Taxonomy, phylogeny, historical biogeography, and historical ecology of the genus *Pontonia* (Crustacea: Decapoda: Caridea: Palaemonidae)

C.H.J.M. Fransen

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C.H.J.M. Fransen, Nationaal Natuurhistorisch Museum, P.O. Box 9517, 2300 RA Leiden, The Netherlands (e-mail: fransen@naturalis.nnm.nl).

Key words: Crustacea; Decapoda; Caridea; Pontoniinae; *Pontonia*; taxonomy; phylogeny; historical biogeography; historical ecology.
Species of the genus *Pontonia* Latreille, 1829, are distributed in tropical and subtropical waters around the world, living in association with either molluscan or ascidian hosts.
In the present taxonomic revision, *Pontonia* sensu lato is divided into six genera: *Pontonia* sensu stricto; *Ascidonia* gen. nov., *Rostronia* gen. nov., *Dactylonia* gen. nov., *Odontonia* gen. nov., and *Bruceonia* gen. nov. A total of 29 species is described and figured, four of which are new to science: *Pontonia pilosa* spec. nov., *Dactylonia holthuisi* spec. nov., *Odontonia rufopunctata* spec. nov., and *O. seychellensis* spec. nov.
The division in six genera is based on a stepwise phylogenetic analysis using morphological characters, performed using PAUP and McClade software.
The hypothesized phylogeny is used to analyse the historical biogeography of the shrimps. A deductive method using Brooks Parsimony Analysis (BPA) is performed with regards to the Atlantic and East Pacific areas. The distribution patterns in the Indo-West Pacific are tested against the three scenario's explaining the 'East Indies Triangle of maximum diversity'.
The historical ecology of the shrimps is analysed using their hypothesized phylogeny. In analogy with the historical biogeographical analyais, a deductive BPA method was applied, measuring the fit of the shrimp phylogeny on the hypothesized host phylogeny at different taxonomical levels of the hosts.

Contents

1. Introduction

Shrimps of the genus *Pontonia* Latreille, 1829, sensu Bruce, 1993, occur in shallow waters of the tropical and warm-temperate regions. They live in association with molluscs and ascidians. An observation on *Pontonia pinnophylax* (Otto, 1821), the type-species of the genus, was published already by Aristotle in his *Historia Animalium*, (book V, chapter 15, p. 547, translated in English by d'Arcy Wentworth Thompson, 1910): "The pinna grows straight up from its tuft of anchoring fibres in sandy and slimy places; these creatures have inside them a parasite nicknamed the pinna-guard, in some cases a small carid [*Pontonia pinnophylax*] and in other cases a little crab [*Pinnotheres pinnotheres* (Linnaeus, 1758)]; if the pinna be deprived of this pinna-guard it soon dies." With *Pontonia*, the subfamily Pontoniinae Kingsley, 1878, comprises 80 genera, including about 470 species.

The objectives of this study on *Pontonia* are fourfold: 1) to revise the taxonomy; 2) to analyse its phylogeny; 3) its historical biogeography; and 4) its historical ecology.

In the course of this study, five new species were discovered: *Pontonia manningi* Fransen, 2000, *Pontonia pilosa* spec. nov., *Dactylonia holthuisi* spec. nov., *Odontonia rufopunctata* spec. nov., and *O. seychellensis* spec. nov.

The availability of a vast amount of material of several species has been extremely useful to the present study. Detailed examination of this material made it possible to 1) evaluate the range of intraspecific morphological variation, and to 2) identify reliable diagnostic characters.

2. Material and methods

Sources of specimens and types used in this study have been the collections of: Nationaal Natuurhistorisch Museum, Leiden (previously Rijksmuseum van Natuurlijke Historie) (RMNH); Zoological Museum, Amsterdam (ZMA); National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM); Muséum National d'Histoire Naturelle, Paris (MNHN); The Natural History Museum, London (BMNH); Museum of Comparative Zoology, Harvard University, New Haven (MCZH); Northern Territory Museum, Darwin (NTM); and Allan Hancock Foundation collections in the Natural History Museum of Los Angeles County, Los Angeles (AHF).

The genus entries in the present study comprise: 1) the original publication of its description; 2) a definition; 3) the type species and the gender of the name; 4) the etymology of the name; 5) the distribution; 6) the host group; and 7) a key to the species.

The species entries comprise: 1) references to the species including the original

description and type-locality of both senior and possibly junior synonyms; 2) a list of material studied with the following particulars: a) number and sex of the specimens, with at least maximum and minimum postorbital carapace lengths in millimeters; b) collection registration number of institute of deposition; c) station number; d) locality data; e) date; f) depth in metres; g) collecting gear or method; h) environmental characteristics; i) host information; j) collector; 3) full description based on the material studied; 4) maximum postorbital carapace lengths of males and females, and minimum pocl. of ovigerous females; 5) colour pattern; 6) information on the type-specimens; 7) geographic and bathymetric distribution; 8) information on hosts.

All drawings were made by the author using a WILD M5 and Olympus BH-2 stereomicroscope with drawing tube. Photographs of live specimens were taken by the author if not indicated otherwise.

Phylogenetic analyses were performed using the software programs PAUP (version 3.1.1) by D.L. Swofford (1993), and MacClade (version 3) by Maddison & Maddison (1992).

Morphological characters have been used to delimit taxa. The morphospecies recognized this way are hypothesized to reflect the evolutionary units found in nature.

Abbreviations: pocl. = postorbital carapace length; MPT = Most Parsimonious Tree; CI = Consistency Index; HI = Homoplasy Index; RI = Retention Index; RC = Rescaled Consistency Index; BPA = Brooks Parsimony Analysis.

3. Historical review

The definition of *Pontonia* by Latreille (1829: 96) is very brief: “Ont, comme les deux sous-genres suivants [*Hymenocera, Gnatophyllum*], les quatre pieds antérieurs en forme de serres et didactyles, mais le carpe n’est point annelé” (“Like the two following subgenera [*Hymenocera, Gnathophyllum*], the four anterior legs pincer-like and two-fingered, but the carpus not jointed”). As *Pontonia* was the first genus described within the subfamily Pontoniinae Kingsley, 1878, the subsequent description of new genera within this subfamily delimited the genus *Pontonia*, whereas the incorporation of new species extended it. After the description of *Pontonia pinnophylax* (Otto, 1821), the next *Pontonia* species to be described were: *P. parasitica* P. Roux, 1831 (= *P. pinnophylax*), *P. custos* Guérin-Méneville, 1832 *(= P. pinnophylax*), *P. heterochelis* Guérin-Méneville, 1832 (= *P. pinnophylax*), *P. macrophthalma* H. Milne-Edwards, 1837 (now in *Coralliocaris* Stimpson, 1860), *P. armata* H. Milne-Edwards, 1837 (now in *Paranchistus* Holthuis, 1952), *P. inflata* H. Milne Edwards, 1840 (= *Anchistus custos* Forskål, 1775), *P. nipponensis* de Haan, 1844 (now in *Conchodytes* Peters, 1852), *P. pulsatrix* Nardo, 1847 (= *Typton spongicola* Costa, 1844), *P. occidentalis* Gibbes, 1848 (nomen nudum), *P. domestica* Gibbes, 1850, *P. tridacnae* Dana, 1852 (now in *Anchistus* Borradaile, 1898), *P. mexicana* Guérin-Méneville, 1844, *P. flavomaculata* Heller, 1864, *P. Diazonae* Joliet, 1882 (= *P. flavomaculata*), *P. biunguiculata* Paulson, 1875 (now in *Conchodytes* Peters, 1852), *P. phallusiae* Marion, 1897 (= *P. flavomaculata*), *P. (Harpilius) dentata* Richters, 1880 (= *Harpiliopsis beaupresii* (Audouin, 1826)), *P. brevirostris* Miers, 1884 (now in *Platypontonia* Bruce, 1968), *P. Vagans* Gourret, 1888 (? *Typton spongicola* Costa, 1844), *P. pinnae* Ortmann, 1894 (= *Anchistus custos* Forskål, 1775), *P. ascidicola* Borradaile, 1898, *P. californiensis* Rathbun,

1902, *P. minuta* Baker, 1907 (now in *Pseudopontonia* Bruce, 1992), and *P. maldivensis* Borradaile, 1915 (now in *Pontonides* Borradaile, 1917).

The genus was redefined by Borradaile (1917: 391): "Body stout, swollen, somewhat depressed; sixth abdominal segment not elongate; rostrum short, depressed, curved downwards, not dentate, with or without a keel below at the free end; eye more or less reduced, outer flagellum of antennule not deeply cleft; antennal scale broad; mandible without palp; inner lacinia of maxillule very broad and hairy; second maxilliped without podobranch, with last joint mediad of preceeding joint; third maxilliped without arthrobranch and with all joints broad, but the widest surface of the last two in a different plane from that of the antepenultimate, so that they are apt to appear narrow; legs stout, directed outwards, the second pair with heavy chela, the last three with dactylopodite nearly straight, simple and without basal protuberance." He classified the following species in the genus: *Pontonia minuta* Baker, 1907 (now in *Pseudopontonia*), *P. pinnae* Ortmann, 1894 (= *Anchisus custos* Forskål, 1775), *P. californiensis* Rathbun, 1902, *P. nipponensis* de Haan, 1844 (now in *Conchodytes* Peters, 1852), *P. flavomaculata* Heller, 1864, *P. tyrrhena* (Petagna, 1792) (= *P. pinnophylax*), *P. grayi* Rathbun, 1902 (= *P. mexicana*), *P. ascidicola* Borradaile, 1989, *P. mexicana* Guérin, 1856, and *P. brevirostris* Miers, 1884 (now in *Platypontonia*). The species *P. quadrotophthalma* (now in *Onycocaris* Nobili, 1904) was added by Balss, 1921.

Kemp (1922) more or less adopted the definition by Borradaile (1917). He excluded *Pontonia nipponensis*, which he designated to the genus *Conchodytes* Peters, 1852, and *P. pinnae* (Petagna), which he regarded synonymous with *Anchistus inermis* (Miers, 1884) (= *A. custos* (Forskål, 1775)), and added the species *P. pinnae* Lockington, 1878, *P. margarita* Smith, 1869 (which were ommitted by Borradaile (1917)), *P. anachoreta* Kemp, 1922, and *P. okai* Kemp, 1922. *Pontonia medipacifica* Edmondson, 1935, and *Pontonia katoi* Kubo, 1940, were subsequently added to the genus.

Holthuis (1951) redefined the genus when revising the American species and introduced five new species: *Pontonia chimaera, P. miserabilis, P. longispina, P. pusilla*, and *P. simplex*. The following years *Pontonia stylirostris* Holthuis, 1952, *P. sibogae* Bruce, 1972, *P. quasipusilla* Chace, 1972, *P. spighti* Fujino, 1972 (= *P. pusilla*), *P. ardeae* Bruce, 1981, *P. hurii* Holthuis, 1981 (now in *Anchiopontonia* Bruce, 1992), and *P. monnioti* Bruce, 1990, were described. The most recent additions to the genus are *Pontonia compacta* Bruce, 1996, *P. simplicipes* Bruce, 1996, and *P. manningi* Fransen, 2000.

Chace & Bruce (1993) and Bruce (1993) presented similar definitions as the one by Holthuis (1951). The most recent comprehensive generic definition is given by Bruce (1993: 125-126): "Small to medium sized shrimps of subcylindrical body form. Rostrum variable, well developed to reduced, compressed to depressed, unarmed or dorsally dentate, lateral carinae well developed or absent. Carapace smooth; inferior orbital angles feebly developed or obsolete, orbit feebly developed; supraorbital, epigastric and hepatic spines absent, antennal spine well developed, anterolateral angle of branchiostegite generally rounded. Abdomen smooth, generally glabrous, posterior margins of pleura rounded, posterolateral angle of sixth segment acutely produced. Telson generally with two pairs of large dorsal spines (five pairs in *P. sibogae*), three pairs of posterior spines. Antennule normal, flagella reduced. Antenna normal, basicerite unarmed, scaphocerite well developed. Eye normal, with globular cornea.

Epistome unarmed. Corpus of paragnaths with deep median fissure (in *P. pinnophylax*). Mandible robust, without palp, molar process stout, incisor process simple; maxillula withy bilobed palp, laciniae normal or broadened; maxilla with simple palp, bilobed endite, scaphognathite broad; first maxilliped with slender palp, narrow basal endite, coxal endite, obsolete, or distinct, exopod with well developed caridean lobe, flagellum broad, densely setose distally, epipod large, oval; second maxilliped with normal endopod, exopod with flagellum well developed, plumose setae distally, epipod large, oval, without podobranch; third maxilliped with endopod normal or broadened, ischiomerus fused to basis, exopod well developed, densely setose distally, coxa with oval, lateral plate, without median process, arthrobranch absent. Fourth thoracic sternite without median process. First pereiopods slender or robust, fingers simple. Second pereiopods with chelae equal or unequal, similar or dissimilar, major chela with fingers generally strongly dentate, without molar process or fossa, minor chela with fingers generally feebly armed. Ambulatory pereiopods slender to robust, dactyls biunguiculate, generally with accessory teeth on ventral corpus, unguis simple. Uropod with protopodite feebly acute distally, exopod with distolateral margin with or without mobile spinule, feebly armed."

As noted by Bruce (1991: 627), the present concept of *Pontonia* suggests that the genus is polyphyletic. No synapomorphies have been found to define *Pontonia* as a monophyletic group. Bruce (1991) indicates three groups which can be distinguished on the basis of the dactyli of the ambulatory pereiopods which might be monophyletic. "These are: (1) simply biunguiculate as in all American species [and East Atlantic species] most of which are associated with molluscs, particularly bivalves; (2) biunguiculate with additional acute proximal and intermediate teeth, as in *P. katoi* and *P. sibogae*, associates of ascidians; and (3) biunguiculate, with series of blunt hooklike teeth distally, as in *P. ascidicola* Borradaile, *P. anachoreta* Kemp, *P. okai* Kemp, and *P. monnioti* Bruce, all associates of ascidians."

In my view the first group falls morphologically apart into an ascidian-associated group with very setose dactyli and the distal alea of the paragnath excavate or bilobed, and a mollusc-associated group with moderately setose dactyli and the corpus of the paragnath with distinctly setose submedian carinae. *P. stylirostris* stands morphologically apart from Bruce's species-group 3. Although it shares the biunguiculate dactylus with blunt hook-like teeth on the corpus with species-group 3, it differs in many aspects of the rostrum and mouthparts. Bruce (1993: 126) noted the possible polyphyletic origin of the mollusc-associated *P. ardeae* Bruce, 1981, which, according to Bruce (1993), has some affinities with species of *Neoanchistus* Bruce, 1975.

In the phylogenetic analysis of the species recognized as belonging to *Pontonia* sensu lato (see § 5.3.), these six groups appear as distinct monophyletic entities, and are given generic status: *Pontonia* Latreille, 1829; *Ascidonia* gen. nov.; *Rostronia* gen. nov.; *Dactylonia* gen. nov.; *Odontonia* gen. nov.; and *Bruceonia* gen. nov. These generic names are used throughout this revision.

Species incertae sedis.— *Pontonia maculata* Stimpson, 1860, was described from Bonin Island, Japan, as associated with a bivalve mollusc of the genus *Tridacna.* The whereabouts of the type specimen are not known. As no *Pontonia* species have been reported from *Tridacna* species later on, it is most likely that *Pontonia maculata* actually

belongs to a species of the genus *Conchodytes* Peters, 1852, *Anchistus* Borradaile, 1898, or *Paranchistus* Holthuis, 1952.

Pontonia unidens Kingsley, 1880, was described from Key West, Florida. The whereabouts of the type material are also unknown. According to Holthuis (1951: 151) this could be a species of *Periclimenaeus*, and definitely not *Pontonia mexicana* Guérin, 1856, as suggested by Kingsley (1880) himself and by Borradaile (1917).

4. Morphology and terminology

In general, the terminology used to describe morphological structures is conform that used for other pontoniine shrimps by Holthuis (1993) and Bruce (1993).

5. Phylogenetic analysis

In this revision I have used the methods of phylogenetic systematics as developed initially by Hennig (1966), who maintained that only strictly monophyletic taxa may be regarded as historical entities, and demonstrated that the only logical basis for inferring monophyly is to show that the component taxa of a group possess one or more shared, derived character states or synapomorphies. The distribution of synapomorphies is determined by the parsimony criterion. On the basis of these synapomorphies, taxa are ordered into a specific pattern represented by a branching hierarchical diagram.

Polytomies in the tree are interpreted either as: 1) irresolution due to lack of suitable characters, or 2) reflecting a punctuated mode of speciation. Eldredge & Gould (1972) demonstrated morphological stasis to be a predominant feature of the fossil record. As morphospecies suddenly appear in the fossil record it is assumed that morphological change is mainly confined to the speciation events. In the case where several species split of from one morphospecies, instantaniously or over time, no synapomorphies will be found in a phylogenetic analysis. This can be traced as a polytomy in the resulting tree.

Pontonia sensu Bruce, 1993, might be of polyphyletic origin as no synapomorphies for the species presently grouped in it are recognized.

A series of cladistic analyses were performed: 1) to find monophyletic groups, 2) to investigate the phylogenetic relations among these groups, and 3) to investigate the phylogenetic relations within these groups.

5.1 Taxa

All 25 species presently included in *Pontonia* as well as four species new to science were considered ingroup taxa in the present analysis. *Palaemonella tenuipes* Dana, 1852, type-species of *Palaemonella* Dana, 1852, was selected as outgroup. *Palaemonella* also belongs to the Pontoniinae, but is regarded sufficiently distant from the ingroup taxa of *Pontonia* sensu lato to function as an outgroup. All genera within the Pontoniinae except *Palaemonella* and *Vir* Holthuis, 1952, lack a mandibular palp. This absence is regarded a synapomorphy for this group of genera within the Pontoniinae. The selection of *Palaemonella tenuipes* as outgroup instead of a possible closer relative within the Pontoniinae avoids the possibility of selecting a species which might ultimately turn out to be part of

the ingroup. *Palaemonella tenuipes* is assumed to be closely related enough to share a sufficient number of homologous characters for the phylogenetic analysis.

5.2 Character state definition

The character set comprises the external morphology of adult specimens. Characters are taken from all parts of the body: rostrum (3 characters), carapace (4), antennula (4), antenna (2), paragnath (5), thoracic sternites (3), mouthparts (14), pereiopods (15), abdomen (2), telson (6), uropod (1), and male first pleopod (2). Characters are considered to be independent. Characters were accepted as such using the following criteria: 1) similarity supposed to be based on homology; 2) character state transformation can be determined on the basis of outgroup analysis. Ontogenetic evidence for character state transformation was also taken into account, but such data were only rarely available. Character states unique to individual species were not included in the analysis. Binary and multistate coding were applied of discrete and discontinuous quantitative characters. Transformation series of individual characters were analysed as being unordered (Fitch parsimony, see Fitch, 1971), ordered (Wagner parsimony, see Kluge & Farris, 1969; Farris, 1970), or irreversible (Camin-Sokal parsimony, see Camin & Sokal, 1965). The character state 0 was assigned to the character state found in the outgroup unless bidirectional multistate characters were involved (characters 52, 54, 57, 58, 61). A stepmatrix was used for the character states of character 1 and 3 when treated ordered (and partly irreversible). The coding of "missing" (= ?) data is treated in the data matrix as equivalent to "all possible states", or inapplicable. In total, 61 characters with apomorphic character states were found by outgroup comparison. The characters and character states used in the analyses are listed below. Their distribution over the species is given in Table 1.

Rostrum

1. Dorsal carina: A, well developed; B, reduced; C, strongly reduced; D, absent. In all species of the ingroup the dorsal lamina of the rostrum is reduced in some way. However, distinct character states can be distinguished. In the reduced state, as present in *Rostronia* and *Dactylonia*, the dorsal carina is a distinct sharply defined ridge bordered by lateral depressions. In the strongly reduced state as present in *Odontonia*, the rostrum is broadly triangular with a low central elevation. In a juvenile specimen of *Odontonia katoi* (fig. 227a), the reduced state (B) has been observed. In the ontogeny of *Pontonia pinnophylax* (cf. Calafiore, Costanzo & Giacobbe, 1991), however, such a transformation through states B and/or C is not observed. The ontogenetic data suggest that the character evolved in a more complex way than by only a linear series of transformations. To reflect this a stepmatrix (see Swoffort, 1993: 15) was constructed that was used in part of the analysis.

	A	B	C	D	
A	0	1	2	1	
B	i	0	1	1	
C	i	i	0	1	
D	i	i	i	0	i = irreversible

2. teeth: 0, series of teeth over entire rostrum; 1, few teeth in distal part of rostrum; 2, one subdistal tooth or tubercle with distal bunch of setae; 3, absent. Only in *Rostronia* a few teeth are present in the distal part of the rostrum. Character state 2 is found in *Pontonia* and *Ascidonia*, state 3 in *Dactylonia*, *Odontonia* and *Bruceonia.* In the ontogeny of *Pontonia pinnophylax* (cf. Calafiore, Costanzo & Giacobbe, 1991) one distinct dorsal spine is present in the sixth and seventh zoeal stages, indicating a linear transformation series in this character from character state 1 to 2.
3. Ventral teeth: A, more than one; B, one subdistal; C, one apical; D, absent. Character state A is also found in the outgroup. A subdistal tooth is present in *Pontonia,* most of the *Odontonia,* and one of the *Dactylonia* species. The rather proximal position of the tooth in the species of *Pontonia* suggests that these teeth are homologous structures. In *Odontonia* and *Dactylonia monnioti* the subdistal tooth is positioned more apically indicating a separate derivation. To accomodate this hypothesis about the evolution of this character a stepmatrix with the two types of subdistal teeth scored as different states is constructed.

	A	B	C	D
A	0	1	1	1
B	i	0	i	1
C	i	i	0	1
D	i	i	i	0

Carapace

4. Inferior orbital angle: 0, produced or angular; 1, broadly rounded or straight. The inferior orbital angle is clearly produced in *Pontonia* and *Rostronia* and broadly rounded or straight in the remainder of the ingroup. In a juvenile of *Odontonia katoi* (fig. 227a) the same state as in the outgroup can be found.
5. Antennal spine: 0, prominent, acute; 1, blunt, rounded. These structures seem to be homologous. In the case of *Ascidonia flavomaculata* and *A. californiensis* the homology seems to be there and the blunt antennal spine is distinct from the inferior orbital angle which can be discerned as a broadly rounded structure. In *Ascidonia miserabilis, A. pusilla, A. quasipusilla* and species of *Odontonia* however, only one structure is present being either a structure homologous to the antennal spine, or the inferior orbital angle, or the merging of both. In these species the antennal spine should not be regarded reduced to a blunt protuberance, but completely absent.
6. Anterolateral margin: 0, not strongly produced; 1, strongly produced.
7. Anterolateral angle: 0, not produced; 1, produced.

Antennulae

8. Distolateral tooth basal segment: 0, present; 1, small or absent; 2, absent. Absence of the distolateral tooth is found in *Pontonia.* In several species this character is polymorphic. The tooth can be very small in small individuals and sometimes absent in larger specimens. This is interpreted here as an intermediate state (state 1) in a linear transformation series.
9. Anterior margin basal segment: 0, present; 1, absent. State 1 is found in several species of *Pontonia* and *Ascidonia.*

10. Ventromedial tooth basal segment: 0, small; 1, strongly developed. *Pontonia domestica* specimens have been found in which the tooth is absent whereas it usually is small but distinct in the genera *Pontonia*, *Ascidonia*, *Rostronia*, *Dactylonia* and *Bruceonia*. In species of *Odontonia*, except for *O. simplicipes*, the tooth is very large.
11. Intermediate segment: 0, twice as long as wide; 1, about as long as wide; 2, about twice as wide as long. *Rostronia* shares state 0 with the outgroup. Intermediate segments that are twice as wide as long are found in *Ascidonia pusilla*, *A. quasipusilla*, *Odontonia seychellensis* and *O. simplicipes*. All other species have the intermediate segment about as wide as long.

Antenna

12. Scaphocerite; distolateral tooth: 0, less than 0.1 times length of scaphocerite; 1, strongly developed, bent inward, more than 0.2 times length of scaphocerite. Character state 1 is present in all species of *Ascidonia*, *Odontonia* and *Bruceonia*. In a juvenile of *Odontonia katoi* (fig. 227a) as well as in the post larvae of *Ascidonia flavomaculata* (cf. Costanzo, Calafiore & Crescenti, 1996), character state 0 was observed.
13. Length antennal peduncle: 0, less than half length of scaphocerite; 1, between 2/3-3/4 length of scaphocerite; 2, as long as or longer than scaphocerite. Character state 1 is present in all species of *Pontonia*, character state 2 in the rest of the ingroup. The ontogenetic studies on both *Pontonia pinnophylax* (cf. Calafiore, Costanzo & Giacobbe, 1991) and *Ascidonia flavomaculata* (cf. Costanzo, Calafiore & Crescenti, 1996) show the character having state 0 in the zoeal stages.

