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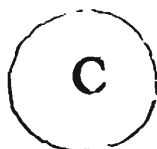
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**MAPPATES PLATAXUS, GEN. ET SP. NOV., A COPEPOD
PARASITIC ON THE FISH, PLATAX TEIRA (FORSK.)**

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INTRODUCTION

The author, while examining a catch of *Platax teira* (Forsk.), landed at Sassoon Docks, Bombay, in November 1953, collected nineteen females of parasitic copepods, attached to the gill-filaments of the fish-host. This lot, on examination, was found to contain four females of *Anuretes branchialis* Rangnekar (1953). The remaining fifteen, mostly females with egg-strings, though undoubtedly belonging to the subfamily Caliginae, could not be assigned to any genera of parasitic copepods known so far. A new genus, *Mappates* (mappa-napkin, alluding to the median lobe overlapping the free thoracic and genital segments) is therefore proposed to accommodate these specimens. The type-specimens are deposited in the Zoological Survey of India, Calcutta.

The author is greatly indebted to Dr. C. P. Gnanamuthu, Director, Zoological Research Laboratory, Madras University, for verification of the material and for his helpful suggestions in preparing this paper for publication. She is also grateful to Shri V. K. Chari, Officiating Curator, Bombay Natural History Society, for identification of the fish-host.

SYSTEMATIC ACCOUNT

Family CALIGIDÆ

Subfamily CALIGINAE

Mappates, gen. nov.

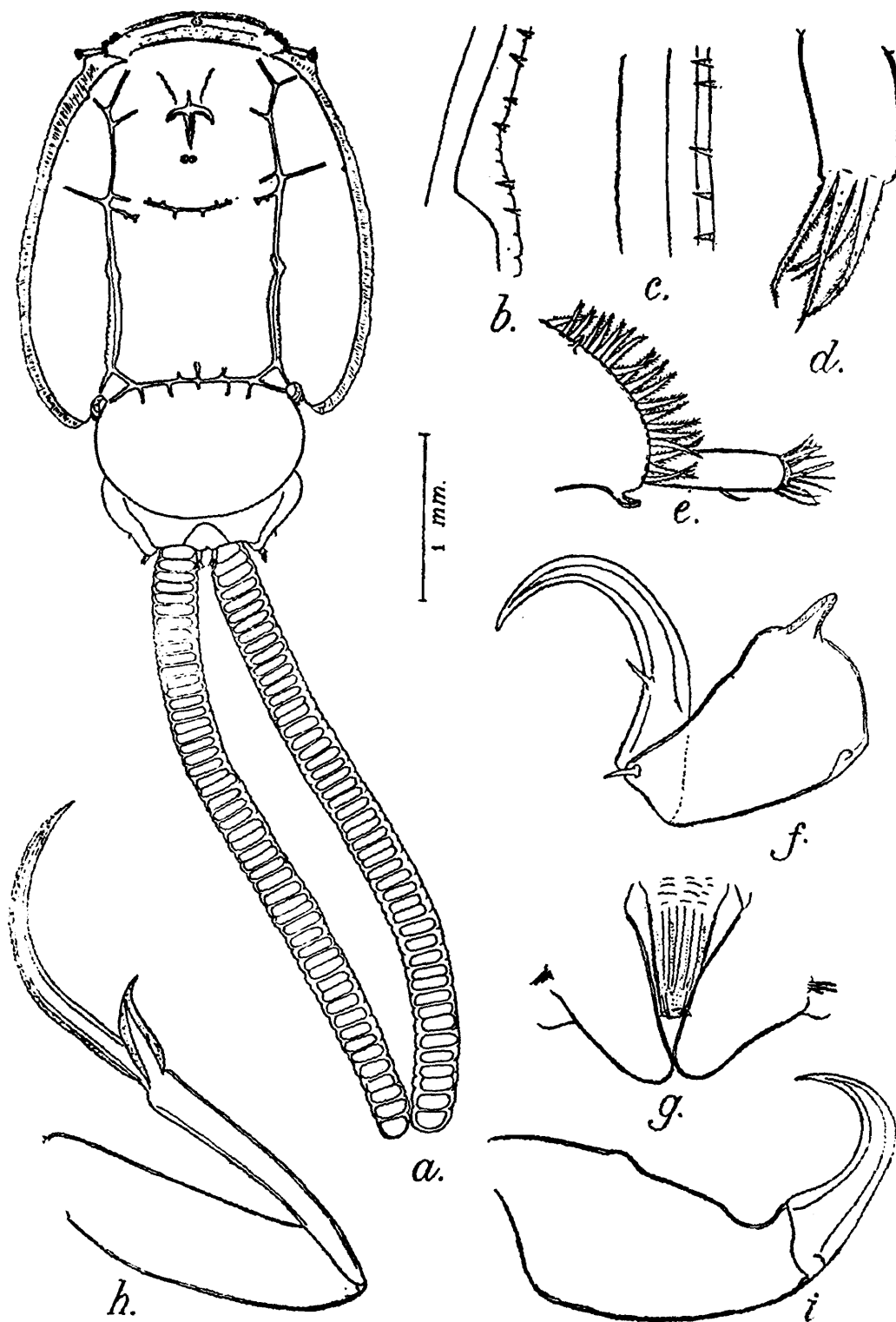
Diagnosis.—Carapace including the median lobe, slightly shorter than the entire body. Lateral lobes, median lobe and ribs lined by seta-like spinous processes along margins. Median lobe produced considerably backwards to overlap the entire fourth thoracic segment, greater portion of the genital segment and a part of the abdomen. Apron of the third segment covering the entire fourth thoracic segment and a part of the genital segment from beneath. Fourth thoracic segment short, free, with legs completely or partially concealed. Genital segment produced backwards under, and on either side of, the abdomen to bear fifth and sixth legs. Abdomen apparently two-jointed, fused dorsally with the genital segment. Egg-strings longer than body. Lunules, first maxillæ and furca absent. First, second and third legs biramous, endopod of first leg very rudimentary. Other appendages of usual caligus type.

Genotype.—MAPPATES PLATAXUS, sp. nov.

Mappates plataxus, sp. nov.

Female (text-fig. 1a).—*Body* 3.30 mm. long (excluding the anal setæ and egg-strings) in the midline, covered with saffranin-coloured spots when fresh, pale cream-coloured in alcohol. Eyes 0.85 mm. behind the anterior end of the carapace. Carapace, including median lobe, approximately nine-tenths of the entire body, elongate ovate in shape, measuring 2.90×1.98 mm. with a transparent membrane along its ventrolateral margins. Frontal plates well-developed, of almost uniform width throughout and each provided with a delicate frill traversed by striations. Lunules absent. Transverse rib removed far backwards as to be in line with the posterior sinuses; longitudinal ribs long, straight, each with a sinuous outer margin about a third from the base and extending well in front upto the base of the first antenna. Both the transverse and longitudinal ribs branching regularly; the latter with series of minute seta-like spinous processes (text-fig. 1b); a few sparsely scattered similar processes on the transverse rib also. Lateral lobes of the carapace with broadly rounded posterior corners, covered by series of similar spinous processes (text-fig. 1c). Median lobe more than half as broad as the carapace, produced far backwards covering up the entire fourth thoracic segment, about two-thirds of the genital segment and nearly half of the abdomen. Median lobe, like the lateral lobe, lined by spinous processes along margins. Ventrally, the apron of the third legs extending medially beneath the fourth thoracic segment, and covering a part of the genital segment also, strengthened by a rectangular frame-work of chitinous ribs supplemented by an oblique one on each side (text-fig. 2e). Posterior rib of the frame arching sharply, leaving a medial protuberance pointing backwards. Third and fourth legs not visible in dorsal view, except a small portion of the protopod of the third segment visible through the shallow posterior sinuses. Free thoracic segment wider than long. Genital segment 0.60×1.15 mm., produced backwards under and on either side of the abdomen to bear fifth and sixth legs, the former at the posterior corner, the latter in front of it (text-fig. 2f). Abdomen fused with the genital segment dorsally, apparently two-jointed, the basal joint being larger and much wider than the terminal joint carrying the anal laminae. Each lamina (text-fig. 1d) tipped with five setæ, two of which situated slightly dorsally, two ventrally and the remaining one at the outer corner. Anal papillæ distinct; anal sinus shallow. Egg-strings longer than the body, measuring 3.90-3.85 mm., each containing 51-49 eggs.

Cephalic appendages.—*First antenna* (text-fig. 1e): terminal cylindrical joint tipped with eleven slender spines, and a similar spine on the posterior margin about a third from anterior end; basal joint with twenty one plumose setæ on the anterior margin, and a blunt claw at the posterior distal corner. *Second antenna* (text-fig. 1f): basal joint carrying a blunt claw at its proximal corner and an accessory spine at its distal corner; terminal claw reinforced by a small spine about a third from base on the concave margin. *Second maxillæ* (text-fig. 1g): conical, with broadly rounded tips pointing towards each other and

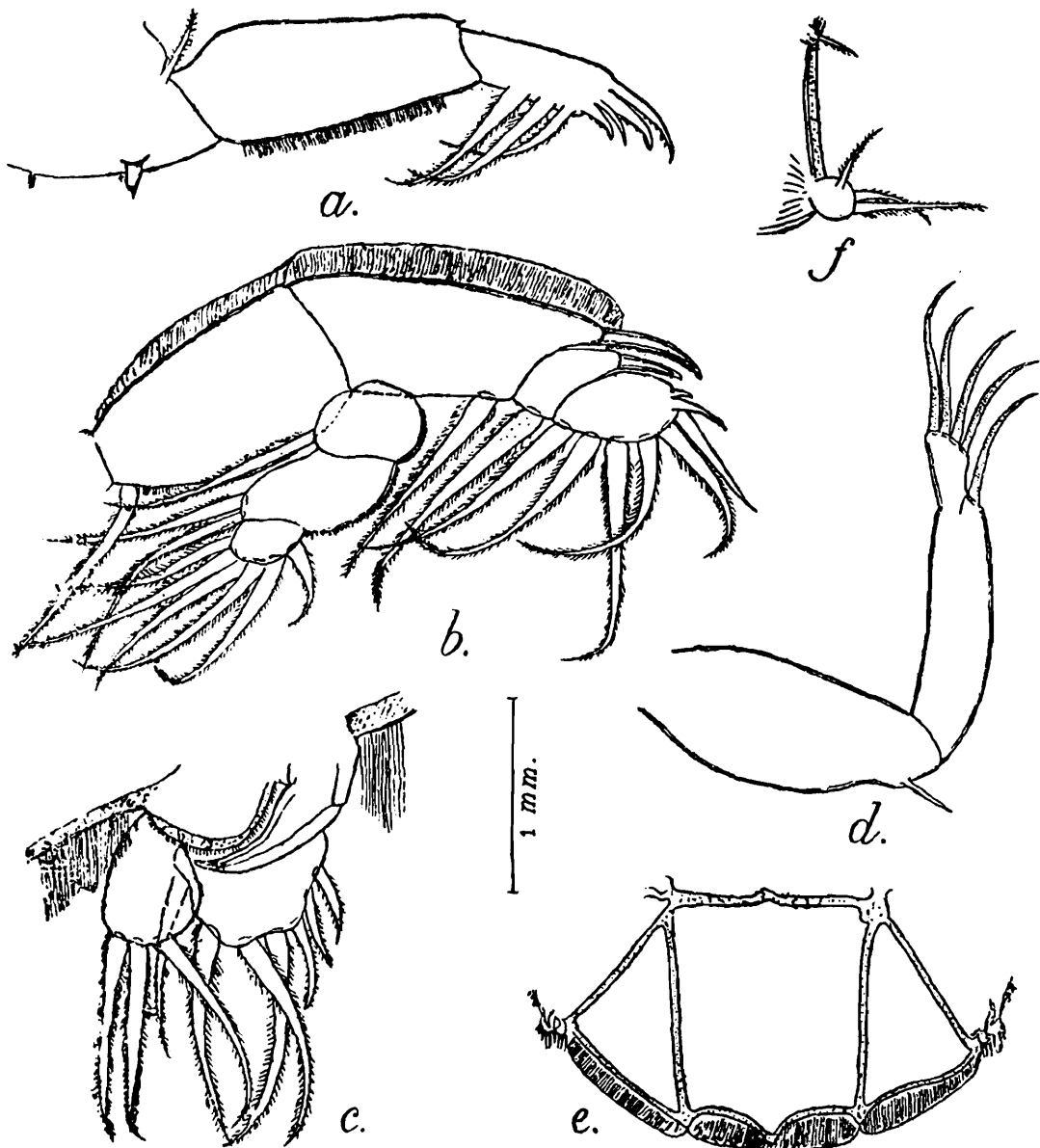


TEXT-FIG. 1.—*Mappates plataxus*, gen. et sp. nov.

a. Female, dorsal view ; *b-c.* Portion of longitudinal rib and lateral lobe (highly magnified) showing spinous processes ; *d.* Anal lamina ; *e.* First antenna ; *f.* Second antenna ; *g.* Second maxilla and mouth cone ; *h.* First maxillipede ; *i.* Second maxillipede.

projecting well beyond the mouth-cone. *Mandibles* slender, each with eleven sharp teeth. *First maxillipede* (text-fig. 1*h*) : Basal and terminal joints nearly equal, the latter with two claws of which the inner claw approximately four times the outer smaller claw ; the latter claw with broad membrane all round, the former with a low frill along one side. *Second maxillipede* (text-fig. 1*i*) : Basal joint concave on its anterior distal margin ; terminal joint in the form of a claw.

Thoracic appendages.—*First leg* (text-fig. 2a): basal joint of the exopod twice as long as the terminal; latter provided with three plumose setæ on the posterior margin, three stout apical claws of graded size and a slender spine between the second and third claws. The inner margins



TEXT-FIG. 2.—*Mappates platarus*, gen. et sp. nov.

a-d. First to fourth legs; *e.* Apron of the third leg showing chitinous frame-work; *f.* Portion of the genital segment, showing positions of the fifth and sixth legs.

of second and third claws apparently pectinate. Protopod bearing a plumose seta on the anterior distal corner and a smaller one on the posterior proximal corner, and also a rudimentary endopod ending in a tiny spine at its posterior distal corner. *Second leg* (text-fig. 2b): biramous, both exo- and endopods three-jointed, with the following arrangement of spines and setæ—exopod, 1-1, 1-1, 2-6; endopod 0-1, 0-2, 0-6; front extremities of the anterior distal margins of the basal and middle joints of the exopod slightly produced forwards to bear each a stout curved claw. *Third leg* (text-fig. 2c): basal joint of the exopod in the form of a stout curved claw lying beneath the terminal joint, latter overlapping a portion of the endopod and carrying seven plumose

setæ of unequal size ; endopod much narrower than the exopod, and with three plumose setæ. *Fourth leg* (text-fig. 2d) : basal joint with a straight spine at the posterior distal corner ; distal fused-joints carrying five spines of nearly equal length. *Fifth and sixth legs* (text-fig. 2f) in the form of single small lobe, the former with one and the latter with three setæ.

Holotype.—Female, No. C 3515/1, Zoological Survey of India, Calcutta.

Paratypes.—Females, No. C 3516/1, Zoological Survey of India, Calcutta.

Host and type locality.—Gill-filaments of *Platax teira* (Forsk.), Bombay ; November 1953. Coll. : M. Rangnekar.

Remarks.—The genus *Mappates* resembles *Pseudanuretes* Yamaguti (1936) and *Eirgos* Bere (1936) in general form, both members of the subfamily Caliginæ, but differs from them in the size of the median lobe, which in *Mappates* is considerably larger than in either of the two. In *Mappates* the median lobe extends far backwards to cover not only the fourth thoracic segment, but also greater part of the genital segment and a portion of the abdomen as well. In the other two genera, only the anterior portion of the genital segment is overlapped by the median lobe. Both in *Mappates* and *Eirgos* the genital segment is produced posteriorly to bear leg rudiments, but in *Pseudanuretes* it is rounded posteriorly. In *Mappates* the abdomen is two-jointed, in *Eirgos* it is greatly reduced, while in *Pseudanuretes* it is lacking. *Eirgos* possesses the prehensile hook, the other two lack it. In the present genus the second maxilla is a conical structure bearing a palp, in *Eirgos* it is bifurcate, while in *Pseudanuretes* only the palp is developed. Except in *Eirgos*, the furca is absent in the other two. In *Pseudanuretes* the fourth legs are greatly reduced, but in the other two they are normal.

Mappates plataxus Rangnekar and *Anuretes branchialis* Rangnekar (1953), though resembling each other in general appearance, differ in many respects. The median lobe of *M. plataxus* is much larger than that of *A. branchialis*. The genital segment of the present species differs from that of *A. branchialis* in being produced backwards. *M. plataxus*, with its two-jointed abdomen, differs from *A. branchialis* in which it is greatly reduced. The shape of the second maxilla in the two species differs greatly. *A. branchialis* possesses the furca, the present species lacks it.

Finally, in none of the species of the three genera discussed here there has been any mention of the seta-like spinous processes characteristic of the present genus *Mappates*, anywhere either in the definition of the genus or in the description of the species of each.

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COCCINELLIDÆ OF NEPAL

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INTRODUCTION

The first comprehensive account of the Coccinellidæ of Nepal was given by Hope¹ in 1831. It contained descriptions of 19 new species, the types of which are in the British Museum (Nat. Hist.), where the present writer had the opportunity of examining these. Since 1831, very little has been added to our knowledge of these beetles from Nepal. Mulsant² and Crotch³ who undertook extensive studies of the family, added three and one species respectively to the list given by Hope and subsequently Dohrn⁴ described one more species from Nepal.

Lately there have been more opportunities of collecting these insects in Nepal. The collections under report contain 26 species of which 5 are new, 16 are being recorded for the first time from Nepal and the remainder 5 are those that have been previously known from Nepal. The present study is based principally on the material collected by the British Museum-Nepal Expedition, 1949 (hereafter referred to as *B.M.-N.E. 1949*) and the 1950 and 1952 British Expeditions to Nepal (*B.-N.E. 1950 or 1952*). The writer wishes to record his thanks to Mr. N. D. Riley, C.B.E., and Mr. E. B. Britton, of the Department of Entomology, British Museum, and Dr. A. M. Easton of Great Bookham, Surrey, for sending the material for study. The writer is also indebted to Dr. S. L. Hora, F.R.S.E., F.N.I., the Director of this Survey, for providing facilities and showing interest in this work. Thanks are also due to Sri N. Paul for making certain drawings.

GEOGRAPHICAL DISTRIBUTION

Following is a revised list of species known from Nepal. Geographical distribution based on published records and on the collections under report is given against each species. Additional information on certain species in the collections of the Zoological Survey of India, has also been added.

¹ Hope, F. W., (in Gray) *Zoological miscellany*, pp. 21-32 (1831).

² Mulsant, E., *Ann. Soc. Agric. Lyon*, III, pp. 1-1, 104 (1850).

³ Crotch, G. R., *A revision of the coleopterous family Coccinellidæ*, pp. 1-311 (1874).

⁴ Dohrn, *Stettin. ent. Ztg.*, XLII, p. 374 (1882).

List of Coccinellidæ known from Nepal

Name of Species

Distribution

Subfamily *EPILACHNINAE*

- | | |
|---|--|
| 1. <i>Epilachna ocellata</i> Redt. | Kashmir to North Bengal. |
| 2. <i>Epilachna 28-punctata</i> F. | Nepal. |
| †3. <i>Afissa grayi</i> (Muls.) | Kumaun Hills ; Nepal ; N. Bengal ; Assam ; Nilgiri Hills ; East Indies. |
| 4. <i>Afissa macularis</i> (Muls.) | Nepal ; Sikkim ; N. Bengal and Assam ; Burma ; China, Czechwan Prov., Tibet. |
| *5. <i>Afissa marginicollis</i> (Hope) | Nepal ; Sikkim ; N. Bengal ; Burma. |
| †6. <i>Afissa mystica</i> (Muls.) | Kumaun Hills ; Nepal ; Sikkim ; N. Bengal ; Burma. |
| †7. <i>Afissa mysticoides</i> (Sic.) | Nepal ; N. Bengal. |
| †8. <i>Afissa nepalensis</i> , sp. nov. | Nepal. |
| 9. <i>Afissa undecimspilota</i> (Hope) | Nepal ; Sikkim ; N. Bengal and Assam ; Burma. |
| †10. <i>Affisula rana</i> , gen. et sp. nov. | Nepal. |
| †11. <i>Aphidentula manderstjernae</i> (Muls.). | Mussoorie Hills ; Nepal ; Sikkim ; N. Bengal ; Burma ; China. |

Subfamily *COCCINELLINAE*

Tribe 1. COCCINELLINI

- | | |
|---|---|
| †12. <i>Adonia variegata</i> (Goeze) | Throughout the Palæarctic Region ; plains and hills of N. India ; Nepal ; China ; Central Africa. |
| 13. <i>Bulæa nevilli</i> Dohrn | Nepal. |
| 14. <i>Tytthaspis univittata</i> (Hope) | Nepal. |
| †15. <i>Adalia luteopicta</i> Muls. | Nepal ; North-East India ; China, Tibet. |

† New records from Nepal.

* Species already recorded from Nepal that are also present in the material under report.

Name of Species	Distribution
16. <i>Adalia tetraspilota</i> (Hope)	Bokhara (W Turkestan) ; Afghanistan ; Nepal.
17. <i>Coccinella axiridis</i> Pallas var. <i>circumvelta</i> Muls.	Throughout the Palæarctic Region ; Nepal ; Naga Hills, Assam.
†18. <i>Coccinella</i> (<i>Synharmonia</i>) <i>billieti</i> Muls.	Kashmir ; Punjab ; Nepal ; Assam.
†19. <i>Coccinella repanda</i> Thunbg.	South, North and N.-East India ; Andamans ; Burma ; Central China ; Java ; Sunda Islands ; Molucca ; New Guinea ; Australia and Tasmania.
†20. <i>Coccinella septempunctata</i> L.	Throughout the Palæarctic region ; plains and hills of India.
21. <i>Calvia uniramosa</i> (Hope)	Nepal.
22. <i>Calvia vulnerata</i> (Hope)	Nepal.

Tribe 2. SYNONYCHINI

*23. <i>Leis dimidiata</i> (Fabr.)	Kashmir to Assam.
24. <i>Aiolocaria dodecaspilota</i> (Hope)	Nepal ; Burma.
25. <i>Aiolocaria hexaspilota</i> (Hope)	Kashmir ; Nepal ; Sikkim ; Upper Burma.
†26. <i>Ballia gustavi</i> Muls.	" N. India Himalaya " ; Nepal ; Sikkim.
27. <i>Palaeoneda miniata</i> (Hope)	Nepal.
†28. <i>Oenopia luteopustulata</i> Muls.	Simla ; Kumaun Hills and Luck- now, U. P., Nepal ; Sikkim ; N. Bengal and Assam ; Andaman Islands ; Burma ; Tibet.
†29. <i>Oenopia sauzeti</i> Muls.	Murree and Dalhousie Hills, Punjab ; Kumaun Hills ; Chota Nagpur, Bihar ; Nepal ; Burma.

†New records from Nepal.

*Species already recorded from Nepal that are also present in the material under report.

Name of Species	Distribution
†30. <i>Coelophora bissellata</i> Muls.	Kumaun Hills ; Nepal ; Sikkim ; N. Bengal ; Assam ; South India ; Sumatra ; Java ; Borneo ; Philippines ; Malacca ; New Guinea.
31. <i>Coelophora cincta</i> (Hope)	Nepal.
32. <i>Coelophora nepalensis</i> Crotch	Nepal.
†33. <i>Coelophora sexareata</i> Muls.	"Himalaya, N. India" ; Nepal ; Sikkim ; Chota Nagpur ; N. Bengal ; Manipur, Assam ; Burma ; West Yunan.
†34. <i>Menochilus sexmaculata</i> (F.)	Throughout the plains of India, foothills of N. W. India and W. Pakistan ; Nepal ; Sikkim ; N. Bengal and Assam ; Burma ; Yunnan ; Andaman Islands ; Sumatra ; Java ; Borneo ; Celebes ; Philippines ; Molucca ; New Guinea.

Tribe 3. CHILOCORINI

- *35. *Chilocorus rubidus* Hope Russia to N. India ; Nepal ;
China ; Japan.
- †36. *Exochomus timurensis*, sp. nov. Nepal.

Tribe 4. STICHOLOTINI

- †37. *Sticholotis amator*, sp. nov. Nepal.

Tribe 5. ASPIDIMERINI

- †38. *Cryptogonus trioblitus* (Gorh.) Kumaun Hills ; Nepal ; Assam ;
Burma.

Tribe 6. SCYMNINI

- †39. *Scymnus bourdilloni*, sp. nov. Nepal.
- †40. *Pullus pyrochellus* Muls. South Bengal ; Nepal.

Tribe 7. PSYLLOBORINI

41. *Halysia straminea* (Hope) Simla Hills ; Nepal ; Sikkim.

† New records from Nepal.

* Species already recorded from Nepal that are also present in the material under report.

It will be observed that out of a total of 41 species, 13 are known only from Nepal while 11 (nearly 27 per cent.) are distributed in various parts of the Himalayas, between Kashmir and Burma. Four other species (Nos. 27, 28, 33 and 40 of the list) occur in the Himalayas as well as in the neighbouring plains of India. Four more species (Nos. 3, 19, 30, and 34) which are widely distributed in the Oriental region, also occur in Nepal. It is, however, worthy of note that these latter species are mostly found at lower altitudes in Nepal. The remaining 9 species (Nos. 4, 11, 12, 15-17, 20, 23, 35), constituting nearly 22 per cent. of the total number of species known from Nepal, are apparently of Palæarctic region. Some of these (Nos. 4, 11, 15, 16, 23, 35) have very wide distribution and extend into China, Japan, or Central Asia in the Palæarctic region while a few others (Nos. 12, 17 and 20) extend beyond that region into the Oriental region.

The geographical distribution of the species may be summarized as follows :

Known only from Nepal	13
Distributed elsewhere in the Himalayas	15
Oriental species	4
Palæarctic species	9

SYSTEMATIC ACCOUNT

Subfamily *EPILACHNINAE*

1. *Epilachna ocellata* Redtenbacher

1844. *Epilachna ocellata* Redtenbacher (in Hugel) *Kaschmir und das Reich der Siek* IV, 2, pp. 497-564. (Type loc. : Kashmir).

1951. *Epilachna ocellata*, Kapur, *Rec. Indian Mus.* XLVIII, pp. 17-29.

Material.—5 examples : Thangiet, 6,000 ft. ; Trisuli to Rasua, 8,000 ft. ; Rasua, 8,000 ft. (*B. M.-N E.*, 1949).

Remarks.—The species is distributed in the Himalayas from Kashmir to North Bengal. Its colouration and other distinctive characters have been recently given by the author (1951).

2. *Afissa grayi* (Mulsant)

1850. *Epilachna grayi*, Mulsant, *Ann. Soc. Agric. Lyon* III, pp. 774-776. (Type loc. : 'Bengal and Northern India').

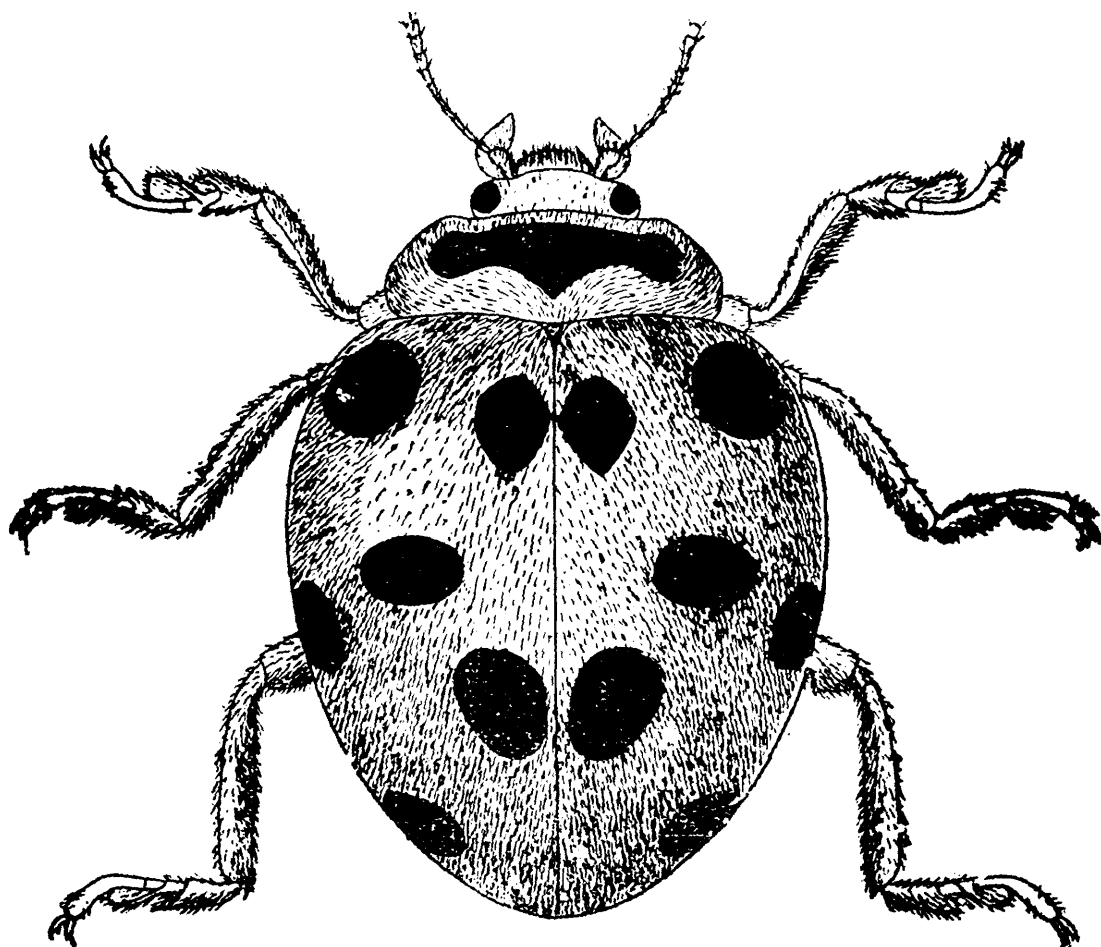
1931. *Epilachna alternans*, var. *grayi*, Korschefsky, *Coleopt. Cat., Berl.* XVI, 118, p. 27.

1933. *Epilachna grayi*, Korschefsky, *Trans. nat. Hist. Soc. Formosa* XXIII, p. 301.

1947. *Afissa grayi* Dieke, *Smithson. misc. Coll.* CVI, 15, pp. 121-122.

Material.—2 examples : Rasua, 7,000 ft. ; Trisuli Valley, 5,000—7,000 ft. (B. M-N E., 1949).

Remarks.—*Epilachna alternans* Mulsant¹ and *Epilachna grayi* Mulsant, were described as distinct species but were later synonymized by Weise². In the light of this synonymy, Korschefsky gave its distribution as North India, Nilgiri Hills, Java and Formosa. Subsequently in 1933, he pointed out differences including those in their colour-patterns, and the species were once again regarded as distinct. Lately, Dieke transferred both the species to the genus *Afissa* Dieke.



TEXT-FIG. 1.—*Afissa grayi* (Muls.).

The Zoological Survey of India (hereafter referred to as Z. S. I.) has examples from Kumaun Hills, N. Bengal (Darjeeling district) and Abhor Hills, Assam. Dieke's material came from Java. The species apparently belongs to the Oriental region.

The colouration in the two examples from Nepal may be described below as it differs slightly from earlier descriptions of the species. In the example from Rasua (Text-fig. 1) the pronotum has a transverse, broad and subtriangular black spot and the elytral spots Nos. 3 and 5 are well developed (The spots are numbered according to their position on the right elytron from left to right and from base to apex). In the

¹ Mulsant, E., *Ann. Soc. Agric. Lyon* III, p. 767 (1950).

² Weise, J., *Arch. Naturg.* LXXXIX, 2, p. 182 (1923).

example from Trisuli Valley the pronotal spot is further enlarged so as to cover almost the whole of pronotum except along the margins, but the elytral spots Nos. 3 and 5 are very much reduced in size. According to Dieke the two examples from Java have spotless pronotum ; Mulsant's examples from North India and Bengal possessed the pronotal spot, which was not quite as prominent as in the examples from Nepal. The male genitalia of the species are figured in text-fig. 8 a-c.

