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AMPHIPODA FROM THE EAST COAST OF INDIA

PART 1. GAMMARIDEA

By T. E. SIVAPRAKASAM

Zoological Survey of India, Southern Regional Station, Madras-4

INTRODUCTION

OUR knowledge on the taxonomy of the amphipod Crustacea is based on a large number of works done since the beginning of the 19th century by Montagu (1808), Milne-Edwards (1840, 1868), Kroyer (1845), Costa (1853), Dana (1853-55), Bate (1862), Haswell (1880, 1885), Mayer (1881-1904), Della Valle (1893), Sars (1895), Stebbing (1888-1910), Chevreux (1900-1911), Stephensen (1912-1942), Chilton (1912-1923), Tattersall (1912-1929), Barnard, K. H. (1916-1955), Pirlot (1930-1939), Shoemaker (1920-1956), Schellenberg (1925-1955), Gurjanova (1951), Reid (1951), Barnard, J. L. (1955) and several other authors. A compilation of all the species of gammaridean Amphipoda was first made by Stebbing in 1906. This work was continued by Barnard, J. L. (1958) who published an index to the families, genera and species of the gammaridean Amphipoda, providing a source of valid names and nomenclatural additions and changes since Stebbing's monograph.

The study of Indian amphipods has received considerable interest since Giles first published a series of papers from 1885 to 1890 on the amphipods collected by H.I.M.S. Investigator from the Bay of Bengal. There are several papers by Stebbing (1904, 1907, 1908), Walker (1904, 1905), Tattersall (1912, 1914, 1925), Chilton (1920, 1921, 1923), Gravely (1927), Raj (1927), Stephensen (1931), Carl (1934), Barnard, K. H. (1935), Nayar (1950, 1956, 1959), Pillai (1954, 1957, 1961) and John (1955) dealing with amphipods collected from the coastal areas of Bengal, Chilka lake, Visakhapatnam, Madras, Kerala and the islands of Laccadives, Maldives, Ceylon and Andaman and from the high ranges of the Himalayas and Nilgiris. In spite of the vast literature, our knowledge of Indian amphipods is far from complete since the studies already made are incomplete and the amphipods of the rest of the Indian subcontinent have not been studied at all. The author was therefore interested in this study and made an exhaustive collection of amphipods from the east coast of India. The collection includes 61 species of which 33 species are recorded for the first time from India. The present paper, which is the first part of this study, gives data on the collection and a systematic account of 29 species belonging to nine gammaridean families. Part 2 to be published in due course (Sivaprakasam, in press) will deal with the rest of the collection together with a discussion on the ecology and geographical distribution.

The author's thanks are due to Drs. M. S. Mani and K. Reddiah of the Zoological Survey of India for providing all the necessary facilities and helping in the preparation of this paper, and to the following persons for sending reprints of their papers on Amphipoda: Dr. J. L. Barnard of U. S. National Museum, Dr. C. H. Edmondson of Bernice P. Bishop Museum, Dr. L. P. H. de Oliveira of Instituto Oswaldo Cruz, Dr. D. E. Hurley of New Zealand Oceanographic Institute and Mr. K. Nagappan Nayar of Central Marine Fisheries Research Institute.

MATERIAL AND METHODS

The amphipod material studied were collected by the author from 21 stations on the east coast of India (see Fig. 1). These stations are listed below with their substations under four well-defined regions :

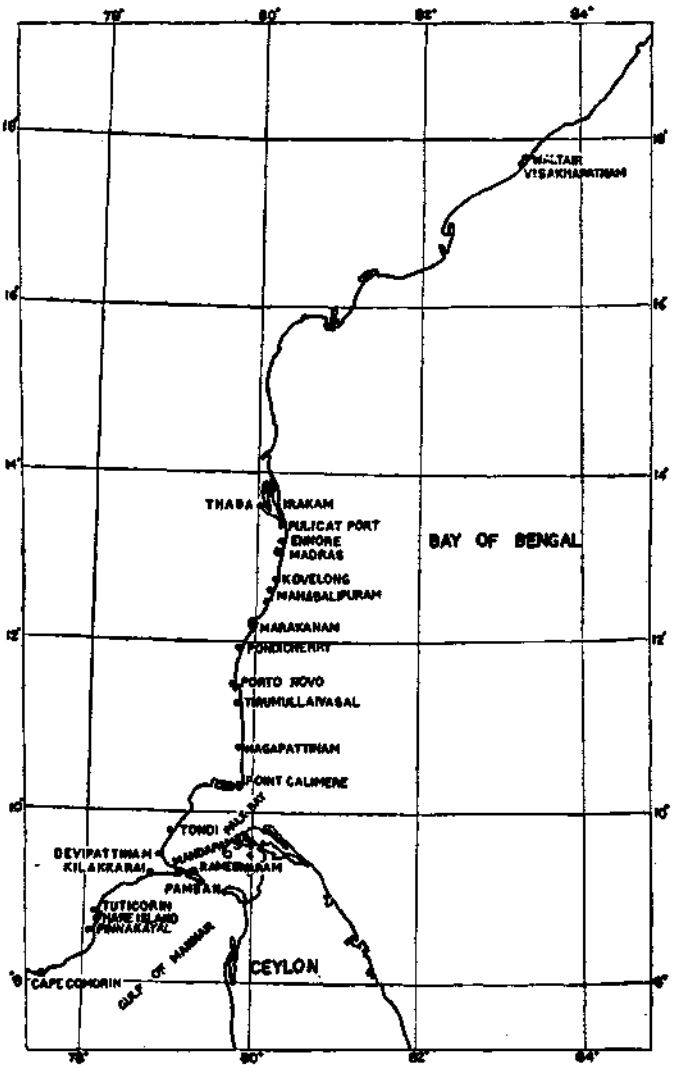

FIG. 1. Map of the east coast of India showing the collection stations.

Gulf of Mannar :
1. Cape Comorin
2. Pinnakayal
3. Tuticorin, Hare Island
4. Kilakkarai
5. Mandapam

Palk Bay :
- 6. Pamban
- 7. Rameswaram
- 8. Devipattinam
- 9. Tondi, Nambuthalai
- 10. Point Calimere

Coramandel coast :
- 11. Nagapattinam
- 12. Tirumullaivasal
- 13. Porto Novo
- 14. Pondicherry
- 15. Marakanam
- 16. Mahabalipuram
- 17. Kovelong
- 18. Madras city
  - Buckingham Canal
  - Adyar estuary
  - Marina beach
  - Cooum estuary
  - Harbour
  - Royapuram beach
- 19. Ennore estuary

Andhra coast :
- 20. Pulicat lake
  - Pulicat port
  - Arambakkam
  - Tada
  - Irakam island
- 21. Visakhapatnam
  - Harbour
  - Waltair.

The collections were made, often in large numbers, from a wide variety of environments. Most of them were collected from the littoral area. Plankton collections were made from the shallow waters and the amphipods were separated from them under a binocular microscope. The seaweeds from the water surface, rocks and the muddy bottom and those washed ashore, were collected in large quantity and immersed in a tray containing 70% alcohol. The amphipods clinging to the weeds were killed instantaneously and floated on the surface. They were collected with a brush and those still clinging to the weeds were picked up with slender forceps. The terrestrial amphipods living in the sand and under stones were collected along with them in polythene bags, killed by pouring 70% alcohol in them and then separated. Some amphipods were collected from the washings of the sponges, holothurians, crinoids and ascidians. Caprellid amphipods were collected from the hydroids and seaweeds growing on rocks.

The collection included nearly 10,000 specimens. They were preserved in 70% alcohol and labelled with locality, date and notes on their ecology. The collections were examined under a binocular microscope. The drawings were made on graph paper with the aid of an ocular graticule micrometer and then traced on cartridge paper.

The terminology and method of description followed here are those adopted by Barnard, K. H. (1916-1955). The size of the specimen given is noted from the largest specimen and refers to length from the head to the end of telson.

SYSTEMATIC ACCOUNT

Order Amphipoda

Suborder Gammaridea

Family LYSIANASSIDAE

Genus **Lysianassa** Milne-Edwards

1. **Lysianassa cinghalensis** (Stebbing)

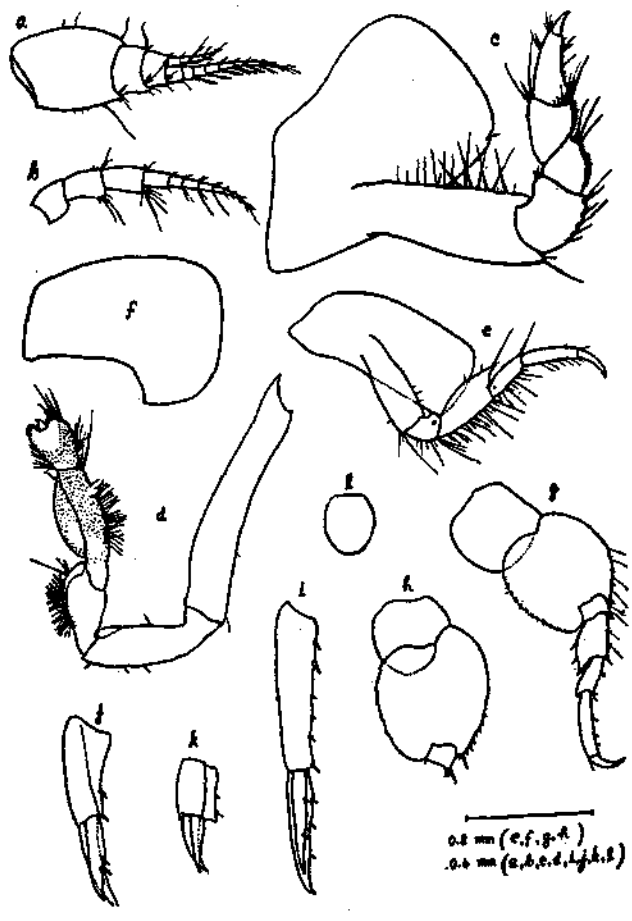

FIG. 2. *Lysianassa cinghalensis* (Stebbing). *Female* : a. antenna 1; b. antenna 2; c. gnathopod 1; d. gnathopod 2; e. peraeopod 1; f. side plate of peraeopod 2; g. peraeopod 4; h. peraeopod 5; i, uropod 1; j. uropod 2; k. uropod 3; l. telson.

Lysianax cinghalensis Stebbing, 1897, p. 28, pl. 7A.

Walker, 1904, p. 242, pl. 1, fig. 6.

1905, p. 925.

Lysianassa cinghalensis Stebbing, 1906, p. 39.

Walker, 1909, p. 328.

Barnard, K. H., 1937, p. 142.

Material : 7 females from seaweeds from Cape Comorin ; 2 males and 5 females from seaweeds at Pamban ; Size 5 mm.

Description : Female—Body smooth, broadly rounded. Side plates large, oblong. Head small, as long as the first segment. Ocular lobe conically produced between antennae 1 and 2. Eyes large, dark and reniform.

Antenna 1 is 1⅓ as long as antenna 2. 1st joint 1½ times as long as wide and twice as long as next two joints. Flagellum shorter than the peduncle, 8-jointed. Accessory flagellum 3-4 jointed. Antenna 2 : 5th joint of peduncle longer than 4th. Flagellum shorter than peduncle, 6-7 jointed.