Paragnath

14. Alae; distal lobe: 0, medially rounded: 1, medially bilobed or excavate. Character state 1 is found in all species of *Ascidonia*.
15. Corpus; carinae: 0, two submedian carinae with distinct median groove: 1, two submedian carinae almost completely fused to form one median carina: 2, one median carina. Character states 1 and 2 are present in species of *Dactylonia*.
16. Corpus; submedian carinae; orientation: 0, oblique; 1, parallel; ?, inapplicable. Parallel carinae are found in all species of *Pontonia*. The character is scored inapplicable in *Dactylonia* as it is absent in that genus (see character 15).
17. Corpus; carina(e); setae: 0, absent; 1, present. Setae are present in *Pontonia* only.
18. Corpus; submedian carinae or median carina; length related to proximal lobe alea: 0, <=1; 1, ca. 1.5; 2, >=2. Character state 0 is present in *Pontonia* and *Dactylonia*.

Thoracic sternites

19. Second thoracic sternite: 0, V-shaped transverse ridge; 1, anterior margin broadly rounded; 2, anterior margin triangular, produced, forming a more or less developed plate. The triangular margin is present in *Pontonia* and *Ascidonia*. The other species of the ingroup have the anterior margin broadly rounded.
20. Fourth thoracic sternite; lateral posteromedial carinae: 0, with distinct median long process, with low lateral carinae; 1, without medial process, with low lateral carinae; 2, with medially developed, centrally notched or completely fused lateral plates. Character state 1 is found in *Pontonia* and *Ascidonia*, character state 2 in the other species of the ingroup.

21. Fifth thoracic sternite; lateral plates: 0, acutely pointed plates, with deep slit in between; 1, broad rectangular, blunt angles medially, left and right carinae separate; 2, broad rectangular, blunt angles medially, left and right carinae partly fused. Left and right carinae are partly fused in species of *Odontonia*. Other species of the ingroup have character state 1.

Mouthparts

22. Mandible; palp: 0, present; 1, absent. The palp is absent in the ingroup.
23. Maxillula; form lower lacinia: 0, small, slender, few setae; 1, large, triangular, with many simple setae; 2, large, triangular, with many simple setae and few robust, long setae at the tip. Character state 1 is present in both *Pontonia* and *Ascidonia*. Character state 2 is present in *Dactylonia*.
24. Maxilla; basal endite; number of setae: 0, many setae on upper and lower lacinia; 1, one or two setae on upper and lower lacinia. Character state 1 is present in *Dactylonia*.
25. Maxilla; basal endite; upper and lower lacinia: 0, both laciniae well developed; 1, upper lacinia well developed, lower lacinia reduced; 2, upper and lower laciniae almost or completely fused. A reduced lower lacinia is found in *Dactylonia*, fusion of upper and lower laciniae in *Pontonia chimaera*, *Odontonia rufopunctata* spec. nov. and *Bruceonia*.
26. Maxilla; length basal endite: 0, as long as or longer than palp; 1, shorter than palp. Character state 1 is present in *Dactylonia*, *Odontonia* and *Bruceonia*.
27. Maxilla; placement upper and lower laciniae: 0, both laciniae distal; 1, lower lacinia far below upper lacinia. In those species in which the laciniae are fused (see character 25) they are regarded both distal. In species in which the lower lacinia is reduced, its position can be traced by the location of the setae. Character state 1 is present in *Ascidonia* and several species of *Dactylonia*.
28. First maxilliped; basal and coxal endites: 0, basal and coxal endites partly fused; 1, basal and coxal endites completely fused. Character state 1 is present in *Pontonia* and *Ascidonia*.
29. First maxilliped; setae along median margin: 0, short, only few on basal endite, not forming a basket; 1, long, on both basal and coxal endites, forming basket. Character state 1 is present in *Pontonia*, *Ascidonia* and *Dactylonia*.
30. Second maxilliped: 0, no distinct angle in the median margin of the basis; 1, basis with distinct angle in median margin. Character state 1 is present in most species of *Odontonia*.
31. Second maxilliped; epipod: 0, small, rounded, posterior expanded; 1, large, triangular. Character state 1 is present in *Pontonia* and *Ascidonia*.
32. Third maxilliped: width ischiomeral segment: 0, slender, as wide as penultimate segment; 1, expanded, much wider than penultimate segment. Character state 1 is present in *Pontonia*, *Ascidonia* and *Dactylonia*. The ontogenetic studies on both *Pontonia pinnophylax* (by Calafiore, Costanzo & Giacobbe, 1991) and *Ascidonia flavomaculata* (by Costanzo, Calafiore & Crescenti, 1996) show the character state to be 0 in the zoeal stages.
33. Third maxilliped; ventral side ischiomeral segment: 0, no dense pile of setae; 1, dense pile of setae. Character state 1 is present in *Dactylonia*, *Ascidonia californiensis*,

A. flavomaculata, A. miserabilis, and *Pontonia longispina*. In the last species the cover is not as dense as in the others.

34. Third maxilliped; arthrobranch: 0, well developed; 1, rudimentary; 2, absent. Rudimentary arthrobranchs are found in *Pontonia*, *Ascidonia* and *Rostronia*. In several species of *Pontonia*, *Ascidonia californiensis* and *A. flavomaculata*, the filaments of the gill are developed. In *Ascidonia miserabilis*, *A. pusilla* and *A. quasipusilla* and several species of *Pontonia*, a more or less distinct protrusion at the position of the arthrobranch is visible. In the other species of the ingroup, there is no trace of a structure visible.
35. Third maxilliped; exopod: 0, with plumose setae in distal part only; 1, with plumose setae along entire length. Character state 1 is present in *Ascidonia californiensis* and *A. flavomaculata*.

Pereiopods

36. First pereiopod; ratio fingers / palm: 0, fingers longer than palm; 1, fingers as long as palm.
37. First pereiopod; ratio chela / carpus: 0, chela shorter than carpus; 1, chela as long as carpus; 2, chela longer than carpus.
38. First pereiopod; ratio carpus / merus: 0, carpus as long as merus; 1, carpus longer than merus; 2, carpus shorter than merus.
39. Second pereiopod; chela: 0, chela similar in shape; 1, chela dissimilar is shape.
40. Second pereiopod; dactylus; medial carina: 0, absent; 1, present. Character state 1 is present in several species of *Pontonia*.
41. Second pereiopod; major chela; median fossa: 0, indistinct or absent; 1, distinct. Character state 1 is present in *Rostronia* and several species of *Pontonia*.
42. Second pereiopod; minor chela: 0, with 0-5 teeth in proximal part fingers; 1, multidentate (> 10 teeth) over entire cutting edges of fingers. Character state 1 is present in *Ascidonia californiensis* and *A. flavomaculata*.
43. Third pereiopod; propodus; spines on flexor margin: 0, spines along whole margin; 1, small spines in distal part; 2, devoid of spines. Spines are absent in *Pontonia chimaera*, *P. pilosa* spec. nov., and *Bruceonia*.
44. Third pereiopod; dactylus: setation: 0, devoid of setae along flexor margin; 1, scattered setae along flexor margin; 2, dense pile of setae along flexor margin. A dense pile of setae is prominent in *Ascidonia*, *Bruceonia*, *Pontonia longispina* and *P. pilosa* spec. nov.
45. Third pereiopod; dactylus; corpus; flexor margin: 0, without teeth; 1, with simple teeth; 2, with minutely spinulate blunt tubercles. Simple teeth are present in *Odontonia* except for *O. seychellensis*. Spinulate tubercles are present in *Dactylonia* and *Rostronia*. In a juvenile specimen of *Odontonia katoi* (fig. 227c) character state 0 can be observed.
46. Third pereiopod; dactylus; corpus; teeth flexor margin: 0, absent; 1, teeth similar, increasing in size distally, directed obliquely forward; 2, proximalmost tooth strong, large, directed forward; distal teeth small, simple, perpendicular to margin. Character state 1 is present in *Rostonia* and *Dactylonia*, character state 2 in most species of *Odontonia*.
47. Third pereiopod; dactylus; unguis: 0, simple or with rows of minute spinules;

1, with distal scales; 2, with patch of small scales in distal part. Character state 1 is present in *Rostronia*, *Dactylonia*, and *Odontonia* except for *O. seychellensis* and *O. simplicipes*. Character state 2 is present in *Bruceonia* only.

48. Third pereiopod; dactylus; corpus dimensions: 0, more than 2.0 times as long as broad; 1, less than 2.0 times as long as broad. Character state 1 is present in some species of *Pontonia* and *Odontonia*.
49. Third pereiopod; dactylus; accessory tooth: 0, absent; 1, present. Character state 1 is present in all species except *Odontonia seychellensis* and *O. simplicipes*. An ontogenetic study on *P. pinnophylax* (by Calafiore, Costanzo & Giacobbe, 1991) shows character state 0 to be present in the zoeal stages.
50. Third pereiopod; dactylus; position accessory tooth: 0, distal; 1, subdistal; ?, inapplicable. This character was ignored in those analyses where *Palaemonella tenuipes* was used as outgroup, as the character is not present in that species.

Abdomen

51. Sixth abdominal segment; posterolateral angle: 0, developed; 1, reduced. Character state 1 is present in species of *Dactylonia*, *Odontonia*, *Bruceonia* and in *Ascidonia miserabilis*, *A. pusilla*, and *A. quasipusilla*.
52. Sixth abdominal segment; posteroventral angle: 0, angular; 1, spiniform. Character state 1 is present in species of *Pontonia* except for *P. chimaera*.

Telson

53. Position proximal pair of dorsal spines on telson: 0, in proximal 1/4; 1, at about 1/3; 2, at about 1/2. The position of the proximal pair of dorsal spines at 1/3 of the telson is the plesiomorphic state. Character state 2 is present in some species of *Pontonia*, character state 0 in species of *Ascidonia*, *Rostronia*, *Dactylonia*, *Odontonia* and *Bruceonia*.
54. Position distal pair of dorsal spines over telson length: 0, in proximal 1/2; 1, at about 1/2; 2, at about 2/3; 3, in distal 1/4. Character state 2 is present in the outgroup. The ontogenetic study of *Ascidonia flavomaculata* (by Costanzo, Calafiore & Crescenti, 1996) shows the character having state 1 or 2 in the post larvae.
55. Position proximal dorsal pair of spines in relation to lateral margins: 0, submarginal; 1, marginal. Character state 1 is present in species of *Ascidonia* and *Pontonia*.
56. Position distal dorsal pair of spines in relation to lateral margins: 0, submarginal; 1, marginal. Character state 1 is present in species of *Pontonia* and in *Ascidonia pusilla* and *A. quasipusilla*.
57. Size distal dorsal pair of spines related to telson length: 0, <0.05; 1, 0.10-0.15; 2, 0.25-0.30; 3, >0.30. The outgroup has character state 1.
58. Relative size proximal and distal dorsal pair of spines: 0, distal pair longer than proximal pair; 1, distal and proximal pair of equal size; 2, distal pair shorter than proximal pair. The outgroup has character state 1.

Uropod

59. Distal lamina of exopod: 0, developed; 1, reduced. Character state 1 is present in *Dactylonia holthuisi*, *D. monnioti* and *D. okai*.

First pleopod male

60. Endopod form: 0, distal part broader than proximal part, flat; 1, gradually tapering distally, flat; 2, gradually tapering distally, twisted; 3, distal part very slender, twisted. Character state 1 is present in *Pontonia*, *Ascidonia*, *Odontonia* and *Bruceonia*, character state 2 in *Rostronia*, and character state 3 in *Dactylonia.*
61. Endopod setation: 0, plumose setae along proximal part lateral margin; simple or indistinctly serrate, short setae along proximal part of median margin; distal part devoid of setae; 1, plumose setae along proximal lateral margin; long simple setae in distal part median margin; short simple setae in proximal part medial margin; 2, plumose setae along lateral and distal part of medial margin; simple or indistinctly serrate, short setae along proximal medial margin; 3, one plumose setae on lateral margin; medial and distal margin devoid of setae; 4, lateral margin without setae; proximal part of medial margin with row of simple short setae. The outgroup has character state 2. Character state 1 and 0 are present in *Pontonia*, state 3 in *Rostronia*, and state 4 in *Dactylonia.*

Table 1. Data matrix used in the cladistic analysis of *Pontonia* s.l.

	1	1111111112	2222222223	3333333334	4444444445	5555555556	6
Species / characters	1234567890	1234567890	1234567890	1234567890	1234567890	1234567890	1
Palaemonella tenuipes	A0A0000000	0000000000	0000000000	0000000000	000000000?	0012001100	2
Pontonia chimaera	D2B0010210	1010011121	1110200110	1101000000	1021000111	0023110101	0
Pontonia domestica	D2B0010210	1010011221	1110000110	1101000001	1011000111	0123110101	0
Pontonia longispina	D2B0010000	1010011121	1110000110	1111000001	1012000010	011111300?	?
Pontonia manningi	D2B0010000	1010011121	1110000110	1101000100	0011000110	0112111101	1
Pontonia margarita	D2B0010200	1010011121	1110000110	1101000100	0011000110	0112111101	0
Pontonia mexicana	D2B0010100	1010011221	1110000110	1101000001	1011000010	0112111101	0
Pontonia pinnae	D2B0010100	1010011221	1110000110	1101000000	1011000110	0123111101	0
Pontonia pinnophylax	D2B0010100	1010011221	1110000110	1101000001	1011000010	0112111101	1
Pontonia simplex	D2B0010000	1010011221	1110000110	1101000001	1011000010	0112111101	0
Pontonia pilosa spec.nov.	D2B0010210	1010011121	1110000110	1101000100	0022000011	0123111102	?
Ascidonia californiensis	D2D1110000	1121000021	1110001110	1111110010	0112000010	0001103201	2
Ascidonia flavomaculata	D2D1010000	1121000021	1110001110	1111100010	0112000010	0000103201	2
Ascidonia miserabilis	D2D1101000	1121000021	1110001110	1111011010	0012000010	1001102001	2
Ascidonia pusilla	D2D1101010	2121000021	1110001110	1001010000	0012000010	1000112001	2
Ascidonia quasipusilla	D2D1101010	2121000021	1110001110	1001010000	0012000010	1001112001	2
Rostronia stylirostris	B1D0000000	0020000011	1100000000	0001010210	1011211010	0001002102	3
Dactylonia anachoreta	B3D1000000	1020?0212	1121111010	0112000210	0011211010	1001002102	?
Dactylonia ascidicola	B3D1000000	1020?0212	1121111010	0112010210	0011211010	1001002103	4
D. holthuisi spec.nov.	B3D1000000	1020?0212	1121111010	0112012210	0011211010	1001002113	4
Dactylonia medipacifica	B3D1000000	1020170111	1121110010	0112010200	0011211010	1000003003	4
Dactylonia monnioti	B3D1000000	1020?0212	1121110010	0112011210	0011211010	1001002113	4
Dactylonia okai	B3D1000000	1020?0212	1121111010	0112012210	0011211010	1001002113	4
Odontonia compacta	C3C1101001	1120000012	2100010001	0002010000	0011121110	10?3001102	?
Odontonia katoi	C3C1101001	1120000012	2100010001	0002010000	0011121110	1002001101	2
O. seychellensis spec.nov.	C3C1101001	2120000012	2100010001	0002010000	0011000002	1002001101	2
Odontonia sibogae	C3C1101001	1120000012	2100010001	0002010000	0011121110	10??001101	2
O. rufopunctata spec.nov.	C3C1100001	1120000012	2100210000	0002010200	0011121110	1002001101	2
Odontonia simplicipes	C3D1101000	2120000012	2100010001	0002010000	0011120102	1002001102	?
Bruceonia ardeae	D3D1101000	1120000012	1100210000	0002000000	0022002010	1013000101	2

5.3. Finding monophyletic groups

A priori assumptions about character evolution are compared in several analysis (Table 2).

Analysis A. All characters were scored "unordered" giving equal weight to all changes. The trees were rooted *a posteriori* between outgroup and ingroup.

Analysis B. As multistate characters are present in the data matrix, a run was performed scoring part of these characters "ordered". As irreversible characters are involved in the stepmatrices characters polarization is *a priori*. Therefore the ancestral node was defined with the character states identical to their homologues in the outgroup.

Analysis C. In this analysis the reduction of external spines and teeth, increasing the probability of parallel evolution, is simulated in analysing the characters concerned as "irreversible". Several of the multistate characters were scored "ordered". This analysis was performed using the complete data set. As irreversible characters are involved, character polarisation is *a priori*. Therefore the ancestral node was defined with character states identical to their homologues in the outgroup.

Analysis D. Because of the special habit of living inside molluscan and ascidian hosts convergence and parallel evolution are expected. Especially reductions of external teeth and spines are likely to have resulted from parallel evolution. This can cause high levels of homoplasy and obscure the deep branching of the tree. In contrast, those characters that have evolutionary novelties have more explanatonary power regarding the deep branching of the tree. Therefore an analysis was carried out using only characters of parts of the body with evolutionary novelties, comprising paragnath, thoracic sternites, mouthparts, dactylus of third pereiopod, and first male pleopod.

Analysis E. The same set of characters was used as in Analysis D, but with several multistate characters scored as in Analysis B.

Analysis F. The same set of characters was used as in Analysis D, but with several multistate characters scored as in Analysis C.

Analysis G. As Analysis D, now using the complementary set of characters.

Analysis H. As Analysis G, with multistate characters scored as in Analysis B.

Analysis I. The same set of characters was used as in Analysis G, but with multistate characters scored as in Analysis C.

The data matrices were too large to carry out an exhaustive search in a reasonable time to find all minimal trees. A heuristic search was carried out using stepwise addition and Tree-bisection-reconnection (TBR) branch-swapping and the MULPARS option in effect. Only minimal trees were kept into memory. The matrices were processed with 50 replications to find minimal trees in other islands (Maddison, 1991) of mutually similar trees. Branches having maximum length zero are collapsed to yield polytomies. Uninformative characters were ignored. In those analyses where irreversible characters were involved an ancestral node identical with the outgroup was defined using the ANCSTATES option in PAUP.

Character reconstructions of analyses without irreversible characters were made *a posteriori* comparing both accelerated transformation (ACCTRAN) which favors

Table 2. Character optimalization used in the cladistic analysis.

Character / Analysis	A	B	C	D	E	F	G	H	I
1	unord.	step.	step.	-	-	-	unord.	step.	step.
2	unord.	ord.	irrev.	-	-	-	unord.	ord.	irrev.
3	unord.	step.	step.	-	-	-	unord.	step.	step.
4	unord.	unord.	irrev.	-	-	-	unord.	unord.	irrev.
5	unord.	unord.	irrev.	-	-	-	unord.	unord.	irrev.
6	unord.	unord.	unord.	-	-	-	unord.	unord.	unord.
7	unord.	unord.	unord.	-	-	-	unord.	unord.	unord.
8	unord.	ord.	irrev.	-	-	-	unord.	ord.	irrev.
9	unord.	unord.	irrev.	-	-	-	unord.	unord.	unord.
10	unord.	unord.	unord.	-	-	-	unord.	unord.	unord.
11	unord.	ord.	ord.	-	-	-	unord.	ord.	ord.
12	unord.	unord.	irrev.	-	-	-	unord.	unord.	irrev.
13	unord.	ord.	ord.	-	-	-	unord.	ord.	ord.
14	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
15	unord.	ord.	ord.	unord.	ord.	ord.	-	-	-
16	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
17	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
18	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
19	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
20	unord.	ord.	ord.	unord.	ord.	ord.	-	-	-
21	unord.	ord.	ord.	unord.	ord.	ord.	-	-	-
22	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
23	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
24	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
25	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
26	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
27	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
28	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
29	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
30	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
31	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
32	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
33	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
34	unord.	ord.	irrev.	unord.	ord.	irrev.	-	-	-
35	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
36	unord.	unord.	unord.	-	-	-	unord.	unord.	unord.
37	unord.	unord.	unord.	-	-	-	unord.	unord.	unord.
38	unord.	unord.	unord.	-	-	-	unord.	unord.	unord.
39	unord.	unord.	unord.	-	-	-	unord.	unord.	unord.
40	unord.	unord.	unord.	-	-	-	unord.	unord.	unord.
41	unord.	unord.	unord.	-	-	-	unord.	unord.	unord.
42	unord.	unord.	unord.	-	-	-	unord.	unord.	unord.
43	unord.	ord.	ord.	-	-	-	unord.	ord.	ord.
44	unord.	ord.	ord.	unord.	ord.	ord.	-	-	-
45	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
46	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
47	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
48	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
49	unord.	unord.	unord.	unord.	unord.	unord.	-	-	-
50	-	-	-	-	-	-	-	-	-
51	unord.	unord.	irrev.	-	-	-	unord.	unord.	irrev.
52	unord.	unord.	unord.	-	-	-	unord.	unord.	unord.
53	unord.	ord.	ord.	-	-	-	unord.	ord.	ord.
54	unord.	ord.	ord.	-	-	-	unord.	ord.	ord.
55	unord.	unord.	unord.	-	-	-	unord.	unord.	unord.
56	unord.	unord.	unord.	-	-	-	unord.	unord.	unord.
57	unord.	ord.	ord.	-	-	-	unord.	ord.	ord.
58	unord.	ord.	ord.	-	-	-	unord.	ord.	ord.
59	unord.	unord.	irrev.	-	-	-	unord.	unord.	irrev.
60	unord.	ord.	irrev.	unord.	ord.	irrev.	-	-	-
61	unord.	ord.	ord.	unord.	ord.	ord.	-	-	-

single origin followed by reversal, and delayed transformation (DELTRAN) favouring two origins of a character state thus parallelism (Maddison & Maddison, 1992; Swofford, 1993).

Results

Table 3. Measures of fit of Analyses A-I to find monophyletic groups within *Pontonia* sensu lato. MPT = number of most parsimonious trees; tl = tree length; CI = Consistency Index; HI = Homoplasy Index; RI = Retention Index; RC = Rescaled Consistency Index.

Analysis	MPT	tl	CI	HI	RI	RC
A	390	170	0.553	0.447	0.848	0.469
B	50	179	0.527	0.473	0.850	0.448
C	24	180	0.524	0.476	0.874	0.457
D	904	68	0.676	0.324	0.911	0.616
E & F	240	69	0.681	0.319	0.921	0.628
G	87	85	0.529	0.471	0.827	0.438
H & I	1144	93	0.464	0.536	0.805	0.374

Analysis A

All minimal trees occurred in the primary search. The strict consensus tree (fig. 1) indicates the presence of several monophyletic groups. The phylogenetic relationship indicated between some of the genera is not consistent. A polytomy of four large groups is present at the base of the tree. There is support for *Bruceonia* being the sister taxon of *Odontonia*, and for *Rostronia* being the sister taxon of *Dactylonia* which is also supported in the 50% majority rule consensus tree (fig. 2). This tree has slightly more resolution at its base, indicating *Pontonia* and *Ascidonia* to be sister groups. A basal trichotomy with *Pontonia/Ascidonia*, *Rostronia/Dactylonia*, and *Odontonia/Bruceonia* remains.

Analysis B

All minimal trees were found in the primary search. Although the number of minimal trees decreased, length and HI increased slightly in comparison with Analysis A (Table 3).

The strict concensus tree (fig. 3) and 50% majority consensus tree (fig. 4) show the genera to be monophyletic. The same three pairs of genera are found. However, the deep branching is now resolved, showing *Odontonia/Bruceonia* as the sister group of the two other pairs of genera which are now sister groups.

Analysis C

All minimal trees were found in the primary search. In this analysis, the genera remained monophyletic. The generic pairs of *Pontonia/Ascidonia*, *Rostronia/ Dactylonia*, and *Odontonia/Bruceonia* occur again in this analysis. The phylogenetic relationships between the genera are completely resolved in both consensus trees. The consensus trees (figs. 5, 6) show *Rostronia / Dactylonia* as the sister group of the other members of the ingroup. It changed places with *Odontonia/Bruceonia* when compared with Analysis B.

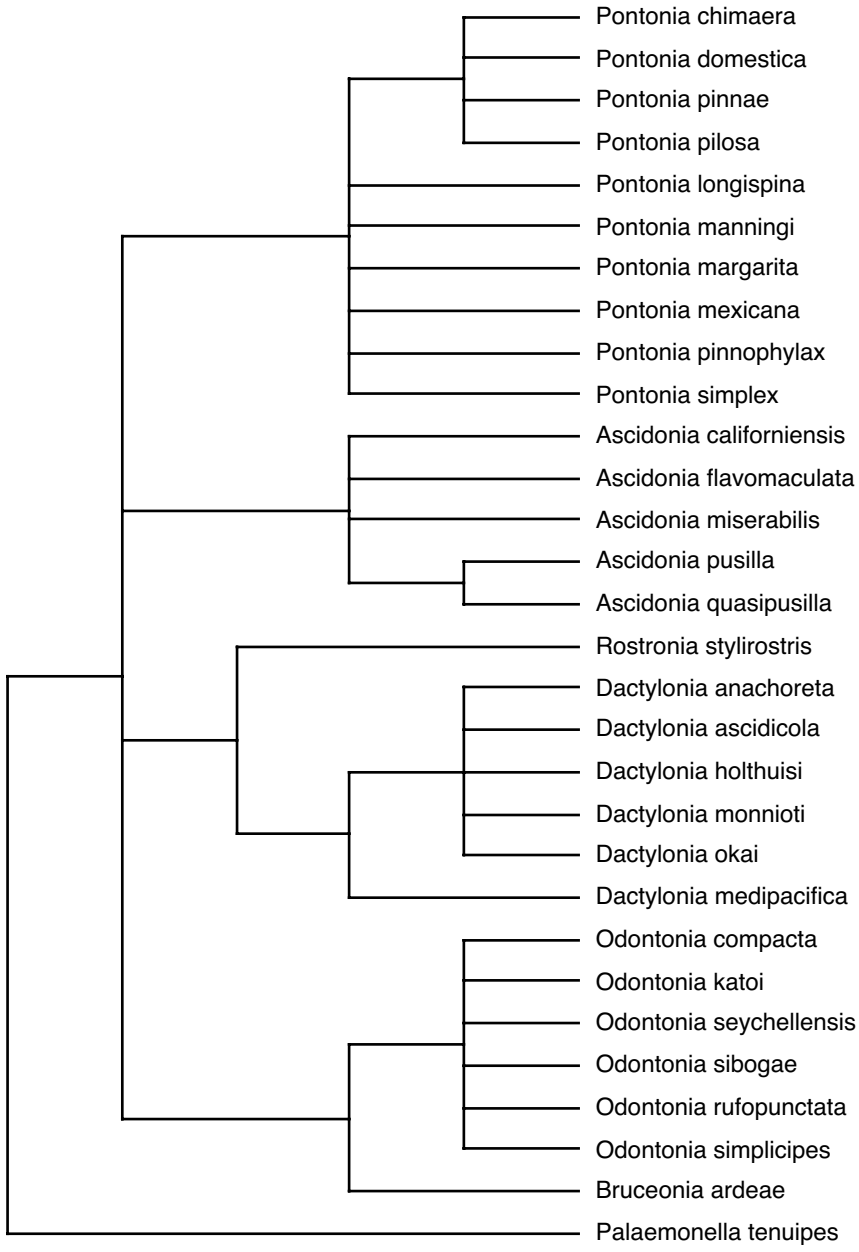


Fig. 1. Analysis A: strict consensus tree.

