

**THE SKELETON SHRIMPS (AMPHIPODA : CAPRELLIDEA) OF
THE TAMIL NADU AND KERALA COASTS**

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ABSTRACT

The paper deals with the caprellid Amphipoda collected from the Tamil Nadu and Kerala Coasts. Descriptions and figures of nine species and keys to the families and Indian species of Caprellidea are given. Notes on the ecology, distribution and evolution of Indian Caprellidea are also given.

INTRODUCTION

THE Caprellidea, which include the skeleton shrimps commonly found among hydroid and polyzoan colonies and the whale-lice ectoparasitic on whales, have not been studied in detail in India. While the whale-lice have not been reported from India, there are a few works on the skeleton shrimps. Giles (1888) described for the first time two new species from the Bay of Bengal, but they are not recognizable because of poor description and illustrations. Mayer (1890) described 4 new species from Pamban in the Gulf of Mannar and later (1904) reported on 5 species from Sri Lanka. Sundara Raj (1927) listed 6 species from Pamban. Sivaprakasam (1969, 1970) recorded 4 species from the Madras Coast. In the present work, nine species of caprellids collected from the Tamil Nadu and Kerala Coasts are dealt with. All are known species, but two are recorded for the first time from India. With the present work, ten species of caprellids are now known from India waters.

The suborder Caprellidea which hitherto included two families, the Caprellidae (skeleton shrimps) and the Cyamidae (whale-lice), now includes five families with the new familial concepts proposed by Vassilenko (1968) and further developed by McCain (1970). An appraisal of the taxonomic characters and the evolutionary trends in Caprellidea was made by McCain (1968, 1970). Some genera could not be placed in any of the families since their mouth parts have not been fully described (McCain, 1970). Detailed descriptions and figures are therefore given in the present paper which will not only aid in the easy recognition of Indian caprellids but also in their revisionary work in future. A key to the families of Caprellidea and a key to the Indian species are also given in this paper.

The author is thankful to the Director, Zoological Survey of India for providing laboratory facilities.

KEY TO THE FAMILIES OF CAPRELLIDEA

1. Mandible without molar or palp; peraeopods 1-2 absent.....CYAMIDAE
- Mandible with molar and palp (at least one of them); peraeopods 1 - 2 segmented or reduced (rarely absent)..... 2

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2. Mandible lacking molar; abdomen of single reduced joint...PHTISICIDAE
These characters not combined..... 3
3. Mandible lacking palp (or with rudimentary palp).....CAPRELLIDAE
Mandible with palp..... 4
4. Peraeopods 1-2 considerably reduced or absent; abdomen of single reduced joint.....AEGINELLIDAE
Peraeopods 1-2 reduced to 1 or 2 joints; abdomen of numerous (5) segments.....CAPROGAMMARIDAE

KEY TO THE SPECIES OF INDIAN CAPRELLIDEA

1. Gills on peraeonites 2 to 4; peraeopods 1-2 absent and peraeopod 3 three-jointed..... *Pseudocaprellina pambanensis*
Gills on peraeonites 3 - 4; peraeopods 1 - 2 rudimentary and peraeopod 3 six-jointed..... 2
2. Mandible with molar and 3-jointed palp..... 3
Mandible with molar but without palp..... 7
3. Peraeonites 6 and 7 fused..... 4
Peraeonites 6 and 7 not fused..... 6
4. Dorsal surface of head and body smooth; gills oval.....
.....*Metaprotella problematica*
Dorsal surface of head and body with spines; gills rod - like..... 5
5. Body attenuated; male gnathopod 2 with 3 bumps on inner margin of 2nd joint; propodus of peraeopods 3-5 nearly straight.....
.....*Metaprotella excentrica*
Body plump; male gnathopod 2 without bumps on 2nd joint; propodus of peraeopods 3-5 curved.....*Metaprotella haswelliana*
6. Body smooth on dorsal surface; gills elliptical.....*Monotropus falcimanus*
Body spinose on head and peraeonites 1-2, gills oval.....
.....*Paradeutella bidentata*
7. Body segments hexagonal in dorsal view, with a pair of ventral spines between gnathopods 2; propodus of gnathopod 1 with large proximal lobe.....*Hemiaegina minuta*
Body segments not hexagonal, without ventral spines and propodus of gnathopod 1 without a proximal lobe.....8
8. Peraeonite 2 with an antero-dorsal tubercle; propodus of male gnathopod 2 deeply notched.....*Paracaprella barnardi*
Peraeonite 2 without antero-dorsal tubercle; propodus of male gnathopod 2 slightly notched.....9

9. Male gnathopod 2 without proximal knob on joint 2; female gnathopod 2 with a notch above grasping spine.....*Paracaprella alata*
 Male gnathopod 2 with a proximal knob on joint 2; female gnathopod 2 without a notch above grasping spine.....*Paracaprella pusilla*

SYSTEMATIC ACCOUNT

SUBORDER : CAPRELLIDEA

Family : *Phtisicidae*Subfamily : *Dodecadinae*Genus *Pseudocaprellina* Sundara Raj, 1927

Flagellum of antenna 2 two-jointed, swimming setae absent. Mandible without molar, palp 3-jointed, setal formula 1-x-1. Maxilliped with outer plate slightly larger than inner. Gills on peraeonites 2 to 4. Peraeopods 1-2 absent, 3rd three-jointed and others 6-jointed. Abdomen with a pair of single jointed appendages and a pair of lobes.

Pseudocaprellina pambanensis Sundara Raj, 1927 (Figs. 1, 2)

Pseudocaprellina pambanensis Sundara Raj, 1927, p. 127, pl. 17.

Material : 1 female from algae on coral heads, Hare Island, Tuticorin, Gulf of Mannar. Length 3.5 mm.

Description : Female body smooth, without any spination. Antenna 1 with peduncle longer than antenna 2. Flagellum 4-jointed. Antenna 2 with 2-jointed flagellum. Upper lip slightly cleft below. Lower lip with inner and outer lobes. Mandible with 6-toothed incisor, 3-toothed lacinia mobilis and 3 other teeth representing spine row. Molar absent. Palp 3-jointed, setal formula for last joint 1-2-1. Maxilla 1 with 6 spines on outer plate. 2nd joint of palp with 2 apical spines and 6-7 lateral setae. Maxilla 2 with 6 apical setae on inner and outer plates. Maxilliped with inner plate shorter than outer, apex truncated with 2 spines and 3 setae. Outer plate with 6-7 marginal setae. Palp stout, 2nd joint wide, 3rd joint with a distal process and last joint acute-tipped. Gnathopod 1 with propodus oval, palm convex with 2 grasping spines in a pocket. Dactylus smooth. Gnathopod 2 with 5th joint projecting. Propodus elongate-oval, palm convex, smooth, with a few setae and ending in a pocket with 2 grasping spines. Dactylus smooth. Three pairs of gills found on peraeonites 2 to 4, elongate-oval, 2nd pair the largest and 3rd pair the smallest. Peraeopods 1-2 absent. Peraeopod 3 three-jointed. Peraeopods 4-5 with a pair of grasping spines and 3 to 5 other spines on propodus. Abdomen with 2 pairs of single jointed appendages, curved backwards, a pair of lobes and a dorsal lobe.

