

Pontellid copepods from Singapore

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Abstract — Fifteen species of copepods from the family Pontellidae were identified around the waters of Sister's Island, Singapore. The samples were collections of the CSK Programme deposited at Tokai University. Three species belong to the genus *Calanopia*, 6 from *Labidocera*, 2 from *Pontella* and 4 from *Pontellopsis*. All species appeared to represent new records for the area. All specimens of both sexes are illustrated and remarks on their taxonomy and distribution are given.

Key words: Indo-Pacific region, CSK Programme, zoogeography, copepods, Pontellidae

Introduction

Copepods of the family Pontellidae represent one of the larger-sized copepods inhabiting the surface waters of tropical and subtropical seas. The pontellids are very interesting copepods to study in that they exhibit sexual dimorphism, their diverse shapes and structures making them among the most bizarre-looking pelagic copepods in the sea. The biogeographical distribution of the pontellids is intriguing and can shed light into the hydrographic feature of the area, the inshore-offshore boundaries and the zoogeographical divisions of the species. This has attracted many scientists to study and review the group (Fleminger 1957, 1967, Silas and Pillai 1973, Fleminger and Hulsemann 1974, Fleminger 1986, Fleminger et al. 1982, Mulyadi 2002). However, there has been very little study on the pontellids in the waters around the Malaysia and Singapore coasts (Othman 1986). Geographically, the waters surrounding Malaysia has connections to both the Indian and Pacific Oceans. The present study looks at the pontellid species present around Sister's Island in Singapore taken during the Co-operative Study of the Kuroshio (CSK) Programme.

Materials and Methods

The samples used in the present study were taken during the CSK Programme between 1969 and 1973. Hauls were taken off Sister's Island, Singapore using a standard plankton net of 300 µm mesh. The location of the sampling site is shown in Fig. 1. The samples were preserved in 4% formalin and kept in vials at the Marine Biological Center, Tokai University, Shimizu, Japan.

All specimens were measured and dissected in glycerol

and whole specimens were drawn by placing the specimens in cavity slides. Dissected specimens were mounted on microslides in polyvinyl lactophenol alcohol. Drawings were made using Zeiss Axioskop with the aid of a camera lucida.

Results and Discussion

A total of 15 species of copepods belonging to the family Pontellidae have been identified around the waters of Sister's Island, Singapore. Three species belong to the genus *Calanopia*, six from *Labidocera*, two from *Pontella* and four from the genus *Pontellopsis* (Table 1).

These species inhabit surface waters of the tropical and subtropical seas and appear to be new records for the locality of Sister's Island, Singapore. The geographical span of each species are summarised in Table 1. *Pontellopsis regalis*, is a cosmopolitan species having been recorded in all the warm oceans including the Atlantic. The majority of species, however, are restricted to the Indo-west Pacific region. The pattern of distribution differ for each species. All three *Calanopia* species have been recorded in both Indian and Pacific Oceans. Of the labidocerans, *Labidocera acuta*, *L. minuta* and *L. pavo*, have been recorded in both the Indian and Pacific Oceans. However, five species, namely *Labidocera bengalensis*, *L. pectinata*, *Pontella investigatoris*, *Pontellopsis herdmani* and *P. scotti*, are found only in the Indian Ocean, while *Labidocera rotunda*, *Pontella forcicula* and *Pontellopsis inflatodigitata* have been recorded only in the West Pacific region. It is interesting to note that both *Labidocera pectinata* and *Labidocera rotunda* belong to the *L. pectinata* species group (Fleminger et al. 1982) whose distributional patterns are somewhat different. *Labidocera pectinata* is an Indian Ocean species whose extent of distribution includes the Starits of Malacca, through Singapore and up to

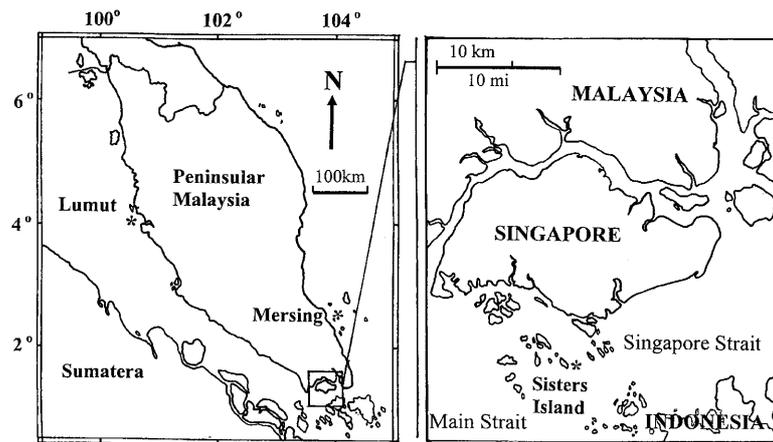


Fig. 1. Location of study area. * denote sampling stations.

Table 1. Copepods of the Sister's Island, Singapore, and their distribution in the neighbouring waters and the major oceans. A=Straits of Malacca, B=South China Sea, C=Indonesia, D=Australia, E=Indian Ocean, F=Pacific Ocean, G=Atlantic Ocean.

No.	Species	A	B	C	D	E	F	G
1	<i>Calanopia aurivilli</i> Cleve, 1901	+	+	+	+	+	+	
2	<i>Calanopia elliptica</i> (Dana, 1849)	+	+	+	+	+	+	
3	<i>Calanopia thompsoni</i> A. Scott, 1909	+		+		+	+	
4	<i>Labidocera acuta</i> (Dana, 1849)	+	+	+	+	+	+	
5	<i>Labidocera bengalensis</i> Krishnaswamy, 1952	+	+	+	+	+		
6	<i>Labidocera minuta</i> Giesbrecht, 1889		+	+	+	+	+	
7	<i>Labidocera pavo</i> Giesbrecht, 1889	+	+	+		+	+	
8	<i>Labidocera pectinata</i> Thompson & Scott, 1903	+	+			+		
9	<i>Labidocera rotunda</i> Mori, 1929	+	+					+
10	<i>Pontella danae</i> var <i>ceylonica</i> Thompson & Scott, 1903	+	+	+		+		
11	<i>Pontella forcicula</i> A. Scott, 1909		+	+			+	
12	<i>Pontellopsis herdmani</i> Thompson & Scott, 1903	+	+	+	+	+		
13	<i>Pontellopsis inflatodigitata</i> Chen & Shen, 1974		+	+			+	
14	<i>Pontellopsis regalis</i> (Dana, 1849)	+	+	+		+	+	+
15	<i>Pontellopsis scotti</i> Sewell, 1932	+	+	+	+	+		

Mersing, Johore in the South China Sea (Fig. 1). *Labidocera rotunda*, on the other hand, is a Pacific species extending into the Straits of Malacca and up the Andaman Sea.

Description and illustrations of each species are given below with restricted synonymies.

Calanopia aurivilli Cleve, 1901 (Fig. 2)

Calanopia aurivilli Cleve, 1901: 37–40, pl. 2, figs. 1–10 (Type locality: Semau Sound, Indonesia); Sewell, 1912: 368; Silas & Pillai, 1973: 784, fig. 2a–e; Greenwood, 1979: 94; Othman et al., 1990: 564, Table 1; Mulyadi, 2002: 36–37, fig. 9.

Material examined: sample no. 1259.

Female: Length 1.10 mm (mean of 8 specimens, range 1.05 to 1.20 mm, s.d. 0.0499), length ratio prosome to urosome 2.04 : 1. Body ellipsoid, cephalon without lateral hook, prosome produced into posteriorly directed acute process.

Urosome 2 segmented, genital segment shorter than anal segment. P5 symmetrical and uniramous, Re one segmented apex terminates in three spines, inner being distinctly longer and plumose at its distal margin.

Male: Length 1.05 mm (mean of 7 specimens, range 0.98 to 1.08 mm, s.d. 0.0355), length ratio prosome to urosome 1.99 : 1. Body similar to female, cephalon without hook. Right A1 geniculate. Urosome 5 segmented, naked. P5 asymmetrical and chelate. Right leg 4 segmented, proximal inner margin of B2 swollen, Re1 with well developed thumb, claw spoon shaped, slightly swollen at tip with one outer marginal seta, one terminal and two inner marginal. Left leg B2 swollen and gibbose, Re1 with distolateral seta, terminal segment with two unequal apical spines.

Remarks: Widely distributed in the Indo-Pacific region. Records in the Indian Ocean is given in Silas and Pillai (1973). Australia and New Zealand (Farran 1936, Greenwood 1979, Othman et al. 1990), Phillipines (Wilson 1950),

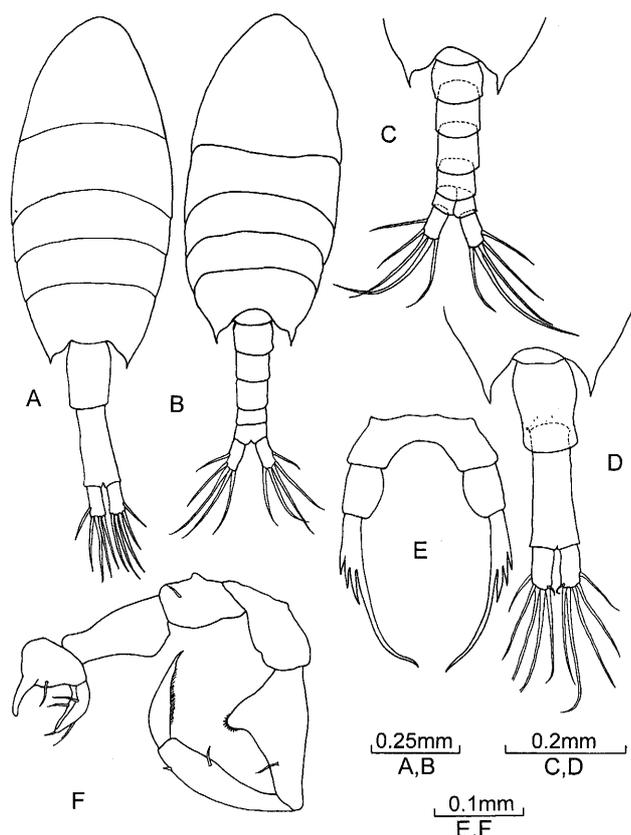


Fig. 2. *Calanopia aurivilli*. A, female dorsal view, B, male dorsal view, C, male Th5 and urosome dorsal view, D, female Th5 and urosome dorsal view, E, female fifth leg, F, male fifth leg.