Gnathopod 1 not subchelate. Side plate large, widening below, with a small setiferous notch on the lower margin. 2nd joint massive, nearly as long as next 3 joints. 3rd joint larger than 4th, hind margin with 5 sets of setae. 4th joint cordate, hind margin with short setules. 5th joint triangular, hind margin with short setules and distally with 3 long setae. 6th joint tapering distally, hind margin concave. Dactylus short, slightly curved. Gnathopod 2 very long. Side plate much narrowed, also with a setiferous notch on lower margin. 2nd joint as long as joints 4 to 6 combined. 3rd joint as long as 5th with a notch on front margin near the base. 4th joint dilated distally, hind margin convex, with divergent setae. 5th joint, hind margin convex, front margin slighlty convex, with divergent setae. 6th joint also setose, half as long as 5th, widening distally, with the short curved dactylus tucked in at the distal end.

Peraeopods 1 and 2 setose, identical except in the shape of side-plate. Side plate oblong in per. 1 ; it is twice as broad in per. 2 with hind margin excavated posteriorly. 2nd and 4th joints nearly of same length and width. Peraeopod 3 similar to the next but shorter. Peraeopod 4 : a little shorter than next. Side plate quadrate, smaller than 2nd joint. 2nd joint round, front margin convex, distally with spines and setae ; hind margin flattened, serrate with short setae. 4th joint widened. Peraeopod 5 : 2nd joint oval, serrations on hind margin larger and fewer.

Uropods 1 to 3 sparsely spinous. Outer ramus shorter than inner in uropods 1 and 2. Uropod 3 : peduncle keeled, rami subequal in length.

Telson oval, concave dorsally.

Male—Antenna 2 as long as the body, slender, flagellum with 50 joints. In one young male antenna 2 was only half as long as body, with 35 joints in flagellum. Peraeopods 1 and 2 : Hind margin fringed with long plumose setae. Uropod 3 : rami with long plumose setae which extend beyond the tip of uropod 1.

Remarks : Stebbing (1897) did not describe the female which differs from the male in the structure of antenna 2, uropods etc. Later authors also did not describe the female and hence a description of the female is given above.

The present material differs from Stebbing's on the following points : the eyes are distinct, not meeting at the top ; antennae 1 and 2 are much longer, flagellum having more joints ; the divergent setae and the squamous condition of gnathopod 2 (also found in Walker's specimen from Ceylon) are not mentioned by Stebbing ; the palm is not transverse but a little produced infero-distally ; the outer rami of uropods 1 and 2 are a little shorter than the inner.

Walker (1904) synonymised *Lysianax urodus* Walker & Scott with this species, Schellenberg (1928) united both *L. cinghalensis* and *L. urodus* with *L. ceratina* (Walker), but this was not accepted by Barnard, K. H. (1937) who united *L. urodus* with *L. coelochir* Walker because of the resemblance of uropod 3. I do not accept this view as the 2nd gnathopods are very different in these two species. The 2nd gnathopods and 3rd uropods of *L. urodus* are similar to the present material and hence I feel that this species should be united with *L. cinghalensis* as done by Walker.

Distribution : Ceylon, Maldives, Seychelles and Amarantes Is., Red Sea and Gulf of Oman. This is the first record of this species from Indian peninsula.

Genus **Shoemakerella** Pirlot

Shoemakerella nasuta (Dana)

Lysianassa nasuta Dana, 1853-55, p. 915, pl. 62, fig. 2 a-m.

Bate, 1862, p. 66, pl. 10, fig. 6.

Stebbing, 1906, p. 40.

Lysianax cubensis Stebbing, 1897, p. 29, pl. 7B.

Lysianassa cubensis Stebbing, 1906, p. 38.

Lysianassa alba Pearse, 1912, p. 369.

Shoemaker, 1921, p. 99.

Shoemakerella nasuta Pirlot, 1936, p. 264.

Shoemaker, 1948, p. 1.

Nayar, 1959, p. 6, pl. 1, figs. 1-15.

Material : 1 female from seaweeds at Kilakkarai ; Size : 7 mm.

Distribution : Florida, Gulf of Mexico, Tortugas, Porto Rico, Cuba, Barbados, Brazil, India. In India this species was recorded from the Madras harbour and now its distribution is extended to the Gulf of Mannar.

Genus **Socarnella** Walker

Socarnella bonnieri Walker

(Fig. 3)

Socarnella bonnieri Walker, 1904, p. 239, pl. 1, fig. 4.

Material : 1 female from seaweeds at Kilakkarai ; Size : 4.5 mm.

Remarks : This species has not been recorded anywhere since it was first described in 1904. Walker described a single female, 5 mm., in length from Ceylon. The present material—also a single female, a little smaller in size—recorded after 60 years after the description of this species, closely agrees with the decription and

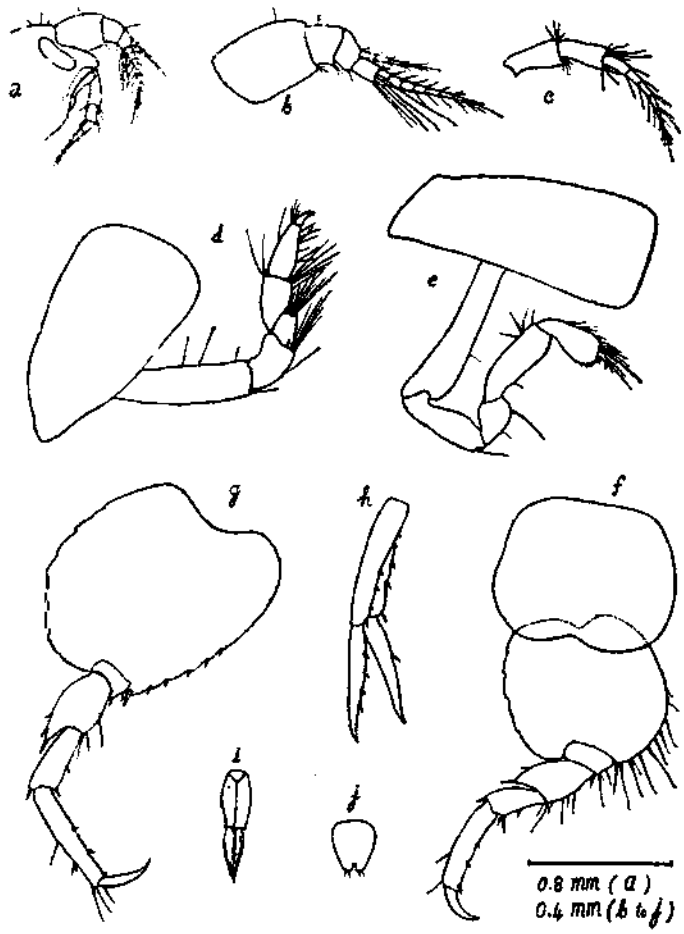

FIG. 3. *Socarnella bonnieri* Walker. *Female* : a. head ; b. antenna 1 ; c. antenna 2; d. gnathopod 1 ; e. gnathopod 2 ; f. peraeopod 3 ; g. peraeopod 5 ; h. uropod 1 ; i. uropod 3; j. telson.

figures of Walker. The gnathopod 2 is however much stouter than in Walker's figures ; 5th joint with fewer setae, widening distally.

Distribution : Ceylon. This is the first record of this species from India.

Genus **Orchomenella** Sars

Orchomenella affinis Holmes

(Fig. 4)

Orchomenella affinis Holmes, 1908, p. 492, fig. 4.
Gunjamorn, 1962, p. 167, fig. 50.

Material : Rameswaram : 10 specimens from the washings of nudibranchs, size : 3.7 mm.

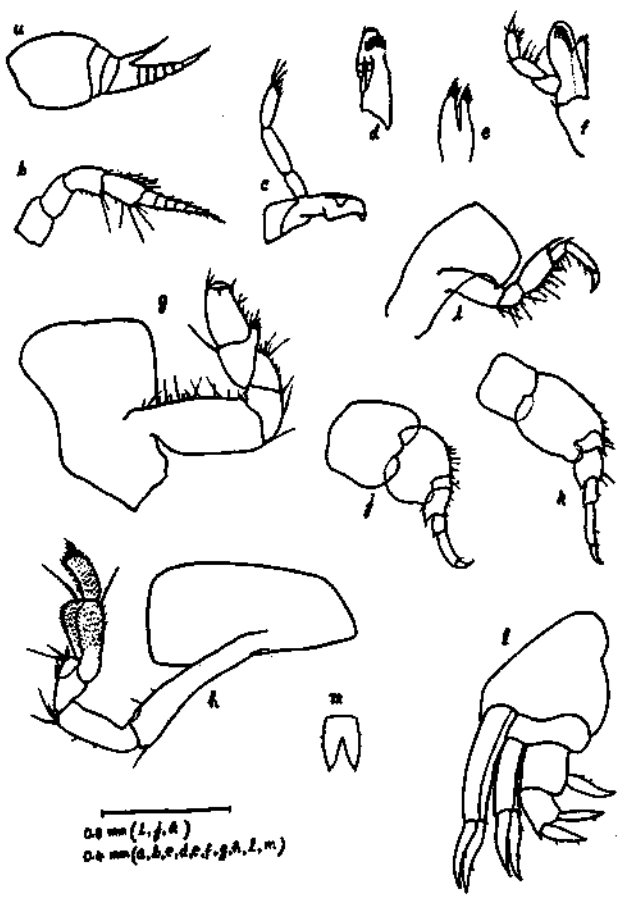

FIG. 4. *Orchomenella affinis* Holmes. *Female :* a. antenna 1 ; b. antenna 2 ; c. mandible ; d. maxilla 1 ; e. maxilla 2 ; f. maxilliped ; g. gnathopod 1 ; h. gnathopod 2 ; i. peraeopod 2 ; j. peraeopod 3 ; k. peraeopod 4 ; l. urus ; m. telson.

Description : Female—Body smooth, 1st urosome with a dorsal transverse depression behind which is a rounded elevation. Side plates large, oblong. Head very

small, shorter than 1st segment. Ocular lobe broadly produced between antennae 1 and 2. Eyes dark, large, oblong.

Antenna 1 first joint of peduncle broad, nearly twice as long as next two which are narrow. Flagellum 8-jointed, 1st joint as long as next three. Accessory flagellum 3-jointed, 1st being very long. Antenna 2 as long as antenna 1. 4th and 5th joints subequal in length, widening distally. Flagellum with 10-11 joints.

Mandible 1st joint of palp longer than usual, 2nd joint is the longest, 3rd joint distally with 7 setae gradually increasing in length. Maxilla 1 with a strong 2-jointed palp ; outer plate with 8 dentate spines, inner plate short with 3 short apical setae. Maxilla 2 : outer plate wider than the inner, both apically with a row of stout setae. Maxilliped : inner plate narrow, nearly $\frac{2}{3}$ as long as outer plate which is broad ; last joint of palp short, unguiform.

Gnathopod 1 very stout. Side plate large, oblong, front margin concave, hind margin straight, distal margin with a short indent in the middle. 2nd joint stout, as long as next 3 joints, front margin setose. 4th joint triangular. 5th joint larger than the previous, hind margin produced into a narrow lobe slightly encircling the base of 6th joint. 6th joint nearly rectangular, narrowing distally. Palm straight and at right angle with hind margin and defined by 2 spines. Dactylus short, stout and curved. Gnathopod 2 long and slender. Side plate oblong. 2nd joint twice as long as the next, with a subterminal setiferous notch on hind margin. 3rd joint also with such notch on hind margin with 3-4 long setae. 4th joint as long as 6th, widening distally ; distal portion squamose with 4 long divergent setae. 5th joint nearly twice as long and wide as 6th, widening distally and with 2 long setae distally and short setules all over. 6th joint narrow, oblong, curved ; with short setules all over. Dactylus short, swollen at the base.

