J. mar. biol. Ass. India, 1973, 15 (2) : 771–858

THE CALANOID COPEPOD FAMILY PONTELLIDAE FROM THE INDIAN OCEAN*

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ABSTRACT

Some species of calanoid copepods, chiefly the members of the family Pontellidae inhabiting the surface waters of the oceanic and neritic regions, have been studied in recent years as possible biological indicators of hydrological properties. Very few studies pertaining to the taxonomy and biogeography of the members of the family Pontellidae from the Indian Ocean have previously been carried out. The present communication gives relevant informations on descriptions and illustrations of some species from the Indian Ocean belonging to this family. A catalogue of all the nominal species (both valid species and synonyms) hitherto described from the world oceans has also been included.

INTRODUCTION

PELAGIC Copepods inhabiting the surface waters of the neritic and oceanic realms have attracted more attention in recent years as the distribution of many groups is closely associated with hydrographic features. Notably, the members of the family Pontellidae which are well adapted for existence in the surface layer (0 to 30 cm layer) offer excellent material for investigations relating to ecology and distribution. The species of Pontellidae generally predominate or concentrate in the surface layer in the tropical to the warm temperate latitudes and have been used recently for investigations on water masses, major zoogeographic divisions, and inshore-offshore boundaries (Fleminger, 1957, 1964, 1967, 1974; Heinrich, 1960; Sherman, 1963, 1964; Voronina, 1962, 1964). In view of the importance of Pontellidae in such studies, critical taxonomic and ecological investigations of this family of Copepoda were taken up.

One of the very first requirements was the completion of a catalogue of the species of Pontellidae known from the Indian Ocean and contiguous seas, as such an account is wanting. Besides rectifying this deficiency the present catalogue also embodies information as to the synonyms of the various species; type localities; the known distribution of the species; and brief remarks on species wherever necessary. It was also felt opportune to give a list of all nominal species of Pontellidae described upto now (both valid species and synonyms) from the different oceans since we have been able to examine most of the relevant literature. The species are listed alphabetically under the different genera.

A brief discussion on the outline classification followed is called for. Giesbrecht (1888–1891, 1892) divided Calanoida into two primary sections, Amphaskandria and Heterarthrandria and placed the family Pontellidae along with Candaciidae,

*Presented at the 'Symposium on Indian Ocean and Adjacent Seas—Their Origin Science and Resources' held by the Marine Biological Association of India at Cochin from January 12 to 18 1971.

In view of the delay in the publication of this paper information on Pontellidae published since 1971 have also been incorporated to make the account up-to-date.

and Centropagidae in the second section. Sars (1903) recognised eleven families including Pontellidae under the Section Heterarthrandria, and erected a third section Isokerandria to comprise calanoids in which the anterior antennae are alike in both sexes. Earlier, Claus (1893) subdivided the family Pontellidae into three subfamilies, namely Eupontellinae (for the genera *Pontella, Pontellina,* and *Anomalocera);* Pseudopontellinae (for the genera *Monops,* and *Pseudopontella);* and Calanopinae (for the genus *Calanopia*). The genus *Pontella* was further subdivided by Claus into two subgenera, namely *Labidocera* Lubbock, and *Eupontella* Claus; the genus *Pontellina* into five subgenera, namely *Eupontellina* Claus, *Iva* Lubbock, *Ivella* Lubbock, *Ivellina* Claus, and *Ivellopsis* Claus. This System has not been accepted by subsequent workers as some of the subgenera recognised by Claus are at present given full generic status, while others have been treated as synonyms of earlier described genera. At present we recognise nine genera of Pontellidae of which seven are represented in the Indian Ocean as follows:

Anomalocera Templeton, 1837
Calanopia Dana, 1852
Epilabidocera Wilson, 1932 (Not represented in the Indian Ocean).
Labidocera Lubbock, 1853
Paralabidocera Wolfenden, 1908 (Not represented in the Indian Ocean)
Pontella Dana, 1849
Pontellopsis Brady, 1883
Pontellina Dana, 1852
Ivellopsis Claus, 1893

Up to now, 174 nominal species (both valid species and synonyms) have been described in literature referable to the family Pontellidae. Of these, 71 species, subspecies and varieties are known to occur in the Indian Ocean and contiguous seas as shown below:

Genus	No. of species, subspecies, etc. described from world oceans**	No. of species, subspecies, etc., described or recorded from the Indian Ocean
Anomalocera Templeton	3 (2)	1
Calanopia Dana	13	8
Epilabidocera Wilson	2 (1)	—
Labidocera Lubbock	57 (11)	29
Paralabidocera Wolfenden	1	—
Pontella Dana	54 (8)	19
Pontellopsis Brady	29 (3)	11
Pontellina Dana	8 (5)	2
Ivellopsis Claus	1	1

The number of species from the Indian Ocean may be eventually augmented by new distributional records and by new species obtained. For those interested in such investigations, the list of all known nominal species of Pontellidae (both synonyms and those considered valid) given at the end should prove useful.

** Of the total number under each genus, synonyms are indicated in paranthesis. The latter figures are provisional as only a global revision of the family would give the correct position.

SPECIES OF THE FAMILY PONTELLIDAE

All the known nominal species of the family Pontellidae, both valid and synonyms are listed below alphabetically under each genus. An (*) denotes definite record from the Indian Ocean; (+) doubtful record from the Indian ocean; and (**or+*) denote synonyms of species described or recorded from the Indian Ocean. The genera are also arranged alphabetically.

Genus **Anomalocera** Templeton, 1837

+*Anomalocera patersoni* Templeton, 1837

[Syn: *Pontia patersoni* Kroyer, 1849; *Pontella eugenioe* Leuckart, 1859; and *Irenaeus splendidus* Goodsir, 1843. *Anomalocera ornata* Sutcliffe, 1950].

Genus **Calanopia** Dana, 1852

Calanopia americana Dahi, 1894
**Calanopia aurivillii* Cleve, 1901
Calanopia biloba Bowman, 1957
**Calanopia elliptica* (Dana) 1849
[Syn: *Pontella elliptica* Dana, 1849]
**Calanopia herdmani* A. Scott, 1909
**Calanopia media* Gurney, 1927
**Calanopia minor* A. Scott, 1902
Calanopia sarsi Wilson, 1950
**Calanopia seymouri* Pillai, 1969.
Calanopia sewelli Jones and Park, 1967
**Calanopia thompsoni* A. Scott, 1909
**Calanopia australica* Bayly and Greenwood, 1966
Calanopia parathompsoni Gaudy, 1969.

Genus **Epilabidocera** Wilson, 1932

Epilabidocera amphitrites (McMurrich), 1916
[Syn: *Paralabidocera amphitrites* McMurrich, 1916]
Epilabidocera longipedata (Sato), 1913
[Syn: *Pontella longipedata* Sato, 1913; and
Paralabidocera amphitrites McMurrich, 1916 p.p.]

Genus **Labidocera** Lubbock, 1853

**Labidocera acuta* (Dana) 1849
[Syn: *Pontella acuta* Dana, 1849]
**Labidocera acutifrons* (Dana) 1849
[Syn: *Pontella acutifrons* Dana, 1849; *Pontellina acutifrona* (Dana), 1852; *Pontia edwardsii* Kroyer, 1849; and *Monops edwardsii* (partim) Claus, 1893].
**Labidocera aestiva* Wheeler, 1900
Labidocera agilis (Dana), 1849
[Syn: *Pontella agilis* Dana, 1849; *Pontellina agilis* (Dana) 1852]
**Labidocera albatrossi* Wilson, 1950

**Labidocera bataviae* A. Scott, 1909
**Labidocera bengalensis* Krishnaswamy, 1952
+*Labidocera bipinnata* Tanaka, 1936
Labidocera brasiliense Farran, 1929
Labidocera brunescens (Czerniavsky) 1868
[Syn: *Pontella brunescens* Czerniavsky, 1868]
Labidocera brunescens var. *dulzettoii* Crisafi, 1960
Labidocera caudata Nicholls, 1944
[Syn: *Labidocera* sp. (nov. ?) Dakin and Colefax, 1940]
Labidocera cervi Kramer, 1896
+**Labidocera chubbi* Brady, 1915
[= *? Labidocera minuta* Giesbrecht, 1889 (Male)]
Labidocera darwinii Lubbock, 1853
[Syn: *Labidocera lubbocki* Giesbrecht, 1892]
**Labidocera detruncata* (Dana), 1849
[Syn: *Pontella detruncata* Dana, 1849; *Pontellina detruncata* (Dana) 1852]
Labidocera detruncata var. *intermedia* T. Scott, 1894
[=*Labidocera nerii* Kroyer, 1849]
Labidocera diandra Fleminger, 1967
**Labidocera euchaeta* Giesbrecht, 1889
Labidocera exigua (Dana) 1849
[Syn: *Pontella exigua* Dana, 1849; *Pontellina exigua* (Dana) 1852]
Labidocera fluviatilus Dahl, 1894
Labidocera frivola (Dana) 1849
[Syn: *Pontella frivola* Dana, 1849; *Pontellina frivola* (Dana) 1852)]
**Labidocera gangetica* Sewell, 1934
[Syn: *Labidocera euchaeta* (Stage–I) Sewell, 1912 *nec* Giesbrecht 1889]
Labidocera hebes (Dana) 1849
[Syn: *Pontella hebes* Dana, 1849]
+*Labidocera inormis* (Brady) 1883
[Syn: *Pontella inermis* Brady, 1883]
Labidocera insolita Wilson, 1950
Labidocera japonica Mori, 1935
Labidocera johnsoni Fleminger, 1964
Labidocera jollae Esterly, 1906
Labidocera kolpos Fleminger, 1967
**Labidocera kroyeri* (Brady) 1883
[Syn: *Pontella kroyeri* Brady, 1883]
**Labidocera kroyeri* var. *bidens* Sewell, 1912
**Labidocera kroyeri* var. *burmanica* Sewell, 1912
**Labidocera kroyeri* var. *gallensis* Thompson and Scott, 1903
**Labidocera kroyeri* var. *stylifera* Thompson and Scott, 1903
***Labidocera kroyeri* var. *similis* Wolfenden, 1906
[=*Labidocera laevidentata* (Brady) 1883]
**Labidocera kroyeri* var. nov. Krishnaswamy, 1953
**Labidocera laevidentata* (Brady) 1883
[Syn: *Pontella laevidentata* Brady, 1883; and *Labidocera kroyeri* var. *similis* Wolfenden, 1906]
Labidocera lubbocki Giesbrecht, 1889
**Labidocera madurae* A. Scott, 1909
Labidocera media (Dana) 1849
[Syn: *Pontella media* Dana, 1849; *Pontellina media* (Dana) 1852]

**Labidocera minuta* Giesbrecht, 1889
Labidocera neoscotti Fleminger
Labidocera nerii (Kroyer) 1849[1]]

[Syn: *Pontia nerii* Kroyer, 1849; *Pontella* (*Pontellina*) *setosa* Lubbock, 1853; *Pontella* (*Hemipontella*) *setosa* Claus, 1893; *Hemipontella rotundifrons* Claus, 1893; and *Labidocera detruncata* var. *intermedia* T. Scott 1894] ([1]"*L. nerii*" Voronina, 1962, from Indian Ocean is said to refer to an undescribed species of *Labidocera* by Fleminger, 1965).

**Labidocera orsinii* Giesbrecht, 1889
**Labidocera pavo* Giesbrecht, 1889
**Labidocera pectinata* Thompson and Scott, 1903
[Syn: *Labidocera similis* Cleve, 1904]
**Labidocera pseudacuta* Silas and Pillai, 1967
Labidocera rotunda Mori, 1929
Labidocera scotti Giesbrecht, 1897
[Syn: *Labidocera darwinii* T. Sott, 1894. (*nec* Lubbock, 1853)]
***Labidocera similis* Cleve, 1904
[=*Labidocera pectinata* Thompson and Scott, 1903]
Labidocera simplex (Dana), 1849
[Syn: *Pontella simplex* Dana, 1849; *Pontellina simplex* (Dana) 1852]
**Labidocera* sp. nov. Voronina, 1962
Labidocera tenuicauda Wilson, 1950
[=*Labidocera trispinosa* Esterly, 1912 (*partim*); *Labidocera detruncata* (Dana), 1849 (*partim*)]
**Labidocera trispinosa* Esterly, 1912
[Syn: *Labidocera tenuicauda* (*partim*) Wilson, 1950]
Labidocera wilsoni Fleminger, 1966
+*Labidocera wollastoni* (Lubbock) 1857
[Syn: *Pontella wollastoni* Lubbock, 1857; and *Pontella helgolandica* Claus, 1863]

Genus **Paralabidocera** Wolfenden, 1908

Paralabidocera hodgsoni Wolfenden, 1908

Genus **Pontella** Dana, 1849

Pontella agassizii Giesbrecht, 1895
Pontella alata A. Scott, 1909
**Pontella andersoni* Sewell, 1912
Pontella argentea Dana, 1849
**Pontella atlantica* (H. Milne Edwards), 1840

[Syn: *Pontia atlantica* H. Milne-Edwards, 1840; *Pontellina* (*Iva*) *magna* Lubbock,1853; *Labidocera magna* Lubbock, 1856; *Pontellina gigantea* Claus, 1863; *Pontella magna* Brady, 1883; and *Pontellina* (*Iva*) *magna* Claus, 1893]

Pontella bairdii Lubbock, 1853
[=*Labidocera acutifrons* (Dana) 1849]
Pontella barbata Tanaka, 1936
[=*Pontella kieferi* Pesta, 1933]

Pontella bifurcata Tanaka, 1936
[=*Pontella chierchiae* Giesbrecht, 1889]
Pontella cerami A. Scott, 1909
Pontella chierchiae Giesbrecht, 1889
[Syn: *Pontella bifurcata* Tanaka, 1936; and *Pontella forcipata* Tanaka, 1936]
**Pontella danae* Giesbrecht, 1889
[Syn: *Pontellina* (*Ivellina*) *danae* Claus, 1893]
**Pontella danae* var. *ceylonica* Thompson and Scott, 1903
**Pontella denticauda* A. Scott, 1909
Pontella dentosa Dana, 1849
**Pontella diagonalis* Wilson, 1950
**Pontella fera* Dana, 1849
[Syn: *Pontellina* (*Eupontellina*) *fera* Claus, 1893]
Pontella forcipata Tanaka, 1936
[=*Pontella chierchiae* Giesbrecht, 1889]
Pontella forficula A. Scott, 1909
Pontella gaboonensis T. Scott, 1894
[Syn: *Pontella mediterranea* var. *gaboonensis* T. Scott]
Pontella gracilis Wilson, 1950
Pontella helgolandica Claus, 1863
[=*Labidocera wollastoni* Lubbock, 1857]
**Pontella indica* Chiba, 1956
**Pontella investigatoris* Sewell, 1912
**Pontella karachiensis* Rehman, 1973
Pontella kieferi Pesta, 1933
[Syn: *Pontella barbata* Tanaka, 1936]
Pontella lobiancoi (Canu) 1888
[Syn: *Pontellina lobiancoi* Canu, 1888]
***Pontella magna* Brady, 1883
[=*Pontella atlantica* (H. Milne-Edwards) 1840]
Pontella marplatensis Ramirez, 1966
Pontella mediterranea (Claus), 1863
[Syn: *Pontellina mediterranea* Claus, 1863]
**Pontella mediterranea* var. *indica* Wolfenden, 1906
Pontella mediterranea var. *jaltensis* Czerniavsky, 1868
Pontella mimocerami Fleminger, 1957
**Pontella natalis* Brady, 1915
**Pontella novoe-zeylandiae* Farran, 1929
Pontella patagoniensis (Lubbock), 1853
[Syn: *Ivella* (*Labidocera*) *patagoniensis* Lubbock, 1853]
Pontella meadii Wheeler, 1900[1]]
[Syn: *?Pontella pennata* Wilson, 1932] ([1] The record of *P. meadii* by Chiba(1956) from the Indian Ocean is due to misidentification. His specimens refer to *Pontella securifer* Brady).
Pontella pennata Wilson, 1932
[=*? Pontella meadii* Wheeler, 1900]
Pontella polydactyla Fleminger, 1957
**Pontella princeps* Dana, 1849
Pontella pulvinata Wilson, 1950
Pontella savignyi (Milne-Edwards) 1828
[Syn: *Pontia savignyi* Milne-Edwards, 1828]
Pontella surrecta Wilson, 1950

Pontella sp. nov. ? Dakin and Colefax, 1940
**Pontella securifer* Brady, 1883
[Syn: *? Pontia brachyura* Kroyer, 1849; *Pontellina (Ivellina) securifer* Claus, 1893; *Pontella spinipes* (Male) Wolfenden, 1906 *nec* Giesbrecht, 1889; *Pontella meadii* Chiba, 1956 *nec* Wheeler, 1900]
Pontella sp. (Nov.?) Voronina, 1962
Pontella speciosa Dana, 1849
Pontella speciosa var. *formosa* Dana, 1849
**Pontella spinipes* Giesbrecht, 1889
Pontella setosa Lubbock, 1853
[=*Pontella* (*Pontellina*) *setosa* Lubbock, 1853; =*Hemipontella* (*Pontella*) *setosa* Claus, 1893; =*Labidocera neerii* (Kroyer), 1849]
+*Pontella spinicauda* Mori, 1937
**Pontella tenuiremis* Giesbrecht, 1889
***Pontella turgida* Dana, 1849
[=*Pontellina plumata* (Dana) 1849]
Pontella valida Dana, 1849
Pontella whiteleggie Krammer, 1896

Genus **Pontellopsis** Brady, 1883

**Pontellopsis armata* (Giesbrecht) 1889
[Syn: *Monops armatus* Giesbrecht, 1888]
***Pontellopsis aequalis* Mori, 1932
[=*Pontellina plumata* Dana]
Pontellopsis albatrossi Wilson, 1950
Pontellopsis bitumida Wilson, 1950
Pontellopsis brevis (Giesbrecht) 1889
[Syn: *Monops brevis* Giesbrecht, 1889]
Pontellopsis contracta (Dana) 1849
[Syn: *Pontella contracta* Dana, 1849; *Pontellina contracta* (Dana) 1852]
Pontellopsis curta (Dana) 1849
[Syn: *Pontella curta* Dana, 1849; *Pontellina curta* (Dana) 1852
Pontellopsis digitata Wilson, 1950
Pontellopsis emerita (Dana) 1849
[Syn: *Pontella emerita* Dana, 1849; *Pontellina emerita* (Dana) 1852]
Pontellopsis globosa Wilson, 1850
**Pontellopsis herdmani* Thompson and Scott, 1903
**Pontellopsis krameri* (Giesbrecht), 1896
[Syn: *Monops krameri* Giesbrecht, 1896]
Pontellopsis laminata Wilson, 1950
Pontellopsis lubbockii (Giesbrecht), 1889
[Syn: *Monops lubbockii* Giesbrecht, 1889]
**Pontellopsis macronyx* A. Scott, 1909
Pontellopsis occidentalis Esterly, 1906
Pontellopsis pacifica Chiba, 1953
**Pontellopsis perspicax* (Dana) 1849
[Syn: *Pontella perspicax* Dana, 1849; *Pontellina perspicax* (Dana) 1852; and *Pontellina pulchra* Dana, 1852]
Pontellopsis pexa A. Scott, 1909
Pontellopsis protensa (Dana) 1849
[Syn: *Pontella protensa* Dana, 1849; *Pontellina protensa* (Dana) 1852]

**Pontellopsis regalis* (Dana) 1849
[Syn: *Pontella regalis* Dana, 1849; *Pontellina regalis* (Dana) 1852; *Monops grandis* Lubbock, 1853; *Monochops grandis* Wilson, 1924]
Pontellopsis rubiscens (Dana) 1849
[Syn: *Pontella rubiscens* Dana, 1849; *Pontellina rubiscens* (Dana) 1852]
**Pontellopsis scotti* Sewell, 1932
Pontellopsis sinuata Wilson, 1950
Pontellopsis speciosa Brady, 1915 b
[=*Pontellina plumata* (Dana) 1852]
**Pontellopsis strenua* (Dana) 1849
[Syn: *Pontella strenua* Dana, 1849; *Pontellina strenua* (Dana) 1852]
**Pontellopsis tenuicauda* (Giesbrecht) 1892
[Syn: *Monops tenuicauda* Giesbrecht 1892]
**Pontellopsis villosa* Brady, 1883
[Syn: *Monops pilosus* Giesbrecht, 1889; *Monops edwardsii* (partim) Claus, 1893]
Pontellopsis yamade Mori, 1937

Genus **Pontellina** Dana 1852

Pontellina elegans Claus, 1863
[Syn: *Pontellina* (*Iva*) *elegans* Claus, 1893]
***Pontellina gigantea* Claus, 1863
[=*Pontella atlantica* (H. Milne-Edwards) 1840]
***Pontellina novalium* Oliveira, 1946
[=*Pontellina plumata* (Dana) 1852]
**Pontellina plumata* (Dana) 1849
[Syn: *Pontella plumata* Dana, 1849; *Pontella turgida* Dana, 1849; *Calanops messinensis* Claus, 1863; *Pontellopsis speciosa* Brady, 1915b; and *Pontellopsis aequalis* Mori, 1932]
***Pontellina pulchra Dana,* 1952
[*Pontellopsis perspicax* (Dana) 1849]
Pontellina platychela Fleminger and Hulsemann, 1974
**Pontellina morii* Fleminger and Hulsemann, 1974
[=*P. Plumata* Mori, 1937]
Pontellina sobrina Fleminger and Hulsemann, 1974

Genus **Ivellopsis** Claus, 1893

**Ivellopsis elephas* (Brady) 1883
[Syn: *Pontella elephas* Brady, 1883]

FAMILY *PONTELLIDAE*

Cephalon separated from T-I, often with lateral cephalic hooks; rostrum bifurcated, ending in two prongs with thickened base, often bearing a lens; eyes usually prominent with one or two pairs of dorsal subcuticular eye lenses and a medioventral eye lens; T-IV and T-V fused together or separated; posterior lateral margin of T-V often produced posteriad; urosome usually asymmetrical, one to three-segmented in female and five-segmented in male; A-1 of female 16–24 segmented, with last two segments usually fused; right A-1 of male geniculate and strongly modified; A-2 with B2 and Ri1 fused together, Re small with five segments; terminal segment of Re shortened, second segment longest; Mnd blade provided with five to seven teeth; Mx-1 with B1 large, B2, Re and Ri relatively small; Mx-2 with distal seta long and roubustly developed in most of the genera, with long setae, B2 and Re relatively small; Re of P1 to P4 three-segmented; Ri of P1-P4 two or three-segmented; female

P5 small, Re of one or two segmented; male P5 uniramous, each leg three or four-segmented, right P5 being chelate.

A discussion of the outline classification of the family Pontellaidae has been presented by Silas and Pillai (1971). Claus (1893) divided the family Pontellidae into three subfamilies, namely Eupontellinae (to include the genera *Pontella, Pontellina* and *Anamalocera*); Pseudopontellinae (to include *Monops* (=*Pontellopsis*) and *Pseudopontella*) and Calanopinae (for the genus *Calanopia*). The genus *Pontella* was further divided into two subgenera, *Labidocera* Lubbock and *Eupontella* Claus. Genus *Pontellina* was divided into five subgenera, namely *Eupontellina* Claus, *Iva* Lubbock, *Ivella* Lubbock, *Ivellina* Claus and *Ivellopsis* Claus. This system has been ignored by subsequent workers, and at present nine genera of the family Pontellidae are recognised, of which the following seven are represented in the Indian Ocean: *Anomalocera* Templeton, 1837; *Calanopia* Dana, 1852; *Labidocera* Lubbock, 1853; *Pontella* Dana, 1849; *Pontellopsis* Brady, 1883; *Pontellina* Dana, 1852 and *Ivellopsis* Claus, 1893. Present collections contain species belonging to five genera of the family.

DIAGNOSIS TO THE IDENTIFICATION OF THE GENERA OF THE FAMILY PONTELLIDAE FROM THE INDIAN SEAS

1. Right A-1 of male with four separate segments beyond hinge; Mxp with six distinct segments; Ri of P1 two-segmented; female urosome consisting of two segments 2

   Right A-1 of male with only two segments beyond hinge; Mxp with five to seven segments; Ri of P1 three-segmented; female urosome consisting of 1-3 segments 3

2. One pair of dorsal cuticular eye lenses and one ventro-median eye lens present on cephalon ..... *Labidocera* Lubbock

   Dorsal cuticular-eye lenses and ventro-median eye absent ..... *Calanopia* Dana

3. Body relatively large; T-IV and T-V separated; prosome more or less of the same width throughout; lateral cephalic hooks prominant; one pair of dorsal cuticular eye lenses and rostral lens well developed; medio-ventral eye prominent ..... *Pontella* Dana

   Body relatively small; T-IV and T-V fused; prosome more broadened in the mid-lateral margin and narrowed anteriad; lateral cephalic hooks absent; rostrum with filamentous fanges rostral lens absent; dorsal cuticular lenses and ventral lens feebly developed 4

4. A-2, Mnd palps and B2 of female P5 with normal setae; CR distinctly separated from anal segment ..... *Pontellopsis* Brady

   A-2, Mnd palps and B2 of female P5 with well developed, long plumose setae; CR with right ramus indistinctly separated from anal segment ..... *Pontellina Dana*

SPECIES OF PONTELLIDAE FROM THE INDIAN OCEAN

FAMILY *PONTELLIDAE*

Genus **Anomalocera** Templeton, 1837

(Synonym: *Irenoeus* Goodsir, 1843. Type : *I. splendidus* Goodsir)

Anomalocera patersoni Templeton, 1837

Anomalocera patersoni Templeton, 1837, p. 35, pl. 5, figs. 1-3 (*Type locality* : Irish Sea)
Irenoeus splendidus Goodsir, 1843.
Pontia patersoni Kroyer, 1849.
Pontella eugenioe Leuckart, 1859.
Irenaeus Patersonii Claus, 1863.

Records from Indian Ocean: *Anomalocera patersoni* Thompson, 1900, p. 283 (South African Coast-region of the Agulhas Current (?); Wolfenden, 1906, p. 1020 (Maldive Islands), Sewell 1932, p. 350 (Only remarks).

Other Records: Brady (1878), Giesbrecht (1892), Canu (1892), Karawajew (1894), Giesbrecht and Schmeil (1898), Sars (1903), Wheeler (1901), Breemen (1908), Fish (1925), Wilson (1932, 1950), Marukawa (1921).

Remarks: Commenting on Thompson's (1900) record of this species, Sewell (1932, remarks that a single specimen was obtained by Thompson in the Wyse Collection from a sample taken near the southern extremity of Africa. The position at which the sample was taken is given as "20°S; 38° 40′ E. Taken after 24 hours of running from bathroom tap which leads from a tank on top deck, kept full for flushing and other purposes". Wolfenden's record of a single female 3.6 mm is the first definite record of this species from the Indian Ocean. Its absence in the "Investigator" collections from the Bay of Bengal and the Arabian Sea led Sewell (1932) to comment that apparently the species is rare in this region. Voronina's list of 23 species of Pontellidae from the Indian Ocean (Voronina, 1962) does not contain this species. Hence, more information on this species from the Indian Ocean will be necessary, especially as Wolfenden (1906) has not described nor illustrated his specimen.

While recording this species from "Albatross" station 5234 (10°00′N; 124°46′ 06′ E in the Philippines), Wilson (1950) remarks that this species "appears in the Monaco, *Siboga*, and *Carnegie* plankton. It is a widely distributed species and is often abundant in a favourable locality". We are unable to find a reference to this species in the *Siboga*-list of A. Scott (1909).

Genus **Calanopia** Dana, 1852

Pontella (part) Dana, 1849. (*Pontella elliptica* Dana, 1849)
Calanopia Dana, 1852. (*Calanopia elliptica* Dana, 1852)

Type species: *Calanopia elliptica* Dana, 1852

(*Pontella elliptica* Dana, 1849) "In Freto Banca, Lect die 2 March, 1842") Cephalon with or without lateral cephalic hooks; dorsal eye lenses absent; rostrum long, bifurcate and without eye lenses; cephalon and T-I separated; T-IV and T-V

fused, postero-lateral corners produced; female urosome two-segmented, male urosome of five segments; female A-1 with 17-19 segments, right A-1 of male geniculate with four distinct segments distal to hinge; Re of A-2 shorter than half length of Ri; Mxp with at least six segments; Ri of P1 to P4 with two segments; female P5 uniramous, with 3 to 4 segments; male P5 on right side forming an ill-developed chela.

The genus *calanopia* was established by Dana in 1852 to accommodate the species *elliptica* described earlier by him (Dana, 1849) under the genus *Pontella*. Subsequently, the following 12 species of the genus have been described from the world oceans; *C. americana* Dahl, 1894 (Atlantic); *C. aurivillii* Cleve, 1901; *C. minor* A. Scott, 1902; *C. thompsoni* A. Scott, 1909; *C. herdmani* A. Scott, 1909; *C. media* Gurney, 1927; *C. sarsi* Wilson, 1950; *C. biloba* Bowman, 1957 (Atlantic); *C. australica* Bayly and Greenwood, 1966; *C. sewelli* Jones and Park, 1967; *C. seymouri* Pillai, 1969 and *C. parathompsoni* Gaudy, 1969. Of these *C. americana* and *C. biloba* are known from the Atlantic, *C. media* from the Suez Canal and the rest from the Indo-Pacific. According to Bowman (1957) the records *C. minor* and *C. elliptica* from the Atlantic (Wilson, 1942, 1950) should be regarded as erroneous. Tsuruta's (1963) record of *C. americana* from northern Indian Ocean is doubtful. Of the 9 species recorded or described from the Indian Ocean, 7 species are represented in the collections examined during the present study.

A perusal of the morphological characters of different species assigned under the genus *Calanopia* recorded from Indian Ocean indicates that they are primarily divisible into two broad groups, based on the presence in the female P5 of one or two segments distal to the seta-bearing basal segment, a view suggested earlier by Bayly and Greenwood (1966). Additional characters which were found to be useful in distinguishing 'species groups' under the genus are:

(1) the structure of rostrum; (2) presence or absence of cephalic side-hooks and (3) the structure and configuration of the chela of the terminal segment of the right male P5.

The following key aids in separating the species group in the genus *Calanopia* from Indian Ocean:

1. Cephalic side hooks lacking; female P5 with one or two segments distal to B2 2

   Cephalic side hooks distinct; female P5 with two distinct segments distal to B2 4

2. Only one segment distal to B2 in female P5; rostrum bulged basally, tapers and converges distally; subterminal notch on rostrum rudimentary or absent....3

   Two segments distal to B2 in female P5; rostrum with flanges tapers irregularly to tip and diverges distally, subterminal notch on rostrum rudimentary or present 4

3. Distinct thumb on chela of right male P5.....*"aurivillii"* group

   Thumb rudimentary or absent on chela of male P5.....4

4. Subterminal notch on rostral flange and thumb on right P5 of male rudimentary .....*"elliptica"* Group

Subterminal notch on rostrum distinct; thumb lacking on chela of Group male right P5 ..... *"thompsoni"* Group

SPECIES GROUPS IN THE GENUS *CALANOPIA* FROM THE INDIAN OCEAN

FEMALES	MALES
	"AURIVILLII" GROUP
Calanopia aurivillii Cleve 1901	*C. aurivillii* Cleve, 1901
(*Calanopia minor* (part), Sewell, 1912)	
Calanopia minor A. Scott, 1902	*C. minor* A. Scott, 1902
(*C. minor* (part), Sewell, 1912)	
	"ELLIPTICA" Group
Calanopia elliptica Dana, 1852	*C. elliptica* Dana, 1852
(*Pontella elliptica* Dana, 1849)	
Calanopia herdmani A. Scott, 1909	*C. herdmani* A. Scott, 1909
Calanopia media Gurney 1927	*C. media* Gurney, 1927
	"THOMPSONI" Group
Calanopia thompsoni A. Scott, 1909	*C. thompsoni* A. Scott, 1909
Calanopia australica Bayly and Greenwood, 1966	*C. australica* Bayly and Greenwood 1966
Calanopia seymouri Pillai, 1969	*C. seymouri* Pillai, 1969
Calanopia parathompsoni Gaudy, 1969	*C. parathompsoni* Gaudy, 1969

Relationship of species in the genus Calanopia *from the Indian Ocean:*

Of the three "species groups", the *'aurivillii'* group which contains *aurivillii* and *minor* and the *"thompsoni"* group which includes *thompsoni, australica, seymouri* and *parathompsoni* represents independent and distinct species assemblages. In the *"elliptica"* group there is a distinct morphological gap separating *herdmani* from the other two species. Except for the absence of cephalic hooks, other features like A-1 of male, and P5 show that it is more akin to the *'thompsoni'* group of species. *Calanopia elliptica* and *C. media* are more closely related species in the *'elliptica'* species group.

