

NEW RECORDS AND TAXONOMY OF THE GENUS *PONTELLA* (CRUSTACEA: COPEPODA: CALANOIDA), WITH NOTES ON ITS DISTRIBUTION IN INDONESIAN WATERS

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ABSTRACT. - A taxonomic study was made on the genus *Pontella* collected from 15 sites in Indonesian waters. Fourteen species of *Pontella* were recorded, including one species, *P. labuanensis* Mulyadi, 1997; two undescribed species, and six species, *P. andersoni* Sewell, 1912; *P. diagonalis* Wilson, 1950; *P. forcicula* A. Scott, 1909; *P. latifurca* Chen & Zhang, 1965; *P. tridactyla* Shen & Lee, 1963; and *P. valida* Dana, 1853, that are new records for the area.

KEY WORDS. - New records, *Pontella*, Calanoida, Copepoda, Indonesia, taxonomy, biogeography.

INTRODUCTION

The species of *Pontella* inhabit surface waters, and provide excellent material for zoogeographic investigations. The genus consists principally of Indo-Pacific species. The genus was proposed by Dana (1849) based on specimens collected by the U.S. Exploring Expedition 1838-1842. The species of *Pontella* are separated from the other genera belonging to the family Pontellidae by the presence of dorsal eye-lenses, the short rostral rami, and the ventral rostral lens. Currently, the literature indicates 44 nominal species as widely accepted taxa world-wide.

In Indonesian waters, hitherto seven species of *Pontella* have been reported (Cleve, 1901; Carl, 1907; A. Scott, 1909; Delsman, 1939; Fleminger, 1986; Ohtsuka et al., 1987). The species thus recorded are: *P. alata* A. Scott, 1909; *P. danae* Giesbrecht, 1889; *P. denticauda* A. Scott, 1909; *P. fera* Dana, 1849; *P. princeps* Dana, 1849; *P. securifer* Brady, 1883; and *P. surrecta* Wilson, 1950. Four of these have been met with in this study, one species, *P. labuanensis* Mulyadi, 1997, has been described as a new species, two new species have not yet been described until I get the males specimens of *Pontella* sp. 1, and adult specimens of *Pontella* sp. 2, while six other species, i.e., *P. andersoni* Sewell, 1912; *P. diagonalis* Wilson, 1950; *P. forcicula* A. Scott, 1909; *P. latifurca* Chen & Zhang,

1965; *P. tridactyla* Shen & Lee, 1963; and *P. valida* Dana, 1853, represent new records for Indonesian waters.

This paper deals with the description and illustration of all species collected. It provides a key for their identification, and a discussion on their geographic distribution. An overview of all collected species (both valid species and synonyms) hitherto described from the world's oceans, has also been included.

MATERIAL AND METHODS

The present plankton samples, many of which were provided from the collections of the Research and Development Center of Oceanology, Indonesian Institute of Sciences (LIPI), were collected at 15 sites in Indonesian waters during 1985-1995 (Fig. 1). All sites except that in the Flores Sea were located near the coast. Sampling was done by surface towing and by vertical hauls (from 10 m, 25 m, 100 m or 200 m deep to the surface) with plankton nets (0.1 mm and 0.33 mm mesh size; 0.35 m and 0.45 m diameter mouth aperture) at day- and nighttime.

Abbreviation used in the text to describe morphological features are: A1 = antennule, A2 = antenna, Ms1-Ms5 = metasomal somites 1-5, P1-P5 =

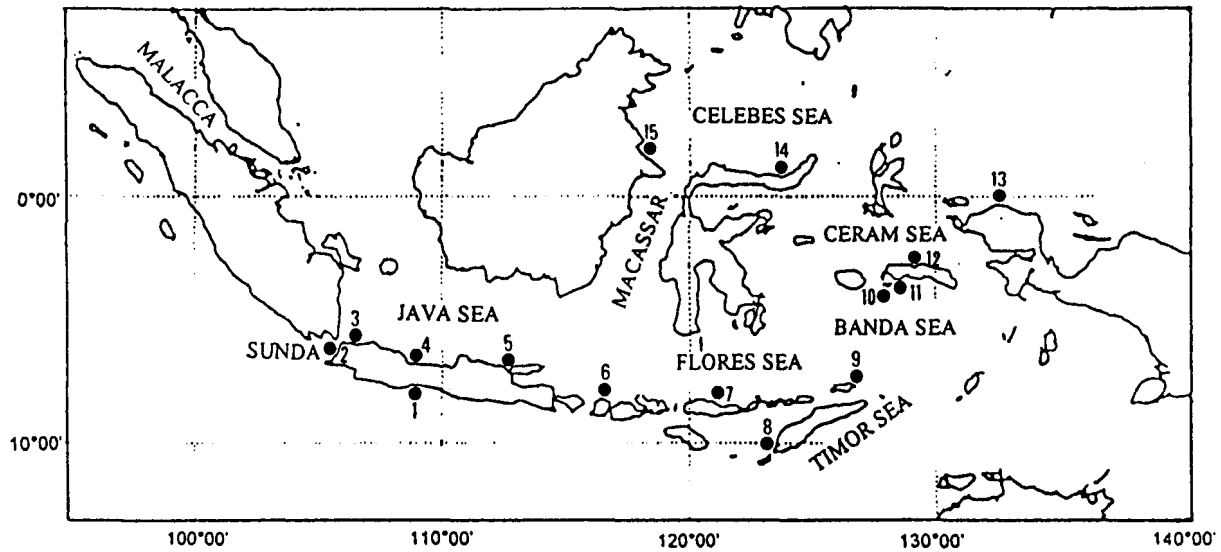


Fig. 1. Map of Indonesian waters showing study sites 1-15

1. Cilacap Bay, central Java (07°40'S 109°00'E), 19 May 1993 and 6 June 1994
2. Off Labuan, west Java (06°10'S 106°00'E), 11 May 1993
3. Jakarta Bay-Seribu Islands (06°00'S 106°45'E), 1-2 June 1994
4. Off Tegal, central Java (06°00'S 109°10'E), 3-4 June 1994
5. Off Surabaya, east Java (07°10'S 109°10'E), 8-9 June 1994
6. Sumbawa Sea (08°40'S 112°45'E), 4 September 1993•
7. Flores Sea (07°29'S 121°05'E), 15 February 1985•
8. Kupang Sea (10°20'S 123° 00'E), 15 December 1994•
9. Banda Sea (07°39'S 126°50'E), 29 July 1992•
10. Ambon Bay (03°40'S 128°10'E), 18 July, 12 Dec. 1994♦ and 13-14 March 1995
11. Haruku Strait (03°40'S 128°00'E), 2 August 1991•
12. Ceram Sea (03°40'S 129°00'E), 23 July 1991•
13. Sorong Sea (00°20'S 132°10'E), 25 January 1995•
14. Off North Celebes (01°30'N 124°00'E), 6 and 9 October 1994•
15. Derawan Strait, east Kalimantan (02°12'N 118°17'E), 22 October 1994•

Notes: • = samples provided from collections of LIPI

♦ = samples provided by Mr. T. Sidabutar

swimming legs 1-5, Ur1-Ur5 = urosomal somites 1-5, CR = caudal rami, B1-B2 = basipods 1-2, Re = exopod, Ri = endopod, St = terminal spine, Se = outer spine, Si = inner spine.

Key to species of *Pontella* in Indonesian waters

Female

1. Posterolateral ends of Ms5 rounded. *P. denticauda*
- Posterolateral ends of Ms5 produced into acute lobes. 2

2. Ur1 without any processes (except for many sensilla). 3
- Ur1 with processes. 7
3. CR slender, almost symmetrical. *P. labuanensis*
- CR short, very asymmetrical. 4
4. Proximal portion of left CR very broad in lateral. *P. fera*
- Proximal portion of left CR normal. 5
5. Setal base of right CR swollen. 6
- Setal base of right CR not swollen. 9

6. Right side of Ur1 with protuberance. *P. danae*
 - Right side of Ur1 without protuberance.
 *P. latifurca*
7. Ur1 with one process on each side. *P. valida*
 - Ur1 with one finger-like or one large posterodorsal
 process. 8
8. Ur1 with finger-like process on left distal corner.
 *P. princeps*
 - Ur1 with a large posterodorsal process and genital
 operculum with blunt process on right side.
 *P. surrecta*
9. A broad dorsal "shield" covers Ur1 and extends
 backwards on left side, overlapping left CR, medio-
 dorsally with spine-like process. *P. spinipes*

Male

1. Posterolateral ends of Ms5 rounded, distal half of
 Re2 of right P5 broad. *P. denticauda*
 - Posterolateral ends of Ms5 produced into acute
 lobe, distal half of Re2 of right P5 elongate. 2
2. Re2 of right P5 with single process on proximal
 corner externally. *P. valida*
 - Re2 of right P5 terminating in single spine (not
 bifurcate). 3
3. Re1 of right P5 with a claw-like hook on proximal
 corner externally, outer marginal spines of Re2 left
 P5 rather short. *P. tridactyla*
 - Re1 of right P5 with finger-like process on proximal
 corner externally, outer marginal spine very large.
 4
4. Outer proximal spinal process of right P5 rather
 short, finger-like. *P. priceps*
 - Outer proximal spinal process of right P5 slender,
 sickle-like. 5
5. CR slender, almost symmetrical. *P. labuanensis*
 - CR short, asymmetrical. 6
6. Distal end of Re2 right P5 with furcate lamelliform
 process. *P. fera*
 - Distal end of Re2 right P5 without process. 7
7. Terminal segment of left P5 rather large, apical
 spine blade-like. *P. spinipes*
 - Terminal segment of left P5 rather short, with
 distinct ridges. 8
8. Re2 of left P5 rather long with short apical spines,

Re2 of right P5 with 2 spinal processes on outer
 base. *P. latifurca*

DESCRIPTIONS

Pontella andersoni Sewell, 1912

(Fig. 2)

Pontella andersoni Sewell, 1912: 323-330, 344-346,
 and 370, pl. 20, figs. 1-9 (Type locality: Off
 Chittagong, Bay of Bengal); 1932: 375; 1934:80;
 Silas & Pillai, 1973: 818-819, fig. 19g-j;
 Madhupratap & Haridas, 1986: 109.

