius, 1798)	Guntur, Visakhapatnam	Present record
46. *Charybdis (Charybdis) natator* (Herbst, 1794)	East Godavari, Krishna, Visakhapatnam	Present record
47. *Charybdis (Charybdis) rostrata* A.Milne Edwards, 1861	Krishna, West Godavari	Dev Roy and Bhadra (2001) and also the present record
48. *Charybdis (Goniohellenus) hoplites* Wood-Mason, 1877	Krishna, Nellore, Prakasam, Visakhapatnam	Present record
49. *Charybdis (Goniohellenus) truncata* (Fabricius, 1798)	Prakasam, Visakhapatnam	Present record
50. *Charybdis (Goniohellenus) vadorum* Alcock,1899	Visakhapatnam	Present record
51. *Thalamita admete* (Herbst, 1803)	Visakhapatnam	Rajabai (1975)
52. *Thalamita chaptali* (Audouin, 1826)	Srikakulam, Visakhapatnam	Present record
53. *Thalamita crenata* (Latreille, 1829)	Visakhapatnam	Rajabai (1975) and also the present record
Subfamily PODOPHTHALMINAE Dana, 1851		
54. *Podophthalmus vigil* (Fabricius, 1798)	Nellore, Prakasam, Visakhapatnam, West Godavari	Dev Roy and Bhadra (2001) and also the present record
Superfamily XANTHOIDEA MacLeay,1838		
Family **GONEPLACIDAE** MacLeay,1838		
55. *Carcinoplax longimanus* (de Haan, 1835)	Prakasam, Visakhapatnam	Present record
56. *Carcinoplax longipes* (Wood-Mason, 1891)	Prakasam, Visakhapatnam	Present record

Family **XANTHIDAE** MacLeay, 1838		
Subfamily TRICHIINAE de Haan, 1841		
57. *Banareia banareias* (Rathbun, 1911)	Visakhapatnam	Deb (1989)
Subfamily XANTHINAE MacLeay, 1838		
58. *Demania splendida* Laurie, 1906	Visakhapatnam	Present record
59. *Demania toxica* Garth, 1971	Visakhapatnam	New record to **India**
60. *Nectopanope rhodobaphes* (Wood- Mason, 1891)	Godavari coast	Wood-Mason (1891)
Subfamily ETISINAE Ortmann, 1893		
61. *Etisus* sp.		
Incertae sedis		
62. *Liagore erythematica* Guinot,1971	Prakasam, Visakhapatnam	Present record
Family **PILUMNIDAE** Samouelle, 1819		
Subfamily GALENINAE, Alcock, 1898		
63. *Galene bispinosa* (Herbst,1783)	East Godavari, Guntur, Krishna, Nellore, Prakasam, Visakhapatnam	Alcock (1898) and also the present record
64. *Galene granulata* Miers, 1884	Krishna	Present record
Subfamily PILUMNINAE Samouelle, 1819		
65. *Eurycarcinus grandidieri* A. Milne Edwards, 1867	Visakhapatnam	Present record
66. *Eurycarcinus orientalis* A. Milne Edwards,1867	Visakhapatnam	Rajabai (1975) and also the present record
Subfamily RHIZOPINAE Stimpson, 1858		
67. *Benthopanope indica* (de Man, 1888)	East Godavari	Present record
68. *Typhlocarcinus rubidus* Alcock, 1900	East Godavari	New record to **India**
69. *Xenophthalmus moebii* Richters, 1880	Visakhapatnam	Present record

Family **ERIPHIIDAE** MacLeay, 1838		
Subfamily MENIPPINAE Ortmann, 1893		
70. *Menippe rumphii* (Fabricius, 1798)	Visakhapatnam	Rajabai (1975) and also the present record
71. *Myomenippe hardwickii* (Gray, 1831)	East Godavari, Guntur, Visakhapatnam	Present record
Superfamily GRAPSIDOIDEA MacLeay, 1838		
Family **GRAPSIDAE** MacLeay,1838		
Subfamily GRAPSINAE Dana,1851		
72. *Grapsus albolineatus* Lamarck, 1818	Visakhapatnam	Rajabai (1975) and also the present record
73. *Metopograpsus messor* (Forskål, 1775)	East Godavari, Krishna, Visakhapatnam, West Godavari	Rajabai (1975) and also the present record
74. *Pachygrapsus minutus* A. Milne Edwards, 1873	Visakhapatnam	Rajabai (1975)
Subfamily VARUNINAE H. Milne Edwards, 1853		
75. *Varuna litterata* (Fabricius,1798)	East Godavari	Dev Roy and Bhadra, (2001) and also the present record
76. *Ptychognathus barbata* (A. Milne Edwards, 1873)	Visakhapatnam	Rajabai (1975)
Subfamily SESARMINAE Dana, 1852		
77. *Parasesarma plicatum* (Latreille, 1803)	Guntur, Nellore, West Godavari	Dev Roy and Bhadra (2001) and also the present record
78. *Episesarma taeniolata* (White, 1847)	East Godavari, West Godavari	Dev Roy and Bhadra (2001)
79. *Episesarma tetragonum* (Fabricius, 1798)	East Godavari, Visakhapatnam	Rajabai (1961) and also the present record

80. *Metaplax crenulata* (Gerstaecker, 1856)	West Godavari	Dev Roy and Bhadra (2001)
81. *Metaplax distinctus* H. Milne Edwards, 1852	East Godavari, Nellore	Present record
82. *Metaplax elegans* de Man, 1888	Godavari	Alcock (1900)
83. *Metaplax indica* H. Milne Edwards, 1852	Guntur, Visakhapatnam	Present record
84. *Metaplax intermedia* de Man, 1888	Godavari	Alcock (1900)
85. *Metasesarma rousseauxii* (H. Milne Edwards, 1853)	Visakhapatnam	Rajabai (1961)
Subfamily PLAGUSIINAE de Haan, 1833		
86. *Plagusa depressa tuberculata* (Lamarck, 1818)	Visakhapatnam	Rajabai (1961)
Superfamily PINNOTHEROIDEA de Haan, 1833		
Family **PINNOTHERIDAE** de Haan, 1833		
Subfamily PINNOTHERINAE de Haan, 1833		
87. *Pinnotheres alcocki* Rathbun, 1910	East Godavari	Lalitha Devi (1981)
88. *Pinnotheres gracilis* Bürger, 1895	East Godavari	Lalitha Devi (1981)
89. *Pinnotheres placunae* Hornell and Southwell,1909	East Godavari	Lalitha Devi (1986)
Superfamily OCYPODOIDEA Rafinesque, 1815		
Family **OCYPODIDAE** Rafinesque, 1815		
Subfamily OCYPODINAE Rafinesque, 1815		
90. *Ocypode ceratophthalma* (Pallas, 1772)	Visakhapatnam, West Godavai	Dev Roy and Bhadra, (2001) and also the present record
91. *Ocypode cordimana* Desmarest, 1825	Nellore, Visakhapatnam	Rajabai (1975) and also the present record

92. *Ocypode macrocera* H. Milne Edwards, 1837	East Godavari, Nellore, Prakasam, Srikakulam, Visakhapatnam	Alcock (1900), Rajabai (1972) and also the present record
93. *Ocypode platytarsis* H. Milne Edwards, 1852	East Godavari, Nellore, Prakasam, Srikakulam, Visakhapatnam	Rajabai (1975) and also the present record
94. *Uca dussumieri* (H. Milne Edwards, 1852)	Visakhapatnam	Alcock (1900)
95. *Uca lactea* (de Haan,1835)	East Godavari, Guntur, Nellore, Vizianagaram,	Dev Roy and Bhadra (2001) and also the present record
96. *Uca triangularis* (A. Milne Edwards,1873)	East Godavari, Guntur	Present record
Subfamily MACROPHTHALMINAE Dana, 1851		
97. *Macrophthalmus (Macrophthalmus) brevis* (Herbst,1804)	Visakhapatnam	Rajabai (1975)
98. *Macrophthalmus (Mareotis) depressus* Rüppell, 1830	Visakhapatnam	Rajabai (1975) and also the present record
99. *Macrophthalmus (Mareotis) tomentosus* Souleyet, 1841	Visakhapatnam	Rajabai (1975)
Subfamily DOTILLINAE Stimpson, 1858		
100. *Dotilla blanfordi* Alcock, 1900	Visakhapatnam	Rajabai (1975)
101. *Dotilla intermedia* de Man, 1888	Prakasam, Srikakulam, Visakhapatnam	Rajabai (1975) and also the present record
102. *Dotilla myctiroides* (H. Milne Edwards, 1852)	Visakhapatnam	Present record
Subfamily CAMPTANDRIINAE Stimpson, 1858		
103. *Baruna socialis* Stebbing, 1904	Visakhapatnam	Rajabai (1975)

SYSTEMATIC ACCOUNT

Family **DROMIIDAE** de Haan,1833

1833. Dromiacea de Haan, In : Siebold, *Fauna japon. (Crust.)* (1) : ix [corrected to Dromiidae by Ortmann, 1892 : 541, 543. Name No. 356 on Official List, in Opinion 688, *Bull. zool. Nomencl.*, **21**(3) : 16 (1964)].

1899b. Dromiidae, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 128.

1993. Dromiidae, McLay, In: A. Crosnier (ed.), Résultats des Campagnes MUSORSTOM, Vol.10. *Mém. Mus. natn. Hist. nat.* **156** : 120.

Diagnosis : Carapace shape variable, generally subglobular, sometimes flat but commonly ovoid or subcircular, often pentagonal. Lateral borders usually distinct and armed with teeth. Front usually tridentate, middle tooth always on a much lower plane than the others or often absent. Antennal flagella shorter than carapace length. Eye-stalk short, stout. External maxillipeds typically opercular, completely closing the buccal cavity. Chelipeds equal, generally much shorter than walking legs. An epipod often present on chelipeds but not on any of the following legs. First two pair of legs generally stout, not much shorter than chelipeds, third pair usually shortest, last two pairs much reduced, prehensile and subdorsal in position. Abdomen of six segments and telson folded under the thorax. Vestiges of uropods usually present on sternal surface of sixth abdominal segment. Genital openings coxal. Sternal grooves of female variable – either ending apart or together between bases of chelipeds and second pair of legs.

Type genus : *Dromia* Weber,1795

Remarks : The family Dromiidae has undegone four major revisions–first by Stimpson (1858) based on collections in the Pacific, second by Alcock (1899b) from India, Sri Lanka, Myanmar and Persian Gulf (Indian Ocean), third by Borradaile (1903) from Maldives, Indian Ocean and the fourth by McLay (1993) based upon specimens mostly from Philippines and New Caledonia and also a few specimens from Indonesia and Hawaii. World-wise, the family contains 32 genera and 133 species, the majority being from the Indo- Pacific. These include the genus *Hypoconcha* Guérin-Méneville, 1854 with six species, all being recorded from the American coast. There are, however differences of opinion among the experts regarding inclusion or exclusion of the genus within the family Dromiidae or to place it in a separate subfamily (McLay, 1993, 2001).

The family is represented by 16 species under 11 genera from Indian coasts which includes an endemic genus *Conchoedromia*. The species *Cryptodromia pileifera* Alcock, 1899 synonymised under *C. tuberculata* Stimpson, 1858 by some authors is now regarded as a valid taxon (McLay, *op. cit.*).

The present collection from Andhra Pradesh contains only two genera namely *Lauridromia* McLay, 1993 and *Sphaerodromia* Alcock, 1899.

Key to genera of the family DROMIIDAE

Front bidentate, antero-lateral margin of carapace entire, female sternal grooves not reaching up to the bases of first pair of legs (second pereiopods) and not culminating in tube-like structure ..... ***Sphaerodromia***

Front tridentate, antero-lateral margin of carapace not entire, female sternal grooves reaching at least up to the bases of first pair of legs (second pereiopods) culminating in well developed tube-like structures ..... ***Lauridromia***

Genus *Lauridromia* McLay, 1993

1900. *Dromia*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 136 (in part).

1903. *Dromidiopsis* Borradaile, *Ann. Mag. nat. Hist.*, ser. 7, **11** : 298 (in part).

1993. *Lauridromia* McLay, In : A. Crosnier (ed.) Résultats des Campagnes MUSORSTOM. Vol. 10. *Mém. Mus. natn. Hist. nat.*, **156** : 145.

Diagnosis : Carapace as broad or slightly broader than long. Coxae of external maxillipeds closely approximated and inserted under tip of sternum. Cheliped with an epipod, upper border of carpus and propodus armed with 2- 4 large tubercles. Legs not knobbed or ridged; propodi and dactyli of first two pairs equal in length, inner margin of the latter typically with seven or more spines; dactyli of third leg opposed by a single spine, usually 2 spines on the outer propodal margin; fourth leg shorter than second, dactyl usually opposed by two propodal spines with up to three spines on the outer margin and usually a spine on the outer margin of dactyl itself. Uropods well developed, visible externally. Joint between last two abdominal segments fused wholly or partially. Sternal grooves of adult females end apart on well developed tubes behind bases of chelipeds.

Type species : *Dromia intermedia* Laurie, 1906, by designation by McLay : 145 (1993).

Remarks : The genus *Lauridromia* McLay, 1993 contains three species namely, *Lauridromia dehaani* (Rathbun, 1923), *L. indica* (Gray, 1831) and *L. intermedia* (Laurie, 1906). The genus is Indo-Pacific in distribution with the exception of *L. dehaani* which has recently been recorded from Sala y Gomez Island (part of Chile) across the Pacific (McLay, 1993). The present collection includes the first named species only.

1. *Lauridromia dehaani* (Rathbun, 1923)
(Pl. 1, Fig. 1)

1839. *Dromia rumphii* de Haan, In : Siebold, *Fauna japon. (Curst.)* : 107, pl. 32.

1899. *Dromia rumphii*, Alcock, *J. Asiat Soc. Bengal*, **68**(2) : 137.

1923. *Dromia dehaani* Rathbun, *Proc. biol. Soc. Washington*, **36** : 68.

1993. *Lauridromia dehaani* McLay, In : A. Crosnier (ed.) Résultats des Campagnes MUSORSTOM. Vol. 10. *Mém. Mus. natn. Hist. nat.*, **156** : 145, 146.

2000. *Lauridromia dehaani*, Ng, Chang and Wang, *National Taiwan Museum Special Publication No.* **10** : 160, fig. 2c.

Material examined : 1(M),1(F), Fishing Harbour, Visakhapatnam, Dist. Visakhapatnam, 05.02.1999, Dr. M. K. Dev Roy, Reg. No. C 5247/2; 2(M),1(F), Maipadu, Dist. Nellore, 13.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5246/2; 1(M), Krishnapatnam Port, Dist. Nellore, Dr. M. K. Dev Roy, Reg. No. C 5248/2.

Measurement : W =	63.1	F = 17.9	L = 59.45
	68.0	18.65	63.45

Diagnosis : Entire body, chelipeds (excepting the finger tips) and legs (excepting the dactyls) densely covered with short tomentum. Carapace broader than long, markedly convex in both the directions and smooth. Antero-lateral teeth three, subequal; postero-lateral tooth directed laterally. Front tridentate, median tooth shorter than the laterals. Fingers pink-coloured in fresh specimens, downcurved and hollowed out internally. Dactyli of legs claw-shaped forming chelae with opposing single propodal spine in the last pair. Sternal sulci of female very prominent ending apart behind cheliped bases.

Type locality : Japan (Rathbun, 1923).

Distribution : Indo-West Pacific.

India : East coast – Nellore, Visakhapatnam; Orissa : Gopalpur coast; Tamil Nadu : Gulf of Mannar, Parangipettai coast. West coast – Kerala : Trivandrum.

Elsewhere : South Africa, Red Sea, Gulf of Aden, Maldives, Pakistan, Hong Kong, China, Nansha Islands, Taiwan, Japan and Indonesia.

Remarks : This is the most common dromiid crab of the state of Andhra Pradesh *vis-a-vis* Indian coasts. The width and length of the single ovigerous female measured during this investigation was 68.0 and 63.45 mm respectively.

In view of the recent revisionary work of McLay (1923) all specimens reported earlier as *Dromia rumphii* or *D. dehaani* from Indian coasts belong to *Lauridromia dehaani.* However, critical examination of the specimens are needed to confirm the same.

This crab is a new record to the crab fauna of the state.

Genus ***Sphaerodromia*** Alcock, 1899

1899. *Sphaerodromia* Alcock, *Investigator Deep Sea Brachyura* : 16.

1899. *Sphaerodromia*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 152.

1993. *Sphaerodromia*, McLay, In : A. Crosnier (ed.), Résultats des Campagnes MUSORSTOM, Vol.10. *Mém. Mus. natn. Hist. nat.*, **156** : 126.

Diagnosis : Carapace subglobose, as broad or broader than long, surface gradually rounded

and tomentose. Front broadly triangular, grooved in midline, rostrum not developed. Cheliped with an epipod and well developed podobranch, first two pair of legs also with epipod and with or without podobranchs. Chelipeds not at all nodose and longer and stouter than the first two pairs of legs. Last two pair of legs reduced, similar in size, only last pair subdorsal; 3 – 5 propodal spines opposing dactyli, outer propodal margin with no spine, inner margin of dactyli with 2 – 4 small spines. Abdomen consisting of six separate segments. Telson rounded, longer than wide in male, wider than long in female. Uropod plates well developed. Female sternal grooves ending wide apart behind genital openings.

Type species : *Dromidia kendalli* Alcock and Anderson, by monotypy.

Remarks : The genus contains five species namely, *Sphaerodromia kendalli* (Alcock and Anderson, 1894), *S. brizops* McLay and Crosnier,1991, *S. ducoussoi* McLay,1991 and *S. nux* Alcock, 1899 (McLay, 1993). The last species was described from Gulf of Martaban by Alcock (*op. cit.*). Only the first species has been recorded from India.

2. *Sphaerodromia kendalli*
(Alcock and Anderson, 1894)

1894. *Dromidia kendalli* Alcock and Anderson, *J. Asiat. Soc. Bengal*, **63**(2) : 175 and *Illustr. Zool. "Investigator" Crust.*, pl. 24, figs. 1, 1a.

1899. *Dromia (Sphaerodromia) kendalli*, Alcock, *Investigator Deep Sea Brachyura* : 16.

1899. *Sphaerodromia kendalli*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 153.

1901. *Sphaerodromia kendalli*, Alcock, *Catalogue of the Indian Decapod Crustacea in the Collection of the Indian Museum, Part I Brachyura*: 39, pl. 4, figs. 18, 18a.

1993. *Sphaerodromia kendalli*, McLay, In : A. Crosnier (ed.), Résultats des Campagnes MUSORSTOM, Vol.10. *Mém. Mus. natn. Hist. nat.*, **156** : 127, figs. 2a-i, 15a.

2000. *Sphaerodromia kendalli*, Ng, Chan and Wang, *National Taiwan Museum Special Publication Series No.* **10** : 163, fig. 3b.

Material examined : 1(F), Station no. 159, Marine Survey, Reg. No. C 9332/9

Measurement : W = 18.85 F = 2.15 L = 17.55

Diagnosis : Carapace subcircular, nearly as broad as long, globose except for a few scattered granules near the borders and on the pterygostomian regions; surface covered with short and thick erect, yellowish, velvet-like tomentum. Lateral borders entire, antero-lateral borders subcristiform terminating at the outer orbital lobe. Subhepatic area tumid with two small granules. Sub-orbital lobe prominent, rounded and bluntly triangular. Front consisting of two conspicuous lateral teeth separated from each other by a shallow sinus. Chelipeds strong, stout with a well developed podobranch; arms granular along the margins; wrist inflated with two strong tubercles besides bearing vesiculous granules; propodus also granular; fingers pinkish-red, elongate and down-curved, not gaped in female; teeth of fingers tended to be obsolete, especially on dactyls. First two pair of legs smooth, little shorter than chelipeds,

their carpi lobed distally, dactyli shorter than propodi bearing spinules along their inner margins, lower border of propodi also armed with a spinule distally; both first and second legs also with podobranchs; third and fourth legs reduced, almost of equal size; their dactyli very much shortened, strongly curved, opposed by four propodal spines with 3 – 4 spinules on the inner margin in third leg and by 6 – 7 closely spaced propodal spines and 6 spinules on the inner border in fourth leg. Abdomen smooth, consisting of six free segments, last segment little broader than long in female but longer than wide in male, their tips rounded. Female sternal grooves shallow, scarcely developed and partially concealed by bases of third legs ending wide apart, dactyli behind bases of second legs on a common transverse ridge.

Type locality : Nellore, Andhra Pradesh, India (Alcock and Anderson, 1894).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Nellore.

Elsewhere : Indonesia, South East Moluccas Islands, Philippines, Taiwan and Japan.

Remarks : In their original description, Alcock and Anderson (1894) stated that the sternal grooves "unite opposite bases of chelipeds" but later on Alcock (1899c) rectified it by stating that they "are very short, ending well behind the level of genital openings" The present work confirms the second view.

This crab appears to be uncommon and within the limits of Indian water, the species is so far known from the east coast and that too by its type locality only. There is no fresh collection of this crab from India since its description by Alcock and Anderson.

Family **DORIPPIDAE** MacLeay, 1838

1838. Dorippina MacLeay, In : Smith, *Illustr. Zool. S. Afr. (Invert.)* : 69 [corrected to Dorippidae by White 1847 : 53. Name No. 355 on Official List, there attributed to de Haan, 1841, in error (fide Manning and Holthuis, 1981, in *Smithson. Contrib. Zool.*, **306** : 28)].

1896. Dorippidae, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 273, 274.

1976. Dorippidae, Sakai, *Crabs of Japan and the Adjacent Seas* : 60.

1990. Dorippidae, Holthuis and Manning, *Researches on Crustacea, Special No.* **3** : 5.

Diagnosis : Carapace depressed, subquadrangular or subcircular, short, leaving the first 2 or 3 abdominal segments uncovered generally visible in dorsal view. Orbits incomplete. Antennules usually too large to fold inside their fossettes. Antennae large. Buccal cavern prolonged forwards to form an efferent branchial canal. First two pair of true legs markedly long and strong, last two pair remarkably short and slender, dorsal in position, terminating in hook-like dactyls. Gills less than nine. Male genital openings coxal, female openings sternal or coxal.

Type genus : *Dorippe* Weber, 1795.

Remarks : The family Dorippidae is divided into two sub-families namely, Dorippinae MacLeay, 1838 and Ethusinae Guinot, 1977. Only the first one is represented in the present collection.

Subfamily DORIPPINAE MacLeay, 1838

1838. Dorippina MacLeay, In : Smith, *Illustr. Zool. S. Afr. (Invert.)* : 69.

1896. Dorippinae, Alcock, *J. Asiat. Soc. Bengal,* **65**(2) : 273, 274.

1990. Dorippinae, Holthuis and Manning, *Researches on Crustacea, Special No.* **3** : 5.

Diagnosis : Third maxillipeds not covering anterior part of buccal cavity, inhalent canals opening in front of chelipeds.

Remarks : Before 1969, all species under this subfamily were assigned to the single genus *Dorippe* Weber, 1795. In 1969, while dealing with species of the genus *Dorippe* of the Indo-Malayan region, Serène and Romimohtarto splitted the old genus into three genera namely, *Dorippe sensu stricto*, *Neodorippe* and *Paradorippe* (the last two being new) besides creating two new subgenera, *Dorippoides* (in *Dorippe*) and *Nobilum* (in *Neodorippe*). Subsequently, Manning and Holthuis (1981) while studying dorippid crabs of West African coast critically evaluated the aforesaid work retaining all the genera erected by them and even raised some of their subgenera to the rank of genera; they also described two additional new genera namely, *Medorippe* and *Phyllodorippe*. In 1985, Chen described still another new genus, *Philippidorippe* from the Philippines. In 1990, while revising crabs of this subfamily from the Indo-West Pacific region, Holthuis and Manning erected further a new genus *Heika* from Japan. Among the nine genera recognized until now, the genus *Phyllodorippe* occurs exclusively in the Eastern Atlantic. Out of the remaining 8 genera, 7 are restricted to Indo-Pacific and the eighth one, *Medorippe* occurs both in Indo-Pacific and Atlantic.

The specimens that we have in our collection from Andhra coast belongs to two genera namely, *Dorippoides* and *Neodorippe*.

Key to genera of the subfamily DORIPPINAE

Carapace wider than long, front reaching almost up to the outer orbital teeth, spine at inner canthus of orbit extremely long ..... ***Dorippoides***

Carapace longer than wide, front reaching far beyond the outer orbital teeth, spine at inner canthus of orbit rudimentary ..... ***Neodorippe***

Genus ***Dorippoides*** Serène and Romimohtarto, 1969

1795. *Dorippe* Weber, *Nomencl. ent. Syst. Fabr.* : 93.

1969. *Dorippe (Dorippoides)* Serène and Romimohtarto, *Mar. Res. Indonesia,* **9** : 3.

1981. *Dorippoides*, Manning and Holthuis, *Smith. Contrib. Zool.*, **306** : 30.

1990. *Dorippoides*, Holthuis and Manning, *Researches on Crustacea, Special No.* **3** : 5, 47.

Diagnosis : Carapace broader than long, surface rather smooth and even but with grooves; lateral and anterior parts granular but lacking large tubercles or spines; branchial and branchiocardiac grooves distinct; cervical grooves distinct in juveniles and males, often indistinct or interrupted in females; mesogastric region with two oblique submedian pits, urogastric region – a convex, circular or oval area flanked by larger rounded and convex branchial lobes; lateral margins lacking lateral branchial spine. Eyes short and stout, cornea ventrolateral. Front consisting of two triangular teeth directed forward or slightly outward, exhalent canal visible in dorsal view between the frontal teeth. Chelipeds distinctly unequal in adult males, equal in females and young males; upper margin of palm and dactylus fringed with long hairs; lower margin of palm with double fringe of shorter, less conspicuous hairs and that of fixed finger without setae; cutting edges with 12-15 teeth of equal size, sharper and more triangular in smaller than in larger specimens. Leg joints flattened, unarmed; lower margin of merus, carpus and propodus often densely pubescent; dactyli flattened, twisted, without fringes of hair. First somite of male abdomen trapezoidal, widening posteriorly; second somite also widening posteriorly with low transverse ridge or two broad blunt tubercles placed in transverse row, lacking erect tubercles or spines; in third somite, lateral parts swollen and separated from the median part by indistinct groove; fourth somite short with blunt median elevations; fifth somite with anteromedian and two posterolateral blunt elevations; sixth somite flat with shallow transverse groove in anterior part; telson bluntly triangular with constricted base. Female abdomen wide and rounded, segments 2 – 5 with blunt but distinct transverse carina; fifth segment widest; telson small, posterior margin semicircular. Abdomen lacking tubercles or spines in both sexes.

Type species : *Cancer facchino* Herbst, 1785: 190, by original designation and monotypy; gender: masculine; name placed on Official List of Generic Names in Zoology, in Opinion 1437, *Bull. zool. Nomencl.*, **44**(2) : 139 (1987).

Remarks : The genus contains two species, of which, only one occurs in India.

3. ***Dorippoides facchino*** (Herbst, 1785)

1785. *Cancer facchino* Herbst, *Versuch. Naturgesch. Krabben Krebse*, **1**(2) : 190, pl. 11, fig. 68.

1896. *Dorippe facchino*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 278.

1969. *Dorippe (Dorippoides) facchino* Serène and Romimohtarto, *Mar. Res. Indonesia*, **9** : 4, 8, figs. 2, 6, 11, 16 A–D, pls. 1C, 3D.

1981. *Dorippoides facchino*, Manning and Holthuis, *Smith. Contrib. Zool.*, **306** : 30.

1990. *Dorippoides facchino*, Holthuis and Manning, *Researches on Crustacea, Special No.*, **3** : 49, figs. 19-25.

Material examined : 1(M), 3(F), Mungergudi, Machilipatnam, Dist. Krishna, 05.09.1995, Dr. T. Roy, Reg. No. C 5253/2; 1(M), Krishnapattam Port, Dist. Nellore, 15.01.1999, Dr. M.

K. Dev Roy, Reg. No. C 5254/2; 1(F), Maginipudi, Machilipatnam, Dist. Krishna, 26.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5276/2; 1(M), 1(F), Fishing Harbour, Visakhapatnam, Dist. Visakhapatnam, 09.12.1999, J. Sarkar, Reg. No. C 5263/2.

Measurement :	W =	22.9	F =	8.25	L =	18.0
		20.3		7.2		15.1

Diagnosis : Carapace and last pair of legs pubescent; hairs lacking in first and second pair of legs in female but confined to both the borders of merus and only posterior border of carpus and propodus in male. Carapace broader than long, smooth upon denudation, lateral borders finely granulate, regions well outlined. Supra-ocular lobe distinct from the frontal lobe projecting to but never beyond the level of frontal teeth. Inner supra-ocular tooth very large, straight and acute extending much beyond the frontal teeth. Chelipeds markedly unequal in male, equal in female; in larger cheliped, outer surface of merus, carpus and propodus and both the surfaces of palm granular; in smaller cheliped, dactylus grooved at the middle for most of its length; outer surface of fixed finger carinated, carinae nearly smooth; opposed margins of both the fingers strongly dentate. Carpus of first and second pair of legs bicarinated, their dactyls conical and fluted; last two legs short, subdorsal in position, all hairy on anterior and posterior margins except the hook-like dactyls. Male abdomen unarmed, third to fifth segments keeled in female.

Type locality : "Sowohl am mittelländischen Meere, als an den ostindischen Küsten," here restricted to Tranquebar (now in the state of Tamil Nadu), Southeastern India (fide Holthuis and Manning, 1990).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Krishna, Nellore, Visakhapatnam; Orissa : Devi river, Gopalpur coast; Tamil Nadu : Gulf of Mannar, Madras (= Chennai), Tranquebar. West coast – Karnataka : Mangalore beach. Andaman Islands.

Elsewhere : Persian Gulf, Gulf of Oman, Sri Lanka, Mergui Archipelago, Malaysia, Singapore, Indonesia, Thailand, Vietnam, Hong Kong, China and Japan.

Remarks : This species of crab occurs in both the coasts of India including the Andaman Islands. However, it is reported for the first time from the state of Andhra Pradesh.

Genus *Neodorippe* Serène and Romimohtarto, 1969

1969. *Neodorippe* Serène and Romimohtarto, *Mar. Res. Indonesia*, **9** : 3, 4, 11.

1990. *Neodorippe*, Holthuis and Manning, *Researches on Crustacea, Special Number*, **3** : 93.

Diagnosis : Carapace depressed, longer than wide or with length and width subequal, surface smooth, tubercles or spines absent; grooves distinct but relatively shallow, mesogastric and urogastric regions low, epibranchial region marked posteriorly with transverse irregular row or rows of pits. Lateral borders smooth or granular, often bearing short hairs. Front

consisting of two triangular teeth, directed anteriorly, opening of exhalent canal not visible in dorsal view. Eyes short and stout, widening distally, cornea ventrolateral. Chelipeds distinctly unequal in adult males, equal in females and juvenile males; upper margin of palm and dactylus fringed with short hairs, lower margin of palm with irregular rows of short hairs; cutting edges of chelae with 14 – 15 teeth of equal size. Leg joints flattened, unarmed, smooth or granular with scattered short setae; third pair longest; dactyli flattened, fringed with long setae on dorsal and ventral margins. First segment of male abdomen trapezoidal, widening posteriorly; second segment also widening posteriorly with low, rounded, median protruberance; third somite trilobed, lateral parts more tumid than median; 4 – 6 somites with low, median elevation and shallow transverse groove anteriorly; telson triangular, apex rounded. No tubercles or teeth on abdomen.

Type species : *Dorippe callida* Fabricius, 1798, a subjective junior synonym of *Cancer facchino* Herbst, 1785, by designation by the International Commission on Zoological Nomenclature; gender: feminine; name placed on Official List of Generic Names in Zoology, in Opinion 1437, *Bull. zool. Nomencl.*, **44**(2) : 139 (1987).

4. *Neodorippe callida* (Fabricius, 1798)

1798. *Dorippe astuta* Fabricius, *Ent. Syst. Suppl.* : 361.

1896. *Dorippe astuta*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 280.

1981. *Neodorippe callida* Manning and Holthuis, *Smithson. Contrib. Zool.*, **306** : 37.

1990. *Neodorippe callida*, Holthuis and Manning, *Researches on Crustacea, Special Number*, **3** : 95, figs. 39–42.

Material examined : 1(M), Nizampatnam, Dist. Guntur, 24.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5274/2;1(F), Kakinada Bay, Dist. East Godavari, 18.09.1995, Dr. T. Roy, Reg. No. C 5275/2.

Measurement :	W = 9.5	F = 2.6	L = 9.6
	13.55	4.05	13.7

Diagnosis : Carapace as long as broad or slightly longer than broad, flattened dorsally with smooth surface, regions defined by grooves. Body and its appendages covered with short, distant hairs not visible to the naked eye. Lateral borders smooth, extending beyond the outer orbital tooth. Spine at inner canthus of orbit rudimentary. Chelipeds unequal; arm roughened with granules; palm broad, fingers granular and ridged, their cutting edges strongly serrated. Both upper and lower margins of dactyl of second and third ambulatory legs fringed with long hairs, dactylus fluted, shorter than propodus. Abdomen consisting of seven distinct segments in both sexes, in female third to fifth terga keeled transversely, male terga unarmed.

Type locality : "In Mari Asiatico" (? = Tranquebar, India) (Fabricius, 1798).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : East coast – Andhra Pradesh : East Godavari, Guntur; Orissa : Gopalpur coast; Tamil Nadu : Madras (= Chennai), Tranquebar. West coast – Maharashtra : Bombay (= Mumbai).

Elsewhere : Red Sea, Karachi, Mergui Archipelago, Thailand, Indonesia, China and Philippines.

Remarks : This species occurs in both the coasts of India including the Andaman Islands. However, it is reported for the first time from the state of Andhra Pradesh.

Family **CALAPPIDAE** de Haan, 1833

1833. Calappidea de Haan, In : Siebold, *Fauna japon. (Crust.)* (1) : xiii and 67 (1837), 119, 124 (1841) [corrected to Calappidae by White, 1847 : 44; name no. 371 on Official List, in Opinion 712, *Bull. zool. Nomencl.*, **21**(5) : 341(1964)].

1896. Calappidae, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 136, 137.

1997. Calappidae, Galil, In : A. Crosnier (ed.), Résultats des Campagnes MUSORSTOM, Vol. 18. *Mém. Mus. Natn. Hist. nat.*, **176** : 2.

2000. Calappidae, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 18.

Diagnosis : Carapace oval or circular in outline. Front almost as broad as orbit. Lateral borders either with a small tooth or strong spine at the junction of antero-lateral and postero-lateral borders or a postero-lateral vault-like expansion over the walking legs. Antenna small, antennules obliquely folded. External maxillipeds may or may not close the buccal cavity fully, their palps either concealed in repose or always exposed. Efferent branchial channels together forming a deep channel in the endostome, afferent branchial openings near bases of chelipeds. Chelipeds massive, greatly enlarged, almost symmetrical in size (asymmetrical in the size of fingers). Palm enormous, often very prominent. Abdomen consisting of five segments in adult male (third to fifth terga fused together) and of seven separate segments in female and young males respectively. Gills nine on each side. Male genital openings coxal.

Type genus : *Calappa* Weber, 1795.

Remarks : The family contains representatives of two subfamilies namely, Calappinae and Matutinae both of which have been collected from Andhra Pradesh and can be distinguished by the following key.

Key to subfamilies of the family CALAPPIDAE

Merus of outer maxilliped not elongate or acute, never concealing the flagellum in repose, ambulatory legs gressorial ..... CALAPPINAE

Merus of outer maxilliped elongated and pointed at tip concealing the flagellum fully in repose, ambulatory legs natatorial ..... MATUTINAE

Subfamily CALAPPINAE de Haan, 1833

1833. Calappidea, de Haan, In : Siebold, *Fauna japon. (Crust.)* : xiii and 67 (1837), 119 (1841).

1896. Calappinae, Alcock, *J. Asiat. Soc. Bengal,* **65**(2) : 138, 139.

1876. Calappinae, Sakai, *Crabs of Japan and the Adjacent Seas* : 126, 127.

Diagnosis : Merus of external maxillipeds not elongate or acute, never concealing the flagellum in repose, ambulatory legs adapted for walking.

Genus ***Calappa*** Weber, 1795

1795. *Calappa* Weber, *Nomencl. ent. Syst. Fabr.* : 92

1896. *Calappa*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 139.

1997. *Calappa*, Galil, In : A. Crosnier (ed.), Résultats des Campagnes MUSORSTOM, Vol. 18. *Mém. Mus. natn. Hist. nat*, **176** : 272.

Diagnosis : Carapace strongly convex, rounded in front, much broadened posteriorly by a pair of clypeiform expansion or wings on each side concealing the legs. Front small, more or less triangular, projecting slightly or not at all, bilobed. Orbits small, circular; suborbital border complete, not notched, inner angle open but filled by stout and expanded basal joint of antenna. No distinct epistome. External maxillipeds leaving between them the exposed anterior prolongations of endopods of first maxillipeds which form the floor of exhalent branchial channels. Chelipeds massive, subequal; merus strongly keeled on its lower margin; palm strongly compressed, its upper border forming a high, sharply dentate or crenulate crest. Male abdomen consisting of five segments, third to fifth somites fused, that of young male and adult female of seven distinct somites.

Type species : *Cancer granulatus* Linnaeus, 1758, by subsequent designation by Latreille, 1810 : 422; gender : feminine; Name No. 1611 on Official List, in Opinion 712, *Bull. zool. Nomencl.*, **21**(5) : 337 (1964).

Remarks : The Indo-Pacific calappid crabs of the genus *Calappa* has recently been revised by Galil (1997). Subsequently, Ng *et al.* (1999) has given further comments on the nomenclature and taxonomic history of *Calappa undulata* Dai and Yang, 1991 and the validity of *C. quadrimaculata* Takeda and Shikatani, 1990 which was considered to be a junior synonym of *C. lophos* (Herbst, 1782) by Galil (*op. cit.*).

Key to species of the genus *Calappa*

Carapace with seven longitudinal parallel lines of bullous tubercles. Clypeiform expansions feebly developed, its free margins never laciniated ..... *C. pustulosa*

Cararapace without longitudinal parallel lines of bullous tubercles. Clypeiform expansions well developed, its free margins strongly cut into six teeth ..... *C. lophos*

5. *Calappa lophos* (Herbst, 1790)
(Pl. 4, Fig. 1)

1790. *Cancer lophos* Herbst, *Versuch. Naturgesch. Krabben Krebse*, **1**(2) : 201, pl. 13, fig. 77.

1896. *Calappa lophos*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 144.

1991. *Calappa lophos*, Dev Roy and Nandi, *J. Indian soc. Coastal agric. Res.*, **9**(1/2) : 73.

1997. *Calappa lophos*, Galil, In : A. Crosnier (ed.), Résultats des Campagnes MUSORSTOM, Vol.18.*Mém. Mus. natn. Hist. nat.*, **176** : 302, figs. 16, 17a, 20a, 32, 35c.

Material examined : 1(F), Station No.24, Elamanchili, Vizagapatnam, 20.09.1995, Dr. T. Roy, Reg. No. C 5228/2;1(F), Maipadu, Dist. Nellore, 13 01.1999, Dr. M.K. Dev Roy, Reg. No. C 4958/2; 1(F), Ongole, Dist. Prakasam, 20.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4957/2; 1(M), Vadarevu, Chirala, Dist. Prakasam, 21.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4956/2; 2(M), 1(F), Kakinada, Dist. East Godavari, 02.02.1999, Dr. M. K. Dev Roy, Reg. No. C 4955/2; 1(M), Fishing Harbour, Visakhapatnam, Dist. Visakhapatnam, 05 02 1999, Dr. M.K. Dev Roy, Reg. No. C 5229/2; 1(F), Visakhapatnam, Dist. Visakhapatnam, 09.12.1999, J. Sarkar, Reg. No. C 5255/2.

Measurement :	W =	F =	L =
	56.0	6.65	44.85
	66.15	7.2	53.05

Diagnosis : Carapace smooth (except for some tubercles at post frontal region) with broad longitudinal ridges. Frontal lobes acute at their apices. Clypeiform expansions well developed, their free margins strongly laciniate. Posterior border of carapace devoid of any spine at the middle. Pterygostomian region densely covered with hairs. Anterior border of endostomial septum deeply concave. Outer surface of wrist and palm of major cheliped nearly smooth, crest of palm strongly dentate.

Type locality : Unknown

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : East Godavari, Nellore, Prakasam, Visakhapatnam; Orissa Gopalpur coast; Tamil Nadu : Gulf of Mannar, Madras (= Chennai) Parangupettai coast; Pondicherry; West Bengal : Hugli, Sundarbans. West coast – Gujarat : Okha, Pirotan Island; Karnataka : Karwar; Kerala : Travancore; Maharashtra : Bombay (= Mumbai). Lakshadweep.

Elsewhere : South Africa, Mozambique, Gulf of Oman, Seychelles, Madagascar, Reunion, Mauritius, Pakistan, Sri Lanka, Singapore, Indonesia, Thailand, Taiwan, China, Japan, Australia, New Caledonia and Chesterfield Island.

Remarks : This species is very common in the trawl catches of the state. The larval development of this crab has been studied by Rajabai (1959).

6. *Calappa pustulosa* Alcock,1896
(Pl. 4, Fig. 2)

1896. *Calappa pustulosa* Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 147, pl.6, fig.1.

1897. *Calappa pustulosa*, Alcock and Anderson, *Illustr. Zool. "Investigator" Crust.*, Part 5 : pl. 28, fig. 1.

Material examined : 3(M), 4((F), Vadarevu, Chirala, Dist. Prakasam, 21.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4959/2; 1(F), Fishing Harbour, Visakhapatnam, Dist., Visakhapatnam, 09.12.1999, J. Sarkar, Reg. No. C 5256/2.

Measurement : W =	50.9	F =	5.75	L =	44.55
	46.75		5.4		42.3

Diagnosis : Carapace not smooth but covered with bullous tubercles arranged in seven parallel longitudinal rows. Frontal lobes blunt at their apices. Antero-lateral borders smooth. Clypeiform expansions divided into five short broad teeth. Posterior border of carapace bounded on either side by a faint prominence. Pterygostomian region sparsely hairy. Outer surface of wrist and palm strongly tuberculate similar to those occurring on the carapace, crest of palm serrated.

Type locality : Off Ganjam and Orissa coasts (Alcock, 1896).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Prakasam, Visakhapatnam; Orissa : Ganjam coast, Gopalpur coast; West Bengal : Sundarbans.

Elsewhere : Japan

Remarks : The tubercles on the posterior part of carapace are low and less developed. Some of the tubercles belonging to the median row has a tendency to become short and low crested.

This species of crab is a new record to the state. It is less common than the previous species and so far, known from the east coast of India only.

Subfamily MATUTINAE de Haan, 1833

1833. Matutoidea de Haan, In : Siebold, *Fauna japon. (Crust.)* : xiii and 119, 126 (1841).

1896. Matutinae, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 138, 139.

1976. Matutinae, Sakai, *Crabs of Japan and the Adjacent Seas* : 127, 139.

2000. Matutinae, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 19.

Diagnosis : Carapace circular with a stout spine at the junction of antero- and postero-lateral borders. Merus of external maxillipeds elongate with acute tip, concealing the flagellum fully in repose.

Remarks : The subfamily is now splitted into four genera (Galil and Clark, 1994), of which, only two are represented in the present collection.

Key to the genera of the subfamily MATUTINAE

Mid-palmar ridge granular and parallel to lower margin of fixed finger, dactylar ridge smooth throughout, carpus of penultimate pereiopod bicarinate ..... ***Ashtoret***

Mid-palmar ridge smooth and oblique, dactylar ridge strongly milled throughout, carpus of last pair of leg unicarinate ..... ***Matuta***

Genus ***Ashtoret*** Galil and Clark, 1994

1994. *Ashtoret*, Galil and Clark, *Zool. Verh. Leiden*, **294** : 4.

Diagnosis : Carapace subcircular and strongly convex bearing tubercles centrally, regions not defined. Front wider than orbit, trilobate, median lobe projecting. Antero-lateral margin arcuate, tuberculate; postero-lateral margin sharply convergent; lateral spines acute. Antenna rudimentary. Orbits obliquely cut, communicating with antennular fossa. Eyestalk stout and elongate, its lower surface thickly covered with long plumose setae. Pterygostomial region bearing several rows of elliptoid tubercles serving as stridulatory organ. Third maxilliped elongate, extending almost up to the anterior margin of carapace. Chelipeds subequal; merus short, trigonal, lower margin tuberculate; carpus with inferior angle produced; palm almost twice its height, outer surface sculptured; upper margin cut into three teeth, diminishing in size distally; mid-palm with a series of tubercles and spines parallel to its lower margin; outer surface of dactylus with a finely milled ridge in male, absent in female. Ambulatory legs with first propodus bearing a triangular teeth on lower margin, penultimate carpus bicarinate, propodus of last pair greatly extended posteriorly. Sternum anteriorly ogival. Male abdomen five segmented, telson 1.5 times as long as wide at base with conspicuously tuberculate carina on third abdominal tergite.

Type species : *Matuta picta* Hess, 1865 : 158; gender : feminine, by designation by Galil and Clark, in *Zool. Verh. Leiden*, **294** : 4 (1994).

Remarks : This genus comprises of eight species in the Indo-Pacific (Galil and Clark, 1994). It is represented by a single species in Andhra Pradesh.

Key to species of the genus *Ashtoret*

A finely milled ridge on outer surface of dactylus in male, absent in female. Plastron coarsely granular ..... *A. lunaris*

No milled ridge on outer surface of dactylus in both sexes. Plastron finely granular ..... *A. miersi*

7. *Ashtoret lunaris* (Forskål, 1775)
(Pl. 1, Fig. 2)

1775. *Cancer lunaris* Forskål, *Desc. Anim.* : 91(part).

1896. *Matuta banski*, Alcock, *J. Asiat. Soc Bengal*, **65**(2) : 158.

1994. *Ashtoret lunaris*, Galil and Clark, *Zool. Verh., Leiden*, **294** : 5, figs. a-b, pl. 1a-b.

Diagnosis : Carapace covered with minute red dots, all the six tubercles of the dorsal surface very prominent, even in juvenile specimens. A strong tubercle present on the postero-lateral border little below the lateral epibranchial spine. Front with straight lobes laterally and a slightly emarginated rostrum medially. Mid-palm of chelipeds – a five-lobed ridge, second and fourth lobes enlarged and acute; dactylus milled at the distal end in adult male, convex and smooth in female and young males.

Type locality : Red Sea (Forskål, 1775).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradseh : East Godavari; Orissa : Gopalpur coast.

Elsewhere : Aden, Red Sea, Malaysia, Singapore, Philippines, Indonesia, New Guinea and Australia.

Remarks : This species was earlier reported from East Godavari District by Dev Roy and Bhadra (2001) as *Matuta lunaris*. The larval development of this crab has been studied by Rajabai (1959). This species breeds throughout the year at Visakhapatnam-Waltair coast (Rajabai, 1975).

8. *Ashtoret miersi* (Henderson, 1887)

1887. *Ashtoret miersi* Henderson, *Madras J. Litt. Sci.*, **29** : 66, figs. 1- 4.

1896. *Matuta miersi*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 163.

1994. *Ashtoret miersi*, Galil and Clark, *Zool. Verh. Leiden*, **294** : 13, pl. 4a-b, figs. 2c-d.

Material examined : 1(F), Station No. 15, Pithapuram Village, Kakinada, Dist. East Godavari, 10.09. 1995, Dr. T. Roy, Reg. No. C 5191/2; 4(M), 5(F), Station No. 21, Krishnapuram Vill., Vizagapatnam, Dist. Visakhapatnam, 17.09.1995, Dr. T. Roy, Reg. No. C 5226/2; 2(M), Station No. 24, Elamanchili, Vizagapatnam, Dist. Visakhapatnam, 20.09.1995, Dr. T. Roy, Reg. No. C 5227/2; 1(M), 1(F), Fishing Harbour, Kakinada, Dist. East Godavari, 02.02.1999, Dr. M.K. Dev Roy, Reg. No. C 5189/2; 1(M), Akkupalli, 9 km. East of Palasa, Dist. Srikakulam, 02.02.2001, Dr. J. G. Pattanayak, Reg No. C 5190/2.

Measurement :	W =	F =	L =
	24.25	5.55	22.90
	20.05	4.45	18.55

Diagnosis : Carapace with six prominent tubercles, surface finely granular bearing minute red dots, especially on the anterior half. Front with straight lobes laterally and a slightly

emarginated rostrum medially. Mid-palm of chelipeds – a five-lobed ridge, second and fourth lobes enlarged and acute; outer surface of dactylus smooth, milled ridge being absent; lower margin of palm with a row of triangular tubercles terminating at the base of fixed finger.

Type locality : Madras, India (Henderson, 1887)

Distribution : Indo-Pacific.

India : East coast – East Godavari, Srikakulam, Visakhapatnam; Orissa : Mahanadi estuary; Tamil Nadu : Madras (= Chennai), Tuticorin.

Elsewhere : Sri Lanka, Japan

Remarks : This species of crab is reported for the first time from the state and so far, it is is known from the east coast of India only. This appears to be a common species in the coastal districts of Andhra Pradesh.

Genus *Matuta* Weber, 1795

1795. *Matuta* Weber, *Nomencl. ent. Syst. Fabr.* : 92.

1896. *Matuta*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 139, 153.

1994. Matuta, Galil and Clark, *Zool. Verh., Leiden*, **294** : 31.

2001. *Matuta*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 38.

Diagnosis : Carapace more or less flat, subcircular. Front almost as broad as orbit, trilobed, middle one more prominent than the others. Postero-lateral borders strongly convergent, generally with a spine at the junction of antero-lateral and postero-lateral borders. Antenna extremely small, inconspicuous. Antennules folded almost longitudinally. Orbits large, oval with a deep groove at the lower border near the external orbital angle and a narrow gap at the inner angle. Eye-stalks stout, usually elongate. External maxillipeds elongate, covering the buccal cavity completely; endostomial septum not separated from the efferent canals. Chelipeds massive, equal; stridulatory organ consisting of two elevated obliquely striated areas – proximal one linear and the distal one either oval or subcircular on inner surface of upper margin of palm along with a double series of transversely elongate tubercles on the pterygostomial region; palm compressed, its upper border cristate and outer surface sculptured. Legs adapted for swimming and burrowing, propodus and dactylus broadened enormously in first and last pair. Abdomen of adult male consisting of five segments in female and young males; first tergum in both sexes concealed under the carapace completely.

Type species : *Cancer victor* Fabricius 1786, a subjective junior synonym of *Cancer lunaris* Forskål, 1775; by subsequent designation by Latreille, 1810; gender : feminine.

Remarks : This genus contains only two species from Andhra Pradesh.

Key to species of the genus *Matuta*

Carapace covered with reticulated loops, frontal lobes nearly straight, outer surface of male chela with a single spine ..... *Matuta planipes*

Carapace covered with minute red dots, frontal lobes rounded, outer surface of chela bispinose ..... *Matuta victor*

9. *Matuta planipes* Fabricius,1798
(Pl. 4, Fig. 3)

1798. *Matuta planipes* Fabricius, *Ent. Syst. Suppl.* : 369.

1957a. *Matuta planipes*, Chhapgar, *J. Bombay nat. Hist. Soc.*, **54**(2) : 406, pl. 2, figs. d-f.

1976. *Matuta planipes*, Sakai, *Crabs of Japan and the Adjacent Seas* : 141, pl. 44, fig. 2.

1991. *Matuta planipes*, Dev Roy and Nandi, *J. Indian Soc. Coastal agric. Res.*, **9**(1/2) : 72.

1994. *Matuta planipes*, Galil and Clark, *Zool. Verh., Leiden*, **294** : 35, pl. 12a-b, figs. 6c-d.

Material examined : 1(M), Maipadu Sea Beach, Dist. Nellore, 13. 01. 1999, Dr. M. K. Dev Roy, Reg. No. C 5187/2.

Measurement : W = 30.4 F = 7.55 L = 38.2

Diagnosis : Carapace with vermicular lines of minute reddish dots forming rings in the anterior half and longer narrow loops in the posterior half. Front with straight horizontal lobes laterally and an emarginated rostrum medially.

Type locality : "Oceano Indico" (Fabricius, 1798)

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Nellore; Orissa : Chilka Lake, Gopalpur coast, Mahanadi Delta; Tamil Nadu : Madras (= Chennai), Parangipettai coast; West Bengal : Mouth of River Hugli,, Sundarbans. West coast – Maharashtra : Bombay (= Mumbai), Bassein, Deogad coast (District Ratnagiri).

Elsewhere : Pakistan, Myanmar, Thailand, Java, China, Japan and Australia.

Remarks : The diagnosis of the species has been made on the basis of carapace characters only since both the chelipeds are missing in the present specimen. Compared to *M. victor*, this crab appears to be less common This crab is a new record to Andhra Pradesh.

10. *Matuta victor* (Fabricius, 1781)
(Pl. 1, Fig. 3)

1781 *Cancer victor* Fabricius, *Species Insectorum Exhibentes*, **2** : 502.

1896. *Matuta victor*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 160.

1994. *Matuta victor*, Galil and Victor, *Zool. Verh. Leiden*, **294** : 39, figs. 7a-b, pl. 13a-b.

1997. *Matuta victor*, Ng and Huang, *Zoological Studies*, **36**(4) : 264, figs. 1G-H and 2A-B.

Material examined : 6(M), Bimlipatnam, Dist. Visakhapatnam, 16.01.1941, Dr. H. A. Hafix, Reg. No. C 5392/1; 5(M), 3(F), Lawson's Bay, Waltair, Dist. Visakhapatnam, 14. 02. 1947, Reg. No. C 5437/1; 1(M), Visakhapatnam, Dist. Visakhapatnam, Reg. No. C 5402/1; 1(M), Visakhapatnam, Dist. Visakhapatnam, H. S. Rao, Reg No. C 5438/1; 1(M), 1(F), Maipadu Sea Beach, Dist. Nellore, 13.01.1999, Dr. M. K. Dev Roy, Reg .No. C 5181/2; 1(F), Kottapatnam, Dist. Prakasam, 19. 01.1999, Dr. M. K. Dev Roy, Reg. No. C 5183/2; 3(M), 2(F), Nizampatnam Harbour, Dist. Guntur, 24.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5185/ 2; 1(M), Kakinada, Dist. East Godavari, 02.02.1999, Dr. M. K. Dev Roy, Reg. No. C 5184/ 2; 1(M), Bhimunipatnam, Dist. Visakhapatnam, 23.01.2001, Dr. J. G. Pattanayak, Reg. No. C 5182/2; 1(M), Pudimadaka, Dist. Visakhapatnam, 24.01.2001, Dr. J. G. Pattanayak, Reg. No.C 5180/2; 1(F), Pukkala Peta, Dist. Srikakulam, 31.01.2001, Dr. J. G. Pattanayak, Reg. No. C 5186/2; 1(M), Akkupalli, Dist. Srikakulam, 02.2001, Reg. No. C 5188/2.

Measurement : W = 40.35 F = 9.4 L = 38.2
35.35 9.3 32.65

Diagnosis : Carapace covered with minute red dots; of the six tubercles, anterior two either absent or faintly indicated. Two very prominent tubercles present on mid-palm of chelipeds, below this surface of palm smooth except for its lower border; dactylus strongly milled in male, milling present or absent in female.

Type locality : Malabar coast, India (Fabricius, 1781)

Distribution : Indo-West Pacific.

India : East coast – East Godavari, Guntur, Nellore, Srikakulam, Visakhapatnam; Orissa : Mahanadi Delta; Tamil Nadu : Hare Island, Krusadai Island, Kutikal Point, Madras (= Channai), Tranquebar, Tuticorin; Pondicherry; West Bengal : Gangetic Delta, Sundarbans. West coast – Maharashtra : Ratnagiri; Malabar. Andaman Islands : South Andamans.

Elsewhere : Mozambique, Madagascar, Comoros, Tanzania, Somalia, Red Sea, Gulf of Aden, Gulf of Oman, Pakistan, Sri Lanka, Myanmar, Thailand, Peninsular Malaysia, Singapore, Philippines, Hong Kong, China, Taiwan, Japan, Indonesia, Timor, Australia, New Caledonia, New Hebrides, Norfolk, Ovolan and Fedjee.

Remarks : This is a widely distributed species occurring all over the Indo-West Pacific (Galil and Clark, *op. cit.*). It is also a common crab in the coastal districts of the state. The two species, *Matuta victor* and *Matuta planipes* closely resemble each other from which they can at once be recognized by the following characters :

Matuta victor	*Matuta planipes*
1. Carapace covered with minute red dots.	1. Carapace covered with reticulated loops.

Matuta victor	*Matuta planipes*
2. Lateral frontal lobes rounded.	2. Lateral frontal lobes straight.
3. Chela bispinose.	3. Chela with single spine.
4. Outer surface of movable finger strongly milled in male, present or absent in female.	4. Milling absent on outer surface of females.

The width and length of the single ovigerous female present in the collection measured 32.75 and 30.2 mm. respectively. This crab is a new record to the state.

Family **LEUCOSIIDAE** Samouelle, 1819

1819. Leucosiadae Samouelle, *Entom. Useful Compend.* : 91[corrected to Leucosiidae by Miers, 1879 : 671. Name No. 374 on Official List, in Opinion 712, *Bull. zool. Nomencl.*, **21**(5) : 341(1964)].

1896. Nursioida Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 166.

1896. Myroida Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 167.

1896. Iphiculoida Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 167.

1896. Nursilioida Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 167.

1896. Nucioida Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 167.

Diagnosis : Carapace subcircular, oval or polygonal. Front narrow, much wider than orbit. Orbits and eyes very small. Antennules obliquely folded, antennae small often obsolete. Inhalent branchial channels opening at bases of third maxillipeds. Gills less than nine. Chelipeds symmetrical. Abdominal segments seldom separate distinctly, usually third to sixth terga in both sexes intimately fused with or without obliteration of sutures. Male openings sternal.

Type genus : *Leucosia* Weber, 1795.

Remarks : The family Leucosiidae is now divided into four subfamilies as discussed earlier by Dev Roy and Bhadra (2001). The family is represented by three subfamilies in the present collection.

Key to subfamilies of the family LEUCOSIIDAE

1. Epistome and infra-orbital lobes well developed ..... EBALIINAE

   Epistome reduced, infra-orbital lobes rarely well developed 2

2. Merus of external maxillipeds more than half the length of ischium measured along the inner border. Fingers stout, gradually narrowing from base to tip..... LEUCOSIINAE

   Merus of external maxillipeds half or less than half the length of ischium measured along the inner border. Fingers slender, almost of the same diameter from base to near to its tip ..... ILLINAE

Subfamily EBALIINAE Stimpson, 1871

1871. Ebaliinae Stimpson, *Bull. Mus. Comp. Zool., Harvard,* **2** : 155, 159.

1918. Ebaliinae, Ihle, *Siboga-Expeditie Monogr., Leiden,* **39B** : 205.

1976. Ebaliinae, Sakai, *Crabs of Japan and the Adjacent Seas* : 67.

Diagnosis : Merus of external maxillipeds half or more than half of the length of ischium, measured along the inner border. Epistome and infra-orbital lobes well developed. Fingers not much flattened or elongated. No thoracic sinus.

Remarks : It is represented by a single genus, *Ebalia.*

Genus *Ebalia* Leach, 1817

1817. *Ebalia* Leach, *Zool. Miscell.*, **3** : 18 and in 1815-1875, *Malac. Podophth. Brit.*, pl. 25.

1855. *Phlyxia* Bell, *Trans. Linn. Soc. Lond. Zool.*, **21** : 303.

1856. *Bellidilia* Kinahan, *J. roy. Dublin Soc.*, **1**(3) : 115, 117, 128.

Diagnosis : Carapace rhomboidal or pentagonal or hexagonal, generally broader than long, regions well defined and tumid, inflated portions nodular or granular, hind margin bilobed or dentiform. Front narrow, subtruncate, usually not much produced. Antennules obliquely or transversely folded. Antennae minute but distinct. Merus of external maxillipeds triangular, about 3/4th the length of ischium measured along the inner border; exopods not dilated. Chelipeds variable, usually massive. Abdomen with third to fifth segments in male and third to sixth segments in female fused; males usually with a denticle at the base of terminal segment.

Type species : *Ebalia bryerii* Leach, 1817, a subjective junior synonym of *Cancer tumefactus* Montagu, 1808, by subsequent designation by H. Milne Edwards, 1837, in 1836-1844, pl. 24, fig. 3 (as *Ebalia brayerii*); gender : feminine; name no. 145 on Official List; type species cited there as *Cancer tuberosus* Pennant, 1777, in error (Manning and Holthuis, 1981).

Remarks : The genus *Ebalia* is divided into many subgenera. Takeda and Miyake (1969) observed that the formation of male abdomen and pleopods amongst the various species within the genus is very different from each other. In 1973, Takeda opined that the genus is "apparently heterogeneous and should be more subdivided" on the basis of abdomen and gonopod structures. However, presently workers like Manning and Holthuis (1981) and Kazmi and Tirmizi (1990) did not use the subgeneric names and their system has been adopted in the present work too. The genus contains two species from Indian coasts but only one is represented in Andhra Pradesh.

11. *Ebalia sagittifera* Alcock, 1896

1896. *Ebalia sagittifera* Alcock, *J. Asiat. Soc. Bengal,* **65**(2) : 188.

Material examined : 1(F), Vizagapatam, Dist. Visakhapatnam, 02.06.1926, Dr. H. S. Rao and G. Varugis, Reg. No. C5336/1; 1(M), Station-2, Waltair, Dist. Visakhapatnam, 22.01.1921, Reg. No. C 5335/1.