Peraeopods 1 and 2 identical except that the side plate is rectangular in the former and oblong with hind margin excavated to 2/3 its length in the latter. 2nd joint as wide as 4th. Peraeopod 3 : Side plate larger than 2nd joint which is oval. Hind margin of 2nd joint faintly serrate, distally forming a lamellar lobe. Peraeopod 4 similar to the next. Peraeopod 5 : Side plate square, small. 2nd joint rather oblong, hind margin faintly serrate and distally forming a lamellar lobe.

Uropods as figured. Uropod 3 : inner ramus shorter than the outer. Telson cleft to 2/3 its length, each lobe with two short marginal setae and a terminal one.

Remarks : The present material, closely agree with the description of Holmes, but the 3rd uropod is not setose and its outer ramus lacks a terminal joint. His specimens were 13 mm. in length whereas the present ones are less than 3 mm.

Distribution : Monterey Bay, west coast of N. America ; North Pacific. This is the first record of this species from India.

Family : AMPELISCIDAE

Genus **Ampelisca** Kroyer

Ampelisca zamboange Stebbing

Ampelisca zamboange Stebbing, 1888, p. 1057, pl. 106.
1906, p. 110.
Pirlot, 1936, p. 280.
Barnard K.H. 1937, p. 149.
Pillai, 1957, p. 30, fig. 1 (1-2).
Nayar, 1959, p. 7, pl. 2, figs. 1-11.

Ampelisca chevreuxi Walker, 1904, p. 254, pl. 3, fig. 15.

Material : 1 female from the cavity of sponges collected at Tondi. Size : 3.0 mm.

Distribution : Philippines, East Indies, Ceylon, India and Red Sea.

Family : AMPHILOCHIDAE

Genus **Amphilochus** Bate

? **Amphilochus schubarti** Schellenberg

(Fig. 5)

Amphilochus schubarti Schellenberg, 1938 (b), p. 204, fig. 1.

Material : 1 male and 3 females from seaweeds at Pamban ; 1 male and 2 females from Kovelong from the washing of ascidians ; 2 females from the oyster rafts at Ennore estuary. Size : 3.5 mm.

Remarks : I am doubtfully referring these specimens to *A. schubarti*, which agree closely with Schellenberg's description and figures, but differ in the antennae and the mandible. Flagella of antennae are much longer, with more joints. Mandible has a small but distinct molar, the 3rd palpar joint subequal to the first two.

Chilton's record (1921b and 1923) of *A. brunneus* appears to be similar to the present material in the mandible having a distinct molar and the carpal process of gnathopod 2 not reaching the palmar angle. He (1923a) also unites *Gitanopsis pusilla* Barnard with *A. neopolitanus* Della Valle. Barnard (1925), however, did not agree with him. The present material is different from *A. brunneus* in the structure of antennae, gnathopods, telson etc. From *A. neopolitanus* it differs in gnathopod 2 with the carpal process not reaching palmar angle, the much narrower 6th joint and the stouter dactylus. From *G. mationis* (Stebbing) it differs in the structure of the gnathopods and telson but the mandible is very similar.

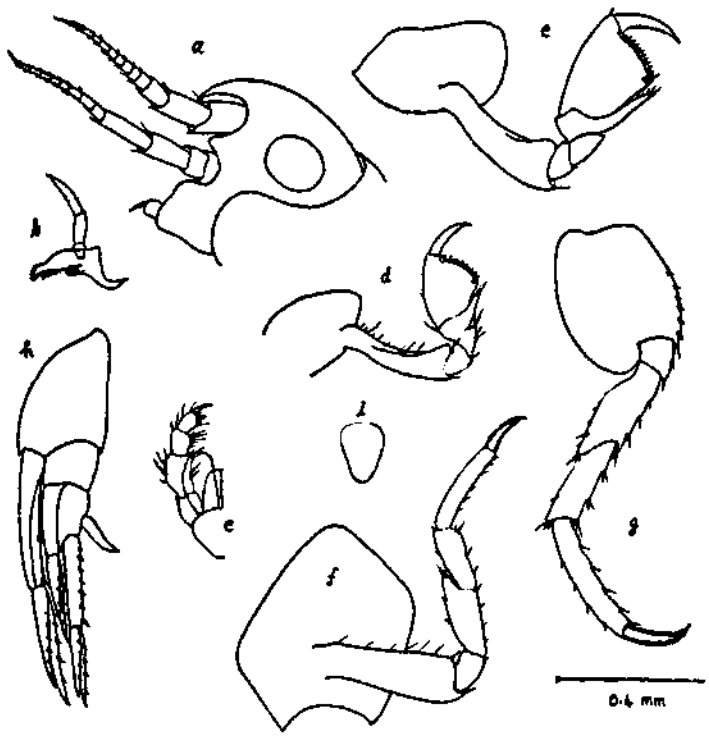

FIG. 5. *Amphilochus schubarti* Schellenberg (?). *Female :* a. head ; b. mandible ; c. maxilliped ; d. gnathopod 1 ; e. gnathopod 2 ; f. peraeopod 2 ; g. peraeopod 5 ; h. urus ; i. telson.

As pointed out by Barnard (1951, p. 705) the well-developed molar of mandible is characteristic of the genus *Gitanopsis* Sars and hence a re-examination of Chilton's specimens of *A. brunneus* is necessary.

Distribution : Brazil, India. This species is recorded for the first time from India.

Genus **Cyproidea** Haswell

Cyproidea ornata Haswell

Cyproidea ornata Haswell, 1880(b), p. 320, pl. 18, fig. 1.
Stebbing, 1906, p. 158.
1910, p. 578.
Barnard K.H. 1925, p. 341.
1940, p. 443.
Hale, 1929, p. 200, fig. 206.
Ruffo, 1938(b), p. 155.
Schellenberg, 1938(a), p. 18.
Nayar, 1959, p. 15, pl. 4, fig. 17-30.

Gallea testicauda Walker, 1904, p. 256, pls. 3 & 8, fig. 16.

Gallea critita Spandl, 1924, p. 243, figs. 1 & 2.

Material : 2 males and 2 females from algae at Kilakkarai. Size : 3.0 mm.

Distribution : Australia, Bismarch Archipelago, Ceylon, India, Suez Canal, east coast of Africa.

Family : LEUCOTHOIDAE

Genus **Leucothoe** Leach

Leucothoe spinicarpa (Abildgaard)

Leucothoe spinicarpa Miers, 1884, p. 312.
Norman, 1889, p. 113.
Della Valle, 1893, p. 652.
Sars, 1895, p. 283, pls. 100, 101, fig. 1.
Stebbing, 1906, pp. 163, 724.
Walker, 1901, p. 302.
1904, p. 258.
1905, p. 925.
1907, p. 18.
1909, p. 331.
Kunkel, 1910, p. 12, fig. 3.
Chevreux, 1911, p. 194.
Pearse, 1912, p. 370.
Chilton, 1912, p. 478.
1921(a), p. 59.
1923(a), p. 88.
Barnard, K.H., 1916, p. 148.
1930, 338, 449.
1931, p. 119.
1932, p. 106.
Tattersall, 1922, p. 6.
Schellenberg, 1931(a), p. 92.
Shoemaker, 1933(a), p. 8.
Pirlot, 1936, p. 293.
1939, pp. 52, 74.
Ruffo, 1938(a), p. 131.
Nayar, 1959, p. 16, pl. 5, figs. 1-6.

Leucothoe antarctica Pfeffer, 1888, p. 128.

Leucothoe brevidigitata Stebbing, 1906, p. 167.

Leucothoe commensalis Haswell, 1880(a), p. 261, pl. 10, fig. 3.
Stebbing, 1906, p. 166.
1910, pp. 580, 636.

Leucothoe diemenensis Haswell, 1880(a), p. 262, pl. 9, fig. 5.

Leucothoe gracilis Haswell, 1880(a), p. 263, pl. 10, fig. 2.

Leucothoe miersi Stebbing, p. 772, pl. 46.
1906, p. 165.

Leucothoe trailli Stebbing, 1906, p. 164.

Material : Pamban—One male from the algae. Tondi : 2 males from sponges. Madras Royapuram : 23 specimens from the washings of holothurians and from under stones. Size : 5.0 mm.

Distribution : Cosmopolitan.

Family : STENOTHOIDAE

Genus **Stenothoe** Dana

Stenothoe gallensis Walker

Stenothoe gallensis Walker, 1904. p. 261, pl. 3, fig. 19.
1909(a), p. 331.
Barnard, K.H., 1916, p. 154.
1925, p. 344.
1937, p. 153.
Schellenberg, 1928, p. 640.
Ruffo, 1938(a), p. 131.
Barnard, J.L., 1955, p. 3, fig. 1.
Nayar, 1959, p. 17, pl. 5, figs. 7-19.

Stenothoe crenulata Chevreux, 1907, p. 412.
1908, p. 471.
Shoemaker, 1935, p. 237, fig. 2.

Stenothoe cattai Stebbing, 1906, p. 195.
Chevreux & Fage, 1925, p. 132, fig. 131.
Schellenberg, 1925, p. 132.
Rudwick, 1951, p. 149.
Reid, 1951, p. 230, fig. 28.

Material : Pamban—2 males and 2 females from seaweeds, Madras harbour: 2 females from seaweeds. Size : 3.0 mm.

Remarks : Nayar's (1959) figure of uropod 3 of male does not show the crenulate condition and is probably drawn from female.

Distribution : Caribbean Sea, Mediterranean Sea, South Africa, Gambier Archipelago, Porto Rico, Ceylon, Zanzibar, Red Sea, India, Hawaii.

Family : CALLIOPIIDAE

Genus **Paracalliope** Stebbing

Paracalliope indica Barnard

Paracalliope fluviatilis Chilton, 1921(b), p. 529, fig. 3. (*not* Thomson).

Paracalliope indica Barnard K.H., 1935, p. 280, fig. 1 a-b.
Nayar, 1959, p. 19, pl. 6, figs. 1-7.

Material : Devipattinam—2 males and 1 female from algae on the sea shore. Madras: Several hundred specimens from the algae and plankton from the Adyar

estuary and Buckingham Canal. Ennore estuary: Several specimens from the seaweeds and plankton. Pulicat lake: Several specimens from the weeds and plankton. Size : 4 mm.

Remarks : This is a common brackish water species. It has been collected from the sea at Devipattinam. Presumably they were washed away from the nearby brackish water ponds by the rains.

Distribution : East coast of India. Previously recorded from lower Bengal, Chilka lake and Madras. Presently its distribution is extended upto the Palk Bay of the South.

Genus **Atylopsis** Stebbing

Atylopsis latipalpus Walker & Scott

(Fig. 6)

Atylopsis latipalpus Walker & Scott, 1903, p. 222, pl. 14A, fig. 7.

Material : Kilakkarai—About hundred specimens from algae. Size: Male 3·5 mm., female 6.5 mm.

Description : Males similar to the females but small-sized, with larger eyes, antennae well-developed, nearly half as long as body, with calceolae on peduncular joints.