Indonesia (Mulyadi 2002) Malaysian coast (Othman et al. 1990).

***Calanopia elliptica* (Dana, 1849)** (Figs. 3 and 4)

Calanopia elliptica (Dana, 1849)

Pontella elliptica Dana, 1849: 27 (Type locality: Bangka Strait, Indonesia).

Calanopia elliptica Dana, 1852: 113P2, pl. 79, Giesbrecht, 1892: 441, Pl. 31, figs. 23, 26, 31, 32, pl. 38, fig. 42, 47, A. Scott, 1909: 176, figs. 1, 5, Sewell, 1932: 341; Farran, 1936: 115; Mori, 1937: 89, Pl. 40, figs. 3–8; Dakin & Colefax, 1940: 105, fig. 156a–d; Wilson, 1950: 175, Tanaka, 1953: 136; 1964: 250; Chiba & Tsuruta, 1955: 87; De Decker & Mombeck, 1964: 11; Chen & Zhang, 1965, Pl. 39, figs. 1–5; Silas & Pillai, 1973: 785, fig. 3a–f; Greenwood, 1979: 94; Matsuo & Marumo, 1982: 93; Othman et al., 1990: 564, Table 1; Mulyadi, 2002: 41–44, fig. 11.

Material examined: sample no. 1261.

Female: Length 1.76 mm (mean of 21 specimens, range 1.67 to 2.10 mm, s.d. 0.0922), length ratio prosome to urosome 2.29:1. Prosome ellipsoid, cephalon without lateral hooks. Thoracic segment produced posteriorly into strong process reaching middle of genital segment. Urosome 2 seg-

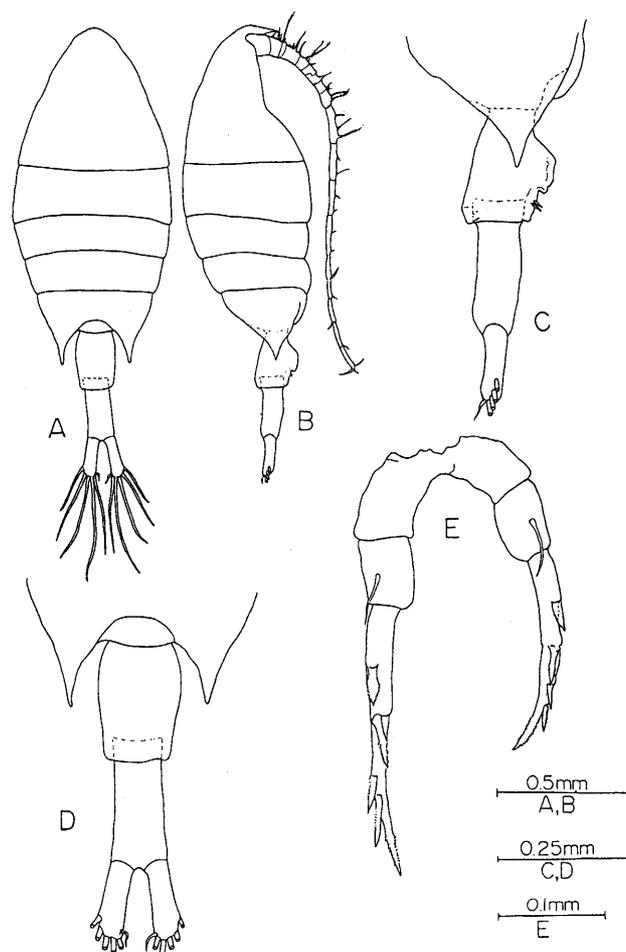


Fig. 3. *Calanopia elliptica* female. A, dorsal view, B, lateral view, C, Th5 and urosome lateral view, D, Th5 and urosome dorsal view, E, fifth leg.

mented, genital segment same in length as Ur2. P5 asymmetrical, left leg longer than right. Re1 with one median and one distolateral spine, Re2 ending in an acute spine with two outer marginal spine.

Male: Length 1.61 mm (mean of 3 specimens, range 1.62 to 1.71 mm, s.d. 0.062), length ratio prosome to urosome 2.35:1. Body similar to female except the right thoracic process is longer than left and pointed inwards. Right A1 geniculate, segments 13–16 swollen while segments 19–21 is denticulate. A1 extends to the genital segment. Urosome 5 segmented, Ur2 with one spiniform process on distal right margin. P5 assymetrical, Right leg Re1 modified as chela, with three inner marginal process blunt and tooth-like, Re2 with three processes along the inner margin. Left leg, Re1 with two outer marginal spines, one at mid-outer margin and another distolaterally, Re2 with two outer marginal spine and terminates in a strong acute spine with setules on the outer margin.

Remarks: Widely distributed in the Indian Ocean and West Pacific region. Records in the Indian Ocean is given in Silas and Pillai (1973). Australia (Farran 1936, Dakin and

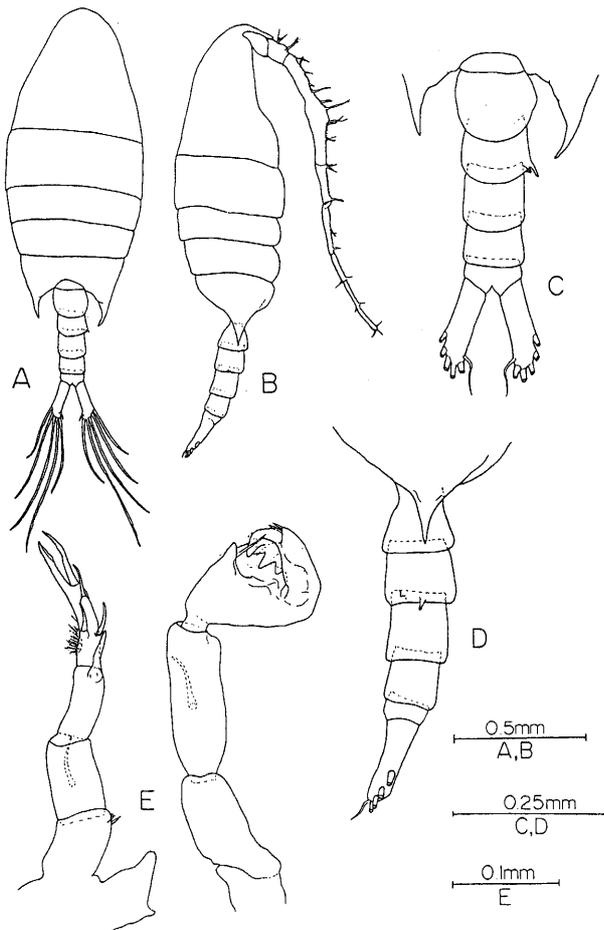


Fig. 4. *Calanopia elliptica* male. A, dorsal view, B, lateral view, C, Th5 and urosome dorsal view, D, Th5 and urosome lateral view, E, fifth leg.

Colefax 1940, Greenwood 1979, Othman et al. 1990) Philippines (Wilson 1950) Indonesia (Mulyadi 2002), Malaysian coast (Othman et al. 1990).

***Calanopia thompsoni* A. Scott, 1909 (Fig. 5)**

Calanopia thompsoni A. Scott, 1909: 178–179, pl. 49, figs. 1–8 (type locality, Siboga Sts. 16, 142, 205 & 213); Silas & Pillai, 1973: 790, fig. 6.

Material examined: sample no. 1259.

Female: Length 1.95 mm (mean of 4 specimens, range 1.78 to 2.35 mm, s.d. 0.280), length ratio prosome to urosome 2.68 : 1. Prosome ovate, elongate and slender, cephalon with lateral hooks. Thoracic segment produced posteriorly into strong process reaching almost half genital segment. Urosome 2 segmented, genital segment much longer than Ur2. P5 symmetrical and uniramous, exopod with 2 segments, Re1 moderately long, distal portion of outer margin with 2 strong spiniform projections. Re2 narrow and spiniform, terminating in a moderately long and stout serrated spine and 2 short spine on the outer margin.

Remarks: Pacific and Indian Ocean. Widely recorded

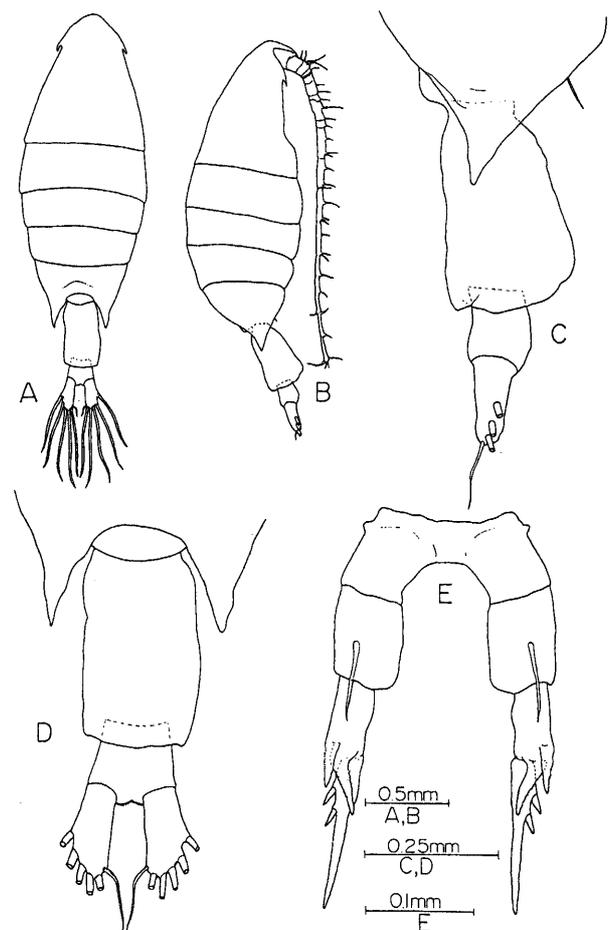


Fig. 5. *Calanopia thompsoni* female. A, dorsal view, B, lateral view, C, Th5 and urosome lateral view, D, Th5 and urosome dorsal view, E, fifth leg.

from Indian Ocean (Silas and Pillai 1973). Indonesian waters (A. Scott 1909).

***Labidocera acuta* (Dana, 1849) (Figs. 6 and 7)**

Pontella acuta Dana, 1849: 30; Brady, 1883: 89, pl. 36, figs. 1–12.