Calanopia minor A. Scott, 1902; (Fig. 1)

Calanpoia minor A. Scott, 1902, pp. 406–407, pl. 1, figs. 1–5 (*Type locality*: Described from both sexes from 8 localities, three in the Red Sea (24°36′N, 36°08′E; 91°53′N, 39°08′E; 15°19′N, 41°55′ E); one from the Gulf of Aden (40′W. of Aden); and four from the Arabian Sea (12°24′N, 49°24′E; 54°33′E; 9°36′N, 65°56′E; 11°33′N, 8°37′N, 71°27′E).

Calanopia minor (Partim) Sewell, 1912, p. 368 (Bay of Bengal).

Material Examined: From 114 R. V. VARUNA stations in the shelf waters of the west coast of India (between 09°20′–12°00′N, and 74°18′E–76°18′E) and from Laccadive Sea (between 09°40′–11°40 N. and 72°00′–74°10′E); from the inshore waters off Bombay from surface hauls made between 0630 and 0730 hrs during December, 1966 and March and April, 1967; from Andaman Islands (AN-1, AN-7, AN-8, AN-18, AN-22, AN-23, AN-24).

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	40	1.24–1.40	1.37	1.8:1
Adult male:	23	1.11–1.18	1.16	2.0:1

Description: FEMALE: Cephalon enlarged medially, maximum width of body at T-II; posterior corners of T-V are pointed and posteriorly produced; rostrum bulged at base and tapers to tip which end in pointed processes; urosome two-segmented; genital segment swollen on either lateral margins; U-II 1.5 times longer than the genital segment; CR twice as long as broad; *P 5*: symmetrical, Re one segmented, terminates distally in one longer inner spine and one shorter outer spine; former with distal half finely setose; another short spine present on outer median margin of terminal segment.

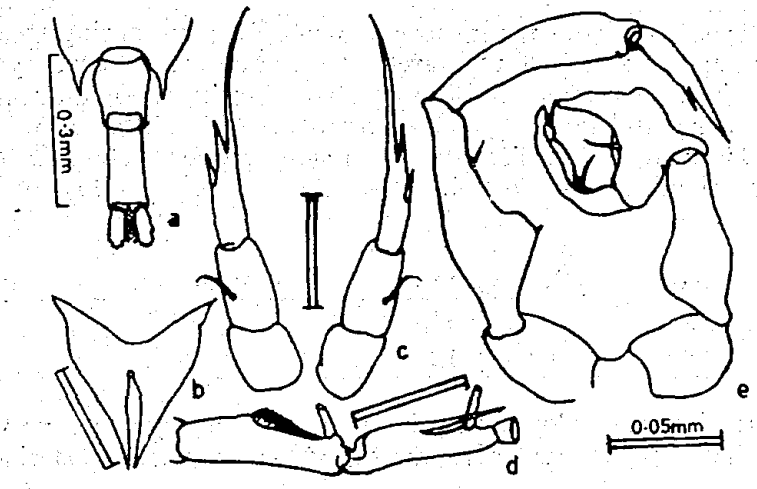

Fig. 1. *Calanopia minor* : a. Urosome - female; b. rostrum - female; c. P 5 - female; d. A 1 - male (partlyenlarged), and e. P 5 - male. (Scale: Single line denotes 0.3 mm and double line denotes 0.05 mm in all the text figures).

MALE: Prosome resembles that of female; lateral margin of T-V with a small setule one on either side; urosome five-segmented; anal lamina crescentic; CR 2.5 times longer than broad; Right *A*-1: geniculate, with segment 18 carrying fine villiform serrations along its dorsal margin; fusion segment 19–21 with a spinous seta at its dorsal midmargin; *P 5*: Right leg: with B2 swollen towards its proximal half; palm-like joint of Re 1 invaginated along its inner margin and with a seta; thumb short and naked; claw spoon shaped, and provided with two inner marginal setae; left leg: with B2 considerably swollen at its proximal end on inner margin, the bulged portion is produced into a small tooth-like spine; a small seta present at distal inner margin of segment; Re 1 more than 4 times longer than broad and with a disto-lateral spine; terminal segment ends in two subequal spines, outer one of which is long and thick; a small seta present on dorsal mid-margin of segment.

Remarks: This species is very closely allied to *C. aurivillii* and *C. americana*. It is well distributed in the coastal and oceanic waters of the Indian Seas and always occurs in good numbers in plankton collections.

Distribution: Indian and Pacific Oceans. From Indian Ocean: Bay of Bengal and Andaman Sea (Sewell, 1912, 1932, INVESTIGATOR stations 614; present record; Tsuruta, 1963); Lawson's Bay, Waltair, (Ganapathi and Shanthakumari, 1961); Ceylon Pearl Banks and Gulf of Mannar (Thompson and Scott, 1903; Sewell, 1914); Indian Coastal waters (Kasthurirangan, 1963; present record); Laccadive Sea (present record); Maldive Archipelago (Wolfenden, 1906); Arabian Sea (A.Scott, 1902; Thompson and Scott, 1903; Cleve, 1903); Bombay Coast (present record); Red Sea and Gulf of Aden (Cleve, 1900; A. Scott, 1902; Cleve, 1904; Pesta, 1941); Between Port Said and Suez (Thompson and Scott, 1903); Persian Gulf (Pesta, 1912); central northern Indian Ocean (Tsuruta, 1963); Madagascar (Gaudy, 1967); south African Coast (Decker and Mombeck, 1964; Decker, 1964).

Calanopia aurivillii Cleve, 1901; (Fig. 2)

Calanopia aurivillii Cleve, 1901, pp. 37–40, pl. 2, figs. 17–22, pl. 3, figs. 1–10 (*Type locality*: Semau Sound, Malay Archipelago).
Calanopia minor (partim) Sewell, 1912, p. 368.

Material Examined: From the inshore waters off Cochin during December, 1968 to February, 1969; January, 1970 to March, 1970; and during February and March, 1971; from the inshore waters off Bombay, from surface zooplankton collections made during January and February, 1967, between 0630 and 0730 hrs; from Palk Bay on 22–6–1959 from the surface samples made between 0600 and 0615 hrs and from Andaman Islands (AN-1, AN-4, AN-8, AN-9, and AN-17).

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	23	1.22–1.31	1.26	2.0:1
Adult male:	18	1·04–1·12	1·09	2·0:1

Description: FEMALE: Prosome widest at middle segment; rostrum bulged proximally and tapers to tip; posterior margin of T-V produced posteriad into acute

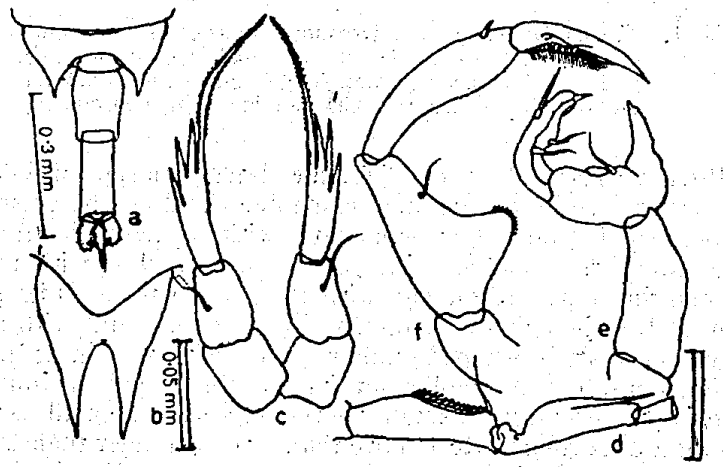

Fig. 2. *Calanopia aurivillii* : a. Urosome - female; b. rostrum - female; c. P 5 - female; d. A 1 - male, and e. P 5 - male.

spines, tip of which reaching to the middle of genital segment; urosome of two segments; genital segment swollen proximally and ventrally genital boss is slightly

swollen and pigmented; U-II slightly longer than genital segment and three times longer than broad; CR symmetrical, twice as long as broad; *P* 5: symmetrical; Re one-segmented, apex of which terminates in three spines, inner being distinctly longer and plumose at its distal margins; another disto-lateral spine present on Re.

MALE: Prosome resembles that of female; urosome of five segments; CR symmetrical, twice as long as broad; Right *A*-1: geniculate and bears few villiform spines towards distal half of segment 18; fusion segment 19–21 with very small spinnules along its dorsal margin; another ill developed spinous seta present along its mid-dorsal margin; *P* 5: Right leg: B2 swollen towards its proximal half; palm of terminal segment with a well developed thumb which is provided with a basal seta; claw spoon-shaped, slighty swollen at tip and provided with one outer marginal seta, one terminal seta and two inner marginal setae; left leg: with B2 highly swollen and gibbose, swollen inner margin being crowned with 10–12 small spinule; Re 1 three times longer than broad and carries a disto-lateral spinous seta; terminal segment ends in two subequal spines of which outer one is much thicker and longer than inner spine; the segment with a dorsal spinous seta towards its mid-length.

Remarks: A. Scott (1909) redescribed this species based on material collected from Ceylon Pearl Banks. Sewell (1912) recorded this species from the coast of southern Burma under *Calanopia minor* which he later (1932) corrected. *C. aurivillii* is closely allied to *C. minor* and *C. americana*, latter species being restricted to the Atlantic Ocean.

Distribution: Pacific and Indian Oceans. From Indian Ocean: Malay Archipelago (Cleve, 1901); Burmese Coast and Bay of Bengal (as *C. minor*, Sewell, 1912; from INVESTIGATOR stations: 555, 556, 558, 583, 587, 588, 590, and 591, Sewell, 1932; Andaman Islands (present record); Madras Coast (Krishnaswamy, 1953); Gulf of Mannar (Sewell, 1914, Kartha, 1959); Palk Bay (present record); Galle Harbour, Ceylon (A. Scott, 1909); Indian coastal waters (Kasthurirangan, 1963); present record; Trivandrum Coast (Saraswathy, 1966); Cochin (present record); Bombay Coast (Pillai, 1968; present record)

Other Records: Farran (1929, 1936), and Wilson (1950), record this species from Off New Zealand and Great Barrier Reef (Farren), and 11 "Albatross" stations among the *Phillippine* islands (Wilson).

Calanopia elliptica (Dana) 1849; (Fig. 3)

Pontella elliptica Dana, 1849, p. 27 (*Type locality:* Banka Strait, east of Sumatra).

Calanopia elliptica Dana, 1852, p. 1132; 1855, pl. 79, figs. 6 a-b; Giesbrecht, 1892, p. 441, pl. 31, figs. 21, 23–26, 31, 32; pl. 38, figs. 42, 47; pl. 40, figs. 49–53; Giesbrecht and Schmeil, 1898, p. 132.

Material Examined : From R. V. VARUNA stations in the shelf waters of the west coast of India (between 09°20′-12°00′N and 74°40′-76°18′E) and from Laccadive Sea (between 09°40′11°40′N and 72°00′-74°10′E); from Cochin Backwater, in the collections made from surface waters during March-April, 1969 and April, 1970 at 0600–0800 hrs; from Vizhinjam, surface zooplankton collections made on 6–2–1961 at 1800 hrs and from Andaman Islands (AN-2, AN-3, AN-4, AN-21, AN-22, AN-23, AN-24).

Size:

	No.	Range (mm)	Mean (mm)	P:UR ratio
Adult female:	25	1.69–1.78	1.75	1.9:1
Adult male:	16	1.62–1.71	1.69	2.0:1

Description: FEMALE: Cephalon enlarged, more than twice as long as broad; cephalon anteriorly conically rounded; rostrum bifid, bulged at base and ending in acute points posterior corners of T-V pointed, symmetrical and project posteriad; lateral margin of T-V with a short seta each on either side; urosome two-segmented, genital segment as long as U-II; genital opening situated on a cushion-like base, which is bulged; CR three times longer than broad; *A-1*: with 17 perceptible segments; *P5*: asymmetrical; Re of two segments, those of left leg distinctly longer; Re 1 with one median and one disto-lateral spine; Re 2 ending in an acute spine and carry two outer marginal spines; all spines are with fine lateral serrations.

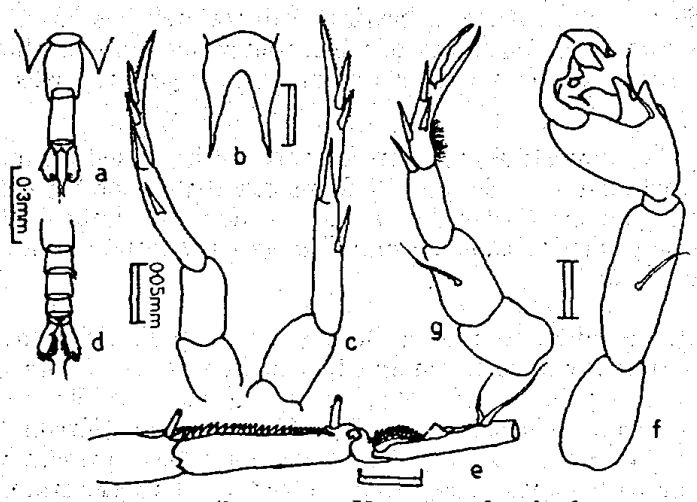

Fig. 3. *Calanopia elliptica* : a. Urosome - female; b. rostrum - female; c. P 5 - female; d. urosome - male; e. A 1 - male, and f. P 5 - male.

MALE: Prosome resembles that of female, except that right posterior margin of T-V asymmetrically pointed, being longer than that of left; urosome of five segments; U-II produced at its distal posterior margin into a spinous process with acuminate tip; CR more than three times longer than broad; Right *A*-1: geniculate, segments 13-16 swollen; segment 17 with a distal dorsal spine directed distad; segment 18 with a denticulated plate on its dorsal margin carrying about 31 villiform teeth; fusion segment 19–21 with small teeth on its proximal half; *P 5*: Right leg: terminal segment modified as a chela; palm-like joint of segment (chela) with three inner marginal processes, which are blunt and tooth-like; distal claw of chela provided with three processes along its inner margin; subterminal segment more than three times longer than broad; left leg: Re 1 with two outer marginal spines, one at its mid-outer margin and another disto-laterally; Re 2 with two outer marginal spines and terminates in a strong acute spine, which is provided with fine setules on its outer margin.

Remarks: This species is fairly widely distributed in the Indian Ocean and the Western Pacific. We are unable to find any definite records of it from the Eastern Pacific, nor is it known from the Atlantic. Wilson's (1942) record of this

species from *Carnegie* Cruise No. 7, Stn. 32 (Caribbean Sea, 15°18′N, 68°11′W) has been shown to be erroneous, and the material described as a new species, *Calanopia biloba* by Bowman (1957).

Bowman's (1957) remark that Gurney (1927) did not find *C. elliptca* in the Suez Canal is not correct as it was recorded by Gurney from Port Taufiq and Kabret, the latter from the Canal. Apparently what Bowman meant was that *C. minor* Scott was not obtained during the Cambridge Suez Expedition reported on by Gurney though Thompson and A. Scott (1903) had earlier collected it from Suez Canal and in the Mediterranean near Port Said (Station 37).

From its distribution it is clear that *C. elliptica* is chiefly a neritic species. Giesbrecht (1896) and Cleve (1901) have given descriptions of this species from the Red Sea and Malay Archipelago respectively. There is hardly any account on the life-history stages of this species from this region, and a detailed description of the species itself will be desirable.

Distribution: Indo-Pacific : from Indian Ocean: west of Sunda Is. (Tsuruta, 1963); Malay Archipelago (Cleve, 1901; as '*C. elliptica* Brady'; A. Scott 1909: from 41 SIBOGA stations); Bay of Bengal (Thompson, 1900; Sewell, 1912; 1932; INVESTIGATOR stations: 540–542,544, 547, 555, 556, 558, 561, 574, 575, 578, 584, 587, 588, 590 and 614) Andaman Islands (Sewell, 1932; present record); Lawson's Bay, Waltair (Ganapathi and Shanthakumari, 1961); Madras Coast (Krishnaswamy, 1953); Gulf of Mannar (Sewell, 1914; Kartha, 1959); Ceylon Pearl Banks (Thompson and Scott, 1903); Southeast Arabian Sea (Tsuruta, 1963); Indian coastal waters (Kasthurirangan, 1963); Vizhinjam Coast (present record); Trivandrum Coast (Menon, 1945; Saraswathy, 1966); Cochin backwater (George, 1958, Pillai, 1972; present record); Maldive Archipelago (Wolfenden, 1906); Laccadive Sea (present record); Arabian Sea (A. Scott, 1902; Cleve, 1904; Pesta, 1913; Sewell, 1947); Red Sea (Giesbrecht, 1891, 1896; Thompson, 1900; A. Scott, 1902; Cleve, 1903; Thompson and Scott, 1903; Gurney, 1927; Pesta, 1941); Gulf of Aden (Cleve, 1903); Vicinity of Muscat and Bushire, Persian Gulf (Pesta, 1912 ;as *calanopia* sp.); Suez Canal (Gurney, 1927); central northern Indian Ocean (Tsuruta, 1963); Madagascar (Gaudy, 1967); African Coast (Thompson, 1900; Decker and Mombeck; 1964).

Other Records: Dana (1949, 1852), Brady (1883); Giesbrecht (1892), Giesbrecht and Schmeil (1898), Farran (1936), Mori (1937), Dakin & Colefax (1940), Wilson (1950), Tanaka (1964).

Calanopia herdmani A. Scott, 1909; (Fig. 4)

Calanopia herdmani A. Scott, 1909, pp. 179–180, pl. 49, figs. 9–16 (*Type locality*: Described from both sexes from "Siboga" stations 109 (6°07′N, 121°44′E), 117 (1° 15′N, 123°37′E-N. W. of Celebes), 141 (1°04′S, 127°25′E - Mollucas), 142 (0°24′S, 127° 36′E), and 143 (1°4′S, 127°52′E)1.

Material Examined: From Gulf of Mannar during three surface zooplankton collections made during 2100–0300 hrs on 13-12-1967; from Andaman Islands (AN-19, AN-20, AN-22, AN-23 and AN-24).

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	9	1.86–1.97	1.88	2.2:1
Adult male:	6	1.72–1.79	1.75	2.0:1

Description: FEMALE: Cephalon ovate and narrowly rounded; T-V posteriorly produced into spiniform processes reaching to half of genital segment; rostrum stout, pointed towards tip; distal end of inner margin of rostral prong barbed; urosome two-segmented; genital segment slightly longer than U-II and slightly produced ventrally distal to genital opening; U-II twice as long as broad; CR asymmetrical, right leg slightly longer; *P* 5: symmetrical, Re two-segmented; Re 1 long and slender, more than three times longer than broad; two moderately stout spines present on distal portion of outer margin of segment; Re 2 short, 1.5 times longer than broad and terminates in a stout spine; outer distal margin of segment is provided with two small spines.

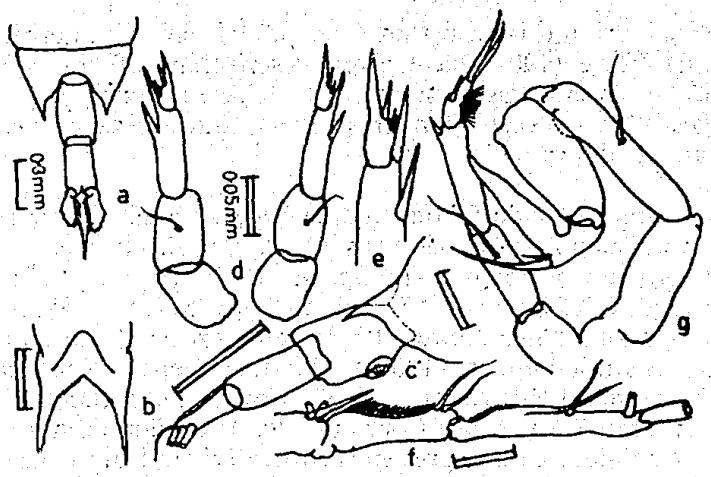

Fig. 4. *Calanopia herdmani* : a. Urosome - female; b. rostrum-female; c. right lateral view of urosome - female; d. P 5 - female; e. enlarged terminal part of P 5 - female; f. A 1 - male, and g. P 5 male.

MALE: Prosome resembles that of female; posterior margin of T-V pointed and extends posteriad up to posterior margin of U-I; urosome five-segmented; CR symmetrical three times longer than broad; Right *A*-1: geniculate, segment 17 with an anteriorly directed small spine directed anteriad; segment 18 with a toothed plate carrying villiform teeth proximally and coarse denticulations distally; segment 19–21 with short teeth along its proximal half and a spinous seta at its mid-dorsal margin; *P* 5: Right leg: with terminal segment oval in shape, and chelate; palm simple with a small bud at its outer distal tip; claw-like joint spoon-shaped with a long spinous seta and a very short seta at its proximal half at point of curvature of claw; left leg: slender, rather cylindrical; Re 1 four times longer than broad and provided with a small spine disto-laterally; Re 2 ends in two moderately long subequal spines, of which outer one is distinctly longer; outer margin is provided with a slender spine and the inner margin sparsely hirsute.

Remarks: Scott (1909) did not mention the asymmetry of the CR which is distinct in the females. This species can easily be identified by the large size, absence of the cephalic hooks and the characteristic features of the *P 5* in both sexes.

Distribution: Indo-west Pacific, From Indian Ocean: Malay Archipelago (A. Scott, 1909); Andaman Islands INVESTIGATOR station 614: (Sewell, 1932; present record); present record of this species from Gulf of Mannar extends its known range of distribution to the Indian waters.

Calanopia media Gurney, 1927; (Fig. 5)

Calanopia media Gurney, 1927, pp. 153-154, fig. 20 a-f (*Type locality*: Both sexes described from Port Taufiq; Kabrat; Toussom and Ismailia in Suez Canal).

Material Examined: Five females and three males collected from the Red Sea by Prof. B. Kimor and personally sent to Dr. E. G. Silas for confirmation of identification (Collected from Tiara on 20–10–1967 from surface; depth at Station 25 fathoms).

Size:

	No.	Range (mm)	Mean (mm)	P : UR ratio
Adult female:	5	1.68–1.98	1.82	2.3: 1
Adult male:	3	1.60–1.95	1.76	2.1: 1

Description: FEMALE: Cephalon anteriorly conically rounded; rostrum bifid with acuminate tips; T-IV and T-V fused,. T-V produced symmetrically posteraid into pointed processes tips of which reaches to mid-lateral margin of genital segment; urosome of two segments; genital segment longer than anal segment, and with two short spines on its right side originating from ventral margin and situated above fold of cuticle; genital opening situated on an elevated genital boss; CR symmetrical, inner margin of the rami slightly indented. *P* 5: symmetrical; Re 1 with two marginal spines on distal half; Re 2 with two subequal marginal spines, proximal one being smaller; segment terminates in a strong distal spine.

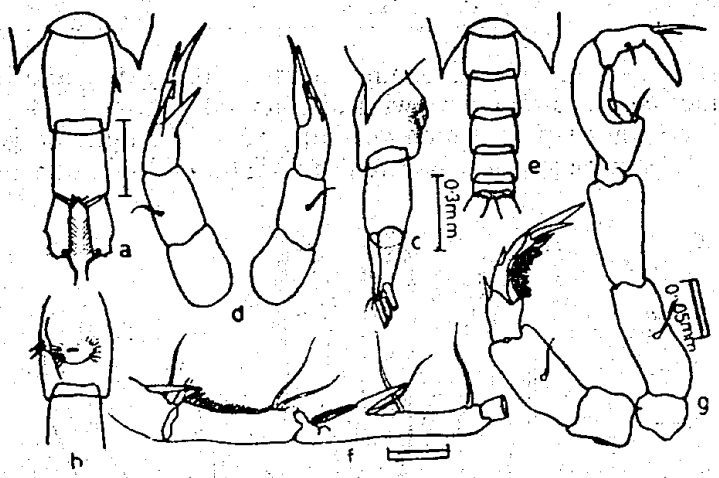

Fig. 5. *Calanopia media* : a. Urosome - female; b. urosome - ventral view of the female genital segment; c. right lateral view of the female urosome; d. P 5 - female; e. urosome-male; f. A 1 - male, and g. P 5 - male.

MALE: Prosome resembles that of female; urosome five-segmented, segments symmetrical; CR symmetrical, almost divergent; Right *A*-1 geniculate; segment 18 with a toothed plate on its dorsal margin, having villiform teeth on proximal half and dentate teeth on distal half; another small toothed plate present on proximal half of fusion segment 19–21, from mid-dorsal margin of which a conical stout spine arises which is indicative of fusion between 19 and 20–21 segments; *P* 5: Right leg chelate; finger having on its outer margin a well developed spine at base of which is present a small seta; at about mid-length of finger, on inner

margin are present two subequal setae; a blunt thumb-like process present towards base of hand which carry an oblong flap with a seta close to its base; left leg: with its distal segment provided with two terminal spines, one subterminal spine and one marginal spine; subterminal segment with a distal outer marginal spine.

Remarks: This species has not been recorded outside Suez Canal since its original description.

Distribution: Suez Canal (Gurney, 1927); Tiara, Red Sea (Pesta, 1941; Kimor, Personal communication).

Calanopia thompsoni A. Scott, 1909; (Fig. 6)

Calanopia thompsoni A. Scott, 1909, 178–179, pl. 49, figs. 1–8 (*Type locality*: Both sexes described from four "Siboga" stations: 16 (6°59′S, 115°24′E), 142 (0°24′S, 127° 36′E), 205 (4° 57′S, 122°43′E) and 213 (6°04′S, 120°23′E).

Material Examined: From the Gulf of Mannar, during surface zooplankton collections made on 13–12–1967, between 2100–2200 hrs; on 15–1–1969 between 2100–2200 hrs; from Vizhinjam Coast, on 13–10–1958, at 0800 hrs from surface; and from Andaman Islands (AN-14, AN-15, AN–17 AN-18, AN-19).

Size:

	No.	Range(mm)	Mean (mm)	P: UR ratio
Adult Female:	29	2.62–2.46	2.68	2.2:1
Adult Male:	14	2.19–2.31	2.22	1.0:1

Description: FEMALE: Cephalosome ovate, elongate and slender; it is angular in outline; cephalic segments with distinct side hooks; T-V produced posteriorly into strong spines tip of which reaching to half length of genital segment; rami of rostrum moderately stout, pointed and distal end of inner margin barbed;

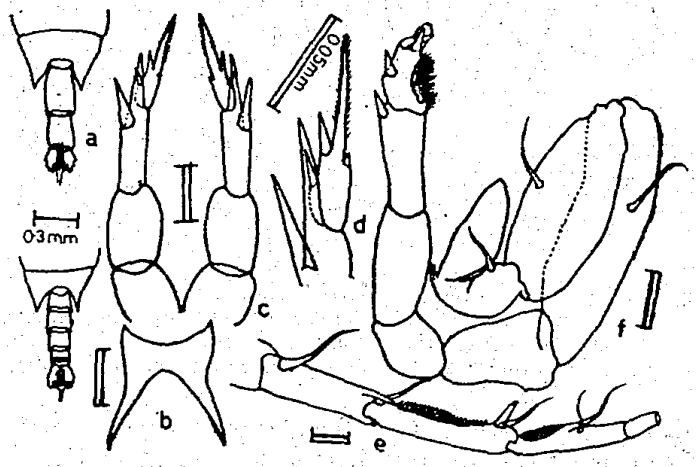

Fig. 6. *Calanopia thompsoni* : a. Urosome-female; b. rostrum-female; c. P 5 - female; d. P 5 - female, terminal part enlarged; e. A 1 - male (part); and f. P 5 - male.

urosome two-segmented, genital segment slightly longer than U-II; it is produced on its ventral side anteriorly and posteriorly into two blunt lobes; genital opening situated on a genital boss; CR asymmetrical, left ramus slightly longer; *A-1*: of 19

perceptible segments, when extended reaching to posterior margin of T-V; *P 5*: symmetrical, Re of 2 segments; Re 1 moderately long, distal portion of outer margin provided with two very strong spiniform projections, segment about 3.5 times longer than broad; Re 2 narrow and spiniform, terminating in a moderately long and stout spine, serrated at both margins; segment also provided with two outer marginal spines and a short inner disto-lateral spine.

MALE: Prosome resembles that of female; urosome of five segments; CR symmetrical, 2.5 times longer than broad; Right *A*-1: geniculate, with segment 17 carrying a disto-dorsal spine; segment 18 with villiform marginal teeth; fusion segment 19–21 with villiform teeth on proximal half and a bulbous seta at mid-dorsal margin; *P 5*: asymmetrical, right leg chelate; palm of chela with a short seta at its inner margin; distal claw sharply recurved outwards, and slightly swollen at middle; two subequal spinnules are inserted at proximal portion of bent outside and one seta at inner junction of claw and palm; left *P 5*: moderately broad; Re 1 nearly twice length of Re 2 and with a disto-lateral spine; Re 2 provided with an outer marginal spine and three sub-equal spines distally; outermost terminal spine curved inwards; middle spine blunt, flat and denticulated; inner one pointed; inner margin of terminal segment with setae.

Remarks: Sewell (1932, pp. 342, 343) recorded two 'types' of females of *C. thompsoni* showing *inter se* differences from INVESTIGATOR stations 587 (11°35′00″ N, 98°34′ 15″E) and 614 (Octavia Bay, Nancowrie Harbour respectively. He pointed out that in the large form from station 614, a well marked swelling was present on the right margin of the genital segment of the female; also in these examples the ventral prominance was present more towards the posterior margin and "therefore somewhat further back than as figured by A. Scott". Specimens from station 587 did not show any protuberance either on the ventral margin or on the lateral margin. His specimens collected from stations 590 (11°34′45″N; 98°34′30″E), 614 and from Ceylon Pearl Banks have the same type of female *P5* as figured by A. Scott (1909), but the material collected from station 587 was different in that the female *P5* was more slender than usual and the terminal spine "is nearly twice the length of that it is in the normal form". He has also described the copepodites III-V of both sexes of this species. Based on these consistent differences from *C. thompsoni* (forma *typica*) in the material collected from Nicobar waters during the present study, Pillai (1969) described *Calanopia seymouri* as new to science.

Ummerkutty (1969) collected an abnormal male specimen of *C. thompsoni* from Gulf of Mannar during December, 1959. Five urosomal segments were clearly traceable in his specimen, but their orientation and size are "curiously distorted". He has also, observed that the live animal moved freely without showing any sign if disorder.

Distribution: Pacific and Indian Oceans: From Indian Ocean: eastern Indian Ocean (Chiba, 1856); Burmese Coast (Sewell, 1912); Bay of Bengal (Sewell, 1932: INVESTIGATOR Stations: 587, 590, 614); from Andaman Sea (present record); Waltair Coast (Ganapathi and Shanthakumari, 1961); Madras Coast (Krishnaswamy, 1953); Gulf of Mannar (Sewell, 1914, 1932; Kartha, 1959; Ummerkutty, 1969; present record); Vizhinjam Coast (present record); Trivandrum Coast (Saraswathy, 1966); Madagascar (Gaudy, 1967).

Calanopia australica Bayly and Greenwood, 1966; (Fig. 7)

Calanopia sp. Bayly, 1965, pp. 330–339, 342.

Calanopia australica Bayly and Greenwood, 1966, pp. 99–105, text figures 1 & 2 (*Type locality*: Moreton Bay, Queensland).

Material Examined: 16 Females and 9 males collected from off Komorto Island, Nancowrie Harbour, Nicobar Islands on 24.4.68 at 1745–1845 hrs and on 25.4.68 at 1700 – 1725 hrs from surface plankton samples (AN-17, AN-18).

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	16	1.84–2.06	1.93	2.3:1
Adult male	9	1.76–1.98	1.84	2.0:1

Description: FEMALE: Prosome robust; cephalon angular in outline; rostrum forked, tapers to tip and with a subterminal notch; cephalic hooks present on each side of cephalon; posterior margin of T-V produced into acuminate spines, tip of which reaching to half length of genital segment; short setules present on outer mid-margin of T-V; urosome two-segmented, genital segment 1.8 times longer than broad; ventrally genital opening prominent; CR asymmetrical, left ramus longer; outermost caudal seta on right ramus with spur-like spinnule arising laterally about half length from base; *A-1* : 19-segmented; *P* 5: symmetrical; Re two-segmented; Re 1 three times longer than wide and produced at its disto-lateral outer margin into two subequal spines arranged one behind the other, both spines with serrated margin; distal spine extends to base of terminal spine of Re 2; proximal process projecting outwards; Re with two outer marginal spines and a long terminal spine with fine marginal serrations; a minute spinnule present at inner base of terminal spine.