Male : Not found in the present material, but described by Sundara Raj (1927).

Remarks : This species is recorded for the first time since it was erected in 1927. The female not known earlier is now described and figured. It differs from Sundara Raj's description in that the 1st flagellar joint of antenna 1 is not a fused segment of 5 joints and the flagellum of antenna 2 is distinctly 2-jointed.

Distribution : Gulf of Mannar, India.

Family : *Aeginellidae*

Subfamily : *Protellinae*

Genus *Metaprotella* Mayer, 1890

Flagellum of antenna 2 two-jointed, swimming setae absent. Mandible with molar and 3-jointed palp, setal formula for last joint 1-x-y-1. Outer plate of maxilliped much larger than inner. Gills on peraeonites 3 and 4. Peracopods 1-2 reduced, single jointed and others 6-jointed. Peraeonites 6-7 fused. Abdomen with a pair of appendages and a pair of lobes in male and a pair of lobes in female.

Metaprotella excentrica Mayer, 1890 (Figs. 3, 4)

Metaprotella excentrica Mayer, 1890, p. 25, pl. 1, figs. 20-21; pl. 3, figs. 30-31, pl. 5, figs. 22, 1903, p. 40, 1904, p. 224. Sundara Raj, 1927, p. 126.

Material : 7 males and 6 females from algae, Kilakkarai and 2 males from algae, Appa Island near Kilakkarai, Gulf of Mannar. Length upto 14.0 mm.

Description : *Male* : Body attenuated. Head and peraeonites 2-3 with paired dorsal spines in the middle. Peraeonite 2 also with a posterodorsal spine. Antenna 1 elongate, $\frac{3}{4}$ as long as body. Flagellum 16-jointed. Antenna 2 as long as peduncular joints 1-2 of antenna 1, flagellum 2-jointed.

Upper lip slightly cleft below. Lower lip with inner and outer lobes. Mandible with molar large and ridged. Incisor and lacinia mobilis 5-toothed. Spine row with 3 spines. Palp 3-jointed, setal formula for last joint 1-12-1. Maxilla 1, outer plate with 7 spines, the inner 2 serrate and the rest bifid. 2nd joint of palp with 6 apical spines and 4 setae. Maxilla 2, apically setose on inner and outer plates. Maxilliped, outer plate with 1 apical seta, close-set setules on entire inner margin and 2 setae in the middle. Inner plates with 2 teeth at inner and outer corners and 4 apical setae. Palp stout, dactylus setulose.

Gnathopod 1 with propodus elongate and triangular, palm slightly convex, proximal $\frac{3}{4}$ finely toothed and with a proximal grasping spine. Dactylus with 16 teeth on inner margin. Gnathopod 2, 2nd joint with 3 large knobs on distal half of inner margin. Propodus with distal part of palm 2-toothed, followed by oblique notch and a pointed tooth and the proximal lobe with a grasping spine. Dactylus falcate, inner margin rough.

Gills on peraeonites 3-4 elongate-oval.

Peraeopods 1-2 reduced to a single joint, about $\frac{1}{4}$ as long as gills and with about 9 setae. Peraeopods 3-5 slender and increasing in length. Propodus nearly straight with a pair of grasping spines and 6 other spines on palm and with an angular process near the base on lower margin.

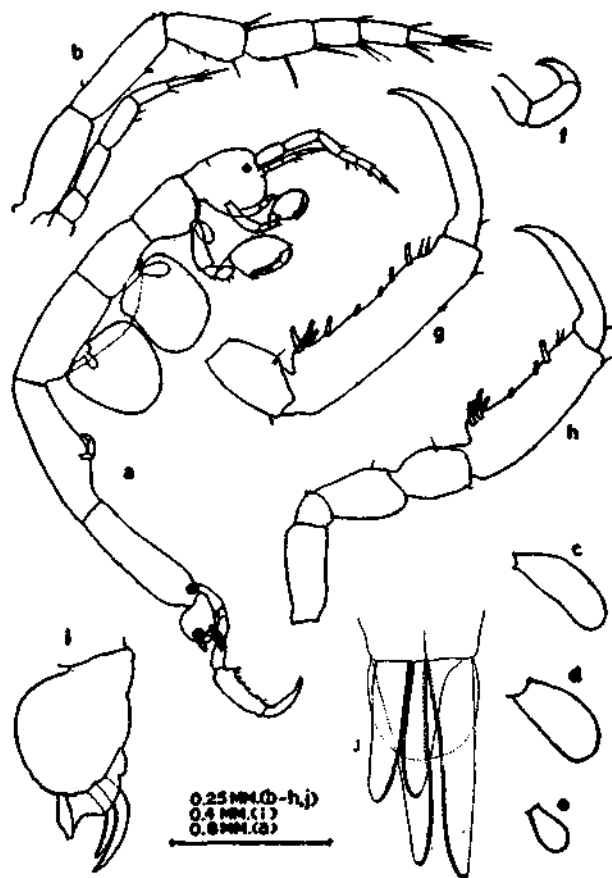


Fig. 1. *Pseudocaprellina pambanensis* - Female : a. entire animal; b. antennae 1 and 2; c, d, e. gills 1, 2, 3; f, g, h. peraeopods 3, 4, 5; i. last peraeonite and abdomen and j. abdomen.

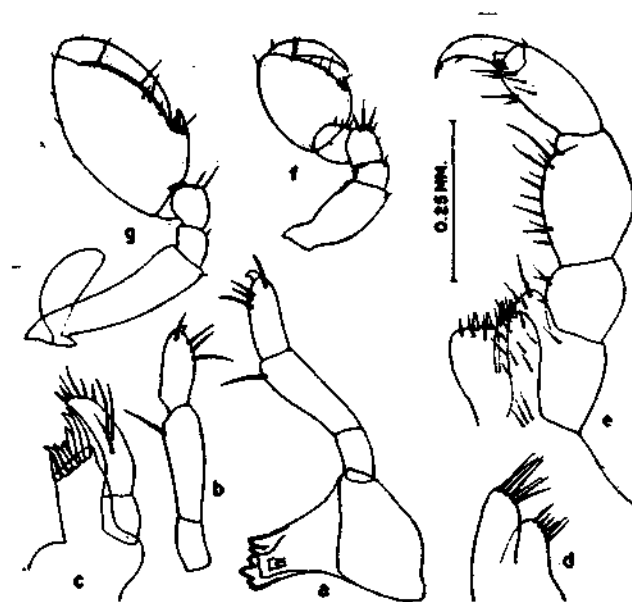


Fig. 2. *Pseudocaprellina pambanensis* - Female : a, b. mandible; c, d. maxillae 1, 2; e. maxilliped; f and g. gnathopods 1, 2.

Abdomen with a pair of appendages fringed with setae on outer margin and an apical papilla with a seta, a pair of lobes and dorsal lobe with 3 plumose setae.