Labidocera acutum Giesbrecht, 1892: 445, pl. 23.

Labidocera acuta, Giesbrecht & Schmeil, 1898: 134; A. Scott, 1909: 164; Thompson & Scott, 1903: 251; Farran, 1936: 116; Mori, 1937: 91; Wilson, 1950; Tanaka, 1964: 254; Chen & Zhang, 1965, pl. 41; Silas & Pillai, 1967: 346–364; Greenwood, 1979; Matsuo & Marumo, 1982: 93; Othman et al., 1990: 564 Table 1; Mulyadi, 2002: 49–51, fig. 13.

Material examined: sample no. 1268.

Female: Length 2.88 mm (mean of 16 specimens, range 2.71 to 2.98 mm, s.d. 0.0981), length ratio prosome to urosome 2.94 : 1. Body elongated ending in a single spiniform process, cephalon rounded with a median anterior hook, dorsal eye lenses moderate, separated. Lateral cephalic hook absent. Thoracic process reaching beyond middle of genital segment. Urosome 3 segmented, genital segment with a stout

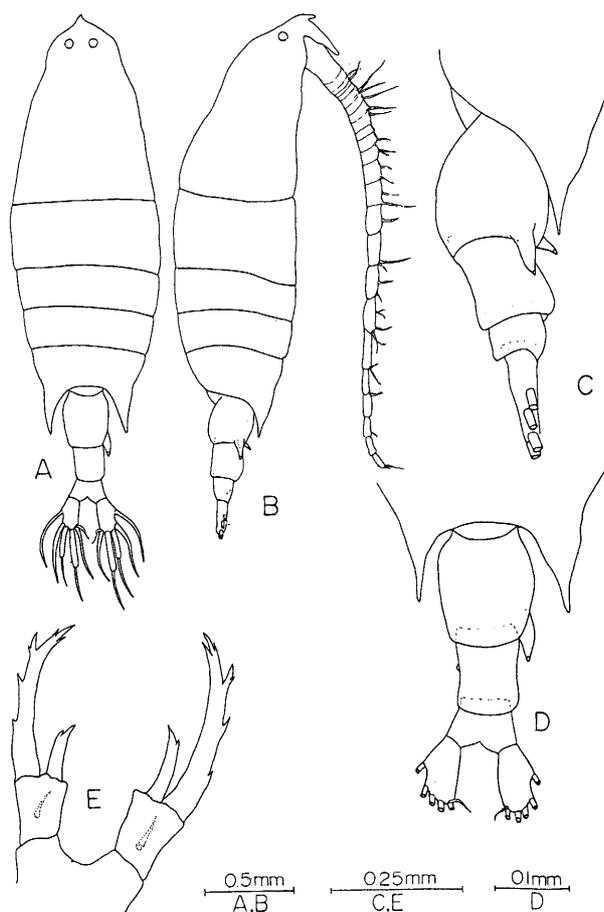


Fig. 6. *Labidocera acuta* female. A, dorsal view, B, lateral view, C, Th5 and urosome lateral view, D, Th5 and urosome dorsal view, E, fifth leg.

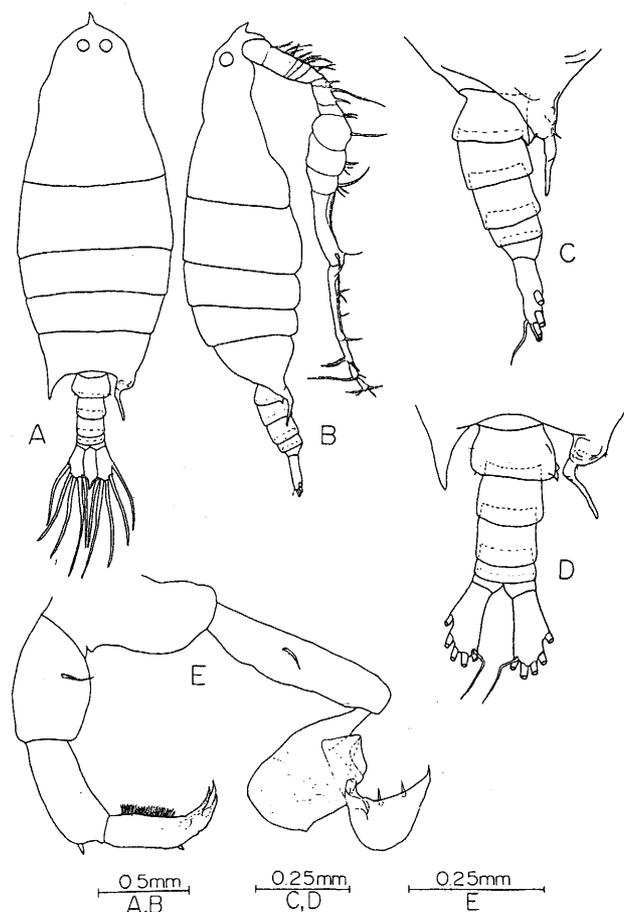


Fig. 7. *Labidocera acuta* male. A, dorsal view, B, lateral view, C, Th5 and urosome lateral view, D, Th5 and urosome dorsal view, E, fifth leg.

distolateral conical process on right margin. P5 asymmetrical, right leg being stouter and longer than left, Re with 3 outer, 1 inner, and 3 apical spines of which medial one longest; Ri bifurcated at apex.

Male: Length 2.65 mm (mean of 18 specimens, range 2.43 to 2.88 mm, s.d. 0.1398), length ratio prosome to urosome 2.96:1. Body similar to female, anterior hook more pronounced, dorsal lenses slightly larger and closer together than female. Thoracic process asymmetrical, left process similar to females, right produced into a curved process turned distolaterally and reaching distal end of Ur2. Urosome 5 segmented, genital segment widest, asymmetrical, left side convex posteriorly, right side armed on posterior end with pointed process. Right A1 geniculate, segment 17 naked, anterior margin of segment 18 with row of prominent denticles, extends proximally to almost whole length of segment 17, fused segments 19–21 with toothed plate extending to 2/3 length of the segment, segment 22 prolonged distally into spur-like process which is as long as its own segment. P5 asymmetrical, right leg chelate, Rel orbicular, Re2 short, broader medially, with 2 inner and 2 apical setae. Left leg, Rel with distolateral spine, Re2 ending in 3 finger-like

processes, 1 small cresented basal process and 1 spine near distal end, inner margin of segment hirsute.

Remarks: Recorded from the tropical and subtropical neritic waters of Indo-Pacific (Silas and Pillai 1973). Australian waters, off New South Wales coast (Dakin and Colefax 1940), Great Barrier Reef waters (Farran 1936), Moreton Bay (Greenwood 1979) Gulf of Carpentaria (Othman et al. 1990). Indo-Malaysian region, frequently recorded as noted by Brady (1883), Cleve (1901), A. Scott (1909), Fruchtl (1924), Delsman (1939), Othman et al. (1990) and Mulyadi (2002).

***Labidocera bengalensis* Krishnaswamy, 1952** (Figs. 8 and 9)

Labidocera bengalensis Krishnaswamy, 1952: 321–323, fig. 1a–i (type locality: Madras coast); Silas & Pillai, 1973: 802–803, fig. 13a–g; Othman et al., 1990: 564 Table 1; Mulyadi, 2002: 55–57, fig. 16.

Material examined: sample no. 1261.

Female: Length 1.77 mm (mean of 47 specimens, range 1.60 to 1.96 mm, s.d. 0.0794), length ratio prosome to uro-

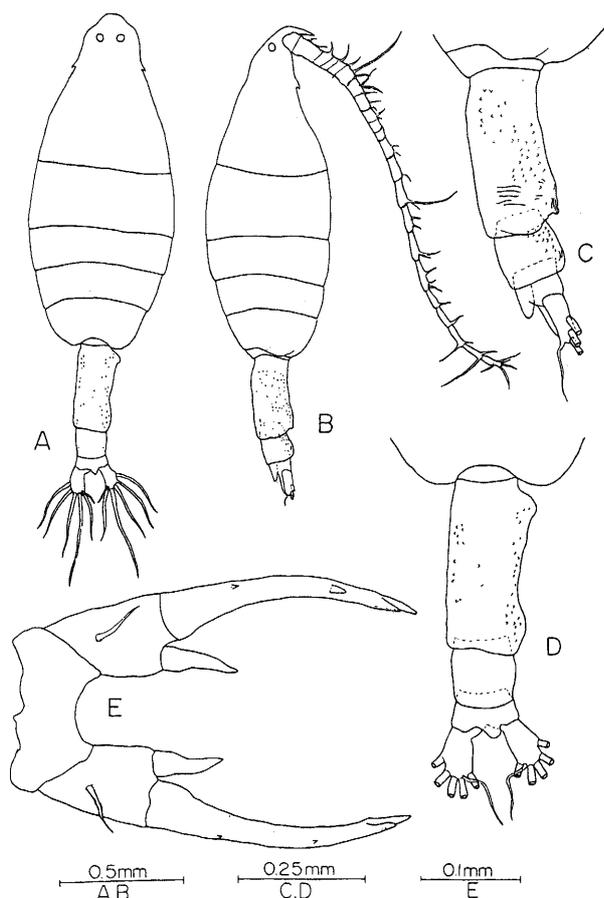


Fig. 8. *Labidocera bengalensis* female. A, dorsal view, B, lateral view, C, Th5 and urosome lateral view, D, Th5 and urosome dorsal view, E, fifth leg.

some 2.38:1. Body somewhat broad at 2/3 length of prosome, cephalon rounded anteriorly, with lateral hooks, prosome rounded at posterior. Urosome 3 segmented, genital segment asymmetrical, elongated, longer than Ur2, Ur3 and CR combined, right margin swollen with a numbers of ventral papillae. P5 symmetrical, Re long, slender and bifurcate, 4 times as long as Ri, with 2 outer spines, and 2 unequal apical spines; Ri short, stout and pointed.