Measurement :	W =	F =	L =
	3.6	0.95	3.75
	4.4	0.95	4.0 (shape distorted)

Diagnosis : Carapace hexagonal, strongly convex in both the directions. Front horizontal, free edges finely beaded. Antero-lateral margin distinct and elegantly milled by tubercles; posterior margin with a petaloid tubercle at either end and bearing a small tooth medially in male. Sub-hepatic and pterygostomian regions very prominent. One median elevated tubercular ridge and two similar lateral ridges forming a "broad arrow" at the posterior half of carapace. Chelipeds subequal; merus cylindrical, outer surface and both of its margins studded with tubercles; outer, inner and upper surfaces of wrist and palm finely granular; palm about two-thirds as broad as long and fingers nearly two-thirds the length of its palm. Leg joints long, smooth; dactylus longer than propodus. Male abdomen consisting of two pieces only; margins of thoracic sternum including the basal part of abdomen festooned with small granules in both male and female.

Type locality : Karachi, Pakistan (Alcock, 1896)

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Visakhapatnam (present record).

Elsewhere : Pakistan

Remarks : The following points have been noted during this study :

1. Front concave medially in juvenile female (Reg. No. C 5336/1).

2. A very prominent enlarged tubercle has been found to be present centrally on the median elevated ridge of carapace. From this median ridge, two rows of granular ridges run parallel side by side extending almost up to the front. These are often absent in juveniles. The lateral ridges of the arrow terminate to a sharp prominence on the postero-lateral margin.

3. A strong tubercle is present on lower surface of palm near its proximal part

This species is a new record to India. So far, this crab is known only from the Indian Ocean.

Subfamily ILIINAE Stimpson, 1871

1871. Iliinae Stimpson, *Bull. Mus. Comp. Zool., Harvard, 2* : 155.

1896. Iliinae, Alcock, *J. Asiat. Soc. Bengal,* **65** (2) : 166.

1918. Iliinae, Ihle, *Siboga-Expeditie Monogr., Leiden,* **39B** : 205.

Diagnosis : Merus of external maxillipeds half or less than half the length of ischium

measured along the inner border. Epistome reduced, infra-orbital lobe rarely well developed. Fingers slender, almost of the same diameter from base to tip.

Remarks : This is represented by three genera in Andhra Pradesh.

Key to genera of the subfamily ILLINAE

1. Buccal cavern narrowly triangular, exognath of external maxillipeds not broadened ... 2

   Buccal cavern transversely broad, exognath of external maxillipeds extremely broad ... ***Parilia***

2. Lateral margin of carapace produced into a large thick lateral process ... 3

   Lateral margin of carapace produced into thin lateral processes ... ***Arcania***

3. Front projecting as far as the salient edges of the afferent branchial canal, fingers two-third the length of palm or about half the combined lengths of wrist and palm ... ***Ixoides***

   Front not projecting as far as the salient edges of afferent branchial canal, fingers hardly half the length of palm ... ***Ixa***

Genus ***Arcania*** Leach, 1817

1817. *Arcania* and *Iphis* Leach, *Zool. Miscell.*, **3** : 19.

1896. *Arcania*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 262.

1976. *Arcania*, Sakai, *Crabs of Japan and the Adjacent Seas* : 90.

Diagnosis : Carapace globular, oval or rhomboidal, lateral and posterior margins armed with definitely arranged large spines or tubercles; surface usually crisply granular, spiny or tubercular, often smooth; regions rarely defined. Front bilobed, prominent. Epistome very small. Buccal cavern elongate-triangular. Merus of third maxilliped distinctly less than half the length of ischium; exopod narrow, its outer margin almost straight. Inner canthus of orbit prolonged into a spine, eyes small. Antennules folded very obliquely. Antennae small, basal joint lodged in the cleft at inner canthus of orbit. Chelipeds very slender, elongate, about twice the length of carapace; fingers and legs also slender. Abdomen with segments 3-5 in male and 3-6 or 4-6 in female fused.

Remarks : The genus *Arcania* consists of 14 species and subspecies in the Indo-Pacific, out of which, seven occur in India. Only three species have been recorded from Andhra Pradesh.

Key to species of the genus *Arcania*

1. Median lateral epibranchial spines very long, much longer than any of the other spines, nearly straight; carapace smooth and and its margins armed with 5-7 spines ... 2

Median lateral epibranchial spines short, not longer than the spines of the posterior part of carapace, claw-shaped; carapace covered with vesiculous granules and its margins armed with 11 spines ..... *A. undecimspinosa*

2. Seven spines on margins of carapace, three very large and four small .... *A. septemspinosa*

Five spines on carapace margins, three very large and two small ... *A. quinquespinosa*

12. *Arcania quinquespinosa* Alcock and Anderson, 1894

1894. *Arcania quinquespinosa* Alcock, *J. Asiat. Soc. Bengal*, **63**(2) : 206.

1896. *Arcania quinquespinosa*, Alcock and Anderson, *Illustr. Zool. "Investigator" Crust.*, Part 4 : pl. 24, fig. 6.

1896. *Arcania quinquespinosa*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 266.

1976. *Arcania quinquespinosa*, Sakai, *Crabs of Japan and the Adjacent Seas* : 95, pl. 28, fig. 3.

1989. *Arcania quinquespinosa*, Chen, In : J. Forest (ed.), Résultats des Campagnes MUSORSTOM, Vol. 5, *Mém. Mus. natn. Hist. nat.*, (A), **144** : 208, pl. 1, fig. 7.

Diagnosis : Carapace broadly conical in outline, surface marked with a large red mark on the cardiac region. Margins of carapace armed with five spines – lateral two largest followed by the intestinal, rest two of the posterior border smallest. Front cut into two sharp teeth. Fingers of chelipeds almost twice the length of palm. Abdomen consisting of five segments in both sexes.

Type locality : Off Madras coast, India (Alcock and Anderson, 1894).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; Orissa : Ganjam coast. Lakshadweep.

Elsewhere : Persian Gulf, Red Sea, Maldives, Sri Lanka, Arakan coast, Vietnam, Philippines, China (South China Sea and East China Sea) and Japan.

Remarks : This species of crab has not been collected by us. However, Alcock (*op. cit.*) reported this crab from Visakhapatnam.

13. *Arcania septemspinosa* (Fabricius, 1787)

1787. *Cancer septemspinosa* Fabricius, *Mantissa Ins.*, **1** : 325.

1798. *Leucosia septemspinosa* Fabricius, *Ent. Syst. Suppl.* : 351.

1896. *Arcania septemspinosa*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 265.

1980. *Arcania septemspinosa*, Hill, In : B.S. Morton and C. K. Tseng (eds.), *The Marine Flora and Fauna of Hong Kong And Southern China* : 201, pl. 4C.

1989. *Arcania septemspinosa*, Chen, In : J. Forest (ed.), Résultats des Campagnes MUSORSTOM, Vol.5. *Mém. Mus. natn. Hist. nat.*, (A), **144** : fig. 9 a-i, pl. 2, fig. 6.

Material examined : 2(M), Krishnapatam Port, Dist. Nellore, 15.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5225/2; 3(M), Kottapatnam, Dist. Prakasam, 19.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5222/2; 2(F), Ongole, Dist. Prakasam, 20.01.1999, Dr..M. K. Dev Roy, Reg. No. C 5220/2; 14(M), 7(F), Vadarevu, Chirala, Dist. Prakasam, 21.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5224/2; 1(M), Maginipudi, Machilipatnam, Dist. Krishna, 26.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5283/2; 14(M), 4(F), Fishing Harbour, Kakinada, Dist. East Godavari, 02.02.1999, Dr. M. K. Dev Roy, Reg. No. C 5221/2; 6(M), 3(F), Fishing Harbour, Visakhapatnam, Dist. Visakhapatnam, 05.02.1999, Dr. M. K. Dev Roy, Reg. No. C 5223/2.

Measurement : W = 23.6 F = 3.6 L = 19.3
18.75 4.1 14.75

Diagnosis : Carapace bluntly rhomboidal, broader than long with fine granular surface; its margins armed with seven spines – lateral spines longest directed forwards or backwards, posterior borders with four smaller spines, one on either side below the large posterior spine. Chelipeds slender, symmetrical, more than double the length of carapace (excluding the posterior spine), upper border of palm slightly shorter than the movable finger.

Type locality : "Oceano Indico" (Fabricius, 1787).

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : East Godavari, Krishna, Nellore, Prakasam, Visakhaptnam; Orissa : Gopalpur coast, Mahanadi Delta; Tamil Nadu : Madras (= Chennai). West coast – Gujarat : Gulf of Kachchh. Andamans.

Elsewhere : South Africa, Red Sea, Persian Gulf, Malay Archipelago, Hong Kong, China, Japan and Australia.

Remarks : This species occurs in both the coasts of India including Andaman Islands. However, this is the first report of its occurrence in Andhra Pradesh.

14. *Arcania undecimspinosa* de Haan, 1841

1841. *Arcania 11 spinosa* de Haan, *Faun. japon. (Crust.)* : 135, pl. 33, fig. 8.

1896. *Arcania undecimspinosa*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 266.

1989. *Arcania undecimspinosa*, Chen, In : J. Forest (ed.), Résultats des Campagnes MUSORSTOM, Vol.5. *Mém. Mus. natn. Hist. nat.*, (A), **144** : 204, figs. 8 a-f; pl. 2, fig. 4.

Material examined : 1(F), Kottapatnam, Dist. Prakasam, 19.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5316/2; 1(F), Ongole, Dist. Prakasam, 20.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5315/2; 3(F), Vadarevu, Chirala, Dist. Prakasam, 21.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5314/2.

Measurement : W = 25.2 F = 4.4 L = 26.15

Diagnosis : Carapace globose, surface covered with close-set prickles, the margins armed

with eleven spines of moderate size. Front sharply cut into two laminar teeth. Major part of arm of cheliped covered with miliary granules.

Type locality : Japan (de Haan, 1841).

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Prakasam; Orissa : Gopalpur coast; Tamil Nadu : 'Madras' side of Palk Strait. Andaman Islands. Aberdeen Bay.

Elsewhere : South Africa, Seychelles, Maldives, Pakistan, Gulf of Martaban, Singapore, Thailand, Vietnam, Korea, South China Sea, East China Sea, Japan, Philippines, Sulu Sea and Australia.

Remarks : The disposition of spines on carapace margins conform to Alcock (1896) except for the second marginal spine which is represented just by a tubercle at the junction of subhepatic and branchial region in the present specimens.

So far, this species is known only from east coast of India and Andaman Islands. This crab is a new record to Andhra Pradesh.

Genus ***Ixa*** Leach, 1815

1815. *Ixa* Leach, *Trans. Linn. Soc. Lond.*, **11** : 334.

1896. *Ixa*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 270.

1962. *Ixa*, Tyndale-Biscoe and George, *J. Roy. Soc. West. Australia*, **45**(3) : 72.

Diagnosis : Carapace broadly rhomboidal. Lateral margins produced into a sausage shaped spine of enormous size, sometimes with an abruptly acuminate tip. Front broadly bilobed. Orbits deep, concealing the eyes completely. Antennules obliquely folded. Antennae with its small flagellum lodged in a gap at inner canthus of the orbit. External maxillipeds sunken altogether or in parts. Chelipeds and legs very slender, fingers filiform, barely half the length of palm and open in a vertical plane. Abdomen with 3–5 in male and 3–6 in female fused.

Type species : *Cancer cylindrus* Fabricius, 1787, by monotypy; gender : feminine; name no. 161 on Official List.

Remarks : The genus *Ixa* contains four species namely, *Ixa cylindrus* (Fabricius, 1787), *I. edwardsii* Lucas, 1858, *I. pulcherrima* (Haswell, 1880) and *I. acuta* Tyndale-Biscoe and George, 1962 from the Indo-Pacific region. Out of these, only two species occur in India. Mention may be made that *I. inermis* recorded by Alcock (1896) from Orissa, Chopra (1933a) from Sandheads and Suseelan (1971) from west coast is now synonymised with *I. edwardsii* (Chen, 1989). Of the two species reported from India, only one has been recorded from Andhra Pradesh.

15. ***Ixa cylindrus*** (Fabricius, 1787)

1787. *Cancer cylindrus* Fabricius, *Mantissa Ins.*, **1** : 323.

1896. *Ixa cylindrus*, Alcock, *J. Asiat. Soc Bengal*, **65**(2) : 271.

1933a. *Ixa cylindrus*, Chopra, *Rec. Indian Mus.*, **35**(1) : 45, text-fig. 6.

Diagnosis : Carapace granular with smooth and polished patches at places; channels deep, well pubescent; lateral processes thick, massive consisting almost of the same diameter at their distal ends, culminating abruptly with an acuminate tip. Buccal cavity triangular, exognath of outer maxillipeds concave and smooth along its inner edges.

Type locality : Tranquebar, India (Fabricius, 1787).

Distribution : Indo-Pacific.

India : East coast – Andra Pradesh : Visakhapatnam; Tamil Nadu : 'Madras' coast in the neighbourhood of Palk Strait; West Bengal : Sandheads. Andaman Islands : Port Blair.

Elsewhere : East coast of Africa, Sri Lanka, Singapore and Thursday Island.

Remarks : This species of crab has not been collected by us. However, first zoea of this crab has been studied and figured by Rajabai (1960a). This crab is not yet reported from the west coast.

Genus ***Ixoides*** MacGilchrist, 1905

1905. *Ixoides* MacGilchrist, *Ann. Mag. nat. Hist.*, Ser. 7, **15** : 255.

1976. *Ixoides*, Sakai, *Crabs of Japan and the Adjacent Seas* : 103.

Diagnosis : Carapace globular, regions not distinctly demarcated, sides produced into two stout, conical, horn-like processes tapering from the base. Outer margin of merus of external maxillipeds cut away and bevelled, the bevelled edge forming inner wall of afferent branchial canal; front moderately broad, prominent, projecting about as far as the salient edges of afferent branchial canal. Chelipeds long, fingers filiform, about two-thirds the length of palm or about half the combined lengths of wrist and palm. Male abdomen consisting of five pieces, third to fifth segments fused, sutures visible in young specimens; in female, only the first, second and last segments distinct, rest all coalesced.

Type species : *Ixoides cornutus* MacGilchrist, 1905; gender : masculine, by monotypy.

16. ***Ixoides cornutus*** MacGilchrist, 1905
(Pl. 1, Fig. 4)

1905. *Ixoides cornutus* MacGilchrist, *Ann. Mag. nat. Hist.*, Ser. 7, **15** : 255.

1905. *Ixoides cornutus*, Alcock and MacGilchrist, *Illustr. Zool. "Investigator" Crust.*, Part 11 : pl. 73, figs. 2, 2a, 2b.

1976. *Ixoides cornutus*, Sakai, *Crabs of Japan and the Adjacent Seas* : 103, text-fig. 56a-b.

1989. *Ixoides cornutus*, Chen, In : J. Forest (ed.), Résultats des Campagnes MUSORSTOM, Vol.5. *Mém. Mus. natn. Hist. nat.*, (A), **144** : 227, fig. 21a-c; pl. 1, fig. 11; pl. 4, fig. 4.

Material examined : 1(M), 2(F), Vadarevu, Chirala, Dist. Prakasam, 21.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5212/2; 2(M), 2(F), Visakhapatnam, Dist. Visakhapatnam, 09.12.1999, J. Sarkar, Reg. No. C 5211/2.

Measurement :	W =	F =	L =
	32.35	6.95	23.65
	32.95	6.55	23.85

Diagnosis : Carapace globular, rhomboidal, broader than long, surface roughened with fine vesiculous granules at the anterior half; hepatic, branchial and intestinal regions smooth; the latter bearing a blunt but prominent, stout tubercle at its rear end, separated from the branchial regions by a deep sulcus. Front bilobed, each lobe broad with bluntly rounded apices. Margin of carapace produced into a stout, conical horn-like lateral process on each side, variable in length and thickness. Antero-lateral convexity of subhepatic region also bearing a small but distinct circular tubercle. Posterior margin of each side adorned with a large, stout papilliform process terminating to an acute tip. External maxillipeds triangular, ischium grooved along the inner border, merus also grooved basally. Chelipeds long, about twice the length of carapace; palm extremely slender distally, fingers filiform, nearly two-thirds the length of palm and hooked at tips. Male abdomen narrow, triangular and consisting of five pieces; third, fourth and fifth segments coalesced together; female abdomen very much broadened and elliptical, only the first, second and last segments distinct, rest coalesced together; seventh segment small, broadly triangular.

Type locality : Persian Gulf (MacGilchrist, 1905).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Prakasam, Visakhapatnam (present record).

Elsewhere : Persian Gulf, Hong Kong, South China Sea, East China Sea, Philippines, Vietnam and Japan.

Remarks : This species is reported for the first time from Indian waters. The largest and smallest ovigerous female measured during this investigation were 32.95 and 30.8 mm respectively.

Genus ***Parilia*** Wood-Mason, 1891

1891. *Parilia* Wood-Mason, *Ann. Mag. nat. Hist.*, ser. 6, **7** : 264.

1896. *Parilia*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 198.

1976. *Parilia*, Sakai, *Crabs of Japan and the Adjacent Seas* : 105.

Diagnosis : Carapace strongly convex, granular and bearing three spines on the posterior margin. Front bilobed. Antennules obliquely folded, antenna lodged in the gap at inner canthus of the orbit. Epistome projecting. Buccal cavity much broader than long, exopod of external maxillipeds markedly broad. Branchial chambers tumid. Chelipeds slender, more than four times the length of carapace. Male abdomen consisting of five distinct segments, female abdomen seven-jointed.

Type species : *Parilia alcocki* Wood-Mason, 1891.

Remarks : Wood-Mason (1891) established the genus based upon collections from the Godavari Delta and Mahanadi Delta. Presently it contains four species namely, *P. alcockii* Wood-Mason, 1891, *P. major* Sakai, 1961, *P. ovata* Chen, 1984 and *P. tuberculata* from the Indo-Pacific region. Of these, only the first species occurs in Indian Ocean while the remaining three are known from the Pacific.

17. *Parilia alcocki* Wood-Mason, 1891

1891. *Parilia alcocki* Wood-Mason, *Ann. Mag. nat. Hist.*, Ser. 6, **7** : 264 and *Illustr. Zool. "Investigator" Crust.*, : pl. 5, figs. 3, 3a.

1896. *Parilia alcocki*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 198

1899. *Parilia alcockii*, Alcock, *Investigator Deep-Sea Brachyura* : 28, pl. 4, fig. 1.

Diagnosis : Carapace deep, transversely oval, appearing hexagonal if viewed from top; surface finely granuler dorsally; regions well marked by broad shallow grooves and lines of dimples; branchial region much inflated, sharply marked off from gastro-cardiac and hepatics by a deep groove. Antero-lateral and posterior borders armed with four and three denticles respectively; another transverse row of three denticles just above the posterior margin – one at the middle of the intestine – the smallest, lateral two on each side of the posterior wall of branchial region much bigger and broader. Epistome projecting well beyond the edge of front. Chelipeds long, slender, cylindrical, finely granular, more than four times the length of carapace in adult male and about twice in female and young males; palm somewhat clavate in male, cylindrical in female. more than three times the length of fingers in male and twice in female; fingers stout, sinuous in male, slightly curved in female, their apposed margins serrated very weakly. Legs of moderate length, cylindrical, finely scabrous dorsally, shorter than arm in male but slightly larger in female; outer surface of merus, carpus and propodus granular; dactyli bluntly pointed, their edges closely fringed with long stiff hairs. Male abdomen five-jointed – third, fourth and fifth joints coalesced together; female abdomen consisting of seven distinct segments bearing an erect spine at the middle of the sternum in between the genital openings.

Type locality : Godavari Delta and Mahanadi Delta (Wood-Mason, 1891).

Distribution : Bay of Bengal.

India : East coast – Andhra Pradesh : Godavari Delta; Orissa : Mahanadi Delta.

Remarks : In live condition, carapace of this crab is deep pink fading away gradually to straw-colour at the posterior margin, leg joints are also pink and chelipeds white (Wood-Mason, *op cit.*).

The limits of distribution of this crab is in between 98 – 102 fathoms. It was collected from a depth of 70 fathoms (=127.4 m) in Godavari Delta and 68 fathom (=123.76 m) in Mahanadi Delta by Wood-Mason (*op. cit.*). This crab is restricted to Bay of Bengal and so far it is not known to occur outside the limits of Indian waters.

Subfamily LEUCOSIINAE Samouelle, 1819

1819. Leucosiadae Samouelle, *Entom. Useful Compend.* : 91.

1896. Leucosiinae, Alcock, *J. Asiat. Soc. Bengal,* **65** (2) : 165, 168.

1976. Leucosiinae, Sakai, *Crabs of Japan and the Adjacen* Seas : 115.

2001. Leucosiinae, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 37

Diagnosis : Merus of external maxillipeds more or much more than half the length of ischium measured along the inner border; fingers stout, gradually narrowing from base to tip. Thoracic sinus present.

Remarks : The subfamily contains two genera both of which can be differentiated by the following key.

Key to genera of the subfamily LEUCOSIINAE

Front narrow, forming a snout; buccal cavity elongate, exopodite of maxillipeds narrow and elongate; a thoracic sinus present above the bases of chelipeds ..... ***Leucosia***

Front broad and truncated, not snout-like; buccal cavity broad visible dorsally, exopodite of external maxillipeds broad; no thoracic sinus ..... ***Philyra***

Genus ***Philyra*** Leach, 1817

1817. *Philyra* Leach, *Zool. Miscell.*, **3** : 18, 22.

1896. *Philyra*, Alcock, *J. Asiat. Soc. Bengal,* **65**(2) : 237.

1976. *Philyra*, Sakai, *Crabs of Japan and the Adjacent Seas* : 108.

Diagnosis : Carapace circular, depressed, margin bounded by a continuous beaded line originating just behind the front, hepatic and branchial regions fairly defined by grooves or creases. Front quadridentate. Edges of pterygostomial ridges and tips of buccal cavity projecting beyond the front. Epistome very small. Buccal cavern transversely oblong. Exopod of third maxilliped broader than merus of endopod. Orbits small, sunken. Antennules transversely folded. Chelipeds symmetrical and more massive than legs. True legs small. Male abdomen consisting of 3 or 4 pieces, that of female of four, fusion lines often quite distinct..

Type species : *Cancer globus* Fabricius, 1775, by subsequent designation by H. Milne Edwards, 1837; gender feminine. Name No. 1642 on Official List, in Opinion 712, *Bull. zool. Nomencl.*, **21**(5) : 338 (1964).

Remarks : The genus is represented by four species in Andhra Pradesh.

Key to species of the genus *Philyra*

1. Carapace circular, upper surface of chelipeds never carinated 2

Carapace hexagonal, upper surface of chelipeds carinated from base of arm to finger cleft ..... *P. sexangula*

2. Epistome extended far beyond the front ..... *P. scabriuscula*

   Epistome extended very little beyond the front 3

3. Margins of carapace bounded by a beaded line of uniform sized granules, sixth segment of male abdomen without any enlarged tooth ..... *P. globosa*

   Some of the granules of carapace margins enlarged to form blunt tubercles, sixth segment of male abdomen with an enlarged tubercle ..... *P. globulosa*

18. *Philyra scabriuscula* (Fabricius, 1798)

1798. *Leucosia scabriuscula* Fabricius, *Ent. Syst. Suppl.* : 349.

1896. *Philyra scabriuscula*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 239.

1950. *Philyra scabriuscula*, Barnard, *Ann. S. Afr. Mus.*, **38** : 381, fig. 72 I.

1962. *Philyra scabriuscula* Tyndale-Biscoe and George, *J. Roy. Soc. West. Australia*, **45**(3) : 74.

Material examined : 2(M), Fishing Harbour, Visakhapatnam, Dist. Visakhapatnam, 09.12.1999, J. Sarkar, Reg. No. C 5307/2.

Measurement : W = 3.65 F = 2.4 L = 3.65

Diagnosis : Carapace discoidal, as broad as long, surface finely pitted and covered with vesiculous granules extending more or less over the branchial, cardiac-intestinal and gastric regions; branchio-cardiac grooves prominent. Margins of carapace closely beaded, beading continued anteriorly up to pterygostomial ridges below eye without any notch or interruption; the blunt inner angles of ridges forming a narrow U-shaped incision with the tip of buccal cavity; in dorsal view, the ridges and buccal cavity project far beyond the front like the lower jaw of a bull-dog. Front bilobed, about 2/3rd the length of carapace. Endopod of third maxilliped granular. Chelipeds slender, symmetrical; arm subcylindrical bearing rows of bead-like granules petering out distally along the upper and inner surfaces, inner margin of wrist with a single row of granules; palm twice as long as broad; dactylus hook-like, almost as long as palm; fingers meeting at tips, their opposed margins denticulate. Leg joints slender, smooth; meropodites with a line of microscopic granules ventrally. Segments 1 and 2 of male abdomen extremely short, almost sunken, 3-6 fused (suture between 5 and 6 not obliterated), sixth tergum without tubercle.

Type locality : "India Orientali" (Fabricius, 1798).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Visakhapatnam; Orissa : Gopalpur coast; Tamil Nadu : Madras (= Chennai), Parangipettai coast. West coast – Karnataka : Karwar, Kumta; Kerala : Travancore. Nicobar Islands.

Elsewhere : South Africa, Persian Gulf, Red Sea, Pakistan, Tavoy, Mergui Archipelago, Mekran coast, East Indies and Australia.

Remarks : This species occurs in both the coasts of India including the Nicobar Islands. It breeds from December to July in Visakhapatnam-Waltair coast, however, intensity of its breeding activity is more pronounced during January to May (Rajabai, 1975). The early zoeal stages and megalopa of this crab have been studied and figured by Rajabai (1960a).

19. ***Philyra sexangula*** Alcock, 1896

1896. *Philyra sexangula* Alcock, *J. Asiat. Soc. Bengal*, **65**(2): 241, pl. 7, fig. 2.

Diagnosis : Carapace hexagonal, as long as broad; a sharp median carina running from front to back; branchial region also traversed obliquely backwards by a carina terminating on the posterolateral margin at a sharp eminence. Posterior margin straight and its outer angles strongly dentiform. Epistome projecting beyond the front; a slight notch at the edge of epistome below eye on each side. Upper surface of cheliped from base of arm to finger-joints traversed by a sharp ridge, inner edge of upper surface of palm also traversed by another sharp ridge; palm as long as broad, fingers much shorter than palm, their cutting edges finely denticulate and hairy. Legs slender, flattened. Sixth segment of male abdomen marked off by a groove and bearing a strong median tooth.

Type locality : Godavari coast, Sacramento Shoal, 6 fms. (= 10.92 m.) (Alcock, 1896).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Godavari coast, Sacramento Shoal; Tamil Nadu : Parangipettai coast.

Elsewhere : Persian Gulf.

Remarks : Entire carapace and as well as the appendages (excluding the finger tips and dactyli of legs) of this crab is closely covered with short, minute velvet-like pubescence both dorsally and ventrally.

This crab is so far recorded from the east coast of India only. However, it could not be collected during the course of our present survey.

20. ***Philyra globosa*** (Fabricius, 1787)
(Pl. 4, Fig. 4)

1787. *Cancer globosus* Fabricius, *Mantissa Ins.*, **1** : 315.

1896. *Philyra globosa*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 243.

1950. *Philyra globosa*, Barnard, *Ann. S. Afr. Mus.*, **38** : 380, figs. 72 f-h.

1957. *Philyra globosa*, Chhapgar, *J. Bombay nat. Hist. Soc.*, **54**(2) : 407, pl. 2, figs., k-m.

Material examined : 1(M), Pukkala Peta, Dist. Srikakulam, 31.01.2001, Dr. J. G. Pattanayak, Reg. No. C 5233/2.

Measurement : W = 17.7 F = 7.5 L = 18.65

Diagnosis : Carapace subcircular, slightly depressed, nearly smooth to the naked eye, the dorsum defined by a continuous beaded line of uniformly sized granules. Third maxilliped glabrous, expod widely expanded. Epistome projecting beyond the front. Front broad, linear, pubescent and deflexing downwards. Arm of chelipeds visibly granular, proximally with close-set flattened pearly granules along the upper, outer and lower borders, rest of chelipeds finely granulate; palm slightly longer than dactyls and about twice its height; fingers fluted, crossing each other, white at tips, their inner margins evenly denticulate. Sixth segment of male abdomen without any enlarged tooth and smooth.

Type locality : "Littora Malabarica" (Fabricius, 1787).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Srikakulam; Orissa : Gopalpur coast; Tamil Nadu : Madras (= Chennai), Parangipettai coast; West Bengal : Mouth of River Hugli,. West coast – Kerala : Travancore; Maharashtra : Bombay (= Mumbai). Andamans.

Elsewhere : South Africa, Persian Gulf, Pakistan, Sri Lanka and Mergui Archipelago.

Remarks : This is the first report of the species from the state of Andhra Pradesh.This crab was collected from sandy beach near Nagarvali River.

21. ***Philyra globulosa*** H. Milne Edwards, 1837
(Pl. 1, Fig. 5)

1837. *Philyra globulosa* H. Milne Edwards, *Hist. Nat. Crust.*, **2** : 132 and In : Cuvier's, *Règne Anim. Crust.* : **2**, pl. 24, fig. 4.

1896. *Philyra globulosa*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 245.

1950. *Philyra globulosa*, Barnard, *Ann. S. Afr. Mus.*, **38** : 383, figs. 72, k-n.

Material examined : 1(M), Nizampatnam Harbour, Dist. Guntur, 23.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5232/2; 3(M), Maginipudi, Machilipatnam, Dist. Krishna, 26.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5230/2; 1(M), 6(F), Fishing Harbour, Kakinada, Dist. East Godavari, 02.02.1999, Dr. M. K. Dev Roy, Reg.No. C 5231/2; 1(F), Sea Beach near Light House, Kakinada, Dist. East Godavari, 02.02.1999, Dr. M. K. Dev Roy, Reg. No. C5284/2.

Measurement : W = 28.3 F = 6.0 L = 28.1
27.7 5.95 26.8

Diagnosis : Carapace circular, thick, surface covered with vesicular granules; its margins bounded by an elegantly beaded line, some of the granules enlarged to form blunt, stout conspicuous tubercles at regular intervals visible even with the naked eye. Front furry, slightly emarginate at the middle, broadly bilobed on denudation of furs. Third maxillipeds densely pubescent especially on the apical part; exopod oval, foliaceous. Chelipeds broad, massive,

markedly unequal but equal or subequal in the same sex; palm shorter than dactylus; cutting edges strongly dentate especially in male, movable finger with an enlarged tooth at its middle, fixed finger also with a large tooth nearer to its base; fingers with a good deal of gap in adult male, less so in female. Sixth segment of male abdomen bearing an enlarged tubercle.

Distribution: Indian Ocean.

India : East coast – Andhra Pradesh : East Godavari, Guntur, Krishna; Orissa : Gopalpur coast; Tamil Nadu : Point Calimere; West Bengal : Sandhead at mouth of River Hugli,. West coast – Kerala : Travancore. Andaman Islands.

Elsewhere : South Africa, Persian Gulf, Pakistan, Gulf of Thailand and Indonesia.

Remarks : In juvenile specimens, the denticles are absent at inner margin of fingers of chelipeds and on sixth abdominal segment. This crab is reported for the first time from this state.

Genus ***Leucosia*** Weber, 1795

1795. *Leucosia* Weber, *Nomencl. ent. Syst. Fabr.* : 92.

1896. *Leucosia*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 168, 209.

1976. *Leucosia* Sakai, *Crabs of Japan and the Adjacent Seas* : 115.

Diagnosis : Carapace thick, subcircular, subrhomboidal or hexagonal in outline; surface smooth, glazed or polished, hepatic region often defined. Front narrowed and upturned (snout-like). Thoracic sinus present. True postero-lateral margins ill-defined posteriorly; epibranchial margin greatly thickened, elegantly milled and continued with a finely-beaded crest forming the hind margin. Epistome very small. Buccal cavern elongate-triangular. Merus of external maxillipeds sharply triangular about as long as ischium; outer margin of exopod nearly straight. Chelipeds symmetrical, rather stout; palm and fingers moving in a horizontal plane. Legs small. Male abdomen generally consisting of 4 pieces, the two large middle pieces formed of fifth terga often fused into one; female abdomen usually of 4 pieces, the large oval third piece formed of fourth terga sometimes fused with the second piece.

Type species : *Cancer craniolaris* Linnaeus, 1758, by designation by Holthuis, 1959; gender : feminine. Name no. 1631 on Official List, in Opinion 712, *Bull. zool. Nomencl.*, **21**(5) : 338 (1964).

Remarks : The genus contains 22 species from India (Alcock, 1896; Chopra, 1933a; Tyndale-Biscoe, 1962), of which, only one species is represented in the present collection.

22. ***Leucosia craniolaris*** (Linnaeus, 1758)

1758. *Cancer craniolaris* Linnaeus, *Syst. Nat.* (ed. 10), **1** : 626.

1783. *Cancer craniolaris* Herbst, *Versuch. Naturgesch. Krabben Krebse*, **1**(2) : 90, pl. 2, fig.17.

1798. *Leucosia craniolaris* Fabricius, *Ent. Syst. Suppl.* : 350.

1896. *Leucosia craniolaris*, Alcock, *J. Asiat. Soc. Bengal*, **65**(2) : 231.

1976. *Leucosia craniolaris*, Sakai, *Crabs of Japan and the Adjacent Seas* : 122, pl. 35, fig. 3.

Material examined : 1(M), Fishing Harbour, Kakinada, Dist. East Godavari, 02.02.1995, Dr. M. K. Dev Roy, Reg. No. C 5319/2.

Measurement : W = 19.25 F = 2.6 L = 21.55

Diagnosis : Carapace hexagonal, distinctly longer than broad by the length of snout, surface smooth, polished and pitted. Antero-lateral margin finely beaded, true postero-lateral margin beaded as far as the level of the base of first pair of legs (second pereiopods); epimeral edge thickened and milled, visible dorsally in all of its extent; posterior margin nearly straight and finely beaded; the deflexed surface below it covered with rows of sharp granules. Thoracic sinus bounded below by finely beaded hind margin of pterygostomian plate. Front culminating in five prongs – outer pair sharp, middle one most conspicuous. Chelipeds equal; arm trigonal with beaded edges, beading more profuse at the proximal end, all of its surfaces smooth; palm almost as broad as long, its inner margin bounded by two conspicuous longitudinal rows of sharp bead-like granules extending some way along the fixed finger; fingers hooked at tips and crossing each other, their opposed margins strongly denticulate, dactylus slightly longer than palm. Carpi of leg joints compressed and carinated dorsally, propodi compressed and carinated both dorsally and ventrally, dactyli broadly lanceolate. Male abdomen consisting of three pieces.

Type locality : Unknown.

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : East Godavari; Tamil Nadu : Gulf of Mannar, Madras (= Chennai); West Bengal : Sandheads, Mouth of River Hugli. West coast – Malabar.

Elsewhere : Sri Lanka, Gulf of Martaban, Gulf of Thailand towards Borneo, Hong Kong, China, Taiwan, Japan, Arafura Sea and Torres Strait.

Remarks : The granule on second piece of male abdomen is absent in the present specimen. The crab is reported for the first time from the state of Andhra Pradesh.

Family **MAJIDAE** Samouelle, 1819

1819. Maiadae Samouelle, *Entom. Useful Compend.* : 88 [corrected to Majidae by Neumann, 1878 : 5].

1895. Maidae, Alcock, *J. Asiat. Soc. Bengal*, **64**(2) : 160.

1976. Majidae, Sakai, *Crabs of Japan and the Adjacent Seas* : 153.

Diagnosis : Oxyrhyncha with chelipeds especially mobile, rarely much greater than other legs, fingers often bent at an angle on the hand. Second article of antenna well developed generally fused with epistome and sometimes with the front. Palp of external maxillipeds articulated either at summit or at antero-internal angle of merus. Orbits generally more or less incomplete. Hooked hairs almost always present. Male genital openings coxal.

Remarks : The family Majidae *sensu lato* is the most speciose brachyuran family containing about 800 species arranged under more than 150 genera (Jamieson, 1998). In terms of species richness, it is next to Xanthidae.

The taxonomy of the family is still in an unsettled state; the number of subfamilies within the family is varying greatly in different classifications proposed by different authors. The present day classification of the group is, however, a modification of the schemes of Alcock (1895) involving a reduction in the number of families of Dana (1851) and Miers (1879). Thus whereas, Dana *(op. cit.)* had proposed 5 families and 27 subfamilies, Miers *(op. cit.)* treated them under 3 families and 11 subfamilies, while Alcock *(op. cit)* for the first time dealt them in a single family which was divided into 4 subfamilies and 7 "alliances" Miers *(op. cit.)*, Garth (1958) and Griffin (1966a, b) have discussed at length the historical review of this group and presently, the family is considered to consist of only seven subfamilies for the Indo-Pacific forms by Griffin and Tranter (1986). Mention may be made that Garth *(op. cit.)* also recognized equal number subfamilies for the majids of Pacific coast of America. In these works, five subfamilies namely, Oregoniinae, Inachinae, Pisinae, Majinae and Mithracinae were considered to be common while two were named differently — the Tychinae in Griffin and Tranter is Opthalminae in Garth and the Epialtinae in Griffin and Tranter is Acanthonychinae in Garth, but Epialtinae being senior has priority.

However, the present collection contains representatives of two subfamilies, namely, Inachinae and Pisinae.

Key to subfamilies of the family MAJIDAE

Eyes without orbits, eye-stalks long either retractile or non-retractile against the sides of carapace or against an acute postocular spine affording no concealment .... INACHINAE

Eyes with commencing orbits having in addition to the supraocular spine, a large cupped postocular process into which the eye retracts, eye-stalks short ..... PISINAE

Subfamily INACHINAE MacLeay, 1838

1838. Inachidae MacLeay, In : Smith, *Illustr. Zool. S. Afr. (Invert.)* : 56 [given preference over Macropodiadae Samouelle, 1819, by International Commission on Zoological Momenclature. Name No 400 on Official List, in opinion 763, 1966 (fide Manning and Holthuis in *Smithson. Contrib. Zool.*, **306** : 252, 1981)].

1895. Inachinae, Alcock, *J. Asiat. Soc. Bengal,* **64**(2) : 160.

1976. Inachinae, Sakai, *Crabs of Japan and the Adjacent Seas* : 154.

Diagnosis : Basal antennal joint extremely slender. Orbits undefined. Eye-stalks usually long, non-retractile or retractile against sides of carapace.

Remarks : The subfamily contains 12 genera from Indian coasts but only the genus *Encephaloides* is recorded from Andhra Pradesh.

Genus ***Encephaloides*** Wood-Mason, 1891

1891. *Encephaloides* Wood-Mason, *Ann. Mag. nat. Hist.*, ser. 6, **7** : 259.

1895. *Encephaloides*, *Alcock, J. Asiat. Soc. Bengal*, **64**(2) : 186.

Diagnosis : Carapace heart-shaped, posteriorly as broad as long (including rostrum), branchial regions markedly inflated, meeting across the carapace in midline. Rostrum simple, beak-like. Eyes retractile with a small preocular and postocular spine but without definite orbit. Basal antennal joint slender throughout, antenna visible dorsally from the base of second joint. Outer corner of merus of external maxillipeds produced to form a foliaceous lobe for covering the branchial orifice. Chelipeds slender in both sexes. Legs long and slender. Abdomen consisting of seven distinct segments in male, 4-6 in female.

Type species : *Encephaloides armstrongi* Wood-Mason, 1891, by monotypy.

Remarks : This genus which is monotypic is at present known only from the Indian Ocean.

23. ***Encephaloides armstrongi*** Wood-Mason, 1891

1891. *Encephaloides armstrongi* Wood-Mason, *Ann. Mag. nat. Hist.*, ser. 6, **7** : 259.

1895. *Encephaloides armstrongi*, Alcock, *J. Asiat. Soc. Bengal*, **64**(2) : 187.

1896. *Encephaloides armstrongi*, Alcock and Anderson, *Illustr. Zool. "Investigator" Crust.* : pl. 19, figs. 2, 2a.

1974. *Encephaloides armstrongi*, Griffin, *Smithson. Contrib. Zool.*, **182** : 10.

Diagnosis : Carapace heart-shaped, gastric and hepatic regions very distinct, branchial region remarkably large and inflated so as to meet together over the back in a straight suture, concealing the cardiac and intestinal regions. Both afferent and efferent branchial openings also very large. Rostrum triangular, beak-like, about one-fourth the length of carapace proper with fine serrations along the edges. Antennary flagella visible from above beyond the margins. Eyes very small, slender and retractile against the sides of carapace, supra-orbital eave culminating to a minute spine anteriorly and posteriorly. Chelipeds short. Legs long, slender, cylindrical without hairs or spines. Male abdomen seven-jointed, in female fourth, fifth and sixth segments firmly fused togerher.

Type locality : Ganjam coast, Godavari coast (Wood-Mason, 1891).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Godavari coast; Orissa : Ganjam coast.

Elsewhere : Gulf of Oman and Arakan coast.

Remarks : Wood-Mason (*op. cit.*) reported this crab to be characteristic of the infra-littoral zone of Bay of Bengal near 100 fathoms (=182 meters) limit from the coast of Arakan to Godavari. Griffin (1974) stated this crab as one of the most distinctive Indo-Pacific majids. However, no fresh material of this deep water crab has been collected from Indian waters since its description.

Subfamily PISINAE Dana, 1851

1851. Pisinae Dana, *Amer. J. Sci. Art.*, ser. 2, **11** : 424.

1896. Pisinae, Alcock, *J. Asiat. Soc. Bengal*, **64**(2) : 160, 165, 200.

1976. Pisinae, Sakai, *Crabs of Japan and the Adjacent Seas* : 215.

Diagnosis : Basal antennal joint broad. Orbits partly defined. Post-ocular cupped process always present, hollowed for retention of the short eye-stalks.

Remarks : It is represented by two genera, *Phalangipus* Latreille, 1825 and *Doclea* Leach, 1815.

Key to genera of the subfamily PISINAE

Carapace subpyriform, an intercalated spine between supraocular eave and postocular cup; first pair of legs extremely long, six times or more the length of carapace..... ***Phalangipus***

Carapace subcircular or globular, intercalated spine absent; first pair of legs of moderate length ***Doclea***

Genus *Doclea* Leach, 1815

1815. *Doclea* Leach, *Zool. Miscell.*, **2** : 41

1895. *Doclea*, Alcock, *J. Asiat. Soc. Bengal*, **64**(2) : 225

1986. *Doclea*, Wagner, *Bull. Mus. natn. Hist. nat. Paris*, sér. 4, **8** : 895

Type species : *Doclea rissonii* Leach, 1815: 42, by monotypy, gender: feminine.

Diagnosis : Carapace globular to subpyriform with lateral and often dorsal spines or tubercles. Rostrum bifid. Eyes small. Antenna very short and inconspicuous, basal joint of antenna produced into a sharp tooth at outer apex, flagella almost rudimentary. Outer angle of buccal frame produced into a spine, pterygostomial ridge absent. Chelipeds longer and stouter in male, shorter and slenderer in female. Legs long, almost 1–4 times as long as carapace, tomentose. Abdomen consisting of seven segments in male and of 4 – 7 in females.

Remarks : The three species represented in the present collection may be distinguished by the following key.

Key to species of the genus *Doclea*

1. Pterygostomian regions distinctly canaliculated from front to back; no tubercle on the median line of carapace; intestinal region unarmed; branchial region with three short spines on the antero-lateral margin, last spine tuberculiform ..... *D. ovis*

   Pterygostomian regions not canaliculated; spines or tubercles present on the median line

of carapace; intestinal spine present; branchial region with four spines or tubercles on the antero-lateral margin, last spine often much enlarged 2

2. Spines, not tubercles on the median line of carapace ..... *D. muricata*

Tubercles, not spines on carapace ..... *D. hybrida*

24. *Doclea ovis* (Fabricius, 1787)
(Pl. 1, Fig. 6)

1787. *Cancer ovis* Fabricius, *Mantissa Ins.*, **1** : 324

1895. *Doclea ovis*, Alcock, *J. Asiat. Soc. Bengal*, **64**(2) : 227

1986. *Doclea ovis*, Wagner, *Bull. Mus. natn. Hist. nat., Paris*, ser. 4, **8** : 897, figs. 1-4, pls. 1, 2

Material examined : 1(F), Elamanchali, Visakhapatnam, Dist. Visakhapatnam, 1995, Dr. T. Roy. Reg No. C 5238/2; 3(F), Maipadu Sea Beach, Dist. Nellore. 13.91.1999, Dr. M. K. Dev Roy, Reg. No. C 5215/2;1(M), 3(F), Maginipudi, Machilipatnam, Dist. Krishna, 26.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5239/2;1(M),1(F), Kakinada Bay, Dist. East Godavari, 05.08.1999, Dr. J. G. Pattanayak, Reg. No. C 5317/2.

Measurement : W =	49.6	F = 10.1	L = 48.75
	50.7	11.25	51.2

Diagnosis : Carapace and its appendages (except for the finger tips of chelipeds and dactyls of legs) densely covered with short, soft fur; surface smooth upon denudation. Pterygostomian region grooved longitudinally. Antero-lateral border armed with four tubercles - first one smallest and fourth one largest, second and third of almost of same size. Chelipeds about 5/7th the length of carapace and rostrum; wrist and palm yellow, fingers leave a wide gap proximally, their tips yellow and cutting edges strongly dentate. Dactylus of legs yellow with reddish tips.

Type locality : "India Orientali" (Fabricius, 1787).

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : East Godavari, Krishna, Nellore, Visakhapatnam; Orissa : Devi river, Gopalpur coast; Tamil Nadu : Gulf of Mannar, Madras (= Chennai), (?) Tranquebar; Pondicherry; West Bengal : Sandheads at mouth of River Hugli.

Elsewhere : Madagascar, Mauritius, Arakan coast, Mergui Archipelago, West Malay Peninsula, Singapore, Gulf of Thailand, Makassar, Hong kong, China and Vietnam.

Remarks : This crab occurs exclusively in the east coast of India.

25. *Doclea muricata* (Fabricius, 1787)

1787. *Cancer muricatus* Fabricius, *Mantissa Ins.*, **1** : 324

1895. *Doclea muricata*, Alcock, *J. Asiat. Soc. Bengal*, **64**(2) : 230

1986. *Doclea muricata*, Wagner, *Bull. Mus. natn. Hist. nat. Paris*, ser. 4, **8** : 911, figs. 16-19, pl. 5

Material examined : 1(M), Pukkala Peta, Dist. Srikakulam, 31.01.2001, Dr. J. G. Pattanayak, Reg No. C5214/2.

Measurement : W = 24.55 F = 5.85 L = 24.55

Diagnosis : Carapace as long as broad, subglobular, bearing eight spines on its median line – first four on the mesogastric region, fifth and sixth in urogastric and cardiac respectively, seventh and eighth in the intestinal region, last one largest. Two spines, one behind the other on the branchial region between median and lateral rows of spines. Antero-lateral border armed with four spines – first two extremely small, tuberculiform; third and fourth larger, last one about twice the third. Chelipeds slender in both sexes; palm larger than dactylus, its height about half of its length.

Type locality : "India Orientali" (Fabricius, 1787).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Srikakulam; Tamil Nadu : Madras (= Chennai), Palk Strait, (?) Tranquebar; Pondicherry. West coast – Kerala : Cochin Harbour; Maharashtra : Ratnagiri.

Elsewhere : South Africa, Sri Lanka, Myanmar, Malaysia and Indonesia.

Remarks : This crab is reported for the first time from Andhra Pradesh.

26. ***Doclea hybrida*** (Fabricius, 1798)
(Pl. 1, Fig. 7)

1798. *Inachus hybridus* Fabricius, *Entom. Syst. Suppl.* : 355

1895. *Doclea hybrida*, Alcock, *J. Asiat. Soc. Bengal*, **64**(2) : 231

1977. *Doclea hybrida*, Kantha Bai and Rao, *Newsl. zool. Surv. India*, **3**(6) : 370

Material examined : 1(M),1(F), Sea coast 3.5 miles East of Kakinada, Dist. East Godavari, Dr. J. J. Asana, Reg. No. C 827/2; 1(M), Maipadu, Dist. Nellore, 13.01.1999. Dr. M. K. Dev Roy, Reg. No. C 5213/2; 1(M), 3(F), Fishing Harbour, Kakinada, Dist. East Godavari, 02.02.1999, Dr. M. K. Dev Roy, Reg. No. C 5234/2; 1(F), Sea Beach near Light House, Kakinada, Dist. East Godavari, 02.02.1999, Reg. No. C 5235/2.

Measurement : W = 33.05 F = 6.1 L = 36.1
40.1 8.6 41.05

Diagnosis : Carapace subglobular, depressed, distinctly longer than broad and bearing tubercles instead of spines on its dorsal surface. Antero-lateral borders also bearing tubercles, the tubercles of antero-lateral series and those on carapace corresponding in number and position with spines of the preceeding species. In adult male, chelipeds almost as long as the carapace and rostrum; palm enlarged.

Type locality : India (Fabricius, 1798).

Distribution : Bay of Bengal.

India : East coast – Andhra Pradesh : East Godavari, Nellore; Tamil Nadu : Madras (= Chennai), Pamban, Rameswaram, (?) Tranquebar. West coast – Maharashtra : Ratnagiri.

Elsewhere : Sri Lanka.

Remarks : Perhaps due to the spinose nature of carapace, Alcock (1895) viewed *D. muricata* as the young form of *D. hybrida* with tubucular carapace probably on the assumption that the spines of young stage could get changed to tubercles during its adult stage. Wagner (1986) in his revisionary work on the genus *Doclea* merged *D. hybrida* under *D. muricata*. The two species closely resemble each other and after examining a series of specimens of both sexes of both the species present in National Zoological Collection and observing the following morphological differences therein, we are inclined to regard both as separate and distinct species.

D. hybrida	***D. muricata***
1. Large crab.	1. Small crab.
2. Carapace longer than broad.	2. Carapace as long as broad.
3. Carapace depressed.	3. Carapace thick.
4. No spines but only tubercles are present on median line of carapace.	4. Median spines of carapace are very large and prominent.
5. Spines of antero-lateral borders extremely small, tuberculated.	5. Spines of antero-lateral borders much larger, last one largest.
6. Anal spine much shorter.	6. Anal spine big.
7. Male abdominal appendage broad, pointed at tip.	7. Male abdominal appendage slender with rounded tip.

Further, evidence from larval developmental studies of *D. hybrida* made by Sankolli and Shenoy (1975), it is revealed that the tubucular nature of the species is developed as early in the megalopa stage and there appeared no possibility of these tubercles transforming into spines at any stage of its life history. Thus, it gave additional clue to resolve the adult taxonomic status of *D. hybrida* and *D. muricata* clarifying that both of these are two independent species. This is in contrary to Alcock's observation.

This crab is confined to the Bay of Bengal and is recorded for the first time from Andhra Pradesh.

Genus ***Phalangipus*** Latreille, 1825

1815. *Egeria* Leach, *Zool. Miscell.*, **2** : 39.

1825. *Phalangipus* Latreille, *Encycl. Meth. Hist nat.*, **10** : 699.

1973. *Phalangipus*, Griffin, *J. nat. Hist.*, **7** : 166.

Diagnosis : Carapace broadly subpyriform, almost as broad as long, convex, tuberculate and spinous. Rostrum consisting of two short, dorsoventrally compressed spines fused for about half or more of their extent, the spines subcylindrical distally. Eyes short. Orbits consisting of narrow eave with a short supraorbital spine midway along lateral margin, an antorbital lobe often present at postero-lateral angle of eave. An intercalated spine present dorsally and a suborbital lobe ventrally. Basal antennal joint rectangular, lateral margin bearing a lobe at distal corner and another adjacent to its base. Antennal flagellum hardly exceeding rostrum in length. Pterygostomian region with a prominent outwardly directed lobe for the most part visible in dorsal view. Merus of external maxilliped as broad as ischium. Chelipeds of both sexes long and slender, chelae of adult males weakly inflated, longer than high, fingers much shorter than palm. Ambulatory legs markedly long, slender, cylindrical and smooth; first pair longest, about six times the length of carapace and rostrum; dactyls remarkably long, weakly curved, sharp and unarmed. Male abdomen of seven separate segments, third somite widest with laterally inflated surfaces, last segment terminally rounded; female abdomen of five free segments, 4-6 segments fused, fifth widest.

Type species : *Cancer longipes* Linnaeus, 1758, by subsequent designation by Griffin, 1973 : 167.

Remarks : The genus *Phalangipus* is Indo-Pacific in distribution occurring throughout the Indian and Western Pacific Oceans from Persian Gulf, Red Sea to the east Malay Archipelago and from Japan southward to Australia.

In India, only three species are referable to this genus, viz. *P. indicus*, *P. longipes* and *P. hystrix*. The two species, *Naxia hystrix* Miers, 1886 and *Egeria investigatoris* Alcock, 1895 are presently considered as synonyms of *P. hystrix* (Miers, 1886) by Griffin (*op. cit.*). Only the first two species have been recorded from Andhra Pradesh (present record).

Key to species of the genus *Phalangipus*

Rostral spines long, major lobe on sternite 1 of male cylindrical and subacute .... *Phalangipus indicus*

Rostral spines short, major lobe on sternite 1 of male rounded apically .... *Phalangipus longipes*

27. *Phalangipus indicus* (Leach, 1815)
(Pl. 1, Fig. 8)

1815. *Egeria indica* Leach, *Zool. Miscell.*, **2** : 40, pl. 73

1895. *Egeria arachnoides*, Alcock, *J. Asiat. Soc., Bengal*, **64** (2) : 223.

1973. *Phalangipus indicus*, Griffin, *J. nat. Hist*, **7** : 179. figs. 2a; 4a, b; 6e; 9a, b

Material examined : 1(M), Station No. 21, Krishnapuram Village, Vizagapatnam, Dist. Visakhapatnam, 17.09.1995, Dr. T. Roy, Reg. No. C 5311/2; 1(M), Fishing Harbour, Visakhapatnam, Dist. Visakhapatnam, 09. 12.1999, J. Sarkar, Reg. No. C 5312/2.

Measurement : W = 16.85 F = 3.75 L = 16.6

R = 7.6 P = 12.7 D = 5.75

Diagnosis : Carapace moderately convex, tuberculated, more or less subpyriform, almost as broad as long when measured behind the base of eye-stalks; regional boundaries distinct; surface uneven and armed with symmetrically disposed spines six of these very prominent, distributed one each on cardiac and intestinal and also one on each side of sub-hepatic and epibranchial regions, besides a set of spinules also present on the gastric region arranged in the form of a T. Rostrum large, hiatus V-shaped; horns long, slender, their outer margins divergent. Antorbital lobe strong, rounded; suborbital lobe high, stout and conical. Chelipeds slender, equal, much longer than the carapace and rostrum; palm subcylindrical, smooth, widening a little distally, more than twice the length of dactylus; fingers without gape in their basal half, the apposed margins finely serrated for distal three-fourths; cutting edge of dactylus with a broad lobe proximally. Ambulatory legs markedly long, slender, cylindrical; merii with a subterminal spine on its upper border. Larger lobe of first male sternite broad, triangular.

Type locality : Unknown.

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Visakhapatnam; Tamil Nadu : Gulf of Mannar, Madras (= Chennai)

Elsewhere : Thailand and Malay Peninsula.

Remarks : There is no spinule behind sub-hepatic spine in the present specimens. The lobe on the cutting edge of dactylus of cheliped is, however, absent in the smaller specimen.

This species is a new record to Andhra Pradesh.

28. ***Phalangipus longipes*** (Linnaeus,1758)

1705. *Cancer arachnoides* Rumphius, *D'Amboinsche Rariteikamer* : 16, pl. 8, fig. 4 [Pre-Linnean name hence inadmissible].

1758. *Cancer longipes* Linnaeus, *Syst. Nat.* (10th ed.), **1** : 629.

1900. *Egeria arachnoides*, Alcock, *J. Asiat. Soc. Bengal*, **64**(2) : 223 (in part).

1935. *Phalangipus longipes*, Chopra, *Rec. Indian Mus.*, **37**(4) : 471.

1973. *Phalangipus longipes*, Griffin, *J. nat. Hist.*, **7** : 182, fig. 1c; 3c, d; 6d; 7d; 8a, b.

Material examined : 2 (M), Fishing Harbour, Visakhapatnam, Dist. Visakhapatnam, 09. 12. 1999, J. Sarkar, Reg. No. C 5313/2.

Measurement : W = 16.0 F = 3.85 L = 13.55
R = 5.0 P = 13.1 D = 5.95

Diagnosis : Carapace broadly subcircular, distinctly broader than long, strongly convex, surface uneven with tubercles and spines; regions distinct; cardiac and intestinal regions each bearing a conspicuous spine; branchial part bearing 4-5 tubercles, epibranchial region smooth medially, mesogastric area with a set of tubercles arranged in the form of a **T**; postero-lateral spinules 2-3; sub-hepatic spine long and sharp, a spinule just behind it. Rostrum short, consisting of two vertically compressed short, stout spines separated from each other by a **U**-shaped sinus. No antorbital lobe, supra-orbital spine sharp; sub-orbital lobe low, conical, separated from the basal antennal article and post-orbital lobe by a broad **U**- shaped sinus. Chelipeds slender, equal, much longer than carapace and rostrum; palm subcylindrical, widening a little distally, much longer than the fingers; dactylus with a broad lobe proximally; fingers gape narrowly in their proximal half, their cutting edges finely serrated for distal three-fourth. Ambulatory legs conspicuously long, slender, cylindrical; distal end of merii armed with a spine on their upper border, spines longer in first two pairs. Larger lobe of first male sternite broad and rounded.

Type locality : Unknown

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; Orissa; Tamil Nadu : Madras (= Chennai); West Bengal : Sandheads. Andaman and Nicobar Islands : Nicobars; Lakshwadweep.

Elsewhere : Maldives, Chittagong coast, Delta of Irrawady, Tenasserim coast, Mergui Archipelago, Gulf of Thailand, Philippines, Hong Kong, Taiwan, Singapore, Indonesia, New Guinea and as far as Australia.

Remarks : This species closely resembles *P. indicus* with which it is sympatric over much of its range. However, it can be readily distinguished from the latter in the form of the rostrum, orbit and in the adult male in the tuberculation of sternum and shape of first male pleopod. The differences are as under :

Phalangipus longipes	***Phalangipus indicus***
1. Rostrum short, hiatus U-shaped.	1. Rostrum long, hiatus V-shaped.
2. Epibranchial area usually smooth medially, often tuberculate.	2. Epibranchial area smooth.
3. No antorbital lobe.	3. Antorbital lobe strong, rounded.
4. Sternal spines not naked but covered with long hairs.	4. Sternal spines naked.

Phalangipus longipes	*Phalangipus indicus*
5. Larger lobe of first male sternite rounded.	5. Larger lobe of first male sternite acuminate.
6. First male pleopod tapering distally, distal part weakly curved outwards.	6. First male pleopod tapering rather abruptly at tip, distal part very strongly curved outwards.

This crab is a new record to Andhra Pradesh.

Family **PARTHENOPIDAE** MacLeay, 1838

1838. Parthenopina MacLeay, In : Smith, *Illustr. Zool. S. Afr. (Invert.)* : 55, 58 [corrected to Parthenopidae by Bell, 1844 : 45; name no. 362 on Official List].

1851. Aethrinae Dana, *Amer. J. Sci. Art.*, ser. 2, **12** : 127 [cited as Oethrinae].

1871. Cryptopodiinae Stimpson, *Bull. Mus. Comp. Zool., Harvard*, **2** : 137.

1871. Hepatinae Stimpson, *Bull. Mus. Comp. Zool., Harvard*, **2** : 154.

1878. Eumedoninae Neumann, *Systematische uebersicht der Gattungen der Oxyrhynchen* : 17.

1878. Lambrinae Neumann, *Systematische uebersicht der Gattungen der Oxyrhynchen* : 17.

Diagnosis : Carapace triangular or pentagonal. Eyes retractile in small, circular, well defined orbits. Antennna small, deeply imbedded in between inner angle of the orbit and antennular fossa, basal segment neither fused with the epistome nor with the front. Chelipeds not especially mobile, usually much longer and more massive than the ambulatory legs, fingers bent on palm towards the side of fixed finger.

Type genus : *Parthenope* Fabricius, 1798.

Remarks : The family contains three subfamilies as discussed earlier by Dev Roy and Bhadra (2001), of which, only two are represented in the present collection.

Key to subfamilies of the family PARTHENOPIDAE

Carapace not laterally expanded ..... PARTHENOPINAE

Carapace expanded to form a vault, concealing the ambulatory legs ..... AETHRINAE

Subfamily PARTHENOPINAE MacLeay, 1838

1838. Parthenopina MacLeay, In : Smith, *Illustr. Zool. S. Afr. (Invert.)* : 55, 58.

1895. Parthenopinae, Alcock, *J. Asiat. Soc. Bengal*, **64**(2) : 258.

1976. Parthenopinae, Sakai, *Crabs of Japan and the Adjacent Seas* : 265.

2001. Parthenopinae, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 39.

Diagnosis : Carapace subpentagonal, ovate-pentagonal, semi-circular or semi-elliptical in outline but commonly equilaterally triangular, surface extremely uneven being covered with granules and tubercles of various sizes. Gastric and cardiac regions marked off from the branchial regions. Rostrum simple or weakly trilobed. Chelipeds enormous in size. Ambulatory legs slender.

Remarks : It is represented by a single genus, *Parthenope*.

Genus ***Parthenope*** Weber, 1795

1795. *Parthenope* Weber, *Nomencl. ent. Syst. Fabr.* : 92.

1815. *Lambrus* Leach, *Trans. Linn. Soc. Lond.*, **11** : 308.

1871. *Platylambrus* Stimpson, *Bull. Mus. Comp. Zool., Harvard*, **2** : 129.

1875. *Aulacolambrus* Paulson, *Podophthalmata & Edriophthalmata (Crustacea)* : 9.

1875. *Pseudolambrus* Paulson, *Podophthalmata & Edriophthalmata (Crustacea)* : 9.

1878. *Rhinolambrus* A. Milne Edwards, in 1873-1881, *Bull. de la Société Philomathique de Paris*, sér. 7, **2** : 148.