Female : Similar to the male in dorsal spines, but body less attenuated. Gnathopod 2 without knobs on 2nd joint. Propodus oval, distal part of palm oblique, followed by a small notch and a tooth, the rest of the palm convex and the proximal lobe with a grasping spine.

Remarks : The present material closely agrees with Mayer's (1890) description and figures. This species can be distinguished from the following species, *M. problematica* by the body spination, the knobs on 2nd joint of gnathopod 2 and the less curved propodus of peraeopods 3-5 which also have a small tooth on proximal corner of lower margin.

Distribution : India, Sri Lanka and Australia.

***Metaprotella problematica* Mayer, 1890 (Fig. 5)**

Metaprotella problematica Mayer, 1890, p. 26, pl. 1, fig. 19; pl. 3, figs. 26, 27; pl. 5, figs. 25-26; pl. 6, fig. 8. 1904, p. 225. Sundara Raj, 1927, p. 125, pl. 15, figs. 1 a-c.

Metaprotella sp. Mayer, 1903, p. 43.

Material : 3 females from algae, Pamban, Gulf of Mannar. Length upto 70 mm.

Description : *Female* : Body smooth on dorsal surface. Antenna 1 about 4/5 as long as body, flagellum 14-jointed. Antenna 2 as long as peduncle of antenna 1, flagellum 2-jointed.

Upper lip slightly bifid below. Lower lip with inner and outer lobes. Mandible with large molar and 3-jointed palp, setal formula for last joint 1-9-3-1. Incisor and lacinia mobilis 5-toothed and spine row with 3 spines. Maxilla 1, outer plate with 7 spines, 2nd joint of palp with 5 spines and 2 setae. Maxilla 2, inner plate shorter than outer, both apically setose, inner plate with a detached seta on inner margin. Maxilliped, inner plate small with 4 apical setae and 4 teeth on inner corner. Outer plate large with an apical seta, inner margin with 8 teeth and a pair of setae in notch at mid-length. Dactylus of palp with setules on inner margin.

Gnathopod 1, propodus triangular, palmar margin minutely toothed and with a pair of grasping spines. Dactylus with 9 teeth on inner margin. Gnathopod 2, propodus widest near the middle, palm with a flat topped tooth near hinge of dactylus, followed by a notch and a tooth, and proximal tooth with a grasping spine.

Gills on peraeonites 3-4 elongate-oval.

Peraeopods 1-2 one-jointed, about $\frac{1}{2}$ as long as gills and with 8-10 setae. Peraeopods 3-5 increasing in stoutness, propodus with a pair of grasping spines on raised lobe and 2-3 spined knobs.

Abdomen with a pair of lobes.

Male : Similar to the female, but not found in the present material.

Distribution : Sri Lanka, India and East Indies.

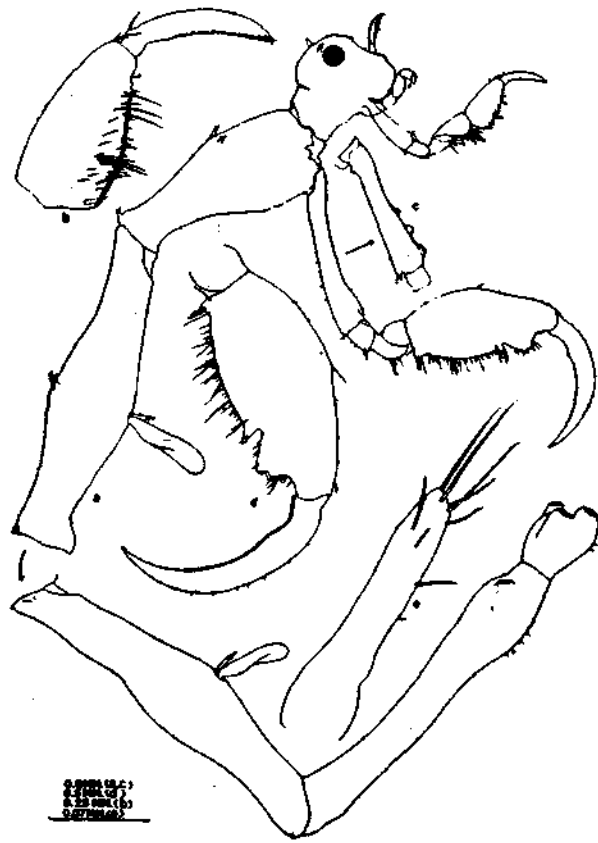


Fig. 3. *Metaprotella excentrica* - Male: a. entire animal; b gnathopod 1; c gnathopod 2, frontal view of 2nd joint; d gnathopod 2 and e peraeopod 1.

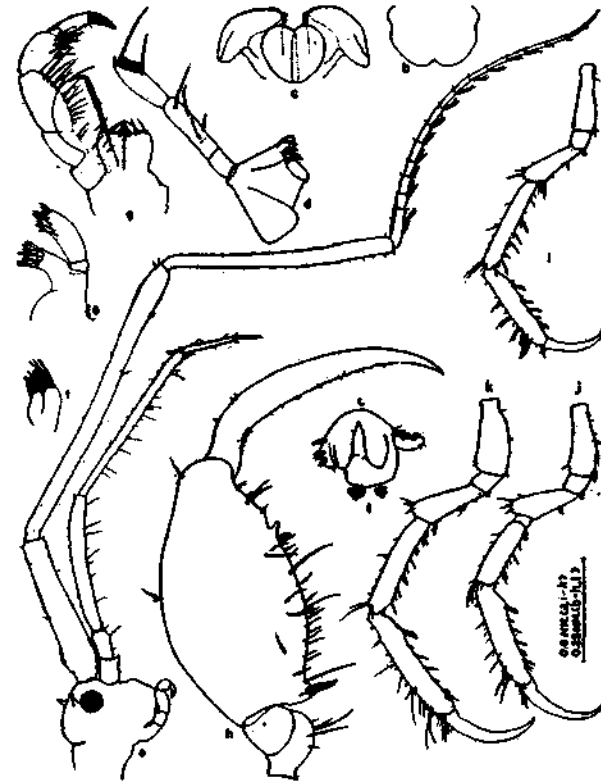


Fig. 4. *Metaprotella excentrica* - Male: a. head with antennae; b, c. upper and lower lips; d. mandible; e, f. maxillae 1, 2; g. maxilliped; i, j, k. peraeopods 3, 4, 5; l. abdomen, and Female: h. gnathopod 2.

Genus *Monoliropus* Mayer, 1903

Flagellum of antenna 2 two-jointed, swimming setae absent. Mandible with molar and 3-jointed palp, setal formula for last joint 1-x-y-1. Maxilliped with outer plate much larger than inner. Gills on peraeonites 3-4. Peraeopods 1-2 reduced, 1-jointed and others 6-jointed. Abdomen with a pair of 2-jointed appendages.

Monoliropus falcimanus Mayer, 1904 (Figs. 6 - 7)

Monoliropus falcimanus Mayer, 1904, p. 225, figs. 1-9. Sivaprakasam, 1969, p. 382, figs. 4 G - H.

