

OCCASIONAL PAPER NO. 165

**RECORDS OF THE
ZOOLOGICAL SURVEY OF INDIA**

**Aquatic and Semi-aquatic Hemiptera (Insecta) of Tamilnadu -I
Dharmapuri and Pudukkottai Districts**

G. Thirumalai

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सत्यमेव जयते

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I N T R O D U C T I O N

In accordance with the policy decision, the Zoological Survey of India is conducting regular districtwise surveys of the State of Tamilnadu, under the State Faunal Survey Programme. Accordingly, the Dharmapuri and Pudukkottai Districts were surveyed both in the pre and post monsoon periods. The extensive collections of aquatic and semi-aquatic bugs made during the faunistic explorations constitute the study material on which the present account is mainly based.

A cursory glance of the relevant literature indicates that not much is known about the aquatic and semi-aquatic hemipterans from the two districts under study. The material has been collected from diverse habitats such as water falls, fast-flowing mountain streams, rivers, slow-moving rivulets, pools & puddles and also from moist or freshly dried river beds. The material under study contained 36 species, belonging to 18 genera which includes (10 subgenera) under 10 families and 14 subfamilies.

The taxonomic account which follows provides a systematic index to all the species covered. The descriptive account of each species includes the synonymy, the diagnostic characters, and the details of their distribution in and outside India. The entire material under report has been deposited in the entomological collections of the Southern Regional Station.

PHYSIOGRAPHY

DHARMAPURI DISTRICT :

The district is situated between 110° and 12°55' of the north latitude and 77°28' and 78°50' of the east longitude, covering a total area of 9,615.89 Sq.kms. The district mainly consists of scarcely wooded undulating plateau, dense jungles and river basins. The mean temperature is 37.8°C and the average rainfall is 680 mm. The two important rivers which flow through the district are the Pennar and the Cauvery. A total of 18 species belong to 14 genera, including 3 subgenera referable to 6 families and 11 subfamilies are being reported from this district.

Fig. 1 Map of Tamilnadu

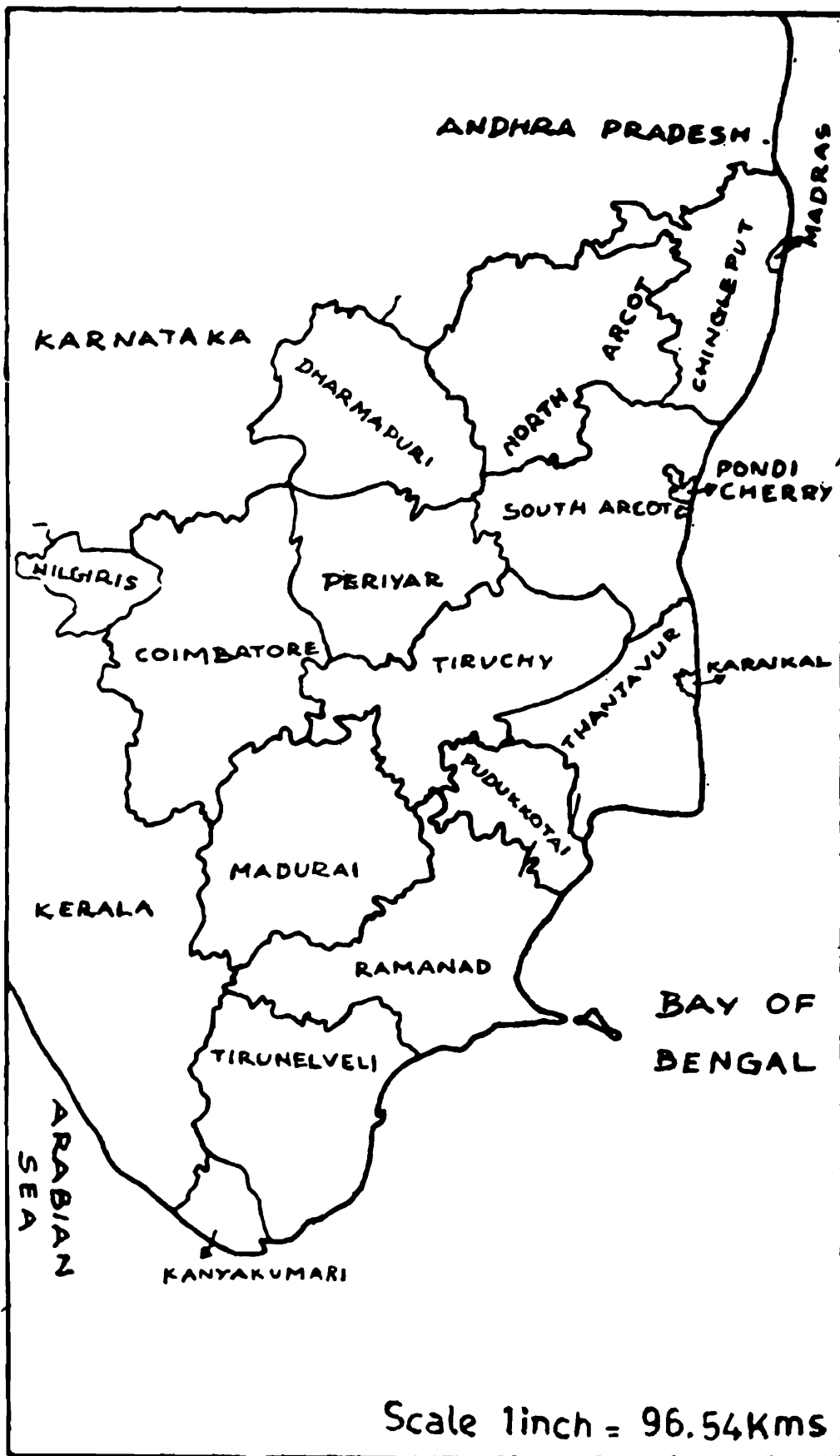


Fig. : 1. Map of Tamilnadu

Fig. 2 Map of Dharmapuri and Pudukkottai Districts

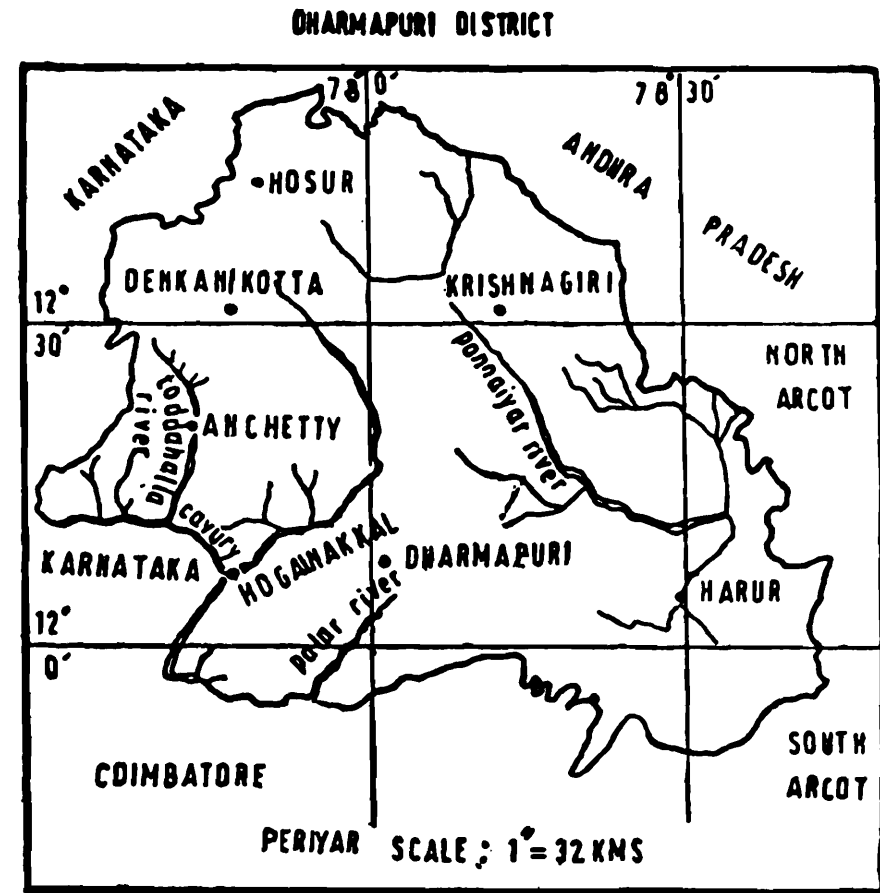
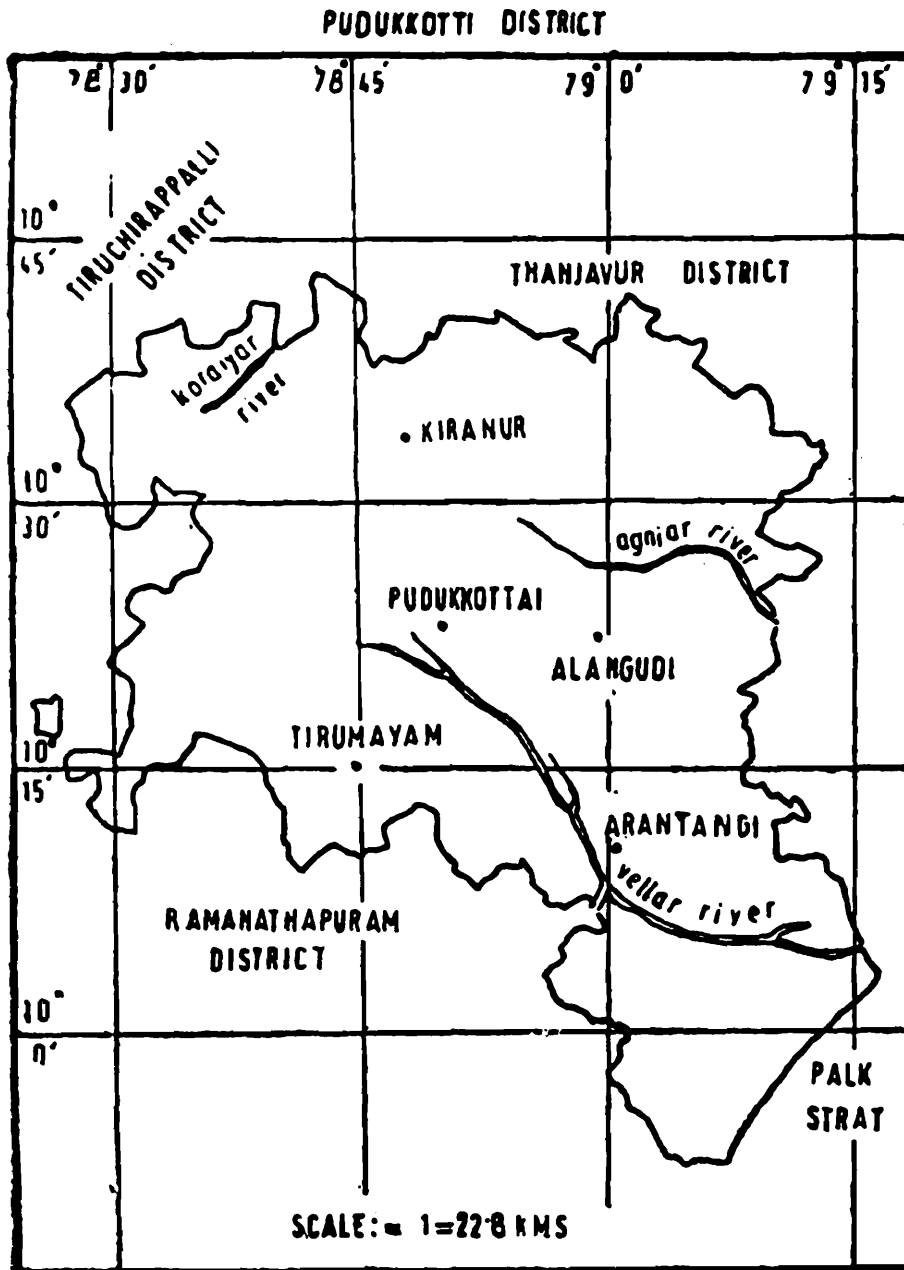


Fig. : 2. Map of Dharmapuri and Pudukkottai District

PUDUKKOTTAI DISTRICT :

The Pudukkottai District lies between latitude 9°50' 30"N and 10°44'N and longitude 78°25'5"E and 79°16'E with a total area of 4650 Sq. km. The district is mainly made-up of flat broad tract of dry thorny scrubs with a few rocky hillocks or outcrops of rocks here and there. There are no perennial rivers in this districts. The vegetation spectrum of the district mainly consists of low, thorny scrubs. The temperature steadily increases after February and May is probably the hottest month of the year. Aquatic and semi-aquatic bugs belonging to 26 species contained in 13 genera, 7 subgenera and referable to 10 subfamilies and 8 families are being reported from this district.

**KEY TO THE FAMILIES OF AQUATIC AND SEMI-AQUATIC
HEMIPTERA OF DHARMAPURI AND PUDUKKOTAI
DISTRICTS**

1. Antenna visible and not concealed, as long as or longer than head..... 2
 Antenna not visible and concealed in groove below the head, shorter than head 5
2. Claws apical , apex of last tarsal segment entire..... 3
 Claws of atleast front tarsi pre-apical ; apex of last tarsal segment cleft or bifid..... 4
3. Head shorter than pronotum; scutellum minute, femora with stiff, erect, bristles..... **MESOVELIIDAE**
 Head long, as long as entire thorax, body slender, cylindrical, antennae and legs filiform..... **HYDROMETRIDAE**
4. Hind femora long, surpassing end of abdomen , middle legs inserted closer to hind legs than to fore legs , head without central groove..... **GERRIDAE**
 Hind femora short, scarcely surpassing end of abdomen ; middle legs inserted about midway between front and hind legs ; head with a central groove..... **VELIIDAE**
5. Rostrum short, triangular unsegmented, front tarsi single segmented, scoop-like, fringed with hairs and setate **CORIXIDAE**

Rostrum cylindrical, three visible segments, front tarsi single to three segmented, neither scoop-like nor fringed without hairs or setae..... 6

6. Tip of abdomen with appendages ; midventral abdominal keel absent 7

Tip of abdomen without any appendages; midventral abdominal keel present NOTONECTIDAE

7. Tip of abdomen with non-retractile, long and slender siphon ; tarsi one segmented NEPIDAE

Tip of abdomen with non-retractile, long and slender siphon , tarsi one segmented BELOSTOMATIDE

Tip of abdomen with retractile, short, flat siphon ; tarsi one or two or three segmented BELOSTOMATIDE

A systematic index to the aquatic and semi-aquatic Hemiptera of Dharmapuri and Pudukkottai districts, Tamilnadu

CLASS : INSECTA
 ORDER : HEMIPTERA
 SUBORDER : HETEROPTERA
 FAMILY : CORIXIDAE
 SUBFAMILY : CORIXINAE

1. *Agraptocorixa (Agraptocorixa) hyalinipennis* (Fabricius)

2. *Corixa (Tropocoroixa) indica* (Hutchinson)

SUBFAMILY : MICRONECTINAE

3. *Micronecta (Sigmonecta) quadristrigata* Breddin

4. *Micronecta (Basileonecta) scutellaris scutellaris* (Stal)

5. *Micronecta (Indonectella) thyesta* Distant

FAMILY : NONONECTIDAE

SUBFAMILY : NOTONECTINAE

6. *Enithares fusca* Brooks

7. *Enithares triangularis* (Guerin-Meneville)

SUBFAMILY : ANISOPINAE

8. *Anisops barbata* Brooks

9. *Anisops bouvieri* Kirkaldy

31. *Tenagogonus (Limnometra) fluviorum* (Fabricius)

32. *Aquarius adelaidis* (Dohrn)

SUBFAMILY EOTRECHINAE

33. *Amemboa (Amemboa) kumari* (Distant)

SUBFAMILY PTILOMERINAE

34. *Ptilomera (Ptilomera) agroides* Schmidt

SUBFAMILY : HALOBATINAE

*35. *Metrocoris stali* (Dohrn)

FAMILY VELIIDAE

SUBFAMILY MICROVELIINAE

36. *Microvelia douglasi* Scott

FAMILY CORIXIDAE

The family Corixidae, the largest family of aquatic Heteroptera, is characterised by single segmented front tarsus called 'pala' - which is flattened and scoop-shaped, The scutellum is exposed or concealed and the male abdominal segments are asymmetrical. In India, this family is represented by four genera and thirty five species.