1878. *Parthenolambrus* A. Milne Edwards, in 1873-1881, *Bull. de la Société Philomathique de Paris*, sér. 7, **2** : 147.

Diagnosis : Carapace broadly triangular or ovate-pentagonal, surface granular, tubercular or spiny. Front pointed, exceedingly short. Eyes contained in distinct orbits. Antennules folded transversely. Antenna small, basal joint extremely short, not reaching up to the front and wedged in between antennulary fossa and the large lobe constituting floor of orbit. Epistome narrow or very large. Buccal frame quadrangular, often narrowed. Chelipeds monstrous in size, ambulatory legs slender. Male abdomen consisting of five or six segments, that of female of seven joints.

Type species : *Cancer longimanus* Linnaeus, 1758, by subsequent designation by Rathbun, 1904: 171; gender: feminine; name no. 1581 on Official List, in Opinion 696, *Bull. zool. Nomencl.*, **21**(2) : 94 (1964).

29. ***Parthenope longimanus*** (Linnaeus, 1764)

1764. *Cancer longimanus* Linnaeus, *Mus. Ludovici Ulrici* : 441.

1895. *Lambrus longimanus*, Alcock, *J. Asiat. Soc. Bengal*, **64**(2) : 260.

2001. *Parthenope (Parthenope) longimanus*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 39.

Diagnosis : Carapace ovate pentagonal in outline with its surface roughened with sharp granules and tubercles of various sizes. Rostrum thin, extremely short and tri-lobed. Chelipeds markedly long, much more massive than the ambulatories; merus prismatic armed with numerous curved spines of large and small sizes arranged alternately; wrist bearing few sharp

teeth on the outer margin; palm trigonal, armed with sharp laciniated teeth on its outer edge arranged alternatively large and small. Second segment of abdomen with a sharp crest, forming a prominent line in the center and bearing a tooth on each side.

Type locality : Unknown.

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : West Godavari; Orissa : Gopalpur coast; Tamil Nadu : 'Madras' coast; Pondicherry. Andaman Islands.

Elsewhere : Mauritius, Sri Lanka, Myanmar, Gulf of Thailand, Taiwan, Japan, Philippines, Singapore, Celebes, Moluccas, Ambon, New Guinea, Java and Australia.

Remarks : The problems relating to the taxonomy of this wide ranging Indo-West Pacific species has been discussed at length by Tan *et. al.*(1999). This species was earlier reported from West Godavari district by Dev Roy and Bhadra (2001) as *Parthenope (Parthenope) longimanus*. However our present collection does not contain this species.

Subfamily AETHRINAE Dana, 1851

1851. *Oethrinae Dana, Amer. J. Sci. Art.*, ser. 2, **12** : 127.

1976. Aethrinae, Sakai, *Crabs of Japan and the Adjacent Seas* : 288.

Diagnosis : Carapace transversely elliptical, pentagonal or octagonal in outline, lateral margins cristate, somewhat expanded to form a vault for the concealment of ambulatory legs. Antennules folded longitudinally.

Remarks : This subfamily is represented by a single genus namely, *Cryptopodia* in Andhra Pradesh.

Genus ***Cryptopodia*** H. Milne Edwards, 1834

1834. *Cryptopodia* H. Milne Edwards, *Hist. Nat. Crust.*, **1** : 360.

1895. *Cryptopodia*, Alcock, *J. Asiat. Soc. Bengal*, **64**(2) : 281.

1976. *Cryptopodia*, Sakai, *Crabs of Japan and the Adjacent Seas* : 291.

1998. *Cryptopodia*, Chiong and Ng, *Raffles Bull. Zool.*, **46**(1) : 159.

Diagnosis : Carapace pentagonal to nearly triangular in outline with large lateral expansions concealing the ambulatory legs fully and prolonged posteriorly beyond the base of abdomen. Postero-lateral margin convex, crenulated; postero-lateral angles truncated; dorsal and ventral surfaces smooth to rough; branchial, cardiac and gastric regions elevated; a deep triangular depression at carapace center bounded by granules, ridges of granules also running from mesobranchial to metabranchial regions. Rostrum almost horizontal, spatuliform and very prominent, post-rostral region depressed. Pterygostomial regions smooth, not ridged. Orbits very small, almost circular with a suture on the upper margin; eyes very small, retractile.

Basal antennal joint slightly dilated, not reaching the orbital hiatus. Antennulary fossae narrow, somewhat oblique. Epistome well developed. Buccal cavity small. External maxillipeds small, outer surface smooth, pitted or granulated, merus distally truncated with the antero-external angle slightly produced. Merus of chelipeds flat with a wing-like lobe on the posterior margin near the distal extremity; palm elongated, tricarinated, dentated and dilated distally, fingers short. Ambulatory legs slender, decreasing successively; upper and lower margins of fourth, fifth and sixth joints carinated, dactyls almost straight. Male abdomen with five movable distinct segments, 3 – 5 somites fused; all the seven segments free in female.

Type species : *Cancer fornicata* Fabricius, 1781, by monotypy.

Remarks : The genus *Cryptopodia* H. Milne Edwards, 1834 currently contains 15 valid species and subspecies, of which, 13 taxa are from the Indo-West Pacific and the remaining 2 from the American coasts. The retention of the two American species namely, *Cryptopodia concava* Stimpson, 1871 and *C. hassleri*, Rathbun, 1925 within the genus *Cryptopodia* are, however, questionable as they differ markedly in their carapace structure. The genus has been revised recently by Chiong and Ng (1998) and accoding to them, *Cryptopodia* must be restricted for the Indo-West Pacific species while the two American species should be referred to their own genus.

Four species namely, *Cryptopodia fornicata* (Fabricius, 1781), *C. patula* Chiong and Ng, 1998, *C. angulata* H. Milne Edwards and Lucas, 1841 and *C. echinosa* Chiong and Ng, 1998 are known so far to occur in Indian waters. Among these, *C. fornicata* is known from Tranquebar, its type locality; *C. patula* from north-western to southern India but is not yet known to extend east of India, *C. angulata* from Sandheads, Orissa, Andhra Pradesh (present record) and Malabar coasts while *C. echinosa* from Malabar coasts, Gulf of Kachchh and Port Cochin.

30. ***Cryptopodia angulata*** H. Milne Edwards & Lucas, 1841

1841. *Cryptopodia angulata* H. Milne Edwards, *Arch. Mus. Hist. Nat., Paris*, sér. 1, **2** : 481, pl. 28, figs. 16-19.

1895. *Cryptopodia angulata*, Alcock, *J. Asiat. Soc. Bengal*, **64**(2) : 282.

1975. *Cryptopodia angulata*, Davie and Turner, *Mem. Qd. Mus.*, **38**(2) : 450, fig. 1 E, F; 2 A, B.

1998. *Cryptopodia angulata*, Chiong and Ng, *Raffles Bull. Zool.*, **46**(1) : 181, figs. 16 A-C, 17 A-E, 21 A.

Material examined : 1(M), 1(F), Ongole, Dist. Prakasam, 20.01.1999, Dr. M. K. Dev Roy, Reg.No. C 4966/2; 1(M), Vadarevu, Chirala, Dist. Prakasam, 21.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4967/2.

Measurement :	W = 52.85	F = 5.5	L = 27.15
	48.35	4.65	25.2

Diagnosis : Carapace very broad, convex, distinctly pentagonal in shape with all its edges markedly toothed and the corners produced to form curved spines. Another spine in front of

either antero-lateral angle followed by one more strong spine on each side of the posterior border of carapace demarcated by abdomen. Triangular gastric depression deep bounded by granular border. Rostrum culminating to a sharp point. Chelipeds massive, unequal having sharp, trigonal joints, major part of the margins being strongly cristiform; outer and inner edges of arm and palm sharply laciniate, lower edge of arm beaded and that of palm crenated; fingers short, stout, strongly incurved and not crossing each other; dactylus much shorter than palm. Leg joints carinate on outer edges forming a swimming blade.

Type locality : Unknown.

Distribution : Indian Ocean.

India : East Coast – Andhra Pradesh : Prakasam; Orissa : Gopalpur coast; West Bengal : Sandheads at mouth of the River Hugli. West coast – Gujarat : Gulf of Kachchh; Malabar coast.

Elsewhere : Pakistan, Bangladesh, Sri Lanka, Malaysia, Thailand, Indonesia and North Western Australia from Arafura sea to the Gulf of Carpentaria.

Remarks : According to Chiong and Ng (1998), *Cryptopodia angulata* reported by Chhapgar (1957a) actually belongs to their new species C. *echinosa* as it resembles the latter very closely especially in its carapace shape. However, the pleopod structure illustrated by Chhapgar (*op. cit.*) is too small to confirm its identity.

This crab is a new record to the crab fauna of the state.

Family **CORYSTIDAE** Samouelle, 1819

1819. Corystidae Samouelle, *Entom. Useful Comp.* : 82 [Name No. 357 on Official List, in Opinion 689, *Bull. zool. Nomencl.*, **21**(1) : 20 (1964).

1893. Nautilocorystidae Ortmann, *Zool. Jb.*, **7** : 26, 28.

1930. Euryalidae Rathbun, *Bull. U. S. natn. Mus.*, **152** : 10.

Diagnosis : Carapace longitudinally oval, convex from side to side, without distinction of regions. Front composed of two or three teeth. Orbits somewhat incomplete, eyes retractile. Antennal flagellum very long and feathered. Antennules folding longitudinally. Epistome absent. Third maxillipeds subpediform, extending almost up to the antennules. Buccal cavern elongate, square-cut with the anterior angles rounded and slightly convergent. Legs either all gressorial or last pair modified for swimming. Sternum and abdomen narrow, the latter consisting of five segments in male, basal segments visible dorsally in both sexes. Male genital openings coxal.

Type genus : *Corystes* Latreille, [1802-1803], by subsequent designation by International Commission on Zoological Nomenclature, name no. 357 on Official List of Generic Names in Zoology, in Opinion 689, *Bull. zool. Nomencl.*, **21**(1) : 20 (1964).

Remarks : This family is represented by a single genus from Andhra Pradesh.

Genus *Jonas* Jacquinot, 1853 in Jacquinot and Lucas, 1853

1853. *Jonas* Jacquinot and Lucas, Crustacés, In: Dumont d'Urvill's, *Voy. Pole Sud., "Aristrolabe" et la "Zélée"* **3** : 85.

1976. *Jonas*, Sakai, *Crabs of Japan and the Adjacent Seas* : 304.

2000. *Jonas*, Ng, Chan and Wang, *National Taiwan Museum Special Publication Series No.* **10** : 166.

Diagnosis : Carapace thick, elliptoid and anteriorly broadened; intestinal region distinctly convex. Lateral margins armed with ten acuminate spines. Outer lateral margins of rostrum slope very sharply giving it a more triangular and narrower appearance. Orbits very long, cornea swollen and reniform. Basal antennal segment distinctly longer than broad. Epistome distinctly elongate, as long as or longer than broad. Outer distal angle of buccal cavity with a long prominent spine. Merus of external maxilliped broader than ischium. Dactylus of last pair of ambulatory legs compressed and paddle-like. Sixth male abdominal segment normal, telson exposed.

Type species : *Jonas macrophthalmus* Jacquinot, 1853.

Remarks : The genus *Jonas* contains six species and subspecies namely, *Jonas macrophthalmus* Jacquinot, 1853, *Jonas distincta distincta* (de Haan, 1835), *Jonas distincta formosae* Balss, 1922, *Jonas distincta indica* Chopra, 1922, *Jonas leuteanus* Ward, 1933 and *Jonas choprai*, Serène, 1971. However, all the three subspecies of *Jonas distincta* are now regarded as three distinct species (Ng *et. al.*, 2000). The present collection is represented by only one species which could be identified only up to generic level.

31. *Jonas* sp.

Material examined : 1(M), 1(F), Fishing Jetty, Visakhapatnam, Dist. Visakhapatnam, 09. 12. 1999, J. Sarkar.

Measurement :	W =	16.95	F =	7.55	L = 26.0
		15.1		6.35	21.45

Remarks : This is the first authentic record of the genus from the state as well as from India. A detailed paper dealing with its taxonomy will be published elsewhere.

Family **THIIDAE** Dana, 1852

1852. *Thiidae* Dana, *Amer. J. Sci. Art.* ser. 2, **13** : 120 [Name No. 361 on Official List, dated 1862, in error].

1899. *Corystidae*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 103.

1981. *Thiidae*, Manning and Holthuis, *Smiths. Contrib. Zool.*, **306** : 69.

1976. *Thiinae*, Sakai, *Crabs of Japan and the Adjacent Seas* : 307.

Diagnosis : Carapace suborbicular and non-rostrate. Antennules transverse, very oblique.

Antennae short and subpilose. Outer maxillipeds projecting over the epistome, in corystoid style.

Type genus : *Thia* Leach, 1815.

Remarks : The family is represented by two genera, *Thia* Leach,1815 and *Nautilocorystes* H. Milne Edwards, 1837. The former is confined to East Atlantic and the latter in Indo-West Pacific. The genus *Kraussia* Dana, 1852 included by some authors (Dana, 1852; Sakai, 1976) in this group is currently treated in a separate subfamily namely, Kraussiinae Ng, 1993 under the family Xanthidae (Ng, 1993). However, out of these, only the genus *Nautilocorystes* has been recorded from Andhra Pradesh.

Genus *Nautilocorystes* H. Milne Edwards, 1837

1837. *Nautilocorystes* H. Milne Edwards, *Hist. Nat. Crust.*, **2** : 149.

1899. *Nautilocorystes*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 104.

Diagnosis : Carapace elongate-ovate, slightly convex from side to side, smooth, regions not distinct, anterior half of the lateral margins dentate. Front moderately broad, horizontal and cut into two or three teeth; sub-orbital region produced forwards beyond the level of apex of front and visible dorsally. Orbits directed forwards, eyes retractile. Antennules folded longitudinally. Antennae coarse, setaceous; basal joints occupying the orbital hiatus, flagellum long, almost half as long as carapace and hairy. Buccal cavern elongate, subquadrate and undefined anteriorly. External maxillipeds elongate, merus narrower than ischium and bearing flagellum at its apex. Chelipeds slightly unequal. Dactyls of first three pairs depressed rather than compressed, that of fifth leg compressed and ovate-lanceolate, inner margin convex. Third to fifth abdominal segments fused in male.

Type species : *Nautilocorystes ocellatus* H. Milne Edwards, 1837, an invalid junior homonym of *Corystes ocellatus*, Gray, 1831; by monotypy; gender : masculine.

Remarks : Alcock (1899a) placed the genus *Nautilocorystes* under the family Corystidae. Barnard (1950) while dealing with the crabs of South Africa also treated it under the same family along with the genus *Gomeza*. But presently the genus *Nautilocorystes* is transferred to the family Thiidae while the genera *Gomeza* and *Jonas* are retained in the family Corystidae (Davies, personal communication, 2002).

The genus *Nautilocorystes* currently contains two species namely, *Nautilocorystes ocellatus* (Gray,1831) and *N. investigatoris* Alcock,1899. The former occurs from South Africa and South-West Africa northward to Angola, and off the Congo while the latter is so far known from Visakhapatnam coast of Bay of Bengal, Indian Ocean.

32. *Nautilocorystes investigatoris* Alcock, 1899

1899. *Nautilocorystes investigatoris* Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 104.

Material examined : 1(F), Station 94, Marine Survey, Reg. No. C 1741/1; 1(F), Station – 94, Marine Survey, Reg. No. C 1751/1.

Measurement : W = 5.8 F = 1.9 L = 6.3

Diagnosis : Carapace longer than broad, longitudinally oval, convex from side to side; surface smooth to the naked eye but finely granular under the binocular, granules larger near the lateral borders; regions not well defined, a longitudinal granular ridge running inwards considerably from the last antero-lateral spine but interrupted at the middle. Front about one-third of the greatest breadth of carapace and tridentate, middle one triangular and more prominent than than the laterals, their edges granular. Antero-lateral borders cut into five acute teeth, postero-laterals larger than the antero-laterals. Orbital edges granular, inner supra-orbital angles acutely dentiform and very conspicuous extending beyond the level of front. Chelipeds equal, nearly as long as carapace; outer surface of wrist granular bearing two distal spines – the one at the outer corner being more prominent; palm bispinose – one spine in front of apex of wrist-joint and the other behind finger-joint; outer surface studded with pearly granules; both palm and fingers compressed, fingers strongly dentate and crossing each other; cutting edge of dactylus armed with a strong molarifirm tooth proximally, its outer surface deeply grooved and upper border granular. Female abdomen consisting of seven distinct segments.

Type locality : Vizagapatam coast, India (Alcock, 1899).

Distribution : Bay of Bengal.

India : East coast – Andhra Pradesh : Visakhapatnam.

Remarks : In the larger spccimen, the palm is trispinose – two spines side by side just behind the finger-joint and the other at wrist-joint. The single ovigerous female is 5.5 mm across its carapace width.

So far, the species is known from its type locality only. No fresh specimen of this species has been collected since its publication. Male specimen of this crab is still unknown.

Family **PORTUNIDAE** Rafinesque, 1815

1815. Portunidia Rafinesque, *Analyse Nature* : 97 [corrected to Portunidae by Samouelle 1819 : 93; name no. 69 on Official List, in Opinion 394, *Bull. zool. Nomencl.* (1956)].

1899. Portunidae, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 5.

2000. Portunidae, Dev Roy and Das, *Rec. Zool. Surv. India, Occ. Paper No.* **185** : 25.

Diagnosis : Carapace depressed, slightly convex, hexagonal, subquadrate, elongate ovate or subcircular, usually broader than long, rarely areolated; regions generally not well defined. Front broad, horizontal and cut into 2-6 teeth or lobes. Antero-lateral borders cut into 4-9 teeth. Antennal flagella usually long and slender, antennules obliquely or transversely folded. Epistome of fair length antero-posteriorly or linear and sunken, palate well defined anteroirly.

Buccal frame quadrate, usually broader than long, merus of external maxillipeds never remarkably long. Chelipeds massive. Last pair of legs usually modified for swimming, with at least the last two joints flattened, broadened and paddle like. Male genital openings coxal.

Type genus : *Portunus* Weber, 1795.

Remarks : The family contains six subfamilies but only two are represented in the present collection.

Key to subfamilies of the family PORTUNIDAE

Eye-stalks remarkably long, orbits occupying almost the entire body of carapace; antero-lateral teeth few ..... PODOPHTHALMINAE

Eye-stalks and orbits normal in size and position; antero-lateral teeth varying from 4-9 ..... PORTUNINAE

Subfamily PORTUNINAE Rafinesque, 1815

1815. Portunidia Rafinesque, *Analyse Nature* : 97.

1896. Lupinae, Alcock, *J. Asiat. Soc. Bengal,* **68**(2) : 6, 8, 10, 22.

1976. Portuninae, Sakai, *Crabs of Japan and the Adjacent Seas* : 323, 335.

2000. Portuninae, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 25.

Diagnosis : Carapace distinctly broad and of typical portunid-shape. Front broad. Antero-lateral teeth from 4 – 9. Orbits of normal size.

Remarks : The subfamily is represented by four genera namely, *Scylla*, *Portunus*, *Charybdis* and *Thalamita* in Andhra Pradesh.

Key to genera of the subfamily PORTUNINAE

1. Carapace oval, antero-lateral borders cut into nine teeth 2

   Carpace hexagonal, antero-laeral borders never cut into nine teeth 3

2. Carapace smooth, without distinction of regions, propodus of chelipeds smooth and inflated ..... ***Scylla***

   Carapce not smooth, regions well defined, propodus of chelipeds prismatic and costate ..... ***Portunus***

3. Antero-lateral border of carapace cut into six teeth ..... ***Charybdis***

   Antero-lateral border of carapace cut into five teeth ..... ***Thalamita***

Genus ***Scylla*** de Haan, 1833

1833. *Scylla* de Haan, In : Siebold, *Fauna japon. (Crust.)* : 11.

1899. *Scylla*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 27.

1998. *Scylla*, Keenan, Davie and Mann, *Raffles Bull. Zool.*, **46**(1) : 228.

2001 *Scylla*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 40.

Diagnosis : Carapace broad, transverse, moderately convex with an almost even surface. Front cut into four teeth. Antero-lateral borders cut into nine subequal teeth (including the outer orbital tooth), postero-lateral borders shorter than the antero-laterals. Basal antenna joint short and broad, its antero-external produced to form a lobule lying in the orbit, flagellum lodged in the orbital hiatus. Antennules transversely folded. Epistome not produced, buccal cavity squarish. Chelipeds massive, wrist and palm smooth, without ridges, palm inflated. Legs stout, in the last pair merus and carpus shortened and broadened, propodus and dactylus typically foliaceous for swimming. Male abdomen broadly triangular, five segmented, third to fifth terga fused, first tergum much concealed beneath the carapace.

Type species : *Cancer serratus* Forskål, 1775, by selection by Rathbun, 1922: 28; gender: feminine, name no. 833 on Official List, in Opinion 73, *Bull zool. Nomencl.* (1956).

Remarks : There is much confusion on the taxonomy of species within the genus *Scylla*. The genus has been revised recently by Keenan *et al.* (*op. cit.*). According to genetic data, there are at least four distinct species (Keenan *et al.*, *op. cit.*). The present collection from Andhra Pradesh contains only two species.

Key to species of the genus *Scylla*

Frontal lobes low, tips rounded; antero-lateral teeth broad..... *Scylla tranquebarica*

Frontal lobes high, tips bluntly pointed; antero-lateral teeth narrow .....*Scylla serrata*

33. ***Scylla serrata*** (Forskål, 1775)

1775. *Cancer serratus* Forskål, *Descr. Anim.* : 90.

1899. *Scylla serrata*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 27.

1998. *Scylla serrata*, Keenan, Davie and Mann, *Raffles Bull. Zool.*, **46**(1) : 228, figs.7A, 8A, 9A, 10.

2001. *Scylla serrata*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 40.

Material examined : 1 (F), Vizagapatam, Opposite to Lova Garden, Dist. Visakhapatnam, May-June, 1926, H. S. Rao and G. Varugis, Reg. No. C 554/2; 1(F), Station 14, Gelanchundi, Machilipatnam, Dist. Krishna, 08.09.1995, Dr. T. Roy, Reg. No. C 4965/2; 1(M), Lawson's Bay, Visakhapatnam, Dist. Visakhapatnam, 14.09.1995, Dr. T. Roy, Reg. No. C 4992/2; 1(F), Kodur, Dist. Nellore, 16.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4993/2.

Measurement : W = 68.55 F = 14.1 L = 48.3

92.2 18.2 68.65

Diagnosis : Frontal lobes high (0.06 times the frontal width when measured between mid-orbital suture), bluntly pointed with concave margins. Antero-lateral teeth narrow, outer margin straight or slightly concave. Chelipeds and legs marked with polygonal patterning in both sexes, the same marking also present on abdomen of female only.

Type locality : Jiddah, Red Sea (Forskål, 1775)

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : East Godavari, Krishna, Nellore, Visakhapatnam, West Godavari; Orissa : Chilka Lake, Gopalpur coast; Tamil Nadu : Madras (= Chennai), Palk Bay, Pulicat Lake. West coast – Goa : Zuari estuary; Gujarat : Gulf of Kachchh; Karnataka : Karwar, Kumta, Mangalore; Kerala : Travancore; Maharashtra : Bombay (= Mumbai), Kolak. Andaman Islands : North, Middle and South Andamans; Nicobar : Car Nicobar, Great Nicobar.

Elsewhere : South Africa, Red Sea, Mauritius, Indonesia, Philippines, Taiwan, Japan, Timor, East and West coasts of Australia, Western Samoa, Solomon Island, Fiji and New Caledonia.

Remarks : This is the most widespread species of the genus *Scylla* occurring naturally throughout the Indo-Pacific from South Africa to Tahiti, northward to Okinawa and southward to Port Hacking in Australia and Bay of Islands, New Zealand. The occurrence of this crab from South Atlantic Ocean off Brazil coast is, however, doubtful since there is no authentic evidence that it has viable population there (Keenan *et al.*, 1998).

Ovigerous females of this crab were recorded during November to April at Kakinada Bay with peak period of activity in December and February (Lalitha Devi, 1985). The early development of this crab has been studied and figured by Naidu (1955).

34. *Scylla tranquebarica* (Fabricius, 1798)
(Pl. 2, Fig. 1)

1798. *Portunus tranquebaricus* Fabricius, *Ent. Syst. Suppl.* : 366.

1998. *Scylla tranquqbarica*, Keenan, Davie and Mann, *Raffles Bull. Zool.*, **46**(1) : 230, figs. 7B, 8B, 9B, 11.

Material examined : 1 (M), 1(F), Vizagapattam Harbour, Dist. Visakhapatnam, January, 1929, H.S. Rao, Reg. No. C 656/2; 2(M), 1(F), Vizagapatam, Dist. Visakhapatnam, May-June, 1926, H.S. Rao and G. Varugis, Reg. No. C 554/2; 1(M), Station No. 14, Gelanchundi, Machilipatnam, Dist. Krishna, 08.09. 1995, Dr. T. Roy, Reg. No. C 5279/2; 1(M), Maipadu Sea Beach, Dist. Nellore, 13.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4968/2; 1(M), Kodur, Dist. Nellore, 16.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5004/2; 3(M), 1(F), Nagayalanka, Dist. Krishna, 27.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5034/2; 3(M), 2(F), Fishing Harbour, Visakhapatnam, Dist. Visakhapatnam, 05.02.1999, Dr. M. K. Dev Roy, Reg. No. C 4994/2.

Measurement :	W =	86.85	F =	19.45	L = 59.95
		82.3		18.05	58.95

Diagnosis : Frontal lobes low (04 times the frontal width when measured between mid-orbital suture) with rounded apices. Antero-lateral teeth broad, outer margin convex. Polygonal patterning weakly present on chelipeds and first two pair of legs but strongly marked in last two pair in both sexes; polygonal patterning absent on male abdomen but variable on female abdomen.

Type locality : "Oceano Indico" (Fabricius, 1798). Indian Ocean probably from Tranquebar, Tamil Nadu, India.

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Krishna, Nellore, Visakhapatnam; Tamil Nadu : Parangipettai coast.

Elsewhere : Pakistan, Malaysia, Singapore and Philippines.

Remarks : The low, rounded frontal lobes of this crab is very prominent even in juvenile specimens (carapace width : 32.25 mm; carapace length : 24.4 mm) and the species can at once be recognized by this character. During the course of present investigation several specimens of Andhra Pradesh present in National Zoological Collection were re-examined. Three specimens of registration no. C 554/2 and all specimens of C 656/2 which were identified earlier as *Scylla serrata* are actually *S. tranquebarica*. Similarly, all specimens of Godavari estuary reported earlier as *Scylla serrata* by us (Dev Roy and Bhadra, 2001) are also found to belong to this species except two specimens of registration no. C 2808.

This is also a widespread species commonly distributed from South China Sea but also occurs at specific locations around the Indo-Pacific (Keenan *et. al.*, 1998).

Genus ***Portunus*** Weber, 1795

1795. *Portunus* Weber, *Nomencl. ent. Syst. Fabr.* : 93.

1899. *Neptunus*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 28.

2001. *Portunus*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 41.

Diagnosis : Carapace transversely broad, depressed or slightly convex. Front broad and cut into 3-6 teeth. Antero-lateral borders cut into nine regular teeth, last tooth often enlarged. Basal antanna-joint short, its antero-external produced to form a lobule or spine extending into the orbit, flagellum lodged in the orbital hiatus. Antennules transversely folded. Orbit with two fissures or sutures on the upper border; lower border also with a suture or fissure near the outer angle, inner angle tooth-like and usually very distinct. Epistome short or linear, often prolonged at the middle forming a spine beneath the inter-antennulary septum. Buccal cavity squarish. Chelipeds long, massive; palm prismatic with longitudinal ridges; fingers

almost as long as palm and strongly dentate. Legs compressed, in last pair merus and carpus broadened and shortened, propodus and dactylus typically foliaceous and paddle-like for swimming. Male abdomen five-jointed, third to fifth segments fused.

Type species : *Cancer pelagicus* Linnaeus 1758, by selection by Rathbun, 1926; in Opinion 394, International Commission on Zoological Nomenclature, 1965; gender : masculine; name no. 986 on Official List.

Remarks : The genus is represented by five species which can be distinguished by the following key.

Key to species of the genus *Portunus*

1. Posterior angle of carapace rounded 2

   Posterior angle of carapace spiniform 4

2. Antero-external angle of merus of third maxilliped rounded 3

   Antero-external angle of merus of third maxilliped produced in a lateral direction ... . *P. gladiator*

3. Posterior border of merus of chelipeds without any spine at its distal end, three blood-red spots on carapace ..... *P. sanguinolentus*

   Posterior border of merus of chelipeds armed with a spine at its distal end, carapace covered with miliary granules and devoid of blood-red spots ..... *P. pelagicus*

4. A spine at the far end of posterior border of merus of last pair of legs ..... *P. spinipes*

   No spine but posterior border of merus of last leg finely serrated distally .... *P. hastatoides*

35. ***Portunus pelagicus*** (Linnaeus, 1758)

1758. *Cancer pelagicus* Linnaeus, *Syst. Nat.* 10th. ed., **1** : 626.

1899. *Neptunus pelagicus*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 34.

2001. *Portunus pelagicus*, Dev Roy Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 41.

Material examined : 1(F), Station No. 12, Gelanchundi, Machilipatnam, Dist. Krishna 06.09.1995, Dr. T. Roy, Reg. No. C 4740/2; 2(F). Station No. 11, Mungergudi, Machlipatnam, Dist. Krishna, 07.09.1995, Dr. T. Roy, Reg. No. C 4739/2; 1(M), Station No. 9, Narsapur, Dist. West Godavari, 22.03.1997, Dr. T. Roy, Reg. No. C 4742/2; 1(M), 1(F), Krishnapatam, Dist. Nellore, 15.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4741/2; 1(F), Kottapatnam, Dist. Prakasam, 19.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4990/2; 1(F), Puluguvari Palem, Dist. Guntur, 22.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4961/2.

Measurement : W = 133.4 F = 13.1 L = 73.45
137.65 14.95 75.6

Diagnosis : Dorsal surface of carapace studded with whitish or bluish miliary granules. Posterior border of arm of cheliped adorned with a spine at its distal end; palm bearing three spines – two just behind the finger-joint side by side and one near apex of the wrist-joint.

Type locality : Unknown.

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : East Godavari, Guntur, Krishna, Nellore, Prakasam, West Godavari; Orissa : Chilka Lake, Gopalpur coast; Tamil Nadu : Gulf of Mannar, Palk Bay; West Bengal : Sundarbans. West coast – Gujarat : Gulf of Kachchh; Karnataka : Coondapore, Karwar, Malpe, Udipi; Kerala : Travancore; Maharashtra : Bombay (= Mumbai), Deodad coast (Ratnagiri). Andaman Islands : North and South Andamans.

Elsewhere : East and South coasts of Africa, the Mediterranean, Red Sea, Persian Gulf, Sri Lanka, Mergui Archipelago, Singapore, Philippines, Hong Kong, Japan, Australia, New Zealand, New Caledonia and Tahiti.

Remarks : This is an economically important species. It is extensively fished along the coastal districts of the state and sold in local markets. This crab inhabits muddy or sandy bottoms in bays, estuaries or river mouths. The largest and smallest ovigerous female measured during this investigation were 137.65 and 105.55 mm across the carapace width. This crab breeds throughout the year at Kakinada Bay (Lalitha Devi, 1985)

36. ***Portunus sanguinolentus*** (Herbst, 1790)
(Pl. 2, Fig. 2)

1790. *Cancer sanguinolentus* Herbst, *Versuch. Naturgesch Krabben Krebse*, **1**(2) : 161, pl. 8, figs. 56, 57.

1899. *Neptunus sanguinolentus*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 32.

2001. *Portunus sanguinolentus*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 42.

Material examined: 5(M), 11(F), Maginipudi, 9 kms. off Kakinada, Dist. Krishna, 04. 12. 1964, Dr. N.V. Subba Rao, Reg. No. C 568/2; 1(M), Station No. 3, Pulicat Lake, Dist., 28.08.1995, Dr. T. Roy, Reg. No. C 4736/2; 1(M),1(F), Mungergudi, Machilipatnam, Dist. Krishna, 07.09.1995, Dr. T. Roy, Reg. No. C 4748/2; 4(M), 6(F), Station No. 22, Bhimunipatnam, Vizagapatnam, Dist. Visakhapatnam, 16.09.1995, Dr. T. Roy, Reg. No. C 5020/2; 1(M), Kalingapatnam, Dist. Srikakulam 18.02.1995, Dr. T. Roy, Reg. No. C 4743/ 2; 1 (F), Station No. 3, Fishing Harbour, Visakhapatnam, Dist. Visakhapatnam, 18.09.1995, Dr. T. Roy, Reg. No. C 5035/2; 1(M),1(F), Elamanchali, Visakhapatnam, Dist. Visakhapatnam, 20.09.1995, Dr. T. Roy, Reg. No. C 4749/2; 1(M), Narsapur, Dist. West Godavari, 22.03 1997, Dr. T. Roy, Reg No. C 4744/2; 4(F), Krishnapatam Port, Dist. Nellore, 15.01.1999, Dr.

M. K. Dev Roy, Reg.No. C 4735/2; 2(F), Midhirevu, Krishnapatam, Dist. Nellore, 17.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4745/2; 1(M), 1(F), Kottapatnam, Dist. Prakasam, 19.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4734/2; 1(F), Puluguvari Palem, Dist. Guntur, 22.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4746/2; 1(M), Chinadani, Nizampatnam, Dist. Guntur, 24.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5022/2; 1(M), Gilakala Dindi, Machilipatnam, Dist. Krishna, 25.01.1999, Dr. M.K. Dev Roy, Reg. No. C 4747/2; 1(M), Maginipudi, Machilipatnam, Dist. Krishna, 26.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5023/2; 1(F), Sea Beach near Light House, Kakinada, Dist. East Godavari, 02.02.1999, Dr. M.K.Dev Roy, Reg. No. C 5024/2; 2(M), 1(F), Fishing Harbour, Kakinada, Dist. East Godavari, 02.02.1999, Dr. M. K. Dev Roy, Reg. No. C 5025/2; 1(M), Ramakrishna Beach, Visakhapatnam, Dist. Visakhapatnam, 06.02.1999, Dr. M. K. Dev Roy, Reg. No. C 5021/2.

Measurement :	W =	111.1	F =	10.6	L =	56.55
		102.3		10.6		53.45

Diagnosis : Carapace marked with three blood-red spots on its surface. Posterior border of arm of chelipeds with no spine; a single spine on palm just behind the finger-joint.

Type locality: Unknown

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : East Godavari, Guntur, Krishna, Nellore, Prakasam, Srikakulam, West Godavari, Visakhapatnam; Orissa : Gopalpur coast; Tamil Nadu : Madras (= Chennai), Palk Bay, Pulicat Lake; West Bengal : Sundarbans. West coast – Goa : Zuari estuary; Karnataka : Coondapore, Karwar, Mangalore; Kerala : Travancore; Maharashtra : Bombay (= Mumbai), Deogad coast (Ratnagiri). Andaman and Nicobar Islands.

Elsewhere : East Africa, Red Sea, Persian Gulf, Sri Lanka, Peninsular Malaysia, Philippines, Hong Kong, Taiwan, Japan, Australia, New Zealand and as far as Hawaii.

Remarks : This species of crab is extensively fished and sold in the local makets. It inhabits muddy or sandy mud bottom in estuaries, bays or river mouths. The width and length of largest ovigerous female was 102.3 and 53.45 mm. while that of the smallest ovigerous female measured 90.03 and 46.7 mm. respectively. This crab breeds from January to October at Visakhapatnam-Waltair coast (Rajabai, 1975). The early first zoea and late first zoea of this crab has been studied and figured by Naidu (1955).

37. ***Portunus gladiator*** Fabricius, 1798

1798. *Portunus gladiator* Fabricius, *Ent. Syst. Suppl.* : 368.

1899. *Neptunus (Amphitrite) gladiator*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 35.

1976. *Portunus (Monomia) gladiator*, Sakai, *Crabs of Japan and the Adjacent Seas* : 341.

1995. *Portunus gladiator*, Bhadra, *Zool. Surv. India Estuarine Ecosystem Series, Part* **2** : *Hugli Matla Estuary* : 256.

Material examined : 1 (M), Station – 22, Fishing Harbour, Visakhapatnam, Dist. Visakhapatnam, 18 09 1995, Dr. T. Roy, Reg. No. C 5017/2.

Measurement : W = 50.95 F = 7.75 L = 32.55

Diagnosis : Carapace flattish, surface marked by low sub-regional elevations; regions distinct and marked with symmetrically disposed fine granules. Front cut into four acute teeth – middle two much smaller and less conspicuous than the laterals, dentiform process of epistome visible between them. Antero-external angle of merus of third maxilliped strongly produced laterally. Median lobe of the supra-orbital margin strongly produced at its outer angle. Four spines present on anterior and two on posterior borders of arm of cheliped. Dactylus of last pair of legs without any spot.

Type locality: "Oceano Asiatico" (Fabricius, 1798)

Distribution: Indo-West Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; Tamil Nadu : Gulf of Mannar, Madras (= Chennai), Parangipettai coast; Pondicherry; West Bengal : Sundarbans. West coast – Kerala : Travancore coast.

Elsewhere : East coast of Africa, South Africa, Madagascar, Mauritius, Persian Gulf, Sri Lanka, Gulf of Martaban, Mergui Archipelago, Peninsular Malaysia, Singapore, Gulf of Thailand, Philippines, Japan, New Guinea and Australia.

Remarks : The fine serrations at the distal posterior border of merus of last pair of legs are not pronounced in many cases.

This crab is reported for the first time from the state.

38. ***Portunus hastatoides*** Fabricius, 1798

1798. *Portunus hastatoides* Fabricius, *Ent. Syst. Suppl.* : 368.

1899. *Neptunus (Hellenus) hastatoides*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 38.

1976. *Portunus (Xiphonectes) hastatoides*, Sakai, *Crabs of Japan and the Adjacent Seas* : 344, pl. 119, fig. 2.

Material examined : 2(M),1(F), Ongole, Dist. Prakasam, 20.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4988/2; 1(M),3F), Krishnapatnam, Dist. Nellore, 15.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5049/2.

Measurement : W = 28.15 F = 7.75 L = 17.95
27.90 4.25 15.45

Diagnosis : Carapace very flat, regional boundaries marked by symmetrically disposed, finely granular low subregional elevations almost concealed by a dense pubescence in most of the specimens. Front quadridentate, middle two teeth very much narrower and acuter than the others. Antero-lateral teeth nine, arranged alternately large and small; postero-lateral

border spiniform. Posterior border of arm of chelipeds with two distinct spines. Distal border of merus of last legs finely serrulate.

Type locality : "Oceano Indico" (Fabricius, 1798).

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Nellore, Prakasam; Orissa : Gopalpur coast; Tamil Nadu : 'Madras' coast, Palk Bay, Parangipettai coast; West Bengal : River Hugli, Sundarbans. West coast – Maharashtra : Bombay (= Mumbai). Andamans; Lakshwadweep.

Elsewhere : South Africa, East coast of Africa, Persian Gulf, Gulf of Oman, Madagascar, Mauritius, Maldives, Sri Lanka, Mergui Archipelago, Malay Peninsula, Singapore, Gulf of Thailand, Indonesia, Hong Kong, China, Philippines, Japan, New Guinea and Australia.

Remarks : The "blackish brown" patch on tips of dactylus of last pair of leg as reported by Alcock (1899a) is lacking in the present specimens. This crab is reported for the first time from Andhra Pradesh. The width and length of the largest ovigerous female noted during this investigation were 27.9 and 15.45 mm while that of the smallest measured 20.0 and 13.1 mm respectively.

39. ***Portunus spinipes*** Miers, 1886

1886. *Neptunus spinipes* Miers, *Report H. M. S. 'Challenger' (Brachyura)*, **17** : 178, pl. 15, fig. 1.

1899. *Neptunus (Hellenus) spinipes*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 39.

Material examined : 1(M), Machilipatnam, Dist. Krishna, 07.09.1995, Dr. T. Roy, Reg. No. C 5021/2; 1(M), Krishnapatnam, Dist. Nellore, 15.01.1999, Dr. M.K. Dev Roy, Reg. No. C 5018/2.

Measurement : W = 12.8 F = 2.65 L = 8.85

Diagnosis : Carapace convex. Front four dentate, middle two much smaller and narrower than the others. Posterior border of carapace forming an angular junction with the postero-lateral borders. Posterior border of arm of chelipeds adorned with two distinct spines. A distinct spine at the far end of posterior border of merus of last pair of legs.

Type locality : Philippines (Miers, 1886).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Krishna, Nellore; Orissa : Gopalpur coast; Tamil Nadu : 'Madras' coast, Parangipettai coast. Andaman Islands.

Elsewhere : Muscat, Akyab coast, Gulf of Martaban and Philippines.

Remarks : Sixth segment of male abdomen of this species of crab is distinctly longer than its greatest width.

So far, there is no report on the occurrence of this crab from the west coast. The species is reported for the first time from Andhra Prdesh.

Genus ***Charybdis*** de Haan, 1833

1833. *Charybdis* and *Oceanus* de Haan In : Siebold, *Fauna japon. (Crust.)* : 9, 10.

1861. *Goniosoma* A. Milne Edwards, *Archs. Mus. natn. Hist. nat. Paris*, sér. 1, **10** : 367.

1899. *Charybdis*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 47.

2000. *Charybdis*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 35.

Diagnosis : Carapace hexagonal, moderately broad, depressed or slightly convex with more or less distinct transverse granular ridges in the anterior half. Front cut into six lobes or teeth (excluding the supraorbital angles). Antero-lateral teeth varying from 5-7 but commonly six. Basal antenna-joint short, broad; its outer angle lobule-like, filling the orbital hiatus, meeting the front and excluding flagellum from the hiatus. Antennules transversely folded. Orbitals as in *Portunus*. Epistome considerably long, buccal cavity as in *Portunus*. Chelipeds, legs and male abdomen as in *Portunus*.

Type species : *Cancer sexdentatus* Herbst, 1783, a subjective junior synonym of *Cancer feriatus* Linnaeus, 1758, by subsequent designation by Glaessner, 1929 : 113; gender: feminine; name no. 1616 on Offiial List.

Remarks: The genus *Charybdis* is divided into five subgenera as pointed out earlier by Dev Roy and Bhadra (2001). However, the present collection contains representives belonging to two subgenera namely, *Charybdis* and *Goniohellenus* both of which can be distinguished by the following key.

Key to subgenera of the genus *Charybdis*

Antennal flagellum not excluded from the orbital hiatus, no spine on the posterior border of arm of cheliped ..... ***Charybdis***

Antennal flagellum completely excluded from the orbital hiatus, a spine may or may not be present on the posterior border of arm of cheliped ..... ***Goniohellenus***

Subgenus ***Charybdis*** de Haan, 1833

1833. *Charybdis* de Haan, In: Siebold, *Fauna japon (Crust)* : 9, 10.

1899. *Goniosoma*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 48, 49.

2000. *Charybdis*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 36.

Diagnosis : Four median tooth of the front nearly of same size. Antero-lateral teeth usually six, often seven. Posterior border of arm of cheliped without any spine.

Key to species of the subgenus *Charybdis*

1. With a transverse granular ridge on the cardiac region 5

No transverse granular ridge behind the cardiac region 2

2. First antero-lateral tooth truncated and notched, sides of sixth abdominal segment curved with gradually convergent sides, a brown cross mark on carapace .... *Charybdis (Charybdis) feriatus*

   First antero-lateral tooth acute, sides of sixth abdominal segment parallel and divergent at the distal third, no cross mark on carapace 3

3. A sharply dentiform lobule at the outer end of lower border of orbit, carapace with two large circular whitish spots on either part of branchial region especially in live or freshly preserved specimens ..... *Charybdis (Charybdis) lucifer*

   Lobule at the outer end of lower border of orbit not dentiform, branchial region of carapace without any such circular spot 4

4. Last antero-lateral tooth largest ..... *Charybdis (Charybdis) helleri*

   Last antero-lateral tooth smallest ..... *Charybdis (Charybdis) annulata*

5. Posterior half of branchial region with transverse granular ridges .... *Charybdis (Charybdis) natator*

   Posterior half of branchial region without transverse granular ridges 6

6. Carapace flat, 3 spines on anterior border of arm and 5 on upper surface of palm .... *Charybdis (Charybdis) affinis*

   Carapace convex, 2 spines on anterior border of arm and 2-3 spines on upper surface of palm 7

7. First antero-lateral tooth notched anteriorly, last tooth spiniform and larger than any of the preceeding ones ..... *Charybdis (Charybdis) callianassa*

   First antero-lateral tooth acute, much larger than any of the successive ones .... *Charybdis (Charybdis) rostrata*

40. *Charybdis (Charybdis) affinis* Dana, 1852
(Pl. 2, Fig. 3)

1852. *Charybdis affinis* Dana, *Proc. Acad. nat. Sci. Philad.*, **6** : 85 and *U. S. Explor. Exped. Crust.*, **13**(1) : 286, pl. 17, figs. 12a-c.

1899. *Charybdis (Goniosoma) affinis*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 56.

1937. *Charybdis (Goniosoma) affinis*, Shen, *Bull. Raffles Mus.*, **13** : 119.

Material examined : 1(F), Station No. 11, Machilipatnam, Dist. Krishna, 05. 09. 1995, Dr. T. Roy, Reg. No. C 4760/2; 1(F), Lawson's Bay, Visakhapatnam, Dist. Visakhapatnam, 14 09.1995, Dr. T. Roy, Reg. No. C 5202/2; 2(F), Nizampatnam, Dist. Guntur, 24.01.1999, Dr.

M. K. Dev Roy, Reg. No. C 5016/2; 1(M), Maginipudi, Machilipatnam, Dist. Krishna, 26.01. 1999, Dr. M. K. Dev Roy, Reg. No. C 4759/2.

Measurement : W = 44.17 F = 12.7 L = 31.7
59.7 13.6 37.5

Diagnosis : Surface of carapace and chelipeds pubescent, cardiac region with transverse ridges. Anterior border of arm and upper surface of palm bearing three and five spines respectively. Sixth male abdominal segment curved and gently convergent.

Type locality : Singapore (Dana, 1852).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Guntur, Krishna, Visakhapatnam; Orissa : Balasore, Chandipur, Mahanadi, Puri; Tamil Nadu : Parangipettai coast; West Bengal : Bakkhali. West coast – Karnataka : Suratkal (Mangalore).

Elsewhere : Akyab, Mergui Archipelago, Malaysia, Singapore, Hong Kong, China and Indonesia.

Remarks : The width and length of the largest ovigerous female noted during the present study were 59.7 and 31.7 mm while that of the smallest ovigerous female were 43.8 and 38.55 mm respectively.

This species of crab is a new record to Andhra Pradesh. It is distributed in both the coasts of India.

41. ***Charybdis (Charybdis) annulata*** (Fabricius, 1798)

1798. *Portunus annulatus* Fabricius, *Ent. Syst. Suppl.* : 364.

1899. *Charybdis annulata*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 54.

2001. *Charybdis (Charybdis) annulata*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 43.

Material examined : 1(F), Bimlipatam, Dist. Visakhapatnam, A.W.Bellis, Reg. No. C 3278/3; 1(M), Waltair Sea Beach, Dist. Visakhapatnam, 12.02.1947, Reg. No. C 703/2; 2(M), 3(F), Waltair Beach, Visakhapatnam, Dist. Visakhapatnam, 22.12.1940, Reg. No. C 710/2; 1(M), Tenneti Park Point, Visakhapatnam, Dist. Visakhapatnam, 22.01.2001, Dr. J.G. Pattanayak, Reg. No. C 5285/2.

Measurement : W = 51.8 F = 14.95 L = 37.55
56.9 16.2 40.3

Diagnosis : Carapace smooth, convex. Frontal teeth sharp. First and second antero-lateral teeth subequal in size, third to fifth broad at base and the last the smallest. Major diameter of orbit nearly a fourth the breadth of the front. Palm armed with five spines – two spines

immediately behind the finger-joints tuberculiform. In last pair of legs, merus about twice as long as broad. Sixth male abdominal segment almost as long as broad with its sides parallel for three-fourth of their extent.

Type locality : "Oceano Indico" (Fabricius, 1798).

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; Orissa : Gopalpur coast; Tamil Nadu : Cape Comorin, Krusadai Island, Tuticorin. West coast – Gujarat : Dwarka, Port Okha; Kerala : Travancore; Maharashtra : Bombay (= Mumbai).

Elsewhere : East coast of Africa, Strait of Hormuz, Gulf of Oman, Pakistan, Sri Lanka, Mergui Archipelago, Malay Peninsula, Thailand, Java and as far as Tahiti.

Remarks : This crab occurs in both the coasts of India. It breeds throughout the year at Visakhapatnam-Waltair coast (Rajabai, 1975).

All specimens bearing registration no. C 710/2 were found among rocks on the Waltair beach and were collected by killing them with fish poison.

42. ***Charybdis (Charybdis) callianassa*** (Herbst, !801)

1801. *Cancer callianassa* Herbst, *Versuch. Naturgesch. Krabben Krebse*, **3**(2) : 45, pl. 54, fig. 7.

1899. *Charybdis (Goniosoma) callianassa*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 57.

1935. *Charybdis (Goniosoma) callianassa*, Chopra, *Rec. Indian Mus.* **37**(4) : 489, pl. 9, fig. 1, text-fig. 11a-b.

1961. *Charybdis (Charybdis) callianassa*, Stephenson, *Aust. J. mar. Freshwat. Res.* **12**(1) : 116.

Material examined : 2(M), 2(F), Gelanchundi, Machilipatnam, Dist. Krishna, 05.09. 1995, Dr. T. Roy, Reg. No. C 4998/2; 4(M),7(F), Vadarevu, Chirala, Dist. Prakasam, 21.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5015/2; 6(M), 2(F), Nizampatnam, Dist. Guntur, 24.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5014/2; 2(F), Gilakala Dindi, Machilipatnam, Dist. Krishna, 25.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4750/2; 2(M), Maginipudi, Machilipatnam, Dist. Krishna, 26.01 1999, Dr. M. K. Dev Roy, Reg. No. C 4758/2; 1(F), Sekhinetipalli, Dist. East Godavari, 29.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4752/2; 1(F), Kakinada Bay, Dist. East Godavari, 05.08.1999, Dr. J. G. Pattanayak, Reg. No. C 4751/2; 2(M), Pukkala Peta, Dist. Srikakulam, 31.01. 2001, Reg. No. C 5193/2.

Measurement :	W =	32.85	F =	7.7	L =	23.05
		37.9		7.9		23.0

Diagnosis : Carapace convex, pubescent with a transverse granular ridge on the cardiac region. First antero-lateral tooth notched anteriorly, last one spine-like; free edges of all the teeth finely serrated. Anterior border of arm of cheliped with two spines; palm inflated and armed with three spines.

Type locality : "Die vaterland ift ostindien" (Herbst, 1801)

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : East Godavari, Guntur, Krishna, Prakasam, Srikakulam; Orissa : Gopalpur coast; Tamil Nadu : Madras (= Chennai), Parangipettai coast; West Bengal : Sandheads, Sundarbans. West coast – Gujarat : Pirotan Island, Udvada; Maharashtra : Bombay (= Mumbai).

Elsewhere : South Africa, Pakistan, Gulf of Thailand, Malay Archipelago, Singapore, Indonesia, Philippines, Hong Kong, China, Japan and Australia.

Remarks : The greatly inflated palm of cheliped is a very characteristic feature of this species. This crab breeds during early rainy season (late June, July and August) at Visakhapatnam-Waltair coast (Rajabai, 1975).

43. ***Charybdis (Charybdis) feriatus*** (Linnaeus, 1758)
(Pl. 2, Fig. 4)

1758. *Cancer feriatus* Linnaeus, *Syst. Nat.* (10th. ed.), **1** : 627.

1899. *Charybds (Goniosoma) crucifera*, Alcok, *J. Asiat. Soc. Bengal*, **68**(2) : 51.

1976. *Charybdis (Charybdis) feriata*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 43.

Material examined : 1(M), Visakhapatnam, Dist. Visakhapatnam, Dr. M. C. and G. R. K., Reg. No. C 677/2; 1(M), Puluguvari Palem, Dist. Guntur, 22.01.1999, Dr. M.K.Dev Roy, Reg. No. C 4999/2; 2(M), 3(F), Fishing Harbour, Kakinada, Dist. East Godavari, 02.02.1999, Dr. M. K. Dev Roy, Reg. No. C 4996/2; 2(F), Visakhapatnam, Dist. Visakhapatnam, 05.02.1999, Dr. M. K. Dev Roy, Reg. No. C 5000/2.

Measurement :	W =	96.65	F =	22.0	L =	64.3
		68.85		22.4		47.8

Diagnosis : Dorsal surface of carapace with purplish brown longitudinal bands arranged in the form of a cross. First antero-lateral spine truncated and notched anteriorly, second to fourth very broad, last one spine-tipped. Major diameter of orbit nearly a third the width of front. In chelipeds, fingers almost as long as their palm. Propodus of last pair of leg bearing 1 or 2 inconspicuous denticles near the distal end of its posterior border. Sixth male abdominal segment much broader than long with gently curved sides.

Type locality : Unknown.

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : East Godavari, Guntur, Visakhapatnam; Orissa : Baleshwar, Gopalpur coast, Mahanadi estuary, Puri; Tamil Nadu : Gulf of Mannar, Palk Bay, Parangipetai coast, Pulicat Lake; West Bengal : Digha coast, Sundarbans. West coast –

Gujarat : Gulf of Kachchh; Kerala : Travancore coast; Maharashtra : Deogad coast (District Ratnagiri). Andaman and Nicobar Islands.

Elsewhere : East coast of Africa, Madagascar, Pakistan, Bangladesh, Malay Peninsula, Singapore, Hong Kong, China, Taiwan, Japan and Australia.

Remarks : This species was earlier reported from East Godavari District by Dev Roy and Bhadra (2001). This crab is edible and was found to be landed in appreciable quantities in Fishing Harbour at Visakhapatnam during January.

44. ***Charybdis (Charybdis) helleri*** (A. Milne Edwards,1867) (Pl. 2, Fig. 5)

1867. *Goniosoma helleri* A. Milne Edwards, *Annls. Soc. Ent. Fr.*, sér. **4, 7** : 282.

1899a. *Charybdis (Goniosoma) merguiensis*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 55.

2000. *Charybdis (Charybdis) helleri*, Dev Roy and Das, *Rec. Zool. Surv. India, Occ. Paper No.* **185** : 36, pl. 2, Fig. 1 and pl. 9, figs. 7, 8.

Material examined : 4(M), 2(F), Visakhapatnam, Dist. Visakhapatnam, 25.12.1940, Reg. No. C 711/2.

Measurement :	W =	29.15	F =	9.35	L = 19.5
		30.65		9.2	20.55

Diagnosis : Carapace broad, convex bearing the usual transverse granular ridges. Front cut into six acute teeth. Chelipeds massive, unequal; arm bearing two large and one small tooth; inner surface of wrist armed with a large spine at its inner angle, outer surface bearing three spinules; palm with five spines – two side by side just behind the finger-joint, other two in the middle and last one near the wrist-joint. Carpus of last pair of legs adorned with a spine on its posterior border. Sixth male abdominal segment as long as broad with the sides parallel at the basal two-thirds and then convergent distally.

Type locality : Indian Archipelago and New Caledonia (A. Milne Edwards, 1867).

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; Orissa : Gopalpur coast; Tamil Nadu : Gulf of Mannar, Palk Bay, Parangipettai coast; West Bengal : Sandheads, Sundarbans. West coast – Kerala : Cochin backwater. Andaman Islands : Middle Andaman.

Elsewhere : Mediterranean Sea, Red Sea, Persian Gulf, Pakistan, Sri Lanka, Mergui Archipelago, Malay Peninsula, Singapore, Indonesia, Thailand, Hong Kong, China, Australia and as far as Hawaii.

Remarks : This crab occurs extensively throughout the Indo-Pacific region. However, it is now recorded for the first time from this state.

45. *Charybdis (Charybdis) lucifera* (Fabricius, 1798)

1798. *Portunus lucifer* Fabricius, *Ent. Syst. Suppl.* : 364.

1894. *Goniosoma luciferum*, Alcock and Anderson, *J. Asiat. Soc. Bengal*, **63**(2) : 201.

1899. *Charybdis (Goniosoma) quadrimaculata*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 54.

1938. *Charybdis (Charybdis) lucifera*, Leene, *Siboga Expeditie Monogr., Leiden*, **39C** : 57, figs. 23-25.

Material examined : 1(M), 1(F), Puluguvari Palem, Dist. Guntur, 22.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5019/2; 1(M), Visakhapatnam, Dist. Viskhapatnam, 06.02.1999, Dr. M. K. Dev Roy, Reg. No. C 4754/2.

Measurement : W = 72.1 F = 19.6 L = 46.75

61.0 17.35 41.30

Diagnosis : Carapace very broad. Two large white spots present on either side of branchial region. Antero-lateral teeth six, claw-shaped. Lower border of orbit with an acutely dentiform lobule at its outer end. Chelipeds subequal, palm with five spines. Sides of sixth male abdominal segment parallel or slightly divergent in two-thirds of their extent.

Type locality : "Oceano Indico" (Fabricius, 1798)

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Guntur, Visakhapatnam; Tamil Nadu : Parangipettai coast. West coast – Kerala : Cochin harbour, Vembanad Lake, Malabar coast; Maharashtra : Bombay (= Mumbai), Deogad coast (District Ratnagiri).

Elsewhere : Sri Lanka, Java, Thailand, Japan and Australia.

Remarks : The four large white spots on carapace is very characteristic of this species. In live condition, it has a reddish appearence. This crab occurs in both the coasts of India. However, this is the first report of the occurrence of this species from this state. This crab was found to be landed in appreciable quantity at Fishing harbour at Visakhapatnam during January.

46. *Charybdis (Charybdis) natator* (Herbst, 1794)

1794. *Cancer natator* Herbst, *Versuch. Naturgesch. Krabben Krebse*, **2**(5) : 156, pl. 40, fig. 1.

1899. *Charybdis (Goniosoma) natator*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 61.

1976. *Charybdis (Charybdis) natator*, Sakai, *Crabs of Japan and the Adjacent Seas* : 360.

Material examined : 1(F), Maginipudi, Machilipatnam, Dist. Krishna, 26.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4757/2; 1(M), Fishing Harbour, Kakinada, Dist. East Godavari, 02.02.1999, Dr. M. K. Dev Roy, Reg. No. C 4991/2; 1(M), Visakhapatnam, Dist. Visakhapatnam, 05.02.1999, Dr. M. K. Dev Roy, Reg. No. C 4756/2; 1(M), Visakhapatnam, Dist. Visakhapatnam, 09.12.1999, J. Sarkar, Reg. No. C 4755/2.

Measurement : W = 59.80 F = 14.7 L = 36.55
51.80 12.85 33.50

Diagnosis : Front six dentate, frontal teeth subequal and bluntly rounded. First antero-lateral tooth truncated, last one not much enlarged. Chelipeds covered with transverse squamiform tubercles, more prominent on palm. Sixth male abdominal segment as long as broad and its sides parallel in three-fourths of their extent.

Type locality : Unknown

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : East Godavari, Krishna, Vasakhapatnam; Tamil Nadu : Gulf of Mannar, Madras (= Chennai), Palk Bay, Parangipettai coast; Pondicherry. West coast – Gujarat : Okha; Kerala : Trivandrum.

Elsewhere : South Africa, Madagascar, Red Sea, Sri Lanka, Malay Archipelago, Singapore, Philippines, Hong Kong, Southern coast of China, Taiwan, Japan and Australia.

Remarks : This crab is a new record to Andhra Pradesh.

47. ***Charybdis (Charybdis) rostrata*** A. Milne Edwards, 1861

1861. *Goniosoma rostratum* A. Milne Edwards, *Archs Hist. nat. Paris*, sér. 1, **10** : 379, 385, pl. 35, fig. 2.

1899. *Charybdis (Goniosoma) rostrata*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 59.

1991. *Charybdis rostrata*, Dev Roy and Nandi, *J. Indian Soc. Coastal agric. Res.*, **9**(1/2) : 71.

2001. *Charybdis (Charybdis) rostrata*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary*: 44.

Material examined : 2(F), Mungergudi, Machilipatnam, Dist. Krishna, 05.09.1995, Dr. T. Roy, Reg. No. C 4975/2.

Measurement : W = 22.6 F = 6.1 L = 15.45

Diagnosis : Front six dentate, middle two teeth blunt and markedly prominent projecting far beyond the others. First antero-lateral tooth very acute, last tooth spiniform and much larger than any of the preceeding ones. Chelipeds unequal, palm six costate bearing two spines on its upper surface. Sixth segment of male abdomen broader than long with curved and gently convergent sides.

Type locality : "Bouches du Gange" (= Mouth of the river Ganges) (A. Milne Edwards, 1861).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Krishna, West Godavari; Orissa : Chandipur; Tamil Nadu : Gulf of Mannar, Madras (= Chennai); West Bengal : Kolkata, River Hugli, Sundarbans. Andaman Islands.

Elsewhere : Sri Lanka, Mergui Archipelago, Gulf of Martaban, Thailand, Indonesia.

Remarks : This species was earlier reported from West Godavari District by Dev Roy and Bhadra (2001). This crab so abundant in Sundarban coast of West Bengal is, however, not common (rather rare) in the coastal waters of Andhra Pradesh.

Subgenus ***Goniohellenus*** Alcock, 1899

1899a. *Goniohellenus* Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 48.

1976. *Goniohellenus*, Sakai, *Crabs of Japan and the Adjacent Seas* : 362.

Remarks: The subgenus is represented by three species in Andhra pradesh.