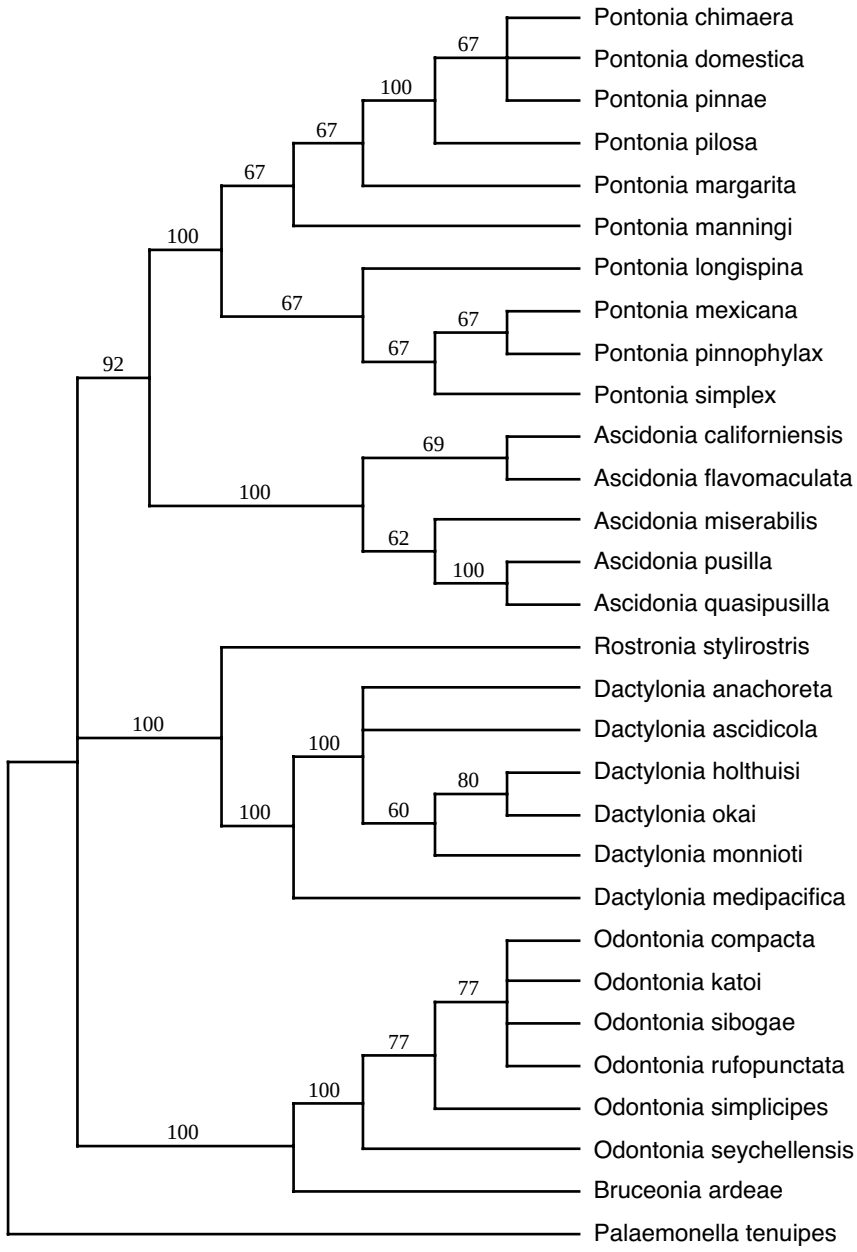


Fig. 2. Analysis A: 50% majority rule consensus tree.

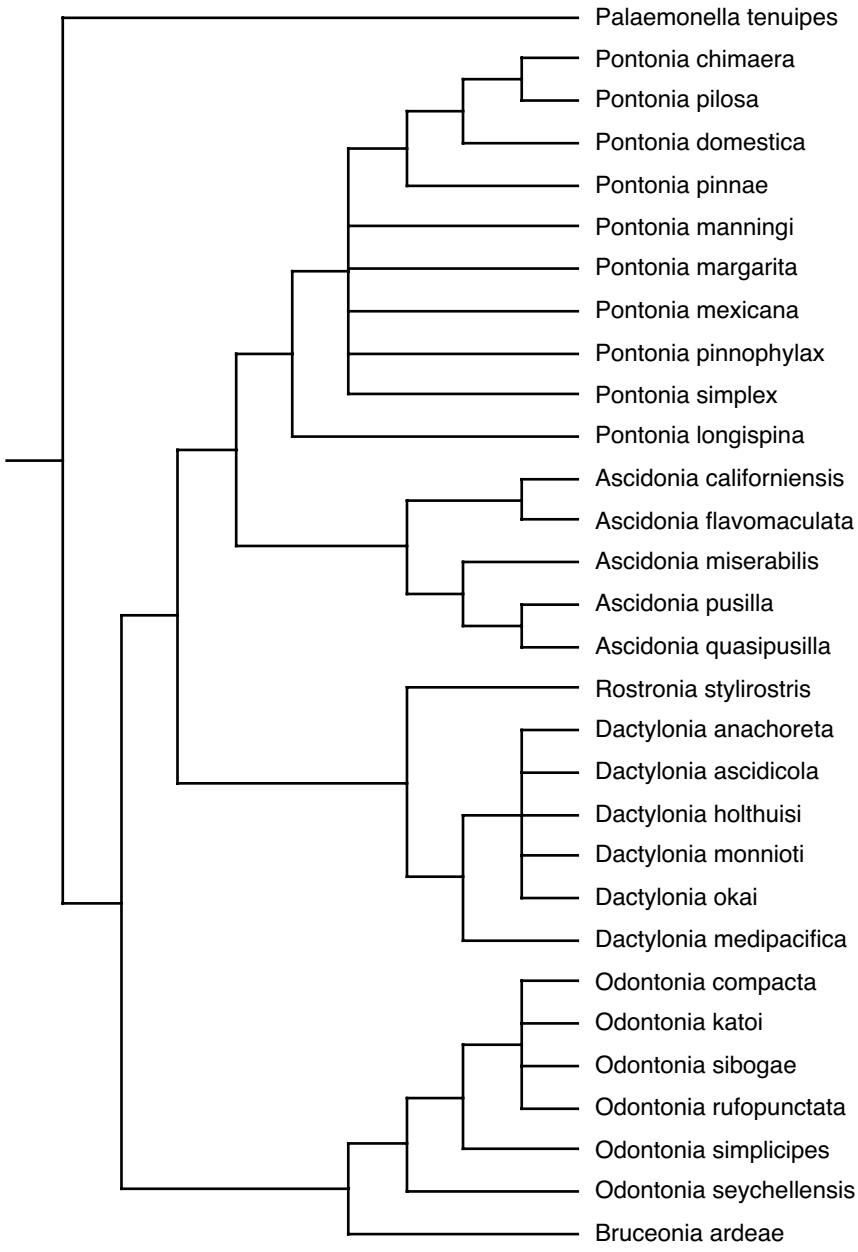


Fig. 3. Analysis B: strict consensus tree.

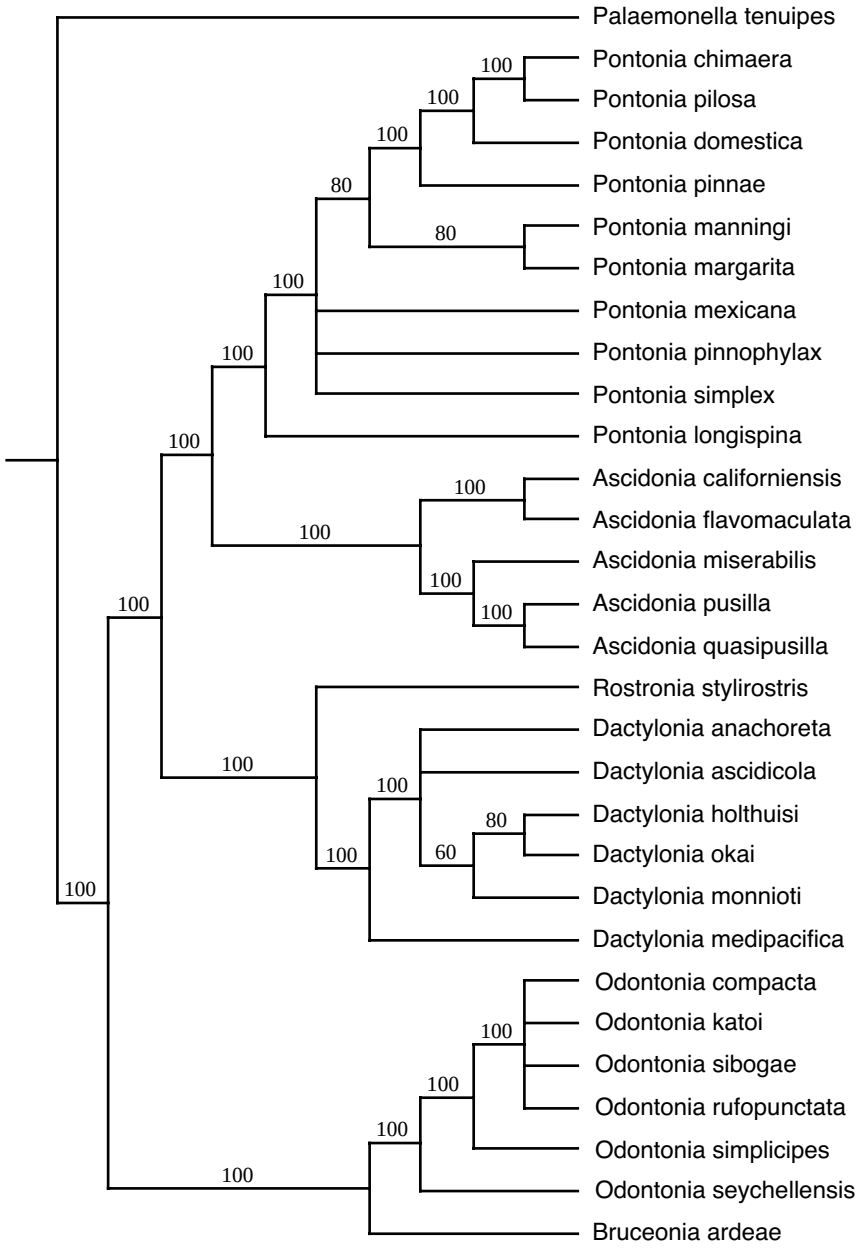


Fig. 4. Analysis B: 50% majority rule consensus tree.

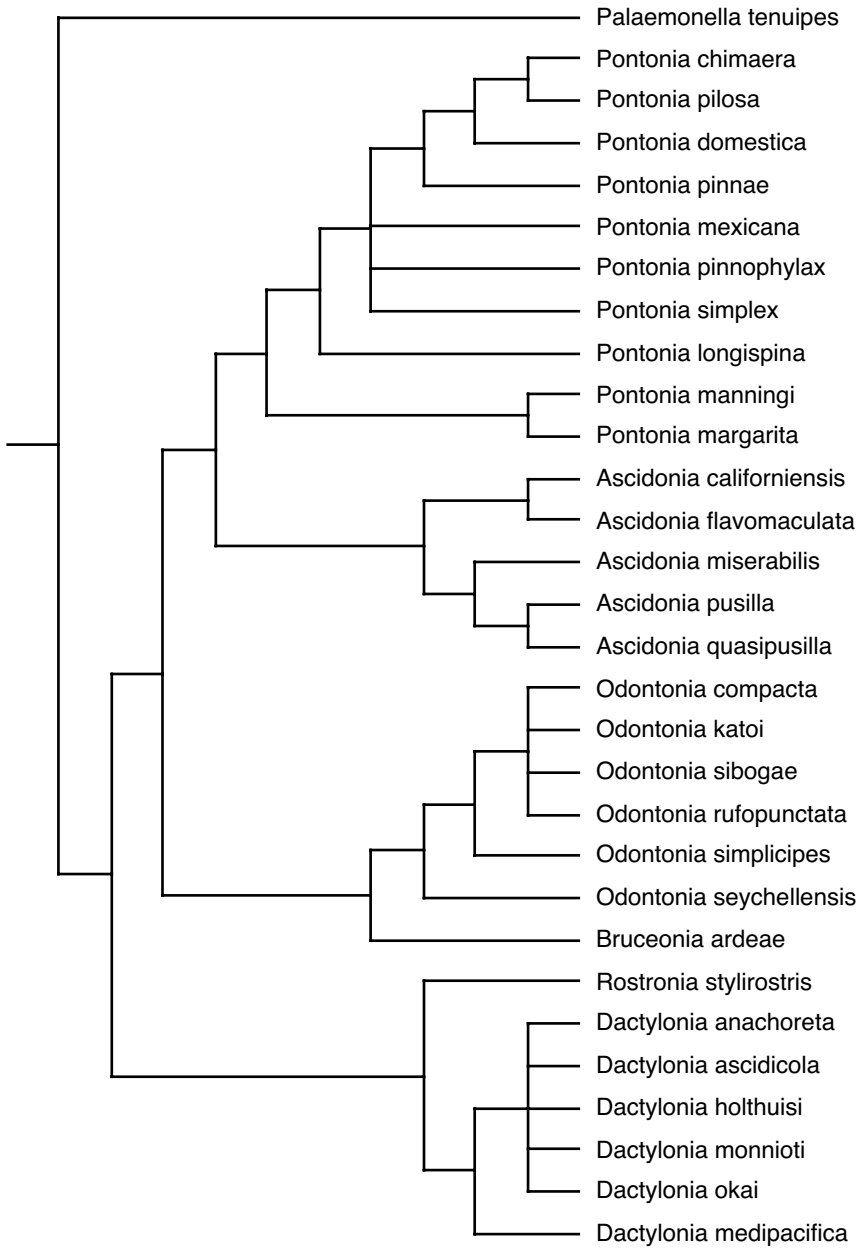


Fig. 5. Analysis C: strict consensus tree.

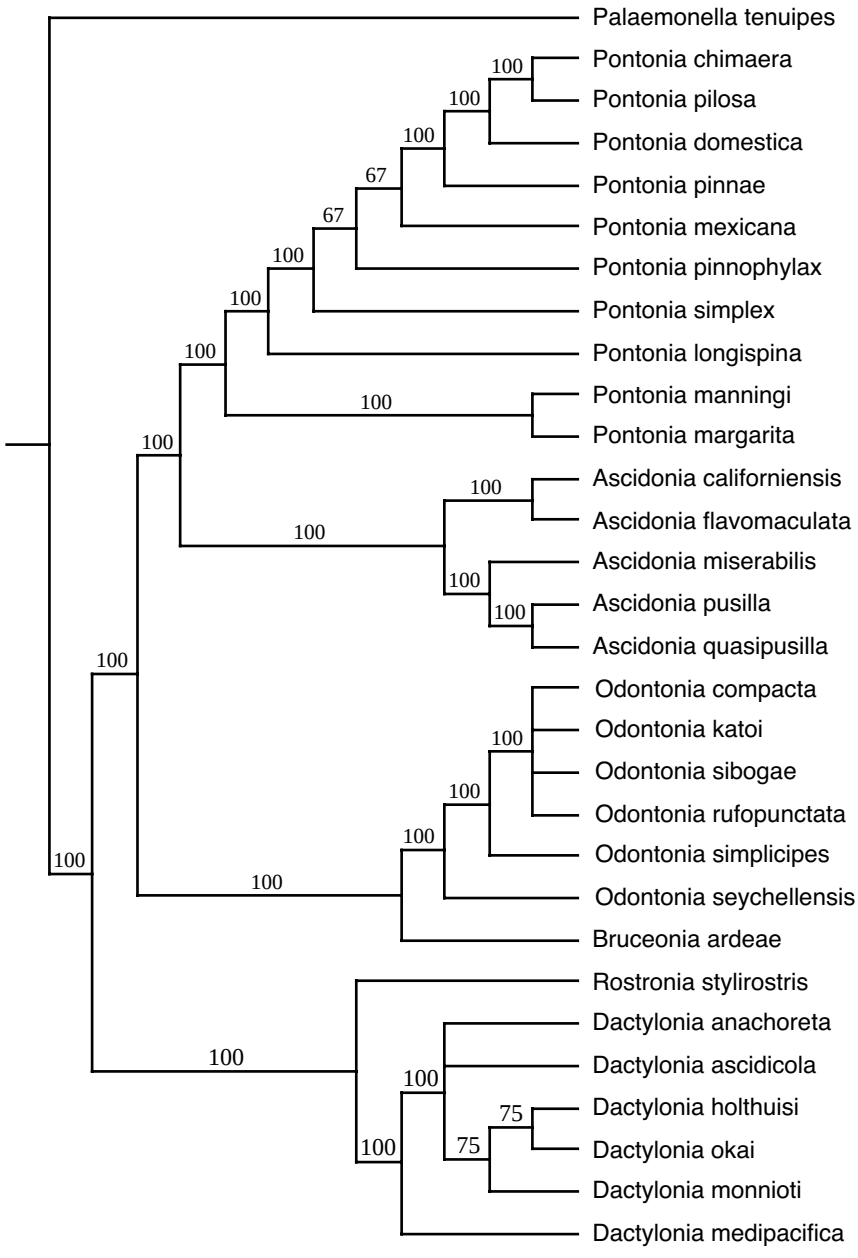


Fig. 6. Analysis C: 50% majority rule consensus tree.

Analysis D

All minimal trees were found in the primary search. The number of minimal trees increased whereas the HI decreased in comparison with Analysis A-C. This is partly due to the smaller size of the data matrix.

Both strict concensus tree (fig. 7) and 50% majority-rule consensus tree (fig. 8) show the genera being monophyletic. Deep branching in the strict consensus tree is not resolved. With regard to the topology of the genera in the consensus trees, there is great similarity with the consensus trees of Analysis A.

Analysis E & F

These analyses resulted both in the same number of trees of identical length. All minimal trees were found in the primary search. The length, CI and HI are almost the same as in Analysis D (Table 3).

The deep tree topologies of both strict concensus (fig. 9) and 50% majority-rule consensus (fig. 10) trees are very similar to those of Analysis A.

Analysis G

All minimal trees were found in the primary search. Although the data matrix is smaller than used in Analyses D-F, the number and length of the minimal trees as well as the HI increased (Table 3).

In both strict consensus tree (fig. 11) and 50% majority-rule consensus tree (fig. 12) most genera still form monophyletic groups. Only *Rostronia* is part of the ingroup of *Dactylonia* in this analysis. The relationships between the genera shown here is quite different from that resulting from the previous analysis, especially with regard to the position of *Bruceonia,* which splits off deeper in the tree, and *Ascidonia* which moved from sister group of *Pontonia* to the sister group of *Dactylonia/Rostronia.*

Analysis H & I

These analyses resulted both in the same number of trees of identical length. All minimal trees were found in the primary search. Compared with analysis G, the length and HI increased (Table 3). The deep branching topology of the consensus trees (figs. 13, 14) is very similar to those produced in Analysis G. The main difference in the latter analysis is the move of *Bruceonia* from sister group of *Ascidonia*, *Rostronia*, *Dactylonia* and *Odontonia* to the ingroup of *Odontonia.*

The strict concensus and 50% majority-rule consensus trees of the analyses using the complete datamatrix and those based on the set of characters with evolutionary novelties, excluding reductions, show the genera as well-supported monophyletic groups that can be defined on the bases of a set of synapomorphies or autapomorphies in relation to other pontoniine species, based on the present knowledge of the characters applied in this group.

5.4. Intergeneric phylogenetic relations

The phylogenetic relations between the genera do not result unambiguously from the previous analyses. A cladistic analysis of the type species of the genera was

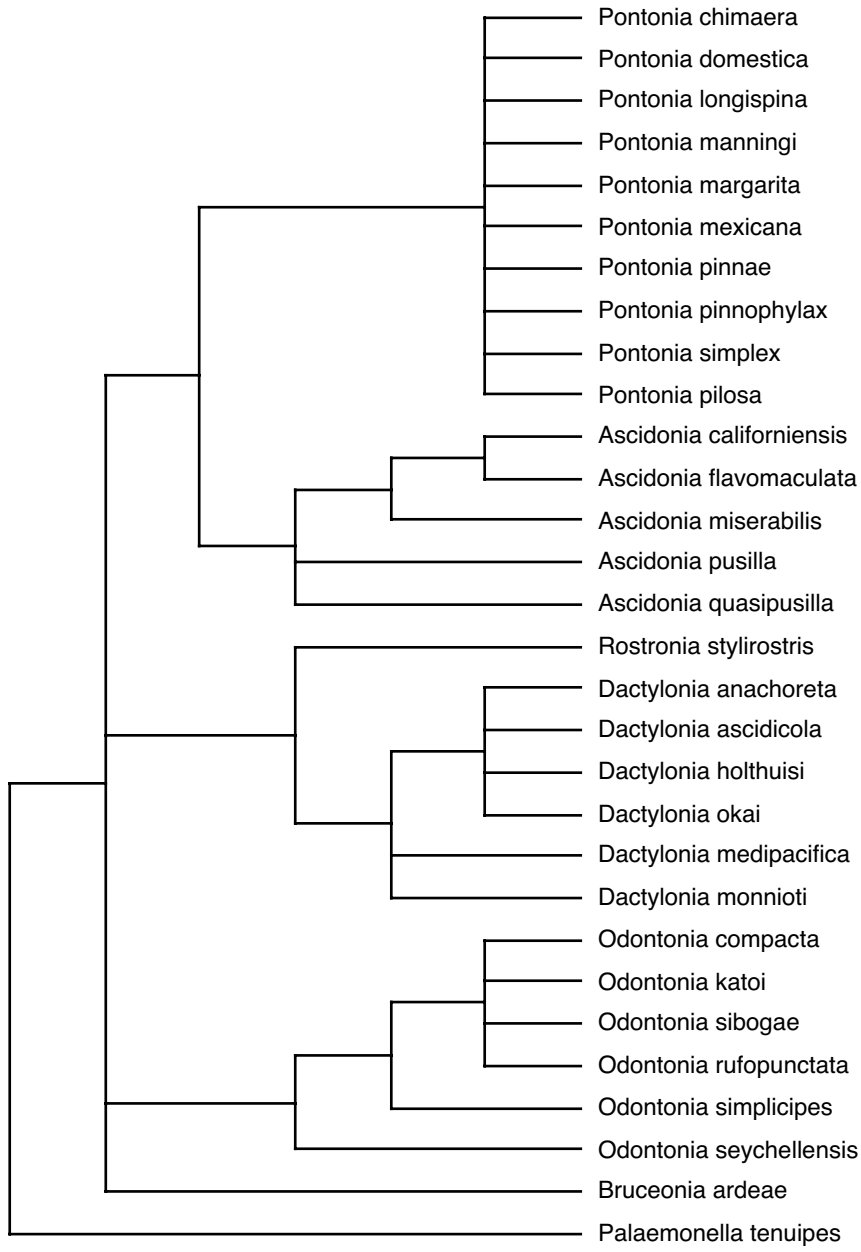


Fig. 7. Analysis D: strict consensus tree.