3. *Afissa marginicollis* (Hope)

1831. *Coccinella marginicollis* Hope, (in Gray) *Zoological miscellany*, p. 31. (Type loc. : Nepal).
 1850. *Epilachna marginicollis*, Mulsant, *Ann. Soc. Agric. Lyon* III, p. 728.
 1874. *Epilachna marginicollis*, Crotch, *Revision of the coleopterous family Coccinellidae*, London, p. 80.
 1931. *Epilachna (Solanophila) marginicollis*, Korschefsky, *Coleopt. Cat., Berl.* XVI, 118, p. 30.

Material.—4 examples : Chilime, 6,000—8,000 ft. ; Langtang, 9,000—11,000 ft. (*B. M.-N. E.* 1949). Langtang Khola, 10,600—11,000 ft. on Labiatae, Nepal (exact locality not given) (*B.-N. E.* 1952, *T. D. Bourdillon*).

Remarks.—The species is distributed in Nepal, Sikkim, North Bengal and Burma. Its pronotal and elytral colour-pattern is illustrated in text-fig. 6, c. It is being transferred to the genus *Afissa* Dieke¹, on account of the absence of basal tooth in the claws which are bifid and on account of the last visible segment in the female being entire and not split into two longitudinally.

4. *Afissa mystica* (Mulsant)

1850. *Epilachna mystica* Mulsant, *Ann. Soc. Agric. Lyon* III, p. 841.
 1947. *Afissa mystica*, Dieke, *Smithson. misc. Coll.* CVI, 15, p. 146.

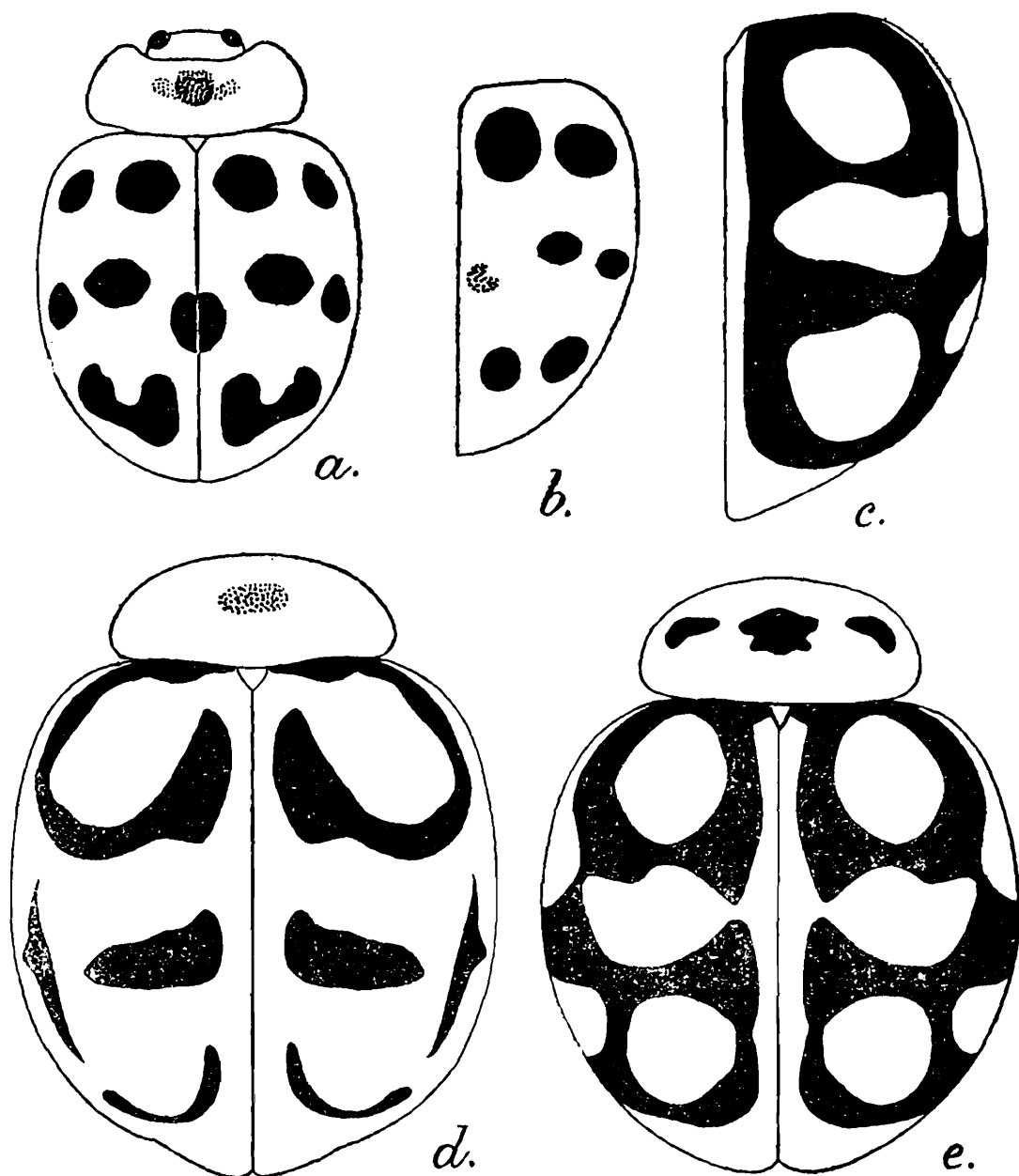
Material.—2 examples : Indrawati Khola, 6,000 ft. (*B. M.-N. E.* 1949). Tate, 11. vi. 1952 (*T. D. Bourdillon*, *B.-N. E.* 1952).

Remarks.—Mulsant was uncertain of its type locality which he gave as East India with a question mark. Known already from Burma, North Bengal and Sikkim, it is being recorded for the first time from Nepal. Examples from Kumaun Hills in northern India, and Bangalore in the south, are present in the Z. S. I.

The species is very variable in markings. In some examples there are five black spots of irregular shape on the elytron ; in others the spots are enlarged into bands which coalesce at places to enclose one to three roundish cells close to the suture. (Text-fig. 2, c-e.) In addition, two incomplete cells are sometimes present near the external margin.

¹ Dieke, G. H., *Smithson. misc. Coll.* CVI, 15 pp. 22-29 (1947).

In the example from Indrawati the three cells near the suture are complete (Text-fig. 2, c.) while in the example from Tate the central cell is incomplete near the suture (Text-fig. 2, e.).



TEXT-FIG. 2.—a.—b. Colour-pattern of *Afidentula manderstjernae* (Muls.); c.—e. Elytral patterns of *Afissa mystica* (Muls.).

5. *Afissa mysticoides* (Sicard)

1912. *Solanophila mysticoides* Sicard, *Ann. Soc. Ent. France* LXXXI, p. 507. (Type loc. : India).

1931. *Epilachna* (*Solanophila*) *mysticoides*, Korschefsky, *Coleopt. Cat., Berl.* XVI, 118, p. 30.

1947. *Afissa mysticoides*, Dieke, *Smithson. misc. Coll.* CVI, 15, p. 145.

Material.—28 examples : Langtang, 9,000—11,000 ft. ; Langtang Khola, 10,600—11,000 ft. (on a *Labiatae*, 16 examples) ; Timure, 10,500 ft. ; East of Timure, 8,000—10,000 ft. (*B. M.-N. E.* 1949). Tate, 12. vi. 1952 (*T. D. Bourdillon, B.-N. E.* 1952).

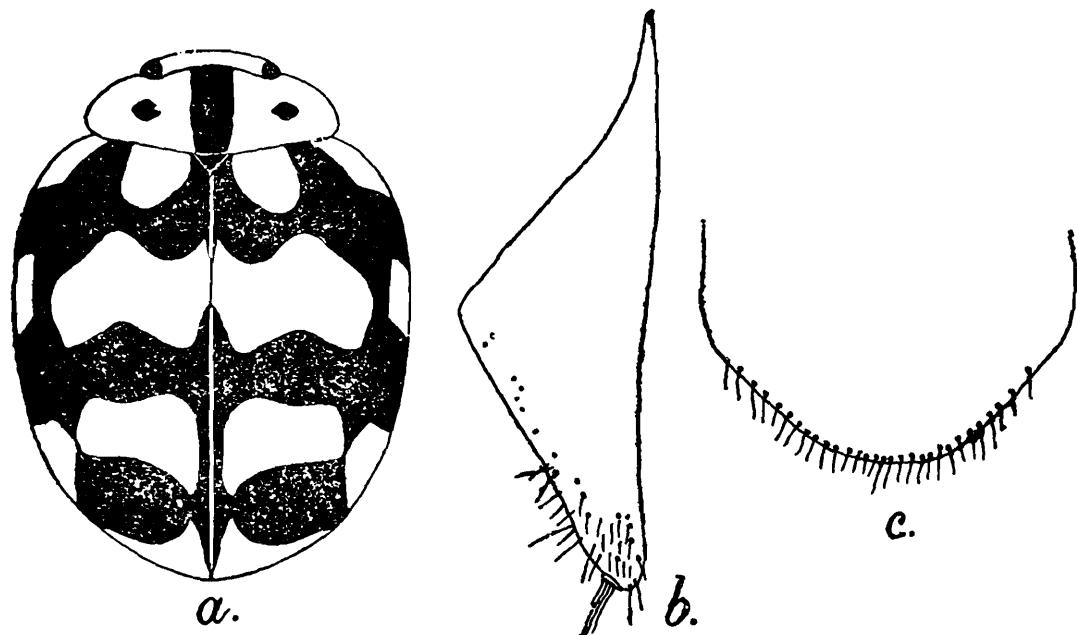
Remarks.—The above-mentioned material contains 28 examples which show considerable variation in colour-pattern. In almost all the examples the spots are a little larger than what have been described by Sicard or

Dieke, though there is no doubt that these belong to the same species. Dieke had only two examples from Darjeeling, N. Bengal, while the exact locality and other particulars of Sicard's material are not known. Confluence of elytral spots, noticed in certain examples in the present series, has also not been described before. In the present series while all the spots are free in 11 examples, in 10 other examples, spots Nos. 1 and 2 become confluent towards their distal ends. In one more example, these spots are confluent at their proximal ends, and remain free at their distal ends. In three other examples they are confluent at both the distal and proximal ends but free in the middle so as to enclose a testaceous (as is the colour of the elytral background) area between them. In two more examples whereas the spots Nos. 1 and 2 have this pattern, the spots Nos. 3 and 4 extend towards the middle so as to join one another. Finally in one more example the spots are much enlarged and the spot No. 2 (situated at the shoulder) not only meets spot No. 1 but also the confluent spots Nos. 3 and 4.

The male genitalia of the species which are very characteristic and reliable for separating the species, are shown in text-fig. 7, *c* and *d*.

6. *Afissa nepalensis*, sp. nov.

♀ Body shortly oval, convex, most so in the middle ; pubescence golden yellow except on the black spots where it harmonizes with the background. Head testaceous to reddish testaceous ; eyes shining-



TEXT-FIG. 3.—*Afissa nepalensis*, sp. nov ; *a*. Pattern of pronotum and elytron ; *b*. ♀ genital plate ; *c*. ♀ tenth tergite.

grey. Pronotum testaceous to reddish testaceous except for a broad, median, black stripe extending from the anterior to the posterior margin and for the two black spots, each situated on either side of the stripe but at equal distance from it and the external margins (Text-fig. 3, *a*). Scutellum black. Elytra testaceous to reddish testaceous with three fairly broad transverse and irregular black bands which become confluent at places to form seven cells enclosing testaceous

or reddish testaceous areas as shown in figure 3 a. The first band is situated at one-fourth of the length of the elytron and is extended towards the base in the middle and along the suture. The second band is situated in the middle of the elytron and extends in the middle to join the first and the third bands. It also extends along the suture so as to touch the third band which is situated at the apical one-fourth of the length of elytron. It usually extends from the suture to the external margin but in one example (Paratype) it stops short of either of these margins. Underside light testaceous except for the meso and metasternum and the abdominal sternites which are piceous ; sometimes the femora may also be darker but not quite piceous.

Head minutely and rather sparsely punctate, with thin, moderately long, yellowish pubescence ; antennae longer than the width of the head and with the distal three segments, forming the club, being rather subtriangular in outline. Pronotum slightly arched, nearly twice as wide as long, widely emarginate anteriorly and moderately rounded anterolaterally. Minutely punctate, punctures being closer than those on the head. Pubescence fine, golden-yellow, moderately long and directed anterolaterally. Scutellum triangular, with pubescence and punctation similar to that on the pronotum. Elytra very convex, with hardly any visible shoulder-boil, shoulder angles rounded, external margin very narrowly bordered ; punctation mixed, surface mostly with minute and rather close punctures in between which coarse, moderately impressed and sparse punctures are present. Pubescence golden-yellow, moderately long, fairly close and subdepressed. Underside with moderately broad epipleurae ; minute, shallow and rather close punctation and fine, short and sparse pubescence. Abdominal lines almost semicircular and extending as far as two-thirds the length of the segment. Claws bifid, the inner denticle shorter and more curved than the outer one. Female genitalia with the genital plates (IX sternite) elongate and triangular in outline and with a pencil of long setae on the papilla near the apex (Text-fig. 3, b.). Tenth tergite rather broadly rounded apically (Text-fig. 3, c.). Male example unknown.

Length 4.5 mm. ; width 3.2 mm.

Holotype.—NEPAL : Trisuli Valley, 5,000 ft. (B. M.-N. E. 1949) ; a female, genitalia mounted in Canada balsam and pinned along with the specimen ; in the British Museum (N. H.).

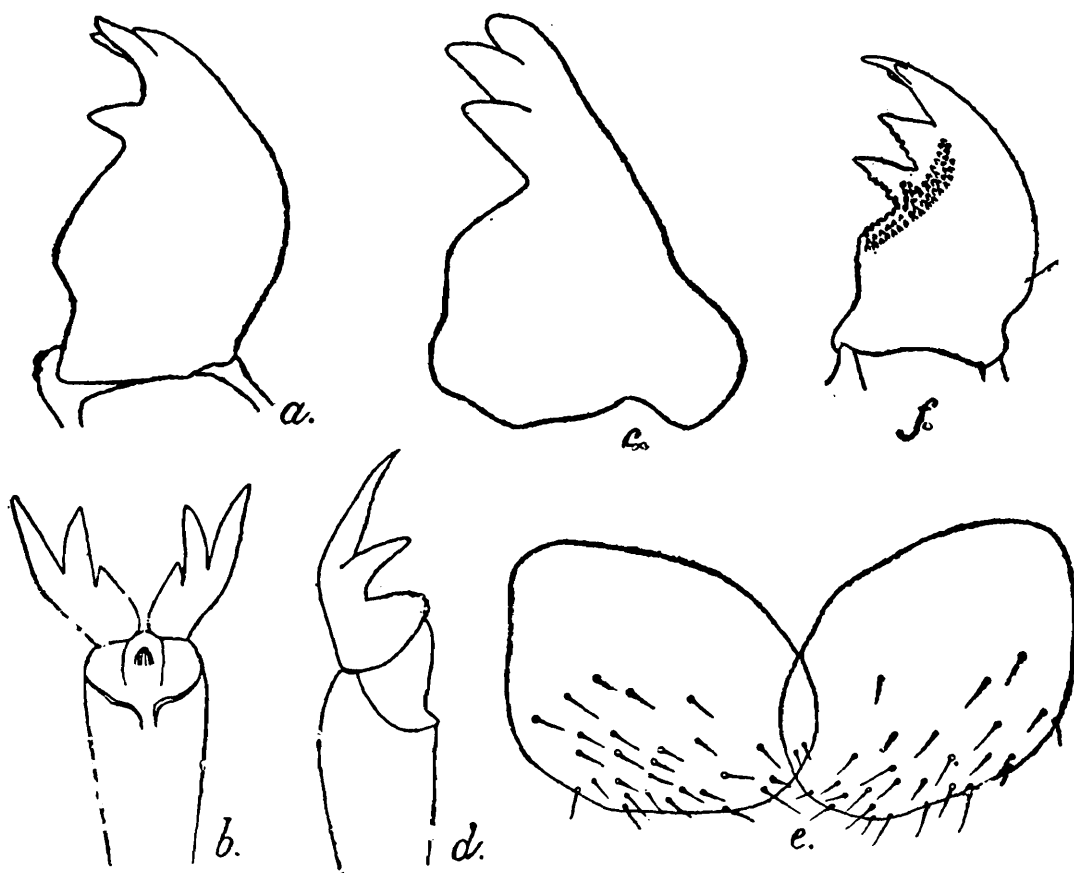
Paratypes.—NEPAL : Langtang Khola, 7,000—9,000 ft., one female (B. M.-N. E. 1949) ; Tate, 11 vi. 1952, (T. D. Bourdillon, B.-N. E. 1952) one female, returned to Dr. Easton. The genitalia of a paratype dissected and mounted as for the holotype.

Remarks.—The colour-pattern of this species is not only beautiful but distinct. The pattern in the three examples shows slight variations. According to Dieke's (1947) key to the groups of the genus *Afissa* (p. 115), this species comes close to the *flavicollis* group but is easily separated from the known species of the group by its distinctive colour-pattern.

***Afissula*, gen. nov.**

Type of the genus : *Afissula rana*, sp. nov.

Referable to the subfamily Epilachninae. Body elongate oval ; legs relatively long permitting the femora and tibial joints to be seen easily from above ; femora rather thin, tibiae thin with short and shallow depression at the distal extremity ; tarsal claws bifid and provided with sub-triangular basal tooth (Text-fig. 4, *b*). Antennae narrow just a little longer than the width of the head. Mandibles, (Text-fig. 4, *a*.) with three apical and one median teeth none of which are serrated. Pronotum not margined ; pronotal and elytral epipleurae without foveae ; the elytral epipleurae horizontal. Abdominal lines semicircular, usually not extending beyond two-fifths of the length of the first abdominal sternite ; the sixth abdominal sternite in the female entire, *i.e.*, not longitudinally split into two, the female genital plates (IX sternite), elongate, much narrowed apically and each with apical papilla bearing a few long setae. Male with the sixth sternite having a median emargination and with conspicuously developed penis.



TEXT-FIG. 4.—*a.-b.* *Afissula rana*, sp. nov. ; *a.* Outline of mandible ; *b.* Tarsal claws ; *c.-d.* *Afidentula manderstjernae* (Muls.) ; *c.* Outline of mandible ; *d.* Tarsal claw ; *e.* ♀ genital plates ; *f.* Outline of mandible of *Afidentula gradaria* (Muls.).

The genus is at once distinguished from *Afissa* Dieke by the presence of the basal tooth in the tarsal claws and from *Epilachna* Chevrolat, as limited by Dieke¹ (1947), by the sixth abdominal sternite in the female being entire. The latter is split longitudinally in the genus *Epilachna*.

¹ Dieke, G. H., *Smithson. misc. Coll.* CVI, 15, pp. 22-29 (1947).

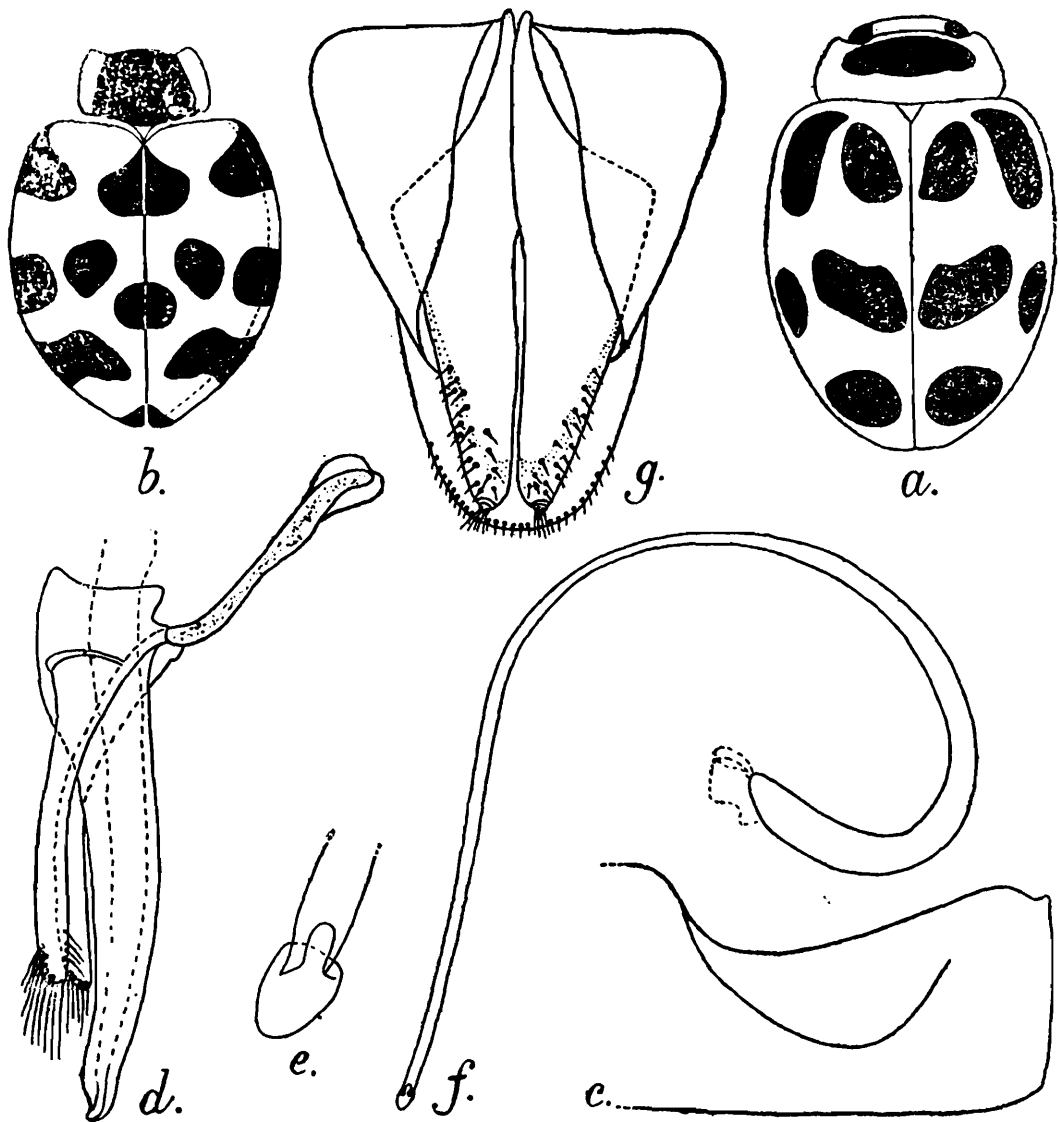
It is distinguishable from the genus *Afidenta* Dieke by the elongate and tapering genital plates of the female and by the well developed male genitalia, which are distinctly short in *Afidenta*. From the genus *Macrolasia* Weise, it is distinguishable by several characters, particularly by the tibiae which are wide and distinctly emarginate near the apex in *Macrolasia*; the latter is also characterized by the subhemispherical body, the subinclined elytral epipleura and the laterally concave and strongly margined prosternum: characters which are not present in *Afissula*.

The various genera mentioned above also differ in the structure of the mouth parts, particularly in the shape of the mandibles, labrum and maxillae and in the opinion of the present writer any revisionary work on the classification of the genera of the subfamily Epilachninae must pay adequate attention to these structures.

7. *Afissula rana*, sp. nov.

Body elongate, oval, convex, most so in the middle. Pubescence greyish except on the black spots where it is usually dark brown but sometimes greyish. Head reddish testaceous, antennae and mouth-parts testaceous and eyes greyish. Pronotum reddish testaceous except along the lateral border which is yellowish testaceous; with one transverse oval black spot which is as wide as the head and which occupies the anterior three-fifths of the pronotum excepting along the narrow anterior margin. In one out of eleven examples this spot shows a tendency to break into three smaller spots which, however, remain connected. Scutellum and ground colour of the elytra reddish testaceous. Each elytron has five, rather gross, black spots arranged as 2, 2, 1 (Text-fig. 5, *a*). Spots Nos. 1 and 2 sub-basal, the former subquadrate, near the suture but not touching it and extending to just beyond one-fourth of the length of the elytron. Spot No. 2 situated on the shoulder-bole, almost rectangular or elongate oval, a little longer than spot No. 1 and extending nearly as far as one-third the length of elytron and not touching the basal or the lateral margins of the elytron. Spots Nos. 3 and 4 lying on a slightly arched, median, transverse line; the 3rd like a transverse band with feeble emargination towards the base and extending from near the suture to just beyond the middle of the width of the elytron. Spot No. 4 situated a little away from the latter spot and a little more towards the apex, subquadrate and not touching the lateral margin. Spot No. 5 is situated at three-fourths the lengths of elytron and is smaller than spot No. 3; laterally it stops short of the sutural and the external margins by a little distance. Variability of spots is common: in seven out of eleven examples, spots Nos. 1 and 2 become confluent near the base but remain otherwise distinct. Confluence of spots Nos. 3 and 4 has not been observed in any of these examples. In certain examples where there is a general increase of black pigment the latter two and the 5th spots are enlarged so as to reach the external margin. In two instances, however, spot No. 5 is reduced in size and consequently remains away from the sutural as well as the external

margin. Underside reddish testaceous except for the metathorax and the basal four abdominal sternites which are piceous ; the legs and usually the epipleurae also remain reddish testaceous.



TEXT FIG 5.— a. Colour-pattern of *Afissula rana*, sp. nov. b. The same of *Afissa undecimspilota* (Hope) (drawn from type) ; c.-g. *Afissula rana*, c. Abdominal lines ; d. Male genitalia except siphus ; e. Tip of siphus ; f. Siphus ; g. Female genitalia.

Head wider than long, very finely and closely punctate, punctures impressed. Pubescence yellowish, very thin, short and not very close. Eyes finely faceted, antennae thin, longer than the width of the head, the first and third segments subequal and the apical three segments forming a serrated club. Labrum transverse, a little wider than long, with the base a little narrower than the clypeus. Mandibles (Text-fig. 4, a) with three apical and one median teeth which are not serrated. Galea and lacinia subrounded and subconical respectively and covered with moderately thick and long setae. Pronotum transverse, slightly emarginate anteriorly and feebly rounded laterally, anterior angles subrounded, the posterior angles rather pointed. Punctuation similar to that on the head ; pubescence also similar but slightly longer and greyish. Scutellum triangular, with punctations and pubescence similar to that on the pronotum. Elytra elongate, with distinct shoulder-boil ;

external margin narrowly bordered; punctation mixed—fine, fairly close and rather shallow punctures interspersed with coarse and sparse punctures. Pubescence moderately long, depressed and fairly close. Prosternum without any carinae or foveae. Legs relatively long, tibiae rather narrow, claws (Text-fig. 4, *b.*) bifid with the inner dentule smaller than the outer and with a subtriangular basal tooth. Elytral epipleura horizontal and without foveae. Abdominal lines (Text-fig. 5, *c.*) semicircular, incomplete and not extending beyond two-thirds the length of the sternite. The sixth abdominal sternite in the female not split longitudinally. Male genitalia with the siphon (Text-fig. 5, *f.*) narrow and somewhat lancet shaped at the apex (Text-fig. 5, *e.*); basal piece small and the paramera shorter than the penis which is well developed and slightly curved and narrowed at the apex (Text-fig. 5, *d.*); trabes piceous. In the female the genital plates (IX sternite) are elongate, narrowed and dark apically and sparsely hairy and each with an apical papilla bearing a few long hairs (Text-fig. 5, *g.*).

Length 4.75—5.0 mm.; width 3.0—3.15 mm.

Holotype.—NEPAL: Syabrubensi (*B. M.-N. E.* 1949); a male; in the British Museum (N. H.).

Allotype.—The same data as for holotype; a female; in the British Museum (N. H.).

Paratypes.—Five examples with the same data as the holotype; other paratypes as follows: Nepal: Langtang, 9,000—11,000 ft. (2 examples); Trisuli Valley, 5,000—10,000 ft. (1 example); Landekhola, 9,000 ft., (1 example). Some of the paratypes in the Zoological Survey of India, Indian Museum, Calcutta, and the remainder in the British Museum (N. H.), London.

Remarks.—Mulsant's¹ description of *Epilachna undecimspilota* (Hope) agrees with the above description to a large extent and also with another and probably yet undescribed species from North-East India, in the collection of the Z. S. I. Mulsant stated that his description of *E. undecimspilota* was based on a typical example sent to him by Hope. Crotch² was, however, doubtful about it and stated that the type of *Epilachna undecimspilota* (Hope) was in the British Museum. Crotch gave a revised description of the species which differed greatly from the one given by Mulsant. In spite of the revised description given by Crotch and of his statement regarding the type of the species being in the British Museum, Dieke³ continued to regard Mulsant's description of *E. undecimspilota* (Hope) as valid. The present writer investigated the matter again and found evidence in support of Crotch's statement. Hope's⁴ description of new Coleoptera from Nepal was based on Major-General Hardwicke's collections, the types of which are in the British Museum (Nat. His.), where the present writer had examined the type of *E. undecimspilota* (Hope) some time back. Very recently at the writer's request, Mr. E. B. Britton of the Department of Entomology, British

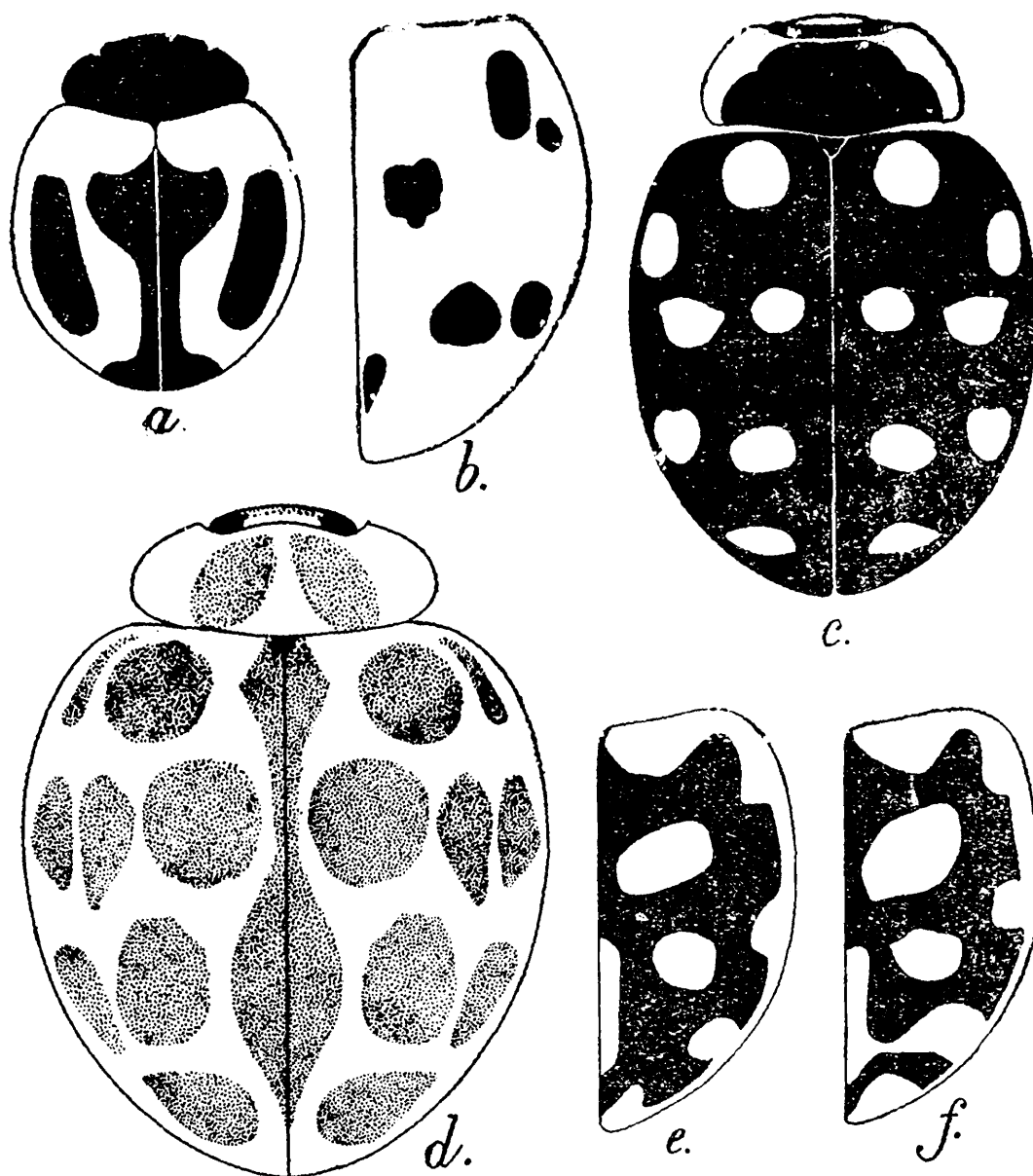
¹ Mulsant, E., *Ann. Soc. Agric. Lyon* III, pp. 799-800 (1850).