Key to species of the subgenus *Goniohellenus*

1. Last antero-lateral spine smaller than others ..... *Charybdis (Goniohellenus) truncata*

   Last antero-lateral spine much larger than others 2

2. Carapace thick, spine at inner angle of wrist of chelipeds shorter .... *Charybdis (Goniohellenus) hoplites*

   Carapace depressed, spine at inner angle of wrist of chelipeds much larger .... *Charybdis (Goniohellenus) vadorum*

48. ***Charybdis (Goniohellenus) hoplites*** Wood-Mason, 1877

1877. *Goniosoma hoplites* Wood-Mason, *Ann. Mag. nat. Hist.*, ser. 4, **19** : 422.

1894. *Goniosoma hoplites*, Alcock and Anderson, *Illustr. Zool. "Investigator" Crust.*, Part 4 : pl. 23, fig. 6.

1899. *Charybdis (Goniohellenus) hoplites*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 66.

1938. *Charybdis (Goniohellenus) hoplites*, Leene, *Siboga Expeditie Monogr., Leiden*, **39C** : 99, figs. 53, 54 a-c.

Material examined : 1(M), Maipadu Sea Beach, Dist. Nellore, 13.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5010/2; 5(M), 1(F), Krishnapattam Port, Dist. Nellore, 15.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5050/2; 7(M), 4(F), Kottapatnam, Dist. Prakasam, 19.01.1999, Dr. M. K. Dev Roy. Reg. No. C 5198/2; 1(M), Ongole, Dist. Prakasam, 20. 01.1999, Dr. M. K. Dev Roy, Reg. No. C 5199/2; 10(M), 1(F), Vadarevu, Chirala, Dist. Prakasam, 21.01.1999, Dr. M. K. Dev Roy, Reg. No.C 5005/2; 1(M), 2(F), Gilakala Dindi, Machilipatnam, Dist. Krishna, 25.01.1999, M. K. Dev Roy, Reg. No. C 5200/2; 1(M), Maginipudi, Machilipatnam Dist. Krishna, 26.01.1999, Dr. M. K. Dev Roy, Reg. No.C 5007/2; 1(M), Ramakrishna Beach, Visakhapatnam, Dist. Visakhapatnam, 06.02.1999, Dr. M. K. Dev Roy, Reg. No. C 5011/2; 1(M), 2(F), Visakhapatnam, Dist. Visakhapatnam, 09.12.1999, J. Sarkar, Reg. No.C 5199/2.

Measurement : W = 41.55 F = 4.55 L = 11.0
24.15 10.65 25.15

Diagnosis : Carapace thick, pubescent; epibranchial area swollen. Last antero-lateral spine larger than any of the others. Anterior border of arm of chelipeds with two large spine and a spinule, posterior border with a single spine; palm six costate, costae with squamiform sculpturings. Sixth segment of male abdomen truncate-triangular.

Type locality : Coromandel coast (Wood-Mason, 1877)

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Krishna, Nellore, Prakasam, Visakhapatnam; Orissa : Gopalpur coast; Tamil Nadu : Parangipettai coast. West coast – Gujarat : Gulf of Kachchh.

Elsewhere : Red Sea, Persian Gulf, Indus Delta, Akyab, Hong Kong.

Remarks : This species of crab is reported for the first time from Andhra Pradesh. It occurs abundantly in the trawl catches. The smallest and largest ovigerous female measured during this investigation were 16.25 and 24.15 mm respectively.

49. *Charybdis (Goniohellenus) truncata* (Fabricius, 1798)

1798. *Portunus truncatus* Fabricius, *Ent. Syst. Suppl.* : 365.

1899. *Charybdis (Goniohellenus) ornata*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 64.

1976. *Charybdis (Goniohellenus) truncata*, Sakai, *Crabs of Japan and the Adjacent Seas* : 363.

Material examined : 10(M), 2(F), Ongole, Dist. Prakasam, 20.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4984/2; 2(M), Visakhapatnam, Dist. Visakhapatnam, 05.02.1999, Dr. M. K. Dev Roy, Reg. No. C 4987/2.

Measurement : W = 39.7 F = 11.5 L = 25.75
26.35 7.35 17.7

Diagnosis : First antero-lateral tooth truncated, last one smallest. Posterior border of dorsum of carapace straight forming an angular junction with postero-lateral borders. Posterior border of arm bearing a spinule. Sixth segment of male abdomen broader than long with strongly convergent sides.

Type locality : "Oceano Indico" (Fabricius, 1798).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Prakasam, Visakhapatnam; Coromandel coast; Tamil Nadu : Parangipettai coast; West Bengal : Mouth of River Hugli.

Elsewhere : Maldives, Arakan coast, Gulf of Thailand, Singapore, Java, Philippines, Hong Kong and Australia.

Remarks : The width and length of the single ovigerous female measured during this study were 20.2 and 14.55 mm. respectively. This crab breeds during December to July at Visakhapatnam-Waltair coast but the intensity of breeding is more pronounced during May-June (Rajabai. 1975).

50. *Charybdis (Goniohellenus) vadorum* Alcock, 1899

1899. *Charybdis (Goniohellenus) hoplites* var. *vadorum* Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 67.

1935. *Charybdis (Goniosoma) vadorum*, Chopra, *Rec. Indian Mus.*, **37**(4) : 493, pl. 9, fig. 2, text-fig., 13a-d.

1938. *Charybdis (Goniohellenus) vadorum*, Leene, *Siboga Expeditie Monogr., Leiden*, **39C** : 114, figs 63-65.

Material examined : 1(F), Station No. 8, Lawson's Bay, Visakhapatnam, Dist. Visakhapatnam, 14.09.1995, Dr. T. Roy, Reg. No. C 5012/2.

Measurement : W = 20.0 F = 6.1 L = 13.2

Diagnosis : Carapace depressed, surface sparsely covered with short tomentum; regions well-marked and areolated; convexities of areolae prominent, some of them granular; epibranchial regions very strongly tumid. Front cut into eight lobes, including inner supra-orbital angle; median lobes large, squarish, projecting much beyond the others and separated from each other by a prominent median notch; next lobe rather small, bluntly rounded, separated from the preceeding one by a broad, shallow groove; third pair smaller, sharper and slenderer than the preceeding pair, separated from the former by a deep, wide gap; inner supra-orbital angle – a fairly large broad tooth with a somewhat acutely-pointed tip. Antero-lateral teeth six (including the ex-orbital angle) separated from one another by rather fairly deep notches; last spine very long and directed outwardly; rest five square-cut, their margins finely serrated. Posterior border of carapace straight, forming an angular junction with the postero-lateral borders. Chelipeds unequal; anterior border of arm with two large spines distally and a spinule proximally, posterior border with a single spine at its far end; spine at the inner angle of wrist very long, much longer than *C. hoplites* and also bearing two spinules at its outer angle; palm six costate, costae with squamiform sculptures and bearing four spines – one near wrist-joint, one near finger-joint, the remaining two side by side slightly behind the former; fingers larger than upper border of palm, tips pointed and crossing each other, their cutting edges strongly dentate. Leg joints of last pair fringed with long hairs. Second and third terga of female abdomen transversely keeled, fourth tergum with a single carina.

Type locality : Orissa coast, Persian Gulf and Arakan coast (Alcock, 1899).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; Orissa; Tamil Nadu : Parangipettai coast; West Bengal : Sandheads.

Elsewhere : Arakan coast and Hong Kong.

Remarks : In this species, posterior border of propodus of last pair of leg was reported to contain 5-6 spinules by Chopra (1935) but these are found to be absent in the specimens examined by us.

This crab was described as a variety of *Charybdis (Goniohellenus) vadorum* by Alcock (1899a). Based upon several morphological differences, Chopra (*op. cit.*) elevated it to the rank of a species. The two species namely, *C. (G.) vadorum* and *C. (G.) hoplites* can readily be distinguished by the following characters:

Charybdis (Goniohellenus) vadorum	*Charybdis (Goniohellenus) hoplites*
1. Carapace depressed.	1. Carapace thick.
2. Spine at the inner angle of wrist of chelipeds shorter; two spinules at the outer angle of wrist.	2. Spine at the inner angle of wrist much longer; three spinules at the outer angle of wrist.
3. Squamiform markings more developed on palm of chelipeds	3. Squamiform markings less developed on palm of chelipeds.
4. Sixth segment of male abdomen truncate-triangular with almost no curve at the sides.	4. Sixth somite of male abdomen barrel-shaped, much broader than long, broadest at the middle, narrowing somewhat abruptly at the two ends and the lateral borders deeply curved inwards.
5. Anterior male appendage with a large bluntly pointed spine on the inner border, slightly below its tip. This appears to be a characteristic feature of this species.	5. Anterior male appendage without such spine.

According to Chopra (1935), geographical range of *C. (G.) vadorum* is restricted to the eastern parts of Indo-Pacific. In Indian waters, however, it is confined to the east coast only. The occurrence of this species from Persian Gulf and Gulf of Oman as recorded by Alcock (1899a) has been criticized by Chopra (*op. cit.*). After examination of all specimens present in the Indian Museum he reached to the conclusion that specimens from those two localities were not referable to *C. vadorum* but could probably be Alcock's dwarf variety *pussila*. The sixth abdominal segment of male abdomen and the anterior male appendages in those specimens were not like those of *C. vadorum*.

This crab is rare.

Genus ***Thalamita*** Latreille, 1829

1829. *Thalamita* Latreille, In : Cuvier's, *Règne Anim. Crust.*, (ed. 2), **4** : 33 (foot note).

1899. *Thalamita*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 11, 72.

2000. *Thalamita*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 39.

Diagnosis : Carapace roughly hexagonal, broad, depressed or slightly convex and usually marked with prominent transverse ridges. Front cut into 2-6 rounded or subquadrate teeth or lobes. Antero-lateral borders cut into five teeth, fourth tooth often rudimentary or absent. Basal antenna-joint broad, apical lobe long, lying in contact for its entire length with the inner orbital tooth, antenna excluded from the orbit. Epistome long, buccal cavity as in *Charybdis*. Chelipeds, legs and male abdomen as in *Portunus* and *Charybdis*.

Type species : *Cancer admete* Herbst, 1803; by monotypy; gender: feminine; name no. 195 on Official List, in Opinion 73, *Bull. zool. Nomencl.* (1956).

Key to species of the genus *Thalamita*

1. Front cut into two lobes 2

   Front cut into six lobes ..... *Thalamita crenata*

2. Antero-lateral teeth square-cut, arm of cheliped with 2 enlarged teeth ..... *Thalamita chaptali*

   Antero-lateral teeth claw-shaped, arm of cheliped eith 3 enlarged teeth ..... *Thalamita admete*

51. ***Thalamita crenata*** (Latreille, 1829)
(Pl. 2, Fig. 6)

1829. *Portunus crenatus* Latreille, *Collection du Museum* : 33.

1899. *Thalamita crenata*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 76.

1957. *Thalamita crenata*, Chhapgar, *J. Bombay nat. Hist, Soc.*, **54**(2) : 423, pl. 7, figs. l-n.

2000. *Thalamita crenata*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 40, pl. 2, fig. 3; pl. 10, figs. 1, 2.

Material examined : 1(M), Ramakrishna Beach, Visakhapatnam, Dist. Visakhapatnam, 06.02.1999, Dr. M. K. Dev Roy, Reg. No. C 4989/2; 1(M), Visakhapatnam Backwaters, Dist. Visakhapatnam, 22.04.1910, S. W. Kemp, Reg. No. C 737/2.

Measurement : W = 46.6 F = 17.25 L = 31.5

Diagnosis : Carapace slightly convex, smooth, transverse ridges obscure. Frontal teeth six, broad, rounded and almost of same size. Antero-lateral margins cut into five claw-shaped teeth, of which, first three teeth larger than the last two, teeth decreasing in size from front to back. Anterior border of arm of cheliped provided with three spines; inner corner of wrist bearing a strong spine, outer surface with three spinules; upper surface of palm armed with four spines in two rows and one near the apex of wrist-joint. Sixth male abdominal segment broader than long with gently curved sides.

Type locality : Unknown

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; Orissa : Gopalpur coast, Lake Chilka; Tamil Nadu : Gulf of Mannar, Palk Bay, Parangipettai coast : Pondicherry. West coast – Maharashtra : Bombay (= Mumbai). Andaman and Nicobar Islands : South and Middle Andamans; Nicobars.

Elsewhere : East coast of Africa, Red Sea, Pakistan, Sri Lanka, Mergui Archipelago, Singapore, Indonesia, Philippines, Japan, Australia, New Zealand, Samoa, Hawaii and Society Islands.

Remarks : Rajabai (1975) studied the breeding biology of this species from Visakhapatnam-Waltair coast. This crab breeds during late winter (late November and December).

52. *Thalamita admete* (Herbst, 1803)

1803. *Cancer admete* Herbst, *Versuch. Naturgesch. Krabben Krebse*, **3**(3) : 40, pl. 57, fig. 1.

1899. *Thalamita admete*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 82.

2000. *Thalamita admete*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 44, pl. 2, fig. 5 and pl. 10, figs. 5, 6.

Diagnosis : Carapace flat, tomentose; surface crossed by fine transverse granular ridges. Front bilobed, broad and squarish with beaded margin. Antero-lateral teeth five, claw-shaped, fourth tooth rudimentary. Chelipeds massive, unequal; inner corner of arm bearing four spines – distal two spines much larger than others; outer surface of wrist with granular costae and three spines, inner corner bearing a strong, sharp spine; palm five costate, its upper border adorned with six spines; inner sutface smooth near the middle with a line of granules on the lower border; fingers much shorter than palm, their tips pointed and crossing each other, both dactylus and fixed finger strongly grooved; cutting edge of dactylus armed with a strong molariform tooth near its proximal end. Leg joints slender, smooth; lower border of merus armed with a sharp spine; propodus bearing 5-10 large spines and 1 or 2 spinules on its lower border. Abdomen consisting of seven segments in both sexes; 3rd-5th segments fused in male, sixth segment almost as long as broad with gently curved sides.

Type locality : Eastern India (Herbst, 1803).

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; Tamil Nadu : Gulf of Mannar, Palk Strait. Andaman and Nicobar Islands : South Andamans, Car Nicobar; Lakshwadweep : Minicoy Islands.

Elsewhere : East coast of Africa, Red Sea, Pakistan, Sri Lanka, Gulf of Martaban, Gulf of Thailand, Japan, Australia, Fiji and Hawaiian Islands.

Remarks : This species has not been collected by us. However, the breeding biology of

this species has been studied by Rajabai (1975). It breeds from December to July at Visakhapatnam–Waltair coast and its peak period of breeding activity is recorded during April May.

53. ***Thalamita chaptali*** (Audouin, 1826)

1826. *Portunus chaptali* Audouin, In: J. –C. Savignyi, *Description de l'Égypte, Histoire naturelle*, **1(2)** : 83. [fig., in Savignyi, 1809: pl. 4, fig. 1 (fide Stephenson, 1957)].

1899. *Thalamita chaptali*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 80.

Material examined : 7 (F), Station No. 4, Waltair, Dist. Visakhapatnam, 24. 01. 1921, Reg. No. C 781/2; 16(M), 18(F), Baruva Backwater, Dist. Srikakulam , 01.03.1939, Reg. No. C 2399/2.

Measurement : W =	12.5	F =	4.8	L =	8.8
	12.0		4.7		8.0

Diagnosis : Carapace broad, convex; surface granular, transverse ridges very distinct. Front very broad forming a shallow arch and notched at the middle. Antero-lateral teeth five – first three teeth square cut, fourth the smallest, fifth tooth well developed but smaller than the first three. Chelipeds unequal; anterior border of arm adorned with two large blunt teeth, posterior border devoid of any spine; inner border of wrist strongly spiniform, the usual spinules on the outer angle obsolescent; palm armed with five small blunt spines, the anterior two just behind the finger-joints obsolete, fingers slightly longer than palm. Sixth male abdominal segment broader than long, its sides being little divergent in about two-thirds of their extent.

Type locality : Unknown.

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Srikakulam, Visakhapatnam; Tamil Nadu : Gulf of Mannar, Madras (= Chennai), Pichavaram. Andaman Islands.

Elsewhere : Red Sea, Madagascar, Mauritius, Gulf of Thailand, Australia, New Caledonia, Solomon Island and Tahiti.

Remarks : This species is reported for the first time from Andhra Pradesh. It is not a common species but appears to be rather rare. The smallest and largest ovigerous female noted during this study were 8.1 and 12.5 mm respectively across the carapace width.

Subfamily PODOPHTHALMINAE Dana, 1851

1851. Padophthalmidae Dana, *Amer. J. Sci. Art.*, ser. 2, **12** : 130.

1907. Podophthalminae Borradaile, *Ann. Mag. nat. Hist.*, ser. 7, **19** : 483.

1876. Podophthalminae Sakai, *Crabs of Japan and the Adjacent Seas* : 323, 382.

2001. Padophthalminae, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* 4 : *Fauna of Godavari Estuary* : 44 (therein author of the subfamily attributed to Miers, in error).

Diagnosis : Front extremely narrow, T- shaped. Antero-lateral teeth few. Orbits very long, occupying the entire anterior border of carapace.

Remarks : The subfamily contains two genera, namely, *Podophthalmus* Lamarck, 1801 and *Euphylax*. The former is Indo-Pacific while the latter is confined to the Atlantic Ocean.

Genus ***Podophthalmus*** Lamarck, 1801

1801. *Podophthalmus* Lamarck, *Syst. Anim. Sans. Vert. (Crust.)* : 152.

1899. *Podophthalmus*, Alcock, *J. Asiat. Soc. Bengal*, **68**(2) : 92.

2001. *Podophthalmus*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 44.

Diagnosis : Carapace extremely broad. Antero-lateral borders transverse in the greater part of their extent turning obliquely backwards and culminating in a large spine. Epibranchial spine rudimentary, standing slightly behind the large outer orbital angle. Front extremely narrow. Antennules stout, lodged in fossa beneath the front. Antenna lodged in orbital hiatus, its basal joint short, flagellum long and slender. Orbits very long, transversely grooved. Chelipeds long, massive. Legs adapted for swimming.

Remarks : The genus comprises of three species only, namely, *Podophthalmus minabenis* Sakai, *P. nacreus* Alcock and *P. vigil* (Fabricius). Only the last one occurs in Andhra Pradesh.

54. ***Podophthalmus vigil*** (Fabricius, 1798)
(Pl. 2, Fig. 7)

1798. *Portunus vigil* Fabricius, *Ent. Syst. Suppl.* : 363.

2001. *Podophthalmus vigil*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 44.

Material examined : 2(M), Elamanchili, Visakhapatnam, Dist. Visakhapatnam, 20. 09. 1995, Dr. T. Roy, Reg. No. C 4727/2; 2(F), Krishnapatam Port, Dist. Nellore, 15.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4728/2; 2(F), Kottapatnam, Dist. Prakasam, 19.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4724/2; 1(M), 9(F), Ongole, Dist. Prakasam, 20.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4726/2; 1(F), Visakhapatnam, Dist. Visakhapatnam, 05.02.1999, Dr. M. K. Dev Roy, Reg. No. C 4725/2.

Measurement :	W =	117.0	F =	1.35	L = 44.25
		86.9		1.2	36.65

Diagnosis : Carapace markedly broadened anteriorly and then convergent obliquely; surface granular along the supra-orbital margin, epibranchial crests and mesobranchial areas; regions fairly defined. Front extremely narrow, T-shaped. Eye-stalk enormously long, eyes terminal.

Palm of chelipeds armed with three spines – one just behind the finger-joint, one in front of apex of wrist-joint and another ventrally in parallel with the first spine at the base of movable finger; both outer and inner surfaces of palm sharply carinated; fingers much shorter than palm, their cutting edges strongly dentate. Upper border of second to fourth pair of legs granular.

Type locality : "Oceano Indico" (Fabricius, 1798).

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Nellore, Prakasam, West Godavari, Visakhapatnam; Orissa : Gopalpur coast; Tamil Nadu : Ennore estuary, Gulf of Mannar, Porto Novo, Pulicat Lake, Sinnur. West coast – Cochin.

Elsewhere : Red Sea, Madagascar, Malay Peninsula, Singapore, Philippines, Taiwan, Japan, Australia, Hawaii, Samoa and Tahiti.

Remarks : This species was earlier reported from West Godavari District by Dev Roy and Bhadra (2001). It occurs abundantly in trawl catches. This crab is edible and sold in large numbers in fish markets in Pacific countries (Edmondson, 1954; Tinker, 1965) supplementing *Portunus sanguinolentus* as a popular edible crab. But it is not consumed in Andhra Pradesh and is discarded while netting. The smallest and largest ovigerous female noted during the present investigation were 40.2 and 56.3 mm. across the carapace width.

This crab occurs in both the coasts of India. It prefers soft muddy or sandy mud bottoms in estuaries, bays and river mouths.

Family GONEPLACIDAE MacLeay, 1838

1838. Gonoplacidae MacLeay, 1838, [corrected to Goneplacidae by Stebbing, 1902 : 15].

1858. Rhizopidae Stimpson, *Proc. Acad. nat. Sci. Philad.* : 95.

1900 Prionoplacinae Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 286, 292.

1900. Pseudorhombilinae Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 286, 292, 297.

Diagnosis : Carapace subquadrilateral. Orbits complete, sometimes elongate. First antenna folded obliquely or transversely. Fifth joint of third maxilliped articulated at or near antero-internal angle of fourth joint, exognath of normal size. Male genital openings sternal or coxal.

Remarks : The family Goneplacidae is divided into four subfamilies namely Carcinoplacinae H. Milne Edwards, 1852, Euryplacinae Stimpson, 1871, Gonoplacinae MacLeay, 1838 and Typhlocarcinopinae Rathbun, 1900. Only members of the subfamily Carcinoplacinae is represented in the present collection.

Subfamily CARCINOPLACINAE H. Milne Edwards, 1852

1852. Carcinoplacinae H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **18** : 164.

1976. Carcinoplacinae, Sakai, *Crabs of Japan and the Adjacent Seas* : 522, 523.

Diagnosis : Carapace xanthoid, regions not distinct. Front square cut, generally of good breadth. Antennules transversely folded, antennal flagella of moderate length. Epistome well defined, buccal cavern squarish, merus of third maxilliped subquadrate. Eyes well pigmented, eye-stalks normally movable. Base of third male abdominal segment covering whole sternum between the last pair of leg. Male openings sternal.

Remarks : So far, only the genus *Carcinoplax* H. Milne Edwards has been recorded from Andhra Pradesh.

Genus *Carcinoplax* H. Milne Edwards, 1852

1833. *Cancer (Curtonotus)* de Haan, *Fauna japon.(Crust.)* : 20 [name preoccupied; a subgenus erected without the inclusion of a nominal species; an invalid junior homonym of *Curtonotus* Stephens, 1827 (Coleoptera)].

1852. *Carcinoplax* H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **18** : 164 [substitute name for *Curtonotus* de Haan, 1833].

1900. *Carcinoplax*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 301.

1989. *Carcinoplax*, Guinot, In : Forest (ed.), Rèsultats des Campagnes MUSORSTOM,Vol. 5. *Mém.Mus. natn. Hist. nat.*, (A), **144** : 273.

Diagnosis : Carapace deep, subquadrilateral, broader than long, regions not distinct. Lateral borders toothed and well arched. Front straight, square cut, weakly notched or with longitudinal groove at midline. Basal joint of antenna short, flagellum not excluded from the orbit, antennules transversely folded. Eye-stalks short, stout. Chelipeds subequal, longer in male than female. Legs slender, unarmed; propodus and dactylus of last pair compressed and decidedly broadened. Abdomen with seven distinct segments in both sexes, second and third segments occupying whole width of sternum between fifth coxae. Genital openings very large in mature female. Penultimate sternal plate forming a protective covering to the external genital duct in male.

Type species : *Cancer (Curtonotus) longimanus* de Haan, 1833, by subsequent designation by Glaessner, 1929 : 111; gender : feminine.

Remarks : The genus *Carcinoplax* has been revised by Guinot (1989) and presently it consists *sensu lato* of 25-27 taxa although Sakai (1969) reported earlier only 16 species. It is represented by four species namely, *C. longimanus* (de Haan, 1835), *C. longipes* (Wood-Mason, 1891), C. *indica* Doflein, 1904 and *C. verdensis* Rathbun (Alcock, 1900; Selvaraj and Kathirvel, 1980) from India. Only the first two species have been recorded from Andhra Pradesh.

Key to species of the genus *Carcinoplax*

Carapace square-cut with some prominent red squarish or roundish spots, all the three antero-lateral teeth very prominent ..... *Carcinoplax longipes*

Carapace subquadrilateral without any spot, antero-lateral borders armed with 3 teeth, of which, first two almost obsolescent ..... *Carcinoplax longimanus*

55. *Carcinoplax longimanus* (de Haan, 1835)
(Pl. 4, Fig. 5)

1835. *Cancer (Curtonotus) longimanus* de Haan, In : Siebold, *Fauna japon. (Crust.)* : 50, pl. 6, fig. 1.

1852. *Carcinoplax longimanus* H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **18** : 164.

1900. *Carcinoplax longimanus*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 303.

1976. *Carcinoplax longimanus*, Sakai, *Crabs of Japan and the Adjacent Seas* : 524, pl. 189.

1989. *Carcinoplax longimanus*, Guinot, In : Forest (ed.), Rèsultats, des Campagnes MUSORSTOM, Vol. 5. *Mèm. Mus. Natn. Hist. nat.*, (A), **144** : 273, figs. 2, 4 A-C, 6 A, B, pl. I, A-D, pl. II, A-D.

Material examined : 1(M), 1(F), Station No. 24, Elamanchili, Vizagapatnam, Dist. Visakhapatnam, 17.09.1995, Dr. T. Roy, Reg. No. C 5318/2; 3(M), 3(F), Vadarevu, Chirala, Dist. Prakasam, 21.01.1999, Dr. M.K.Dev Roy, Reg. No. C5249/2; 3(F), Fishing Harbour, Visakhapatnam, Dist. Visakhapatnam, 09.12.1999, J. Sarkar, Reg. No. C5250/2.

Measurement :	W =	F =	L =
	42.25	11.1	27.25
	41.1	9.95	28.85

Diagnosis : Carapace deep, subquadrilateral; surface glabrous and finely frosted. Antero-lateral margins armed with two tubercles behind the outer orbital angle – first one obsolete, last one very sharp and dentiform in juveniles, becoming much worn away in adults. Front feebly notched at the middle, its free edges grooved longitudinally. Pterygostomial region granular. Chelipeds massive, subequal; longer and slenderer in male, shorter and compressed in female; upper surface of arm bearing a tooth distally and one each on either corner of wrist; palm shorter than dactylus in female, much longer in male; a blunt ridge traversing the inner surface of palm; fingers crossing each other and pointed at tips, their opposed margins strongly dentate. Legs long, anterior border of carpus and both the margins of propodus and dactylus fringed with setae.

Type locality : Japan (de Haan, 1835).

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Prakasam, Visakhapatnam. Andamans (52-60 fathoms = 94.64 – 109.2 m.)

Elsewhere : South Africa, Madagascar, Gulf of Martaban Thailand, Korea and Japan.

Remarks : The two post frontal ridges are very prominent in large female specimens only. In live condition, entire carapace, chelipeds (except fingers) and merus, carpus and propodus of leg joints are pale red or deep brown in colour, fingers whitish; ventrally abdomen, pterygostomial region and maxillipeds are white; under surface of wrist, palm and dactylus

are light red or brown. Posterior surface of merus of leg joints are whitish proximally, light red distally while those of carpus and propodus are whitish only.

Although this species is common in the coastal waters of Andhra Pradesh, however, it is recorded for the first time from mainland India. Besides Andhra Pradesh, it is also known to occur in Andaman Islands.

56. *Carcinoplax longipes* (Wood-Mason, 1891)
(Pl. 4, fig. 6)

1891. *Nectopanope longipes* Wood-Mason, *Ann. Mag. nat. Hist.* ser. 6, 7 : 262.

1895. *Nectopanope longipes*, Alcock and Anderson, *Illustr. Zool. "Investigator" Crust.*, pl. 14, fig. 2.

1899. *Carcinoplax longipes*, Alcock, *Investigator Deep Sea Brachyura* : 71.

1900. *Carcinoplax longipes*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 303.

1976. *Carcinoplax longipes*, Sakai, *Crabs of Japan and the Adjacent Seas* : 527, text-fig. 281.

Material examined : 1(F), Vadarevu, Chirala, Dist. Prakasam, 21.01.1999, Dr. M.K.Dev Roy, Reg. No. C5251/2; 1(F), Fisheries Harbour, Visakhapatnam, Dist. Visakhapatnam, 09.12. 1999, J. Sarkar, Reg. No. C 5257/2.

Measurement : W= 24.55 F= 7.45 L= 20.3

Diagnosis : Carapace square-cut, depressed; regions not defined; surface smooth bearing some prominent red squarish and circular spots. Antero-lateral margins cut into two teeth behind the outer orbital angle – first tooth broad, blunt; second one sharp, prominent. Front conspicuous, slightly emarginated at the middle, free edges grooved longitudinally. Chelipeds subequal, smooth; inner border of arm with two tubercles, distal one spiniform; palm compressed, upper border of palm much shorter than dactylus, fingers pointed and crossing each other, their cutting edges strongly dentate. Legs thin, carpus and propodus with few hairs, dactylus well plumed, terminal joints of last pair compressed but not so subfoliaceous as in the preceeding species.

Type locality : Andaman Sea, Station 56, off west coast of Andaman between North and South Sentinel Islands, 240-220 fathoms (436.8 – 400.4 m) (Wood-Mason, 1891).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Prakasam, Visakhapatnam. West coast – Kerala : Travancore (430 fathoms = 782.6 m.). Andaman Islands (220 – 290 fathoms = 400.4 – 527.8 m.); Great Nicobar.

Elsewhere : China and Japan.

Remarks : Alcock (1900) and Sakai (1976) mentioned the presence of one spine at the inner angle of wrist of chelipeds. But in addition to this, the specimens present in our collection contain, another spine at the outer corner also.

This is a deep water species having been recorded from depths varying from 220-430 fathoms (= 400.4 782.6 m). Compared to the preceeding species, this crab is rare.

Wood-Mason (1891) dealt this crab under the family Cancridae and had referred it under the genus *Nectopanope* "provisionally" But at present, it is placed under the family Goneplacidae (Sakai, 1976). The same is maintained in the present paper too.

Family **XANTHIDAE** MacLeay, 1838

1838. Xanthidae MacLeay, *Entom. Useful Compend.* : 59 [Name No. 73 on Official List; therein dated from Dana, 1851, in error].

1841. Trichidea de Haan, In : Siebold, *Fauna japon. (Crust.)* : 109.

1898. Zozymoida Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 77, 94

1862. Liagorides A. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 4, **18** : 41

1898. Carpilioida, Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 77

1898. Euxanthoida Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 77, 109

1898. Xanthoida Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 77, 112

1898. Halimedoida Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 78, 134

1898. Galenoida Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 77, 112

1898. Chlorodioida Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 78, 159.

1898. Cymoida Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 78, 172.

1898. Menippioida Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 176, 177.

1898. Ozioida Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 176, 181.

1898. Ruppellioida Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 176, 186.

1898. Pilumnoida Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 177, 190.

1898. Eriphioida Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 177, 213.

1898. Trapezioida Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 177, 217.

1898. Domecioida Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 177, 229.

Diagnosis : Carapace transversely oval, hexagonal or subquadrate, often subcircular, usually broader than long. Front broad or broadish but never rostrum-like or acute. Antero-lateral borders usually arched with lobes, teeth or spines. Antennules transversely or obliquely folded, antennary flagella short and slender. Anterior margin of buccal cavity very distinct, not covered by the external maxillipeds. Chelipeds symmetrical or asymmetrical. Leg joints adapted for walking. Male abdomen five-jointed.

Type genus : *Xantho* Leach, 1814.

Remarks : There is much controversy regarding the taxonomic arrangement in this family

as discussed earlier in details by Dev Roy and Das (2000). The family is currently divided into 12 subfamilies namely, (i) Xanthinae MacLeay,1838, (ii) Trichiinae de Haan, 1839, (iii) Polydectinae Dana, 1851, (iv) Etisinae Ortmann, 1893, (v) Zosiminae Alcock, 1898, (vi) Euxanthinae Alcock, 1898, (vii) Actaeinae Alcock, 1898, (viii) Cymoinae Alcock, 1898, (ix) Zalasiinae Serène, 1968, (x) Liomerinae Sakai, 1976 (xi) Kraussiinae Ng, 1993 and (xii) Antrocarcininae Ng and Chia, 1994 (Davies, personal communication, 2002).

The present collection from Andhra Pradesh contains representatives of three subfamilies namely, Xanthinae, Trichiinae and Etisinae.

Key to subfamilies of the family XANTHIDAE

1. Basal segment of antenna with an external antero-lateral lobe occupying the orbital hiatus, antennal flagellum excluded from the orbit ..... ETISINAE

   Basal segment of antenna without an antero-external lobe, antennal flagellum included in the orbit 2

2. Surface of carapace granular, tuberculate or spinose, antero-lateral border cut into three teeth (excluding the outer orbital angle) or granular or spinose lobes, sternite 4 of sternal plastron not much prominent ..... TRICHIINAE

   Surface of carapace smooth or granular, antero-lateral teeth four (excluding the outer orbital angle), slightly projecting or obliterated but often more and may be as many as ten teeth, sternite 4 very large and prominent ..... XANTHINAE

Subfamily TRICHIINAE de Haan, 1841

1841. Trichidea de Haan, In : Siebold, *Fauna japon. (Crust.)* : 109

1899. Trichiinae, Alock, *J. Asiat. Soc. Bengal,* **68**(2) : 5, 96.

1984. Trichiinae, Serène, *Faune Tropicale,* **24** : 35.

Diagnosis : Carapace more xanthoid, broader than long; dorsally convex, only partly flattened and covered with numerous setae, regions delineated or indicated. Antero-lateral margins usually cut into lobes or teeth, last one often continued on to the branchial region by a transverse crest. Postero-lateral margins markedly separated from the antero-laterals. Chelipeds subequal, similar; fingers thin, acute and cross at their extremities, a strong cutting submedian tooth on the fixed finger.

Remarks : The subfamily Trichiinae consists of three genera namely, *Trichia* de Haan,1841, *Banareia*, A. Milne Edwards, 1869 and *Calvactaea* Ward, 1933, of which, only the genus *Banareia* has been recorded from Andhra Pradesh.

Genus ***Banareia*** A. Milne Edwards, 1869

1869. *Banareia* A.Milne Edwards, *Annls. Soc. ent. Fr.*, sér. 4, **9** : 168.

1898. *Banareia*, Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 153.

1989. *Banareia*, Deb, *Rec. Zool. Surv. India, Occ. Paper No.* **117** : 39.

Diagnosis : Carapace broadly oval, convex and covered with thick hairs; lobules perfectly demarcated and studded with closer-set pearly granules beneath the tomentum. A narrow median hiatus left between ischia by the external maxillipeds, somewhat narrowed proximally. Fingers of chelipeds compressed, smooth, glazed and trenchant, cutting edges entire and blade-like at distal half.

Type species : *Banareia armata* A. Milne Edwards, 1869; gender: feminine; name no. 773 on Official List, in Opinion 85, *Bull. zool. Nomencl.*(1955).

Remarks : The genus *Banareia* was dealt under the subfamily Actaeinae by Alcock (1898) and Deb (*op. cit.*) while Sakai (1976) treated it under Zalasiinae. In the present communication, however, it has been treated under Trichiinae following Serène (1984). The genus currently consists of 15 species from the Indo-West Pacific and a single species from the Atlantic Ocean. From India, only three species namely, *Banareia armata* A. Milne Edwards, 1869, *B. banareias* (Rathbun, 1911) and *B. odhneri*, Sakai, 1976 have been recorded (Alcock, *op. cit.*; Deb, *op. cit.*; Dev Roy and Nandi, in press). In Andhra Pradesh, however, it is represented by *B. banareias* only.

57. ***Banareia banareias*** (Rathbun, 1911)

1911. *Actaea banareias* Rathbun, *Trans. Linn. Soc. Lond. Zool.*, sér. 2, **14**(2) : 223, pl. 18, figs. 7, 8.

1968. *Banareia banareias*, Takeda and Miyake, *Biol. Mag. Okinawa*, **5** : 5, pl. 1, Fig. D.

1971. *Banareia banareias* Guinot, *Bull. Mus. nat. Hist. Nat. Paris*, **42**(5) : 1070.

1989. *Banareia banareias*, Deb, Rec. *Zool. Surv. India, Occ. Paper No.* **117** : 42, text-fig. 34.

Diagnosis : Carapace and its appendages almost completely covered by a thick, dark, shaggy coat of soft and long fine hairs; regions and sub-regions distinct but not lobulate, irregularly placed conical granules scattered all over the surface become visible upon denudation of hairs; anterior part of body strongly convex, posterior half flattened. Antero-lateral borders longer than postero-laterals, strongly arched and cut into five low, teeth (including the outer orbital angles), fourth tooth more prominent than others; postero-lateral borders much concave, shorter and bearing tubercles, two of which very prominent. Front narrow, consisting of two deflexed lobes separated from each other by a V – shaped notch medially. Chelipeds subequal, massive, thickly covered with hairs and bristles; all the three margins of arm beaded bearing a conspicuous subdistal tubercle on its upper edge; outer surface of wrist and palm granular; upper and lower margins of palm and fingers also granulate; fingers black, thin, flat and hooked; tips pointed, without much gaping when apposed; a longitudinal groove present near the upper margin of dactylus. Legs short, broad; dactyli long, very slender; margins of leg joints fringed with bristles, upper margin of merus of first three pairs beaded. Male abdomen consisting of seven distinct segments, sternal plates markedly granular.

Type locality : Egmont, lagoon, 6-7 fathoms (= 10.92 - 12.74 m) (Rathbun, 1911).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam.

Elsewhere : Chagos Archipelago, Ryu Kyu Island, Australia, Tonga and Hawaii.

Remarks : Our present study material does not contain this species. However, it has been included on the authority of Late Dr. (Miss) Maya Deb who reported the species from Andhra Pradesh. This crab is so far recorded from the east coast of India only.

Subfamily XANTHINAE MacLeay, 1838

1838. Xanthidae MacLeay, In : Smith, *Illustr. Zool. S. Afr. (Invert.)* : 59

1851. Xanthinae, Dana, *Amer. J. Sci. Art.*, ser. 2, **12** : 124.

1898. Xanthoida (in part), Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 77, 112.

1984. Xanthini, Serène, *Faune Tropicale*, **24** : 172.

Diagnosis : Carapace transversely oval or hexagonal, usually broader than long. Front almost linear or cut into two lobes, without a marginal crest and fissured at the middle. Antero-lateral teeth usually four or more.

Remarks : The subfamily is represented by two genera, *Demania* and *Nectopanope* from Andhra Pradesh.

Key to genera of the subfamily XANTHINAE

Carapace flattened, pentagonal; regions well delimited and subdivided into numerous lobules, branchial part not inflated; front conspicuously bilobed; leg joints (except dactyli) cristiform ..... ***Demania***

Carapace thick, roughly quadrilateral; regions obscurely defined, not divided into lobules, branchial part inflated; front extremely obscurely notched at the middle; leg joints not cristate ..... ***Nectopanope***

Genus *Demania* Laurie, 1906

1815. *Xantho* Leach, *Trans. Linn. Soc. Lond.*, **11** : 320

1861. *Lophoxanthus* A. Milne Edwards, *Miss. Sci. Crust.* : 256.

1906. *Demania* Laurie, *Ceylon Pearl Oyster Fisheries, Supplementary Reports*, **5** : 396.

Diagnosis : Carapace pentagonal, moderately convex from front to back, flattened from side to side, regons well areolated and subdivided into many lobules, surface smooth. Antero-lateral borders blunt, cut into four lobes by shallow grooves, postero-lateral borders straight

and strongly convergent. Front distinctly bilobed, its breadth being about a third the greatest breadth of carapace. Orbits large with three prominent sutures near its outer angle, eyes on short, thick stalks. Antennules folded in a transversely oblique direction. Basal joint of antenna broad, flagellum very much shortened and lodged in the orbital hiatus. No ridges delimiting efferent branchial channels on the endostome. Merus of external maxillipeds pointed anteriorly. Chelipeds equal in both sexes, fingers not hollowed at tips. Legs with the upper border of merus, carpus and propodus and lower margin of propodus carinated. Abdomen consisting of seven separate segments in both sexes.

Key to species of the genus *Demania*

Lobules of carapace, abdominal segments and sternal areas smooth, upper and lower borders of palm of cheliped devoid of hair ..... *D. splendida*

Lobules of carapace, abdominal segments and sternal areas studded with clusters of squamiform granules, upper and lower borders of palm and fingers fringed with hairs ..... *D. toxica*

58. ***Demania splendida*** Laurie, 1906
(Pl. 2, Fig. 8)

1906. *Demania splendida* Laurie, *Ceylon Pearl Oyster Fisheries, Supplementary Reports*, **5** : 397, pl. 1, fig. 8 and pl. 2, fig. 1.

1989. *Demania splendida*, Davie, *Mem. Qd. Mus.*, **27**(2) : 123, figs. 1, 2 and 3a-c.

Material examined : 1 (M), Station No. 18, Lawson's Bay, Visakhapatnam, Dist. Visakhapatnam, 14.09.1995, Dr. T. Roy, Reg. No. C 5252/2.

Measurement : W = 25.3 F = 7.2 L = 20.15

Diagnosis : Carapace smooth, somewhat pentagonal in shape, convex from front to back and also from side to side, regions well outlined and broken into lobules by deep grooves especially at the posterior half; protogastric, mesogastric and cardiac areas very distinct. Front projected considerably beyond the orbitals, deeply notched, forming two conspicuous bluntly pointed lobes; outer angle of the larger lobe produced as distinct, blunt forwardly directed tooth. Antero-lateral borders rounded, cut into four lobes by shallow grooves; postero-laterals straight and strongly convergent. Chelipeds symmetrical; outer surfaces of wrist and palm and upper and lower surfaces of arm polished with transverse squamiform sculpture resembling reminiscent of brain convolutions, inner surfaces smooth; inner border of arm adorned with 3-4 blunt teeth; inner corner of wrist produced into a short blunt tooth followed by a denticle just beneath it at the inner surface; upper border of palm armed with 4-5 blunt tubercles; fingers stout, dactylus meeting immobile fingers without gape, their tips pointed, whitish and cutting edges toothed throughout. Leg joints compressed, foliaceous; upper borders of merus, carpus and propodus carinated; ventral border of merus with two ridges, anterior ridge more prominent running the entire length of the segment especially in the fourth leg; dactyls more

or less flattened antero-posteriorly bearing a longitudinal groove both at its outer and inner surfaces, upper and lower borders fringed with dense hairs. Male abdomen consisting of seven distinct segments, sixth segment almost twice the length of any of its preceeding five, last segment also smaller than the sixth.

Type locality : Trincomalee, Sri Lanka (Laurie, 1906).

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam (present record); Tamil Nadu : Gulf of Mannar.

Elsewhere : Madagascar, Sri Lanka, East and West Australia.

Remarks : This species is a new record to Andhra Pradesh. So far, the crab is known from the east coast only.

59. *Demania toxica* Garth, 1971

1971. *Demania toxica* Garth, *Micronesica*, 7(1-2) : 179. pl.1, figs. 1-6.

Material examined : 1 (F), Station No.3, Bheemunipatnam coast, Dist. Visakhapatnam, 08.07.1963, Dr. A. Daniel, Reg. No. C 5320/2.

Measurement : W= 45.4 F= 11.05 L= 37.3

Diagnosis : Carapace roughly pentagonal in shape, convex antero-posteriorly and also from side to side, regional convexities marked by deep grooves, regional areoles covered with numerous squamiform tubercles, posterior two-fifth roughened with larger tubercles. Antero-lateral sides rounded with thickened edges and cut into four lobes by deep grooves, of which, third lobe broadest and most prominent; fourth lobe smallest but distinct, little acuminate but never dentiform and not projecting beyond the arc of antero-lateral margin; postero-lateral margin straight, granular; posterior margin beaded and slightly wavy. Front angularly produced, bilobed; lobes concave and sloping obliquely. Third maxilliped finely tuberculate, ischium grooved, merus subquadrate and slightly produced at the outer angle. Chelipeds massive, equal; upper, lower and outer surfaces of arm, wrist and palm roughened with squamate tubercles interspersed with longer setae; upper edge of palm armed with five broad, conical teeth, of which, third tooth largest; fingers broad, ridged, grooved and basally tuberculate, tips pointed and crossing each other, their opposed margins strongly dentate and meeting throughout their lengths. Leg joints compressed except dactylus, their upper and lower edges sharply crested and outer surfaces roughened with tubercles; upper border of merii produced into a blunt spine; dactyls long, conical and covered with an upper and lower band of thick brownish fur. Female segments consisting of seven distinct segments, all the segments bearing granular ridges at the middle, sixth segment broader than long, sternum tuberculate.

Type locality : Philippine Islands (Garth, 1971).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam (present record).

Elsewhere : Philippine Islands.

Remarks : This species of crab is a new record to India. At present, it is known only from the east coast.

Genus *Nectopanope* Wood-Mason, 1891

1891. *Nectopanope* Wood-Mason, *Ann. Mag. nat. Hist.*, ser. 6, **7** : 261

1898. *Nectopanope*, Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 212

2001. *Nectopanope*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 4.

Diagnosis : Carapace broad, smooth and convex from front to back; branchial regions very much inflated, other regions not well defined. First antero-lateral tooth cconfluent with the outer orbital angle. Front projecting a little beyond the supra-orbital angle and sharply cut off from it by an angular notch on each side. Antennules transversely folded; basal antennal joint extremely short, flagellum considerably longer than major diameter of the orbit. Chelipeds equal in females, fingers compressed and pointed. Legs long, slender; propodus and dactylus of last pair markedly compressed and slightly broadened.

Type species : *Nectopanope rhodobaphes* Wood-Mason, 1891.

Remarks : This genus was erected by Wood-Mason in 1891 describing two new species, *Nectopanope rhodobaphes* and *N. longipes*. The last named species is, however, transferred to the family Goneplacidae under the genus *Carcinoplax*.

60. *Nectopanope rhodopbaphes* Wood-Mason, 1891

1891. *Nectopanope rhodobaphes* Wood-Mason, *Ann. Mag. nat. Hist.*, ser. 6, **7** : 261.

1898. *Nectopanope rhodobaphes*, *J. Asiat. Soc. Bengal*, **67**(2) : 213.

2001. *Nectopanope rhodobaphes*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 45.

Material examined : 1(F), Bay of Bengal, Marine Survey, Reg. No. 6194/9.

Measurement : W = 25.95 F = 8.9 L = 21.3

Diagnosis : Carapace much broader than long, smooth and glabrous; regions well demarcated, branchial region tumid, separated from the gastric by a V-shaped white mark, hepatic area low. Front obscurely grooved at the middle with a straight margin. Antero-lateral borders much shorter than postero-laterals and cut into three teeth – first tooth broad and rounded lying in contact with the orbit; second one also broad but low and squarish; last tooth produced into a short, acute spine. Cheliped smooth, massive, subequal and long; inner

corner of arm with a short acute spine at its distal end; wrist smooth, subquadrate with a spinule at its inner angle; palm much shorter than the fingers, nearly half of dactylus, upper margin of propodous subcarinate, lower margin strongly ridged on the outer sutface; fingers hooked, pointed and crossing each other, their cutting edges armed with strong teeth, fixed finger very broad. Legs thin, first two pair sub-equal, third pair slightly shorter than the preceeding pair; first three pair not much shorter than chelipeds with the curved meropodites and long compressed-styliform dactylus; dactylus grooved on each side and fringed with setae on upper and lower margins, those on the last pair being longer especially ventrally. Male abdomen consisting of seven distinct segments, sixth segment longer than broad, in female all the seven segments free, fifth segment longest, sixth segment longer than broad.

Type locality : Indian Ocean (Wood-Mason, 1891).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Godavari coast. West coast – Kerala : Calicut.

Remarks : Only a single specimen from Godavari coast is available in the National Zoological Collection of Zoological Survey of India and reported earlier by Dev Roy and Bhadra (2001) under the family Pilumnidae inadvertently. It is worth mentioning that this deep water species has not been collected from Indian waters during the last 114 years.

Subfamily ETISINAE Ortmann, 1893

1893. Etisinae Ortmann, *Zool. Jb. (Syst.)*, **7** (2) : 429, 470.

1984. Etisinae, Serène, *Faune Tropicale*, **24** : 217.

Diagnosis : Carapace smooth or finely granular, regions more or less delineated and projecting, but always indicated, antero-lateral teeth 4 – 8 with acute or subacute apices. Front bilobed or quadrilobed, straight and generally projecting with a markedly median fissure and a large lateral sinus separating it from the supra-orbital angles. Basal antennal segment with an external antero-lateral lobe occupying the orbital hiatus; antennal flagellum excluded from the orbit.

Remarks : The subfamily contains two genera, *Etisus* H. Milne Edwards, 1834 and *Paraetisus* Ward, 1933. Only the first one is represented in the present collection.

Genus *Etisus* H. Milne Edwards, 1834

1834. *Etisus* H. Milne Edwards, *Hist. Nat. Crust.*, **1** : 410

1852. *Etisodes* Dana, *Proc. Acad. nat. Sci. Philad*, **6** : 77 and *U. S. Explor. Exped. Crust.* **13**(1) : 184.

1898. *Etisus*, Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 128.

1984. *Etisus*, Serène, *Faune Tropicale*, **24** : 218.

Diagnosis : Carapace broad, thick, regions moderately well marked. Front narrow, laminar, separated from supra-orbital angles by a deep notch and splitted at its middle by a suture. Antero-lateral borders cut into 4 – 8 lobes or spiniform projections. Orbital margin with three sutures, the tooth at inner corner of lower border of orbit very prominent. Basal joint of antennae reaching up to the front, its outer angle produced, flagellum excluded from the orbit either by the produced lobe of basal joint or by the meeting of upper and lower inner orbital margins. Outer border of merus of third maxillipeds oblique. Chelipeds massive, slightly unequal in male; fingers stout, strongly curved, meeting at tip. Male abdomen with 3 – 5 segments fused.

Remarks : The genus *Etisus* contains 20 species (Takeda and Miyake, 1968; Crosnier, 1987; Deb, 1992) from the Indo-Pacific waters. Only 6 species belonging to this genus have been reported from India.

The present collection constitutes its first record from Andhra Pradesh.

61. ***Etisus*** sp.

Material examined : 2(M), Waltair coast, Dist. Visakhapatnam, 08.07.1963, Dr. A. Daniel

Measurement : W = 44.15 F = 7.85 L = 27.95

Remarks : For determining its species status more critical examination of specimens and literature survey are required. The detailed account of this species will be published Elsewhere.

INCERTAE SEDIS

Genus ***Liagore*** de Haan, 1833

1833. *Liagore* de Haan, *Fauna japon. (Crust.)* : 19.

1898. *Liagore*, Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 93.

1976. *Liagore*, Sakai, *Crabs of Japan and the Adjacent Seas* : 389.

Diagnosis : Carapace more or less quadrilateral, strongly convex from front to back, less so from side to side; surface smooth, regions not defined. Front broadly bilobed, slightly deflexed. Antero-lateral margins moderately arched, entire or notched. Orbital margin thin, entire; outer corner slightly thickened. Eye-stalks very short. Basal antennal joint very short and broad; flagellum lodged in the orbital hiatus. Antennules almost transversely folded. Chelipeds robust, equal in both sexes, fingers pointed. Legs subcylindrical. Male abdomen five-jointed, third to fifth segments fused; female abdomen of seven separate segments.

Remarks : The genus *Liagore* de Haan contains two species namely, *Liagore rubromaculata* de Haan and *L. erythematica* Guinot. The former is Indo-Pacific in distribution while the latter is so far recorded from the Indian Ocean only.

62. *Liagore erythematica* Guinot, 1971
(Pl. 4, Fig. 7)

1923. *Liagore rubromaculata*, Kemp, (nec de Haan, 1835), *Rec. Indian Mus.*, **25**(4) : 408, pl. 10. fig. 2.

1935. *Liagore rubromaculata*, Chopra, *Rec. Indian Mus.*, **37**(4) : 508, fig. 16.

1971. *Liagore erythematica* Guinot, *Bull. Mus. natn. Hist. nat. Paris*, sér. 2, **42**(5) : 1091, figs. 1, 3.

1998. *Liagore rubromaculata*, Deb, *Zool. Surv. India, State Fauna Series* **3** : *Fauna of West Bengal, Part* 10 : 371.

Material examined : 13(M), 1(F), Ongole, Dist. Prakasam, 20.01.1999, Dr. M. K. Dev Roy, Reg. No. C5261/2; 2(M), Fishing Harbour, Visakhapatnam, Dist. Visakhapatnam, 09.12.1999, J. Sarkar, Reg. No. C5259/2.

Measurement : W =	43.05	F =	11.4	L =	30.2
	34.25		9.4		23.7

Diagnosis : Carapace transversely oval to quadrilateral in outline, thick, strongly convex fore and aft and also from side to side; surface smooth, pitted and granular when observed under the lens. Antero-lateral margin faintly divided into four blunt lobes – first two lobes almost obsolete; last two prominent and very close to each other. Front broad, faintly bilobed, outer angle of each of which prominent and produced into a pimple-like thickening, separated from the supra-orbital margin by a shallow groove. Chelipeds smooth, equal and polished; upper border of arm with 3 - 4 blunt tubercles, distal two much larger; wrist also bearing blunt tubercle on its outer and inner angles; fingers long, hooked, and pointed at tips, their cutting edges dentate but those of the fixed finger much broader and stronger than the dactylus. Legs long, cylindrical, smooth and polished; dactyli long, setose. Male abdomen consisting of seven segments, 3 - 5 segments fused; female abdomen made up of seven separate segments with the sides fringed with hairs, last segment broad.

Type locality : Calcutta, India, Bay of Bengal (Kemp, 1923).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Prakasam, Visakhapatnam. West Bengal : Calcutta (= Kolkata), Sandheads.

Elsewhere : Persian Gulf and Sri Lanka.

Remarks : Guinot (1971) has pointed out the differences between the two species of the genus namely, *L. erythematica* and *L. rubromaculata* and opined that the Indian specis was referable to the former. In the light of observations made by her, the present specimens were re-examined and all were found to belong to the single species, *L. erythematica*. The species closely resembles *Liagore rubromaculata* from which it can be differentiated by the following points: antero-lateral margin entire and rounded in *L. rubromaculata* versus four lobes in *L. erythematica*, chelae and walking legs slenderer in *L erythematica*. Besides, they also differed

in colouration. (Guinot, personal communication, 2002; Holthuis, personal communication, 2002).

Family PILUMNIDAE Samouelle,1819

1819. Pilumnidae Samouelle, *Entom. Useful Compend.* : 86.

1978. Pilumnidae, Guinot, *Bull. Biol. Fr. Belg. (N.S.)*, **112**(3) : 274.

1984. Pilumnidae, Serène, *Faune Tropicale*, **24** : 11.

Diagnosis : Carapace thin or thick, inflated or not, surface sharply or plainly granular. Antero-lateral borders generally shorter than the postero-laterals and usually armed with spines or teeth. Front bilobed, outer angle of each forming an independent tooth or spine-like lobule, separated from the supraorbital angle by a notch or groove. Basal joint of antenna may or may not be in contact with front. Abdomen elongated and narrow, covering most of sternite 4 and with a locking mechanism. Genital openings coxal or coxo-sternal.

Type genus : *Pilumnus* Leach, 1815

Remarks : Members of crabs belonging to this family commonly referred to as "hairy crabs" are extremely common in the Indo-Pacific. Pilumnids constitute one of the largest family in the superfamily Xanthoidea containing more than 250 species accommodated in 30 genera (Ng. 1987). The family is now splitted into 10 subfamilies namely, Pilumninae Samouelle, 1819, Actumninae Dana, 1851, Eumedoninae Dana, 1852, Rhizopinae Stimpson, 1858, Typhlocarcinopsinae Stimpson,1858, Galeninae Alcock, 1898, Halimedinae Alcock,1898, Ceratocarcininae Stevcic, Gore and Castro,1988, Calmaniini Stevcic, 1991 and Tanaocheleinae Ng and Clark, 2000 (Davies, Personal communication, July, 2002). Among these, only three subfamilies namely, Rhizopinae, Pilumninae and Galeninae comprising of five genera and seven species have been recorded from Andhra Pradesh.

Key to subfamilies of the family PILUMNIDAE

1. Antero-lateral corners of carapace rounded, eye-stalks immovable with the cornea minute or obsolete ..... RHIZOPINAE

   Antero-lateral corners of carapace not rounded, eye-stalks movable, cornea well developed 2

2. Carapace with the regions well defined and areolated ..... PILUMNINAE

   Regions of carapace defined though somewhat vaguely ..... GALENINAE

Subfamily GALENINAE Alcock, 1898

1898. Galenoida Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 77 (corrected to Galeninae by Alcock, 1898 : 136).

1976. Galenoida, Sakai, *Crabs of Japan and the Adjacent Seas* : 385, 440.

Diagnosis : Carapace broad, pentagonal, approaching the quadrilateral. Antero-lateral border hardly longer than the postero-lateral. Basal antennal joint not meeting the front. Male abdomen of seven separate segments.

Remarks : The subfamily is represented by a single genus *Galene*.

Genus *Galene* de Haan, 1833

1833. *Galene* de Haan, In : Seibold's, *Fauna japon. (Crust.)* : 19.

1898. *Galene*, Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 136.

1976. *Galene*, Sakai, *Crabs of Japan and the Adjacent Seas* : 441.

Diagnosis : Carapace roughly quadrilateral, strongly convex from front to back, less so from side to side, surface granular in parts or nearly smooth. Front bilobed or quadridentate, obliquely deflexed. Antero-lateral borders moderately curved, indistinctly four lobed, last 2 or 3 lobes spine-like. Orbital margin with three distinct grooves in the vicinity of its outer angle. Eye-stalk thick, of moderate length. Antennules transversely folded. Basal joint of antenna broad, extremely short, not reaching up to the front, flagellum lodged in the broad orbital hiatus. Anterior margin of third maxiliped slightly oblique. No ridges delimiting efferent branchial canals on the endostome. Chelipeds unequal and massive in both sexes, fingers pointed. Legs long, stout. Male abdomen of seven distinct segments.

Type species: *Cancer bispinosus* Herbst, 1783.

Remarks: The genus contains two species namely, *Galene bispinosa* (Herbst, 1783) and *G. granulata* (Miers, 1884). Both are represented in the present collection.

Key to species of the genus *Galene*

Entire surface of carapace and chelipeds profusely granular, antero-lateral teeth three ..... *Galene granulata*

Only the borders of carapace, outer surface of wrist and proximal parts of palm sparsely granular, antero-lateral teeth two ..... *Galene bispinosa*

63. *Galene bispinosa* (Herbst, 1783)
(Pl. 2, Fig. 9)

1783. *Cancer bispinosus* Herbst, *Versuch. Naturgesch. Krabben Krebse*, **1**(2) : 144, pl. 6, fig. 45.

1898. *Galene bispinosa*, Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 136.

1998. *Galene bispinosa*, Deb, *Zool. Surv. India State Fauna Series* **3** : *Fauna of West Bengal, Part* 10 : 371.

Material examined : 1(M), Thimavaram, Kakinada, Dist. East Godavari, 18.07. 1973, Dr. A. Daniel, Reg. No. C 1179/2; 1(M), Mungergudi, Machilipatnam, Dist. Krishna, 05.09.1995, Dr. T. Roy, Reg. No. C 5245/2; 2(M), Krishnapatnam, Dist. Nellore, 15.01.1999, Dr. M. K.

Dev Roy, Reg. No. C 5240/2; 1(F), Ongole Sea Beach, Dist. Prakasam, 20.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5244/2; 2(F), Vadarevu, Chirala, Dist. Prakasam, 21.01.1999, Reg. No. C 5241/2; 2(M), 1(F), Nizampatnam Harbour, Dist. Guntur, 23.01.1999, Reg. No. C 5243/2; 1(M), 1(F), Fishing Harbour, Kakinada, Dist. East Godavari, 02.02.1999, Dr. M. K. Dev Roy, Reg. No. C 5244/2.

Measurement : W = 68.85	F = 12.55	L = 54.0
46.1	9.8	33.15

Diagnosis : Carapace broader than long, nearly pentagonal in outline, strongly convex from front to back, less so from side to side; surface smooth for the most part, rough near the borders especially the postero-lateral borders; regions indistinct, only cardiac and intestinal areas recognizable marked by strong grooves in large specimens. Front bilobed, outer and inner angles of each of which equally prominent giving it the appearance of 4 - dentate. Antero-lateral margins quadrilobate – first two obsolete, last two marked by spine like teeth; posterior margin about half of the greatest breadth of carapace. Chelipeds massive, unequal; upper border of arm with two strong teeth at its distal end; inner corner of wrist adorned with two obtuse teeth, outer corner with a long stout teeth; lower outer part covered with enlarged granules; upper border of palm shorter than dactylus, outer surface studded with tubercles proximally; fingers pointed, crossing each other, their opposed margins bearing strong, molariform teeth. Legs long, stout; upper border of merii spinulate; those of carpus, propodus and dactylus and lower border of propodus and dactylus plumose.

Type locality: Unknown.

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : East Godavari, Guntur, Krishna, Nellore, Prakasam, Visakhapatnam; Orissa : Gopalpur coast; Tamil Nadu : Gulf of Mannar, Parangipettai coast; West Bengal : Sandheads, Mouth of River Hugli. West coast – Bombay (= Mumbai).

Elsewhere : Tenasserim, Hong Kong, South China, Taiwan and Australia.

Remarks : Alcock recorded this species from Visakhapatnam as early in 1898. The present field study shows this crab to be very common in the trawl catches among the coastal districts of the state. The width and length of the single ovigerous female present in the collection are 49.25 and 36.6 mm respectively.

64. ***Galene granulata*** Miers, 1884

1884. *Galene granulata* Miers, *H. M. S. "Alert" Crustacea* : 208, pl. 20, fig. a.

1935. *Galene granulata*, Chopra, *Rec. Indian Mus.*, **37**(4) : 510, pl. 9, fig. 7.

