

ON THE SPECIES OF *PONTELLA* DANA AND *PONTELLOPSIS* BRADY
OF THE INTERNATIONAL INDIAN OCEAN EXPEDITION
COLLECTIONS (1960 - 1965)

P. PARAMESWARAN PILLAI

Central Marine Fisheries Research Institute, Cochin 682 018, India

ABSTRACT

The copepod material belonging to the genera *Pontella* Dana and *Pontellopsis* Brady (Calanoida: Pontellidae) sorted out from the International Indian Ocean Expedition Collections were studied. The collections were made from 87 stations scattered all over the area and include the Arabian Sea, Bay of Bengal, Central, South-east, and South-west parts of the Indian Ocean. In all eleven species were identified. In view of the paucity of the material for evaluating their distribution in different geographical areas in the Indian Ocean the report deals mainly with the taxonomy of different species with discussion on their distribution.

INTRODUCTION

SPECIES of the calanoid copepod family Pontellidae are the most characteristic inhabitants of the surface waters of the neritic and oceanic regions. Systematics of certain pontellid copepods in the Indian Seas had been studied by Sewell (1912, 1932) from the Bay of Bengal. Voronina (1962) in her studies on the surface zooplankton collected during the 31st cruise of R. V. *VITIAZ* in the Indian Ocean identified twenty-three species belonging to the family Pontellidae and presented the geographical distribution of fifteen species. Silas and Pillai (1973) presented relevant information on description and illustrations of some species of pontellid copepods from the Indian Ocean. In the above paper a catalogue of all nominal species (both valid and synonyms) hitherto described from the world oceans has been included and the significance of pontellids as indicators of water masses has briefly been discussed. In addition, several faunistic accounts and taxonomic reviews on the zooplankton of the Indian Ocean and contiguous seas contain records of various species of Pontellidae from different sectors of this area (Giesbrecht, 1896; Cleve, 1901, 1904; A. Scott, 1902; Thompson and Scott, 1903; Wolfenden, 1906; A. Scott, 1909; Pesta, 1912; Brady, 1915; Menon, 1931, 1945; Sewell, 1947; Krishnaswamy, 1953; Tsuruta, 1963; Saraswathy, 1966; Silas and Pillai, 1967; Fleminger, 1974).

The present report is based on the results of the examination of the subsorted material of *Pontella* and *Pontellopsis* collected during the International Indian Ocean Expedition (1960-1965). The specimens of *Pontella* examined were obtained from 54 stations and those of *Pontellopsis* from 32 stations as indicated in the distribution maps. The data of collections details are described in the "Hand Book to the International Zooplankton Collections" (volume 1, 1969). Due to the paucity of the material available for quantitative distribution studies, the present report is limited to contain the taxonomy of the different species of Pontellidae with discussion on their spatial distribution in the Indian Ocean.

Dr. E. G. Silas, Director, Central Marine Fisheries Research Institute, has been responsible for initiating the study of pontellid copepods in the Institute. The

author is greatly indebted to him for the guidance and valuable suggestions offered during the course of the study and for the permission to carry out this work in the Institute Laboratory.

STATUS OF THE MATERIAL AND SPECIES COMPOSITION

Examination of the material of *Pontella* and *Pontellopsis* subsorted at the Indian Ocean Biological Centre and sent to the author for detailed studies shows the following results regarding the status of the material:

	<i>Pontella</i> (08.28)	<i>Pontellopsis</i> (08.29)
Specimens intact	69%	72%
Specimens brittle and mutilated	21%	16%
Dissolution of soft tissues	10%	12%

Except for one specimen of *Pontellina plumata* (Dana) (Copepodite V, female, 0.984 mm) found in the vial bearing the label "Group 08.28 from Anton Bruun station 303" no 'contamination' was observed in the subsorted material.

All the species of *Pontella* and *Pontellopsis* are represented by only very few specimens. Six species of *Pontella* were identified from the sorted material of which one adult female specimen collected from "Anton Bruun station 307, (35°42'S., 55°15'E.) has been found to be undescribed so far. Hence it is described, illustrated and assigned under '*Pontella* sp. nov.'. As the male of this species has not been collected it is not considered in this report under the binomial nomenclature. *Pontellopsis* material belonged to five species.

Table 1. *List of Species*

Order	: Calanoidea
Sub-order	: Heterarthrodria
Family	: Pontellidae

Genus *Pontella* Dana

Pontella fera Dana, 1849
P. diagonalis Wilson, 1950
P. securifer Brady, 1883
P. spinipes Giesbrecht, 1889
P. denticauda A. Scott, 1909
Pontella sp. nov.?

Genus *Pontellopsis* Brady

Pontellopsis armata (Giesbrecht) 1889
P. villosa Brady, 1883
P. krameri (Giesbrecht) 1896
P. macronyx A. Scott, 1909
P. regalis (Dana) 1849

Pontella fera Dana, 1849 (Figs. 1 a - c; 4)

Pontella fera Dana, 1849, p. 34; 1852, p. 1169, pl. 82, figs. 5 a-i.

Pontellina (*Eupontellina*) *fera* Claus. 1893, p. 2.

Material

AB-27 (CV); AB-28 (CIV); AB-32 (CIV); AB-57 (1F); AB-110 (1F, 1M, CIII); AB-298 (CV); AB-323 (1F); AB-324 (1F); AB-333 (1F, 1M, CV, CIV, CIII); ArLu-6 (CV); ArLu-10 (4F, 2M, CV); ArLu-15 (1F); ArLu-34 (1F); ArLu-53 (CIV); ArLu-55 (CV); ArLu-71 (1F); ArLu-85 (1F); Dm-60/65 (2M); Dm-3/129 (3F, 2M, CV, CIV); Di-5412 (CV); Di-5437 (1F, 1M, CV); Os-1/45 (1M, 1F, CV, CIV); Os-7/7 (1M); Os-11/13 (1F); Vi-35 (1F, 1M, CII, CIII).