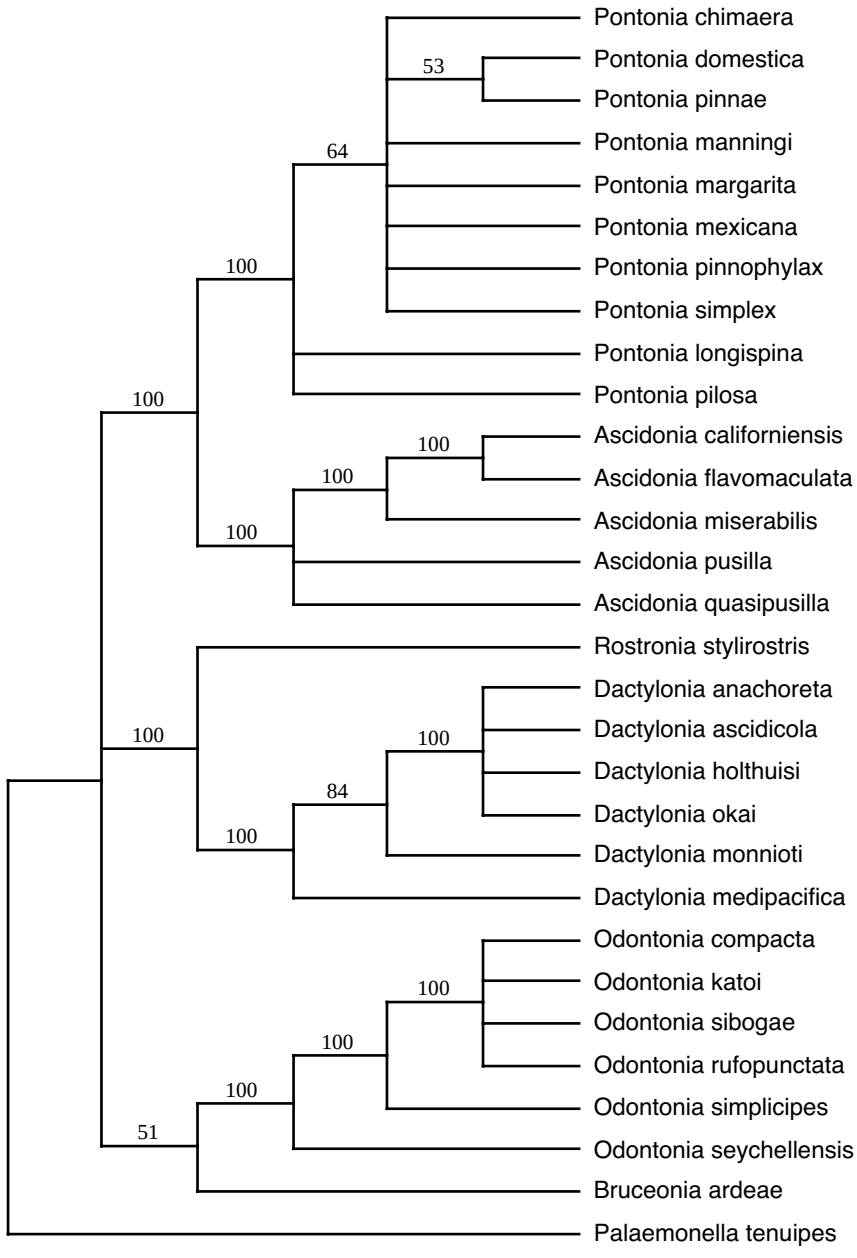


Fig. 8. Analysis D: 50% majority rule consensus tree.

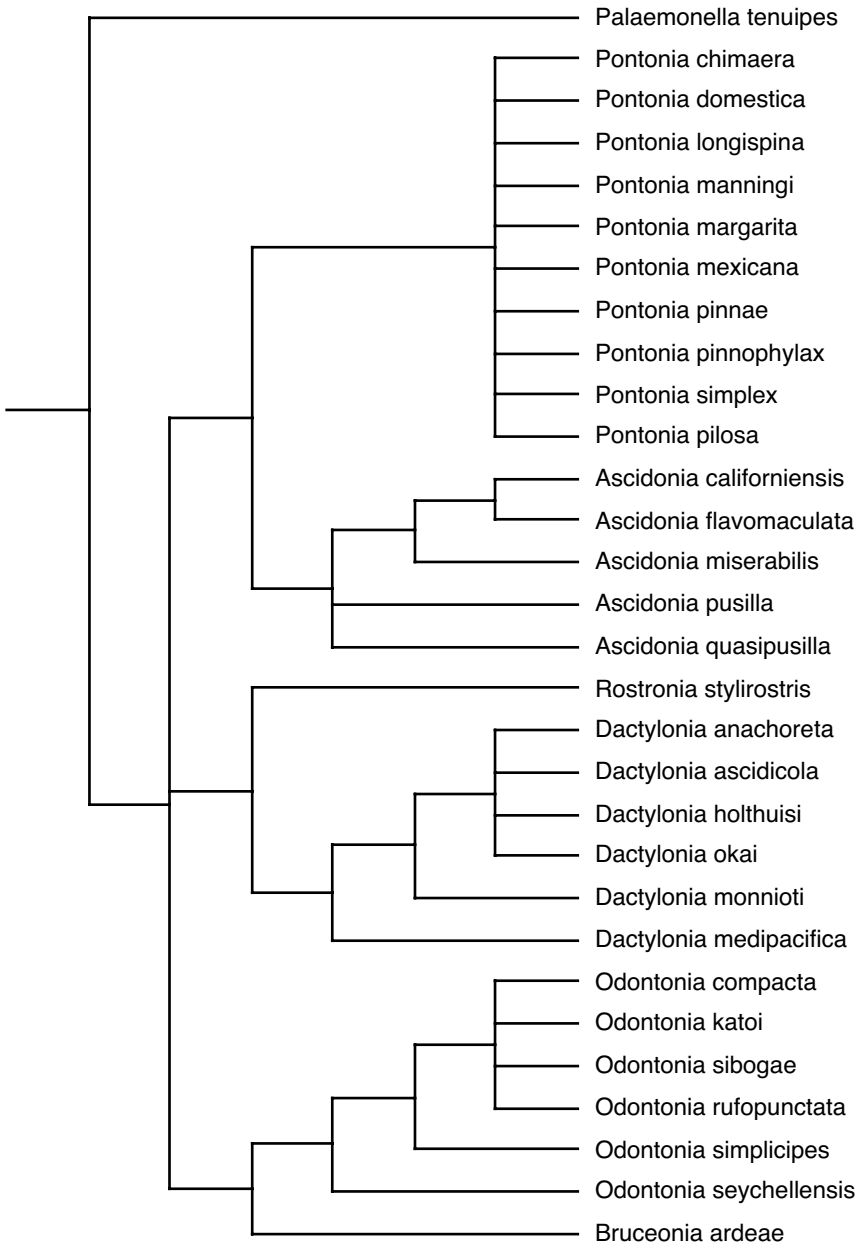


Fig. 9. Analysis E & F: strict consensus tree.

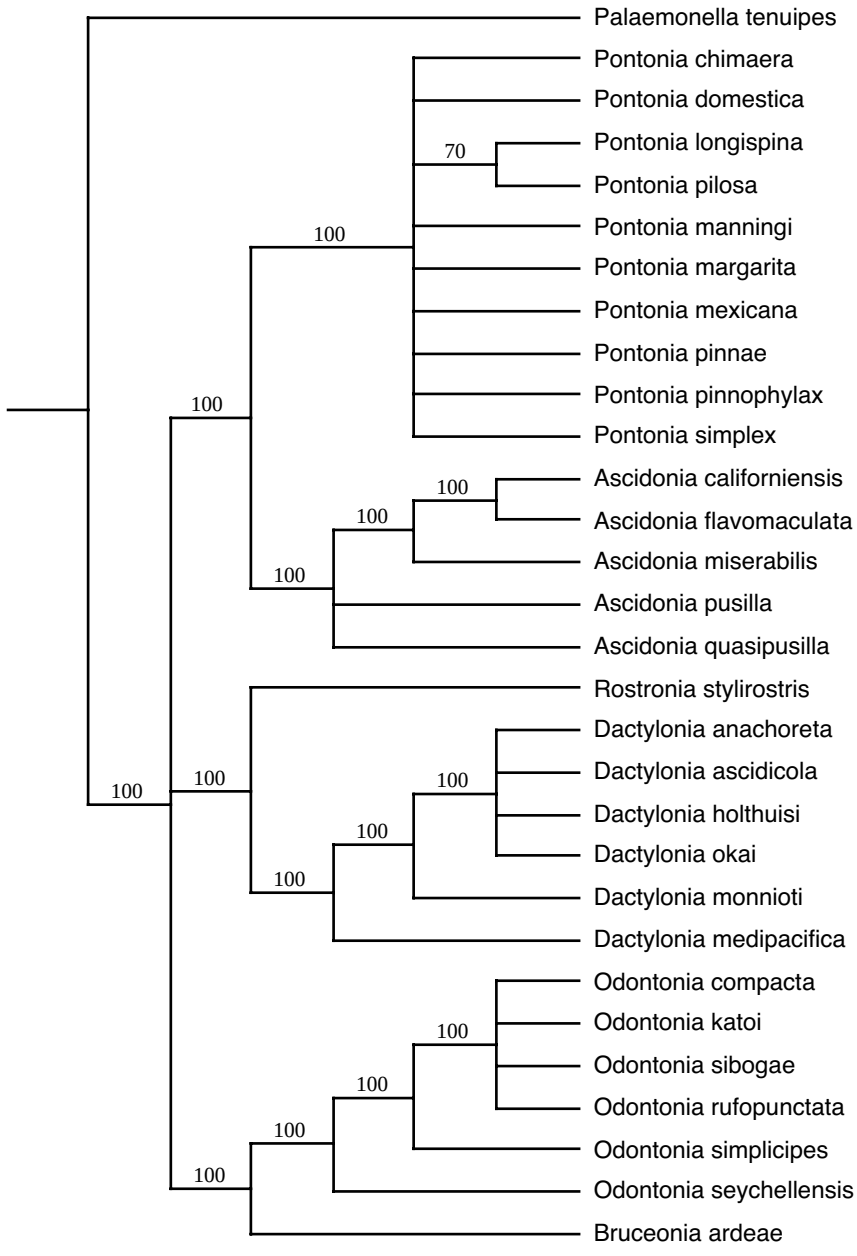


Fig. 10. Analysis E & F: 50% majority rule consensus tree.

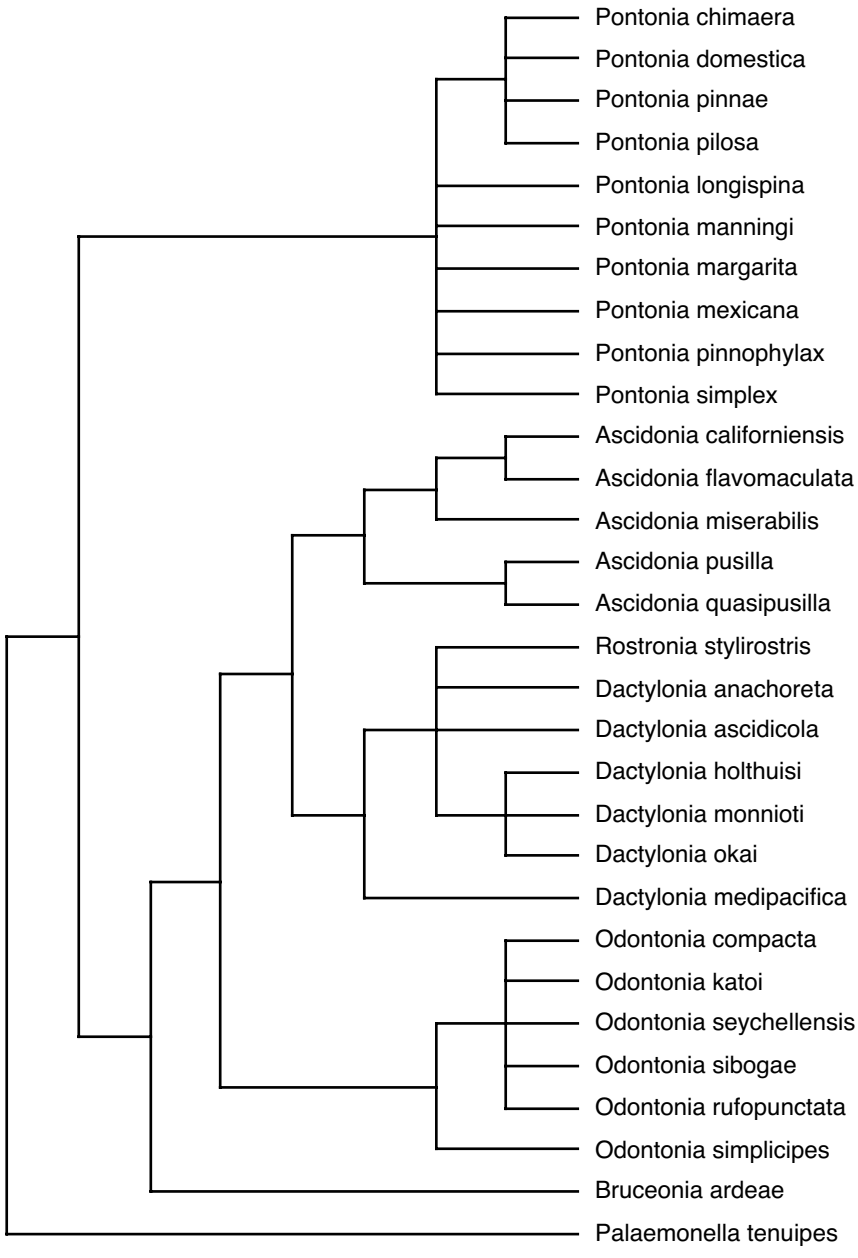


Fig. 11. Analysis G: strict consensus tree.

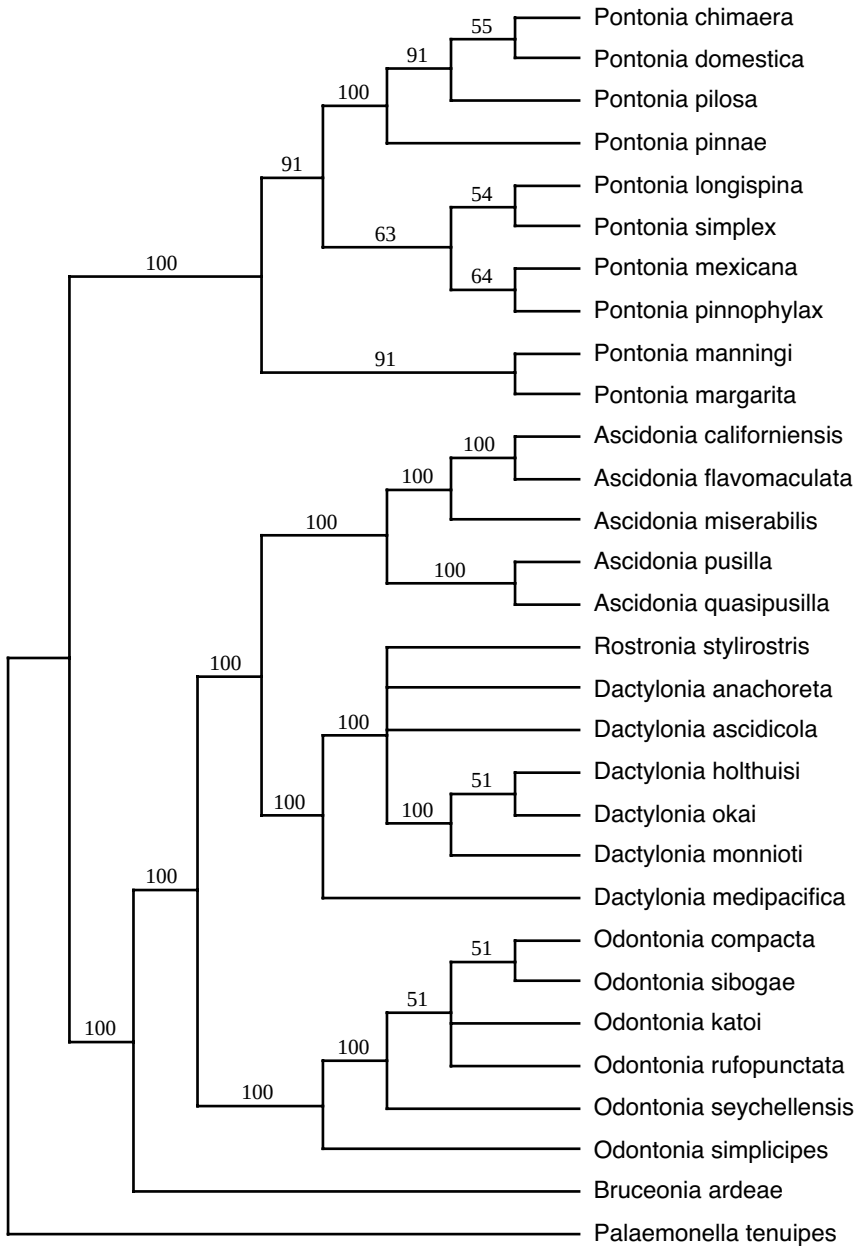


Fig. 12. Analysis G: 50% majority rule consensus tree

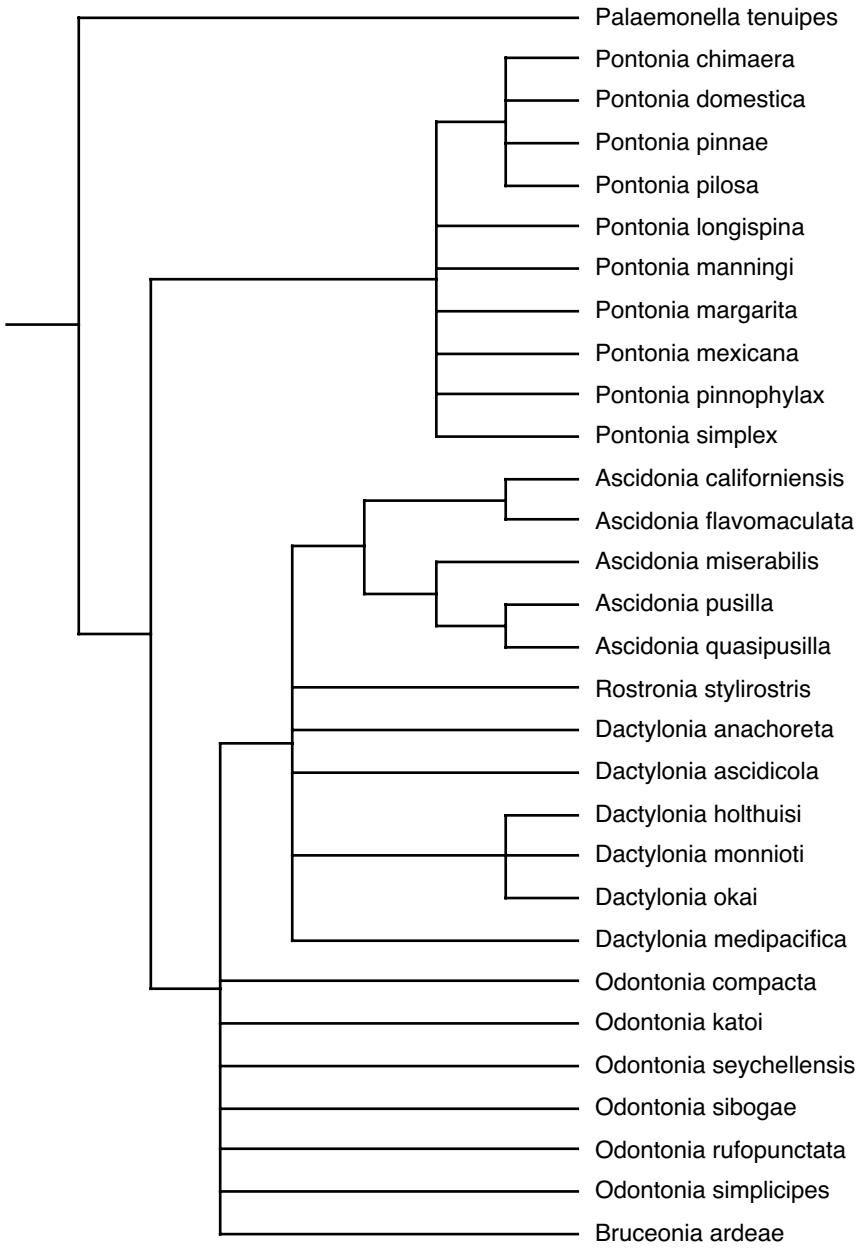


Fig. 13. Analysis H & I: strict consensus tree.

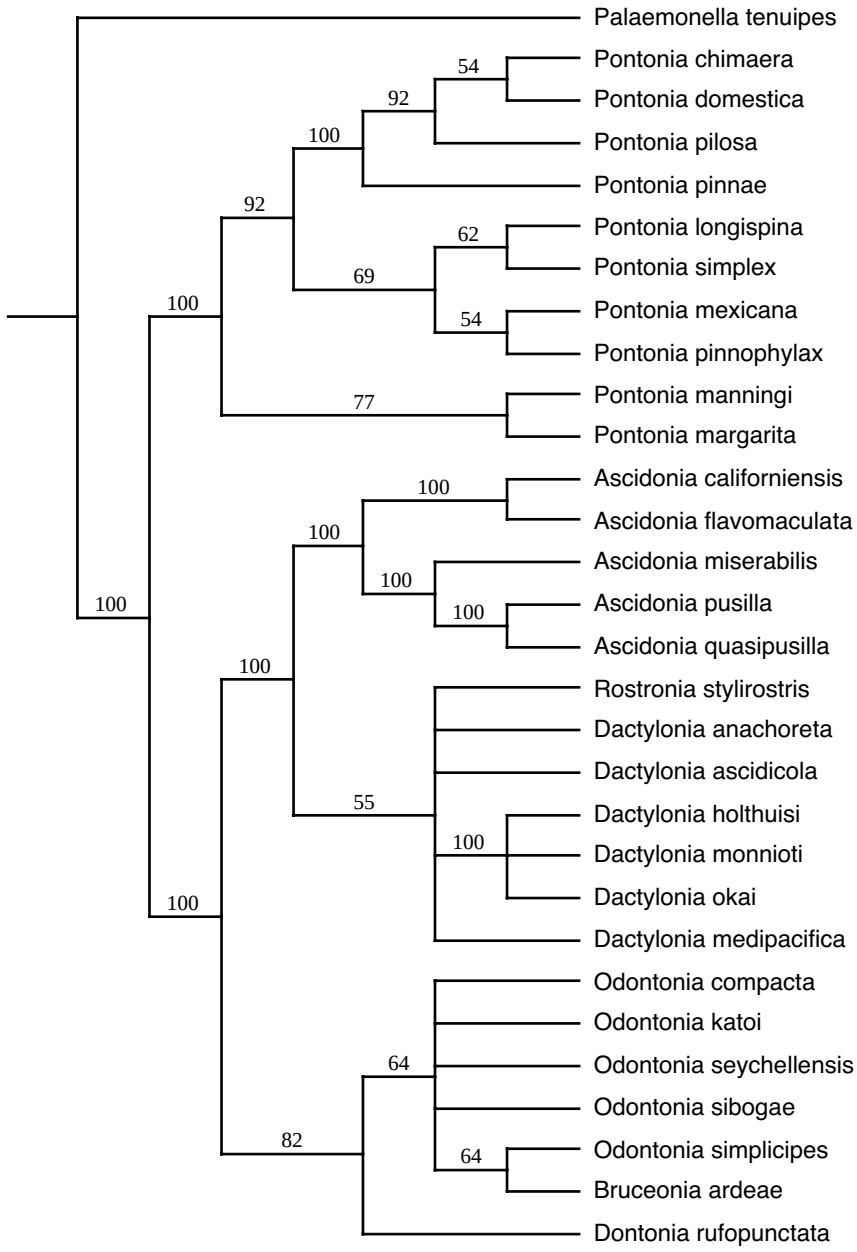


Fig. 14. Analysis H & I: 50% majority rule consensus tree.

carried out conform Analyses A-F. The search was exhaustive. *Palaemonella tenuipes* was used as the outgroup. All analysis show few most parsimonious trees and high consistency indices (Table 4).

Table 4. Measures of fit of phylogenetic analyses (A-F) of the type species of the genera. MPT = number of most parsimonious trees; tl = tree length; CI = Consistency Index; HI = Homoplasy Index; RI = Retention Index; RC = Rescaled Consistency Index.