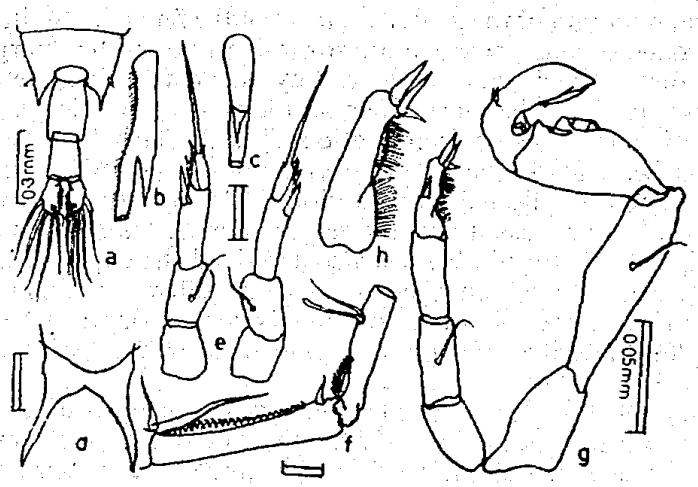

Fig. 7. *Calanopia australica* : a. Urosome - female; b, c. outer caudal seta enlarged; d. rostrum-female; e. P 5 - female; f. A 1 - male; g. P 5 - male, and h. P 5 - left terminal segment of male.

MALE: Prosome resembles that of female; CR symmetrical, outermost caudal seta of right CR without any modifications; Right *A*-1: geniculate; segment 13–16 swollen and partly fused; segments 18 and proximal half of fusion segment 19–21 carry small villiform teeth on their dorsal margins; *P* 5: Right leg chelate; basal palm of chela enlarged with a cluster of small spinnules at its mid inner margin; inner margin of basal portion carrying two smoothly curved projection; a small spine present at junction of proximal and distal portions of claw; distal finger recurved outwards on to basal part, tapering to a point; two small spines present at the outer margin of base of finger; left leg:

4-segmented; Re 1 with an outer disto-lateral spine; Re 2 with an outer mid-marginal spine and three subequal terminal spines; a bunch of setae present on proximal inner margin; outer terminal spine with marginal serrations and directed inwards; middle spine broad, blunt and with serrations on inner margin; inner terminal spine with serrations along both edges.

Remarks: Close structural relationship exists between *C. thompsoni, C. australica, C. seymouri* and *C. parathompsoni* but the present species can easily be separated by the modifications in the genital segment, CR, caudal seta and the P5 of both sexes.

Distribution: So far known only from the type locality; present record of this species from Andman Sea considerably extends its known range of distribution to 10°N into the Indian Seas.

Calanopia seymouri Pillai, 1969

Calanopia seymouri Pillai, 1969, pp. 317–319, figs 1 a-j (*Type locality*: Nancowrie Harbour, Nicobar Is; Andaman Sea).

Description: A detailed description of this species was given by Pillai (1969).

Distribution: Nicobar Island, Andaman Sea.

Genus **Labidocera** Lubbock, 1853

Labidocera Lubbock, 1853
Pontella (part) Dana, 1849
Pontellina (part) Dana, 1852
Pontia Kroyer, 1849

Type species: *Labidocera darwinii* Lubbock, 1853 (off Argentina at Lat. 38°5′S).

Cephalon and T-1 separate; with or without lateral cephalic hooks; cephalon provided with one pair of subcuticular lenses on forehead; rostrum deeply bifurcate and lacking a lens; medio-ventral eye protuberant and extending antero-ventrad between rostral prongs; T-IV and T-V fused, latter usually produced posterad; urosome two-or three-segmented in female and four-or five-segmented in male; P1 with two-segmented R1 and three-segmented Re; Right A1 of male with at least four separate segments distal to hinge between segments 18 and 19/21; Mx-1 with basipod about twice the length of endite-2; Mxp with six distinct segments; P5 in female usually biramous, in male uniramous, right leg with a well developed chela.

Labidocera acutifrons (Dana) 1849; (Fig. 8)

Pontella acutifrons Dana, 1849, p. 30 (*Type locality*: "In mario Pacifico, prope insulam 'El gran Cocal' at. aust. 5°40′long. orient 175°30′; etiam prope insulas "Kingsmill"; lect diebus 25 March; 1 April 1841").

Pontellina acutifrons Dana, 1852, p. 1149; 1855, pl. 80, figs. 11a-h.

Labidocera acutifrons Giesbrecht, 1889, p. 72.

Pontia edwardsi Kroyer, 1849, p. 572, pl. 6, figs. 8–11.

Pontella bairdii Lubbock, 1853, p. 116, pl. 5, figs. 1-6.

Material Examined: From Andaman Islands (AN-17, AN-18).

Size:

	No.	Range (mm)	Mean (mm)	P:UR ratio
Adult female:	2	3.2–3.8	3.65	—
Adult male:	1	—	3.28	—

Description: FEMALE: Segmentation between cephalon & T-I well defined; lateral cephalic hooks absent; median crest on anterior margin of cephalon present; posterior T-V corners produced into broad acuminate lobes; urosome three-segmented, asymmetrical; genital segment unevenly swollen on both sides; U-II broader than long with a spine directed posteriad to its right posterior margin; anal lamina triangular, and situated more towards right half; CR asymmetrical, left ramus being distinctly larger and bearing two rudimentary spines along its outer margin and four caudal setae of which bases of outer three are swollen; *P* 5: asymmetrical; left leg slightly larger; Re ending in two spines, inner spine in turn bifid at tip thus appearing trifid; Ri reduced a conical stout spine.

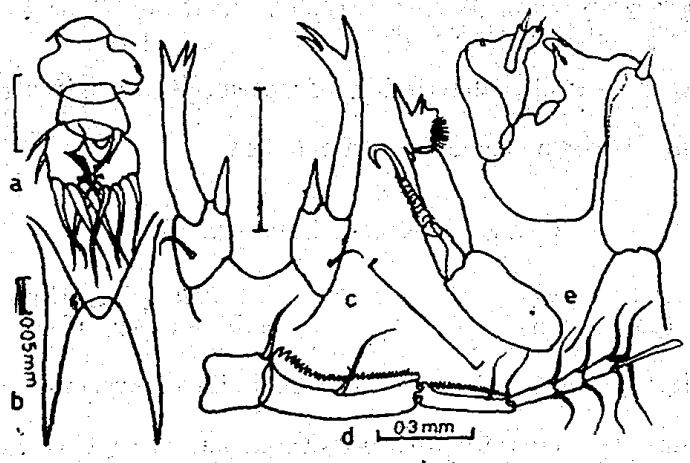

Fig. 8. *Labidocera acutifrons* : a. Urosome - female; b. rostrum-female; c. P 5 - female; d. A 1 - male; and e. P 5 - male.

MALE: Cephalosome as in female except that dorsal eye lenses are conspicuously developed and placed close together; postero-lateral corners of T-V broadly acuminate; urosome five-segmented, with a reduced lateral swelling on its left margin; U-III generally larger than other segments; Right *A*-1: geniculate; a reduced spine present on outer base of first segment; segment 18 and fusion segment 1921 with denticulated plates on their dorsal margins; those on 18 coarse and dentiform while teeth on segment 19–21 are villiform and more closely packed; *P* 5: right leg: chelate; chela swollen at base and with a movable finger carrying a wide flap; a rectangular lateral process, carrying a seta towards its base present on distal base of finger; two short blunt spines present along inner edge of finger and flap; hand with an inner flap; basal part of which has a conical projection bearing an outer marginal spine; left leg: with a transversely ridged, strong, curved filament; penultimate segment with an outer distal spine; proximal segment carry two unequal spines along distal outer margin and a short conical spine slightly further inwards; terminal segment with a patch of short setae along inner margin.

Remarks: This species has previously been collected mainly from the oceanic waters of Indian Ocean. Whenever they occur in the plankton, they never constitute a numerically dominant species.

Distribution: Atlantic, Pacific and Indian Oceans. From Indian Ocean: Andaman Sea (present record); Lawson's Bay, Waltair (Ganapathi and Shanthakumari, 1961); western Indian Ocean (Thompson, 1900; Mullin, 1966); Coast of Arabia, Arabian Sea (Sewell, 1947); Indian Ocean (Voronina, 1962); south African Coast (Decker and Mombeck, 1964). Present record of this species extends its range of distribution to Andaman Sea.

Other Records: For the numerous records of this species from the Atlantic and Pacific Oceans, reference is invited to the list given by Vervoort (1965: 187–188).

Labidocera acuta (Dana), 1849; (Fig. 9)

Pontella acuta Dana, 1849, pp. 30–31 (*Type locality*: 'Prope insulam Mindoro; In mari Sinensia' in 1842).

Pontellina acuta Dana, 1852, pp. 1150–1151; 1855; pl. 80, figs. 12 a-c figs 15, 44, 46; pl. 25, figs. 31, 33; pl. 41, figs. 10, 19, 20, 28, 29, 40.

Labidocera acutum, Giesbrecht, 1892, p. 445, pls. 23.

Labidocera acuta, Giesbrecht and Schmeil, 1898, p. 134; Silas and Pillai, 1967, p. 346-364.

Material Examined: From 28 R. V. VARUNA stations in the shelf waters of the west coast of India (between 09°20′–12°00′N and 74°40′–76°18′E) and from Laccadive Sea (between 09°40′ to 11°40′N and 72°00′-74°10′E); from surface zooplankton collections made at Stations 3562, 3565, 4137; R. V. KALAVA stations 423, 428 in the Laccadive Sea and from Andaman Island (AN-6 to AN-10).

Size:

	No.	Range (mm)	Mean (mm)	P:UR ratio
Adult female:	62	3.01–3.60	3.32	2.8:1
Adult male:	30	2.73–3.21	3.02	2.7:1

Description: FEMALE: Cephalon rounded with a conspicuous anterior rostral hook; lateral cephalic hooks absent; dorsal eye lenses moderately large, wider apart and separated by about twice eye lens diameter; rostrum deeply bifurcate, prongs divergent distally; T-IV and T-V fused, T-V proximally produced into acuminate lobes, tip reaching distal margin of genital segment; urosome three-segmented, about one-third length of prosome; genital segment with a stout postero-lateral conical process present on its right side; U-II as long as broad, anal segment well developed; CR asymmetrical, right ramus 1.7 times longer than broad; third and fourth caudal setae from outer margin proximally thickened; enlarged portion of seta distinctly longer than CR all setae directed posteriad; A-1 with 25 segments; *P* 5 markedly asymmetrical; left leg being stouter and longer; Re ending in three distal spines of which two subterminal ones are well developed; Re with three outer marginal spines and one inner marginal spinnule.

MALE: Cephalon resembles that of female except that dorsal cuticular eye lenses are larger and placed close together; posterior corners of T-V modified into an acutely pointed lobe on left side and a right lobe with a curved process turned lateroposteriad, tip of process not extending beyond U-III; urosome five-segmented; genital segment on its right posterior margin bears a short spine inner to which is present a conical process which is less than half length of genital segment; CR asymmetrical, right ramus being larger and twice as long as broad; caudal setae not bulged at base as in female; Right *A*- 1: geniculate; segment 17 lacking in denticulated ridge; segment 18 with prominent denticulated ridge, extend proximad and overlapping

almost whole length of preceding segment; fusion segment 19–21 with well developed toothed plate extending to two-third length of the segment; segment 22 with distal spiniform process which is as long as segment itself. *P 5*: Right P 5 chelate; B2 large; hand of chela orbicular, with inner margin of hand carrying a trinagular outgrowth; finger short, broad at middle and with 2 inner marginal and 2 terminal setae: left leg: terminal segment distally with three finger-like processes, a small crescentic basal process and a distal outer marginal spine; inner margin of the segment setose; subterminal segment with a disto-lateral spine.

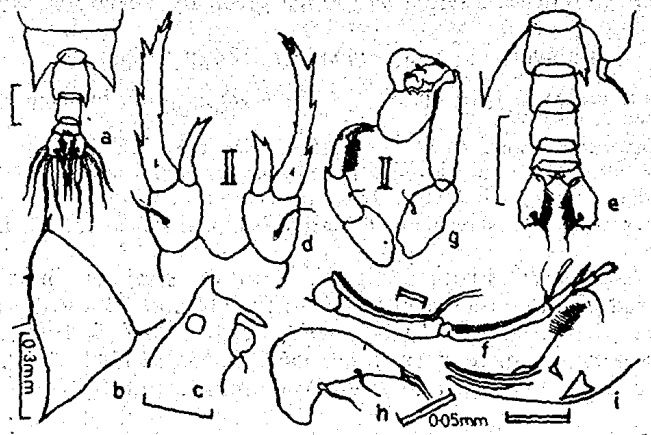

Fig. 9. *Labidocera acuta* : a. Urosome - female; b. right lateral view of T V; c. rostrum - female and anterior part of cephalon; d. P 5 - female; e. urosome - male; f. A 1 - male; g. P 5 - male, and h, i. terminal segments of P 5 - enlarged.

Remarks: *L. acuta* is chiefly a neritic species, widely recorded from Indian Seas. An oceanic cognate of *L. acuta* has recently been described as *L. pseudacuta* by Silas and Pillai (1969).

Distribution: Indo-Pacific. From Indian Ocean: Malay Archipelago (Cleve, 1901: as *L. acutum;* A. Scott, 1909); Bay of Bengal and Andaman Sea (Thompson, 1900; Sewell, 1912; 1932: from INVESTIGATOR stations: 542, 543, 552, 555, 556, 558, 559, 582, 583, 587, 588, 590, 591 and 614; present record; Vizag Coast (Ganapathi and Rao, 1954); Lawson's Bay, Waltair (Ganapathi and Shanthakumari, 1961); Madras Coast (Menon, 1931; Krishnaswamy, 1953); Gulf of Mannar (Sewell,1914); Ceylon Pearl Banks (Thompson and Scott, 1903); Indian Coastal waters (Kasthurirangan, 1963); Trivandrum Coast (Menon, 1945; Saraswathy, 1966) Calicut (Jacob and Menon, 1947); Maldive Archipelago (Wolfenden, 1906); Arabian Sea (Thompson and Scott, 1903; Cleve, 1903; Sewell, 1947); Laccadive Sea (present record); Red Sea (Giesbrecht, 1891; 1896; as *L. acutum;* A. Scott, 1902; Thompson and Scott, 1903; Cleve, 1903, Santucci, 1937); Persian Gulf (Besta, 1912); Western Indian Ocean (Thompson, 1900); Seno *et al.*,1963); Central Indian Ocean (Tsuruta, 1963; Voronina, 1962); Madagasear (Gaudy, 1967); Durban Bay, African Coast (Brady, 1915); South African Coast (Thompson, 1900; Cleve, 1904; Decker, 1964; Decker and Mombeck, 1964).

Other Records: Dana (1849, 1852, 1855), Brady (1883), T. Scott, (1894), Giesbrecht (1892, 1896), Breeman (1908), Mori (1929, 1937, 1964), Wilson (1950), Grice (1962), Tanaka (1964) and Fleminger (1967).

Labidocera detruncata (Dana) 1849; (Fig. 10)

Pontella detruncata Dana, 1849, p. 29 (*Type localities*: "in mari Pacifico, lat. aust. 26°8′, long. occ. 178°; lect. die 18 Ap., 1840. Lat. aust. 5°20′, long. orient. 175°30′; lect. die 25 Mar., 1841: etiam prope insulas "Kingsmill").

Pontellina detruncata Dana, 1852, p. 1143–1145; 1855, pl. 80, figs. 7 a-i.

Labidocera detruncatum Giesbrecht, 1892, p. 445, pls. 23, 25, and 41.

Labidocera detruncata Giesbrecht and Schmeil, 1898, p. 135.

Labidocera detruncata var. Wolfenden, 1906, pp. 1017–1018, pl. 98, figs. 16, 19, 21, 34, and 36.

Labidocera detruncatum var. Dakin and Colefax, 1940, p. 103, figs. 146 a-g (Variety from Sydney, Australia).

Material Examined: From 16 R.V. VARUNA stations in the shelf waters of the west coast of India (between 09°20′ - 12°00′N and 74°40′-76°18′E); and from the Laccadive Sea (between 09° 40′N - 11° 40′N and 72° 00′-74° 10′)E; surface zooplankton collections made at stations: 3562, 3565, 4137, 4161; from R. V. KALAVA Station 428 and from Andaman Islands (AN-6; AN-10; AN-18, AN-19).

Size:

	No.	Range (mm)	Mean (mm)	P : UR ratio
Adult female:	61	2.48–2.77	2.72	
Adult male:	40	2.30–2.61	2.43	

Description : FEMALE: Separation between cephalon and T-I distinct: lateral cephalic hooks absent; posterior corners of T-V produced into two conspicuous

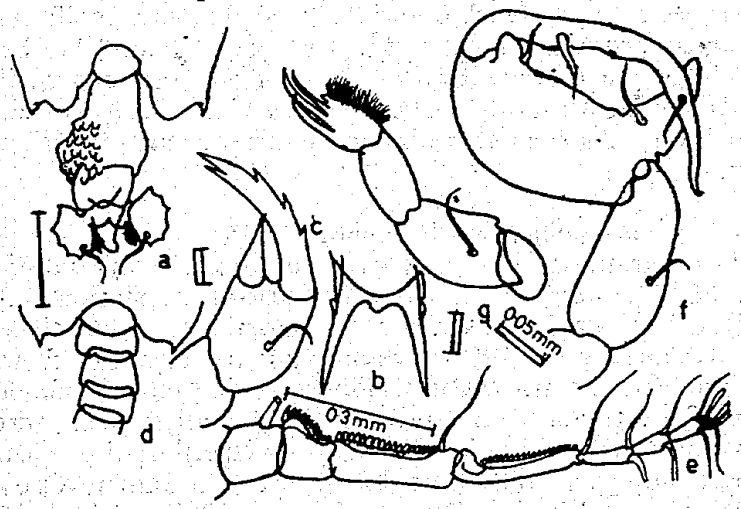

Fig. 10. *Labidocera detruncata* : a. Urosome - female; b. rostrum - female; c. P 5 - female; d. urosome - male (part); e. A 1 - male; f. P 5 - male (right); and g. P 5 - male (left).

asymmetrical lobes, each with a ventro-lateral marginal spine; urosome three-segmented, asymmetrical; genital segment posteriorly enlarged, with a conspicuous swelling dorsally as well as on its left side; genital segment with a ventral elevation and genital opening ventro-lateral; U-II narrow and broad; anal segment

posteriorly bifid, right half slightly larger; anal lamina well developed, conical and extending to posterior margin of CR; CR laterally placed and nearly circular in shape; right ramus is larger and anteriorly placed; caudal setae well developed, second seta from inner margin swollen; *P* 5: slightly asymmetrical, Re of left leg being stouter; with three outer marginal spines and with a subequally bifid tip, inner distal spine being smaller; Ri slender with a broad basal part.

MALE: Cephalon as in female except that dorsal eye lenses are large and placed close together; rostrum short and with acuminate prongs; posterior corners of T-V asymmetrical, pointed and lobate, right side being larger; urosome five-segmented; CR slightly asymmetrical, left ramus slightly shorter; caudal seta bulbous at its base; Right *A*-1: geniculate, with denticulated plates on dorsal margins of segments 17 to 19–21; a proximal knobular projection present on segment 18; plates on fusion segment 19–21 run along distal knobular projection; *P 5*: Right leg: terminal segment forming a chela; thumb well developed, hand broad but long; movable finger slender elongate and curved inwards; base of thumb and distal end of hand with one seta each and a pair of seta along elevated inner margin of finger; left leg: terminal segment with four elongated, subequal distal spinous processes, second from base being longest; terminal portion as well as inner margin of segment with marginal hairs; subterminal segment short with a distolateral spine.

Remarks: There are many discrepancies in the description of *L. detruncata*. Fleminger (1965) stated that Brady's (1883) record of this species from off Buenos Aires refers in part to *L. nerii* kroyer. Brady (1883) described and illustrated a variation in the P 5 of *L. detruncata* which has also been reported by Farran (1936) from the Great Barrier Reef material; this variation refers to the condition of the P5 of copepodite-V. Wolfenden's (1906) record of *L. detruncata* var. from Maldive Archipelago and the '*L. detruncata Sydney* var'. described by Dakin and Colefax (1940) are referrable to *L. detruncata sensu stricto* and not to the 'variant' (Cop V) of Brady. Vervoort (1965) indicated that the *L. detruncata* var. *intermedia* described by T. Scott (1894) from Gulf of Guinea is a synonym of *L. nerii*, a view which was earlier expressed by Giesbrecht (1892). As such there is no definite record of this species from the Atlantic Ocean.

Distribution: Indo-Pacific. From Indian Ocean: eastern Indian Ocean and west of Sunda Is. (Tsuruta, 1963); Malay Archipelago (A. Scott, 1909); Bay of Bengal and Andaman Sea (Sewell, 1932: from INVESTIGATOR stations 393 and 614; present record); Lawson's Bay, Waltair (Ganapathi and Shanthakumari, 1961); Madras Coast (Krishnaswamy, 1953); around Indian Coast and from Trincomalee, Ceylon (Thompson and Scott, 1903); Maldive Archipelago (Wolfenden, 1906: as *L. detruncata* var.); west coast of India and Laccadive Sea (present record); Arabian Coast and Arabian Sea (Sewell, 1947); northern Indian Ocean (Voronina, 1962); Red Sea (Thompson and Scott, 1903); western Indian Ocean (Grice and Hulsemann, 1967); central Indian Ocean (Tsuruta, 1963); African Coast (Brady, 1915).

Other Records: From the Pacific Ocean — Dana (1849, 1852), Streets (1877), Brady (1883), Giesbrecht (1889), A. Scott (1909), Farran (1936), Mori (1937, 1964), Dakin and Colefax (1940), Chiba (1956), and Grice (1962).

Labidocera laevidentata (Brady) 1883; (Fig. 11)

Pontella laevidentata Brady, 1883, p. 93, pl. 38, figs. 1–6 (*Type locality*: Off Sibago Islands).

Labidocera laevidentatum Giesbrecht, 1892, p. 446.
Labidocera kroyeri var. *similis* Wolfenden, 1906, p. 1016, pl. 98, figs. 22, 23 and 33 (*Type locality*: Laccadive and Maldive Archipelagoes).

Material Examined: From R. V. VARUNA, surface zooplankton samples from stations 3583, 3856, 4161 and from Andaman Islands (AN-17).

Size:

	No.	Range (mm)	Mean (mm)	P:UR ratio
Adult female:	6	2.20–2.36	2.29	—

Description: FEMALE: Cephalon broadly angular in outline; cephalic hooks much closer to the frontal margin than in any other species of *Labidocera;* T-V symmetrical, posterolateral angles produced into spiniform processes; urosome three-segmented, genital segment symmetrical, as long as combined lengths of U-II and U-III; a strong spine each on distal dorso-lateral corner of genital segment; U-II symmetrical, postero-distal margin with a bifurcated spine; ventro-lateral margin of U-II fringed with closely set small spinnules; anal segment asymmetrical, right side shorter than left side; CR distinctly asymmetrical, right furca much broader and longer; *A-1*: of 24 segments; *P5*: slightly asymmetrical, right Re stouter and rather shorter than left; each Re provided with three outer marginal spines and two spines towards distal part of inner margin; Re terminates in a strong curved spine; Ri of each leg short, with their apices feebly bifurcate.

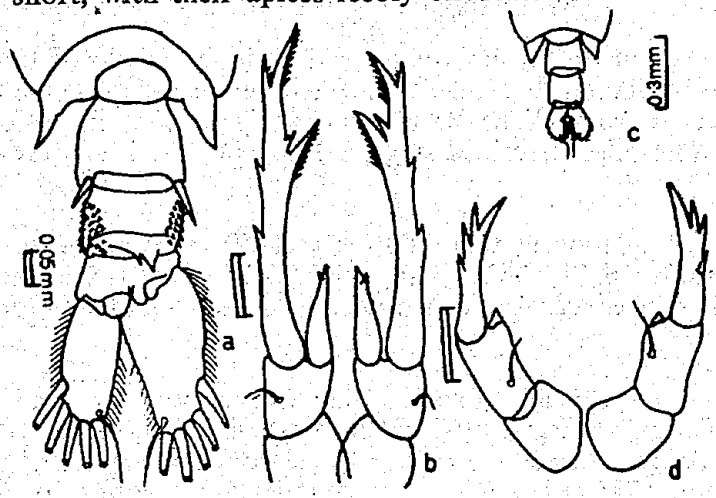

Fig. 11. a and b. *Labidocera laevidenta* : a. Urosome - female; b. P 5 - female; *Labidocera euchaeta* : c. urosome - female, and d. P 5 - female.

Remarks: Brady (1883) described this species based on a single male collected off Sibago Islands, Philippines. Wolfenden (1906) recorded both male and female of this species and described them under *L. kroyeri* var. *similis*. A. Scott (1909) drew attention to the description by Wolfenden and stated that his female specimens actually belong to *L. laevidentata*.

Distribution: Indo-Pacific. From Indian Ocean: Malay Archipelago (A. Scott, 1909); Nicobar Islands, Bay of Bengal (Sewell, 1932): INVESTIGATOR station 616); Andaman Islands (present record); Maldive Archipelago (Wolfenden, 1906: as *L. kroyeri* var. *similis*); Laccadive Sea (present record), Madagasar (Gaudy, 1967).

Other Records: From the Pacific Ocean, Brady (1883), Giesbrecht (1892), Fruchtl (1924), and Wilson (1950).

Labidocera euchaeta Giesbrecht, 1889; (Fig. 11)

Labidocera euchaeta Giesbrecht, 1889, p. 27 (*Type locality*: Amoy, Formosa Strait); 1892 pp. 446, 459, pl. 23, fig. 31; pl. 41, figs. 7 and 36.

Labidocera euchaeta Stage–II, Sewell, 1012, p. 341, pl. 19, figs. 1–3.

Labidocera euchaeta forma *minor* Sewell, 1932, p. 362.

Material Examined: 1 female collected from the mouth of Rangoon, River, opposite Syrian Point from surface on 19th January, 1971, at 1500-1730 hrs.

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	1	—	2.31	3.8:1

Description: FEMALE: Body elongate; anterior margin of cephalon imperfectly rounded; dorsal eye lenses small and placed apart; cephalic hooks absent; T-IV and T-V separated, latter produced posteriorly into acuminate lobes; urosome two-segmented, segments more or less of equal size; CR asymmetrical, right ramus being broader, second caudal seta much longer than others; A-1 of 23 segments; *P 5*: symmetrical, Re ending in two subequal spines, inner spine longer; two outer marginal spines present on Re, one towards tip and another at mid-outer margin; Ri rudimentary as a small rounded lobe on B2.

Remarks: Sewell (1912) described the female and male of this species as *L. euchaeta* "Stage II Diamorph 2" based on the differences he observed between some specimens collected from Hinze Basin which he later (Sewell, 1934) described as *L. gangetica*. He has also described stages III and IV of this species from the Hinze Basin.

Fleminger (1965) reports that Willson's (1950) records of this species from ALBATROSS stations 16, 31, 3628, 3901, 4037, 5175 and 5415 are erroneous as no specimen of this species was found in the collections from the stations in the Pacific mentioned above.

Distribution: Indo-Pacific. From Indian Ocean: west of great Sunda Is. and eastern Indian Ocean (Tsuruta, 1963); Hinze Basin, Burmese Coast (Sewell, 1912, 1933); Bay of Bengal (Sewell, 1914; 1932, from INVESTIGATOR stations: 563, 574, 575, 577 and 578); Lawson's Bay, Waltair (Ganapathi and Shanthakumari, 1961).

Other Records: From the Pacific Ocean, known from the Formosa Strait (Giesbrecht, 1889), and Phillippines (Wilson, 1950).

Labidocera minuta Giesbrecht, 1889; (Fig. 12)

Labidocera minuta Giesbrecht, 1889, p. 27; 1892, pp. 446 and 459, pl. 23, figs. 16, 35, and 36, pl. 41, figs. 8, 15, 16, and 35 (*Type locality*: Hong Kong).

Material Examined: From 46 R. V. VARUNA stations in the shelf waters of the west coast of India (between 09°20′–12°00′N and 74°40′–76°18′E) and from the Laccadive Sea (Between 09°40′–11°40′N and 72°00′–74°10′ E); from surface zooplankton collections made at R. V. VARUNA stations 3352, 3562, 3565, 4137, 4161; from near floating Light House in the inshore waters of Bombay during

February and March, 1967, at 0630–0730 hrs; from Gulf of Mannar on 13–12–1967 at 0300–0330 hrs from surface; from Andaman Islands (AN-2, AN-4, AN-10, AN-11 AN-19, AN-29).

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	40	1.96–2.20	2.06	2.5:1
Adult male:	20	1.46–1.83	1.66	3.1:1

Description: FEMALE: Cephalosome narrow with small dorsal eye lenses; lateral hooks present; posterior lateral margin of T-V with a short spine, that on right side directed ventrad; urosome three-segmented, genital segment elongated and of half length of urosome; right posterior corner of U-I modified into a short lobular projection partly overlapping U-II laterally; another rudimentary lateral lobe present at right anterior margin of U-I; U-II as broad as long, ventrally with chitenous tubercles which are spread laterally along its right margin; CR longer than broad; asymmetrical, right ramus larger; *A-1*: of 23 segments; *P 5*: symmetrical, Re and Ri subequally bifid distally; Re with a minute spine on outer margin medially.

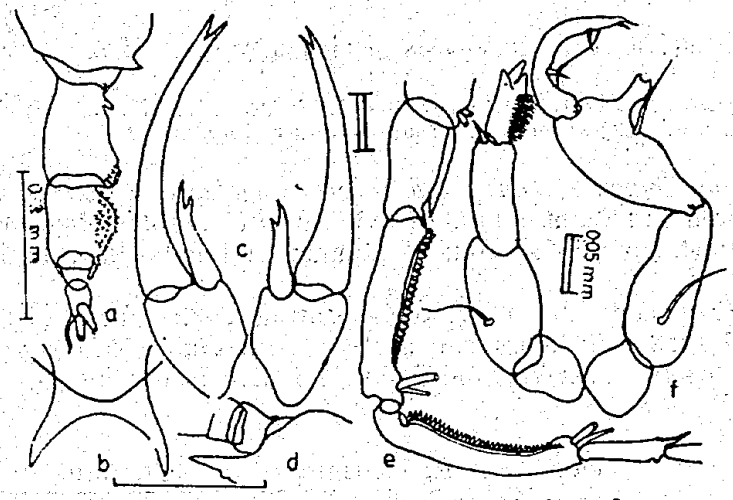

Fig. 12. *Labidocera minuta* : a. Right lateral view of urosome - female; b. rostrum - female; c. P 5 - female; d. lateral view of T V- male; e. A 1 - male, and f. P 5 - male.

MALE: Cephalon resembles that of female except that dorsal eye lenses are conspicuously large and placed close together; T-V asymmetrical, produced posteriad into a narrow long process at right distal corner ending in a flat curved tip; left corner of T-V ending in a short pointed process; urosome five-segmented, genital segment broader than long and with a small lobe at its right posterior margin; Right *A-1* geniculate, with a conspicuous spine on segment 17; segment 18 and fusion segment 19–21 carry dorsal denticulated plates, teeth on former villiform and on latter blunt; distal outer margin of segment 22 projects anteriad into a spine-like process; *P5*: Right P5: with a chela; distally placed thumb short, broader towards tip and with a basal seta; finger bent inwards at its distal half and with an inner marginal transparent flap with three setae along its inner margin and two setae distally; left leg: three-segmented, terminal segment with two pairs of subequal stout processes, outer one of longer pair pointed; inner margin of segment fringed with marginal hairs; penultimate segment with an outer rudimentary spine at its distal end.

Remarks: This species is widely distributed in the shelf and oceanic waters of the Indian Seas, particularly in the Arabian Sea.

Records from Indian Ocean: *Labidocera minuta* (*-um*) Giesbrecht, 1896, p. 318 (Red Sea); Cleve, 1901 (as *L. minutum*) p. 7 (Malay Archipelago); A. Scott, 1902, p. 407 (Indian Ocean); Thompson and Scott, 1903, p. 251 (Ceylon Pearl Banks); Wolfenden, 1906, pp. 1018–1019, pl. 98, figs. 18, 24, 25, 29, 32, and 37 (Laccadive and Maldive Archipelagoes); A. Scott, 1909, pp. 167-168 (12 out of 26 "Siboga" stations from which *L. minuta* was obtained are from Malayasian and Indonesian waters of the Indian Ocean Sector); Pesta, 1912, p. 53, fig. 14 (Persian Gulf); Sewell, 1912, p. 370 (Bay of Bengal); 1914, p. 234 (Coast of Burma); Gurney, 1927, p. 154 (Red Sea); Sewell, 1932, p. 364 ("Investigator" station No. 540-545, 552, 556, 558, 562, 577, 578, 582, 584, 587, 588, 590, 591, and 614); 1947, pp. 249–250 (Arabian Sea); Krishnaswamy, 1953, p. 134 (Madras Coast); Voronina, 1962, p. 68 (Indian Ocean); Kasturirangan, 1963, pp. 50–51, fig. 52 a-e (Indian Coastal waters); Saraswathi, 1966, p. 82 (Trivandrum Coast, Kerala, India).