Size

	No.	Range (mm)	Mean (mm)
Adult Female :	19	2.67 — 3.10	2.89
Adult Male :	12	2.40 — 2.66	2.62
CV-Female :	6	2.24 — 2.38	2.28
CV-Male :	5	1.82 — 2.36	2.15
CIV-Female :	3	1.98 — 2.10	2.03
CIV-Male :	1	1.94	
CIII :	5	1.48 — 1.88	1.73
CII :	12	1.12 — 1.37	1.24

Remarks

Apparently no variation in the morphological features has been observed in the present material. *P. fera* is a warm water species and is known to have a wide distribution in the surface waters of the Indian and Pacific Oceans.

From Indian Ocean this species has previously been recorded from Malay Archipelago, Bay of Bengal, Arabian Sea, Red Sea, northern Indian Ocean and South-west Indian Ocean.

***Pontella diagonalis* Wilson, 1950 (Figs. 1 d + i; 5)**

Pontella diagonalis Wilson, 1950, pp. 291-293, pl. 28, figs. 410-413.

P. spinipes (part), Wolfenden, 1906, p. 1020.

Material

AB-34 (1M); AB-50 (1M); AB-51 (1F); AB-74 (1M); AB-79 (1M); AB-114 (1F); Me-135 (1F).

Size

	No.	Range (mm)	Mean (mm)
Adult Female :	3	4.24 — 4.94	4.50
Adult Male :	4	3.42 — 3.84	3.71

Remarks

The present material agrees with the description of the species by Wilson (1950) but slight differences were noted in the female P5 in that four instead of three outer marginal spines were noted on the Re. Re of both P5 extend beyond CR.

Silas and 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.

Previous records of this species from Indian Ocean are from the Bay of Bengal, Central, North-east and South-west Indian Ocean.



Fig. 1. a - c. *Pontella fera*: a. Female, urosome, dorsal view; b. Female, P5; c. Male, P5; d - i. *Pontella diagonalis*: d. Female, urosome, dorsal view; e. Female, cephalon, lateral view; f. Male, cephalon, lateral view; g. Female, P5; h. Male, A1; i. Male, P5; j - l. *Pontella securifer*: j. Male, cephalon, lateral view; k. Male, A1; l. and Male, P5.

Pontella securifer* Brady 1883 (Figs. 1 j - 1; 5)Pontella securifer* Brady, 1883, p. 96, pl. 45, figs. 1-9.*Pontella brachyura* Kroyer, 1849, pp. 661, 609.*Pontellina (Ivellina) securifer* Claus, 1893, p. 274, pl. 5, fig. 6.*Pontella spinipes* (part) Wolfenden, 1906, p. 1020 (Male only).**Material**

AB-49 (1M); AB-56 (1M); AB-69 (1M); AB-196 (2M); AB-323 (1M, damaged); ArLu-20 (1M); Na-5 (CV,M).

Size

	No.	Range (mm)	Mean (mm)
Adult Male:	6	3.70-4.45	4.03
? CV, Male:	1	—	3.82

Remarks

Although this species has previously been reported from Indian Ocean, no description of it was made from this area until Silas and Pillai (1973) described it based on material collected from Indian seas. It prefers warm surface waters. According to Vervoort (1965) the distribution range of *P. securifer* in the Indian Ocean is "north of 35°S."

The description of *P. meadii* Wheeler by Chiba (1956) from two stations in the Indian Ocean clearly indicates that he was dealing with the male of *P. securifer*.

From Indian Ocean this species has previously been recorded from the Malay Archipelago, Bay of Bengal, Arabian Sea and Central and Northern Indian Ocean.

Pontella spinipes* Giesbrecht 1889 (Figs. 2 a, b; 6)Pontella spinipes* Giesbrecht, 1889, p. 28; 1892, pp. 461, 462, pls. 24, fig. 30; pl. 40, figs. 2, 23, 24.*P. spinipes* (part) Wolfenden, 1906, pp. 1020, 1021 (female).**Material**

AB-55 (1F); AB-56 (2F); AB-69 (2F); AB-72 (1F); AB-78 (1F); AB-96 (1F); AB-110 (1F); AB-117 (1F); AB-183 (1F); AB-189 (11 F).

Size

	No.	Range (mm)	Mean (mm)
Adult Female:	22	4.04-4.48	4.19

Remarks

Sewell (1912) described the male of this species from the Bay of Bengal and according to him Wolfenden's (1906) description of the male of this species "is in all probability merely a variation of the male of *P. securifer*."

Previous records of this species from the Indian Ocean are from the Bay of Bengal, Arabian Sea and Northern Indian Ocean.



Fig. 2. a, b. *Pontella spinipes*: a. Male, P5; b. Male, cephalon, lateral view; c, d. *Pontella denticauda*: c. Male A1, part enlarged; d. Male, P5; e—j. *Pontella* sp. nov?: e. Female, dorsal view; f. cephalon, lateral view; g. Female, urosome, lateral view; h. Female urosome, left lateral view; i. Female, urosome, right lateral view; and j. Female, P5.

***Pontella denticauda* A. Scott, 1909 (Figs. 2 c, d)**

Pontella denticauda A. Scott, 1909, pp. 161, 162, pl. 52, figs. 1-12.

Material

ArLu-1 (1M) 3.7 mm.

Remarks

A. Scott (1909) described this species from the Sulu Sea, Celebes Sea and Timor Sea in the Malay Archipelago and has given the size of the female as 2.9 mm. The present material collected from near its type locality measures 3.07 mm.