Material examined.- Five immature females (3.50-
 3.55 mm), 5 immature males (3.32-3.38 mm)
 specimens collected off Labuan, west Java by surface
 tow of 0.1 mm mesh plankton net at night on 18 June
 1994.

Female immature (stage V).- Cephalon and Ms1 not
 completely separate; Ms4 and Ms5 separate,
 posterolateral ends produced into acute lobes and
 reaching middle of Ur1 when folded backwards.
 Rostrum with strong rami, rostral lenses absent.
 Urosome composed of 3 somites, Ur1 almost
 symmetrical; CR symmetrical with 5 plumose and 1
 small setae. A1 not reaching distal end of Ms5 when
 folded backwards, segments 11 and 12 partially fused.
 P1 with 3-segmented Re and Ri; B1 with 1 plumose
 seta on inner margin. P5 almost symmetrical, with 2
 basal segments and unsegmented Re and Ri; B2
 broader distally with 1 plumose seta on posterior
 surface; Re more than twice as long as Ri, with 3 outer,
 1 inner and 2 apical spines; Ri bifurcate at apex.

Male immature.- Cephalon and Ms1 separate; Ms4
 and Ms5 separate, posterolateral ends symmetrical and
 extending beyond distal end of Ur1. Rostrum with
 asymmetrical rami, left side curved inwards, rostral
 lens absent. Urosome composed of 4 somites, Ur3
 longest; CR somewhat symmetrical more elongated
 than in female, with 5 plumose and 1 small setae.

Right A1, segments 12-16 forming spindle-like
 swelling, but distal segments here not yet completely
 fused together; segment 14 with long spiniform
 process; distal segment 19 with spiniform process
 extending to segments 20-21, this being the future
 toothed plate. Left A1 as in female. P5 asymmetrical,
 right leg longer than left, with 2 basal and 1 exopodal
 segments, B2 with 1 plumose seta on posterior surface,
 Re with 3 outer, 1 inner and 2 apical spines. Left leg,

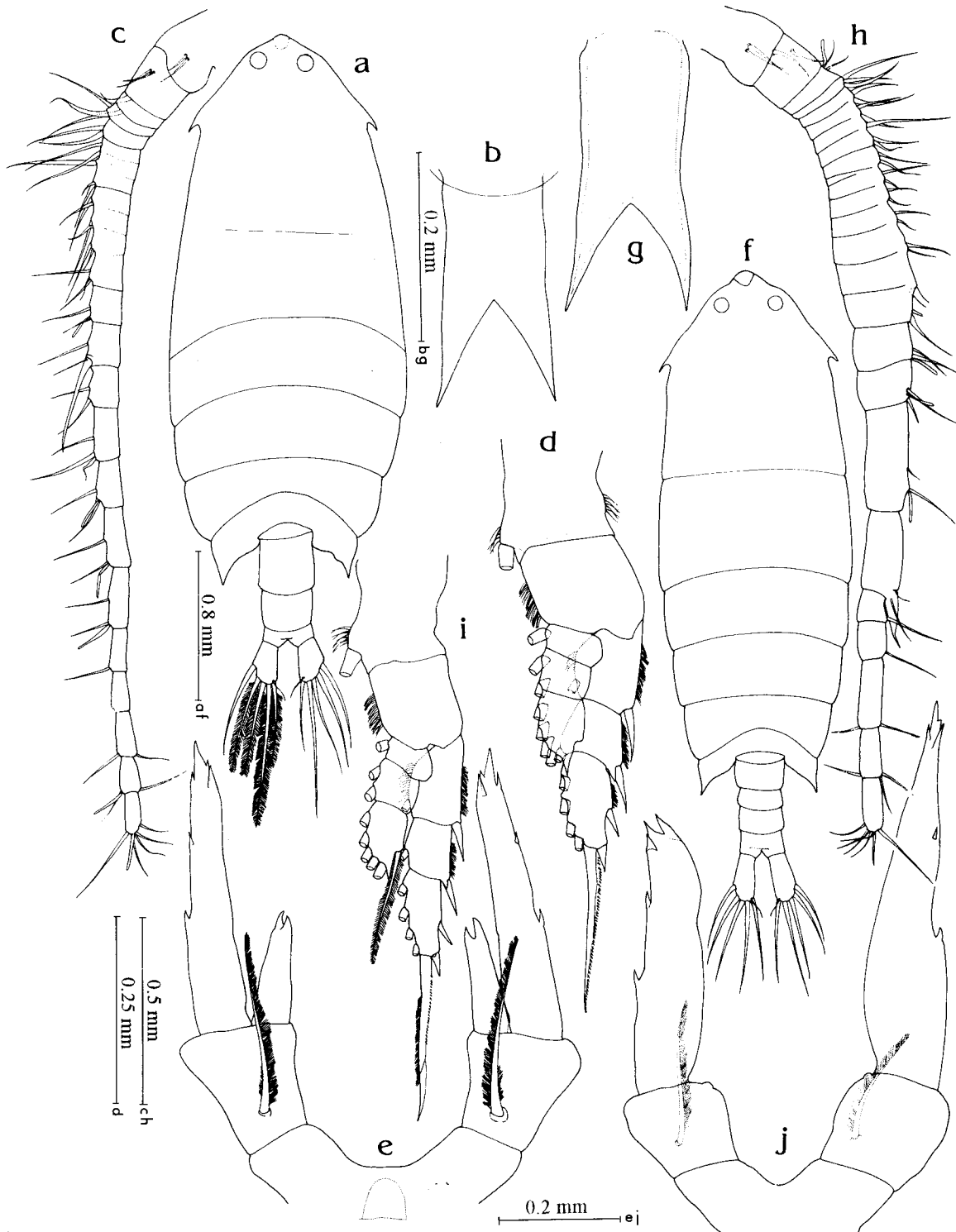


Fig. 2. *Pontella andersoni*, immature female. a, whole animal, dorsal view; b, rostrum, anterior view; c, antennule; d, 1st leg; e, 5th legs; immature male. f, whole animal, dorsal view; g, rostrum, anterior view; h, right antennule; i, 1st leg; j, 5th legs.

Re with 3 outer and 2 apical spines.

Remarks.- Sewell (1912) has been described *P. andersoni* based on a single male and a damaged female from the Bay of Bengal, and described copepodid stage III of this species in detail.

Distribution.- Widely recorded from Indian Seas, Bay of Bengal coast (Sewell, 1912), Salt lakes, Calcutta (Sewell, 1934), Madras coast (Krishnaswamy, 1953), Lawsons Bay, Waltair (Ganapathi & Santhakumari, 1961), Gulf of Mannar (Silas & Pillai, 1973), and off Labuan, west Java (present records).

***Pontella denticauda* A. Scott, 1909**
(Fig. 3)

Pontella denticauda A. Scott, 1909: 161-162, pl. 52, figs. 1-12 (Type locality: from 13 Siboga stations, eastern Indonesia); Sewell, 1932: 376; Wilson, 1950: 291; Silas & Pillai, 1973: 828-829, fig. 23; Matsuo & Marumo, 1982: 93, table 1; Madhupratap & Haridas, 1986: 109.

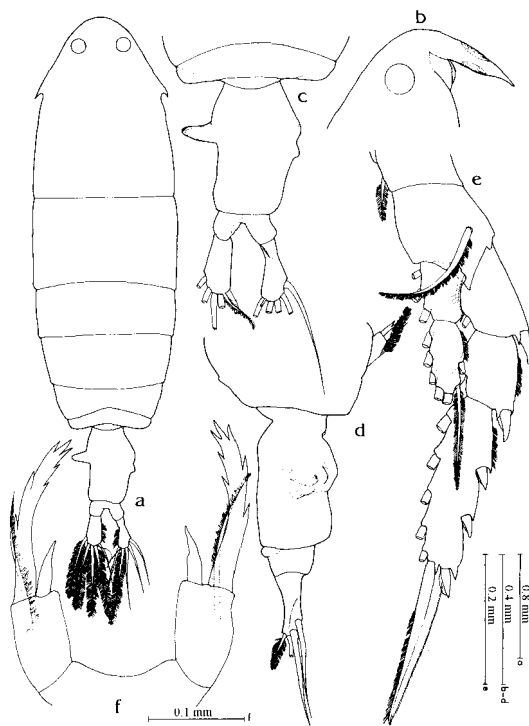


Fig. 3. *Pontella denticauda*, female. a, whole animal, dorsal view; b, cephalon, lateral view; c, Ms5 and urosome, dorsal view; d, Ms5 and urosome, ventral view; e, 4th leg; f, 5th legs.

Material examined.- Five females (2.91-2.95 mm) collected from Jakarta Bay by surface tow of 0.1 mm mesh plankton net at daytime on 2 June 1994.

Female.- Posterolateral ends of Ms5 symmetrical, narrowly rounded. Urosome composed of 2 somites, Ur1 asymmetrical, proximo-lateral margin of left side produced into large spiniform process, right side produced into 2 rounded processes; Ur2 very short, as long as spiniform process on Ur1; CR asymmetrical, left ramus distinctly broader than right. A1 22-segmented, reaching distal end of Ms3 when folded backwards. A2, mandible, maxillule, maxilla, and maxilliped usual *Pontella* type. P5 symmetrical, similar to that of *P. fera*, Re with 3 inner spines distally, 3 wide apart of outer spines and 1 spiniform process at apex. Ri with acuminate process at apex.

No male was found in the present study.

Remarks.- This species was described by A. Scott (1909) based on specimens collected from the Sulu Sea, Celebes Sea and Timor Sea and has given the size of the female as 2.9 mm. The present females agree with the female figures by Scott (1909) in the following: (1) A1 with 22 segments, (2) Ri not very slightly bifurcate at apex, and (3) the right side of Ur1 produced into 2 rounded processes.

Distribution.- Indo-Pacific. From Indian Ocean: Bay of Bengal (Sewell, 1932; Silas & Pillai, 1973), eastern Indian Ocean, south of Java (Veronina, 1962). Wilson (1950) described a single female from Caldera Bay, West Mindanao, Philippines.

***Pontella diagonalis* Wilson, 1950**
(Fig. 4)

Pontella diagonalis Wilson, 1950: 292-293, pl. 28, figs. 410-413 (Type locality: Albatross St. 5553, off Jolo, Philippines); Silas & Pillai, 1973: 824, figs. 21-22; Pillai, 1975: 131, figs. 1d-i; Madhupratap & Haridas, 1986: 109.