KEY TO THE SPECIES OF CORIXIDAE FOUND IN DHARMAPURI AND PUDUKKOTTAI DISTRICTS.

- 1. Antenna three segmented; scutellum visible (Subfamily Micronectiane) 2
- Antenna four segmented ; scutellum hidden (Subfamily Corixinae) 4
- 2. Strigil absent in males *Micronecta thyseta* Distant
- Strigil present in males 3
- 3. Eighth abdominal tergite of male sigmoid in outline ; size not more than 3 mm long *Micronecta quadristrigata* Breddin
- Eighth abdominal tergite of male not sigmoid in outline ; size over 3 mm long *Micronecta scutellaris scutellaris* (Stal)
- 4. Pronotum without lines, elytra unmarked *Agraptocorixa hyalinipennis* (Fabricius)
- Pronotum and elytra marked..... *Corixa indica* (Hutchinson)

SUBFAMILY CORIXINAE

* Refer in Addendum

1. *Agraptocorixa (Agraptocorixa) hyalinipennis* (Fabricius)

Sigra hyalinipennis Fabricius, 1803, *Syst. Rhyn. Brusvigae*, 105. *Agraptocorixa hyalinipennis* (Fab.) : Jaczewski, 1926, *Ann. Zool. Mus. Polon Warsw.* 5 : 18 ; Thirumalai, 1989, *Misc. Occ. Pap. Rec. zool. Surv. India.* 118 : 11.

This is the only species of the genus so far known from India and it is easily recognised by its uniform hyaline brown colouration, unmarked elytra and pronotum, male stridulatory comb and the structure of male parameres Fig 3 a to c. This species is commonly found to inhabit the ditches, puddles and stagnant pools in various parts including the Eastern Ghats.

Material examined Pudukkottai Dt 6 (Male) , 20 (Female from Atthipalam , 4. V. 1986, Coll G. Thirumalai.

Distribution INDIA ; MYANMAR ; NEW GUINEA ; PAKISTAN ; TAIWAN.

2. *Corixa (Tropocorixa) indica* (Hutchinson)

Corixa (Tropocorixa) indica Hutchinson, 1940. *Trans. connecticut Acad. Art Sci.*, 33 : 445.

Hutchinson (1940) considered *C. indica* to be a widely distributed and eurytopic form. The inner penis sheath is anchorshaped (Fig. 4b) at apex, closely resembling *C. nilgirica* Hutchinson and *C. pruthiana* Hutchinson, but can be easily separated by the shape of rights & left parameres (Fig. 4 a, c). This species is being reported for the first time from Southern part of the peninsular India.

Material examined Pudukkottai Dt 1(Male) from Namana samudram Road, 1.V. 1986, Coll G. Thirumalai.

Distribution INDIA , PAKISTAN

SUBFAMILY

MICRONECTINAE

3. *Micronecta (Sigmonecta) quadririgata* Breddin

Micronecta quadririgata Breddin, 1905, *Soc. Ent. Zurich*, 20 : 57. *M. minthe* Distant, 1910b, *Fauna British India*, 5 : 347. *M. quadririgata* Breddin : Lundblad 1934, *Arch. Hydrobiol. Suppl.*, 12 : 87 ; Hafiz & Ribero, 1939, *Rec. Indian Mus.*, 41 : 435 ; Hutchinson, 1940, *Trans. Conn. Acad. Art Sci.*, 33 : 376 ; Hafiz & Pradhan, 1947, *Rec. Indian Mus.*, 45 : 355 ; Wroblewski, 1962, *Bull Acad. Polon. Sci. II.*, 10 : 176 ; Thirumalai, 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 14.

This is a very common species in southern and eastern India. Further, it is also recorded from the pools of brackish water (Thirumalai, 1989). The eighth free lobe of abdominal tergite of male which is sigmoid in outline and the struc-

ture of left paramere are the main characters to confirm the identity of this species.

Material examined Dharmapuri Dt. 1 (Female) from Hoegenekal Forest Bungalow (light trap), 18. IV. 1985, Coll K. M; Pudukkottai District 6 (Male) , 15 (Female) from Vamban, 1. II. 1985, Coll G. Thirumalai

Distribution INDIA, INDONESIA; IRAN, MALAYSIA; PHILIPPINES , SRILANKA.

4. *Micronecta (Basileonecta) scutellaris scutellaris* (Stal)

Sigra scutellaris Stal, 1858, Vetens akad. Forh., 15 : 319. *Micronecta dione* Distant, 1910b, *Fauna British India*, 5 : 348. *M. proba*. Distant, 1910b, *Fauna British India*, 5 : 348. *M. scutellaris scutellaris* (Stal) : Hutchinson, 1940, *Trans. Conn. Acad. Arts Sci.*, 33 : 365 ; Hafiz & Pradhan, 1947, *Rec. Indian Mus.*, 45 : 354 ; Thirumalai, 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 15.

This is the largest Indian species of the genus *Micronecta* (more than 3.0 mm), distributed over a very wide area in India. It is also the most commonest of the genus. The tip of the left paramere is club - shaped and possesses minute denticles.

Material examined Pudukkottai Dt. 1 (Male) from Tiruchy Road, 21, I. 1985 ; 2 (Male) 7 (Female) from Vamban, 3. II. 1985 , 1 (Male) from Atthipalam, 4 V. 1986 , 4 (Male) from Namanasamudram Road, 8. V. 1986, Coll G. Thirumalai.

Distribution AFRICA (CENTRAL) , CHINA ; INDIA, INDONESIA , MALAYASIA ; SAUDI ARABIA , SRILANKA ; VIETNAM.

5. *Micronecta (Indonectella) thyesta* Distant

Micronecta thyesta Distant, 1910b, *Fauna British India*, 5 : 349 ; Chen, 1960 , *J. Kans. Ent. Soc.*, 33 : 117 ; Thirumalai, 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 13.

This species can be differentiated from the known Oriental forms by the absence of strigil in males. The parameres and free lobe of eight abdominal tergites are as in Fig. 5 a to c. Chen (1960), while studying the genus *Micronecta* of India, Japan, Taiwan and adjacent regions, considered *M. pillosella* Matsumura a synonym of *M. thyesta*. Hutchison (1940) recorded this species from the flooded paddy fields and Thirumalai (1989) commented that it is attracted towards light.

Material examined Pudukkottai Dt. 1 (Male) , 3 (Female) from Arimalam, 1. II. 1985 ; 1 (Male) 1 (Female) from Atthipalam, 4 V. 1985, Coll G. Thirumalai.

Fig. 3 Agraptocorixa (A) hyalinipennis (Fabricius)

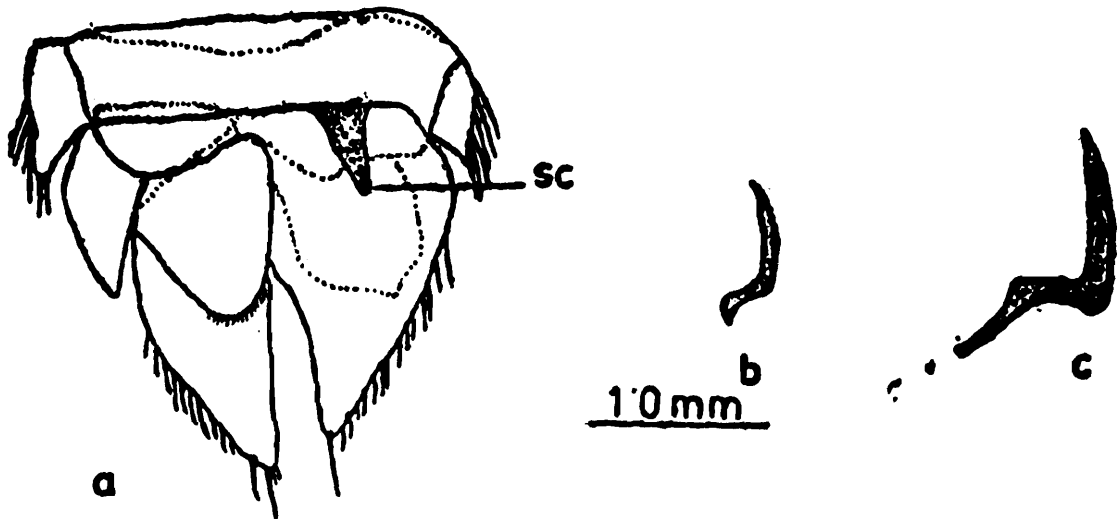


Fig. 4 Corixa (T) indica Hutchinson

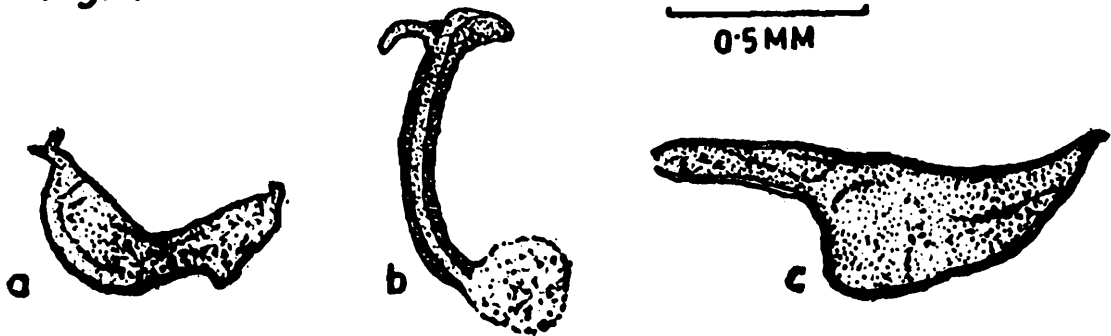


Fig. 5 Micronecta (I) thyseta Distant

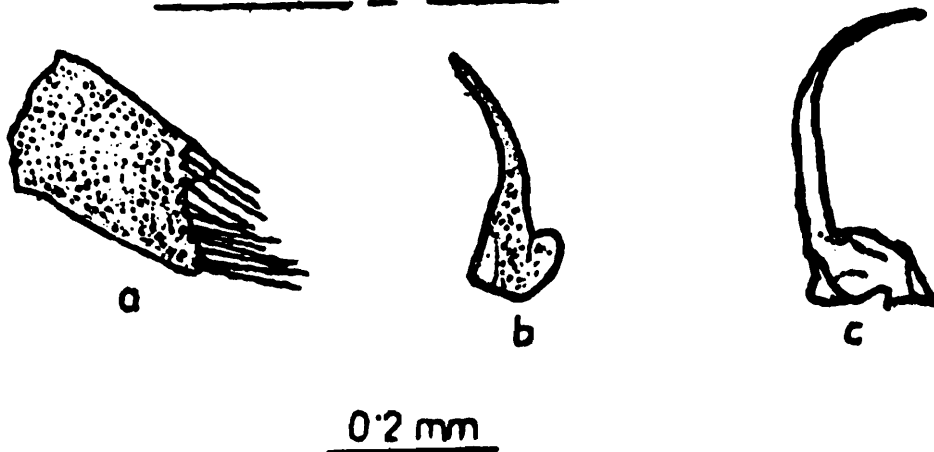


Fig. : 3. *Agraptocorixa (A) hyalinipennis* (Fabricius) (Male) a. Sixth to eighth abdominal segments SC - Stridulatory Comb. b. Left paramere c. Right paramere

Fig. : 4 *Corixa (T) indica* Hutchinson (Male) a. Left paramere
b. Penis sheath c. Right paramere

Fig. : 5 *Micronecta (I) thyseta* Distant (Adult Male) a. Free lobe of eighth abdominal tergite.
b. Left paramere c. Right paramere

Distribution CHINA ; INDIA ; JAPAN , TAIWAN ; VIETNAM.

FAMILY

NOTONECTIDAE

The notonectids are small, medium-sized, oblong bugs, characterized by four segmented antennae, 3 or 4 segmented rostrum, absence of ocelli, non-raptorial legs, flattened hind legs which lack claws. All the members of this family are predaceous and well known as biological agents in mosquito control. This family is one of the largest families of Nepomorpha comprising 10 genera and as many as 325 species divided as two subfamilies (Polhemus, 1982), of these, 3 genera and 24 species of the two known sub-families are so far reported from India. The following account deals with 2 genera and 11 species of notonectids collected from Dharmapuri and Pudukkottai districts, out of which the genus *Enithares* Spinolae is recorded from the Dharmapuri district only.