Male: Length 1.49 mm (mean of 25 specimens, range 1.40 to 1.64 mm, s.d. 0.0506), length ratio prosome to urosome 2.99:1. Body elongated, dorsal eye lenses prominent and contiguous. Posterolateral end of prosome produced into asymmetrical pointed processes, right process slightly longer extending slightly beyond distal end of genital segment. Urosome 5 segmented, naked. Right A1 geniculate, fused segments 17–18 with row of coarse denticles on anterior margin; fused segments 19–21 with villiform denticles from proximal fifth to distal end of its anterior margin, segment 22 prolonged distally into spur-like process. P5 asymmetrical, right leg proximal B2 with row of spinules on inner margin and 1 plumose seta on posterior surface, chela well developed, concave surface with 1 blunt process and 1 spiniform seta. Re2 bent inwards medially and with 1 marginal transparent flap,

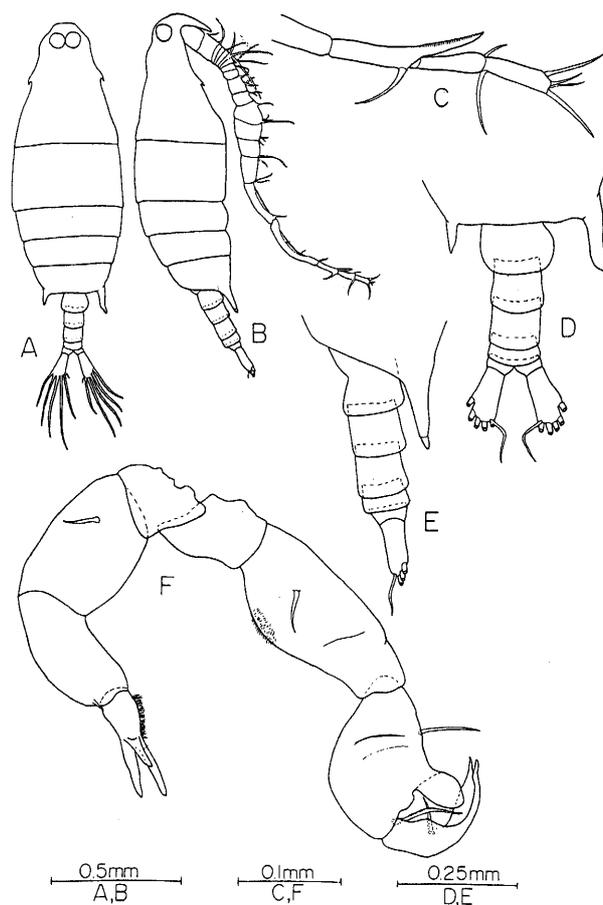


Fig. 9. *Labidocera bengalensis* male. A, dorsal view, B, lateral view, C, A1, segment 21–24, D, Th5 and urosome dorsal view, E, Th5 and urosome lateral view, F, fifth leg.

proximal inner margin with 1 long and 1 short seta at 1/3 length of segment, and 2 subequal spines at apex. Left leg 4-segmented, Rel with distolateral spine; Re2 with 3 stout processes distally and 1 seta towards outer margin of inner process, inner margin hirsute.

Remarks: *L. bengalensis* is often mistaken for *L. minuta* in the general shape and size of both sexes. Female *bengalensis* have a much longer genital segment and male *minuta* have a much longer right thoracic process. The species is an Indian ocean species having first described from the Madras coast (Krishnaswamy 1952), also from Andaman Sea (Silas and Pillai 1973), Gulf of Carpentaria (Othman et al. 1990), and Malaysian coast (Othman et al. 1990) and Indonesia (Mulyadi 2002).

***Labidocera minuta* Giesbrecht, 1889** (Figs. 10 and 11)

Labidocera minuta Giesbrecht, 1889: 27; 1892: 446, 459, pls. 16, 35, 36, pl. 41, figs. 8, 15, 35 (Type locality: Hongkong); Cleve, 1901: 7; 1903: 363.

Labidocera minuta Giesbrecht & Schmeil, 1898: 137; Scott, 1902: 407; 1909: 167; Thompson & Scott, 1903: 251; Gurney, 1927; Sewell, 1932: 363; Farran, 1936: 116; Dakin & Colefax, 1940: 101, fig. 145a–e; 154; Delsman, 1949: 129;

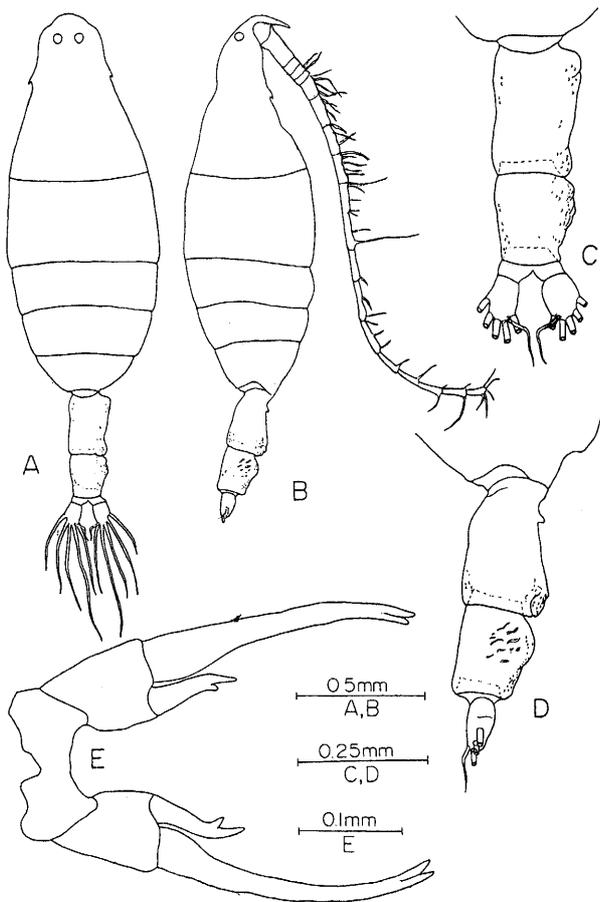


Fig. 10. *Labidocera minuta* female. A, dorsal view, B, lateral view, C, Th5 and urosome dorsal view, D, Th5 and urosome lateral view, E, fifth leg.

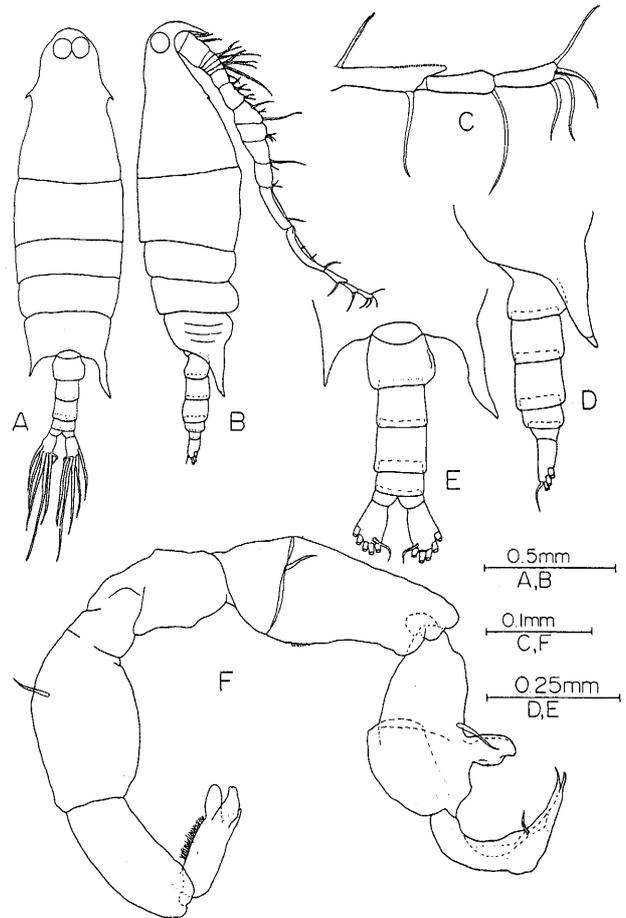


Fig. 11. *Labidocera minuta* male. A, dorsal view, B, lateral view, C, A1, segment 21–24, D, Th5 and urosome lateral view, E, Th5 and urosome dorsal view, F, fifth leg.

Wilson, 1950: 247, pl. 24, figs. 356–359; De Decker & Mombeck, 1964: 13; Tanaka, 1964: 257, fig. 233; Chen & Zhang, 1965, pl. 41, figs. 11–16; Silas & Pillai, 1967: 346, fig. 12; Greenwood, 1979: 101–103, fig. 5a–g; Matsuo & Marumo, 1982: 93; Othman et al., 1990: 564 Table 1; Mulyadi, 2002: 71–73, fig. 22.

Material examined: sample no. 1269.

Female: Length 1.89 mm (mean of 7 specimens, range 1.84 to 1.95 mm, s.d. 0.0456), length ratio prosome to urosome 2.78:1. Body similar in shape as *L. bengalensis*, cephalon with lateral hooks, dorsal eye lenses small. Thoracic segment rounded posteriorly. Posterolateral ends of Ms5 produced into short spine, right side directed ventrally. Urosome 3 segmented, genital segment elongated, as long as Ur2 and Ur3 combined, right posterior margin modified into a short lobular projection, ventrally with chitinous tubercles which are spread laterally along its right margin. P5 symmetrical and uniramous, Re longer than Ri, all ending bifurcated at apex.

Male: Length 1.56 mm (mean of 6 specimens, range 1.55 to 1.57 mm, s.d. 0.0130), length ratio prosome to uro-

some 3.33:1. Body elongated, dorsal eye lenses prominent and contiguous. Posterolateral end of prosome produced into asymmetrical pointed processes, right process slightly longer, bladelike extending to distal end of Ur2. Urosome 5 segmented, naked. Right A1 geniculate with 1 conspicuous spine on segment 17; anterior margin of segment 18 with villiform denticulate ridge; fused segments 19–21 with blunt denticulate plate, segment 22 with spur-like process distally. P5, right leg, thumb of chela short, broader toward tip with 1 process and 2 setae; Re2 bent inwards at distal half, inner margin with 1 transparent flap, 3 setae along its inner margin and 2 setae at apex. Left leg 3-segmented, Rel with 1 distolateral rudimentary spine; Re2 with 2 pairs of unequal stout processes, outer one of longer pair pointed, inner margin hirsute.