² Crotch, G. R., *Revision of the coleopterous family Coccinellidae*, p. 81 (1874).

³ Dieke, G. H., *Smithson. misc. Coll.* CVI, 15, p. 138 (1947).

⁴ Hope, F. W., (in Gray) *Zoological miscellany*, p. 31 (1831).

Museum, sent a pencil sketch of the pronotal and the elytral pattern of the type. The same is reproduced in black and white in text-figure 5, *b*. It is very different from the pattern given in text-fig. 5, *a* which is the pattern of the species described above and which fits in with the description of *E. undecimspilota* of authors, particularly Mulsant. However, the original description of a line and a half given by Hope would fit both the species. It is apparent that Mulsant did not describe *E. undecimspilota* from the type which was in the B. M. Furthermore, an



TEXT-FIG. 6.—*a*. *Exochomus himalayensis*, sp. nov. *b*. Elytral pattern of *Oenopia luteopustulata* Muls. var. *nigromaculata* Mader. *c*. *Afissa marginicollis* (Hope). *d*. *Rallio gustavi* Muls.; *e*-*f*. Elytral patterns of *Adalia luteopicta* Muls. (*e*. typical; *f*. Variety).

examination of a collection of Coccinellidae identified by Mulsant and deposited in the Hope Department of Entomology, Oxford University, showed that while it contained types of several new species described by Mulsant in 1850, it did not contain any type or example of a coccinellid from Major-General Hardwicke's collection. Dieke suggested

that it seemed likely that Mulsant saw the original type which subsequently may have been confused with another specimen. In view of the position explained above regarding the careful preservation of the collections at the British Museum and at Oxford, and in the absence of any direct evidence in support of the presumption made by Dieke, the present writer has, like Crotch, regarded the type of *E. undecimspilota* (Hope) in the B. M. to be the valid one, and has dealt with the taxonomy of the species involved on that basis. Crotch regarded *E. stephensi* Mulsant (1950) to be a synonym of *E. undecimspilota* (Hope) (1831) but he did not propose any name for *E. undecimspilota* Mulsant (not Hope).

Afidentula, gen. nov.

Type of the genus : *Epilachna manderstjernae* Mulsant (1853)

Referable to the subfamily Epilachninae and close to the genus *Afidenta* Dieke from which it is distinguishable by the following characters : Body shortly oval, usually small ; antennae subequal to the width of the head, with a relatively thick and compact club ; clypeus and labrum narrow ; mandibles (Text-fig. 4, *c.*) sub-triangular in shape, very much narrowed towards the apex which is provided with three teeth which are without any dentulations or serrations, submedian or median tooth absent, viewed from the front, only one of the three apical teeth mentioned above is visible, the other two being concealed behind it. Tarsal claws (Text-fig. 4, *d.*) bifid, the inner division being shorter than the outer and provided with sub-triangular basal tooth. The sixth abdominal sternite in the female entire as in *Afidenta*, but the male genitalia are well developed unlike the case in the latter genus. In *Afidenta* the body is sub-hemispherical and the antennae are shorter than the width of the head, the clypeus and labrum are also wide and the mandibles are larger, curved, externally smooth, on the inner margin provided with three major teeth which are situated at different levels (Text-fig. 4, *f.*) ; the apical tooth is the longest and has two prominent dentules, one on either side, the sub-apical and median teeth as well as the proximal molar surface bear a large number of dentules ; the tarsal claws are bifid but the divisions are sub-equal in length and the basal tooth is subquadrate in outline.

As far as known, the type of the genus *Afidenta*, namely *Afidenta gradaria* (Muls.) (Synonym : *Afidenta mimetica* Dieke), feeds on leguminous plants. The other two species, namely *Afidenta minima* (Gorham) and *Afidenta bisquadripunctata* (Gyllenhal), which were doubtfully included in the genus *Afidenta* by Dieke, do not appear to belong to that genus. One of these, namely *A. minima*, appears to be congeneric with *A. manderstjernae* and should be transferred to the genus *Afidentula*. Incidentally it may be pointed out that Dieke missed to observe the basal tooth in the tarsal claw of *manderstjernae* and placed it in the genus *Afissa*.

8. *Afidentula manderstjernae* (Mulsant)

1853. *Epilachna manderstjernae*, Mulsant, *Ann. Soc. linn. Lyon*, I, p. 256
 1874. *Epilachna manderstjernae*, Crotch, *A revision of the coleopterous family Coccinellidae*, p. 83.
 1885. *Epilachna manderstjernae*, Weise, *Stettin. ent. Ztg.*, XLVI, p. 228.
 1931. *Epilachna manderstjernae*, Koreschefsky, *Coleopt. Cat., Berl.*, XVI, 118, p. 24.
 1947. *Afissa manderstjernae*, Dieke, *Smithson. misc. Coll.*, CVI, 15, p. 125.

Material.—6 examples : Trisuli Valley, 5,000—7,000 ft. ; Lende Khola, 8,000—9,800 ft. ; Rasua, 7,000 ft. (*B. M.-N. E.* 1949).

Remarks.—The species is already known from Mussoorie Hills (Uttar Pradesh), Kurseong (N. Bengal), Sikkim, and Burma. It is also reported to occur in China.

The typical pattern of the species is shown in text-figure 2, *a*, except for the fact that the apical spot or spot No. 6 shows a tendency to split into two. Another variation in pattern is exhibited in one example where spot No. 5 is faint and a little smaller than usual and is situated away from the suture and where also spot No. 6 is completely split into two distinct spots (Text-fig. 2, *b*). The male and female genitalia of species are characteristic and are shown in text-figure 7, *e* and *f* and in text-figure 4, *e*, respectively. The genital plates in the female are roundish ; for this reason and for the claws being bifid and with basal tooth, the species cannot be placed in the genus *Afissa*, as was done by Dieke. It does not belong to the genus *Epilachna* (*sensu stricto*) because the last visible abdominal sternite in the female is entire and not split into two longitudinally, and also because it differs markedly in the structure of its mandible and other mouth-parts from those in *Epilachna*. It can not be placed in the genus *Afidenta* for the reasons already given earlier while defining the genus *Afidentula*.

Subfamily COCCINELLINAE

Tribe COCCINELLINI

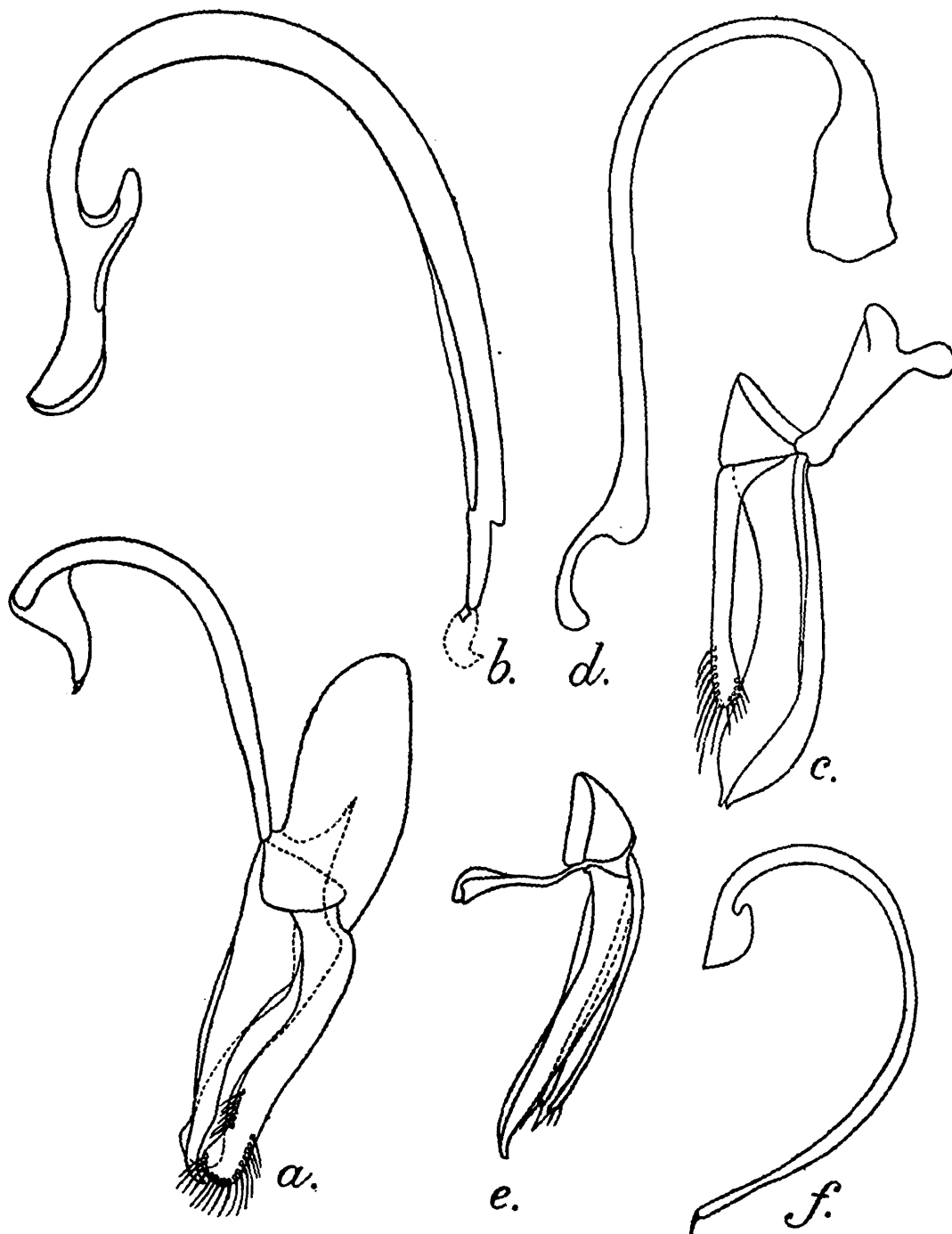
9. *Adonia variegata* (Goeze)

1777. *Coccinella variegata* Goeze, *Ent. Beyrt.* I, p. 247.
 1846. *Adonia variegata*, Mulsant, *Histoire naturelle des coleopteres de France : Sulcicolles-Securipalpes*, p. 39.
 1932. *Adonia variegata*, Koreschefsky, *Coleopt. Cat., Berl.* XVI, 120, pp. 346-359.
 1942. *Adonia variegata*, Kapur, *Indian J. Ent.* IV, pp. 49-66.

Material.—7 examples : Timure, 10,500 ft. (*B.M.-N.E.* 1949). Mar-siandi Valley, 3,000 ft. (*B.-N.E.* 1950). Above Those, 10. iv. 1952 (*T D. Bourdillon, B.-N. E.* 1952).

Remarks.—This palaearctic species is widely distributed not only in the Palaearctic region but also in the neighbouring parts of the Aethiopean and the Oriental regions. In India it has been recorded earlier from the northern parts, namely from Kashmir to Mussoorie Hills. The present record from Nepal extends its distribution further east. In the Z. S. I. collections two examples from Darjeeling (N. Bengal) are present. The present writer has not yet seen an example from Assam or Burma,

The colour-pattern in the species is very variable. In the examples from Nepal, nearly all the spots are present and in some the spots are enlarged and united and on the whole present patterns similar to those found in the subspecies *doubledayi* Mulsant, from Kashmir and the Punjab Hills.



TEXT-FIG. 7.—a. Male genitalia of *Ballia gustavi* Muls.; b. Siphon of the same; c. Male genitalia of *Afissa mysticoides* (Sic.); d. Siphon of the same; e. Male genitalia of *Afidentula manderstjernae* (Muls.); f. Siphon of the same.

10. *Adalia luteopicta* Mulsant

1866. *Adalia luteopicta* Mulsant, *Monogr. Coccinell.*, p. 45 (*Mem. Acad. Lyon* XV (1865-66), p. 45).

Material.—7 examples: Timure, 10,500 ft.; Langtang Khola, 10,600 ft., 10,600-11,000 ft., 13,500-14,000 ft.; Langtang, 11,500 ft. *BM.-N.E.* 1949). Nepal (no precise locality given) (1 ex.); Tate, 13-14. vi. 1952 (*T. D. Bourdillon, B.-N.E.* 1952).

Remarks.—Recorded earlier from east and north India and China, the present writer has seen examples of it from Dehra Dun (in Z.S.I.) and Sikkim. The colour pattern of the examples mentioned above generally agrees with the typical pattern (Text-fig. 6, *e.*) of the species. In one example (Tate, 13-14. vi. 1952, *T. D. Bourdillon*), however, the area of black markings shows a reduction, especially in the apical half of the elytron as shown in text-figure 6, *f.*

11. *Coccinella*(*Synharmonia*) *billeti* (Mulsant)

1853. *Harmonia billeti* Mulsant, *Ann. Soc. linn. Lyon* I, p. 144.

1931. *Synharmonia billeti*, Mader, *Evidenz Palaearctic Coccinellidae*, p. 191, t. 40, f. 1, 2.

1932. *Coccinella billeti*, Korschefsky, *Coleopt. Cat., Berl.* XVI, 120, p. 447.

Material.—2 examples : Timure, 10,500 ft. ; East of Timure, 8,000-10,000 ft. (*B.M.-N.E.* 1949).

Remarks.—The species is known from northern India and has been hitherto recorded from Kashmir, Punjab and Assam. The present writer has seen three examples from Yarkand (in Z.S.I. ; damaged condition), West Almora and Mussoorie. Each of these examples has different pattern.

Variation in colour-pattern.—The colour pattern which agrees with the description of the type is shown in text-figure 9, *a* (drawn from the example from W Almora). The elytral pattern of variety *indica* Weise is shown in text-figure 9, *b*. (Type locality : Assam ; figure drawn from an example from Timure). The example from Mussoorie (*ca.* 6,000 ft. VIII. 1933, *H. S. Pruthi* coll., in Z.S.I.) has testaceous elytra except for a narrow black margin along the suture and a transverse, rather wavy and moderately broad, black band along the transverse median line (Text-fig. 9, *c.*). For convenience of reference, this variety is named *pruthii*, **var. nov.** The only example from "East of Timure", mentioned above has no trace of black area on the elytra which are yellowish testaceous but apparently not tennerial (Text-fig. 9, *d.*) ; its pronotal pattern and the scutellum show the normal black colouration. This variety is named *testacea*, **var. nov.** Since the species is variable in colour-pattern, the male and the female genitalia are shown in outline for purposes of confirming the identification based on external characters. The penis (Text-fig. 9, *e. f.*) is curved towards the paramera near the apex and is a little asymmetrical ; the paramera have also conical and subapical projections pointing towards the penis (Text-fig. 9, *e*) but appears rather spatulate when viewed from the front (*g*) ; the siphon (*h*) is well developed. The female genital plates are small (Text-fig. 9, *i.*), but the spermatheca (*j*) is well developed.

12. *Coccinella repanda* Thunberg

1781. *Coccinella repanda* Thunberg, *Nov. Ins. Spec.* I, p. 18.

Material.—2 examples : Marsiandi Valley, 2,500 ft. ; 3,000-5,000 ft. (*B.-N.E.* 1950).

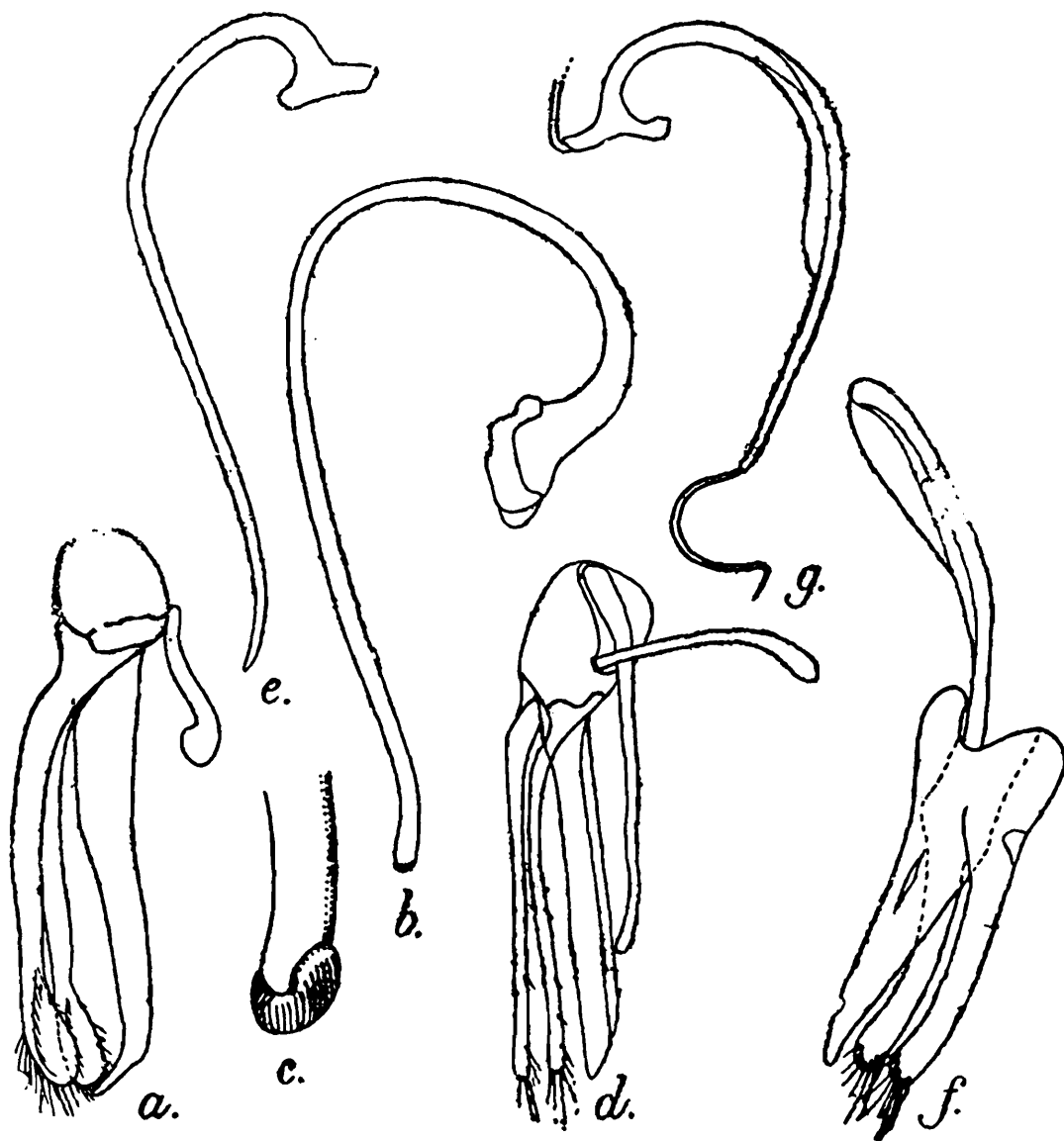
Remarks.—The species is widely distributed in the Oriental Region and also extends to the Australian Region. In India it has been recorded from almost the whole of peninsular India, Bengal, Assam and the Andaman Islands.

Outside India it is distributed in Central China, Sunda and Molucca Islands, New Guinea, Australia, Tasmania and New Zealand. It will be noted that like two other Oriental species, *Menochilus sexmaculata* (F.) and *Coelophora bissellata* Muls., which are widely distributed in South-East Asia, the present species also comes from a place of relatively lower altitude in eastern Nepal, namely an altitude of 2,500 ft. in Marsiandi Valley.

13. *Coccinella septempunctata* Linnaeus

1758. *Coccinella 7-punctata* Linnaeus, *Systema Naturae* (ed. X), p. 365. (Type loc.: Europe.)

Material.—10 examples : Trisuli Valley, 5,000 ft. ; 5,000-7,000 ft. East of Timure, 8,000-10,000 ft. ; Timure, 10,500 ft. ; Syagrubensi, ca. 5 000 ft. ; Langtang Khola, 7,000-10,000 ft. (*B. M.-N.E.* 1949).



TEXT-FIG. 8.—a.-c.—*Afissa grayi* (Muls.): a. Male genitalia except siphus; b. Siphus; c.—Enlarged apex of siphus. d.-e. *Sticholotis amator*, sp. nov.: d. Male genitalia except siphus; e. Siphus. f.-g. *Oenopia luteopustulata* Muls.: f. Male genitalia except siphus; g. Siphus.

Remarks.—This palaearctic species extends widely beyond the Palaearctic region and is known from the plains of India and the Himalayas already. In three examples the elytral spots are enlarged and confluent.

Tribe SYNONYBHINI

14. *Leis dimidiata* (Fabr.)

1871. *Coccinella dimidiata* Fabr. *Species insectorum*...I, p. 94.

1850. *Leis dimidiata*, Mulsant, *Ann. Soc. Agric. Lyon* III, p. 242.

Material.—1 example : Marsiandi Valley, 2,500 ft. (B.-N.E. 1950).

Remarks.—The species is widely distributed in the Himalayas, being known from Kashmir to Assam. Outside India, it is recorded from China and Japan. It is very variable in colour-pattern, several varieties having been described and named. Five varieties are known from Nepal alone. The present example has a humeral black spot on the elytron, the apical two thirds of which is black. It is very much like the variety *humeralis* Weise,¹ described from Dehra Dun.

15. *Ballia gustavi* Mulsant

1853. *Ballia gustavi* Mulsant, *Ann. Soc. linn. Lyon* I, p. 165. (Type loc. : N. India, Himalaya).

Material.—1 example : Rasua, ca. 7,000 ft. (B.M.-N.E. 1949).

Remarks.—Crotch² considered *gustavi* (Text-fig. 3, *d*) to be variety of *Ballia diana*e Mulsant, also from North India, but to the present writer the two appear to belong to two distinct species with different colour-patterns. It must, however, be admitted that various species of this genus form a very compact group. Nearly half a dozen species comprising the genus are similar in general form but differ basically in the schemes of their colour-patterns. The male genitalia of *B. diana*e, *B. eucharis* Muls., *B. gustavi* (Text-fig. 7, *a, b*), *B. korschefskyi* Mader, and a few apparently un-named species which the present author has come across, appear to be similar in shape and are not, as far as the preliminary examination shows, very helpful in separating the species. Until more is known of the genus it seems more appropriate that the described species should not be synonymized. *Ballia gustavi* is, therefore, regarded here as a distinct species.

16. *Oenopia luteopustulata* Mulsant

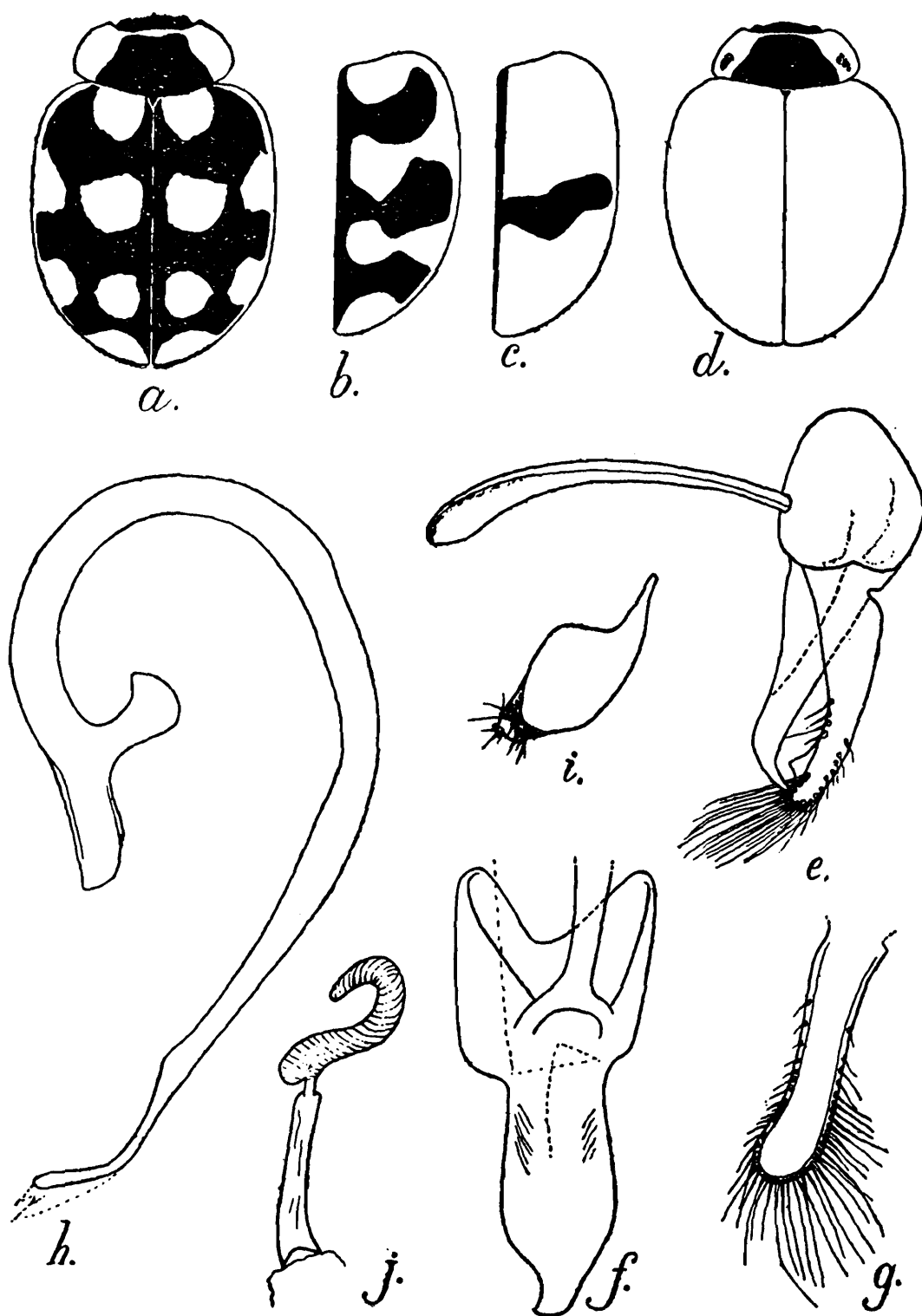
1850. *Oenopia luteopustulata* Mulsant, *Ann. Soc. Agric. Lyon* III, p. 421. (Type loc. : Assam).

Material.—10 examples : Rasua, 7,000 ft. (1 ex., typical form). Rasua, 7,000 ft. (2 ex.); Indrawati Kholā, 6,000 ft.; Sayabrubensi (1 ex. each, var. *thibetina* Mulsant). Rasua, 8,000 ft.; Thangiet, 6,000 ft. (1 ex. each, var. *pracuae* Weise). Rasua, 7,000 ft.; Thangiet, 6,000 ft.

¹Wiese, J., *Arch. fur Naturg.*, Jahrg. LXXVIII A, 12, p. 113 (1912).

²Crotch, G. R., *Revision of the coleopterous family Coccinellidae*, p. 128 (1874).

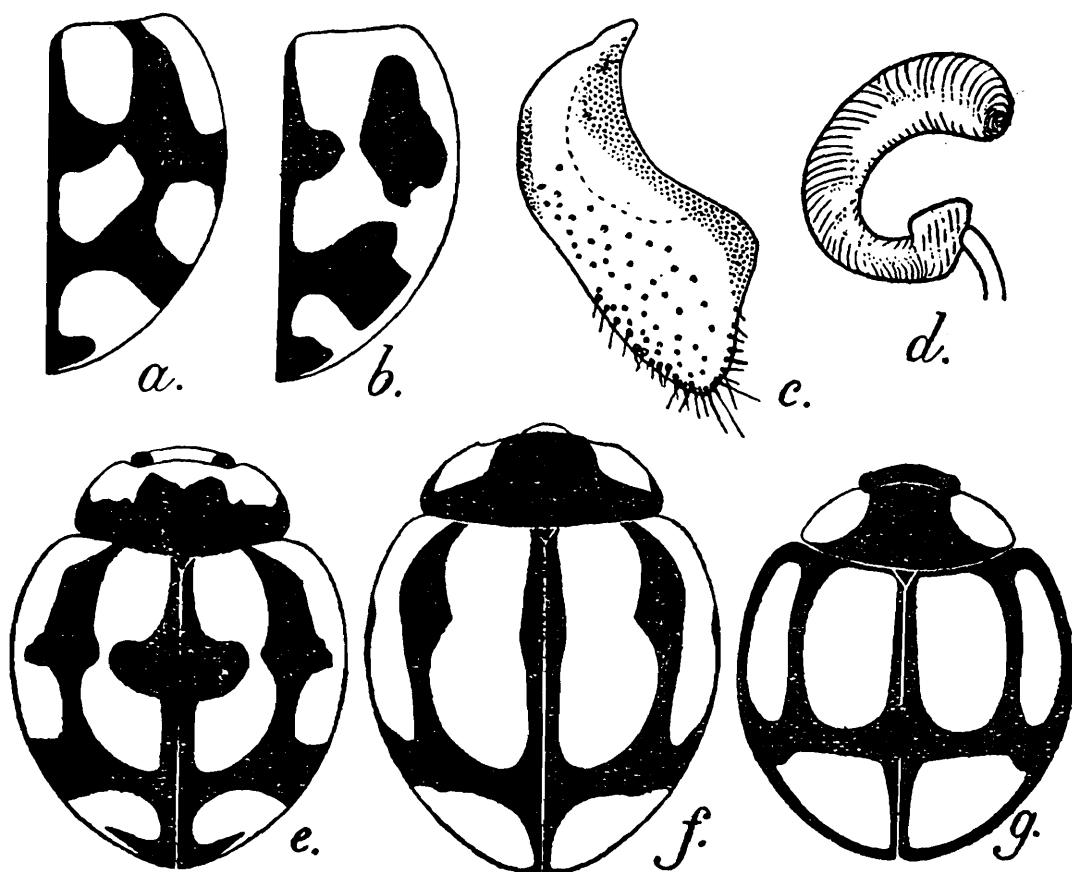
(1 ex. each, var. *nigromaculata* Mader;) Rasua, 7,000 ft. (1 ex., Type, var. *subpedicata*, var. nov.) (all collected by the B.M.-N.E. 1949).



TEXT-FIG. 9.—*Coccinella billieti* Muls. a. Colour-pattern of typical form; b. The same of var. *indica* Weise; c. The same of var. *pruthii*, var. nov.; e. Male genitalia except siphon. f. Front view of basal piece and penis; g. Parameron; h. Siphon; i. Female genital plate; j. Spermatheca.

Remarks.—The species is widely distributed being known from the Simla and Kumaun Hills; plains of U.P. (Lucknow); Nepal; Sikkim; N. Bengal; Assam, and Andaman Islands; Burma and Tibet. It is also very variable in its colour-pattern. The elytral pattern of the typical form *luteopustulata* is shown in text-fig. 10, a; of variety *pracua*

in fig. 10, *b* ; the pronotal and elytral pattern of variety *thibetina* in fig. 10, *e*. The male genitalia siphon (*g*) and the rest (*f*) of the species are shown in text-fig. 8, *f*. and *g*. and the female genital plate (*IX* sternite) (*c*) and spermatheca (*d*) in text-fig. 10, *c*, and *d*. *Oenopia luteopustulata* var. *subpedicata*, var. nov. (Text-fig. 10, *f*) is similar to the variety *pedicata* Mulsant¹ but has three pale yellow cells on the elytron instead of the four that are present in *pedicata*. This caused by the disappearance of the external transverse black line which is situated at the basal one-third of the length of the elytron in *pedicata*. In the long series of nearly 70 examples of the species in the collection of the Zoological Survey of India, almost all intermediate stages between the varieties mentioned above are present.