Analysis	MPT	tl	CI	HI	RI	RC
A	1	68	0.721	0.279	0.578	0.416
B	1	93	0.714	0.286	0.642	0.458
C	2	94	0.706	0.294	0.691	0.488
D	3	32	0.750	0.250	0.636	0.477
E	3	43	0.791	0.209	0.719	0.568
F	1	43	0.791	0.209	0.775	0.613

In Analyses A-C (figs. 15a-d), the indicated phylogenetic relations between the three pairs of genera do not differ from those analyses of the complete set of taxa. As the character set with evolutionary novelties seems more suitable to investigate the deep branching of the tree than the complete character set and the set with reduc-

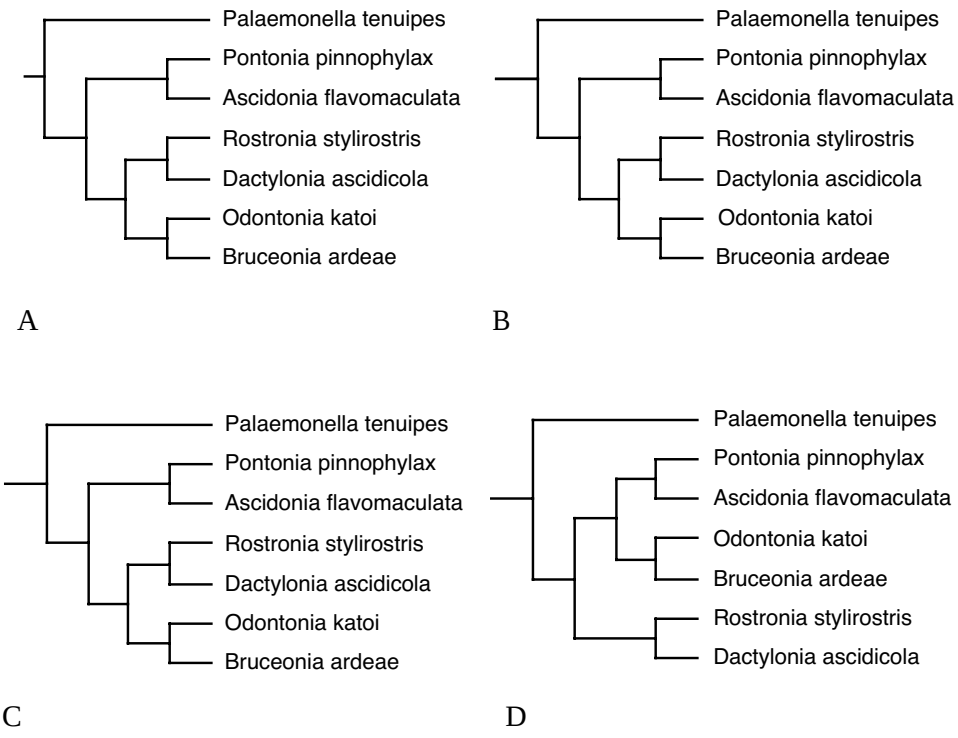


Fig. 15. Intergeneric phylogenetic relations. A; Analysis A, most parsimonious tree; B, Analysis B, most parsimonious tree; C, D, Analysis C, two most parsimonious trees.

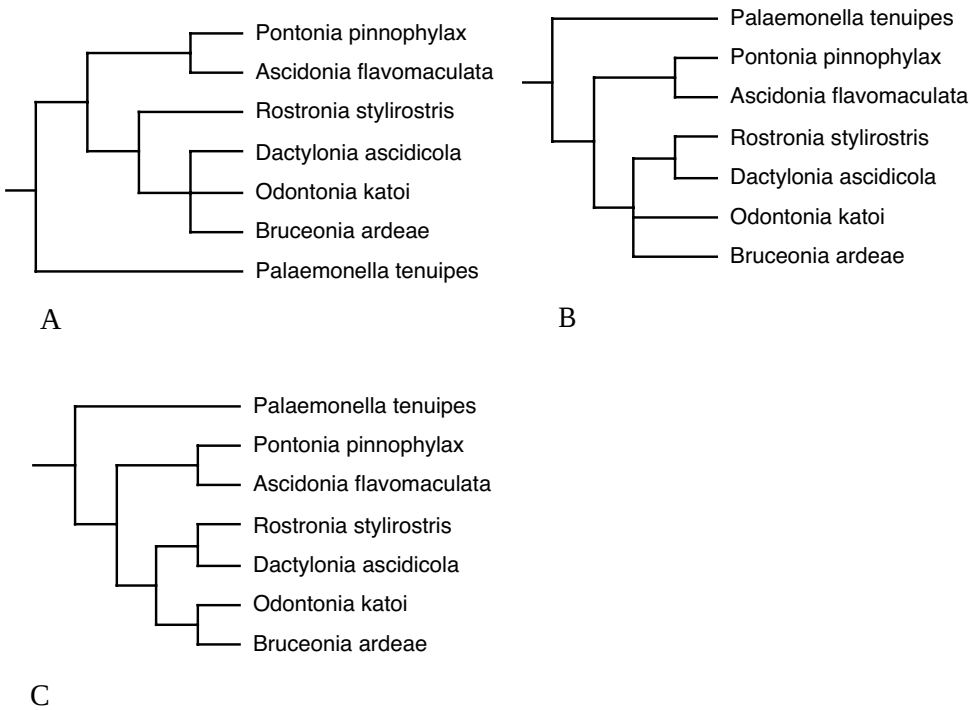


Fig. 16. Intergeneric phylogenetic relations. A; Analysis D, strict consensus tree; B, Analysis E, strict consensus tree; C, Analysis F, most parsimonious tree.

tions, it is hypothesized that the branching pattern represented by these analyses (D-F, figs. 16a-c) most likely reflects the actual phylogenetic relationships between the genera. In these analyses the position of *Pontonia/Ascidonia* as sister group of the other genera is clear. Analysis F shows the same topology as A-C. However, there is no clear signal with regard to the relations between the remaining genera in Analysis D and E. In the three equally parsimonious trees of Analysis D, *Rostronia* comes out as the sister taxon of the remaining genera. One the of the three equally parsimonious trees of Analysis E has the same topology as the single most parsimonious trees of Analysis A-C and F. The topology of Analysis A-C, and F is chosen as input in further analysis.

5.5. Intrageneric phylogenetic relations

The initial analyses show ambiguity within some of the generic clades, especially in *Pontonia,* whereas the phylogenetic relationships within *Ascidonia* seem constant and well supported in most of the analyses. To obtain more resolution in certain clades, the initial cladogram has been cut into parts. Each genus was analysed using the complete set of characters. In the case of *Pontonia,* Analysis G and H, comprising

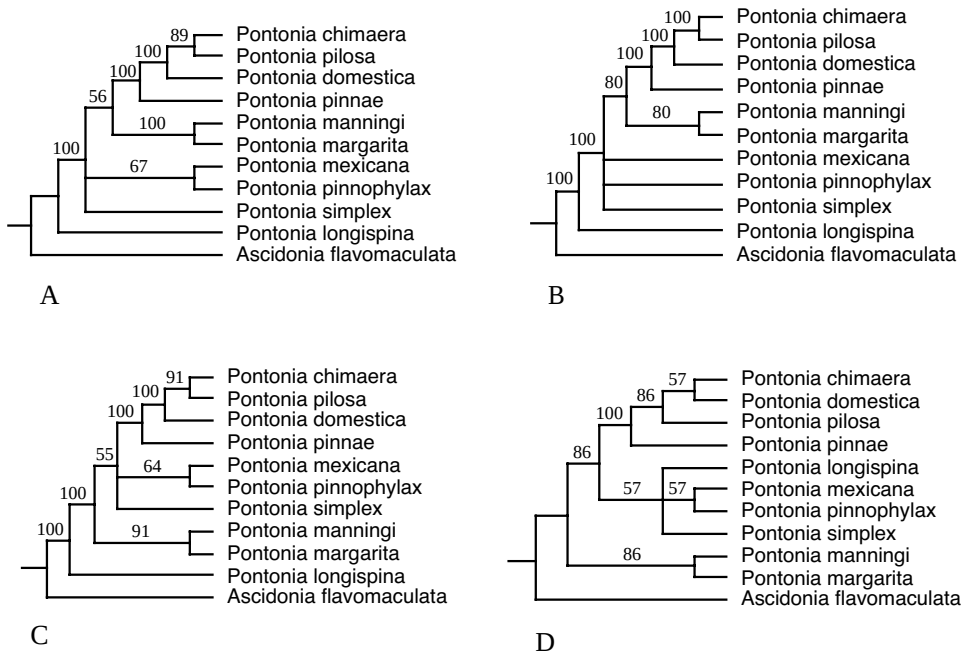


Fig. 17. Intrageneric relations of *Pontonia* Latreille, 1829. A, Analysis A, 50% majority rule consensus tree; B, Analysis B, 50% majority rule consensus tree; C, Analysis C, 50% majority rule consensus tree; D, Analysis G, 50% majority rule consensus tree.

characters in which the apomorphic states are reductions, were also carried out. Uninformative characters were omitted. The type-species of the sister group according to the previous analysis was used as the outgroup in these analyses. Search was heuristic for *Pontonia*, exhaustive for the other groups.

***Pontonia* Latreille, 1829**

Ascidicola flavomaculata was used as outgroup.

These analysis (figs. 17, 18, table 5) show: 1) that *Pontonia longispina* is the species closest to *Ascidicola flavomaculata*; 2) that *P. simplex*, *P. pinnophylax*, and *P. mexicana* form an ill-supported monophyletic group; 3) *P. margarita* and *P. manningi* form a monophyletic group; 4) *P. chimaera*, *P. domestica*, *P. pilosa* spec. nov., and *P. pinnae* form a monophyletic group; 5) *P. pinnae* is the sister species of *P. chimaera*, *P. domestica* and *P. pilosa* spec. nov. The topology of these groups is rather constant in the analysis, except for the position of the *Pontonia pinnophylax* and *P. margarita*-groups, which change places in the analysis. One of the nine most parsimonious trees from Analysis A (fig. 19) most closely reflects the above considerations and is therefore chosen as the hypothetical phylogeny of *Pontonia*.

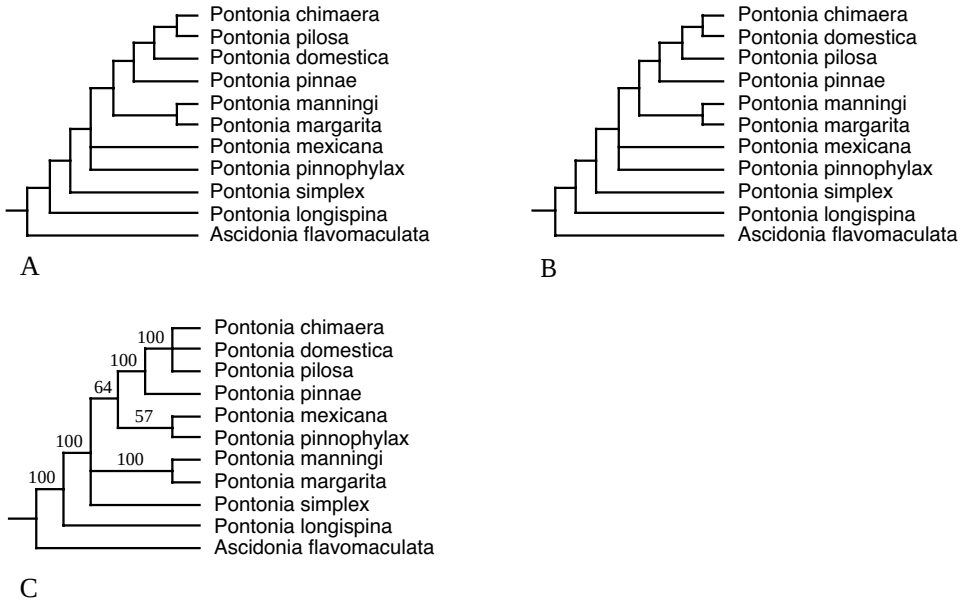


Fig. 18. Intrageneric relations in *Pontonia* Latreille, 1829. A, Analysis H, most parsimonious tree 1; B, Analysis H, most parsimonious tree 2; C, Analysis I, 50% majority rule consensus tree.

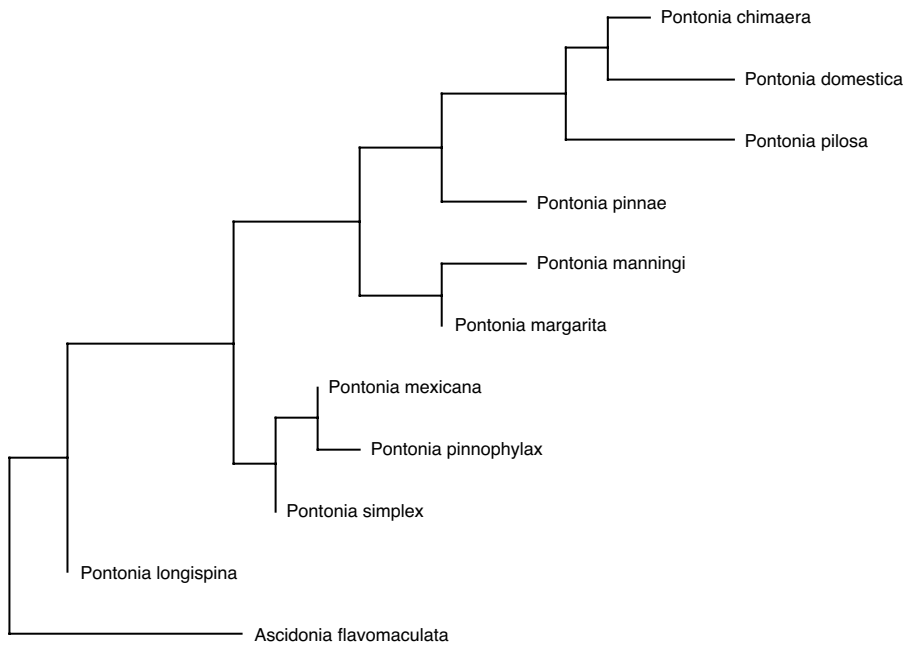


Fig. 19. Intrageneric relations in *Pontonia* Latreille, 1829. Phylogram of one of the nine most parsimonious trees.

Table 5. Measures of fit of the phylogenetic analyses (A-C, G-I) within *Pontonia* sensu stricto. MPT = number of most parsimonious trees; tl = tree length; CI = Consistency Index; HI = Homoplasy Index; RI = Retention Index; RC = Rescaled Consistency Index.

Analysis	MPT	tl	CI	HI	RI	RC
A	9	37	0.622	0.378	0.650	0.404
B	5	54	0.712	0.288	0.783	0.557
C	11	55	0.698	0.302	0.816	0.570
G	12	24	0.667	0.333	0.714	0.476
H	2	33	0.710	0.290	0.786	0.558
I	28	34	0.688	0.312	0.808	0.555

***Ascidonia* gen. nov.**

Pontonia pinnophylax was used as outgroup.

The 50% majority-rule consensus tree of Analysis A and the trees of Analyses B and C (fig. 20, table 6) have identical topologies and are, therefore, chosen as the hypothetical phylogeny of *Ascidonia*.

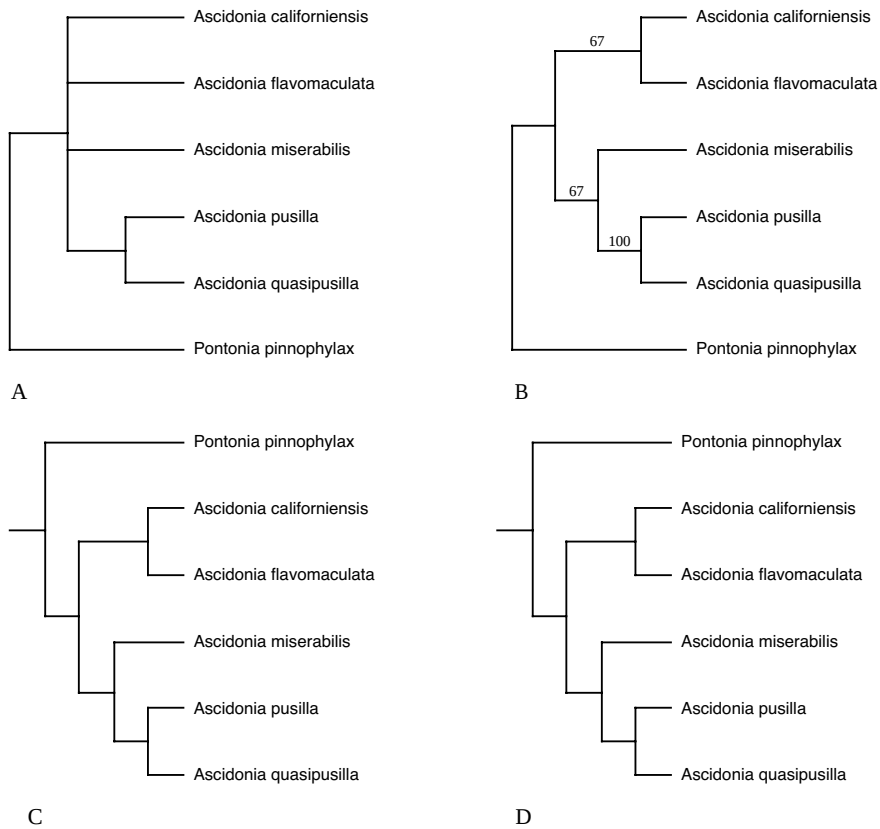


Fig. 20. Intrageneric relations in *Ascidonia* gen. nov. A, Analysis A, strict consensus tree; B, Analysis A, 50% majority rule consensus tree; C, Analysis B, most parsimonious tree; D, Analysis G, most parsimonious tree.

Table 6. Measures of fit of the phylogenetic analyses (A-C) within *Ascidonia*. MPT = number of most parsimonious trees; tl = tree length; CI = Consistency Index; HI = Homoplasy Index; RI = Retention Index; RC = Rescaled Consistency Index.

Analysis	MPT	tl	CI	HI	RI	RC
A	3	25	0.760	0.240	0.727	0.553
B	1	42	0.854	0.146	0.857	0.732
C	1	42	0.854	0.146	0.885	0.755

***Dactylonia* gen. nov.**

Rostronia stylirostris was used as outgroup.

The 50% majority-rule consensus trees of the analysis show identical topologies including one trichotomy (figs. 21, 22, table 7). This topology is used as input for further analyses.

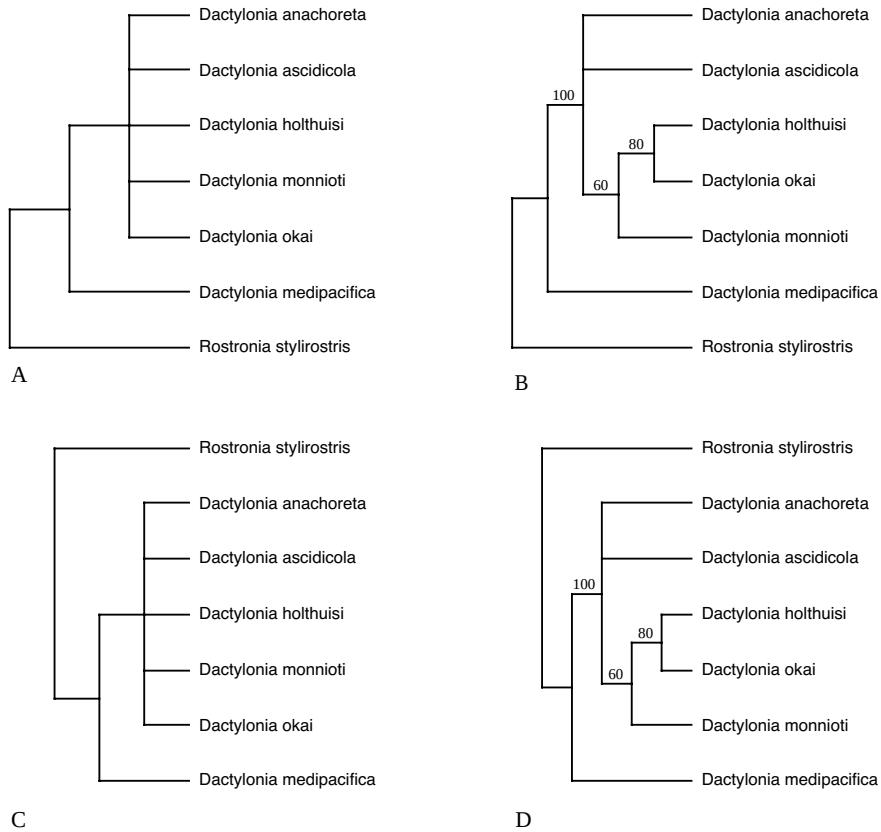


Fig. 21. Intrageneric relations in *Dactylonia* gen. nov. A, Analysis A, strict consensus tree; B, Analysis A, 50% majority rule consensus tree; C, Analysis B, strict consensus tree; D, Analysis B, 50% majority rule consensus tree.

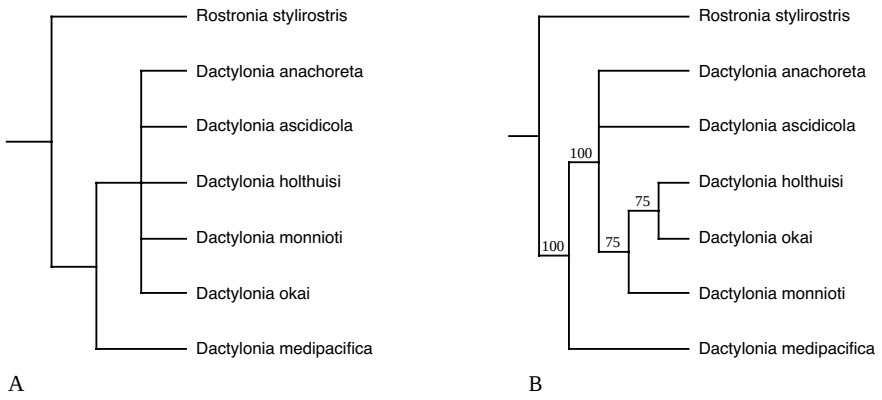


Fig. 22. Intrageneric relations in *Dactylonia* gen. nov. A, Analysis C, strict consensus tree; B, Analysis C, 50% majority rule consensus tree.

Table 7. Measures of fit of the phylogenetic analyses (A-C) within *Dactylonia*. MPT = number of most parsimonious trees; tl = tree length; CI = Consistency Index; HI = Homoplasy Index; RI = Retention Index; RC = Rescaled Consistency Index.

Analysis	MPT	tl	CI	HI	RI	RC
A	5	6	0.833	0.167	0.833	0.694
B	5	26	0.960	0.040	0.963	0.924
C	4	25	0.960	0.040	0.980	0.941

Odontonia gen. nov.

Bruceonia ardeae was used as outgroup.

The consensus trees of the analysis show identical topologies including one polytomy (fig. 23, table 8). This topology is used as input for further analyses.

Table 8. Measures of fit of the phylogenetic analyses (A-C) within *Odontonia*. MPT = number of most parsimonious trees; tl = tree length; CI = Consistency Index; HI = Homoplasy Index; RI = Retention Index; RC = Rescaled Consistency Index.

Analysis	MPT	Length	CI	HI	RI	RC
A	6	18	0.667	0.333	0.455	0.303
B & C	6	28	0.773	0.227	0.792	0.612

5.6. A complete cladogram

A complete cladogram was constructed by joining the analysis per group onto the generic tree (fig. 24). The characters were optimized according to Analysis C, F, and I. In comparison with Analysis C of the complete dataset, the length increased from 180 to 184 steps and the CI slightly decreased with 0.007. This is in particular due to the joining of the *Pontonia* branch onto the generic tree. Using *Ascidonia flavomaculata* as the outgroup of this genus changed the direction of several characters resulting in extra steps when joining the trees.

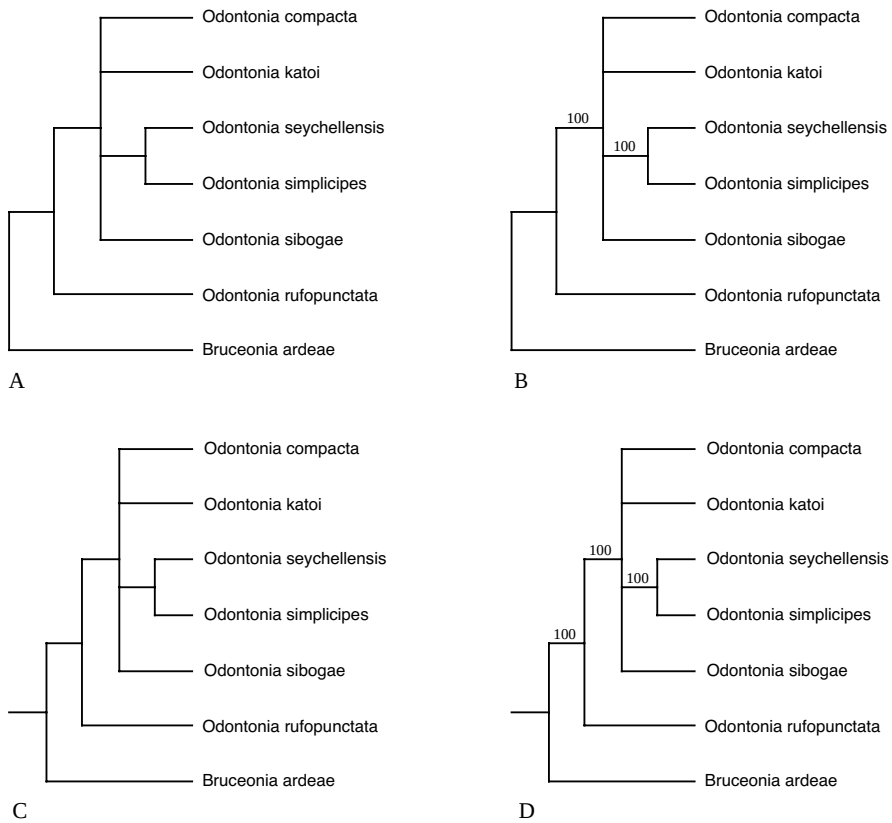


Fig. 23. Intrageneric relations in *Odontonia* gen. nov. A, Analysis A, strict consensus tree; B, Analysis A, 50% majority rule consensus tree; C, Analysis B & C, strict consensus tree; D, Analysis B & C, 50% majority rule consensus tree.

5.7. Character evolution in retrospect

The ingroup is clearly monophyletic in relation to *Palaemonella tenuipes* as it is supported by eleven apomorphic character states. However, with regards tot the other 77 genera recognized within the Pontoniinae, many of these apomorphic character states do not hold. The genera of the ingroup can be defined on the basis of the following unambiguous apomorphic character states in relation to all other genera within the Pontoniinae:

Pontonia: 1) corpus of paragnath with two parallel submedian carinae; 2) submedian carinae of paragnath with row of setae; 3) posteroventral angle of sixth abdominal segment spiniform (except in *P. chimaera* in which the character is assumed to be reversed to the plesiomorphic state).