KEY TO THE SPECIES OF FAMILY NOTONECTIDAE OF DHARMAPURI AND PUDUKKOTAI DISTRICT

1. Hemelytral commissure without a hair-lined pit at anterior end (Subfamily : Notonectinae) 2
 Hemelytral commissure with a hair-lined pit (Subfamily : Anisopinae) 3
2. Ventrally embolium greatly expanded towards head ; size more than 12.5 mm *Enithares triangularis* (Guerin-Meneville)
 Ventrally embolium not greatly expanded ; size less than 10.0 mm *Enithares fusca* Brooks
3. Synthlipsis wide, one-third or more than the anterior width of vertex..... 4
 Synthlipsis narrow, less than one-third the anterior width of vertex..... 6
4. Robust species, more than 8.00 mm long ; two tufts of hairs on fascial tubercle..... *Anisops barbata* Brooks
 Fusiform species, less than 8.00 mm long ; fascial tubercle without tufts of hairs..... 5
5. Anterior margin of the vertex not extended beyond eyes ; eyes wider than the anterior width of pronotum..... *Anisops paranigrolineata* Brooks

- Anterior margin of the vertex slightly extended beyond eyes ; eyes not wider
 *Anisops campbelli* Brooks
6. Eyes holoptic basally *Anisops breddeni* Kirkaldy
 Eyes not holoptic 7
7. Interocular space produced anteriorly into a cephalic projection in males ; size
 more than 5.5 mm long..... 8
 Interocular space not produced anteriorly into a cephalic
 projection in males ; size less than 5.5 mm long..... 10
8. Pronotal lateral margin more than one half of the median length ; cephalic
 projection short and rounded at apex in males..... *Anisops cavifrons* Brooks
 Pronotal lateral margin less than one half of the median length ; cephalic pro-
 jection long and acuminate at apex in males..... 9
9. Fusiform species ; third abdominal segment possesses expanded keel laterally
 *Anisops bouvieri* Kirkaldy
 Robust species ; third abdominal segment lacks the keel laterally
 *Anisops sardea* Herrich-Shaffer
10. Synthlipsis one fifth to one sixth the anterior width of vertex..... *Anisops exigera*
 Horvath
 Synthlipsis one seventh to one eighth the anterior width of
 vertex..... *Anisops waltirensis* Brooks

SUBFAMILY

NOTONECTINAE

6. *Enithares fusca* Brooks

Enithares fusca Brooks, 1948, *J. Kans. Ent. Soc.*, 21 : 46 ; Lansbury, 1968, *Pacif. Insects*, 10 : 412 ; Thirumalai ; 1986, *Rec. Indian Mus.*, 84 : 30.

Size more than 9.0 mm (9.1 to 9.45 mm) ; Similar to *E. ciliata* (Fabricius) in general size and colouration, but the absence of black spicules on the mesotrochanter and the presence of a large nodule on the inner surface of the mid-tibia distally separate *E. fusca* from *E. ciliata*. This species is so far reported only from Kerala and hence the occurrence of this species in the Dharmapuri District of Tamilnadu is an additional interesting record.

Material examined Dharmapuri Dt 2 (Female) from Sitteri-Horur Road. Maamarathuodai, alt. 430-620 M, 4. III. 1986, Coll. K. M.

Distribution INDIA.

7. *Enithares triangularis* (Guerin-Meneville)

Notonecta triangularis Guerin-Meneville, 1844, I. *Con. Reg. Anim.*, 354. *Enithares triangularis* (G-M): Distant, 1906, *Fauna British India*, 3 : 44 ; Lansbury, 1968, *Pacific Insects*, 10 : 369.

Size 13 to 15 mm; the median length of the metaxyphus 2 times longer than of the basal width. This species is more commonly found in Western Ghats, is endemic to India as far as the known distribution goes.

Materials examined Dharmapuri Dt 3 immature stages from Sitteri-Hour Road, Maamarathuodai, alt. 430-620 M, 4. III. 1986, Coll K. M.

Distribution INDIA.

SUBFAMILY

ANISOPINAE

8. *Anisops barbata* Brooks

Anisops barbata Brooks 1951, *Kans. Univ. Sci. Bull.*, 34 : 387 ; Lansbury, 1964, *Ann. Zool. Warszawa*, 22 : 211 ; Thirumalai ; 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 23.

This is the largest species (8.00 mm and above) of *Anisops* so far known from India and can be identified by its large size, presence of two tufts of hairs on the fascial tubercle and chaetotaxy of male front femur as shown in Fig. 6 a. The male parameres are asymmetrical with left paramere moderately excavate (Fig. 7 a). Female ovipositor with teeth arranged in two longitudinal rows and small lateral tooth-like setae near apex (Fig. 8 a). Lansbury (1964) considered that *A. barbata* is a synonym of *A. hyalina* Fieber. The data on distribution include plains to the foothills of the Western Himalayas.

Material examined Pudukkottai Dt 2 (Male) , 1 (Female) and 1 immature stage from Arsampatti, 6. I. 1985 , 4 (Male) from Arimalam, 1. II. 1985, Coll G. Thirumalai.

Distribution CHINA , INDIA , INDONESIA ; MALAYSIA , MYANMAR , SRILANKA , TAIWAN ; VIETNAM.

9. *Anisops bouvieri* Kirkaldy

Anisops bouvieri Kirkaldy, 1904, *Wiener Ent. Zeit.*, 23 : 116 ; Brooks, 1951, *Kans. Univ. Sci. Bull.*, 34 : 430 ; Leong and Fernando, 1962, *J. Bombay nat. Hist. Soc.*, 59 : 519 ; Thirumalai, 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 23.

A. bouvieri is commonly found in India. The habitat of this species includes fresh water pools, lakes, ponds, forest streams. The males of *A. bouvieri* have more or less acuminate and longer cephalic projection which extends one fifth of its ventral length beyond the anterior margin of the eyes. The male fore femur chaetotaxy is as in Fig. 6 c. The left paramere is deeply excavate (Fig. 7 b) and the female ovipositor is normal and the arrangement of teeth and setae is as in Fig. 8 c.

The life history of *A. bouvieri* has been studied by Julka (1965).

Material examined Pudukkottai Dt 1 (Male), 1 (Female) from Tiruchy Road, 21. I. 1985 ; 17 (Male), 28 (Female) from Koppanapatti, 26. I. 1985 , 40 (Male) , 35 (Female) ; from Paramangudi, 19. I. 1985 , 4 (Male) 21 (Female) from Arimalam , 1. II. 1985 ; 3 (Male), 10 (Female) from Viralimalai Road, 2. II. 1985 , 10 (Male), 10 (Female) and 1 immature stage from Vamban, 3. II. 1985 , 4 (Female) from Melatemathapatti, 3. V. 1986 ; 33 (Male) , 109 (Female) from Namanasamudram Road, 8. V. 1986, 17 (Female) from Pudukkottai - Tiruchy Road, 12. V. 1986, Coll *G. Thirumalai*.

Distribution BANGLADESH , CHINA , INDIA , MALAYSIA , MYANMAR , NEW GUINEA , THAILAND.

10. *Anisops breddeni* Kirkaldy

Anisops breddeni Kirkaldy, 1901 a, *Entom. London*, 34 : 5 ; Distant, 1910 b, *Fauna British India*, 5 : 333 ; Hafiz & Pradhan, 1947, *Rec. Indian Mus.*, 45 : 351 ; Brooks, 1951, *Kans. Univ. Sci. Bull.*, 34 : 439 ; Leong & Fernando, 1962, *J. Bombay nat. Hist. Soc.*, 59 : 518.

This species can be distinguished by the parallel lateral margin of pronotum, holoptic eyes and the structure of male stridulatory comb which is composed of a few flattened and spatulate combs. The chaetotaxy of male fore femur is as show in Fig. 6 b. The male parameres are small with left one weakly emarginate (Fig. 7 c) while the teeth and setal arrangements of female ovipositor are in Fig. 8 b. In Madras, this species has been noticed to be abundant in pond with rich organic content and vegetation (Thirumalai and Raghunathan, 1988).

Material examined Pudukkottai Dt 1 (Female) from foothills of Sevalimālai, 26. I. 1985, Coll *G. Thirumalai*.

Distribution INDIA , INDONESIA , MALAYSIA , MYANMAR , NEW GUINEA , SRILANKA , VIETNAM.

11. *Anisops campbelli* Brooks

Anisops campbelli Brooks, 1951, *Kans. Univ. Sci. Bull.*, 34 : 322 ; Lansbury, 1964, *Ann. Zool. Warszawa*, 22 : 213.

Fig.6 Male fore tibiae and tarsi of Anisops spp.

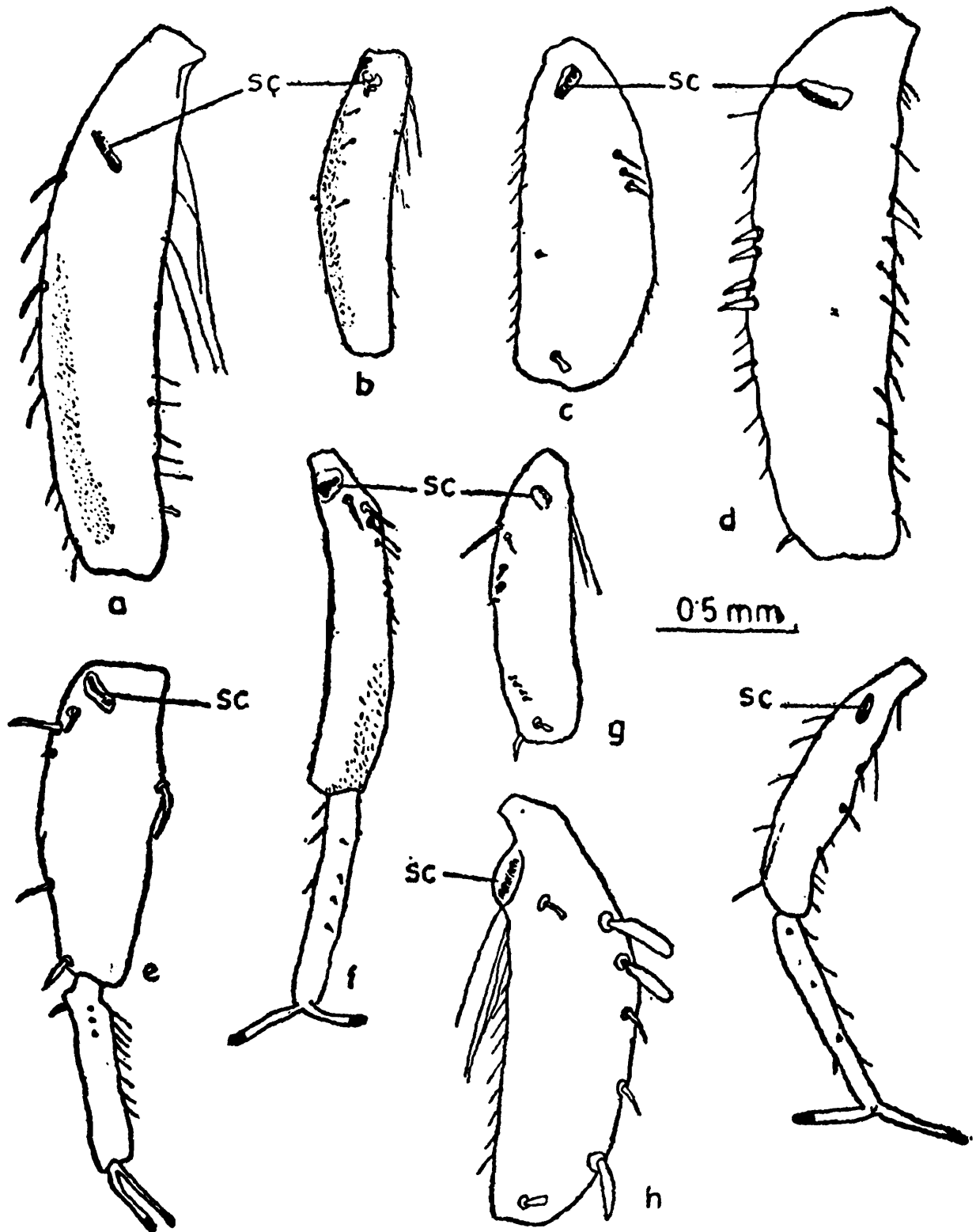


Fig. : 6 Male fore tibiae and tarsi of *Anisops* Spp. (SC: Stridulatory Comb) a. Tibia of *A. barbata* Brooks b. Tibia of *A. breddeni* Kirkaldy c. Tibia of *A. bouvieri* Kirkaldy d. Tibia of *A. campbelli* Brooks e. Tibia and tarsus of *A. cavifrons* Brooks f. Tibia and tarsas of *A. paranigrolineata* Brooks g. Tibia of *A. exigera* Horvath h. Tibia of *A. sardea* Herrich-Shaffer i. Tibia and tarsus of *A. waltirensis* Brooks

A. campbelli is almost entirely confined to the Indian subcontinent. The interocular space in male projects anteriorly into a very short cephalic horn. The chaetotaxy of the male front leg as in fig. 6 d. The parameres are asymmetrical with the left very deeply excavate on the posterior margin (Fig. 7 d). The ovipositor with two rows of longitudinal teeth and seven tooth like lateral setae near apex as in Fig. 8 (d).

Material examined Pudukkottai Dt 67 (Male), 62 (Female) from Atthipalam, 4. V. 1986. Coll G. Thirumalai.

Distribution INDIA ; MYANMAR.

12. *Anisops cavifrons* Brooks

Anisops cavifrons Brooks 1951, *Kans. Univ. Sci. Bull.*, 34 : 418 ; Thirumalai, 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 24.

This species is very closely related to *A. batillifrons* Lundblad but the males of *A. cavifrons* have a procumbent spine on the foretibia which is absent in *A. batillifrons*. There are three closely arranged small setae near the base of tarsus in males (Fig. 6 e). The left male paramere is moderately excavate (Fig. 7e) and the teeth arrangement of female ovipositor is as in Fig 8 e. Interestingly enough, *A. cavifrons* is recorded from the backwaters of Cochin, Kerala.

Material examined Dharmapuri Dt 1(Male) , 2 (Female) from Todehalla River, Anchetty R. F, alt. 500 M, 11. IV. 1985; 1 (Female) from Anchetty-Natrapalayam Road, alt. 475 M, 13. IV. 1985, 2 (Male) , 2 (Female) from Doddahalla River, South Anchetty, alt. 500 M. 14. IV. 1985 , Coll K. M Pudukkottai Dt 1 (Male) , 1 (Female) from Koppannapatti, 25. I. 1985 , 5 (Male) , 7 (Female) from Paramangudi, 29. I. 1985 , 1(Male), 1(Female) from Viralimalai Road, 2. II. 1985 , 9 (Male) , 26 (Female) from Athipalam, 4. V. 1986, Coll G. Thirumalai.

Distribution INDIA ; PAKISTAN.

13. *Anisops exigera* Horvath

Anisops exigera Horvath 1919, *Abhandl. Senckenberg. Naturf. Ges.*, 35 : 314 ; Brooks, 1951, *Kans. Univ. Sci. Bull.*, 34 : 447 ; Leong & Fernando, 1962, *J. Bombay nat. Hist. Soc.*, 59 : 517 ; Lansbury, 1964, *Ann. Zool. Warszawa*, 22 : 213.

This is a small species exhibiting a discontinuous distribution. Both the male and the female possess a very narrow synthlipsis (in some case almost holoptic) which is one-fifth to one-seventh of the anterior width of vertex , the male's

Fig.7 Right and left genital parameres of adult male of Anisops spp.