Remarks: Recorded from tropical and subtropical regions of Indo-Pacific (Sewell 1932). Australian waters records were given by Greenwood (1979). In Indonesian waters recorded by Scott (1909), Delsman (1949) and Mulyadi (2002), Malaysian coast (Othman et al. 1990)

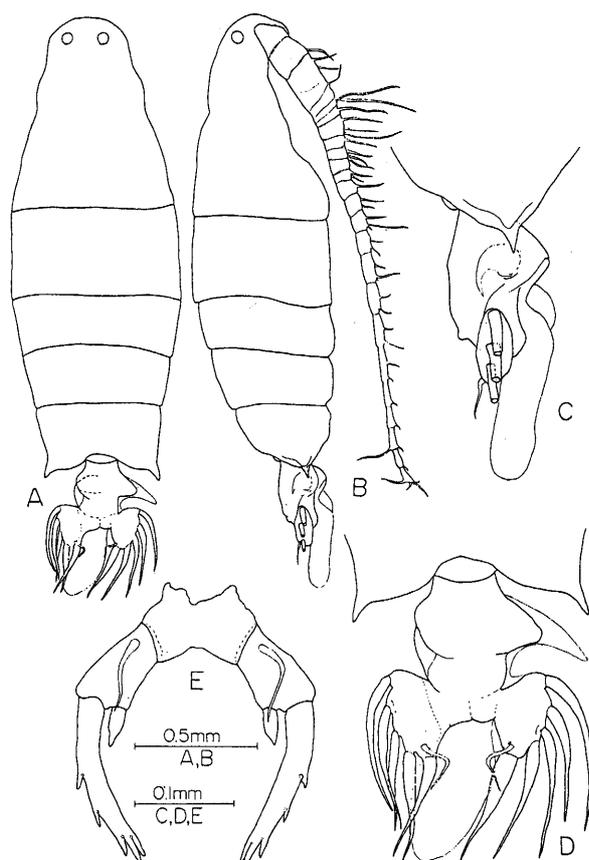


Fig. 12. *Labidocera pavo* female. A, dorsal view, B, lateral view, C, Th5 and urosome lateral view, D, Th5 and urosome dorsal view, E, fifth leg.

***Labidocera pavo* Giesbrecht, 1889** (Figs. 12 and 13)

Labidocera pavo Giesbrecht, 1889: 27; 1892: 446, 460, pls. 25, 34, pl. 41, figs. 18, 38. (Type locality: Red Sea); Cleve, 1901; Sewell, 1914: 234, pl. 21, figs. 13; 1924: 789: 1932: 365; Gurney, 1927: 154; Mori, 1937: 92, pl. 42, figs. 6–12; Wilson, 1950: 248, pl. 25, fig. 363; Tanaka, 1964: 255; Silas & Pillai, 1973: 804, fig. 14; Mulyadi, 2002: 79–81, fig. 26

Material examined: sample no. 1392.

Female: Length 2.21 mm (mean of 10 specimens, range 2.10 to 2.29 mm, s.d. 0.0694), length ratio prosome to urosome 4.95 : 1. Body robust, without lateral hooks, dorsal eye lenses moderate, prosome produced into symmetrical pointed process. Urosome 2 segmented, genital segment asymmetrical, right margin with 1 conical lobe, left margin with rounded knob-like process. P5 asymmetrical, right leg, Re with 2 outer spinules and 3 unequal spines at apex, middle one longest. Ri long and produced at apex. Left leg, Re with 2 outer spinules and 3 subequal spines at apex, Ri short and rounded.

Male: Length 1.92 mm (mean of 25 specimens range 1.60 to 2.31 mm, s.d. 0.2157), length ratio prosome to urosome 4.03 : 1. Body shape similar to female except dorsal eye

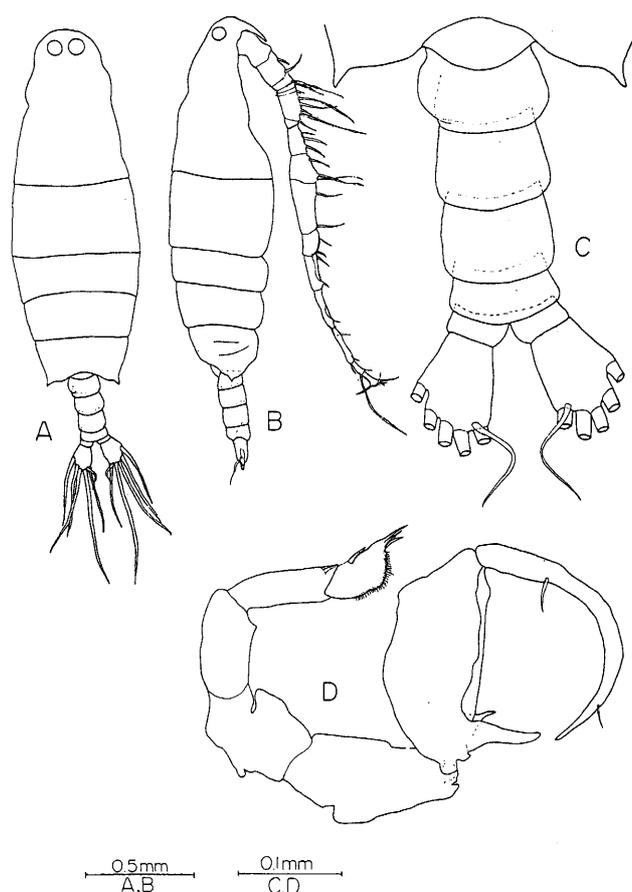


Fig. 13. *Labidocera pavo* male. A, dorsal view, B, lateral view, C, Th5 and urosome dorsal view, D, fifth leg.

lenses larger and contiguous. Urosome 5 segmented, naked. Right A1 geniculate, segment 17 rounded anteriorly into arched ridge, slightly sculptured with irregular ribbing, segment 18 with row of denticles on anterior margin which are closely placed, fused segments 19–21 with row of villiform denticles on anterior margin, extending to 3/4 length of segment, segments 24–25 completely fused. P5 chelate, right leg, Rel with well developed thumb, outer margin between thumb and distal end of Rel with 1 seta; Re2 elongated, curved with 1 blunt conical projection along inner margin at 1/3 distance from base, inner margin with 2 mid-marginal setae and 1 terminal seta. Left leg, Rel with distolateral spine; Re2 with 1 outer spine and 3 subequal spines at apex, all turned inwards, inner margin of segment irregularly lobular and hirsute.

Remarks: Tropical to subtropical Indo-Pacific in distribution. Widely recorded from Indian Ocean (Silas & Pillai 1973). Philippine waters (Wilson 1950), and Indonesian waters (Cleve 1901) and Mulyadi (2002).

***Labidocera pectinata* Thompson & Scott, 1903** (Figs. 14 and 15)

Labidocera pectinata Thompson & Scott, 1903: p. 252, pl. 2, figs. 10–14 (type locality: Palk Strait, Sri Lanka); Silas

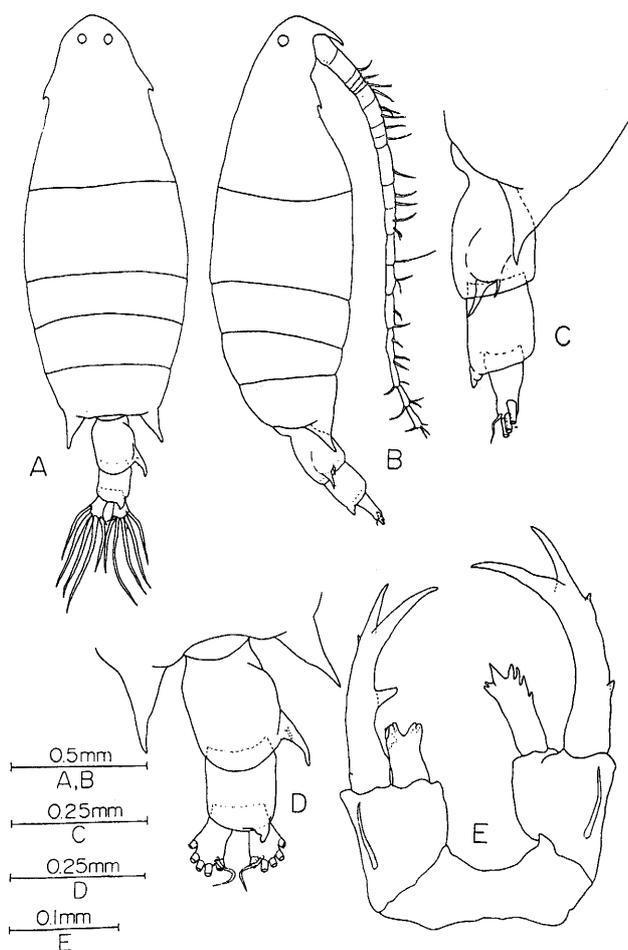


Fig. 14. *Labidocera pectinata* female. A, dorsal view, B, lateral view, C, Th5 and urosome lateral view, D, Th5 and urosome dorsal view, E, fifth leg.

and Pillai, 1973: p. 808, fig. 17a-f; Fleminger et al., 1982: p. 262-264, figs. 4K&L, 5E, 6I&J, 7E, 8E.

Labidocera similis Cleve, 1904: p. 378-380, pl. 19, figs. 4-6 (type locality: off Karachi, Pakistan).

Material examined: sample no. 2217.

Female: Length 2.01 mm (mean of 10 specimens, range 1.84 to 2.15 mm, s.d. 0.0695), length ratio prosome to urosome 3.25:1. Body elongated ending in a single spiniform process, right and left thoracic process symmetrical. Cephalon separated from Th1. Cephalic hooks and small dorsal eye lens present. A1 symmetrical extends to the genital segment. Urosome 3 segmented, right distal end of genital segment with unequal lateral spurs. Distal end of second segment with dorsal tubercle on right side, extending posteriad over anal segment. P5 asymmetrical, right slightly longer than left. Right exopod with one medial, one terminal and one lateral spiniform processes, endopod with 7 denticles. Left exopod with two lateral denticles, one lateral spiniform process and terminating in an attenuated spiniform process.