Pontella* sp. nov. ? (Figs. 2 e-h)Material*

AB-307 (1F) 7.283 mm.

Description

Female : Prosome - Urosome ratio—2.9:1; body robust; rostrum bifid, basally thickened and tapers to tip; rostral prongs directed laterad; dorsal eye lenses rounded and placed apart; ventral eye lens well developed; separation between T-I and cephalon and T-IV and T-V distinct; posterior corners of T-V developed into asymmetrical acuminate lobes, tips of which are projected laterad and reaching to the posterior two-third length of the genital segment; left lobe on dorsal view broader, with lobular base; urosome two-segmented, separation between U-I and U-II discernible dorsally; U-I (genital segment) longer than broad and produced as an obtuse lobe posteriad overlapping U-II; on the right lateral side genital segment is provided with a spinous process, directed posteriad; U-II as long as broad, with three spinous teeth along its posterior margin; ventrally this projection appears as a flat process overlapping the CR; CR symmetrical with relatively short setae. A1 of 23 segments, reaching the proximal margin of T-IV; P5: symmetrical; Re bifurcate distally, with a small spine between the terminal prongs; distal half of the outer margin with three spines placed equidistant; Ri asymmetrically bifid at tip.

Remarks

The female specimen described here differs markedly from all known species under the genus *Pontella* in the nature of the urosome and the characteristics of the p5. As no male could be procured from the collection where this species occurred, the material is not considered here under binomial system of nomenclature.

***Pontellopsis armata* (Giesbrecht), 1889 (Figs. 3a, b; 7)**

Monops armatus Giesbrecht, 1889, p. 28.

Pontellopsis armata Giesbrecht, 1898, p. 148.

Material

AB-149 (IF) 2.4 mm; ArLu-85 (1CV, M, damaged); Me-151 (CV, F) 2.2 mm.

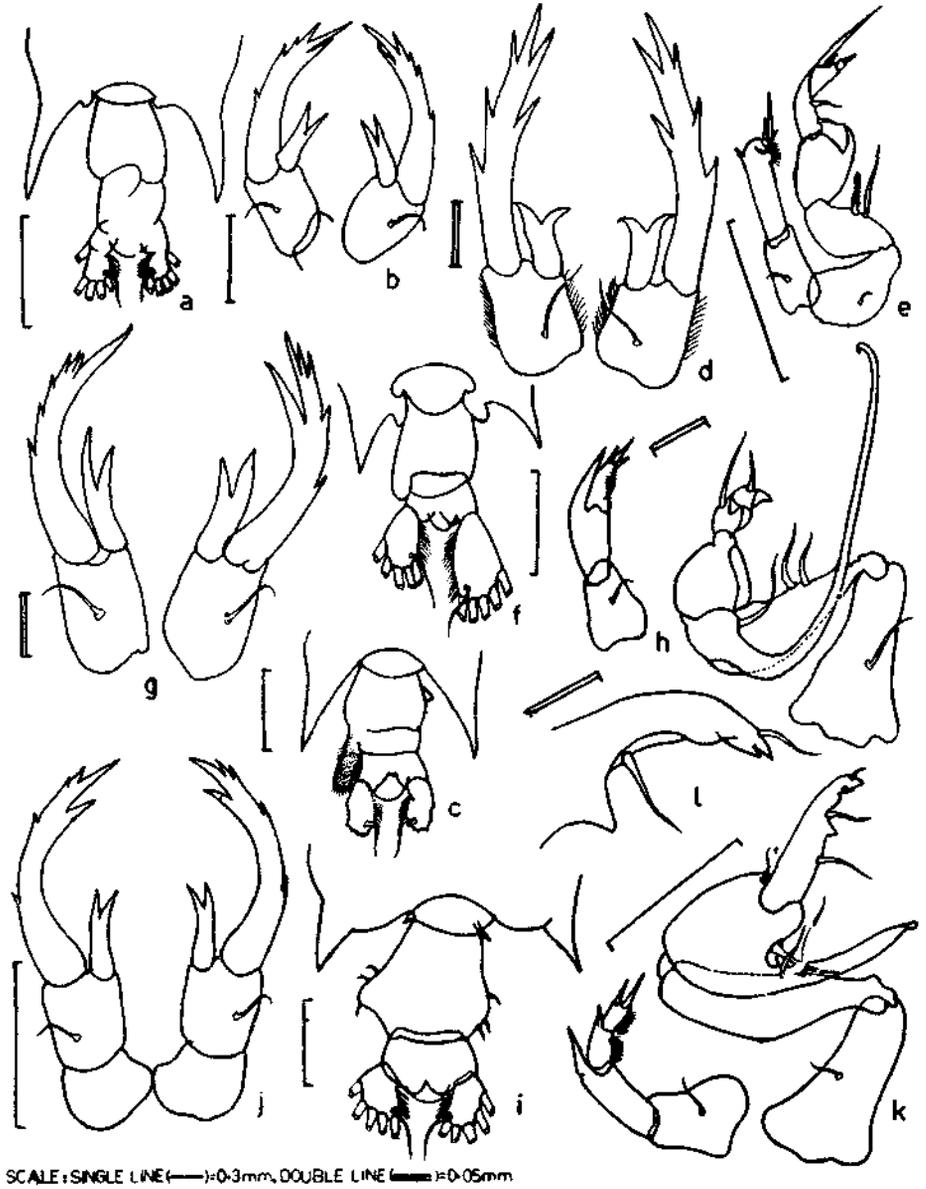


Fig. 3. a, b. *Pontellopsis armata*: a Female, urosome, dorsal view; b. Female, P5; c, d. *Pontellopsis villosa*: c. Female, urosome, dorsal view; d. Female, P5; e. Male, P5. f, g. *Pontellopsis krameri*: f. Female, urosome, dorsal view; g. Female, P5; h. *Pontellopsis macronyx*: Male, P5; i-l. *Pontellopsis regalis*: i. Female, urosome, dorsal view; j. Female, P5; k. Male, P5; and l. terminal portion of finger, enlarged.