TEXT-FIG. 10.—*a* Elytral pattern of *Oenopia luteopustulata* Muls. (Typical) ; *b*. The same of var. *praeuiae* Ws. ; *c*. Female genital plate of *O. luteopustulata* ; *d*. Spermatheca of the same ; *e*. Pronotal and elytral pattern of *O. luteopustulata* var. *thibetina* Muls. *f*. The same of var. *subpedicata*, var. nov ; *g*. The same of *Coelophora sexareata* Muls.

17 *Oenopia sauzeti* Mulsant

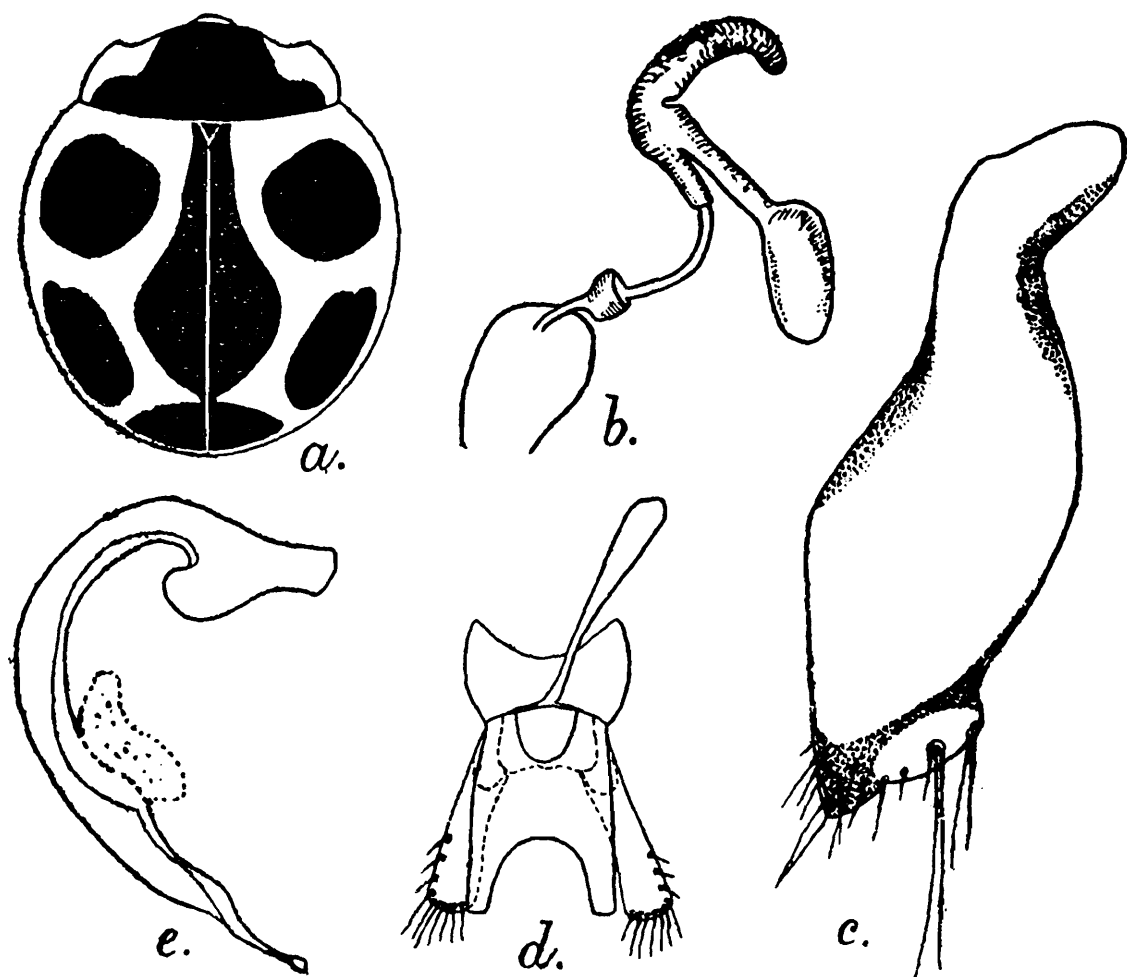
1866. *Oenopia sauzeti* Mulsant, *Monogr. Coccinell.*, p. 281 (*Mem. Acad. Lyon* XVII (1869-1870), p. 55). (Type loc. : India).

Material.—10 examples, Malemchi Gaon, 6,000 ft. ; Rasua, 7,000 ft. ; Indrawati Khola, 6,000 ft. ; Chilime, 6,000-8,000 ft. (*B.M.-N.E.* 1919) ; Marsiandi Valley, 2,500 ft. ; 3,000-5,000 ft. (*B.N.E.* 1950).

Remarks.—Although at the time when this species was first described, the precise locality in India from where the material came was not given, it was latter on recorded from Konbir and Mandir (formerly in Bengal and Burma. The present one is the first record from Nepal. The

¹ Mulsant E., *Ann. Soc. linn. Lyon* I, p. (1853).

species appears to be widely distributed. The Zoological Survey of India contains examples from Murree and Dalhousie Hills (Punjab), Kumaun Hills (U.P.), Sikkim, and Darjeeling District (N. Bengal). The colour pattern in this species does not appear to be very variable (Text-fig. 11,*a.*). The male genitalia (*e,d.*) and the female genital plates (*c.*) and also the spermatheca (*b.*), are very characteristic.



TEXT-FIG. 11.—*Oenopia sauzeti* Muls.;

- a.* Pronotal and elytral pattern; *b.* Spermatheca; *c.* Female genital plate;
d. Male genitalia except siphus; *e.* Siphus.

18. *Coelophora bisellata* Mulsant

1850. *Coelophora bisellata* Mulsant, *Ann. Soc. Agric. Lyon* III, p. 400. (Type loc.: Bengal; Java (*sic.*).)

1956. *Coelophora bisellata*, Kapur, *Rec. Indian Mus.* LXI, p. 335.

Material.—8 examples: Marsiandi Valley, 2,500 ft.; 3,000-5,000 ft.; 6,000 ft. (*B.-N.E.* 1950).

Remarks.—Originally described from Bengal and Java, the species has since been recorded from South India, Malacca, Sumatra, Borneo, the Philippines and New Guinea. The present writer has recently recorded it from Kumaun Hills, Sikkim, Darjeeling and Assam. The examples from Nepal show a rather uniform pattern of spots.

19. *Coelophora sexareata* Mulsant

1853. *Coelophora sexareata* Mulsant, *Ann. Soc. linn. Lyon* I, p. 181. (Type loc. : N. India).
 1874. *Coelophora sexareata*, Crotch, *Revision of the coleopterous family Coccinellidae*, p. 157.
 1894. *Coelophora sexareata*, Gorham, *Ann. Soc. ent. Belg.* XXXVIII, p. 209.
 1895. *Coelophora sexareata*, Gorham, *Ann. Mus. Civ. Genova* XXXIV, p. 685.
 1932. *Coelophora sexareata*, Korschefsky, *Coleopt. Cat., Berl.* XVI, 120, p. 296.
 1956. *Coelophora sexareata*, Kapur, *Rec. Indian Mus.* LII, p. 334.

Material.—1 example : Thangiet, 6,000 ft. (*B.M.-N.E.* 1949).

Remarks.—First described from 'N. India', the species was further recorded from West Yunann by Crotch, from Konbir and Mander (formerly Bengal, now Bihar) and Burma by Gorham, and from N. Bengal, Assam and Sikkim by the present writer. The pronotal and elytral patterns of the species are shown in Text-fig. 10, *g*. It will be noted that the external border of the elytron is black throughout.

20. *Menochilus sexmaculata* (Fabr.)

1781. *Coccinella sexmaculata* Fabricius, *Species insectorum*, p. 96.
 1850. *Chilomenes sexmaculata*, Mulsant, *Ann. Soc. Agric. Lyon* III, p. 144.
 1932. *Chilomenes sexmaculata*, Korschefsky, *Coleopt. Cat., Berl.* XVI, p. 120.

Material.—1 example : Marsiandi Valley, 2,500 ft. (*B.-N.E.* 1950).

Remarks.—This Oriental species is found commonly in the plains of India but sometimes extends to the foot-hills. The present example is the first one to be recorded from Nepal and comes from the eastern part and from low altitude of 2,500 ft. only. Outside India, Korschefsky gives its distribution as the Philippines, Borneo, Celebes, Sumatra, Java, Molucca and New Guinea. The species is very variable but the example mentioned above has typical elytral pattern, namely, two black, wavy bands and a subapical roundish spot.

Tribe CHILOCORINI

21. *Chilocorus rubidus* Hope

1831. *Chilocorus rubidus* Hope (in Gray), *Zoological miscellany*, p. 31. (Type loc. : Nepal).
 1956. *Chilocorus rubidus*, Kapur, *Réc. Indian Mus.* LII, pp. 262-264.

Material.—1 example : Nepal (Precise locality not given) (*T. D. Bourdillon* ; *B.-N.E.* 1952).

Remarks.—Originally known from Nepal, the species is widely distributed in North India, China, Japan, Russia, etc. A revised description and notes on its taxonomy and biology have been recently given by the present writer.

22. *Exochomus himalayensis*, sp. nov.

Body shortly oval, convex (Text-fig. 6, *a.*), black throughout except for the elytra which are reddish testaceous with black markings as follows : each elytron has an elongate, moderately wide, black, discal

band which is a little longer than one-half of the length of the elytron ; running along the apical seven-eighth of the length of the suture is another black border which is distinctly wider near its base and at apex and together with the opposite border on the other elytron, it gives the appearance of a wine-glass as shown in text-fig. 6, *a*. Elytral epipleura which are elsewhere reddish testaceous, are black or piceous near the apex. In one example (NEPAL : (Precise locality not given), *T. D. Bourdillon; B.-N.E. 1952*) the discal and the sutural bands meet at their basal ends.

Head with very fine, rather sparse and shallow punctures, pubescence very sparse and greyish. Pronotum with similar and slightly coarser punctures and with very sparse, short and greyish pubescence towards the lateral margins. Scutellum small, triangular and with four fine punctures. Elytra with fine, impressed and fairly close punctation ; spaces between the punctures smooth ; glabrous throughout. Underside of the body with sparse to rather sparse, fine and impressed punctation and with very sparse, short and greyish pubescence. Male a little smaller than the female.

Length 3.0—3.2 mm. ; width 2.3—2.5 mm.

Holotype.—NEPAL : Timure, 10,500 ft. (*B.M.-N.E. 1949*), a male in the British Museum (N.H.) ; genitalia mounted in Canada balsam and attached to the specimen.

Allotype.—A female, with the same data as the holotype, also deposited in the B.M. (N.H.).

Paratypes.—Seven in number, both sexes, with the same data as the holotype, in the B. M. (N.H.) and the Z.S.I. One more example with partly confluent discal and sutural black bands on the elytra (*vide supra*) returned to Dr. A. M. Easton.

Remarks.—The species is easily distinguished by its characteristic elytral pattern and shortly oval body and by its punctation and pubescence from other species of the genus. *Exochomus uropygialis* Mulsant and *Exochomus lituratus* Gorham, which are also known from the Himalayas and have testaceous elytra are distinguishable by their coarse and impressed punctation and short and subdepressed pubescence which is present all over the surface of the elytra. In *E. uropygialis* only the apex of the elytra is black while in *E. lituratus* there is, in addition, a long, subdiscal black streak. Moreover, in these two species the spaces between the elytral or other punctures are not very smooth but mat.

Tribe STICHOLOTINI

23. *Sticholotis amator*, sp. nov.

Body subhemispherical, glabrous. Head and pronotum reddish testaceous, scutellum and elytra piceous except for the moderately broad, reddish testaceous external border of the elytra. Underside testaceous except for the fumeus meso- and metasternum.

Head very finely, rather sparsely and uniformly punctate. Pronotum with coarser and closer punctures which are more impressed towards the lateral margins of the pronotum and less so towards its base. Scutellum very small, with only a couple of fine punctures. Elytra with coarse and moderately close punctures which are similar to those on the pronotum but rather less impressed, uniformly distributed and without an indication of their being arranged in lines; external border of elytra narrowly margined. Prosternum with two subparallel carinae enclosing a subquadrangular flat area; punctation on the underside coarse but shallow and sparse. Male genitalia (Text-fig. 8, *d.*, *e.*) with a long and narrow siphon (*e*) and with the penis nearly as long as the paramera and slightly narrowed near the apex which is broadly conical (*d*). Female unknown.

Length 2.5 mm. ; width 2.1 mm.

Holotype.—NEPAL: Rasua, 7,000 ft. (*B.M.-N.E.* 1949); male genitalia mounted in Canada balsam and attached to the specimen; deposited in the British Museum (N.H.).

Remarks.—This species is easily distinguished from other species by its distinctive colour-pattern and the nearly hemispherical form of the body. In Korschefsky's catalogue¹ *Jauravia limbata* Mots. has been included in the genus *Sticholotis* but the present writer² had transferred it back to *Jauravia*, the species of which are pubescent. The present species resembles *J. limbata* in colouration but is at once separated from it by the absence of pubescence.

Tribe ASPIDIMERINI

24. *Cryptogonus trioblitus* (Gorham)

1895. *Aspidimerus trioblitus* Gorham, *Ann. Mus. Stor. nat. Genova* XXXIV, p. 690. (Type loc. : Burma).

1949. *Cryptogonus trioblitus*, Kapur, *Trans. R. ent. Soc. Lond.* XC, pp. 101-102.

Material.—1 example : Tate, 9,300 ft. 12. vi. 1952 (*T. D. Bourdillon* ; *B.-N.E.* 1952).

Remarks.—Originally known from Burma, this species has been lately recorded from Kumaun Hills and Assam. The present record from Nepal fills up a gap in its distribution.

Tribe SCYMNINI

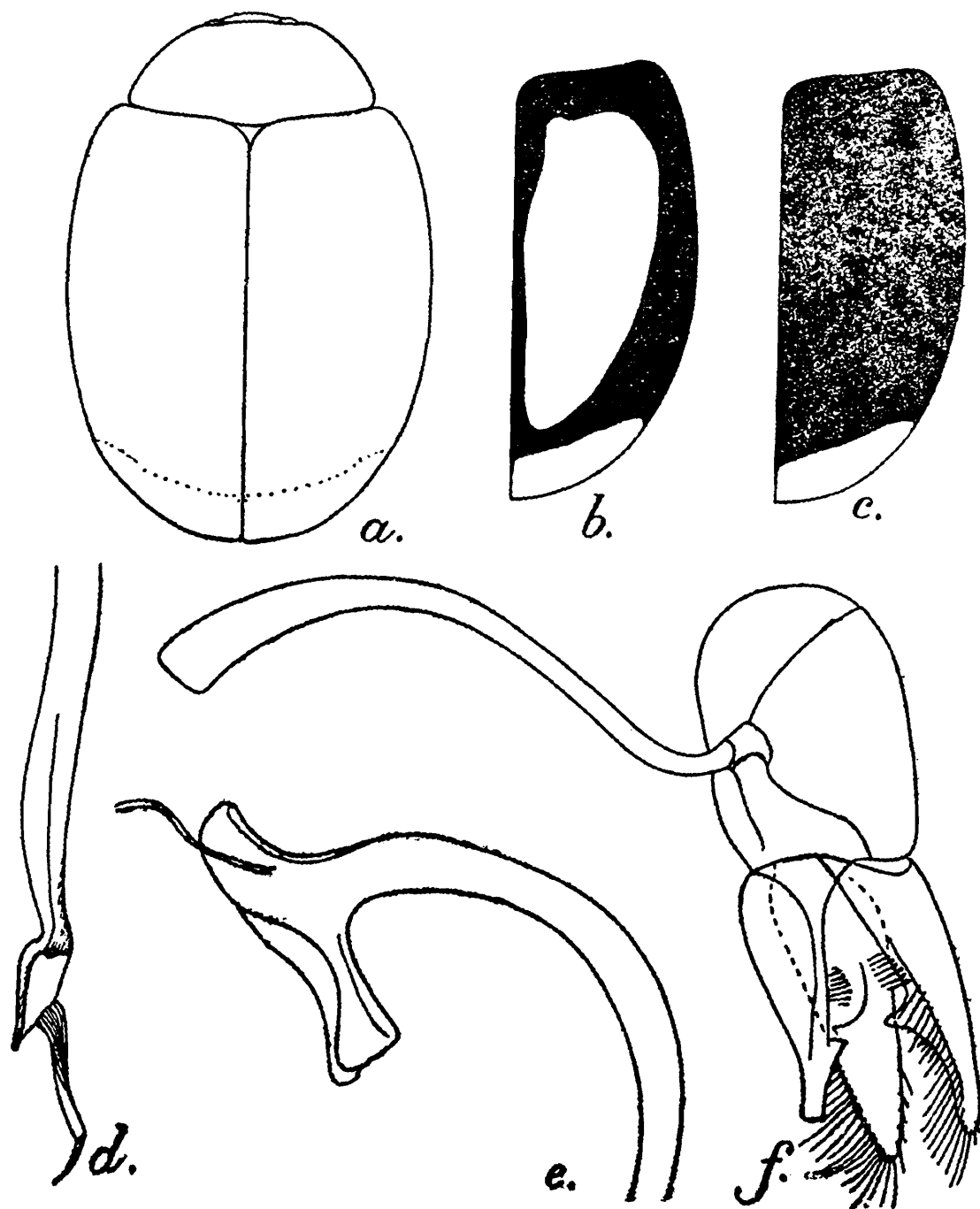
25. *Pullus bourdilloni*, sp. nov.

Body oblong oval (Text fig. 12, *a.*), convex, with rather indistinct humeral calli. Colouration very variable : of the four examples two have reddish testaceous head, pronotum and elytra, one has black border along the elytral margin, another is mainly black (excluding the apex in the last two cases). Detailed description of colouration is as follows : (1) *Typical*—Head, antennae and mouth parts reddish testaceous, eye

¹ Korschefsky, R., *Coleopt. Cat., Berl.* XVI, 118, p. 212 (1931).

² Kapur, A. P., *Ann. Mag. nat. Hist.* (11) XIII, pp. 78, 82-83 (1947).

shining yellowish grey, pubescence yellowish grey. Pronotum reddish testaceous except towards the anterior angles where it is testaceous, pubescence greyish. Scutellum fuscous red or piceous. Elytra reddish testaceous except for the apical one-seventh part which is testaceous, pubescence greyish. Legs and underside reddish testaceous except for the meso- and metasternum and first two or three abdominal sternites



TEXT-FIG. 12.—*Pullus bourdilloni*, sp. nov.

a. Outline of the typical (holotype) form ; b.-c. Elytral patterns of two varieties ; d. Apex of siphon ; e. Siphonal capsule ; f. Male genitalia except siphon.

which are piceous to fuscous. (2) The next variety has a pattern similar to the above except that the scutellum is black and that the elytra are bordered black along the base, the suture and the external margin except near the apex which remains testaceous (Text-fig. 12, b.). On the underside the meso- and metasternum and the elytral epipleura are black and the first three abdominal sternites black to piceous. (3) The

third variety of patterns is mainly black. Front and underside of the head are dark piceous, eyes shining grey but black in the centre, antennae and mouth-parts fuscous red. Pronotum piceous to black except for the fuscous red anterior angles and border. Scutellum black. Elytra black (Text fig. 12, c.) except for the apical one-seventh part which is testaceous, the shape of the latter area on the elytron is almost oval. Underside dark piceous to black except for the narrow, testaceous pronotal epipleura, the dark testaceous tibiae, tarsi and the external margins of the apical abdominal sternite. In other structural details, the four examples agree with one another, the following being further description from the holotype.

Head with very fine, rather impressed, close and uniform punctuation on the front, pubescence short, sparse and grey. Pronotum emarginate anteriorly, anterior angles acute, lateral margins slightly rounded, base feebly margined; punctuation and pubescence similar to that on the head. Scutellum triangular, with the basal angles less sharp, with about a dozen fine and close punctures. Elytra with the shoulder-angles rounded, external margin very narrowly bordered, apex subrounded; punctuation close, fine to moderately fine generally shallow but with a number of impressed punctures distributed irregularly all over but are more in number near the base and suture; pubescence fine, greyish, slightly longer than that on the head, directed posteriorly and towards the suture on the basal half and towards the external margin in the apical half of the elytron. Underside with the prosternal carinae gradually converging near the anterior margin of prosternum which is uniformly and finely punctate, meso- and metasternum with coarser and denser punctures, the remainder of the underside with finer punctures; pubescence greyish, depressed, rather sparse and slightly shorter than that on the dorsal surface. Abdominal lines semi-circular, almost reaching the distal margin of the sternite. The male genitalia (Text-fig. 12, d., e., f.) with the basal piece and paramera well developed, the latter characterized by a median conical projection and a group of short blunt hairs (f), penis wedge shaped but with a blunt, truncate apex; spiho with well developed siphonal capsule (e) pointed and curved apex (d).

Length 2.5 mm.; width 1.75 mm.

Holotype.—NEPAL: Thase, ca. 6,000 ft., 9. iv. 1952 (*T.D. Bourdillon*; *B. N. E. 1952*); a male; genitalia dissected and mounted in Canada balsam and attached to the specimen; in the British Museum (N.H.)

Paratypes.—NEPAL: Namche (ca. 12,000 ft.) to Tate (ca. 9,300 ft.) 10. vi. 1952 (*T. D. Bourdillon*; *B. N. E. 1952*), 1 example, reddish testaceous in colour like the holotype. Tate (ca. 9,300 ft.) 12. vi. 1952 (*T.D. Bourdillon*; *B. N. E. 1952*) one male, example with elytra margined black; 11. vi. 1952 (*T. D. Bourdillon*; *R.-N. E. 1952*), example that is mostly black.

Remarks.—Species of the genus *Scymnus* (*sensu lato*) of which *Pullis* and *Nephus* were first described as subgenera, are distinguished from one another with difficulty and as far as the Oriental species are concerned—a thorough revision of the genus is badly required especially as the

species are of considerable economic importance as predators of plant-lice and mealy-bugs. It seems almost a lucky coincidence that markedly different varieties described above, should be present in a small series comprising four examples. Hitherto no example of the tribe *Scymnini* was known from Nepal and very few species of the tribe are recorded from the Himalayas. *Pullus victoris* (Mots.) which is known from the latter area differs from *P. bourdilloni* in having a less narrow body and a large black spot covering the middle of the elytra and the pronotum. *Pullus pallidicollis* Muls. *Pullus apiciflavus* (Mots.) and *Pullus pyrochellus* Muls., have very different colour-patterns than *P. bourdilloni*, *Pullus xerampelinus* Muls. is smaller, more roundish and throughout reddish testaceous or testaceous, unlike the typical form described above which is mostly piceous on the underside. The male genitalia in the different species mentioned above are very distinctive in each case.

26. *Pullus pyrochellus* Mulsant

1153. *Scymnus (Pullus) pyrochellus* Mulsant *Ann. Soc. linn. Lyon* I, p. 281. (Type loc. : Calcutta).

Material.—1 example : Nepal (no precise locality mentioned) (*T. D. Bourdillon* ; *B.-N. E.* 1952).

Remarks.—The example mentioned above compares well with the material of the species from Calcutta, the type locality. The species, though fairly common in Calcutta as a predator of certain mealy-bugs, has hitherto not been recorded from elsewhere.

SUMMARY

The paper contains a report on 26 species of Coccinellidae collected by various British expeditions to Nepal between 1949 and 1952, and also notes on certain related material in the collections of the Zoological Survey of India. Geographical distribution of all the 41 species known from Nepal is given. Of these, 13 species are known only from Nepal, 15 are distributed in the rest of the Himalayas, 4 others are distributed widely in the Oriental region and the remaining 9 are of Palaearctic origin.

Of the 26 species under report 5 are new, 16 are being recorded for the first time from Nepal and 5 others are such that have been already known from there.

Two new genera, *Afissula* and *Afidentula*, are described. The five new species described are : *Afisa nepalensis*, *Afissula rana*, *Exochomus himalayensis*, *Sticholotis amator* and *Scymnus bourdilloni*. In the case of several species which were represented by long series of examples, variability of colour pattern has been described in detail and certain varieties named as *Coccinella billieti* var. *pruthii* var. nov. ; *C. billieti* var. *testacea*, var. nov. and *Oenopia luteipustulata*, var. *subpedicata*, var. nov. *Epilachna marginicollis* (Hope) has been transferred to *Afissa* Dieke and *Epilachna manderstjernae* Muls. and *Epilachna minima* Gorham, likewise transferred to *Afidentula*, gen. nov.

HYDROMEDUSAE IN THE INDIAN MUSEUM

By P. L. KRAMP, *Zoological Museum, Copenhagen, Denmark*

INTRODUCTION

The collection of Hydromedusae dealt with in the present paper belongs to the Zoological Survey of India, Calcutta. I am greatly indebted to Dr. H. S. Rao, who begged me to work up this most interesting collection. For various reasons the final treatment has been considerably delayed, but I trust that my increasing knowledge of the medusae belonging to areas outside European waters has secured more reliable results of my investigations of the Indian collection. At least, my original notes which were made shortly after I had received the collection, have been altered to some degree during the final treatment.

Most of the specimens are preserved in alcohol ; they are generally in a fairly good condition and give occasion to interesting remarks on their morphology. From a zoogeographical point of view the collection is of very considerable interest. It is mainly derived from the coastal waters around the Bay of Bengal : the east coast of India from Vizagapatam northwards to the Ganges estuary, the west coast of Burma, the Mergui Archipelago, and the Nicobar Islands. Some few samples were taken in scattered localities off other parts of the Indian coasts. Of special interest are some species taken in brackish or fresh-water, partly in the Ganges estuary, partly in the Vizagapatam Channel. Two of them, *Blackfordia virginica* and *Ostroumovia inkermanica*, are inhabitants of brackish-water swamps on the coasts of the Black Sea ; *Moerisia gangetica*, which is described as a new species, is closely related to, if not identical with, *M. lyonsi* in lake Qurun in Egypt. A tabular survey of the occurrence of the species is given at the end of the paper.

For each species are given : the most important references to previous literature¹ ; previous records from Indian waters ; localities where the species were taken ; morphological and systematical remarks, when desired ; geographical distribution. The majority of the samples were collected by the Marine Survey of India ; in the list of occurrence these localities are provided with a station number.

The collection contains 37 species of Hydromedusae, viz. : 5 Anthomedusae, 19 Leptomedusae, 5 Limnomedusae, 5 Trachymedusae, and 3 Narcomedusae. Two new species are described : *Octophialucium indicum* and *Moerisia gangetica*. The types are in the Zoological Survey of India, Calcutta.

¹For details of references cited in the synonymy the bibliography appended at the end of the paper may be consulted.

The collection of Scyphomedusae from the same investigations was worked up by H. S. Rao¹. Some few specimens of Scyphomedusae were, however, found among the Hydromedusae sent to me; they will be briefly mentioned in some additional remarks.

Previous records of Hydromedusae from restricted parts of the Indian coasts are given by: Bigelow² (Maldiv Islands), Browne³ (Maldiv and Laccadive Islands), Browne⁴ (Ceylon), Annandale⁵ (Ganges estuary), Browne⁶ (Kathiawar), M. G. K. Menon⁷ (Madras), Lele & Gae⁸ (Bombay), M. A. S. Menon⁹, and Nair¹⁰ (Trivandrum Coast), and Bal & Pradhan¹¹ (Bombay).

ANTHOMEDUSAE

Euphysora bigelowi Maas

- 1905. *Euphysora bigelowi*, Maas, p. 7, pl. I, figs. 1-3.
- 1910. *Steenstrupia bigelowi*, Mayer, p. 36, fig. 9.
- 1928. *Euphysora bigelowi*, Kramp, p. 35, figs. 8-12.
- 1951. *Euphysora bigelowi*, Nair, p. 50.
- 1952. *Steenstrupia bigelowi*, Bal & Pradhan, p. 76.

Marine Survey. Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars. 2-5. V 1922. Surface. 1 specimen.

The specimen is 3 mm in height, 2 mm in diameter. It has no apical canal. The principal tentacle has 14 lateral nematocyst knobs and a well-marked terminal knob. The tentacle opposite the principal tentacle is much smaller than the two lateral ones, which are of equal size.

Distribution.—Widely distributed in the tropical parts of the Indian Ocean and the western parts of the Pacific Ocean; recently recorded from Chile on the west coast of South America (Kramp, 1952). Previous records from India: Trivandrum Coast (Nair, 1951); Bombay (Bal & Pradhan, 1952).

Cytaeis tetrastyla Eschscholtz

Stat. 632. Off Muz, Car Nicobars. 23. II. 1922. Surface. 6 specimens. The specimens are 3-5 mm in height. None of them carry medusa buds.

¹Rao, H. S., *Rec. Indian Mus.* XXXIII, pt. 1, pp. 25-62 (1931).

²Bigelow, H. B., *Bull. Mus. comp. Zool. Harv.* XXXIX, No. 9, pp. 245-269 (1904).

³Browne, E. T., *Fauna and Geography of the Maldiv and Laccadive Archipelago* II, pt. iii, pp. 951-971 (1906).

⁴Browne, E. T., *Rep. Pearl Oyster Fisheries, Ceylon* XXVII, pp. 131-156 (1905).

⁵Annandale, N., *Proc. Asiat. Soc. Beng. N. S.* III, No. 2 pp. 79-81 (1907).

⁶Browne, E. T., *Rep. to the Govt. of Baroda on the Marine Zool. of Okhamandal in Kothiawar*, part ii, pp. 151-153 (1916).

⁷Menon, M. G. K., *Bull. Madras Govt. Mus. N. S.* III, No. ii, pp. 1-32 (1932).

⁸Lele, S. H. and Gae, P. B., *J. Univ. Bombay.* III, 5, pp. 90-101 (1935).

⁹Menon, M. A. S., *Proc. Indian Acad. Sci.* XXII B, 2, pp. 31-62 (1945).

¹⁰Nair, K. K., *Bull. Central Research Institute, Univ. Travancore, Ser. C. Nat. Sci.* II, No. i, pp. 47-75 (1951).

¹¹Bal, D. V. and Pradhan, L. B., *J. Univ. Bombay. N. S.* XX, B5, p. 76 (1952).

Distribution.—Widely distributed in the tropical parts of all the oceans.—Recorded from the Trivandrum Coast by Nair (1951, p. 53).

***Bougainvillea fulva* Agassiz & Mayer**

1899. *Bougainvillea fulva*, Agassiz & Mayer, p. 162, pl. 2, fig. 6.
 1905. *Bougainvillea fulva*, Maas, p. 10, pl. 1, fig. 8; pl. 2, figs. 9, 10.
 1910. *Bougainvillea fulva*, Mayer, p. 160.
 1928. *Bougainvillea fulva*, Kramp, p. 47, figs. 21-23.
 1951. *Bougainvillea fulva*, Nair, p. 54.

Stat. 461. 10°15'N. 90°15'E. 19.IV.1912. Midwater trawl. 1 specimen.

Stat. 563. 11°58'15"N. 98°21'10"E. 10-11.XI.1913. Surface. 2 specimens.

Stat. 602. 11°27'40"N. 98°36'15"E. 17-18.III.1914. 2 specimens.

Stat. 604. 11°17'20"N. 98°29'40"E. 28-30.III.1914. 1 specimen.

Stat. 606. 11°24'10"N. 98°27'50"E. 31.III.—1.IV.1914. Surface. 2 specimens.

Off Puri, Orissa Coast. 24-29.III.1916. 4-4½ fms. 18 specimens.

Stns. 563, 602, 604 and 606 are in the Mergui Archipelago. Stat. 461 is in the Sea of Bengal west of the Andaman Islands; the specimen from this locality is infested with larvae of Narcomedusae.

Distribution.—This is a common medusa in the coastal waters of the Indian Ocean and in the western Pacific from N. E. Australia to Japan.—It is recorded from Madras (Menon, 1932) and the Trivandrum Coast (Nair, 1951).