Other Records: Hong Kong (Giesbrecht, 1889, 1892), Great Barrier Reef, Australia (A. Scott, 1909); Fruchtl, 1924); and Western Pacific (A. Scott, 1909).

Labidocera bengalensis Krishnaswamy, 1952

Labidocera bengalensis Krishnaswamy, 1952, pp. 321–323, fig. 1 a- j, Madras and Krusadi, (*Type locality*: Madras Coast, India).

Records from Indian Ocean: *Labidocera bengalensis* Krishnaswamy, 1952 (as above); Ganapathi and Shantha kumari 1961, p. 9 (Lawson's Bay, Waltair, India); Ummerkutty, 1964, pp. 53–59 (Gulf of Mannar and Palk Bay, India).

Material Examined: R. V. VARUNA station 3882; from Vizhinjam inshore waters on 13–10–1958 at 0845 hrs from surface; from Gulf of Mannar, on 1–10–1960, at 0610 – 0650 hrs from surface and from Andaman Islands (AN-3, AN-4).

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	12	1.41–1.68	1.44	2.1:1
Adult male:	7	1.09–1.26	1.18	3.2:1

Description: FEMALE: Cephalon anteriorly squarly rounded; rostrum pointed and bent ventrally; dorsal eye lenses prominant; right posterior corner of T-V with a lobular projection when viewed laterally adding to asymmetry of posterior margin of T-V; urosome three-segmented, genital segment elongated, longer than combined lengths of U-II, U-III and CR; genital segment slightly swollen on its right margin and bears a number of ventral papillae; U-II produced posteriorly slightly on right margin; CR asymmetrical, left ramus slightly longer and broader; A-1 of 22 segments; *P* 5: with Re long, slender and bifid at its tip; Re about 4 times longer than Ri, latter being short, stout and with a pointed tip.

MALE: Cephalon resembles that of female; dorsal eye lenses well developed, closely packed; right posterior corner of T-V produced into acutely pointed lobe; urosome five-segmented, CR symmetrical, Right *A*-1: geniculate with segments 18 and fusion segments 19–21 carrying villiform and coarse, denticulated teeth respectively; segment 22 distally produced into a spinous structure. *P* 5: Right P5

with a well developed chela; palm of hand with an inner marginal blunt process and with a spinous seta, claw bent inwards at its distal half and with an inner marginal transparent flap; a seta present proximally along inner margin and a second curved seta present distally; left leg: three-segmented; subterminal segment with a disto-lateral spine; terminal segment with a pair of stout processes distally and a seta towards outer margin of inner process; inner proximal margin of segment hirsute.

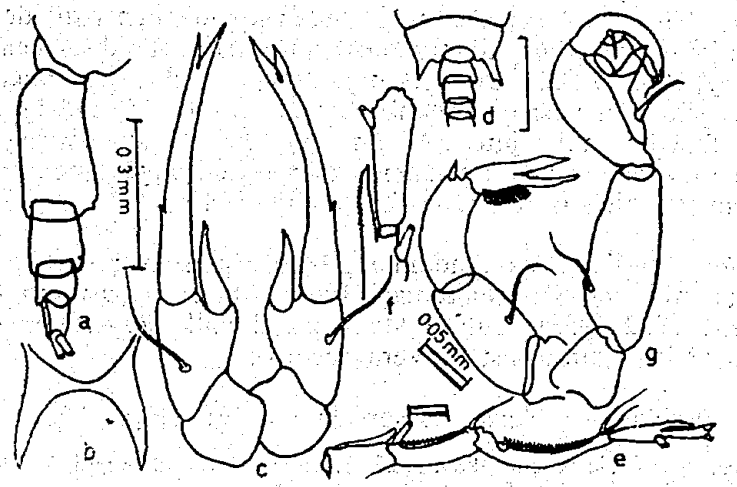

Fig. 13. *Labidocera bangalensis* : a. Urosome - female; b. rostrum - female; c. P 5 - female; d. urosome - male (part); e. A-1 - male; f. A 1 - male (part) - enlarged, g. P 5 - male.

Remarks: We note some discrepancies between the description and drawings of this species given by Krishnaswamy (1952). In addition, a few points which need clarfication are also given below:

1. In the female, "posterior corners of the cephalothorax rounded." In the specimens of *L. bengalensis* from Gulf of Mannar that we have examined, the right posterior corner of the cephalothorax has a lobular projection which can be clearly seen when viewed laterally. Apparently, both Krishnaswamy (1952) and Ummerkutty (1964) have failed to notice this. In fact, this lobe adds to the slight asymmetry in the posterior corners of the last thoracic segment.

2. Krishnaswamy (1952) notes that "Genital segment is as long as the combined length of the next segment and the anal segment." In Fig. 1 a given by him, the genital segment is shown to be distinctly longer than the combined lengths of the second abdominal segment, the anal segment and the caudal rami. In this character, our material shows agreement with the drawing given by Krishnaswamy, but not with his description of the species.

3. Regarding the second abdonmial segment, Krishnaswamy (1952) notes that the segment is "produced posteriorly on the left side." His drawings (Fig.1a and 1 c) show that the slight modification is on the right side and not on the left side, as is also evident from our material.

4. Krishnaswamy (1952) remarks that "The caudal furca is symmetrical .....". Our material clearly shows that the caudal rami are asymmetrical, the left ramus being distinctly longer and broader than the right in the female.

5. In the female, the antennule is said to be 22-jointed, but the joints between third and fifth segments indistinct. However, Fig. 1 d shows only 20 segments (19 joints). In addition, in the text the sequence of segmentation, number, and the proportional lengths show apparent confusion; nor are proportional lengths given for segments 20 to 23.

6. In the male, the total number of segments in the geniculate antennule is given as 21. This number is said to include the indistinctly divided 'third joint' and the 'sixth joint' which are said to consist of 4 and 2 fused segments respectively (Krishnaswamy, 1952, p. 323; Ummerkutty, 1964, p. 59). The geniculate antennule will have 23 segments inclusive of the fused segments 17–18, and 19–20 which these authors have failed to take into account. Besides, Krishnaswamy (1952, p. 322, fig. 1 h) has shown the last two segments of the geniculate antennule to be indistinctly segmented which is not true for adult *Labidocera*.

Distribution: Indian Seas: Andaman Islands (present record); Lawson's Bay, Waltair (Ganapathi and Shanthakumari, 1961); Madras Coast and Krusadi Island (Krishnaswamy, 1952, 1953); Gulf of Mannar and Palk Bay (Ummerkutty, 1964; present record); Vizhinjam Coast (present record).

Labidocera pavo Giesbrecht, 1889; (Fig. 14)

Labidocera pavo Giesbrecht, 1889, p. 27; 1892, pp. 446 and 460, pl. 25, 34, pl. 41, figs. 18 and 38; (*Type locality*: Red Sea).

Material Examined: From inshore waters of Cochin, during April, 1968, collected from surface at 0600–0800 hrs; from Gulf of Mannar on 5 and 8 March, 1960, at 1800 – 1850 hrs; and 0200–0230 hrs respectively; from Andaman Islands (AN-8 to AN-11; AN-19).

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	21	1.98–2.52	2.34	4.6:1
Adult male:	10	1.79–2.06	1.92	3.5:1

Description: FEMALE: Body robust; lateral cephalic hooks absent; dorsal eye lenses moderately developed and placed apart; rostrum bifurcate, with acuminate tips; T-IV and T-V united, latter produced postero-laterally into symmetrical lobes; urosome of two segments, genital segment produced into a conical lobe with rounded tip on its right side; posterior margin of segment is produced ventrally into a lobe, resembling a bottle, which extends to middle, of CR; CR broad, arranged perpendicular to the urosome, nearly symmetrical; caudal setae bulbous at base and are short; *A–1*: of 23 segments; *P 5*: Re and Ri asymmetrical; Re with two outer marginal spines and terminates in three subequal spines, median spine longest; Ri asymmetrical, on left leg it is rounded and on right leg it is long and produced at its tip.

MALE: Cephalic region rounded anteriorly; dorsal eye lenses arranged close together; T-V posteriorly produced into symmetrical points; urosome of five segments, CR slightly asymmetrical, right ramus slightly broader than left. Right *A-1*: geniculate; segment 17 rounded anteriad into an arched ridge, lightly sculptured with irregular ribbing; segment 18 with a row of denticles on its dorsal margin which are closely placed; fusion segment 19–21 with a row of villiform denticles, extending to three quarters length of segment; segment 24–25 completely

fused. *P* 5: Right P5: chelate; hand of chela with a well developed thumb, towards inner base of which is a seta; claw elongata, curved, and with a blunt conical projection along inner margin at one-third distance from base; claw with two inner mid-marginal setae and one terminal seta; left leg: terminal segment with one outer marginal spine and three terminal subequal spines, all turned inwards; inner margin of segment irregularly lobular and with a patch of fine hairs; subterminal segment with a disto-lateral spine.

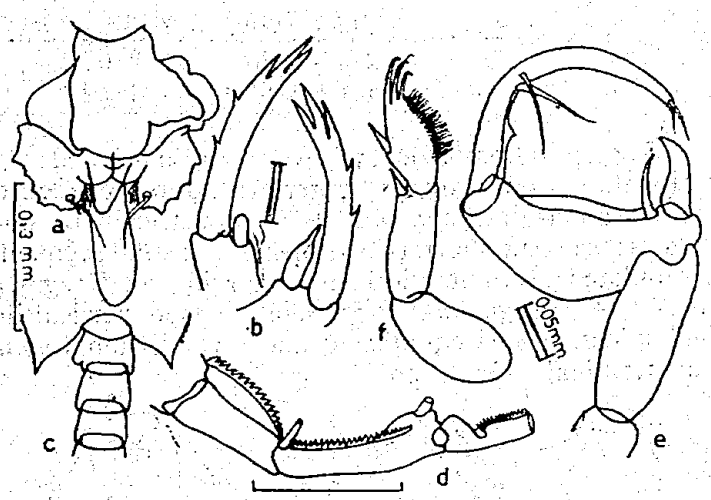

Fig. 14. *Labidocera pavo* : a. Urosome - female; b. P 5 - female; c. urosome - male (part); d. A 1 - male; e. P 5 male (right), and f. P 5 - male (left).

Remarks: Giesbrecht's original description was based on female. Mori (1932) later described the male of this species. *Labidocera pavo* is closely allied to the two Indo-Pacific species *viz.*, *bataviae* and *L. madurae*. Fleminger (1967) included this species under the Super-species '*detruncata*'.

Sewell (1932) has commented on the very close relationship between *L. pavo, L. bataviae,* and *L. madurae*. This species is chiefly known from neritic waters, with the exception of some oceanic records by Tsuruta (1963). The latter would need confirmation.

Distribution: Indo-Pacific. From Indian Ocean: Eastern Indian Ocean and west of Sunda Is. (Tsuruta, 1963); Malay Archipelago (Cleve, 1901); Bay of Bengal (Sewell, 1932: INVESTIGATOR stations 544 and 614); Andaman Islands (present record); Coast of Burma (Sewell, 1914); Chilka Lake (Sewell, 1924; Devasundaram and Roy, 1954); Madras Coast (Krishnaswamy, 1953); Ceylon Pearl Banks (Thompson and Scott, 1903); Gulf of Mannar (Present record); Indian Coastal waters (Kasthurirangan, 1963; present record); Trivandrum Coast (Saraswathy, 1966); Cochin Backwater (Pillai, 1972; present record); Red Sea (Giesbrecht, 1891; 1896; Cleve, 1903); Suez (Gurney, 1927); Central Part of northern Indian Ocean (Tsuruta, 1963).

Other Records: Mori (1929, 1932, and 1937) records this species from East China Sea, Yellow Sea, and from near Korea Strait. Wilson (1950) reported this species from Fort Binagga and Luzon, Philippines, and Tanaka (1964) from Izu Region, Japan.

Labidocera madurae A. Scott, 1909; (Fig. 15)

Labidocera madurae A. Scott, 1909, p. 169, pl. 50, figs. 9–16 (*Type locality*: Bay of Kankamaran, Molucca Passage, Banda Sea; and off Timor).

Material Examined: From Andaman Islands (AN-2, AN-3, AN-4, AN-30).

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	11	2.11–2.80	2.62	5.0:1
Adult male:	6	1.62–1.96	1.82	4.0:1

Description: FEMALE: Body elongate, ovate and narrowed; lateral cephalic hooks wanting; cephalon bluntly rounded anteriorly; dorsal eye lenses feeble, small and placed apart; rostrum as in *L. bataviae;* T-V symmetrically produced posteriorly into pointed processes; urosome short, two-segmented; genital segment asymmetrical, it is considerably inflated at right mid-lateral margin; anal segment very small; CR symmetrical; A-1 of 23 segments; *P 5*: slightly asymmetrical in size; Re with two outer maginal spines, placed equidistant and three terminal spines; Ri conical spine-like with no terminal bifurcation.

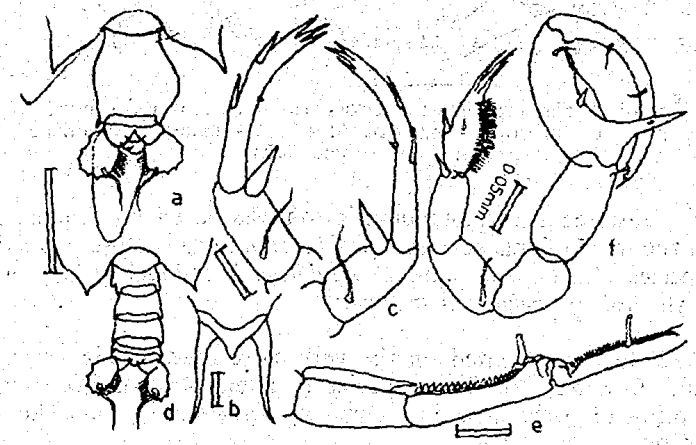

Fig. 15. *Labidocera madurae* : a. Urosome - female; b. rostrum - female; c. P 5 - female: d. urosome - male; e. A 1 - male, and f. P 5 - male.

MALE: Prosome resembles that of female except that dorsal eye lenses are slightly large and placed close together; urosomal segments as in *L. bataviae;* Right *A-1:* geniculate, with 17th segment carrying a dorsal elevated plate with no teeth; segments 18 and 19–21 with dorsal denticulated plates, those on segment 18 spinuous and on 19–21 villiform. *P 5*: Right P5: with a chela; thumb at proximal part of hand long, stout; inner margin of hand with a small median spine; claw elongate, curved and narrow, and provided with three inner marginal setae and one terminal seta; left leg: resembles that of *L. bataviae;* terminal segment ovate, twice as long as broad and with one outer mid-marginal and three subequal distal spines; inner margin fringed with fine hairs; subterminal segment with a spine disto-laterally.

Remarks: A. Scott (1909) drew attention to the affinities of this species to *L. nerii* which is an Atlantic species. As opined by Sewell (1932), Cleve's (1901)

record of *L. nerii* from Malay Archipelago is doubtful. Also, Voronina (1962) listed *L. nerii* from Indian Ocean, but she later corrected her identification to *Labidocera* sp. (Fleminger, 1965).

Distribution: Indo-Pacific. From Indian Ocean: Malay Archipelago (A. Scott, 1909); Andaman Islands (Sewell, 1932: from INVESTIGATOR station, 614; present record); Madagascar (Gaudy, 1967).

Labidocera bataviae A. Scott, 1909; (Fig. 16)

Labidocera batavjiae A. Scott, 1909, pp. 168–169, pl. 50, figs. 1–8 (*Type locality*: From six "Siboga" stations - Sta. 16, 66, 71, 81, 98, and 282 - from Malayasian and Indonesian waters).

Material Examined: From Andaman Islands (AN-4, AN-9 to AN-11).

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	9	2.06–2.38	2.31	5.8:1
Adult male:	4	1.92–1.97	1.96	4.5:1

Description: FEMALE: Body broadly ovate; lateral cephalic hooks absent; cephalon anteriorly rounded; dorsal eye lenses placed apart; rostrum bifid, prongs elongated and tapering towards tip; T-IV and T-V fused, T-V symmetrically produced posterad into divergent points; urosome short, two-segmented; genital segment asymmetrical, large, distal margin dilated and produced on the right side; anal

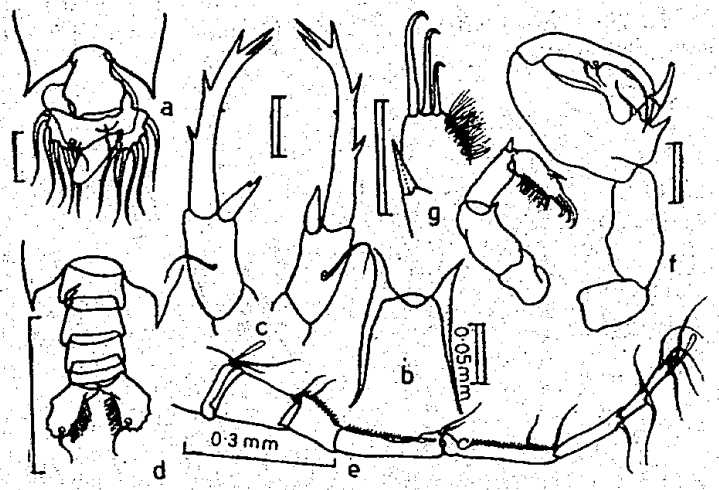

Fig. 16. *Labidocera bataviae* : a. Urosome - female; b. rostrum female; c. P 5 - female; d. urosome- male; e. Al-male f. P5-male; and g. terminal segment of P 5 enlarged male.

lamina well developed; CR asymmetrical, left ramus nearly two times broader than long and so shaped as to be at right angles to urosome; caudal setae slightly bulged at bases; *P* 5: asymmetrical, left leg longer; Re with two outer marginal spines; apex of Re terminates in three subequal spines, middle spine longer and serrated along both margins; a minute spine present on inner mid-margin of Re; Ri small, with bifid tip.

MALE: Prosome resembles that of female except that posterior margin of T-V asymmetrical, right one being longer than left; urosome five -segmented; U-I with a marginal notch on its left side; CR slightly asymmetrical, right ramus being broader than left; Right *A*-1: geniculate, with 17, 18 segments and fusion segment 19–21 carrying denticulated plates on their dorsal margins; those on 18 coarse and those on 19–21 villiform; *P* 5: Right P5 chelate; thumb at proximal end of hand long and stout; there is a dintict spine and a flagellum-like seta close to base of thumb; claw curved inwards with a conical elevation at its inner mid-margin; three inner marginal setae and one terminal seta were present on claw; left leg: terminal segment twice longer than broad and provided with one outer mid-marginal spine and three terminal curved spines of which outermost is longest; inner margin of segment with a patch of fine setae; subterminal segment with a disto-lateral spine.

Remarks: Sewell (1932) pointed out the asymmetry of the right posterior margin of T-V of males. The marginal serrations of the mid-distal spine and the minute spinnule on the inner mid margin of Re of female P5 observed during this study has not been discussed by either A. Scott (1909) or Sewell (1932). Apparently they have been overlooked in the earlier reports.

Distribution: Indo-Pacific form; previously recorded from the Malay Archipelago (A. Scott, 1909) and from Andaman Sea (Sewell, 1932) (INVESTIGATOR stations: 614 and 625; present record).

Labidocera pectinata Thompson and Scott, 1903; (Fig. 17)

Labidocera pectinata Thompson and Scott, 1903, p. 252, pl. 2, figs. 10–14 (*Type locality*: Palk Strait, Ceylon).

Labidocera similis Cleve, 1904, pp. 378-380, pl. 19, figs. 4-6 (*Type locality*: Off Karachi, Pakastan).

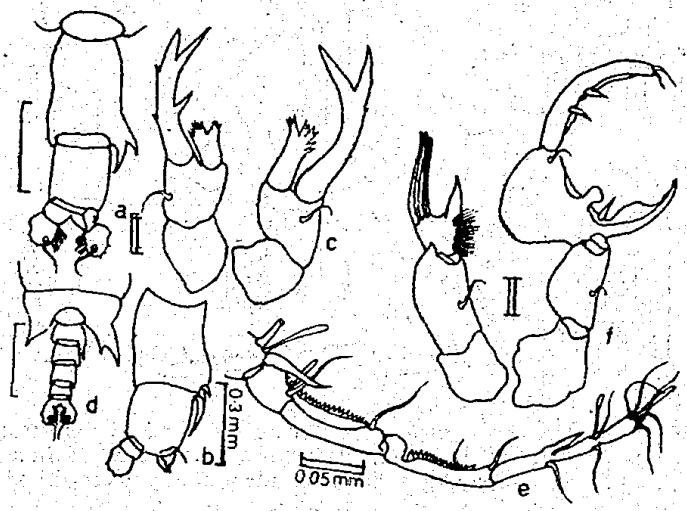

Fig. 17. *Labidocera pectinata* : a. Urosome - female; b. urosome female (variant); c. P 5 female; d. urosome-male; e. A I male, and f. P 5 - male.

Material Examined: From Cochin Backwater during January to April, December, 1969; January-April, November and December, 1970; January, February, March, 1971, from surface hauls made at 0600-0800 hrs; Near Floating

Light House, Bombay during February, 1967 at 0630–0730 hrs, from surface zooplankton collections; from Gulf of Mannar on 15-1-1969, at 1905-2015 hrs from surface zooplankton collections; from Palk Bay on 15–4–1959, at 0600–0800 hrs from surface.

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	30	1.91–2.10	2.0	2.8:1
Adult male:	25	1.60–1.73	1.7	2.5:1

Description: A brief description of the adult male and female has been given by Pillai (1972).

Remarks: Pillai (1972) described and illustrated the post-naupliar developmental stages of this species from Indian waters and has also drawn attention to the variations in the genital segment and female P 5 evinced by this species.

L. bipinnata Tanaka is listed by us in this account as a doubtful record from theIndian Ocean in lieu of Tsuruta's listing of this species from West of Sunda Island, though Sewell considered it a doubtful synonym of *L. pectinata*. More recent works (Tanaka, 1964) indicate that *L. bipinnata* is apparently a valid species restricted to Japanese waters (Tanaka, 1964), and north western Pacific (Brodsky, 1950). *L. rotunda* Mori (1929) was considered by Sewell (1948, p. 408) as a doubtful synonym of *L. pectinata*, but Tanaka (1964) has recently listed the former from Japanese waters. From the known distribution of *L. pectinata*, it would appear as a valid species that this species is restricted to the neritic waters of the Arabian Sea and Bay of Bengal.

Labidocera kroyeri (Brady) 1883

Pontella kroyeri Brady, 1883, p. 93, figs. 1–19 (*Type locality*: Arafura Sea, Lat. 8° S Long. 136° E, off Sibago Islands, and other places among Philippines).

Labidocera kroyeri Giesbrecht, 1892, p. 446, pls. 23, 25, and 41.

Labidocera kroyeri var. *stylifera* Thompson and Scott, 1903, pp. 251-252, pl. 2, figs. 8, 9 (Type locality: From several stations around Ceylon).

Labidocera kroyeri var. *gallensis* Thompson and Scott, 1903, p. 252, pl. 2 figs. 6, 7 (Type locality: Galle Harbour and elsewhere, Ceylon).

Labidocera kroyeri var. *burmanica* Sewell, 1912, p. 369, pl. 23, figs. 4, 5 (Type locality: Mouth of Rangoon River, Burma).

Labidocera kroyeri var. *bidens* Sewell, 1912, p. 369, pl. 24, fig. 8 (Type locality: Region of the mouthof Tavoy River, Burma).

Labidocera kroyeri var. nova Krishnaswamy, 1953, pp. 132–133, figs. 13–19 (From Kundagal Channel; Galaxea Reef; Adyar Plankton; and Madras Plankton).

Records from Indian Ocean: *Labidocera kroyeri* (varieties) Celve, 1901, p. 7 (as *L. kroyeri* from Malay Archipelago); Thompson and Scott, 1903 (as varieties *stylifera* and *galensis* given above); A. Scott, 1909, pp. 165–166 (as *L. kroyeri* from Malayan Archipelago); Sewell, 1912 (as varieties *bidens* and *burmanica* given above); Sewell, 1914, p. 233 (as varieties *stylifera* and *burmanica* from Gulf of Mannar); Brady, 1915, p. 135 (as *L. kroyeri* — name only from Durban Bay, S. Africa); Sewell, 1932, pp. 362–363 (as varieties *galensis, stylifera* and *burmanica* from "Investigator" stations 445, 545, 552, 556, 562, 663, 577, 578, 582 and 614); Krishnaswamy, 1953 (as var. nov.? - four types of females as given above);

Ganapathi and Shanthakumari, 1961, p. 9 (as *L. kroyeri* from Lawson's Bay, Waltair, India); George, 1958, p. 384 (as var. *galensis* from Cochin Backwater); Voronina, 1962, p. 68 (as *L. kroyeri* from Indian Ocean); and Saraswathy, 1966, p. 83 fig. 1 (4–8) (as *L. kroyeri* from Trivandrum Coast, India).

Other Records: From the Atlantic Ocean this species has been recorded from off the west coast of Ireland (Breemen, 1908). From the Pacific Ocean, *L. kroyeri* is known from the Western Pacific including Japan (Brady, 1883; A. Scott, 1909; Mori, 1937; Nicholls, 1944; Wilson, 1950; and Tanaka, 1964).

Remarks: *Labidocera kroyeri* var. *similis* described by Wolfenden (1906) from the Laccadive-Maldive Archipelagoes is considered a synonym of *Labidocera laevidentata* (Brady) by A. Scott (1909).

While describing *L. kroyeri*, Brady (1883) remarked that the species is subject to a good deal of variation especially in the peculiar distortion or outgrowths of abdominal somites. Subsequent workers while describing varieties of *L. kroyeri* have commented on the influence of environmental conditions as being responsible for such variations. Atleast five varieties of this species have been described from a relatively limited area in the Indian Ocean, each based on material of a single sex. It is interesting that a widely distributed species such as *L. kroyeri* should evince such variations in a limited area. Up to now, no serious attempt has been made to see whether varieties based on different sexes could be matched. As it stands, varieties *stylifera, galensis* and *burmanica* are known only from males, and variety *bidens* and "var. nov.?" of Krishnaswamy (1953) are known from females.

Krishnaswamy (1953) has indicated four types of variations of *L. kroyeri*, all females. From the material available to us collected along the west coast of India, we find that atleast two of these can be matched with varieties *galensis* and *stylifera* respectively as they have been obtained together in plankton hauls. In the absence of details regarding other diagnostic characters it is difficult to evaluate the status of the remaining two types of variations mentioned by Krishnaswamy (1953). Apparently the four types of infra varietal variations mentioned by him are more or less of the same status as considered by Sewell (1912) for his varieties.

According to Saraswathy (1966) " ....the characters on which the varieties are based do not appear to be constant and intermediates between any two varieties are very common." We would like to mention that although overlapping in the ornamentation of the abdominal segments may occur, it is not difficult to identify in any collection the varieties described by Thompson and Scott (1903) and Sewell (1912). Moreover a good series of female specimens referable to the variety *stylifera* collected from the west coast of India at different times do not show any marked variations in the modifications of abdominal segments to recognise intergrades. Up to now, no attempt has been made to evaluate differences between *L. kroyeri* forma typica and these nominal varieties. Apparently *L. kroyeri* is a composite species of neritic waters and it will not be surprising if at a later date, some of the so-called varieties may be considered as good species under the *Labidocera kroyeri* Species Complex.

Labidocera stylifera Thompson and Scott, 1903 (*nom. transl*) (fig. 18)

Labidocera kroyeri var. *stylifera* Thompson and Scott, 1903, p. 252, pl. 2, fig. 9 (*Type locality*: several stations around Ceylon).

Labidocera kroyeri var. nov (Partim) Krishnaswamy, 1953, pp. 132, 133, figs. 13 (From Krusadi Is., Madras, south-east coast of India).

Labidocera kroyeri var. *burmanica* Sewell, 1912, p. 369, pl. 23, figs. 4, 5 (mouth of Rangoon River, Burma Coast).

Material Examined: See Table 3.

Size:

	No.	Range (mm)	Mean (mm)	P:UR ratio
Adult female:	102	2.58–2.95	2.76	3.2:1
Adult male:	83	2.27–2.61	2.41	3.5:1

Description: FEMALE: Body stout; cephalon anteriorly rounded with lateral hooks; dorsal eye lenses small, arranged wide apart; rostrum bifid, prongs pointed and symmetrical; distinct suture separates cephalon and T-I and T-IV and

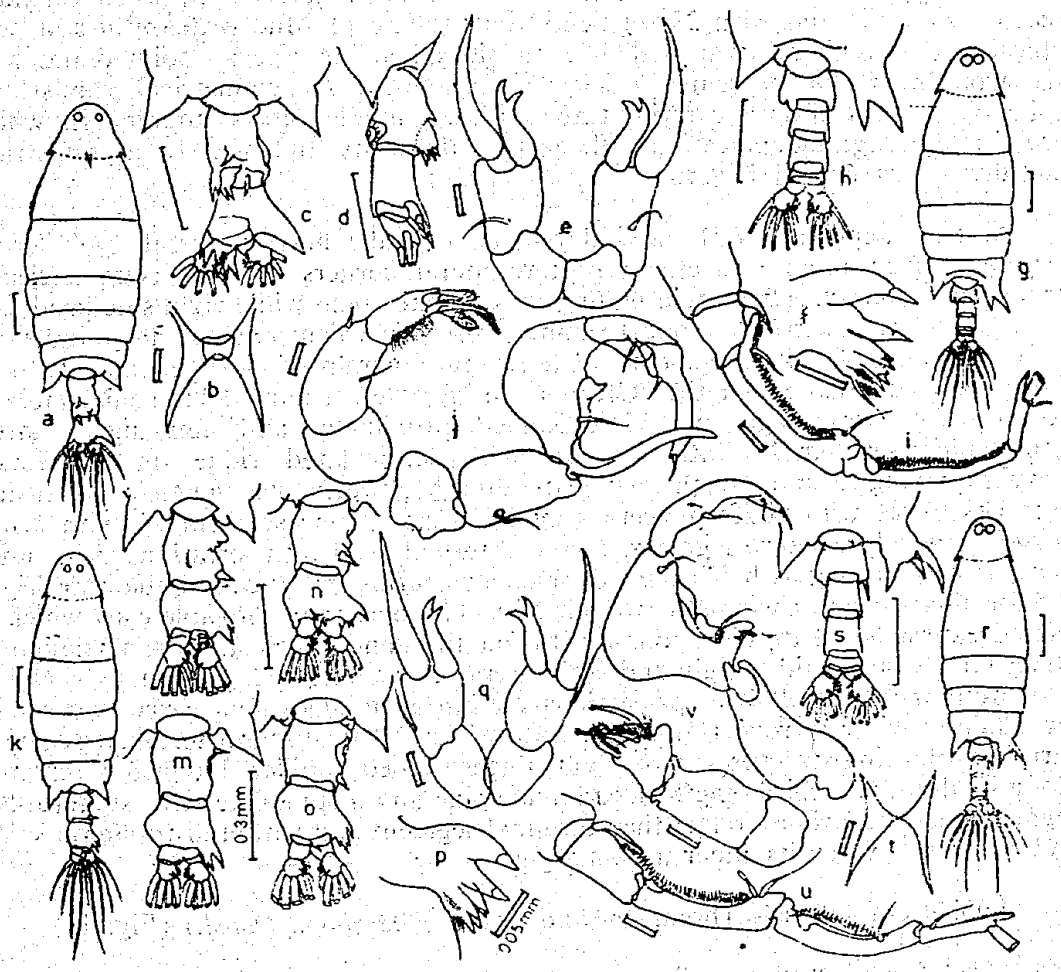

Fig. 18. a - j. *Labidocera stylifera* : a. dorsal view - female; b. rostrum - female; c. urosome-female; d. urosome (lateral view) - female; e. P 5 - female; f. mandible - female; g. dorsal view - male; h. dorsal view of urosome - male; i. A1 - male, and j. P 5 - male. k - v. *Labidocera gallensis* : k. dorsal view - female; l. urosome - female *typica;* m. urosome - female (variant 1); n. urosome - female (variant 2); o. urosome - female (variant 3); p. mandible - female; q. P 5 - female; r. dorsal view - male; s. urosome - male; t. rostrum - male; u. A1 - male ; and v. P 5 - male.