Male: Length 1.80 mm (mean of 10 specimens, range

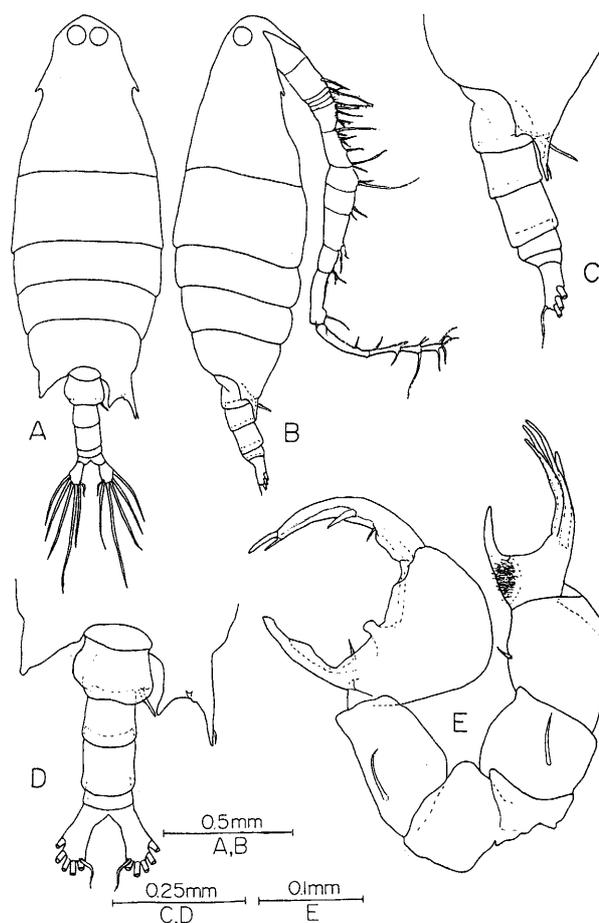


Fig. 15. *Labidocera pectinata* male. A, dorsal view, B, lateral view, C, Th5 and urosome lateral view, D, Th5 and urosome dorsal view, E, fifth leg.

1.58 to 2.03 mm, s.d. 0.0949), length ratio prosome to urosome 3.33:1. Body same as female with cephalic hooks, dorsal eye lens larger than females and contiguous. Right A1 geniculate extending beyond anal segment when extended, villiform teeth on segments 18-21. Right thoracic corner expanding horizontally, distally ending in lateral spiniform process and a medial process. Genital segment with short acicular process not reaching middle of segment 2. P5 with apical segment of left leg with medio-distal spur separated from cluster of three spiniform and two setiform processes by wide shallow notch. Right leg with lamelliform process on proximal chelate segment, distal margin rounded and skewed toward thumb.

Remarks: Specimens agrees with those described by Silas and Pillai (1973) and Fleminger et al. (1982). Recorded from inshore waters bordering the Indian subcontinent. According to Fleminger et al. (1982) the known western limit is Karachi, Pakistan and its eastern limit is Andaman Sea coast of Burma where *pectinata* may be sympatric with *rotunda*. The present result has shown that both *pectinata* and *rotunda* can be found in Sister's Island Singapore. Unpublished work by the present authors indicate that the extent of *pectinata* is

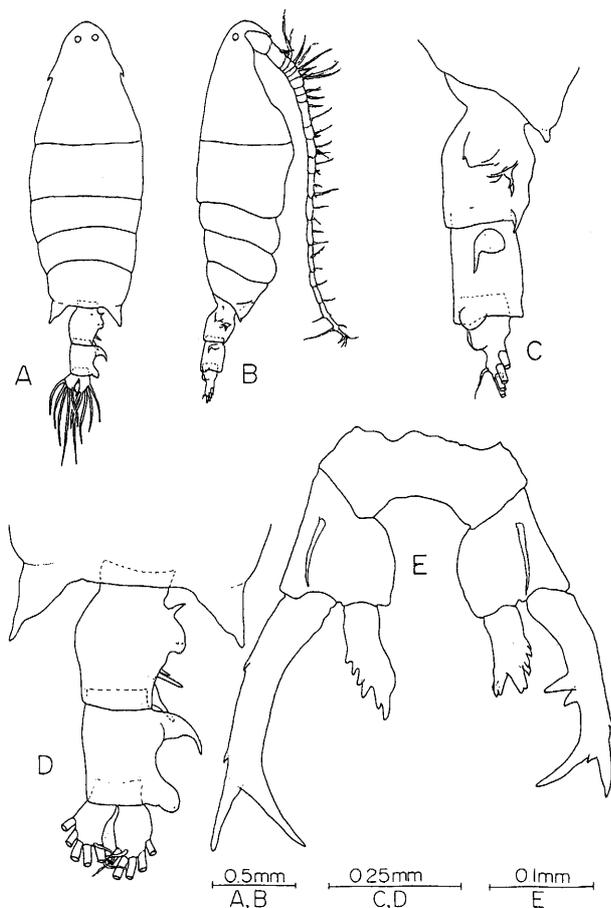


Fig. 16. *Labidocera rotunda* female. A, dorsal view, B, lateral view, C, Th5 and urosome lateral view, D, Th5 and urosome dorsal view, E, fifth leg.

at Mersing, South China Sea (see Fig. 1).

***Labidocera rotunda* Mori, 1929** (Figs. 16 and 17)

Labidocera rotunda Mori, 1929: 177, pl. 10, figs. 1–8; Mori, 1964: 35; Fleminger et al., 1982: p. 264–266, figs. 4M&N, 5F, 6K&L, 7F&G, 8F.

Labidocera rotundata Tanaka, 1964: 52

Labidocera bipinnata Tanaka, 1936: 31, pl. 2, figs. 1–10, pl. 3 figs. 1–7; Tanaka, 1964: 25–29; Mori, 1937: 94, pl. 43, figs. 1–8; Brodsky, 1948: 66, pl. 20, figs. 1–5; Brodsky, 1950: 410, fig. 291; Shen & Bai, 1956: 191–192, pl. 5, figs. 36–41; Shen & Lee, 1963: 581; Chen & Zhang, 1965: 97, pl. 39, figs. 10–13, pl. 40, figs. 1–5; Silas & Pillai, 1973: 814.

Material examined: sample no. 1960.

Female: Length 2.11 mm (mean of 10 specimens, range 1.97 to 2.31 mm, s.d. 0.1035), length ratio prosome to urosome 3.32:1. Body elongated ending in a single spiniform process, right and left thoracic process symmetrical. Cephalon separated from Th1. Cephalic hooks and small dorsal eye lens present. A1 symmetrical extends to the genital segment. Urosome 3 segmented, genital segment expanded near midlateral margin shaped of a knob and with

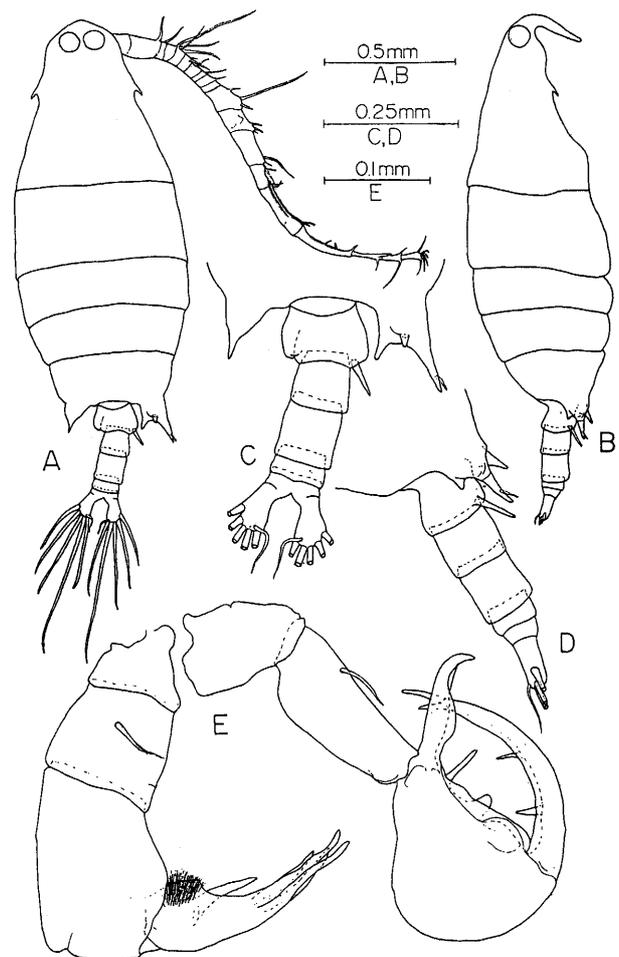


Fig. 17. *Labidocera rotunda* male. A, dorsal view, B, lateral view, C, Th5 and urosome dorsal view, D, Th5 and urosome lateral view, E, fifth leg.

four spiniform process along the lateral margin. Second segment expanded like a knob at the distal lateral right margin, proximal lateral right margin with expanded spiniform process pointing posteriorly. P5 asymmetrical, right slightly longer than left. Left exopod similar to *pectinata*. Right exopod with small intercalary denticle between distal spiniform processes, medial margin with two denticles.

Male: Length 1.80 mm (mean of 10 specimens, range 1.55 to 2.02 mm, s.d. 0.1301), length ratio prosome to urosome 3.13:1. Body same as female with cephalic hooks, dorsal eye lens larger than females and contiguous. Right A1 geniculate villiform teeth on segments 18–21. Th 5 asymmetrical, left thoracic corner as in female, right thoracic corner similar to that of *pectinata* except that the denticles between the lateral and medial spiniform processes is more pronounced. Genital segment with acicular process reaching slightly beyond middle of segment 2. P5 with apical segment of left leg, in general, similar to *pectinata*, however it differs from *pectinata* in that here the origin of the spiniform and setiform processes is distal to the tip of spur whereas in *pectinata* the origin is proximal to the tip. Right leg with

thumb of chelate with pronounced hook at distal end.

Remarks: There has been a mix-up between *L. rotunda* described by Mori (1929) from Pusan, Korea and *L. bipinnata* from Sagami Bay described by Tanaka (1936). Fleminger et al. (1982) argued that the minor difference is based on the presence or absence of cephalic hooks and had synonymised *bipinnata* with *rotunda*. *L. rotunda* is widely recorded in the western Pacific. According to Fleminger et al. (1982) the westward extent of *rotunda* is in the Andaman Sea. Unpublished work by the present authors on the pontellids around Peninsular Malaysia indicate that the extent of *rotunda* is at Lumut, Straits of Malacca (see Fig. 1).

***Pontella danae* var. *ceylonica* Thompson & Scott, 1903** (Fig. 18)

Pontella danae var. *ceylonica* Thompson and Scott, 1903: (female only). P. 252, pl. 2, figs. 1–5 (Type locality: around Sri Lanka); Silas & Pillai, 1973: 820–821, fig. 20. Othman et al., 1990: 564 Table 1

Material examined: sample no. 1960.