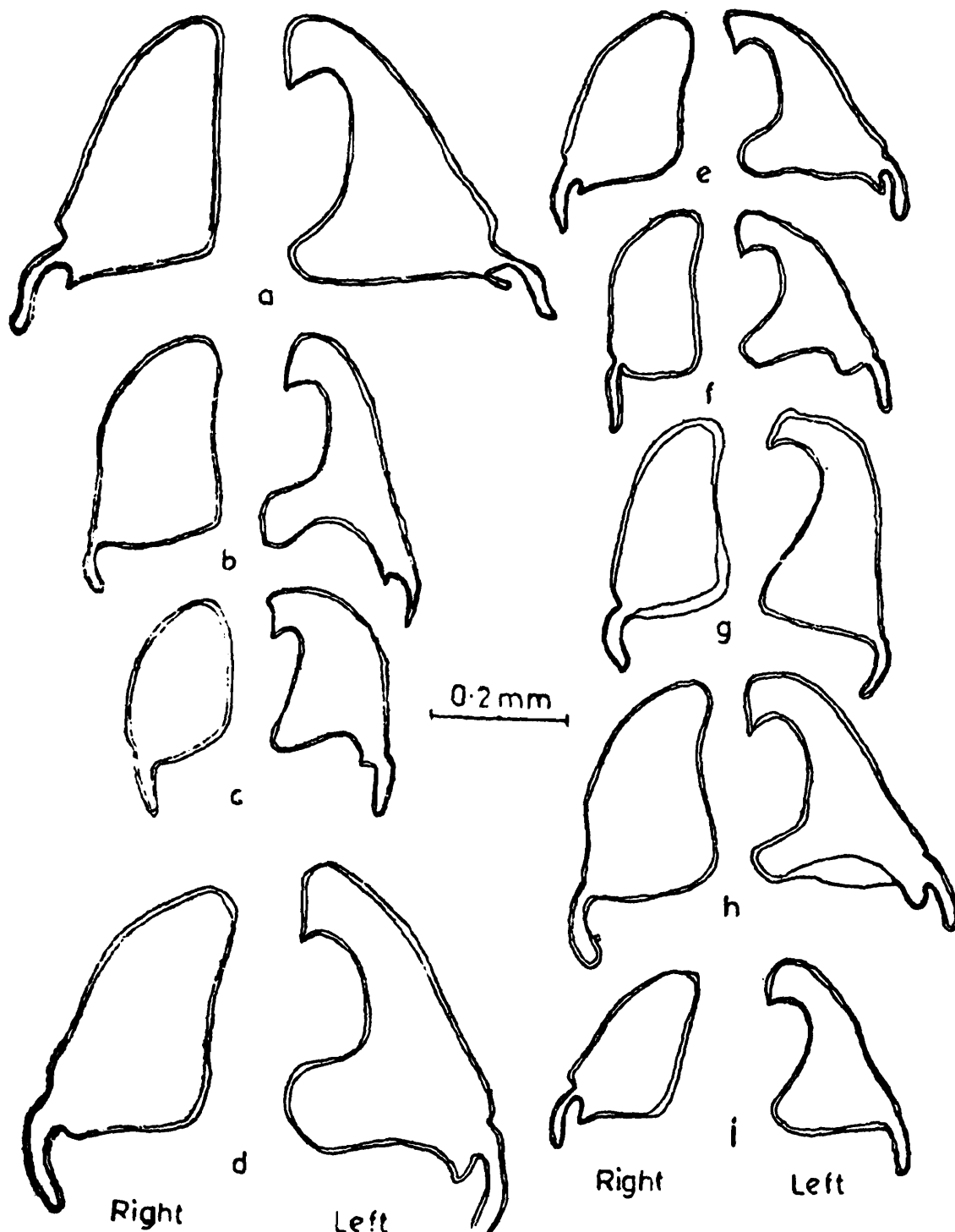


Fig. : 7 Right and left genital parameres of adult male of *Anisops* spp. a. *A. barbata* Brooks
 b. *A. bouvieri* Kirkaldy c. *A. breddeni* Kirkaldy d. *A. campbelli* Brooks e. *A. cavifrons*
 Brooks f. *A. exigera* Horvath g. *A. paranigrolineata* Brooks h. *A. sardea* Herrich-Shaffer i.
A. waltirensis Brooks

foretarsi have five smaller prominent spines. The chaetotaxy of male foretibia is as in Fig. 6 g. The left paramere of male is slightly excavate (Fig. 7 f) and the female ovipositor is as in Fig. 8 f. This species is also reported from backwaters of Kerala.

Material examined Pudukkottai Dt 5 (Male), 1 (Female) from Atthipallam, 4. V. 1986, Coll G. Thirumalai.

Distribution INDIA , NEW GUINEA , VIETNAM.

14. *Anisops paranigrolineata* Brooks

Anisops paranigrolineata Brooks, 1951. *Kans. Univ. Sci. Bull.*, 34 : 407.

Anisops paranigrolineata is so far known only from India and has a remarkable distribution in being restricted so far to Maharashtra, Tamilnadu and Uttar Pradesh. The interocular space is not swollen. The male foretibia chaetotaxy is in Fig. 6 f. The left paramere in male is little excavate (Fig. 7 g) and the female ovipositor is as in Fig. 8 g.

Material examined Dharmapuri Dt 1 (Male) 2 (Female) from Sitteri-Horur Road, Maamarathuodai, alt. 430-620 M, 4. III. 1986. Coll K. M.

Distribution INDIA.

15. *Anisops sardea* Herrich-Shaffer

Anisops sardeus Herrich-Shaffer, 1850. *Die Wanzenartigen Insecten*, 9 : 41 ; Distant, 1906. *Fauna British India*, 3 : 45 ; *A. sardeus* (H-S) : Kirkaldy 1904, *Wiener Ent. Zeit.*, 23 : 114 ; Hafiz & Pradhan, 1947. *Rec. Indian Mus.*, 45 : 350 ; Brooks, 1951, *Kan. Univ. Sci. Bull.*, 34 : 423 ; Thirumalai, 1989 *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 26.

This is a moderately larger species (more than 7.3 mm) with the male having a cephalic projection, the two basal tibial setae of anterior legs in male spatulate (Fig. 6 h). The right and left parameres are as in Fig. 7 h with the left deeply excavate. The ovipositor of female with the longitudinal teeth and lateral tooth-like setae are as in Fig. 8 h. *A. sardea* has a wide distribution. It is known to occur in Mediterranean countries and Western Asia and also widely distributed in Ethiopian, Oriental and Southern Palearctic regions.

Material examined Dharmapuri Dt 1 (Female) from Anchetty-Natrapalayam Road, alt. 475 M, 13. IV. 1985 , 1 (Male) from Doddahalla River, South Anchetty, alt. 500 M, 14. IV. 1985, Coll K. M.

Distribution : AFGHANISTAN ; AFRICA ; ALBANIA ; CANARY ISLANDS ; INDIA ; MYANMAR ; SYRIA ; TURKEY

16. *Anisops waltirensis* Brooks

Anisops waltirensis Brooks, 1951, *Kans. Univ. Sci. Bull.*, 34 : 457 ; Lansbury, 1964, *Ann. Zool. Warszawa*, 22 : 214 ; Thirumalai , 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 27.

A waltirensis has been so far known only from India and can easily be recognised by the much narrower synthlipsis, acuminate rostral prong at the apex, chaetotaxy of male fore tibia (Fig. 6 i) and presence of three small prominent spines on the male fore tarsus. The female ovipositor is normal and as in Fig. 8 i & the male parameres are as shown in Fig. 7 i.

Material examined : Pudukkottai Dt 1 (Male) , 1 (Female) from Trichy Road, 21 I. 1985 ; 1(Male) from Koppanapatti, 26. I. 1985 ; 4 (Male) ; 8 (Female) from Arimalam, 1. II. 1985 ; 10 (Male) , 22 (Female) from Atthipallam, 4. V. 1986, Coll G. Thirumalai.

Distribution : INDIA.

FAMILY

NEPIDAE

The family Nepidae comprises of dorsoventrally flattened or cylindrical bugs with long and slender legs, the anterior pair of which is raptorial. They are predatory, cryptic, found in very shallow water at the edges of ponds or slow streams, and well adapted from climbing. Two subfamilies, i. e., Nepinae and Ranatrinae are recognised and the family contains 14 genera and nearly 250 species, besides several Old world generic taxa, the status of which is still in doubt. In India, the family is represented by three genera and 15 species ; of these , 2 genera and 5 species are included in the present study.

KEY TO THE SPECIES OF NEPIDAE OF DHARMAPURI AND PUDUKKOTTAI DISTRICTS

1. Body oblong or elongately subovate ; pronotum as long or a little shorter than broad (Subfamily Nepiane) 2
 - Body very long, narrow and thin , pronotum longer than broad (Subfamily Ranatrinae) 3
2. Small, not exceeding 20 mm length, prosternum strongly acute along the median line *Laccotrephes griseus*(Guerin)

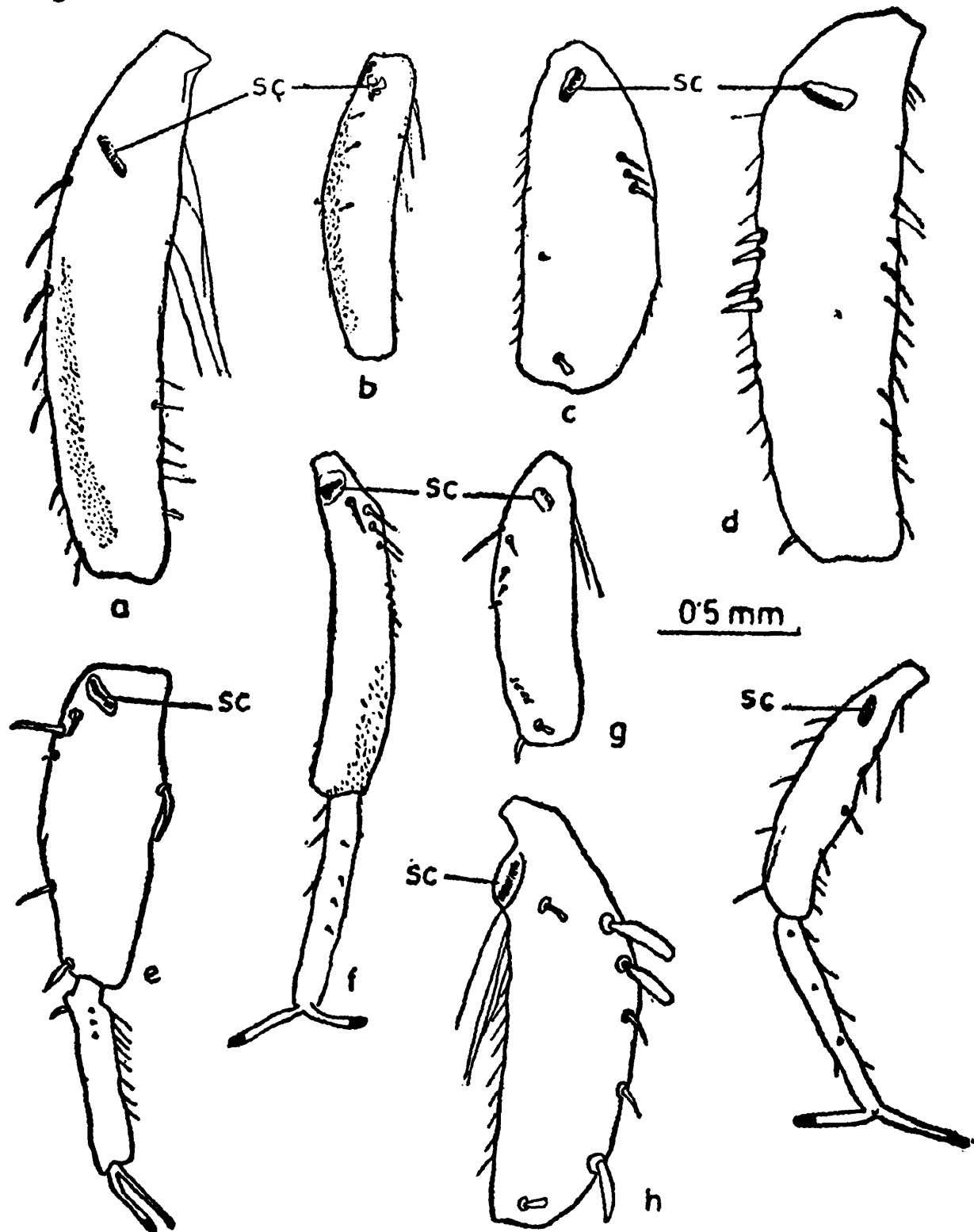
Fig.6 Male fore tibiae and tarsi of Anisops spp.

Fig. : 8. Laterodorsal view of Ovipositors of adult female of *Anisops* spp.
 a. *A. barbata* Brooks b. *A. breddeni* Kirkaldy c. *A. bouvieri* Kirkaldy d. *A. campbelli* Brooks
 e. *A. cavifrons* Brooks f. *A. exigera* Horvath g. *A. paranigrolineata* Brooks h. *A. sardea*
 Herich-Shaffer i. *A. waltirensis* Brooks

- Long, more than 20 mm length ; prosternum convex
 *Laccotrephes ruber* (Linnaeus)
3. Large body size (38-60 mm) ; respiratory siphon equal or longer than the
 body *Ranatra elongata* Fabricius
- Small body size (20-30 mm) ; respiratory siphon shorter than the body
 4
4. Fore femora broad with irregular brown markings *Ranatra varipes*
 Stal
- Fore femora not broad without brown markings, scarcely annulated with
 light and brown rings..... *Ranatra filiformis* Fabricius

SUBFAMILY

NEPINAE

17. *Laccotrephes griseus* (Guerin)

Nepa griseus Guerin, 1844, *Iconogr. Regne. Anim. Ins.*,- 352. *Laccotrephes griseus*
 (Guerin) : Distant, 1910b, *Fauna British India*, 5 : 314 ; Ravishankar & Venkatesan, 1988,
Entomon, 13 : 227 ; Thirumalai , 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 28.

This is a very sluggish species often found under weeds or at the
 bottom of water in slow or stagnant waters. It is a very common
 species in peninsular India and occurs in permanent ponds near the edges. The
 parameres are symmetrical and slightly hooked (Fig. 9 b). The abdominal
 appendages are distinctly shorter than the body. Based on the sexual dimorphic
 and alpha characters, Ravisankar and Venkatesan (1988) redescribed *L. griseus*
 and *L. ruber* (Linn.) and commented on their affinities with closely allied forms.