T-V; posteriorly T-IV and T-V narrowed, T-V flared proximally and produced posteriorly into acuminate spines, posterior tip of which reaches to distal one-third

of genital segment; posterior lobes of T-V slightly asymmetrical, in dorsal view left posterior corner of T-V slightly longer; left lobe more stocky and bulged at base; urosome of three segments; anal segment very short; genital segment large, asymmetrical and in dorsal view with two swellings on its right lateral margin; dorsally a single spine present towards distal one-third of its length; at left postero-dorsal margin of genital segment four teeth-like spines present in two sets directed posteriad; another spine projects from the postero-dorsal margin of genital segment; genital pore placed slightly to right of mid-longitudinal axis; U-II produced into a robust triangular process extending from right lateral margin of segment; posteriorly segment extends over anal segment and is produced on its right distal margin into five sharp teeth in two sets, one set at its distal outer angle (two spines) and another at its disto-median margin(three teeth); CR symmetrical, setae concentrated at its distal margin; second seta from inner margin being longest; *A-1*: when extended reaches to T-IV, and with 23 segments; gnathobase of Mnd with apical and subapical teeth acuminate; two median teeth bicuspidate, basal cusp pointed and with six strong bristles at its ventral base; *P* 5: biramous; Re symmetrical, robust and spine-like, curved inwards carrying three minute spinnules on its outer margin which are visible in high magnification; Ri deeply bifid at its tip, weakly asymmetrical and distal part curved inwards.

MALE: Cephalon with well developed cephalic hooks; dorsal eye lenses large and placed close together; postero-lateral corners of T-V asymmetrically produced posteriad, left margin ending in an acute spine while right side produced into two asymmetrical robust spines, tip of which extends to middle of U-II; urosome of five segments, left leteral margin of U-I expanded; U-II and U-III of same length; CR as in female; Right *A*-1: geniculate, in dorsal view with segment 17 expanded proximally and carrying a stout setose spine; segment 18 with a crescentic, denticulated ridge on its dorsal margin carrying recurved teeth, plate extending backwards over segment 17; fusion segments 19–21 with villiform teeth scattered throughout; segment 22 with disto-dorsal spine, adpressed to segment, curved externally and with serrations at its outer margin; it is as long as half length of segment bearing it; *P* 5: subquadrate, right P 5 forming a chela; chela large, thumb of chela longer than movable claw which is curved externally at its distal one-fourth length; hand of chela with a triangular lamella at its inner mid-margin and with a seta; claw elongated, proximally carrying two pronounced lamelliform projections on inner margin which carry two setae; terminally claw is narrowed and with a distal seta; left leg with terminal segment carrying following structures: two blunt, finger-shaped papillae completely serrated along its distal two-third length; a terminal spine and a spine-like seta; subterminal segment nearly 1.5 times longer than terminal segment and with a disto-lateral spine and a small seta at its inner mid-margin.

Labidocera gallensis Thompson and Scott, 1903 (*nom. transl.*) (Fig. 18)

Labidocera kroyeri var. *gallensis* Thompson and Scott, 1903, (Male) p. 252, pl. 2, figs. 6, 7. (*Type locality* : Galle Harbour (part) and elsewhere, Ceylon) Krishnaswamy, 1953, p. 132 (Madras Coast).

Labidocera kroyeri var. *nov.* ? (partim) Krishnaswamy, 1953, p. 132–133, figs 14–19 (female only) (Madras, SE coast of India).

?*Labidocera kroyeri* var. *burmanica* Sewell, 1912, p. 369, pl. 23, figs. 4, 5 (male only from Mouth of Rangoon River, Burma).

Material Examined: See Table 3.

Size:

	No.	Range (mm)	Mean (mm)	P : UR ratio
Adult female:	111	2.30–2.70	2.48	3.1:1
Adult male:	76	2.08–2.20	2.13	3.0:1

Description: FEMALE: Body narrowed and short; prosome a little more than three times length of urosome; cephalon anteriorly rounded with a pair of lateral hooks; rostrum slender; dorsal eye lenses as in *L. stylifera*; separation between T-IV and T-V obscure; asymmetry of posterior corners of T-V more pronounced, left lobe distinctly longer and reaches to middle of genital segment; urosome three-segmented, anal segment exceedingly short; genital segment asymmetrical in dorsal view, its left margin smoothly curved while right margin bears two distinct lobes, posterior lobe carrying a triangular stout spine projecting perpendicular to segment at its apex; U-II produced into a pair of subequal robust ventrally directed spines at its right lateral margin; U-II extends posteriorly over anal segment and produced into three subequal spines at its right posterior margin; CR asymmetrical, caudal setae as in female *stylifera*; A-1 and other cephalic appendages resembles those of *L. stylifera*; *P* 5: Re asymmetrical, left Re slightly longer; Re appears more straight when compared to that of *L. stylifera*, where it is perceptibly curved inwards; Ri symmetrical, nearly half length of Re and is bifid at its tip.

MALE: Cephalon narrowed as in female, but dorsal eye lenses large and placed close together; postero-lateral corners of T-V produced asymmetrically left corner ending in an acute spine while right margin being drawn out into a squared lobe carrying three subequal, stout projecting spines; tip of inner spine reaching to middle of U-II; urosome of five segments, left lateral margin of U-I produced into a lobe as in *L. stylifera*, but with a spine, directed posterad, nearly half length of U-II, originating from right distal corner of U-I; CR as in female; *A*-1: right A-1 geniculate; segment 17 with a spine-like seta; segments 18 and fusion segments 19–21 with dorsal toothed plates as in *L. stylifera*; segment 22 with a disto-dorsal serrated spine, which is nearly onefourth length of segment; *P* 5: ovate, stout and stocky; right P 5 with a chela; thumb of chela short, blunt and hardly 25 per cent length of claw, and with a basal seta; hand with two lamellae on its inner margin and with a distal inner seta; claw more pointed than that of *L. stylifera*; inner margin of claw lacking in pronounced lamelliform ridges found in *L. stylifera*, and it is with one terminal and two inner marginal setae; left leg: terminal segment with a well-developed inner marginal protuberance; distally segment with two blunt lamelliform structures crowned with spinnules, a curved, stout spine and with two flagelliform setae with papillated tips; subterminal segment twice longer than terminal segment and with a disto-lateral spine.

Labidocera inermis (Brady) 1883

Pontella inermis Brady, 1883, pp. 95–96, pl. 45, figs. 10–15 (*Type locality*: Off Ascention Islnad, S. Atlantic).

Labidocera inermis Brady, 1915, p. 135.

Records from Indian Ocean: *Labidocera inermis* Brady, 1915 (as above, from Durban Bay. Name only).

Remarks: But for its original description, hardly anything is known about this species. Although Brady (1915) has listed it as occurring in Durban Bay,

South Africa, a definite record and description of this species from the Indian Ocean is wanting.

Labidocera orsinii Giesbrecht, 1889

Labidocera orsinii Giesbrecht, 1889, p. 27 (*Type locality*: Red Sea).

Records from Indian Ocean: *Labidocera orsinii* Giesbrecht, 1889 (As above); 1896, p. 318 (Red Sea).

Remarks: This is a little known species, apparently endemic to the Red Sea.

Labidocera gangetica Sewell, 1934

Labidocera euchaèta Stage–I, Sewell, 1912, pp. 339–341, pl. 18, figs. 1–9 (From Chittagong).

Labidocera euchaeta forma *major* Sewell, 1932, pp.361–362 (*Type locality*: "Investigator" stations 563, 574, 577 and 578).

Labidocera gangetica Sewell, 1934, pp. 79–80 (Mouth of Ramree River; Tavoy River; and from Chittagong from the east side of Gangetic Delta. Also recorded from Tenasserim, Burma; and mouth of Hooghly River).

Indian Ocean Records: Sewell (1912, 1932, and 1934 as above).

"**Labidocera** sp. (nova ?)" Voronina, 1962

Remarks: Recorded by Voronina (1962) from 5 stations of R. V. "Vitiaz" off west coast of Australia, but no description of it is given by her.

Labidocera bipinnata Tanaka, 1936

Labidocera bipinnata Tanaka,1936, p. 31, pl. 2, figs. 1–10, pl. 3, figs. 1–7 (*Type locality*: Sagami Bay, Japan).

Records from Indian Ocean: *Labidocera bipinnata* Tsuruta, 1963, p. 74 (west of Sunda Islands).

Other Records: Tanaka (1936, 1964) from Japanese Seas.

Remarks: Tsuruta's record (1963) of this species from the Eastern Indian Ocean is unaccompanied by any description or illustration. Sewell (1948) considers *L. bipinnata* as a doubtful synonym of *L. pectinata* Thompson and Scott. However, recently Tanaka (1964) considers his species as a valid representative in the Japanese waters. A definite record of this species from the Indian Ocean is wanting.

Labidocera chubbi Brady, 1915

Labidocera chubbi Brady, 1915, pp. 137–138, pl. 9, figs. 7–13 (*Type locality*: Durban Bay, South Africa).

Records from Indian Ocean: *Labidocera chubbi* Brady, 1915 (as above).

Remarks: The status of this species needs clarification. Sewell (1932) remarks that Brady's *L. chubbi* may perhaps be only the male of *L. minuta* Giesbrecht, but he lists this species among those known from the Indian Ocean.

"Labidocera trispinosa Esterly, 1912

Labidocera trispinosa Esterly, 1912, pp. 307-311, figs. 1-8 (*Type locality*: San Diego California).

Labidocera tenuicauda (partim) Wilson, 1950 (see Fleminger, 1965, p. 128).

Records from Indian Ocean: *Labidocera trispinosa* Brady, 1915, p. 135 (Durban Bay, South Africa).

Remarks : Brady's (1915) record of this species from Durban Bay is unaccompanied by description or drawings. As early as 1932, Sewell expressed doubts as to the occurrence of this species in South African Waters. More recent works on species of *Labidocera* in the Eastern Pacific (Fleminger, 1964, 1967) would almost certainly indicate that Brady's record of this species is an error. The occurrence of *L. trispinosa* in the Indian Ocean needs confirmation based on definite records.

TABLE 3. *Details of collection of the material of* Labidocera gallensis *and* L. Stylifera *from Indian Seas*

Locality	Date	Time (Hrs)	Type of haul	No. of specimens *gallensis*	*stylifera*
Bombay Coast	March, 1966; March, 1968	0630–0730	S	9	14
Karwar Coast	R. V. VARUNA	stns. 3657, 4176	S	10	28
Calicut Coast	R. V. VARUNA	stn. 4179	S	9	10
Cochin Coast	13-3-1968; 21-4-1968	0700–0800	S	12	40
Cochin Backwater	March, 1969; Jan.-May, 1970	0630–0800	S	16	83
Vizhinjam Coast	5-9-1968;	0800	S		
	13-10-1958;	0845	S		
	6-2-1961	1800	S	26	48
Gulf of Mannar	9-3-1960;	0600–0650			
	13-12-1967;	2200–2315	S	30	52
	15-1-1969	2100–2210			
Madras Coast	Jan., 1967; Dec., 1976	0730–0900	S	20	58
Laccadive Sea					
10°33′N, 74° 39′E	12-12-1966	1900–19 35	S	11	60
12°00′N, 74° 58′E	5-10-1967	1905–19 20	S	13	19
Andaman Sea					
Port Blair	3-4-1968;	0600–0625	S		
	1-5-1968;	1710–1730	S	9	11
	8-5-1968	0620–0655	S		
Nicobar Is.	10-4-1969;	1800–1905	S		
	13-4-1968;	1850–1920	S		
	15-4-1968	0800–0827	S	12	18
Nancowrie Harbour	24-4-1968;	1745–1845	S		
	25-4-1968	1700–1725	S	7	10

(S: Horizontal Surface haul)

Labidocera wollastoni (Lubbock), 1857

Pontella wollastoni Lubbock, 1857, p. 406, pl. 10, figs. 9-11; pl. 11, fig. 18 (*Type locality*: Weymouth, U. K).

Pontella helgolandica Claus, 1863, p. 208, pls. 36, and 37.

Labidocera wollastoni Giesbrecht, 1892. p. 445, pl. 4, fig. 14; pl. 23, figs 5, 6, 9, 17, 18, 20, 25, and 37; pl. 41, figs. 1, 12-14, 21, 22, and 27.

Records from Indian Ocean: *Labidocera wollastoni* Wolfenden, 1906, p. 1017, pl. 98, figs 17, 30, 31 and 35 Laccadive and Maldive Archipelagoes).

Remarks: In the structure of the 5th legs and in the projection on the dorsal side of the genital segment the female of *L. wollastoni* briefly described by Wolfenden shows some agreement with the typical form known from North Atlantic and the Mediterranean. However, the 5th legs of the male of this species figured by Wolfenden show differences leading us to suspect that this may belong to a different species. Sewell (1948) included *L. wollastoni* in the list of known Copepoda from the Indo-Pacific. Recently, Fleminger (1965) has shown that Wilson's (1950) record of this species from the Pacific Ocean based on "Albatross" collections is wrong. It is likely that Wolfenden's description of the female *L. wollastoni* may also be based on immature specimen. In view of these, we feel that a definite record of this species from the Indian Ocean is wanting.

Labidocera pseudacuta Silas and Pillai, 1967

Labidocera acutum (*partim*) Giesbrecht, 1892, p. 445, pl. 41, fig. 29 (From Arbian Sea and Red Sea).

Labidocera psuedacuta Silas and Pillai, 1967, pp. 346-364, figs. 1–9 *Type locality*: R. V. "Anton Bruun" station Nos. 283–285, 287, 288, 290, 291, 294, and 297 – all from north western India Ocean and Arabian Sea collected in 1964).

Records from Indian Ocean: As above.

Remarks: It is likely that some of the earlier records of *L. acuta* (*-um*) from the Arabian Sea (Cleve, 1901, 1904; Sewell, 1947; and Voronina, 1962) may eventually prove to be in part, *L. pseudacuta.*

We refer to records of *L. acuta* from oceanic waters of the Arabian Sea.

Genus **Pontella** Dana, 1849

Pontella Dana, 1849
Pontia Milne-Edwards, 1828
Iva Lubbock, 1853
Labidocera (part) Lubbock, 1853
Pontellina (part) Claus, 1893

Cephalon with lateral cephalic hooks, usually without a crest and is separated from T-I; one pair of dorsal cuticular eye lenses and ventral eye lens present; rostrum bifurcate with short rami and with distinct lens, which are well developed in male than in female; T-IV and T-V separated, T-V produced posterad, often asymmetrical in female; urosome two- or three-segmented in female; asymmetrical, with lobes and corrugations of various shape; in male, urosome four-or five-segmented, often symmetrical; CR mostly asymmetrical in female; Mnd palp with 7 teeth; Mx-1 and Mx-2 like those of *Labidocera,* but B2 of Mx–2 as long as internal lobe; Mxp-7 segmented; Right A–1 of male with two segments distal to articulation between 18 and 19–21 segments; Ri of Pl with three segments; P5 biramous in female, reduced or sometimes asymmetrical; it is uniramous in male, right leg chelate with stout finger and thumb.

Type species: *Pontia atlantica* Milne-Edwards, 1828

Pontella fera Dana, 1849; (Fig. 19)

Pontella fera Dana, 1849, p. 34 (*Type locality*: Pacific, 11°–12°45′N, 170°–171° E); Dana, 1852, p. 1169, pl. 82, figs. 5 a-i; Giesbrecht, 1892, p. 462, pl. 24, figs. 14, 34, 36, 45; pl. 40, figs. 15, 18, 27, 63; Giesbrecht and Schmeil, 1898, p. 144.

Pontellina (*Eupontellina*) *fera* Claus, 1893, p. 273.

Material Examined: From R. V. VARUNA (surface hauls) stations 3562, 3565; and from R. V. KALAVA stations 428 from Laccadive Sea.

Size:	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	51	2.36–2.92	2.68	3.2:1
Adult male:	28	2.33–2.67	2.41	3.3:1

Description: FEMALE: Separation between cephalon and T-I, and T-IV and T-V distinct; rostrum slender and pointed; rostral lenses feebly developed; dorsal eye lenses moderately large; posterior corners of T-V asymmetrically produced on either side into wing like processes extending beyond middle of genital segment; urosome two-segmented, genital segment asymmetrical, being produced laterally on left side; ventrally segment with two knob-like processes, which vary in size and

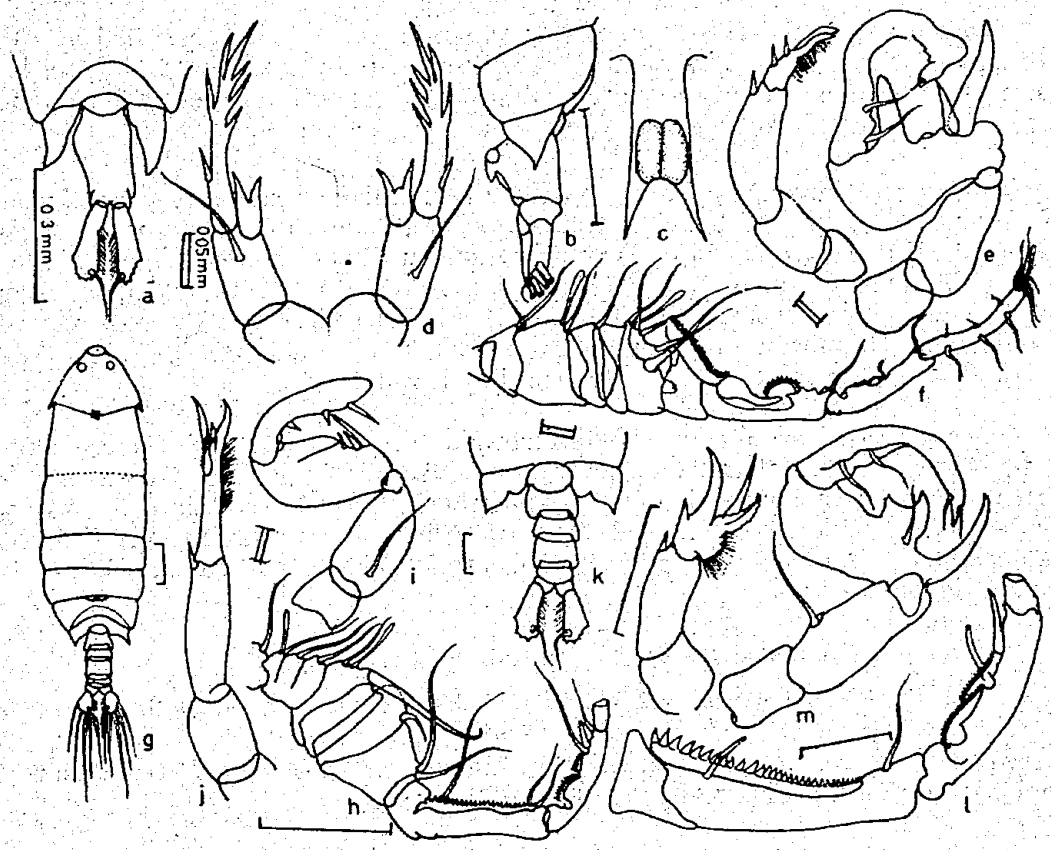

Fig. 19. a - f *Pontella fera* : a. Urosome - female; b. urosome - female (lateral view); c. rostrum female; d. P 5 - female; e. P 5 - male; f. A 1 - male. g - j. *Pontella andersoni* : g. dorsa view - male; h. A 1 - male; i.P 5 - male (right); j. P 5 - male (left); k - m. *Pontella investigatoris* : k. urosome - male; l. A 1 - male, and m. P 5 - male.

shape according to age of animal; CR asymmetrical, left ramus being larger; *A-1*: 23-segmented; *P* 5: symmetrical, Ri short and bifid apically, bifurcation varying from blunt to pointed process in different specimens; Re elongated, with three spines each on inner and outer margins, outer marginal spines being widely separated; apex of Re elongated, pointed and generally twice length of distal inner spine; seta on B2 long, generally extending beyond posterior tip of Ri.

MALE: Cephalon as in female; small lateral setules seen on lateral margins of T-III and T-V; T-V ending in bluntly rounded posterior projections of more or less equal size; urosome five-segmented, genital segment with a small lateral bulge on its right side; CR asymmetrical, right ramus being slightly broader; right *A*-1: geniculate, with a curved denticulated plate on upper margin of segment 18; fusion segment 19–21 with a button-shaped process and two knob-like projections on dorsal surface; *P* 5: Right leg chelate; hand of chela with three finger-shaped processes of unequal length, one at base of movable finger, other two ahead of projecting lamina at base of hand; finger bent inwards, with a recurved blunt tip, bearing a small seta; two moderately long setae present at proximal inner base of finger; left leg: with distal segment terminating in three finger-like subequal processes middle one being slightly longer than others; in addition, two short spines present along its outer margin; subterminal segment of left leg with a spine at its distal outer margin; inner margin of terminal segment fringed with marginal hairs.

Remarks: Wilson (1950) opined that the male of *P. fera* described by Dana (1852, pl. 82. figs. 5, 1) is referable to *P. tenuiremis* Giesbrecht, 1889. *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 (Sherman, 1964; Heinrich, 1968).

Distribution: Indian and Pacific Oceans. From Indian Ocean: Malay Archipelago (A. Scott, 1909); Bay of Bengal, Andaman Sea (Sewell, 1932); coast of Burma (Sewell, 1912); Lawson's Bay, Waltair (Ganapathi and Shanthakumari, 1961); Gulf of Mannar (Sewell, 1914; 1932); Ceylon Pearl Banks (Thompson and Scott, 1903); Maldive Archipelago (Wolfenden, 1906); Laccadive Sea (present record); Arabian Sea (Thompson and Scott, 1903; Sewell, 1947); Red Sea (A. Scott, 1902); Indian Ocean (Voronina, 1962); Durban Bay (Brady, 1915).

Other records: Wolfenden (1911) recorded *P. fera* west of Cape Colony, South Africa (South Atlantic). The records from the Pacific Ocean are by Farren (1936: Great Barrier Reef); A. Scott (1909: from 12 "Siboga" stations from Western Pacific); Wilson (1950: from 10 "Albatross" stations around Hawaiian Islands and Philippines); Sherman (1964: Central Pacific); and Tanaka (1964: Izu Region, Japan).

Pontella andersoni Sewell, 1912; (Fig. 19)

Pontella andersoni Sewell, 1912, pp. 323–330, 344–346, and 370, pl. 20, figs. 1–9 (*Type locality*: Off Chittagong, Bay of Bengal).

Material Examined: From Gulf of Mannar on 13-12-1967 from surface zooplankton samples collected at 2100 – 2205 hrs.

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult male:	1	—	2.88	3.3:1

Description: MALE: Cephalon distinct from T-I; lateral cephalic hooks present; rostral eye lenses rather small; dorsal eye lenses not well developed; T-V posteriorly produced into a symmetrical short spine; urosome five segmented, U-III larger than rest; Right *A*-1: geniculate; segment 17 produced at its dorsal surface as a low crest terminating in a short spine distally; segment 18 with a denticulated plate, extending to three-fourth of its dorsal margin; fusion segment 19–21 with two dorsal toothed plates, each armed with fine spinuous teeth; distally, segment with a

falcate spine; *P* 5: right P 5 chelate; hand with two subequal spines and a proximal hood-like projection; finger distally club-shaped and with four spinuous setae along inner margin; left P 5 : with short B 2; terminal segment elongate, with one spine and two processes distally; an additional serrated spine at about two-thirds of its distance along its outer surface; a tuft of small hairs present along its inner margin; subterminal segment elongate and with a conspicuous spine at outer distal margin.

Remarks: This species had been recorded from coastal and brackish water environments. Its original description was based on a single male and partly on a damaged female obtained from Chittagong. Sewell (1932) described the Copepodite-III and discussed the growth stages in detail.

Distribution: From Indian Seas. Burmese coast (Sewell, 1912); Salt Lakes, Calcutta (Sewell, 1934; Dutta *et al.*, 1954) Lawson's Bay, Waltair (Ganapathi and Shanthakumari, 1961); Madras Coast (Krishnaswamy, 1953); Gulf of Mannar (present record).

Pontella danae Giesbrecht, 1889; (Fig. 20)

Pontella danae Giesbrecht, 1889, p. 28 (*Type locality*: Pacific Ocean betwen 82° to 128°W, and 9°S to 12°N); 1892, p. 461, pls. 24 and 40. Giesbrecht, 1892. pp. 477, pl. 24, figs. 461, 32, 33, 35, 40; pl. 40, figs. 16, 20; Giesbrecht and Schmeil, 1898, p. 143.

Pontellina (Ivellina) danae Claus, 1893, p. 274.

Material Examined: Two males. One collected from Port Blair, Andaman Islands from surface haul made from Marine Bay on 27–3–1968 at 0610–0635 hrs; another specimen collected from the surface zooplankton collection made from Laccadive Sea (10°33′N, 74°39′E) on 12–12–1966 at 1900 – 1935 hrs.

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult male:	2	3.01–3.08	3.05	3.0:1

Description: MALE: Body robust; dorsal eye lenses, ventral lens and rostral lens are well developed; T-V posteriorly produced into acuminate lobes; urosome five-segmented; U-III longer than others; CR asymmetrical, right ramus slightly larger than left and three times longer than broad; Right *A* –1 : geniculate; segment 14 with a long dorsal spine carrying a small flagellum at tip; segment 18 with dorsal toothed plate which extends over segment 17 also; fusion segments 19–21 with two denticulated plates, arranged one behind the other and these plates carry short spiniform teeth; segment distally carrying a falcate spur; segments 22–25 fused. *P5*: Right leg chelate; hand of chela squarish, with a well developed conical thumb; inner margin of hand provided with a squared process and towards base of thumb externally another conical spine present turned inwards; finger with a crescentic outgrowth at its inner mid-margin and terminates in a small hook which carry a seta; left leg: terminal segment with two outer marginal spines and two distal spines, outer distal spine being curved and with serrated margin; inner margin of segment with setose hairs; subterminal segment with a disto-lateral spine.

Remarks: This species had been previously recorded from Indian and Pacific Oceans. Thompson and Scott (1903) described a variety based on female specimens of this species from Ceylon waters as *P. danae* var. *ceylonica*. A. Scott (1909) remarked that his material collected from SIBOGA Station 117-a from Malay Archipelago (north west of Celebes) showed characters intermediate between *P. danae*

typica and *P. danae* var. *ceylonica*, thus forming a connecting link between the typical form and the variety. It may be that this species is highly variable.

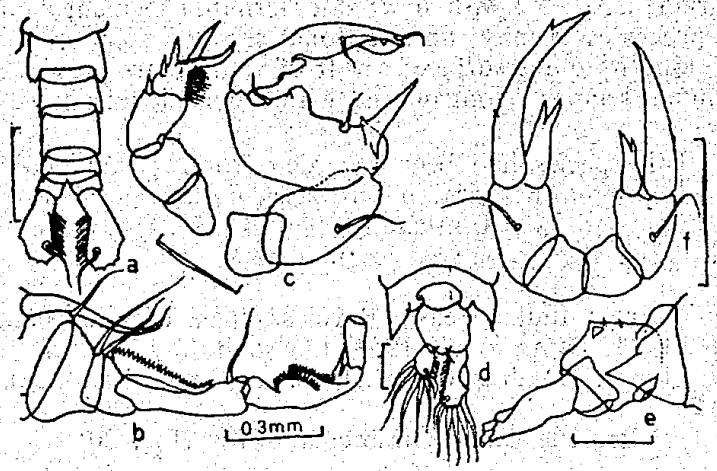

Fig. 20. a : c. *Pontella danae* : a. Urosome - male; b. A 1 - male, c. P 5 - male; d - f. *Pontella danae ceylonica* : d. urosome - female (dorsal view); e. urosome - female (lateral view); and f. P 5 - female.

Distribution: Pacific and Indian Oceans. From Indian Ocean: Bay of Bengal and Andaman Sea (Sewell, 1932: INVESTIGATOR Stations 575 and 614; present record); Trivandrum coast (Menon, 1945); Indian coastal waters (Kasthurirangan, 1963; Calicut (Jacob and Menon, 1947); Indian Ocean (Voronina, 1962); Red Sea (Giesbrecht, 1896).

Pontella danae var. **ceylonica** Thompson and Scott, 1903; (Fig. 20)

Pontella danae var. *ceylonica* Thompson and Scott, 1903 (Female only), p. 252, pl. 2, figs. 5–1 (*Type locality*: five stations around Ceylon).

Material Examined: From inshore waters of Cochin during March, April, 1969 collected from surface at 0600–0800-hrs; From Gulf of Mannar, on 12–1–1960 at 09.45-10.00 hrs from surface; from Vizhinjam inshore waters on 6–2–1961 at 18.00 hrs from surface; and from R. V. VARUNA station 3352 (Surface haul).

Size:

	No.	Range (mm)	Mean (mm)	P:UR ratio
Adult females:	34	3.39–3.51	3.42	3.8:1

Description: FEMALE: Cephalon with dorsal eye lenses and ventral lenses well developed; rostrum bifid, tapers to tip; rostral lens feebly developed; prosome more or less of same width throughout; T-IV and T-V separated, T-V asymmetrically produced posteriorly into acuminate spines, left lobe longer than right; urosome of two segments, genital segment somewhat globular; a blunt projection was observed on mid-dorsal margin of genital segment, perceptible in lateral view; CR asymmetrical. right ramus distinctly broader and longer and carries a marginal fold medio-dorsally, ratio of L:W of right ramus being 3:1 while that of left ramus is 1:5:1; middle three setae of right ramus bulbous at bases; A-1 relatively short and consists of 23 segments; *P 5*: asymmetrical, left ramus distinctly larger; Re

stout and ends in acuminate tips; left Re provided with three outer marginal spinnules of which distal most one is large; Ri of both legs asymmetrically bifid at tip.

Remarks: Sewell (1932) has pointed out that the specimens collected by A. Scott (1909) from the Malay Archipelago was intermediate in structure between the Pacific form and var. *ceylonica* of Indian waters, and that they form a series rather than separate varieties. Specimens from Malay Archipelago were characterised by the nature of P 5 which resembles that of var. *ceylonica* but the caudal rami agree with Giesbrecht's original description. In the shape of the body the typical Pacific form tapers gradually from T-II to T-V while in specimen for the Indian waters the prosome is nearly of the same length throughout. The shape of the genital segment is also more quadrate in the Pacific form while it is more globular in Indian specimens. In the present material, which fits in with the description of var. *ceylonica*, P 5 also shows different spinulations for Re, and the caudal setae are distinctly bulbous on the right ramus. One additional feature noted in the material at hand is the presence of short processes on the dorsal margin of genital segment.

Sewell (1932) remarked that although he considered the two forms, *P. danae* var. *ceylonica* and *P. investigatoris* (male only) as being respectively the female and male of a single species (1914), his studies on the growth-factor on these material proved that the males show distinct growth-factors and *P. investigatoris* should be regarded as a separate species.

Distribution: From Indian Ocean: Malay Archipelago (A. Scott, 1909); Bay of Bengal and Coast of Burma (Sewell, 1912; 1932, INVESTIGATOR stations 542, 544, 556, 563,574, 577, 583, 587, 588 and 591); Lawson's Bay, Waltair (Ganapathi and Shanthakumari, 1961); Madras Coast (Krishnaswamy, 1953); Gulf of Mannar (Sewell, 1914; present record); Mandapam waters (Prasad, 1956); Ceylon Pearl Banks (Thompson and Scott, 1903); Indian coastal waters (Kasthurirangan, 1963); Vizhinjam Coast (present record); Trivandrum Coast (Saraswathy, 1966); Cochin Backwater (Pillai, 1972).

Pontella investigatoris Sewell, 1912; (Fig. 19)

Pontella investigatoris Sewell, 1912, pp. 371–372, pl. 23, figs. 1–3 (Male only) (*Type locality*: 14°08′ to 14°10′N, 97° 45′ to 97° 46′E; and 13° 47′ to 13° 52′N, 98°03′ to 98°06′E).

Material Examined: 8 males from the surface samples collected from R. V. VARUNA station 4161; 5 males from Vizhinjam Coast, collected on 12–1-1960 at 0945 - 1000 from surface; 6 males from Andaman Islands (AN-17, AN-18).