Female: Length 3.30 mm (mean of 15 specimens, range 2.95 to 3.40 mm, s.d. 0.1398), length ratio prosome to urosome 4.07:1. Body robust, cephalon with well developed dorsal and ventral eye lenses, Th4 and Th5 fused produced into an asymmetrically posterior directed process, left process slightly longer than right. Urosome 2 segmented, genital segment globular, with a small blunt projection on mid-dorsal margin, caudal ramus asymmetrical, left ramus much larger than right. A1 symmetrical, short not reaching last thoracic segment. P5 asymmetrical, left Re slightly shorter than right but much stouter at base, right Re with 3 outer marginal spinules of which the most distal one is large. Ri ends in bifid apex, left one smaller than right.

Remarks: *Pontella danae* var. *ceylonica* is known only from its female, differs from the normal described by Giesbrecht in the shape of the prosome, the genital segment in the normal is more quadrate and with no dorso medial process and the spinulations of P5 differs slightly. Both species appear to be sympatric and are widely distributed in the Indo-West Pacific. Its distribution in the Indian Ocean is given by Silas and Pillai (1973) Malaysian coast (Othman et al. 1990)

***Pontella forcicula* A. Scott, 1909** (Fig. 19)

Pontella forcicula Scott, 1909: 162, pl. 53, figs. 1–7 (Type locality: St. 93 Siboga Expedition, Sulu Sea, Philippines); Mulyadi, 2002: 98–99, fig. 33

Material examined: sample no. 1400.

Male: Length 2.61 mm (based on 1 specimen), length ratio prosome to urosome 3.35:1. Prosome elongate, postero-lateral end of thorax rounded, somewhat symmetrical, lateral cephalic hooks prominent. Urosome 5 segmented,

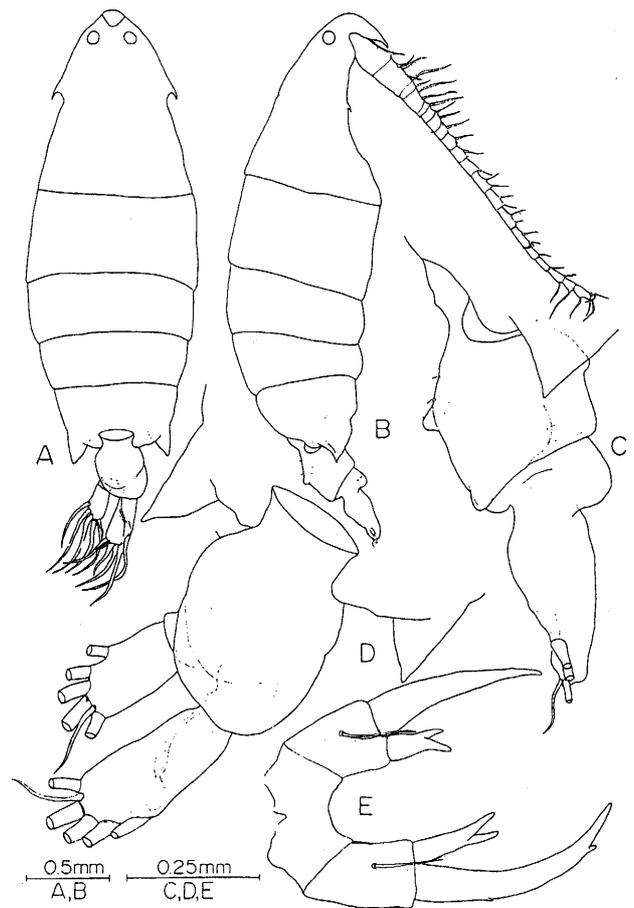


Fig. 18. *Pontella danae* female. A, dorsal view, B, lateral view, C, Th5 and urosome lateral view, D, Th5 and urosome dorsal view, E, fifth leg.

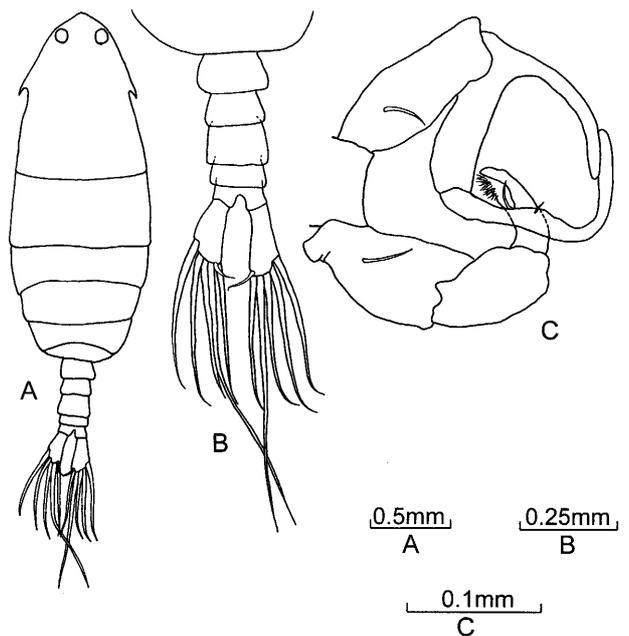


Fig. 19. *Pontella forcicula* male. A, dorsal view, B, Th5 and urosome dorsal view, C, fifth leg.

naked, CR asymmetrical, right ramus being longer. P5 assymetrical, right leg, thumb of Rel prominent, long and spini-form, curved inwards distally with 1 long seta on base, without process on middle segment. Re2 long and curved almost at right angle midway near the distal end with 1 apical and 2 unequal marginal spines. Left leg with short B1, B2 with 1 long plumose seta, Rel with 1 spine at distal end, Re2 curved and slender, bifurcate at apex, inner margin hirsute.

Remarks: A. Scott (1909) described *P. forcicula* from Sulu Sea, Philippines. So far the only other record of the species is from Jakarta Bay, Indonesia (Mulyadi 2002), besides the present record.

***Pontellopsis herdmani* Thompson & Scott, 1903** (Fig. 20)

Pontellopsis herdmani Thompson and Scott, 1903: (female only) 253–254, pl. 2, figs. 15–17 (Type locality: Galle Harbour & off Kavarativ Island, Gulf of Mannar); Silas & Pillai, 1973: 843–844, fig. 31; Greenwood, 1979: 109, fig. 9. Othman et al., 1990: 564 Table 1; Mulyadi, 2002: 128–130, fig. 47.

Material examined: sample no. 1392.

Female: Length 1.60 mm (mean of 10 specimens, range 1.53 to 1.70 mm, s.d. 0.0697), length ratio prosome to urosome 2.86:1. Body robust, cephalon separated from Th1, broadly rounded with small projection over base of rostrum, Th4 and Th5 fused, produced posteriorly into acute processes, slightly assymetrical, right process slightly longer. Urosome 2 segmented, assymetrical, genital segment assymetrical, left margin slightly swollen near distal end, right distal margin projected postero-laterally into an acutiform process, proximal margin with setule-like projection. P5 assymetrical, right leg slightly longer, Re with with 2 small outer marginal spines and bifurcated at apex. Ri bifid at tip, both rami curved inwards.

Male: Length 1.45 mm (mean of 6 specimens, range 1.44 to 1.62 mm, s.d. 0.0472), length ratio prosome to urosome 3.15:1. Body elongated, cephalon separated from Th1, Th4 and Th5 fused. Posterior thoracic corners assymetrical, left broadly triangular extending beyond middle of genital segment, right acuminate curving inwards reaching distal end of Ur3. Urosome five segmented, genital segment broader than long with 2 setae on distal right margin, Ur3 with a prominent lobe on right margin, crowned with spinules at apex. Right A1 geniculate, segment 13–17 enlarged, serrated plates present on anterior margins of segments 17 and 18, base of fused segments 19–21 with serially arranged spines. P5 assymetrical, right leg chelate, Re1 with an elongated thumb, exceeding length of claw, curved at the proximal, and is serrated at apex; Re2 inner margin with 2 setae and another seta at apex. Left leg, short, terminal segment with 2 subequal spine at apex, one outer marginal seta, inner margin

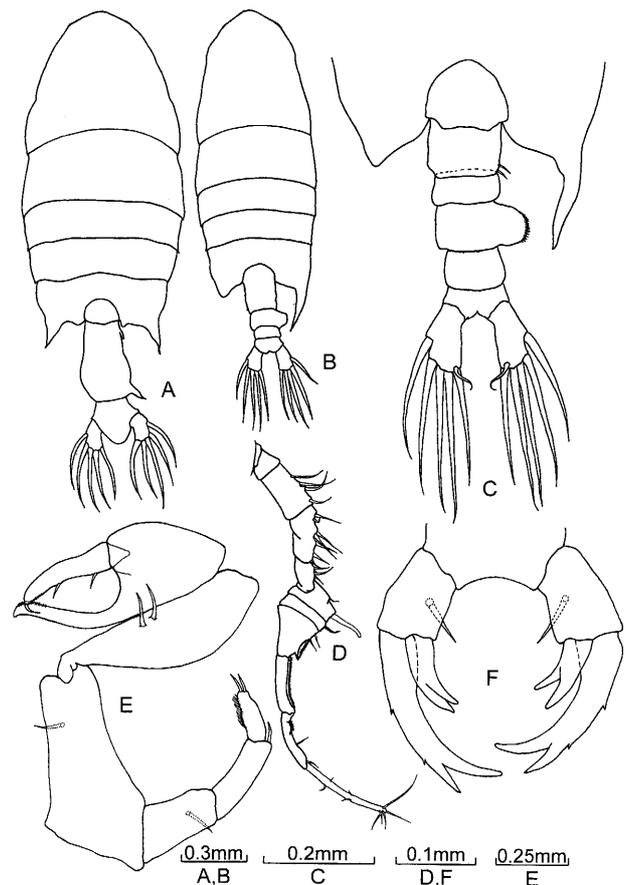


Fig. 20. *Pontellopsis herdmani*. A, female dorsal view, B, male dorsal view, C, male Th5 and urosome lateral, D, male A1, E, male fifth leg, F, female fifth leg.

hirsute.

Remarks: Specimen agrees with those described by Silas and Pillai (1973). Recorded from Indian Seas, Andaman Sea and west coast of India (Silas and Pillai 1973), Australia (Greenwood 1979), Indonesian waters (Mulyadi 2002), Malaysian coast (Othman et al. 1990).