Female : Head produced in front into a rostrum ; with rostrum it is subequal in length to first 3 segments. Eyes dark, large, reniform, occupying a major portion of the head. Lateral lobes squarely produced. Body segments clearly overlapping, segments 1-6 narrow, 7-10 long, 6th being the shortest and 7th the longest. Side plates large, oblong. 3rd epimere convex behind with a notch above ; hind corner not produced ; lower margin with 6 submarginal spines. 1st urosome with a dorsal depression. 3rd urosome 1½ times as long as 2nd. Branchiae pleated as in *Atylus minikoi* in peraeopods 3-5 and reduced in others bearing incubatory lamellae.

Antenna 1—Less than 1/3 body length, a little shorter than antenna 2. 1st joint of peduncle stout, as long as next two, 3rd joint very short. Flagellum slender, with 22-25 joints (as against 10 in Walker & Scott). Antenna 2 : 5th joint of peduncle a little longer than 4th. Flagellum with 26-29 joints.

Mandible—Body triangular, primary cutting plate with 5 teeth and the accessory smaller with 5 teeth. Spine row with 4 spines. Molar oval, well-developed. 1st joint of palp very short ; 2nd 1½ times as long as 3rd, widening distally, inner margin with 8 stout setae. Maxilla 1 : inner plate small, mango-shaped, apically with 2 plumose setae. Outer plate apically with 6 dentate spines and a few setae on inner margin. 1st joint of palp somewhat triangular, front margin distally produced. 2nd joint very wide, wider than the outer plate, apically with 3 long setae and 6-7 denticles on the sloping margin. Maxilla 2 normal. Maxilliped : Outer plate a little broader than inner, both apically and on inner margin setose. 2nd joint of palp very wide, inner margin setose. 4th joint serrate on inner margin.

Gnathopod 1—Side plate large, oblong. 2nd joint as long as the side plate, front margin with a row of short setae, hind margin with a few long setae. 5th

joint nearly as long as 6th, widening distally. 6th joint a little widening distally ; palm oblique, convex, shorter than hind margin, with short setae and posteriorly defined by 2 unequal spines. Dactylus as long as palm, inner margin faintly serrate. Gnathopod 2 a little longer than gnathopod 1. 2nd joint stout, as long as the side plate. 5th joint shorter than the 6th, hind lobe conically produced along and upto half of the hind margin of 6th joint. 6th joint narrower and palm more oblique than in gnathopod 1, otherwise similar to it.

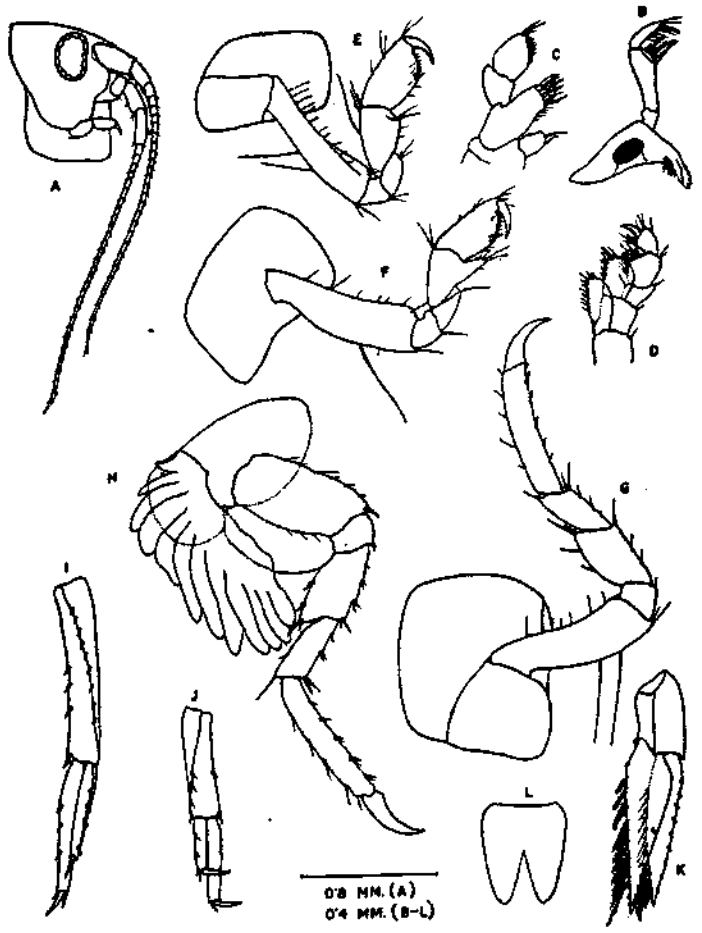

FIG. 6. *Atylopsis latipalpus* Walker & Scott. *Female :* a. head ; b. mandible ; c. maxilla 1 ; d. maxilliped ; e. gnathopod 1 ; f. gnathopod 2 ; g. peraeopod 1 ; h. peraeopod 3 ; i. uropod 1 ; j. uropod 2 ; k. uropod 3 ; l. telson.

Peraeopods very spinous with strong curved dactyli. Peraeopod 1 similar to the next. Side plate broad. 2nd joint as long as the width of side plate. 4th joint only a little longer than 5th, but much broader. 6th joint as long as 4th and 5th combined. Peraeopod 3 similar and nearly as long as next two. 2nd joint with nearly straight front margin and rounded, faintly serrate hind margin. 6th joint as long as 4th and 5th combined.

Uropods very spinous. Uropod 1 reaches half the length of rami of uropod 3; inner ramus $\frac{2}{3}$ as long as peduncle, outer ramus $\frac{2}{3}$ as long as the inner. Uropod 2 reaches half the length of inner ramus of uropod 1; inner ramus $\frac{2}{3}$ as long as peduncle, outer ramus $\frac{2}{3}$ as long as inner. Uropod 3: Peduncle short, half as long as rami. Outer ramus a little shorter than inner, both lanceolate and armed with short spines and plumose setae as figured.

Telson longer than broad, cleft to half its length, tips of divisions rounded and naked.

Remarks: I have given a detailed description to supplement that of Walker & Scott, who examined a single female with some parts missing (for example the mandibular palp). The present material closely agrees with their description and figures.

This species has not been recorded anywhere else since it was described in 1903.

Distribution: Abd-el-Kuri I. This is the first record of this species from India.

Family: ATYLIDAE

Genus **Atylus** Leach

Atylus minikoi (Walker)

(Fig. 7)

Paratylus minikoi Walker, 1905, p. 925, fig. 141.

Nototropis minikoi Stebbing, 1906, p. 728.
Walker, 1916, p. 344.
Chilton, 1922, p. 9, fig. 4 a-h.
1923(b), p. 242.
Shoemaker, 1932, p. 199.
Schellenberg, 1938(b), p. 206, fig. 2.
Oliveira, 1953, p. 305, pl. 2.
Pillai, 1957, p. 47, fig. 8.

Material: Cape Comorin—1 female from seaweeds. Hare Island: 4 specimens. Kilakkarai: Several specimens from seaweeds. Devipattinam: Several specimens from seaweeds and plankton. Rameswaram: 7 specimens. Pamban: 5 specimens. Tondi-Nambuthalai: 3 specimens. Point Calimere: Several specimens from algae at the tidal edge. Size: Male 6.5 mm., female 11 mm.

Description: I am describing the male gnathopods below. These are different from the female and are not described by the earlier authors.

Gnathopods 1 and 2 have the joints 4 to 7 characteristically upturned. Gnathopod 1 similar to the next but shorter and plumpy. Side plate oblong. 5th joint short. 6th joint thrice as long as 5th and much broader than its counterpart

in gnathopod 2. Gnathopod 2 long, broader than gnathopod 1. 2nd joint as long as 5th and 6th combined. 6th joint thrice as long as 5th, 2½ times as long as its width; front margin straight, hind margin convex, continuous with the palm. Palm convex, defined by 3 pairs of spines arranged one behind the other. Dactylus slender, curved, with a subterminal seta on the inner margin.

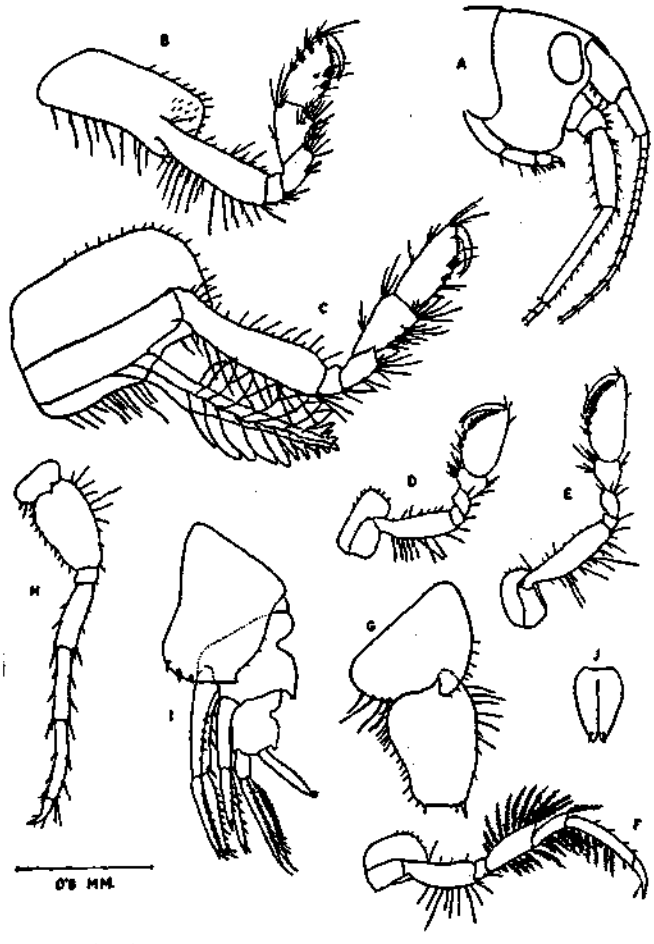

FIG. 7. *Atylus minikoi* (Walker). *Male :* a. head ; d. gnathopod 1 ; e. gnathopod 2 ; f. peraeopod 1 ; h. peraeopod 4 ; i. 3rd pleosome and urus ; j. telson. *Female :* b. gnathopod 1 ; c. gnathopod 2; g. peraeopod 3.

Remarks : Barnard, J. L. (1956) reviewed this genus, in which the genus *Nototropis* Costa was synonymised with *Atylus* Leach.

The upturned condition of joints 4-7 of the male gnathopods is characteristic and recalls the condition found in *Paracalliope indica* Barnard. The structure of the urus and the pinnate branchiae are also characteristic of this species.

The present specimens are the largest size ever recorded of this species, the male being 6.5 mm. and the female 11 mm.

Some of the specimens bear fine granulations on the integument characteristic of *Nototropis granulosus* (Walker) from Ceylon. This condition was also observed by Chilton (1922, p. 10). It would be necessary to unite these two species though presently it is not possible as Walker (1904) does not give detailed description or figures. The granulose condition may not be a constant character, as in Barnard's (1916, p. 173) single specimen of *N. granulosus* from South Africa, these granulations were not well-marked.

Distribution : East coast of N. America, Brazil, Minikoi I., India, Western Australia. This is the first record of this species from the east coast of India.

Family : GAMMARIDAE

Genus **Eriopisa** Stebbing

Eriopisa chilkensis (Chilton)

Niphargus chilkensis Chilton, 1921(b), p. 531, fig. 4.

Eriopisa chilkensis Barnard K.H., 1935, p. 283.
1951, p. 705.
Nayar,1959, p. 20, pl. 6, figs. 8-17.