Material : 1 male from algae, Appa Island and 1 female from Nallattanni island, near Kilakkarai, Gulf of Mannar. Length 3.5-11.0 mm.

Description : *Male* : Body smooth on dorsal surface, with strong triangular ventrolateral projection on peraeonites 2 to 4. Antenna 1 less than half the body length, peduncle longer than flagellum which is 10-jointed. Antenna 2, flagellum 2-jointed.

Upper lip slightly cleft below. Lower lip with inner and outer lobes. Mandible with molar and 3-jointed palp, setal formula for last joint 1-3-1-1. Incisor 5-toothed and lacinia mobilis 4-toothed. Spine row with 3 spines. Maxilla 1, outer plate with 7 spines and 2nd joint of palp with 7 spines and 6 setae. Maxilla 2, both plates apically setose. Maxilliped, inner plate with 5 apical setae. Outer plate much larger, with a long seta in apical notch, followed by a rounded, slightly bifid lobe and a strong notch with a seta. 3rd joint of palp with a slight distal lobe. Dactylus minutely serrate.

Gnathopod 1, propodus minutely toothed on palm and with a proximal grasping spine. Dactylus with about 12 teeth on inner margin and the interspaces minutely serrate. Gnathopod 2 large, propodus sickle-shaped, with a flat-topped distal tooth, followed by a strong tooth at $\frac{2}{3}$ its length and the proximally produced lobe with a grasping spine, Dactylus strongly arched, with minute setules.

Gills on peraeonites 3-4 elliptical.

Peraeopods 1-2 reduced to a single joint with 4 setae. Peraeopods 3-5 gradually increasing in size. Propodus of peraeopod 5 with a stout grasping spine and 4 spined knobs.

Abdomen with a pair of 2-jointed appendages fringed with setae.

Female : Antennae less attenuated. Propodus of gnathopod 2 oval, the distal flat-topped tooth followed by a notch and a tooth and the proximal lobe with a grasping spine. Abdomen with a pair of lobes.

Distribution : Sri Lanka and India.

Genus *Paradeutella* Mayer, 1890

Flagellum of antenna 2 two-jointed, swimming setae absent. Mandible with molar and 3-jointed palp, setal formula for last joint 1-x-1. Maxilliped with outer plate larger than inner. Gills on peraeonites 3-4. Peraeopods 1-2 reduced, 2-jointed and others 6-jointed. Abdomen with a pair of appendages and a pair of lobes.

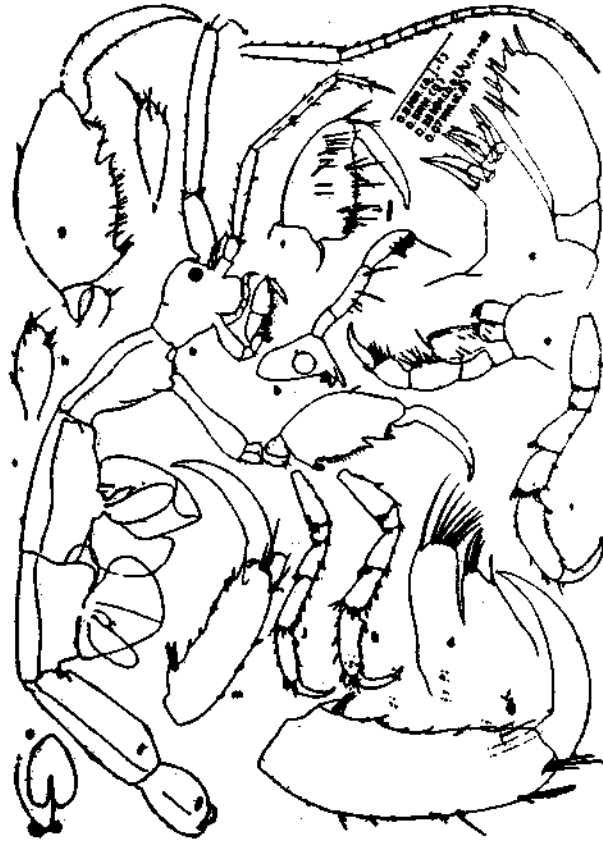


Fig. 5. *Metaprotella problematica* - Female : a. entire animal; b. mandible; c, d. maxillae 1,2; e. maxilliped; f, g. gnathopods 1,2; h, i. pereopods 1, 2; h, i. pereopods 1, 2; j, k. 1. pereopods 3, 4, 5; m, n. pereopods 3, 5, distal joints enlarged; and o. abdomen.

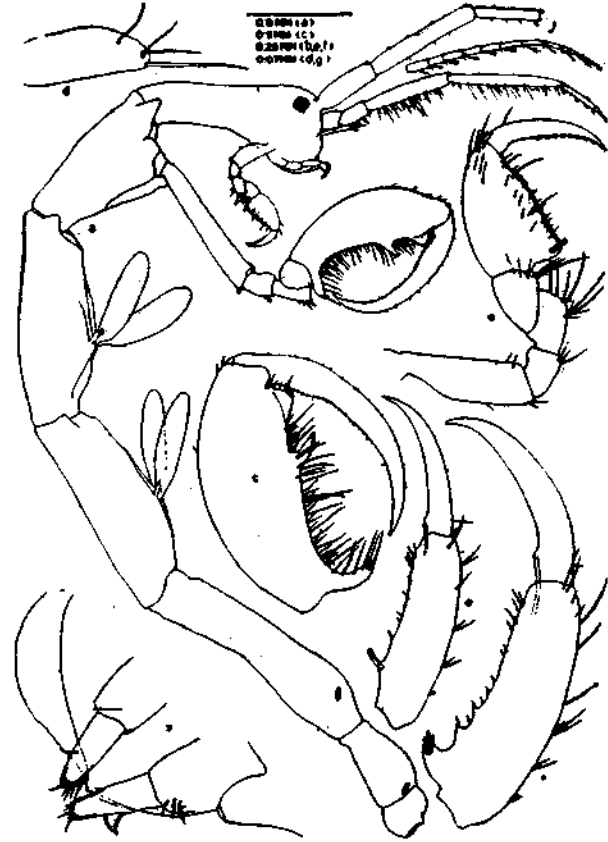


Fig. 6. *Monoliropus falcimanus* - Male : a. entire animal; b, c. gnathopods 1, 2; d, e, f. pereopods 2, 3, 5; g. abdomen.