Ascidonia: 1) distal lobe of alae of paragnath medially bilobed or excavate.

Rostronia: 1) endopod of first male pleopod with one plumose setae along lateral margin, medial and distal margins devoid of setae.

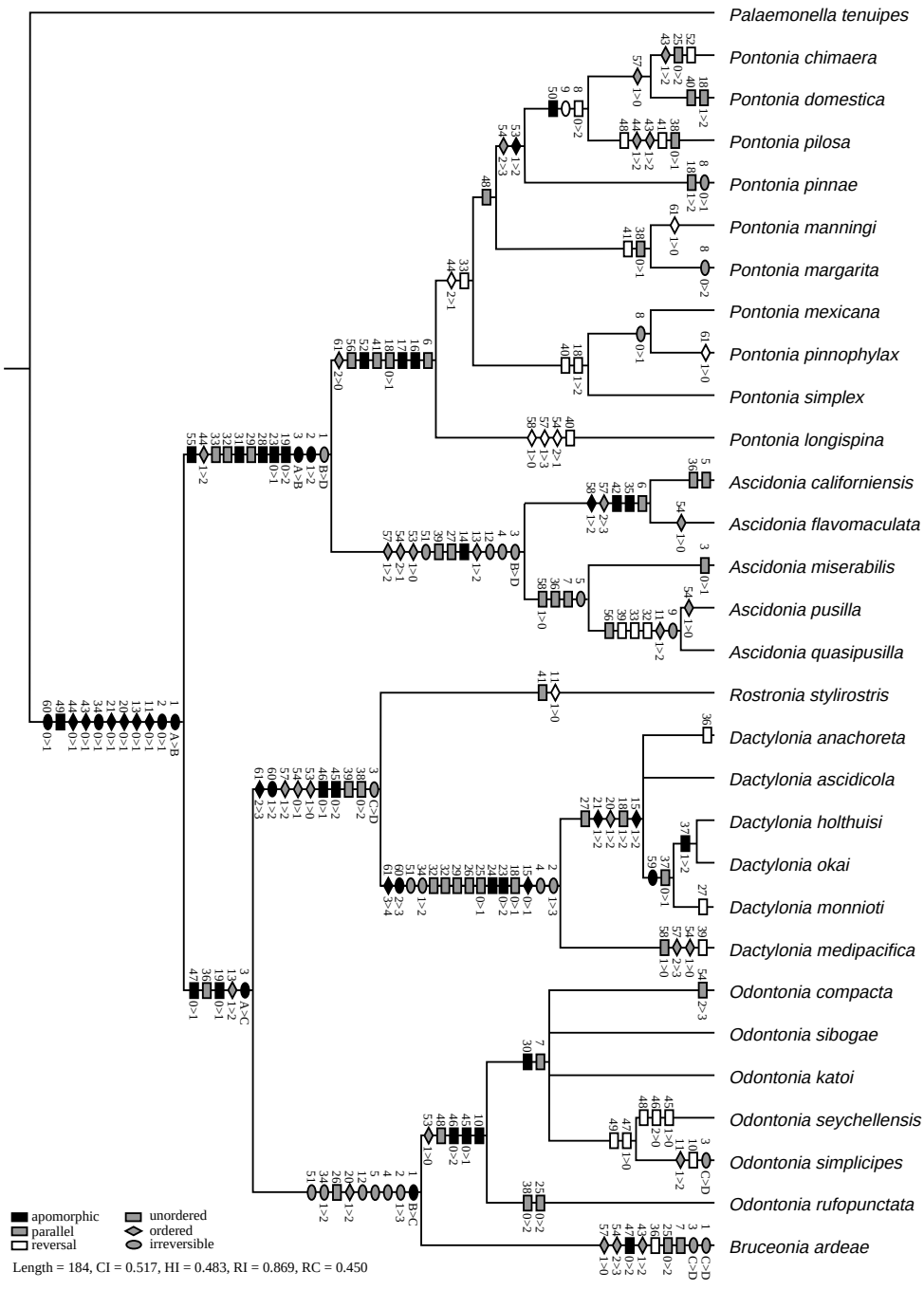


Fig. 24. Hypothesized general cladogram of *Pontonia* s.l.

Dactylonia: 1) corpus of paragnath with one median carina or with two submedian almost completely fused carinae to form one median carina; 2) lower lacinia of maxillula large, triangular, with many simple setae and few robust, long setae at tip; 3) upper and lower lacinia of basal endite of maxilla with one or two distal setae. 4) endopod of first male pleopod gradually tapering or very slender, twisted in distal part; 5) lateral margin of endopod of first pleopod of male without setae, proximal part of medial margin with row of simple short setae.

Odontonia: 1) strongly developed ventro-medial tooth on basal segment of antennular peduncle (reversed to plesiomorphic state in *O. simplicipes*); 2) corpus of dactylus of third pereiopod with series of simple teeth; 3) proximal-most tooth on corpus of dactylus of ambulatory pereiopods largest, directed forward.

Bruceonia: 1) unguis of dactylus of ambulatory pereiopods with patch of small scales in distal part.

It has to be assumed that many characters have states that evolved in parallel on the tree. These characters are mostly morphological adaptations to life inside molluscan or ascidian hosts and evolved independently in several clades. As can be seen in the analyses per genus these parallelisms disappear for the larger part when analysing the genera separately. Parallelism is especially distinct in characters in which the apomorphic state is a reduction. The secondary loss of structures can be traced as reversals in the more distal branches of the tree.

6. Historical biogeography

Historical biogeography tries to explain distibution patterns of taxa. As shown by Gittenberger (1990: 152), these patterns are the result of the interplay between the biological characteristics of the taxa concerned (migratory capacities, habitat limitations, longevity, speciation rate, etc.) and external processes (plate-tectonics, climatic change, environmental change, etc.).

6.1. Biological characteristics

Important biological characteristics of the group of shrimps under study which determine their susceptibility to external processes mentioned above are: 1) preference for warm temperate and tropical coastal waters, limiting latitudinal dispersal and vicariance events; 2) the association with certain host-species with their own biological characteristics limiting possible distributions; 3) pelagic larval stages and adult bentic stage in the life cycle determining dispersal capabilities; 4) isolating mechanisms and speed of divergense determining speciation rate.

6.2. Processes

The interplay between the taxon and its environment may result in processes like vicariance, coalescence, dispersal, non-allopatric speciation and extinction, that are thought to be the main causes of the biogeographical patterns. Vicariance is the splitting of a larger area into two or more smaller areas, usually through geological processes such as plate-tectonics. Coalescence is the merging of smaller areas into

larger areas, usually through geological processes such as plate-tectonics. Dispersal is the active migration of a taxon to another area. Several modes of speciation have been recognized which are non-allopatric, e.g. instantaneous through polyploidy, or through ecological allopatry (but geographical sympatry) when switching to another host in taxa living in association with other organisms.

As in phylogeny reconstructions, absence causes problems in historical biogeography. Extinction (= absence through loss) and primitive absence (= the species never was there) are commonly used as *ad hoc* explanations for otherwise unexplainable gaps in distribution patterns. Incomplete data on the distribution of certain species as well as absence of a fossil record may also cause problems in biogeographical analysis.

6.2.1. Vicariance

Vicariance occurs when biotas split into smaller ones and barriers arise between parts of a former larger ('ancestral') distribution area. The breakaway parts of an area and their biota will follow their own history. This may trigger speciation. In relation to the biological characteristics of the group under study, two types of geological events resulting in vicariance are recognized.

1. The separation of originally coherent water masses by land. This is a 'hard' event as there is complete genetic isolation between the populations in de areas concerned. In the research area, two major events are recognized: A) the closure of the Tethys Sea in the early Miocene, ca. 20 million years ago (Adams, 1967, 1983; Hallam, 1967; Rögl & Steiniger, 1984); B) the forming of the Panama Isthmus in the early Pliocene, ca. 3 million years ago (Keigwin, 1978; Duque-Caro, 1990; Lessios, 1998). No similarly effective events are known to have taken place in the Indo-Pacific.

2. The separation of coastal communities by deep-sea water masses. This is a 'soft' event as there may be a less dramatic genetic isolation between the populations in the areas concerned as pelagic larvae might cross the deep-sea if the distance is not too long in relation to their lifetime and the velocity of the water-currents. For the group under study the distance between the Pacific islands and the East Pacific coast has been too large for these shrimps to disperse along this track. In other Pontoniine genera there are species like *Periclimenes soror* Nobili, 1904, which lives in association with sea stars, that seem to have crossed the Pacific as they occur in the Indo-West Pacific and East Pacific. Rosen (1984) showed that the coral fauna of the East Pacific got largely extinct after the raise of the Panama Isthmus and was subsequently colonized by dispersal from the Indo-West Pacific. The opening of the Atlantic in the Tertiary is a 'soft' vicariance event recognized with regard to the group under study. The raise of landmasses or the lowering of sea-level in the Indonesian Archipelago, with the resulting limited throughflow of water from the Pacific Ocean into the Indian Ocean, might have had some effect in recent geological time and can be regarded a 'soft' vicariance event.

3. The separation of coastal communities by breaking up of the habitat. When species are confined to hard substrate habitats, like shrimps that are associated with ascidians, the decrease of for instance carbonate coastal structures being replaced by large areas with sandy coastlines could cause vicariance effects. Events of this kind

could have effected the distribution of the group under study, partly disconnecting the western Indian Ocean from the Indo-Malayan region.

6.2.2. Coalescence

When biotas, like coastal communities, merge into larger areas, the innitially smaller ('ancestral') ranges disappear. Biota may react to these events partly by extinction due to species selection, and / or by increasing biodiversity due to the overlapping of originally allopatric faunas. In relation to the biological characteristics of the group under study, such an event has been recognized in the Indo-West Pacific, where Asian, Australian and Pacific plates are merging.

6.2.3. Dispersal

Dispersal capabilities depend on the mobility of the organisms in question. Adults of the group under study are benthic and seem to have low capabilities for dispersal. As the larvae are pelagic, it is assumed that dispersal takes place in this phase of the life cycle. Calafiore et al.(1991) were able to rear *Pontonia pinnophylax* through eight larval stages to the first post-larva in 28-30 days. They also showed that metamorphosis from larva to first post-larva can only be induced by the presence of the host mussel, whereas larval development is retarded in the absence of the host. This enhances the dispersal capabilities of the species. This is supported by the presence of *Pontonia pinnophylax* and in part *Ascidonia flavomaculata* on geologically young islands like Ascension, St. Helena, Madeira, Cape Verde Islands and the Azores. Colonization of these islands can only have taken place through dispersal from continental coastal areas. The same process must have taken place in the archipelagoes of the Indo-West Pacific. Another dispersal event is the recolonization of the Mediterranean in the early Pliocene (Rögl & Steiniger, 1984) after the late Miocene (Messinian) salinity crisis.

6.2.4. Non-allopatric speciation

In recent years, there is more attention for hypotheses involving sympatric speciation (Howard & Berlocher, 1998). Many of these studies are concerned with taxa that live in close association to other organisms like insects with plants (Bush, 1969; Bush, 1994; Feder, 1998; Menken & Roessingh, 1998). The mechanisms revealed in these studies could well have their parallel in pontoniine shrimps living in association with various reef organisms. Berlocher (1998) investigated how hypothesis of sympatric speciation via host or habitat shift might be tested with biogeographic and phylogenetic evidence. Sympatric distributions of sister species can be explained as allopatric speciation followed by dispersal (Mayr, 1947, 1963). However, the ad hoc use of dispersal can explain almost any distribution pattern and almost any speciation process and is therefor as such not very informative. One of the predictions Berlocher (1998) makes is that the frequency of sympatric sister species in the top of a phylogenetic tree will be high in the case of a predominantly sympatric mode of speciation while low in a predominantly allopatric mode of speciation. This prediction can be tested in the

case of the genera *Pontonia* and *Ascidonia*. Both these genera entail species distributed on either side of the Panama Isthmus (see fig. 26). In all these pairs the distribution of the species is allopatric. This at least indicates that no sympatric speciation has occurred in the last 3 million years. Another prediction in the case of taxa living in association with other taxa is that the frequency of sympatric sister species in which one shifted hosts in the process of speciation is high in the top of the tree. This phenomen is not clear in the phylogenetic tree of the group under study (fig. 31). Drastic host shifts from Ascidiacea to Mollusca or vise versa cannot be found in the top of the tree. The only rather drastic host-shift between bivalves and gastropods in the sister species concerns the allopatric species *P. chimaera* and *P. domestica* and is thus no indication of a sympatric speciation mode. Although sympatric speciation can still be involved, the explanation would be ad hoc.

6.2.5. Extinction

Extinction is an important phenomenon with regard to distributional patterns. Unfortunately there is no fossil record of the Pontoniinae which can support hypotheses on extinction events. There is an opportunity to obtain indirect evidence about the possible extinction of associated shrimp species from the rather extensive fossil record in the molluscan hosts groups like for instance the Pinnidae of which the first representatives are known from the Cretaceous.

6.3. Distributional patterns

Geographical distributions of many of the species studied are probably incompletely known as often only few records are available. It is expected that the range of several species will prove to be larger than actually known when more material becomes available. It is also expected that more species new to science will be discovered when potential host species are more systematically studied for the presence of associated shrimps. Nonetheless some general trends can be observed. Those species of which a reasonable number of records is available have rather wide distributions. Because of the above reasons relatively large areas have been used as entries in the biogeographical analysis: East Pacific (EP), West Atlantic (WA), East Atlantic (EA), Mediteranean Sea (M), Eastern Indian Ocean (EI), and Indo-West Pacific (IWP). Patterns can be visualized by superimposing distributions of species onto the hypothesized general phylogenetic cladogram of the group (fig. 25).

The genera recognized are confined to either Indo-West Pacific (*Rostronia*, *Dactylonia*, *Odontonia* and *Bruceonia*) or Atlantic and East Pacific (*Pontonia* and *Ascidonia*). If extinction does not play a major role this indicates a separate development within these groups after the closure of the Tethys Sea; it also indicates insufficient dispersal capabilities to cross the Pacific Ocean.

6.3.1. The Atlantic and East Pacific area

In the general area in which *Pontonia* and *Ascidonia* occur, two ‘hard’ vicariance events have been recognized: A) the closure of the Tethys Sea in the early Miocene (ca. 20

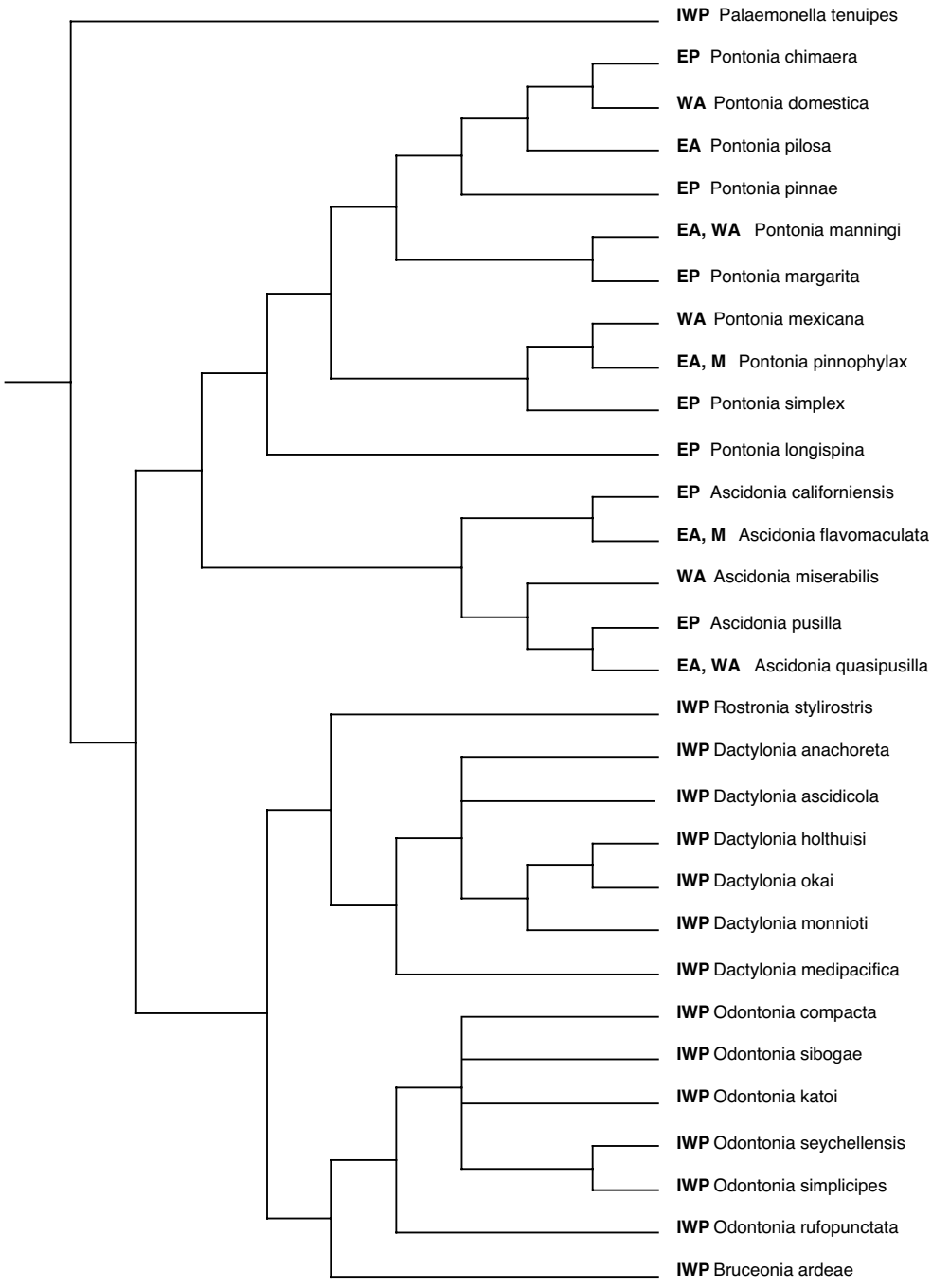


Fig. 25. Cladogram of *Pontonia* s.l. with distributions of species superimposed on hypothesized general phylogenetic cladogram.

million years ago), separating the Atlantic and Indo-West Pacific; B) the forming of the Panama Isthmus in the Pliocene (ca. 3 million years ago), separating the West Atlantic and East Pacific. One 'soft' vicariance event in the area is the opening of the Atlantic Ocean, starting in the early Cenozoic separating the East and West Atlantic faunas. Dispersal events that have to be postulated are the colonization of Oceanic Islands in the Atlantic and the recolonization of the western Mediterranean from the East Atlantic.

To test if these events are reflected by the phylogenies of the species resulting in congruent distributional patterns, a deductive method (de Jong, 1996) using BPA (Brooks Parsimony Analysis) (Brooks, 1990; Brooks & McLennan, 1991) was carried out. The terminal taxa in the cladogram are substituted by their distributional areas (fig. 26) which are taken as characters in an area-by-character matrix. The areas of the ancestors (= sum of the areas of descendants, internodes on the tree) are added to the matrix. The method starts from primitive cosmopolitanism and repeated fragmentation of the area followed by speciation. If no extinction would have occured, the CI of the area-by-character matrix on the hypothesized area cladogram would be 1.0. The

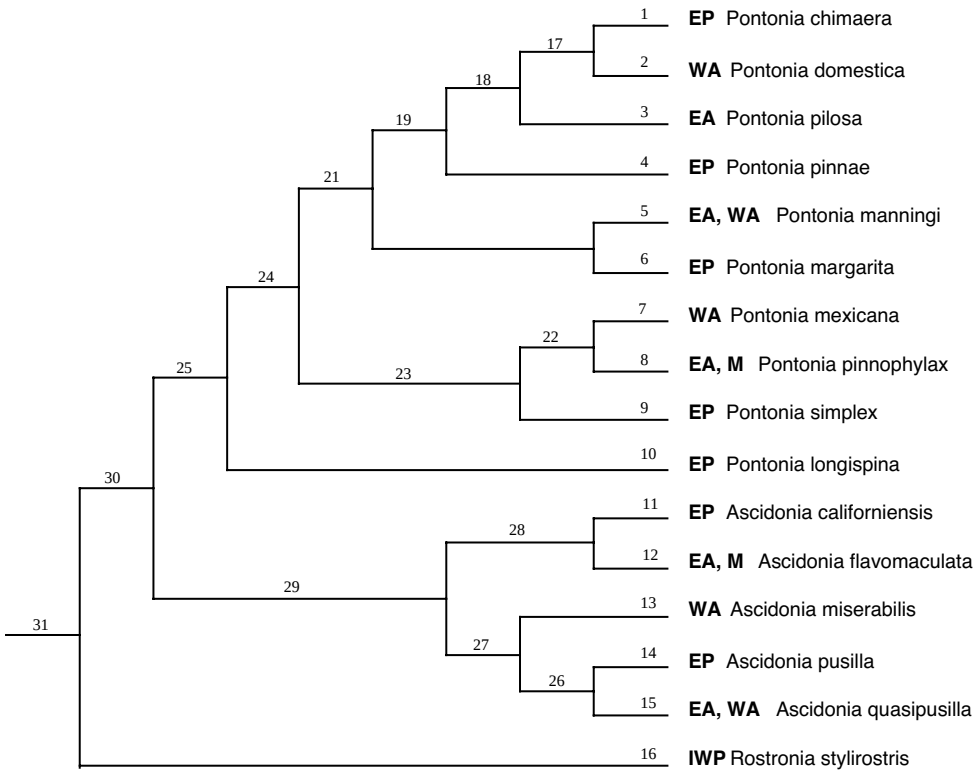


Fig. 26. Cladogram of *Pontonia* s.l. with distributions of the Atlantic and East Pacific species superimposed on hypothesized general phylogenetic cladogram with terminal branches and internodes indicated as characters for an area-by-character matrix (table 3).

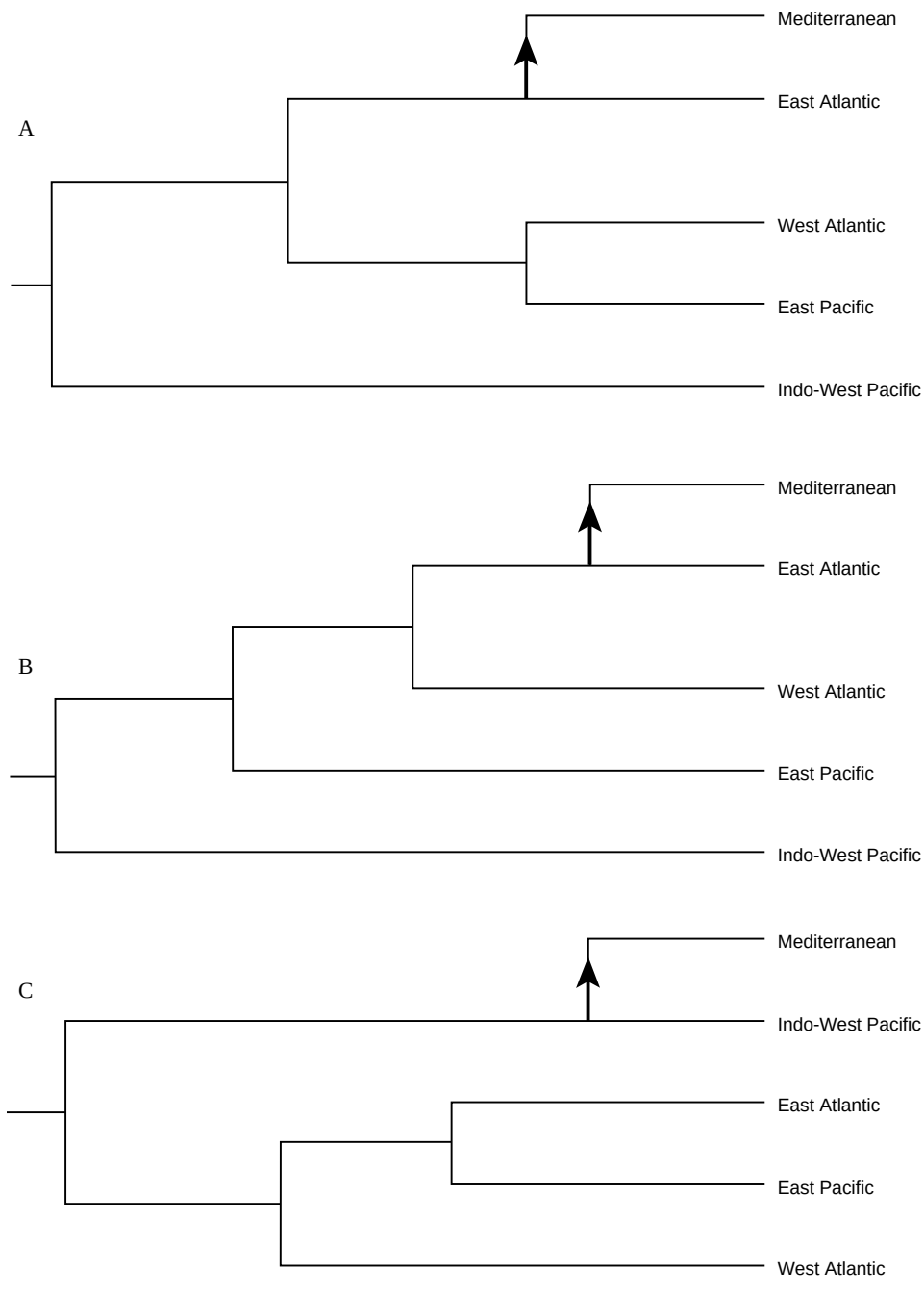


Fig. 27. Hypothesized area cladograms for the Atlantic and East Pacific. A, When dispersal capabilities are low; B, when dispersal capabilities are high; C, anti-thesis area cladogram.

distribution of the taxa (extant and ancestral) over the hypothesized area cladogram can be visualized by simple optimization procedures (e.g. by applying the option "Show reconstructions" in PAUP 3.1.1., or the option "Trace character" in MacClade 3.0). Incongruence of the BPA cladogram with the area cladogram based on geological data can be considered the result of a different process from vicariance (dispersal, non-allopatric speciation, extinction).