***Merga violacea* (Agassiz & Mayer)**

1899. *Pandea violacea*, Agassiz & Mayer, p. 160.
 1910. *Pandea violacea*, Mayer, pp. 119, 490, pl. 11, fig. 7; pl. 12, fig. 1.
 1913. *Merga violacea*, Hartlaub, p. 249, fig. 204.
 1913. *Mergintha lobianci*, Hartlaub, p. 250, fig. 265.
 1932. *Merga violacea*, Menon, p. 7, pl. 1, fig. 10.
 1951. *Merga violacea*, Nair, p. 51.
 1953. *Merga violacea*, Kramp, p. 265.

Stat. 614. Octavia Bay, Nancowry Harbour, Nicobars. 2-5.II.1922. Surface. 6 specimens.

The specimens are 3-4 mm in diameter; all of them have 8 tentacles, and between two successive tentacles there are sometimes 2, but usually 3 rudimentary marginal bulbs, with ocelli.

Distribution.—Mediterranean; Tortugas (Florida) and the Bahamas in the Atlantic; west coast of Mexico, Fiji Islands, and N. E. Australia in the Pacific.—India: Madras (Menon, 1932), Trivandrum Coast (Nair, 1951).

Leuckartiara hoepplii Hsu

1919. *Leuckartiara octona*, Bigelow, p. 282, pl. 29, figs. 5, 6.
1928. *Leuckartiara hoepplii*, Hsu, p. 7, figs. 1-4.
1937. *Leuckartiara octona* var. *minor*, Ling, p. 353, fig. 2.
1938. *Cirrhitiara hoepplii*, Uchida, p. 144.

Stat. 632. Off Muz. Car Nicobar. 23.XII.1922. Surface. 2 specimens.

The present specimens are smaller and have fewer tentacles than the Chinese specimens described by Hsi-Fan Hsu (1928), but in all structural details they agree perfectly with the types. They are only 5 mm wide and 6-7 mm high, and the gelatinous apical projection is small and pointed, not globular as in the original specimens. The gonads have about 5 folds on either side; the mouth rim is very complexly folded. The edges of the free portions of the radial canals are faintly serrated. There are four perradial tentacles with very large basal bulbs, laterally compressed and provided with a strongly developed, hook-like abaxial spur. The tentacles have numerous deep transversal folds and pits on their adaxial side. Four interr radial marginal bulbs have a similar abaxial spur as the fully developed tentacles, but they are much smaller, and tentacles are not yet developed on these bulbs. Moreover, there are eight very small adradial rudimentary bulbs with a pointed tip and each with a distinct abaxial ocellus, whereas the four interr radial bulbs and the basal bulbs of the four perradial tentacles have no ocelli but only some scattered pigment granules.

The original specimens, described by Hsu, were larger, 7-8 mm wide and 14-15 mm high, and had eight tentacles and 16-24 rudimentary bulbs, these latter with ocelli. The author emphasizes the large tentacle bulbs, "so that the tentacles appear to arise from the side of the bell partly above the bell-margin", and also that in the proximal part of the tentacles one side is "not smooth but wavy"

L. hoepplii may sometimes have been confused with the well-known and widely distributed *L. octona* but in *L. octona* the abaxial, spur-like processus of the tentacle bulbs is considerably less pronounced, and the rudimentary marginal bulbs are club-shaped. The tentacles of *L. octona* have no adaxial folds and pits. Moreover, *L. hoepplii* is characterized by the small number of gonadal folds and the extraordinarily complex folding of the mouth-rim. I consider the two species will separated from each other, and I have not the slightest doubt that the specimens from the Nicobars are younger stages of the Chinese species described by Hsu. It is also recorded from Japan (Uchida, 1938), and it seems probable that the medusa from the Chekiang Coast, China, described by Ling (1937) as *Leuckartiara octona* var. *minor* belongs to this species. Moreover, the specimens from the Philippine Islands described by Bigelow (1919) as *L. octona* undoubtedly belong to *L. hoepplii*. On the other hand, the specimens from Madras (Menon, 1932, p. 9, pl. 1, fig. 5) and the Trivandrum Coast (Nair, 1951, p. 52) were probably correctly identified as *L. octona*.

Distribution.—Amakusa, Japan (Uchida); Che-Kiang Coast, China (Ling); Amoy, China (Hsu); the Philippines (Bigelow); the Nicobars.

LEPTOMEDUSAE

***Laodicea indica* Browne**

1905. *Laodice indica*, Browne, p. 136, pl. 1, fig. 5; pl. 4, figs. 7-11.

1951. *Laodicea undulata* var. *indica*, Nair, p. 59.

1953. *Laodicea indica*, Kramp, p. 268.

Stat. 614. Octavia Bay, Nancowry Harbour, Nicobars. Febr. 1922. Surface. 1 specimen.

The specimen is small, measuring 2.2 mm in diameter in its present condition with the umbrella margin turned inwards. It has about 56 tentacles, spirally coiled, and there is an adaxial ocellus on about every third of the tentacle bulbs. The cordyli are lost, but some few marginal cirri are retained. The gonads are well developed, Male.

The affinities of this and related species have been discussed earlier (Kramp, 1953).

Distribution.—Ceylon (Browne, 1905), Trivandrum Coast, India (Nair, 1951), Torres Strait (Mayer, 1915 as *L. fiji*ana), N. E. Australia (Kramp, 1953). Probably also: Gulf of Aden (Vanhöffen, 1911), and in several localities in the Malayan Archipelago (Maas, 1905 and 1906).

***Tiaropsidium roseum* (Maas)**

1905. *Tiaropsis rosea*, Maas, p. 30, pl. 7, figs. 45-47.

1916. *Tiaropsis rosea*, Browne, p. 186.

1932. *Tiaropsidium roseum*, Kramp, p. 368, text-figs. 2, 50.

Stat. 632. Off Muz. Car Nicobar. 23.XII.1922. Surface. 7 specimens.

The specimens are 5-8 mm in diameter and up to 7 mm. in height. They all have four perradial tentacles, and the number of rudimentary marginal bulbs is constantly 7 in each quadrant without regard to the size of the specimens; this is in accordance with previous statements (see Kramp 1932). The gonads are shorter in the small than in the large specimens, their proximal ends placed at a very short distance from the corners of the stomach.

Distribution.—Observed on few occasions only: Damar in the Malayan Archipelago (Maas); Mauritius in the western part of the Indian Ocean (Browne); now also taken at the Nicobars.

***Blackfordia virginica* Mayer**

1910. *Blackfordia virginica*, Mayer, p. 277, pl. 36, figs. 3-5; pl. 37, fig. 6.

1935. *Blackfordia virginica*, Valkanov, pp. 278, 289, pl. 5-6, figs. 14-16 (the medusa); pl. 6-8, figs. 17-27 (the hydroid).

1935. *Blackfordia virginica*, Thiel, p. 169, figs. 1-2

1910. ? *Blackfordia manhattensis*, Mayer, p. 277, pl. 36, fig. 2.

Stat. 2. Salt Lake, near Calcutta. 8.V.1926. 9 specimens.

It was a great surprise to find this species in the Ganges estuary. It was first described by Mayer from Hampton Roads and Norfolk

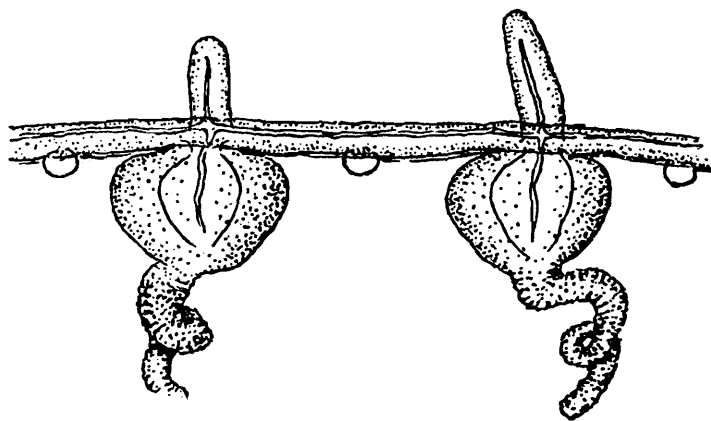
Harbour in Chesapeake Bay, Virginia, on the east coast of North America. Several large rivers are emptied through Chesapeake Bay; presumably, therefore, the medusae were taken in brackish water. Later on Valkanov (1935) found the same species in great abundance in the brackish water of the Mandra swamps on the Bulgarian coast of the Black Sea in water of 3-7 per mille salinity. Valkanov also described the corresponding hydroid, which he referred with some doubt to the hydroid genus *Campanulina* (*C. pontica*); its hydranths are provided with a web between the bases of the tentacles. Thiel (1935) examined some of the same specimens of the medusa and came to the conclusion that the occurrence of this species in an American harbour was probably due to transportation with ships from the Black Sea area, where presumably it is indigenous. This explanation seems to me very reliable, and the appearance of the medusa in the Ganges estuary, near Calcutta with its lively traffic, may presumably be explained in the same way.

I have been able to compare the specimens from the Ganges estuary with specimens from Norfolk Harbour, kindly sent to me by professor H. B. Bigelow, and professor A. Valkanov was likewise kind enough to send me several specimens from Bulgaria; there is not the slightest doubt that the specimens from the three widely separated areas all belong to the same species.

The specimens from Calcutta were sorted out from a sample containing several hundred specimens of another medusa, *Eirene menoni* (see below). Nine specimens of *Blackfordia* were found; they have the following dimensions:

Diameter of umbrella in, mm.	4	6	7	8	8	9	9	10	11
Number of tentacles . . .	72	72	84	84	92	84	88	84	92

I may confirm the statement by Mayer that the peculiar finger-shaped diverticula from the tentacle bulbs into the gelatinous substance of the umbrella are purely endodermal. They are present at



TEXT-FIG. 1.—*Blackfordia virginica*. Part of umbrella margin.

the base of all the tentacles (text-fig. 1), but their shape is somewhat variable, sometimes long and slender, sometimes broadly oval. There is almost always one marginal vesicle between each successive pair

of tentacles, very rarely two. There is no trace of black pigment granules adjacent to the statocysts. The gonads surround the radial canals completely and are not divided by a median line on their subumbrellar side.

In the Bulgarian specimens the endodermal diverticula from the tentacle bulbs are very variable in length and width, sometimes hardly visible; in the two American specimens, which I have seen, they are comparatively short. In the American as well as in the Bulgarian specimens the marginal vesicles alternate regularly with the tentacles, just as in the specimens from Calcutta.

Mayer described another and very similar species, *Blackfordia manhattensis*, which was taken in some localities on the coast of New Jersey. According to the description it differs from *B. virginica* by a greater number of marginal vesicles, of which there are usually two and sometimes three between each successive pair of tentacles. Mayer himself, however, emphasizes that *B. virginica* is distinguished from *B. manhattensis* by the presence of "dense-black endodermal pigment-granules adjacent to the lithocysts" in *B. virginica*. As a matter of fact, no trace of such pigment granules are seen in any of the specimens examined by me, neither in the Indian, nor in the Bulgarian or the American specimens. All these must be referred to *B. virginica*, because the number of marginal vesicles is equal to the number of tentacles; but future examination may possibly show that the two species are identical.

Distribution.—Indigenous in the brackish water swamps of the Bulgarian coast of the Black Sea; occurrence in estuaries on the east coast of North America and in the Ganges estuary presumably due to transportation with ships.

***Phialucium mbenga* (Agassiz and Mayer)**

1899. *Mitrocoma mbenga*, Agassiz and Mayer, p. 168, pl. 8, figs. 24, 25.

1905. *Phialucium virens*, Maas, p. 32, pl. 6, figs. 36, 37.

1910. *Phialucium mbenga*, Mayer, p. 276.

1911. *Phialucium mbenga*, Vanhöffen, p. 225, pl. 22, fig. 12, text-fig. 13.

1953. *Phialucium mbenga*, Kramp, p. 275, text-fig. 1.

Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars 2-5.II.1922.
Surface. 1 specimen.

Stat. 632. Off Muz, Car Nicobar. 23.XII.1922. Surface. 1 specimen.

The specimen from Stat. 614 is abnormal; it is 7 mm in diameter, the mouth is bilateral, and there are only two gonads; it has 14 tentacles and 3-6 rudimentary bulbs between successive pairs of tentacles.

The specimens from Stat. 632 all have four radial canals; one of them is only 3.5 mm. in diameter with 11 tentacles and 4-6 rudimentary bulbs between successive tentacles. The other specimens from this station vary in size from 4 to 10 mm. in diameter with 14-16 tentacles and 4-9 rudimentary bulbs between the tentacles.

The specimens recorded from the Trivandrum Coast by Nair (1951, p. 62) as *P. mbenga* probably belong to *P. carolinae*.

Phialucium mbenga differs from *P. carolinae* not merely in numerical characters, but also in the structure of the rudimentary marginal bulbs (see Kramp, 1953).

Distribution.—Fiji Islands ; Malayan Archipelago ; Sumatra ; N. E. Australia. The records from Java Sea and Singapore (Stiasny, 1928, p. 208) are uncertain.

***Phialucium carolinae* (Mayer)**

- 1900. *Oceania carolinae*, Mayer, p. 7, pl. 3, fig. 9; pl. 4, figs. 10, 11.
- 1905. *Octocanna polynema*, Browne, p. 144, pl. 2, figs. 8, 9, 10.
- 1905. *Octocanna polynema*, Maas, p. 38.
- 1910. *Phialucium carolinae*, Mayer, p. 275, pl. 36, fig. 1.
- 1911. *Phialidium heptactis*, Vanhöffen, p. 225, pl. 22, fig. 11, text-fig. 15.
- 1912. *Phialidium phosphoricum* forma *polynema*, Vanhöffen, p. 19.
- 1919. *Phialucium mbenga* var. *polynema*, Bigelow, p. 296, pl. 41, fig. 8.
- 1932. *Octocanna polynema*, Menon, p. 23, pl. 3, fig. 25.
- 1947. *Phialucium carolinae*, Uchida, p. 307.
- 1951. *Phialucium mbenga*, Nair, p. 62.
- 1952. ? *Phialucium virens*, Bal and Pradhan, p. 76.
- 1953. *Phialucium carolinae*, Kramp, p. 276, text-figs. 2, 3.

The complicated history of the genus *Phialucium* has recently been discussed by me (Kramp, 1953, pp. 273 ff). I found that the specimens recorded from various localities as *Phialucium virens* belong partly to *P. mbenga*, partly to *P. carolinae*. The small marginal bulbs in *P. carolinae* are not permanently rudimentary, as they are in *P. mbenga*, and in *P. carolinae* the number of radial canals is highly variable ; there are usually 4, but very frequently 6, 7 or 8 canals, which have caused much confusion and induced some authors to refer their specimens to "*Octocanna*" or to describe them as new species or varieties.

The present collection contains only one specimen of this species.

Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars. February 1922. Surface. 1 specimen.

It is in a rather poor condition ; the radial canals are indistinct, apparently five in number. There are about 17 fully developed tentacles.

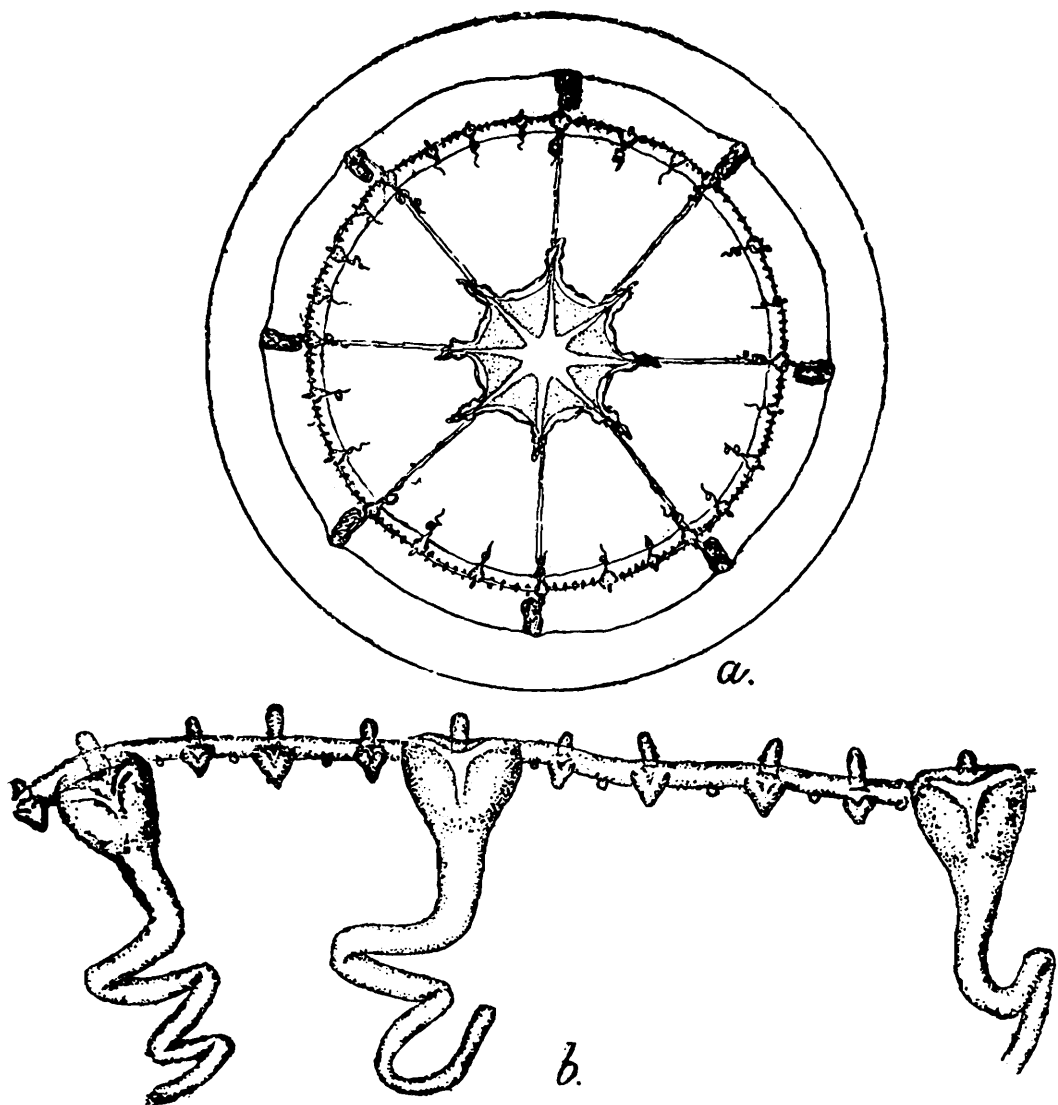
Distribution.—Originally described from the east coast of North America : Charleston Harbour and Florida ; recorded under different names from several localities in the tropical parts of the south-western Pacific : Philippine Islands ; Malayan Archipelago. In Indian waters it is recorded from Madras (Menon, 1932), Ceylon (Browne, 1905), Trivandrum Coast (Nair, 1951) and probably from Bombay (Bal and Pradhan, 1952).

***Octophialucium indicum*, sp. nov.**1932. *Octocanna polynema*, Menon, p. 23, pl. 3, fig. 25.1951. ? *Octocanna polynema*, Nair, p. 63.Stat. 524. $12^{\circ} 29\frac{3}{4}'$ N., $98^{\circ} 12'$ E. Mergui Archipelago. 13.III.1913. Surface. 1 specimen.Stat. 563. $11^{\circ} 58' 15''$ N., $98^{\circ} 21' 10''$ E. Mergui Archipelago. 10-11.III.1913. Surface. 2 specimens.

Stat. 691. Akyab Harbour, Burma. 7.XI.1925. Surface. 150 specimens.

One of the specimens from Stat. 691 is chosen as the *type*.

(Text-figs. 2a, b). Diameter up to 13 mm. Umbrella disk-like, gelatinous substance very thick, frequently lenticular. The base of the stomach is about $\frac{1}{6}$ of the diameter of the umbrella. The stomach is short, the mouth provided with 8 pointed lips with crenulat-

TEXT-FIG. 2.—*Octophialucium indicum*, sp. nov.

a. Oral view ; b. Part of umbrella margin, abaxial view.

ed margin. The number of radial canals is usually 8 ; they are continued inwards from the periphery of the stomach, usually almost to the centre. The canals are narrow, the gonads very short, never more than $\frac{1}{5}$ as long as the radial canals, situated very near the umbrella

margin. Ring-canal narrow. 19-28 tentacles, most frequently about 24; the tentacles are fairly short, spirally coiled and slightly flattened. Tentacle bulbs broadly conical, each with a well-developed adaxial excretory papilla which is fairly long and narrow; no abaxial spur-like processus. Between two successive tentacles there are 3-5, most frequently 4 rudimentary marginal bulbs, all of about equal size, triangular, all with an excretory papilla of about the same length and shape as in the tentacle bulbs. There is on small marginal vesicle between each successive pair of marginal bulbs, whether those carry a tentacle or not. Velum narrow.

The majority of the specimens have 8 radial canals, but some few have more or less, varying from 6 to 11. The canals are usually regularly arranged, almost equidistant; irregularities and abnormalities are rare. In 150 specimens I have counted the radial canals and tentacles as follows:

Number of radial canals	6	7	8	9	10	11
Number of specimens	1	10	135	2	1	1
Average number of tentacles	20	20	22	21	24	?

There is no distinct correlation between the numbers of radial canals and tentacles.

Comparison with other species

The genus *Octophialucium* was recently erected by me (Kramp, 1955). I found it necessary to regard the genus *Octocanna* Haeckel and the two species originally referred to it, *polynema* and *octonema*, as obsolete and introduce a new generic name, *Octophialucium*, for the various medusae with (normally) eight simple radial canals and eight mouth lips, and with closed marginal vesicles. Most of these medusae were previously referred to *Octocanna*, some of them to the species *O. polynema* Haeckel, others were described as separate species.

I shall briefly recapitulate the results of my revision of the species of *Octophialucium*, with addition of the new species described above.

Survey of the species of *Octophialucium*

Valid name, <i>Octophialucium</i> .	Previous name.	Diam. mm.	No. of tentacles.	Bulbs between tentacles.	Gonads in proportion to radial canals.	Distribution.
<i>solida</i> (Menon)	<i>Octocanna solida</i> Menon 1932.	10	4	c. 11	almost 1/1	Madras.
<i>bigelowi</i> Kramp	<i>Octocanna poly-</i> <i>nema</i> Bigelow 1909.	8	8	1-3	almost 1/1	Mexico. Pacific.
<i>medium</i> Kramp	..	17-22	16	c. 3	distal $\frac{2}{3} = \frac{2}{3}$	West Africa.
<i>indicum</i> Kramp	..	10-13	c. 24	c. 4	distal $\frac{1}{3} = \frac{1}{3}$	Bay of Bengal.
<i>aphrodite</i> (Bigelow)	<i>Octocanna aph-</i> <i>rodite</i> Bigelow 1919.	20-25	80-100	2-3	distal $\frac{1}{3} = \frac{1}{3}$	Malayan Archipelago.
<i>funerarium</i> (Q.&G.)	<i>Octocanna fune-</i> <i>rarium</i> (Quoy and Gaimard).	36-40	64-128	0-1	distal $\frac{1}{3}$	N. E. At- lantic. Mediterranean.

Octophialucium indicum is distinguished from the first three of these species by its very short gonads and a larger number of tentacles. In *O. aphrodite* and *funerarium* the gonads are likewise short and situated lower near to the ring-canal, but their tentacles are much more numerous.

The medusae described by Menon (1932, p. 23) as *Octocanna polynema* Hckl. probably belong to *Octophialucium indicum*. They were found in great abundance near Madras; they may grow to a somewhat larger size, 22 mm in diameter, and their gonads are slightly longer, $\frac{1}{3}$ as long as the radial canals; the number of radial canals may be more or less than eight; they have up to 30 tentacles (in the specimens examined by me as many as 28 were found), and the number of rudimentary bulbs between successive tentacles is 3-4. According to the text (p. 23) "both normal tentacle bulbs and the rudimentary ones have large excretion papillae", though in the figure (Pl. III, fig. 25) no papillae are indicated on the rudimentary bulbs. The agreement between the two forms seems to me so complete that we must regard the specimens from Madras as full-grown individuals of the species which I have described above as *O. indicum*.

The three specimens from Ceylon described by Browne (1905, p. 144, Pl. II, figs. 8-10) as *Octocanna polynema* were up to 12 mm wide; they had only 16 tentacles, and their gonads were more elongated than in *O. indicum*, situated along the distal half of the radial canals (in one specimen along the middle part of the canals). According to the description and figures this form agrees more with the West-African species *O. medium* than with *O. indicum*. I have seen one of Browne's original specimens in the British Museum in London, and it seems to me impossible to refer it to *O. indicum*. Until more material has been collected, the affinity of the Ceylonese form seems to me open to doubt.

I am also somewhat in doubt of the identification of the specimens recorded from the Trivandrum Coast in south-western India by Nair (1951, p. 63) and by him referred to *Octocanna polynema*. Detailed countings of radial canals (8-11), tentacles (7-24), rudimentary bulbs (32-106) and statocysts (54-200) are given for 6 specimens, 5-25 mm in diameter. One specimen is small (5 mm wide with 7 tentacles); the others are larger than those examined by me, being 14-25 mm wide, yet with a comparatively low number of tentacles:

Diam. in mm	.	.	14	15	16	18	25
Tentacles	.	.	10	24	17	14	19

The number of statocysts is considerably larger than the number, of tentacles+bulbs, whereas in *O. indicum* there is nearly always only one statocyst in each space between the marginal bulbs. Unfortunately Nair gives no information of the length and situation of the gonads. It seems probable that the Trivandrum specimens belong to *O. indicum*, but I am not sure.

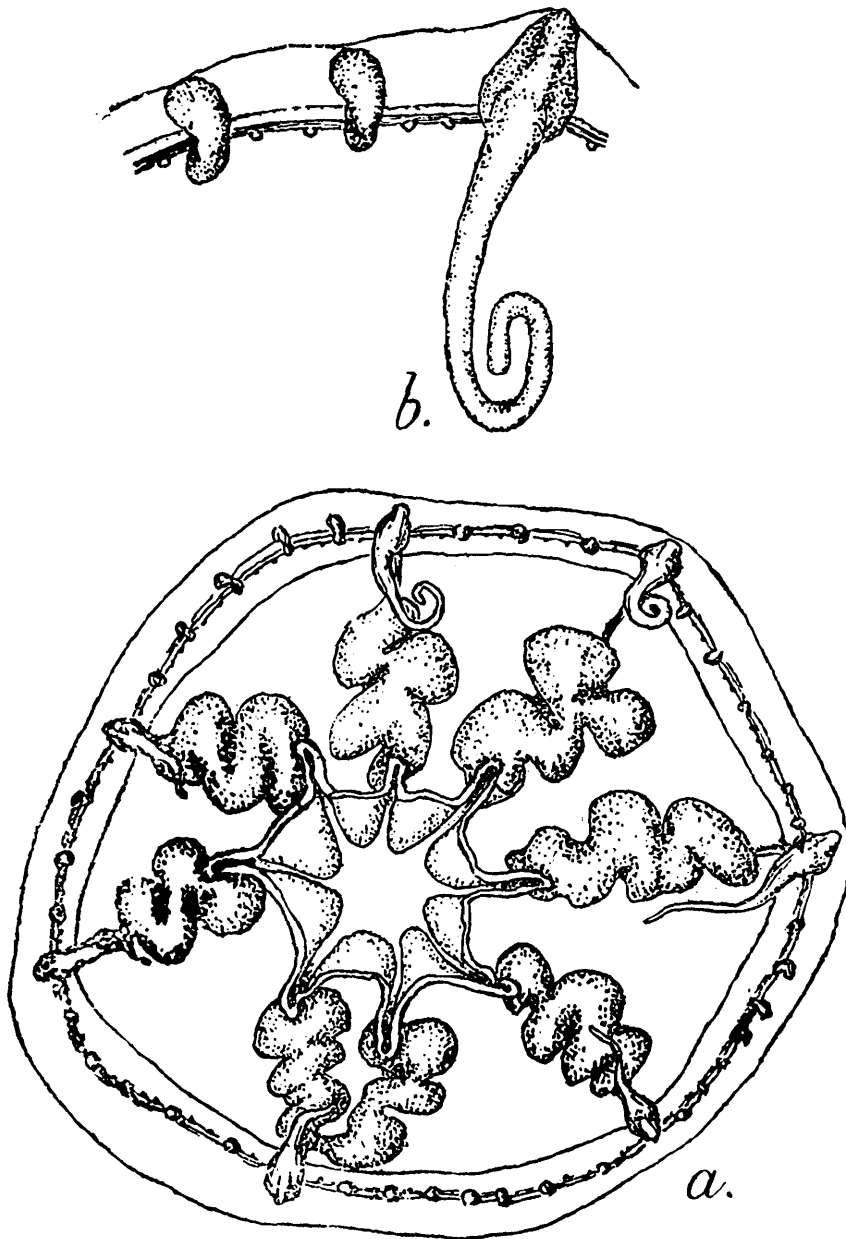
Distribution.—Abundant off the coasts of Burma and near Madras. ? Trivandrum in south-western India.

Octocannoides ocellata Menon

1932. *Octocannoides ocellata*, Menon, p. 21, pl. III, figs. 27, 28.

Stat. 604. 11° 17' 20"N., 98° 29' 40"E. Mergui Archipelago. 28-30 III.1914. 1 specimen.

The specimen (text-fig. 3a) is 6 mm in diameter, 3.5 mm in height ; the gelatinous substance is fairly thick, the umbrella margin somewhat inward turned. The stomach is short and broad, 2 mm in diameter, star-shaped, deeply incurvated in the eight interradii, mouth with 8 lips, fairly short, with faintly crenulated margins and a deep ventral groove. There are 8 narrow radial canals ; the 8 gonads are very



TEXT-FIG. 3.—*Octocannoides ocellata* Menon.
a. Oral view. b. Part of umbrella margin.

thick, wavy, situated along the proximal half of the radial canals ; the gonads completely surround the radial canals. Ring.-canal narrow. The tentacles are 8 in number, opposite the radial canals ; they are spirally coiled, in extended condition hardly more than half as long as the radius of the umbrella. The tentacle bulbs are pear-shaped each with a well developed, broad, spur-like abaxial processus with

distinct median keel (Text-fig. 3b). Between successive tentacles are 3-6 (altogether 28) rudimentary bulbs each consisting of a small, adaxial knob and a large abaxial spur broadening outwards and grasping over the margin of the umbrella. Excretory papillae seem to be absent. In each space between marginal bulbs are 2 small marginal vesicles. Velum fairly narrow.

In all essential features this specimen agrees perfectly with the description and figures of *Octocannoides ocellata* as described by Menon (1932). However, no black pigment is found on the marginal bulbs, and the gonads are not divided into two halves as stated by Menon. Nevertheless the two forms are so much alike that I feel sure they belong to the same species.

Distribution.—Madras (Menon) ; Mergui Archipelago.

***Eirene tenuis* (Browne)**

1904. *Phialidium tenue*, Browne, p. 730, pl. 54, fig. 4; pl. 57, fig. 16.

Stat. 614. Octavia Bay, Nancowry Harbour, Nicobars. 2-5.II.1922.
2 specimens.

The identity of "*Phialidium tenue*" Browne may now at last be determined; the present specimens agree perfectly with the original description of this species, which has been much discussed.

The description of "*Phialidium tenue*" was based on one single specimen, 15 mm wide, from the Maldive Islands. It was distinguished from other species of *Phialidium* by the stomach being "situated on a semi-globular thickening of the umbrella", i.e., it had a short, but distinct gastric peduncle. In his paper on medusae from Ceylon (Browne 1905, p. 143) the author himself regarded *P. tenue* as an abnormal specimen of *Irenopsis hexanemalis* with only four instead of six radial canals. In this supposition he was followed by Mayer (1910, p. 310), whereas Maas (1905, p. 32, 1906, p. 93 and 1909, p. 23) and Bigelow (1909, p. 158) were inclined to refer it to the genus *Phialucium* (*P. virens*). I have recently stated (Kramp, 1953, p. 275) that "*Phialidium tenue*" does not belong to *Phialucium*, but I expressed no definite opinion of its affinities.