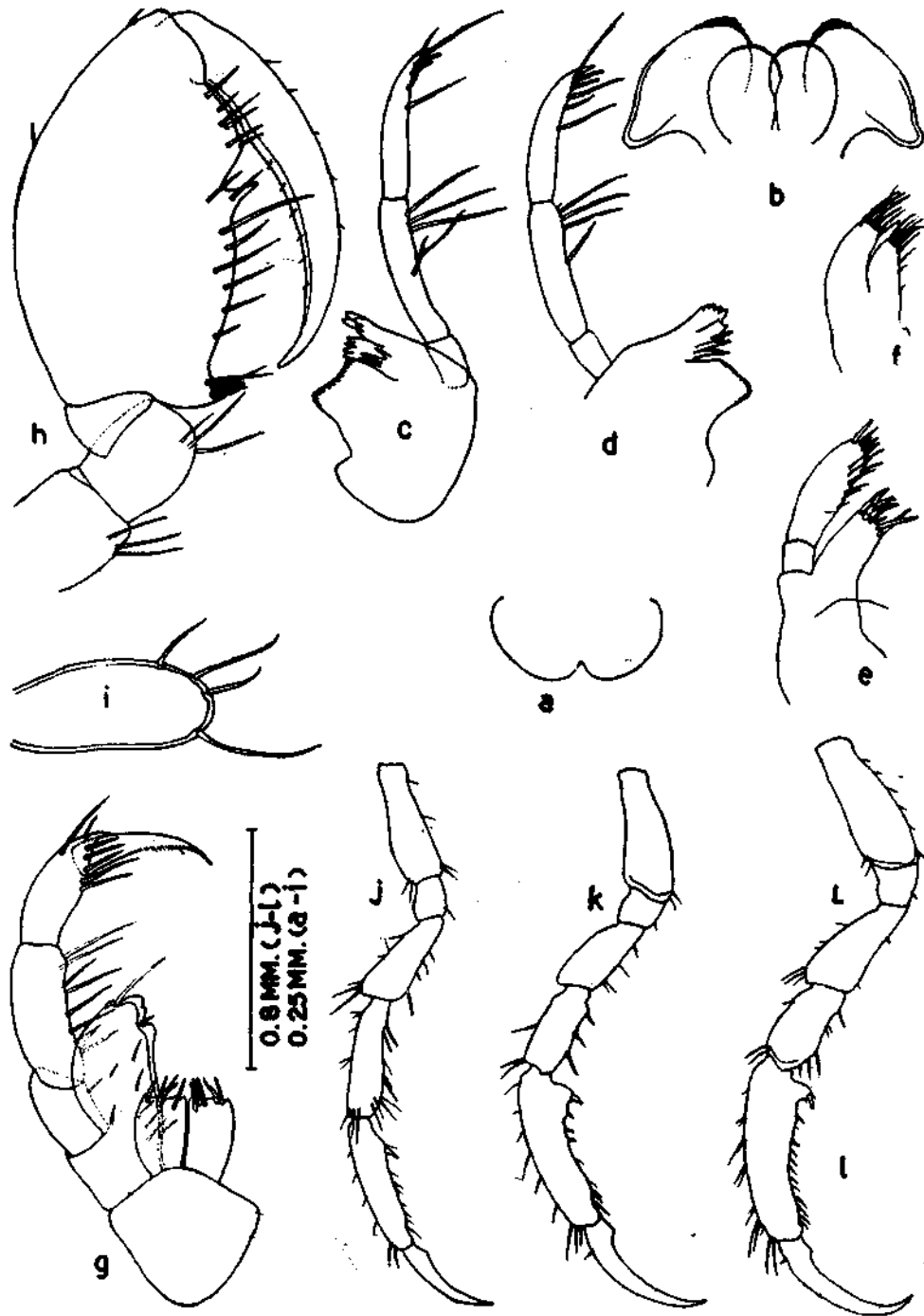


Fig. 7. *Monoliropus falctmanus* - Male : a, b, upper and lower lips; c, d, mandible; e, f, maxillae 1, 2; g, maxilliped; j, k, l, pereopods 3, 4, 5. Female - h, gnathopod 2; and i, pereopod 2.

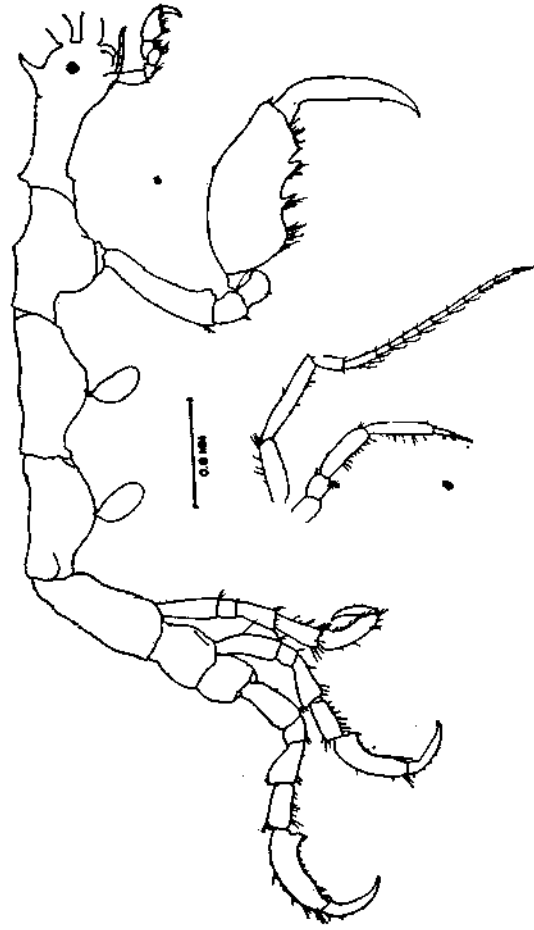


Fig. 8. *Paradeutella bidentata*- Male : a. entire animal and b. antennae 1, 2.

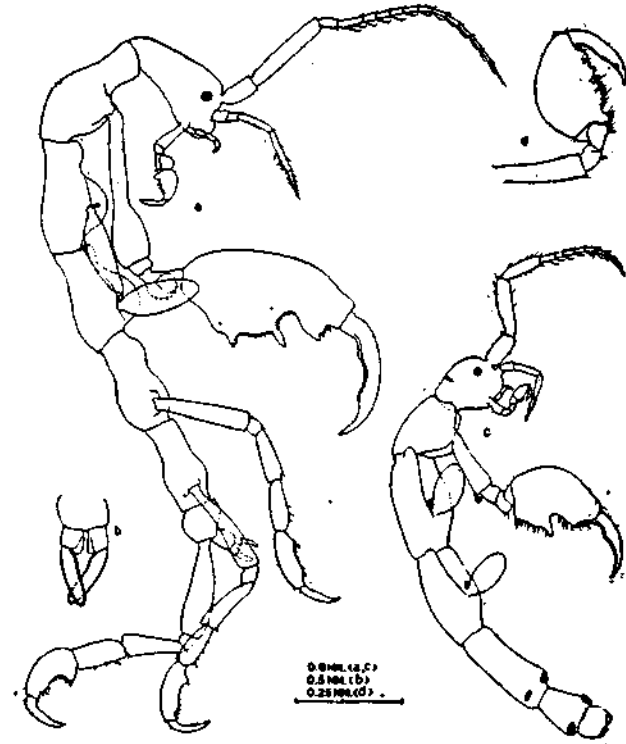


Fig. 9. a, b: *Hemiaegina minuta* - Male : a. entire animal; b. abdomen; c, d. *Paracaprella alata* - Male : c. entire animal. Female : d. gnathopod 2.