1998. *Galene granulata*, Deb, *Zool. Surv. India, State Fauna Series* **3** : *Fauna of West Bengal, Part* 10 : 371.

Material examined : 1(M), Mungergudi, Machilipatnam, Dist. Krishna, 07.09.1995, Dr. T. Roy, Reg. No. C 5282/2.

Measurement : W = 19.7 F = 4.7 L = 14.35

Diagnosis : Carapace strongly convex from front to back, less so from side to side, surface punctate and finely granulate with long white scattered hairs, granules of the lateral margins and those of the posterior half being much larger; regions well-marked; gastric, cardiac and intestinal areas distinct. Antero-lateral teeth three - first tooth low, blunt and the smallest; second broad, high with rounded tip; third tooth acuminate and directed obliquely upwards. Front cut into two distinct lobes by a broad deep notch, margins of each of which straight and granulate; both outer and inner corners of lobe produced into blunt teeth, of which, inner one much larger than the outer one; two shallow longitudinal grooves run on each side of the frontal region, another transverse groove behind each orbital margin. Chelipeds unequal; outer surface of arm and wrist granulate; inner corner of wrist bidentate placed one above the other in larger cheliped but with a single spine in smaller cheliped; of the two teeth, upper one short, blunt and low; lower one much larger; outer corner with a row of spines in both the chelipeds, spines gradually decreasing in size, at least three of them much enlarged, among these first one largest and most prominent; outer surface of palm roughened due to the presence of granules and tubercles; palm of larger cheliped crenated with four spines, crenulations varying from 4-8 in smaller cheliped; upper border of dactylus tuberculated proximally, tubercles numbering from 4-8; dactylus with long, fine golden hairs proximally; fingers broad at base and pointed at tips; their apposed margins strongly dentate, fixed finger of larger cheliped with a strong molariform tooth at its base. Leg joints long, slender; merii smooth; both the margins of propodus and dactylus and upper margin of carpus densely fringed with long hairs. Male abdomen consisting of seven distinct segments, sixth segment squarish, seventh much longer.

Type locality : Port Darwin (Miers, 1884).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Krishna; West Bengal : Sandheads at mouth of River Hugli.

Elsewhere : Singapore and Australia.

Remarks : Clusters of pearly granules may be seen on carapace near the lateral borders of its posterior half.

This species of crab is reported for the first time from Andhra Pradesh. It appears to be a rare species.

Subfamily PILUMNINAE Samouelle, 1819

1819. Pilumnidae Samouelle, *Entom. Useful Compend.* : 86.

1898. Pilumninae, Alcock, *J. Asiat. Soc. Bengal,* **67**(2) : 176, 190.

1984. Pilumninae, Serène, *Faune Tropicale,* **24** : 11, 15.

2000. Pilumninae, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 62 (therein author of the subfamily attributed to Ortmann, in error).

2001. Pilumninae, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 45 (therein author attributed to Alcock, in error).

Diagnosis : Carapace generally granular, sometimes spinose, covered with setae on most of its surface and near the antero-lateral margins. Regions somewhat distinct. Antero lateral borders cut into three prominent teeth behind the outer orbital angle. Chelipeds dissimilar, strongly granular or even spinose and at least partly covered with setae.

Remarks : It is represented by a single genus *Eurycarcinus.*

Genus ***Eurycarcinus*** A. Milne Edwards, 1867

1867. *Eurycarcinus* A. Milne Edwards, *Annls. Soc. ent. Fr.,* sér. 4, **7** : 276.

1898. *Eurycarcinus,* Alcock, *J. Asiat. Soc. Bengal,* **67**(2) : 209.

Diagnosis : Carapace transversely oval, convex, without distinction of regions. Front moderately broad, straight and squarish. Antero-lateral margins with three notches. Orbits shallow, upper margin entire, a gap at lower margin below the outer angle. Basal joint of antenna short, not reaching up to the front; flagellum long, standing in the orbital hiatus. Antennules transversely folded. Anterior margin of third maxilliped not notched. Buccal cavern wider anteriorly than posteriorly. Chelipeds unequal in both sexes, finger tips pointed, not hollowed. Male abdomen seven jointed.

Remarks : Alcock (*op. cit.*) recorded three species namely, *Eurycarcinus orientalis* A. Milne Edwards, 1867, *E. maculatus* (A. Milne Edwards, 1867) and *E. grandidieri* A. Milne Edwards, 1867 under the genus *Eurycarcinus* from Indian coasts. Subsequently, Deb (1998) added another new species, *E. bengalensis* from Sundarbans, West Bengal. Among these, *E. maculatus* is presently synonymised with the species *Heteropanope glabra* Stimpson. Only two species as follows have been recorded from the Andhra coast.

Key to species of the genus *Eurycarcinus*

Fixed finger of larger cheliped with an enlarged tooth at its base, infra-orbital border finely granulate ..... *Eurycarcinus orientalis*

Fixed finger without such enlarged tooth at its base, infra-orbital border obscurely denticulate ..... *Eurycarcinus grandidieri*

65. ***Eurycarcinus orientalis*** A. Milne Edwards, 1867

1867. *Eurycarcinus orientalis* A. Milne Edwards, *Annls. Soc. ent. Fr.,* sér. 4, **7** : 277.

1898. *Eurycarcinus orientalis*, Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 210.

1957a. *Eurycarcinus orientalis*, Chhapgar, *J. Bombay nat. Hist. Soc.*, **54**(2) : 436, pl. 11, figs. d-f.

Material examined : 2(M), 3(F), Vizagapatnam Harbour, Dist. Visakhapatnam, January 1929, H. S. Rao, Reg. No. C 850/2; 1(M), Station-4, Nizampatnam, Dist. Guntur, 14.12.1968, Dr. N. V. Subba Rao, Reg. No. C 853/2.

Measurement : W = 11.95 F = 5.75 L = 8.85

11.95 5.2 9.3

Diagnosis : Carapace broad, transversely oval, convex from front to back and from side to side, surface smooth but finely granulate under the lens. Front straight, squarish, obscurely sinuous at the middle. Antero-lateral border much longer than the postero-lateral and cut into three notches – first lobe low, least prominent, continuous with external orbital angle and gently rounded; second broadly truncate but more prominent than the first, third and fourth lobes anteriorly acuminate; last lobe smallest and directed forwards. Sub-orbital border finely denticulate. Chelipeds assymetrical, outer surfaces of wrist and palm granular; immobile finger armed with a strong molariform tooth at its base.

Type locality : Bombay, India (A. Milne Edwards, 1867).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Guntur, Visakhapatnam. West coast – Kerala : Travancore coast; Maharashtra : Bombay (= Mumbai), Kolak, Umarsadi. Andaman Islands.

Elsewhere : Pakistan and Thailand.

Remarks : This species occurs in both the coasts of India including the Andaman Islands.

The smallest and largest ovigerous females measured during this study were 9.45 and 11.95 mm. respectively. This crab is a continuous breeder at Visakhapatnam-Waltair coast (Rajabai, 1975).

66. *Eurycarcinus grandidieri* A. Milne Edwards, 1867

1867. *Eurycarcinus grandidieri* A. Milne Edwards, *Annls. Soc. ent. Fr.*, sér. 4, **7** : 277.

1898. *Eurycarcinus grandidieri*, Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 211.

Material examined : 2(M), Station-21, Waltair, Dist. Visakhapatnam, 26.01.1921, S. Kemp and B. Chopra, Reg. No. C 839/2.

Measurement : W = 15.8 F = 4.8 L = 10.85

Diagnosis : Carapace broad, strongly convex from front to back and also from side to side, surface smooth to the unaided eye, minutely granulate and punctate if observed under the binocular, glabrous but hairy along the antero-lateral margins; regions not defined. Antero-lateral border cut into four lobes by three incisions – first two lobes large, almost of same

size, gently curved and separated by a shallow notch; third lobe smaller than the preceeding two and separated by a deep sulcus; last lobe obtuse, tooth-like, directed antero-laterally, seperated from the third by a deep incision; edges of lobes very much thickened and granulate. Front square-cut and slightly deflexed; its anterior margin nearly straight with a narrow median incision but more marked than the preceeding species. Sub-orbital margin obscurely denticulate. Chelipeds smooth, unequal; inner corner of wrist produced into a blunt tooth; palm compressed, its height exceeding its width; fingers chocolate brown, strongly grooved and crossing each other; dactylus slightly longer than the upper border of palm; immobile finger with two enlarged teeth at its cutting edge. Ambulatory legs hairy along their upper and lower margins, hairs very less on meropodites but much more on the last two joints.

Type locality : "Iile de Zanzibar" (A. Milne Edwards, 1867).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Visakhapatnam. Bay Islands : South Andamans; Nicobars.

Elsewhere : Tanzania.

Remarks : Seperation of third and fourth antero-lateral lobes is often not well marked. This species is recorded for the first time from mainland India.

Subfamily RHIZOPINAE Stimpson, 1858

1858. Rhizopidae Stimpson, *Proc. Acad. nat. Sci. Philad.* : 41.

1898. Rhizopinae, Alcock, *J. Asiat. Soc. Bengal*, **67** (2) : 287, 293, 317, 318.

1976. Rhizopinae, Sakai, *Crabs of Japan and the Adjacent Seas* : 522, 541.

Diagnosis : Antero-lateral corners of carapace cut away and rounded off. Front either square-cut and broad or narrow, almost distinctly bilobed and deflexed. Antennules transversely folded, very often crampled and folded obliquely or sometimes not at all folded in their fossae; antennal flagellum usually short. Eye-stalks often fixed, cornea small or obsolete, infraorbital border running downwards toward the epistome. Buccal cavern squarish, often diminished in breadth anteriorly. External maxillipeds close the buccal cavern completely or with a gap left between them. Epistome either well defined and prominent or ill defined and sunken. Male abdomen not covering all the space between the last pair of legs.

Remarks : The subfamily Rhizopinae has been revised and redefined by Ng (1987). It is now removed from the family Goneplacidae and currently it contains 20 genera, of which, the following three are represented in Andhra Pradesh.

Key to genera of the subfamily RHIZOPINAE

1. Eyes well formed ..... ***Benthopanope***

   Eyes obsolete or nearly so 2

2. Carapace much broader than long, postero-lateral borders parallel ..... ***Typhlocarcinus***

   Carapace just broader than long, postero-lateral borders posteriorly divergent ..... ***Xenophthalmodes***

Genus ***Benthopanope*** Davie, 1989

1898. *Heteropanope*, Alcock, *J. Asiat. Soc. Bengal*, **67(2)** : 207.

1989. *Benthopanope* Davie, *Mem. Qd. Mus.*, **27**(2) : 143.

Diagnosis : Carapace convex along the mid-line, flat from side to side across the branchial regions. Regions strongly defined by granular dorsal crests. Frontal margin protruding with prominent median lobes, almost sinuous laterally with distinct lateral lobules. Antero-lateral margins cut into 4-5 teeth, first lobe often develop a secondary tooth distinct from the exorbital angle. Orbits somewhat kidney-shaped, infraorbital margin with a large triangular tooth at the inner end visible in dorsal view. Eye-stalk thick, short. Basal antennal joint broad, sub-rectangular; flagellum extremely long, extending much beyond the orbitals. Merus of third maxilliped much smaller than ischium. Chelipeds unequal, massive. Legs of moderate length, unarmed; second pair longest, dactyli of about the same length as propodi or slightly longer than propodi, culminating in an acute chitinous tip. Male abdomen consisting of seven separate segments. Sternal plastron with the fused segments 3 - 4 relatively short and broad, sternite 8 visible distinctly laterally beside the male abdomen.

Type species: *Benthopanope estuaries* Davie, 1989; gender : feminine, by designation by Davie, 1989, *Mem. Qd. Mus.*, **27**(2) : 143.

Remarks: The genus *Benthopanope* erected by Davie (1989) differs markedly from the genera *Heteropanope* and *Pilumnopeus* by the strong regional definition of carapace and the unusal shape of the sternal plastron in having sternites 3 – 4 relatively shorter and broader. It differs especially from *Heteropanope* in having sternite 8 visible laterally and in the formation of male abdomen. The genus currently contains six valid species namely, *Benthopanope africanus* (de Man, 1902), *B. estuaries* (Davie, 1989), *B. eucratoides* (Stimpson, 1858), *B. indica* (de Man, 1888), *B. sexangula* (Rathbun, 1909) and *B. pharaonica* (Nobili, 1906). Only one species as follows is represented in the present collection.

67. ***Benthopanope indica*** (de Man, 1888)

1888. *Heteropanope indica* de Man, *J. Linn. Soc. London*, **22** : 53, pl. 3, figs. 1, 2.

1898. *Heteropanope indica*, Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 208.

1989. *Benthopanope indica* Davie, *Mem. Qd. Mus.*, **27**(2) : 144.

1998. *Heteropanope indica*, Deb, *Zool. Surv. India, State Fauna Series* **3** : *Fauna of West Bengal, Part* 10 : 374.

Material examined : 3(M), 7(F), Sekhinetipalli, Dist. East Godavari, 30.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5277/2.

Measurement : W = 18.45 F = 6.2 L = 7.5

15.95 6.95 10.4

Diagnosis : Carapace small, hexagonal, broader than long, slightly convex, surface finely granular bearing a few sparsely distributed short hairs especially near the margins; regions poorly indicated; two short transverse elevated granular ridges present on each side of the epigastric lobe; further two transverse ridges also run on each side of the protogastric lobe, of which, outer ridge about half of the inner ridge; below this another pair of slightly oblique elevated granular line extend near the third and fourth antero-lateral teeth. Front broad, bilobed, outer angle dentiform and well separated from the supra-orbital edges, free frontal edge crenated. Antero-lateral borders deeply cut into four prominent teeth (including the outer orbital angle) - first tooth broad, low, squarish; second tooth also broad but much narrower than the first, high and acuminate; third and fourth triangular but rather acute and directed obliquely forward, third being most prominent; fourth tooth smallest; outer margin of all the teeth crenated. Chelipeds markedly unequal in both sexes but more so in male: in larger cheliped, upper border of arm marked with a strong, broad and curved tooth at its distal end, outer surface finely granular near the upper part but smooth otherwise; inner corner of wrist adorned with a short but strong tooth, outer surface granular; outer surface of palm pitted bearing microscopic granules on the upper part, rest smooth; fingers stout, chocolate brown in colour and meeting at tips, their cutting edges armed with 3 - 4 large teeth; in smaller cheliped, upper margin of palm crenated, outer surface roughened with larger granules, fingers ridged longitudinally. Leg joints hairy, dactylus almost as long as the propodus, culminating in small horny tips; upper and lower border of leg joints and their outer surfaces granulated. Male abdomen consisting of seven distinct segments, penultimate segment sub-quadrate, slightly broader than long.

Type locality : Mergui Archipelago (de Man, 1888).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : East Godavari; Orissa : Chilka Lake; Tamil Nadu : Ennur backwater; West Bengal : Salt Lake. West coast – Karnataka : Murudeswar. Andaman Islands.

Elsewhere : Pakistan, Sri Lanka, Myanmar and Japan.

Remarks : This species is reported for the first time from Andhra Pradesh.

These specimens were collected from intertidal line below boulders.

Genus ***Typhlocarcinus*** Stimpson, 1858

1858. *Typhlocarcinus* Stimpson, *Proc. Acad. nat. Sci. Philad.* : 41.

1900. *Typhlocarinus*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 321.

1976. *Typhlocarcinus*, Sakai, *Crabs of Japan and the Adjacent Seas* : 543.

Diagnosis : Carapace deep, subquadrilateral with the anterior angles rounded off, regions indistinct. Front bilobed. Antero-lateral borders well arched, sometimes emarginated; postero-lateral borders parallel. Orbits small and in usual position, eye-stalk immovable, eyes obsolete or nearly so. Basal joint of antanna short, flagellum lodged in orbital hiatus. Antennules transversely folded. Epistome prominent, external maxillipeds closed by buccal cavern completely or almost fully. Chelipeds unequal or subequal; palm short, deep and compressed. Legs slender, unarmed; third pair longest, dactyli styliform. Abdomen consisting of seven distinct segments in both sexes.

Type species : *Typhlocarcinus nudus* Stimpson, or *Typhlocarcinus villosus* Stimpson, 1858; gender : masculine.

Remarks : This genus is represented by a single species from Andhra Pradesh (present record).

68. *Typhlocarcinus rubidus* Alcock, 1900

1900. *Typhlocarcinus rubidus* Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 323.

Material examined : 2 (M), 1(F), Fishing Harbour, Kakinada, Dist. East Godavari, 12.09.1995, Dr. T. Roy, Reg. No. C 5309/2.

Measurement : W =	13.0	F =	2.7	L =	9.3
	9.75		2.65		7.0

Diagnosis : Carapace deep, subquadrilateral, broader than long with the antero-lateral angles rounded off; surface smooth but granular under the binocular, glabrous excepting a few hairs on the anterior and antero-lateral margins; regions indistinct, epibranchial regions bulging out dorsally. Antero-lateral margins entire, granular. Front bilobed. Buccal cavity square-cut, antero-external angle of merus of outer maxilliped prominent, exognath normal. Chelipeds unequal in both sexes; outer surface of arm, wrist and palm polished, inner angle of wrist produced into a strong tooth; a fine granular line fringed with long hairs running on the upper and lower margins of wrist, palm and fingers, hairs golden yellow in colour; fingers broad, strongly dentate, their tips pointed and crossing each other, dactylus with a strong molariform tooth at its middle. Leg joints slender, unarmed; merus and propodus much elongated; propodus and dactylus thickly fringed with long hairs. Abdomen consisting of seven distinct segments in both sexes, sixth segment almost as long as broad in male, last segment much longer.

Type locality : Bay of Bengal, 25 65 fathoms (= 45.5 118.3 m.) (Alcock, 1900).

Distribution : Bay of Bengal.

India : East coast – Andhra Pradesh : East Godavari.

Remarks : Pigment speck which represents eye is absent in this species.

Alcock (*op. cit.*) described this crab from Bay of Bengal without mentioning its collecting locality. As such, present report of this species constitutes its first record from India vis-a-vis Andhra Pradesh. This crab is restricted to the Bay of Bengal and it appears to be quite common at Kakinada Bay.

Genus ***Xenophthalmodes*** Richters, 1880

1880. *Xenophthalmodes* Richters, In : Möbius, *Meeresf. Maurit.* : 155.

1990. *Xenophthalmodes*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 323.

1950. *Xenophthalmodes*, Barnard, *Ann. S. Afr. Mus.*, **38** : 296.

Diagnosis : Carapace roughly semicircular, widest posteriorly across hind margin. Front moderately broad, bilobed. Orbits small and in usual position. Eye-stalks immovable, very short and stout, cornea obsolete or nearly so. Basal joint of antenna short and lodged in orbital hiatus. Epistome prominent, buccal cavern closed by the external maxilliped completely or almost so. Chelipeds equal or unequal; palm short, deep and flattened. Legs slender, unarmed; dactylus styliform, successively decreasing from second to fifth legs. Abdomen consisting of seven separate segments in both sexes, in male second segment much narrower than first or third.

Remarks : The genus *Xenophthalmodes* currently consists of four species namely, *X. moebii* Richters,1880, *X. dolichophallis* Tesch, 1918, *X. morsei*, Rathbun, 1932 and *X. brachyphallus* Barnard, 1955. Only one species occurs in Indian coasts as follows

69. ***Xenophthalmodes moebii*** Richters, 1880

1880. *Xenophthalmodes moebii* Richters, In : Möbius, *Meeresf. Maurit.* 155, pl. 16, fig. 29 and pl. 17, figs. 1-5.

1900. *Xenophthalmodes moebii*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 324.

1950. *Xenophthalmodes moebii*, Barnard, *Ann. S. Afr. Mus.*, **38** : 297, fig. 56 a-c.

Material examined : 3(M), 2(F), Waltair coast, Dist. Visakhapatnam, Reg. No. C5308/2

Measurement : W = 12.1	F = 2.5	L = 9.6
9.7	1.9	7.9

Diagnosis : Carapace subsemicircular, widest posteriorly across the hind margin, deep and convex from front to back; surface smooth excepting two semilunar impressions, finely granulate and sparsely hairy especially near antero-lateral and lateral margins. Front narrow but prominent, cut into two lobes by a V-shaped groove medially. Orbits oval, eye-stalks immovable, eyes obsolete. Antero-external angle of merus of third maxilliped rounded. Chelipeds unequal, inner angle of wrist angular; upper border of palm sharp, granulate and cristiform; lower border with a low, granular crest; palm high about half the length of dactylus, its outer and inner surfaces smooth and polished; fingers hook-like near tips, dactylus

armed with two strong teeth of almost of same size proximally, immobile finger also with two strong teeth but the distal tooth much larger than the proximal one. Leg joints unarmed, thickly fringed with long silky hairs; dactylus styliform. Abdomen in both sexes consisting of seven distinct segments. Sternites between chelipeds finely granular along border of median groove. First male pleopod straight, slender, extremely long extending much beyond seventh abdominal segment, reaching almost up to the buccal cavity.

Type locality: Black River, Mauritius (Richters, 1880).

Distribution: Indian Ocean.

India : East coast – Andhra Pradesh : Visakhapatnam; Coromandel coast. West coast – Malabars. Andamans.

Elsewhere : South Africa, Red Sea, Persian Gulf, Mauritius and Gulf of Martaban.

Remarks : This species is reported for the first time from Andhra Pradesh.

Family ERIPHIIDAE MacLeay, 1838

1838. Eriphidae MacLeay, In : Smith's *Illustr. Zool. S. Afr. (Invert.)* : 59, 60 [corrected to Eriphiidae by Stimpson, 1870 in *Bull. Mus. Comp. Zool., Harvard*, **2** : 141].

1894. Menippidae Ortmann, *Zool. Jb. (Syst.)*, 7(3) : 428, 431.

1984. Menippidae, Serène, *Faune Tropicale*, **24** : 11, 15, 302.

2000. Menippidae, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 68.

Diagnosis : Carapace xanthoid-shaped, dorsally convex and narrow. Antero-lateral margins spinose. Front very broad, half or more the greatest breadth of carapace. Basal antennal joint not meeting the front. Chelipeds unequal and weakly dissimilar, smaller cheliped without noticeably elongated fingers.

Remarks : The family Eriphiidae MacLeay is divided into three subfamilies – Eriphiinae MacLeay, 1838, Oziinae Dana, 1851 and Menippinae Ortmann, 1893, only the last one is represented in Andhra Pradesh.

Subfamily MENIPPINAE Ortmann, 1894

1894. Menippinae Ortmann, *Zool. Jb. (Syst.)*, 7(3) : 429.

1989. Menippinae, Alcock, *J. Asiat. Soc. Bengal*, 67(2) : 176.

1976. Menippinae, Sakai, *Crabs of Japan and the Adjacent Seas* : 468.

Diagnosis : Carapace xanthoid-shaped or transversely oval; Antero-lateral margins usually with lobes, teeth, spine or spinules. Abdomen with seven segments.

Key to genera of the subfamily MENIPPINAE

Orbits completely closed, antennary flagellum excluded from the orbital hiatus, front six-lobulate ..... ***Myomenippe***

Orbits not closed completely, antennary flagellum in the orbital hiatus, front quadrilobulate ..... ***Menippe***

Genus *Menippe* de Haan, 1833

1833. *Menippe* de Haan, In : Siebold, *Fauna japon. (Crust.)* : 21.

1898. *Menippe*, Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 177.

Diagnosis : Carapace thick, broad, transversely oval; except the gastric, other regions ill defined. Antero-lateral margin strongly curved and cut into four teeth.. Front narrow, horizontal and cut into two conspicuous lobes, outer angle of each of which forming a distinct tooth. Orbits circular with three well marked grooves near the outer angle. Eye-stalks short, thick. Basal antennal joint not reaching up to front, flagellum long and lodged in the orbital hiatus. Antennules folded almost transversely. Anterior margin of merus of third maxillipeds slightly sinuous but not excised. Ridges of endostome defining expiratory channels complete but low and faint. Chelipeds robust, slightly unequal in both sexes; fingers stout, pointed, not hollowed. Male abdomen of seven separate segments.

Type species : *Cancer rumphii* Fabricius, 1798, by subsequent designation by Glaessner, 1929 : 253; gender : feminine.

Remarks : This genus contains a single species from Andhra Pradesh.

70. *Menippe rumphii* (Fabricius, 1798)
(Pl. 3, Fig. 1)

1798. *Cancer rumphii* Fabricius, *Ent. Syst. Suppl.* : 336.

1898. *Menippe rumphii*, Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 178.

1998. *Menippe rumphii*, Deb, *Zool. Surv. India, State Fauna Series* **3** : *Fauna of West Bengal, Part* **10** : 373.

Material examined : 1(M), 1(F), Lawson's Bay, Waltair, Dist. Visakhapatnam, 21.01.1921, S. W. Kemp and B. Chopra, Reg. No. C 5618/1; 1(M), Vizagapatam, Dist. Visakhapatnam, 02.01.1941, Reg. No. C 5621/1; 1(F), Dolphin's Nose, Vizagapatam, Dist. Visakhapatnam, 07.01.1941, Reg. No. C 5081/1; 1(F), Tenneti Park Point, Dist. Visakhapatnam, 22.01.2001, Dr. J. G. Pattanayak, Reg No. C 5282/2.

Measurement : W =	52.25	F = 10.1	L = 35.5
	65.25	12.2	43.95

Diagnosis : Carapace broad, slightly convex longitudinally, rather declivous towards the front and antero-lateral margins, surface pitted. Only the gastric region distinct and subdivided into three lobes by shallow grooves, a faintly marked arcuate granular line running almost parallel with the curve of the antero-lateral border traverse the branchial regions. Front broad, bilobed, each consisting of two obtuse rounded lobes, inner lobes about twice as broad as the outer ones. Antero-lateral borders almost as long as the postero-laterals and cut into four lobes (excluding the outer orbital angle), posterior two becoming dentiform and slightly prominent, anterior two broad but hardly prominent and indistinct especially the first lobe; each lobe separated from one another by rather small, shallow notches; postero-lateral margins oblique, straight. Chelipeds massive, unequal; inner corner of wrist slightly prominent, blunt and rounded; fingers stout, shorter than palm and chocolate black in colour. Both the borders of carpus, propodus and dactylus of leg joints hairy but those of the last two segments being denser. Carapace, chelipeds and legs reddish.

Type locality : "Indiae Orientalis" (Fabricius, 1798).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Viaskhapatnam; Tamil Nadu : Gulf of Mannar, 'Madras' coast, Tranquebar; West Bengal : Sandheads. West coast – Karnataka : Dhareswar, Karwar, Sirur; Kerala : Travancore coast. Bay Islands : Nicobars; Lakshwadweep.

Elsewhere : Persian Gulf, Pakistan, Sri Lanka, Tavoy, Mergui Archipelago, Penang and Sumatra.

Remarks : In smaller specimens, chelipeds are subequal. This is a very common crab of Indian coasts being represented both in the Bay of Bengal and Arabian Sea.This crab is edible. The single ovigerous female present in the collection measured 65.25 and 43.95 mm across its carapace width and length respectively. This crab breeds during late winter, summer and early rainy season (late December to July), however, the breeding activity is intensified during January to June (Rajabai, 1975). This crab was collected from partially submerged rocks of the inter-tidal zone.

Genus *Myomenippe* Hilgendorf, 1879

1879. *Myomenippe* Hilgendorf, *MB. AK. Berl.* : 795.

1898. *Myomenippe*, Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 179.

1984. *Myomenippe*, Serène, *Faune Tropicale*, **24** : 307.

Diagnosis : Resembling the preceeding genus *Menippe* very closely differing from it by the following points :

Menippe	*Myomenippe*
1. Carapace and chelipeds smooth.	1. Carapace and chelipeds not smooth but roughened with granules.
2. Regions of carapace faintly indicated.	2. Regions of carapace very prominent.
3. Hepatic regions with four distinct tubercles.	3. Tubercles of hepatic regions indistinct.
4. Antero-lateral lobes less prominent, their margins smooth; only the first two lobes broad, last two lobes dentiform.	4. Antero-lateral lobes more prominent, their margins granular; first three lobes broad, only the last lobe dentiform.
5. Front bilobed, each lobe consisting of two teeth, notch between the frontal lobes narrow, inner frontal lobe narrow.	5. Front bilobed, each consisting of three teeth, notch between the frontal lobes broad, inner frontal lobe square-cut.
6. Antenna in the orbital hiatus.	6. Antenna excluded from the orbital hiatus.
7. Wrist lacking any granular line.	7. A line of granules run from distal part of wrist to its proximal part at the inner angle.

Remarks : The genus contains two species from the Indian Ocean, namely, *Myomenippe hardwickii* (Gray, 1831) and *M. fornasinii* (Bianconii, 1851). Only the first one has been recorded from Andhra Pradesh (present record).

71. *Myomenippe hardwickii* (Gray, 1831)
(Pl. 3, Fig. 2)

1831. *Myomenippe hardwickii* Gray, *Zool. Miscell., London* : 39-41 (not seen).

1898. *Menippe (Myomenippe) granulosa*, Alcock, *J. Asiat. Soc. Bengal*, **67**(2) : 179.

1957. *Myomenippe hardwickii*, Chhapgar, *J. Bombay nat. Hist. Soc.*, **54**(2) : 432, pl. 10, figs. a-c.

1998. *Menippe hardwickii*, Deb, *Zool. Surv. India, State Fauna Series* **3** : *Fauna of West Bengal, Part* 10 : 373.

Material examined : 1(F), Vizagapatam Backwater, Waltair, Dist. Visakhapatnam, 24.01.1921, S. Kemp and B. Chopra, Reg. No. C 5936/1; 1(M), Lawson's Bay, Waltair, 25.01.1921, S. Kemp and B. Chopra, Reg. No. C 5937/1; 1(F), Kakinada, Dist. East Godavari, 20.11.1964, N. V. Subba Rao, Reg. No. C 5944/1; 2(M), Upputern canal near Nizampatam, Dist. Guntur, 14.12.1964, N.V. Subba Rao, Reg. No. C 5945/1.

Measurement : W = 14.45	F = 3.0	L = 10.0
58.45	13.0	41.8

Diagnosis : Carapace broad, rather convex, regions distinct, separated from one another by deep grooves, elevated areas of epibranchials covered with large vesiculous granules, postero-lateral borders also granular. Front broad, cut into two lobes, each lobe consisting of three teeth, median two broadest, squarish and most prominent; second lobe tuberculiform, third one bigger than the second; a small round, granular tubercle present just behind the second lobe. Antero-lateral teeth four, first three broad with granular margins, separated from one another by deep incisions, fourth tooth directed obliquely outwards and forwards. Chelipeds unequal, upper border of both chelipeds and outer surface of smaller cheliped covered with large vesiculous granules, inner surface apparently smooth but finely granular under the lens; outer surface of wrist roughened with large vesiculous granules, a line of granules run from distal part of wrist to its proximal part at the inner angle, the granules diminishing in size from front to back, inner corner of wrist produced into a blunt spine; outer surface of merus also granulate; fingers shorter than upper border of palm and meeting at tips, their apposed margins strongly dentate, fixed finger with a molariform tooth. Both the borders of leg joints fringed with fine stiff long hairs. Carapace, chelipeds and legs brick red in colour.

Type locality : Unknown.

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : East Godavari, Guntur, Visakhapatnam; Tamil Nadu : Gulf of Mannar, Madras (= Chennai); West Bengal : Sandheads, Sundarbans. West coast – Gujarat : Port Okha; Maharashtra : Bombay (= Mumbai).

Elsewhere : East coast of Africa, Bangladesh, Akyab, Mergui Archipelago, Singapore and Indonesia.

Remarks : This species is recorded for the first time from Andhra Pradesh. The single ovigerous female present in the collection measured 58.45 and 41.8 mm across the carapace width and length respectively.

Family GRAPSIDAE MacLeay, 1838

1838. Grapsidae Macleay, In : Smith's, *Illustr. Zool. S. Afr. (Invert.)* : 63, 65

1851. Plagusinae Dana, *Amer. J. Sci. Art.*, ser. 2, **12** : 288 [corrected to Plagusiinae by Miers, 1878 : 147].

1852b Sesarminae Dana, *U. S. Explor. Exped. Crust.*, **13**(1) : 333, 353.

1853. Varunacaea H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **20** : 175 [corrected to Varuninae by Alcock, 1900 : 288, 400]. Name No. 377 on Official List.

1853. Cyclograpsacea H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **20** : 191.

Diagnosis : Carapace thick or depressed, quadrilateral with lateral margins either straight or slightly convex. Front very broad. Orbits at or very close to the antero-lateral angles. Buccal cavern square cut; a gap often wide and rhomboidal in shape left between the external maxillipeds. Chelipeds massive. Legs strong. Male genital openings sternal.

Type genus : *Grapsus* Lamarck, 1801.

Remarks : The family is divisible into four subfamilies, all are represented in the present collection.

Key to subfamilies of the family GRAPSIDAE

1. Antennules fold beneath the front in the normal manner 2

   Antennules fold longitudinally in deep notches in the front, visible in dorsal view .... PLAGUSIINAE

2. No oblique hairy ridge on the exposed surface of third maxilliped 3

   An oblique hairy ridge on the exposed surface of third maxilliped ..... SESARMINAE

3. A wide gap left between third maxillipeds, exopod narrow. Infra-orbital margin extending uninterruptedly to buccal cavity. Male abdomen occupying all the space between bases of last ambulatory legs ..... GRAPSINAE

   A moderate gap left between third maxillipeds, exopod broad. Infra-orbital margin incomplete, supplemented by a sub-orbital crest. Male abdomen hardly occupying all the space between bases of last ambulatory legs ..... VARUNINAE

Subfamily GRAPSINAE MacLeay, 1838

1838. Grapsidae MacLeay, In : Smith, *Illustr. Zool. S. Afr. (Invert.)* : 63, 65.

1900. Grapsinae, Alcock, *J. Asiat. Soc. Bengal,* **69**(2) : 288, 295, 390.

1976. Grapsinae, Sakai, *Crabs of Japan and the Adjacent Seas* : 628.

2000. Grapsinae, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 81.

Diagnosis : Carapace flat. External maxillipeds not traversed by any oblique hairy crest, their exognath very slender and exposed throughout. Male abdomen filling entire space between the last pair of ambulatory legs.

Key to genera of the subfamily GRAPSINAE

1. Front less than half the greatest breadth of carapace, merus of third maxillipeds longer than broad ..... ***Grapsus***

   Front more than half the greatest breadth of carapace, merus of third maxillipeds broader than long 2

2. Antenna completely excluded from the orbit ..... ***Metopograpsus***

   Antenna in the orbital hiatus ..... ***Pachygrapsus***

Genus *Grapsus* Lamarck, 1801

1801. *Grapsus* Lamarck, *Syst. Anim. Sans Vert., (Crust.)* : 150.

1900. *Grapsus*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 390.

2000. *Grapsus*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 82.

Diagnosis : Carapace flat, slightly broader than long, regions faintly indicated, branchial grooves distinct, branchial regions with parallel oblique ridges; gastric region marked by a transverse squamiform sculpture. Front broad, strongly deflexed. Lateral borders curved and armed with a tooth just behind the outer orbital angle. Basal antenna joint short, broad; flagellum exceedingly short. Antennules transversely folded, inter antennular septum very broad. Orbits deep, divided into two fossae. Epistome well defined, of good length from front to back. Buccal cavern squarely cut with the antero-lateral corners rounded off, external maxillipeds leaving between them a large rhomboidal gap exposing the mandibles. Chelipeds subequal in both sexes, finger tips broad and hollowed. Legs broad and compressed, especially the fourth joints, dactyls thorny. Abdomen of seven segments in both sexes, its base almost as broad as sternum between the last pair of legs in male.

Type species : *Cancer grapsus* Linnaeus, 1758, by tautonomy; gender: masculine.

Remarks : The genus *Grapsus* contains two species from Indian coasts. The present collection is, however, represented by a single species.

72. *Grapsus albolineatus* Lamarck, 1818

1818. *Grapsus albolineatus* Lamarck, *Hist. Nat. Anim. Sans. Vert.*, **5** : 249 (not seen).

1900. *Grapsus strigosus*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 393.

1960. *Grapsus albolineatus*, Banerjee, *Temminckia*, **10** : 147, figs. 1c, 2 o,p and 3 a-f.

2000. *Grapsus albolineatus*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 82, pl. 5, fig. 7; pl. 17, figs. 1, 2.

Material examined : 1(M), Waltair, Dist. Visakhapatnam, 18.11.2002, Dr.(Mrs.) P. Mukhopadhyay, Reg. No. C 5209/2.

Diagnosis : Carapace subcircular, depressed; gastric region well outlined, branchial part bearing low smooth oblique ridges; surface between these ridges and cardiac and intestinal areas smooth. Lateral borders smooth, arched strongly with a tooth just behind the outer angle. Front deep, deflexed vertically, its free edge nearly straight and not so distinctly crenulate; post-frontal lobes four, bearing strongly developed transverse ridges extending posteriorly over the gastric area. Inner angle of lower border of orbit with a subacute tooth. Chelipeds unequal, strong; inner border of arm strongly spinate, outer border with 1 or 2 inconspicuous denticles at the distal end; tooth at the inner angle of wrist straight, not talon-shaped; upper border of palm about half the length of its dactylus and traversed longitudinally by two lines of 4-5 granules, those of the outer line culminating in a sharp spinule; outer

surface of palm roughened with ridges and granules, lower border marked by oblique ridges. Fingers stout, spoon-tipped, their cutting edges strongly dentate. Leg joints broad, compressed; first pair shortest, third pair longest, first and fourth pair subequal in length; upper border of merus crest-like, finely crenulated, terminating in a short spine; outer surface roughened owing to the presence of transverse squamiform sculpture; dactyli thorny, propodi also with thorns and bristles. Male abdomen six-segmented, sixth segment much shorter than the fifth, terminal segment triangular.

Type locality : Unknown.

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; Orissa : Mahanadi estuary; Tamil Nadu : Gulf of Mannar, Madras (= Chennai), Palk Bay. West coast – Gujarat : Gulf of Kachchh; Kerala : Travancoe coast; Maharashtra : Bombay (= Mumbai), Deogad coast (Ratnagiri). Andaman Islands : North, Middle, South and Little Andamans; Nicobars; Lakshwadweep : Minicoy.

Elsewhere : East coast of Africa, Red sea, Baluchistan, Sind coast, Sri Lanka, Arakan and Tenasserim coasts, Mergui Archipelago, Philippines, Japan, Polynesian Islands, Australia and as far as Hawaii.

Remarks : This is a widely distributed species of the Indo-Pacific region. This crab occurs in both the coasts of India including the Bay Islands and Lakshwadweep. It breeds from December to July at Visakhapatnam, however, the intensity of breeding is more during February to June (Rajabai, 1975).

Genus ***Metopograpsus*** H. Milne Edwards, 1853

1853. *Metopograpsus* H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **20** : 164.

1900. *Metopograpsus*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 389, 396.

1960. *Metopograpsus*, Banerjee, *Temminckia*, **10** : 172.

2000. *Metopograpsus*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 84.

Diagnosis : Carapace flattish, quadrangular, slightly broader than long, regions inconspicuous, branchial grooves distinct, fine oblique ridges present on the lateral parts of branchial region. Front very broad, more than half of the greatest breadth of carapace, deflexed with a rugose surface and crenulated free margin, postfrontal lobes four. Lateral borders with or without any tooth. Antenna excluded from the orbit by the inner suborbital tooth. Antennules transversely folded in the fossa. Orbits of moderate size, eye-stalk thick, short. Epistome well defined, not very deeply excavated, rather short and broad. Buccal cavern squarish with the antero-lateral corners rounded off, a large rhomboidal gap left between the external maxillipeds exposing the mandibles. Chelipeds subequal or unequal; fingers short and stout, tips broad, hollowed and spoon-shaped. Legs broad, compressed

especially the merus, edges of terminal three joints bearing bristles, dactylus thorny. Abdomen consisting of seven distinct segments in both sexes; in male, its base as broad as sternum between the fifth pair of legs.

Type species : *Grapsus thukuhar* Owen, 1839, by selection by Holthuis, 1977; gender : masculine.

Remarks : The genus *Metopograpsus* contains six valid taxa, of which, four are available in India. It is represented by a single species in Andhra Pradesh.

73. *Metopograpsus messor* (Forskål, 1775)
(Pl. 3, Fig. 3)

1775. *Cancer messor* Forskål, *Desc. Anim.* : 88.

1900. *Metopograpsus messor*, Alcock, *J. Asiat Soc. Bengal*, **69**(2) : 397.

1960. *Metopograpsus messor*, Banerjee, *Temminckia*, **10** : 174, figs. 4 h, i and 5 c.

Material examined : 3(M), Vizagapatam, Dist. Visakhapatnam, H. S. Rao and G.Varugis, Reg. No. C 463/2; 1(F), Nagayalanka, Dist. Krishna, 27.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5208/2; 3(M), Sekhinetipalli, Dist. East Godavari, 30.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5286/2; 3(F), Chinchinada, Dist. West Godavari, Dr. M. K. Dev Roy, 31.01.1999, Reg. No. C 5287/2.

Measurement : W = 25.15 F = 15.15 L = 20.3
11.65 6.25 8.75

Diagnosis : Carapace broader than long, lateral borders distinctly convergent posteriorly. Front broad, free margins beaded, slightly sinuous at the middle, post frontal lobes with fine transverse lines of small tubercles. Inner angle of lower border of orbits denticulate. Chelipeds unequal, upper surface of arm and wrist with wrinkles, their inner borders spinate; upper and lower borders of palm granular, dactylus not much longer than the upper border of palm; fingers blunt, their cutting edges armed with few big teeth. In the last three pair of walking legs, greatest breadth of merus about half of its length. Terminal segment of male abdomen triangular.

Type locality : Red Sea (Forskål, 1775).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : East Godavari, West Godavari, Krishna, Visakhapatnam; Orissa; Tamil Nadu; Parangipettai coast; West Bengal : Haora, North and South 24 Parganas, Midnapore. West coast – Gujarat : Okha, Umarsadi; Karnataka : Coondapore; Maharasthra : Bombay (= Mumbai); Malabar. Andaman and Nicobar Islands.

Elsewhere : Suez canal, Red Sea, Aden, Madagascar, Pakistan, Sri Lanka, Bangladesh, Myanmar, Australia and as far as Hawaii.

Remarks : This species occurs extensively in both the coasts of India including the Andaman and Nicobar Islands. It breeds during late rainy season and winter (August to November) (Rajabai, 1975). Early and late first zoeal stages of this crab has been studied and figured by Rajabai (1961).

Genus ***Pachygrapsus*** Randall, 1840

1840. *Pachygrapsus* Randall, *Journ. Acad. nat. Sci. Philad.*, **8** : 126.

1898. *Pachygrapsus*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 399.

Diagnosis : Carapace quadrate, slightly convex, regions indistinct with transverse ridges. Lateral borders with 1 - 3 teeth or none behind the outer orbital angle. Front broad, half or more than half the maximum breadth of carapace. Inner angle of lower border of orbit with a small lobe, antennae not excluded from the orbit. Chelipeds massive, equal or unequal, dactylus and thumb apically spooned.

Type species : *Pachygrapsus crassipes* Randall, 1840, by selection by Kingsley, 1880: 198, name no. 1638 on Official List.

Remarks : The genus contains four species viz. *Pachygrapsus crassipes* (Randall, 1840), *P. minutus* A. Milne Edwards,1873, *P. plicatus* (H. Milne Edwards, 1837) and *P. fakaravensis* Rathbun, 1907 from the Indo-Pacific region. The record of the occurrence of the species *P. transversus* (Gibbes, 1850) from the Indo-West Pacific is either erroneous or very dubious (Manning and Holthuis, 1981). Only the species, *P. minutus* has been recorded from Andhra Pradesh.

74. ***Pachygrapsus minutus*** A. Milne Edwards, 1873

1873. *Pachygrapsus minutus* A. Milne Edwards, *Nouv. Archs Mus. Hist. nat. Paris (N.S.)*, **9** : 292, pl. 14, fig. 2.

1900. *Pachygrapsus minutus*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 399.

1961. *Pachygrapsus minutus*, Sankarankutty, *J. mar. biol. Ass. India*, **3**(1-2) : 109.

Diagnosis : Carapace broader than long, entire dorsal surface marked with fine transverse and oblique lines, lateral borders strongly convergent posteriorly and without any spine behind the acute outer orbital angle. Front broad, moderately deflexed, its free edge little sinuous. Major diameter of orbit exceeding one-third the breadth of front, sub-orbital border not denticulate. Chelipeds smooth except for some squamiform markings on arm, subequal in male, much more massive than legs and about twice the length of carapace; both the borders of arm crenulate, inner border expanded distally to form a denticulate lobe; inner corner of wrist tooth-shaped; fingers stout, blunt. Second and third pair of legs largest, last three leg joints bearing bristle-like hairs, anterior border of merus armed with a spine at the distal end and posterior border with two spines at its far end.

Type locality : New Caledonia (A. Milne Edwards, 1873).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam. Nicobars : Car Nicobar; Lakshwadweep : Minicoy.

Elsewhere : Maldives, Mergui Archipelago, South of Mindanao, Aor Island, Japan, Christmas Island and New Caledonia.

Remarks : Rajabai (1975) studied the breeding biology of this species from Visakhapatnam-Waltair coast. It breeds during winter, summer and early rainy season (late December to July) and its peak period of breeding activity has been recorded during May. However, this species has not been collected during our present survey.

Subfamily VARUNINAE H. Milne Edwards, 1853

1853. Varunacea H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **20** : 175.

1900. Varuninae, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 288, 296, 400.

1976. Varuninae, Sakai, *Crabs of Japan and the Adjacent Seas* : 628, 637.

Diagnosis : Carapace depressed. Front moderately or slightly deflexed, often sublaminar. Antennal flagella of good length. Exognath of third maxilliped generally broad. Male abdomen rarely occupy all space between the last pair of ambulatory legs.

Remarks : The subfamily is represented by ten genera in the Indo-Pacific region. It contains only three genera from India viz. *Ptychognathus* Stimpson, 1858, *Varuna* H. Milne Edwards, 1830 and *Pyxidognathus* A. Milne Edwards, 1878. Only the first two genera have been recorded from Andhra Pradesh.

Key to genera of the subfamily VARUNINAE

Exognath of external maxillipeds narrower than ischium, propodus and dactylus of ambulatory legs thin, broad and compressed ..... ***Varuna***

Exognath of external maxillipeds broader than long or as broad as ischium, dactyli of legs compressed but not broadened ..... ***Ptychognathus***

Genus *Varuna* H. Milne Edwards, 1830

1830. *Varuna* H. Milne Edwards, *Dict. Hist. Nat.*, **16** : 511.

1900. *Varuna*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 400.

2001. *Varuna*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 48.

Diagnosis : Carapace almost as broad as long, flattened with thin sharp edges, regions fairly distinct, especially the gastric-cardiac and cardiac-branchial grooves. Front broad, more than a third the greatest breadth of carapace, straight, sublaminar and slightly deflexed.

Antero-lateral borders curved and cut into three teeth including the outer orbital angle. Orbit small, lower border broken and incomplete. Antennules obliquely folded, interantennulary septum broad. Antenna of fair length, standing in orbital hiatus. Epistome well defined. Buccal cavern square cut. Chelipeds equal, massive in adult male. Legs with last three joints compressed, dilated and fringed with hairs, natatory. Abdomen of seven distinct segments in both sexes, the entire space between bases of fifth legs not covered in males.

Type species : *Cancer litteratus* Fabricius,1798, by monotypy; gender: feminine; name no. 926 on Official List, in Opinion 85, *Bull. zool. Nomencl.*(1956).

Remarks : The genus *Varuna* contains two species from Indian Ocean, of which, only one species occurs in India.

75. *Varuna litterata* (Fabricius, 1798)
(Pl. 3, Fig. 4)

1798. *Cancer litteratus* Fabricius, *Entom. Syst. Suppl.* : 342.

1900. *Varuna litterata*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 401.

2001. *Varuna litterata*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary*: 49.

Material examined : 4(M), Sekhinetipalli, Dist. East Godavari, 29.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5264/2.

Measurement : W = 29.0 F = 12.7 L = 26.55

Diagnosis : Carapace depressed, smooth with a H-shaped groove at its middle, surface pitted and frosted. Antero-lateral borders arched and cut into three spines (including the outer orbital angle), margins finely beaded. Front broad, straight and slightly deflexed, its edges finely crenated. Inner border of arm denticulate; inner corner of wrist with a large sharp spine; inner surface of palm granular, outer surface with some fine reticulate markings running parallel with the lower border; upper border of palm shorter than dactylus; fingers strongly dentate, meeting at tips; fixed finger with a fine raised line on its outer surface.

Type locality : "India Orientali" (Fabricius, 1798)

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : East Godavari, Krishna, Visakhapatnam; Orissa : Chilka Lake, Cuttak, Puri; Tamil Nadu : Gulf of Mannar, Madras (= Chennai), Palk Bay; West Bengal : Sundarbans. West coast – Kerala : Trivandrum; Maharashtra : Bombay (= Mumbai).

Elsewhere : East Africa, Bangladesh, Myanmar, Singapore, Philippines, Hong Kong, Japan, New Guinea, Australia and New Zealand.

Remarks : The species occurs commonly throughout the Indo-Pacific region. It was recorded earlier from Visakhapatnam, Krishna and East Godavari districts by Dev Roy and Bhadra (*op. cit.*).

Genus ***Ptychognathus*** Stimpson, 1858

1858. *Ptychognathus* Stimpson, *Proc. Acad. nat. Sci. Philad.* : 50.

1868. *Gnathograpsus*, A. Milne Edwards, *Nouv. Archs Mus. Hist. nat., Paris (N.S.)*, **9**, sér. 2, **4** : 180.

1900. *Ptychognathus*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 402.

Diagnosis : Resembles the preceeding genus very closely differing from it only by the following points:

(i) Regions of carapace not so distinct.

(ii) Exopod of external maxillipeds as broad as or broader than ischium.

(iii) Dactyli of legs compressed but not broadened.

Type species : *Ptychognathus glaber*, Stimpson, 1858; gender : masculine.

Remarks : The genus is represented by a single species in Andhra Pradesh.

76. ***Ptychognathus barbata*** (A. Milne Edwards, 1873)

1873. *Gnathograpsus barbatus* A. Milne Edwards, *Nouv. Archs. Mus. Hist. nat., Paris, (N.S.)*, **9** : 316, pl. 17, fig. 4.

1894. *Ptychognathus barbatus*, Ortmann, *Zool. Jb. (Syst.)*, **7** : 712.

1900. *Ptychognathus barbata*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 406.

Diagnosis : Carapace broader than long, flat, depressed, without distinction of regions. Antero-lateral teeth three (including outer orbital angle), first tooth largest and third the smallest. Front markedly sinuous, about two-fifths the greatest breadth of carapace; post-frontal tubercles two, fairly distinct. Antennules folded almost transversely. Inner angle of wrist slightly pronounced in male, dentiform in female; palm massive and much longer bearing a tuft of hair in finger-cleft in male but about as long as carapace, less massive and glabrous in female; fingers blunt; dactylus slender, nearly twice the length of upper border of palm, its cutting edges less strongly toothed than the fixed finger; in female, outer surface of palm and fixed finger traversed near the lower border by a raised line.

Type locality : New Caledonia (A. Milne Edwards, 1873).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam.

Elsewhere: Myanmar and New Caledonia

Remarks : Rajabai (1975) studied the breeding biology of this crab from Visakhapatnam-Waltair coast. It breeds during winter, summer and early rainy season (late December to July) and its maximum breeding activity has been recorded during May-June. However, our present collection does not contain this species.

Subfamily SESARMINAE Dana, 1852

1852. Sesarminae Dana, *U. S. Explor. Exped.*, **13**(1) : 333.

1900. Sesarminae, Alcock, *J. Asiat Soc. Bengal*, **69**(2) : 289, 296, 409.

1976. Sesarminae, Sakai, *Crabs of Japan and the Adjacent Seas* : 654.

2000. Sesarminae, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 87.

Diagnosis : Carapace thick or flat. External maxillipeds traversed by an oblique hairy crest across ischium and merus, their exognath slender and partly or almost fully hidden. Male abdomen may or may not be filling the entire space between the last pair of ambulatory legs.

Remarks : The taxonomy and nomenclature within the members of the genus *Sesarma* is still in an unstable state as discussed earlier by Dev Roy and Das (2000). Several attempts were made to sort out the relationships among them (Tesch, 1917; Crosnier, 1965). In their review on Indo-Pacific sesarmine crabs, Serène and Soh (1970) elevated the subgenera to generic status, erecting as many as 10 new genera and opined that Sesarma Say, 1817 *sensu stricto* is not represented in the Indo-Pacific region but confined to the Atlantic. However, the taxonomic problems of the group are not fully resolved even then. Several generic names proposed by them were corrected by Manning and Holthuis (1981) and Ng (1994). In the present communication, the subgenus *Parasesarma* has been treated as a genus following Ng (*op. cit.*) and the generic name *Episesarma* de Man, 1895 has been used in place of *Neoepisesarma* Serène and Soh, 1970 as the former has priority. The subfamily is represented by four genera namely, *Parasesarma*, *Episesarma*, *Metaplax* and *Metasesarma* in Andhra Pradesh.

Key to genera of the subfamily SESARMINAE

1. Carapace broader than long, pterygostomian regions and side-walls with a sieve-like reticulation, lower border of orbit not abnormally prominent 2

   Carapace much broader than long, pterygostomian regions and side-walls not reticulated, lower border of orbit prominent beyond the front ..... ***Metaplax***

2. Antenna in the orbital hiatus 3

   Antenna excluded from the orbital hiatus ..... ***Metasesarma***

3. Palm of chelipeds with a longitudinal pectinated crest on its upper part... ***Episesarma***

   Palm of chelipeds with 2-3 transverse pectinated crest on its upper part ..... ***Parasesarma***

Genus ***Parasesarma*** de Man, 1895

1895. *Parasesarma* de Man, *Zool. Jb. (Syst.)*, **9** : 181.

1976. *Parasesarma*, Sakai, *Crabs of Japan and the Adjacent Seas* : 655.

2001. *Parasesarma*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 46.

Diagnosis : Resembling the genus *Sesarma sensu stricto* very closely, differing from it in the lateral border of carapace which is entire and not toothed behind the outer orbital angle.

Type species : *Cancer quadratus* Fabricius, 1798, by selection by Rathbun, 1918 : 284; gender : neuter.

Remarks : It is represented by a single species.

77. ***Parasesarma plicatum*** (Latreille, 1803)

1803. *Ocypode plicata* Latreille, *Hist. Nat. Crust.* : 47.

1900. *Sesarma quadrata*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 413.

1957. *Sesarma (Sesarma) quadrata*, Chhapgar, *J. Bombay nat. Hist. Soc.*, **54**(3) : 520, pl. 16, figs. a-c.

2000. *Sesarma (Parasesarma) plicatum*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 91, pl. 6, fig. 4 and pl. 18, figs. 5, 6.

2001 *Sesarma (Parasesarma) plicatum*, Dev Roy and Bhadra, *Zool. Surv. India, Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 46.

Material examined : 2(M), 5(F), Kodur, Dist. Nellore, 16.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5205/2; 5(M), 7(F), Muthukur, Dist. Nellore, 19.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5196/2; 1(M),1(F), Nizampatnam Harbour, Dist. Guntur, 23.01.1999, Dr. M. K. Dev Roy, Reg. No. C5203/2; 8(M), 2(F), Nizampatnam, Dist. Guntur, 24.01.1999, Dr. M. K. Dev Roy, Reg. No. C5204/2.

Measurement : W = 19.85 F = 11.2 L = 16.4

19.2 11.1 14.95

Diagnosis : Carapace thick, convex from front to back in male, flattish in female, its length about 4/5th the greatest breadth of carapace at the antero-lateral angle. Front broad, more than half of the greatest breadth of carapace, deflexed downwards; free edge slightly sinuous at the middle; post-frontal lobes four, middle pair broader than the outer ones and more prominent. Lateral borders almost parallel, slightly convergent posteriorly and devoid of any tooth behind the outer orbital angle. Chelipeds differ in sexes, more massive in male, less so in female; outer surface of arm, wrist and palm granular; inner border of arm bearing a large spine at its distal end; upper border of male palm with two oblique pectinated crests female palm tuberculated and less developed; upper border of male dactylus elegantly milled with 10-20 blunt, coarse transverse lamellae, milling incomplete and much less prominent in female.

Type locality : East India (Latreille)

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Guntur, Nellore, West Godavari; Orissa : Mahanadi estuary; Tamil Nadu : Gulf of Mannar, Madras (= Chennai), Parangipettai coast; Pondicherry; West Bengal : North and South 24 Parganas. West coast – Gujarat : Gulf of Kachchh; Karnataka : Karwar; Kerala : Travancore; Maharashtra : Kolak, Umarsadi. Andaman Islands : South and Middle Andamans.

Elsewhere : East coast of Africa, Madagascar, Pakistan, Sri Lanka, Myanmar, Malay Archipelago, China, Korea and Japan.

Remarks : This species occurs extensively in both the coasts of India including the Andaman and Nicobar Islands. This crab was earlier recorded from West Godavari district as *Sesarma (Parasesarma) plicatum* by Dev Roy and Bhadra (2001). The largest and smallest ovigerous females recorded during the present investigation are 19.5 and 16.9 mm respectively across the carapace width.

Genus ***Episesarma*** de Man, 1895

1895. *Episesarma* de Man, *Zool. Jb. (Syst.)*, **9** : 165.

1970. *Neoepisesarma* Serène and Soh, *Treubia*, **27**(4) : 395, 405.

2001. *Neoepisesarma*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 47.

Diagnosis : Distinguished from the genus *Sesarma* Say by its relatively narrower carapace and front. Antero-lateral tooth behind the outer orbital angle strongly marked instead of just indicated as in *Sesarma*. Anterior border of arm of male cheliped with a sub-distal triangular dentate process instead of a granular subdistal convexity as found in *Sesarma*. A longitudinal pectinated crest on upper part of palm of male cheliped running parallel to the margin instead of a granulated line not distinct from the margin as in *Sesarma*. Dactylar tubercle of male cheliped conspicuously shaped instead of a row of 7 – 9 depressed spinules as in *Sesarma*.

Type species : *Sesarma taeniolatum* Miers, 1877 (= *Sesarma taeniolata* White, 1847, a *nomen nudum*), a subjective junior synonym of *Sesarma mederi* H. Milne Edwards, 1853, by selection by Holthuis, 1978; gender : neuter.

Remarks : This genus is represented by three species in India, of which, two species occur in Andhra Pradesh.

Key to species of the genus *Episesarma*

Upper border of dactylus of larger cheliped in male with an elegantly milled crest of 40-60 fine lamellae ..... *E. taeniolata*

Upper border of dactylus of larger cheliped in male with a coarsely crenulate crest. ..... *E. tetragonum*

78. *Episesarma taeniolata* (White, 1847)

1847. *Sesarma taeniolatum* White, *List of the Specimens of Crustacea in the collection of the British Museum, London* : 38.

1900. *Sesarma taeniolatum*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 419.

1957. *Sesarma (Sesarma) taeniolata*, Chhapgar, *J. Bombay nat. Hist. Soc.*, **54**(3) : 521, pl. 16, figs. h-j.

2001. *Neoepisesarma (Neoepisesarma) taeniolata*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 47.

Diagnosis : Carapace flat, square-cut; surface covered with tufts of hairs, those of the anterior half longer than posterior part. In male cheliped, pectinated crest of palm extending from its proximal to distal margin and upper border of dactylus elegantly milled with 40-60 fine lamellae.

Type locality : Philippine Islands (White, 1847).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : East Godavari, West Godavari, Visakhapatnam; West Bengal : Sundarbans. West coast – Maharashtra : Ratnagiri. Andaman Islands : South Andamans.

Elsewhere : Pakistan, Mergui Archipelago, Malay Peninsula, Singapore, Indonesia, Thailand, China and Japan.

Remarks : This species was reported earlier from Visakhapatnam, East and West Godavari districts by Dev Roy and Bhadra (2001). However, no specimen belonging to this species could be collected during our present survey.

79. *Episesarma tetragonum* (Fabricius, 1798)

1798. *Cancer tetragonus* Fabricius, *Entom. Syst. Suppl.* : 341.

1900. *Sesarma tetragonum*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 420.

2000. *Neopisesarma (Neoepisesarma) tetragonum*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 97, pl. 6, fig. 7 and pl. 19, figs. 3, 4.

Material examined : 1(F), Channel connecting the backwater with sea, Vizagapatam, Dist. Visakhapatnam, May and June, 1926, H. S. Rao and G. Varugis, Reg. No. C 5084/1; 1(F), B. V. Palem near Kakinada, Dist. East Godavari, 12.04.1995, T. Venkataswarlu, Reg. No. C 2803; 1(F), Sekhinetipalli, Dist. East Godavari, 29.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5278/2.

Measurement : W = 37.2 F = 19.65 L = 31.9

Diagnosis : Carapace thick, squarish, broader than long; dorsal surface covered with sparsely distributed tufts of hair; gastric region well marked with deep groove. Front deflexed,

broad, almost half of the greatest breadth of carapace; post frontal lobes four, inner pair broader than the outer one, free margin markedly sinuous and beaded. Antero-lateral borders cut into two teeth including the outer orbital angle; first tooth large, acuminate separated from the second by a deep sulcus; second tooth also large but acute, less prominent than the first. Chelipeds massive, subequal; outer surface of arm and wrist granular-rugulose, that of palm polished but finely granulate if observed under the lens; inner surface of palm with a transverse granular ridge; fingers stout, hollowed, meeting at tips; upper border of dactylus coarsely crenulate (number of crenulations varying from 8-10) their apposed margins armed with 2 – 3 denticles. Leg joints broad, compressed; meropodites broadened, rugulose, their upper margins serrated culminating to a subterminal spine; third leg longest; dactylus claw-shaped, both propodus and dactylus clothed with velvety hairs especially on the anterior and posterior surfaces. Female abdomen consisting of seven separate segments.

Type locality : "India Orientali" (Fabricius, 1798).