Pontella spinipes (part), Wolfenden, 1906: 1020.

Material examined.- Two males (3.95 mm) collected from Jakarta Bay by surface tow of 0.1 mm mesh plankton net at daytime on 2 June 1994.

Male.- Posterolateral ends of Ms5 produced into acuminate lobes. Urosome composed of 5 somites, Ur1 asymmetrical, with lobe-like projection on left side; CR asymmetrical, right ramus larger and broader

distally with 5 plumose and 1 small setae, outer seta with spur-like spinule arising laterally about 1/5 length of proximal end. Right A1 geniculate, segment 14 with stout, elongated spine and claw-like at apex; anterior margin from distal margin segment 16 to middle of segment 18 with toothed ridge of triangular denticles; fused segments 19-21 with an elevated process on proximal anterior part, with 3 stout and conspicuous unequal teeth, middle one longest, proximal plate with row of denticles and ending in falcate spur distally; segments 22-25 completely fused. P5, right leg, Re1 well developed, thumb with 2 unequal processes; concave surface with 1 spine-like process armed with 1 seta near base, and 1 large rounded process; Re2 slender, elongated, pointed, with 2 inner setae and 1 seta on anterior surface. Left leg, B2 with plumose seta on posterior surface; Re1 with distolateral outer spine and 1 inner seta; Re2 with 2 outer spines at apex and 2 patches of fine setae on inner margin.

No female was found in the present study.

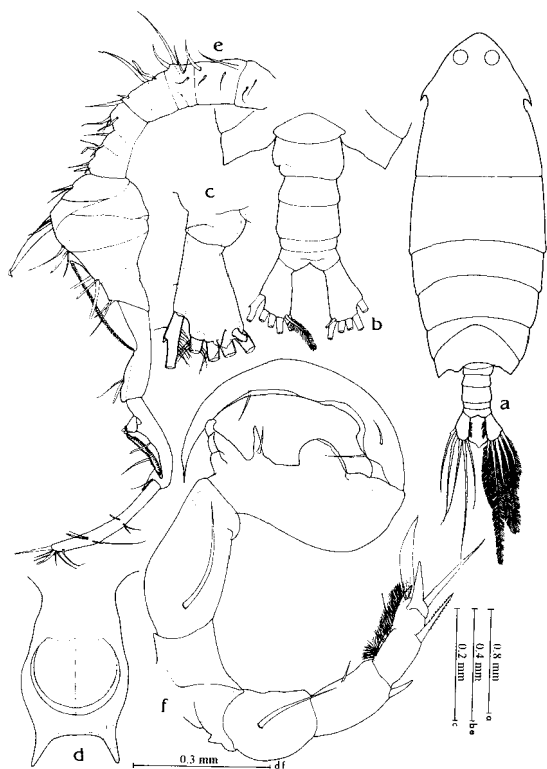


Fig. 4.

Fig. 4. *Pontella diagonalis*, male. a, whole animal, dorsal view; b, Ms5 and urosome; c, left caudal ramus, dorsal view; d, rostrum, anterior view; e, right antennule; f, 5th legs.

Remarks.- Wilson (1950) described *P. diagonalis* based on the female specimens from off Jolo, Philippines. The male of *P. diagonalis* was figured by him as *P. securifer* (Wilson, 1950, pl. 28, fig. 425). Silas & Pillai (1973) discussed in detail the diagnostic features of this species from Indian Ocean and according to them the male of *P. spinipes* described by Wolfenden (1906) belongs to this species. The present male specimen agrees with the description of the species by Wilson (1950) but slight differences were noted in having the proximal outer seta of left CR with a spur-like spine, and in the form of P5.

Distribution.- Indo-West Pacific. From Indian Ocean: Bay of Bengal (Sewell, 1912), Andaman Sea, west coast of India and the Laccadive (Silas & Pillai, 1973), and Maldive Archipelagoes (Wolfenden, 1906), South African coast (De Decker & Mombeck, 1964), and Jakarta Bay (present records).

***Pontella fera* Dana, 1849**

(Figs. 5-6)

Pontella fera Dana, 1849: 34; Giesbrecht, 1898: 462, pls. 24, 40 (Type locality: Pacific, 11°-12°45'N, 170°-171°E); Giesbrecht & Schmeil, 1898: 144; A. Scott, 1902: 408; 1909: 159; Thompson & Scott, 1903: 252; Wolfenden, 1906: 1021; Sewell, 1914: 237; 1932: 377, fig. 12; Wilson, 1950: 298, pl. 28, fig. 414; Tanaka, 1964: 263-264, fig. 237; Chen & Zhang, 1965, pl. 45, figs. 1-7; Zheng et al., 1989; Silas & Pillai, 1973: 816, fig. 19a-f; Matsuo & Marumo, 1982: 93, table 1; Madhupratap & Haridas, 1986: 109.

Pontellina (Eupontellina) fera, Claus, 1893: 273.

Material examined.- Three females (2.80-2.85 mm), 2 males (2.50-2.60 mm) collected from Jakarta Bay by surface tow of 0.1 mm mesh plankton net at daytime on 2 June 1994.

Female.- Posterolateral ends of Ms5 produced into short asymmetrical wing-like processes. Rostrum slender, dorsal lens moderately large, rostral lens feebly developed. Urosome composed of 2 somites, Ur1 asymmetrical, produced laterally in a pair of knob-like processes on left side, ventral surface of somite with a pair of processes on proximal part of genital opening; anal somite slightly asymmetrical, very short less than 1/6 as long as Ur1; CR asymmetrical, left ramus being larger. A1 23-segmented, reaching middle of Ms3 when folded backwards. P5 symmetrical, Ri short and bifid apically, bifurcation

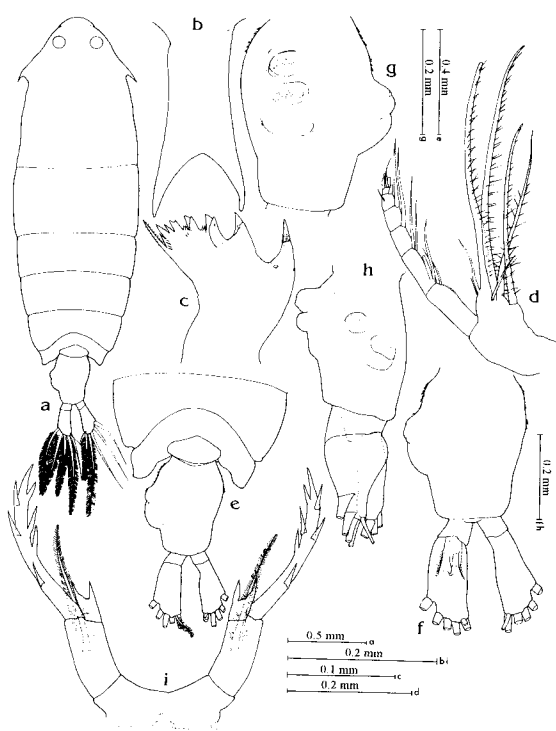


Fig. 5. *Pontella fera*, female. a, whole animal, dorsal view; b, rostrum, anterior view; c, mandible dentition; d, maxilliped; e, Ms5 and urosome, dorsal view; f, urosome, dorsal view; g, genital complex, ventral view; h, urosome, lateral view; i, 5th legs.

varying from blunt to pointed process in different specimens; Re elongated, with 3 outer and 3 inner spines, outer marginal spines being widely separated, apex pointed.

Male.- Cephalosome as in female. Ms5 ending in bluntly rounded posterior processes of more or less equal in size. Urosome composed of 5 somites, Ur1 asymmetrical, right side slightly longer than left; CR asymmetrical, right ramus slightly longer. Right A1 geniculate, with curious shape process with serrated upper margin on segment 17 and 18, fused segments 19-20 with 1 button-shape process and 2 knob-like projections on anterior surface. P5, right leg chelate, hand of chela with 3 unequal finger-like processes, one at base, other 2 a head of projecting lamina at base of hand; finger bent inwards, with recurved blunt tip, armed with small seta, 2 moderately long setae present at proximal inner base of finger. Left leg, with terminal segment ending in 3 subequal finger-like processes, middle one being slightly longer than others, in addition, 2 short spines present along its outer margin; subterminal segment with distolateral spine.

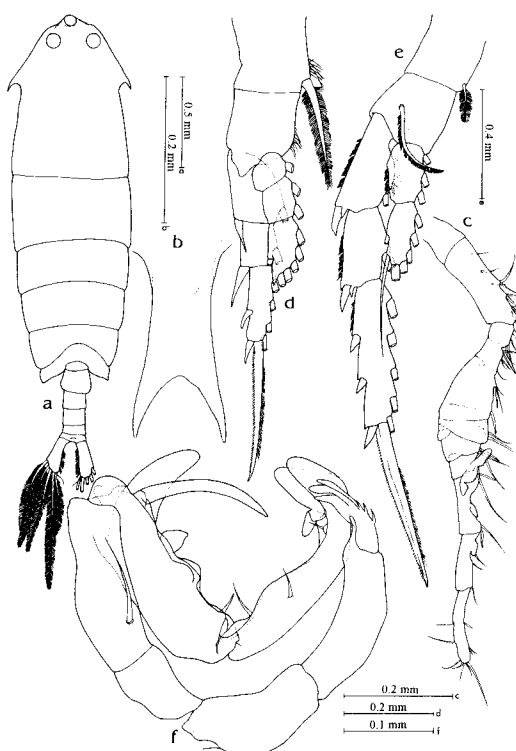


Fig. 6. *Pontella fera*, male. a, whole animal, dorsal view; b, rostrum, anterior view; c, right antennule; d, 1st leg; e, 4th leg; f, 5th legs.

Remarks.- Wilson (1950) assumed that the male of *P. fera* described by Dana (1892, pl. 82, fig. 5) is referable to *P. tenuiremis* Giesbrecht, 1889. The present specimens differ from the original description of *P. fera* or *P. tenuiremis* by the form of the genital processes in the female, and the form of P5 in the male, but are identical with illustrations of *P. fera* provided by Tanaka (1964) and Chang & Zhang (1965), but not with Silas & Pillai (1973: 816, fig. 19a-f), figures.