The present specimens settle the question. The species, as described by Browne, must be retained, but referred to the genus *Eirene*. One of the specimens is 10 mm wide and 4 mm high, the gelatinous substance moderately thick. The gastric peduncle is short and broad, 4 mm at its base, sharply set off from the subumbrella. Stomach cruciform, mouth with four crenulated lips. The gonads are straight, 2.5 mm long, situated 1.5 mm from the base of the peduncle, 1 mm from the umbrella margin, female with ripe eggs. There are 32 tentacles, spirally coiled, sharply set off from the bulbs, which are somewhat broader than long and provided with a small adaxial papilla. Some of the tentacles are extended and almost as long as the radius of the umbrella. The distance between the tentacles is somewhat variable, in each space between the tentacles are 1-3 very small rudimentary bulbs; when there are three, the middle one is somewhat larger

than the others; usually four small statocysts between successive tentacles. The other specimen is 8 mm wide. Its gastric peduncle is somewhat more slender than in the above specimen, being 2 mm long and 2 mm wide at its base. The gonads are male, situated as in the female specimen. 24 fully developed tentacles. Six of the young bulbs are fairly large, but still without a pointed tip.

These specimens are certainly not young ones, their gonads being well developed. They are quite distinct from small specimens of *Eirene hexanemalis*, also such with only four radial canals, of which I have seen several specimens. *Eirene tenuis* is a distinct species; it bears some resemblance to *E. palkensis* in which, however, the peduncle is longer and more slender, it has a larger number of tentacles, and the tentacle bulbs are narrower, more conical and with longer excretory papillae; moreover, its gonads are longer than in *E. tenuis*.

Distribution.—Ceylon (Browne); Nicobar Islands.

***Eirene palkensis* Browne**

1905. *Irene palkensis*, Browne, p. 141, pl. 3, figs. 12-16.

1910. *Phortis palkensis*, Mayer, p. 309.

1936. *Eirene palkensis*, Kramp, p. 250 (all previous literature).

1953. *Eirene palkensis*, Kramp, p. 283.

Stat. 606. 11° 24' 10"N., 98° 27' 50"E. Mergui Archipelago. 30.I.1914.
Surface. 2 specimens.

The two specimens are 4-11 mm in diameter. The gastric peduncle is short, transversally wrinkled, evidently strongly contracted. The tentacles are in different stages of development; in the middle of the space between two fully developed tentacles is one half-developed tentacle and between this and the adjacent tentacle usually a very small or quite rudimentary tentacle. The complete number therefore amounts to 35-40 in each quadrant, about the same number as in the type specimen described by Browne. The excretory papillae are very distinct.

Distribution.—Ceylon (Browne); according to Vanhöffen also found at the Nicobar Islands, near Amoy and Hong Kong, and at Port Natal in East Africa; North-East Australia (Kramp). Now also taken in the Mergui Archipelago.

***Eirene ceylonensis* Browne**

1905. *Irene ceylonensis*, Browne, p. 140, pl. 3, figs. 9-11.

1910. *Phortis ceylonensis*, Mayer, p. 309.

1919. *Phortis ceylonensis*, Bigelow, p. 304.

1928. *Phortis ceylonensis*, Stiasny, p. 209.

1936. *Eirene ceylonensis*, Kramp, p. 249 (all previous literature).

1951. *Phortis ceylonensis* Bal and Pradhan, p. 76.

1951. *Eirene ceylonensis*, Nair, p. 64 (part).

1953. *Eirene ceylonensis*, Kramp, p. 285.

Stat. 563. 11°58'15"N. 98°21'10"E. Mergui Archipelago. 10-11.XI. 1913. Surface. 1 specimen.

Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars. 26-27. X.1921. 1 specimen.

Stat. 614. Same locality. February 1922. Surface. 20 specimens.

Stat. 632. Off Muz, Car Nicobar. 23.XII.1922. 1 specimen.

Stat. 691. Akyab harbour, Burma. 7.XI.1925. Surface. 16 specimens.

In a small creek at low water near ferry, Vizagapatam. May-June 1926. Rao and Varugis leg. 1 specimen.

The specimen from Stat. 563 is very small, 2 mm wide, with 32 tentacles. Another young specimen was taken at stat. 632; it is 3.5 mm wide, the peduncle is very small, there are 31 tentacles all alike and about 31 statocysts. The specimens from the other localities vary in size between 4 and 14 mm in diameter and are typical in every respect.

According to Nair (1951) *E. ceylonensis* is represented on the Trivandrum Coast by two distinct types of specimens. The "bigger type" undoubtedly belongs to *E. ceylonensis*, but the "smaller type", which Nair has compared with the specimens recorded by Menon (1932, p. 18) as *Phortis* sp. from Madras, should probably, like these latter, be referred to the species described by me (1953) as *Eirene menoni* (see below). The same probably applies to the specimens found in brackish-water ponds in the Ganges estuary and recorded as *Irene ceylonensis* by Annandale (1907).

Distribution.—Ceylon (Browne, 1905); Trivandrum Coast (Nair, 1951); Bombay (Bal & Pradhan, 1951); Java Sea (Stiasny, 1928); Philippine Islands (Bigelow, 1919); N. E. Australia (Kramp, 1953). Now also found in several localities in the eastern part of the Sea of Bengal and at Vizagapatam on the east coast of India.

***Eirene menoni* Kramp**

1907a. *Irene ceylonensis*, Annandale, p. 79, pl. 2, fig. 5; 1907 b, pp. 36, 38; 1907c pp. 139, 142, fig. 4.

1932. *Phortis* sp., Menon, p. 18.

1937. *Phortis lactea*, Ling, p. 357, figs. 9-10.

1951. *Eirene ceylonensis*, "smaller type", Nair, p. 64.

1953. *Eirene menoni*, Kramp, p. 286, pl. 2, fig. 6.

Off Puri, Orissa Coast, 4-4½ fms. 70 specimens.

Shambazar Khal, Dakhnidari Canal, near Calcutta. 13.V.1926. Thousands of specimens.

In the collection of medusae from the Great Barrier Reef off north-eastern Australia (Kramp, 1953) I found a single specimen of a medusa which I described as a new species of *Eirene*. Since it agreed perfectly with the unnamed species, which was described by Menon (1932) as *Phortis* sp., I named it *E. menoni*. I also identified it with the species recorded from the Chekiang Coast, China by Ling (1937) and by him

referred to *Phortis lactea* Mayer, a species formerly described from Florida on the Atlantic coast of North America. The "smaller type" of *Eirene ceylonensis* found off the Trivandrum Coast (Nair 1951) undoubtedly also belongs to the same species. By further consideration it likewise seems to me most probable that the "*Irene ceylonensis*" Annandale (1907) must be referred to *Eirene menoni*; it was found in great abundance in the same area (the Ganges estuary), from which the present collection contains an enormous number of specimens.

The Australian type specimen of *Eirene menoni* was characterized as follows: Umbrella 12 mm wide and 5 mm high, evenly rounded; jelly fairly thin; gastric peduncle slender, slightly widened at the base, its length somewhat less than the height of the umbrella cavity. Stomach short, mouth with four-pointed, frilled lips. Gonads linear, somewhat sinuous, from the base of the peduncle almost to the ring-canal. 46 tentacles with conical bulbs and two young marginal bulbs. No excretory papillae. The tentacles are all of nearly the same size, but the distance between them is variable; 1-3 statocysts between successive tentacles, dependent on the distance between them.

This is one of those species of *Eirene* in which every newly developed tentacle quickly attains full size, so that in any stage of development of the medusa none or very few young bulbs are seen between the fully developed tentacles. The 70 specimens from the Orissa Coast are 4-10 mm wide, and almost all of them have about 48 tentacles. A representative sample of the numerous specimens from near Calcutta shows the following numbers of tentacles according to the size of the specimens:

Diam. mm .	1	2	3	4	5	6	7	8	9	10	11	12	13
Average	16		28	32	38	44	48	56	60	62	64	..	72
number of tentacles													

In this sample the number of tentacles was accordingly evenly increasing with age. In structural details the specimens are in perfect agreement with all the medusae which I have referred to *Eirene menoni*.

Distribution.—Southern part of the west coast of India; Madras, Vizagapatam, and the Ganges estuary on the east coast; Chekiang Coast in China; north-eastern coast of Australia.

***Eirene hexanemalis* (Goette)**

- 1886. *Irenopsis hexanemalis*, Goette, p. 832.
- 1905. *Irenopsis hexanemalis*, Browne, p. 142, pl. 1; fig. 4; pl. 3, figs. 5-8.
- 1911. *Irenopsis hexanemalis*, Vanhöffen, p. 229, text-fig. 19.
- 1932. *Irenopsis hexanemalis*, Menon, p. 19.
- 1936. *Eirene hexanemalis*, Kramp, p. 248 (all previous literature).
- 1951. *Eirene hexanemalis*, Nair, p. 63.
- 1953. *Eirene hexanemalis* Kramp, p. 281, fig. 5.

Stat. 524. 12°29 $\frac{3}{4}$ 'N. 98°12'E. Mergui Archipelago. 13.III.1913. Surface. 1 specimen.

Stat. 563. 11°58'15"N. 98°21'10"E. Mergui Archipelago. 10-11.XI. 1913. Surface. 1 specimen.

Stat. 606. 11°24'10"N. 98°27'50"E. Mergui Archipelago. 31.I.1914. Surface. 2 specimens.

Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars. 26-27. XI.1921. 18 specimens.

Stat. 614. Same locality. February 1922. Surface. 22 specimens.

The variation of this well-known species was dealt with by me (Kramp 1953). I found that among numerous specimens from north-eastern Australia 83 per cent had 6 radial canals, but the number varied from 4 to 8; newly liberated specimens have only four radial canals. In the present collection I found the following variation, independent of the size of the specimens which varied between 3 and 10 mm in diameter:

Number of radial canals	.	.	.	5	6	7
Number of specimens	.	.	.	5	31	3

Thus 79.5 per cent have six radial canals.

Distribution.—Widely distributed in the Indian Ocean from the east coast of Africa eastwards and in the tropical parts of the western Pacific. In Indian waters it is recorded from the Trivandrum Coast (Nair), Ceylon (Browne), Madras (Menon), and the Nicobar Islands (Vanhöffen). Now it has been found again at the Nicobars and also in the Mergui Archipelago.

***Helgicirrha malayensis* (Stiasny)**

1928. *Eirene malayensis*, Stiasny, p. 210, fig. 1.

1932. *Eirene malayensis*, Menon, p. 20, pl. 3, fig. 23.

1932. *Eirene madrasensis*, Menon, p. 20, pl. 3, fig. 24.

1936. *Helgicirrha malayensis*, Kramp, pp. 255, 257.

1936. *Helgicirrha madrasensis*, Kramp, p. 256.

1951. *Helgicirrha malayensis*, Nair, p. 64.

1951. *Helgicirrha madrasensis*, Nair, p. 65.

1953. *Helgicirrha malayensis*, Kramp, p. 286.

Stat. 571. Jack Island, Mergui Archipelago. 29.XI—10.XII.1913. Numerous specimens.

Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars. February 1922. Surface. 2 specimens.

In my paper on the medusae of the Great Barrier Reef, Australia (Kramp, 1953) I expressed the opinion that *H. madrasensis* (Menon) was identical with *H. malayensis* (Stiasny). The present specimens confirm that supposition. Menon found a distinguishing feature in the presence of lateral cirri on young marginal bulbs as well as on the bulbs of fully developed tentacles in *madrasensis*, whereas in *malayensis* the rudimentary bulbs do not carry any cirri. The cirri are, however,

readily lost in preserved specimens ; in the present specimens only some few cirri are retained, but in some of the Australian specimens of *malayensis*, which were in a particularly good state of preservation, I found cirri also on the young bulbs. In *H. malayensis* the tentacle bulbs are provided with a short, but distinct abaxial "spur" grasping around the umbrella margin ; on a previous occasion (Kramp 1936, p. 257) I called attention to the probability that Menon, as well as Stiasny, had mistaken these abaxial processes for excretory papillae, which were said to be "prominent" in *malayensis* but absent in *madrasensis*. As a matter of fact the excretory papillae, which always are adaxial in position are small and inconspicuous in *H. malayensis*.

As far as the number of marginal organs are concerned the specimens from the Mergui Archipelago fall within the same limits of variation as the Australian specimens examined by me. It is characteristic of *H. malayensis* that the succession of development of the tentacles proceeds very irregularly, so that the relative numbers of fully developed and young tentacles and rudimentary bulbs are subject to considerable variation. I called attention to this fact in 1953 (p. 287), and the following countings of tentacles and bulbs in a number of specimens picked out at random from the great quantity taken at Stat. 571 likewise show a considerable variation in this respect :

Diam. mm.	Tentacles			total number
	large	small	rudimentary	
11	62	48	18	128
12	36	56	24	116
12	36	64	24	124
12	72	44	20	136
13	36	32	16	84
13	60	68	0	128
13	66	52	40	158
14	36	52	42	120
14	32	54	40	126
14	60	52	24	136
15	32	40	28	100
15	36	36	32	104
16	60	40	28	128
16	56	40	48	144

Average number of tentacles+bulbs 124.

As a rule there is one statocyst in each space between the marginal tentacles and bulbs, but also in this respect irregularities are sometimes observed.

Distribution.—Java Sea (Stiasny) ; Trivandrum Coast (Nair) ; Madras (Menon) ; N.E. Australia (Kramp). Now also found in the Mergui Archipelago and at the Nicobars.

***Eutima orientalis* (Browne)**

- 1905. *Octorchis orientalis*, Browne, p. 139, pl. 3, fig. 4.
- 1910. *Eutima orientalis*, Mayer, p. 299.
- 1912. *Eutima mira*, Vanhöffen, 1912 b, p. 23 (in part).
- 1932. *Eutima mira*, Menon, p. 18.
- 1951. *Eutima mira*, Nair, p. 63.

Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars. February 1922. Surface. 3 specimens.

Vizagapatam Channel. V-VI.1926. Rao and Varugis leg. 1 specimen.

The specimens are 8-9 mm in diameter, the gastric peduncle 7-14 mm long. The four gonads on the peduncle are well developed, extending almost throughout the length of the peduncle, exactly as in Browne's figure. The gonads of the subumbrella are thin and juvenal, but distinct, situated along the middle one-third of the subumbrellar parts of the radial canals. The four tentacle bulbs are slightly laterally compressed, but they do not grasp around the margin of the umbrella, as they do in *Eutima curva*. About 20 rudimentary bulbs in each quadrant. No adaxial papillae. The specimens agree perfectly with the description given by Browne, and since I have seen the original specimens in the British Museum I can state that the description is absolutely reliable.

Menon found this species near Madras, but he refers it to *Eutima mira* McCrady, because Vanhöffen "has shown that *E. orientalis* is not different from *E. mira*" Nair (1951) who found the species off the Trivandrum Coast likewise follows Vanhöffen and mentions his specimens as *E. mira*. Vanhöffen, however, has shown nothing of the kind. In his usual superficial way and regardless of structural differences he has united all the species of *Eutima* with four tentacles (10 species), besides *levuka* which has eight, into one species under the name of *E. mira* (Vanhöffen, 1912) ; it is correct in some few instances, but quite irrelevant in others. I will not deny that, according to the descriptions of *E. mira* available up to now, this East-American species is rather like *E. orientalis* in the Indian waters, but I do not take their identity for granted because Vanhöffen says so, and not until we know more about the structural details of *E. mira*. In the paper quoted above (1912) Vanhöffen records "*E. mira*" from two new localities ; the specimen from Ceylon presumably belongs to *E. orientalis*, whereas the identity of the two small specimens from Amoy is less certain.

Distribution.—Indian coasts : Trivandrum, Ceylon, Madras, Vizagapatam ; Nicobar Islands.

***Eutima hartlaubi*, nom. nov.**

1909. *Octorchandra orientalis*, Hartlaub, p. 456, pl. 20, figs. 11-15.

1910. *Eutima campanulata*. (?), Mayer, p. 495.

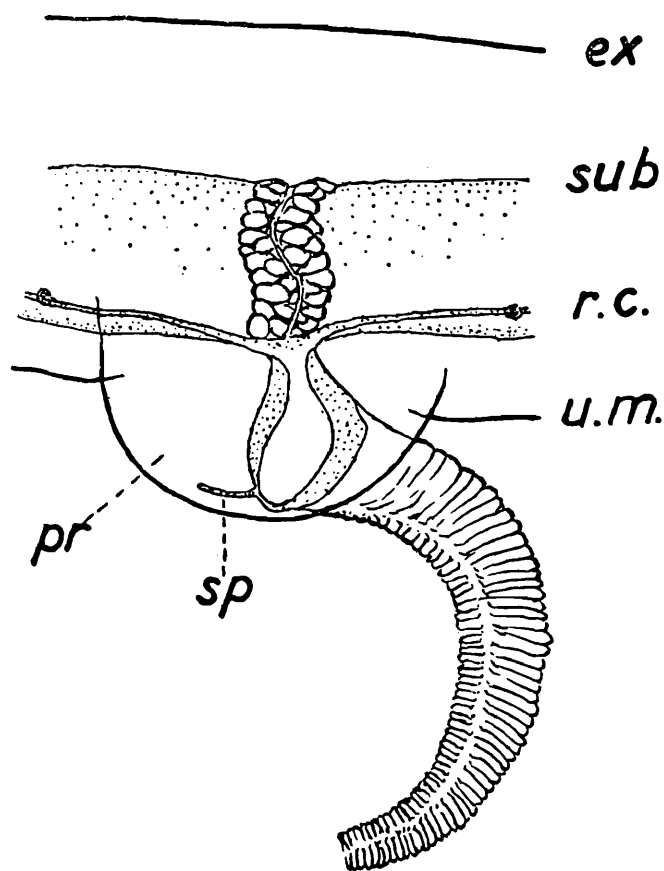
Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars. February 1922. Surface. 1 specimen.

This species undoubtedly belongs to *Eutima*, but since the specific name *orientalis* has been applied to another species of the same genus (Browne, 1905), the present form must be provided with a new name, and I propose to name it after Cl. Hartlaub, who gave the first description of it (1909).

The genus *Eutima* comprises several species ; not all of them are equally well defined, and a revision is desirable. It is not sufficient, however, to characterize the species merely by numerical features ; structural details must also be taken into consideration, and *E. hartlaubi* presents certain morphological structures which have not been observed in other species of the genus. It seems to me, therefore, that we must retain it as a distinct species, at least provisionally.

"*Octorchandra orientalis*" was well described and figured by Hartlaub after two specimens from Djibuti on the east coast of Africa, and it has not been observed again until now. The largest of the two specimens from Djibuti was about 15 mm in diameter, the peduncle about as long as the radius of the bell, tapering in thickness from the base towards the stomach, which is small, with four short lips. The four radial canals are somewhat dilatated towards the umbrella margin. There are four gonads on the subumbrella, situated along the radial canals almost from the base of the peduncle to the ring-canal, and four tiny, oval gonads in the middle part of the peduncle. There are 13 fully developed tentacles and 2 young ones ; the tentacles are strong, densely transversely wrinkled and, as emphasized by the author, without swollen basal bulbs. The marginal warts are few in number and very small, developed only on the exumbrellar side of the ring-canal (in contradistinction to *E. gegenbauri*, in which the warts are developed on both sides of the ring-canal). Cirri were not seen in the large specimen, but in the smaller one some few cirri were present on the lateral sides of some of the marginal warts. A very characteristic feature in the medusa from Djibuti is a large, almost spherical, gelatinous protuberance vaulting from the umbrella margin over the base of each tentacle (see Hartlaub Pl. 20, fig. 12). These protuberances are also present in the specimen from the Nicobars, and I have not seen them in any other species of *Eutima*.

In general appearance the present specimen is very like that described and figured by Hartlaub, but it is smaller, only 8 mm in diameter and 2.5 mm in height, the gelatinous substance is fairly thick, evenly vaulted, the margin somewhat inward bent. The peduncle is small, 2 mm long and 2 mm wide at its base, conical, the stomach very small, mouth with four very short, simple lips. No gonads are developed on the peduncle; this may be due to the specimen being in a younger stage of development than the type (similar delay in the development of one group of the gonads is also known in other species of *Eutima*). The gonads on the subumbrellar parts of the radial canals occupy the distal two-thirds of the canals, touching the ring-canal; one of them is well developed, somewhat sinuous, with numerous large eggs (text-fig. 4) the three other gonads are of the same length but thin and immature. In one of the quadrants the umbrella margin is mutilated; the three others contain the following number of tentacles and minute marginal warts: I: 2 tentacles, 3+3+6 warts; II: 3 tentacles (one of them very small), 2+2+1+3 warts; III: 3 tentacles, 4+1+2+2 warts. With addition of the four perradial tentacles the total number of tentacles thus has been about 14. Each of the marginal warts is provided with one or two small lateral cirri, whereas no cirri are seen on the tentacle bulbs. There are two statocysts in each quadrant. The tentacles are



TEXT-FIG. 4.—*Eutima hartlaubi* Kramp, nom. nov. Base of tentacle.

ex., exumbrella; pr., gelatinous protuberance; r. c., ring canal; sp., abaxial spur; sub., subumbrella; u.m., umbrella margin.

about as long as the radius of the umbrella; they are fairly thick, evenly tapering in thickness outwards, with densely set transverse wrinkles which are interrupted on the abaxial side by a narrow line throughout

the length of the tentacle (text-fig 4). The tentacles have no swollen basal bulbs ; the base of each tentacle is adnate to the lower surface of a vaulted gelatinous protuberance of the umbrella margin (fig. 4). A very narrow spur-like processus issues from the abaxial side of the tentacle-base ; this tiny "spur" is purely ectodermal, embedded in a shallow, narrow groove in the gelatinous protuberance. This spur-like structure is not mentioned by Hartlaub in his description of the medusa from Djibuti, but it is so tiny that it may have been overlooked. Apart from this point the present specimen agrees so well with Hartlaub's specimens in all essential features that I do not hesitate to refer it to the same species, which seems to me to present sufficiently distinguishing structures as to allow us to regard it as a valid species, *Eutima hartlaubi*.

Distribution.—Djibuti in Gulf of Aden ; Nicobar Islands.

Aequorea conica Browne

1905. *Aequorea conica*, Browne, p. 145, pl. 1, fig. 2; pl. 2, figs. 16, 17, 18.
1928. *Aequorea conica*, Stiasny, p. 213.
1951. *Aequorea conica*, Nair, p. 68.
1953. *Aequorea conica*, Kramp, p. 289.

Stat. 563. 11°58'15"N. 98°21'10"E. Mergui Archipelago. 10-11. XI. 1913. Surface. 1 specimen.

The specimen is 4 mm. wide and 1.2 mm high, jelly fairly thick in the central part, with flattened top ; the subumbrellar side of the umbrella is convex. Stomach 1.2 mm. wide, with 16 pointed, slightly crenulated lips. 8 radial canals, with thick, mature, female gonads in their proximal one-third. The dorsal wall of the stomach has no radiating grooves. There are 19 fully developed tentacles up to twice as long as the radius of the umbrella, and 4 young tentacles, the tentacle bulbs pear-shaped with a faintly heart-shaped base ; no excretory papillae. Between successive tentacles usually one, but sometimes two or three very small rudimentary bulbs and one or two small statocysts.

Apart from the lower shape of the umbrella this specimen agrees well with the description of *A. conica* as given by Browne (1905). The original specimens had 16 radial canals ; in the present specimen only 8 canals are developed ; in a small specimen from the Great Barrier Reef, Australia (Kramp, 1953, p. 289) with 15 radial canals gonads were only developed on 7 of the canals, whereas the remaining eight canals were thin and destitute of gonads.

Distribution.—Ceylon (Browne) ; Trivandrum Coast (Nair) ; Singapore and Java Sea (Stiasny) ; north-eastern Australia (Kramp) ; now also taken in the Mergui Archipelago.

***Aequorea pensilis* (Haeckel)**

1879. *Mesonema pensile*, Haeckel, p. 226.
 1904. *Mesonema pensile*, Browne, p. 733, pl. 55, fig. 4; pl. 57, figs. 2-9.
 1905. *Mesonema pensile*, Browne, p. 147, pl. II, figs. 11-15.
 1910. *Aequorea pensilis*, Mayer, p. 333.
 1916a. *Mesonema pensile*, Browne, p. 188.
 1932. *Aequorea pensile*, Menon, p. 24.
 1951. *Aequorea pensile*, Nair, p. 67.
 1953. *Aequorea pensilis*, Kramp, p. 295.

Stat. 604. 11°17'20"N. 98°29'40"E. Mergui Archipelago. 28-30. III. 1914. 1 specimen.

Off Puri, Orissa Coast. 4-4½ fms. 24-29. III. 1916. 1 specimen. Sandheads, mouth of River Hoogly, Ganges estuary. 4th November 1922. R. Smyth leg. Fragments.

Vizagapatam. In small creeks at low water near ferry. May-June 1926. Rao and Varugis leg. 1 specimen.

Bay of Bengal, 17°34'N. 89°59½'E. (Date not stated). 2 fragmentary specimens.

The relation between *A. pensilis* and *macrodactyla* has recently been dealt with by me (Kramp, 1953). Most of the present specimens are small, 20-25 mm. in diameter and more or less badly preserved. The specimen from Vizagapatam is 57 mm. wide, biconvex, the stomach 35 mm. It has about 120 or 125 radial canals, about five times as many radial canals than tentacles; 3-7 marginal warts between successive tentacles. The tentacle bulbs are of the pensilis-type, with long lateral extensions and no abaxial keel.

Distribution.—Widely distributed in the tropical parts of the Indian and Pacific Oceans. Records from the Atlantic are doubtful. Records from Indian waters: Maldiv Islands (Browne, 1904), Ceylon (Browne, 1905), Madras (Menon, 1932), Trivandrum Coast (Nair, 1951). Now also found in three localities further north on the east coast of India, in the central part of the Bay of Bengal, and in the Mergui Archipelago.

***Aequorea macrodactyla* (Brandt)**

1838. *Mesonema macrodactylum*, Brandt, p. 359, pl. 4.
 1904. *Aequorea maldivensis*, Browne, p. 732, pl. 56, figs. 4-12.
 1910. *Aequorea macrodactyla*, Mayer, p. 333.
 1916a. *Aequorea macrodactyla*, Browne, p. 189.
 1932. *Aequorea macrodactyla*, Menon, p. 23.
 1953. *Aequorea macrodactyla*, Kramp, p. 294.

Stat. 580. Celerity Passage. 1 specimen.

Stat. 602. 11°27'40"N. 98°36'15"E. Mergui Archipelago. 17-18. III. 1914. 1 specimen.

Stat. 632. Off Muz, Car Nicobar, 23rd December 1922. Surface. 23 specimens.

In all these specimens the tentacle bulbs are provided with the abaxial keel and clasp characteristic of *A. macrodactyla*. The specimens have the following dimensions:

Stat. 580. Diameter about 60 mm. (somewhat crumpled), stomach about 30 mm., about 80 radial canals, number of tentacles uncertain.

Stat. 602. Diameter 9 mm., badly preserved, number of radial canals uncertain, about 20 tentacles.

Stat. 632. 23 specimens, diameter 7-28 mm.

Diam. of umbrella, mm	Diam. of stomach, mm	Number of radial canals	Number of tentacles
7	3.5	31	13
8	4	c. 26	11
8	4	42	c. 15
9	4	c. 24	c. 12
9	4.5	c. 24	c. 10
9	4.5	c. 36	c. 12
10	5	c. 40	18
11	5	27	15
11	6	c. 34	c. 18
12	8	40	14
13	6	30	17
13	7	34	17
13	6	c. 34	c. 13
13	7	34	17
14	6	c. 35	17
14	6	34	14
16	8	31	c. 15
17	11	30	16
18	11	35	c. 20
19	9	38	c. 23
21	12	40	20
23	12	c. 42	c. 22
28	12	c. 23	c. 21

The number of tentacles and radial canals are variable as in all other localities within the areas of distribution of this species. In the present specimens there are, on an average, about half as many tentacles as radial canals.

Distribution.—Widely distributed in the warm parts of the Indian and Pacific Oceans from East-Africa to America; it also occurs in the Atlantic, mainly in the southern parts. Indian records: Maldivé Islands (Browne 1904), Madras (Menon 1932). Now also found in the Mergui Archipelago and at Car Nicobar.

***Zygocanna buitendijki* Stiasny**

1928. *Zygocanna buitendijki*, Stiasny, p. 218, text-figs. 5a-e, 6, 7.

1932. *Zygocanna buitendijki*, Menon, p. 25, pl. 3, figs. 34, 35.

Stat. 597. 11°09'05"N. 98°55'07"E. Mergui Archipelago. 11th March 1914. Surface. 1 specimen.

The specimen is small, but typical in structure; 11 mm. in diameter (the margin somewhat inward bent); stomach 6 mm. wide. There are 12 primary radial canals issuing from the periphery of the stomach, dividing so that the number of terminal branches is 75. The number of tentacles has apparently been about 16, but some of them are lost.

Stiasny's original specimens were up to 33 mm. wide, but one of the specimens recorded by Menon was more than 100 mm. in diameter.

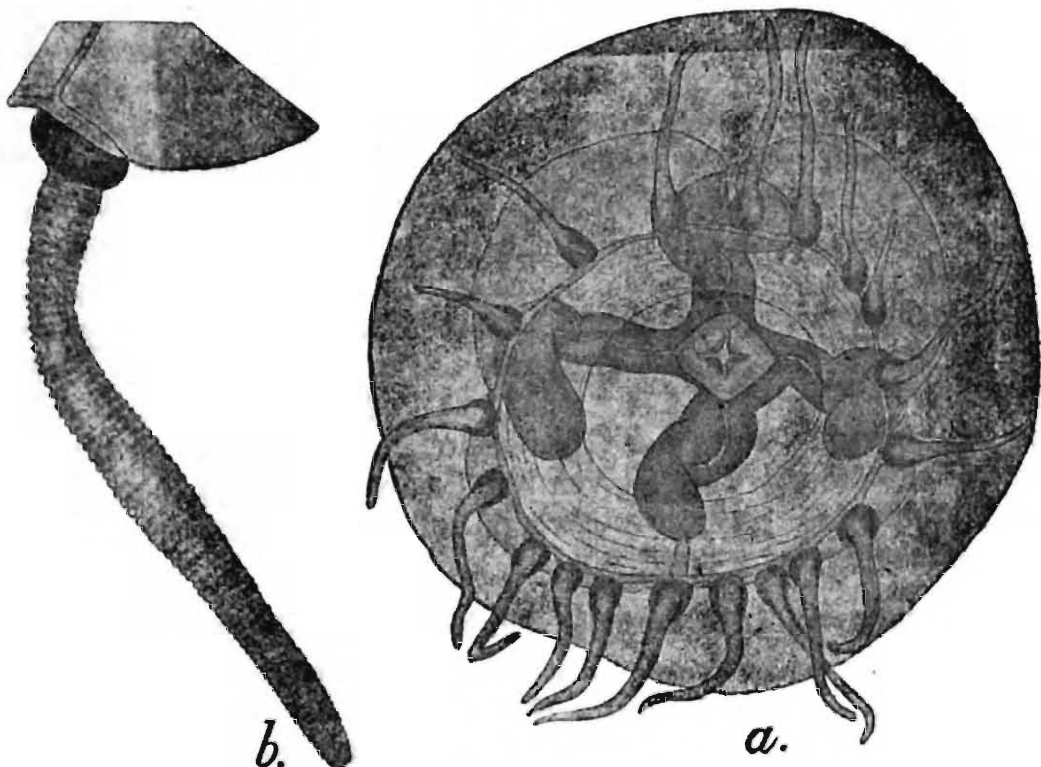
Distribution.—Java Sea (Stiasny); Madras (Menon); Mergui Archipelago. An undetermined species of *Zygocanna* is recorded from the Trivandrum Coast by Menon (1945, p. 41).

LIMNOMEDUSAE***Moerisia gangetica*, sp. nov.**

1908. ? *Moerisia lyonsi*, Boulenger, p. 357, pl. 22-23.

Shambazar Khal, Dakhnidar, near Calcutta, low tide. 13th May 1926. 1 specimen.