Although the 'soft' vicariance event of the opening of the Atlantic started much longer ago than the 'hard' vicariance event of the development of the Panama Isthmus, the actual isolation and possible speciation resulting from it might be delayed by the dispersal capabilities of the species. If dispersal capabilities are low, it is hypothesized that species distribution is congruent with the area cladogram depicted in fig. 27a. If dispersal capabilities are high it is hypothesized that species distribution is congruent with the area cladogram depicted in fig. 27b. For comparison a third anti-thesis area cladogram (fig. 27c) was tested. It is expected that species occurring in the Mediterranean also occur in the East Atlantic if dispersal capabilities are high, or have their sister species in the East Atlantic when dispersal capabilities are low and isolation in some degree has been established between populations in the two areas.

A matrix was constructed with five areas, distributions of 16 terminal taxa and internodes (table 9). As the Mediterranean Sea was never part of an 'ancestral' area, this 'character' is coded missing analogous to a phylogenetic analysis. Uninformative distributions were ignored when calculating measure of fit indices.

Characters were set "unordered", allowing reversals (extinctions). Irreversibility would also overestimate independent dispersal over ancestral connections followed by partial extinction. To emphasize the latter the optimization was carried out using accelerated transformation optimization (ACCTRAN), which places the changes as close to the root as possible, preferring single origin followed by reversal (Swofford, 1993: 20). In cases of ambiguity involving the Mediterranean, delayed transformation optimization (DELTRAN) was applied giving preference to dispersal over single origin followed by extinction.

For the optimization the Trace Character option of MacClade 3 (Maddison & Maddison, 1992) was used.

Table 9. Datamatrix for biogeographical analysis of *Pontonia* and *Ascidonia*. – Columns: 1, *Pontonia chimaera*; 2, *P. domestica*; 3, *P. longispina*; 4, *P. manningi*; 5, *P. margarita*; 6, *P. mexicana*; 7, *P. pinnae*; 8, *P. pinnophylax*; 9, *P. simplex*; 10, *P. pilosa*; 11, *Ascidonia californiensis*; 12, *A. flavomaculata*; 13, *A. miserabilis*; 14, *A. pusilla*; 15, *A. quasipusilla*; 16, *Rostronia stylirostris*; 17-31, internodes, see fig. 26.

	1	1111111112	2222222223	3
	1234567890	1234567890	1234567890	1
Indo-West Pacific	0000000000	0000010000	0000000000	1
Mediterranean Sea	????????1??	?1?????????	??????????	?
East Atlantic	0001000101	0100100111	1111111111	1
West Atlantic	0101010000	0010110111	1111110111	1
East Pacific	1010101010	1001010111	1101111111	1

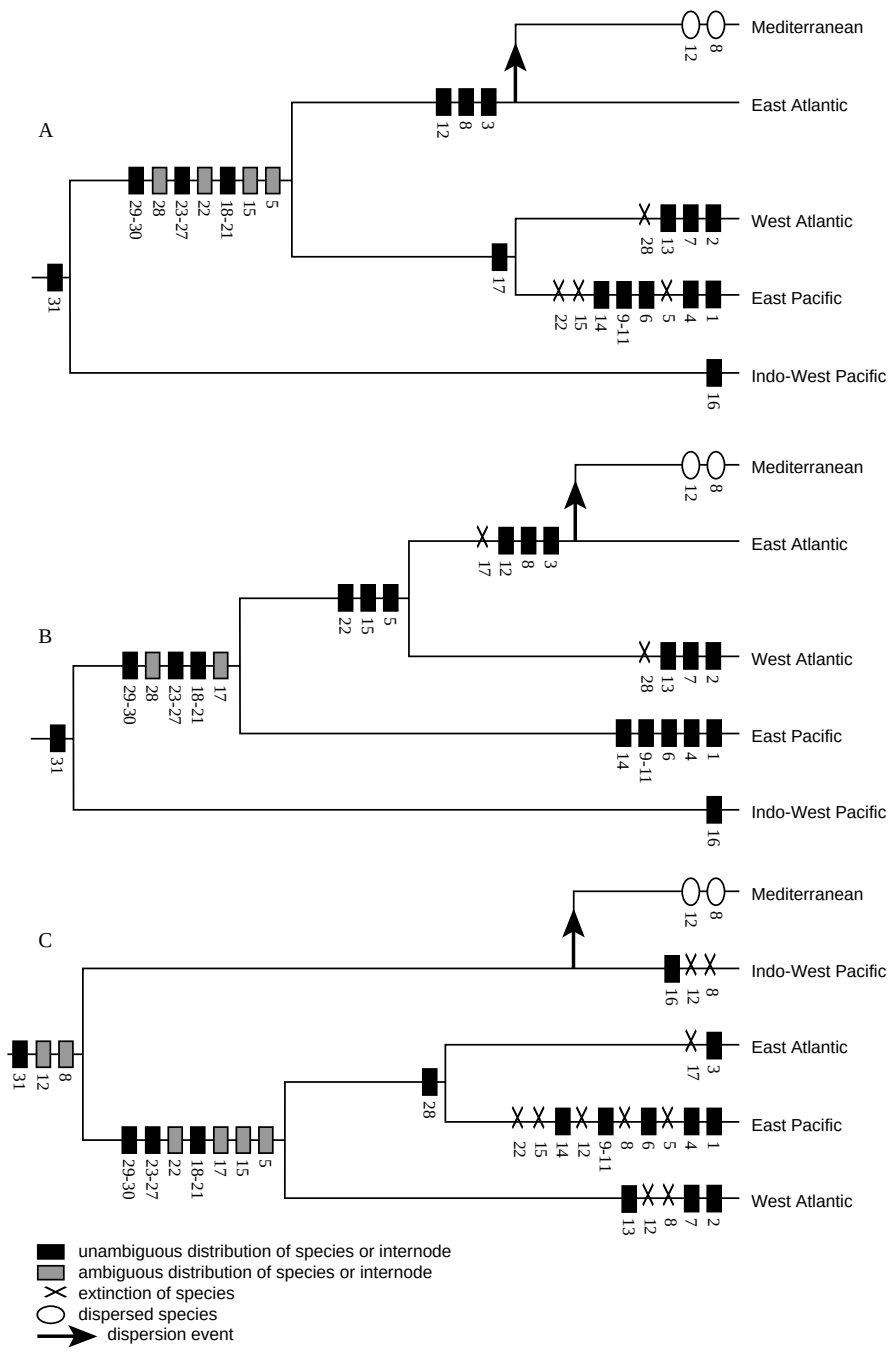


Fig. 28. Fit of area-by character matrix (table 3) on hypothetical area cladograms for the Atlantic and East Pacific. A, When dispersal capabilities are low; B, when dispersal capabilities are high; C, antithesis area cladogram.

Results

Table 10. Measures of fit of the area-by-character matrix (table 9) on hypothetical area cladograms (A-C). tl = tree length; CI = Consistency Index; HI = Homoplasy Index; RI = Retention Index; RC = Rescaled Consistency Index.

Area cladogram	tl	CI	HI	RI	RC
A (fig. 28a)	11	0.636	0.364	0.429	0.273
B (fig. 28b)	9	0.778	0.222	0.714	0.556
C (fig. 28c)	13	0.538	0.462	0.143	0.077

The area-by-character matrix has the best fit on hypothetical area cladogram B (table 10). This indicates that dispersal capabilities in the group are high. Homoplasy is mainly due to the distributions of *Pontonia chimaera, P. domestica,* and of *Ascidonia californiensis* and *A. flavomaculata* which require one reversal (absence through extinction or undersampling of the area). *Pontonia domestica* is missing an East Atlantic sister species. In the case of *Pontonia domestica,* there might be a sister species in the East Atlantic as there is one doubtful record of *P. domestica* from Porto Santo, near Madeira.

As is noted in the taxonomic part, the distinction between East and West Atlantic populations of *Pontonia manningi* and *Ascidonia quasipusilla* could not be investigated thoroughly because of shortage of material. For the time being these populations are regarded as conspecific. The East Atlantic *Pontonia pinnophylax* and West Atlantic *P. mexicana* are well represented in collections. However, the colour patterns of the species are very similar and the morphological differences between these taxa are minor. It might well be that some gene-flow between these East and West Atlantic populations is still present. More material and possibly DNA-techniques could reveal the taxonomic status of these populations. When East and West Atlantic populations of both *Pontonia manningi* and *Ascidonia quasipusilla* are treated as separate species in the BPA, the measure of fit indices for area cladogram A-C do not change.

6.3.2. The Indo-West Pacific area

The distribution of land and sea, depth changes of seas, changes in climate and in ocean circulation, result from geological processes, and have played an important role in the Cenozoic development of biogeographical patterns in the Indo-West Pacific (Hall, 1998). In current vicariant biogeographical methodology, dichotomous diagrams of area relationships are generated, indicative of progressive fragmentations of previously continuous areas. As long as these breaking-up events are clear - as they are in the Atlantic/East Pacific region - there is no methodological conflict. However, regarding the complex history of divergence and coalescence that characterizes the Indo-West Pacific, combined with the high dispersal capabilities of many marine organisms it seems highly improbable that vicariant methods alone can clarify the observed biogeographical patterns in this area (Holloway & Hall, 1998).

From several studies on the biogeography of marine organisms of which a relatively complete fossil record is available - stony corals (Rosen, 1984; Wilson & Rosen, 1998; Hoeksema, 1989, 1993), coral barnacles (Ross & Newman, 2000), and molluscs (Hallam, 1967) - it becomes apparent that high diversity shifted from the Atlanto-Mediter-

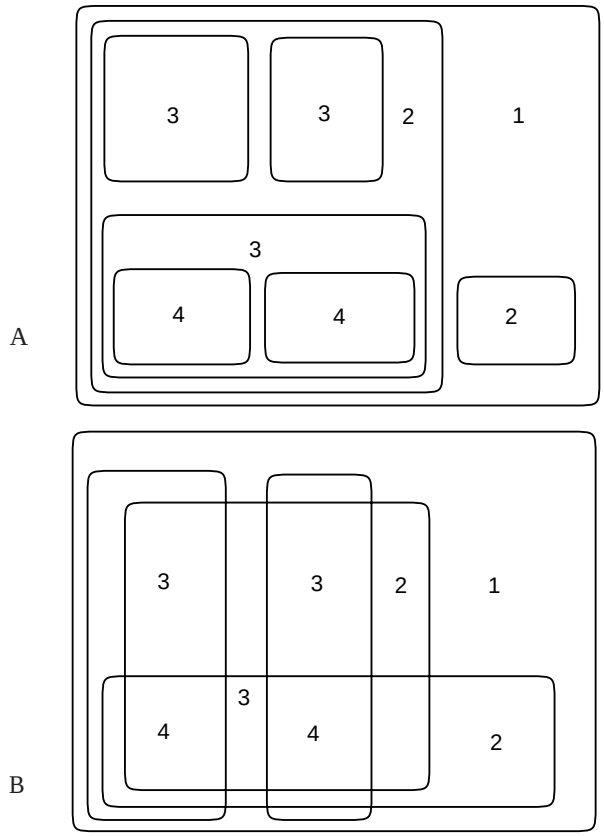


Fig. 29. Identical biodiversity distributions caused by different patterns. A, Centre of origin scenario; B, Centre of accumulation scenario.

ranean / East Pacific area, existing before the fragmentation of the Tethyan seaway, to the Indo-West Pacific area with highest diversity in the so-called 'East Indies Triangle of maximum diversity', including Malaysia, Indonesia, the Philippines and Papua New Guinea (Briggs, 1974, 1992; Paulay, 1997). Wilson & Rosen (1998) stressed the influence of geotectonics on biodiversity, particularly in controlling availability of suitable habitats as they observed a dramatic increase in shallow-water carbonates - which they used as a proxy for availability of coral habitats - early in the Neogene (ca. 25 Ma). This is coincident with the collision of Australia and SE Asia and with the diversification of zooxanthellate corals and subsequently the fauna associated with the corals.

To explain the high diversity in the Indo-West Pacific, three scenario's have been postulated: 1, Center of Origin (e.g. Briggs, 1974, 1992; Stehli & Wells, 1971; Veron, 1995); 2, Center of Accumulation (e.g. Ladd, 1960 [based on a suggestion of Fenner Chace]; McCoy & Heck, 1976; Rosen, 1984, 1988; Jokiel & Martinelli, 1992); 3, Center of Survival (McCoy & Heck, 1976). Wilson & Rosen (1998: table 1) summarize the evolutionary characteristics within and beyond the centre together with predicted patterns

for the fossil record. In addition to this table, differences in the present distributional pattern of taxonomic groups can be added.

1. Centre of origin. In groups with similar biological characteristics there will be: A) a high level of congruence between the distributions of the members of the group as the result of dispersal along the same tracks, originating from the centre; B) a high level of endemicity in the centre as compared to peripheral areas (Fig. 29a).

2. Centre of Accumulation. In groups with similar biological characteristics there will be: A) a low level of congruence between the distributions of the members of the group, resulting from dispersal along different tracks from peripheral areas; B) a low level of endemicity in the centre as compared to peripheral areas (fig. 29b).

3. Centre of Survival. No particular pattern is expected.

Overlapping distribution patterns indicating the Centre of Accumulation scenario have been detected for several scleractinian coral groups like fungid corals (Hoeksema, 1993), siderastereids and mussids (Pandolfi, 1992), some species of *Acropora* (Wallace et al., 1991), sea urchins (Palumbi, 1996) and several other groups (Paulay, 1997). Benzie (1998) showed evidence for the Centre of Accumulation scenario studying the population genetics of groups of molluscs and echinoderms. In several groups that lack a planktonic period in their development, such as gastropods and sepioid cephalopods, closely related species have very restricted, largely allopatric distributions (e.g. Weaver & duPont, 1970; Fleminger, 1986). For these groups the dynamic Indo-West Pacific area is likely to be a centre of allopatric speciation due to vicariant isolation resulting from sea-level fluctuations and tectonic movements. It is obvious that the biological characteristics of taxa play an important role in the relative dominance of the scenario's behind the development of their biogeographic patterns.

In the literature, distribution patterns of pontoniine shrimps in the Indo-West Pacific are biased. Especially those localities where A.J. Bruce resided for some time are relatively well known, e.g. Kenya, Zanzibar, Hongkong and especially Australia. In recent years, sampling by the present author at the Seychelles, eastern Indonesia and the Philippines, added many records. However, many localities especially in the Central Indian Ocean, western Indonesia and Pacific plate islands need to be searched more intensively to fill distributional gaps.

From the 14 Indo-West Pacific taxa, five (*Rostronia stylirostris, Odontonia katoi, O. sibogae, Dactylonia ascidicola,* and *D. okai*) have wide distributions ranging from the western Indian Ocean to eastern Indonesia and Australia, not penetrating onto the Pacific plate. Of these species, *Odontonia katoi* and *O. sibogae* are closely related. Their sympatric occurrence could be the result of sympatric speciation or dispersal after allopatric speciation. *Dactylonia anachoreta* is the only species that seems to have an Indian Ocean distribution. *Dactylonia medipacifica* is the only species which ranges from the West Pacific to Hawaii. The other seven species are only known from one or few specimens at a single locality. It is assumed that their actual distributional range will be larger.

Allopatric patterns are almost absent within *Odontonia* and *Dactylonia.* It is therefore hypothesized that dispersal after allopatric or sympatric speciation is the major process accounting for the biogeographical pattern in this group.

The highest diversity is found in the "East Indies Triangle" and the Coral Sea (fig. 30). Endemicity is not concentrated in a particular area. Overlapping distributions are observed in *Dactylonia*. These data support the 'Centre of Accumulation" scenario.

Fig. 30. Lines drawn around the extreme distributional records per species indicating part of their present and past distributions.

7. Historical ecology

As defined by Brooks (1985), historical ecology concerns the study of macroevolutionary components of ecological associations, such as host-parasite or herbivore-plant systems, or communities and biotas. It is assumed that evolutionary diversification of any given clade occurs in association with members of other clades. In the present study, the association between host molluscs and ascidians and their shrimp symbionts is dealt with. The study of these associations is conceptually and analytically analogous to historical biogeographic studies, except that in this case one taxon, designated as the "host", replaces the concept of "area" in a historical biogeographic analysis. Two processes determine the congruence between the phylogenies of the hosts and their associates: cospeciation (analogue with vicariance in historical biogeography) and host-switching (analogue with dispersal in historical biogeography). In the cospeciation analysis, homoplasies indicate episodes of colonization, called "dispersal' in biogeography and "host-switching" in coevolutionary studies (when the homoplasies are parallelisms or convergences), or of extinction (when homoplasies are reversals).

7.1. Methodology

To test the degree of cospeciation between host and associate, a deductive method analogue to the biogeographical analaysis (de Jong, 1996) using BPA (Brooks Parsimony Analysis) (Brooks, 1990; Brooks & McLennan, 1991) was carried out. The terminal taxa in the cladogram are substituted by their hosts (fig. 31) which are taken as characters in a host-by-character matrix. The hosts of the ancestors (= sum of the hosts of descendants, internodes on the tree) are added to the matrix (tables 12-15). If only cospeciation, no host-switching and no extinction would have occurred, the CI of the host-by-character matrix on the hypothesized

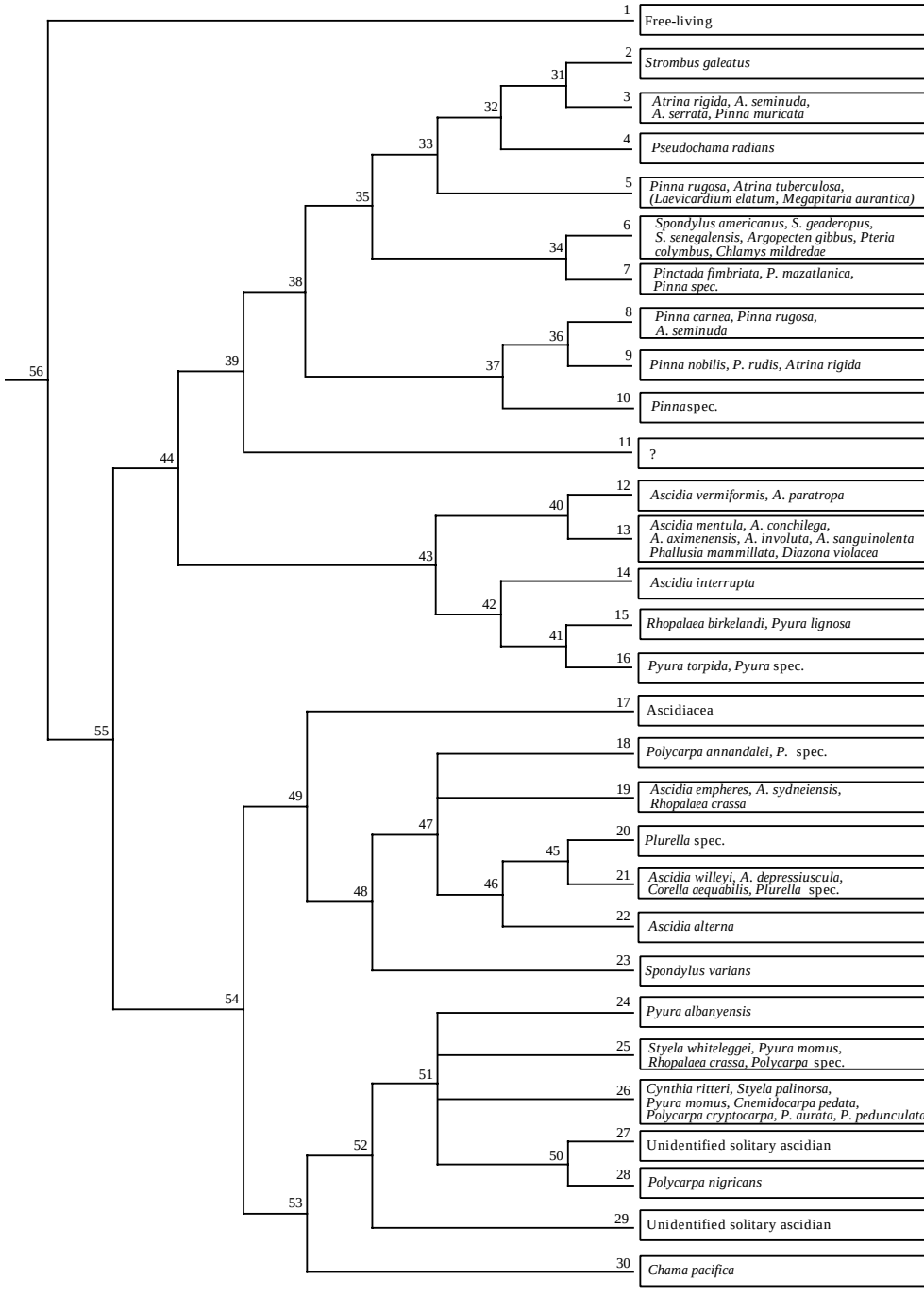


Fig. 31. Hypothesized general cladogram of *Pontonia* s.l., with host-range per species superimposed on taxa. Terminal branches and internodes referring to the the host-by-character matrix (tables 5-8).

host phylogeny would be 1.0. The distribution of the taxa (extant and ancestral) over the hypothesized host cladogram can be visualized by simple optimization procedures (e.g. by applying the option “Show reconstructions” in PAUP 3.1.1., or the option “Trace character” in MacClade 3.0). Incongruence of the BPA cladogram with the hypothesized host phylogeny can be considered the result of host-switching or extinction.

7.2. The hosts

As no phylogenetic studies on both bivalve molluscs and ascidians have been published, a hypothesized phylogeny is based on a traditional systematic classification (Parker, 1982). Refinement of the ascidian classification to subfamily level is based on Monniot, Monniot & Laboute (1991). The host-species are incorporated in this classification (table 11).

Table 11. Classical systematic classification of host species.

Kingdom: Animalia
- Phylum: Mollusca
  - Class: Gastropoda
    - Subclass: Prosobranchia
      - Order: Mesogastropoda
        - Superfamily: Strombacea
          - Family: Strombidae
            - Genus: *Strombus*
              - *Strombus galeatus* Swainson, 1823
  - Class: Bivalvia
    - Subclass: Pteriomorphia
      - Ordo: Pterioida
        - Suborder: Pteriina
          - Superfamily: Pteriacea
            - Family: Pteriidae
              - Genus: *Pinctada*
                - *Pinctada fimbriatus* (Dunker, 1852) [*Pteria sterua* (Gould, 1851)]
                - *Pinctada mazatlanica* (Hanley, 1856)
              - Genus: *Pteria*
                - *Pteria colymbus* (Röding, 1798)
        - Suborder: Pinnina
          - Superfamily: Pinnacea
            - Family: Pinnidae
              - Genus: *Pinna*
                - *Pinna carnea* (Gmelin, 1791)
                - *Pinna muricata* Linnaeus, 1758
                - *Pinna nobilis* Linnaeus, 1758
                - *Pinna rudis* Linnaeus, 1758
                - *Pinna rugosa* Sowerby, 1835
              - Genus: *Atrina*
                - *Atrina rigida* (Lightfoot, 1786)
                - *Atrina seminuda* (Lamarck, 1819)
                - *Atrina serrata* (Sowerby, 1825)
                - *Atrina tuberculosa* (Sowerby, 1835)

- Order: Ostreoida
  - Suborder: Pectinina
    - Superfamily: Pectinacea
      - Family: Spondylidae
        - Genus: *Spondylus*
          - *Spondylus americanus* Hermann, 1781
          - *Spondylus gaederopus* Linnaeus, 1758
          - *Spondylus senegalensis* Schreibers, 1793
          - *Spondylus varians* Sowerby, 1847
      - Family: Pectinidae
        - Genus: *Argopecten*
          - *Argopecten gibbus* (Linnaeus, 1758)
        - Genus: *Chlamys*
          - *Chlamys mildredae* Bayer, 1941
- Subclass: Heterodonta
  - Order: Hippuritoida
    - Superfamily: Chamacea
      - Family: Chamidae
        - Genus: *Chama*
          - *Chama pacifica* Broderip, 1835
        - Genus*: Pseudochama*
          - *Pseudochama radians* (Lamarck, 1819)

- Phylum: Chordata
  - Subphylum: Tunicata
    - Class: Ascidiacea
      - Order: Phlebobranchia
        - Family: Cionidae
          - Genus: *Diazona*
            - *Diazona violacea* Savigny, 1816
          - Genus: *Rhopalaea*
            - *Rhopalaea birkelandi* Tokioka, 1871
            - *Rhopalaea crassa* (Herdman, 1880)
        - Family: Ascidiidae
          - Genus: *Ascidia*
            - *Ascidia altera* Monniot & Monniot, 1991
            - *Ascidia aximensis* Müller, 1953
            - *Ascidia conchilega* O.F. Müller, 1776
            - *Ascidia depressiuscula* Heller, 1878
            - *Ascidia empheres* Sluiter, 1895
            - *Ascidia interrupta* Heller, 1878
            - *Ascidia involuta* Heller, 1875
            - *Ascidia mentula* O.F. Müller, 1776
            - *Ascidia paratropa* (Huntsman, 1912)
            - *Ascidia sydneiensis* Stimpson, 1854
            - *Ascidia vermiformis* (Ritter, 1913)
            - *Ascidia willeyi* Oka, 1915
          - Genus: *Phallusia*
            - *Phallusia mammillata* (Cuvier, 1815)
        - Family: Corellidae
          - Genus: *Corella*
            - *Corella aequabilis* Sluiter, 1904
        - Family: Plurellidae
          - Genus: *Plurella*
            - *Plurella* spec.