Distribution.- Suruga Bay, Japan (Tanaka, 1964), Yellow Sea and East China Sea (Chen & Zhang, 1965), and Java Sea (present records).

***Pontella forcicula* A. Scott, 1909**

(Fig. 7)

Pontella forcicula A. Scott, 1909: 162, pl. 53, figs. 1-7 (Type locality: St. 93 Siboga Expedition, Sulu Sea, Philippines).

Material examined.- Two males (2.59 mm) collected from Pari Island, Jakarta Bay by surface tow of 0.1 mm mesh plankton net at daytime on 2 June 1994.

Male.- Posterolateral ends of Ms5 produced into asymmetrical rounded lobes. Rostrum bifurcate, asymmetrical, right side short and broader than left. Urosome composed of 5 somites, CR asymmetrical, right ramus being longer. Right A1 inflated medially, without processes, proximal hinge segment with 1 large saucer-like process with blunt teeth, dorsal hinge segment short, upper margin with 2 simple plates. Left A1 19-segmented reaching distal end of Ms2 when folded backwards.

P5 rather small; right leg, thumb of Re1 long and spiniform, curved inwards distally with 1 long seta on base, without process on middle segment. Re2 long and curved with 1 apical and 2 unequal marginal spines. Left leg with short B1, B2 with 1 long plumose seta, Re1 with 1 spine at distal end, Re2 curved and slender, bifurcate at apex and 3 outer spinules, inner margin hirsute.

Remarks.- A. Scott (1909) has been described *P. forcicula* based on 2 males specimens collected from Sulu Sea, southern Philippines waters. *P. forcicula* may ultimate prove to be the males of some species now founded upon females alone. Until that can be proven, however, Scott's species remains valid.

Distribution.- A. Scott (1909) originally described this species from Sulu Sea, Philippines. No other

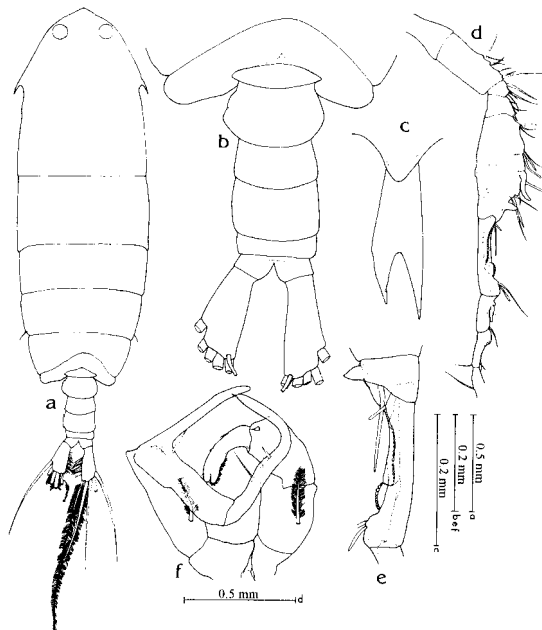


Fig. 7. *Pontella forcicula*, male. a, whole animal, dorsal view; b, Ms5 and urosome, dorsal view; c, urosome, ventral view; d, rostrum, anterior view; e, right antennule; f, segment 18 of right antennule; g, 5th legs.

geographical record of this species available, so this species might be restricted in southern waters of Philippines, particularly in Jakarta Bay.

***Pontella labuanensis* Mulyadi, 1997**
(Figs. 8-10)

Pontella labuanensis Mulyadi, 1997: 667-673, figs. 8-10 (Type locality: off Labuan, west Java, Indonesia).

Material examined.- Ten females (2.90-3.10 mm), 10 males (2.50-2.60 mm) collected off Labuan, west Java by surface tow of 0.1 mm mesh plankton net at daytime on 18 June 1994.

Female.- Body robust, cephalon provided with distinct lateral hook on each side, articulations between cephalon and Ms1, and between Ms4 and Ms5 distinct; posterior corners of Ms5 produced into symmetrical, acuminate lobes reaching middle of urosome, lobe as

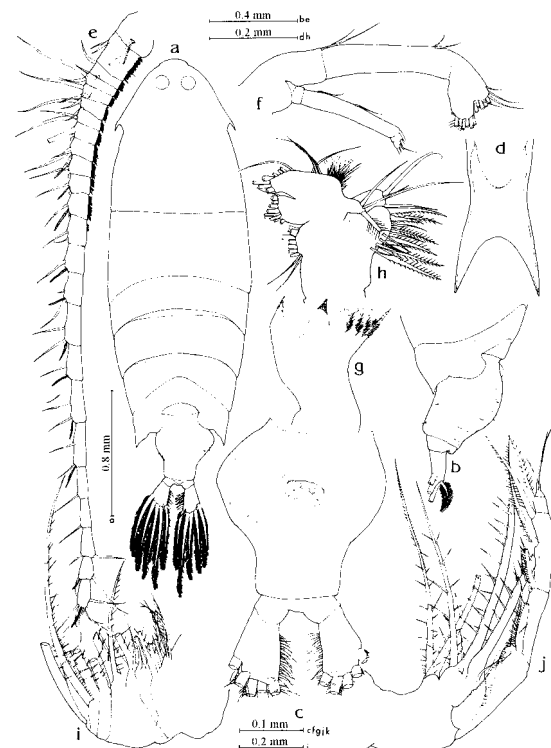


Fig. 8. *Pontella labuanensis*, female. a, whole animal, dorsal view; b, Ms5 and urosome, lateral view; c, urosome, ventral view; d, rostrum, anterior view; e, antennule; f, antenna; g, mandible dentition; h, maxillule; i, maxilla; j, maxilliped.

long as broad with globular base in dorsal view. Rostrum bifid, thickened basally and tapering distally, directed ventrally, without lenses. Dorsal eye lenses distinct and rounded. Urosome composed of 2 somites, Ur1 onion-shaped, asymmetrical, right margin more swollen than left, dorso-lateral surface bearing several small sensilla, Ur2 small and short. CR slightly asymmetrical, right side slightly longer than left, each bearing 5 plumose and 1 small setae, the latter arising from dorsal surface between 2 inner

plumose setae. A1 24-segmented, not extending beyond Ms3 when folded backwards. P1-P4 biramous, basipod 2-segmented, B1 with 1 plumose seta on inner margin; Re 3-segmented, Ri 3-segmented in P1 and 2-segmented in P2-P4. P5 slightly asymmetrical, B2 with long, plumose seta reaching middle of Re, in one of the paratypes 2 unequal setae were found on right B2; Re unjointed, horn-shaped, twice as long as Ri, right leg bearing 4 minute spinules on lateral margin; Ri bifid at tip.



Fig. 9. *Pontella labuanensis*, female. a-e, 1st-5th legs; f, 5th legs, other specimen.

Male.- Rostrum bulbous with bifid, short conical projections. Dorsal eye lenses small and rostral eye lenses well developed. Ms5 produced posteriorly into asymmetrical short and pointed lobes reaching distal end of Ur1. Urosome composed of 5 somites, Ur1 widest, somewhat asymmetrical, left side more swollen than right; Ur3 longer than Ur4 and Ur5 combined. Right A1 geniculate, segment 14 with long spine; anterior margin from middle of segment 17 to distal fourth of segment 18 with toothed ridge provided with coarse denticles on proximal half and fine denticles in distal half; fused segments 19-21 provided with strong spur distally and two toothed plates, proximal plate with acuminate teeth and distal one with lamelliform teeth. Left A1 as in female.

P5 uniramous, asymmetrical, right Re1 (chela) more or less rectangular, with bilobed thumb at proximal end of outer margin, both lobes subequal, stout, proximal one slightly curved proximally, outer margin distal to

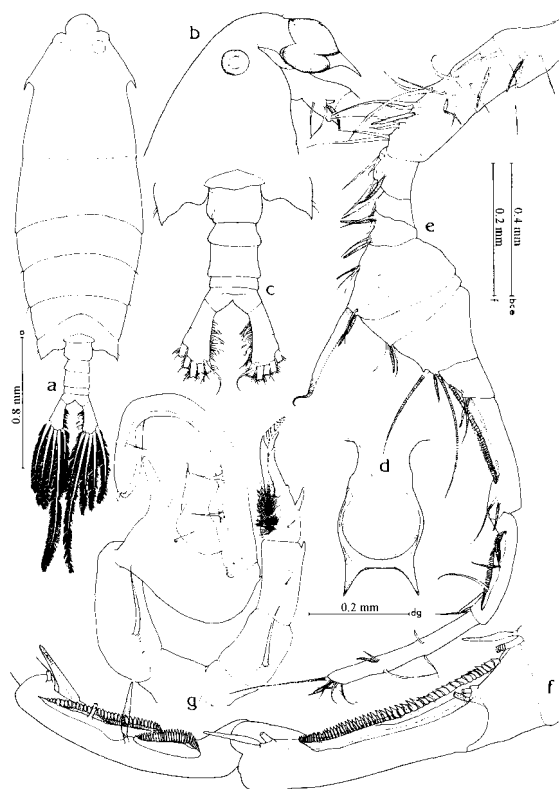


Fig. 10. *Pontella labuanensis*, male. a, whole animal, dorsal view; b, cephalon, lateral view; c, Ms5 and urosome, dorsal view; d, rostrum, anterior view; e, right antennule; f, geniculate region of right A1; g, 5th legs.

thumb concave, with 2 minute setae, one at base of thumb and another on anterior surface near base of Re2. Right Re2 (finger) elongated, turned outwards about 180° at distal third and ending in spatulate structure with small spine at apex, outer margin with 3 setae, 2 near base of finger and 1 near distal end. B1 of left P5 short; B2 with 1 plumose seta; Re1 with 1 small spine at distal end of outer margin and 1 small spine in center of posterior surface; Re2 bulb-shaped, outer margin armed with short, pointed spine medially, apex with 3 round-tipped spines which are becoming shorter outwards, innermost one ribbed in distal half, 1 small spine present on proximal posterior surface, inner margin hirsute.