Description.—(text-fig. 5a, b): Umbrella 3 mm. in diameter, 2 mm. high, gelatinous substance very thick, almost spherical. Manubrium very small, quadrangular, with a simple cross-shaped mouth-opening without lips. Four radial canals and ring-canal narrow. There is



TEXT-FIG. 5.—*Moerisia gangetica*, sp. nov.
a. Oral view; b. Tentacle, lateral view.

one cross-shaped gonad, completely encircling the manubrium, with prolongations out along the four radial canals almost to the ring-canal. In the proximal part of each radial canal the gonad is interrupted in a narrow median line on the subumbrellar side, but in the distal part the gonad completely encircles the radial canal and the distal portion of the gonad hangs freely into the bell cavity as a broadly rounded sack. In the present specimen there are 19 marginal tentacles, all of about the same size, fairly short in their contracted state. Each tentacle has a short, almost semiglobular basal bulb; on the abaxial side of the bulb is a small reddish ocellus. The tentacles are hollow; their nematocysts are arranged in numerous complete rings which in the contracted tentacles are closely set, but very distinct. Velum broad. Apart from the ocelli the preserved medusa is colourless.

It is mainly for zoogeographical reasons that I describe this little medusa as a new species. If in future more specimens are found in the same or neighbouring localities, it may possibly prove to be identical with *Moerisia lyonsi* which has only been found in Lake Qurun in Egypt. The majority of the numerous specimens of *M. lyonsi* examined by Boulenger have only four marginal tentacles, but occasionally as many as 22 may occur. Apparently the narrow median lines dividing the proximal parts of the gonadal lobes in *M. gangetica* into two lateral halves are not present in *M. lyonsi*. Moreover, in *M. gangetica* the lobes of the gonads are much longer, and the sack-like, pendent distal prolongations seem to be far more strongly developed than in *M. lyonsi*. Thus certain morphological differences really seem to exist between the two species.

There is also the possibility that the specimen from the Ganges estuary may belong to *Moerisia pallasii* Derzhavin, which occurs in the Caspian Sea. A modern description of this species is needed. According to the original description and figures of "*Caspionema*" *pallasii* given by Derzhavin (1912, p. 390, figs. 1-5) it has up to 32 tentacles, which are of very unequal length, and the radial lobes of its gonad are much shorter than in *M. gangetica* and not pendent. Remarks on the morphology of *M. pallasii* are given by Valkanov (1938), but his paper is written in the Bulgarian language; according to one of his figures (fig. 3a) the lobes of the gonad reach only about half-way down the radial canals, whereas in *M. gangetica* they reach almost to the ring-canal. The specimens from Cete in France, recorded by Hartlaub (1913, pp. 238, 247, 248) as *Moerisia pallasii*, belong to *Odessia maeotica* (Ostroumoff.). A useful preliminary revision of the Moerisiidae is given by Picard (1951); I look forward to the forthcoming complete revision of this interesting family of Limnomedusae by Dr. Picard.

***Ostroumovia inkermanica* (Paltschikowa-Ostroumova)**

- 1925. *Moerisia inkermanica*, Paltschikowa-Ostroumova, p. 273, figs. 1-3.
- 1928. *Ostroumovia inkermanica*, Hadzi, p. 39.
- 1938. *Ostroumovia inkermanica*, Valkanov, p. 309, figs.
- 1938. *Ostroumovia inkermanica*, Kramp, pp. 45-60, pl. figs. 1-6; text figs. 1-5.
- 1951. *Ostroumovia inkermanica*, Picard, p. 7.

Vizagapatam Channel. May-June 1926. Rao and Varugis leg. 1. specimen.

It was this interesting brackish-water medusa from the Black Sea which induced me to erect the *Limnomedusae* as a new suborder of the *Leptolina*, first in a preliminary account in the *Zoologischer Anzeiger*, vol. 122, 1938, and then in the paper quoted above, in which I gave a thorough description of the medusa. Its systematic position has been the subject of much discussion between professor Valkanov in Bulgaria and me, and Valkanov's latest contribution (1954), which has recently come into my hands, is not suitable for an elucidation of the gasteion.

The present specimen from Vizagapatam agrees in every respect with the Bulgarian specimens previously examined by me. It is a comparatively large specimen, 8 mm wide and 6 mm high, with a fairly thick jelly. The stomach is prismatic, half as long as the height of the umbrella cavity. The mouth-rim is provided with small, wart-like protuberances studded with nematocysts. The gonads are male, wavy, situated along the distal three-fourth of the radial canals, their distal portions sack-like, pendent; there are no gonads in the walls of the stomach. There are about 32 long tentacles with numerous, distinct rings of nematocysts completely encircling the tentacles; the largest tentacles issue at some distance above the umbrella margin.

When I observed the nematocysts in the mouth-rim in this specimen I re-examined the specimens from the Bulgarian swamps and found, in contradiction to my previous statement (1938 p. 47), that also in these medusae the mouth-rim contains numerous nematocysts, though they are not collected in wart-like protuberances as in the present specimen. This may possibly be due to the Indian specimen being in a far advanced stage of development, which is also evident from the fact that its gonads have lost every connection with the walls of the stomach.

Distribution.—From a zoogeographical point of view it is very interesting that this species has now been found in a locality, presumably with brackish water, on the east coast of India. It was originally described from the Bay of Sevastopol, later found in great abundance in the brackish-water swamps on the Bulgarian coast of the Black Sea.

***Scolionema suvaensis* (Agassiz & Mayer)**

- 1899. *Gonionemus suvaensis*, Agassiz & Mayer, p. 164, pl. 5, figs. 14-16.
- 1904. *Gonionemus pelagicus*, Bigelow, p. 256, pl. 4, figs. 12-14.
- 1905. *Gonionemus hornelli*, Browne, p. 149, pl. 1, fig. 6; pl. 2, fig. 4.
- 1910. *Scolionema gemmifera*, Kishinouye, p. 31, pl. 5, figs. 32, 33.
- 1932. *Gonionemus suvaensis*, Menon, p. 26, pl. 2, figs. 20, 21.
- 1951. *Gonionemus suvaensis*, Nair, p. 68.
- 1951. *Scolionema suvaensis*, Picard, p. 44.

Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars. February 1922. Surface. 1 specimen.

The specimen is very similar to that described from Gulf of Manaar by Browne (1905) as *Gonionemus hornelli*, a small medusa only 6 mm. wide; the present specimen is in a still younger stage being only 2 mm. in diameter.

The synonymy of this species is finally stated by several authors. Picard (1951) regards it as generically distinct from *Gonionemus* and refers it to the genus *Scolionema* Kishinouye, and I think he is right in this respect.

Distribution.—Japan ; Low Archipelago east of New Guinea ; Fiji Islands ; Bermuda in the Atlantic ; Villefranche on the Mediterranean coast of France. Indian records : Maldiv Islands (Bigelow), Trivandrum Coast (Nair), Gulf of Manaar, Ceylon (Browne), Madras (Menon) (see the map in Picard 1951). Now also found at the Nicobar Islands.

Olindias singularis Browne

1904. *Olindias singularis*, Browne, p. 737, pl. 56, fig. 2; pl. 57, fig. 1.
1909. *Olindias singularis*, Bigelow, p. 109, pl. 4, fig. 1; pl. 31, figs. 1-10 ; pl. 32, fig. 8.
1916. *Olindias singularis*, Browne, p. 192.
1932. *Olindias singularis*, Menon, p. 27.
1945. *Olindias singularis*, Menon, p. 41.
1951. *Olindias singularis*, Nair, p. 69.
1953. *Olindias singularis*, Kramp, p. 298.

Karachi, near the mouth of River Indus. February 1917. C. R. Stevens legit. 1 very large specimen.

Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars. 26-27th. October 1921, 1 specimen ; February 1922, 8 specimens ; 16-17th November 1922, 1 specimen.

The specimen from Karachi is very large, somewhat mutilated, about 40 mm in diameter. The specimens from the Nicobars are fairly small, up to 15 mm wide, some of them quite juvenile. One very young stage is of particular interest ; it is only 2 mm wide and high, dome-shaped with almost perpendicular lateral sides. The base of the stomach is as broad as the umbrella cavity, and its entire upper surface is attached to the subumbrella ; the stomach is broadly conical with a very short, square mouth-tube, oral lips are not yet indicated. The radial canals and ring-canal are broad, gonads not developed ; one very short, broadly triangular centripetal canal in each interradius. There are four very large perradial primary tentacles, more than one and a half times as long as the height of the umbrella, issuing at some distance from the bell-margin, with closely set transversal clasps of nematocysts, adhesive pads just indicated. Moreover, in each quadrant one very small interradial tentacle, two tiny adradial rudiments and two thick and broad marginal "clubs" There is a single statocyst at the base of each of the perradial and interradial tentacles. Velum broad. This young specimen is very similar to the young stage of *Olindias tenuis* figured by Mayer (1910, pl. 47, fig. 9).

Distribution.—*Olindias singularis* is widely distributed in the tropical parts of the Indo-West-Pacific region. Indian records : Maldiv Islands (Bigelow), Trivandrum Coast (Menon 1945, Nair 1951), Madras (Menon 1932). Now also found at the Nicobar Islands and near Karachi in the Arabian Sea.

Proboscidactyla ornata (McCrary)

1857. *Willsia ornata*, McCrary, p. 47, pl. 9, figs. 9-11.
1904. *Proboscidactyla ornata*, Browne, p. 726.
1904. *Proboscidactyla gemmifera*, Browne, p. 727.
1904. *Proboscidactyla tropica*, Browne, p. 727.
1904. *Proboscidactyla varians*, Browne, p. 728, pl. 54, figs. 1, 2.
1905. *Proboscidactyla flavicirrata* var. *stolonifera*, Maas, p. 21, pl. 4, figs. 24-28.
1909. *Proboscidactyla ornata* var. *stolonifera*, Bigelow, p. 220, pl. 6, figs. 1, 2; pl. 41, figs. 1-7.
1932. *Proboscidactyla ornata*, Menon, p. 12, pl. 2, fig. 18.
1932. *Proboscidactyla conica*, Menon, p. 13, pl. 2, figs. 12, 13.
1951. *Proboscidactyla ornata*, Nair, p. 57.
1951. *Proboscidactyla mutabilis*, Nair, p. 57.

Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars. February 1922. 2 specimens.

The various species and varieties mentioned in the above list of synonyms are mainly separated from each other by the situation of their medusa buds, or by absence of medusa buds. While on the Danish Galathea expedition in 1951 I found, however, numerous specimens representing all possible combinations in one sample taken at the Philippine Islands. I can state, therefore, that the situation or absence of medusa buds present no specific characters, and none of the morphological characters indicated by various authors are reliable as distinguishing features; they are all due to individual variation or different stages of development.

The present specimens are 3 mm in diameter with 15—18 tentacles some few of which are smaller than the others; the gonads follow the proximal branching of the radial canals. The intertentacular nematocyst tracks are dissolved into small, round clusters forming meridional lines right up to the top of the umbrella. The specimens are very similar to *P. varians* Browne (from the Maldive Islands), but they have no medusa buds. *P. conica* Menon is remarkable by its high shape and comparatively large number of tentacles, but this can hardly be specific characters; I have seen specimens with very different forms of the umbrella from several localities. Nair (1951) is inclined to regard *P. conica* as an irregular form of the subantarctic species *P. mutabilis* Browne; it is true that I have previously been of the same opinion (Browne & Kramp, 1939), but since I have had the opportunity to study numerous specimens of *P. ornata*, partly in living condition, I have altogether left that supposition; *P. mutabilis* is a distinct species, and *P. conica* is a synonym of *P. ornata*.

Distribution.—*P. ornata* is widely distributed in the coastal areas of all the oceans. Indian records: Maldive Islands (Browne), Trivandrum Coast (Nair), Madras (Menon). Now also found at the Nicobar Islands.

TRACHYMEDUSAE

Halicreas minimum Fewkes

1882. *Halicreas minimum*, Fewkes, p. 306.

1902. *Halicreas papillosum*, Vanhöffen, p. 68, pl. 9, figs. 7, 8 ; pl. 11, fig. 30.

Stat. 670. 5°56'N. 76°22'E. West of Ceylon. 23.IV.1924. 200 fms. to surface. 1 specimen.

Distribution.—Widely distributed in the deep parts of all the oceans, except in the arctic seas and the Mediterranean.

Halitrephes maasi Bigelow

Stat. 670. 5°56'N. 76°22'E. 23.IV.1924. 200 fms. to surface. 2 specimens.

The specimens are in a very poor condition, no traces of stomach, radial canals and gonads are left. Some club-shaped statocysts are retained, showing that the specimens belong to the family Halicreidae ; their umbrellas are thin and disk-like, one of them is 28 mm in diameter with 36 tentacles, the other 33 mm with 45 tentacles. The sizes indicate that they belong to the genus *Halitrephes* of which probably only one species exists, *H. maasi* Bigelow (1909, p. 146, pl. 33, figs. 1—5, 7, 10 ; pl. 45, fig. 13).

Distribution.—Probably widely distributed in the deep parts of all the oceans.

Rhopalonema velatum Gegenbaur

Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars. 2-5. II.1922. 1 specimen.

Distribution.—Generally distributed and very common in the warm parts of all the oceans, including the Mediterranean.

Sminthea eurygaster Gegenbaur

1856. *Sminthea eurygaster*, Gegenbaur, p. 245, pl. 9, figs. 14, 15.

Stat. 670. 5°56'N. 76°22'E. West of Ceylon. 23.IV.1924. 200 fms. to surface. 1 specimen, 15 mm wide.

Distribution.—Mediterranean ; warm parts of the Atlantic Ocean. In the surroundings of the Amirante and Chagos Islands in the Indian Ocean.

Liriope tetraphylla (Chamisso & Eysenhardt)

1904. *Liriope indica*, Bigelow, p. 258. pl. 5, figs. 17, 18.

1916. *Liriope tetraphylla*, Browne, p. 198.

1932. *Liriope tetraphylla*, Menon, p. 28.

1935. *Liriope tetraphylla*, Lele & Gae, p. 97.

1945. *Liriope tetraphylla*, Menon, p. 41.

1951. *Liriope tetraphylla*, Nair, p. 70.

1952. *Liriope tetraphylla*, Bal & Pradhan, p. 76.

Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars. 2-5. II. 1922. 3 specimens.

Stat. 524. $12^{\circ}29\frac{3}{4}'N$. $98^{\circ}12'E$. Mergui Archipelago. 13.III.1913. Surface. 1 specimen.

Stat. 563. $11^{\circ}58'15"N$. $98^{\circ}21'10"E$. Mergui Archipelago. 10-11.XI. 1913. Surface. 9 specimens.

Stat. 602. $11^{\circ}27'40"N$. $98^{\circ}36'15"E$. Mergui Archipelago. 17-18. III.1914. 18 specimens.

Stat. 604. $11^{\circ}17'20"N$. $98^{\circ}29'40"E$. Mergui Archipelago. 28-30. III. 1914. 3 specimens.

Stat. 606. $11^{\circ}24'10"N$. $98^{\circ}27'50"E$. Mergui Archipelago. 31.III-1.IV.1914. Surface. 14 specimens.

Off Puri, Orissa Coast. 24-29.III.1916. S. W Kemp legit. 17 specimens.

Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars. 26-27.X. 1921. 14 specimens.

Stat. 632. Off Muz, Car Nicobar. 23.XII.1922. Surface. 6 specimens.

Bottom of channel, Vizagapatam. May-June 1926. Rao and Varugis leg. 1 specimen.

Channel, Vizagapatam. May-June 1926. Rao and Varugis leg. 1 specimen.

In small creek at low water near ferry, Vizagapatam. May-June 1926. Rao and Varugis leg. 1 specimen.

Most of the specimens are small, less than 10 mm in diameter, only some few reach a size of 12-14 mm. The specimen from the last-mentioned locality, however, is 21 mm wide, its gastric peduncle 17 mm long, its gonads are mutilated.

Distribution.—*L. tetraphylla*, the only species of the genus, is generally distributed in the warm parts of all the oceans. Previous Indian records : Maldive Islands (Bigelow), Bombay (Lele & Gae, Bal & Pradhan), Trivandrum Coast (Menon, Nair), Madras (Menon).

NARCOMEDUSAE

***Solmundella bitentaculata* (Quoy & Gaimard)**

1916. *Solmundella bitentaculata*, Browne, 1916 b, p. 152.

1932. *Solmundella bitentaculata*, Menon, p. 28.

1935. *Solmundella bitentaculata*, Lele & Gae, p. 99.

1951. *Solmundella bitentaculata*, Nair, p. 70.

1945. *Solmundella bitentaculata*, Menon, p. 41.

1952. *Solmundella bitentaculata*, Bal & Pradhan, p. 76.

Stat. 606. $11^{\circ}24'10"N$. $98^{\circ}27'50"E$. Mergui Archipelago 31.III-1.IV.1914. Surface. 2 specimens.

Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars. February 1922. 29 specimens.

Off Puri, Orissa Coast. 24-29.III.1916. S. W Kemp legit. 110 specimens.

Distribution.—Widely distributed in all the oceans, particularly common in the southern hemisphere. Previous Indian records: Kathiawar (Browne), Bombay (Lele & Gae, Bal & Pradhan), Trivandrum Coast (Menon, Nair), Madras (Menon).

Aegina citrea Eschscholtz

Stat. 614. Octavia Bay, Nancowry Harbour, the Nicobars. February 1922. Surface. 1 specimen.

The specimen is only 4 mm in diameter and has four marginal lappets and tentacles.

Distribution.—*Aegina citrea* is widely distributed in the warm parts of all the oceans, where it may be met with at all depths; it also penetrates into colder areas, but there it occurs only in deep water. No previous records from Indian waters.

Cunina octonaria McCrady

1857. *Cunina octonaria*, McCrady, p. 109, pl. 12, figs. 4, 5.

1879. *Cunocantha octonaria*, Haeckel, p. 316.

1932. *Cunocantha octonaria*, Menon, p. 29.

1951. *Cunocantha octonaria*, Nair, p. 71.

1953. *Cunina octonaria*, Kramp, 1953, p. 304.

Stat. 606. 11°24'10"N. 98°27'50"E. Mergui Archipelago. 31.III-1.IV.1914. 4 specimens.

Distribution.—Widely distributed in the warm parts of all the oceans including the Mediterranean. Indian records: Trivandrum Coast (Nair), Madras (Menon). Now also found in the Mergui Archipelago.

Distribution of the species within the areas investigated

Species	East coast of India	Burma	Mergui Archipelago	Nicobar Islands	Other localities
Anthomedusae					
<i>Euphysora bigelowi</i>	..	..	..	X	..
<i>Cytaeis tetrastyla</i>	..	..	..	X	..
<i>Bougainvillia fulva</i>	X	..	X	..	X
<i>Merga violacea</i>	..	..	..	X	..
<i>Leuckartiara hoepflii</i>	..	..	..	X	..
Leptomedusae					
<i>Laodicea indica</i>	..	..	..	X	..
<i>Tiaropsidium roseum</i>	. .	..	..	X	..
<i>Blackfordia virginica</i>	. .	..	..	..	..
<i>Phialucium mbenga</i>	..	..	..	X	..
<i>Phialucium carolinae</i>	..	..	..	X	..

Distribution of the species within the areas investigated—*contd.*

Species	East coast of India	Burma	Mergui Archipelago	Nicobar Islands	Other localities
Leptomedusae					
<i>Octophialucium indicum</i>	..	X	X	..	..
<i>Octocannoides ocellata</i>	..	..	X	..	..
<i>Eirene tenuis</i>	..	..	..	X	..
<i>Eirene palkensis</i>	..	..	X	..	..
<i>Eirene ceylonensis</i>	X	X	X	X	..
<i>Eirene menoni</i>	X	..	..	..	..
<i>Eirene hexanemalis</i>	..	..	X	X	..
<i>Helgicirrha malayensis</i>	..	..	X	X	..
<i>Eutima orientalis</i>	X	..	..	X	..
<i>Eutima hartlaubi</i>	..	..	..	X	..
<i>Aequorea conica</i>	..	..	X	..	..
<i>Aequorea pensilis</i>	X	..	X	..	X
<i>Aequorea macrodactyla</i>	X	..	X	X	..
<i>Zygocanna buitendijki</i>	..	..	X	..	..
Limnomedusae					
<i>Moerisia gangetica</i>	X	..	..	..	..
<i>Ostroumovia inkermanica</i>	X	..	..	..	..
<i>Scolionema suvaensis</i>	..	..	..	X	..
<i>Olindias singularis</i>	..	..	..	X	X
<i>Proboscoidactyla ornata</i>	..	..	..	X	..
Trachymedusae					
<i>Halicreas minimum</i>	..	..	..	..	X
<i>Halitrephes maasi</i>	..	..	..	..	X
<i>Rhopalonema velatum</i>	..	..	..	X	..
<i>Sminthea eurygaster</i>	..	..	..	..	X
<i>Liriope tetraphylla</i>	X	..	X	X	..
Narcomedusae					
<i>Solmundella bitentaculata</i>	X	..	X	X	..
<i>Aegina citrea</i>	..	..	..	X	..
<i>Cunina octonaria</i>	..	..	X	..	..
Number of species	118	2	14	22	6

Additional Notes on SCYPHOMEDUSAE

Tamoya bursaria Haeckel

1880. *Tamoya bursaria*, Haeckel, p. 444.
1919. *Tamoya bursaria*, Stiasny, p. 38, figs. 6-11.
1931. *Tamoya alata*, Rao, p. 27.
1932. *Tamoya gargantua*, Bigelow, p. 151.

Puri Coast. June 1909. P. C. Singh legit. Fragments of one large specimen.

Stat. 524. $12^{\circ}29\frac{3}{4}'N$. $98^{\circ}12'E$. 13.III.1913. Surface. 1 specimen.

Stat. 597. $11^{\circ}09'05"N$. $98^{\circ}55'07"E$. 11.III.1914. Surface. 1 specimen.

Stat. 602. $11^{\circ}27'40"N$. $98^{\circ}36'15"E$. 17-18.III.1914. 3 specimens.

Stat. 604. $11^{\circ}17'20"N$. $98^{\circ}29'40"E$. 28-30.III.1914. 6 specimens.

The four last-mentioned localities are in the Mergui Archipelago, and the specimens from these localities are all young stages 4-11 mm high. In all these young specimens the exumbrella carries warts of nematocysts, more or less numerous. Mesenteries are not yet developed, and there are only about four velar canals in each quadrant. The scales above as well as below the sensory niches have an entire margin, which is characteristic of both species of *Tamoya* in contradistinction to *Carybdea*.

Distribution.—Widely distributed in the tropical parts of the Indian Ocean and western Pacific. It is recorded from several Indian localities by Rao (1931, p. 27) as *Tamoya alata* and *Tamoya* sp.

***Chrysaora quinquecirrha* (Desor)**

1862. *Dactylometra quinquecirrha*, L. Agassiz, pp. 124, 166.

1910. *Dactylometra quinquecirrha*, Mayer, p. 585, pl. 62, 63, 64, 64A.

1955. *Chrysaora quinquecirrha*, Kramp, p. 297.

Puri Coast. June 1909. 1 specimen, 70 mm. wide.

This species is recorded from the same locality by Rao (1931, p. 30) as *Chrysaora helvola*, and some specimens from the Bay of Bengal, identified as *C. melanaster* (Rao, 1931, p. 31) probably belong to the same species. Other Indian records: Madras (Menon, 1930, Gravely, 1941), Travancore (Nair, 1946), Karwar Coast (Patil, 1951), all as *Dactylometra quinquecirrha*; Trivandrum Coast (Nair, 1951) as *Chrysaora melanaster*.

As recently stated by me (Kramp, 1955) there is no reason why to keep *Dactylometra* and *Chrysaora* apart as two distinct genera.

***Cephea* sp.**

Stat. 632. Off Muz, Car Nicobar. 23.XII.1922. 1 specimen (juvenile).

Diameter 13 mm. the centre of the disk with about seven large flattened warts surrounded by several smaller ones. The canals as in *Cephea cephea*, 4-5 canal roots between successive rhopalar canals. Oral arms with numerous filaments, all very small. Eight marginal lappets per octant.

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SEXUAL DIMORPHISM IN THE CARP *BARBUS (PUNTIUS)* *CURMUCA* (HAMILTON)

By B. SUNDARA RAJ, M.A., Ph.D., F.A.Z., F.Z.S.I., F.N.I.

(Plate III)

A number of instances of sexual dimorphism among Indian carp are on record¹. A striking instance was observed by the writer in the hill carp *Barbus curmuca* (Hamilton), when making collections in the Periyar Lake on the Western Ghats in Travancore in 1936 and 1939.

Barbus curmuca occurs in Mysore and on the Western Ghats from Travancore to South Kanara. It is one of the large carps of the Periyar Lake and regularly breeds there. Several breeding males and females were available to me for examination.

Though Hamilton records a maximum size of 3 ft. for this species, Day considers that it attains "at least 4 ft. in length". Sexually mature specimens from the Periyar Lake ranged only up to 20 inches in length. The secondary sexual characters exhibited by this species are given below.

In the adult male (Plate III, fig. 1) there are usually three parallel rows of prominent pearl organs (horny tubercles) extending from about the tip of the snout along the upper jaw and face as far as the posterior margin of the eye. Mrs. J. G. Abraham of the Madras Fisheries Department, who has made a large collection at Periyar recently, found that pearl organs begin to appear as a single row when the males reach a length of 13 cm. Whilst most adult males have only 3 horizontal rows, the number may vary from 1 to 5 according to age. She also found some young females with rudiments of pearl organs as in males of the same size. In addition to pearl organs the anal fin in the male is short and rounded with the median rays somewhat elongated forming a bluntly pointed prominence in the middle of the free margin of the fin which when laid back hardly reaches the root of the caudal fin.

¹Hora, S. L. & Mukerji, D. D., *J. Asiat. Soc. Bengal* (New Series) 'XXVII, pp. 137-139, 2 figs. (1931) [in *Barbus chagunio* (Hamilton)]; Hora, S. L. & Mukerji, D. D., *Rec. Indian Mus.*, XXXVIII, p. 139 (1936) [in *Barbus spilopholus* McClelland]; Hora, S. L., *Rec. Indian Mus.*, XXXVIII, p. 141 (1936) [in *Barbus putitora* (Hamilton)]; Hora, S. L. & Misra, K. S., *Rec. Indian Mus.*, XXXVIII, pp. 341-342 (1936) [in *Labeo dero* (Hamilton)]; Misra, K. S., *Rec. Indian Mus.*, XL, p. 258, fig. 1 (1938) [in *Barbus (Puntius) melanampyx* (Day)]; Hora, S. L., *Rec. Indian Mus.*, XXXIX, pp. 22-24, figs. 8-9 (1939) [in *Barbus (Puntius) filamentosus* (C.V.)]; Hora, S. L. & Law, N. C., *Rec. Indian Mus.*, XLIII (2), p. 245, fig. 2 (1941) [in *Barbus (Puntius) filamentosus* (C.V.)].

In the adult females (Plate III, fig. 2) the pearl organs are absent. The anal fin is much longer than in the adult male, and has a characteristic shape. The anterior rays in adults are much prolonged and may reach as far as the middle of the caudal fin, when depressed. Mrs. Abraham found the anal fin shorter in young females up to a length of 20 cm., but the characteristic shape of the fin is noticeable even in the young.

Previous authors failed to recognise such marked differences as secondary sexual characters, apparently because their collections did not include mature specimens of both the sexes. Nevertheless, all the previous descriptions and illustrations confirm the existence of the secondary sexual characters described above.

Hamilton's original description¹ and his later detailed account² mention the tubercles on the head along with a "rather rounded" anal fin, and his figure illustrates both these male characters. McClelland³, according to Valenciennes⁴ only repeats Hamilton's description. Valenciennes described the species from Hamilton's account and figure, and mentioned the facial tubercles and the rounded anal fin of the male. Day's descriptions and figure are, however, interesting. His first description⁵ is unmistakably that of a mature female, as the facial tubercles are not mentioned and the anal fin is stated to be long, reaching the base of the caudal fin. In his later description⁶ the tubercles are mentioned as occurring in adults and the anal fin is not described. His figure, however, does not show the tubercles mentioned in his later descriptions but depicts the typically long pointed anal fin of the female. Evidently the figure illustrates Day's original description. Hora and Law⁷ figure a juvenile specimen. The tubercles on the head and the short anal fin indicate that the fish figured is a male.

¹ Buchanan, F. (later Hamilton), *A Journey from Madras through Mysore, Canara and Malabar* III, Chap. xviii, pp. 344-345, pl. xxx (1807).

² Hamilton, F., *Fishes of the Ganges*, pp. 294, 387 (1822).

³ McClelland, J., *Asiat. Research*, XIX, pp. 276, 353 (1839).

⁴ Valenciennes, M. A., *Hist. Nat. Poiss.* XVI, p. 317 (1842).

⁵ Day, F., *Proc., Zool. Soc. London*, p. 707 (1873).

⁶ Day, F., *Fishes of India*, p. 566, pl. cxli, fig. 1 (1878); *Fauna Brit. India. Fish*, I, p. 310 (1889).

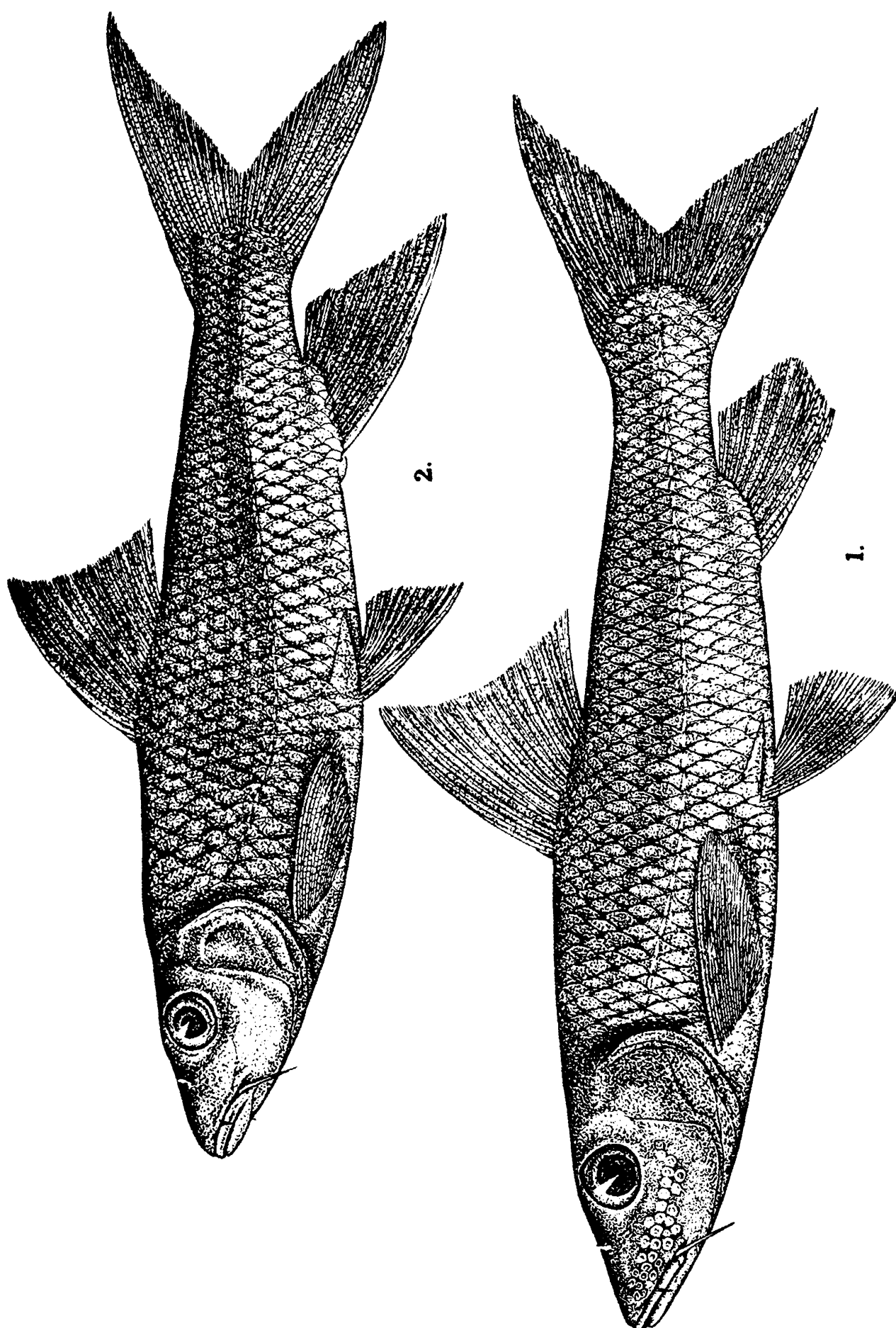
⁷ Hora, S. L. & Law, N. C., *Rec. Indian Mus.* XLIII, p. 245, pl. ix, fig. 1 (1941).