Remarks

The flagellar organ on the right posterior corner of T-V is the distinguishing feature of the male of this species.

This species has previously been recorded from the Malay Archipelago, Bay of Bengal, Arabian Sea and the Equatorial waters in the Indian Ocean.

***Pontellopsis villosa* Brady 1883 (Figs. 3 c-e; 7)**

Pontellopsis villosa Brady, 1883, p. 86, pl. 34, figs. 10-13; pl. 35, figs. 14-20.

Monops pilosus Giesbrecht, 1889, p. 28.

Monops villosus Giesbrecht, 1892, p. 486, pl. 26, figs. 10, 12, 17, 23, 33, 34; pl. 41, figs. 45, 51, 57, 69.

Monops edwardsii (part) Giesbrecht, 1893, p. 277.

Material

AB-109 (1F, ICVF); Di-5406 (1M); Di-5400 (1F); Ki-304 (1, F1M); Os-7 (1F); Na-176 (1F).

Size

	No.	Range (mm)	Mean (mm)
Adult Female:	5	2.40-2.84	2.65
Adult Male:	2	2.11-2.14	2.12
CV, Female:	1	1.92	—

Remarks

Silas and Pillai (1973) described the female and male of this species from the Indian seas in detail and drew attention to the variation observed in the specimens from the Indian Ocean.

P. villosa has previously been recorded from the Malay Archipelago, Bay of Bengal, Arabian Sea and South equatorial current region in the Indian Ocean.

***Pontellopsis krameri* (Giesbrecht), 1896 (Figs. 3 f, g; 6)**

Monops krameri Giesbrecht, 1896, p. 323, pl. 5, figs. 1, 2.

Pontellopsis krameri Giesbrecht and Schmeil, 1898, p. 147.

Material

AB-191 (1F); AB-196 (1F); AB-323 (1F); Co-198 (1F); Zu-5 (1F).

Size

	No.	Range (mm)	Mean (mm)
Adult Female:	5	1.98-2.24	2.11

Remarks

Giesbrecht (1896) described this species from the Red Sea based on females. Subsequently, A. Scott (1902) described the male from the same area. The features of the female specimen presented by Wolfenden (1906) indicate that his description is based on an immature specimen of *P. krameri*, which possessed a distorted posterior spine on T-V.

From Indian Ocean this species has previously been recorded from the Malay Archipelago, Bay of Bengal, Arabian Sea and Red Sea.

***Pontellopsis macronyx* A. Scott, 1909 (Fig. 3 h; 8)**

Pontellopsis macronyx A. Scott, 1909, p. 173, pl. 54, figs. 1-10.

Pontellopsis herdmani (not Thompson and Scott) Sewell, 1912, p. 375, pl. 24, fig. 5.

Material

AB-193 (1M); 1.78 mm.

Remarks

Silas and Pillai (1973) described the female and male of this species based on material collected from the Indian seas and commented on the variation evinced by this species from Indian Ocean. *P. macronyx*, *P. herdmani* and *P. scotti* are closely related and show morphological similarities.

Previous records of this species from the Indian Ocean are from the Bay of Bengal, Arabian Sea and North Indian Ocean.

***Pontellopsis regalis* (Dana), 1849 Figs. 3 i-l; 8)**

Pontella regalis Dana, 1849, p. 31.

Pontellina regalis Dana, 1852, pp. 1154, 1155; 1853, pl. 81, figs. 1 a b.

Pontella strenua (part) Brady, 1883, p. 95, pl. 45, fig. 18.

Monops grandis Lubbock, 1853, p. 116, pl. 15, figs. 7-13, pl. 7, fig. 5.

Monops regalis Giesbrecht, 1892, pp. 486, 487, 493, 496; pl. 1, fig. 6; pl. 26, figs. 1-9, 11, 13, 14, 20-22, 24, 29; pl. 41, figs. 50, 54, 56, 62, 64, 66, 67.

Monochops grandis Wilson, 1924, p. 16.

Pontellopsis regalis Giesbrecht, 1898, p. 147.

Material

AB-183 (1M); AB-295 (1M); ArLu-5 (1M); ArLu-8 (1F); ArLu-71 (1F); Ka-7 (1M); Ko-16/17 (1M); Me-1/161 (1F); Os-7/7 (CV, F); Me-1/174 (CIV, damaged).

Size

	No.	Range (mm)	Mean (mm)
Adult Female:	3	2.74-3.16	2.94
Adult Male:	5	2.64-3.01	2.81
CV, Female:	1	2.30	—

Remarks

Variations in the genital segment of the female and P5 in both sexes have attracted the attention of various authors. Silas and Pillai (1973) described two types of "variants" observed in the female and male of this species from the Indian Ocean. According to them 'in view of the consistent differences shown by the two "varieties", the possibility of recognising one as a distinct species cannot be ruled out.' The present material belongs to the 'Type-I variant' described by them.

From the Indian Ocean this species has previously been reported from the Malay Archipelago, Bay of Bengal, Arabian Sea, Equatorial Current Region and from the South West Indian Ocean.

DISTRIBUTION

The features of distribution of different species are illustrated in a series of maps (Fig. 4-9) showing the occurrence of species at different stations from where plankton samples were collected.