Remarks.- Fleminger (1986) instituted three species groups in the Indo-West Pacific *Pontella*: the *P. alata*-group, the *P. fera*-group, and the *P. andersoni*-group, but he did not give any definition for these groups. Ohtsuka et al. (1987) subsequently described the *P. alata*-group at the time of the establishment of their new species, *P. rostraticauda*. *P. labuanensis* is more similar to the *P. alata*-group than the other two groups in having the female rostrum without lens, the female P5 with the exopod virtually naked, the male rostrum with double convex lenses, and the male left P5 with the terminal segment armed with a large aesthete-like seta, but it cannot be included in this group because of the genital opening without any operculum and the male right P5 with the proximal segment without a slender and elongated thumb.

P. labuanensis is distinguishable from other species of *Pontella*, not belonging to these three groups, by the following combination of characteristics. In the female (1) Ur1 does not bear any process, including a genital operculum, except for several small sensilla on the dorso-lateral surface, (2) the CR are slightly asymmetrical, the right ramus being slightly longer, and (3) the terminal segment of the P5 is virtually naked and that of the left P5 is slightly longer and more strongly curved than that of the right P5. In the male, (1) the rostrum has large, double convex lenses, (2) the right P5 has a proximally forked process on Re1 instead of a slender thumb.

***Pontella latifurca* Shen & Zhang, 1965**
(Fig. 11)

Pontella latifurca Chen & Zhang, 1965: 127, pl. 46, figs. 1-8 (Type locality: Gulf of Pohai, Yellow Sea, China); Zheng et al., 1989: 155; Kim, 1985: 127-129, pl. 43, figs. a-f.

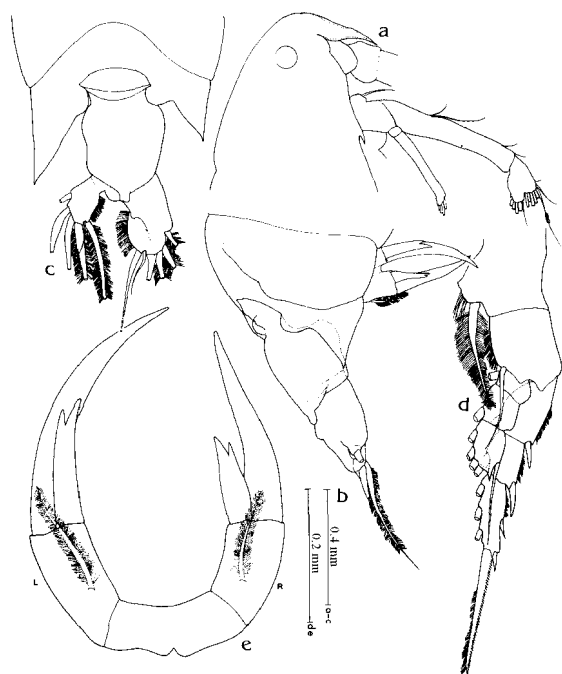


Fig. 11. *Pontella latifurca*, female. a, cephalon, lateral view; b, Ms5 and urosome, lateral view; c, Ms5 and urosome, dorsal view; d, 1st leg; e, 5th legs.

Material examined.- One female (2.90 mm) collected off Surabaya, east Java by surface tow of 0.1 mm mesh plankton net at daytime on 8 June 1994.

Female.- Body robust, cephalon obtusely triangular anteriorly with lateral hooks, separate from Ms1; Ms4 and Ms5 separate, posterolateral ends asymmetrical, acutely pointed posteriorly, left lobe longer than right; in lateral view, right lobe reaching middle of Ur1. Rostrum bifid, thickened basally, without lenses.

Urosome composed of 2 somites, Ur1 globular, dorsal surface rather swollen with ventral small process; anal somite short; CR asymmetrical, right ramus much larger and longer than left, with swollen setae. A1 24-segmented, extending distal end of Ms3 when folded backwards; segment 11 with a small process on anterior margin. A2, Ri much larger and longer than Re. P5 asymmetrical, with 1-segmented rami (unjointed Ri and Re), Re claw-like, twice length than Ri.

No male was found in the present study.

Remarks.- Chen & Zhang's (1965) described *P. latifurca* based on 4 females and 3 males specimens from the Gulf of Pohai, Yellow Sea in summer and autumn. The present female agrees with their female

in the following, (1) A1 with 24 segments, (2) P5 asymmetrical, without spinules or prominences on inner and outer margins, (3) Ur1 without any processes. The differences between Chen & Zhang's descriptions and the present female is the asymmetrical Ur1, right margin more swollen than left and armed with 1 process posteriorly.

Distribution.- Chen & Zhang (1965) originally described this species from the Gulf of Pohai, China Seas. Later this species also recorded in Korean coast (Kim, 1985), and off Surabaya, east Java, Indonesia (present records).

Pontella princeps Dana, 1846

(Fig. 12)

Pontella princeps Dana, 1846: 34 (Type locality: Tongatabu Island, Pacific); Giesbrecht, 1892: 461, pls. 24, 40; Giesbrecht & Schmeil, 1898: 142; Thompson & Scott, 1903: 252; A. Scott, 1909: 160; Sewell, 1912: 371; 1932: 282, fig. 127a-d; Wilson, 1950: 293; Tanaka, 1964: 261, fig. 235a-d; Zheng et al., 1989: 255; Silas & Pillai, 1973: 827, fig. 23a-h; Matsuo & Marumo, 1982: 93, table 1; Madhupratap & Haridas, 1986: 109.

Pontellina (Ivellina) princeps, Claus, 1893: 283.

Material examined.- Two males (4.20-4.25 mm) collected from Jakarta Bay by surface tow of 0.1 mm mesh plankton net at daytime on 2 June 1994.

Male.- Cephalon and Ms1 not really fused as also Ms4 and Ms5, posterolateral ends sharply pointed. Cephalic hooks prominent, dorsal eye lenses more conspicuous and rostral lens well developed. Rostrum bifid, with a slight indication of lens, terminating in 1 pair of stout spines. Urosome composed of 5 somites, Ur1 slightly asymmetrical, longest, with 1 lobe on left proximal margin; Ur2 with 1 seta on each lateral side, dorsal surface bearing several small sensilla; Ur4 shorter than anal somite. CR almost symmetrical, longer than wide, with 5 normal plumose small setae.

Right A1 geniculate, segment 14 with 1 elongated spine and 1 curved flagellum at base; anterior margin of segment 15 with short and stout spine; segments 17 and 18 each with 1 large toothed plates; fused segments 19-21 with 2 smaller toothed plates, proximal teeth coarse and denticulated, distal one villiform, with 1 falcate spine distally; segments 22-25 completely fused. P5, right leg, inner margin of Re1 (chela) with 1 bluntly rounded process and 1 seta at

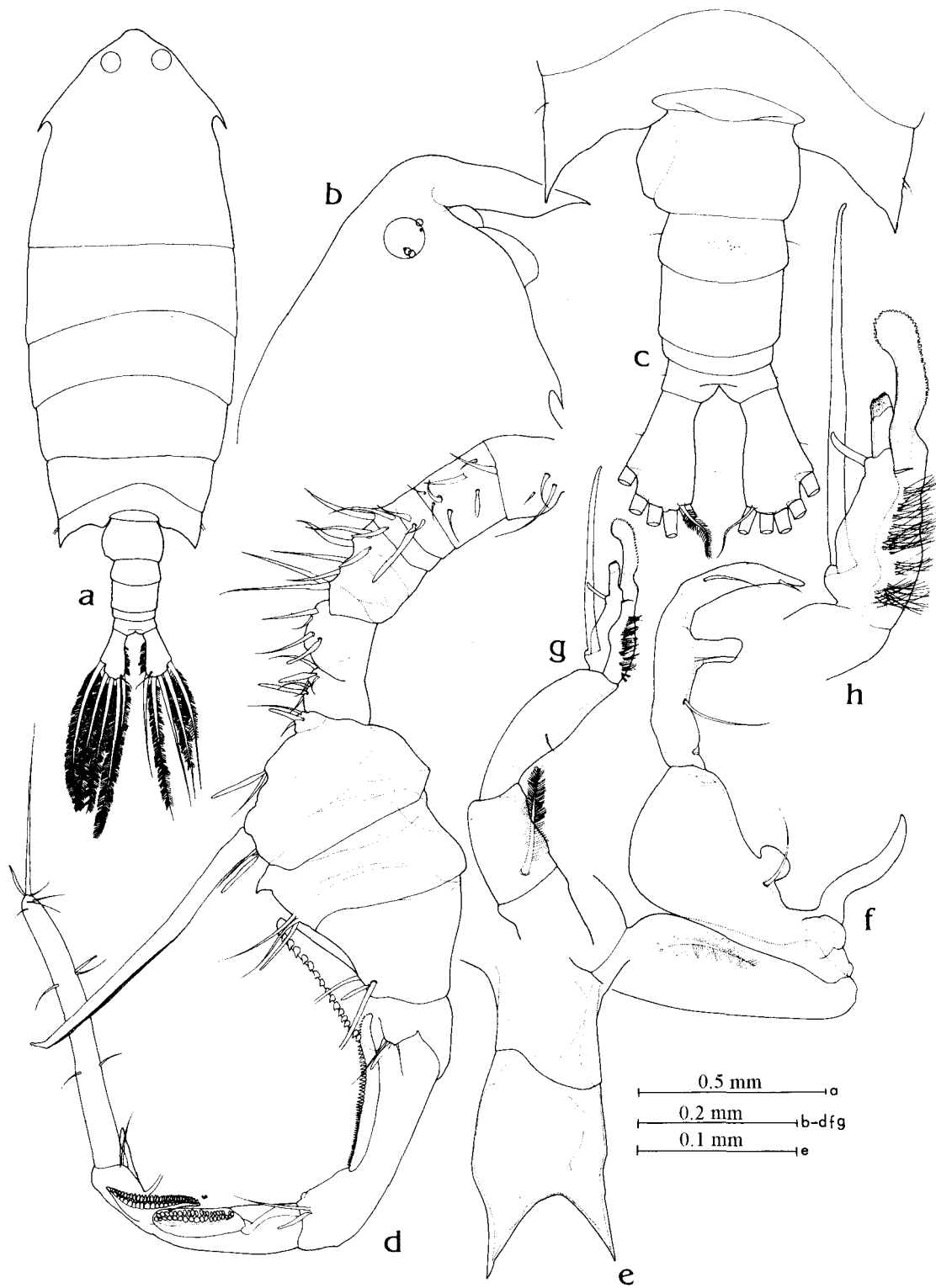


Fig. 12. *Pontella princeps*, male. a, whole animal, dorsal view; b, cephalon, lateral view; c, Ms5 and urosome, dorsal view; d, right antennule; e, rostrum, anterior view; f, right 5th leg; g, left 5th leg; h, distal segment of left 5th leg.

base; thumb long, curved inwards, pointed at tip with 1 rounded process near base; inner margin of Re2 with 1 large toothed-like process medially, 3 setae along inner margin and 1 seta on anterior surface distally. Left leg, ending in 2 unequal processes distally, each expanded along tips, longer one of these process is spatulate and with crenulated margin, shorter process truncate distally and armed with short setae towards its apex and a pair of spines at base; and 1 very long outer spine-like process (longer than its own segment), inner margin hirsute.