Material : Tada, Pulicat lake—1 female from filamentous algae in the salt pan canals. Size : 6 mm.

Distribution : Tale Sap, India and South Africa.

Genus **Maera** Leach

Maera inaequipes (Costa)

Maera inaequipes Stebbing, 1906, p. 435.
1910(b),p. 599.
Walker, 1909, p. 334.
Kunkel, 1910, p. 44, fig. 16.
Chevreux, 1911, p. 218.
Barnard K.H., 1916, p. 193.
Chevreux, & Fage, 1925, p. 240.

Gammarus scissimanus Costa, 1853, p. 221, pl. 3, fig. 7.

Maera scissimana Walker, 1904, p. 273, pl. 5, fig. 32.
1905, p. 927.

Maera truncatipes Della Valle, 1893, p. 725, pl. 22, figs. 26-40.

Maera inaequipes inaequipes (Costa)

Maera inaequipes Schellenberg, 1938(a), p. 40.

Material : Pamban—Several specimens from seaweeds. Size : 7.0 mm.

Remarks : Schellenberg erected a new subspecies *M. inaequipes serrata* and showed the differences with the type subspecies which he recorded separately. He did not designate the latter as a subspecies as presently done. The present material agrees well with the type subspecies.

The present specimens have well-developed 2nd gnathopods with a marked sinus in the centre of the palm ; dactylus is stout, with a depression followed by a rounded tooth on inner margin, fitting with the anterior tooth and the sinus of palm respectively. Peraeopod 5 robust, the distal half of hind margin of 2nd joint with 6-7 serrations, each with a short seta. Hind margin of 3rd epimere smooth. Uropod 3 with peduncle $\frac{2}{3}$ as long as outer ramus which is a little longer than inner. Outer margin of outer ramus with 2 fascicles of 3 spines and the inner ramus with one spine. Telson longer than broad, cleft to the base, the divisions not ending in two teeth, but flat with 4-5 spines.

There are some large specimens (7 mm.) agreeing with Walker's (1904) description of *M. scissimana* in which the 6th joint of gnathopod 2 was much larger and more triangular ; palm slightly convex, without a sinus, corner tooth prominent ; dactylus also smooth without any depression or tooth on inner margin ; uropod 3 with peduncle as long as rami which are subequal ; telson broader than long, each division terminally flat, with 6 spines.

Nayar's (1959) *M. pacifica* undoutedly belongs to this species as his figures are very similar to my material described above. Whether it belongs to the subspecies *serrata* (described below), it is not possible to say as he has not described or figured peraeopod 5, 3rd epimere, uropod 3 and the telson.

Distribution: Cosmopolitan in tropical and temperate seas. This is the first record of this species from India.

Maera inaequipes serrata Schellenberg

Maera inaequipes serrata Schellenberg, 1938(a), p. 41, fig. 18.

Maera tenella Walker, 1904, p. 272, pl. 5, fig. 31.
Tattersall, 1922, p. 8.
Pirlot, 1936, p. 309.

Material : Cape Comorin—1 male from seaweeds. Kilakarai: Several specimens from seaweeds. Pamban: 4 specimens from seaweeds. Size : 8 mm.

Remarks : The present material is much longer than Schellenberg's (6 mm.). The large specimens (6-8 mm.) from Kilakkarai closely agree with his description and figures : 6th joint of gnathopod 2 much wider distally, palm with a marked, rounded

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sinus separating them into 2 spinous regions and a posterior short sinus separating the corner tooth from the palm ; spination as in Schellenberg. Dactylus in his material had only a small tooth on inner margin whereas in the present material, it is stout with a depression and a tooth as described above for *M. inaequipes inaequipes*. 2nd joint of peraeopod 5, hind margin a little concave, strongly serrate as also hind margin of 3rd epimere. Uropod 3 with peduncle $\frac{2}{3}$ as long as rami which are subequal ; outer margin of outer ramus with 3 fascicles of spines and inner ramus with 4-5 single spines. Telson longer than broad, divisions narrow, ending in two teeth, with 2-3 spines.

The structure of the palm and dactylus of gnathopod 2 is subject to considerable variation connected with age. In a juvenile 4.5 mm. in length from Kilakkarai the palm was slightly convex without a sinus ; dactylus also without a depression but with a small tooth as in Schellenberg. In a male 5 mm. in length, the palm was convex with a slight sinus which fits with a faint tooth on dactylus.

In specimens from Pamban the development of the sinus on palm is even more delayed. In a specimen 6 mm. in length, the palm had only a very small indent. Even this was not found in another 5.5 mm. in length, the palm being evenly convex.

Schellenberg has discussed the affinities of *M. tenella* of Walker (1904) and Pirlot (1936). I am quite sure that Walker's specimens must be referred to this subspecies as it closely resembles my material from Pamban with no sinus on palm.

Distribution : Gilbert and Fiji Is., South Pacific Ocean ; Ceylon ; Wasin, East Africa ; Australia. This species is recorded for the first time from India.

Maera pacifica Schellenberg

Maera pacifica Schellenberg, 1938(a), p. 42, figs. 19 & 20.

Not *Maera pacifica* Nayar, 1959, p. 23, pl. 8, figs. 16-17.

Material : Pamban—9 specimens from seaweeds growing on the rocks under the railway bridge. Size ; 7.0 mm.

Remarks : These specimens are strikingly similar to those of Schellenberg.

Distribution : Hawaii Is., Gilbert and Fiji Is., South Pacific Ocean, This is the first record of this species from India as Nayar's (*op. cit.*) earlier record of *M. pacifica* is actually *M. inaequipes*.

Maera quadrimana (Dana)

Gammarus quadrimanus Dana, 1853, p. 955, pl. 65, fig. 9.

Maera quadrimanus Bate, 1862, p. 194, pl. 35, fig. 5.

Maera auadrimana Stebbing, 1906, p. 434.
Schellenberg, 1938 (a), p. 45, figs. 21-22.
Barnard J.L., 1955, p. 13.
Nayar, 1959, p. 23, pl. 8, figs. 6-15.

Material : Kilakkarai—2 males from seaweeds. Pamban : 2 males from algae. Madras, Royapuram : Several specimens from the washings of holothurians. Size : 6 mm.

Remarks : These specimens closely agree with Schellenberg's description ; gnathopod 2 are as in his figure 22, with the sinus more pronounced, followed by a distinct tubercle a little separated from the posterior half ; the corner tooth and the adjoining sinus are more pronounced.

In juvenile specimens 3-4 mm. in length, the palm of gnathopod 2 was evenly convex but the 2nd joint of peraeopods were rectangular with hind margin smooth as in Schellenberg.

Melita setipes Oliveira (1953, not Dana) has been considered synonymous with *Maera inaequipes* by Barnard J.L. (1958, p. 62). But I feel that it should be united with *M. quadrimana.* Oliveira's figures are similar to this species except that the sinus on palm of gnathopod 2 is deeper and the one adjoining the corner tooth is not distinct.

Distribution : Tropical Pacific Ocean, India.

Maera othonides Walker

Maera othonides Walker, 1904, p. 271, pl. 5, fig. 29.
1905, p. 927.
Chilton, 1921 (b), p. 535, fig. 5.
Barnard K.H., 1935, p. 285, fig. 5.
Nayar, 1959, p. 24, pl. 8, figs. 1-18.

Material : Pinnakayal—1 male and 1 female from Tambraparani estuary. Tondi : 2 males and 1 female from the mouth of a stream. Ennore estuary : 2 males and 2 females from the shells of backwater oyster. Irakam Island, Pulicat lake : 1 male from mud pools along the eastern shore. Size : 9.0 mm.

Distribution : Ceylon, Maldive Is., South Africa, India.

Maera subcarinata (Haswell)

Megamoera subcarinata Haswell, 1880 (b), p. 335, pl. 24, fig. 4.

Elasmopus subcarinatus Della Valle, 1893, p. 733.
Stebbing, 1906, p. 441.
Walker, 1909 (a), p. 335.
Stebbing, 1910 (a), p. 457.
Tattersall, 1922, p. 9.
Barnard K.H., 1935, p. 286.
Pirlot, 1936, p. 317, figs. 136-145.

Maera subcarinata Barnard K.H., 1940, p. 460, fig. 26.

Elasmopus persetosus Stebbing, 1888, p. 1019, pl. 98.

Material : Tondi—4 males from seaweeds. Size : 7.0 mm..

Remarks : This is a variable species. My specimens agree with the description of Walker (1904). The paired carinae on 1st urosome, the mandible and gnathopod 2 are slightly different from those of Barnard (1940).

Distribution : Australia, New Zealand, Ceylon, east coast of India, Indian Ocean islands, South Africa and Mediterranean.

Genus **Elasmopus** Costa

Elasmopus pectenicrus (Bate)

Maera pectenicrus Bate, 1962, p. 192, pl. 34, fig. 8.

Elasmopus pectenicrus Barnard K.H., 1916, p. 197, pl. 28, fig. 33.
1937, p. 161.
1940, p. 461.
Schellenberg, 1928, p. 647.
1938 (a), p. 55.
Shoemaker, 1935, p. 238.
Pirlot, 1936, p. 312.
Ruffo, 1938 (a), p. 136.
1938 (b), p. 162.
Reid, 1951, p. 236, fig. 32.
Rudwick, 1951, p. 152.
Barnard J.L., 1955, p. 8, fig. 4.
Nayar, 1959, p. 27, pl. 9, figs. 20-35.

Elasmopus serrula Walker, 1904, p. 277, pl. 8, fig. 34.
1905, p. 336.

Elasmopus brasiliensis Stebbing, 1906, p. 443 (part).

Material : Cape Comorin—Several specimens from zoantharian colonies. Tuticorin : 1 male and 1 female from algae growing on stones. Kilakkarai : Several specimens from seaweeds. Rameswaram : 1 male and 8 females from algae. Pamban : Several specimens from seaweeds growing under the bridge. Point Calimere : 1 female from algae. Kovelong : 13 females from the washings of crinoids. Madras harbour and Royapuram : Several specimens from algae growing on the concrete blocks. Visakhapatnam harbour : Several specimens from wooden rafts. Size : 8.0 mm.

Distribution : Cosmopolitan in the tropical and subtropical seas.

Elasmopus spinidactylus Chevreux

(Fig. 8)

Elasmopus spinidactylus Chevreux, 1907, p. 412.
1908, p. 486.
Walker, 1909, p. 336.
Schellenberg, 1938 (a), p. 55.