The data pertaining to the total volume of the sample, time of collection, fraction of sample sorted, fraction sub-sorted and the total number of *Pontella* and *Pontellopsis* specimens present in the sub-sample are given in Table 2. The material examined were collected by vertical hauls with the Indian Ocean Standard Net from a depth of 200 metres to surface in the deeper regions and from bottom to surface in the shallower regions. As reported earlier (Fleminger, 1957, 1967; Heinrich, 1960; Voronina, 1962; Sherman, 1963, 1964; Silas and Pillai, 1973) the members of the family pontellidae are well adapted for existence in the upper layers of the water and they generally predominate the surface layers in the tropical to the warm temperate latitudes. Their distribution being such, collections from the surface strata would yield more specimens and provide material for a realistic picture of their distribution patterns. This would explain the paucity of material in the samples collected by vertical hauls which were used for sub-sorting pontellid copepods.

Of the different species studied *Pontella fera* has been found to be widely distributed in the northern Indian Ocean, dominating in the waters of monsoon currents, the Equatorial Counter Current and not extending to south of sub-tropical convergence. On the south its boundary lies along the border between the South Equatorial Current and the Equatorial Counter Current. As stated by Voronina (1962), the distribution pattern of *P. fera* in the Indian Ocean differs substantially from its distribution in the Pacific Ocean where it is limited to the area of low salinity. She recorded this species within the salinity range of 33.8 to 34.4‰ and temperature range of 28.2 to 29.2°C. and stated that the lowest salinity did not hinder the development of *P. fera* in the Indian Ocean. According to her it may be the temperature which acts as a major limiting factor determining the position of its southern boundary. During the present study the northern boundary of this species was observed at 10°N. in the Arabian Sea and it was not found in the high saline waters of the North Arabian Sea whereas it penetrates up to the low salinity regions of the northern part of the Bay of Bengal. However, the distribution pattern of *P. fera* derived from the available material shows concurrence with that presented by Voronina (1962).

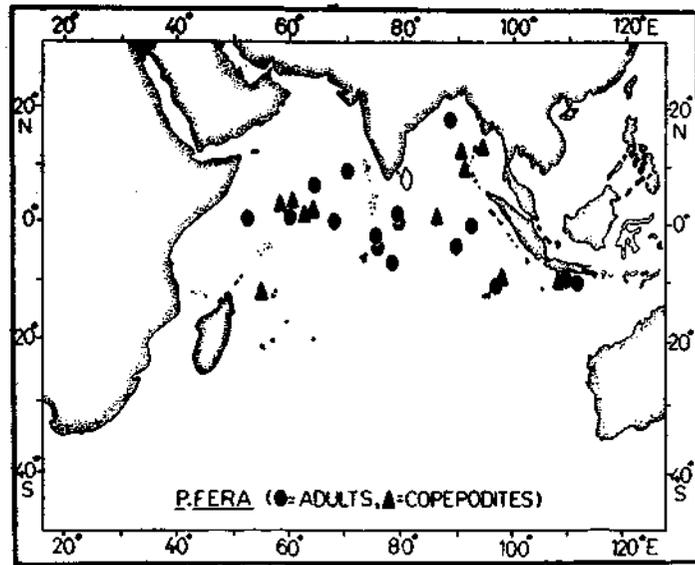


Fig. 4. Occurrence of *Pontella fera* Dana (adults and copepodites) at the IIOE stations.

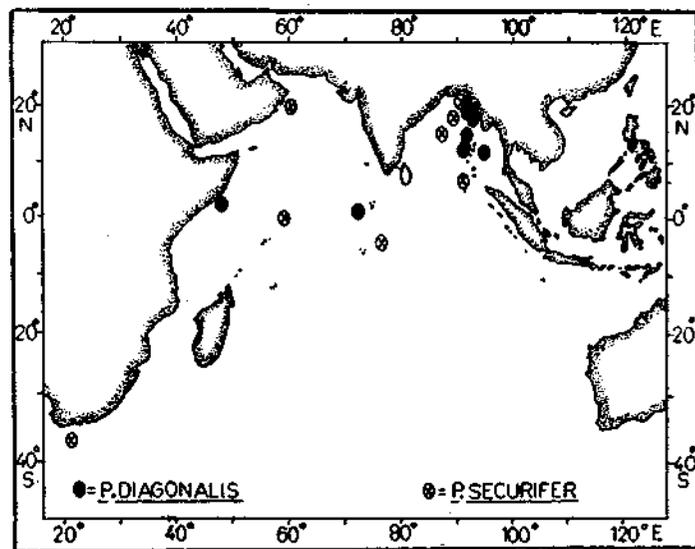


Fig. 5. Occurrence of *Pontella diagonalis* Wilson and *P. securifer* Brady at the IIOE stations.

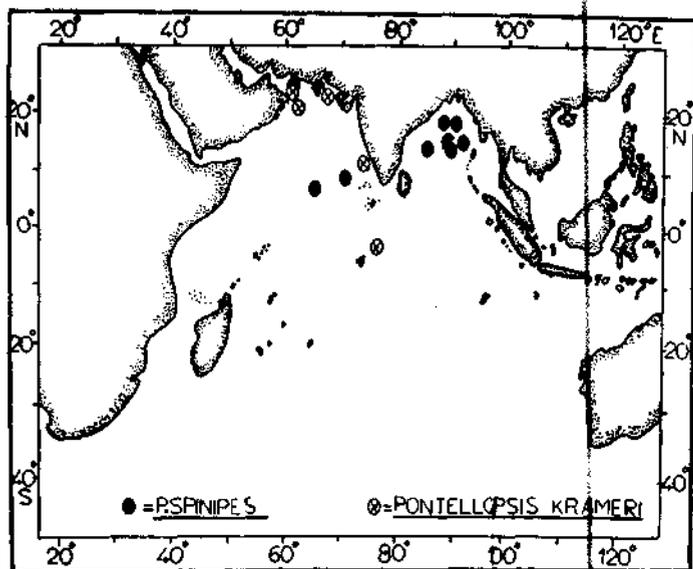


Fig. 6. Occurrence of *Pontella spinipes* Giesbrecht and *Pontellopsis krameri* (Giesbrecht) at the IIOE stations.