No female was found in the present study.

Remarks.- The male is identifiable by the very long outer spine-like process on distal segment of left P5, and the elongated spine on segment 14 of the right A1.

Distribution.- Indo-Pacific species. Widely recorded from Indian Ocean, Ceylon Pearl Banks and Gulf of Mannar (Thompson & Scott, 1903), Bay of Bengal (Sewell, 1912), Andaman Sea (Sewell, 1932), Trivandrum coast (Saraswathy, 1966), west coast of Australia, and Arabian Sea (Veronina, 1962), eastern Indonesian waters (A. Scott, 1909), and Jakarta Bay, west Java (present records). From the Pacific Ocean, Japanese waters (Tanaka, 1964; Matsuo & Marumo, 1982), west Pacific (Wilson, 1950), and China Seas (Zheng et al., 1989).

***Pontella spinipes* (Giesbrecht, 1889)**

(Fig. 13)

Pontella spinipes Giesbrecht, 1889: 28 (Type locality: Arabian Sea at 60°E and 140°N); Giesbrecht, 1892: 461-463, pl. 24, fig. 30, pl. 40, figs. 2, 23, 24; Wolfenden, 1906: 1020-1021; Silas & Pillai, 1973: 826, figs. 21, 22; Pillai, 1975: 133, fig. 2a-b; Madhupratap & Haridas, 1986: 109.

Pontella spinipes (part) Wolfenden, 1906: 1020-1021 (female).

Material examined.- One male (3.10 mm) collected off Surabaya, east Java by surface tow of 0.1 mm mesh plankton net at daytime on 8 June 1994.

Male.- Body robust, dorsal and ventral lenses and rostral lenses well developed, posterolateral ends of Ms5 produced into symmetrical lobes with inner flanges. Urosome composed of 5 somites, CR symmetrical and rather elongated. Right A1 geniculate, segment 18 with larger toothed plates, extending beyond segment 17 and reaching middle of

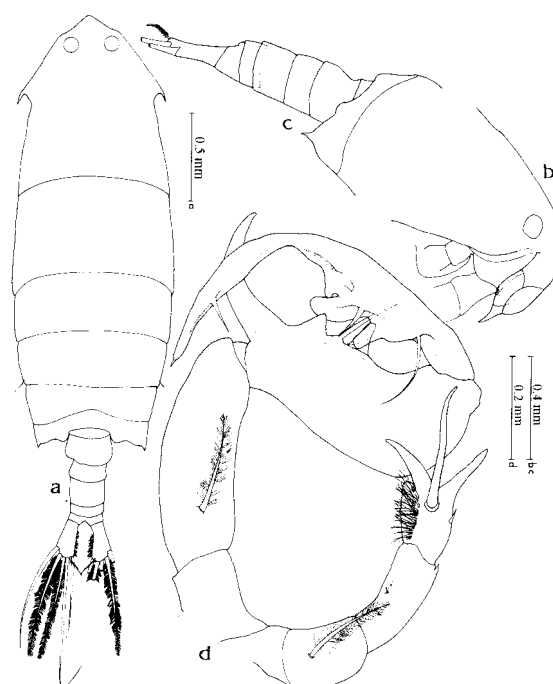


Fig. 13. *Pontella spinipes*, male. a, whole animal, dorsal view; b, cephalon, lateral view; c, Ms5 and urosome, lateral view; d, 5th legs.

segment 16; segment 14 with 1 stout long spine with 1 flagellum at its tip; fused segments 19-21 with 2 toothed plates, proximal one shorter than distal and both with villiform teeth, segment ending in falcate spur.

P5, right leg chelate, Re1 (chela) well developed, thumb stout and curved inwards, concave surface with 3 rounded processes and 1 median seta; Re2 (claw) elongated, curved and with 3 rounded processes on its inner margin; claw provided with 3 inner setae. Left leg, Re1 with distolateral spine; Re2 short, ending in 2 subequal spine-like processes and 1 long flagelliform process, and 1 outer spinule, inner margin hirsute.

No female was found in the present study.

Remarks.- Sewell (1912) remarked the differences between the male of *P. spinipes* and *P. securifer*, and the relation between the size and the length of toothed plates on the fused segments 19-21. He concluded that in the smaller specimens of *P. spinipes*, the distal plate of fused segments 19-21 will be longer than the proximal one. Wolfenden's (1906) description of the male *P. spinipes* was referred to variation of *P. securifer* by Sewell (1912).

Distribution.- Indo-Pacific. Indian Ocean records: Bay of Bengal (Sewell, 1912, 1932), Andaman Sea and west coast of India (Silas & Pillai, 1973), Indian coastal waters (Kasturirangan, 1963), Maldivé Archipelago (Wolfenden, 1906), Arabian Sea (Giesbrecht, 1889, 1892), Central Indian Ocean (Veronina, 1962), and off Surabaya, east Java, Indonesia (present records).

***Pontella surrecta* Wilson, 1950**

(Fig. 14)

Pontella surrecta Wilson, 1950: 299, pl. 29, figs. 426-427, and 429 (Type locality: northeastern Mindanao, Philippines); Ohtsuka et al., 1987: 568, fig. 6.

Material examined.- Two males (2.93 mm) collected from Jakarta Bay by surface tow of 0.1 mm mesh plankton net at daytime on 2 June 1994.

Male.- Body more compact than in female. Cephalosome and Ms1, Ms4 and Ms5 separate, posterolateral ends slightly asymmetrical. Rostrum, anterior and posterior sides with 2 well developed

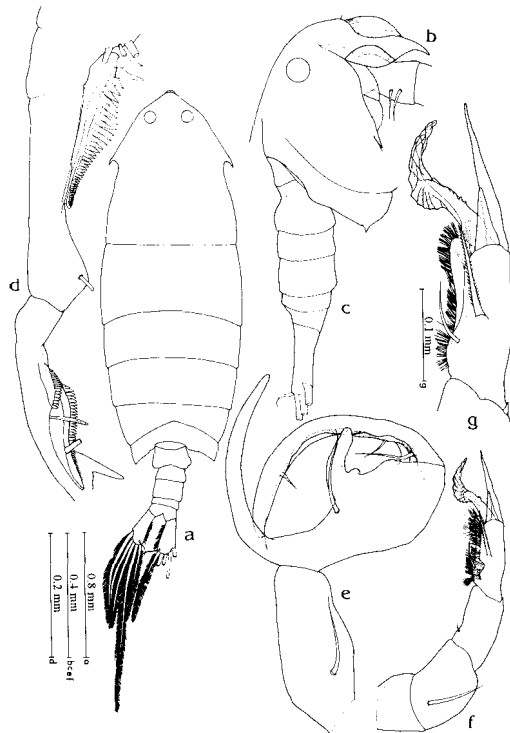


Fig. 14. *Pontella surrecta*, male. a, whole animal, dorsal view; b, cephalon, lateral view; c, Ms5 and urosome, lateral view; d, geniculate region of right antennule; e, right 5th leg; f, left 5th leg; g, distal segment of left 5th leg.

lenses. Urosome composed of 5 somites, Ur1 slightly asymmetrical, left side weakly produced; CR symmetrical, rather elongated.

Right A1 geniculate, 25-segmented, segments 1 to 12 proximal to expanded 4 (13 to 16) segments incompletely fused, last 4 segments fused. Left A1 25-segmented, segments 11 and 12 partially fused. P5 asymmetrical, Ri absent, chela formed by penultimate and terminal segments in right leg, thumb of chela ending in slender process curving inwards, large digitiform process arising perpendicular to concave surface with naked seta at base; finger of chela elongated almost as long as left leg, curved outwards at middle point, tip slightly expanded, lamelliform, 4 short setae present along concave surface. Left leg, penultimate segment carrying hirsute patch, minute seta, and spinulose seta laterally, and spine, aesthete-like seta, and spine-like process terminally.

No female was found in the present study.

Remarks.- The male of *P. surrecta* is identifiable by the large digitiform process on the concave surface of chela. Examination of Wilson's (1950) type series of *P. surrecta* revealed that the male that he attributed to *P. surrecta* is misidentified, it is in all details a male of *P. elephas* Brady, 1883 (p. 300, figs. 428, 430). An oceanic cognate of *P. surrecta* has been recently described as *P. rostraticauda* by Ohtsuka et al. (1987). Small numbers of both sexes of *P. surrecta* have been reexamined by Ohtsuka et al. (1987) based on specimens collected from surface towing off eastern and northern New Guinea and northeastern Mindanao, Philippines. This species are also recorded from the Great barrier Reef waters between 17° and 19°S, and off northern Palawan.

***Pontella tridactyla* Shen & Lee, 1963**

(Fig. 15)

Pontella tridactyla Shen & Lee, 1963: 581, figs. 26-29 (Type locality: Chiekong estuary, South China Sea), Zheng et al., 1989: 255.

Material examined.- Nine males (2.46-2.50 mm) collected off Labuan, west Java, by surface tow of 0.1 mm mesh plankton net at night on 8 June 1994.