Distribution : Bay of Bengal.

India : East coast – Andhra Pradesh : East Godavari, Visakhapatnam; Orissa : Chilka Lake, Mahanadi Delta; Tamil Nadu : Madras (= Chennai), Pichavaram, Pulicat Lake; West Bengal : Sundarbans. Andaman Islands : South Andamans.

Elsewhere : Sri Lanka.

Remarks : The width and length of the single ovigerous female noted during our present investigation were 32.6 and 27.95 mm respectively. Rajabai (1961) has described and illustrated the early first zoea and late first zoea of this crab from Visakhapatnam under the name *Sesarma tetragona*.

Genus ***Metaplax*** H. Milne Edwards, 1852

1852. *Metaplax* H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **18** : 161.

1900. *Metaplax*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 431.

2001. *Metaplax*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 47.

Diagnosis : Carapace quadrilateral, more or less flat, broader than long; regions well-defined or fairly so, cervical and branchial grooves distinct. Front deflexed. Lateral borders straight or slightly curved anteriorly, almost parallel and divided into 4-5 teeth, last 1-2 teeth very indistinct. Basal antennal joint very short, flagellum fairly long, antenna lodged in the orbital hiatus. Antennules folded almost transversely, inter-antennular septum broad. Outer wall of orbit incomplete, lower border crenulate; eye-stalks not much extended. Epistome short, distinct and prominent, buccal cavern squarish. Chelipeds markedly differ in the sexes; longer and much more massive in males, shorter and slenderer in females; males always with a short oblique horny crest either on or close to and parallel with the inner border of arm for scrapping against the lower border of orbit to produce a musical sound. Legs slender, second

and third pair longer than the first and last pair, third pair longest. Abdomen consisting of seven distinct segments in both sexes; in males, third to fifth segments often fused together; in females, seventh segment small and deeply impacted in the sixth.

Type species : *Metaplax indicus* H. Milne Edwards, 1852 or *M. distinctus* H. Milne Edwards, 1852; gender : feminine.

Remarks : The genus is represented by five species in Andhra Pradesh.

Key to species of the genus *Metaplax*

1. Male chelipeds three times the length of carapace, legs spiny ..... *M. crenulata*

   Male chelipeds less than three times the length of carapace, legs smooth 2

2. Dactylus of male chelae with a prominent lobe on its dentary edge, male chelipeds markedly unequal 3

   Dactylus of male chelae without any prominent lobe on its dentary edge, male chelipeds equal 4

3. Third to fifth segments of male abdomen fused together ..... *M. indica*

   Segments of male abdomen separate ..... *M. distinctus*

4. Palm of larger cheliped longer than high in male ..... *M. elegans*

   Palm of larger cheliped higher than long in male ..... *M. intermedia*

80. ***Metaplax crenulata*** (Gerstaecker, 1856)
(Pl. 3, Fig. 5)

1856. *Rhaconotus crenulatus* Gerstaecker, *Arch. Naturgesch. Johrg.*, **22**(1) : 142.

1900. *Metaplax crenulata*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 435.

2001. *Metaplax crenulata*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 48.

Diagnosis : Regional areas of carapace very prominent and well outlined by deep grooves. Front deflexed, slightly convex and its free margin crenulated. Lateral borders cut into five teeth – first four teeth very prominent, first tooth broadest, separated from the second by a deep groove, last tooth inconspicuous. Lower orbital border elegantly beaded in male, pectinate in female. Chelipeds markedly unequal, but equal in the same sex; very long and massive in male, much shorter and slenderer in female; arm long, slender and slightly dilated proximally; upper margin of wrist and both upper and lower borders of palm granulate; palm long and compressed, its inner surface with a row of granules at the middle; fingers slender, acute, incurved and not chanelled; their apposed margins dentate but without any prominent lobe. Leg joints long, stout; third pair longest nearly as long as male chelipeds; both the margins of merus and only the upper margin of carpus and propodus spinose; dactylus long, slender

and fringed with hairs. Abdomen consisting of seven separate segments in both sexes, sixth segment squarish in male.

Type locality : Unknown ("Der Fundort ist unbekannt") (Gerstaecker, 1856).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : West Godavari; Orissa : Mahanadi estuary; West Bengal : Sundarbans. Andaman Islands : South and Middle Andamans.

Elsewhere : Mergui Archipelago, Malay Peninsula and Thailand.

Remarks : This species was reported earlier from West Godavari district by Dev Roy and Bhadra (2001). The present collection, however, does not contain this species. In India, this crab is so far known from the east coast only.

81. ***Metaplax distincta*** H. Milne Edwards, 1852

1852. *Metaplax distinctus* H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **18** : 162, pl. 4, fig. 27.

1900. *Metaplax distincta*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 432.

2000. *Metaplax distincta*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 104, pl. 7, fig. 4 and pl. 20, figs. 3, 4.

Material examined : 10(M), 6(F), Muthukur, Dist. Nellore, 18.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5195/2; 1(M), Kakinada, Dist. East Godavari, 28.05.1955, Reg. No. C 2296/2.

Measurement : W = 20.9 F = 5.55 L = 15.0

17.45 5.4 12.75

Diagnosis : Carapace deep with its surface finely granular, gastric region well outlined, cervical and branchial grooves very conspicuous. Lateral borders cut into four teeth by three incisions – first tooth much deep and larger than the posterior most two, first and second tooth of almost of same size. Free margin of front smooth. Infra-orbital ridge extended backwards behind the orbit to the level of second incision of lateral margin of carapace, the ridge comprising of 25-30 small lobules successively diminishing in size backwards; first 6-7 lobules of the ridge broader than long, next 1 or 2 as long as broad, the rest much smaller and even longer than broad. Chelipeds markedly unequal but equal in the same sex; broad and massive in male, slenderer in female; inner margin of arm bordered with several teeth of which distal four very strong; inner border of wrist also strongly toothed; outer surface of palm coarsely granular at the upper half, inner surface also coarsely granular; both outer and inner surfaces of fingers, upper margin of dactylus and lower margin of fixed finger coarsely crenulate, the crenulations of fixed finger being extended almost upto the wrist-joint; fixed finger slightly deflexed with a small lobe on its dentary edge, immobile finger strongly curved downwards like a strong hook, finger tips broad and hoofed. Leg joints long, slender; anterior border of meropodites of first and last pair armed with a subterminal spine, the

number of spines varying from 2-3 in second and 2-5 in third pair. Abdomen consisting of seven distinct segments in both sexes, all the segments fringed with hairs.

Type locality : Bombay (H. Milne Edwards, 1852).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : East Godavari, Nellore; Tamil Nadu : Madras (= Chennai), Pichavaram; Pondicherry; West Bengal : Sundarbans. West coast – Karnataka : Karwar; Maharashtra : Bombay (= Mumbai). Andaman Islands : North, Middle and South Andamans.

Elsewhere : Mergui Archipelago and Thailand.

Remarks : These crabs were seen to colonise in large numbers on earthen bunds near a mangrove swamp at Muthukur (Dist. Nallore) where the entire area was cleared of mangrove vegetation for the purpose of cultivation. As a result of their burrowing activities, the entire bunds appeared as honey-combed.

This crab is a new record to Andhra Pradesh. The smallest and largest ovigerous female noted during this investigation were 15.65 and 17.45 mm respectively across the carapace width.

82. *Metaplax elegans* de Man, 1888

1888. *Metaplax elegans* de Man, *J. Linn. Soc. Zool.*, **22** : 164, pl. 11, figs. 4-6.

1900. *Metaplax elegans*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 434.

2000. *Metaplax elegans*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 106, pl. 7, fig. 5 and pl. 20, figs. 5, 6.

Diagnosis : Carapace broader than long, slightly convex in both the directions, regional areas faintly indicated. Front declivous, its free margin crenulated. Lateral borders nearly straight and cut into five teeth – first tooth prominent, broad; second tooth larger than the first, third very small and the last tooth very much indistinct. Lower boder of orbit very finely and regularly pectinated. Chelipeds markedly unequal in male; arm not much long; musical crest very fine, lying at the middle of inner border of arm; outer surface of wrist and palm smooth, upper border and inner surface of palm granular; palm of larger cheliped longer than high; fingers obliquely truncate, stronglty channeled, both bearing a lobe near the middle of their dentary edges, their tips broad and hoofed, dactylus strongly curved in larger chela. Leg joints long, slender, anterior border of meropodites armed with a single subterminal spine in first pair of legs, 3-6 on second pair and from 7-10 on third and fourth pair; posterior border of meropodites of second and third pair with 2-3 spinules at their distal ends. Male abdomen consisting of seven separate segments.

Type locality : Mergui Archipelago (de Man, 1888).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Godavari Delta; Tamil Nadu : Pichavaram; Andaman Islands : Middle Andaman.

Elsewhere : Mergui Archipelago, Malay Peninsula, Singapore, Thailand and Indonesia.

Remarks : This species has not been collected by us during our present survey. The occurrence of this crab from Godavari estuary is based on Alcock (1900). It is not yet recorded from the west coast.

83. ***Metaplax indica*** H. Milne Edwards, 1852

1852. *Metaplax indicus* H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **18** : 161.

1900. *Metaplax indica*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 432.

1995. *Metaplax indica*, Ghosh, *Zool. Surv. India Estuarine Ecosystem Series*, Part **2** : *Hugli Matla Estuary* : 236.

Material examined : 6(M), 1(F), Station No. 2, Waltair, Dist. Visakhapatnam, 22.01.1921, Reg. No. C 280/1; 5(M), Station No. 2, Waltair, Dist. Visakhapatnam, 26.01.1921, Reg. No. C 281/1.

Measurement : W =	19.85	F = 5.7	L = 14.5
	15.0	3.7	11.35

Diagnosis : Carapace nearly three-fourths as long as broad, deepish, surface smooth to the naked eye but finely granular under the binocular; regional boundaries obscure. Lateral borders nearly straight and cut into four teeth – first two teeth large and prominent, tip of first tooth acuminate, that of second blunt, third very small and the last tooth almost obscure. Front bilobed. Lower orbital border extended upto the level of first notch of lateral border of carapace, evenly crenulate in female and unevenly in male. Chelipeds unequal but equal in the same sex; male chelipeds smooth and massive, female chelipeds much slenderer; arm long, slender, musical crest almost on the inner border close to its proximal end; palm about twice as long as high; fingers slender, acute and devoid of any prominent lobe on their dentary edges. Legs quite unarmed, anterior border of carpus and propodus smooth. Third, fourth and fifth segments of male abdomen fused together.

Type locality : "Indes Orientalis" (H. Milne Edwards, 1852).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Visakhapatnam; Orissa; West Bengal : South 24 Parganas. West coast – Maharashtra : Kolak.

Elsewhere : Pakistan.

Remarks : The specimens examined agree well with the description of Alcock (*op. cit.*). However during our present investigation following variations were noted : (1) anterior border of meropodites of first and last pair of legs armed with a single spine and those of

second and fourth with several sharp spines, (2) carpus and propodus of the middle two pair of legs devoid of hairs.

This species is a new record to Andhra Pradesh.

84. *Metaplax intermedia* de Man, 1888
(Pl. 3, Fig. 6)

1888. *Metaplax intermedius* de Man, *J. Linn. Soc. Zool.*, **22** : 166, pl. 11, figs. 7 - 9.

1900. *Metaplax intermedia*, Alcock, *J, Asiat. Soc. Bengal*, **69**(2) : 435.

2001. *Metaplax intermedia*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari estuary* : 48.

Diagnosis : Lower end of orbit extended beyond the first antero-lateral notch and cut into 5 or 6 little even teeth at its inner end diminishing in size from within outwards and then gradually becoming minutely and regularly pectinate. Chelipeds markedly unequal in male; arm little broadened across the middle, the musical crest lying at middle of its inner border, close to and parallel with that border; palm of larger cheliped higher than long in male, dactylus hooked with a prominent lobe on its dentary edge and corresponding with this lobe cutting edge of fixed finger notched proximally followed by a high lobe descending obliquely to the tip of the finger. Anterior border of merii of leg joints armed with a subterminal spine. Male abdomen consisting of seven distinct segments and rather broadly triangular.

Type locality : Mergui Archipelago (de Man, 1888).

Distribution : Bay of Bengal.

India : East coast – Andhra Pradesh : Godavari Delta; Orissa : Chandipur; West Bengal : Sundarbans.

Elsewhere : Myanmar.

Remarks : Our present collection does not contain this species. However, it has been included on the authority of Alcock who recorded this crab from Godavari estuary as early in 1900. This crab occurs exclusively in the east coast of India.

Genus *Metasesarma* H. Milne Edwards, 1853

1853. *Metasesarma* H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **18** : 188.

1900. *Metasesarma*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 427.

2000. *Metasesarma*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 107.

Diagnosis : Carapace broader than long, thick, regions indistinct. Front broad, vertically deflexed, overhanging the epistome; post-frontal lobes indistinct. Lateral borders slightly curved and convergent posteriorly. Orbits deep, oval. Antennae extremely small and excluded from the orbit. Antennules transverse. Merus of external maxillipeds broader than long.

Reticulation of pterygostomian and its adjacent regions finer, closer and more confused than those in *Sesarma*. Chelipeds subequal; finger tips subacute and hollowed. Legs not much broad and compressed. Abdomen seven-segmented in both sexes.

Type species : *Metasesarma rousseauxii* H. Milne Edwards, 1853, by monotypy, gender: feminine; name no. 884 on Official List.

85. *Metasesarma rousseauxii* H. Milne Edwards, 1853

1853. *Metasesarma rousseauxii* H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sèr. 3, **18** : 188.

1900. *Metasesarma rousseauxii*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 427.

2000. *Metasesarma rousseauxii*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 107, pl. 7, fig. 6 and pl. 20, figs. 9, 10.

Diagnosis : Carapace deep, squarish, slightly convex from front to back; surface smooth to the naked eye but granular especially near the frontal part when observed under the lens; regions quite distinct, gastric region separated from the cardiac by a short semilunar valve, epibranchial regions rugulose. Front vertical, deep; free edge convex and smooth but sinuous very slightly; post-frontal lobes four, middle pair prominent, outer pair hardly recognizable. Lateral borders entire, curved and convergent posteriorly bearing no tooth behind the external orbital angle. Chelipeds stout and markedly unequal in opposite sex but almost equal in the same sex; outer surface of arm and wrist tubercuate; margins of the former denticulate, inner corner of the latter sharply pronounced; outer surface of palm smooth, inner surface with a patch of granules at the middle; upper border of palm and base of dactylus with a few small blunt serrulations; cutting edges of fingers armed with 3 – 4 big teeth. Leg joints slender, smooth, without any spine; meropodites narrow, their upper and lower margins crest-like, outer surfaces granular; dactyli as long as propodites and fringed with dark spine-like bristles; third pair longest.

Type locality : Zanzibar, Tanzania (H. Milne Edwards, 1853)

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; Tamil Nadu : Madras (= Chennai); West Bengal : Sundarbans. Andaman Islands : South Andamans; Nicobars; Lakshwadweep : Minicoy.

Elsewhere : East Africa, Madagascar, Maldives, Sri Lanka, Mergui Archipelago, Philippines, Australia and Samoa.

Remarks : This species has not been collected by us. However, Rajabai (1961) has studied the larval development of this crab from Visakhapatnam.

This crab occurs widely in the Indo-Pacific region.

Subfamily PLAGUSIINAE Dana, 1851

1851. Plagusiinae Dana, *Amer. J. Sci. Art.* ser. 2, **12** : 288

1900. Plagusiinae, Alcock, *J. Asiat. Soc. Bengal,* **69**(2) : 289, 297, 436.

1976. Plagusiinae, Sakai, *Crabs of Japan and the Adjacent Seas* : 675.

Diagnosis : Carapace flat, subcircular. Front cut into lobes or teeth. Antennal flagella short. Exognath of third maxilliped slender. Male abdomen covering all space between the last pair of legs.

Remarks : This subfamily includes two genera namely, *Plagusia* 1806 and *Percnon*, Gistel, 1848. Both the genera occur in India. Only the first one has been recorded from Andhra Pradesh.

Genus ***Plagusia*** Latreille, 1804

1804. *Plagusia* Latreille, *Nouv. Dict. Hist. Nat.*, **24** : 125.

1899. *Plagusia*, Alcock, *J. Asiat. Soc. Bengal,* **69**(2) : 436.

Diagnosis : Carapace subcircular, depressed. True front absent. Antero-lateral borders toothed. Interorbital space broad, consisting of two deep notches for reception of first antennae. Orbits deep, eye-stalks short and thick. Antenna lodged in orbital hiatus, flagellum short. Inter-antennular septum broad. Epistome short. Anterior margin of buccal cavity strongly projecting, crenate or dentate. Merus of third maxilliped as broad as ischium, their exognaths without flagella. Chelipeds and legs rugose-granulose, the former massive in male, weak in female. Legs strong with broad massive meri; dactyls short, spinose. Abdomen consisting of seven separate segments, third to fifth segments firmly coalesced in both sexes.

Type species : *Cancer depressus* Fabricius, 1775, by designation by Latreille; gender : feminine; name no. 1644 on Official List, in Opinion 712, *Bull. zool. Nomencl.*, **21**(5) : 338 (1964).

Remarks : The genus contains two species from India, *Plagusia dentipes* (de Haan, 1835) and *P. depressa tuberculata* Lamarck, 1818 (Alcock, 1900; Sethuramalingam and Khan, 1991). Only the last species has been recorded from Andhra Pradesh.

86. ***Plagusia depressa tuberculata*** Lamarck, 1818

1818. *Plagusia tuberculata*, Lamarck, *Hist. Nat. Anim. Sans. Vert.*, **5** : 247.

1894. *Plagusia depressa*, Alcock and Anderson, *J. Asiat. Soc. Bengal,* **63**(2) : 202.

1900. *Plagusia depressa* var. *squamosa*, Alcock, *J. Asiat. Soc. Bengal,* **69**(2) : 437.

1998. *Plagusia depressa tuberculata*, Deb, *Zool. Surv. India Estuarine Ecosystem Series* **3** : *Mahanadi Estuary* : 159.

Diagnosis : Carapace subcircular, depressed, surface covered with flat pearly or squamiform

tubercles fringed anteriorly with little close-set bristles of uniform length; regions well-marked. Antero-lateral teeth four, decreasing in size from front to back. True front absent, antennular fossae visible dorsally as deep clefts in the anterior border of carapace. Epistome prominent and cut into seven lobes. Male chelipeds massive, nearly half as long as carapace but slender and almost as long as carapace in female; inner corner of wrist tooth-like; tubercles of upper surface of palm and dactylus arranged in longitudinal rows while those on outer surface especially the upper part in transverse rows. Legs with a subacute tooth on the posterior margin of dorsal surface of basipodites, the tooth being most prominent in second and third pair; anterior margin of merii culminating in a subterminal spine; upper border of carpus, propodus and dactylus traversed longitudinally by a thick strip of long bristles.

Type locality : "Ile de France" (Lamarck, 1818).

Distribution : Cosmopolitan.

India : East coast – Andhra Pradesh : Visakhapatnam; Orissa : Mahanadi estuary; Tamil Nadu : Gulf of Mannar, Madras (= Chennai), Palk Strait, Parangipettai coast. West coast – Gujarat : Kodinar; Karnataka : Karwar; Kerala : Kovalam; Malabar. Nicobars.

Elsewhere : East coast of Africa, Red Sea, Hawaii and west coast of America from Lower California to Chile.

Remarks : The early and late first zoeal stages of this crab have been studied and figured by Rajabai (1961) under the name *Plagusia depressa squamosa*. Further, the breeding biology of this species has been investigated by Rajabai (1975) from Visakhapatnam-Waltair coast. This crab breeds from December to July and its peak period of breeding activity has been recorded during January-February at this coast. However, this crab has not been collected by us during our present survey.

Family PINNOTHERIDAE de Haan, 1833

1833. Pinnotheridea de Haan, In : Siebold, *Fauna japon. (Crust.)* : 2, 5 [corrected to Pinnotheridae by Bell, 1845 : 119].

1858. Asthenognathidae Stimpson, *Proc. Acad. nat. Sci. Philad.* : 53.

1858. Xenophthalmidae Stimpson, *Proc. Acad. nat. Sci. Philad.* : 53.

1870. Dissodactylidae Smith, *Trans. Conn. Acad. Arts Sci.*, **2** : 172.

1900. Pinnotherelinae Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 294, 335.

1931. Anomalofrontinae Rathbun, *Lingnan Sci. J.*, **8** [1929] : 84.

Diagnosis : Carapace more or less membranous, sub-circular or transversely oval. Front narrow. Eyes and orbits very small, cornea often obsolescent. Antennules and antennae generally very small and cramped. External maxillipeds vary – merus often large, ischium small or sometimes merus and ischium fused, palp short; exopod small, almost concealed.

Buccal cavern short, of good breadth, commonly semi-circular in outline. Male abdomen very narrow. Male genital openings sternal.

Remarks : The family Pinnotheridae is divided into four subfamilies namely, Asthenognathinae Stimpson, 1858, Pinnotherinae de Haan, 1833, Pinnotherelinae Alcock, 1900 and Xenophthalminae Alcock, 1900. Only three species belonging to the subfamily Pinnotherinae are reported from Andhra Pradesh.

Subfamily PINNOTHERINAE de Haan, 1833

1833. Pinnotheridea de Haan, In : Siebold, *Fauna japon. (Crust.)* : 2, 5

1900. Pinnoterinae, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 287, 293, 337

1976. Pinnotherinae, Sakai, *Crabs of Japan and the Adjacent Seas* : 567.

Diagnosis : Carapace not transverse. Ischium of external maxillipeds rudimentary or fused indistinguishably with the merus forming a single piece, the palp not so large as the merus-ischium.

Remarks : The subfamily contains two genera namely, *Pinnotheres* Bosc, 1802 and *Xanthasia* White, 1846. Only the first genus is recorded from this state.

Genus *Pinnotheres* Bosc, 1802

1802. *Pinnotheres* Bosc, *Hist. Nat. Crust.*, **1** : 59, 239.

1900. *Pinnoteres*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 337.

Diagnosis : Carapace ill calcified, smooth, transversely oval, circular or subhexagonal or subquadrangular, margins ill defined, regions seldom defined. Front narrow, usually deflexed in female, not in male. Orbits small, circular; eye-stalks short, eyes small. Antennules obliquely folded. Antennae small, flagellum minute, standing at inner corner of orbit. Epistome well defined. Buccal cavern of a curious cresentic shape. Merus and ischium of third maxilliped fused and obliquely directed, palp 3-jointed; exopod concealed for the most part. Chelipeds and legs short, the former being equal and stouter than legs in female. Male abdomen narrow; in female, abdomen usually longer than sternum and consisting of seven separate segments.

Type species : *Cancer pisum* Linnaeus, 1767, by selection by Latreille, 1810 : 422; gender: masculine; name no. 352 on Official List.

Remarks : Alcock (*op. cit.*) in his 'Carcinological Fauna of India' included only five species of pinnotherid crabs. Among these, *P. edwardsi* de Man (1895) was recorded from Mergui Archipelago while the locality data for another species, *P. parvulus* Stimpson (1858) was not mentioned. Since then, these two species did not appear in the Indian literature during the last 100 years and hence both the species have been excluded.

During the last hundred year or so, a good number of crabs belonging to this genus have

been recorded from both the coasts of India as well as from Andaman and Nicobar Islands and Lakshadweep. The genus as is now known contains 19 species (Nobili, 1906; Chopra, 1931; Chhapgar, 1957b; Sankarankutty, 1965; Lalitha Devi, 1981, 1986). Besides, further four species from four different lamellibranch hosts have been recorded from the coasts of India (Awati and Rai, 1931; Silas and Algarswamy, 1967; Jones, 1950; Dev Roy, unpublished), their specific identification is, however, still indeterminate.

87. ***Pinnotheres gracilis*** Bürger, 1895

1895. *Pinnotheres gracilis* Bürger, *Zool. Jahrb. Abt. Syst.*, **8** : 368, pl. 9, fig. 6 and pl. 10, fig. 6.

1951. *Pinnotheres gracilis*, Pillai, *Bull. Cent. Res. Inst. Travancore*, ser. C, **2**(1) : 26.

1981. *Pinnotheres gracilis*, Lalitha Devi, *J. mar. biol. Ass. India*, **23**(1-2) : 214, fig. 1.

Diagnosis : Not available.

Host : *Amusium pleuronectes* (Linnaeus)

Other host records : *Solen* spp. and *Katelysia opima*

Type locality : Ubay, Philippines (Bürger, 1895).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : East Godavari. West coast – Karnataka : Karwar; Kerala : Trivandrum.

Elsewhere : Gulf of Thailand and Philippines.

Remarks : Our present collection does not contain this species. However, it was reported from Kakinada Bay (Host: *Amusium pleuronectes*) by Lalitha Devi (1981). As noted by her, the incidence of infestation was 2% and the invasion of these crabs occurred in early stages.

88. ***Pinnotheres alcocki*** Rathbun, 1910

1910. *Pinnotheres alcocki* Rathbun, *Kjohenhavan Vid. Selks. Skr. 7 Raekke*, **5**(4) : 331, pl. 2, fig. 9.

1981. *Pinnotheres alcocki*, Lalitha Devi, *J. mar. biol. Ass. India*, **23**(1-2) : 215, fig.1, 2 a-e and 3 a-e.

Diagnosis : Not available.

Host : *Anadara* sp.

Other host records : *Cytherea* sp., *Mytilus* sp.

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : East Godavari.

Elsewhere : Mergui Archipelago, Indonesia and Philippines.

Remarks : Our present collection does not contain this species. However, it was reported from Kakinada Bay by Lalitha Devi (1981).

89. ***Pinnotheres placunae*** (Hornell and Southwell, 1909)

1909. *Pinnoteres placunae* Hornell and Southwell, In: H. James (ed.), *Marine Zoology of West Coast*: 99, figs. 1-10.

1957. *Pinnotheres placunae*, Chhapgar, *J. Bombay nat. Hist. Soc.*, **54**(3) : 503, pl. 12, figs. a-l.

Diagnosis : Body soft, membranous in female, harder in male. Carapace wider than long, smooth, much compressed dorsoventrally, squarish in female, circular in male. Antero-lateral angle rounded and conspicuous, margins entire. Front broad and sharply truncated; straight in female; short, roughly triangular and raised in male. Antero-external angle of ischium-merus of outer maxillipeds rounded, dactylus not reaching up to the apex of propodus. Chelipeds smooth, dactylus as long as palm and sparsely hairy. Legs slender, increasing in size posteriorly in female except the last pair in which it is shorter than the first pair; dactyli of last two pair about 1.5 times as long as those of the first two; in male, first pair of legs almost equal in length to the chelipeds, second pair longer than the first by slightly more than a dactylus, third pair longer than the second by a dactylus. Abdomen broadened considerably posteriorly in female, narrowed in male and consisting of seven distinct segments in both sexes; first pair of male abdominal appendage long, cylindrical and rod-like projecting from beneath the abdomen.

Host : *Placenta placuna.*

Type locality : Gulf of Kachchh (Hornell and Southwell, 1909).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : East Godavari. West coast – Gujarat : Balapur Bay, Beyt Island and Rann Bays; Maharashtra : Bombay (= Mumbai).

Elsewhere : Sri Lanka.

Remarks : Our present collection does not contain this species. However, it was reported from Kakinada Bay by Lalitha Devi (1986).

Family **OCYPODIDAE** Rafinesque, 1815

1815. Ocypodia Rafinesque, *Analyse de la Nature* : 96 [corrected to Ocypodidae by MacLeay, 1838 : 63, 64; Name No. 375, on Official List, in Opinion 712, *Bull. zool. Nomencl.*, **21**(5) : 341(1964)].

1851. Dotinae Dana, *Amer. J. Sci. Art.* ser. 2, **12** : 286.

1851. Macrophthalminae Dana, *Amer. J. Sci. Art.* ser. 2, **12** : 286.

1851. Ucainae Dana, *Amer. J. Sci. Art.* ser. 2, **12** : 289.

1852. Heloeciacaea H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **18** : 153.

1858. Macrophthalmidae Stimpson, *Proc. Acad. nat. Sci. Philad.* : 42.

1858. Dotillidae Stimpson, *Proc. Acad. nat. Sci. Philad.* : 44.

1858. Camptandriidae Stimpson, *Proc. Acad. nat. Sci. Philad.* : 52.

1880. Gelasimiden Nauck, *Z. wiss. Zool. (Leipzig)*, **34** : 8, 17, 23, 64, 66.

1886. Gelasimidae Miers, *Chall. Rep. Zool.*, **17** : viii.

1900. Scopimerinae Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 290, 295, 363.

1971. Camptandriinae Serène and Sasekumar, *Fedn. Mus. J. (N. S.)*, **16** : 75.

1974. Camptandrini Pretzmann, *Annln. Naturh. Mus. Wien.*, **78** : 443.

1977. Cleistotomatini Pretzmann, *Mitt. hamb. Zool. Mus. Inst.* **74** : 66.

Diagnosis : Carapace deep or flat, subquadrangular, subcubical or subglobose, usually broader than long; regions indistinct; front narrow, deflexed, usually a mere lobe between the long eye-stalks. Orbits occupying almost the entire anterior border of carapace; eye-stalks slender, often much elongated. Palp of external maxillipeds coarse, articulated at or near the antero-external angle of merus; exopod usually slender, often concealed; buccal cavern large, covered by external maxillipeds completely. Chelipeds markedly unequal either in both sexes or in males only. Legs strong, fourth pair much shorter and less massive than the first three pair, an orifice or recess thickly fringed with hairs along the edges between the bases of second and third pair. Male abdomen narrow. Male genital openings sternal.

Type genus : *Ocypode* Weber, 1795.

Remarks : Majority of the experts working on this group currently recognize only four subfamilies (Serène,1974; Manning and Holthuis, 1981) within this family namely, Ocypodinae Rafinesque, 1815, Dotillinae, Stimpson, 1858, Macrophthalminae, Dana, 1851 and Camptandriinae Stimpson, 1858. The subfamily Dotillinae contains the genera *Dotilla* Stimpson, 1858 and *Scopimera* de Haan, 1833 while the subfamily Scopimerinae Alcock, 1900 also consists of the same genera and are thus synonyms. However, Dotillinae being the senior name has priority over Scopimerinae (Manning and Holthuis, 1981). The representatives of all the subfamilies have been found to occur along the coast of this state.

Key to subfamilies of the family OCYPODIDAE

1. A hairy-ridged pouch between bases of second and third pair of legs ..... OCYPODINAE

   No such pouch between bases of second and third pair of legs 2

2. Carapace deep, merus of legs, chelipeds and sternal segments bearing membranous spaces or tympana ..... DOTILLINAE

   Carapace depressed, no tympanum on merus of legs, chelipeds and sternal segments 3

3. Merus of external maxillipeds shorter than ischium and its last two segments thick, male gonopod straight or slightly bent ..... MACROPHTHALMINAE

Merus of external maxillipeds as long as or longer than ischium and the distal two segments slender, male gonopod strongly recurved ..... CAMPTANDRIINAE

Subfamily OCYPODINAE Rafinesque, 1815

1815. Ocypodia Rafinesque, *Analyse de la Nature* : 96.

1900. Ocypodinae, Alcock, *J. Asiat. Soc. Bengal,* **69**(2) : 290, 294, 343.

1976. Ocypodinae, Sakai, *Crabs of Japan and the Adjacent Seas* : 597, 598.

2000. Ocypodinae, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 114.

Diagnosis : Carapace deep, subquadrilateral, regions indistinct. Front narrow, deflexed, usually a mere lobe between the eye-stalks. Lateral borders with or without any tooth behind the outer orbital angle. Antennules folded obliquely or nearly vertically, flagellum short, inter-antennular septum broad. Buccal cavity enclosed by the external maxillipeds fully. An orifice or recess between bases of second and third pair of legs. Chelipeds unequal, often remarkably in males.

Key to genera of the subfamily OCYPODINAE

Antennular flagella rudimentary, completely concealed under the front; antennae small almost rudimentary; eyes very large, occupying the major part of ventral surface of eye-stalks; chelipeds unequal, ambulatories large ..... ***Ocypode***

Antennular flagella small, not concealed under the front; antennae long; eyes small, terminal on long, slender eye-stalks; one of the male chelipeds enormously enlarged, the other being very small; ambulatories short ..... ***Uca***

Genus *Ocypode* Weber, 1795

1795. *Ocypode* Weber, *Nomencl. ent. Syst. Fabr.* : 92.

1801. *Ocypoda* Lamarck, *Systêm. Anim.* : 49.

1900. *Ocypoda*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 342, 343.

2000. *Ocypode*, Dev Roy and Das, *Rec. Zool. Surv. India, Occ. Paper No.* **185** : 114.

Diagnosis : Carapace deep, subquadrilateral, slightly broader than long; regions ill defined. Front narrow, deflexed. Lateral borders with or without any tooth behind the outer orbital angle. Basal antennal joint short, flagellum rudimentary. Antennules extremely small, almost hidden beneath front. Orbits large and divided into two fossae; eye-stalks often prolonged in a horn or style. Epistome short. Buccal cavern as broad as long in its widest part, but narrowed anteriorly; external maxillipeds more or less narrow and elongated. Chelipeds unequal in both sexes; palm of larger chela short, high and usually with a stridulating ridge of granules or striae for scrapping against a corresponding ridge on the ischium. Legs strong, fourth pair much shorter and less massive than the other pair, dactylus flute-like; a cavity

thickly fringed with hairs connecting the branchial chamber between bases of second and third pair. Abdomen of seven segments in both sexes.

Type species : *Cancer ceratophthalmus* Pallas, 1772; by selection by Holthuis, 1962; gender: feminine; name no. 1637 on Official List.

Remarks : The genus *Ocypode* is represented by seven species from Indian coasts, of which, only one species namely *O. portonovoensis* is endemic to India. However, the present collection includes only four species from Andhra Pradesh.

Key to species of the genus *Ocypode*

1. A stridulating ridge present on the inner surface of palm, eye-stalk prolonged beyond the eye as horn or style 2

   No stridulating ridge on the inner surface of palm, eye-stalk not prolonged beyond the eye in the form of a horn or style ..... *Ocypode cordimana*

2. Fingers of both chelae pointed 3

   Finger of smaller chela expanded and flattened at tip ..... *Ocypode macrocera*

3. Stridulating ridge narrow consisting of tubercles only, brushes of hair absent on propodous of legs ..... *Ocypode platytarsis*

   Stridulating ridge consisting of tubercles gradually passing into striae, anterior surface of propodus of first two pairs of legs covered with dense hairs ..... *Ocypode ceratophthalma*

90. ***Ocypode ceratophthalma*** (Pallas, 1772)

1772. *Cancer ceratophthalmus* Pallas, *Spicilegia Zool.*, **9** : 83, pl. 5, fig. 7.

1900. *Ocypoda ceratophthalma*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 345.

2001 *Ocypode ceratophthalma*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4** : *Fauna of Godavari Estuary* : 50.

Material examined : 1(M), Waltair, Dist. Visakhapatnam, 18. 11. 2002, Dr. (Mrs) P. Mukhopadhyay, Reg. No. C 5210/2; 1(M), 3(F), Lawson's Bay, Upland, Waltair, Dist. Visakhapatnam, 26.05.1926, H. S. Rao and G. Varugis, Reg. No. C 2257/2.

Measurement : W = 20.2 F = 3.55 L = 19.5

Diagnosis : Carapace thick, squarish, almost as long as broad, surface covered with fine granules; regions indistinct. Front narrow, deflexed, its free edge rounded. Anterior 1/3 of the lateral borders nearly straight and parallel, margins finely beaded except the posterior border. Antero-lateral angle acute and slightly turned outwards. Orbits large, upper orbital margin wavy and finely crenulated, lower margin also crenated with an indistinct notch at its middle and having no gap at its outer corner; eye-stalk prolonged beyond the carapace as a blunt,

narrow horn. Chelipeds markedly unequal, scabrous, rugulose or with squamiform arrangement; inner corner of wrist armed with a strong spine; palm compressed, high; outer surface coarsely granular, the stridulatory organ consisting of a few rounded granules on the upper part of inner surface of palm very close to the base of fixed finger followed by several rather widely spaced striae and then more very close striae at the lower half; upper border of dactyl, outer surface of both dactyl and fixed finger and also the lower border of fixed finger granular; fingers pointed at tips, their cutting edges armed with large teeth. Leg joints long, stout; merus of first three pair of walking legs broadened, fourth pair shortest with a much narrower merus; propodus of first two pair densely hairy on the anterior edge of adults but absent in juveniles; dactylus stout, fluted, fringed with hairs on the antero-lateral margin. In both sexes, abdomen consisting of seven separate segments, sixth segment longer than broad in male.

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : West Godavari, Visakhapatnam; Orissa : Chandipur, Chilka Lake; Tamil Nadu : Gulf of Mannar, Pulicat Lake. West coast – Gujarat : Kolak, Umarsadi; Karnataka : Karwar, Sirur (Bhatkal); Maharashtra : Bombay (= Mumbai). Andaman Islands : North, Middle and South Andamans; Nicobars; Lakshwadweep : Kavaratti, Amindivi and Minicoy Islands.

Elsewhere : East coast of Africa, Madagascar, Mauritius, Maldives, Sri Lanka, Malay Peninsula, Singapore, Indonesia, China, Japan, Australia, Sandwich Island, Tahiti and Hawaii.

Remarks : This species of crab was earlier reported from West Godavari district of the state by Dev Roy and Bhadra (2001). It occurs extensively in both the coasts of India including the Bay Islands and Lakshwadweep.

91. ***Ocypode cordimana*** Desmarest, 1825

1825. *Ocypode cordimana* Desmarest, *Consid. génér. Crust.* : 121 (not seen).

1900. *Ocypoda cordimana*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 349.

1957. *Ocypode cordimana*, Chhapgar, *J. Bombay nat. Hist. Soc.*, **54**(3) : 507, pl. 13, figs. d-f.

Material examined : 5(M), 3(F), Bimplipatam, Dist. Visakhapatnam, Marine Survey, Reg. No. C 3692/2; 1(J), Station No. 23, Lawson's Bay, Visakhapatnam, Dist. Visakhapatnam, 19.09.1995, Dr. T. Roy, Reg. No. C 5298/2; 2(M), 1(F), Kodur, Dist. Nellore,16.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5295/2; 1(M), Vadarevu, Chirala, Dist. Prakasam, 21.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5306/2; 1(M), Station No. 15, Pithapuram Village, Kakinada, Dist. East Godavari, 10.09.1995, Dr. T. Roy, Reg. No. C 5217/2.

Measurement : W = 21.1	F = 2.3	L = 18.1
19.1	2.45	15.5

Diagnosis : Carapace thick, quadrilateral, convex from front to back, surface finely granulate; regional boundaries indistinct. Antero-lateral angles acute projecting rather inwards. Upper border of orbit sinuous, lower border notched almost at the middle and with a deep gap at the outer angle, eye-stalks without any terminal style. Chelipeds stout, markedly unequal; lower margin of arm and palm and inner edges of wrist serrated; upper border of palm and dactylus serrated, both outer and inner surfaces studded with evenly disposed granules, stridulating ridge absent; fingers broad, compressed, their cutting edges strongly dentate. Propodus and dactylus of second and third legs less hairy, dactyli fluted. Sixth segment of male abdomen distinctly broader than long, about twice as broad as long and converging.

Type locality ; Unknown.

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : East Godavari, Nellore, Prakasam, Visakhapatnam; Orissa : Chandipur, Gopalpur coast; Tamil Nadu : 'Madras' coast, Gulf of Mannar, Palk Strait, Pulicat Lake. West coast – Kerala : Travancore; Maharashtra : Umarsadi. Andaman and Nicobar Islands; Lakshadweep : Minicoy, Kavaratti Islands.

Elsewhere : East coast of Africa, South Africa, Red Sea, Mauritius, Maldives, Pakistan, Sri Lanka, Myanmar, Malaysia, Singapore, Japan, Australia and as far as Tahiti.

Remarks : This is the smallest ocypodid crab of the genus *Ocypode* occurring in both the coasts of India. The post-larval development of this crab has been dealt with by Naidu (1954).

92. ***Ocypode macrocera*** H. Milne Edwards, 1837
(Pl. 4, Fig. 8)

1837. *Ocypode macrocera* H. Milne Edwards, *Hist. Nat. Crust.*, **2** : 49.

1900. *Ocypoda macrocera*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 347.

1998. *Ocypode macrocera*, Deb, *Zool. Surv. India, Estuarine Ecosystem Series* **3** : *Mahanadi Estuary* : 149.

Material examined : 2(M), 3(F), Maginipudi, Masulipatam, Dist. Krishna, 5.12.1964, Dr. N.V. Subba Rao, Reg No. C 2238/2; 1(M), 1(F), Fishing Harbour, Kakinada, Dist. East Godavari, 12.09.1995, Dr. T. Roy, Reg. No. C 4729/2; 3(M), Station No. 18, Lawson's Bay, Vizagapatnam, Dist. Visakhapatnam, 14.09. 1995, Dr. T. Roy, Reg. No. C 5294/2; 2(M), Maipadu Sea Beach, Dist. Nellore, 13.01. 1999, Dr. M. K. Dev Roy, Reg. No.C 5077/2; 1(M), Krishnapattam, Dist. Nellore, 15.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4730/ 2;1(M), 2(F),Midhirevu, Dist. Nellore, 17.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4731/2; 2(M), 1(F), Kottapatnam, Dist. Prakasam, 19.01.1999, Dr. M. K. Dev Roy, Reg. No. C 4733/ 2; 1(M), Sea beach near Light House, Kakinada, Dist. East Godavari, 02.02.1999, Dr. M. K. Dev Roy, Reg. No. C 4732/2; 1(M), Pukkala Peta, Dist. Srikakulam, 31.01.2001, Dr. J. G. Pattanayak, Reg. No. C 5289/2.

Measurement : W =	34.25	F =	4.1	L =	26.95
	29.25		3.4		22.6

Diagnosis : Carapace squarish, little convex, surface covered with uniformly small close granules. Orbits slightly oblique. Granules of external maxillipeds minute and iess prominent. Stridulatory ridge comprising of striations only bearing much less hair. Fingers broad, spatulate and lamellar right up to the tips; upper border of palm and dactylus and lower border of immobile finger crenated. Anterior surface of propodus of first two pair of legs conspicuously fringed with brushes of hair. Sixth segment of male abdomen almost equal to its width.

Type locality : Pondichery, India (H. Milne Edwards, 1837).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : East Godavari, Krishna, Nellore, Srikakulam, Visakhapatnam; Orissa : Bhitarkonica, Gopalpur coast, Lake Chilka, Mahanadi estuary; Tamil Nadu : Palk Bay, Gulf of Mannar; Pondicherry; West Bengal : Bakkhali, Sagar, Sundarabsn.

Elsewhere : Myanmar and Gulf of Thailand.

Remarks : The bright red colouration (in live condition) and also the broad lamellar finger tip of smaller chela are very distinctive of this species. This crab is smaller than *Ocypode platytarsis* but larger than *O. cordimana*. The species is restricted to the Bay of Bengal extending eastwards to as far as Gulf of Thailand. So far, it is not recorded from the west coast of India.

Kemp (1915) described the colour of this crab and had dealt very interesting notes on the habits etc. in its early stages.

At Lawson's Bay and Ramakrishna Beach of Visakhapatnam and Maipadu sea beach of Nellore, this crab was found to inhabit among the sand binding creepers of the genus *Ipomaea* sp. in the upper tidal zone. In the aforesaid areas, these crabs were also noticed to occur in open sandy areas and also around drainages affected by domestic sewages. When these crabs congregate in large numbers, the beach looks like a red carpet from a distance. The maximum concentration of this crab recorded during the present investigation varied from 3 – 4 per m^2. Rajabai (1972) recorded this species all along the littoral zone with concentrations at Lawson's Bay and coastal Battery area on the Visakhapatnam-Waltair beach.

The burrows of larger size class were noted mostly just above the high water mark of the beach retaining enough moisture whereas the juveniles occurred a little downwards inundated by all tides. During our field survey, several burrows were excavated and the burrows were found to extend from 50 –70 cm. from the top. The diameter of the burrows varied from 22 – 84 mm.

93. *Ocypode platytarsis* H. Milne Edwards, 1852
(Pl. 4, Fig. 9)

1852. *Ocypode platytarsis* H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **18** : 141.

1900. *Ocypoda platytarsis*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 348.

1995. *Ocypode platytarsis*, Deb, *Zool. Surv. India Wetland Ecosystem Series* **1** : *Fauna of Chilka Lake* : 356

Material examined : 3(M), Station No.15, Pithapuram, Kakinada, Dist. East Godavari, 10.09.1995, Dr. T. Roy, Reg. No. C 5291/2; 4(M), 1(F), Station No. 17, Fishing Harbour, Kakinada, Dist. East Godavari, 12.09.1995, Dr. T. Roy, Reg. No. C 5080/2; 1(F), 1(J), Station No.18, Lawson's Bay, Vizagapatnam, Dist. Visakhapatnam, 14.09.1995, Dr. T. Roy, Reg. No. C 5292/2; 1(M), Station No. 21, Krishnapuram, Vizagapatnam, Dist. Visakhapatnam, 17.09.1995, Dr. T. Roy, Reg. No. C 5290/2; 1(M), 1(F), Lawson's Bay, Vizagapatnam, Dist. Visakhapatnam, 19.09.1995, Dr. T. Roy, Reg. No. C 5079/2; 7(M), Maipadu Sea Beach, Dist. Nellore, 13.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5078/2; 1(M), Kodur, Dist. Nellore, 16.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5296/2; 1(M), Midhirevu, Dist. Nellore, 17.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5270/2; 2(M), Muthukur, Dist. Nellore, 18.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5305/2; 3(M), 2(F), Kottapatnam, Dist. Prakasam, 19 01.1999, Dr. M. K. Dev Roy, Reg. No. C 5075/2; 3(M), Palm Beach,Visakhapatnam, Dist. Visakhapatnam, 19.01.2001, Reg. No. C 5301/2; 1(F), Akkupalli, 9 km. North-east of Palasa, Dist. Srikakulam, 02.02.2001, Dr. J. G. Pattanayak, Reg. No. C 5293/2.

Measurement : W = 62.25 F = 6.8 L = 48.9

57.2 5.8 39.1

Diagnosis : Carapace deep, quadrilateral, strongly convex from front to back with almost straight orbits. Stridulatory ridge without hair and consisting exclusively of small tubercles. Dactyli of legs compressed dorso-ventrally. Propodus of legs devoid of hair.

Type locality : Pondichery, India (H. Milne Edwards, 1852).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : East Godavari, Nellore, Srikakulam, Visakhapatnam; Orissa : Bhitarkonika, Gopalpur coast, Lake Chilka; Tamil Nadu : Gulf of Mannar; Pondicherry. West coast – Kerala : Travancore, Mahe. Nicobars.

Elsewhere : Sri Lanka.

Remarks : Entire surface of carapace of this crab is studded with granules, those on the branchial region being larger in size than the other regions such as gastric, frontal and post-frontal. Antero-lateral border of carapace is straight and serrulated up to 1/3rd of its length then becomes convergent and strongly beaded. Surface of external maxilliped was reported to be quite smooth by Alcock (1900) but it is found to be roughened with granules in the present

specimens including the juveniles. The entire body of crab is yellow in colour. Merus of major cheliped is also yellow and its edges are strongly crenulated, its outer surface is tuberculated while the inner surface is studded with microscopic granules. Outer surface of wrist, fingers and both outer and inner surfaces of palm and upper border of dactylus are strongly tuberculated while the lower border of palm is strongly crenated excepting finger tips.

This is the most common ocypodid crab of the genus *Ocypode* of the state. They inhabit sandy areas above High Tide Level (HTL). During high tide, the beach was found to be crowded with innumberable crabs of different size groups. Naidu (1951, 1954) has described and published very interesting notes on the bionomics and habits of this species. *O. platytarsis* breeds from December to July at Visakhapatnam -Waltair coast (Rajabai, 1975). The prezoea, zoea, megalopa and first crab stage of this crab has been studied and described by Naidu (1954).

This crab is restricted to the Bay of Bengal. It was found to be eaten raw by the poorer people at Visakhapatnam.

Genus *Uca* Leach, 1814

1814. *Uca* Leach, In: D. Brewster, *The Edinburgh Encyclopedia*, **7**(2) : 430.

1817. *Gelasimus* Latreille, *Nouv. Dict. Nat.*, **12** : 517.

1852. *Acanthoplax* H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **18** : 151.

1914. *Eurychelus* Rathbun, *Proc. U. S. natn. Mus.*, **47** : 126.

1954. *Minuca* Bott, *Senckenberg. biol.*, **35**(3-4) : 155, 160.

1973. *Mesuca* Bott, *Senckenberg. biol.*, **54**(4-6) : 316.

1973. *Latuca* Bott, *Senckenberg. biol.*, **54**(4-6) : 317.

1973. *Tubuca* Bott, *Senckenberg. biol.*, **54**(4-6) : 322.

1973. *Australuca* Bott. *Senckenberg. biol.*, **54**(4-6) : 322.

1973. *Paraleptuca* Bott, *Senckenberg. biol.*, **54**(4-6) : 322.

1973. *Heteruca* Bott, *Senckenberg. biol.*, **54**(4-6) : 323.

1973 *Planuca* Bott, *Senckenberg. biol.*, **54**(4-6) : 324.

1973. *Leptuca* Bott, *Senckenberg. biol.*, **54**(4-6) : 324.

1975. *Deltuca* Crane, *Fiddler Crabs of the World. Ocypodidae : Genus Uca* : 21.

1975. *Thalassuca* Crane, *Fiddler Crabs of the World. Ocypodidae : Genus Uca* : 75.

1975. *Amphiuca* Crane, *Fiddler Crabs of the World. Ocypodidae : Genus Uca* : 96.

1975. *Boboruca* Crane, *Fiddler Crabs of the World. Ocypodidae : Genus Uca* : 109.

1975. *Afruca* Crane, *Fiddler Crabs of the World. Ocypodidae : Genus Uca* : 116.

1975. *Celuca* Crane, *Fiddler Crabs of the World. Ocypodidae : Genus Uca* : 211.

1975. *Australuca* Crane, *Fiddler Crabs of the World. Ocypodidae : Genus Uca* : 62.

Diagnosis : Carapace deep, subquadrilateral or subhexagonal, broader than long, surface usually smooth, seldom setose or tuberculate, regions indistinct, excepting the H-form depression. Front deflexed, moderate to very narrow, spatulate or broadly arcuate. Antero-lateral angles generally pointed. Antero-lateral margins absent or moderately parallel, converging or slightly diverging. Antennae with well developed flagella. Antennules very small, folded obliquely. Orbits deep, little sinuous, suborbital border cut into numerous more or less truncated lobules; eyes small, articulated at or near antero- external angle of merus; exopod slender, often concealed; buccal cavity completely closed by the outer maxillipeds. Chelipeds remarkably unequal in male, small and equal in female. Legs strong, meropodites of second and third pair foliaceous, dactyli very sharp. Abdomen consisting of seven distinct segments in both sexes, often two or more segments fuse together.

Type species : *Cancer vocans major* Herbst, 1782, by monotypy; gender : feminine; name no. : 1648 on Official List.

Remarks : The systematics of fiddler crabs (Genus *Uca*) is still very puzzling and confusing as discussed at length by Dev Roy and Das (2000). Bott (1973) splitted *Uca* into 10 genera based on the structure of gonopod tips while Crane (1975) dealt all fiddlers under a single genus *Uca* within which she recognized 9 subgenera. This resulted to a serious taxonomical and nomenclatural problem since Crane's names were objective synonyms and these, in spite of the fact that the subgenera proposed by her were very compresensive and treated in an ideal way, however, Bott's names published in a short, not too well-documented would have priority as per the norms of International Commission on Zoological Nomenclature. In the present work, therefore, the authors have preferred to use Hagen's (1976) suggestion to the use of simple binomials for the genus *Uca* and its species without further subdivisions like subgenera and subspecies for the time being to avoid taxonomical hazards.

Key to species of the genus *Uca*

1. Front narrow ..... *Uca dussumieri*

   Front wide 2

2. Carapace subquadrilateral, major cheliped porcelain white and its tip obliquely truncate ..... *Uca lactea*

   Carapace hexagonal, major cheliped yellow, its tip never truncate..... *Uca triangularis*

94. ***Uca dussumieri*** (H. Milne Edwards, 1852)
(Pl. 3, Fig. 7)

1852. *Gelasimus dussumieri* H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **18** : 148, pl. 4, fig. 12.

1900. *Gelasimus dussumieri*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 361.

1995. *Uca (Deltuca) dussumieri spinata*, Bairagi, *Zool. Surv. India Estuarine Ecosystem Series, Part* **2** : *Hugli Matla Estuary* : 273.

1998. *Uca dussumieris dussumieri*, Deb, *Zool. Surv. India State Fauna Series*, **3** : *Fauna of West Bengal, Part* **10** : 398.

1982. *Uca dussumieri*, George and Jones, *Rec. West. Aust. Mus. Suppl. No.* **14** : 31, figs. 19a, 20a, 39a-g and 55e.

2000. *Uca dussumieri*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 119, pl. 4, fig. 6 and pl. 14, figs. 3,4.

Diagnosis : Carapace deep, strongly convex from front to back, regions recognizable but not strongly defined. Dorso-lateral margin long, definite reaching up to the level of third walking legs, finely beaded but becoming very weak or absent posteriorly. Antero-lateral angle acute, slightly directed forward. Antero-lateral margins short, definite, converging and finely beaded, postero-lateral stria absent. Front extremely narrow and deflexed downwards. Infra-orbital crenellations low, separate and truncate, slightly larger near the antero-lateral angle. Chelipeds markedly unequal; in major cheliped, two distinct long grooves running most of the length on its outer surface and a similar groove on outer pollex; inner dorsal margin of arm tuberculate in a single row, the tubercles increasing in size regularly near the distal end, terminal tubercle enlarged and bicuspid; upper surface of wrist tuberculate; outer surface of palm bearing enlarged tubercles; fingers very long and strong; cutting edge of dactylus armed with two enlarged teeth in its proximal half, dentary edge of pollex adorned with an enlarged median or submedian triangular lobe or tooth; fingers crossing, curved like a hook at their tips, leaving a wide gap when closed; in minor cheliped, gape of male extremely small, evenly serrated with few long dense setae dorsally; anterior border of dactylus with a dense brush of setae, ventral margin of pollex with less hairs; gape of female small with a central pair of enlarged teeth in both the chelae. Leg joints long, slender; merus markedly slender in last pair of legs in male but conspicuously bordered in female in last two pair with pile along the postero-lateral margin; dactylus claw-like, fringed with bristles. Abdomen in both sexes consisting of seven distinct segments.

Type locality : Malabar, Samarang (H. Milne Edwards, 1852).

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; Orissa; West Bengal : Sundarbans. West coast – Gujarat : Gulf of Kachchh; Maharashtra : Bombay (= Mumbai), Kolak, Umarsadi. Andaman Islands : North, Middle, South and Little Andamans; Nicobar Islands : Car Nicobar, Great Nicobar.

Elsewhere : Madagascar, Mergui Archipelago, Malay Peninsula, Singapore, Indonesia, Thailand, Philippines, Hong Kong, China, Japan, RyuKyu Island, Palau Island, East Indies, New Guinea, Australia, New Caledonia, Solomon Islands and Caroline Islands.

Remarks : This crab was earlier recorded from Bimlipatnam by Alcock (1900). During our

present survey, however, we could not collect or observe any specimen belonging to this species. As such, the status of this species of crab needs to be reassessd on the basis of further field surveys.

95. *Uca lactea* (de Haan, 1835)
(Pl. 4, Fig. 10)

1835. *Ocypode (Gelasimus) lacteus* de Haan, In: Siebold, *Fauna japon. (Crust)* : 54, pl. 15, fig. 5.

1900. *Gelasimus annulipes*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 353.

1900. *Gelasimus lacteus*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 355.

1975. *Uca (Celuca) lactaea*, Crane, *Fiddler Crabs of the World* : 292, pls. 39, 40, 45A, 47 c-d, 50A, figs. 17-20.

1995. *Uca (Celuca) lactaea annulipes*, Bairagi, *Zool. Surv. India Estuarine Ecosystem Series, Part* **2**: *Hugli Matla Estuary* : 273.

2001. *Uca lactea*, Dev Roy and Bhadra, *Zool. Surv. India Estuarine Ecosystem Series* **4**: *Fauna of Godavari Estuary* : 51.

Material examined : 2(M), Kakinada, Dist. East Godavari, 28.05.1955, Reg. No. C 2246/2. 6(M), Kodur, Dist. Nellore, 16.01.1999, Dr. M. K. Dev Roy, Reg. No. C5266/2; 1(F), Muthukur, Dist. Nellore, 18.01.1999, Dr. M. K. Dev Roy, Reg. No. C5269/2; 6(M), Puluguvari Palem, Dist. Guntur, Dr. M. K. Dev Roy, Reg. No. C5267/2; 14(M), Sekhinetipalli, Dist. East Godavari, 30.01.1999, Reg. No. C5265/2; 4(M), Near Light House, Kakinada, Dist. East Godavari, Dr. M. K. Dev Roy, Reg No. C5268/2; 6(M), Koanada, Dist.Vizianagaram, 27.01.2001, Dr. J. G. Pattanayak, Reg. No. C 5302/2.

Measurement : W = 17.8 F = 3.15 L = 10.6

Diagnosis : Carapace subquadrilateral, much broader than long, anterolateral angles sharp, claw-shaped and diagonally produced outwards; regions indistinct, only the protogastric and cardiac regions faintly outlined. Front broad, about 1/6th the greatest breadth of carapace. Antero-lateral borders nearly straight, converging; dorso-lateral margins defined by fine, raised convergent lines extending beyond the level of second pair of walking leg. Upper border of orbits sinuous and smooth; lower border finely crenated at inner half, the crenellations increasing in size near antero-external angle. Chelipeds remarkably unequal in male, equal in female; outer surface of chelipeds smooth; upper border of palm about half the length of dactylus, inner surface with an oblique tuberculate ridge; dactylus hook-like, compressed; pollex little curved upwards, truncated at tips due to the presence of an enlarged tooth. Merus of last pair of legs markedly slender. Male abdomen consisting of seven distinct segments.

Type locality : Japan (de Haan, 1835)

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : East Godavari, Guntur, Nellore, Vizianagaram;

Orissa : Chilka Lake, Gopalpur beach, Mahanadi estuary; Tamil Nadu : Gulf of Mannar, Madras (= Chennai), Parangipettai coast, Pichavaram, Pulicat Lake; Pondicherry. West coast – Gujarat : Okha; Karnataka : Karwar; Kerala : Travancore; Maharashtra : Bombay (= Mumbai), Kolak, Umarsadi. Andaman and Nicobar Islands : North, Middle, South and Little Andamans; Nicobars.

Elsewhere : South Africa, East Africa, Madagascar, Mauritius, Red Sea, Persian Gulf, Pakistan, Mergui Archipelago, Malay Peninsula, Singapore, Thailand, Indonesia, Philippines, China, Japan, Ryukyu Island. New Guinea, Australia, New Caledonia and as far as Samoa.

Remarks : The porcelain white major chela of male is very characteristic of this species.

The reclaimed mangrove areas near Krishnapatnam Port (District Nellore) and Nizampatnam Fishing Harbour (District Guntur) were dominated by two broad fronted species of fiddler crabs, *Uca lactea* and *U. triangularis*. Both the species were found to occur sympatrically in good numbers. The former was also seen around pebbles and boulders on the bank of the river Godavari at Sekhinetipalli (East Godavari district). However, its population was much less in comparision to the other two areas.

This species was earlier reported from East Godavai District by Dev Roy and Bhadra (2001). This crab occurs extensively in both the coasts of India including the Andaman and Nicobar Islands.

96. *Uca triangularis* (A. Milne Edwards, 1873)
(Pl. 3, Fig. 8)

1873. *Gelasimus triangularis* A. Milne Edwards, *Nouv. Archs. Mus. Hist. nat. Paris, (N.S.)*, **9** : 275.

1900. *Gelasimus triangularis*, Alcock, *J. Asiat. Soc. Bengal*, **69(2)** : 356.

1975. *Uca (Celuca) triangularis bengali* Crane, *Fiddler Crabs of the World* : 290, 610, pl. 38K-L, fig. 24J, 32N-O, 68C.

1995. *Uca (Celuca) triangularis bengali*, Bairagi, *Zool. Surv. India Estuarine Ecosystem Series*, Part 2. *Hugli Matla Estuary* : 274.

1998. *Uca triangularis bengali*, Deb, *Zool. Surv. India, State Fauna Series* **3** : *Fauna of West Bengal*, Part 10 : 398.

1982. *Uca triangularis*, George and Jones, *Rec. West. Aust. Mus. Suppl. No.* **14** : 77, figs. 4a, 5a, 52a-f, 58c.

Material examined : 2(M), Puluguvari Palem, Dist. Guntur, 22.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5273/2; 3(M), Nizampatnam, Dist. Guntur, 24.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5271/2; 1(M), Sekhinetipalli, Dist. East Godavari, 30.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5272/2; 1(M), Near Light House, Kakinada, Dist. East Godavari, 02.02.1999, Dr. M. K. Dev Roy, Reg. No. C 5270/2.

Measurement : W = 15.35 F = 2.55 L = 9.0

Diagnosis : Carapace distinctly hexagonal, strongly convex, regions not defined; surface covered with microscopic granules. Antero-lateral angles strongly acute, directed antero-laterally; antero-lateral margins absent; dorso-lateral margin strongly convergent posteriorly, defined by a fine raised line and extending up to the level of third walking leg; postero-lateral striae absent. Front broad, about 1/6th the greatest breadth of carapace, pterygostomian region well-covered with setae. Sub-orbital crenellations low and continuous at inner half, high and partly seperated at the outer end. Chelipeds markedly unequal in male; in major cheliped, all the margins of arm and and wrist serrated; dactylus longer than palm; upper border of palm with a double row of tubercles extending almost up to the middle of dactylus; outer surfaces of palm and fingers studded with vesiculous granules and scattered minute pits; inner surface of palm with moderately high oblique ridge and large tubercles, those of fingers smooth; both dactylus and pollex moderately slender; in minor cheliped, dactylus and pollex relatively longer and slenderer with a few weak serrations in gape; merus flattened bearing granules near ventral margin and curving abruptly distally.