***Pontellopsis inflatodigitata* Chen & Shen, 1974** (Fig. 21)

Pontellopsis inflatodigitata Chen & Shen, 1974: 132–133, 136, figs. 35–43 (Type locality: South China Sea); Mulyadi, 2002: 131–133, fig. 48.

Material examined: sample no. 1392.

Male: Length 1.49 mm (based on 2 specimens), length ratio prosome to urosome 2.85:1. Body slender, cephalon and Th1 separated, thoracic process assymetrical, left rounded extending to middle of genital segment, right acuminate curving inwards reaching middle of anal segment. Urosome 5 segmented, Ur2 and Ur3 assymetrical, right margin extended toward right and with dense short spinules. P5 assymetrical, right leg chelate, thumb of Rel prominent, extremely long and curved, digitate, distal end enlarged and knob-shaped, one long stout seta present near base of Re1.

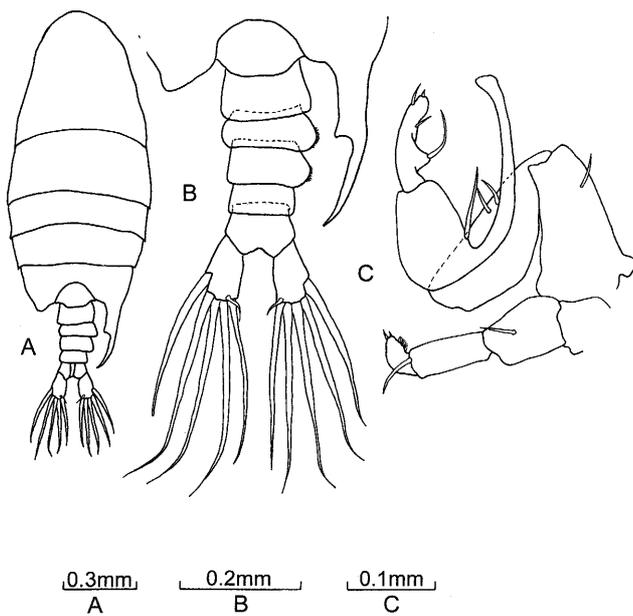


Fig. 21. *Pontellopsis inflatodigitata* male. A, dorsal view, B, Th5 and urosome dorsal view, C, fifth leg.

Re2 2/3 length of Re1 curving inward slightly, inner margin with one long and a short setae, outer margin one seta and a short seta at apex. Left leg with short B1, B2 with 1 seta, Re1 with 1 spine at distal end, Re2 short and small with 2 unequal distal spine, inner margin hirsute

Remarks: Chen and Shen (1974) described *Pontellopsis inflatodigitata* from the South China Sea. So far the only other record of the species is from Java Sea (Mulyadi 2002) besides the present record.

***Pontellopsis regalis* (Dana, 1849) (Fig. 22)**

Pontella regalis Dana 1849: 31 (Type locality: Sulu Sea).

Pontellina regalis Dana, 1852: 1154–1155; 1855, pl. 81, fig. la–b.

Pontella streuna (part), Brady, 1883: 95, pl. 45, fig. 18.

Monops grandis Lubbock, 1853: 116, pl. 15, figs. 7–13, pl. 7, fig. 5.

Monops regalis, Giesbrecht, 1892: 486–487, pl. 1, fig. 6, pl. 26, figs. 1–9.

Pontellopsis regalis, Giesbrecht, 1898: 147; A. Scott, 1909: 171; Farran, 1936: 118; Tanaka, 1964: 266, fig. 23a–f; Silas & Pillai, 1973: 838–839, fig. 29a–f; Mulyadi, 2002: 141–144, fig. 52.

Material examined: sample no. 1788.

Male: Length 1.64 mm (based on 1 specimen), length ratio prosome to urosome 3.05 : 1. Prosome broadly rounded, cephalon separated from Th1, Th4 and Th5 fused. Posterior thoracic corners asymmetrical, produced into acuminate processes, left extends beyond genital segment, right directed posteriorly and curved inwards apically, reaching anal seg-

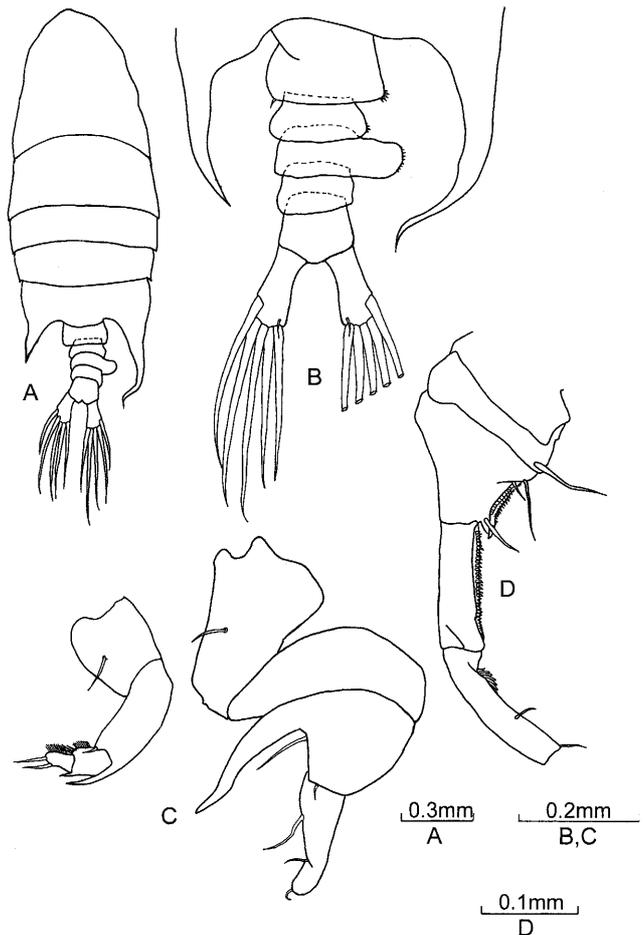


Fig. 22. *Pontellopsis regalis* male. A, dorsal view, B, Th5 and urosome dorsal view, C, fifth leg, D, A1.

ment. Urosome five segmented, genital segment broader than long, Ur3 with a prominent lobe on right margin, crowned with spinules at apex. Right A1 geniculate, segment 13–17 enlarged, serrated plates present on anterior margins of segments 17 and 18, base of fused segments 19–21 with serially arranged spines. P5 asymmetrical, right leg, B2 with 1 seta on inner margin; Re1 (chela) short and broad with an elongated thumb, inner base of chela with 1 long seta; Re2 (finger) with bent tip and 2 inner setae. Left leg, Re1 with a strong distolateral spine; Re2 with 2 outer and 2 unequal apical spines of which inner one shortest; inner margin hirsute.

Remarks: There have been reports of small variations in the P5 of both sexes (see Silas and Pillai 1973). Specimen agrees very well with those described by Silas and Pillai (1973) and Mulyadi (2002). This species is widely recorded from the Indian Ocean, Bay of Bengal (Sewell 1932), Andaman Sea (Silas and Pillai 1973), and South African waters (De Decker and Mombeck 1964), eastern Indonesian waters (A. Scott 1909), Lombok Sea and Banda Sea (Mulyadi 2002) as well as the Atlantic (see Vervoort 1965)

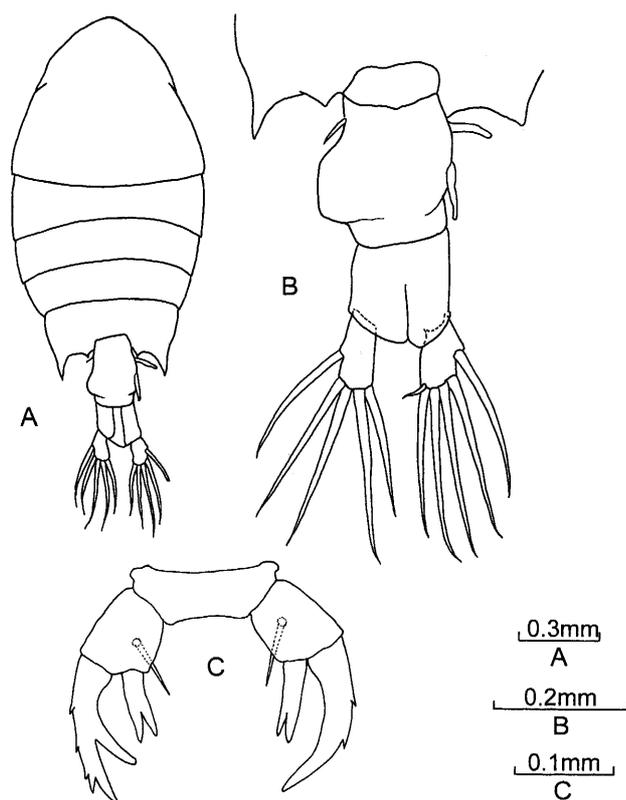


Fig. 23. *Pontellopsis scotti* female. A, dorsal view, B, Th5 and urosome dorsal view, C, fifth leg.

***Pontellopsis scotti* Sewell, 1932 (Fig. 23)**

Pontellopsis scotti Sewell, 1932: 388–390, fig. 129a–f (Type locality: Burmese coast); Silas & Pillai, 1973: 844–845, fig. 32. *Pontellopsis herdmani* (part) Sewell, 1912: 375, pl. 14, fig. 5. Othman et al., 1990: 564 Table 1.

Material examined: sample no. 1259.

Female: Length 1.54 mm (mean of 6 specimens, range 1.48 to 1.64 mm, s.d. 0.0533), length ratio prosome to urosome 3.05 : 1. Cephalon separated from Th1, broadly rounded with small projection over base of rostrum, Th4 and Th5 fused, produced posteriorly into acute processes. Urosome 2 segmented, genital segment asymmetrical, left margin swollen distally, proximal margin with 1 spine, proximal right margin with 2 spines, distal right margin with one spine. P5 asymmetrical, Re of left leg shorter than right, with 2 outer spines, Re of right leg with 4 outer spines, inner margin produced into a stout thick spinuous process. Ri bifid at tip.

Remarks: Specimen agrees very well with those described by Sewell (1932) and Silas and Pillai (1973). Recorded from Indian Seas, Andaman Sea and west coast of India (Silas and Pillai 1973), Burmese coast (Sewell 1912, 1932), other areas of India (see Silas and Pillai 1973) Cilacap Bay and off Labuan, Indonesia (Mulyadi 2002), Malaysian coast (Othman et al. 1990) and present record.

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