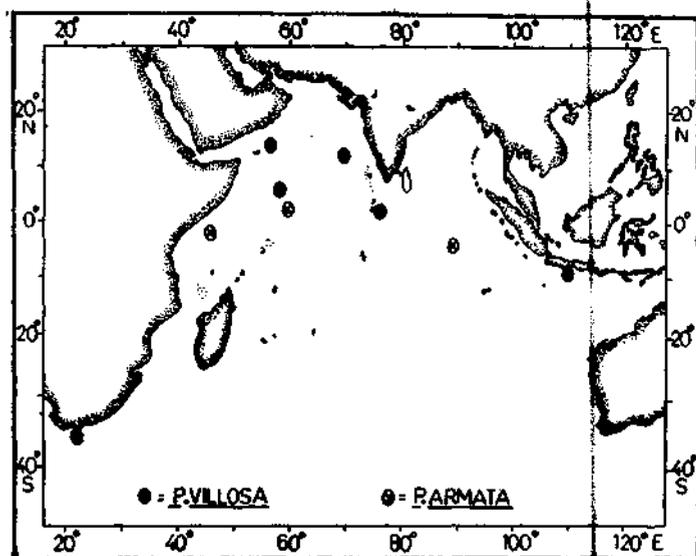


Fig. 7. Occurrence of *Pontellopsis villosa* Brady and *P. armata* (Giesbrecht) at the IIOE stations.

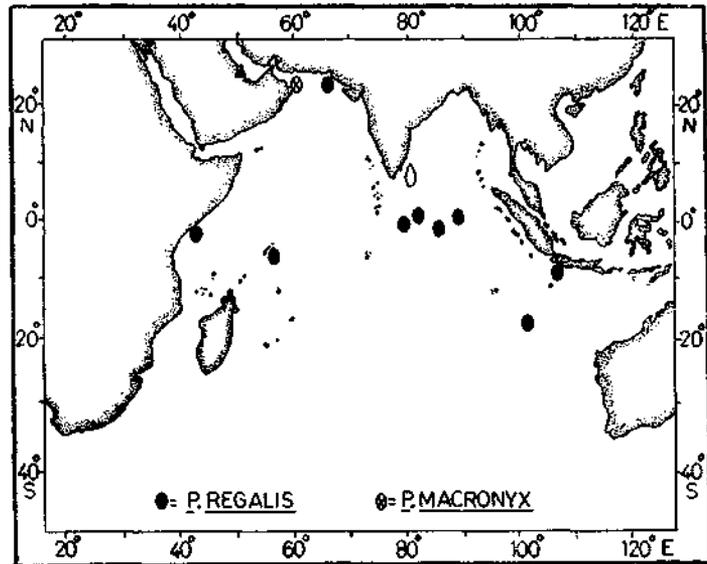


Fig. 8. Occurrence of *Pontellopsis regalis* (Dana) and *P. macronyx* A. Scott at the IIOE stations.

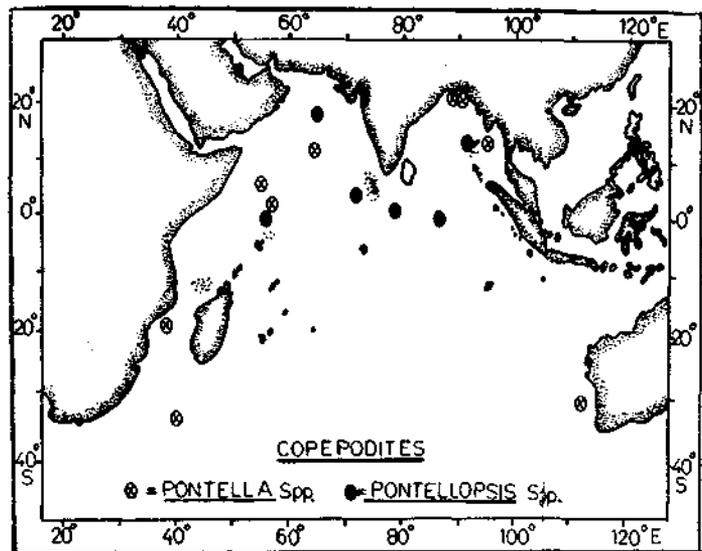


Fig. 9. Occurrence of copepodites of *Pontella* spp. and *Pontellopsis* spp. at the IIOE stations.