Type locality : New Caledonia (A. Milne Edwards, 1873)

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : East Godavari, Guntur; Tamil Nadu; Pondicherry : Yanam; West Bengal : Sundarbans.

Elsewhere : Myanmar, Malaysia and Australia.

Remarks : This species of crab is a new record to Andhra Pradesh. It was found to occur sympatrically with *U. lactea* near mangroves or in open areas adjacent to mangrove vegetation The yellow major cheliped of male is characteristic of this species and can at once be recognized from *U. lactea* which has white chela.

Subfamily DOTILLINAE Stimpson, 1858

1858. *Dotillidae* Stimpson, *Proc. Acad. nat. Sci. Philad.* : 44.

2000. *Dotillinae,* Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 128.

Diagnosis : Carapace very deep, subglobose or quadrilateral in outline. Front narrow, deflexed, often a mere lobe. Lateral borders with or without tooth. Antennular flagellum rudimentary, almost vertically folded remaining concealed under the front, inter-antennular septum broad. Orbits shallow. Buccal cavern large, often enormous, completely closed by the external maxillipeds. Chelipeds equal or subequal in both sexes. Legs slender; a conspicuous membranous area known as "tympana" present on merus of legs, often on chelipeds and on some of the sternal segments; no hairy recess between bases of second and third pair of legs.

Genus *Dotilla* Stimpson, 1858

1858. *Dotilla* Stimpson, *Proc. Acad. nat. sci. Philad.* : 98.

1900. *Dotilla*, Alcock, *J. Asiat. Soc. Bengal*, **69** (2) : 363.

2000. *Dotilla*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 128.

Diagnosis : Carapace deep, subcubical or subglobose, as broad or broader than long, dorsal and lateral surfaces curiously sculptured resembling brain-convolutions. Front, a narrow deflexed lobe. Lateral borders with or without tooth. Antennae with short flagellum. Antennular flagellum rudimentary, almost vertically folded and remaining hidden below the front. Orbits shallow; eye-stalks long and slender, eyes terminal. Buccal cavern enormous, suboval or subcircular; external maxillipeds very large, completely covering the buccal cavity as a strong hemispherical bulge. Chelipeds equal in both sexes; fingers slender, acute, slightly deflexed and without any prominent tooth. Legs moderate, not much variable in length; upper surface of meri of leg joints and chelipeds with a characteristic oval membranous space or "tympanum", similar space often present on some of the segments of sternum. Abdomen of seven segments in both sexes, distal end of fourth segment thickly fringed with setae, fifth segment not constricted in male.

Type species : *Cancer sulcatus* Forskål, by monotypy; gender: masculine.

Remarks : The genus *Dotilla* has been revised by Alcock (1900) and thereafter by Kemp (1919a). Of the eight species recognized by Kemp (*op. cit.*) only six species occur in Indian coasts. The species *Dotilla brevitarsis* de Man is now placed under the genus *Dotillopsis* Kemp, 1919.

Key to species of the genus *Dotilla*

1. Carapace broader than long, chelipeds at most slightly more than twice the length of carapace, no "tympana" on sternum 2

   Carapace as long as braod, chelipeds 3 to 4 times the length of carapace, "tympana" present on each segment of sternum ..... *D. myctiroides*

2. Only a single groove extending from side of cardiac region towards postero-lateral angle; palm slightly shorter than fingers; lower surface of palm not carinated .... *D. blanfordi*

   Two oblique grooves extending from side of cardiac region towards postero-lateral angle; palm much shorter about half the length of fingers, lower surface of palm strongly carinated ..... *D. intermedia*

97. *Dotilla blanfordi* Alcock, 1900

1900. *Dotilla blanfordi* Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 366.

1901. *Dotilla blanfordi* Alcock and McArdle, *Illustr. Zool. "Investigator" Crust.*, Part 10 : pl. 63, figs. 3, 3a.

1919. *Dotilla blanfordi*, Kemp, *Rec. Indian Mus.*, **36**(5) : 330, text-fig. 9e.

1995. *Dotilla blanfordi*, Bairagi, *Zool. Surv India, Estuarine Ecosystem Series, Part* **2**, *Hugli Matla Estuary* : 278.

Diagnosis : Carapace broader than long, dorsally areolated with smooth grooves – lateral two grooves (of which one very conspicuous and the other less distinct) extending from antero-lateral to postero-lateral angle, a six-rayed star of grooves of about equal size running from mesogastric towards the front, hepatic, branchial and cardiac regions; postgastric region bearing four symmetrical tubercles; subhepatic and pterygostomian regions having the characteristic convoluted structure. Outer maxillipeds studded with microscopic granules, merus twice as big as ischium. Chelipeds not much longer than carapace, fingers slightly longer than palm. Legs little longer than chelipeds, meropodites slender and each bearing a 'tympanum'; dactylus slightly longer than propodus, and about double the length of propodus in last pair. Sternum without tympanum.

Type locality : Sind and Baluchistan, Pakistan (Alcock, 1900).

Distribution : Indian Ocean.

India : East coast – Andhra Pradesh : Visakhapatnam; West Bengal : South 24 Parganas. West coast – Maharashtra : Bombay (= Mumbai).

Elsewhere: Pakistan.

Remarks : This species has been recorded from both the coasts of India. The larval development of this species has been studied by Rajabai(1960b). It breeds from December to July at Visakhapatnam-Waltair coast with its peak period of breeding activity being recorded during March to May (Rajabai, 1975). However, this species has not been collected by us.

98. ***Dotilla intermedia*** de Man, 1888

1888. *Dotilla intermedia* de Man, *J. Linn. Soc. Zool.*, **22** : 135, pl. 9, figs. 4-6.

1900. *Dotilla clepsydrodactylus* Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 365.

1902. *Dotilla clepsydrodactylus*, Alcock and McArdle, *Illustr. Zool. "Investigator" Crust.* Part 10 : pl. 63, figs. 2, 2a.

1919a. *Dotilla intermedia*, Kemp, *Rec. Indian Mus.*, **16**(5) : 331, text-figs. 9f, 10a-f.

1995. *Dotilla intermedia*, Bairagi, *Zool. Surv. India Estuarine Ecosystem Series*, Part **2**, *Hugli Matla Estuary* : 278.

Material examined : 44 (M, High), 10(M, Low), Mahendran River, Baruva, Dist. Srikakulum, Reg. No. C 2351/2; 29 (M, High), 1(F, High), 1(F, Low), Vadarevu, Chirala, Dist. Prakasam, 21.01.1999, Dr. M. K. Dev Roy, Reg. No. C 5310/2.

Measurement : W =	9.75	F = 1.1	L = 7.75
	5.85	2.0	4.40
	3.95	0.75	3.65

Diagnosis : Carapace broader than long, areolated with deeply cut grooves resembling the shape of a 5-rayed star; anterior most of these – frontal grooves reaching up to gastric region and also two grooves running in between post-gastric region and postero-lateral angle; elevated parts of carapace covered with microscopic granules; gastric region bearing four minute tubercles, disappearing upon ageing; pterygostomian and subhepatic regions sulcate and granular. Merus of outer maxillipeds almost twice as long as ischium, the sculpturing consisting of a simple convolution parallel with the outer border, inner half of these joints quite being smooth. Outer surfaces of arm and wrist minutely granular; palm also covered with vesiculous granules at its outer surface; lower surface of palm with two granular ridges running from its proximal part to tip of fixed finger; fingers longer than palm, gradually tapering in to an acute tip and finely denticulate at base. Legs slightly longer than chelipeds, meropodites distinctly dilated and provided with a 'tympanum'; dactylus long, slender, flute-like and grooved; propodus shorter than dactylus. Sternum smooth, without tympanum.

Type locality : Sullivan Island, Mergui (de Man, 1888).

Distribution : Bay of Bengal.

India : East coast – Andhra Pradesh : Prakasam, Srikakulam; Orissa : Balassore, Chandipur, Lake Chilka, Mahanadi Delta; Tamil Nadu : Parangipettai coast; West Bengal : Sagar Island.

Elsewhere : Mergui Archipelago, Tavoy.

Remarks : Kemp (1919a) observed two very distinct dimorphic forms as elaborated below – 'high' and 'low' among the males at Chandipore coast, Orissa. Examination of the present materials from Andhra Pradesh also reveal the same. 'High' males are predominant than the 'low' forms, females are very rare.

In form and areolation of carapace, these two groups resemble each other very closely. However, both the groups can be separated from each other by the following characteristics:

High form	Low form
1. Larger in size.	1. Smaller in size.
2. Each finger of chela bearing a large lobe or tooth near the middle of its prehensile edge.	2. Fingers of chela without any lobe on their dentrary edge but the dactylus bearing a low rounded lobe near the base of its prehensile edge which is further back in 'high' male.
3. First abdominal sternum bearing a sharp transverse ridge on each side.	3. First abdominal sternum marked anteriorly with a pair of large triangular teeth.
4. Tip of male pleopod blunt bearing numerous setae.	4. Tip of male pleopod finely pointed, not bearing conspicuous setae.

This crab is an addition to the brachyuran fauna of the state.

99. *Dotilla myctiroides* (H. Milne Edwards, 1852)

1852. *Doto myctiroides* H. Milne Edwards *Annls. Sci. nat. (Zool.)*, sér. 3, **18** : 152, pl. 4, fig. 24.

1900. *Dotilla myctiroides*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 368.

1919a. *Dotilla myctiroides*, Kemp, *Rec. Indian Mus.*, **16**(5) : 326.

2000. *Dotilla myctiroides*, Dev Roy and Das, *Rec. Zool. Surv. India, Occ. Paper No.* **185** : 128, pl. 5, fig. 2 and pl. 15, figs. 7, 8.

Material examined : 1(M), Bimlipatam, Dist. Visakhapatnam, Reg. No. C 4194/4.

Measurement : W = 8.0 F = 1.0 L = 9.0

Diagnosis : Carapace subcubical, as long as broad, surface faintly grooved. Front extremely narrow, deflexed and grooved. A groove running parallel with each of the lateral margins and a second longitudinal groove slightly fainter than the preceeding one also extending in parallel with the upper one. Lateral borders strongly divergent backwards, sidewalls finely granular and sculptured anteriorly with the grooves resembling "brain convolution" Merus of third maxillipeds about twice as big as ischium, its outer surface studded with microscopic granules. Chelipeds long, slender, unarmed; fingers slender, pointed, longer than palm, slightly deflexed and devoid of any prominent tooth on its cutting edges. Leg joints long, outer surface of merii conspicuously dilated with a curious membranous area known as "tympanum"; dactylus long, slender; propodus shorter than dactylus in the last pair. Abdomen 7-segmented in both sexes, sixth segment of male abdomen longer than broad. Tympanum present on either side of the last four thoracic sterna.

Type locality : Mahe, Seychelles (H. Milne Edwards, 1852).

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; Orissa : Chilka Lake; Tamil Nadu : Ennore, Gulf of Mannar, Palk Bay; Pondicherry : Mahe. West coast – Goa : Mormugao, Panaji; Karnataka : Karwar; Kerala : Travancore; Maharashtra : Bombay (= Mumbai). Andaman Islands. North and South Andamans.

Elsewhere : Seychelles, Sri Lanka, Tenasserim coast, Mergui Archipelago, Malay Peninsula, Singapore, Indonesia and Phillipines.

Remarks : This crab is a new record to Andhra Pradesh.

Subfamily MACROPHTHALMINAE Dana, 1851

1851. *Macrophthalminae* Dana, *Amer. J. Sci. Art.*, ser. 2, **12** : 286.

1900. *Macrophthalminae*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 290, 294.

1976. *Macrophthalminae*, Sakai, *Crabs of Japan and the Adjacent Seas* : 598, 609.

2000. *Macrophthalminae*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 130.

Diagnosis : Carapace rectangular, broader than long, moderately flat, not very deep; regions well marked. Front variable but never very broad. Antennules transversely folded, their flagellum well developed, inter-antennular septum very narrow. Eye-stalks usually elongate. External maxillipeds leaving somewhat wide median hiatus. Chelipeds usually subequal. No special recess between bases of any of the legs. Tympanum absent.

Remarks : This subfamily according to Alcock (1900) contained three genera namely, *Cleistostoma*, *Tylodiplax* and *Macrophthalmus* from India. But, presently the first two genera (whose representatives are not yet recorded from Andhra Pradesh) are transferred to the subfamily Camptandriinae (Serène and Kumar, 1971; Serène, 1974; Manning and Holthuis, 1981).

Genus *Macrophthalmus* Latreille, 1829

1829. *Macrophthalmus* Latreille, In: Cuvier's, *Régne Anim.*, ed. 2, **4** : 44.

1900. *Macrophthalmus*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 343, 375.

1967. *Macrophthalmus*, Barnes, *Trans. Zool. Soc. Lond.*, **31** : 201.

2000. *Macrophthalmus*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 130.

Diagnosis : Carapace depressed, quadrilateral, broader than long; regions well defined, cervical and branchial grooves markedly prominent both on dorsum and lateral margins. Front narrow, deflexed. Lateral borders cut out in two distinct teeth or lobes. Basal antennal joint short, flagellum of good length. Antennules transversely folded. Orbits and eye-stalks very long. Epistome very short, almost linear. Buccal cavern rather large, somewhat curved anteriorly. Chelipeds equal or subequal, much enlarged in male, shorter and slenderer in female, fingers of both sexes curiously deflexed, bent or curved inwards distally. First and last pair of legs usually short and slender compared to second and third pair; third pair longest and stoutest, fourth pair shortest and weakest of all; dactylus broad, stout and laterally compressed in all the legs. Abdomen in both sexes consisting of seven distinct segments, male narrower at base than the breadth of sternum.

Type species : *Goneplax transverses* Latreille, by selection by H. Milne Edwards, 1841; gender : masculine.

Remarks : The genus *Macrophthalmus* exhibits a wide range of structural diversity. It is one of the most diverse of all brachyuran genera. This genus has been revised by Barnes (1967). Out of 55 described species , it presently contains only 35 valid taxa accommodated in 6 subgenera and the same has been adopted in this work. It is worth-mentioning that from India, only 15 species of this genus have been recorded so far. These are contained in four subgenera namely *Macrophthalmus*, *Mareotis*, *Mopsocarcinus* and *Venitus*. Two species namely, *Macrophthalmus travancorensis* Pillai, 1951 and *M. gastrodes* Kemp, 1915 are now synonymised with *Macrophthalmus (Macrophthalmus) brevis* (Herbst, 1804) (Barnes, 1971)

and *M. (Venitus) leptophthalmus* (H. Milne Edwards, 1852) respectively. However, only the first two subgenera have been recorded from Andhra Pradesh

Key to subgenera of the genus *Macrophthalmus*

Lateral teeth narrow and pointed strongly; eye-stalks extending up to the tip or projecting beyond the external outer orbital angle; male abdomen broad ..... ***Macrophthalmus***

Lateral teeth very broad, rectangular; eye-stalks not projecting beyond the tip of external orbital angle; male abdomen narrow ..... ***Mareotis***

Subgenus *Macrophthalmus* Latreille, 1829

1829. *Macrophthalmus* Latreille, In : Cuvier's, *Régne Anim.*, ed. 2, **4** : 44

1967. *Macrophthalmus* Barnes, *Trans. Zool. Soc. Lond.*, **31** : 202

2000. *Macrophthalmus*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 131.

Diagnosis : Carapace very broad and marked with two prominent granular eminences on either side of the branchial region. Lateral teeth narrow and pointed strongly. Eye-stalks extending to tip of or projecting beyond the external orbital angle. External surface of palm of chelipeds in male bearing a prominent longitudinal ridge close to and parallel with its lower margin. Male abdomen broad compared to its length.

Remarks : The subgenus *Macrophthalmus* contains 18 valid taxa. It is represented by six species in India, of which, only one has been recorded from this state.

100. *Macrophthalmus (Macrophthalmus) brevis* (Herbst, 1804)

1804. *Cancer brevis* Herbst, *Versuch. Naturgesch. Krabben. Krebse*, **3**(4) : 9, pl. 6, fig. 4

1852. *Macrophthalmus carinimanus* H. Milne Edwards, *Annls. Sci. nat. (Zool.)*, sér. 3, **18** : 156.

1915. *Macrophthalmus brevis*, Tesch, *Zool. Meded., Leiden*, **1**(3-4) : 169, pl. 6, fig. 5.

1919b. *Macrophthalmus brevis*, Kemp, *Rec. Indian Mus.*, **16**(5) : 392.

1951. *Macrophthalmus travancorensis* Pillai, *Bull. Cent. Res. Inst. Univ. Travancore*, ser. C, **2**(1) : 30, fig. 5a-c.

1998. *Macrophthalmus brevis*, Deb, *Zool. Surv. India State Fauna Series* **3** : *Fauna of West Bengal, Part* 10 : 293.

1971. *Macrophthalmus (Macrophthalmus) brevis*, Barnes, *Zool. Verh., Leiden*, **115** : 4, figs. 1a-b.

Diagnosis : Carapace quadrilateral, depressed, about twice as broad as long, surface with the exception of central gastric region covered with small to medium sized rounded granules, largest and densest anterolaterally and near furrow separating the cardiac and gastric regions; regions quite prominent, gastric, cardiac and intestinal areas tumid, branchial parts with distinct elevated lumps of coarse granules. Lateral borders straight, slightly convergent

posteriorly and cut into two large and one small anterolateral teeth, their margins beaded; first tooth narrow, acute, directed obliquely forward not reaching upto the level of supra-orbital border; second tooth broad, angular, directed outwards and forwards, projecting almost equally with the external orbital angle and separated from the first by a deep incision; third one much smaller but distinct, triangular, pointed, directed outwards and slightly forwards separated from the preceeding one by a notch. Front extremely narrow, deflexed, bifid with smooth surface. Supraorbital border curved, somewhat backwardly sloping, granular or beaded; infra-orbital margin elegantly denticulate, teeth increasing in size outwards; eye-stalks slender, not extended beyond the anterolateral angle. Chelipeds 3 – 4 times the length of carapace, arm trigonal, all the three edges of arm and only the inner edge of wrist spinate; palm very much elongated, its length being about four times its greatest height, its outer surface granulated at the upper border, a strong beaded ridge from its proximal part running parallel to its lower margin and extending almost up to the tip of propodus; inner surface with a strong tooth at its proximal part; fingers broad, thin, vertically deflexed; dactylus curved, the basal part bearing a stout rectangular tooth proximally; cutting edge of immobile finger serrated carrying a large wedge-shaped crenulated tooth at its middle; inner surface of palm and fingers matted with thick hairs. Leg joints long, strong, fringed with hairs; first and last pair small, third largest and fourth shortest. Male abdomen triangular with a broad base, fourth and fifth segments slightly convex or straight.

Type locality : East India (Herbst, 1804)

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; Pondicherry : West Bengal : Sundarbans. West coast – Kerala : Ashtamudi Lake.

Elsewhere : Mauritius, Arakan coast, Mergui Archipelago, Singapore, Celebes and Moluccas.

Remarks : It is needed to mention that the early development (late first zoea) of this species of crab was studied at Visakhapatnam by Rajabai (1974) under the name *Macrophthalmus travancorensis*. However, this species has not been collected by us.

Subgenus *Mareotis* Barnes, 1967

1967. *Mareotis* Barnes, *Trans. Zool. Soc. Lond.*, **31** : 203

2000. *Mareotis*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 133.

Diagnosis : Carapace narrow, with no eminence on its outer surface. Lateral teeth very broad, rectangular. Eye-stalks not projecting beyond the tip of external orbital angle. No longitudinal ridge on palm of larger cheliped in male. Male abdomen narrow compared to its length.

Remarks : The subgenus *Mareotis* contains 9 valid taxa. In India, it is represented by five species, of which, only two occur in Andhra Pradesh.

Key to species of the subgenus *Macreotis*

Lateral borders of carapace parallel, eyes reaching almost up to the end of orbital trench ..... *Macrophthalmus (Mareotis) depressus*

Lateral borders divergent posteriorly, eyes not reaching up to the end of orbits..... ..... *Macrophthalmus (Macreotis) tomentosus*

101. *Macrophthalmus (Mareotis) depressus* Rüppell, 1830

1830. *Macrophthalmus depressus* Rüppell, 24 *Kurzschwänz Krabben Rothen Meeres* : 19, pl. 4, fig. 6.

1900. *Macrophthalmus depressus*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 380.

2000. *Macrophthalmus (Mareotis) depressus*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 133, pl. 5, fig. 4 and pl. 16, figs. 3, 4.

Material examined: 1(M), Waltair, Dist. Visakhapatnam, 24.01.1921, S. W. Kemp, Reg. No. C 2424/2.

Measurement : W = 18.0 F = 2.0 L = 13.0

Diagnosis : Carapace rectangular, broader than long, its length being about two-thirds its greatest width, deep in male, depressed in female; surface (excepting the central gastric region) covered with fine granules not visible to the naked eye; epibranchial regions marked with two longitudinal rows of fine granules of which inner one fainter. Front narrow, constricted, deeply furrowed at the middle but not bilobed, its free edge straight and granular. Lateral borders parallel, antero-lateral angle truncated cutting into a small and two large lobes; first lobe large, quadrangular and broad; second one largest, broad and rectangular, separated from the preceeding one by a deep, wide U-shaped incision; third lobe smallest; margins of lobes beaded with rounded granules. Upper orbital border nearly straight, gently sloping backwards, its margin studded with rounded granules; lower border distinctly and regularly crenulate. Eye-stalks long, slender almost reaching the external orbital angle. Chelipeds markedly unequal but equal in the same sex; outer surface of arm finely granulose, borders denticulate, its inner and outer surfaces covered with close hairs; outer surface of wrist and palm smooth; inner corner of wrist bearing tubercles; upper and lower border of palm granular, inner surface densely hairy; dactylus strongly curved, exceeding two-thirds the length of palm; its cutting margin with a large rectangular crenulated tooth proximally bearing a row of low, less distinct teeth extending from base to almost upto its tip; fixed finger without any large tooth but coarsely denticulated and not curved downwards. Legs unarmed with the exception of a subterminal denticle on the anterior border of meropodites, upper and lower border of merii serrated; dactylus long, claw-shaped, thickly fringed with hairs.

Type locality : Red Sea (Rüppell, 1830).

Distribution : Indo-West Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; Tamil Nadu : Gulf of Mannar, Palk

Bay; Pondicherry. West coast – Maharashtra : Bombay (= Mumbai), Kolak. Andaman Islands : Middle and South Andamans.

Elsewhere : East coast of Africa, Madagascar, Persian Gulf, Red Sea, Aden, Suez, Sri Lanka, Mergui Archipelago, Indonesia, Ryukyu Islands, Australia, Samoa and Hawaiian Islands.

Remarks : The early development (late first zoea) of this species of crab was studdied at Visakhapatnam by Rajabai (1974) under the name *Macrophthalmus depressus*.

As mentioned by Kemp (1915), Mergui specimens recorded by Alcock were subsequently re-examined by de Man and labelled as *Macrophthalmus depressus* in his own handwriting. According to Kemp (*op. cit.*) those specimens actually belonged to his new species *Macrophthalmus teschi*. The single female specimen recorded from Atjeh, Sumatra by de Man under the name *M. depressus* was also referrable to this species. However, specimens recorded by Alcock from Aden were true *Macrophthalmus depressus*.

This crab occurs extensively throughout the Indo-Pacific and has been recorded from both east and west coasts of India.

102. *Macrophthalmus (Mareotis) tomentosus* Souleyet, 1841

1841. *Macrophthalmus tomentosus* Souleyet, *Voy. "Bonite", Zool. (Crust.)*, **1** : 243, pl. 3, fig. 8.

1900. *Macrophthalmus tomentosus*, Alcock, *J. Asiat. Soc. Bengal*, **69**(2) : 382

1915. *Macrophthalmus tomentosus*, Tesch, *Zool. Meded., Leiden*, **1**(3-4) : 193, pl. 9, figs. 12, 12a

Material examined : 1(F), Station No. 20, Bheemunipatnam, Vizagapatnam, Dist. Visakhapatnam, 16.09.1995, Dr. T. Roy, Reg No. C 5281/2.

Measurement : W = 22.5 F = 2.55 L = 15.85

Diagnosis : Entire carapace studded with short, pearly granules, granulations slightly less on the mesogastric and in median part of cardiac regions but more towards the branchial region; surface hairy, hairs denser near the lateral borders. Two somewhat oblique parallel granular ridges present on each side of the epibranchial region behind the branchial groove. Lateral margins divergent considerably posteriorly, cut into two square lobes by incisions, first being the most distinct, third one inconspicuous. Front narrow, longitudinally grooved but not bilobed. Upper orbital border elegantly crenated, curved and almost straight but the crenulation of sub-orbital border much more conspicuous. Chelipeds slender, smooth; both outer and inner surfaces of arm and palm furnished with long hairs; fingers long, slender, slightly larger than palm and clothed with long hairs; their apposed margins finely serrated, meeting at tips. Legs unarmed; meropodites strong, broad and armed with a subterminal spine in first three pair; upper surface of meropodites and both the surfaces of carpus, propodus and dactylus densely clothed with hairs.

Type locality : Manilla, Phillipines (Souleyet, 1841).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; West Bengal : Sundarbans.

Elsewhere: Mergui Archipelago, Aru Islands, Philippines and New Caledonia.

Remarks : This species is reported for the first time from Andhra Pradesh. However, it appears to be a rare species in this coast.

Subfamily CAMPTANDRIINAE Stimpson, 1858

1858. *Camptandriidae* Strimpson. *Proc. Acad. nat. Sci. Philad.* : 52.

1981. *Camptandriinae*, Manning and Holthuis, *Smithson. Contrib. Zool.*, **306** : 193.

2000. *Camptandriinae*, Dev. Roy and Das, *Rec. zool. Surv. India, Occ. paper No.* **185** : 134.

Diagnosis : Resembling Macrophthalminae closely except in the shape of male gonopod and merus of external maxillipeds. Gonopod strongly recurved in male and merus of external maxillipeds as long as or longer than ischium, the distal two segments being slenderer in camptandriinae.

Remarks : In 1858, Stimpson had established the family Camptandriidae to accommodate his new genus *Camptandrium*. Subsequently, many authors synonymised Camptandriidae with the subfamily Macrophthalminae Dana, 1851. Following the views of Serène and Kumar (1971), Serène (1974) formally recognized Camptandriinae as one of the subfamily of the Ocypodidae in which two genera namely, *Leipocten* and *Paracleistostoma* were included. In 1981, Manning and Holthuis while critically evaluating their works had recognized the subfamily and provided a key to 12 genera of the subfamily known until then. According to them, the differences between the genera *Macrophthalmus* Desmarest, 1823 and *Australoplax* Barnes, 1966 on one hand and the genera *Camptandrium* Stimpson, 1858, *Cleistostoma* de Haan, 1833, *Paracleistostoma* de Man, 1895 *Tylodiplax* de Man, 1895 and *Leipocten* Kemp, 1915 on the other are so significant as to separate the last five genera as a distinct subfamily for which the name Camptandriinae Stimpson was available. The subfamily presently contains 13 genera (including one in the addendum, Manning and Holthuis, 1981), of which, only four namely, *Camptandrium*, *Cleistostoma*, *Tylodiplax* and *Baruna* occur in India. However, only the last genus has been recorded from Andhra Pradesh.

Genus ***Baruna*** Stebbing, 1904

1904. *Baruna* Stebbing, *Spolia Zeylanica*, **2**(5) : 3.

1915. *Leipocten* Kemp, *Mem. Indian Mus.*, **5** : 243.

1981. *Leipocten*, Manning and Holthuis, *Smithson. Contrib. Zool.*, **306** : 207.

1991. *Baruna*, Harminto and Ng, *Raffles Bull. Zool.*, **39**(1) : 189.

Diagnosis : Carapace subquadrangular, slightly broader than long, little convex in both the directions, regional boundaries faintly indicated, surface tuberculate with wooly hairs and/or

small bristles. Front moderately broad, slightly depressed and notched at the middle. Antero-lateral margins slightly shorter than postero-laterals and cut into one or two blunt lobes or teeth (excluding the orbitals). Orbits large, without any fissure or suture, upper margin occasionally obscurely crenulate, lower margin evenly curved and crenulate. Basal antennal joint short and broad, flagellum lodged in the orbital hiatus. Antennules transversely folded. Epistome very short, buccal cavern enormous, broader than long; external maxillipeds large, ischium quadrate, merus as long as broad and larger than the ischium. Chelipeds equal or subequal, much larger and swollen in male; outer surface of male chela smooth or granulose for the most part, cutting edges with numerous blunt denticles, dactylus with a molariform tooth near its proximal end; outer surface of female chela with bristles and/or wooly hairs bearing rows of sharp to blunt granules along its length, fingers almost as long as palm without cutting teeth or with very low obscure denticles. Ambulatory legs short, stout with shaggy hair, meral segments more or less dilated with spinules and sharp granules at its lower edge, last pair shortest. Male abdomen of six free segments, second and third somites fused, separated by an obscure median suture; female abdomen consisting of seven separate segments, broad with thickly hirsute margins.

Type species : *Baruna socialis* Stebbing.

Remarks : The genus *Baruna* was erected by Stebbing in 1904 for the inclusion of a new species, *B. socialis* from Ceylon (= Sri Lanka), placed it under the family Grapsidae on the basis of the form of outer maxillipeds and believed it to be nearer to *Varuna* and *Pseudograpsus*.

In 1915, Kemp established the genus *Leipocten* for his new species *L. sordidulum* from Ennur backwater near Madras, India. Later on, this crab was reported from various parts of the Indo-West Pacific region by different workers. Based upon its carapace shape, Kemp (*op. cit.*) placed this genus under the family Xanthidae while Balss (1935) shifted it under Ocypodidae on the basis of similarities in the shapes of chelae, outer maxillipeds and male abdomina to *Paracleistostoma*.

In 1974, Serène first indicated that *Baruna* Stebbing, 1904 was probably a senior synonym of *Leipocten* Kemp, 1915 although he took no formal action to merge the two genera. Manning and Holthuis (1981) also observed much similarity between these two genera especially with regard to the shapes of male chelae, pereiopods, male abdomen and of the antero-lateral margins of carapace and hinted that the two genera might be synonymous. They pointed out.... " should the gonopods of *Baruna* and *Leipocten* prove to be very similar there would be no good reason not to synonymize the two names and the older of them, *Baruna* Stebbing, 1904 would have to be used." Subsequently, this genus has been revised by Harminto and Ng (1991) and after examination of gonopods of both the type specimens of *Baruna* and *Leipocten*, they confirmed the view expressed by Manning and Holthuis (*op. cit.*).

The genus *Baruna* currently contains four valid species (Harminto and Ng, *op. cit.*; Tan and Huang, 1995) but only one is so far known from India.

103. *Baruna socialis* Stebbing, 1904

1904. *Baruna socialis* Stebbing, *Spolia Zeylanica*, **2**(5) : 3, pl. 1A.

1915. *Leipocten sordidulum* Kemp, *Mem. Indian Mus.*, **5** : 244, text-figs. 16-20, pl. 12, fig. 8.

1991. *Baruna socialis*, Harminto and Ng, *Raffles Bull. Zool.*, **39**(1) : 189, figs. 1-3.

2000. *Leipocten sordidulum*, Dev Roy and Das, *Rec. zool. Surv. India, Occ. Paper No.* **185** : 135, pl. 5, fig. 5 and pl. 16, figs. 5, 6.

Diagnosis : Carapace subquadrangular, broader than long, slightly convex with tracts of bristles and long hairs posteriorly; surface granulose and finely pitted upon denudation of hairs. Front deflexed, about half of the maximum width of carapace; frontal margin smooth and straight. Antero-lateral border cut into three lobes - first lobe near the orbit largest bearing six or seven granules, second with three or four granules, last one produced into a blunt tooth and with or without granules; postero-lateral margins shorter than the antero-laterals, converging, gently granulose in male, strongly in female. Supra and infra-orbital borders crenulated; eye-stalks short, stout; cornea not swollen. Chelipeds equal in the same sex, much larger and stouter in males than females; wrist swollen; palm strongly tumid, its upper border crenulated, lower border smooth, outer surface roughened with coarse granules in male; fingers broad, their apposed margins weakly dentate, dactylus armed with a strong molariform tooth. First three leg joints short, stout, broad and tomentose, fourth pair markedly small; merus trigonal, its upper border with tubercles, lower border bearing spinules and tubercles, spinules of last pair much longer than others; dactylus strongly curved. Male and female abdomen consisting of six and seven segments respectively; in male, first four segments although made up of four distinct segments apparently forming a single immovable piece.

Type locality : Sri Lanka (Stebbing, 1904).

Distribution : Indo-Pacific.

India : East coast – Andhra Pradesh : Visakhapatnam; Orissa : Chilka Lake; Tamil Nadu : Ennur near Chennai. Andaman Islands : South Andaman.

Elsewhere : Sri Lanka, Peninsular Malaysia.

Remarks : The larval development of this crab has been studied by Rajabai (1972) under the name *Leipocten sordidulum*. It breeds throughout the year at Visakhapatnam (Rajabai, 1975). However, this species has not been collected by us.

GENERAL REMARKS ON TAXONOMIC DISTRIBUTION

A total of 103 species belonging to 55 genera under 16 families have been dealt with in this communication. Out of these, 89 species under 47 genera and 15 families are present in the National collection of Zoological Survey of India (including the present collections). These species have been critically examined by the present authors. Among these, 46 species have been recorded for the first time from the area under study , these include 4 new records

viz. Ebalia sagittifera, Ixoides cornutus, Demania toxica and *Typhlocarcinus rubidus* from India. Two species namely, *Carcinoplax longipes* and *Eurycarcinus grandidieri* are also recorded for the first time from mainland India. Taxic diversity from family levels of these crabs is presented in Table - 1. The table reveals that the family Portunidae represents maximum number of species (22) followed by Grapsidae (15), Ocypodidae (14), and Leucosiidae (12) constituting 21.36 %, 14.56 %, 13.59 % and 11.65 % respectively of the total number of species of brachyuran crabs reported from Andhra Pradesh. The family Grapsidae contains maximum number of genera (9) followed by Calappidae (7) while Portunidae, Xanthidae, Pilumnidae and Ocypodidae containing 5 genera each. The district-wise dstribution (Table - 2) of the occurrence of these crabs show highest number of species in Visakhapatnam (70 species), followed by East Godavari (32 species), Nellore (24 species) and Krishna (19 species). Least number of species has been recorded from Vizianagaram district (1 species only). Occurrence of such a poor number of species in this district is attributed to the fact that it was not adequately surveyed.

Of the 101 species of crabs (excluding *Jonas* sp. and *Etisus* sp.), 65 species are Indo-Pacific in distribution while 35 species are restricted to Indian Ocean, of which, only 8 species are confined to Bay of Bengal. Only one species, *Plagusia depressa tuberculata* is cosmopolitan in distribution. Endemicity is very poor. The crab, *Nautilocorystes investigatoris* described by Alcock (1899) from Andhra Pradesh is the only species which is not known to occur outside this state.

SUMMARY

A total of 103 species of marine and estuarine crabs belonging to 55 genera and 16 families have been recorded from the coast of Andhra Pradesh. Out of these, 46 species have been recorded for the first time from this part of the country. These include 4 new records from India. Taxonomic account of each species has been dealt with in this communication. Geographical distribution of these crabs has been discussed. The present study reveals that most of these species are of wide distribution in the Indo-Pacific region. Brief notes on ecology and breeding biology of some selected species have also been presented.

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Table-1. Distribution of Marine and Estuatine Crabs of Andhra Pradesh

Family	No. of Genus	No. of species
Dromiidae	2	2
Dorippidae	2	2
Calappidae	3	6
Leucosiidae	7	12
Majidae	3	6
Parthenopidae	2	2
Corystidae	1	1
Thiidae	1	1
Portunidae	5	22
Goneplacidae	1	2
Xanthidae	5	6
Pilumnidae	5	7
Eriphiidae	2	2
Grapsidae	10	15
Pinnotheridae	1	3
Ocypodidae	5	14
Total	**55**	**103**

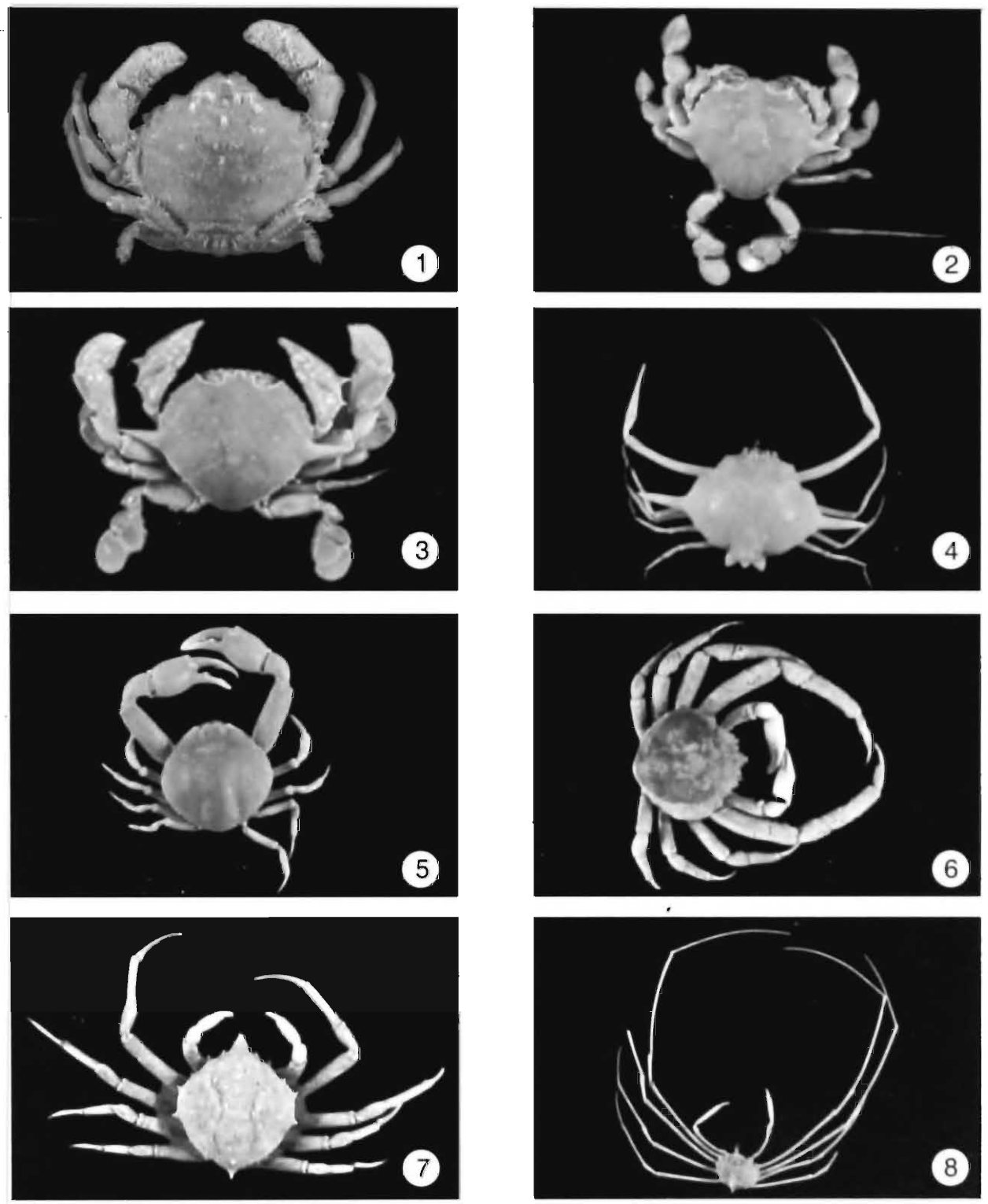
Table-2. District-wise Distribution of Marine and Estuarine Brachyuran Crabs of Andhra Pradesh

Family	1	2	3	4	5	6	7	8	9
Dromiidae		-	1	-					2
Dorippidae	-	-	1	1		1	1		1
Calappidae	2	-	5	4	-	-	1	3	3
Leucosiidae	1	-	6	3		2	1	3	1
Majidae	1	-	3	2		1	-		2
Parthenopidae		-		-	1		-	1	
Corystidae	-	-	1	-	-				
Thiidae	-	-	1						
Portunidae	3	-	18	5	4	10	6	6	8
Goneplacidae	-	-	2					2	
Xanthidae	-	-	5	-				1	
Pilumnidae	-	-	4	3		2	2	1	1
Eriphiidae	-	-	2	1	-		1		
Grapsidae	-	-	10	5	3	2	1		2
Pinnotheridae	-	-		3					
Ocypodidae	3	1	11	5	1	1	2	4	4
TOTAL	**10**	**1**	**70**	**32**	**9**	**19**	**15**	**21**	**24**

• Three species namely, *Philyra sexangula*, *Parilia alcocki* and *Encephaloides armstrongi* are excluded from this table since their collecting localities are shown as "Godavari Coast" and "Godavari Delta" Therefore, district-wise demarcation of these species could not been ascertained at this stage.

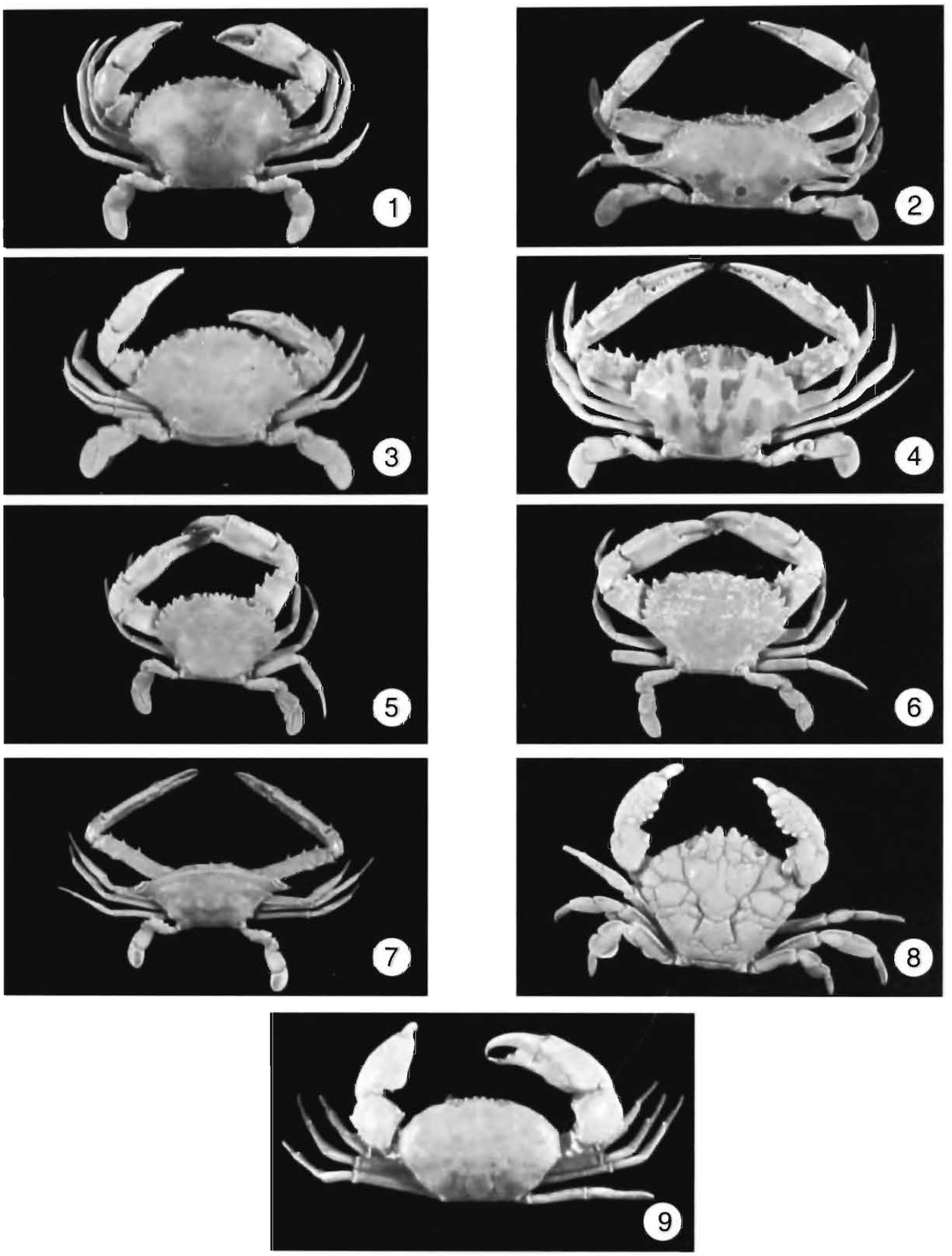
** 1 = Srikakulam 4 = East Godavari 7 = Guntur
2 = Vizianagaram 5 = West Godavari 8 = Prakasam
3 = Visakhapatnam 6 =Krishna 9 = Nellore

PLATE - I



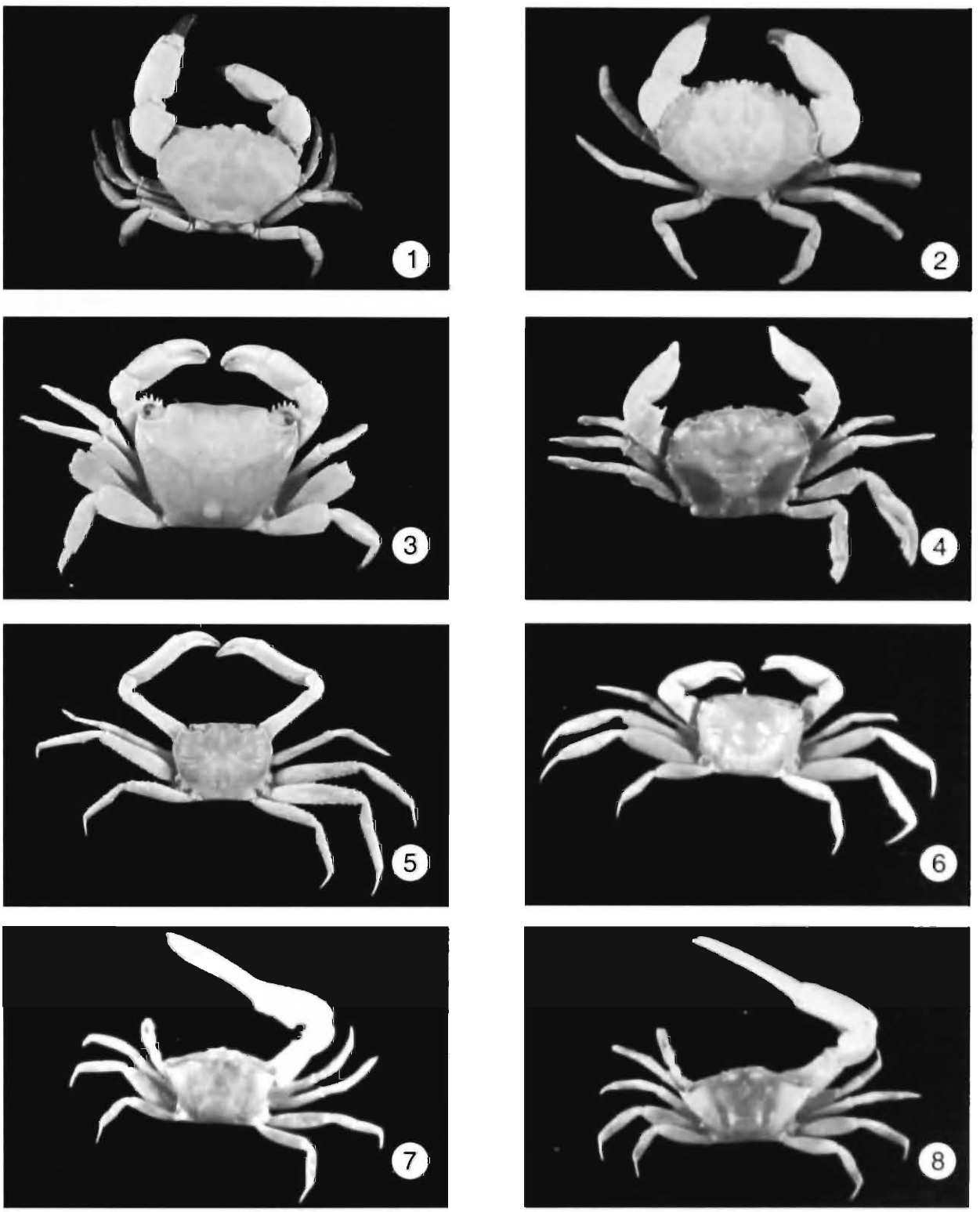
Figs. 1-8. Dorsal view of Marine & Estuarine crabs of Andhra Pradesh : 1. *Lauridromia dehaani* (Rathbun); 2. *Ashtoret lunaris* (Forskål); 3. *Matuta victor* (Fabricius); 4. *Ixoides cornutus* MacGilchrist; 5. *Philyra globulosa* H. M. Edwards; 6. *Doclea ovis* (Fabricius); 7. *Doclea hybrida* (Fabricius); 8. *Phalangipus indicus* (Leach).

PLATE - II



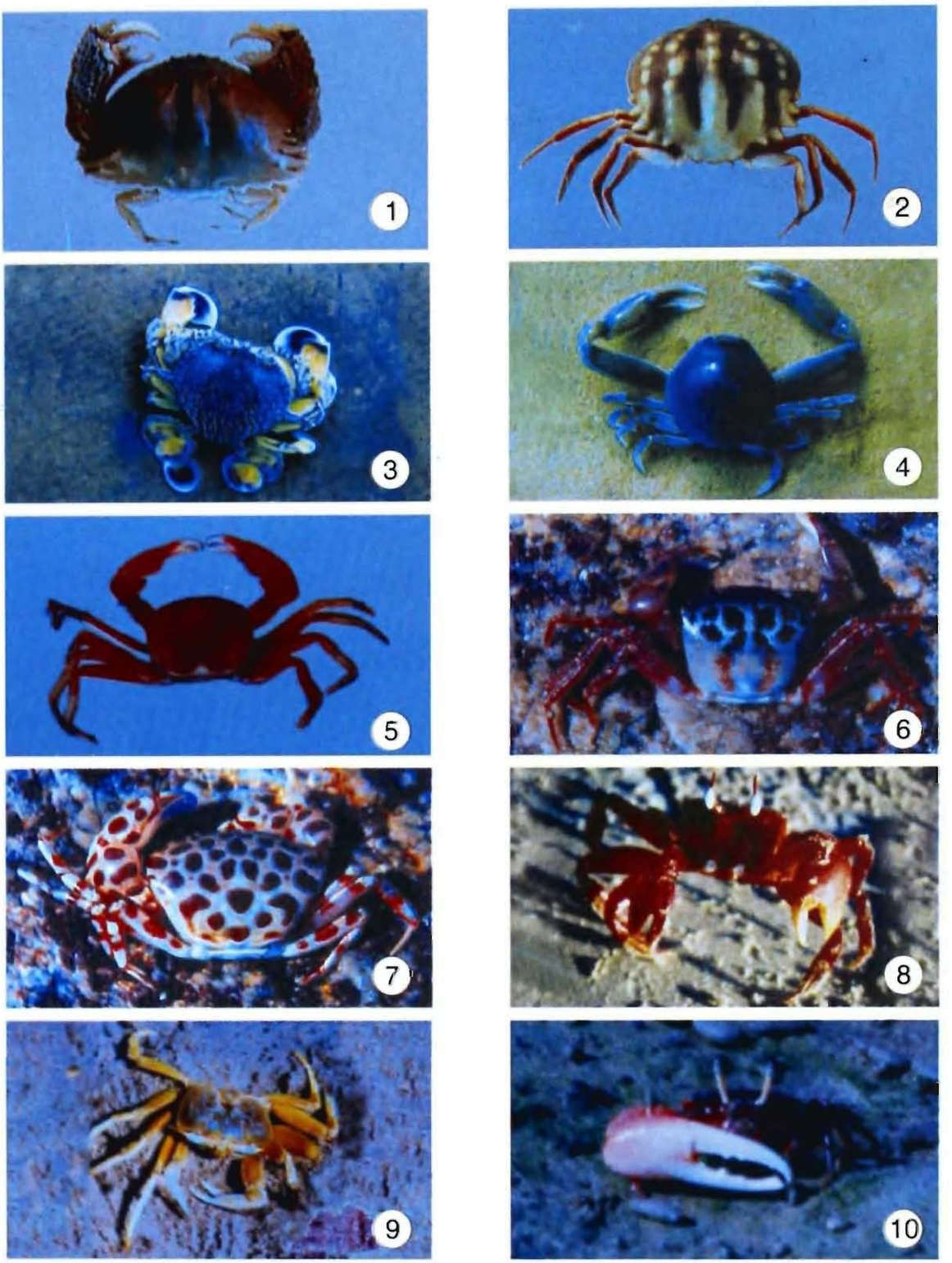
Figs. 1-8. Dorsal view of Marine & Estuarine crabs of Andhra Pradesh : 1. *Scylla tranquebarica* (Fabricius); **2.** *Portunus sanguinolentus* (Herbst); **3.** *Charybdis (Charybdis) affinis Dana*; **4.** *Charybdis (Charybdis)feriatus* (Linnaeus); **5.** *Charybdis (Charybdis) helleri* A.M. Edwards; **6.** *Thalamita crenata* (Latreille); **7.** *Podopthalmus vigil* (Fabricius); **8.** *Demania splendida* Laurie; **9.** *Galene bispinosa* (Herbst).

PLATE - III



Figs. 1-8 Dorsal view of Marine & Estuarine crabs of Andhra Pradesh : 1. *Menippe rumphii* (Fabricius); **2.** *Myomenippe hardwickii* (Gray); **3.** *Metopograpsus messor* (Forskål); **4.** *Varuana litterata* (Fabricius); **5.** *Metaplax crenulata* (Gerstaecker); **6.** *Metplax intermedia* de Man; **7.** *Uca dussumieri* (H.M. Edwards); **8.** *Uca triangularis* (H.M. Edwards).

PLATE - IV



Figs. 1-8. Dorsal view of Marine & Estuarine crabs of Andhra Pradesh : 1. *Calappa lophos* (Herbst); **2.** *Calappa pustulosa* Alcock; **3.** *Matuta planipes* Fabricius; **4.** *Philyra globosa* (Fabricius); **5.** *Carinoplax longimanus* (de Haan); **6.** *Carcinoplax longipes* (Wood-Mason); **7.** *Liagore erythematica* Guinot; **8.** *Ocypode macrocera* H.M. Edwards; **9.** *Ocypode platytarsis* H.M. Edwards. **10.** *Uca lactea* (de Haan).

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CRUSTACEA : DECAPODA : PENAEOIDEA

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INTRODUCTION

Inspite of so much attention, our knowledge on Penaeoid prawns of Andhra Pradesh coastal region is still inadequate. The limits of Andhra Pradesh coastal region included for the present study is the coastal belt of nearly 12,000 sq. km. This is the first contribution of a planned series of scientific papers dealing with the high, but rather poorly known species diversity of Penaeoides of coastal region of Andhra Pradesh. However, the Penaeoid prawns dealt with in the present work comprising 17 species belonging to 08 genera and 02 families under Super family Penaeoidea. To breakwise the entire species of Penaeoid prawn of Andhra Pradesh coastal region, the following details of the groupwise strength of species and genus are as follows :

01 species under genus ***Solonocera;*** 03 species under genus ***Metapenaeopsis;***

04 species under genus ***Metapenaeus;*** 04 species under genus ***Parapenaeopsis;***

01 species under genus ***Penaeopsis;*** 02 species under genus ***Fenneropenaeus;***

01 species under genus ***Penaeus*** and 01 species under genus ***Trachypenaeus.***

It is indeed true that Penaeoid prawns of the Andhra Pradesh coastal region is rich and diverse in nature and therefore, this group has been studied and reported by Rao, S.N. (1964), Subramanyam (1964, 1965), Sebastian *et al.* (1964) and Ganapathy & Subramanyan (1966). Since Alcock's (1906) monograph on Indian Penaeid prawns, mention was not made about their occurrence in particular locality of the Andhra Pradesh coastal region. In all such cases, they have cited as authority of occurrence of Penaeid prawns of Andhra Pradesh coastal region. Hence, this study was undertaken and designed to facilitate identification of Penaeoid prawns of the Andhra Pradesh coastal region and their general information. It is hoped that the use of this work will definitely contribute to the improvement to the fishery resources, survey work, sampling schemes and fishery activities in general.

MATERIAL AND METHODS

The material was collected with the help of a fine meshed hand net from the rocks and tide pools of Andhra Pradesh. For collecting the shallow and deep water benthic forms trawls and dredges were used. After collection, the specimens were narcotised by spraying 5% formaldehyde solution. After 3-4 days the specimens were washed thoroughly in water and thereafter, material was preserved in 70-90% ethyl alcohol. after proper labelling such as exact locality (place name, district, state), date of collection, station number and name of the collector.

The preparation of the list of Penaeoid prawns based on examination of specimens, collected by the authors present in the National Collections of the Zoological Survey of India, Calcutta and also various available literature on Penaeoid prawns of the Andhra Pradesh coast.

The present paper deals with the diagnostic characters of a particular species given by those authors, ommission and commission of the characters also made where necessary for accuracy. Besides information on diagnostic characters, the range of distribution, present catchment areas in the state and other part of the Countries and type species are also given. The general classification adopted in the paper is based on Burukevskii (1982). In order to assist the identification of species and genera, the keys are artificial and not strictly phylogenitical.

SYSTEMATIC ACCOUNTS

Class CRUSTACEA

Order DECAPODA

Suborder (DECAPODA) NATANTIA

Infra Ordcer PENASIDEA

Superfamily PENAEOIDEA

Family SOLENOCERIDAE

1. *Solenocera crassicornis* (H. Milne-Edwards, 1837)

Family PENAEIDAE

2. *Metapenaeopsis stridulans* (Alcock, 1905)
3. *Metapenaeopsis megiensis* (M. J. Rothbun, 1902)
4. *Metapenaeopsis palmensis* (Haswell, 1879)
5. *Metapenaeus monoceros* Fab., 1798
6. *Metapenaeus dobsoni* (Miers, 1878)
7. *Metapenaeus brevicornis* (H. Milne-Edwards, 1837)

8. *Metapenaeus ensis* De Haan, 1844
9. *Parapenaeopsis maxilipedo* Alcock, 1905
10. *Parapenaeopsis uncto* Alcock, 1905
11. *Parapenaeopsis coromondelica* Alcock, 1906
12. *Parapenaeopsis hardwicki* (Miers, 1878)
13. *Penaeopsis rectacuta* (Bate, 1888)
14. *Fenneropenaeus penicilatus* (Alcock, 1905)
15. *Fenneropenaeus penicilatus* (Alcock, 1905)
16. *Penaeus monodon* Fab., 1798
17. *Trachypenaeus curvirostris* (Stimpsen, 1860)

A key to the identification of families of the superfamily PENAEOIDEA

Antennules are long and folecieus ..... SOLENOCERIDAE

Antennules are short and cylindrical ..... PENAEIDAE

Family SOLENOCERIDAE

Genus ***Solenocera***

1. ***Solenocera crassicornis*** (H.M. Edwards, 1837)

Type species : *Penaeus crassicornis* H. Milne-Edwards, 1837, *Hist. Nat. Crust.*, **2** : 418.

1937. *Solenocera sinensis* Yu

1945. *Solenocera indicus* Nataraj

1949. *Solenocera subnuda* Kubo

1956. *Solenocera kuboi* Hall

Material examined : 03♀♀ & 01♂(50-90 mm), Reg. No. C 4761/2, Gelanchundi, Machlipatnam, 6.ix.1995, T. Roy & Party; 01♂& 04♀♀ (31-61 mm.), Reg. No. C 4797/2, Pulicat Lake, 26.viii.1995, T. Roy & Party.

Diagnosis : Rostrum exceeding little beyond the eye, armed with 9+1 dorsal teeth: postrostral crest low and rounded, reaching posterior border of carapace; cervical groove deep, reaching dorsal midline of carapace; postorbital spine present; hepatic crest curved ventrally on anterior part, delimiting a broadly rounded loop slightly behind frontal margin of carapace; telson unarmed, not trifurcate; fifth pereopod without a coxal spine.

Distribution : In India : East coast and West coast of India.

Elsewhere : Indo-West Pacific : Pakistan and India to the Malay Archipelago, China and Japan.

Family PENAEIDAE

A key to the identification of genera of the family PENAEIDAE

1. Petasma symmetrical; no basial spine on third maxilliped 2

   Petasma asymmetrical; a basial spine on third maxilliped..... ***Metapenaeopsis*** Bouvier

2. Presence of ventral teeth on rostrum 3

   Absence of ventral teeth on rostrum 4

3. Gastrofrontal carina present ..... ***Penaeus*** Fabr

   Gastrofrontal carina absent ..... ***Fenneropenaeus*** Perezr Farfenty & Kensly

4. Presence of longitudinal suture on carapace 5

   Absence of longitudinal suture on carapace 6

5. Presence of transvers suture on carapace..... ***Parapenaeopsis*** (Alcock)

   Absence of transvers suture on carapace ..... ***Trachypenaeus*** (Alcock)

6. Fifth pereiopod with exopod; with branchiostegal spine ..... ***Penaeopsis*** Bate

   Fifth pereiopod without exopod; absence of branchiostegal spine on carapace .....
   ..... ***Metapenaeus*** Wood-Mason & Alcock

Genus *Metapenaeopsis* Bouvier, 1905

A key to the identification of species of the genus *Metapenaeopsis*

1. Presence of stridulating ridge on carapace 2

– Absence of stridulating ridge on carapace..... *M. mogiensis* (M. J. Rothbun, 1902)

2. Shape of the arrangement of stridulating ridges curved; Presence of spine on posterior end of 5th & 6th terga ..... *M. palmensis* (Hoswell, 1879)

– Shape of the arrangement of stridulating ridges straight; absence of spine on posterior end of 5th & 6th terga ..... *M. stridulans* (Alcock, 1905)

II. Genus *Metapenaeopsis* Bouvier, 1905

2. *Metapenaeopsis mogiensis* (M. J. Rathbun, 1902)

1906. *Metapenaeus mogiensis* M.J. Rathbun.