Male.- Cephalon rounded anteriorly, separate from Ms1; Ms4 and Ms5 separate, posterolateral ends produced into symmetrical lobes. Urosome composed of 5 somites, Ur1 with 1 process on left side, as long as

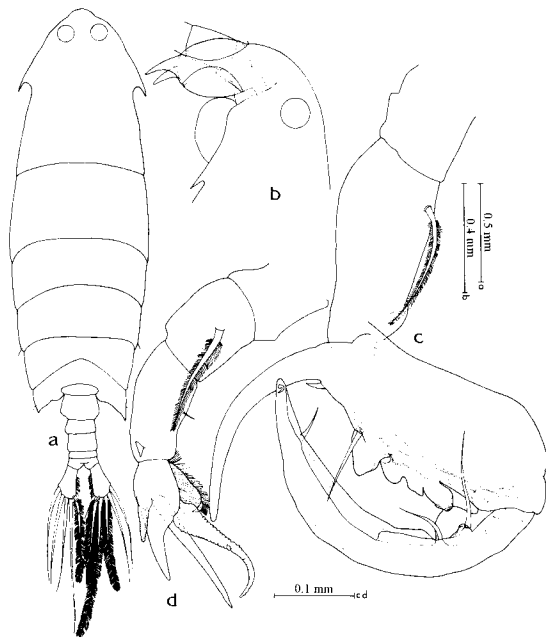


Fig. 15. *Pontella tridactyla*, male. a, whole animal, dorsal view; b, cephalon, lateral view; c, right 5th leg; d, left leg.

Ur3; Ur4 shortest; CR almost symmetrical with 5 plumose and 1 small setae. P5, right leg, B2 with 1 long plumose seta, Re1 with claw-like hook and 1 short spine on proximal corner externally, inner margin with 4 unequal lamella and 1 long seta on third length; Re2 claw-like, distal half elongated, inner margin produced into a rounded process near base and 3 setae along inner margin. Left leg, 4-segmented, B2 with 1 plumose seta; Ri1 with distolateral spine and 1 small seta on a half its length; Re2 short, ending in 3 unequal spine-like processes and 1 flagelliform process, inner margin hirsute.

Remarks.- Shen & Lee (1963) have been established *P. tridactyla* based on 13 females and 10 males collected from the South China Sea. They described and figured the species too briefly, and their female appears to be a copepodid stage of the male by the structure of a 3-segmented urosome and not a yet developed P5. The present male specimens differs from Shen & Lee's (1963) figures by (1) the presence of 1 short spine on proximal corner of chela near the thumb, (2) the 4 unequal lamella and 1 long seta on third length of chela of right P5, and (3) the presence 3 unequal spine-like processes and 1 flagelliform process on Re2 of left P5.

Distribution.- So far *P. tridactyla* only known from the type locality, Chiekong estuary, South China Sea, and extends to Java Sea (present records).

***Pontella valida* Dana, 1853**

(Fig. 16)

Pontella valida Dana, 1853: 1171, pl. 28, fig. 6a-g (Type locality: north of New Zealand); Wilson, 1950: 301, pl. 29, figs. 432-434.

Pontella elephas, Brady, 1883: 94-95, pl. 37, figs. 7-14.

Pontellina (Ivellopsis) elephas Claus, 1893: 274.

Ivellopsis elephas Giesbrecht & Schmeil, 1898: 139; Silas & Pillai, 1973: 852.

Pontella surrecta (male) Wilson, 1950: 300, figs. 428, 430.

Material examined.- Eleven females (2.97-3.00 mm) collected from Jakarta Bay by surface tow of 0.1 mm mesh plankton net at daytime on 2 June 1994.

Female.- Cephalon triangular and rather sharply pointed in front but without median crest; Ms4 and Ms5 separate, posterolateral ends rounded. Rostrum bifurcated, stout and pointed, directed downward, rostral lenses absent. Dorsal eye lenses large and set in contact with each other and more or less concealed by their opaque covering. Urosome composed of 2 somites, Ur1 rectangular, longer than anal somite and

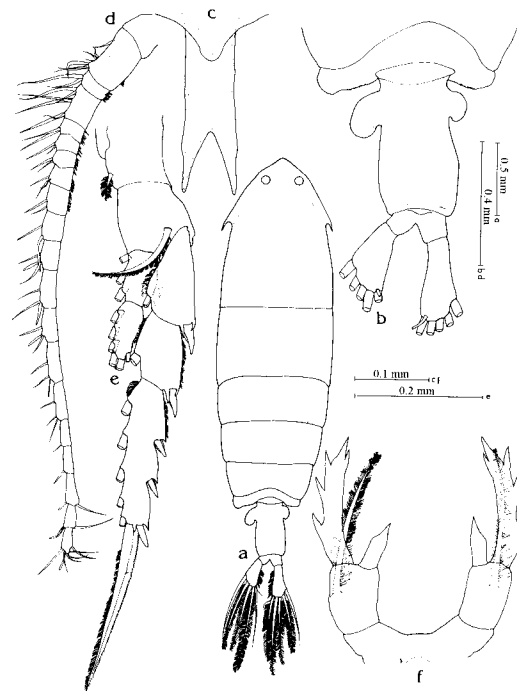


Fig. 16. *Pontella valida*, female. a, whole animal, dorsal view; b, Ms5 and urosome, dorsal view; c, rostrum, anterior view; d, antennule; e, 4th leg; f, 5th legs.

CR combined, with 1 rounded process on each side near base, left process slightly larger than right, each joined to somite by a narrow neck. CR asymmetrical, right ramus longer, enlarged distally, more than twice as long as wide, inner margins hirsute. P5 asymmetrical, with 2 basal, 1 exopodal, and 1 endopodal segments; B2 with 1 plumose seta on posterior surface; Re with 3 outer and 2 unequal apical spines; Ri acuminated.

No male was found in the present study.

Remarks.- Dana (1853) has described *P. valida* based on male specimens collected from the north of New Zealand. Subsequently recorded from off Sibago Island, Philippines (Brady, 1883; Wilson, 1950).

***Pontella* sp. 1**
(Fig. 17)

Material examined.- Three females (3.40-3.45 mm) collected from Jakarta Bay by surface tow of 0.1 mm mesh plankton net at daytime on 2 June 1994.

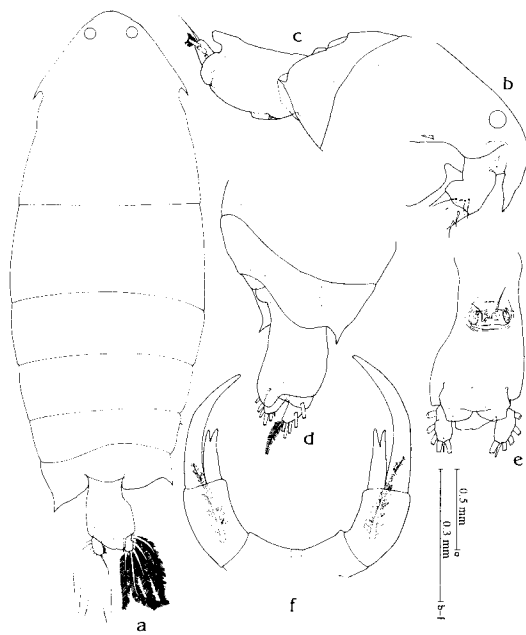


Fig. 17. *Pontella* sp. 1. female. a, whole animal, dorsal view; b, cephalon, lateral view; c, Ms5 and urosome, lateral view; d, Ms5 and urosome, lateral view; e, urosome, ventral view; f, 5th legs.

Female.- Body robust, cephalon and Ms1 separate, Ms4 and Ms5 separate, posterolateral ends produced into asymmetrical acuminate lobes, left side reaching middle of Ur1, right side produced outwards. Rostrum bifid, basally thickened and tapers to tip, rostral lenses absent, dorsal eye lenses rounded and small. Urosome composed of 2 somites, Ur1 longer, distal end extending almost Ur2 length, genital opening armed with 2 setae; CR small, asymmetrical with relatively short caudal setae. A1 24-segmented, reaching distal end of CR when folded backwards. P5, Re naked, spine-like, twice as long as Ri; Ri bifid at apex.

Remarks.- The present female specimens resemble *P. surrecta* Wilson, 1950, but is distinguished from the latter by the almost symmetrical P5, the naked Re of P5, and the absence of a large spiniform process on genital opening. As no male could be procured from the collection where this species occurred, the material is not considered here under binomial system of nomenclature.

***Pontella* sp. 2**
(Fig. 18)

Material examined.- Ten immature females (2.50-2.55 mm) collected from Jakarta Bay by surface tow of 0.1 mm mesh plankton net at daytime on 2 June 1994.

Immature female.- Cephalon and Ms1 separate, Ms4 and Ms5 separate, posterolateral ends symmetrical and reaching middle of Ur1. Rostrum with strong rami, rostral lenses absent. Urosome composed of 3 somites, CR somewhat symmetrical with 5 plumose and 1 small setae. A1 22-segmented, distal end of segment 11 with spiniform process. P4 with 2 basal, 2 endopodal and 3 exopodal segments; B1 with inner plumose seta; B2 with 1 plumose seta on posterior surface. P5 somewhat symmetrical, with 2 basal and 1 exopodal segments; B2 with 1 plumose seta on posterior surface; Re with 3 outer and 2 apical spines.

Remarks.- These immature females most resemble *P. tridactyla* Shen & Lee, 1963 in having an almost symmetrical P5, in the urosomal somites, and in the absence of rostral lenses, but are distinguishable from the latter species by the presence of 3 outer spines on the Re of P5. It is very difficult to describe the copepodid stages of *Pontella*. I will describe the present species if I get the complete specimens and covering all stages of development in the future studies.