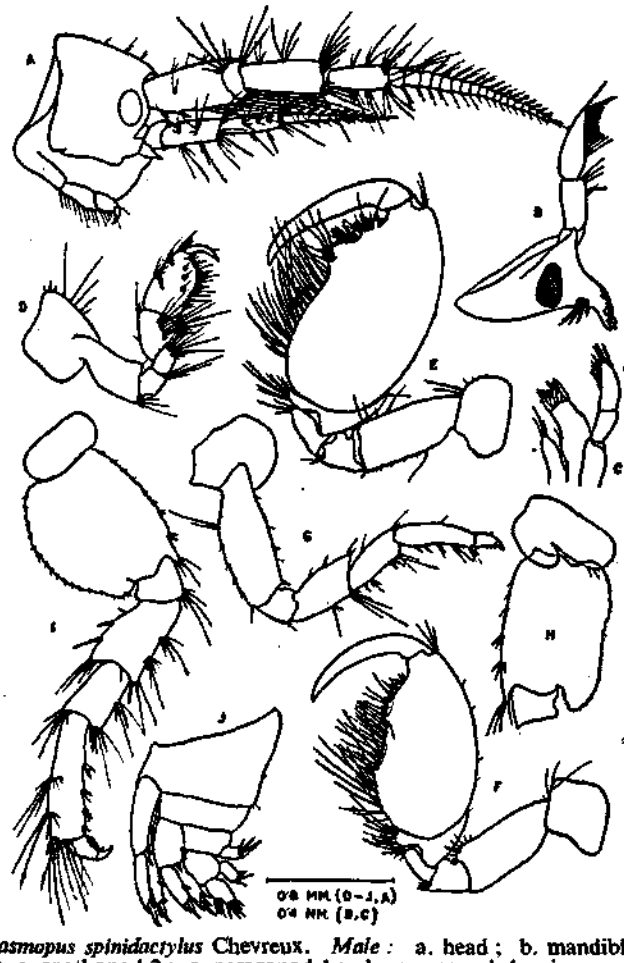

FIG. 8. *Elasmopus spinidactylus* Chevreux. *Male :* a. head ; b. mandible ; c. maxilla 1 ; d. gnathopod 1 ; e. gnathopod 2 ; g. peraeopod 1 ; h. peraeopod 4 ; i. peraeopod 5 ; j. urus. *Female :* f. gnathopod 2.

Material : Pamban—3 females and 6 males from the seaweeds growing on rocks under the railway bridge. Size : Male 9.5 mm., Female 7 mm.

Description : Male—Body short and robust, with short setules all over. Head twice as long as 1st segment. Eyes medium-sized, dark, oval, ocular lobe rather flattened in front.

Antennae short, robust and densely setose. Antenna 1 about 1/3 as long as body. 1st joint of peduncle very stout, 2/3 as long as next two, hind margin proximally with 2 spines. 3rd joint $\frac{2}{3}$ as long as and narrower than 2nd. Flagellum $\frac{2}{3}$ as long as peduncle, with 16-20 short and broad joints. Accessory flagellum 2-jointed. Antenna 2 reaching end of peduncle of antenna 1. 4th and 5th joints of peduncle subequal. Flagellum as long as 1st peduncular joint of antenna 1, with 9-11 joints.

Mandible : molar well-developed. Cutting plate with 8 teeth and spine row with 4 spines. 3rd joint of palp $1\frac{1}{2}$ times as long as 2nd, tapering distally, inner margin with comblike setae. Maxilla 1 inner plate with 3 unequal apical setae. Outer plate apically with 6 serrate spines. Last joint of palp apically with 3 spines, inner margin straight and setose. Maxilla 2 and maxilliped normal.

Gnathopod 1 small. Side plate quadrate, larger than in gnathopod 2. 2nd joint stout, widening distally. 4th joint shorter than 3rd. 6th joint broader and longer than 5th, both densely setose. Palm oblique, convex, undefined. Dactylus slender, curved. Gnathopod 2 large, well-developed. Side plate small, oblong. 2nd joint stout, distal half of front margin setose, hind margin spinulose. 3rd and 4th joints subequal in length. 5th joint very short, hind lobe setose. 6th joint very large, oblong-oval in form ; front margin convex, distally with a few setae, hind margin convex proximally and concave distally. Palm well-defined, anterior half is a spinous ridge with 3 recurved spines, posterior half produced into a recurved tooth, its pointed angle defining the palm. Hind margin and inner surface densely setose with a groove in between, the dactylus resting in this. Dactylus falcate, longer than palm.

Peraeopod 1 a little shorter than 2nd, otherwise similar. Side plate rounded. 2nd joint stout, as long as 4th and 5th combined. Dactylus characteristic, proximal $\frac{2}{3}$ of inner margin with 3 toothlike spines increasing in length distally, the distal $\frac{1}{3}$ transparent and curved, with a seta in between. Peraeopods 3-5 similar, robust, very spinous and increasing in length. Peraeopod 3 dactylus with 3 spines. Peraeopod 4. 2nd joint, hind margin slightly concave, serrate and setiferous, produced distally ; front margin with 6 sets of spines. Dactylus with 6 spines. Peraeopod 5 : front margin of 2nd joint nearly straight, spinous ; hind margin convex, serrate, each with a seta. Dactylus with 6 toothlike spines proximally, curved distally.

Uropods very spinous. Uropod 3 extending a little beyond others. Peduncle broad. Outer ramus with a spinous notch on outer margin, inner ramus small.

Telson cleft to the base, each division distally notched, with 3 spines.

Female—Gnathopod 1 as in male. Gnathopod 2 nearly as large as in male. Side plate quadrate. 2nd joint stout, front margin distally with a spine and a few setae. 5th joint longer than in male. 6th joint large as in male, tapering a little distally. Palm very oblique, much longer than hind margin, both densely setose ; anterior half of palm is a convex ridge with 6-7 curved spines, posterior half concave. Dactylus strong, as long as palm.

Remarks : The present material is much larger than recorded before. From Walker's description it differs on the following points : Flagellum of antenna 1 with more joints, 16-20 against 14, that of antenna 2 with 9-11 joints against 7,

2nd joint of peraeopods 1 and 2 not narrow and as long as next 3 joints, but stout and as long as 4th and 5th joints. Dactylus of peraeopods 4 and 5 with 6 spines instead of 5. The above differences are presumably due to their larger size.

Distribution : Paumotu Archipelago, Gilbert I., Gambier and Tuamotu Archipelagoes, Chagos Is., Egmont and Praslin Reefs. This species is recorded for the first time in India.

Elasmopus latibrachium Walker

(Fig. 9)

Elasmopus latibrachium Walker, 1905, p. 928, pl. 58, figs. 6-10.

Elasmopus odontoplax, Pirlot, 1936, p. 326, fig. 146.

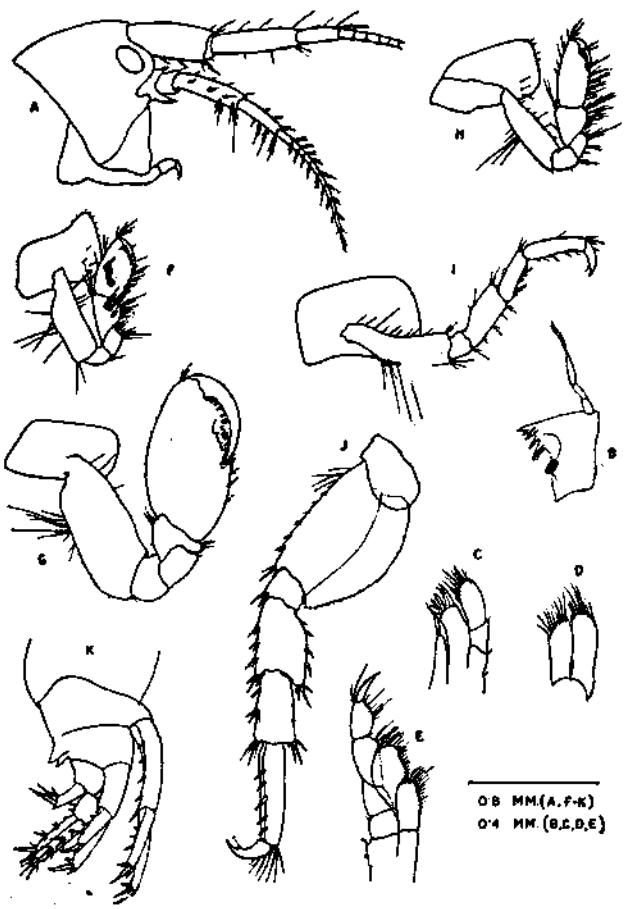

FIG. 9. *Elasmopus latibrachium* Walker. *Male :* a. head ; b. mandible ; c. maxilla 1 ; d. maxilla 2 ; e. maxilliped ; f. gnathopod 1 ; g. gnathopod 2 ; i. peraeopod 2 ; j. peraeopod 5 ; k. urus ; *Female :* h. gnathopod 2.

Material : Tondi—14 specimens from a log of palmyra wood rotting at the tidal edge. Nambuthalai : 1 male and 2 females from seaweeds. Size : Male 5.5 mm., female 8.5 mm.

Remarks : These specimens, much larger than Walker's (5 mm.) closely agree with his description and figures. 1st urosome with 2 parellel carinae. Antenna 1 : 1st joint of peduncle with 2 small spines and a long distal one on lower margin. Flagellum is stated to be 9-jointed though 23 joints are found in his figures ; in the present specimens there are 20-25 joints in the flagellum and 2 in the accessory flagellum. Flagellum of antenna 2 with 8-10 joints. Mouth parts as in Walker. Gnathopod 2 of male very large, almost naked. 2nd joint remarkably wide, subequal in length and width to 6th joint. Palm is a little different from Walker's specimens : following the hinge of dactylus there is a 5-tubercular prominence, nearly half as long as palm ; following this is a groove bordered by small tubercles. Distal half of hind margin with 3 setiferous notches. Dactyli of peraeopods with a seta on inner margin.

In Walker's list of species (p. 924) *E. eurybrachion* may be corrected to *E. latibrachium*.

Pirlot's (1936) *E. odontoplax* is clearly synonymous with the present species as pointed out by Schellenberg (1938a, p. 39).

In Stephensen's (1932) synopsis of species of *Elasmopus*, *E. latibrachium* should be transferred from group A to group C 1, as it has a pair of dorsal processes on urosome 1.

Distribution : Minikoi Is., Isles of Paternoster. This is the first record of this species from Indian peninsula.

Elasmopus sokotrae Walker & Scott

(Fig. 10)

Elasmopus sokotrae Walker & Scott, 1903, p. 223, pl. 14B, fig. 1.

Material : Cape Comorin—2 males and 3 females from seaweeds. Size : 8 mm.

Description : Male—Head as long as first two segments. Eyes moderate, dark, oval. Ocular lobe flattened in front. Body smooth, urus short. 1st urosome with 2 dorsolateral carinae as in the previous species. Side plates rather small, oblong.

Antennae densely setose. Antenna 1 half as long as body. Peduncle with plumose setae ; 1st joint stout, a little longer than 2nd, lower margin with 4 stout spines ; 3rd joint 1/3 as long as 2nd. Flagellum with about 25 joints, accessory flagellum 3-jointed. Antenna 2 : Peduncle reaching end of peduncle of antenna 1. Flagellum with 10 long joints, reaching middle of flagellum of antenna 1. Mouth parts as in *E. latibrachium*.

Gnathopod 1 small. Side plate oblong, front margin concave, produced distally. 6th joint as long as 5th ; palm oblique, smooth. Gnathopod 2 large,

well developed. 2nd and 3rd joints with angular ribs on front side. 5th joint narrow, with 2 spines, one in the middle and the other terminal ; hind lobe setose. 6th joint large, long-oval shaped, with 2 spinules on front margin. Palm as long as hind margin, both densely setose. Palm very oblique, with an anterior spinous ridge with 3-4 spines and a tooth with a spine ; this is followed by a broad sinus and a 3-tubercular prominence ; the corner tooth defining the palm is transverse, separated from the rest by a short sinus. Dactylus massive, extending far beyond the palm, inner margin with short setules and tubercles.