1929. *Caratopenaeus mogiensis* Kishinonye.

Type species : *Parapenaeus mogiensis* M. J. Rathbun, 1902. *Proc. U.S. Natl. Mus.*, **26 :** 39.

Material examined : 01 ♂ & 01 ♀ (40-42 mm.), Reg. No. C 4798/2, Pulicat Lake, Andhra Pradesh, 26.xiii.1995, A. Chanda.

Diagnosis : Carapace with velvet texture; rostrum with 08 dorsal teeth, a pair of tooth like structures posterior to main plate of thelycum; Petasmal lobes almost equal in length; absence of stridulating organ on posterior part of carapace.

Distribution : India : East and West coast and Andaman & Nicobar Is.

Elsewhere : Indo-West Pacific: Red Sea and India to Japan and N.E. Australia.

3. ***Metapenaeopsis palmensis*** (Haswell, 1879)

1905. *Metapenaeus palmensis* Alcock

1911. *Penaeopsis palmensis* de Man

1962. *Metapenaeopsis barbeensis* Hall

Type species : *Penaeus palmensis* Haswell, 1879. *Proc. Linn. Soc. N.S.W.*, **4** : 43.

Material examined : 02♂ & 02♀ (40-50 mm.), Reg. No. C 4799/2, Pulicat Lake, Andhra Pradesh, 26.viii.1995, A. Chanda.

Diagnosis : Rostrum with 07 dorsal teeth, and straight body with velvet texture; greeve along with dorsal ridge of third abdominal segment wide and shallow; shape of the stridulating ridge curved, presence of spine on posterier end of fifth and sixth abdominal terga. longer lobe of petasma has been found terminate in a fringe of very short projections. The anterior plate of thelycum is sub-rectangular and has an anterior margin which appears superficially to be concave or straight.

Distribution : India : First time recorded from Andhra Pradesh coast.

Elsewhere : Indo-West Pacific: Malay Archipelago and northern Australia.

4. ***Metapenaeopsis stridulans*** (Alcock, 1905)

1911. *Penaeopsis stridulans* De Man

Type species : *Metapenaeus stridulans* Alcock, 1905. *Ann. Mag. Nat. Hist.*, (7) **16** : 518, 526.

Material examined : 01♂ & 01♀ (62-66 mm.), Reg. No. C 4838/2, Lawsen's Bay, Vizag, Andhra Pradesh, 14.ix.1995, A. Chanda; 01♂ & 02 ♀ (71-72 mm.), Reg. No. C 4840/2, Muthukuru F.L.C., Nellore, Andhra Pradesh, 01.ix.1995, A. Chanda.

Diagnosis : Body densely pubescent. Rostrum armed with 07 dorsal teeth; stridulating organ consisting of 05 very strong and straight ridges at posterior part of carapace. Petasma asymmetrical, right distoventral projection shorter and bearing a few small apical processes;

anterior thelycal plate subquadrate with rounded corners and slightly wider than long; intermediate plate broadly trapezoidal; coxal plates of fourth pereiopods smaller than thelycal plate.

Distribution : India : East and West coast, Andaman & Nicobar Is.

Elsewhere : Indo-West Pacific: Arabian Sea to the Malay Archipelage, New Guinea and New Britain.

III. Genus *Metapenaeus* Wood-Mason & Alcock, 1891

A key to the identification of species of the genus *Metapenaeus*

1. Post-rostral crest not reaching the posterior margin of carapace; telson armed with 03 pairs of movable spine ..... *M. brevicornis* (H.M.Edw., 1837)

   Post-rostral crest reaching the posterior margin of carapace; telson unarmed 2

2. Rostrum exceeding antennular peduncle; adrostral crest reaching epigestric teeth; presence of a basial spine on 3rd pereiopod ..... *M. dobsoni* (Miers, 1878)

   Rostrum not exceeding antennular peduncle; adrostral crest not reaching epigestric teeth; basial spine absent on 3rd pereiopod 3

3. Distemedian projection of petasma swollen and triangular; lateral plates of thelycum with strongly raised lateral margins forming posteriorly 02 inwardly curved triangular projections ..... *M. ensis* De Haan, 1844

   Distomedian projection of petasma swollen and bulbiform; lateral plates of thelycum with strongly raised lateral margins forming 02 longitudinal crests .... *M. monoceros* (Fab., 1798)

5. *Metapenaeus monoceros* (Fab., 1798)

1798. *Penaeus monoceros* Fab., *Suppl. Ent. Syst.*, 409.

1911. *Penaeopsis monoceros* De Man.

Type species : *Penaeus monoceros* Fab., 1798. *Suppl. Ent. Syst.* 409.

Material examined : 01♂ (67 mm.), Reg. No. C 4837/2, Lawson's Bay, Vizag, 14.ix.1995, A. Chanda; 11♂ & 01♀ (75-80 mm.), Reg. No. C 4846/2, Pithapuram, Kakinada, 10.ix.1995, A. Chanda; 16♂ & 16♀ (50-110 mm), Reg. No. C 4847/2, Kaligiri Reservoir, 30.viii.1995, T. Roy and party; 01♂ (120 mm), Reg. No. C 4863/2, Bhimapattanam, Vizag, 25.iii.1997, T. Roy & Party; 20♂ & 35♀ (60-90mm), Reg. No. C 4768/2, Narsapur, W. Godavari, 20.iii.1997, T. Roy & Party; 05♀ & 02♂ (75-100 mm), Reg. No. C 4763/2, Chilogalapudi, Kakinada, 11.ix.1995, A. Chanda; 12♂ & 14♀ (65-120 mm), Reg. No. C 4765/2, Kothapattanam, Ongole, 30.viii.1995, A. Chanda.

Diagnosis : Rostrum armed with 09 dorsal teeth; adrostral crest ending behind second rostral teeth; telson armed only with spinnules, one ischial spine on first pereioped. In males, merus of fifth pereioped with a proximal notch; disto-median projection swollen, bulbiform directed antero-laterally; anterior plate of thelycum long and deeply grooved.

Distribution : India : East and West Coast.

Elsewhere : E. and S. E. Africa, Red Sea to Bay of Bengal, Suez canal and Mediterranean.

6. ***Metapenaeus dobsoni*** (Miers, 1878)

1878. *Mangalura dobsoni* Miers.

1911. *Penaeopsis dobsoni* De Man.

1942. *Metapenaeus dobsoni Choprai* Nataraj.

Type species : *Penaeus dobsoni* Miers, 1878. *Proc. Zool. Soc. Lond.,* : 302, 307.

Material examined : 03♂ & 08♀ (30-100 mm), Reg. No. C 4895/2, Pulicat Lake (South), 26.viii.1995, T. Roy & Party; 03♂ & 03♀ (30-60 mm), Reg. No. C 4880/2, F.L.C. channi, 27.viii.1995, T. Roy & Party; 01♂ (70 mm), Reg. No. C 4844/2, Muthukuru, F.L.C. Nellore, 1.ix.1995, T. Roy & Party; 01♂ & 03♀ (70-80 mm), Reg. No. C 4848, Kaligiri Reservoir, 30.viii.1995, T. Roy & Party.

Diagnosis : Rostrum armed with 7-9 dorsal teeth, but toothless on its distal half; adrostral crest reaching as far as epigastric tooth; basial spine of third pereiopod extremely long and barbed. Disto-median projection of petasma with a short filament both on ventral and dorsal surface, anterior plate of thelycum typically tongue like.

Distribution : India : East and West Coast.

Elsewhere : Indonesia and the Phillipines.

7. ***Metapenaeus brevicornis*** (H.M. Edw., 1837)

1852. *Penaeus avirostris* Dana.

1903. *Metapenaeus avirostris* Nobili.

1911. *Penaeopsis brevicornis* De Man.

Type species : *Penaeus brevicornis* H.M. Edw., 1837. *Hist. Nat. Crust.,* **2** : 417

Material examined : 06♂ (76-80 mm), Reg. No. C 4836/2, Lawson's Bay, Vizag, 14.ix.1995, T. Roy & Party; 01♂ & 02♀ (50-70 mm), Reg. No. C 4866/2, Narsapur, W. Godavari, 20.iii.1997, T. Roy & Party; 05♂ & 01♀ (80-120 mm), Reg. No. C 4766/2, Mungergudi, Machhliptanam, 07.ix.1995, A. Chanda; 01♂ & 01♀ (70-120 mm), Reg. No. C 4830/2, Ramakrishna Beach, Vizag, 15.ix.1995, A. Chanda.

Diagnosis : Rostrum armed with 05 dorsal teeth, distal half straight and toothless; adrostral crest and groove reaching as far as second rostral tooth, telson armed with 03 pairs of movable spine; each disto-median projection of petasma with a long and slender apical filament. Anterior plate of thelycum large square and grooved and lasteral plates boomerang shaped.

Distribution : India : East and West Coast.

Elsewhere : Arabian Sea off Pakistan to Malaya, Indonesia and Thailand.

8. *Metapenaeus ensis* (De Haan, 1844)

1879. *Penaeus mastersii* Haswell

1905. *Metapenaeus incisipes* Alcock

1911. *Penaeopsis ensis* De Man

Type species : *Penaeus ensis* De Haan, 1844. In. ven. Siebold, *Fauna Japonica, Crustacea* (6/7) pl. 46. Fig. 2.

Material examined : 02♂ (60-70 mm), Reg. No. C 4889/2, F.L.C. Channi, 27.viii.1995, T. Roy & Party.

Diagnosis : Rostrum armed with 08 dorsal teeth, adrostral crest ending is behind second rostral tooth, merus of fifth pereioped in adult male with a proximal notch followed by a inwardly curved spiniformed process. Disto-median projections of petasma swollen and traingular, anterior plate of thelycum long and deeply grooved; lateral plates with strongly raised lateral margins forming posteriorly 02 inwardly curved triangular projections.

Distribution : India : East coast.

Elsewhere : Sri Lanka and Malaya to S.E. China, Japan, the Malay Archipelage, New Guinea and Western, Northern and Eastern Australia.

IV. Genus *Parapenaeopsis* Alcock, 1901

A key to the species of the genus *Parapenaeopsis*

1. Distal half of the rostrum toothless; Presence of movable spine on rostrum 2

– Entire rostrum toothed; absence of spine on rostrum 3

2. Antennular flagella longer than carapace; disto-median lobe of petasma longer than distolateral; anterior plate of thelycum square shaped .... *P. ceromandelica* Alcock, 1906

– Antennular flagella not longer than carapace, desto-lateral lobe of petasma longer than disto-median; anterior margin of anterior plate of thelycum is rounded .... *P. hardwickii* (Miers, 1878)

3. Tip of rostrum slightly downward; presence of a basial spine on 3rd pereioped; anterior plate of thelycum subquadrate ..... *P. maxillipedo* Alcock, 1905

   Tip of rostrum curved upward; basial spine absence on 3rd pereioped, anterior margin of anterior thelycal plate is rounded ..... *P. uncta* Alcock, 1905

9. *Parapenaeopsis maxillipede* Alock, 1905

1965. *Parapenaeopsis cornuta maxillipede* Racek & Dall

Type species : *Parapenaeopsis maxillipede* Alcock, 1905. *Ann. Mag. Nat. Hist.*, (7) **16** : 522, 527.

Material examined : 02♂ (70 mm), Reg. No. C 4886/2, F.L.C. Channi, 27.viii.1995, T. Ray & Party; 01 ♂ (57 mm), Reg. No. C 4835/2, Lawsen's Bay, Vizag, 14.ix.1995, T. Roy & Party; 04 ♂ & 03♀ (70-120 mm), Reg. No. C 4859/2, Ramachandrapuram, E. Godavari, 22.iii.1997, T. Roy & Party; 02♀ & 06♂ (40-71 mm), Reg. No. C 4793/2, Pulicat Lake, 26.viii.1995, T. Roy & Party.

Diagnosis : Rostrum armed with 09-10 dorsal teeth and not exceeding the length of antenular articles; Post rostral crest reaching posterior margin of carapace; longitudinal suture reaching 1/3 to 1/2 of carapace length; epipod present on first and second pereiopods; basial spine present on first 03 pairs of pereiopods; telson unarmed. Petasma with long horn-like disto-lateral projections, curving inward distally, disto-median projection very small. Anterior plate of thelycum subquadrate; a median tuft of long setae behind the thelycum.

Distribution : India : East and West coast of India.

Elsewhere : Sri Lanka to Malay Indonesia and Australia.

10. *Parapenaeopsis uncta* Alcock, 1905

1965. *Parapenaeopsis probata* Hall.

Type species : *Parapenaeopsis uncta* Alcock, 1905 *Ann. Mag. Nat. Hist.* (7) **16** : 522.

Material examined : 02♂ (70-71 mm), Reg. No. C 4794/2, Fulicat Lake, 26.viii.1995, T. Roy & Party.

Diagnosis : Rostrum armed with 09-11 dorsal teeth; post rostral crest grooved and reaching posterior margin of carapace; longitudinal suture reaching 3/4 of carapace length; telson unarmed; epipod and basial spine present on first pereiopod; both also present on second pereiopod of females but in males the basial spine is absent or very small. Disto-lateral projections of petasma simply tapering to end, each with a long dorso-median projections very small. Anterior plate of thelycum wide and short, curved anterior margin.

Distribution : India : West and East coast of India.

Elsewhere : Pakistan, Bangladesh to Sri Lanka.

11. ***Parapenaeopsis coromandelica*** Alock, 1906

Type species : *Parapenaeopsis stylifera coromandeliea* Alcock, 1906. *Cat. Indian Decap. Crusta.*, **3** (1) : 37.

Material examined : 01♂ (70 mm), Reg. No. C 4795/2, Pulicat Lake, 26.viii.1995, T. Roy & Party.

Diagnosis : Rostrum sigmoidal, toothless on atleast distal half and strongly upcurved; Post-rostral crest almost reaching posterior margin of carapace; longitudinal suture reaching 2/3rd of carapace length; telson armed with two pairs of subapical fixed spines; epipod and basal spine present on first and second pereiopods; disto-lateral projections of petasma horn-like and directed anterolaterally; distomedian projections small; anterior plate of thelycum square and concave, with a slender stem-like posterior process.

Distribution : India : East coast only.

Elsewhere : Sri Lanka to Indonesia.

12. ***Parapenaeopsis hardwickii*** (Miers, 1878)

1906. *Parapenaeopsis aculptilis hardwickii* Alcock

Type species : *Penaeus hardwickii* Miers, 1878, *Proc. Zool. Soc. Lond.*, **18** B : 300, 306.

Material examined : 01♂ and 04♀ (60-100 mm), Reg. No. C 4834/2, Lawsen's Bay, Vizag, 14.ix.1995, T. Roy & Party; 01♂ and 05♀ (60-100 mm), Reg. No. C 4832/2, Ramakrishna Beach, Vizag, 15.ix.1995, T. Roy & Party.

Diagnosis : Rostrum armed with 8-10 dorsal teeth upcurved in female and downcurved in adult male. Epigastric tooth small; longitudinal suture reaching 3/4th of carapace length; telson armed with four pairs of small mobile spines; epipod and basial spine present on first and second pereiopod. Petasma with distomedian projections wing-like, anterior margin erenulate; disto-lateral projections short and directed laterally. Thelycum with anterior plate concave, rounded anteriorly.

Distribution : India : East and West Coast.

Elsewhere : Pakistan to China and Indonesia.

V. Genus ***Penaeopsis*** Bate, 1888

A key to the species of the genus *Parapenaeopsis*

13. ***Penaeopsis rectecuta*** (Bate, 1888)

1891. *Metapenaous rectacutus* Wood-Mason.

1901. *Parapenaeus rectacutus* Alcock.

Type species : *Penaeus rectacutus* Bate, 1888. *Ann. Mag. Nat. Hist.*, (5) 8 : 180.

Material examined : 02♀ (70-83 mm), Reg. No. C 4762/2, Gelanchundi, Machhlipatnam, 06.ix.1995. A. Chanda.

Diagnosis : Rostrum almost horizontal, straight or slightly sinuous, armed with 12-16 dorsal teeth, carapace with branchiostegal spine; hepatic spine situated at about same level as antenal spine; fifth pereiopod with exopod; telson armed with a pair of fixed lateral spines and three pairs of small movable spines. Anterior plate of thelycum rounded with a base posteriorly, petasma symmetrical with distal part of ventral costae curving abruptly dorso-medially and ending in short, relatively narrow pocesses.

Distribution : India : East and West Coast and Andaman & Nicobar Island.

Elsewhere : S. E. Africa to Japan, the Philippines, Indonesia and Fiji.

VI. Genus ***Fenneropenaeus*** Perez-farfenty & Kensly, 1997

A key to the species of the genus *Fenneropenaeus*

1. Antennular flagella sub equal; gastro-orbital crest extending over posterior 2/3 of distance between hepatic spine and orbital margin; in adult males, dactyl of third maxilliped almost equal in length. ..... *Fenneropenaeus indicus* (H.M. Edw., 1837)

   Anterior flagella equal; gastro-orbital crest extending over middle third of distance between hepatic spine and orbital margin; in adult males, dactyl of third maxilliped much linger than propodus ..... *F. penicilatus* (Alcock, 1905)

14. ***Fenneropenaeus indicus*** (H.M. Edw., 1837)

1892. *Penaeus indicus longirostrics* De Man.

Type species : *Penaeus indicus* H.M. Edw., 1837. *Hist. Nat. Crust.*, **2** : 415.

Material examined : 01♂ (50 mm), Reg. No. C 4883/2, F.L.C. Channi, 27.viii.1995, T. Roy & Party; 01♀ & 02♂ (110-120 mm), Reg. No. C 4768/2.

Diagnosis : Rostrum slender with 7-9 teeth on dorsal and 4-6 teeth on ventral, adrostral crest and groove extending as far as or just beyond epigastric tooth; gastrofrontal and hepatic crest absent; gastro-orbital crest extending ever posterior 2/3 of distance between hepatic spine and orbital margin. Petasma with distomedian projections everhanging distal margin of costae; outer surface of lateral lobes with a few rows of minute tubercles. Thelycum with lateral plates, their median margins forming tumid lips beset with papillae on their inner surface; anterior process rounded distally, posterior process completely inserted between lateral plates.

Distribution : India : East and West Coast, Andaman & Nicobar Island and Lakshadwip.

Elsewhere : Indo-West Pacific : E. and S.E. Africa to S. China, New Guinae and N. Australia.

Remarks : It has a major fishery importance in Andhra Pradesh Coast.

15. ***Fenneropenaeus penicilatus*** (Alcock, 1905)

Type species : *Fenaeus indicus penicillatus* Alcock, 1905. *Ann. Mag. Nat. Hist.,* (7) **16** : 525.

Material examined : 02♂ and 01♀ (60-70 mm), Reg. No. C 4891/2, Myadu, Nellore, 31.viii.1995, T. Roy & Party.

Diagnosis : Blade of restrum convex and armed with 7-9 teeth on dorsal and 3-5 teeth on ventral margin; adrostral crest and groove extending just beyond epigastric teeth; gastro-frontal and hepatic crests absent; gastro-orbital crest extending over middle third of distance between hepatic spine and orbital margin. Petasma symmetrical. Thelycum with lateral plates, their median margin forming tumid lips; anterior process slightly concave, rounded distally; posterior process completely inserted between lateral plates.

Distribution : India : East and West Coast.

Elsewhere : Indo West Pacific : from Pakistan to Taiwan and Indonesia.

VII. Genus ***Penaeus*** Fabricius, 1798

16. ***Penaeus monodon*** Fabricius, 1798

1852. *Penaeus carinatus* Dana.

1862. *Penaeus tahitonsis* Heller.

1949. *Penaeus bubulus* Kube.

1959. *Penaeus monodon monodon* Burkonroad.

Type species : *Penaeus monodon* Fab., 1798. Suppl. *Ent. Syst.,* 408.

Material examined : 01♂ (140 mm), Reg. No. C 4764/2, Kothapattanam, Ongole, Andhra Pradesh, 30.viii.1995, A. Chanda; 08♀ & 02♂ (110-130 mm), Reg. No. C 4767/2, Mungergudi, Machhlipattanam, Andhra Pradesh, 07.ix.1995, A. Chanda; 01♂ & 01♀ (60-70 mm), Reg. No. C 4890/2, Mypadu, Nellore, Andhra Pradesh, 31.viii.1995, A. Chanda; 07♀ & 02♂ (50-70 mm), Reg. No. C 4881/2, F.L.C. Channi, T. Roy & Party, 27.viii.1995; 01♂ & 01♀ (55-80 mm), Reg. No. C 4845/2, Pithapuram, Kakinada, 10.ix.1995, T. Roy & Party; 08♀ & 02♂ (30-170 mm), Reg. No. C 4928/2, Gelanchundi, Machhlipattanam, 08.ix.1995, T. Roy & Party.

Diagnosis : Carapace smooth. Rostrum sigmoidal, armed with 7-8 teeth on dorsal and 3-4 teeth on ventral margin; adrostral crest and groove extending as far as slightly ahead, of

epigastric teeth, gastro-frontal crest absent; antennal crest very prominent, ending above middle of hepatic crest; Gastro-orbital crest extending over posterior half, or less, of distance between hepatic spine and orbital margin; hepatic crest straight, almost horizental, distinctly seperated from base of antennal crest; fifth pereiopod without exopod. Petasma symmetrical, inner surface of lateral lobes armed with spinnules. Thelycum with lateral plates, their median margin sometimes forming tumid lips; anterior process concave, rounded distally; posterior process subtriangular, partly inserted between thelycal plates.

Distribution : India : East, West Coast, Andaman & Nicobar Island and Lakshadwip.

Elsewhere : Indo West Pacific: E. & S.E. Africa and Pakistan to Japan, the Malay Archipelago and northern Australia.

Remarks : It has a great importance to the fisheries.

VIII. Genus ***Trachypenaeus*** (Alcock, 1901)

17. ***Trachypenaeus curvirostris*** (Stimpson, 1860)

1875. *Penaeus longipes* Paulson.

1902. *parapenaeus curvirostris* M.J. Rathbun.

1905. *Trachypenaeus asper* Alcock.

1959. *Trachypenaeus (Trachysalambria) curvirostris malaiana* Burkonroad.

Type species : *Penaeus curvirostris* Stimpson, 1860. *Proc. Acad. Nat. Soc. Phila,* 1860 : 44.

Material examined : 01♂ and 01♀ (90-95 mm), Reg. No. C 4856/2, Lawsen's Bay, Vizag, 26.iii.1997, T. Roy & Party; 03♂ & 01♀ (36-65 mm), Reg. No. C 4796/2, Pulicat Lake, 26.viii.1995, A. Chanda.

Diagnosis : Rostrum armed with 7-11 dorsal teeth; longitudinal suture short; telson with 03 pairs of small movable spines. Petasma with broad, wing like disto-lateral projections directed laterally; anterior plate of thelycum concave anteriorly, with a middle groove posteriorly and a blantly pointed anterior margin.

Distribution : India : East and West Coast and Andaman Island.

Elsewhere : Red Sea, East Africa and Madagascar to China, Japan and Australia, Moditerranean, Suez canal, Egypt, Israel and Turkey.

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CRUSTACEA : DECAPODA : PALAEMONIDAE : POTAMONIDAE

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INTRODUCTION

In spite of so much attention, our knowledge on Crustacean fauna specially freshwater prawns and crabs of Andhra Pradesh is still inadequate. The limits of Andhra Pradesh region included for the present study is restricted to freshwater bodies. The Palaemonid prawns and Potamonid crabs dealt with in the present work were available from the collections of faunistic surveys of Andhra Pradesh conducted by T. Roy, A. K. Pandey, K. V. Rama Rao, S. U. A. C. Sekhar and Ramakrishna and parties and also other unnamed collections, present in the National Zoological Collection, Zoological Survey of India, Kolkata. These examples comprising 05 species of Palaemonid prawns and 02 species of Potamonid crabs.

It is indeed true that fauna of any group is a flexible work tool. Capable of periodical updating through additions and revisions. However, Palemonid prawns and Potamonid crabs of Andhra Pradesh have been studied and reported by Wood-Mason (1872), Alcock (1910) and Bott. (1972) monographs on Indian Palaemonid prawns and Potamonid crabs.

A list of identified Palaemonid prawns from Andhra Pradesh :

1. *Macrobrachium altifrons* (Henderson)
2. *M. kistnensis* (Tiwari)
3. *M. lamarrei* (H. M. Edwards)
4. *M. malcolmosonii* (H. M. Edwards)
5. *M. rosenberqii* (De Man)

A key to species of the genus *Macrobrachium*

1. Merus shorter than Carpus 2

   Merus longer than Carpus ..... *Macrobrachium altifrons*

2. Rostrum never extends at the tip of antennal scale ..... *Macrobrachium kistnensis*

   Rostrum extends at the tip of antennal scale 3

3. Tip of telson reaching beyond the tip of longer posterior spines .... *Macrobrachium rosenberqii*

   Tip of telson everreached by the longer posterior spines 4

4. Basal crest not much elevated, provided with 5 to 9 teeth. Palm of second pereiopods not swollen and longer than fingers ..... *Macrobrachium lamarrei*

   Basal crest distinctly elevated, provided with 9 to 12 teeth. Palm of second pereiopods swollen and shorter than fingers ..... *Macrobrachium malcolmsonii*

1. *Macrobrachium altifrons* (Henderson)

Type species : ***Palaemon altifrons***
Type locality : North India

1893. *Palaemon altifrons* Henderson, *Trans. Linn. Soc. Lond.* (Zool.), **5** (2) : 444, pl. 40, figs. 4 6.

1963. *Macrobrachium altifrons* Tiwari, *Proc. Zool. Sec.* **16** (2) : 225, figs. 1–8.

Material examined : 01. ex Seediametla tank, coll. ?, 23. 2. 90 ; 01 ex., Allapadu (Kolleru Lake), coll. A. K. Pandey, 11. 12. 91 ; 21 exs., Kaligiri Reservoir, coll. T. Roy, 30. 8. 95 ; 04 exs. Kattapattanum, Ongole, coll. T. Roy, 03. 9. 95 ; 8 exs., Machlipatnum market, coll. T. Roy, 08. 9. 95.

Diagnosis : Rostrum short and high, extends at the tip of antennuler peduncle, sometimes reaches at the tip of antennal scale. Rostral formula 5 – 14 / 1 – 5 with 1 – 5 teeth on Carapace behind orbital border. Carpus of 2nd pereiopods shorter than palm. No pubescence on second pereiopods otherwise covered with spinules. In very young specimens, the spinules may be absent or feeble. Cutting edge of mobile and immobile fingers of male with 5 – 6 and 4 – 5 tubercles respectively. In females and young males tubercles are feeble or may be absent.

Distribution : India : Andhra Pradesh, Delhi, U. P., Bihar, Assam.

Elsewhere : Nepal, Pakistan.

Remarks : This species is recorded for first time from South India and appears to be moderate in this area.

2. *Macrobrachium kistnensis* (Tiwari)

Type species : ***Palaemon Kistnensis***
Type locality : Wai (Maharastra)

1949. *Palaemon lanchesteri* Tiwari, *Rec. Indian Mus.*, **45** : 340.

1988. *Macrobrachium kistnensis* Jalihal, Shenoy and Sankolli, *Rec. zool. Surv. India Occ. Paper No.* **112** : 34.

Material examined : 02 exs., Shameerpet pond, coll. K. V. Rama Rao, 20. 3. 90.

Diagnosis : Rostrum extends at the mid way between tips of antennular penduncle and antennal scale- sometimes extends at the tip of antennal scale or exceeds it. Rostral formula 8 - 9 /4 with 01 or 02 teeth on carapace behind orbital border. Carapace always longer than rostrum. Chela of second pereiopods shorter than Carpus ; palm shorter than half of carpus ; fingers more than half the length of palm, smooth, non pubescent with weak teeth near the base. Entire cheliped smooth. Males shorter than female.

Distribution : India : Andha Pradesh, M. P., Maharastra, U. P., Rajasthan.

Elsewhere : Sri Lanka.

Remarks : The hill - stream species extends from Vindhyan Satpura range of mountain to Sri Lanka through the Western ghats.

3. ***Macrobrachium lamarrei*** (H. M. Edwards)

Type species : ***Palaemon lamarrei***
Type locality : Karnataka

1837. *Palaemon lamarrei* H. M. Edwards, *Hist. nat. Crust.*, **2** : 397.

1993. *Macrobrachium lamarrei* Kurian and Sebastian, *prawns and prawn fisheries of India* : 77.

Material examined : 24 exs., Agadala Lanka (Kolleru Lake). Hyderabad, coll. A. K. Pandey, 09. 12. 91, 08 exs., Nattagulla padu (Kolleru Lake). Hyderabad, coll. S. U. A. C Sekher, 22. 12. 92 ; 16 exs., Pitlam Cheruva, Hyderabad, coll. K. V. Rama Rao, 27. 2. 90, 04 exs., Chatakaya (Kolleru Lake). Hyderabad, coll. S. U. A. C. Sekher, 22. 12. 92 ; 02 exs. 06 exs., Adari Kolanu (Kolleru Lake), coll. S. U. A. C. Sekher, 23. 2. 94, 24 exs., Atli Cheruva, Hyderabad, coll. Ramakrishna, 06. 3. 90 ; 11 exs., Jeedimetla, Hyderabad, coll. ?. 07. 6. 85; 06 exs., Korvadi Lanka (Kolleru Lake) Hyderabad, coll. A. K. Pandey, 13. 12. 91; 14 exs., Shameerpet pond, coll. K. V. Rama Rao, 20. 3. 90.

Diagnosis : Rostrum equal to or slightly longer than antennal scale. Upper margin with a distal gap between a proximal series of 6-9 teeth and distal 1-2 subapical teeth, sometimes the gap being fill up by 1-2 teeth. Chela of second perciopods always longer than half but shorter than $^{3}/_{4}$th of Carpus, it is shorter than half of Carpus where the female length 64 mm., palm invariably shorter than half of Carpus.

Distribution : India : West Bengal, Bihar, Orissa, Tamil Nadu.

Elsewhere : Pakistan, Upper Myanmar.

Remarks : This species is widely distributed in fresh and brackish Indian waters, sometimes it is subterranean.

4. *Mecrobrochium malcomsonii* (H.M. Edwards)

Type species : *Palaemon malcolmsonii*
Type locality : Barkul (Bangla Desh)

1910. *Palaemon malcolmsonii* Henderson & Matthai, *Rec. Indian Mus.*, **5** : 283, pl. 15, fig. 2.

1993. *Macrobrachium malcolmsonii* Kurian & Sebastian, *Prawns and Prawn Fisheries of India* : 77.

Material examined : 06 exs., Chinamellipadu (Kolleru Lake), Coll. S.U.A.C Sekher, 19.2.'94; 01 ex., Nichimilli (Kelleru Lake), Coll. S.U.A.C. Sekher, 27.4.'94; 04 exs., Dumpa Gadapa (Kolleru Lake), Coll. S.U.A.C. Sekhar, 18.4.'93; 04 exs., Dharmapuram, (Kolleru Lake), Coll. S.U.A.C. Sekher, 20.2.'94; 04 exs., Bhujabalapeluam (Kelleru Lake), Coll. S.U.A.C. Sekhar, 17.4.'93; 01 ex. Allapadu (Kolleru Lake), Coll. A.K. Pandey, 11.12.'91; 04 exs., Chintapadu (Kolleru Lake) Coll. A.K. Pandey, 14.12.'91; 03 ex., Kolleru Lake, Coll. S.U.A.C. Sekher, 19.12.'94; 09 exs., Kolleru Lake, 14.9.'80; 03 exs., Pallevada (Kolleru Lake), Coll. Sekhar, 16.4.'93; 02 exs. Tirupati, Coll. T. Roy. 23.6.'96; 03 exs., Vijayawada, Coll. T. Roy, 5-6.6.'96; 05 exs. Vijayapuri North, Dist. Nolgonda, Coll. T. Roy, 11.3.'97; 37 exs., Kattabata, Dist. East Godavari, Coll. T. Roy, 23.3.'97; 35 exs., Akivilu, Dist. West Godavari, Coll. T. Roy, 20.3.'97; 44 exs Kolleru Lake, West Godavari, Coll. T. Roy, 19.3.'97 : 30 exs., Kolleru Lake, Guntur, Coll. T. Roy, 8.3.'97; 50 exs., Amaravati, Guntur, Coll. T. Roy, 9.3.'97; 06 exs. Kaligiri Reservoir, Coll. T. Roy, 30.8.'95; 06 exs., Kattapattanum, Ongole, Coll. T. Roy, 3.9.'95.

Diagnosis : Rostrum equal to or slightly longer than antennal scale and generally straight. Distal part of restrum without dorsal teeth. Lower margin of rostrum with 4-7 teeth. An adult specimen about 230 mm in length. Carpus of second pereiopods of adult male, shorter than chela; palm swollen and fingers longer than palm in young male about 60 mm in length.

Distribution : India : Andhra Pradesh, Bihar Orissa, Tamil Nadu, Gujrat, M.P.

Elsewhere : Bangla Desh, Myanmar.

Remarks : This species is found in both fresh and salt waters and appears to be abundant in studied area.

5. *Macrobrachium rosenbergii* (De Man)

Type species : *Palaemon rosenbergii*
Type locality : Andai (N. W. New Guinea).

1879. *Palaemon rosenbergii* De Man, *Notes Leyden Mus.*, **1** : 167.

1993. *Macrobrachium rosenbergii* Kurian & Sebastian, *Prawns and Prawn Fisheries of India* : 77.

Material examined : Rostrum longer than antennal scale and curved upwards. Lower margin of rostrum with 8-14 teeth. Rostrum with a distinct elevated basal crest. Carpus of

second pereiopods of adult male slightly longer than half as long as chela; length of finger equal to palm.

Distribution : India : Andhra Pradesh, Himachal Pradesh, Punjab, Gujarat, Maharashtra, Kerala, Tamilnadu, Andhra Pradesh, Orissa, West Bengal.

Elsewhere : Sri Lanka, Myanmar, Singapore, Hong Kong, Japan, Australia, Java, Sumatra.

Remarks : Found in freshwater and brackiskwater. In India, common in Lakes and estuaries along coast lines.

Family POTAMONIDAE RATHBUN, 1904

A. Genus *Oziotelphusa* Muller, 1887

1. Species *Oziotelphusa senex senex* (Fabricius 1978)

Type species : *Cancer senex* Fabricius, 1798
Type locality : S. Indian, Tranquebar

1798. *Cancer senex* Fabricius, *Entom. Syst.* (Suppl.) 340.

1799. *Cancer aurantius Herbst. Naturs. Krabben, Krebse,* **3** : 59, T. 48 F.5.

1825. *Telphusa indica Latreille, Encycl. meth. Hist. nat.* (Entom), **10** : 563.

1837. *Telphusa indica,* H. Milne-Edwards, *Hist. nat. Crust.*, **2** : 13.

1863. *Telphusa leschenaulti,* H. Milne-Edwards, *Ann. Sci. nat.* (3) **20** : 211.

1887. *Telphusa (Oziotelphusa) hippocastanum* Muller, *Verh. naturw. Ges. Basel* **8** : 492, T. 5 F. 7.

1904. *Potamon (Potamon) senex,* Rathbun, *Nouv. Arch. Mus.*, (4) **6** : 292.

1910. *Paratelphusa (Oziotelphusa) hydrodromus,* Alcock, *Cat. Ind. decap. Crust. ind. Mus.*, **1**(2) : 97 (part).

1910. *Paratelphusa (Oziotelphusa) bouvieri,* Alcock, *Cat. Ind. decap. Crust. ind. Mus.*, **1**(2) : 100, T. 13 F. 61.

1914. *Paratelphusa beuvieri,* Blass, Zool. Jb. (Syst.), **37** : 408.

1960. *Paratelphusa hippocastanum,* Fernando, *Ceylon J. Sci. (Biol.)*, 4:213, Abb. 13e, f. 17.

1960. *Paratelphusa ceylonensis* Fernando, *Ceylon J. Sci. (Biol.)* **4** : 215, T.2, Abb 13g, h. 18.

1970. *Ozietelphusa senex,* Bott. *Rev. suisse (zool.),* **77** : 337.

1970. *Oziotelphusa senex senex,* Bott., *Ark. Zool. Stockholm,* (2) 22 : 632, T. 1 F. 2, 3, T. 2 F. 5, T. 5, F. **12**, Abb. 2.

Material examined : 1F, Manuguru (Kolleru Lake), S.U.A.C. Sekhar & Party, 9.11.94, 1F, Bhujabalapatnam (Kolleru Lake), S.U.A.C. Sekhar & Party, 26.12.92; 1M, 3F, Kuller Village (Dist. Kurnool), Sta. No. 5, T. Roy & Party, 15.6.96; 3M, 2F, Sta. No. 7, Cuddapah Dist.,

T. Roy & Party, 19.6.96; 2F, 2M, Sta. No. 4, Kurnool Dist., T. Roy & Party, 14.6.96; 3M, 1F, Sta. No. 9, Vonurmitta Vill., T. Roy & Party, 19.6.96; 2M, 1F, Sta. No. 10, Tirupati, T. Roy & Party, 25.7.96; 2M, 5F, Sta. No. 6, Cuddapah, T. Roy & Party, 18.6.96; 1M, Siddapuram, Kolleru Lake, S.U.A.C. Sekhar & Party, 17.2.94.

Distribution : India : Ranigunj, Low. Bengal, Dumagudin and Ellore, Pondicherry, Chennai, (Madras), Calcutta, Barabhoom, Low. Bengal, Allahabad, Trivandrum, Travancore, S. India, Ramnad, Madura, Surlake, Orissa, Pallode Travancore, Calicut, Sheveraroy Hills, Bankura, Low. Bengal, Shencottah, Travancore, Vembanaad Lake, Travancore.

Elsewhere : Ceylon.

Remarks : *Oziotelphusa senex senex* is widely distributed and commons available in South India. But this species is abundant in this area.

B. Genus ***Barytelphusa*** *(Barytelphusa) cunicularis* (West Wood 1836)

Type species : *Thelphusa cunicularis* West Wood 1836

Type locality : Umgebung von Bombay, West Ghats 17°-19° 23'N 73°-75°E (cunicularis) Umgebung von Poona (jacquemontii, Ruthbun).

1836. *Thelphusa cunicularis* West Wood, in Sykes & West Wood, *Trans. entom. Soc. London,* **1** : 183 T. 19.

1837. *Thelphusa indica,* Milne Edwards, *Hist. nat. Crust.,* T 14 bis F. 9 (non **2** : 13=*Oziotelphusa senex* (Fabricius).

1844. *Thelphusa indica,* Milne Edwards, *Voyage l'Inde Par Victor Jacquemont,* 4(Crust,) : 7, T. 2F. 1 (Part).

1853. *Thelphusa indica,* Milne Edwards, *Ann. Sci. nat.,* (3) **20** : 209.

1861. *Telphusa indica* Herelots, *Symbolae* Carc 13.

1897. *Potamon (Potamonautes) indicus,* Ortman, *Zool. Jb* (Syst) **10** : 304, 305.

1909. *Paratelphusa (Barytelphusa) jacquemontii* Alcock, *Cat. ind. decapod. Crust. ind. Mus.,* 1(2) : 86, T. 5 F. 21.

1931. *Paratelphusa pulvinata,* Roux, *Rev. Suisse (zool.)* **38** : 52.

1970. *Barytelphusa (Barytelphusa) cunicularis,* Bott. *Rev. Suisse* (Zool.), **77** : 335.

Material examined : 3M, Sta. 1, Pulicat & Sta. 3, Matchrela Dist. Nalgonda, T. Roy & Party, 28.8.95 & 10.3.97; 4M, Pedamindu, Kolleru Lake, S.U.A.C. Sekhar & Party, 23.2.94.

Distribution : *In India* : Coorg, Parisnath Hill, Barrabhum, Coonoor, Nilgiris, Anamalai Hills, Khandalla and Mahableswar, Debnaddi Narbudda basin, Hardwar, Morar, Chotanagpur, Nassik, Upper Godavari, Poona, Shervaroy Hills, Calicut, Hoshangabad, Manbhum, Otacamund, Parisnath Hills, Madathoray, Travancore, Mangalore, Nilgiris.

Elsewhere : Not Known.

Remarks : This species is represented from Andhra Pradesh by limited numbers.

SUMMARY

In the present report five species of Palaemonid prawns belonging to one genus and two species of Potamonid crabs belonging to two genera are dealt with. One species of Palaemonid prawn *Macrobrachium altifrons* (Hendergon) is recorded for the first time from south India and it appears to be moderate in this area. It is interesting to note that the species *Macrobrachium malcolmsonii* (H. M. Edwards) is found abundant in the study area. Regarding Potamonid drabs the species *Oziotelphusa senex senex* (Fabricius) is widely distributed in South India. Brief synonym and Zoo-geographical distribution for all the species have been dealtwith.

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FRESH WATER BRYOZOA

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INTRODUCTION

Fresh water bryozoa belongs to smaller coelomate groups comprising five families of the phylum bryozoa with relatively simple body organisation. They live in the aquatic environment of ponds, water reservoirs, lakes, streams and adhering to the surface of the substratum i.e., aquatic weeds, logs, stones, bricks etc. They live together in the form a colony, usually yellowish-brown, pinkish brown, dark-brown, reddish-brown, green or black in colour. Approximately 5000 living species of bryozoa exist today of which between forty five and fifty occur in fresh water. The majority of these belong to the class phylactolaemata.

Work on fresh water bryozoa in India initiated by Annandale (1911) followed by Roonwal (1969), Rao (1972, 1976, 1991), Rao *et al.* (1962, 1978, 1979, 1985), Srivastava (1981, 1985), Agarwal *et al.* (1981), and Chaubey *et al.* (1985) from different places of India. As a result twenty species have so far been recorded from india, out of which only one species is reported from Madras Presidency. The present author has dealt with nine species from West Bengal (2001), five from Meghalaya (1999), four from Tripura (2000) and four from Sikkim (2003).

The present work is an attempt to study the systematics of the group of the coastal districts of Andhra Pradesh. Material for the study was collected through field surveys from Srikakulum, Vijianagram and Vishakapatnam districts during October, 1995, from East-Godavari, West-Godavari and Krishna districts during April, 1997 and from Nellore district of Andhra Pradesh during April, 1998. The material so far collected is represented by six species under four genera and two families, none of them is new to science but all the species show new locality records. The present paper deals with the synonymy (original and latest ones) diagnostic characters, distribution together with key to identification of six species. In addition to this, a general account of morphology and terminology as well as methods of narcotisation and preservation, and tables (I and II) showing districtwise and statewise distribution of the species have also been included.

MORPHOLOGY AND TERMINOLOGY

Polypide : It is an organ connected directly and indirectly with nutrition and a part of the muscular system and also retractile in nature.

Zooecium : It is a living cage in which polypide is enclosed. The shape and structure varies greatly in different groups – in its simplest form it is a cylindrical tube of living matter which secrets an outer horny or gelatinous covering. It possess an apical aperture "Orifice" through which certain parts of polypide can always be extruded or withdrawn into it along with a portion of the former. Zooecia of a colony may be separated but are contiguous with walls in contact or in common.

Lophophore or Tentacular Crown : It consists of a body wall extension being subdivided distally into a single row of ciliated tentacles. All parts of the lophophore are hollow, having a continuous coelomic cavity. It is circular or horse-shoe shaped surrounding the mouth.

Tentacles : They serve as organs for capture of prey but are not highly contractile and not provided with nettle cells but are covered with cilia. In extruded stage they form a conspicuous calix-like crown to the zooecium but in retracted condition they are closely packed together and lie parallel to one another.

Mouth : It is a hole situated in the midst of the tentacles and leads directly into a funnel-shaped oesophagus.

Statoblast : It is flattened and has a circular, oval or approximately oval outline. It consists essentially masses of cells enclosed in a capsule with thick horny walls. This capsule is surrounded by a "Swim-ring" composed of mass of horny walled chambers filled with air. Sometimes margin of the "Swim-ring" bears peculiar hooked processes.

NARCOTISATION AND PRESERVATION

The living specimens are placed in a glass tube nearly filled with clean water and allowed to expand their tentacles. 2% aqueous solution of cocaine, 2–3 drops at a time, are gradually dropped in the water containing fully expanded specimens and the process is to be continued until tentacular movement ceases. Then commercial formaldehyde solution is to be added drop by drop. The material is to be kept as it is for half an hour. For anatomical investigation the material is to be washed thoroughly with tap water and treated with different alcoholic

grade (upto 90%). For museum purpose the material is to be kept permanently in 8% formalin.

Statoblast : It is the asexual reproductive body and to be treated with strong nitric acid for a few minutes. Then acid is to be removed from the statoblast with water, and the material after passing through different alcoholic grade and oil of cloves is to be mounted on a slide with a small quantity of canada balsum under a cover slip, taking care that the statoblast lie parallel to the latter.

SYSTEMATIC ACCOUNT

A. Class GYMNOLAEMATA

Order CTENOSTOMATA

I. Family HISLOPIIDAE

1. Genus ***Hislopia*** Carter

1. *Hislopia lacustris* Carter

B. Class PHYLACTOLAEMATA

II. Family PLUMATELLIDAE

2. Genus ***Plumatella*** Lamarck

2. *Plumatella diffusa* Leidy
3. *Plumatella fruticosa* Allman
4. *Plumatella javanica* Kraepelin

3. Genus ***Hyalinella*** Jullien

5. *Hyalinella punctata* (Hancock)

4. Genus ***Stolella*** (Annandale)

6. *Stolella indica* Annandale

Key to Class

– Polypides with epistome projecting upwards and forwards ...within the circle of tentacles... anus; zooecia not distinct from one another ..... PHYLACTOLAEMATA

– Polypides without epistome; zooecia distinctly separated from one another by transverse perforated plates ..... GYMNOLAEMATA

A. Class GYMNOLAEMATA

Diagnosis : Polypides without epistome; zooecia distinctly separated from one another by transverse perforated plates; majority of zooecia in each zoarium more or less flattened but

some of them often modified to form "Vibracula" and "avicularia" In some zooecia provided with a collar-like membrane; and usually more or less tubular; in some zooecia provided neither with a lip nor with a collar-like membrane, tubular and usually with circular orifices.

Order CTENOSTOMATA

Zooecium simple, flexible, uncalcified and composed of chitinous cuticle, usually more or less tubular in shape and provided with a collar-like membrane; orifice lacking a closing apparatus; heterozooids other than kenozooids in the form of stolons and rhizoids lacking.

I. Family HISLOPIIDAE

Diagnosis : Zoarium recumbent, often forming an almost uniform layer on solid objects; zooecia flattened, adherent with dorsal orifice, either surrounded by a chitinous rim or situated at tip of an erect chitinous tubule; parietal muscles absent.

Remarks : In this family only *Hislopia* is recorded from Andhra Pradesh.

1. Genus ***Hislopia*** Carter

1858. *Hislopia* Carter, *Ann. Nat. Hist.* (3) **1** : 169.

1880. Norodonia Jullien, *Bull. Soc. zool. France,* 5 : 77.

1901. *Echinella* Korotneff, *Biol. Centrbl.,* **21** : 311.

1976. *Hislopia* Rao, *Rec. zool. Surv. India,* **69** : 331.

Diagnosis : Zoarium consisting primarily of a main axis running in a straight line, with lateral branches pointing forwards and outwards; zooecia arising directly one from another having an orifice surrounded by a chitinous rim; polypide with 12 to 20 tentacles; funiculus rudimentary or absent.

Distribution : Africa ; Europe; Russia; Japan; India; Burma; America.

1. ***Hislopia lacustris*** Carter

1858. *Hislopia lacustris* Carter, *Ann. Mag. Nat. Hist.,* (3) 1 : 169.

1880. *Norodonia combodgiensis* Jullien, *Bull. Soc. zool. France,* **5** : 77.

1976. *Hislopia lacustris* Rao, *Rec. zool. Surv. India,* **69** : 331.

Material : (1) West Godavari Dist.–8 colonies, Kaikaluru, 9.iv.1997; 1 colony, Kamavarapukota, 12.iv.1997, coll. T. K. Samanta. (2) Krishna Dist.–8 colonies, Nonna, 14.iv.1997; 8 colonies, Mailavaram, 15.iv.1997; 8 colonies, Nandigama, 16.iv.1997; 8 colonies, Pamarru, 17.iv.1997, coll. T.K. Samanta.

Diagnosis : Zoarium forms a flat, more or less solid layer and closely adherent to foreign objects with radiating branches at edges but forms narrow, closely – compressed masses when growing on slender twigs or stems of water-plants; zooecium never grows over another and variable in shape, irregularly oval, posterior extremity being often narrower than anterior while triangular or almost square shaped zooecia often observed; orifice on a slight eminence nearer anterior than the posterior margin of dorsal surface and surrounded by a strong chitinous rim, square or subquadrate in shape; zooecium usually surrounded by a chitinous margin; polypide with 12 to 20 tentacles, but usually 16 in number.

Habitat : Attached to slender twigs, stems of water plants.

Distribution : India : Andhra Pradesh – West Godavari dist., Krishna Dist.; Madhya Pradesh; Maharashtra; Meghalaya; Orissa; Rajasthan; Tamil Nadu; Uttar Pradesh; West Bengal.

Elsewhere : Africa; Europe, West Germany, Russia, Japan; Myanmar; America.

Remarks : The material conforms in general with the specimens identified and recorded by Annandale (1911) from Calcutta. Overgrowth of colonies was observed in the material studied as well as reported by Rao (1976) but Annandale (1911) reported "one zooecium, however, never grows over another" Present investigation indicates that ***hislopia lacustris*** is the first time recorded from this area.

B. Class PHYLACTOLAEMATA

Zooecia never distinct from one another and their orifices circular; polypide possess a leaf-like ciliated organ, epistome, arising within the lophophore between mouth and anus and projecting upwards and forwards over mouth; lophophore either horse shoe-shaped or circular; tentacles webbed at base; statoblast, a peculiar reproductive body, present.

II. Family PLUMATELLIDAE

Lophophore horse shoe-shaped; ectocyst well developed but not specialised to form an organ of progression; statoblasts provided with "Swim-ring" having chitinous chambers containing air.

Remarks : The material studied possessed statoblast without marginal processes.

Key to Genera

1. Zooecia flat, embedded in a gelatinous investment ..... ***Hyalinella*** Jullien
– Zooecia cylindrical, not embedded in a gelatinous investment 2
2. Zooecia arising directly from one another; no stolon ..... ***Plumatella*** Lamarck

– Zooecia arising singly or in groups from an adherent stolon ..... ***Stolella*** Annandale

2. Genus ***Plumatella*** Lamarck

1816. *Plumatella* Lamarck, Animan Sansvert (ed. Ire) **2** : 106. *Alcyonella,* id. ibid : 100.

1976. *Plumatella* : Rao, *Rec. zool. Surv. India,* **69** : 334.

Diagnosis : Zoarium dendritic, recumbent, erect or partly recumbent and partly erect; zooecia tubular, not confined in a gelatinous syoecium; ectocyst usually horny; statoblasts of two kinds : free and stationery; polypide with less than 65 tentacles.

Habitat : The zoaria of the species of *Plumatella* found firmly attached to stones, bricks, logs of wood, sticks, flating seeds, the stems and roots of water plants and occasionally to the shells of molluscs.

Distribution : Central Africa ; Europe; India; N. America.

Key to Species

1. Ectocyst by no means, of a uniform pale colour; zooecia straight, curved or sinuous, elongate, cylindrical but never emarginate or furrowed ..... *P. fruticosa* Allman

– Ectocyst rigid; zooecia emarginate and furrowed 2

2. Ectocyst pigmented 3

– Ectocyst colourless ..... *P. javanica* kraepelin

3. Zooecia distinctly L-shaped ..... *P. diffusa* Leidy

2. ***Plumatella diffusa*** Leidy

1852. *Plumatella diffusa* Leidy, *P. Ac. philad.,* **5** : 261.

1911. *Plumatella diffusa* Annandale, *The Fauna. British India,* p. 223.

Material : (1) Sri kakulum dist. – 4 colonies, Palakonda Road side, 16.x.1995; 5 colonies, Etcherla, 17.x.1995; 7 colonies, Amadalavalasa, 18.x.1995; coll : Sri T. K. Samanta. (2) Vishakapatnam Dist. – 1 colony, Tagarapuvalasa, 25.x.1995; 3 colonies, Endara, 26.x.1995, coll : Sri T. K. Samanta. (3) East Godavari Dist. – 5 colonies, Sarpavaram, 7.iv.1997; coll : T. K. Samanta.

Diagnosis : Zoarium in the typical form loose in appearance and ectocyst by no means rigid; branching lateral and as a rule occurs chiefly on one side of a main branch or trunk; zooecia cylindrical and bear a simple keel on their dorsal surface; never emarginate or furrowed; ectocyst thin, colour usually uniform pale pinkish brown and fading little towards the tip of the zooecium; both free and stationary statoblasts formed, but stationary statoblasts

rare in occurrence; free statoblasts very elongate; capsule relatively large, resembling swim-ring in outline and its sides distinctly convex and ends rounded; polypide about 40 to 50 tentacles and not festooned at base.

Habitat : The steams of aquatic plants, floating seeds and logs, stones and bricks in the pond.

Distribution : India : Andhra Pradesh – Sri Kakulum, Vijianagram and Vishakapatnam districts; Himalayan region; Kerala; Maharashtra; Madhya Pradesh; Meghalaya; Orissa; Rajasthan; Sikkim; Tripura; West Bengal.

Elsewhere : Africa; Europe, Pakistan; Bangladesh; North America.

Remarks : *P. fruticosa* in Lower Bengal is a cold weather species. This is first time recorded from Andhra Pradesh.

4. ***Plumatella javanica*** kraepelin

1906. *Plumatella javanica* Kraepelin, *Mitt. Nat. Mus. Hamburg,* **23** : 123.

1976. *Plumatella javanica* : Rao, *Rec. zool. Surv. India,* **69** : 339.

Material : (1) Sri Kakulum dist. – 8 colonies, Palakonda Road side, 16.x.1995; coll : Sri T. K. Samanta. (2) East Godavari dist.–8 colonies, Acthanapeta, 4.iv.1997; 4 colonies, Rajanagaram, 5.iv.1997; 6 colonies, Rajamundry, 6.iv.1997, coll. Sri T. K. Samanta. (3) West Godavari dist. – 10 colonies, Kolleru lake, 9.iv.1997, coll : Sri T. K. Samanta.

Diagnosis : Zoarium always entirely recumbent having lateral and irregular branches; zooecia slender, long, strongly emarginate and furrowed; ectocyst hyaline and colourless; free statoblasts with rounded extremities and sides slightly or distinctly convex; variable in length, either distinctly elongate or elongate only to a moderate degree; capsule relatively large, and free portion of the swim-ring not much broader at the ends that at the sides; fixed statoblasts elongate and surrounded by an irregularly shaped chitinous membrane.

Habitat : Leaves of water-lilies, floating seeds and sticks, submerged leaves of *pandani* and stems of water-plants in the pond.

Distribution : India : Andhra Pradesh – East-Godavari district; West-Godavari district and Sri Kakulum district; Kerala; Madhya Pradesh; Maharashtra; Meghalaya; Sikkim; Tamil Nadu; Tripura; West Bengal.

Elsewhere : Europe; China; Japan; Java; North America.

Remarks : The transparent glassy ectocyst and strong furrowed keel are very characteristic of this species. This is first time recorded from Andhra Pradesh.

3. Genus ***Hyalinella*** Jullien

1885. *Hyalinella* Jullien, *Bull. Soc. Zool. France,* **10** : 133.

1976. *Hyalinella* : Rao, *Rec. zool. Surv. India,* **69** : 340.

Diagnosis : Zoarium entirely recumbent and often appears to form an almost uniform flat layer instead of a dendritic body; orifice of the zooecium prominent; ectocyst almost gelatinous in nature, soft, swollen and contractile, and capable of transverse wrinkling all over the zooecium which never emarginate.

Habitat : Submerged roots and stems of water plants, submerged leaves and submerged bricks and stones in the pond.

Distribution : Europe; India; North America.

5. ***Hyalinella punctata*** (Hancock)

1850. *Plumatella punctata* Hancock, *Ann. Mag. nat. Hist Ser.* II, **5** : 173.

1976. *Hyalinella Punctata* : Rao, *Rec. zool. Surv. India,* **69** : 340.

Material : (1) Vishakapatnam dist. – 5 colonies, simhachalam, 24.x.1995; 5 colonies, Endara, 26.x.1995, coll : Sri T. K. Samanta. (2) East Godavari Dist. – 10 colonies, chollangi village, 2.iv.1997; 10 colonies, Peddapuram, 6.iv.1997. 10 colonies, Samalkot. 6.iv.1997, coll : Sri T. K. Samanta. (3) West Godavari dist. – 8 colonies, Raulpalaen, 11.iv.1997, coll : Sri T. K. Samanta.

Diagnosis : Zoarium entirely recumbent and often appears to form an almost uniform flat layer instead of a dendritic body; zooecia greatly swollen with colourless or faintly brown gelatinous ectocyst and neither emarginate nor furrowed; stationary statoblasts absent ; free statoblasts variable and often asymmetrical in outline, but free portion of swim-ring always of nearly equal diameter all round the periphery and the capsule relatively large. Polypide comparatively short and stout, and having 20 to 30 tentacles.

Habitat : Submerged bricks, woods, stones, leaves and stems of water plants in the pond and also the tips of creepers falling into water in the pond.

Distribution : India : Andhra Pradesh – Vishakapatnam dist. East-Godavari dist, West Godavari dist; Madhya Pradesh; Meghalaya; Rajasthan; Sikkim; Tripura; West Bengal.

Elsewhere : Europe; North America.

Remarks : In Andhra Pradesh *H. punctata* flourishes both during the "rains" and in winter. This is first time recorded from Andhra Pradesh.

4. Genus ***Stolella*** Annandale

1909. *Stolella,* Annandale, *Rec. Ind. Mus.,* **3** : 279.

1976. *Stolella* : Rao, *Rec. zool. Surv. India*, **69** : 341.

Diagnosis : Zoarium consisting of groups of zooecia joined together by an adherent rhizome; gelatinous investment absent; zooecia with fixed as well as free statoblast. Adult zooecia resembling those of *plumatella* except in being sometimes more or less upright.

Habitat : Roots of duckweed, stems and dead leaves of aquatic plants, bark, submerged rocks and stones in the pond.

Distribution : India : Madhya Pradesh; Maharashtra ; Rajasthan; West Bengal.

Elsewhere : North America.

6. *Stolella indica* Annandale

1909. *Stolella indica* Annandale, *Rec. Ind. Mus.*, **3** : 279.

1976. *Stolella indica* : Rao, *Rec. zool. Surv. India*, **69** : 341.

Material : (1) West Godavari Dist.–one colony, Bhimavaram, 10.iv.1997; coll : Sri T. K. Samanta. (2) Nellore dist. – 10 colonies, Foto Road, Kalju village, 7.iv.1998, coll : Sri S. K. Mukherjee & party.

Diagnosis : Zoarium adherent and linear having neither lateral nor vertical branches; zooecia short and slender, erect, distinctly emarginate and furrowed; ectocyst soft, colourless and transparent but minutely roughened on the surface; both free and fixed statoblasts present and both variable in form, the latter varying in outline from circular to broadly oval; tentacles 30 to 35; rather short and stout, sometimes being slightly expanded at the tips.

Habitat : Roots of duckweed, stems of water plants, submerged rocks, dead leaves, sticks and barks in the pond.

Distribution : India : Andhra Pradesh–West Godavari dist. Nellore dist.; Madhya Pradesh; Maharashtra; Rajasthan; West Bengal.

Remarks : *Stolella indica* flourishes during rains. This is first time recorded from Andhra Pradesh.

SUMMARY

The paper deals with a systematic account of 6 species of fresh water Bryozoa hitherto known from the coastal districts of Andhra Pradesh. Each of the species is provided with a synonymy, diagnostic characters, habitat and distribution. It also furnishes the keys to families, genera and species for their easy identification. A general account on morphology and terminology, and narcotisation and preservation have also been included.

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Table-1 : Distribution of Freshwater bryozoa in the coastal districts of Andhra Pradesh

Name of species	Name of Districts						
	East Godavari	West Godavari	Krishna	Nellore	Srikakulum	Vijianagram	Vishakhapatnam
1. *Hislopia lacustris* Carter		+	+				
2. *Plumatella diffusa* Leidy	+				+		+
3. *Plumatella fruticosa* Allman					+	+	+
4. *Plumatella javanica* Kraepelin	+	+			+		
5. *Hyalinella punctata* (Hancock)	+	+					+
6. *Stolella indica* Annandale		+		+			

Table-II : Freshwater bryozoa of the coastal districts of Andhra Pradesh–Distribution in other states of India

Name of Species	Name of the States																		
	Arunachal Pradesh	Assam	Himachal Pradesh	Jammu and Kashmir	Karnataka	Kerala	Madhya Pradesh	Maharashtra	Manipur	Meghalaya	Mizoram	Orissa	Punjab	Rajasthan	Sikkim	Tamil Nadu	Tripura	Uttar Pradesh	West Bengal
1. *Hislopia lacustris* Carter							+	+		+		+		+		+		+	+
2. *Plumatella diffusa* Leidy										+			+		+		+		+
3. *Plumatella fruticosa* Allman						+	+	+		+		+		+	+		+		+
4. *Plumatella Javanica* Kraepelin						+	+	+		+					+	+	+		+
5. *Hyalinella Punctata* (Hancock)							+			+				+	+		+		+
6. *Stolella indica* Annandale							–	+	–		+			+					+