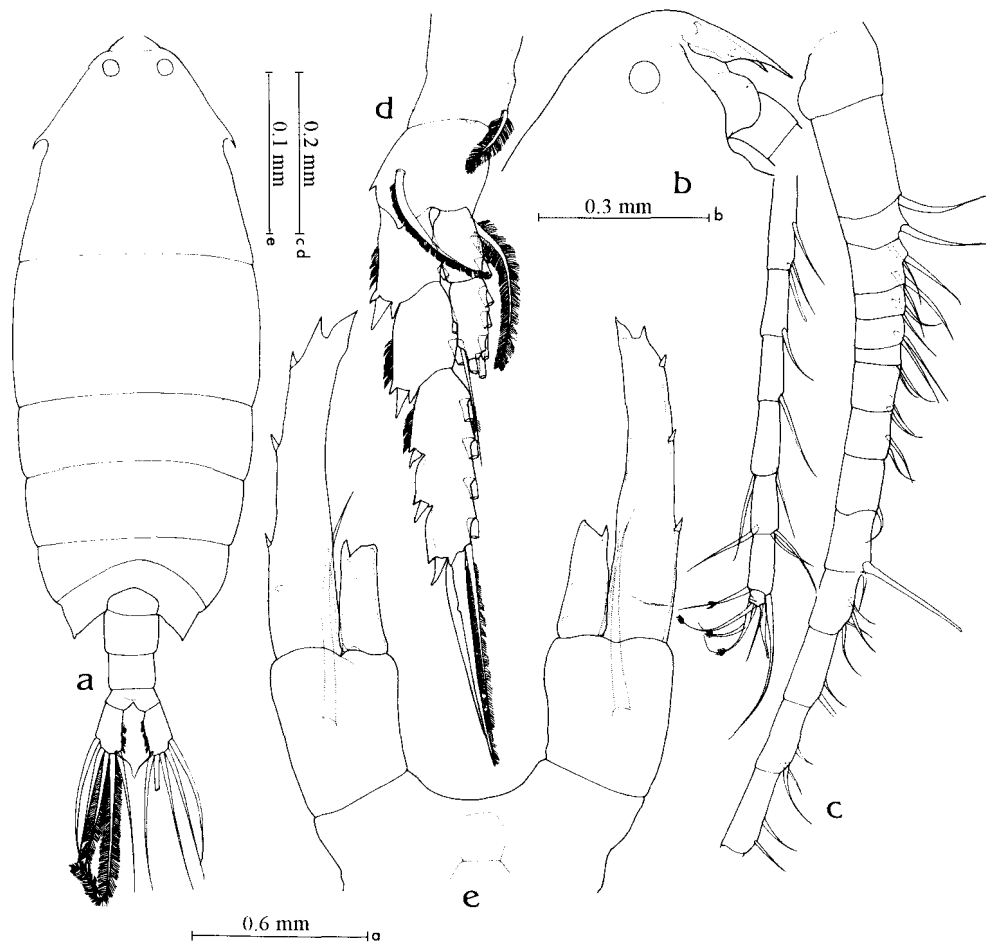


Fig. 18. *Pontella* sp. 2. immature female. a, whole animal, dorsal view; b, cephalon, lateral view; c, antennule; d, 4th leg; e, 5th legs.

DISCUSSION

Fourteen species of *Pontella* were recorded in the present study. Four previously known species, *P. denticauda*, *P. fera*, *P. spinipes*, and *P. surrecta* have been recorded. Six species were new records for the area. One species, *P. labuanensis* has been described as new, and two species have not yet been described until I get the complete specimens and covering all stages of development for these species. All the species of *Pontella* are recorded in the surface waters of Java Sea, except *P. denticauda* and *P. surrecta*, which occurred commonly in Indonesian waters (Table 1).

All the species recorded are belonging to Indo-Pacific neritic forms. Among them *P. denticauda*, *P. spinipes*, and *P. fera* widely recorded in Indian and Pacific Oceans. So far *P. andersoni* and *P. surrecta* only recorded from the Indian Ocean and Pacific Ocean, respectively. Six species, *P. denticauda*, *P. diagonalis*,

P. fera, *P. princeps*, *P. spinipes*, and *P. valida* occurred in both Oceans. Among the remaining species, *P. latifurca* and *P. tridactyla*, have been thought to be endemic species for the China Seas before this study; *P. labuanensis* considered to be endemic to the southern Java, Indian Sea side, and two are undescribed species. Records of *P. princeps* and *P. fera* from the Atlantic were based on wrong identifications.

The species of *Pontella* recorded in this study comprise a somewhat heterogeneous assemblage. So far, no complete review of the group based on the study of the species from all over the world has been made, and very little attempt has ever been made to separate groups of related species. It will be shown, that there are several different groups of species, each with a number of important features in common, which tend to constitute morphologically distinct groups. In the genus *Pontella*, species and species-groups can be

Table 1. Species of the genus *Pontella* recorded in the present study, with sampling sites and previous records in Indonesian waters, neighbouring areas, and the major oceans. ○ = present records, ● = previous records, n = new species, nr = new records, A = Indonesian waters, B = Malaysian waters, C = China Sea, D = Australian waters, E = Japanese waters, F = Philippine waters, I = Indian Ocean, P = Pacific Ocean, At = Atlantic Ocean.

SPECIES	SITES															Neighbouring areas						Oceans					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	A	B	C	D	E	F	I	P	At			
<i>Pontella andersoni</i>		○														nr											●
<i>P. denticauda</i>			○				○							○	○	●				●	●	●	●				
<i>P. diagonalis</i>			○													nr					●	●					
<i>P. fera</i>			○													●			●				●	●			
<i>P. labuanensis</i>	○	○														●											
<i>P. latifurca</i>		○	○	○	○											nr		●									
<i>P. princeps</i>			○		○											nr		●					●				
<i>P. spinipes</i>		○			○											●			●	●	●	●	●	●			
<i>P. surrecta</i>			○		○									○		●						●	●				
<i>P. tridactyla</i>		○	○	○	○											nr		●									
<i>P. valida</i>			○													nr						●	●				
<i>Pontella</i> sp. 1				○												n											
<i>Pontella</i> sp. 2				○												n											

distinguished by the structure of the last metasomal somite, the first urosomal somite, the caudal rami, the rostrum, and the fifth legs of both sexes (Ohtsuka et al., 1987; Mulyadi, 1997).

Fleminger (1986) recognized three species-groups among the Indo-West Pacific *Pontella*: i.e., the *P. alata*-group, the *P. andersoni*-group, and the *P. fera*-group, but they did not give any definitions for these groups. By analyzing the characteristics of all these groups I still recognized three other groups. These are the *P. danae*-group, the *P. labuanensis*-group, and a yet to be assigned-group, respectively. Therefore, all the species of *Pontella* recorded in this study were assigned to six *Pontella* species-groups (i.e., *alata*, *andersoni*, *fera*, *danae*, *labuanensis*, and unassigned). The characteristic features of the Indo-West Pacific *Pontella*-groups and their members have been explained in detail by Ohtsuka et al. (1987), and Mulyadi (1997).

Distributional characteristic of each group and the species obtained in this study representing these groups are as follows:

P. alata-group Fleminger, 1986 (predominantly neritic, Indo-West Pacific): *P. surrecta* Wilson, 1950; and *P. tridactyla* Shen & Lee, 1963.

P. andersoni-group Fleminger, 1986 (predominantly neritic, Indian Ocean): *P. andersoni* Sewell, 1912.

P. fera-group Fleminger, 1986 (predominantly neritic, Indo-West Pacific): *P. denticauda* A. Scott, 1909; *P. fera* Dana, 1849; and *P. valida* Dana, 1853.

P. danae-group Mulyadi, 1997 (predominantly neritic, Indo-West Pacific): *P. latifurca* Chen & Zhang, 1965.

P. labuanensis-group Mulyadi, 1997 (neritic, Indian Sea side of southern Java): *P. labuanensis* Mulyadi, 1997.

Unassigned-group Mulyadi, 1997 (predominantly neritic, Indo-West Pacific): *P. diagonalis* Wilson, 1950; *P. forcicula* A. Scott, 1909; and provisionally designed as *Pontella* sp. 1 and *Pontella* sp. 2.

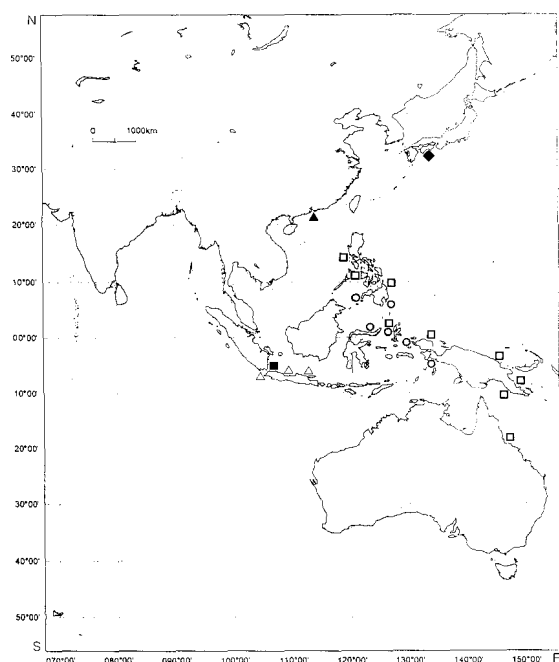


Fig 19. New and published records of the *Pontella alata*-group. ◆ = *P. rostricauda* Ohtsuka, Fleminger & Onbe (previous records), ○ = *P. alata* A. Scott (previous records), ◻ = *P. surrecta* Wilson (previous records), ◼ = *P. surrecta* Wilson (new records), ▲ = *P. tridactyla* Shen & Lee (previous records), △ = *P. tridactyla* Shen & Lee (new records).

Distribution of published and new records of the *P. alata*-group are restricted to inshore regions of sea areas between 33°N and 20°S and 106°E (Fig. 19). *P. surrecta* is widely distributed from eastern Australian waters to Philippine waters; *P. alata* in the vicinity of Wallacea; *P. tridactyla* from the South China Sea to the Java Sea; and *P. rostricauda* seems to be endemic to southern Japanese waters.

P. andersoni so far was known from the northern Indian Ocean (Sewell, 1912, 1934; Silas & Pillai, 1973; Pillai, 1975); *P. latifurca* from the Gulf of Pohai, and the Yellow Sea (Chen & Zhang, 1965), the Korean coastal waters (Kim, 1985) extending to the eastern Java Sea, Indonesia (present records); while *P. labuanensis* was collected from the surface waters off Labuan, west Java and Cilacap Bay, southern Java. It may be an endemic species which has a preference for low salinity (Mulyadi, 1997). *P. diagonalis* and *P. forcicula* are restricted to Philippine waters, the northeastern Indian Sea, and the Java Sea (present records). The remaining species, *P. denticauda*, *P. fera*, and *P. valida* (*P. fera*-group) have been recorded from the Indian Ocean and west Pacific, including Japanese waters (Matsuo & Marumo, 1986).

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