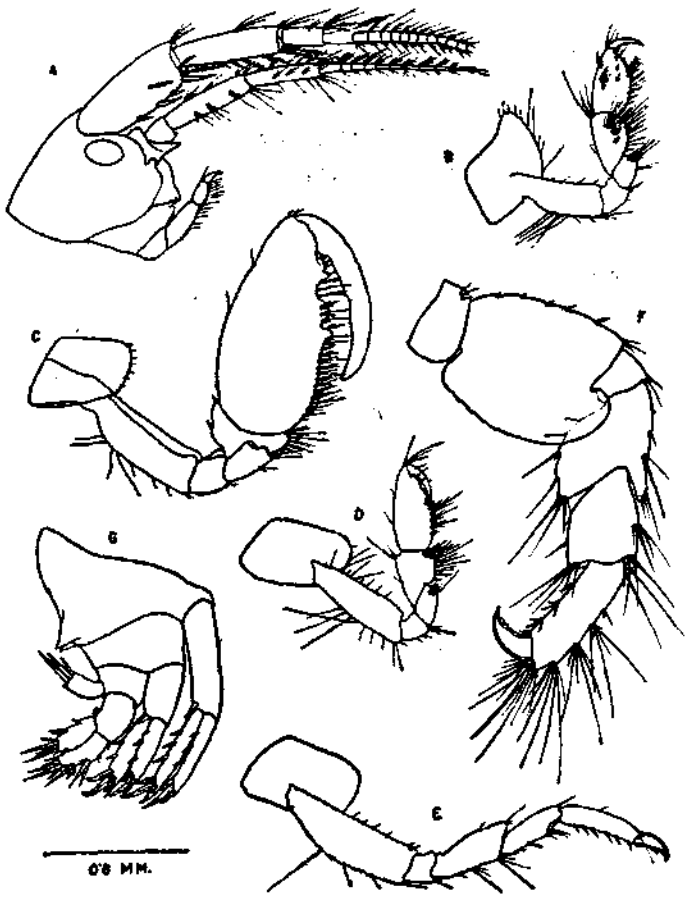

FIG. 10. *Elasmopus sokotrae* Walker & Scott. *Male :* a. head ; b. gnathopod 1 ; c. gnathopod 2 ; e. peraeopod 1 ; f. peraeopod 5 ; g. urus ; *Female :* d. gnathopod 2.

Peraeopod 1 a little longer than peraeopod 2, otherwise similar to it. Side plate oblong. 2nd joint subequal in length to 4th and 5th combined. Joints 5 and 6 spinous on hind margin. Dactylus with a short spine on inner margin. Peraeopods 3-5 very robust and spinous, increasing in length, with broad and plumpy joints. Peraeopod 5 very robust and spinous, with long stout setae. 2nd joint spinous on front margin and faintly serrate behind. 4th and 5th joints very wide. Dactylus strong, with a spine on inner margin.

Uropods very spinous. Uropod 3 projecting a little beyond others. Telson deeply cleft, each division terminally flat with 3 unequal spines.

Female : Gnathopod 1 as in male, but 6th joint is a little narrower. Gnathopod 2 slender, better-developed than gnathopod 1. 5th joint 2/3 as long as 6th, hind margin densely setose. 6th joint oblong-oval in form, hind margin densely setose. Palm very oblique, shorter than hind margin, with an anterior rounded prominence, followed by a low tubercular region and 3 unequal spines defining the palm.

Remarks : I have no doubt in assigning these specimens to this species which has not been recorded anywhere since it was first described in 1903. The present specimens are much larger and hence the well-differentiated palm and setose condition of male gnathopod 2 which are not found in Walker & Scott's specimens. The peduncle of uropod 3 is stated to be longer than rami though in their figure (as also in the present material) the rami are much longer than peduncle.

The females described and figured by Walker & Scott presumably belong to someother species ; they are stated to be without dorsal carinae on urosome 1 ; the 5th and 6th joints of gnathopod 2 are rather broad. In the present material the females have a pair of carinae on urosome 1 ; the 5th and 6th joints of gnathopod 2 are much narrower.

Distribution : Abd-el-Kuri I. This is the first record of this species from India.

Genus **Ceradocoides** Nicholls

? **Ceradocoides chiltoni** Nicholls

(Fig. 11)

Ceradocoides chiltoni Nicholls, 1938, p. 123.
Sheard, 1939, p. 277, fig. 5 N,. O.

Material : 1 male from seaweeds at Cape Comorin. Size : 9 mm.

Description : Male—Head subequal in length to the first two segments. Eyes rather small, dark, oblong, twice as long as broad, placed at the base of antenna 1, ocular lobe slightly produced. Body broadly curved, smooth. Epimeral plates of pleon segments with 2-3 spines on front margin and 2 teeth on hind margin. 2nd gnathopods dimorphic, the left one being large and well-developed, the right one under-developed.

Antenna 1 as long as body, sparsely setose. Peduncle shorter than flagellum ; 1st joint stout, shorter than next and thrice as long as 3rd, with a subterminal spine on lower margin. Flagellum with 29 joints, accessory with 4 joints. Antenna 2 nearly $\frac{2}{3}$ as long as antenna 1. Peduncle reaching tip of 2nd peduncular joint of antenna 1, 4th joint longer than 5th. Flagellum with 11 joints.

Mandible body triangular, molar rather small, cutting plate with 6 serrate teeth, spine row with 6 spines. 1st joint of palp short and broad ; 2nd joint longer than 3rd, both with a few long setae on the inner margin. Maxilla 1 inner plate

terminally with 3 stout setae, outer plate with 4 dentate spines and 'some setae. 2nd joint of palp with 7 apical setae. Maxilla 2 and maxilliped normal, as figured.

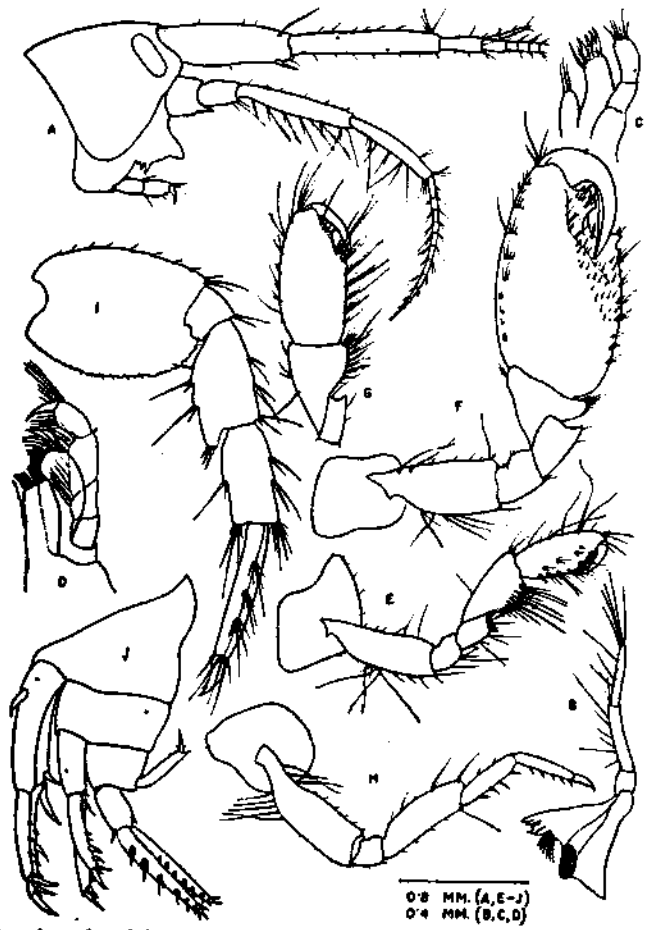

FIG. 11. *Ceradocoides chiltoni* Nicholls (?) *Male*: a. head; b. mandible; c. maxilla 1; d. maxilliped; e. gnathopod 1; f. left gnathopod 2; g. right gnathopod 2; h. peraeopod 1; i. peraeopod 5; j. urus.

Gnathopod 1 slender and setose. Side plate with front margin concave, produced anteriorly. 2nd joint 1½ times as long as 5th. 5th joint a little shorter than 6th, hind lobe rounded, with dense setae. 6th joint narrower than 5th, with long setae. Palm very oblique, with 3 spines anteriorly and one at the defining angle. Dactylus slender, curved. Gnathopod 2 the left one large, robust. Side plate small, front and hind margins slightly concave, rounded below. 2nd joint stout, thrice as long as next, with long setae on both margins. 3rd and 4th joints of same length. 5th joint triangular, hind lobe narrow, with short setae. 6th joint large, oblong-oval; front margin with about 10 sets of short setae on the inner aspect, hind margin with 7 sets of setae. Palm narrow, well-differentiated, with two flat-topped teeth each with a long spine on the inner aspect; this is followed by a deep sinus with a spine and posteriorly a large, acute tooth and a small one behind it

which define the palm. Dactylus stout, strongly curved, its tip lying in the concave groove below the palm. The right gnathopod 2 is under-developed and somewhat like the gnathopod 1.

Peraeopod 1 side plate rounded. 2nd joint stout, basal portion slender with long setae. 4th to 6th joints spinous. Dactylus short, with a setae on the inner margin. Peraeopod 2 similar to the above, but shorter. Peraeopods 3 to 5 nearly identical except in their increasing length. Peraeopod 5 very spinous. 2nd joint oval, front margin spinous, hind margin serrate, each with a seta.

Uropods very spinous. Uropod 1 peduncle as long as inner ramus, with a stout spine on outer margin near the base and two other spines of unequal length distally on inner margin. Outer ramus shorter than inner, both spinous. Uropod 2 : Peduncle shorter than rami, with 2 spines distally on inner aspect. Outer ramus a little shorter than inner, both spinous. Uropod 3 extends beyond others. Peduncle short with 2 distal spines ; rami subequal, 2½ times as long as peduncle, each with 6-7 sets of spines on their margins.

Telson longer than 3rd urosome, cleft to the base, each lobe deeply notched distally, with a long and a small spines terminally and a small subterminal one dorsally.

Remarks : I am doubtfully assigning this specimen to *C. chiltoni* as I have not seen the original description by Nicholls. However the present material fits into Sheard's key to the genera of the *Ceradocus*-group and agrees with the description and figure of the mandible of *C. chiltoni* which is the only species of this genus.

Distribution : Australia, India. This is the first record of this species from India.

Genus **Melita** Leach

Melita fresneli (Audouin)

Melita fresnalli Walker, 1909, p. 334.

Melita fresnelii Kunkel, 1910, p. 31.
Stebbing, 1910 (b), p. 596.
Pearse, 1912, p. 371.
Barnard K.H., 1916, p. 189, pl. 28, fig. 32.
1937, p. 159.
Chilton, 1921 (a), p. 70.
Hale, 1927, p. 314.
Schellenberg, 1928, p. 644.
Shoemaker, 1935, p. 239.
1941, p. 187.
Pirlot, 1936, p. 304.
1939, p. 76.
Rudwick, 1951, p. 152.

Melita fresnelli Reid, 1951, p. 242.

Melita fresneli Schellenberg, 1938 (a), p. 64.
Barnard K.H., 1940, p. 334.
Oliveira, 1953, p. 311.
Barnard J.L., 1955, p. 13.

Maera valida Dana, 1953-55, p. 966, pl. 66, fig. 6.

Maera setipes Dana, 1953-55, p. 967, pl. 66, fig. 7.

Maera anisochir Dana, 1853-55, p. 968, pl. 66, fig. 8.

Melita anisochir Bate, 1862, p. 186, pl. 34, fig. 1.
Walker, 1904, p. 270, pl. 4, fig. 28.