Material examined : Dharmapuri Dt 1 (Male) , 1 (Female) from Teertharu,
 Hosur-Muruyamma Bridge, alt. 700 M, 4. IV. 1985 ; 6 (Male) ; 4 (Female)
 from Doddahalla River, South Anchetty, alt. 500 M, 14. IV. 1985, Coll K. M.
 Pudukkottai Dt. 1 (Male) from Pudukkottai-Poonamaravathi Road, 20. I. 1985,
 1 (Male), 1 (Female), 4 immature stages from Pudukkottai Town, 23. I. 1985 ;
 2 (Male) from Vamban, 3. II. 1985 ; 1 (Male) from Melatemathapatti , 3. V.
 1986 ; 2 (Male) , 1 (Female) from Atthipallam. 4. V. 1986 ; 1
 (Male) , 5 (Female), 1 immature stage from Namnasamudram Road, 8. V.
 1986 , 2 (Male), 3 (Female) from Pudukkottai-Trichy Road, 12. V. 1986, Coll
 G. Thirumalai.

Distribution INDIA , MALAYSIA , MYANMAR , SEYCHELLES ,
 SRILANKA , THAILAND.

18. *Laccotrephes ruber* (Linnaeus)

Nepa ruber Linnaeus, 1764, *Mus. Lud. Ulr.*, 165 ; *Laccotrephes ruber* (Linnaeus) : Distant 1906, *Fauna British India*, 3 : 18 ; Ravishankar & Venkatesan, 1988, *Entomon*, 13: 231 ; Thirumalai, 1989, *Misc. Occ. Pap. Rec. Zool. Surv. India*, 118 : 29.

This is a larger species with the abdominal appendices slightly longer than the body. The male parameres are curved and hook-shaped (Fig. 9 a). *L. ruber* is reported from a wide variety of habitats like rivers, streams, tanks etc., and is the most common species widely distributed in the Indo-Australian region.

Material examined : Pudukkottai Dt 5 (Male) , 7 (Female) from Pudukkottai-Poonnamaravathi Road, 20. I. 1985 ; 4 (Male) , 2 (Female) from Namanasamudram and 2 (Female) from Arsampatti, 22. I. 1985 , 1 (Male) from Poolalpatti, 27. I. 1985 ; 1 (Female) from Melatemathapatti, 3. V. 1986 ; 1 (Male), 2 (Female) from Arimalam-Mimisal Road, 13. V. 1986, Coll G. Thirumalai.

Distribution : CHINA , INDIA ; JAPAN ; NEPAL , PAKISTAN , TAIWAN.

SUBFAMILY

RANATRINAE

19. *Ranatra elongata* Fabricius

Ranatra elongata Fabricius, 1790, *Skrif. Nat. Selesk.*, 1 : 228 ; Distant, 1906, *Fauna British India*, 3 : 20; Lansbury, 1972, *Trans. R. Ent. Soc. Lond.*, 124 : 306 ; Thirumalai , 1989, *Misc. Occ. Pap. Rec. zool. Surv India*, 118 : 30.

The metasternal process is subtriangular and longitudinally foveately sulcate centrally ; forecoxae are two-thirds the length of prothorax and anterior lobe of prothorax less than twice the length of posterior lobe. *R. elongata* has been reported to feed on tadpoles, nymphs of dagonflies and mayflies and other aquatic hemipterans. During adverse situations, especially when water drives up, this species is known to migrate to suitable areas. Rao (1962, 1976) has paid attention to the bioecological aspects of this species.

Material examined : Dharmapuri Dt. 1 (Female) from Maamarathuodai, Sitteri-Horur Road, alt. 430-620 M, 4. III. 1986, Coll K. M.. Pudukkotai Dt 1 (Male) , 1 (Female) , 1 immature stage from Arimalam, 1. II. 1985, Coll. G. Thirumalai.

Distribution : AUSTRALIA ; INDIA ; NEPAL ; SRILANKA.

20. *Ranatra filiformis* Fabricius

Ranatra filiformis Fabricius, 1790, *Skrif. Nat. Selsk.*, 1 : 228 ; Distant, 1906, *Fauna British India*, 3 : 21 ; Lundblad, 1934 *Arch. Hydrobiol. Suppl.*, 12 : 36 ; Lansbury, 1972, *Trans. R. ent. Soc. Lond.*, 124 : 320 ; Thirumalai, 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 31.

This species is rather smaller than *R. elongata* and the males are identified by the absence of a tooth but with several stout spines on the inner margins of distally hook-shaped parameres (Fig. 9 c) and by the wide interocular space. The respiratory siphon is shorter than the body. *R. filiformis* mostly occurs amid vegaation fringing the shallower parts of water bodies, where it clings to the submerged vegetation. It preys on live nymphs of dragonflies and mosquito pupae, which are caught between the raptorial forelegs. The biocological aspects of this species have been studied by Nowrojee (1911), Rao (1976) and Kumari & Nair (1984).

Material examined : Pudukkottai Dt. 1 (Male), 2 (Female) from Pudukkottai-Ponnamaravathi Road, 20. I. 1985 , 5 (Male), 1 (Female) , 1 immature stage from Namanasamudram and 1 (Female) , 1 immature stage from Arsampatti, 22. I. 1985 , 5 immature stages from Paramangudi, 29. I. 1985 ; 3 (Male), 5 (Female) 3 immature stages from Viramalai Road, 2. II. 1985 , 1 (Female) from Adanankottai, 11. V. 1986, Coll G. Thirumalai.

Distribution INDIA ; NEPAL , PAKISTAN ; PHILIPPINES ; SRILANKA.

21. *Ranatra varipes* Stal

Ranatra varipes Stal, 1861, *Ofvers. K. Vetensk. Akad. Forh.*, 18 : 203 ; Lundblad, 1934, *Arch. Hydrobiol. suppl.*, 12 : 34 ; Lansbury, 1972, *Trans. R. ent. Soc. Lond.*, 124 : 316.

Ranatra varipes is readily distinguished by the characteristic structure of male paramere which is hatchet-shaped distally. The fore femora are broad with irregular brown markings.

Material examined : 5 (Female) from Mamanasamudram, 8. V. 1986, Coll G. Thirumalai.

Distribution AUSTRALIA ; INDIA , INDONESIA ; MALAYSIA ; MYANMAR , TAIWAN.

FAMILY

BELOSTOMATIDAE

The family includes the largest of the aquatic hemipterans. The identification of the taxa has been rendered difficult because of the similarity in appearance and most of them are separable only by ambiguous and the much variable genitalic characters (Polhemus, 1982). The most distinctive adult belostomatid feature is a pair of retractable, straplike appendages at the abdominal apex, each bearing a spriacle basally. There are nine genera with about 150 species worldwide, referable to three families, of which 3 genera and 7 species are Indian. Species of this family are predacious and live in large and small ponds,

Fig. 9

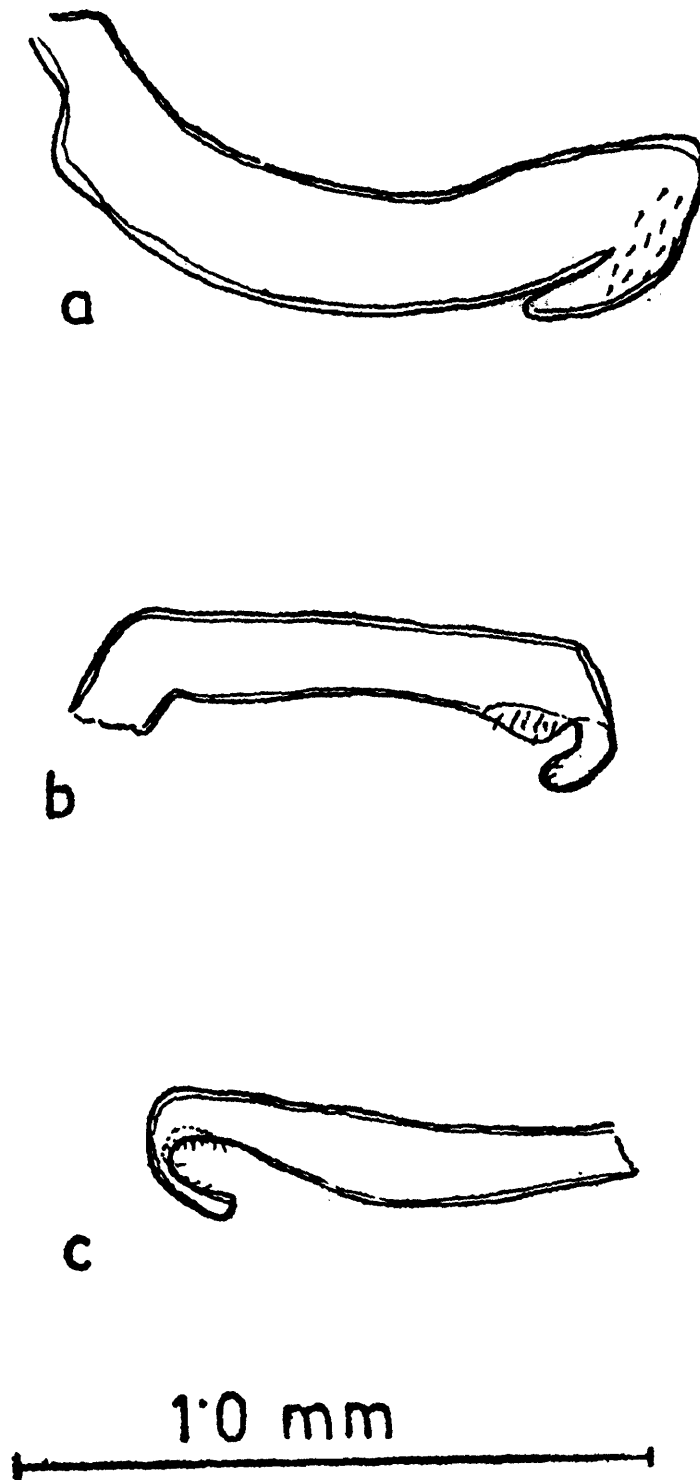


Fig. : 9. a. *Laccotrephes ruber* (Linnaeus) - paramere of adult male. b. *Laccotrephes griseus* (Guerin) - paramere of adult male. c. *Ranatra filiformis* (Fabricius) paramere of adult male.

streams and swamps. *Lethocerus* Mayr has been reported to kill even a full-grown frog and even a small woodpecker, while some belostomatids are known to feed on snails, potential vectors of Schistosomiasis.

KEY TO THE SPECIES OF BELOSTOMATIDAE OF DHARMAPURI AND PUDUKKOTTAI DISTRICTS

Lateral basal margins of pronotum and embolium pale ; fore tarsus single segmented *Diplonychus rusticus* (Fabricius)

Lateral basal margins of pronotum and embolium not pale ; fore tarsus two segmented *Diplonychus annulatum* (Fabricius)

SUBFAMILY BELOSTOMATINAE

22. *Diplonychus annulatum* (Fabricius)

Nepa annulatum Fabricius, 1803, *Systema Rhyngotorum*, 106. *Sphaerodema annulatum* (Fab.); Distant, 1906, *Fauna British India*, 3 : 35 ; Hafiz & Pradhan, 1947 *Rec. Indian Mus.*, 45 : 375 ; Venkatesan & Rao, 1981, *J. Bombay nat. Hist. Soc.*, 77 : 299.

This is rather a large species (more than 20 mm long) with greatest expanse of hemelytra which together size up the total body length. The anterior tarsus is two segmented.

Material examined Dharmapuri Dt. 1 (Female) from Doddahalla River, South Anchetty, alt. 500 M, 14. V. 1985, Coll K. M.

23. *Diplonychus rusticus* (Fabricius)

Nepa rustica Fabricius, 1794, *Ent. Syst.*, 4 : 62 ; *Sphaerodema rusticum* (Fab.) : Distant, 1906 *Fauna British India*, 3 : 36 ; Lundblad, 1934, *Arch. Hydrobiol. Suppl.*, 12 : 55. *D. rusticus* (Fab.) : Lauck & Menke, 1961, *Ann. Entomol. Soc. Amer.*, 54 : 649 ; Venkatesan & Rao, 1981, *J. Bombay nat. Hist. Soc.*, 77 : 299 ; Thirumalai 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 32.

This is a smaller species (less than 20 mm) with single segmented fore tarsus and a smaller claw, head length shorter than the width between the eyes. *D. rusticus* is commonly found in fish ponds and is a voracious feeder on fish larvae. It is also known to feed on a wide variety of aquatic organisms including mosquito larvae.

Material examined Pudukkottai Dt. 2 (Female), 1 immature stage from Pudukkottai-Ponnamarvathi Road, 20. I. 1985, 1 (Male), 2 (Female) from Poolampatti, 27. I. 1985, 10 (Female), 2 immature stages from Mallaiedu, 14. V. 1986, Coll G. Thirumalai.

Distribution : AUSTRALIA ; CHINA ; INDIA ; INDONESIA , JAPAN , MALAYSIA ; MYANMAR ; NEW GUINEA ; NEW ZEALAND , SRILANKA ; THAILAND.

FAMILY

MESOVELIIDAE

The family Mesoveliidae comprises of small, slender, semi-aquatic greenish insects, characterised by the saw-like ovipositor and three segmented tarsi. The macropterous forms have two or three closed cells in the forewing, ocelli and exposed scutellum elevated at base, while the apterous forms lack ocelli (or reduced), scutellum and wing pads. The majority of these bugs live upon the banks or weedy surfaces of ponds or streams, while a few live on rocks in streams, and some species are terrestrial. The two genera, *Speovelia* Esaki & *Darwinivelia* Andersen & Polhemus prefer intertidal zone as habitat. These bugs are carnivorous, feeding on a variety of dead or disabled insects found on the water surface or floating vegetation. They are also reported to feed on weaker members of their ownkind. Apterous forms far outnumber macropterous forms in *Mesovelia* Mulsant & Rey.

The family Mesoveliidae, which is divided into two subfamilies, enjoys a worldwide distribution but most genera have apparently a restricted range, with the genus *Mesovelia* being cosmopolitan in its distribution. A total of thirty seven species in nine genera are known so far, out of which one genus and three species referable to one subfamily are reported from India.