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult male:	16	2.88-3.28	3.12	3.5:1

Description: MALE : Body robust; dorsal eye lenses, ventral lenses and rostral lenses are well developed and conspicuous; separation between T-IV and T-V distinct, latter ending in a pointed triangular process on each side; urosome of five segments; CR asymmetrical, right ramus being stouter, rami being nearly two times as long as broad; Right *A*–1: geniculate; segments 18 and fusion segments

19–21 carrying denticulated plates on their dorsal margins; segment 14 with a long spine, carrying a small flagella at its tip; denticulated plate on segment 18 with sharp teeth and extends proximally over segment 17; segment 19-21 with two toothed plates, both armed with sharp, villiform teeth; segment ends in a falcate spur; segments 22–25 fused completely. *P* 5: Right P 5 chelate; thumb well developed, in the form of a curved stout spine; inner margin of hand with a quadrate process, dorsal margin of which is crescentic and this process carries a seta towards its base; claw curved, elongated and with three inner marginal and one outer distal spine; left leg: terminal segment short, and provided with one outer marginal spine, two terminal spines and a flagelliform process; inner margin of segment provided with two patches of hairs; subterminal segment with a distolateral spine.

Remarks: Sewell (1914) considered this species which is described from male specimens only, as the male of *P. danae* var. *ceylonica*. Later (1932) he drew attention to the differences, chiefly in the growth-factors of the two forms and opined that they are different. Almost throughout the collections from where *P. investigatoris* were found, *P. danae* var. *ceylonica* was also collected.

Distribution: Recorded only from the Indian waters : Bay of Bengal and coast of Burma (Sewell, 1912, 1914, 1932: INVESTIGATOR stations 563, 577, 578, 583, 587, 590, and 591); Andaman Sea (present record); Lawson's Bay, Waltair (Ganapathi and Shanthakumari, 1961); Vizhinjam Coast (present record); Trivandrum Coast (Saraswathy, 1966); shelf waters of west coast of India (present record); Cochin Backwater (Sewell, 1932).

Pontella securifer Brady, 1883; (Figs. 21, 22)

Pontella securifer Brady, 1883, p. 96, pl. 45, figs. 1–9 (*Type locality*: Mid Pacific); Giesbrecht, 1892, pp. 461, 466, 474, 477; pl. 24, figs. 9, 37, 41, 43; pl. 40, figs 6, 14, 21, 32 and 34; Giesbrecht and Schmeil, 1898, p. 142.

Pontia brachyura Kroyer, 1849, pp. 601, 609.
Pontellina (Ivellina) securifer Claus, 1893, p. 274, pl. 5, fig. 6.
Pontella spinipes (part) Wolfenden, 1906, p. 1020 (male).

Material Examined: From vertical zooplankton collections made at R. V. VARUNA stations 3590, 3591, 3641, 3651; from surface hauls made at R. V. VARUNA stations 4161, 4137; from surface zooplankton collections made at R. V. KALAVA stations 428, 435.

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult male:	16	3.62–4.02	3.90	—

Description: MALE: Body resembles that of *P. spinipes;* rostrum bulbous and lenses well developed except dorsal eye lenses which are relatively small and set wide apart; cephalic side hooks well developed; posterior corners of T-V symmetrical, with inner flanges well developed; urosome of five segments, genital segment broad and symmetrical; CR asymmetrical, right ramus longer; Right *A*–1: geniculate, with a moderately long and stout spine on dorsal margin of segment 14; dorsal toothed plate on segment 18 overlapping segment 17 and extends to proximal half of segment 16; segment 19 of fusion segment 19-21 with a well developed elevation on its inner proximal margin bearing about 7-9 well developed lamellar teeth, median

teeth being larger; fusion segment also with two toothed plates, denticles on the upper one villiform and the lower one triangular; segment terminates in a falcate spine; segments 22–25 fused completely. *P* 5: Right P 5 chelate; and of chela more or less rectangular, with two well developed processes proximal to thumb; inner most process, curved, short and rounded at tip; second process elongate, pointed and with a broad base, bearing a seta on its inner margin; inner margin of proximal part of finger with a small rounded outgrowth; left P 5 with two outer marginal and two terminal spines on distal segment; subterminal segment with a disto-lateral spine; two distinct patches of fine setae are present on inner margin of terminal segment.

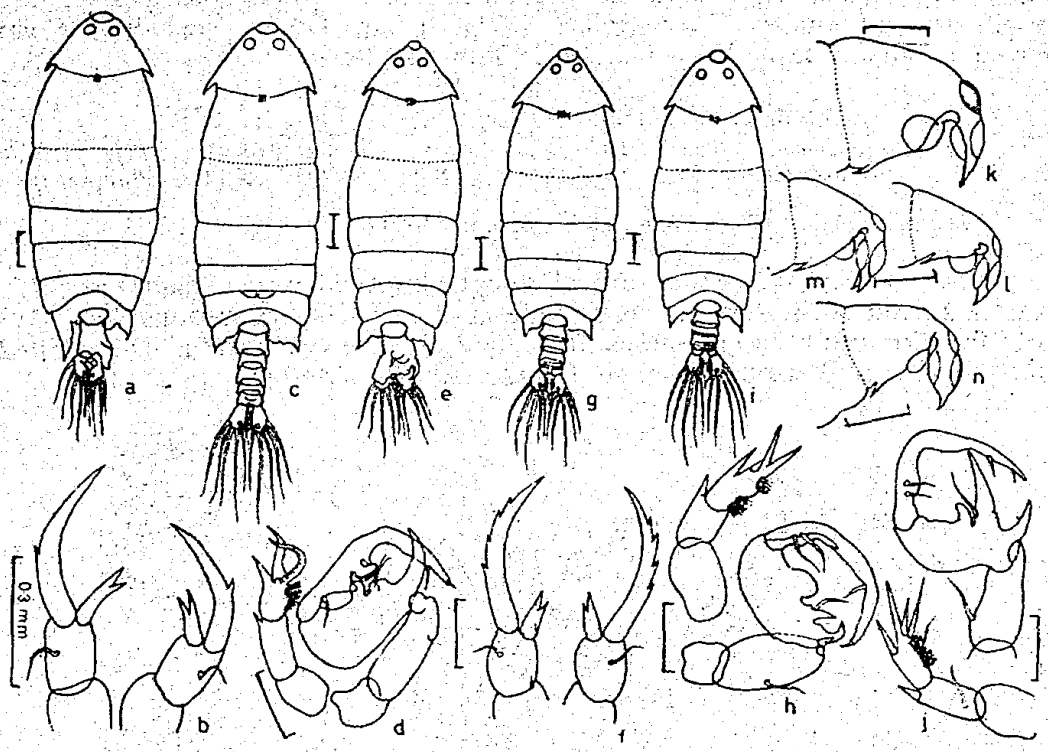

Fig. 21. *Pontella spinipes* : a. dorsal view-female; b. P 5 - female; c. dorsal view-male; d. P 5 - male. k. rostrum-male. *Pontella diagonalis* : e. dorsal view-female; f. P 5-female; g. dorsal view-male; h. P 5 - male; l. rostrum - male; m. rostrum-female. *Pontella securifer* : i. dorsal view - male; j. P 5 - male; and n. rostrum - male.

Remarks: Although there are many records of its occurrence in the Indian Ocean, no description of this species is available from this area. Sherman (1963) remarked that this species prefers warm surface waters. According to Vervoort (1965) the distribution range of this species in Pacific and Atlantic is between 35° N to 35° S, and in Indian Ocean north of 35°S, and the records of this species from Puget Sound (as stated by Sewell, 1947, p. 250) and from Woods Hole (Wilson, 1932) are doubtful. Chiba (1956) described the male of *P. meadi* from Indian Ocean (from 1°29′ N, 96°25′E and 8°40′S, 110°25′E), but his descriptions clearly indicates that his specimens belong to *P. securifer*.

P. securifer, *P. diagonalis* and *P. spinipes* are closely allied belonging to a "species group". Some differences were observed in the rostrum of males and the nature and disposition of rostral lenses in all three species as : the rostral lenses

are greatly developed in *P. diagonalis* while they are relatively small in *P. spinipes* and *P. securifer* evincing an intermediate condition.

Distribution: Atlantic, Pacific and Indian Oceans. From Indian Ocean Malay) Archipelago (Scott, 1909); Singapore Strait (Wickstead, 1961); Bay of Bengal: Sewell, 1912; 1932: INVESTIGATOR stations 552, 614); Waltair Coast (Ganapathi and Rao, 1958; Ganapathi and Shanthakumari, 1961); Madras Coast (Menon, 1931; Iyer, Menon and Menon, 1936; Krishnaswamy, 1953); Gulf of Mannar (Sewell, 1914; Prasad, 1956); Indian coastal waters (Kasthurirangan, 1963); Maldive Archipelago (Wolfenden, 1906; also as *P. spinipes* on p. 1020); Minicoy, Laccadives and Indian Ocean (Thompson and Scott, 1903; present record; Arabian Sea (Cleve, 1903; Sewell, 1947); Bombay Coast (Pillai, 1971); Indian Ocean including Central Northern Indian Ocean (Voronina, 1962; Tsuruta, 1963).

Pontella diagonalis Wilson, 1950; (Figs. 21, 22)

Pontella diagonalis Wilson, 1950, pp. 292–293; 28, figs. 410–413. (*Type Locality*: ALBATROSS station 5553 at 5° 51′ N, 120°46′ 30″ E, off Jolo, Philippines).

Pontella spinipes (Part), Wolfenden, 1906, p. 1020.

Material Examined: From vertical zooplankton collection made at R. V. VARUNA station 3854; surface hauls made at R. V. VARUNA stations 3565, 4137, 4161; from zooplankton collections made at R. V. KALAVA stations 424, 425, 426, 428, 429, 485; and from Andaman Islands (AN-17, AN-18).

Fig. 22. a and b. *Pontella spinipes* : a. Urosome - female; b. A - 1 male.
c and d. *Pontella diagonalis* : c. urosome - female; d. A 1 - male.
Pontella securifer : e. A 1 - male.

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	3	4.23–4.80	4.33	—
Adult male:	17	3.94–4.15	3.98	—

Description: FEMALE: Prosome longer than wide; rostal projection conspicuous with enlarged rostral lenses as in male; ventral eye lenses and dorsal lenses

moderately developed; lateral cephalic hooks present; segmentation between cephalon and T-I and T-IV and T-V distinct; three circular mid-dorsal pigmented patches are present on dorsal margin of segments T-I, T-II, and T-III; postero-lateral lobes of T-V asymmetrically pointed, basal flanges of lobes well developed; urosome asymmetrical, a broad dorsal 'shield' covers genital segment and extends backwards on left side overlapping left CR, and having an almost truncate posterior margin; dorsal profile of genital segment elevated, with a short blunt process directed posterad; right posterior corner of 'shield' produced into a stout claw-like spine in front of outer margin of base of right CR; CR very asymmetrical, right ramus being longer and broader; *P* 5: highly elongated, Re of both legs considerably surpassing end of CR; Re distally acuminate, and bears 4 spinnules on its outer margin; Ri short, about 25% length of Re and bifid at tip.

MALE: Prosome resembles that of female; segmentation between T-IV and T-V distinct; posterior margin of T-V ending in acuminate spines; urosome five-segmented, genital segment larger and asymmetrical, having a lobe like projection on left side; CR asymmetrical right ramus larger and distally broader. As in female, three dusky mid-dorsal pigmented spots present on T-I, T-II and T-III; Right *A*-1: geniculate; segment 13 with a stout, elongate spine, terminating in a claw-like tip; segments 17, 18 and fusion segment 19-21 carry dorsal toothed plates; that of former overlapping 16th segment and extends to middle of 18th segment, and provided with triangular denticles; plates on segment 19–21 preceded by an elevated process on proximal dorsal part of segment 19, which bear three stout and conspicuous subequal teeth, middle one longest; dorsal plate with a single row of denticles; segment ends distally in a falcate spur; segments 22–25 perfectly fused. *P* 5: chela on right leg well developed; hand with three processes, inner most process being broadly hemispherical; at base of thumb, two stout spine-like processes are present, internal one with a basal seta; finger slender, elongate, pointed and with three internal setae towards its base; left P 5 with distal segment carrying two spines on outer margin and two terminal; penultimate segment with a distal outer spine; two patches of fine setae present on the inner margin of terminal segment.

Remarks: The present material agrees with the earlier description by Wilson in: (1) the unusually enlarged rostral lenses and (2) dorsal 'shield' over the urosome diagonally extending backwards. Slight differences noted between these two materials are: (1) female P5 has four instead of three outer marginal spines and Re of P 5 itself reaches beyond CR and (2) the slight differences in the disposition of the dorso-median coloured blotches.

The male of *P. diagonalis* has not been described properly so far. Wolfenden (1906) described the male of *P. spinipes* which was later identified as a variation, 'either seasonal or local, of *P. securifer*' (Sewell, 1912). Wolfenden's specimens were characterised by: (1) the right A-1 of male carrying a rounded projection with three teeth on the proximal part of fusion segment 19-21, (2) male P 5 lacking in the spine-like triangular process on the basal part of the claw (which occurs in *P. securifer*), and (3) in the presence of a rounded outgrowth on the margin of the claw near its middle and having some distance between it and the proximal spine-like process. Since a large number of males of the kind described by Wolfenden were obtained along with the *P. diagonalis* females on many occasions it was felt reasonable to consider these males as belonging to this species. In most of the collections examined, specimens of males and females of *P. spinipes* were found along with *P. diagonalis*.

Distribution: Indian Ocean and west Pacific. From Indian Ocean: Andaman Sea (present record); Maldive Archipelago (Wolfenden, 1906, male only as

P. spinipes); west coast of India and the Laccadive Sea (present record); southern Indian Ocean (Seno, 1962); S. African Coast (Decker and Mombeck, 1964).

Pontella spinipes (Giesbrecht), 1889; (Figs. 21, 22)

Pontella spinipes Giesbrecht, 1889, p. 28 (*Type locality*: Arabian Sea at 60° E and 14° N); Giesbrecht, 1892, pp. 461, 462, 463; pls. 24, fig. 30; pl. 40, figs. 2, 23, 24.
Pontella spinipes (part) Wolfenden, 1906, pp. 1020, 1021 (Female).

Material Examined: From vertical zooplankton collections made at R. V. VARUNA stations: 3578, 3621, 3686; from surface hauls made at R. V. VARUNA stations 3562, 3565, 3856, 3865, 4137, 4161; from surface zooplankton collections made at R. V. KALAVA stations 424, 428, 429, 435; and from Andaman Islands (AN-10, AN-11).

Size:

	No.	Range (mm)	Man (mm)	P: UR ratio
Adult female:	15	3.98–4.68	4.51	4.6:1
Adult male:	10	3.62–4.06	3.80	2.8:1

Description: FEMALE: Body short and robust; dorsal and ventral eye lenses and rostral lenses well developed; T-IV and T-V distinct; three blue rounded pigmented blotches are observed mid-dorsally on segments T-I, T-II and T-III, T-V asymmetrically produced into acuminate lobes, left posterior lobe conspicuously larger and reaches to middle of lateral margin of CR; the posterior margin of T-V in the shape of crescentic lobular processes on either side between these pointed lobes T-V and insertion of urosome; urosome of two segments, genital segment bulged on its right lateral margin and dorsally extends backwards over right CR, thus covering U-II completely; CR asymmetrical, right ramus distinctly larger; *A-I* of 23 segments, reaches to posterior margin of T-V; *P* 5: asymmetrical, right leg larger Re of each leg acuminate, curved inwards with three to four short spinnules on outer margin, proximal spinnule being larger than others; Ri about half length of Re and asymmetrically bifid at tip.

MALE: Body robust; dorsal and ventral lenses and rostral lenses well developed; posterior corners of T-V symmetrical with inner flanges well developed; urosome of five segments; CR symmetrical; Right *A-I*: geniculate; toothed plates present on segments 18 and fusion segment 19–21; denticles on former are large and set wide apart diminushing in size distad; plate extends over segment 17 and reaches to middle of 16th segment; segment 14 with a stout long spine with a flagellum at its tip; fusion segment 19–21 with two toothed plates, proximal one being shorter than distal and both with villiform teeth; segment ends dorsally in a falcate spur. *P* 5: Right leg chelate; hand of chela well developed; thumb present as a stout curved spine, inner margin of which is provided with three blunt rounded processes and with a median seta; claw elongated, curved and with three rounded processes on its inner margin; claw is also provided with one terminal and two inner marginal setae; left leg with terminal segment short and with a stout curved spine and two flagelliform processes, middle one of which is serrated on its margin; hair-like setae present on its inner margin; subterminal segment with a disto-lateral spine.

Remarks: Although found in abundance in some collections, this species shows a discontinuous pattern of distribution. Sewell (1912) described the male of this

species from the Bay of Bengal and drew attention to the differences in the characters of the male of this species that of *P. securifer*. He also remarked about the relation between the size of the specimens and the length of toothed plates on the fusion segments 19–21 i. e. in smaller specimens the distal plate will be longer than the proximal one in length and *vice versa*. He opined that Wolfenden's (1906) description of the male *spinipes* is 'in all probability merely a variation of the male of *P. securifer*'.

Distribution: Indian and Pacific Oceans. From Indian Ocean: Bay of Bengal (Thompson, 1900; Sewell, 1912; 1932. INVESTIGATOR stations 542, 544, 556, 577, 582, 590, and 591); Andaman Sea (present record); Indian coastal waters (Kasthurirangan, 1963); Maldive Archipelago (Wolfenden, 1906: Female); west coast of India and Laccadive Sea (present record); Arabian Sea (Giesbrecht, 1889; 1892); Indian Ocean (Voronina, 1962).

Pontella princeps Dana, 1849; (Fig. 23)

Pontella princeps Dana, 1849, p. 34 (*Type locality*: Tongatabu Is. in Pacific) Giesbrecht, 1892, p. 461, pl. 24, figs. 2, 28, 29, 39; pl. 40, figs. 11, 25, 38; Giesbrecht and Schmeil, 1898, p. 142.

Pontellina (*Ivellina*) *princeps* Claus, 1893, p. 283.

Material Examined: From surface zooplankton collections made at R. V. VARUNA stations 3562, 3565 and from surface zooplankton samples made at R. V. KALAVA stations 428, 435.

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	4	4.98–5.56	5.32	2.9:1
Adult male:	2	5.11–5.30	5.04	3.0:1

Description: FEMALE: Cephalic side hooks prominent; rostral lenses and dorsal eye lenses moderately developed; ventral eye lens conspicuous; cephalon and T-I separated, T-IV and T-V distinct; posterior margin of T-V produced as two asymmetrical flaps on either side of urosome, terminating in acute spines, that on left side reaching distal end of genital segment; urosome of two segments, genital segment on its right dorsal side with a conspicuous process followed by four subequal, short conical outgrowths; left lateral margin of genital segment concave at middle, due to two lateral projections; ventrally segment with three subequal stout spines on right side, middle one being longer; genital flap conspicuous; anal segment asymmetrically bifid posteriorly, left lobe being larger; CR asymmetrical, right ramus longer and broader; *P* 5: Re stout and well developed, twice as long as Ri; both bifid asymmetrically at apex, outer spine of bifurcation being small; three minute outer marginal spines present on Re which are scarcely visible in low magnification.

MALE: Prosome resembles that of female; dorsal eye lenses are more conspicuous and rostral lens well developed; T-V ending in pointed lobes, directed posterad; urosome of five segments, genital segment with a lobe on its left proximal margin; CR longer than broad, right ramus slightly larger than left; Right *A*-1: geniculate, segment 14 with an elongated spine, with a curved flagellum at its tip; a short, stout spine present on outer dorsal margin of segment 15; two large toothed plates each on segment 17 and 18 and two other smaller toothed plates on fusion segment 19–21 present; teeth on the former are coarse and denticulate, while those

on latter villiform; a falcate spine present on distal margin of segment 19–21; segments 22-25 completely fused; *P5*: Right P 5 with a chela; finger of chela with three subequal setae on its inner margin, a short, bent spine-like projection present at base of distal fold of finger; hand enlarged at middle in the form of curved, triangular structure; inner margin of hand with a bluntly rounded process followed by a seta at base and tooth-like pointed process at base of thumb; left leg: distally ending in two subequal processes, each expanded along tips; longer one of these processes is spatulate and with crenulated margin; shorter process truncate distally and with short seta towards its base; distal segment with an elongated spiniform proximal outer seta; two tufts of marginal hairs present at inner margin of distal segment.

Remarks: Giesbrecht (1892) has not shown the three minute marginal spinnules present on the outer margin of Re of female P 5 (Pl. 24, fig. 29); these spinnules closely resembles those of *P. atlantica* Milne-Edwards.

Distribution: Indian and Pacific Oceans. From Indian Ocean: west coast of Australia (Voronina, 1962); Bay of Bengal (Sewell, 1912); Andaman Sea (Sewell, 1932, INVESTIGATOR station 614); Ceylon Pearl Banks, Gulf of Mannar (Thompson and Scott, 1903); Trivandrum Coast (Saraswathy, 1966); Laccadive Sea (present record); Arabian Sea and Central Indian Ocean (Voronina, 1962).

Pontella denticauda A. Scott, 1909; (Fig. 23)

Pontella denticauda A. Scott, 1909, pp. 161–192, Pl. 52, figs. 1–12 (*Type locality:* females and males from 13 SIBOGA stations in Malay Archipelago).

Material Examined: 1 partly damaged male from Nicobar waters, Andaman Islands collected from surface waters on 14-4-1968 between 1745–1865 hrs. at Nancowri Harbour.

Size:

	No.	Range (mm)	Mean (mm)	P : UR ratio
Adult male:	1	—	3.264	3.2:1

Description: MALE: Body robust and elongated; dorsal eye lenses and ventral and rostral lenses moderately developed; T-V ending posteriorly in conical points; urosome of five segments, U-II and U-III of more or less of same length; CR symmetrical; Right *A*–1: geniculate; segment 14 with a spine on its dorsal surface; segment 16 with a crescentic dorsal surface; segment 18 with a crescentic toothed plate, extending proximad over segment 17, proximal denticles on this segment being triangular and distal ones villiform and adpressed close together; fusion segment 19–21 carrying a pear-shaped projection at its proximal part and a non-serrated plate, terminating in an acute spine distally; segments 22–25 fused. *P* 5: large and well developed; right leg with a chela; thumb-like process on chela large, spiniform and with an outwardly curved apex; inner margin of hand with a triangular spine and a conspicuous tubular blunt process; claw lamelliform and spoon-shaped and provided with two basal setae; basal segment of right leg with a spinuous process which Scott (1909) described as 'rudimentary Ri'; left leg with distal segment terminating in two strong subequal spines, inner one pointed and with marginal setules, outer spine bluntly rounded and broad; towards middle of segment, there are three setose spines arranged one behind the other; subterminal segment with a disto-lateral spine; basal segment with a small spine attached to seta.

Remarks: Scott (1909) described this species from Malay Archipelago and stated that his specimens measured 2.9 mm. The present material from near its type locality measured 3.26 mm. Scott has pointed out its close relationship to *P. tenuiremis* Giesbrecht.

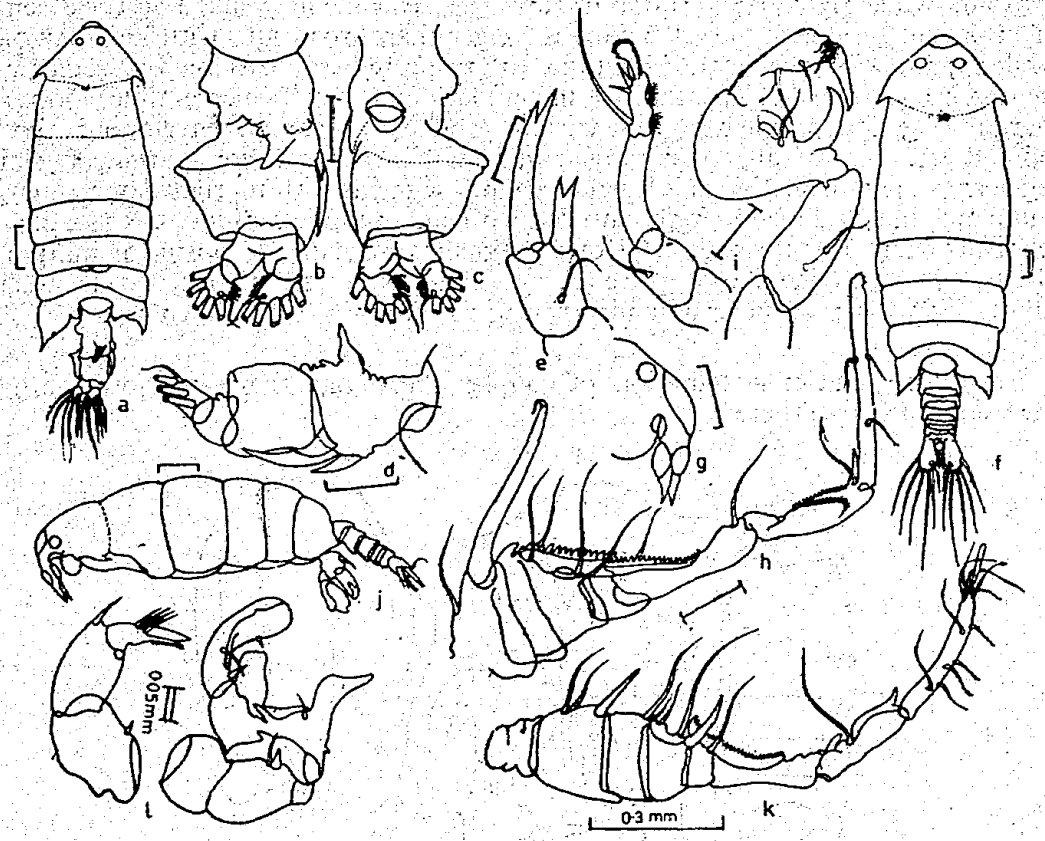

Fig. 23. *Pontella princeps* : a. dorsal view : female; b. urosome - female (dorsal view); c. urosome - female (ventral view);d. urosome - female (lateral view); e. P 5 - female; f. dorsal view - male; g. rostrum - male; h. A l; i. P 5 - male. *Pontella denticauda* : j. lateral view-male; k. A l - male, and l. P 5 - male.

Distribution : Indian and Pacific Oceans. From Indian Ocean: Bay of Bengal (Sewell, 1932: INVESTIGATOR Station 614; present record); Eastern Indian Ocean, South of Java Sea (Voronina, 1962).

Pontella sp. A; (Fig. 24)

Material Examined: 10 Females collected from the west coast of India as follows: R. V. VARUNA station 1325, 11°22′N, 74°56′E (2F); station 1342, 11°58′N, 70°00′E (2F); station 1710, 08°26′N, 76°54′E (3F); 10°33′N, 74°39′E (2F) and 1 female from surface collection from Vizhinjam, made on 13-10-1958 at 0845 hrs.

Size:

	No.	Range (mm)	Mean (mm)	P:UR ratio
Adult female:	10	3.77–4.42	4.16	4.5:1

Description: FEMALE: Body robust; rostrum bifid, basally thickened and tapers to tip; tips of rostrum projected laterad; rostrum lacking in distinct lenses; dorsal eye lenses rounded and placed wide apart; ventral eye lens well developed; separation between T-I and Cephalon and T-IV and T-V distinct; posterior corners of T-V modified into asymmetrical acuminate lobes, left side reaching middle of urosome while right lobe produced outwards, reaching proximal two-third length of urosome; on dorsal view left lobe is longer than broad and with globular base, while right lobe is broader than long and with truncate base; urosome two-segmented, the suture separating U-I and U-II incomplete and hardly perceptible; posterior margin of genital segment asymmetrically produced posterad, enveloping part of left CR and almost fully right ramus; in lateral view, posterior margin of genital segment projects over CR as a 'shield'; genital segment with its right lateral margin undulated and its dorsal margin flattened with smooth indentations; CR small, with relatively short caudal setae. *A-I* of 24 segments, reaching to posterior margin of U-III; *P* 5: with spine-like Re; Re nearly 2.5 times longer than Ri; it is basally stout, slightly curved inwards and tapering towards tip; Ri bifid at tip.

Structure and ornamentation of coupler sheath and spermatophore sac have been described elsewhere.

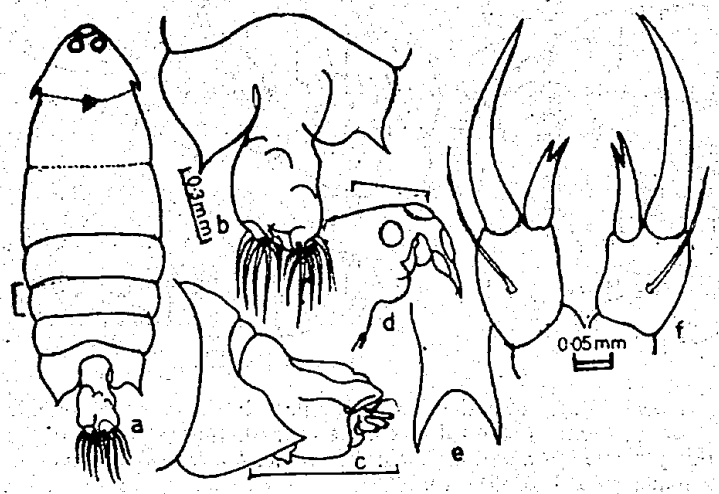

Fig. 24. *Pontella sp.* A : a. Dorsal view - female; b. urosome female (dorsal view); c. urosome-female (lateral view); d, e. rostrum - female; and f. P 5 - female.

Remarks: Reference may be made to notes under "remarks" given along with *Pontella* sp. B. on page 831. In view of the fact that the females of some species from this area, such as *P. andersoni* and *P. investigatoris* are unknown, it has been desirable not to describe this present species as a new species.

Pontella sp. B; (Fig. 25)

Material Examined: 7 Females from the Laccadive Sea and Andaman Islands as follows: R. V. VARUNA station 1342, 11°58′N, 70°00′E (2F); surface collections from Andaman Islands, Port Blair: From Marine Bay, Port Blair, on 15–12–1967, at 0615–0700 hrs (1F); on 18–10–1967, at 0615–0700 hrs (1F); on 27–9–1967 at 0630–0710 hrs (2F); and on 8–11–1967 at 0620–0710 hrs (1F).

Size:

	No.	Range (mm)	Mean (mm)	P : UR ratio
Adult female:	7	3.46–3.61	3.55	4.7:1

Description: FEMALE: Cephalon anteriorly broader than the condition found in *Pontella* sp. A; dorsal eye lenses wide apart, rostral lens not developed; separation between cephalon and T-I and T-IV and T-V distinct; T-V produced posteriorly into lobes, nearly symmetrical, tips of which reaches to anterior two-thirds of urosome; inner flanges of T-V similar on either side of the insertion of urosome; urosome two-segmented, segmentation between U-I and U-II weakly marked; posterior margin of genital segment extends posterad, enveloping part of right ramus and projecting over left ramus covering proximal half of the ramus; genital segment on lateral view with its posterior dorsal part in form of a rounded 'shield'; two uneven protuberances present on right lateral margin of genital segment, larger one situated towards proximal part and smaller one towards its right tip; left lateral margin of segment swollen at its distal part; CR short asymmetrical, right ramus being slightly larger than left; right A-1 geniculate, resembles that of sp. A; *P* 5: Re in the form of a stout spine, basally thickened and tapering to tip; it is nearly 2.8 times longer than Ri; Ri spinuous, asymmetrically bifid at tip, outer spine of bifurcation being longer.

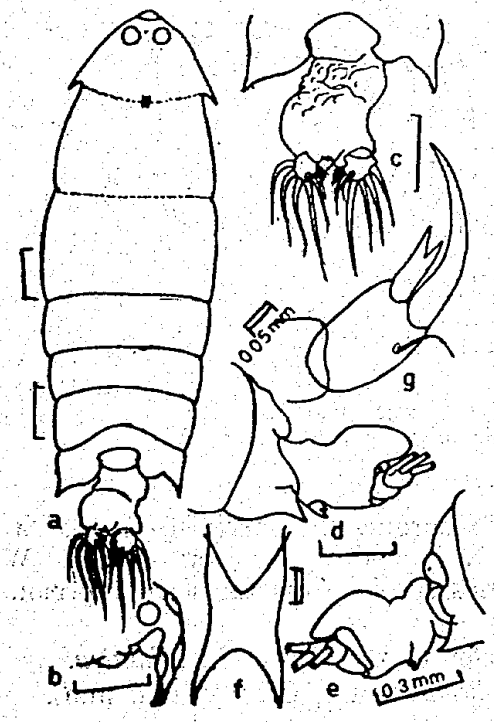

Fig. 25. *Pontella* sp. B : a. dorsal view - female; b. lateral view of cephalon-female; c. urosome-female; d. lateral view of urosome (left) - female; e. lateral view of urosome (right)-female; f. rostrum - female, and g. P 5 - female.

Remarks: The two species described herein as *Pontella* sp. A and *Pontella* sp. B. differ markedly from all known species under the genus. The characteristic nature of the urosome, caudal rami and the proportionate lengths of Re:- Ri

separates the former from the latter. As no male could be procured from the collections where these species occurred, these material are not considered here under binomial nomenclature.