Paradeutella bidentata Mayer, 1890 (Fig. 8)

Paradeutella bidentata Mayer, 1890, p. 29, pl. 1, figs. 35-36; pl. 3, figs. 36-41; pl. 5, figs. 34-35; pl. 6, figs. 12, 25. 1904, p. 225. Sundar Raj, 1927, p. 125, pl. 15, figs. 2 a-b. Sivaprakasam, 1970, p. 161, fig. 16.

Material : 7 males and 6 females from algae, Pamban, Gulf of Mannar. Length upto 6.5 mm.

Description : *Male* : Head with a large anteriorly directed spine. Peraeonite 1 with a posterodorsal spine, peraeonite 2-4 with trace of dorsal spine at midlength and peraeonites 5-7 without spines. Antenna 1 as long as head plus peraeonites 1-3. Flagellum with 11 joints. Antenna 2 with 2 flagellar joints.

Upper lip slightly cleft below. Lower lip with inner and outer lobes. Mandible with molar and 3-jointed palp, setal formula for last joint 1-7-1. Incisor and lacinia mobilis 5 dentate. Spine row with 3 spines. Maxilla 1 with 6 spines on outer plate and 3 spines and a seta on 2nd palpal joint. Maxilla 2 with 3-4 apical setae on inner and outer plates. Maxilliped, inner plate with 2 apical setae. Outer plate much larger, apically with 3 setae. 3rd joint of palp without a distal lobe. Dactylus with minute setules on inner margin.

Gnathopod 1, propodus triangular, with smooth palm and a pair of grasping spines. Dactylus smooth except for a subdistal tooth. Gnathopod 2, propodus with a flat-topped part near hinge of dactylus, two oblique notches followed by two teeth and a proximal grasping spine. Dactylus smooth.

Gills on peraeonites 3-4 elongate-oval.

Peraeopods 1-2 reduced, 2-jointed, last joint with 2 setae. Peraeopods 3-5 six jointed, propodus slightly curved.

Abdomen with a pair of densely setose lobes.

Female : Similar to the male.

Remarks : As pointed out by the author earlier (1970), this species appears to be endemic to the Gulf of Mannar as all earlier records are from this area.

Distribution : Gulf of Mannar, India and Sri Lanka

Family : *Caprellidae*

Genus Hemiaegina Mayer, 1890

Flagellum of antenna 2 two-jointed, swimming setae absent. Mandible with molar and without palp. Maxilliped with outer plate larger than inner. Gills on peraeonites 3-4. Peraeopods 1-2 reduced, 1-jointed and others 6-jointed. Abdomen with a pair of 2-jointed appendages.

Hemiaegina minuta Mayer, 1890 (Fig. 9 a-b)

Hemiaegina minuta Mayer, 1890, p. 40, pl. 1, figs. 25-27; pl. 3, figs. 32-35; pl. 5, figs. 52-53; pl. 6, figs. 13, 33-34; pl. 7, fig. 4, 1903, p. 65, pl. 6, fig. 72. Arimoto, 1930, p. 45, fig. 2. Barnard, 1937, p. 134, 198. Utinomi, 1947, p. 70. Edmondson and Mansfield, 1948, p. 206, fig. 3. Steinberg and Dougherty, 1957, p. 281, figs. 8-11, 13, 29. McCain, 1965, p. 192. 1968, p. 613 figs. 29, 30, 50. 1969, p. 297, fig. 2.

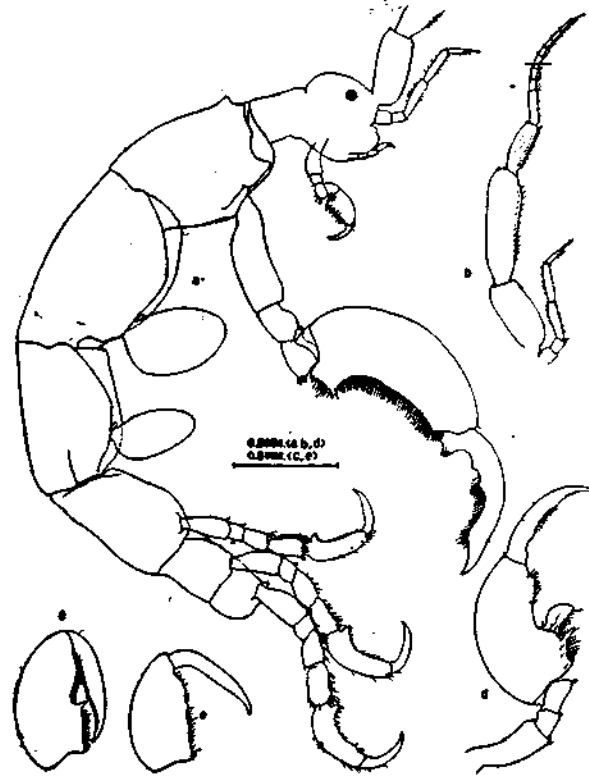


Fig. 10. *Paracaprella barnardi* - Male : a. entire animal; b. antennae 1, 2; c. gnathopod 2 of young male; d. gnathopod 2 of abnormal male. Female : e. gnathopod 2.

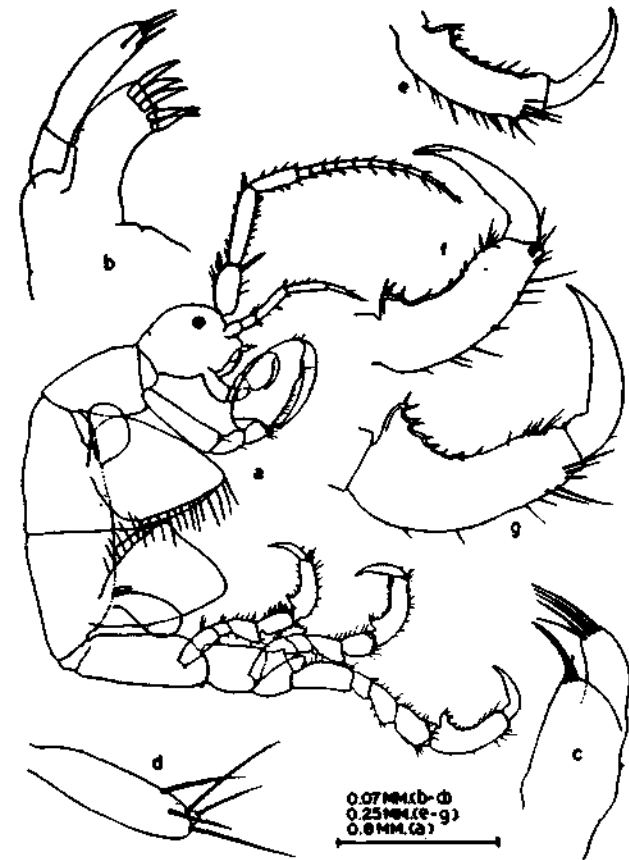


Fig. 11. *Paracaprella pusilla* - Female : a. entire animal; b, c. maxillae 1, 2; d, e, f, g. peraeopods 2, 3, 4, 5.