KEY TO THE SPECIES OF MESOVELIIDAE OF DHARMAPURI AND PUDUKKOTTAI DISTRICTS

Middle femora not hairy below ; the last abdominal segment of male with a single median spines in group..... *Mesovelia vittigera* Horvath

Middle femora hairy below ; the last abdominal segment of male without the single median spines in group..... *Mesovelia horvathi* Lundblad

SUBFAMILY

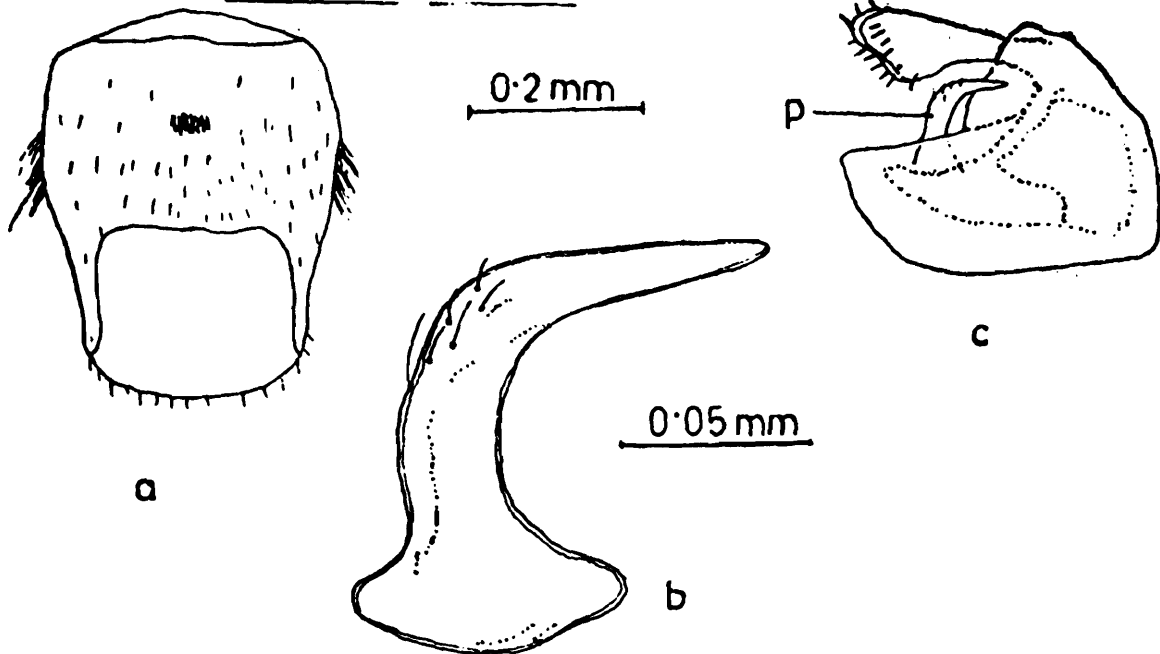
MESOVELIINAE

24. *Mesovelia horvathi* Lundblad

Mesovelia horvathi Lundblad, 1934 , *Arch. Hydrobiol. Suppl.*, 12 : 190 ; Andersen & Polhemus, 1980, *Ent. Scand.*, 11 : 390 ; Thirumalai, 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 35.

The body length is not more than 2 mm long, with middle femora hairy below. The last abdominal segment, in males, is without the median spines but

Fig. 10 Mesovelia vittigera Horvath



Mesovelia horvathi Lundblad

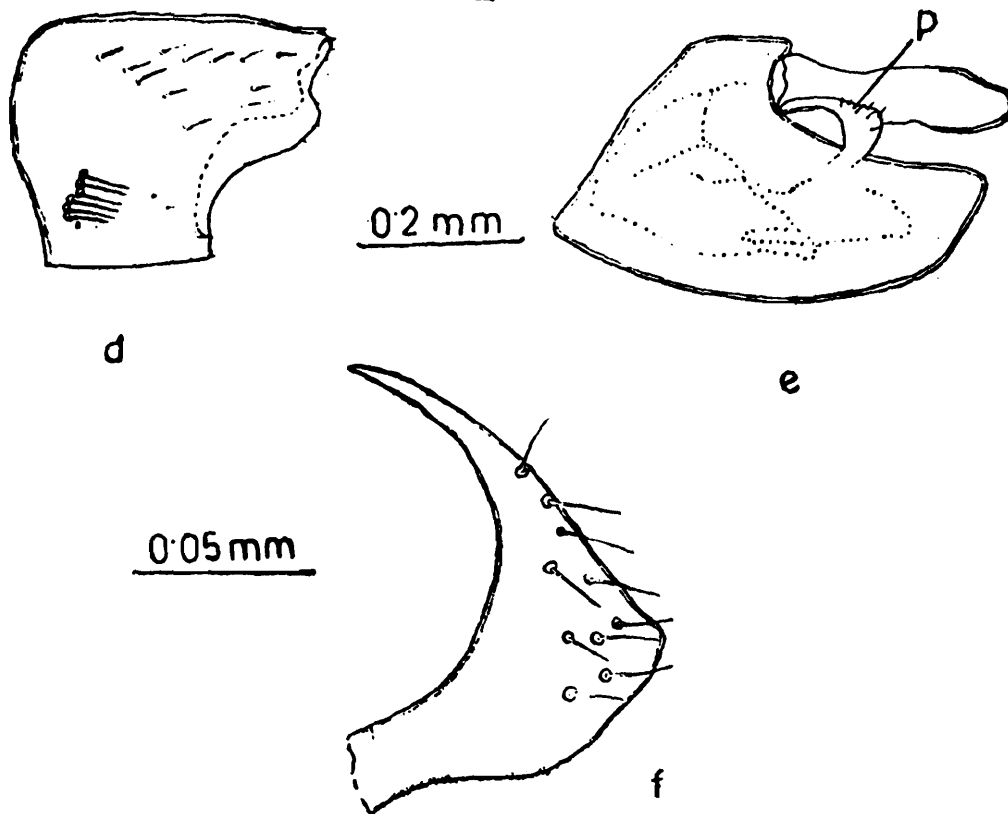


Fig. : 10 *Mesovelia vittigera* Horvath adult male a. Last abdominal ventral segment b. Lateral view of last genital segments (P - paramere) c. Paramere *Mesovelia horvathi* Lundblad adult male d. Lateral view of last abdominal segment. e. Lateral view of last genital segments (P Paramere) f. Paramere.

with two lateral groups of spines (Fig. 10 d). The lateral view of last male abdominal segments and male paramere are as in Fig. 10 e & f. This species is very widely distributed in India. *M. horvathi* has been recorded from Tamilnadu including Eastern Ghats (Thirumalai, 1989).

Material examined : Pudukkottai Dt. Apterous 1 (Female) from Arimalam, 1. II. 1985, Coll G. Thirumalai.

Distribution : INDIA , INDONESIA ; MALAYSIA , SRILANKA , THAILAND ; VIETNAM.

25. *Mesovelia vittigera* Horvath

Mesovelia vittigera Horvath, 1895, *Rev. Entomologie*, 14 : 160. *M. orientalis* Kirkaldy, 1901 b, *Ann. Mus. Civ. Genova*, 20 : 808 ; Lundblad, 1934, *Arch. Hydrobiol. Suppl.*, 12 : 186; *M. mulsanti* white : Distant , 1903, *Fauna British India*, 2 : 169 ; Distant, 1910 b, *ibid*, 5 : 137. *M. vittigera* Horvath, 1915, *Ann. Mus. Nat. Hung.*, 8 : 550 ; Hafiz & Riebeiro, 1939, *Rec. Indian Mus.*, 41 : 424 ; Andersen & Polhemus, 1980, *Ent. Scand.*, 11 : 390 ; Thirumalai, 1989. *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 35.

M. vittigera is a remarkably distributed over a wide range viz., South Europe, Eastern Palaearctic, Ethiopian, Orient, Australia, Oceanica, eastward to Samoa Islands which is unmatched by any other species of semi-aquatic bugs. In males, the abdominal ventral segment possess a group of median spines and two sets of brush like hairs laterally (Fig. 10 a). The lateral view of last abdominal segments and male paramere are as shown in Fig. 10 b & c. The middle femur, in females, is spiny below. This species prefers stagnant or slow running water covered by emergent or floating vegetation.

Material examined : Pudukkottai Dt. Apterous 1 (Male), 1 (Female) from Viralimalai Road, 2. II. 1985, Coll G. Thirumalai.

Distribution : AFRICA ; AUSTRALIA ; EGYPT ; INDIA ; INDONESIA ; MALASIA , PALESTINE , PHILIPPINES ; SYRIA ; SAMOA ISLANDS ; SRILANKA.

FAMILY

HYDROMETRIDAE

The members of this family are thin, slender, with thread-like legs and very elongate heads as long as the thorax. The adults are dimorphic in respect of wings. Majority of hydrometrids are found near the margin of ponds, streams, ditches, or on floating emergent vegetation, while a few primitive taxa are predominantly terrestrial, commonly found on vertical rock surfaces above the water level. The family contains about ninety one species, classified as three subfamilies and seven genera, of which three species of the genus *Hydrometra* Lamarck are found in India.

KEY TO THE SPECIES OF HYDROMETRIDAE OF DHARMAPURI AND PUDUKKOTTAI DISTRICTS

The terminal dorsal process one half as long as the sixth abdominal segment ; sixth abdominal segment swollen ventrally..... *Hydrometra butleri* Hungerford & Evans

The terminal dorsal process not proportionate; sixth abdominal segment not swollen ventrally *Hydrometra greeni* Kirkaldy

SUBFAMILY : HYDROMETRINAE

26. *Hydrometra butleri* Hungerford & Evans

Hydrometra butleri Hungerford & Evans, 1934, *Ann. Mus. Nat. Hung.*, 28 : 71.

This species is endemic to India and can be distinguished by the swollen ventral sixth abdominal segment ; a brush of stiff hair extends to the posterior margin in males (Fig. 11d). The male parameres are symmetrical (Fig. 11 e & f). The terminal dorsal process is sharp, long and about one half as long as the 6th abdominal segment in both the sexes.

Material examined : Dharmapuri Dt : 1 (Male) from Anchetty Reserve forest, Todchalla River, alt. 500 M, 11. IV. 1985, Coll : K. M. Pudukkottai Dt : 3 (Female) from Pudukkottai-Trichy Road, 12. V. 1986, Coll : G. Thirumalai.

Distribution : INDIA.

27. *Hydrometra greeni* Kirkaldy

Hydrometra greeni 1898, Kirkaldy, *Entomologist*, 31 : 2. *H vittata* Stal : Distant, 1903, *Fauna British India*, 2 : 170 ; Hungerford & Evans, 1934, *Ann. Mus. Nat. Hung.*, 28 : 79 ; Thirumalai, 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 38.

The hemelytra extends upto the 5th abdominal segments in both the sexes. A transverse depression on the 6th ventral abdominal segment along the dorsal margin is fringed with short erect hair in males (Fig. 11 a) The males last abdominal segments and paramere are as shown in Fig. 11 b & c. This species is widely distributed all over India and is also reported to have been attracted towards light.

Material examined : Dharmapuri Dt : 1 (Male), 1 (Female) from Anchetty Reserve Forest, Todchalla River, alt. 500 M, 11. IV. 1985, Coll : K.M. Pudukkottai Dt : 1 (Male) from Pudukkottai-Ponnamaravathi Road, 20. I. 1985 ; Coll : G. Thirumalai.

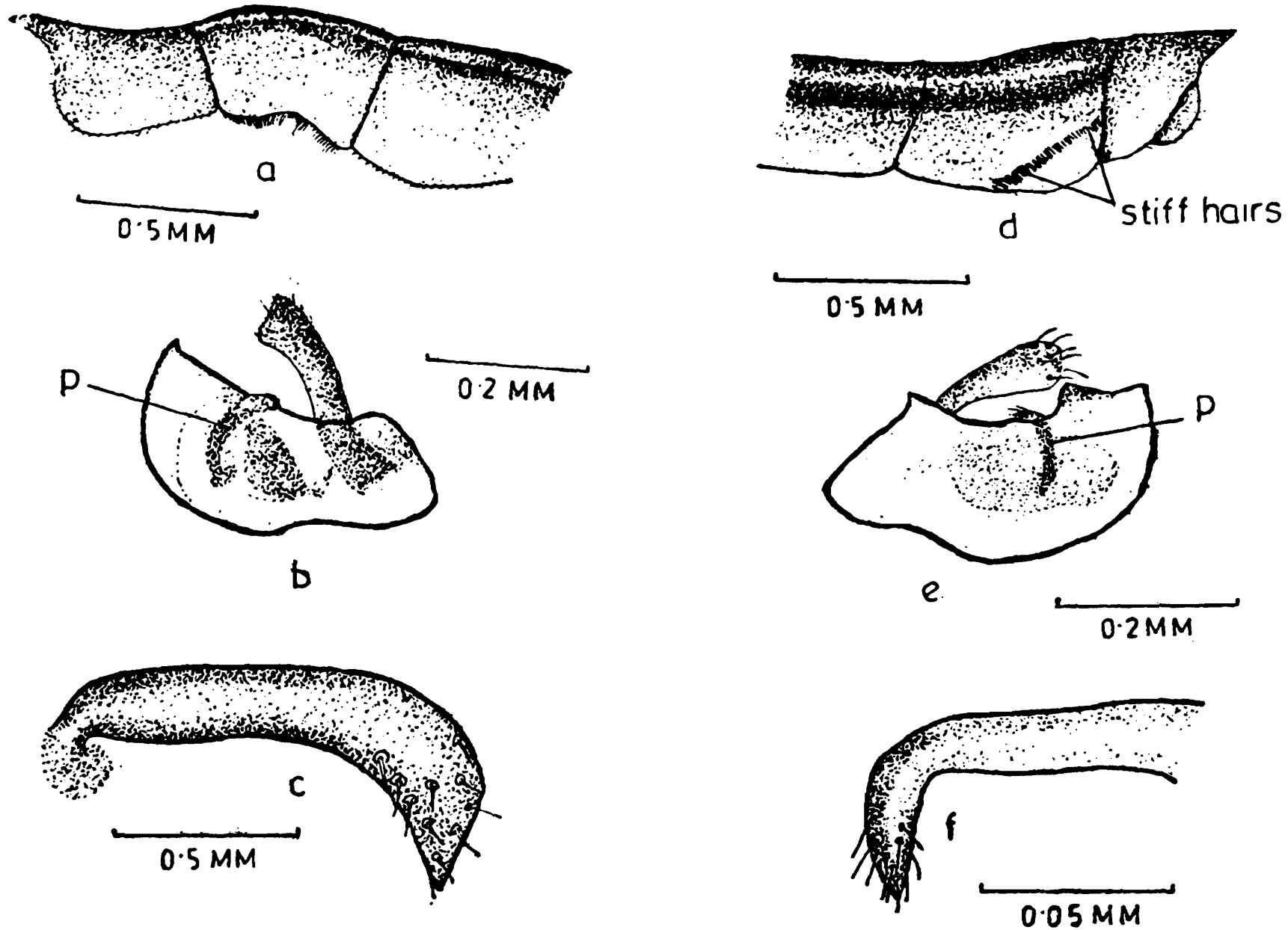


Fig. : 11 *Hydrometra greeni* Kirkaldy Adult male a. Lateral view of fifth, sixth and seventh abdominal segments. b. Lateral view of last genital segments (P - paramere) c. Paramere. *Hydrometra butleri* Hungerford & Evans (Adult male) d. Lateral view of fifth, sixth and seventh abdominal segments. e. Lateral view of last genital segment (P- Paramere) f. Paramere.

Distribution : INDIA ; JAPAN ; MALAYSIA ; MYANMAR ; PHILIPPINES ; SRILANKA.