TABLE 2. Details of the copepod material (*Pontella* and *Pontellopsis*) studied

Vessel and Station	Volume (ml)	Fraction sorted (%)	Sub-sample (%)	Time (Day/Night)	Number of Adult specimens	copepodites
<i>PONTELLA</i>				(08.28)		
AB 11	16.0	20	16	N	1	-
AB 27	27.0	25	20	N	-	1
AB 28	12.0	25	20	D	-	1
AB 32	14.5	25	20	N	-	1
AB 34	4.5	75	60	D	1	1
AB 49	14.0	30	24	N	1	-
AB 50	60.0	25	20	D	2	-
AB 51	25.0	25	20	D	1	-
AB 55	10.0	30	24	N	1	-
AB 56	4.5	75	60	D	3	4
AB 57	7.0	50	40	D	1	-
AB 69	8.0	50	40	D	3	-
AB 72	41.0	50	40	D	1	-
AB 74	3.0	90	72	D	11	-
AB 78	5.0	75	60	D	-	-
AB 79	13.5	50	40	N	1	-
AB 96	9.0	50	40	D	1	-
AB 110	4.0	75	60	D	4	2
AB 114	5.0	75	60	D	1	-
AB 183	94.0	38	30	N	1	-
AB 189	7.5	50	40	N	11	-
AB 196	40.0	10	4	N	3	-
AB 298	3.5	30	72	D	-	1
AB 303	2.2	90	36	D	-	1
AB 307	1.5	90	72	D	1	-
AB 323	7.0	50	40	D	2	-
AB 324	3.0	90	72	D	2	-
AB 333	13.0	60	48	D	3	3
AB 404	9.0	50	20	N	-	2
ArLu 1	3.0	85	68	N	1	-
ArLu 6	6.0	50	40	D	-	1
ArLu 10	8.0	50	40	N	8	1
ArLu 15	6.5	50	40	N	1	-
ArLu 20	6.0	20	40	D	1	-
ArLu 34	30.0	10	8	D	1	-
ArLu 53	5.0	80	54	D	-	1
ArLu 55	6.0	50	40	D	-	3
ArLu 71	8.5	50	40	N	1	-
ArLu 85	10.5	30	24	N	1	-
Dm 1/60	2.5	90	60	N	3	2
Dm 3/129	12.5	30	24	D	6	3
Dm 5/210	6.0	50	40	D	-	1
Di 5275	21.0	20	16	N	-	1
Di 5385	11.0	40	32	N	-	1
Di 5412	14.5	75	60	N	-	2
Di 5437	9.5	40	32	D	2	2
Me 135	18.1	20	16	N	1	-
Na 5/128	16.5	25	70	D	-	1
Na 6/150	2.5	90	72	N	-	4
Os 1/45	3.5	87	35	D	3	4
Os 7/07	7.5	50	40	N	1	-
Os 11/13	5.0	75	20	D	1	-
Vi 35/5217	3.5	90	72	D	2	13
Ko 14/1	2.5	87	70	N	1	-

TABLE 2 Contd.

Vessel and Station	Volume (ml)	Fraction sorted (%)	Sub-sample (%)	Time (Day/Night)	Number of specimens Adults	Copepodites
<i>PONTELLOPSIS</i> (08.29)						
AB 74	3.0	90	72	D	1	-
AB 109	5.5	75	60	D	2	-
AB 149	5.0	75	60	D	1	-
AB 183	94.0	38	30	N	1	-
AB 191	35.0	10	8	N	1	-
AB 193	30.0	10	8	N	1	-
AB 196	40.0	10	40	N	2	-
AB 200	17.0	20	16	D	-	1
AB 295	3.0	90	72	D	1	-
AB 323	7.0	50	40	D	1	-
AB 355	2.0	90	72	D	-	1
ArLu 5	3.0	87	70	N	1	-
ArLu 8	3.0	90	72	D	1	-
ArLu 71	8.5	50	40	N	1	-
ArLu 85	10.5	30	24	N	-	1
Di 5400 B	2.0	90	72	D	1	-
Di 5406 A	33.0	10	8	D	1	-
Ka 7	5.5	90	72	N	1	-
Ka 9	3.0	90	72	N	-	1
Ka 3/16	16.5	20	16	N	-	1
Me 151	21.0	20	16	D	-	1
Me 161 B	7.0	50	40	D	1	-
Me 174	17.0	50	40	N	-	1
Co 198	10.0	30	24	D	1	-
Ki 13/296	38.0	-	40	N	-	2
Ki 304	10.0	50	40	N	4	-
Ko 16/17	3.0	87	70	N	1	-
Na 5/128	16.5	25	20	D	-	1
Na 176	26.0	15	12	N	1	-
Os 7/7	7.5	50	40	N	1	1
Os 11/19	3.5	87	70	D	1	-
Zu 5	12.0	25	20	D	1	-

Pontella spinipes appears to be confined to the Arabian Sea and Bay of Bengal, between 5° to 24°N. *P. securifer* was recorded from the Bay of Bengal, Arabian Sea and Central Indian Ocean whereas *P. diagonalis* was found in the Equatorial Current region and north eastern sector of the Bay of Bengal. *Pontella denticauda* was recorded from off Java, near its type locality and its origin can be related to the waters from the Java Sea.

Pontellopsis regalis has been found to inhabit the waters of the region of the equatorial current but was not encountered south of the subtropical convergence.

It was also recorded from the North Arabian Sea near Karachi Coast. *P. armata* was met with in the Equatorial water mass. *P. krameri* was encountered in the equatorial water mass and in the northern and south-eastern Arabian Sea while *P. macronyx* was recorded only from the high saline regions of North Arabian Sea. *P. villosa* has been found to be the most widely distributed species in the collections examined. It was recorded from the equatorial water mass, southern part of Arabian Sea, waters to the west of Sumatra, and near south coast of Africa (35°S.) Voronina (1962) while discussing the pattern of distribution of this species stated that it has a high relative significance in 'area of sub-tropical convergence and waters lying to the north of it; the area south of the coast of Java and the sector of the 30°S. section near Australia'. However, in the absence of sufficient material no decisive conclusion could be drawn regarding its preference to the different water masses in the Indian Ocean.