Pontella prox. **atlantica** (H. Milne-Edwards) 1840; (Fig. 26)

Pontia atlantica H. Milne-Edwards, 1840, p. 420, pl. 37, figs. 4–7 (*Type locality*: Atlantic Ocean).

Labidocera (*Iva*) *magna* Lubbock, 1853, p. 208, pl. 10, figs. 8–11 (*Type locality*: South Atlantic atl 8° S, and 2° W).

Labidocera magna Lubbock, 1856, pp. 115–116, pl. 7, fig. 2.
Pontella magna Brady, 1883, p. 96.

Pontellina gigantea Claus, 1863, p. 210, p. 37, figs. 8, 9 & 12 (*Type locality*: Messina).

Pontellina (Iva) magna Claus 1893, p. 273, pl. 5, fig. 5.

Pontella atlantica Giesbrecht, 1889, p. 27; 1892, pp. 461, 466, 467, 472 and 477, pl. 24, figs. 1, 3, 7, 13, 15, 18, 45, 49 & 50; pl. 40, figs. 5, 8, 12, 33, 41 & 42.

Records from Indian Ocean: *Pontella atlantica* Wolfenden, 1911, p. 361 (Off Port Natal, South Africa); Voronina, 1962, p. 68, maps 2 and 5 (Southern Indian Ocean west of Australia).

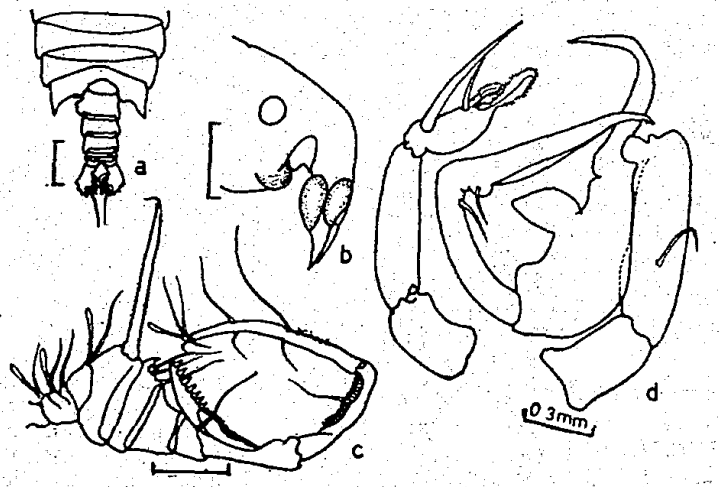

Fig. 26. *Pontella atlantica* : a. Urosome - male; b. lateral view of rostrum - male; c. A 1 - male, and d. P 5- male.

Other Records: For a list of references recording this species from the Atlantic Ocean and the Mediterranean, reference is invited to Vervoort (1965). Wilson (1942, 1950) and Heinrich (1960) report this species from the Pacific Ocean.

The list of synonyms given above refer to the typical *P. atlantica.*
Material Examined: R. V. '*Anton Bruun*' stn. 307: 1M (5.6 mm).

Description: Male: Closely resembling *Pontella princeps* Dana, but showing the following differences in the right A1, the nature of the urosome and P 5. Right A1 geniculate, elongate spine on 14th segment 'boomerang-shaped' with a bend at basal one third of its length and concave margin of spine upto tip minutely serrated; spine shorter than combined length of first 13 segments; proximal plate on segment

17 with conspicuously enlarged teeth placed wide apart and numbering eight, the third from inner being largest; projection on left side of genital segment more pronounced than in *P. princeps*, and segment about 0.75 times as long as wide; caudal rami twice as long as broad, its length equalling combined length of second and third abdominal segments; chelate condition of right P 5 highly developed; thumb and finger being elongate with pointed claw-like tips; inner margin of finger with three setae of almost equal length, two on either side of angle where the finger is bent and a third present almost at middle of distal half of form given by Giesbrecht (1892). Only a good description of the species from the Pacific Ocean can help to clarify its status there.

Pontella spinicauda Mori, 1937

Pontella spinicauda Mori, 1937, p. 96, pl. 44, figs. 3–11 (*Type locality*: Lat. 34° 18′ N, Long. 126° 25′ E, in the Saishu Strait near Yellow Sea.
Labidocera spinicauda Tsuruta, 1963, p. 74, 92.

Remarks: It is presumed that Tsuruta's record of *Labidocera spinicauda* (p. 94) from central part of Indian Ocean refers to this species as in two place p. 74 and 92) he has mentioned the species as *Pontella spinicauda*. Unfortunately no description of the species is given by him which would have been desirable as the species upto now has not been reported outside Japanese waters. We consider the occurrence of this species in the Indian Ocean as doubtful.

Pontella mediterranea var. **indica** Wolfenden, 1906

Pontella mediterranea var. *indica* Wolfenden, 1906, p. 1021 (*Type locality*: Laccadive Maldive Archipelagoes).

Records from Indian Ocean: *Pontella mediterranea* var. *indica* Wolfenden, 1906 (As above).

Remarks: Two varieties of *Pontella mediterranea* (Claus) 1863 have been described the first, var. *jaltensis* Czerniawsky (1868) from "Schwarzes Meer", and the second, var. *indica* mentioned above. Wolfenden's brief description of var. *indica* is appa rently based on a single female 3.1 mm long which is said to differ from the typical female as described by Giesbrecht (1892, pl. 24, fig. 48) in the size of the external spines of the expodites of the fifth legs, as well as the size and structure of the endopodites.

There is no subsequent record of this variety from the Indian Ocean. Sewell (1948, p. 432) remarked that the "...record of occurrence of *Anomalocera patersoni, Pontella mediterranea,* and *Parapontella brevicornis* from the Maldives and the Laccadives by Wolfenden (1906) could be explained by accidental mixing of collections from this region and the Atlantic Ocean."

Pontella natalis Brady, 1915 b

Pontella natalis Brady, 1915 b, pp. 138–139, pl. 12, figs. 6–14 (*Type locality*: Durban Bay, South Africa).

Remarks: Brady (1915 b) described *P. natalis* based on both males and females and noted that in the nature of the caudal furcae and the fifth pair of legs in both sexes, the species differed from all known species of the genus. His description of the species is brief, and it has not been recorded subsequently.

Pontella novae-zeylandiae Farran, 1929

Pontella novae-zeylandiae Farran, 1929, pp. 277–279, figs. 32 a- (*Type locality*: Off North Islands, New Zealand).

Records from Indian Ocean: *Pontella novae-zeylandiae* Voronina, 1962, p. 68 (Eastern Indian Ocean, west of Australia) (Record, without description).

Other Records: The species has also been recorded from off New South Wales, Australia, by Dakin and Colefax (1940).

Pontella meadii Wheeler, 1901

Pontella meadii Wheeler, 1901, p. 180, fig. 17 (*Type locality*: Woods Hole Harbour).

Remarks: Chiba (1956) recorded this species from 1° 29′ N, 96° 25′ E, and 8° 40′ S, 110° 25′E from the Indian Ocean. However, the illustrations of a male given by him indicate that his species is not *P. meadii,* but *Pontella securifer* Brady (1883). *P. meadii* as known at present is restricted to the north west Atlantic and the Gulf of Mexico (Wilson, 1932, 1950; Fleminger, 1957).

Pontella tenuiremis Giesbrecht, 1889

Pontella tenuiremis Giesbrecht, 1889, p. 28 (*Type locality*: Tropical Pacific at 160° to 173° E, 14° to 20°N); 1892, pp. 462 and 477, pl. 24, figs. 6, 24–26; pl. 40, figs. 3, 4, 7 and 37).

Pontella fera (partim) Dana, 1849, p. 34 (Male only).

Records from Indian Ocean: *Pontella tenuiremis* Thompson and Scott, 1903, p. 252 (Palk Straits, Ceylon); Tsuruta, 1963, p. 92 (central part of northern Indian Ocean).

Other Records: Not recorded from the Atlantic Ocean. Records from the Pacific Ocean are (Giesbrecht, 1889, 1892; Wilson, 1942, 1950; Grice, 1962).

Remarks: Wilson (1950) drew attention to the fact that the male of Dana's *Pontella fera* (Dana, 1849) should belong to this species. A description of this species from the Indian Ocean is wanting.

"**Pontella** sp. (nova ?)" Voronina, 1962

Remarks: Voronina (1962) reportd *Pontella* sp. (nova ?) from the area south west of Java and noted that it was closely associated with *Pontella denticauda,* and though very similar to it, the form and orientation of the processes on the genital segment helped to distinguish the two species. No further details are available.

Pontella indica Chiba, 1956

Pontella indica Chiba, 1956, pp. 46–47, figs. 35 a-g and 36 a-c (*Type localities*: 8°40′S, 110°27′ E and 9°12′ S, 116°19′ E).

Records from Indian Ocean: *Pontella indica* Chiba, 1956 (As above); Tsuruta, 1963, p. 124 (Eastern Indian Ocean).

Remarks: The description of *P. indica* given by Chiba is very meagre. His illustrations of the male very closely resemble the condition as seen in *Pontella fera*. The illustrations of the female of *P. indica* given by him undoubtedly belong to an immature specimen. Thus the validity of this species is in doubt.

Chiba (1956, p. 47) also mentions of a species. "*Pontella gracilis*", but to our knowledge, there is no species of *Pontella* with this name, though a species of *Centropages*, namely *C. gracilis* (Dana) occurs in the Indo-Pacific.

Genus **Pontellopsis** Brady, 1883

Pontella (part), Dana, 1846, 1849
Pontellina (part), Dana, 1852
Monops Lubbock, 1853
Monochops Witson, 1924
Pontellopsis Brady, 1883

Type species: *Pontellopsis villosa* Brady, 1883 (Pacific Ocean)

Cephalon separated from T-I; and devoid of cephalic hooks; ventral and dorsal subscuticular eye lenses present, but less prominant; rostrum bifid with long and filamentous rami; rostral lens absent; T-IV and T-V fused, posterior process of T-V usually asymmetrical in male; urosome in female with one or two segments, in male with five segments, usually U-III will be modified; A-1 in female with 16 segments, in male the right A-1 with two distinct segments beyond hinge; distal setae of Mx-2 large, and spinuous; Mxp five segmented; Re of P 1 to P4 three segmented; P 5 biramous in female, uniramous in male, with a chela on right leg.

Pontellopsis krameri (Giesbrecht) 1896; (Fig. 27)

Monops krameri Giesbrecht, 1896, p. 323, pl. 5, figs. 1–2 (*Type Locality*: Red Sea).
Pontellopsis krameri, Giesbrecht and Schmeil, 1898, p. 147.

Material Examined: From vertical zooplankton collection made at R. V. VARUNA station 3986; from surface zooplankton collections from R. V. VARUNA stations 3662, 4110, 4237, 4161; and from Andaman Islands (AN-14, AN-15, AN-16).

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	16	1.86–2.98	2.30	2.5:1
Adult male:	3	1.62–2.17	1.96	2.8:1

Description: FEMALE: Prosome narrowed anteriorly; rostral base not well defined as in other species of the genus; rostrum narrowed terminally; T-IV and T-V fused together, T-V produced posteriorly into lobes with acuminate tips, tips of lobes reaching to posterior margin of genital segment; urosome two-segmented genital segment large, produced at its left distal margin into a blunt rounded process extending by side of anal segment; proximal margin of genital segment on either side provided with a band of small setules; anal lamina well developed; CR distinctly asymmetrical, right ramus twice longer and nearly 1.5 times broader than left ramus, *A-1* of 16 segments; *P* 5: asymmetrical, right leg longer than left; right Re with three outer marginal spines and two terminal spines; inner terminal spine being longer; inner distal margin of Re produced

into a spinous process which falls short of terminal spines; left Re with three outer marginal spines and two distal spines; inner distal margin is provided with a spinous process which far exceeds terminal spines by two-thirds its length; Ri subequally bifid at tip and is nearly half length of Re.

MALE: Cephalon resembles that of female, rostral base prominant; T-V posteriorly modified into a rounded lobe on left side and a more or less straight spine on its right side, tip of spine reaching U-III; U-I with two short spinuous setae on its right distal corner; U-II with a band of denticles on its right margin and U-III with a prominent protuberance on its right side, carrying very minute spinnules at its apex; CR symmetrical. Right geniculate *A*-1: as in genus; a stout spine present on segment 13; segments 17 with a dorsal denticulated plate; segment 18 with closely packed triangular teeth on its dorsal margin; segment 19–21 with a row of 6-8 small flagellar setae; *P* 5: Right leg chelate, thumb of chela well developed, elongated and with striations at apex; claw recurved at its tip and with two setae along its inner margin; left P 5 with terminal segment carrying two distal spines and one outer marginal spine; inner margin of segment provided with short hairs; subterminal segment with an outer distal spine.

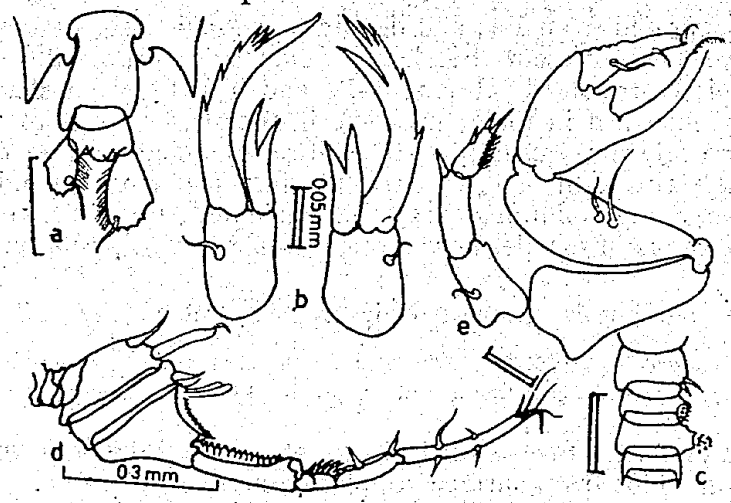

Fig. 27. *Pontellopsis krameri* : a. Urosome - female; b. P 5 - female; c. urosome - male; d. Al- male, and e. P 5-male.

Remarks: Giesbrecht (1896) originally described this species from Red Sea based on females. A. Scott (1902) added a short description of the male of this species. The present material shows full agreement to the form described by A. Scott (1902). The male of this species show close affinity with that of *P. herdmani*, but they can be distinguished by the nature of P 5.

Wolfenden (1906) described the female of *P. krameri* collected from the Maldive Archipelago which differed from the present material, collected from very near Wolfenden's locality in: (1) the horizontal nature of the right spine of T-V; (2) weak asymmetry of CR and (3) the nature of Re and Ri of female P 5. In all probability, it appears that his description is based on an immature speimen of *P. krameri*, which possessed a distorted T-V posterior spine.

Distribution: Indian Ocean: Malay Archipelago (A. Scott, 1909); Bay of Bengal (Sewell, 1912; 1932: INVESTIGATOR stations 542, 569 and 582); Andaman Sea (present record); coast of Burma (Sewell, 1914); Trivandrum Coast

(Saraswathy, 1966; Maldive Archipelago (Wolfenden, 1906); Laccadive Sea (present record); Red Sea (Giesbrecht, 1896 as *Monops krameri*; A. Scott, 1902; Thompson and Scott, 1903).

Other Records: Scott (1909) from 10 "Siboga" stations from Indonesian waters; Farran (1936) from the Great Barrier Reef; and Dakin and Colefax (1940) from off New South Wales, Australia.

Pontellopsis villosa Brady, 1883; (Fig. 28)

Pontellopsis villosa Brady, 1883, p. 86, pl. 34, figs. 10-13; pl. 35, figs. 14-20 (*Type locality*: In the Pacific Ocean, 30° 32′N., 154° 56′W; and between latitudes 37° S to 38° S, and longitudes 45° W and 48° E).

Monops pilosus Giesbrecht, 1889, p. 28 (35°W, 13° S).

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

Monops edwarsii (part) Claus, 1893, p. 277.

Pontellopsis villosa, Giesbrecht and Schmeil, 1898, p. 148.

Material Examined: From vertical zooplankton samples made at R. V. VARUNA stations 3591, 3654, 3849; from surface zooplankton samples from R. V. VARUNA stations 4110, 4161; from surface zooplankton collection made at R. V. KALAVA Station 428 in the Laccadive Sea and from Andaman Islands (AN-9, AN-29).

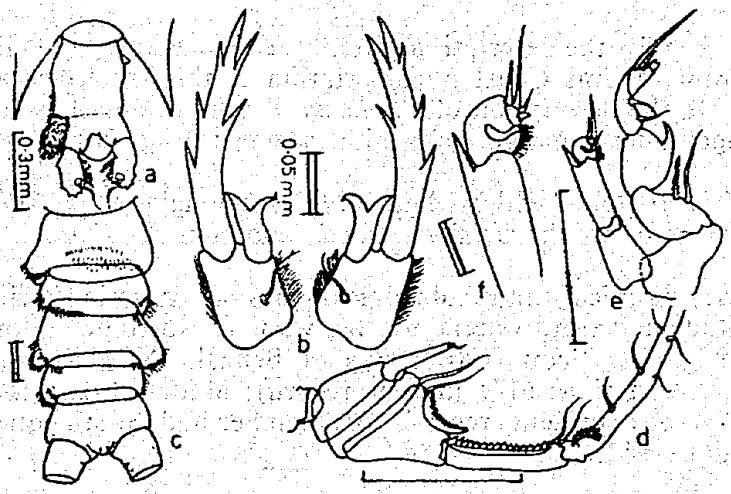

Fig. 28. *Pontellopsis villosa* : a. Urosome-female; b. P 5-female; c. urosome - male (enlarged). d. A 1 - male; e. P 5 - male, and f. left P 5 - male (enlarged).

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	46	2.68–2.81	2.72	3.2:1
Adult male:	14	2.05–2.48	2.23	3.5:1

Description: FEMALE: Cephalon anteriorly rounded with a knobular rostral base; cephalon separated from T-I; T-V ending in acuminate symmetrical points posteriorly, tip reaching half length of urosome; urosome two-segmented, segmentation indistinct dorsally; genital segment broader than long, with convex lateral margins and provided with a short, stout conical process on its right proximal half; U-II modified, with a conspicuous finger-like process profusely covered with

short setules present on its left posterior margin; anal lamina slightly asymmetrical, situated more towards the right half; CR asymmetrical, right ramus being broader and longer; *A-1* of 16 segments, reaches to middle of U-II; *P* 5: Re with three outer marginal spines and an inner marginal spine situated towards distal half; terminally Re is bifid subequally; Ri broadly bifid at tip; inner and outer margins of B 2 with tufts of hairs.

MALE: Cephalon similar to that of female; posterior corners of T-V produced posteriad into asymmetrical acuminate points, right lobe being longer than that on left; U-I and U-II larger; postero-lateral margins of all urosomal segments slightly produced backwards; CR symmetrical; Right *A*-1: geniculate; segment 13–17 enlarged; 13th segment with a hooked spine; segments 17 and 18 with serrated plates on their dorsal margins; teeth on former small, on latter rectangular; fusion segment 19–21 with 10–12 serially arranged radiating spines on its proximal base; *P* 5: Right leg with a broad triangular hand and a reduced thumb; finger long, uniformly broad and curved at its mid-length, and distally with a short segment carrying a flagellum; finger also provided with two subequal setae along inner distal margin, and two setae along proximal inner half; a short seta present at outer base of thumb; left leg: with terminal segment modified and curved inwards with tip bearing three subequal setae, middle seta longest; a short conical spine present at its inner distal margin, towards base of inner distal seta; inner margin of terminal segment with tufts of setae; subterminal segment with a disto-lateral spine.

Remarks: But for the description given by Krishnaswamy (1953), based on a single female from Madras Coast no description of this species is available from Indian Ocean. In the description of *P. villosa* Krishnaswamy has not shown the spine on the right lateral margin of genital segment (Fig. 20).

Tanaka (1964, p. 268) titled his figure 240 as belonging to *P. villosa*, but these figures in reality refer to those of *P. regalis* and not *P. villosa*.

Distribution: Tropical and subtropical parts of Atlantic, Pacific and Indian Oceans. From Indian Ocean: 'waters to the west of Australia' (Voronina, 1962); Malay Archipelago (A. Scott. 1909); Bay of Bengal, Nicobar waters (Sewell, 1932: INVESTIGATOR station; 614; present record); Madras Coast (Krishnaswamy, 1953); Laccadive Sea (present record); Arabian Sea and South equatorial current region (Voronina, 1962)

Other Records: From the Atlantic Ocean (Brady, 1883; Claus, 1893; T. Scott, 1894; Owre, 1962; and Vervoort, 1965). From the Pacific Ocean (Brady, 1883; Giesbrecht, 1889, 1892; A. Scott, 1909; Wilson, 1942, 1950; Tanaka, 1964).

Pontellopsis regalis (Dana) 1849; (Fig. 29)

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

Pontellina regalis Dana, 1852, pp. 1154–1155; 1855, pl. 81, figs. 1 a, b; Sulu Sea, 15 miles West of Panay.

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, fig. 1-9, 11, 13, 14, 20, 21, 22, 24, 29; pl. 41, figs. 50, 54, 56, 62, 64, 66, 67.

Pontellopsis regalis, Giesbrecht, 1898, p. 147.

Material Examined: From vertical zooplankton collections made at R. V. VARUNA stations 3592, 3635, 3854, 3857, 3865; from surface zooplankton from R. V. VARUNA stations: 3562, 4161; from surface zooplankton collection made at R. V. KALAVA station: 428 and from Andaman Islands (AN-18, AN-19).

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	20	3.39–4.22	3.51	3.8:1
Adult male:	13	3.25–3.58	3.35	3.1:3

Description: FAMALE: Prosome broadly rounded anteriorly; segmentation distinct between T-I and cephalon and indistinct between T-IV and T-V; posterior corners of T-V drawn out into symmetrical acuminate lobes; urosome two-segmented; genital segment enlarged and asymmetrically produced on left side into a distinct lobe; right lateral margin with no such modification; ventrally a median spine present near genital opening; a pair of short spinnules present at base of genital segment and with a few short setae along its lateral margin; U-II broader than long; CR asymmetrical, left ramus being larger; *A-1* of 16 segments; *P* 5: symmetrical, Re long and curved; Ri short, apically bifid; outer lateral margin of Re with three minute spines and inner margin with one long spine; apically it is bifid subequally with outer branch being smaller.

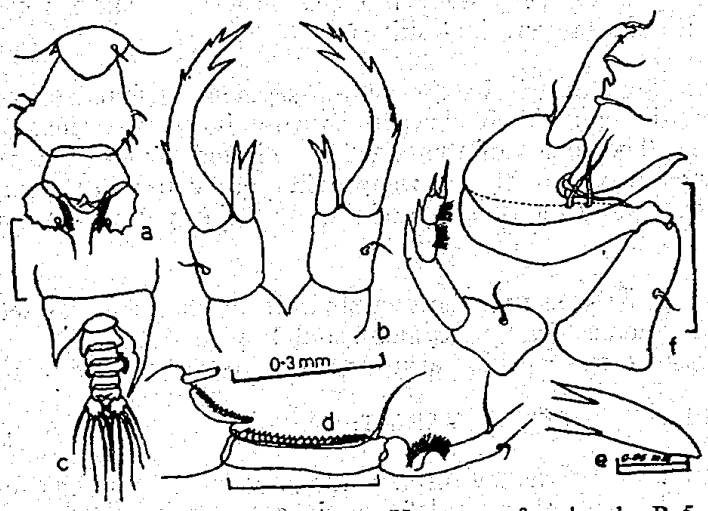

Fig. 29. *Pontellopsis regalis* : a. Urosome - female; b. P 5 - female; c. urosome - male; d. A 1 - male; e. terminal part of thumb (P 5) - male (enlarged), and f. P 5 - male.

MALE: Cephalosome symmetrical, resembles that of female (with *no* swelling on right side as reported by Wilson, 1932); posterior corners of T-V asymmetrical; with right lobe produced into an acuminate, elongate spine, which reaches base of CR; it is elevated at about its mid-length and has two spinnules on its outer margin; urosome five-segmented; genital segment broader than long and produced at its right distal corner into a short process bearing two setae; U-II narrow with two spinnules on right side and a short spine ventro-laterally on left side; U-III with a prominent lobe on right side, crowned with spinnules; a perceptible lobe present on its left side also, but without spinulation; Right *A*-1: geniculate, segments 13–17 enlarged; segment 13 with an elongated hooked spine; serrated plates present on

dorsal margins of segments 17 and 18; serially arranged spinnules present towards base of 19–21 segment. *P* 5: Right leg chelate, with a broad hand and an elongated thumb; latter with a seta on its inner base; finger with bent tip and two marginal setae; it carries a conical process at its mid inner margin; two subequal setae present on B 2; left leg: distal segments with two outer lateral spines and two subequal spines apically of which outer one is longest; penultimate segment drawn into a spine at outer distal margin; inner margin with a tuft of setae.

Remarks: Variations in the genital segment of females and the P 5 in both sexes have been drawn attention to by earlier authors. Dana (1855, pl. 81, fig. 1) has shown the genital segment of female to be without any modifications. Giesbrecht (1892) indicated three variations of female genital segment, but shown only one type of female P5 in that its terminal spines being subequal and in the male P 5 the finger of terminal segment of the right leg has been shown to be without any modification. Wilson (1932) reproduced the figure of a male P 5 given by Wheeler (1900) whichs hows agreement with that illustrated by Giesbrecht. Tsuruat (1963) has shown the female genital segment bulged on either side and the P 5 of female with almost equal terminal spines based on the material collected from the Bay of Bengal. Tanaka (1968) described *P. regalis* having swelling on the right side of the genital segment (Fig. 239, p. 269) and Park (1968) described the material from the North Pacific Ocean, the females having the genital segment "with each side projected posteriorly into a conical process" and the P 5 with similar terminal spines.

The material at hand shows the genital segment of females to have a distinct bulge on its left side and this is characteristically linked with the subequal terminal spines on P 5. The males of this species collected from Laccadive Sea and Andaman Islands also show the characteristic modification in the finger of terminal segment of right leg and the presence of a slightly elevated flap-like structure behind its tip.

Thus it would be seen that the combination of characters as seen in the modification of the female genital segment and P 5 in both sexes agree to suggest two main types of infra-specific variations in *P. regalis* as follows.

CHARACTERS	TYPE-I VARIATION	TYPE-II VARIATION
1. Female genital segment	Swelling on one side only, either on left or right.	Swelling on either side.
2. Female P 5	Subequal apical spines; outer spine one-third length of inner spine.	Terminal spines equal in length.
3. Male P 5	A prominent projection at about the mid-length of the inner margin of the finger and with an elevated flap behind the tip.	No modification to the finger of right P 5.

Park (1968) has remarked that according to Fleminger (personal communication) this variation is not outside the usual variability shown by the species. However, in view of the consistant differences shown by the two 'varieties', the possibility of recognising Type-II as a distinct species from the former (Type-I) cannot be ruled out.

Distribution: Atlantic, Pacific and Indian Ocean. From Indian Ocean: Malay Archipelago (Cleve, 1901 as *Monops regalis*); Bay of Bengal (Thompson, 1900; Sewell, 1912, 1932: INVESTIGATOR stations 528, 614 and 642; Tsuruta, 1963); Andaman Sea (present record); Lawson's Bay, Waltair Coast (Ganapathi and Shanthakumari, 1961); Gulf of Mannar (Sewell, 1914); Arabian Sea (Sewell, 1947: JOHN MURRAY EXPEDITION stations: 61, 145, 172); west coast of India and Laccadive Sea (present record); Equatorial current region of Indian Ocean (Voronina, 1962); S. African Coast (Decker and Mombeck, 1964).

Other Records: From the Atlantic Ocean (T. Scott, 1894; Farran, 1929; Wilson, 1932; Owre, 1962; Vervoort, 1965); Mediterranean (Thompson and Scott, 1903; Pesta, 1912; Crisafi, 1960) and Pacific Ocean (Dana, 1849, 1852; Brady, 1883; Giesbrecht, 1889, 1892; Scott, 1909; Farran, 1929, 1936; Tanaka, 1953, 1964; Sherman, 1963). A detailed list of references pertaining to this species is given by Vervoort (1965).

Pontellopsis macronyx A. Scott, 1909

Pontellopsis macronyx A. Scott, 1909, p. 173, pl. 54, figs. 1–10 (*Type locality* : "Siboga" station No.37, 109, and 213, all from Indonesian waters, Western Pacific).

Pontellopsis herdmani (*nec.* Thompson and Scott) Sewell, 1912, p. 375, pl. 24, fig. 5 (coast of Southern Burma).

Material Examined: From vertical zooplankton collections made at R. V. VARUNA stations 3882; from surface zooplankton samples collected from R. V. VARUNA stations 3562, 4137, 4161; Gulf of Mannar, from surface waters, on 15–1–1969 at 2100–2200 hrs and from Andaman Islands (AN-7 to AN-9).

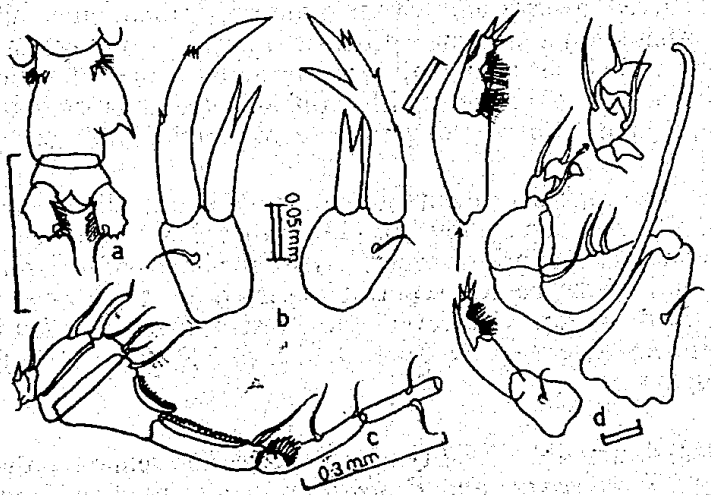

Fig. 30. *Pontellopsis macronyx* : a. Urosome - female; b. P 5 - female; c. A 1 - male, and d. P 5- male.

Size:	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	12	1·80–1·94	1·87	3·0:1
Adult male:	14	1·55–1·68	1·61	3·1:1

Description: FEMALE: Body robust; rostral base on dorsal view prominant; T-IV and T-V fused together, T-V produced into a sharp acuminate lobe on each

side, tip of lobes reaching to middle of genital segment; T-III to T-V, including outer base of posterior spine are clothed with a band of small spinnules, resembling condition reported from *Pontellopsis pexa* by Scott (1909, p. 173, pl. 54, fig. 11); urosome of two segments, genital segment longer than U-II and asymmetrical; genital segment is provided with three spines, two towards proximal dorsal side with a band of fine spinnules at their bases on either side; third spine situated at tip of a rounded eminence on right side; laterally genital segment provided with scattered setae; anal lamina well developed, situated more towards right side; CR short, symmetrical; *A-1* of 16 segments. *P* 5: asymmetrical; Re spiniform on each leg; right Re is longer than left and with two outer marginal spines and three terminal spines; innermost terminal spine being longest; Re at its inner margin, towards distal half is produced into a strong spine; left Re resembling that of right but without inner marginal spine; distally it is produced into a stout thick spine; Ri of both legs subequally bifid at tip.

MALE: Cephalon resembles that of female; T-IV and T-V united, T-V produced posteriorly into lobes, that on left acuminate and on right margin as a long recurved spiniform process extending to posterior margin of U-IV; urosome of five segments; U-III at its right lateral margin with a well defined blunt process; CR asymmetrical, right ramus slightly larger than left; both rami longer than broad; right *A*-1: geniculate; and with a moderately long spine at dorsal margin of 13th segment; segment 17 with a concave sculptured ridge on its dorsal margin; segment 18 with triangular denticles on its dorsal margin; proximal part of fusion segment with an arched ridge carrying flagella-like setae; *P* 5: Terminal segment of right P 5 chelate; thumb-like process on hand slender, curved and highly elongated and recurved at its tip, nearly 2.5 times longer than B 2; it carries a seta at its base; claw-like terminal segment short, curved inwards and with two outer marginal setae and one inner mid-marginal seta situated on an elevated process; B 2 with two long outer mid-marginal setae; left leg: terminal segment with three terminal spines of which middle spine is longest; inner margin of segment with a tuft of setae; subterminal segment with a long disto-lateral spine, tip reaching to base of terminal spines.