FAMILY : GERRIDAE

The family Gerridae, popularly known as 'water striders' or 'Pond Skaters' are elongate or oval insects with subapical claws, hind femora reaching beyond the apex of abdomen and the middle leg usually distinctly longer than the hind legs. The body is covered with a velvety hydrofuge hairpile and the body colour varies, from black or grey to brown, the dorsum being marked with light grey or yellow lines or spots. Both macropterous and apterous forms are frequently encountered. The family Gerridae contains about 71 genera and slightly over 460 species grouped in eight subfamilies of which 23 genera and about 59 species of seven subfamilies are found in India. Gerrids are found in all kinds of water bodies and their habitat ranges from tiny ponds to lakes, trickles to rivers and the open ocean as well. They are predaceous and prey on mainly insects and other organisms that float on the water as well as other aquatic forms found on the surface.

KEY TO SUBFAMILIES OF GERRIDAE OF DHARMAPURI AND PUDUKKOTTAI DISTRICTS.

1. **Metasternum greatly reduced, represented by a very short subtriangular plate behind mesonotum..... Halobatinae**
Metasternum well developed..... 2
2. **Fore tarsus very long, at least one half the length of tibia..... Ptilomerinae**
Fore tarsus not long..... 3
3. **Pronotal lobe reduced in wingless forms; middle and hind tarsi with ventral spinous hairs ; lateral sutures between meso and metathorax distinct..... Eotrechinae**
Pronotal lobe not reduced in wingless forms ; lateral sutures between meso and metathorax indistinct..... Gerrinae

KEY TO THE SPECIES OF GERRIDAE OF DHARMAPURI AND PUDUKKOTTAI DISTRICTS,

1. **Body comparatively long and thin 2**
Body comparatively elongate or oval 7
2. **Hind tarsus fused; distal half of middle femur bears a dense brush of long hairs in males *Ptilomera (Ptilomera) agroides* Schmidt**

- Hind tarus not fused ; no dense brush of long hairs in males..... 3
3. Anterior part of pronotum with a pair of elongate spots or lines. Pronotal lobe usually with a median line covering the entire mesonotum in winged forms..... 4
- Anterior part of pronotum not as above, but with a large median light spot. Pronotal lobe without a median line in winged forms..... *Neogerris parvula* (Stal)
4. Seventh abdominal tergite in male produced into a spine like process. Pronotum with a dark line to its entire length 5
- Seventh abdominal tergite in male not as above, but connexivum terminating in a fairly prominent spine. Pronotum with yellow spots or median yellow longitudinal stipe..... 6
5. Middle coxa with a spine like projection on the dorsolateral rear margin. Second antennal segment shorter than third..... *Tengogonus (Limnometra) fluviorum* (Fabricius)
- Middle coxa without spine like projection. Second antennal segment longer than third..... *Aquarius adelaidis* (Dohrn)
6. Connexivum terminating in a fairly prominent spine. Pronotal lobe without yellow median line..... *Limnogonus (Limnogonus) nitidus* (Mayr)
- Connexivum not terminating in a prominent spine. Pronotal lobe with a median yellow line extending to its entire length..... *Limnogonus (Limnogonus) fossarum fossarum* (Fabricius)
7. Body elongate. Hind tibia and tarsus shorter than hind femur..... *Amemboa* *(Amemboa) kumari* (Distant)
- Body oval & flattened. Hind tibia and tarsus not proportionate *Metrocoris stali* (Dohrn)

SUBFAMILY

GERRINAE

28. *Limnogonus (Limnogonus) fossarum fossarum* (Fabricius)

Cimex fossarum Fabricius, 1775, *Syst. Ent.*, 727. *Gerris fossarum* (Fab.): Distant, 1903, *Fauna British India*, 2 : 178. *L. (L) fossarum* (Fab.): Matsuda, 1960, *Kans. Univ. Sci. Bull.*, 41 : 198 ; Andersen, 1975, *Ent. Scand. Suppl.*, 7 : 30 ; Thirumalai, 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 40.

This species can be separated from all other known species of gerrids by the colour pattern. The pronotal lobe is with a median yellow line extending its

entire length (Fig. 12 c). The connexivum does not terminate in a prominent spine (Fig. 12 d). *L. fossarum* is a common gerrid, widely distributed in Indo-Australian regions. It has a wide variety of habitats ranging from hot springs, brackish pools, from sealevel to about 1000 metres.

Material examined : Pudukkottai Dt apterous 1 (Male) , 3 (Female) from Foothills of Sevalimalai, 26. I. 1985 , apterous 7 (Female) ; macropterous 1 (Male), 4 (Female) from Viralimalai Road 2. II. 1985 , apterous 1 (Female) from Adanankottai, 11. V. 1986, Coll G. Thirumalai.

Distribution : CHINA.; HONGKONG , INDIA , INDONESIA , JAPAN MALAYSIA ; MYANMAR ; PHILIPPINES ; SINGAPORE , TAIWAN THAILAND ; VIETNAM.

29. *Limnogonus (Limnogonus) nitidus* (Mayr)

Hydrometra nitida Mary, 1865, *Verh. Zoo.*, 15 : 443. *Gerris nitida* (Mayr) : Distant, 1903. *Fauna British India*, 2 : 178. *L. nitidus* (Mayr) : Hafiz & Ribeiro, 1939, *Rec. Indian Mus.* 41 : 427 ; *L. (L.) nitidus* (Mayr) : Hungerford & Matsuda, 1959, *J. Kans. Ent. Soc.*, 32 : 41 ; Andersen, 1975, *Ent. Scand. Suppl.*, 7 : 62 ; Thirumalai : 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 41.

L. nitidus is easily separated from all the known species of this genus by the presence of fairly, prominent connexival spines and the anterior pronotal lobe is with yellow markings (Fig. 12 a,b) This species has been recorded from temporary pools, rice fields, ponds, etc., from sea level to about 1000 metres and is mostly found as winged individuals. It has also been reported (Anonymous, 1982) that *L. nitidus* as one of the predators of the Brown planthopper of Paddy.

Material examined : Dharmapuri Dt macropterous 2 (Male) , 2 (Female) from Anchetty- Natrapalayam Road, alt. 475 M, 13. IV. 1985 , macropterous 1 (Female) from Daddahalla River, South of Anchetty, alt. 5 00 M, 14. IV. 1985 , Coll K. M., Pudukkottai Dt macropterous 1(Female) from Pudukkottai-Ponnammaravathi Road, 20. I. 1985 ; macropterous 2 (Male) 2 (Female) from Trichy Road, 21. I. 1985 , macropterous 2 (Female) from Poolampatti, 27. I. 1985 , macropterous 1(Female) from Viralimalai Road, 2. II. 1985, Coll G. Thirumalai.

Distribution : INDIA, INDONESIA, MALASIA , MALDIVE ISLANDS , MYANMAR , NEPAL ; SINGAPORE , SRILANKA , THAILAND , VIETNAM.

30. *Neogerris parvula* (Stal)

Gerris parvula Stal, 1859, *Zoology*, 4 : 265 *Gerris tristan* Kirkaldy : Distant, 1903, *Fauna British India*, 2 : 179. *Limnogonus parvulus* (Stal) : Hafiz & Ribeiro, 1939, *Rec. Indian Mus.*, 41 : 427 ; L. (*Neogerris*) *parvulus* (Stal) : Matusuda, 1960, *Kans. Univ. Sci. Bull.*, 41 : 114 *Neogerris parvula* (Stal) Andersen, 1975, *Ent. Scand. Suppl.*, 7 : 86 ; Thirumalai, 1989, *Misc. Occ. Pap. Rec. zool. Surv.* 118 : 42.

A large round or quadrangular yellow spot on the pronotum separates this from all other known species (Fig. 12 e). This gerrid, widely distributed in Indo-Australian region, enjoys a distribution from the Eastern part of the Arabian Peninsula to Solomon Island and from Ryuku Islands to Java. Andersen (1975) has felt that the variation in the relative and length of the pronotal lobe among apterous individuals has no significance in the distributional pattern. This species is very common in slow running streams, reserviors, ponds and rain-fed pools.

Material examined Dharmapur Dt macropterous, 1 (Female) from Anchetty Reserve Forest, Todehalla River, alt. 500 M, 11. IV. 1985 ; macropterous, 2 (Male) , 1 (Female) from Anchetty-Natrapalayam Road, alt. 475 M, 13. IV. 1985 , macropterous, 1 (Male) from Daddahalla River, Anchetty, alt. 500 M, 14. IV. 1985, Coll K. M. Pudukkottai Dt macropterous 1 (Female) from Pudukkottai-Ponnamaravathi Road, 20. I. 1985 ; macropterous 2 (Female) from Trichy Road, 21. I. 1985 ; apterous, 1 (Male) from Foothills of Selvelimalai, 26. I. 1985 , macropterous, 1 (Male), 1 (Female) , 1 immature stage from Poolampatti, 27. I. 1985 , macropterous, 5 (Male) , 2 (Female) apterous, 1 (Male), 5 (Female), from Viralimali Road, 2. II. 1985. Coll. G. Thirumalai.

Distribution CHINA , INDIA , INDONESIA ; IRAN , JAPAN , MALAYSIA , MYANMAR ; NEW GUINEA ; OMAN ; PHILIPPINES , PAKISTAN ; SOLOMON ISLANDS ; SRILANKA ; TAIWAN , THAILAND , VIETNAM.

31. *Tenagogonus (Limnometra) fluviorum* (Fabricius)

Cimes fluviorum Fabricius, 1775, *Syst. Ent.*, 4 : 727 ; *Gerris fluviorum* (Fab.) : Distant 1903, *Fauna British India*, 2 : 177. *L. fluviorum* (Fab.) : Hungerford & Matsuda, 1958. *Kans. Univ. Sci. Bull.*, 39 : 401 ; Thirumalai, 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 43.

The middle coxa is with a spine-like projection on the dorsolateral rear margin, which differentiates this species from all other known species (Fig. 12 f). *L. fluviorum* is a very common species of gerrinae found throught Southern India and is also known to occur in a wide variety of fresh water habits.

Fig. 12

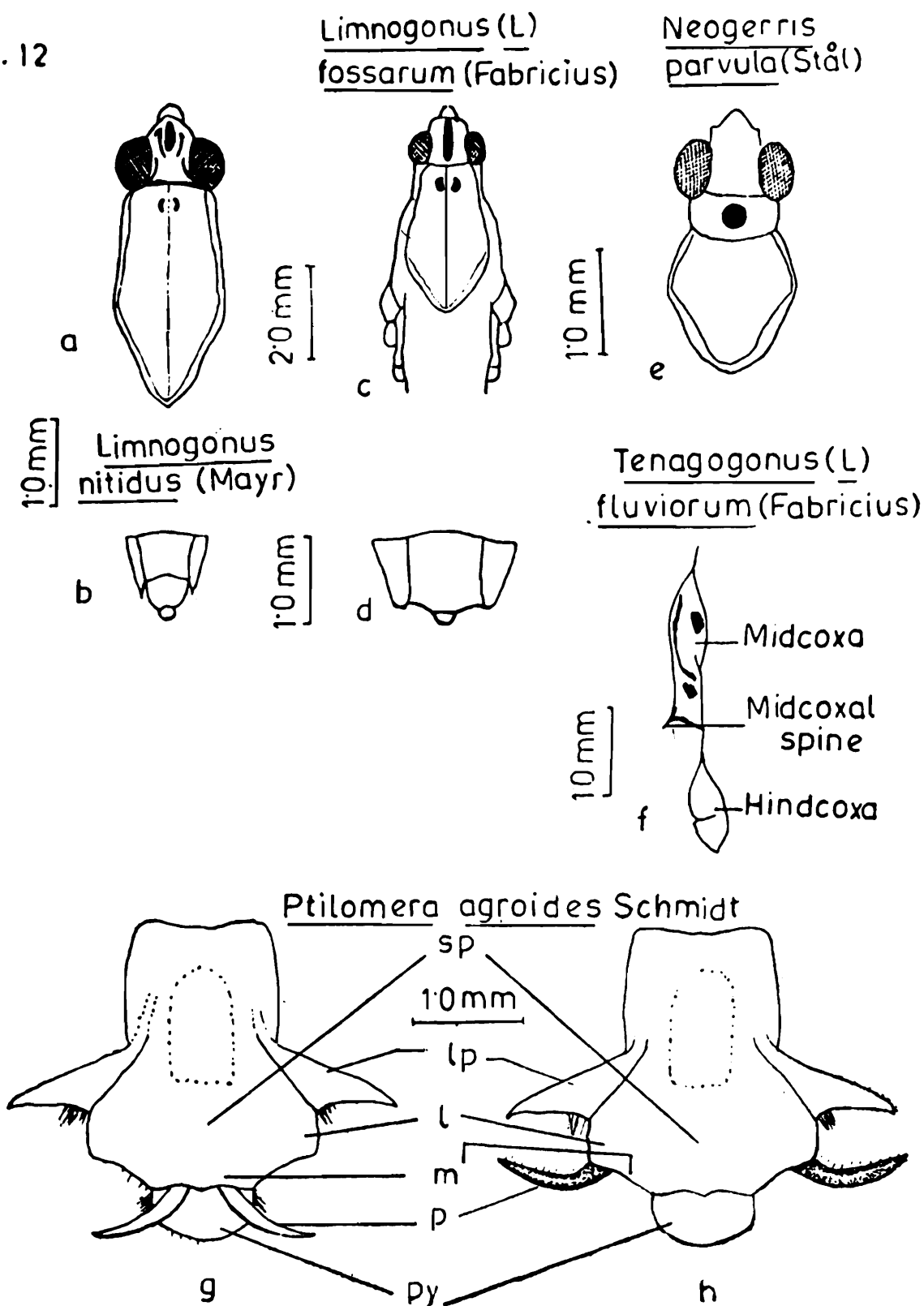


Fig. 12 : a. Dorsal view of head and pronotum *Limnogonus nitidus* (Mayr) (Winged male) b. Dorsal view of apical abdominal segment *Limnogonus nitidus* (Mayr) (Winged male) c. Dorsal view of head and pronotum *Limnogonus* (L) *fossarum* (Fabricius) (Winged female) d. Dorsal view of apical abdominal segment *Limnogonus* (L) *fossarum* Fabricius (Winged female) e. Dorsal view of head and thorax *Neogerris parvula* (Stal) (Winged male) f. Mid coxal spine of *Tenagogonus* (L) *fluviorum* (Fabricius) g & h. *Ptilomera agroides* (Schmidt apical genital segments (apterous male) L. Lateral wing L.P. Lateral Projection of Pygofer M. Median lobe P Paramere Py Pygofer sP Surnal plate.

Material examined : Dharmapuri Dt macropterous, 10 (Female) from Daddahalla River, Anchetty, alt. 500 M, 14. IV. 1985 ; macropterous, 2 (Female) from Sitteri-Horur Road, Maamarathuodai, alt. 430-620 M, 4. III. 1986, Coll K. M.