Melita Australis Haswell, 1880 (a), p. 264, pl. 9, figs. 6-7.

Melita cotesi Giles, 1890, p. 64, pl. 2, fig. 1.

Dulichiella spinosa Stout, 1912, p. 141, figs. 79-80.

Material : Pamban—4 females from the seaweeds below the railway bridge. Tondi-Nambuthalai: 1 male and 8 females from the seaweeds and sponges. Size: 3 mm.

Remarks : In the single male specimen from Tondi, the right gnathopod 2 was enormously developed whereas the left one was underdeveloped resembling the female gnathopod 2.

Distribution : Cosmopolitan in the tropical and subtropical seas.

Melita zeylanica Stebbing

(Fig. 12, a-j)

Melita zeylanica Stebbing, 1904, p. 22, pl. 5.
Barnard K.H., 1940, p. 455.
John, 1955, p. 117, fig. 18.
Pillai, 1961, p. 53, fig. 26.

Melita inaequistylis Barnard K.H., 1916, p. 191 (part, not Dana)
Chilton, 1921 (b), p. 535 (not Dana)

Material : 1 male and 1 female from seaweeds at Pamban and Kilakkarai. Size: 8.5 mm.

Remarks : These specimens closely agree with the description of Stebbing (1904) and Barnard (1940): 1st urosome without a tooth. 2nd urosome dorsally with a submedian fascicle of 2-3 spines on each side. Side plate 1 not markedly triangular. Side plate 6 in the female with a distinct hook. 6th joint of gnathopod 1 without

a distal lobe overhanging the base of dactylus ; palm short, distally produced into a setose lobe with which the short dactylus fits in.

FIG. 12 a-j. *Melita zeylanica* Stebbing. *Male :* a. head ; b. mandible ; c. maxilla 1 ; d. maxilla 2 ; e. maxilliped ; f. gnathopod 1 ; g. gnathopod 2 ; i. peraeopod 1 ; j. peraeopod 5 ; *Female :* h. gnathopod 2. FIGS. k-m. *Melita orgasmos* Barnard. *Female :* k. urus ; l. uropod 3 ; m. telson.

Walker's (1904, p. 273, pl. 5, fig. 33) record of *Maera tenuicornis* seems to be different from this species in the structure of the teeth on urosomes and the 6th joint of gnathopod 1, though Barnard doubtfully assigned it to this species. Chilton's (1921b) record of *M. inaequistylis* is however similar to this species.

This species has been found to be destructive to submerged timber and capable of digesting cellulose (John, 1955).

Distribution : Ceylon, India, east coast of South Africa. This is the first record of this species from the east coast of India.

Melita orgasmos Barnard

(Fig. 12, k-m)

Melita inaequistylis Barnard K.H., 1916, p. 191 (part, not Dana)

Melita orgasmos Barnard K.H., 1940, p. 454.

Material : Kilakkarai—1 female from the seaweeds. Size : 6 mm.

Remarks : Barnard's record (1916) of *M. inaequistylis* was actually composed of two species which he later (1940) separated into *M. zeylanica* Stebbing and a new species *M. orgasmos*. As a strange coincidence my material was also composed of these two species which I had first considered as a single species, *M. zeylanica*.

The present specimen was black coloured and closely agrees with the characters set out by Barnard : 1st urosome with a slender median tooth produced backwards as far as 2/3 the length of 2nd urosome which has one or two submedian spines on each side. Posterior corner of 3rd epimere acutely produced. Side plate 1 more triangular than in *M. zeylanica*. Side plate 6 in the female hooked, but not so distinctly as in the previous species. Gnathopod 1 : 6th joint with a distal lobe overhanging the base of dactylus which is as long as palm ; palm convex, nearly at right angle with the hind margin. Peraeopods 3-5 : hind margin of 2nd joint feebly serrate ; 4th joint markedly wider than 5th, unlike Barnard's material. Other characters as in *M. zeylanica*.

Distribution : East coast of South Africa. This species is recorded for the first time from India.

Family : AORIDAE

Genus **Lembos** Bate

? **Lembos kergueleni** (Stebbing)

(Fig. 13)

Autonoe kergueleni Stebbing, 1888, p. 1087, pl. 111.

Lembos kergueleni Walker, 1909, p. 337, pl. 43, fig. 6.

Material : Kilakkarai: 1 male and 11 females from algae. Tondi: 2 males and 3 females from red sponges. Nambuthalai: 1 female from algae. Size: 6 mm.

Remarks : These specimens agree with the description of Stebbing and of Walker, but 2nd joint of male gnathopod 2 is not very wide. The following details are added to these : Antenna 1 : 1½ times as long as antenna 2. 1st joint of peduncle stout, a little shorter than 2nd, distal 2/3 of hind margin with 3 stout spines ; 3rd joint 1/3 as long as 2nd. Flagellum 22-jointed, accessory flagellum 8-jointed. Antenna 2 : 4th and 5th joints of peduncle subequal, flagellum with 9 joints.

Male—Gnathopod 1 hind lobe of 5th joint acute, densely setose. 6th joint not widening distally as in Walker, but the front and hind margins nearly parallel ; hind margin with a subterminal spine and a distal tooth which defines the palm ; this is followed by a rounded sinus and a flat-topped prominence which is not swollen and separated as in Walker. Dactylus serrate on inner margin, not smooth and swollen in the middle as in Walker. Gnathopod 2 5th joint longer than 6th. Palm transverse, defined by a stout spine.

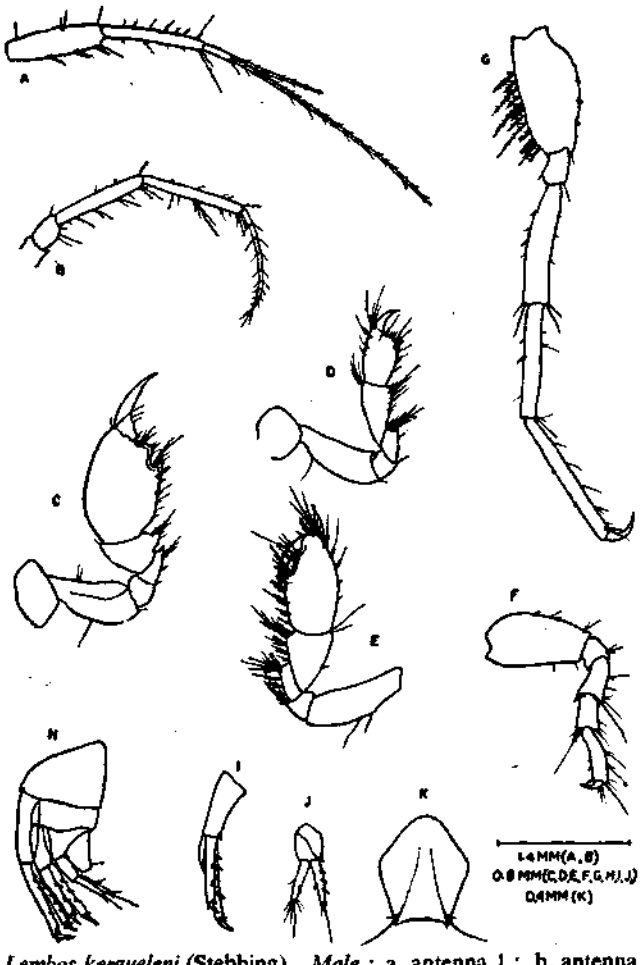

FIG. 13. ? *Lembos kergueleni* (Stebbing). *Male :* a. antenna 1 ; b. antenna 2 ; c. gnathopod 1 ; d. gnathopod 2 ; f. peraeopod 3 ; g. peraeopod 5 ; h. urus ; i. uropod 1 ; j. uropod 3 ; k. telson ; *Female :* e. gnathopod 1.

Female gnathopods 1 and 2 as in Walker.

Peraeopod 5 very long, surpassing the body. 2nd joint with plumose setae on hind margin. Telson 5-sided, with the dorsal depression ; hind margin concave, the lateral corners each with a long and a short seta.

Distribution : Kerguelen I., Cargados and Wasin. This is the first record of this species from India.

Lembos leptocheirus Walker

(Fig. 14)

Lembos leptocheirus Walker, 1909, p. 338, pl. 43, fig. 7.
Schellenberg, 1926, p. 373.
Schellenberg, 1928, p. 662.
Barnard K.H., 1940, p. 478.

Material : Pamban—2 males and 1 female from seaweeds. Size: 6 mm.

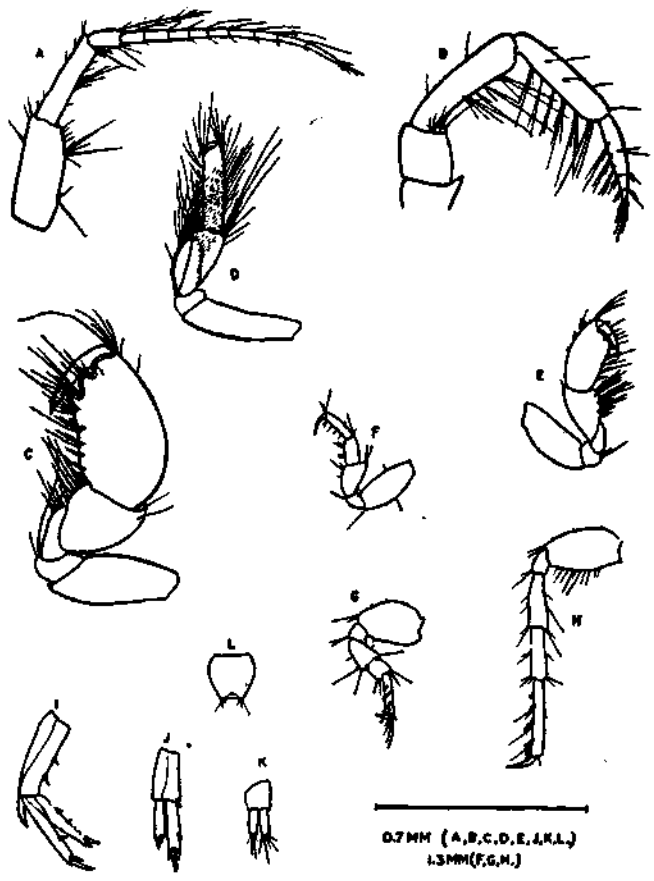

FIG. 14. *Lembos leptocheirus* Walker. *Male :* a. antenna 1; b. antenna 2; c. gnathopod 1; d. gnathopod 2; f. peraeopod 1; g. peraeopod 3; h. peraeopod 5; i. uropod 1; j. uropod 2; k. uropod 3; l. telson; *Female :* e. gnathopod 1.

Remarks : These specimens are much larger than Walker's (3.5 mm.). They agree with his description except on the following points. Antennae as in Walker, but the flagellum of antenna 2 is 3-jointed instead of 5, the 1st joint being twice as long as next two combined. Gnathopod 1 of male is a little different in the 6th joint which is bulbous at the base, narrowing a little distally. Palm not subequal to hind margin but half its length; there is a short sinus near the base of dactylus,

followed by a flat-topped prominence ; this is followed by a deep and wide sinus and an acute tooth which defines the palm. Dactylus nearly straight, extending far beyond the palm (not as long as palm as in Walker). Gnathopod 2 characteristic, dactylus longer than the palm.

Distribution : Suez, Port Said, east coast of South Africa. This species is recorded for the first time in India.

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