Remarks: The genital segment of the female shows slight variation from the form described by A. Scott (1909, p. 173) in that there were only three spines, the left disto-lateral spine being absent. Also, the bands of fine setules at the base of proximal spines of the genital segment observed in the present material have not been described so far. However, the present material shows close alliance with the specimens described by Sewell (1932, p. 387, fig. 128 c) from Port Blair Harbour, Andamans.

Sewell (1948) doubted the validity of this species and remarked that "it is possible that *P. herdmani, P. macronyx* and *P. scotti* are members of the same species".

Distribution: Recorded from Indian Ocean and west Pacific only. From the Indian Ocean: Bay of Bengal and Andaman Sea (Sewell, 1912 as *P. herdmani*; 1932: INVESTIGATOR station 614; present record); Indian coastal waters (Kasthurirangan, 1963); Gulf of Mannar (present record); Trivandrum Coast (Saraswathy, 1966); Laccadive Sea (present collection); northern Indian Ocean (Voronian, 1962).

Other Records: The only records of this species outside the limits of the Indian Ocean are by Scott (1909) from three "Siboga' stations given above.

Pontellopsis herdmani Thompson and Scott, 1903; (Fig. 31)

Pontellopsis herdmani Thompson and Scott, 1903, (Female only) pp. 253–254, pl. 2, figs. 15–17 (*Type Locality*: Galle Harbour and off Kavarathiv Island in the Gulf of Mannar).

non *Pontellopsis herdmani* Sewell, 1912, p. 375, pl. 24, fig. 5. (Burmese Coast).

Material Examined: 9 females collected from Gulf of Mannar during surface haul on 13–12–1967 at 0110–0150 hrs; 2 Males and 3 Females from Vizinjam, from surface zooplankton collections made on 6–2–1961 at 1800 hrs.

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	12	1.92–2.32	2.16	3.0:1
Adult male:	2	1.76–2.00	1.80	2.8:1

Description: FEMALE: Body stout, rostral base prominent on dorsal view; T-IV and T-V partly fused, but line of demarcation clearly visible along lateral margin; posterior corners of T-V produced posterad, and slightly asymmetrical, tip of its right margin reaches to posterior three-fourth length of genital segment while left side reaches to half length of genital segment; urosome asymmetrical and of two segments, genital segment longer than U-II; segment dorsally towards mid-dorsal margin on the left side with a small spine directed posterad and with a well developed spine on its right distal corner; a short indentation present on its left distal corner; anal lamina well developed, situated more towards right side; CR slightly asymmetrical, right one being perceptibly broader than left; *A-1* of 16 segments reaching to posterior margin of U-III; *P 5*: symmetrical, Re with two small outer marginal spines and with subequally bifid tip; Ri bifid at its tip, both rami curved inwards.

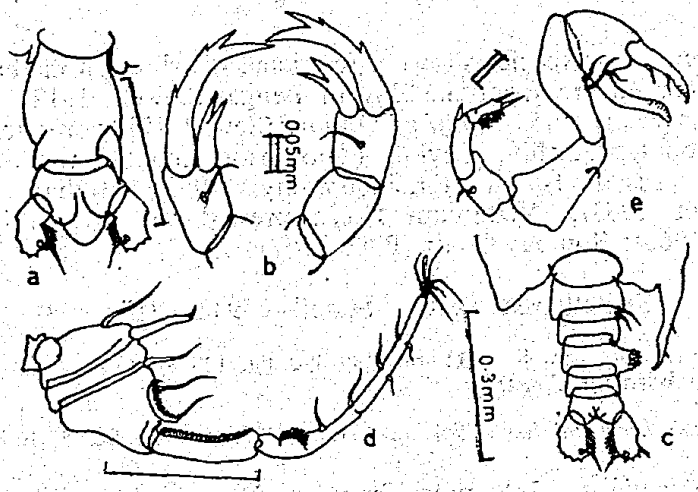

Fig. 31. *Pontellopsis herdmani* : a. Urosome - female; b. P 5- female; c. urosome-male; A 1-male; d. and e. P 5- male.

MALE: Two male specimens collected along with the females from Vizhinjam, south Kerala Coast. It shows differences in diagnostic characters from all known species of the genus, and in view of their co-occurrence with the females of *P. herdmani*, these specimens are described here as the male of this species, which has remained hitherto unknown.

Cephalon resembles that of female; posterior corners of T-V modified into a rounded lobe on its left side and into an acuminate long spine on its right side, which is directed ventrad and curved inwards; tip of this process reaches mid-margin of U-III; U-I with two small spinuous setae at its right distal margin; U-II not modified; U-III with a prominent projection at its right margin beset with small denticles; CR asymmetrical, left ramus broader than long, while right ramus is longer than broad; right *A*-1: geniculate; segment 14 with a moderately long spine with a flagellum at its tip; segment 17 with a dorsal plate, finely serrated; 18 with dorsal denticles more triangular and well packed; segment 19 of fusion segment 19–21 with 5–7 flagellum like setae arranged radially; *P* 5: bears a close resemblance to that of *P. krameri;* right leg with a chela; thumb of chela is long, exceeds length of claw and is serrated at its apex; inner margin of hand with a triangular protuberance; claw more or less straight, with striated outer margin; it is proximally thicker and tapers to apex; inner margin of claw with two setae and with another seta at its apex; left leg with terminal segment carrying two subequal spines distally and one outer marginal spine; inner margin with a hand of setae; subterminal segment with a distolateral spine.

Remarks: The present material differs from the original description of this species by Thompson and Scott, (1903, p. 253, pl. 2, figs. 15–17) in that, the genital segment has one dorsal and one right lateral spine instead of "two thorn-like projections on the left side". Sewell (1912, p. 375, pl. 24, fig. 5) described a form 'intermediate' between *P. herdmani* and *P. macronyx* and commented that these are different forms of a single variable species. Later (1932, p. 388–390, fig. 129 a-f) he described this 'intermediate' form as *P. scotti.*

The male sex of this species, which remained undescribed so far shows close resemblance to that of *P. krameri.* The diagnostic characters of the P 5 separates this species from the former.

Distribution: This species shows a restricted distribution in the Indian Ocean. The species recorded are from the Bay of Bengal (Sewell, 1912, 1932); Madras Coast (Krishnaswamy, 1953); Gulf of Mannar (Sewell, 1914; present record); Galle Harbour and off Kavarathiv, Ceylon (Thompson and Scott, 1903); coast of Madras and Krusadi Island (Krishnaswamy, 1953); Indian coastal waters (Kasthurirangan, 1963); Vizhinjam Coast (present record); Trivandrum Coast (Saraswathy, 1966); Bombay Coast (Pillai, 1971).

Pontellopsis scotti Sewell, 1932; (Fig. 32)

Pontellopsis scotti Sewell, 1932, pp. 388–390, fig. 129 a-f (*Type locality*: Several stations from Burmese Coast).

Pontellopsis herdmani (part) Sewell, 1912, p. 375, pl. 24, fig. 5 (Burmese Coast).

Material Examined: 2 Females from surface zooplankton collections made from off west coast of India (R. V. VARUNA station 1708) and 5 females from Port Blair, Andaman Islands (AN-3).

Size:

	No.	Range (mm.	Mean (mm)	P: UR ratio
Adult females:	7	—	1.72	2.5:1.

Description: FEMALE: Cephalon separated from T-I, and in dorsal view broadly rounded and with a projection over base of rostrum; rostral filaments long and spiniform; T-IV and T-V fused, produced posteriorly into acuminate spiniform processes on either side; posterior acuminate processes were almost symmetrical in shape; urosome of two segments, genital segment asymmetrical; it carries two small subequal spines on right distal margin and a small spine proximally on left margin; at distal left margin a distinct swelling is observed which is produced posteriorly as a papilla; right lateral margin of genital segment with a moderately long spine at its mid length, originating from a cushion like base; anal lamina well marked; CR slightly asymmetrical, right ramus being broader and longer and placed slightly posteriad; *A-1* of 16 free segments; *P* 5: closely resembling that of *P. macronyx*, asymmetrical, Re of left leg shorter than that of right; right leg with two outer marginal spines and three distal spines of which innermost spine is longer and broader; inner margin of Re at its distal half is produced into a stout thick spinuous process; left Re with four outer marginal spines and is produced at its apex into a stout spiniform process; Ri bifid at its tip.

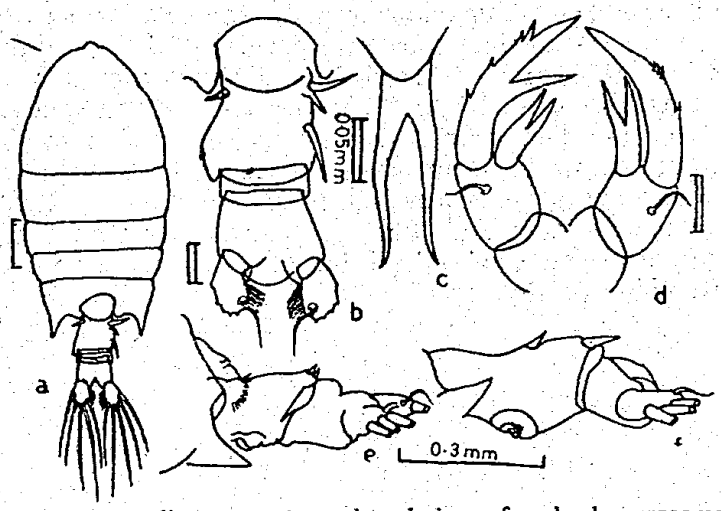

Fig. 32. *Pontellopsis scotti* : a. dorsal view - female; b. urosome-female; c. rostrum-female; d. P 5-female; e. urosome-female (lateral view); and f. urosome of another specimen- female (lateral view).

Remarks: Slight differences noted in the material at hand from the original description are:(1) the asymmetry of the posterior margin of T-V are not marked as reported by Sewell (1932, p. 388) for the specimens from the Burmese Coast; (2) presence of an additional proximal spine in the material at hand is not mentioned in the original description. However, it was observed that the species group comprising of *P. herdmani, P. macronyx* and *P. scotti* are highly variable with regard to their morphological features, especially the spinulation of the genital segment. Sewell (1932) while describing this species opined that it may ultimately prove to be a 'diamorphic form' of *P. macronyx* A. Scott.

Distribution: Recorded from Indian Seas only: Andaman Sea (present record); Burmese Coast (Sewell, 1912, 1932); Lawson's Bay, Waltair (Ganapathi and Shanthakumari, 1961); Indian coastal waters (Kasthurirangan, 1963); Bombay Coast (Pillai, 1971); west coast of India (present record).

Pontellopsis armata (Giesbrecht), 1889; (Fig. 33)

Monops armatus Giesbrecht, 1889, p. 28 (*Type locality*: east of Philippines at 137°E and 10° N). Giesbrecht, 1892, pp. 487, 496; pl. 26, figs. 19, 26, 27; pl. 41, figs. 46, 47 and 58; Cleve, 1901, p. 7.

Pontellopsis armatus Giesbrecht and Schmeil, 1898, p. 148.

Material Examined: From vertical zooplankton collections made at R. V. VARUNA stations 3590, 3627, 3647, 3854, 3856; from surface zooplankton samples collected from R. V. VARUNA stations 3652, 4137, 4161, 3565 and from Andaman Islands (AN-4).

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	8	2.36–2.51	2.40	—
Adult male:	6	1.90–2.11	1.98	—

Description: FEMALE: Cephalon broadly rounded anteriorly; separation between cephalon and T-I distinct; posterior corners of T-V produced into acutely pointed symmetrical lobes; three blue coloured blotches present mid-dorsally on prosomal segments T-II, T-III and T-IV; urosome two-segmented; segments covered with hirsute setae; genital segment with a posteriorly directed spine ahead of genital orifice; the segment with a broad, postero-dorsal swelling on its right side; anal segment symmetrical, distally overlapping CR dorsally; CR symmetrical; *P* 5: Re stout and turned inwards with three minute marginal spines and three apical spines of which middle one is longest; tip of inner apical spine curved; Ri bifid apically.

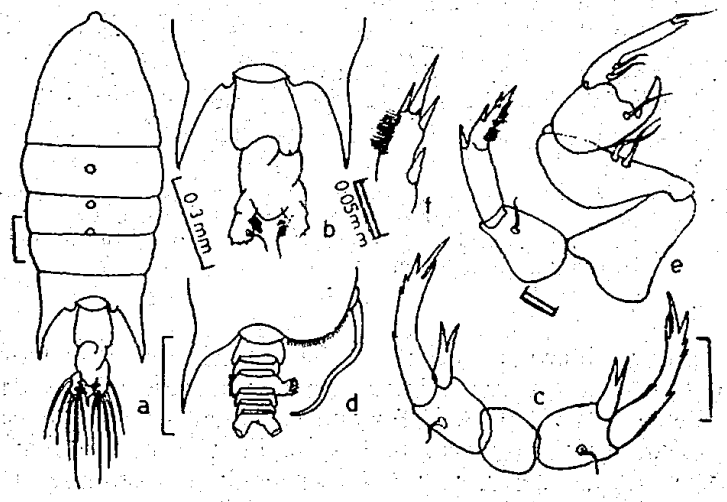

Fig. 33. *Pontellopsis armata* : a. dorsal view - female; b. urosome - female; c. P 5 - female. d. urosome - male; e. P 5 - male; and f. P 5 - male (terminal part of left leg enlarged);

MALE: Cephalosome resembles that of female; posterior T-V margin highly modified, left side produced into an acutely pointed lobe reaching U-III; right side bluntly rounded bearing a slender, elongated curved organ extending to basal margin of CR; marginal hairs present between this organ and base of urosome insertion;

urosome of five segments, genital segment broader than long and sparsely hirsute; U-III with a stout finger-like projection on its right margin carrying a group of small spinnules at tip; left margin of segment not projecting but bordered with small dense short spinnules; right *A*-1: geniculate, with small denticulations on segment 17 and 18; segment 13 with a stout spine at its distal tip; segment 19–21 with a row of 10–12 radially arranged spines towards its proximal part; *P* 5: Right leg chelate; B2 medially broad, and with two subequal setae; hand squared with a short thumb, carrying an elongated seta at its base; finger thinned and slightly bent medially and with two short setae at proximal inner part and one distal seta; a short conical spine present at outer basal margin of finger; left leg with characteristic features of *P. regalis*; terminal segment with two outer marginal spines and two subequal spines apically, of which outer one is longest; subterminal segment with a disto-lateral spine; inner margin of terminal segment profusely hirsute.

Remarks: Wilson (1950) drew attention to the discrepancies in the figures of this species by Giesbrecht (1892) which had not shown the marginal hairs and the position of the attachment of the flagellar organ on the right posterior margin of T-V correctly. The flagellar organ of the male distinguishes *P. armata* from the other species.

Distribution: In the western and central Pacific and Indian Oceans. From Indian Ocean: west of Sunda Islands (Tsuruta, 1963); Malay Archipelago (Cleve, 1901; as *Monops armatus;* A. Scott, 1909); Bay of Bengal, (Sewell 1932: INVESTIGATOR station: 614; present record); Waltair Coast (Ganapathi and Shanthakumari, 1961); Gulf of Mannar (Sewell, 1914); Pearl Banks of Ceylon (Thompson and Scott, 1903); Trivandrum Coast (Saraswathy, 1966); Maldive Archipelago (Wolfenden, 1906); west coast of India and Laccadive Sea (present record); Arabian Sea (Sewell, 1947); equatorial waters of Indian Ocean (Voronina, 1962).

Other Records: From the western and central Pacific Ocean including Japanese waters by Giesbrecht (1889, 1892), Scott (1909), Mori (1937), Wilson (1942, 1950), Sherman (1963) and Tanaka (1964).

Pontellina plumata (Dana) 1849; (Figs. 34, 35)

Pontella plumata Dana, 1849, p. 27 (*Type locality*: Lat. 5° N., long. 21° E in Atlantic Ocean).

Pontellina plumata Dana, 1852, p. 1135; 1855, pl. 79, figs. 10 a-d; Giesbrecht, 1892, p. 497, pl. 4, fig. 1; pl. 25, figs. 1, 4, 6, 7, 9, 12–14, 18, 20, 21, 23–26, 36; pl. 40, figs. 49–53; Giesbrecht and Schmeil, 1898, p. 149.

Pontella turgida Dana, 1849, p. 28, Atlantic: 8½°N to 0°S, long. 23°–18°W; 1–4½° S., 17½°-21½°W; Agulhas Bank off Cape Colony; 4°30′S, long. 25° W; 0° 15′N, long. 31°W; also fromHills and Pitts Is, Kingsmill group in the Pacific Ocean).

Pontellina turgida Dana 1852, p. 1136; 1855, pl.79, fig. 11.

Calanops messinensis Claus, 1863, p. 212, pl. 2, fig. 11; pl. 36, figs. 13–16; pl. 37, fig. 10 (Messina, Mediterranean Sea).

Pontellopsis speciosus Brady, 1915, p. 138, pl. 10, fig. 1–8 (Durban Bay, S. Africa).
Pontellopsis aequalis Mori, 1932, p. 172, pl. 4, figs. 7–13 (southern waters of Japan).
Pontellina novalium Oliviera, 1946, p. 472, fig. 12 (Bais de Ilha, Grands e Sepetiba, Brazil).

Material Examined: From 89 R. V. VARUNA stations from the in shore waters of the west coast of India (Between 09° 20′–12° 00′N. and 74°40′ - 76° 18′ E) and from the Laccadive Sea Between 09°40′– 11°40′N and 72°00′ - 74°10′ E); from surface zooplankton collections made from R. V. VARUNA stations 3352, 3562,

3565, 4161; from surface zooplankton collections made at R. V. KALAVA stations 427, 428 and from Andaman Islands (AN-2, AN-3, AN-4, AN-10, AN-11, AN-29, AN-30).

Size:

	No.	Range (mm)	Mean (mm)	P: UR ratio
Adult female:	102	1.49–1.60	1.51	3.5:1
Adult male:	81	1.26–1.60	1.42	3.0:1

Description: FEMALE : Body short and robust; separation between T-I and cephalon distinct; dorsal eye lenses feebly developed; rostrum long and pointed; T-V posterior margin lobate with pointed tips; urosome two-segmented, genital segment longer than anal segment; segmentation between right CR and anal segment indistinct; CR symmetrical; *A-1* with 17 joints, extending to CR; A-2 and mandibular palp with well developed long densely plumose setae; *P* 5: symmetrical; Ri ending in acute apically bifid processes; Re uniramous, armed distally with two elongated setae and a median serrated flagellum; terminal segment with one outer marginal seta; B 2 with elongated marginal seta.

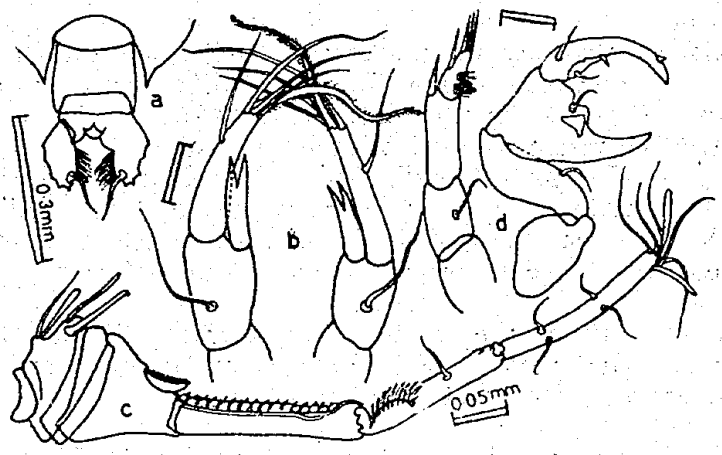

Fig. 34. *Pontellina plumata* : a. Urosome - female; b. P 5 - female; c. A 1 male; and d. P 5 - male.

MALE: Prosome similar to that of female; dorsal eye lenses close together; posterior marginal lobes of T-V rounded, with minute acumination at tip; urosome five-segmented, genital segment longer than others; CR symmetrical; right *A-1*: geniculate, with a long blunt dorsal spine; denticulated plates present on dorsal margins of segments 17, 18 and fusion segment 19–21; latter, with a row of 10–11 spines, elongated, and arranged one behind the other above a crescentic projection. *P* 5: asymmetrical; right P 5 ending in a chela; hand broad, more or less conical, movable finger blunt and claw like; hand with a conical tooth-like elevation on inner margin and a seta; finger with one inner marginal and two outer marginal setae; inner margin of finger irregular with small elevations; penultimate segment with well developed plumose seta; left leg: distal segment with prominent outer marginal spine and three distal subequal spines; inner margin of terminal segment with broad tuft of marginal hairs; subterminal segment with a disto-lateral spine.

Remarks: Grice (1962) from equatorial Pacific Ocean recorded the females of this species possessing P 5 with Ri forked on one leg and single and pointed on

the other. Recently, Park (1968) described the females of *P. plumata* with unequal, acuminate Ri with no distal forks from central north Pacific Ocean. However, the specimens recorded from the various localities in the Indian Seas were with apically bifid Ri. The male P 5 showed slight differences in the specimens collected from the neritic waters off the west coast of India and from the Laccadive Sea. In the oceanic specimens the movable finger of male P 5 is provided with a spatulate tip, while the specimens from neritic waters does not show any such modification. The distal outer marginal seta on the finger is spinuous in the neritic forms while in the oceanic specimens it is more slender and setose. These characters were not observed by earlier workers.

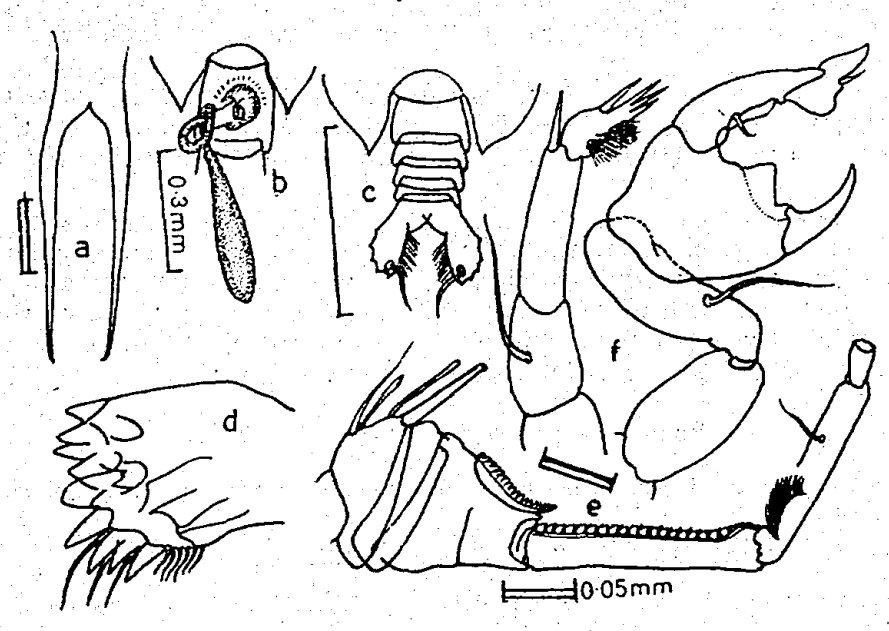

Fig. 35. a and b. *Pontellina plumata* .: a. rostrum - female; b. genital segment with sperm sac - female. c - f. *Pontellina morii* : c. urosome-male; d. mandible - male; e. A 1 - male, and f. P 5 - male.

Distribution: Atlantic, Pacific and Indian Oceans between 40° N and 40°S. From Indian Ocean: Malay Archipelago (Cleve, 1901; A. Scott, 1909); Bay of Bengal (Sewell, 1912; 1932); Andaman Sea (present record); Lawson's Bay, Waltair (Ganapathi and Rao, 1958; Ganapathi and Shanthakumari, 1961); Madras Coast (Krishnaswamy, 1953); Gulf of Mannar (Sewell, 1914); around Ceylon Pearl Banks (Thompson and Scott, 1903); Trivandrum Coast (Saraswathy, 1966); Indian coastal waters (Kasthurirangan, 1963); west coast of India and the Laccadive Sea (present record); Maldive Archipelago (Wolfenden, 1906); Arabian Sea (A. Scott, 1902; Cleve, 1903; Sewell, 1947); Red Sea (Cleve, 1900; A. Scott, 1902; Cleve, 1903); Gulf of Suez (Thompson and Scott, 1903); central, northern and eastern Indian Ocean and SE Arabian Sea (Tsuruta, 1963); Indian Ocean (Thompson, 1900; Vinogradov and Voronina, 1961; Voronina, 1962; Fleminger and Hulseman, 1973); Madagascar (Gaudy, 1967); S. African Sea (Cleve, 1904; Decker, 1964; Decker and Mombeek, 1964); Durban Bay (Brady, 1915).

Pontellopsis perspicax (Dana) 1849

Pontella perspicax Dana, 1849, p. 32 (*Type locality*: "in mari Atlantico, lat. aust. 0° 40′, long. occ. 18°; lect. die Nov., 1838. Forsan, lat. bor. 7°25′, long. occ. 20°; lect. die 17 Oct., 1838).

Pontellina perspicax Dana, 1852, pp. 1155–1157; 1855, pl. 81, fig. 2 a–d.

Pontellina pulchra Dana, 1852, pp. 1157–1158 (*Type locality*: Atlantic. Lat. 7°N, Long. 23° 45" W on Oct. 17, 1838); 1855, pl. 81, fig. 3 a-e.

Pontella (*Pontellina*) *perspicax* Lubbock, 1860, p. 180.

Monops perspicax Giesbrecht, 1889, p. 28.

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

Records from Indian Ocean: *Pontellopsis perspicax* Thompson and Scott, 1903, p. 253 (Cheval and Periya Parrs, Ceylon Pearl Banks, Gulf of Mannar); Sewell, 1914, p. 239 (coast of Burma); 1932, pp. 387–388 (Lists previous records); 1947, p. 251 ("John Murray Exped." stn. 172, central area of Arabian Sea).

Other Records; In the Atlantic Ocean (Dana, 1849, 1852; Giesbrecht, 1889, 1892; T. Scott, 1912; Farran, 1929, Wilson, 1942; Owre, 1962). In the Pacific Ocean (A. Scott, 1909; Mori, 1937; Wilson, 1950; Tanaka, 1953; Chibba, 1956).

Remarks: A good description of this species from the Indo-Pacific is badly needed as almost all authors have merely listed this species with the exception of Mori (1937) who gave a brief diagnosis of *P. perspicax* along with illustrations. As pointed out by Vervoort (1965), Wilson's (1950) record of *P. perspicax* from the north Pacific (53° 12′ N, 171° 37′ W) would need confirmation.

Pontellopsis strenua (Dana) 1849

Pontella strenua Dana, 1849, p. 32 *Type locality* : "in mari Pacifico, lat. aust. 3°, long. orient 175°).

Pontellina strenua Dana, 1852, pp. 1158–1159; 1855, pl. 81, figs. 4 a-d.

Monops strenus, Giesbrecht, 1892, p. 486, pl. 26, figs. 25, 28; pl. 41, figs. 48, 53 and 65.
Monops grandis (partim) Claus, 1893, p. 277.

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

Records from the Indian Ocean: *Pontellopsis strenua* Cleve, 1901 (As *Monops strenua* from Malay Archipelago); Thompson and Scott, 1903, p. 253 (Cheval Parr and Periya Parr, Ceylon Pearl Banks, Gulf of Mannar); and Voronina, 1962, p. 68 (One R. V. "Vityaz" station, Indian Ocean).

Other Records: From the Pacific Ocean (Giesbrecht, 1889, 1892; A. Scott, and Wilson, 1909; 1950).

Remarks: References to this rare Indo-Pacific species are few and a description of it from the Indian Ocean is wanting. Wilson (1950) while giving a redescription of this species has commented on its nomenclatorial status. Earlier, Scott (1909) showed that Brady's (1883) record of *P. strenua* from the south Atlantic is based on misidentification, partly being *Pontella atlantica* male and partly *Pontellopsis regalis* male.

Pontellopsis tenuicauda (Giesbrecht) 1889

Monops tenuicauda Giesbrecht, 1889 (*Type locality*: Formosa Strait near Amoy); 1892, p. 487, pl. 26, fig. 31 and pl. 41, figs. 43 and 61.

Pontellopsis tenuicauda Giesbrecht and Schmeil, 1898, p. 148.

Records from the Indian Ocean: *Pontellopsis tenuicauda* Chiba, 1963, p. 378 (from 8° 4′ N, 94° 05′ E; and from 9° 51′ N, 94° 05′ E - Andaman Sea).

Other Records: From the Pacific Ocean (Giesbrecht, 1889, 1892; Mori, 1937; Shen and Bai, 1956).

Remarks: *P. tenuicauda* is a little known species previously recorded only from the Formosan Strait and Saishu Strait near the Yellow Sea, both in the western Pacific. Chiba's (1963) record of it from the Andaman Sea is unaccompanied by description or figures and as such a definite record of this species with proper description from the Indian Ocean is desirable.

Genus **Pontellina** Dana, 1852

Pontellina Dana, 1852. *Calanops* Claus, 1863. *Pontellopsis* (part) Brady, 1883.

Cephalon and T-I separated; rostrum long, bifid and filamentous; dorsal cuticular eye lenses feebly developed; T-IV and T-V fused, with latter produced posterad into acuminate lobes; prosome slightly narrowed anterad; urosome two-segmented in female, CR with right ramus and anal segment indistinctly separated; A-2 and palps of Mnd are furnished with long and densely plumose setae; Mx-2 with strong distal setae; Mxp with internal lobe carrying long setae with spinnules; Re of P 1 to P 4 three-segmented, Ri of P 1 three-segmented, that of P 2 to P 4 two-segmented; P 5 in female biramous, in male uniramous, right P 5 with a chela.

Fleminger and Hulseman (1974) in their detailed review of the systematics and distribution of 4 sibling species of the genus *Pontellina* have given the diagnostic characters of *P. plumata* and at the same time describing three new species namely *P. platychela, P. morii* and *P. sobrina*, of these *P. platychela* is known from the Atlantic and *P. sobrina* from the eastern Pacific. *P. morii* is known from the Indo-Pacific and is reported to have a wide distribution in the Indian Ocean, particularly in the Arabian Sea and Bay of Bengal (Fleminger and Hulseman, 1974, fig. 12).

Type species: *Pontellina plumata* Dana, 1852 (Atlantic Ocean).

Pontellina morii (Fleminger and Hulsemann) 1974; (Fig. 35 c-f)

Pontellina morii Fleminger and Hulsemann, 1964, Fish. Bull., 72 (1): 79-84.

Material: 5 males from R. V. VARUNA stations 4161 and 3562.

Male: 1.28 – 1.60 (Mean : 1.51) mm.

Cephalon resembles that of male *P. plumata*. T-V posteriorly tapers to small spiniform symmetrical process; *A-1* chelate, resembling that of *P. plumata*; *P-5*: with base of chela more or less squarish; thumb long, curved inside; movable finger with a digitiform process at tip, resembling cat's paw, inner marginal process of the base of chela blunt and conical.

P-5 of this species is essentially *plumata* type, but differs from the former in the modification of the movable finger.

Genus **Ivellopsis** Claus, 1893

(*Ivellopsis* Claus, 1893, p. 274. Genotype : *Pontella elephas* Brady, 1883, p. 87).

Ivellopsis elephas (Brady) 1883

Pontella elephas Brady, 1883, p. 87, pl. 38, figs. 7–14 (*Type locality*: Approximately 6°30′N, 122° 0′E off Sibago Island and other localities in the neighbourhood of the Philippine Islands).

Pontellina (*Ivellopsis*) *elephas* Claus, 1893, p. 274.

Ivellopsis elephas Giesbrecht and Schmeil, 1898, p. 139.

Records from the Indian Ocean: *Ivellopsis elephas* Wickstead, 1961, pp. 60, 73 (off Singapore); Wickstead and Krishnaswamy, 1964, pp. 27–32, figs. 1–15 (off Singapore).

Remarks: While recording *Ivellopsis elephas* from Off Singapore, Wickstead (1961) remarked that on the basis of the pattern of water movements, this species could be expected to extend atleast to the Java, South China, Sulu, and Celebes Seas. The close association of this species with floating *Sargassum* was drawn attention to by Wickstead and Krishnaswamy (1964). However, these authors failed to comment on Wilson's (1950) remarks about the conspecificity of *Pontella valida* Dana and *Ivellopsis elephas* (Brady). Sherman (1967) has recently clarified the position by redescribing *Pontella valida* from central south Pacific. He has shown that Wilson's remarks on *P. valida* are based on misidentification and his description and figures (pp. 301–303 abd pl. 29, figs. 432–444) actually represent *Ivellopsis elephas*. This clarification on the validity of *Pontella valida* Dana by Sherman (1967) thus adds a few more localities in the Philippine Seas from where *Ivellopsis elephas* has been recorded.

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