Distribution INDIA , PHILIPPINES , SRILANKA.

32. *Aquarius adelaidis* (Dohrn)

Gerris adelaidis Dohrn, 1860, *Stett. ent. Ztg.*, 21 : 408 *G. spinolae* Leth. & Sev., 1896, *Cat. gen. Hemip.*, 3 : 63 ; Distant , 1903 ; *Fauna British India*, 2 : 180 ; Hafiz & Mathai, 1938, *Rec. Indian Mus.*, 45 : 207. *Aquarius adelaidis* (Dohrn) ; Andersen , 1990 *Steenstrupia* 16 : 61.

This is one of the very common species inhabiting the permanent waterbodies in India, with both macropterous and apterous forms. The first antennal segments is the longest, the head, rostrum, pronotum and forelegs are black. The last abdominal segment, genital capsule and parameres are as in Fig. 13 a to c. *A. adelaidis* has a tropical, mainly continently South and Southeast Asian distribution (Andersen, 1990).

Material examined Pudukkottai Dt macropterous 7 (Male) , 6 (Female) , apterous 4 (Male) , 8 (Female) , 22 immature stages from foot hills of Selvelimalai, 26. I. 1985, Coll G. Thirumalai.

Distribution : BANGLADESH , CHINA ; INDIA , INDONESIA , MYANMAR , NEPAL , PHILIPPINES , SRILANKA , THAILAND , VIETNAM.

SUBFAMILY

EOTRECHINAE

33. *Amemboa (Amemboa) kumari* (Distant)

Onychotrechus kumari Distant, 1910 a, *Ann. Mag. nat. Hist.*, 5 : 145 ; Distant, 1910 b, *Fauna British India*, 5 : 147. *A. kumari* (Distant) ; Esaki, 1928, *Ann. Mag. nat. Hist.*, 2 : 509. *A. pervati* Pradhan, 1950 b, *Rec. Indian Mus.*, 48 : 12. *A. (A) kumari* (Distant) : Polhemus & Andersen, 1984, *Steenstrupia*, 10 : 85 ; Thirumalai, 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 45.

Fore femur in male relatively slender, with two separate hair tufts beyond middle, the basal hair tufts small and pointed. The females cannot be easily identified without the associated males. This species is reported to occur in small pools or on river banks. *A. kumari* is so far known from India.

Material examined Dharmapuri Dt Apterous, 1 (Female) from Kottapatti-Vannithiparai, Chinnar River, alt. 337 M, 25. II. 1986 , apterous, 1 (Female) from Singleri, alt. 290 M, 28. II. 1986 ; apterous, 4 (Male), 1(Female) from Shevroy Hills, alt. 450 M, 8. III. 1986, Coll K.M.

Distribution : INDIA

SUBFAMILY

PTILOMERINAE

34. *Ptilomera (Ptilomera) agroides* Schmidt

Ptilomera agroides Schmidt, 1926, *Ent. Mitt.*, 15 : 63 ; Hungerford & Matsuda, 1965, *Kans. Univ. Sci. Bull.*, 45 : 431 ; Thirumalai, 1986, *Rec. Indian Mus.*, 84 : 15. *P. lachne* Schmidt, 1926, *Ent. Mitt.*, 15 : 64. *P. laticaudata* (Hardwicke) : Distant, 1903, *Fauna British India* 2 : 185.

The long dorsolateral projection of pygofer, which extends half its length beyond lateral wings of suranal plate as viewed from above, separates this species from all other known species (Fig. 12 g, h). The distal half of middle femur bears a dense brush of long hairs. The connexival spine of female arising from beneath the connexival edge of the seventh abdominal segment near its base. This species is for known only from Southern India.

Material examined : Dharmapuri Dt all apterous, 2 (Female) from Todehalla River, Anchetty, alt. 500 M, 11. IV. 1985 ; 2 (Male) , 4 (Female) from Chinnar River, Kottapatti-Vannathiparai, alt. 337 M, 25. II. 1986 , 2 (Female) from Sitteri-Horur Road, Maamarathuodai, alt. 430-620 M, 4. III. 1986 , 7 (Male), 3 (Female) from Shevory Hills, Bommidi Section, alt. 450 M, 8. III. 1986, Coll K.M.

Distribution INDIA.

SUBFAMILY

HALOBATINAE

35. *Metrocoris stali* (Dohrn)

Halobates stali Dohrn, 1860, *Stett. ent. Zeit.*, 21 : 408. *M. stali* (Dohrn) : Distant, 1903, *Fauna British India*, 2 : 190 ; Den-Boer, 1965. *Zool. Verh.*, 74 : 8 ; Thirumalai, 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 46.

The eighth tergite of male is semicircular in outline while the posterior margin of seventh abdominal segment of female is some what convex. *M. stali* is commonly noticed in reservoirs, rivers, fast and slow flowing mountain streams and is very widely distributed all over India. In Southern India, it has been recorded at altitudes upto 2400 M.

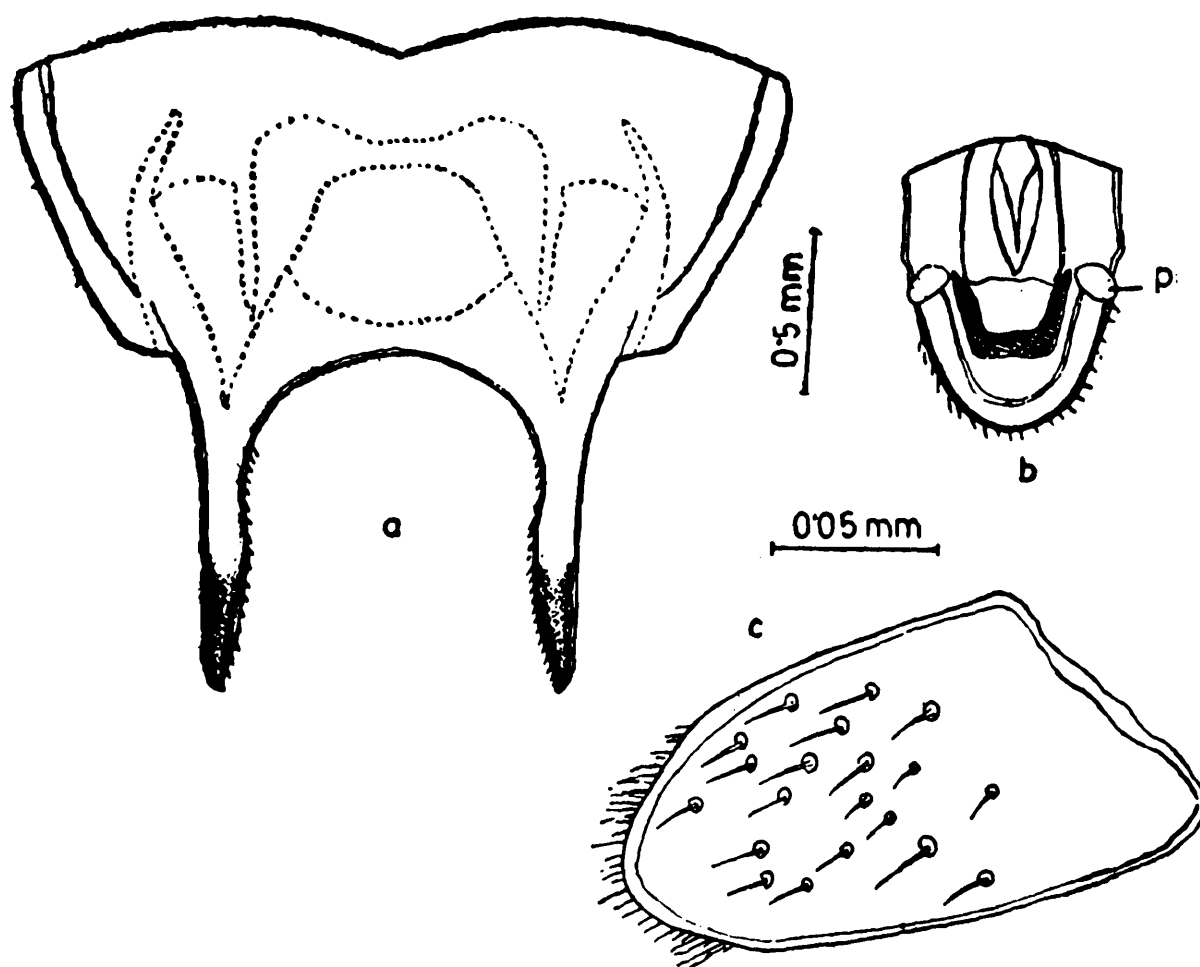
Fig.13 Aquarius adelaidis (Dohrn)

Fig. : 13 *Aquarius adelaidis* (Dohrn) a. Dorsal view of apical abdominal segment. b. Ventral view of last genital segment (P-Paramere) c. Paramere

Fig. 14 Microvelia douglasi. Scott

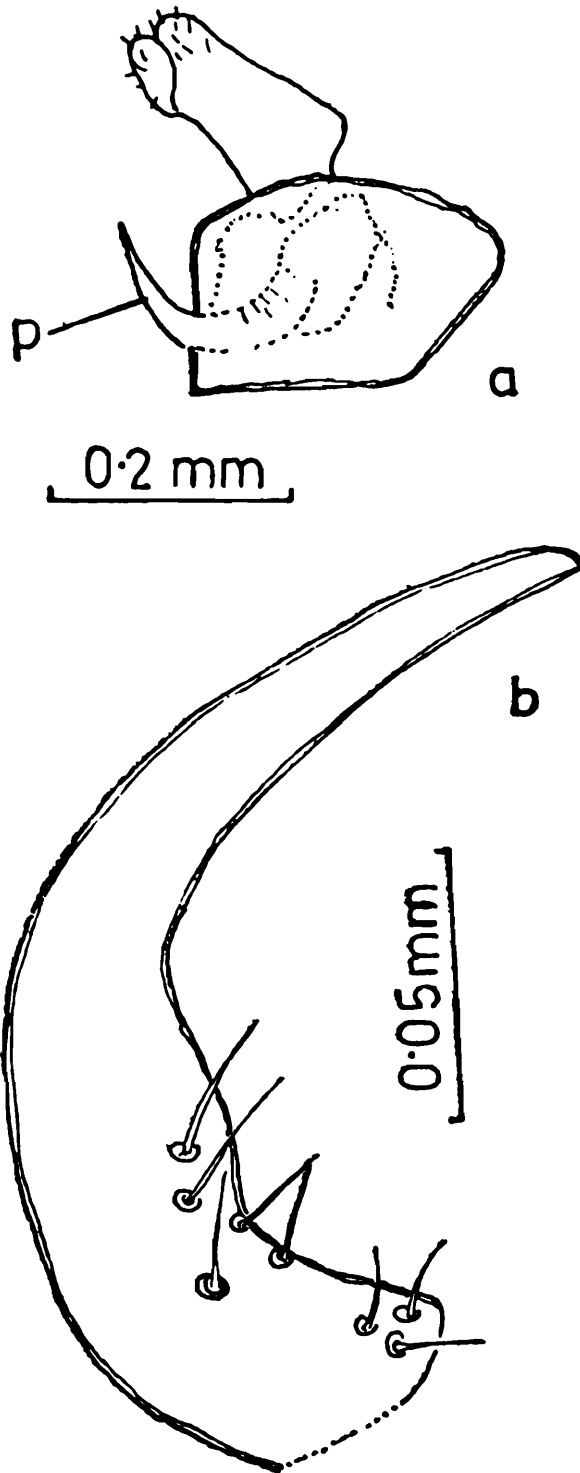


Fig. : 14 *Microvelia douglasi* Scott (Male) a. Lateral view of genital segment (P- Paramere) b. Paramere

Material examined : Dharmapuri Dt (macropterous, 2 Female), apterous 8(Male), 4 (Female) from Chinnar River, Kottapatti - Vannathiparai, alt. 337 M, 25. II. 1986 ; apterous, 17 (Male), 2 (Female) & 3 immature stages from Singleri, alt. 290 M, 28. II. 1986, apterous 4 (Male), 1 (Female) from Shevroy Hills, alt. 450 M, 8. III. 1986, Coll K. M.

Distribution : NEPAL ; INDIA ; SRILANKA.

FAMILY

VELIIDAE

The veliids are small oval or elongate bugs, characterised by preapical claws, short legs and absence of ocelli. The general colour varies from yellowish-brown to grey or black, with dorsum often marked with yellow or bluish grey or silvery spots. The wing polymorphism is common and apterous forms are the commonly encountered morphs. The habitat includes freshwater streams, ponds, springs, marshes, salt water bays, brackish water pools, mangrove swamps and open water or bays close to shore. The family Veliidae is divided into seven subfamilies containing about 30 genera and approximately 420 species of which 4 subfamilies, 6 genera and 16 species are so far known from India.

SUBFAMILY

MICROVELIINAE

36. *Microvelia douglasi* Scott

Microvelia douglasi Scott, 1874, *Ann. Mag. nat. Hist.*, 14 : 448. *M. repentina* Distant, 1903, *Fauna British India*, 3 : 174. *M. singalensis* Distant, 1903, *ibid.*, 3 : 174. *M. kumaonensis* Distant, 1909, *Ann. Mag. nat. Hist.*, 3 : 500; *M. douglasi* Scott : Lundblad, 1934, *Arch. Hydrobiol. Suppl.*, 12 : 347 : Thirumalai, 1989, *Misc. Occ. Pap. Rec. zool. Surv. India*, 118 : 53.

The fourth antennal segment is the longest in males, tibial comb present only in fore-tibia and the intermediate tibiae are distinctly smaller than femora. The lateral view of male genital segments and paramere are as showing in Fig. 14 a & b , left paramere rudimentary.

Material examined Pudukkottai Dt 3 (Male), 3 (Female) from Pudukkottai-Trichy Road, 12. V. 1986, Coll G. Thirumalai.

Distribution INDIA , INDONESIA , JAPAN , SRILANKA.

S U M M A R Y

The aquatic and semi-aquatic Hemiptera of Dharmapuri and Pudukkottai districts, Tamilnadu collected during the State Faunal Surveys undertaken by the Southern Regional Station of the Zoological Survey of India during the years, 1985 & 1986 were studied in depth. The study revealed the presence of 18 genera and 36 species belonging to 8 families. In addition to the world-wide distribution of each species, brief remarks facilitating identification of the taxa reported are also provided. A vast majority of the species, genera, and subfamilies discussed constitute new and additional material recorded for the first time from the study area. Keys to the families, subfamilies and species are provided.

A C K N O W L E D G E M E N T S

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ADDENDUM

While this manuscript is in print, the Oriental water strider genus *Metrocoris* Mayr has been redescribed, revised by Chen & Nieser (1993) (*Steustrupia*, 19 : 1-43 ; 45-82, 1993). *Metrocoris stali* (Dohrn) from South India, belongs to *M. indicus* Chen & Nieser.