Hemiaegina quadripunctata Sundara Raj, 1927, p. 126, pl. 18.

Material : 9 males and 11 females from algae, Pamban, Gulf of Mannar. Length upto 5.0 mm.

Description : **Male** : Body smooth, segments hexagonal in dorsal view and with a pair of conical sternal spines between gnathopods 2. Suture between head and 1st peraeonite indistinct, Antenna 1 half as long as body, flagellum longer than peduncle and 12-jointed. Antenna 2 with 2-jointed flagellum.

Upper lip slightly cleft below. Lower lip with outer lobe larger than inner. Mandible with a large, triturative molar and without a palp. Incisor and lacinia mobilis 5-dentate. Maxilla 1 with 6 spines on outer plate and 4 spines on 2nd joint of palp. Maxilla 2, inner and outer plates with 4-6 apical setae. Maxilliped, inner plate half as long as outer, with 2 apical setae. Outer plate with 2 setae on inner margin. Palpar dactylus with minute setules on inner margin.

Gnathopod 1, propodus with a proximal lobe at palmar corner. Palm and dactylus smooth. Gnathopod 2, 2nd joint distally widened. Propodus distally with a flat-topped part and a tooth, followed by a deep, rounded notch and a sharp tooth. Grasping spine small. Dactylus with 2 teeth on inner margin. Palmar notch narrower in young specimens.

Gills on peraeonites 3-4 elliptical.

Peraeopods 1-2 reduced, 1-jointed. Peraeopods 3-5 with propodus gradually becoming stouter and palm more concave with 6-7 spined knobs.

Abdomen with a pair of 2-jointed appendages.

Female : Similar to the male.

Remarks : Sundara Raj (1927) erected with reservation a new species, *H. quadripunctata* based on the squarish and not triangular palmar notch on gnathopod 2, but this species has since been synonymised with *H. minuta*. The palmar notch is triangular in young specimens and becomes large and rounded in the adults.

Distribution : Cosmopolitan in tropical and temperate seas.

Genus *Paracaprella* Mayer, 1890

Flagellum of antenna 2 two-jointed, swimming setae absent. Mandible with molar and palp 0- to 3-jointed. Maxilliped with outer plate much larger than inner. Gills on peraeonites 3-4. Peraeopods 1-2 reduced, 2-jointed and others 6-jointed. Abdomen of male with a pair of appendages and a pair of lobes, female with a pair of lobes.

Paracaprella alata Mayer, 1903 (Fig. 9 c-d)

Paracaprella alata Mayer, 1903, p. 67, pl. 2, figs. 40-41; pl. 9, fig. 73. Sivaprakasam, 1970, p. 163, fig. 18.

Material : 13 males and 11 females on sponge-hydroid complex, Marina Beach, Madras. Length upto 4.0 mm.

Description : Male : Body smooth on dorsal surface. Peraeonite 2 with a rounded anteroventral projection and peraeonites 3-4 with less pronounced projections. Antenna 1 with peduncle longer than flagellum which is 9-jointed. Antenna 2 with 2-jointed flagellum.

Upper lip slightly cleft below. Lower lip with outer lobe larger than inner. Mandible with molar and without palp. Incisor and lacinia mobilis 5-dentate. Spine row with 3 spines. Maxilla 1 with 6 spines on outer plate and 4 setae on 2nd joint of palp. Maxilla 2 as usual. Maxilliped, inner plate apically with a tooth and 3 setae. Outer plate larger with 6 setae. Palp rather slender, 3rd joint with a distal lobe and dactylus tipped by a spine.

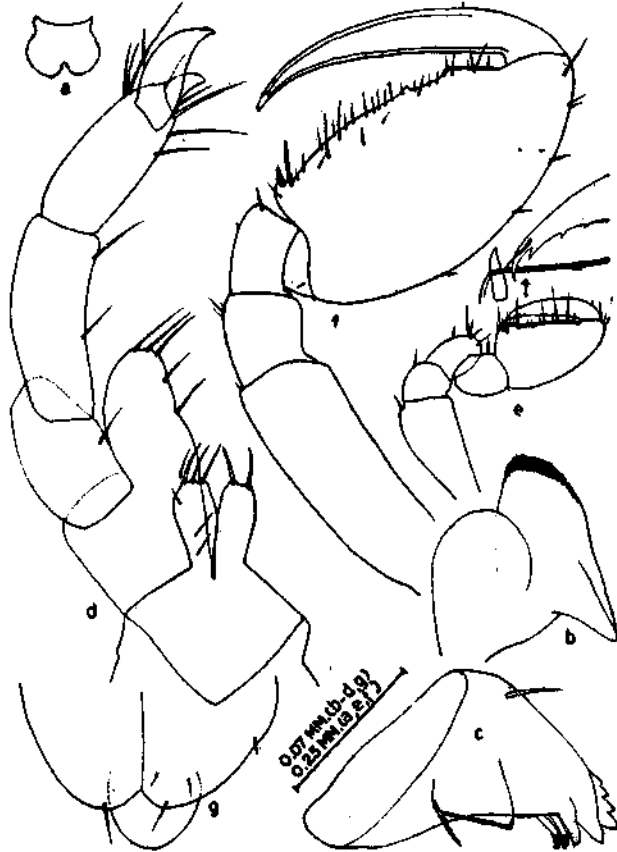


Fig. 12. *Paracaprella pusilla* - Female: a, b, upper and lower lips; c, mandible; d, maxilliped; e, f, gnathopods 1, 2; and g, abdomen.

Gnathopod 1, propodus triangular, with a grasping spine. Palm minutely serrate. Dactylus with 2 distal teeth on inner margin. Gnathopod 2, propodus rather wide, palmar notch wide and followed by a tooth and the proximal lobe bearing a grasping spine. Dactylus with a tooth at $\frac{1}{4}$ its length from base.

Gills on peraeonites 3-4 elongate-oval.

Peraeopods 1-2 two-jointed, the terminal one bearing 3 setae. Peraeopods 3-5 missing.

Abdomen with a pair of appendages and a pair of lobes.

Female : Gnathopod 2, propodus with 2 small teeth distally and the lobe carrying grasping spine separated by a small notch. Dactylus stout and smooth.

Remarks : The ventrolateral projection on peraeonite 2 in the present material is not so pointed as figured by Mayer (1903), but this may be due to their small size and the semi-dried condition in which they were collected.

Distribution : Australia and India.

***Paracaprella barnardi* McCain, 1967 (Fig. 10)**

Paracaprella barnardi McCain, 1967, p.219, figs. 1-2.

Tritella pillmana Sivaprakasam, 1970, p.162, fig. 17 (*non* Mayer).

Material : Several hundred examples from hydroid colonies, Madras harbour, Kovelong and Kilakkarai, Tamil Nadu; 5 males and 5 females from hydroids, Dharmadam Island, near Tellicherry, Kerala; 1 female from hydroids, Mahe, Union Territory of Pondicherry. Length upto 6.5 mm.