REFERENCES

- ANON, 1969. Handbook to the International Zooplankton Collections HIOE Station list, Vol. 1: 1-139.
- BRADY, G. S. 1883. Report on the Copepoda collected by HMS *Challenger* during the years 1873-1876. *Rep. Sci. Res. HMS Challenger, Zool.*, 8: 1-142.
- 1915. Notes on the pelagic Entamostracca of Durban Bay. *Ann. Durban Mus.*, 1: 134-146.
- CLAUS, C. 1893. Über die Entwicklung und das System der Pontelliden. *Arb. zool. Inst., Univ. Wien.*, 35 (5): 10: 233-282.
- CLEVE, P. T. 1901. Plankton from the Indian Ocean and the Malay Archipelago. *K. Svenska Vetensk. Akad. Handl.*, 35 (5): 1-58.
- 1904. Plankton of the South African Seas. I. Copepoda. *Mar. Invest. S. Afr.*, 3: 177-210.
- CHIBA, T. 1956. Studies on the development and systematics of Copepoda. *Journ. Shimono-seki coll. Fish.*, 6: 291-313.
- DANA, J. D. 1847, 1849. Conspectus Crustaceorum, in orbis terrarum circumnavigatione, C. Wilkes, e classe Republicae Foederatae duce, collectorum. *Proc. Amer. Acad. Arts Sci.*, 1 (1847): 149-155, 2 (1849): 9-61.
- 1853, 1855. Crustacea. In: U.S. Exploring Expedition during the years 1838-1842, under the command of Charles Wilkes. 13 (2): 1019-1262 (1853); atlas pls. 70-88 (1855).
- FLEMING, A. 1957. New calanoid copepods of *Pontella* Dana and *Labidocera* Lubbock with notes on the distribution of the genera in the Gulf of Mexico. *Tulane Stud. Zool.*, 5: 19-34.
- 1967. Taxonomy, distribution and polymorphism in the *Labidocera jollae* group with remarks on the evolution within the group. *Proc. U.S. Nat. Mus.*, 120 (3567): 1-61.
- AND K. HULSEMANN 1974. Systematics and distribution of the four sibling species comprising the genus *Pontellina* Dana (Copepoda: Calanoida). *Fish. Bull. U.S.*, 72 (1): 63-120.
- GIESBRECHT, W. 1888-1889. Elenco dei copepodi pelagici raccolti dal tenente di Vascello Gaetano Chierchia durante il viaggio della R. corvetta "Veitor Pisani" negli anni 1882-'85 e dal tenente di vascello Francesco Orsini nel Mar Rosso, nel 1884. *Rend. Acc. Lincei.*, (4): 4 (2): 1888 204-287, 330-338; 5 (1889): (1), 811-815; (2) 24-29; 7 (1) (1891): 474-481; (2), 63-68, 2-282.67
- 1892. Systematik und Faunistic der pelagischen copepoden des Golfes von Neaple. *Fauna u. Flora Golf. Neaple*, 19: 1-831.

- AND O. SCHMEL 1898. Copepoda I. Gymnoplea. *Das Tierreich*, 6: 1-169.
- HEINRICH, A. K. 1960. The surface plankton of the Central Pacific. *Tr. Inst. Okeanol. Akad. Nauk SSSR*, 41: 42-47.
- KRISHNASWAMY, S. 1953. Pelagic Copepoda of the Madras Coast. *J. Madras Univ.*, B: 23 (1): 61-75; 23 (2): 107-144.
- KROYER, H. 1849. Karcinologische Bidrag. *Naturh. Tidskr.*, 2: 527-609.
- LUBBOCK, J. 1853. On two new species of calanidae with observations on the spermatid tubes of *Pontella*. *Ann. Mag. nat. Hist.*, (2): 12: 115-124; 159-165.
- MENON, K. S. 1931. A preliminary account of the Madras plankton. *Rec. Indian Mus.* 33: 489-516.
- PESTA, O. 1912. Wissenschaftliche Ergebnisse der Expedition nach Mesopotamien. I. Teil: Copepoden aus dem Golfes von Persien. *Ann. K. K. naturh. Hofmus., Wien*, 26: 39-62.
- SARASWATHY, M. 1966. Pelagic copepods from the inshore waters of Trivandrum Coast. *Proc. Symp. Crustacea*, MBI, Pt. I: 74-106.
- SCOTT, A. 1902. On some Red Sea and Indian Ocean Copepoda. *Proc. Liverpool biol. Soc.*, 16: 397-428.
- 1909. Copepoda of the Siboga Expedition. Pt. I. Free-swimming, littoral, and semi-parasitic Copepoda. *Siboga Exped. Mon.*, 29a: 1-323.
- SEWELL, R. B. S. 1912. Notes on the surface living Copepoda of the Bay of Bengal I and II. *Rec. Indian Mus.*, 7: 313-382.
- 1932. The Copepoda of the Indian seas. *Mem. Indian Mus.*, 10: 223-407.
- SILAS, E. G. AND P. PARAMESWARAN PILLAI 1967. *Labidocera pseudacuta* a new pontellid copepod from the Indian Ocean with remarks on the related species *Labidocera acuta* (Dana). *J. mar. biol. Ass. India*, 9 (2): 346-364.
- AND ————— 1973. The calanoid copepod family Pontellidae from the Indian Ocean. *Ibid.*, 15 (2): 771-858.
- THOMPSON, I. C. AND A. SCOTT 1903. Report on the Copepoda collected by Prof. Herdman at Ceylon in 1902. *Rep. Gov. Ceylon Pearl Oyster Fisheries*, 1: 227-307.
- TSURUTA, A. 1963. Distribution of plankton and its characteristics in the oceanic fishing grounds, with special reference to their relation to fishery. *J. Shimonoseki Univ. Fish.*, 12 (1): 13-214.
- VERVOORT, W. 1965. Pelagic Copepoda, Pt. II. *Atlantidae Rep.*, 8: 1-216.
- VORONINA, N. M. 1962. On the surface plankton of the Indian Ocean. *Trud. Inst. Okeanol.*, 58: 67-79.
- WILSON, C. B. 1950. Copepods gathered by the United States fisheries steamer *Albatross* from 1887-1909, chiefly in the Pacific Ocean. *U.S. Nat. Mus. Bull.*, 100: 14 (4): 141-441.
- WOLFENDEN, R. N. 1906. Notes on the collection of Copepoda. *The fauna and geography of the Maldiva and Laccadive Archipelagoes*, 2: supp. I, 989-1040.