EXPLANATION OF PLATE III.

Sexual Dimorphism in *Barbus (Puntius) curmuca* (Hamilton)

1. Male

2. Female



Sexual dimorphism in the carp *Barbus (Puntius) curmuca* (Hamilton).

ANOTHER NEW SPECIES OF *NICHOLLSIA* (CRUSTACEA : ISOPODA : PHREATOICOIDEA)

By KRISHNA KANT TIWARI, *Zoological Survey of India, Calcutta*

A few months back my colleague, Shri A. G. K. Menon, collected several amphipods and a few isopods from an abandoned well at Monghyr in Bihar. The isopods, on examination, proved to belong to the subterranean phreatoicoid genus *Nichollsia* Chopra and Tiwari,¹ so far known by a single species, *N. kashiense* Chopra and Tiwari, from wells at Banaras and Lahagara in Uttar Pradesh. In general appearance and structure of mouth-parts, peraeopods and pleopods, the specimens from Monghyr resemble *N. kashiense*, but due to certain salient differences in the head and telson, I propose to accommodate these in a new species.

As a very complete description of the general body structure and the structure of appendages is already available for *N. kashiense*, I shall, in the following paragraphs, enumerate only such features in which the present species differs from the only other known species of this genus.

Order ISOPODA

Suborder PHREATOICOIDEA

Family NICHOLLSIDAE

*Nichollsia menoni*², sp. nov.

This species differs from *N. kashiense* in the following characters :

The angular projection of the fronto-lateral corner of the head is much shorter and less conspicuous (text-fig. 1b, c). The subocular incisure is represented by a small indentation. The suborbital notch is inconspicuous. The genal groove is present.

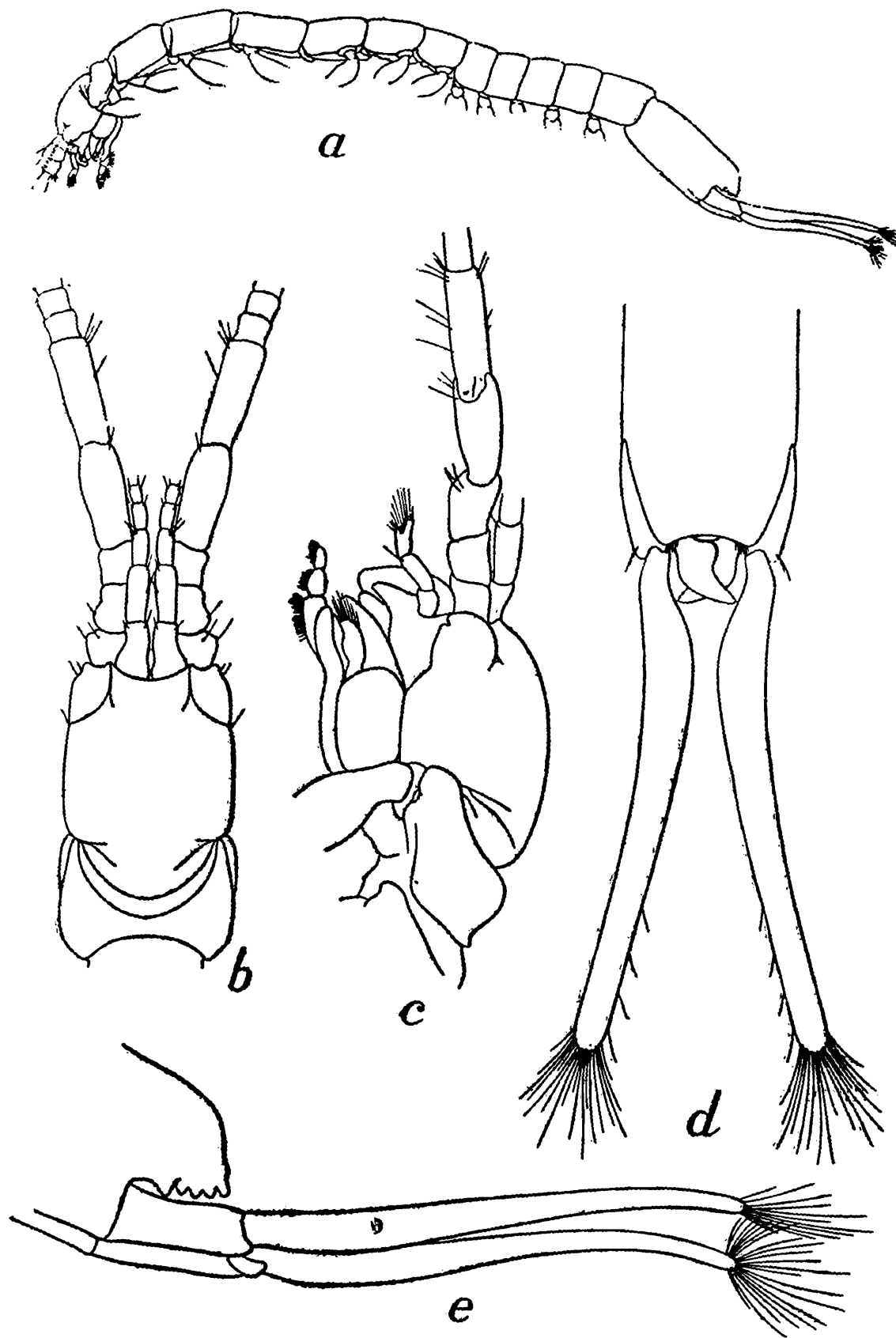
The postero-lateral edge of telson is convex and smooth in its upper half, but the lower part is crenulate (text-fig. 1e). In dorsal view the posterior margin of the telson, therefore, appears smooth and does not show bidentate angles (text-fig. 1d). The inner ramus of uropod is shorter than in *N. kashiense*, more stout with a broader basal region and more strongly curved apical half.

The filiform antennule consists of 14 joints, being a shade shorter than in *N. kashiense*. The antenna has a five-jointed peduncle and a flagellum consisting of 36 segments. In *N. kashiense* the antennal

¹ Chopra, B. N., & Tiwari, K. K., *Rec. Indian Mus.*, XLVII, pp. 277-290, pls. xvii-xx (1950).

² Named after Shri A. G. K. Menon, who collected the specimens.

flagellum is shorter, having only 30 joints. When stretched back, the antenna extends as far back as the posterior margin of the fourth pereon segment.



TEXT-FIG. 1.—*Nichollsia menoni*, sp. nov.

a. Entire animal (holotype), lateral view: $\times 5$; b. Head, dorsal view: $\times 17\frac{1}{2}$; c. Head, lateral view: $\times 17\frac{1}{2}$; d. Tailpiece, dorsal view: $\times 17\frac{1}{2}$; e. Tailpiece, lateral view: $\times 17\frac{1}{2}$.

The largest male is about 16 mm. long. The three females measure 12.6, 12.5 and 8.7 millimetres in length. The shortest specimen is a male measuring only 7.9 millimetres, in which the penes are absent, but the appendix masculina on the endopod of second pleopod is developed.

Type-specimens.—Holotype ♂, Regd. No. C3521/1, Z. S. I.

Paratypes 4♂, 3♀ Regd. No. C3522/1, Z. S. I.

Type locality.—Well in the Dak Bungalow, Monghyr (Bihar). Coll. A. G. K. Menon, dated 22-11-1955.

Remarks.—While describing *N. kashiense*, Chopra and Tiwari (*loc. cit.*) had hinted at the possibility of a rather wider distribution of *Nichollsia* in the Gangetic Plains. The occurrence of the present species from Monghyr in Bihar was thus not wholly unexpected.

So far no phreatoicoids have been recorded from surface waters in India, or any other part of the world excepting Australia, Tasmania, New Zealand and Cape Province of South Africa.

The Indian genus, which now contains two species, is subterranean and is so far known to occur in wells only.

It is interesting to observe that though not separated by a big geographical gap, the forms from U. P. and Bihar are different specifically. This is probably due to their specialised subterranean habitat which does not apparently permit free mixing of populations from the two regions.

ON A COLLECTION OF CHELONIANS AND SNAKES FROM CHOTA NAGPUR, BIHAR

By M. N. ACHARJI, *M.Sc., Assistant Zoologist, Zoological Survey of India,
Calcutta*

I. INTRODUCTION

In order to study the "ecological succession¹" of animals, in the proposed dam sites² in Chota Nagpur, Bihar, two parties were sent in April and November 1948, for the collection of zoological material. During their faunistic survey of the areas, where dams are to be constructed, they collected various types of animals³ and made notes on their ecological conditions, habits, habitats, etc.

In addition to this collection a small collection of Chelonians, comprising 14 specimens referable to three species was made from the River Ganges below Rajmahal, District Chota Nagpur, Bihar, in the early part of January 1954. The present scientific report is based on both the collections.

From zoogeographical point of view and taking into consideration the distribution of Indian reptiles, Smith⁴ has divided India, including Indo-Chinese subregions, Tenasserim and Siam into twelve well defined faunistic zones. Regarding the Chota Nagpur area he observed as follows :

"This includes Bihar south of the Gangetic Plain, the northern part of Orissa, and the eastern part of the Central Provinces. This area is mountainous, and except in the neighbourhood of Chaibasa, where industrial occupations have sprung up in the recent years, is heavily forested and sparsely populated. The average rainfall is between 50 to 70 inches in the year, being higher near the coast, lower inland. Its fauna is incompletely known, but is of interest in that it contains a Himalayan and Assamese element, although separated from the mountains of those parts by the Gangetic Plain. The highest peak in Chota Nagpur area is Parasnath Hill, an isolated mountain of 4,800 feet, altitude, in its north-eastern corner; the nearest point to it in the Himalayas is the Nepal foot-hills nearly 200 miles away."

Annandale⁵ in his admirable paper "The tortoises of Chota Nagpur" dealt mainly with two families Testudinidae (land forms) and Trionychidae (mud forms) and made no mention of the family Emydidae (fresh-water forms) which comprises almost the major portion of the Chelonian⁶ population of that area.

¹ Elton, Charles, *Animal Ecology*, p. 18 (1927).

² Some of the dams have now been completed in the Damodar Valley areas, popularly known as D.V.C.

³ Bhola Nath, *Rec. Ind. Mus.*, XLVIII, pp. 24-44 (1950).

⁴ Smith, M. A., *Fauna Brit. India* (Rept. & Amph.), I, pp. 18-21 (1931).

⁵ Annandale, N., *Rec. Ind. Mus.*, IX, pp. 63-78 (1913).

⁶ The word Chelonian has been used in a general sense.

Blanford,¹ in his account of "The distribution of Vertebrate animals in India, Ceylon and Burma", came to the conclusion that the fauna of the Parasnath Hills contains a large number of animals found in the Himalayas and its neighbouring areas and as such is of great interest from zoogeographical point of view.

In recent years, the enunciation of the Satpura hypothesis by Hora² and its amplification by a number of his students^{3, 4, 5} have added much greater importance to the Chota Nagpur region, as it is believed to have served as route of migration of the so-called Malayan fauna to Peninsular India during successive periods of Pleistocene glaciations. Menon³, through faunistic surveys has shown that Eastern Ghats, so far as the fish-fauna is concerned, did not serve as the route of migration which lay across the Garo-Rajmahal Gap.

II. PROVENANCE OF MATERIAL

Altogether 46 species of reptiles referable to 5 families were studied as follows :

Testudines : Emydidae 2

Trionychidae 1

Serpentes : Boidae 1; Colubridae 7; Viperidae 1. Collections were made from the following localities⁶ :—

Shore of a tank near Inspection Bungalow, Barakar, West Bengal.

Kanja Pahar (Durgapur), alt. ca. 1,480 ft., Manbhum district, Bihar.

Inanpur, Manbhum district, Bihar

Panchet Hills, alt. ca. 1,600 ft. situated halfway between Raghunathpur and the junction of Barakar and Damodar rivers, 23°37' N. and 87°47' E. Manbhum district, Bihar.

Kumardhubi near Ranigunge Coal fields, Bihar.

Konar river, Hazaribagh district, Bihar.

Maithon Hills (near the Dam site), alt. ca. 725 ft., Bihar.

Charan Hill, N. W. of Barakar.

Chaurasi near Raghunathpur, Manbhum district, Bihar.

III. SYSTEMATIC LIST OF SPECIES

The following species are represented in the collection :—

CHELONIANS

Family EMYDIDAE

Hardella thurgii (Gray) 4 specimens

Kachuga dhongoka (Gray) 9 ,,

Kachuga kachuga (Gray) 3 ,,

¹ Blanford, W. T., *Phil. Trans. Roy. Soc.* CLXLIV (B), pp. 335-436 (1901).

² Hora, S. L., *Science Progress*, No. 162, pp. 245-255 (1953).

³ Menon, A. G. K., *Proc. Nat. Inst. Sci. India* XVII, pp. 475-497 (1951).

⁴ Silas, E. G., *ibid.* XVIII (5), pp. 423-448 (1952).

⁵ Menon, A. G. K., *ibid.* XX (4), pp. 467-493 (1954).

⁶ For Physiography and detailed description of the localities, please see Bhola Nath, *Rec. Ind. Mus.*, XLVIII, pp. 29-31 (1950).

Family TRIONYCHIDAE

Lissemys punctata granosa (Schoepff.) 1 specimen

SNAKES

Family BOIDAE

Eryx conicus (Schneid.) 1 specimen

Family COLUBRIDAE

Ptyas mucosus (Linn.) 1 specimen*Oligodon cyclurus* (Cantor) 1 ,,*Natrix stolata* (Linn.) 10 specimens*Natrix piscator* (Schneid.) 4 ,,*Boiga trigonata* (Schneid.) 1 specimen*Lycodon aulicus* (Linn.) 2 specimens

Subfamily HOMALOPSINAE

Enhydryis enhydryis (Schneid.) 7 specimens

Family VIPERIDAE

Subfamily VIPERINAE

Echis carinatus (Schneid.) 2 specimens

IV ACKNOWLEDGMENT

I am grateful to Dr. S. L. Hora, Director, Zoological Survey of India, for kindly going through this report and making valuable suggestions for its improvement.

V SYSTEMATIC ACCOUNT

Order TESTUDINES

Family EMYDIDAE

***Hardella thurgii* (Gray)**1831. *Emys thurgii*, Gray, *Syn. Rept.* pp. 22, 72 (type locality : India).1912. *Hardella thurgi*, Chaudhuri, *Rec. Indian Mus.* VII, p. 213.1949 *Hardella thurgii*, Constable, *Bull. Mus. comp. Zool. Harv.* CIII, no. 2, p. 76.

Specimens collected.—4♀♀ from the R. Ganges, below Rajmahal, district Santal Parganas, Bihar (23-25. i. 1954).

Measurements (in mm.).—Length of the carapace (straight) (Coll. no. 10 25.i.54)—313 and the smallest ♀ (Coll. no. 13)—260; Breadth of the carapace (straight)—230 and 190 respectively.

It has been observed that Gray in the original description (*loc. cit.* pp. 22 and 72) of the species has spelt the specific name as *thurji* several times, but in the list of "Addition and correction" which came out as an appendix to the same volume, on page 72 has spelt the specific name as *thurgii*. Smith in the revised edition of the *Fauna British India* series (Rept. & Amph.) volume I, p. 122 (1931) has show the specific name as *thurgi*. It seems that the correct spelling should be *thurgii* and not *thurji*. I have adopted the same. Constable (*loc. cit.* p. 79) as also done the same.

Kachuga dhongoka (Gray)

1834. *Emys dhongoka* Gray, *Illus. Indian Zool.* III, pl. ix (type locality North India).

1912. *Kachuga dhongoka*, Chaudhuri, *Rec. Indian Mus.* VII, p. 212.

Specimens collected.—9 (3♂♂, 5♀♀, 1 juv. unsexed) from the R. Ganges, below Rajmahal, Chota Nagpur, Bihar (23-26.i.54).

Measurements (in mm.).—Length of the largest carapace (straight)—290 ; Breadth of the carapace—90.

Shell brownish above with not very distinct (in dry shell) longitudinal stripes. The juvenile specimen (coll. no. 14 Jan. 1954) had traces of spots on each shield.

Chiefly found in the Gangetic river system including the Brahmaputra in Assam (I. M. Reg. no. 18319. Sonapur, Assam by L. W. Middleton).

Kachuga kachuga (Gray)

1831. *Emys kachuga* Gray, *Illus. Indian Zool.* pt. 5, pl. 9 (type locality N. India).

1931. *Kachuga kachuga*, Smith, *Fauna Brit. India* (Rept. & Amphibia) I; p. 131.

Specimens collected.—3 (1♂ and 2 ♀♀) from the R. Ganges below Rajmahal, Santal Parganas, Bihar (23.i.54).

Measurements (in mm.).—Length of carapace (straight) of the largest ♀ (coll. no. 15)—248 ; Breadth of the carapace—200.

Shell olive in colour, yellowish below. In the living example crimson-red noticed on the top of the head, extending to the fore part of the carapace. This condition of colouring may be associated with the breeding season.

Kachuga kachuga can be distinguished from its allied species *Kachuga dhongoka* by its larger size and very smooth carapace. This tortoise is largely aquatic in habits, sitting on the edge of the river at dusk and at slightest alarm dives down in the river. The sense of hearing is not very acute, but the sense of smell is very well developed.

From enquiries made from the turtle hunters on the spot it appears that there are at least six distinct species of water tortoises, which they could easily distinguish. Out of these, three species *Hardella thurgii*, *K. dhongoka* and *K. kachuga* were collected. Popular local names of all the species were ascertained from the turtle catchers, who belonged mostly to the tribal group of people inhabiting the whole of Santal Parganas.

TABLE I. SHOWING LOCAL NAME AND DISTRIBUTION OF SPECIES

Scientific name of the species	Local name	Distribution	Remarks
Family EMYDIDAE (Hard-shelled)			
<i>Kachuga kachuga</i> (Gray)	Sal	Gangetic river system	Very common.
<i>Kachuga dhongoka</i> (Gray)	Dhoor or Dhundi.	Ganges as far West as Allahabad and north to Nepal.	Ditto.
<i>Kachuga tectum</i> (Gray)	Ponchoria	Ganges, Brahmaputra and Indus river system.	Occasional.
<i>Hardella thurgii</i> (Gray)	Kalikattuas	Gangetic and Brahmaputra river system.	Abundant.
Family TRIONYCHIDAE (Soft-shelled)			
<i>Trionyx gangeticus</i> Cuvier	Katta, Kachims or Kachapps.	Common in the lower reaches of the Ganges.	Common.
<i>Chitra indica</i> (Gray)	Sim	Not uncommon in the Gangetic delta.	Occasional.

In 1912, Chaudhuri¹ made certain observations on the Chelonians of the "Middle Ganges and Brahmaputra", and recorded that the local turtle hunters could easily distinguish 9 species of aquatic tortoises found in the Ganges below Rajmahal. During my investigation covering one week, I could trace from the entire catch of the turtle hunters six species of tortoise only as enumerated above and was unable to trace out specimens of *Kachuga smithii*, *Trionyx hurum* and *Lissemys punctata* (= *Emyda granosa*) which are said to be found below Rajmahal as stated by Chaudhuri. From a zoogeographical point of view it is very likely that *Kachuga smithii*, *Trionyx hurum* and *Lissemys punctata* may occur in the Ganges system as well. According to Smith² *Kachuga smithii* and *Lissemys punctata* are found in the Ganges and Indus rivers, whereas *Trionyx hurum* has been recorded from the Ganges and Brahmaputra rivers. The Ganges and the Indus systems together formed a continuous westward flowing drainage along the base of the Himalayas during the Pliocene-Pleistocene and probably only during the late Pleistocene or the recent epochs this drainage was cut into two separate systems, one flowing westwards as the present day Indus and the other eastwards as the Ganges.³

¹ Chaudhuri, B.L., *Rec. Indian Mus.* VII, p. 212-214 (1912).

² Smith, M.A., *Fauna Brit. India* (Rept. & Amph.) I, pp. 126, 159, 173 (1931).

³ Hora, S. L., Anniversary Address, *Nat. Inst. Sci. India*, pp. 1-13 (1953).

Family TRIONYCHIDAE

Lissemys punctata granosa (Schoepff.)

1792. *Testudo granosa*, Schoepff, *Hist. Test.*, p. 127, pls. xxx (type locality : Coromandel coast).

1913. *Emyda granosa intermedia*, Annandale, *Rec. Indian Mus.* VII, pp. 172-176, pl. VI and p. 264 (type locality : Purulia, Manbhum district, Santal Parganas ; Ind. Mus.).

Specimens collected.—1 juv. (unsexed) “from the shore of a tank near Inspection Bungalow, Barakar, Burdwan district, Bengal (now West Bengal), (8. xi. 48) Chota Nagpur Survey.

Measurements (in mm.).—Length of the carapace (straight) 86; Breadth of the carapace—81 ; Length of the plastron (Notch to Notch)—91. Plastral callosities 6, entoplastral callosity very feebly developed ; fore limbs and hind limbs with 3 claws.

Carapace olive-brown without any markings ; head greenish, olive with black streaks.

Mostly found in the rivers. Annandale states that “This race is apparently common all over Chota Nagpur except probably in the hills”.

In the “Taxonomic Assessment of a species ” Hora ¹ has discussed in detail the interspecific relation of a species and the conception of a species as differently understood by herpetologists at different stages and the category of various changes brought about by the Scientists in the nomenclature. Smith² while revising the Indian Testudines in the *Fauna of the British India* series on the ground of “Rules of Zoological nomenclature” proposed a new name *Lissemys* for the well established generic name *Emyda* and recognised only one species *Lissemys punctata* in place of *Emyda granosa*, *E. vittata* and *E. scutata* and regarded *granosa* and *scutata* as of interspecific rank. Thus *Emyda granosa intermedia* Annandale 1912, became synonymous with *Lissemys punctata granosa* (Schoepff.).

Order SQUAMATA

Suborder SERPENTES

Family BOIDAE

Eryx conicus (Schneider)

1943. *Eryx conicus*, Smith, *Fauna Brit. India*, (Rept. & Amph.) III, p. 112.

Specimens collected.—One (dissected specimen) from the base of Panchet Hills, about 3 miles from Inanpur Inspection Bungalow, Manbhum district, Bihar, (4. xii. 1948) Chota Nagpur Survey.

¹ Hora, S. L., *J. zool. Soc. India* I, no. 2, pp. 92-96 (1949).

² Smith, M A., *Fauna Brit. India* (Rept. & Amph.) I, p. 154-160 (1931).

Rostral visible from above ; nostril slit-like, situated in the enlarged scales of the nasal and inter-nasals ; 12 scales round the eye. Ventrals 164, subcaudals 19. Mental groove absent. Tail pointed.

Measurements (in mm.).—Length of the head (measured dorsally)—17. Maximum width of the head—11. Total length—336.

Very little is known about its habits. Fowler¹ has noted *Eryx jaculus* (Linn.) and *Eryx j. johani* (Russell) are ovoviviparous, and it is quite likely that other species of *Eryx* have similar habits. It has been recorded from Naini Tal, alt. ca. 6,000 ft., Western Himalayas (I. M. Reg. No. 16115).

Family COLUBRIDAE

***Ptyas mucosus* (Linn.)**

1758. *Coluber mucosus*, Linnaeus, *Syst. Nat. Ed. 10*, I, p. 226 (type locality India).

1949. *Ptyas mucosus*, Constable, *Bull. Mus. comp. Zool. Harv.* CIII, p. 27.

Specimens collected.—1 Juv. from Chaurasi, 2½ miles W of Inanpur, Manbhum district, Bihar, (26.xi.1948), Chota Nagpur Survey.

Scales in the midbody 17 ; Ventrals 194 ; anal divided ; upper labials 8, 4th and 5th entering the eye. Total length-685 mm.

Recorded from the Western Himalayas (Almora, Simla Hills : I. M. Reg. No. 4130 and 7279).

***Oligodon cyclurus* (Cantor)**

1839. *Coronella cyclura*, Cantor, *Proc. zool. Soc. Lond.* p. 50 (type locality not known).

1943. *Oligodon cyclurus*, Smith, *Fauna Brit. India*, (Rept. & Amphibia) III, p. 202.

Specimens collected.—1 Juv. from Inspection Bungalow Inanpur, Manbhum district, Bihar, (26.xi.1948), Chota Nagpur Survey.

Supra labials 8, 4th and 5th touching the eye ; total length-390 mm.

Dark reddish-brown above with black markings on the edge of the scales. On the basis of colour pattern as found on the dorsal scales Smith (*loc. cit.*) has separated *Cyclurus* into five well defined colour forms found in different geographical areas. According to him, it corresponds with the form I as shown in his text-fig. 63A.

***Lycodon aulicus* (Linn.)**

1943. *Lycodon aulicus*, Smith, *Fauna Brit. India* (Rept. & Amphibia) III, pp. 263-266.

Specimens collected.—1 from Chaurasi, 3 miles west of Inanpur, Manbhum district, Bihar, (26.xi.48) ; 1 juv. (unsexed) "from under stones, Maithon dam site, 6 miles N. W of Barakar, Manbhum district, Bihar, (15.xi.1948), Chota Nagpur Survey.

¹ Fowler, S. S., *Proc. zool. Soc. Lond.* pp. 735-851 (1933).

Scales in the midbody 17 ; ventrals 178 & 182 ; anal divided ; upper labials 9, 3rd, 4th and 5th touching eye ; white cross bands on the dorsal aspect 14 and 20, faintly marked on the posterior part of the body.

Specimens have been collected from Sikkim (I. M. Reg. No. 16441) ; Naini Tal district, Western Himalayas (I. M. Reg. No. 16510) and Nepal Valley (I. M. Reg. No. 18656).

Natrix stolata (Linn.)

1943. *Natrix stolata*, Smith, *Fauna Brit. India* (Rept. & Amphibia) III, pp. 303-305.

Specimens collected.—2♂♂, collected 1 mile north of Barakar, Burdwan district, W Bengal, (8.xi.1948) ; 1 ♀ with mutilated tail (Sta. 6 b), from the neighbourhood of Nirsa about 6 miles west of Barakar, Manbhum district, Bihar (10.xi.1948) ; 1 from Kanja Pahar, 13 miles from Barakar Railway Station, (20.xi.1948) ; 2 from 1½ mile west of Inanpur, Manbhum district, Bihar (24.xi.1948) ; 1 from the base of the Panchet Hills, 1½ miles west of Inanpur, Manbhum district, Bihar (25.xi.48) ; 1 from Kumardhubi, 2 miles from the Inspection Bungalow Manbhum district, Bihar (14.xi.1948) ; 1 from 2½ miles south of Inanpur Manbhum district, Bihar (27.xi.1948), “Caught near the edge of the Nallah” 1♀ collected “in a paddy field on the bank of Konar river, south of Hazaribag district,” Bihar (17.xi.1951), Chota Nagpur Survey. The last specimen mentioned in the list was collected by Dr. B. Biswas.

In all the examples, there are 8 upper labials, 3rd, 4th and 5th touching the eye. The maximum total length of the largest specimen of the series 560 mm., while that of the smallest 240 mm. The tail occupies almost the quarters of the total length.

Distributed all over India. In Burma it has been recorded from Tenasserim and this seems to be its southernmost limit. So far, there is no record of its occurrence in the Malay Peninsula. de Rooij¹ has also doubted its existence in that area.

Natrix piscator (Schneider)

1799. *Hydrus piscator*, Schneider, *Hist. Amph.* I, p. 247 (type locality : East Indies).

Specimens collected.—One example (Sta. 8) from Maithon Dam site about 6 miles from Barakar, Manbhum district, Bihar (13.xi.1948) ;, one collected from a “pool, 1½ miles W of Barakar”, Bihar (24.xi.1948) ; one (dissected specimen) near a nallah, 1½ miles S. of Inanpur, Manbhum district, Bihar (12.xii.1948) ; one (dissected specimen) from a field near Inanpur, Manbhum district, Bihar, Chota Nagpur Survey.

Supra labials 9, in 1 example 8, 4th and 5th touching the eye ; scales keeled in 19 rows in the midbody. Ventral counts in 4 specimens varies between 126-150 ; subcaudals 72-84.

¹ de Rooij, *Reptiles of the Indo-Australian Archipelago* (Ophidia), p. 88 (1917).

This snake is so variable in colour and in the setting of the black dots on the dorsal aspect that Smith¹ has erected four geographical races, based on these characters. One example (collected on 13th November, 1948) has yellowish ventrals edged with black, which fairly approaches the form II of Smith (*loc. cit.*), while another (collected on 24th November, 1948) has pinkish colour on the ventral aspect nearing to *flavipunctata*, which is distributed from the Indo-Chinese region to the west as far as Assam.

It has been recorded from Sikkim, E. Himalayas (I. M. Reg. No. 18668); Nepal, alt. ca., 5,000 ft. (I. M. Reg. No. 15832-15834) and Dharampur, alt. ca., 5,300 ft., Western Himalayas.

***Boiga trigonata* (Schneider)**

1943. *Boiga trigonata*, Smith, *Fauna Brit. India* (Rept. & Amph.) III, p. 349.

Specimens collected.—1 juv. (unsexed) "from under stones, Charan Hills, about 6 miles N. W. Barakar Railway Station", Manbhum district, Bihar (20.xi.1948). Chota Nagpur Survey.

Preocular 1. Scales in the midbody 21 ; ventral 232 ; subcaudals 80. Total length—256 mm.

Greyish-brown above with vertebral series of black edged shaped marks. Lower side having black dots on the margin of the ventrals.

Specimens have been recorded from Sabathu near Simla, alt. ca. 6,500 ft. (I. M. Reg. No. 7836).

***Enhydris enhydris* (Schneider)**

1799. *Hydrus enhydris*, Schneider, *His. Amph.* I, p. 245 [based on Russell's *Ind. Serp.*, I, p. 35, pl. xxx] (type locality : Ankapilly Lake, India).

1943. *Enhydris enhydris*, Smith, *Fauna Brit. India* (Rept. & Amph.) III, p. 383.

Specimens collected.—5 specimens thus : 4 adult from a private pond full of aquatic vegetation in the village Deriana near Nirsha about 7 miles from Barakar, Bihar (10.xi.1948) ; 1 from Sultandih, 3 miles N. of Inanpur, Manbhum district, Bihar (8.xii.1948). Chota Nagpur Survey.

Snout blunt (rounded) ; 8 upper labials, 4th entering the eye, last one very small. Scales smooth in 19 rows ; ventrals 148-168 ; subcaudals 48-68 (counts based on 5 specimens).

Smith (*loc. cit.*) on the basis of colour pattern divided the three species of *Enhydris* into two distinct colour forms. According to his views, the specimens under report conforms with group I as shown by him.

A very widely distributed species, found from north-eastern India to Assam. It has also been recorded as far north as the Himalayan foot hills.

¹ Smith, M. A., *Fauna Brit. India* (Rept. & Amph.) III, p. 296 (1943).

Family VIPERIDAE

Subfamily VIPERINAE

Echis carinatus (Schneider)

1801. *Pseudoboa carinata*, Schneider, *Hist. Amph.* II, p. 285 [based on Russell]
(type locality : Arni near Madras).

Specimens collected.—2 (dissected specimens) “from the foot of the Panchet hills, $1\frac{1}{2}$ miles S. of Inanpur Inspection Bungalow, Manbhum district, Bihar (10.xii.1948), Chota Nagpur Survey.

Total length.—324 and 280 mm. respectively. It is essentially a desert form but has also been recorded at an altitude of 5,000 ft. (I. M. Reg. No. 8581, Kalagan, Baluchistan).