Description : *Male* : Body smooth except for a small anterodorsal spine and a strong anteroventral spine on peraeonite 2. Antenna 1 with peduncle stout and flagellum 9-jointed, the 1st joint of 4 fused joints. Antenna 2 with 2-jointed flagellum.

Upper and lower lips as usual. Mandible with molar. Palp absent, its rudiment not traceable. Incisor and lacinia mobilis 6-dentate. Maxilla 1, outer plate with 6 spines and 2nd joint of palp with 3 spines and a seta. Maxilla 2, outer plate longer than inner, both with 3 apical setae. Maxilliped, inner plate minute, with 2 apical setae. Outer plate larger, with 4 setae on inner margin. Palp long and slender, 3rd joint with a conical distal lobe and dactylus tipped by a spine.

Gnathopod 1, propodus with a proximal grasping spine and palm smooth. Dactylus with 5 teeth on inner margin. Gnathopod 2, propodus nearly twice as long as 2nd joint, strongly arched, palm deeply notched, setose, followed by the poison tooth and grasping spine. Dactylus setose and grooved on inner margin, with a large subdistal tooth, two small teeth in the middle and a large basal tooth.

Gills on peraeonites 3-4, the 1st one larger.

Peraeopods 1-2 reduced, 2-jointed, the terminal joint with 3 setae.

Peraeopods 3-5 six-jointed, propodus with 5-6 spined knobs.

Abdomen with a pair of serrate appendages, a pair of setose lobes and a dorsal lobe.

Female : Body smooth as in young males. Gnathopod 2, propodus with a proximal grasping spine, palm nearly straight with 2 subdistal tubercles. Abdomen with a pair of lobes.

Variation : The young males have the anterodorsal and ventrolateral tubercles on peraeonite 2 poorly developed and the palmar notch on gnathopod 2 shallow. A large abnormal male had a large tooth on palmar notch above the poison tooth as figured.

Remarks : The present material closely agrees with the description and figures of *P. barnardi* McCain (1967), but the palmar margin of gnathopod 1 is smooth, the anterodorsal spine on peraeonite 2 is small even in large males and the ventrolateral projection on the same segment is not sharp. Since these differences are only quantitative and not qualitative in nature, the present material is assigned to this species.

Distribution : West coast of Panama. This is the first record of this species from India.

***Paracaprella pusilla* Mayer, 1890 (Figs. 11-12)**

Paracaprella pusilla Mayer, 1890, p. 41, pl. 1, figs. 28-30; pl. 3, figs. 45-47; pl. 5, figs. 48-49; pl. 6, fig. 10. 1903, p. 67, pl. 2, figs. 36-37; pl. 7, fig. 52. Schellenberg, 1928, p. 677. 1939, p. 136. Edmondson and Mansfield, 1948, p. 208, fig. 4. Barnard, 1955, p. 99. Steinberg and Dougherty, 1957, p. 283, figs. 16, 19, 24, 30. McCain, 1968, p. 82, figs. 32 a-b, 41, 42, 53.

Caprella nigra Reid, 1951, p. 283, fig. 58.

Material : 1 female from algae, Neendakara river mouth, near Quilon Kerala. Length 4.5 mm.

Description : *Female :* Body smooth. Antenna 1 about half as long as body. Flagellum shorter than peduncle, 10-jointed. Antenna 2 with a 2-jointed flagellum.

Upper and lower lips as usual. Mandible with a molar. Palp absent, represented by a single seta. Incisor and lacinia mobilis 5-toothed. Spine row of 2 spines and a few setules. Maxilla 1, outer plate with 6 spines and 2nd joint of palp with 3 apical spines and a lateral seta. Maxilla 2 with outer plate longer than inner, both apically with 4-5 setae. Maxilliped, inner plate apically truncate with 3 setae. Outer plate rather large, with 3 apical and 2 lateral setae. Palp large, 3rd joint with a distal process and dactylus blunt.

Gnathopod 1, propodus with a proximal grasping spine, palm minutely serrate and dactylus with 3 teeth on inner margin. Gnathopod 2, propodus with a grasping spine and palm convex with 2 distal tubercles.

Gills on peraeonites 3-4 oval.

Peraeopods 1-2 reduced, 2-jointed. Peraeopods 3-5 gradually increasing in size, propodus with a pair of grasping spines and 2-5 spined knobs.

Abdomen with a pair of lobes and a dorsal lobe.

Male : Not found in the present material.

Remarks : Although the determination of females in this genus is a difficult task, the author has no doubt in assigning the present material to this species as it closely agrees with McCain's (1968) description and figures of this species.

Distribution : Western North Atlantic, Jamaica, Brazil, tropical West Africa, Congo, South Africa, Tanzania, Suez Canal, India, China and Hawaii. This is the first record of this species from India.

NOTES ON THE ECOLOGY, DISTRIBUTION AND EVOLUTION OF
CAPRELLIDEA

The caprellids are semi-sedentary and are mostly non-specific as to their habitats. They require some objects to cling to and are thus found on algae, sponges, hydroids, anthozoans, polyzoans, ascidians etc. and sometimes in plankton. The caprellids studied here were collected from algae, sponges and hydroids. They usually feed on the soft parts of invertebrates, diatoms, detritus, algae etc and themselves form food of fishes and larger crustaceans.

The caprellid fauna of India comprise of only 10 species which is a poor figure when compared to those of Japan, where over 60 species are known and those of western North Atlantic where 26 species are known (McCain, 1968). But this cannot be explained at this stage when the caprellid fauna of India still remains to be studied to a great extent. In spite of the limited locomotory powers and absence of free-living larval stages, the caprellids are mostly widespread in their distribution. Among Indian caprellids, *H. minuta* and *P. pusilla* are cosmopolitan in tropical and temperate waters. *M. haswelliana*, *M. problematica*, *M. excentrica* and *P. alata* are widely distributed in the Indo-Pacific. The following three species: *P. pambanensis*, *M. falcimanus* and *P. bidentata* are limited to the Gulf of Mannar in their distribution. *P. barnardi* described recently from the west coast of Panama has now been found in India and its full distribution remains to be known.

The Caprellidea appear to have taken their origin from a podoceric like ancestor. The genera *Neoxenodice*, *Caprogammarus* and *Cercops* provide such an even gradation between the Gammaridea and Caprellidea that McCain (1968) even suggested their merger. McCain (1970) has shown three lines of evolution, the first to the Cyamidae, the second to the Phtisicidae and the third to the Caprellidae through the Caprogammaridae and the Aeginellidae. Among Indian Caprellidea, *Pseudocaprellina* represents the Phtisicidae which have evolved by loss of mandibular molar and retention of 3 pairs of gills. Further in this genus, the peraeopods 1-2 are absent and peraeopod 3 is reduced to 3 joints. The Aeginellidae represented by *Metaprotella*, *Monotropus* and *Paradeutella*, have evolved by retention of typical mandibles and reduction of gills to 2 pairs. The Caprellidae have evolved from the Aeginellidae by loss of mandibular palp. In this process, *Paracaprella* with its rudimentary palp represents an intermediate stage and *Hemiaegina* which has no mandibular palp, represents fully evolved Caprellidae.

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