Order: Stolidobranchia
- Family: Styelidae
  - Subfamily: Styelinae
    - Genus: *Polycarpa*
      - *Polycarpa annandalei* Oka, 1915
      - *Polycarpa aurata* (Quoy & Gaimard, 1834)
      - *Polycarpa cryptocarpa* (Sluiter, 1885)
      - *Polycarpa nigricans* Heller, 1878
      - *Polycarpa pedunculata* (Heller, 1878)
    - Genus: *Cynthia*
      - *Cynthia ritteri* Oka, 1915
    - Genus: *Styela*
      - *Styela palinorsa* (Sluiter, 1895)
      - *Styela whiteleggei* (Herdman, 1899)
    - Genus: *Cnemidocarpa*
      - *Cnemidocarpa pedata* (Herdman, 1881)
- Family: Pyuridae
  - Genus: *Pyura*
    - *Pyura albanyensis* Michaelsen, 1927
    - *Pyura lignosa* Michaelsen, 1908
    - *Pyura momus* (Savigny, 1816)
    - *Pyura* spec.
    - *Pyura torpida* (Sluiter, 1898)

To investigate cospeciation at different taxonomic levels, matrices were constructed with hosts at the order, family, genus, and species level, with hostranges of 30 shrimp species and internodes (tables 5-8). Identification of the hosts has not always been possible to the species level. In those cases where the host is identified to a higher taxonomic level, but other hosts are identified to species level within that taxonomic group, the entry is ommited from the analysis. If well-identified species of that group are present in the area concerned and present in the analysis, these are scored with a "?". In those cases where hosts were identified to a taxonomic level above the species level, but subsequent revisions of the host group make it problematic to fix the

Table 12. Datamatrix for historical ecological analysis to order level of hosts. – Columns: 1, *Palaemonella tenuipes*; 2, *Pontonia chimaera*; 3, *P. domestica*; 4, *P. pilosa*; 5, *P. pinnae*; 6, *P. manningi*; 7, *P. margarita*; 8, *P. mexicana*; 9, *P. pinnophylax*; 10, *P. simplex*; 11, *P. longispina*; 12, *Ascidonia californiensis*; 13, *A. flavomaculata*; 14, *A. miserabilis*; 15, *A. pusilla*; 16, *A. quasipusilla*; 17, *Rostronia stylirostris*; 18, *Dactylonia anachoreta*; 19, *D. ascidicola*; 20, *D. holthuisi*; 21, *D. okai*; 22, *D. monnioti*; 23, *D. medipacifica*; 24, *Odontonia compacta*; 25, *O. sibogae*; 26, *O. katoi*; 27, *O. seychellensis*; 28, *O. simplicipes*; 29, *O. rufopunctata*; 30, *Bruceonia ardeae*; 31-56 internodes, see fig. 31.

	1	1111111112	2222222223	3333333334	4444444445	555555
	1234567890	1234567890	1234567890	1234567890	1234567890	123456
Free-living	1000000000	?000000000	0000000000	0000000000	0000000000	000001
Gastropoda	0100000000	?000000000	0000000000	1110100110	0001000000	000011
Pterioida	0010111111	?000000000	0000000000	1111111110	0001000000	000011
Ostreoida	0000010000	?000000000	0010000000	0001100110	0001000110	000111
Hippuritoida	0001000000	?000000000	0000000001	0110100110	0001000000	001111
Phlebobranchia	0000000000	?11110?011	110010?0?0	0000000001	1111111111?	111111
Stolidobranchia	0000000000	?00011?100	100111?1?0	0000000000	1111001111	111111

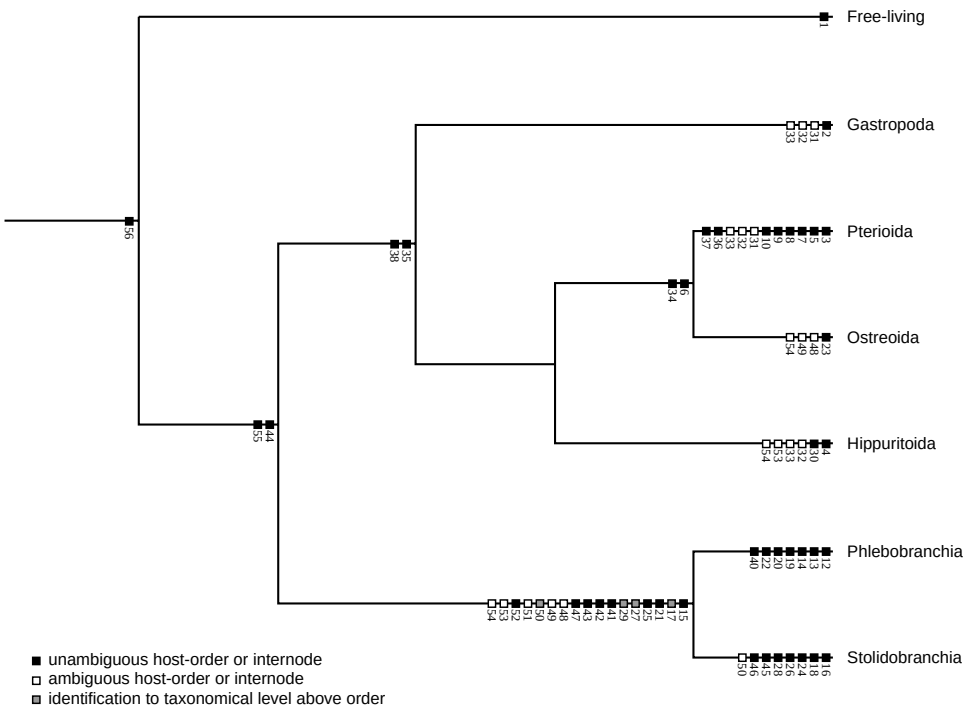


Fig. 32. Fit of the host-by-character matrix (table 12) on the hypothesized host cladogram at order level.

Table 13. Datamatrix for historical ecological analysis to family level of hosts. – Columns: 1, *Palaemonella tenuipes*; 2, *Pontonia chimaera*; 3, *P. domestica*; 4, *P. pilosa*; 5, *P. pinnae*; 6, *P. manningi*; 7, *P. margarita*; 8, *P. mexicana*; 9, *P. pinnophylax*; 10, *P. simplex*; 11, *P. longispina*; 12, *Ascidonia californiensis*; 13, *A. flavomaculata*; 14, *A. miserabilis*; 15, *A. pusilla*; 16, *A. quasipusilla*; 17, *Rostronia stylirostris*; 18, *Dactylonia anachoreta*; 19, *D. ascidicola*; 20, *D. holthuisi*; 21, *D. okai*; 22, *D. monnioti*; 23, *D. medipacifica*; 24, *Odontonia compacta*; 25, *O. sibogae*; 26, *O. katoi*; 27, *O. seychellensis*; 28, *O. simplicipes*; 29, *O. rufopunctata*; 30, *Bruceonia ardeae*; 31-56 internodes, see fig. 31.

	1	1111111112	2222222223	3333333334	4444444445	555555
	1234567890	1234567890	1234567890	1234567890	1234567890	123456
Free-living	1000000000	?000000000	0000000000	0000000000	0000000000	000001
Strombidae	0100000000	?000000000	0000000000	1110100110	0001000000	000011
Pteriidae	0000011000	?000000000	0000000000	0001100110	0001000000	000011
Pinnidae	0010101111	?000000000	0000000000	1111111110	0001000000	000011
Spondylidae	0000010000	?000000000	0010000000	0001100110	0001000110	000111
Pectinidae	0000010000	?000000000	0000000000	0001100110	0001000000	000011
Chamidae	0001000000	0000000000	0000000001	0110100110	0001000000	001111
Cionidae	0000000000	?01010?010	0000100000	0000000001	1111001111	111111
Ascidiidae	0000000000	?111002010	1100000000	0000000001	0111111111	???111
Corellidae	0000000000	?00000?000	1000000000	0000000000	0000111110	000111
Plurellidae	0000000000	?00000?001	?000000000	0000000000	0000111110	000111
Styelidae	0000000000	?00000?100	100011?1?0	0000000000	0000001111	111111
Pyuridae	0000000000	?00011?000	000111?0?0	0000000000	1111000??	111111

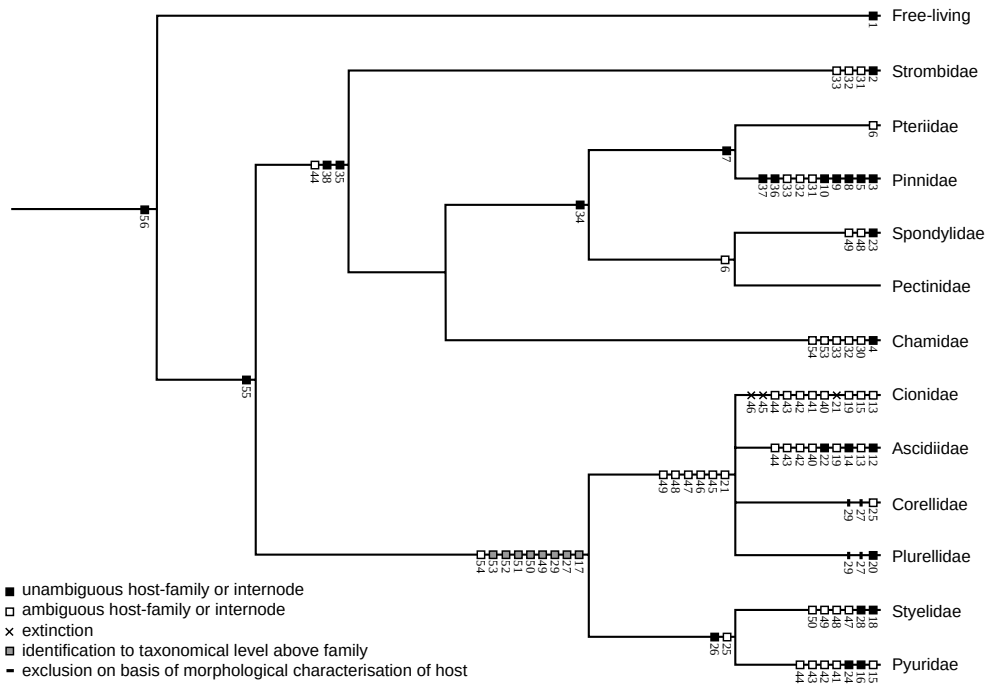


Fig. 33. Fit of the host-by-character matrix (table 13) on the hypothesized host cladogram at family level.

host to the present-day taxonomic classification in the group, the nearest higher taxonomic level to which it could be fixed with certainty is used. In those cases where errors in host-identification might be expected (e.g. *Pinna* and *Atrina*) the same method was applied. As the host of *Pontonia longispina* is not known, this species (entry 11 and 39) was excluded from the analysis.

Characters were set unordered, allowing reversals. To emphasize host-switching over single origin of association followed by reversal to the ancestral host-taxon, delayed transformation optimization (DELTRAN) was applied.

For the optimization the Trace Character option of MacClade 3 (Maddison & Maddison, 1992) was used.

Uninformative host-distributions were ignored when calculating measures of fit indices.

7.3. Results

The consistency index of the analysis at the order-level of hosts is high. Homoplasy is mainly caused by the host-switches of *Pontonia chimaera* (2), *Dactylonia medipacifica* (23), and *Bruceonia ardeae* (30) from a group associated with ascidian hosts to a mollusc host, and by the switch from *Pontonia pilosa* (4) from the the Pterioida to the

Table 14. Datamatrix for historical ecological analysis to genus level of hosts. – Columns: 1, *Palaemonella tenuipes*; 2, *Pontonia chimaera*; 3, *P. domestica*; 4, *P. pilosa*; 5, *P. pinnae*; 6, *P. manningi*; 7, *P. margarita*; 8, *P. mexicana*; 9, *P. pinnophylax*; 10, *P. simplex*; 11, *P. longispina*; 12, *Ascidonia californiensis*; 13, *A. flavomaculata*; 14, *A. miserabilis*; 15, *A. pusilla*; 16, *A. quasipusilla*; 17, *Rostronia stylirostris*; 18, *Dactylonia anachoreta*; 19, *D. ascidicola*; 20, *D. holthuisi*; 21, *D. okai*; 22, *D. monnioti*; 23, *D. medipacifica*; 24, *Odontonia compacta*; 25, *O. sibogae*; 26, *O. katoi*; 27, *O. seychellensis*; 28, *O. simplicipes*; 29, *O. rufopunctata*; 30, *Bruceonia ardeae*; 31-56 internodes, see fig. 31.

	1	1111111112	2222222223	3333333334	4444444445	555555
	1234567890	1234567890	1234567890	1234567890	1234567890	123456
Free-living	1000000000	?000000000	0000000000	0000000000	0000000000	000001
Strombus	0100000000	?000000000	0000000000	1110100110	0001000000	000011
Pinctada	0000001000	?000000000	0000000000	0001100110	0001000000	000011
Pteria	0000010000	?000000000	0000000000	0001100110	0001000000	000011
Pinna	0010101111	?000000000	0000000000	1111111110	0001000000	000011
Atrina	0010100110	?000000000	0000000000	1110111110	0001000000	000011
Spondylus	0000010000	?000000000	0010000000	0001100110	0001000110	000011
Argopecten	0000010000	?000000000	0000000000	0001100110	0001000000	000011
Chlamys	0000010000	?000000000	0000000000	0001100110	0001000000	000011
Chama	0000000000	?000000000	0000000001	0000000000	0000000000	001111
Pseudochama	0001000000	?000000000	0000000000	0110100110	0001000000	000011
Diazona	0000000000	?01000?000	000000?0?0	0000000001	001100000??	????11
Rhopalaea	0000000000	?00010?010	000010?0?0	0000000000	1111001111?	111111
Ascidia	0000000000	?11100?010	110000?0?0	0000000001	0111111111?	???111
Phallusia	0000000000	?01000?000	000000?0?0	0000000001	001100000??	????11
Corella	0000000000	?00000?000	1000000000	0000000000	0000111111?	???111
Plurella	0000000000	?00000?001	?000000000	0000000000	0000111111?	???111
Polycarpa	0000000000	?00000?100	000011?1?0	0000000000	000?001111	111111
Cynthia	0000000000	?00000?000	000001?0?0	0000000000	000?0000??	111111
Styela	0000000000	?00000?000	000011?0?0	0000000000	000?0000??	111111
Cnemidocarpa	0000000000	?00000?000	000001?0?0	0000000000	000?0000??	111111
Pyura	0000000000	?00011?000	000111?0?0	0000000000	111100000??	111111

Hippuritoida (fig. 32). If these shrimps (2, 4, 23, 30), the hosts (Gastropoda, Hippuritoida), and the internodes involved (48, 53) are excluded from the analysis and the datamatrix is corrected for these changes (Ostreoida: 49 1>0; 54 1>0), then the CI = 1.

At the family (fig. 33) and genus level (fig. 34) the consistency indices still indicate a high level of coevolution. Although the CI at the genus-level is slightly lower than the CI at the family level, a compensation of the larger dataset at the genus level makes its RI to rise above the RI at the family level. Part of the homoplasy is caused by the four host-switches already mentioned at the order level. Exclusion of these species and the relevant hosts increases the CI at the family level to 0.500 and RI to 0.511. At the genus level the CI increases to 0.516 and the RI to 0.643. Another part of the homoplasy is due to the unresolved phylogeny of the Ascidiacea, especially the Phlebobranchia, in combination with possible erroneous identifications within this host group and identifications at a higher taxonomic level (table 16).

At the species level, the CI and also the RI are much lower than at the higher taxonomic levels. Here the homoplasy is mainly caused by the unresolved host tree at the lower taxonomic levels (Fig. 35), the higher possibility of misidentifications, and a higher influence of host-identifications to a higher taxonomic level. These are all

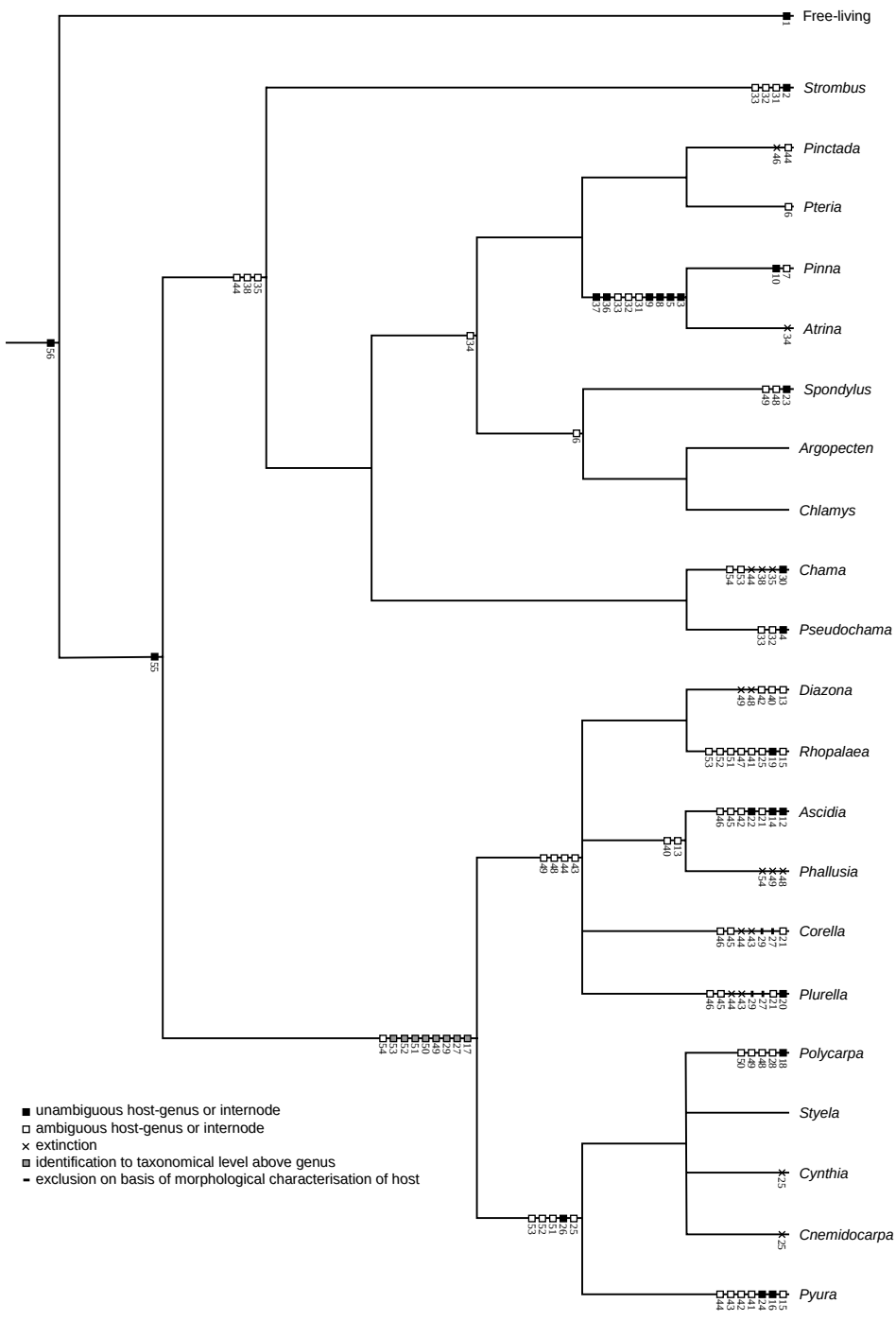


Fig. 34. Fit of the host-by-character matrix (table 14) on the hypothesized host cladogram at genus level.

Table 15. Datamatrix for historical ecological analysis to species level of hosts. – Columns: 1, *Palaemonella tenuipes*; 2, *Pontonia chimaera*; 3, *P. domestica*; 4, *P. pilosa*; 5, *P. pinnae*; 6, *P. manningi*; 7, *P. margarita*; 8, *P. mexicana*; 9, *P. pinnophylax*; 10, *P. simplex*; 11, *P. longispina*; 12, *Ascidonia californiensis*; 13, *A. flavomaculata*; 14, *A. miserabilis*; 15, *A. pusilla*; 16, *A. quasipusilla*; 17, *Rostronia stylirostris*; 18, *Dactylonia anachoreta*; 19, *D. ascidicola*; 20, *D. holthuisi*; 21, *D. okai*; 22, *D. monnioti*; 23, *D. medipacifica*; 24, *Odontonia compacta*; 25, *O. sibogae*; 26, *O. katoi*; 27, *O. seychellensis*; 28, *O. simplicipes*; 29, *O. rufopunctata*; 30, *Bruceonia ardeae*; 31-56 internodes, see fig. 31.

	1	1111111112	2222222223	3333333334	4444444445	555555
	1234567890	1234567890	1234567890	1234567890	1234567890	123456
Free-living	1000000000	?000000000	0000000000	0000000000	0000000000	000001
Strombus galeatus	0100000000	?000000000	0000000000	1110100110	0001000000	000011
Pinctada fimbriatus	0000001000	?000000000	0000000000	0001100110	0001000000	000011
Pinctada mazatlanica	0000001000	?000000000	0000000000	0001100110	0001000000	000011
Pteria colymbus	0000010000	?000000000	0000000000	0001100110	0001000000	000011
Pinna carnea	0000000100	?000000000	0000000000	0000011110	0001000000	000011
Pinna muricata	0010000000	?000000000	0000000000	1110100110	0001000000	000011
Pinna nobilis	0000000010	?000000000	0000000000	0000011110	0001000000	000011
Pinna rudis	0000000010	?000000000	0000000000	0000011110	0001000000	000011
Pinna rugosa	000010?10?	?000000000	0000000000	0010111110	0001000000	000011
Atrina rigida	0010000010	?000000000	0000000000	1110111110	0001000000	000011
Atrina seminuda	0010000100	?000000000	0000000000	1110111110	0001000000	000011
Atrina serrata	0010000000	?000000000	0000000000	1110100110	0001000000	000011
Atrina tuberculos	000010?00?	?000000000	0000000000	0010100110	0001000000	000011
Spondylus americanus	0000010000	?000000000	0000000000	0001100110	0001000000	000011
Spondylus gaederopus	0000010000	?000000000	0000000000	0001100110	0001000000	000011
Spondylus senegalensis	0000010000	?000000000	0000000000	0001100110	0001000000	000011
Spondylus varians	0000000000	?000000000	0010000000	0000000000	0000000110	000111
Argopecten gibbus	0000010000	?000000000	0000000000	0001100110	0001000000	000011
Chlamys mildredae	0000010000	?000000000	0000000000	0001100110	0001000000	000011
Chama pacifica	0000000000	?000000000	0000000001	0000000000	0000000000	001111
Pseudochama radians	0001000000	?000000000	0000000000	0110100110	0001000000	000011
Diazona violacea	0000000000	?010000000	0000000000	0000000001	0011000000	000011
Rhopalaea birkelandi	0000000000	?000100000	0000000000	000000002?0	1111000000	000011
Rhopalaea crassa	0000000000	?00000?010	000010?0?0	0000000000	000000111?	111111
Ascidia alterna	0000000000	?00000?000	010000?0?0	0000000000	000001111?	???111
Ascidia aximenedes	0000000000	?010000000	0000000000	0000000001	0011000000	000011
Ascidia conchilega	0000000000	?010000000	0000000000	0000000001	0011000000	000011
Ascidia depressiuscula	0000000000	?00000?000	100000?0?0	0000000000	000011111?	???111
Ascidia empheres	0000000000	?00000?010	000000?0?0	0000000000	000000111?	???111
Ascidia interrupta	0000000000	?001000000	0000000000	0000000000	0111000000	000011
Ascidia involuta	0000000000	?010000000	0000000000	0000000001	0011000000	000011
Ascidia mentula	0000000000	?010000000	0000000000	0000000001	0011000000	000011
Ascidia paratropa	0000000000	?100000000	0000000000	000000002?1	0011000000	000011
Ascidia sydneiensis	0000000000	?00000?010	000000?0?0	0000000000	000000111?	???111
Ascidia vermiformis	0000000000	?100000000	0000000000	000000002?1	0011000000	000011
Ascidia willeyi	0000000000	?00000?000	100000?0?0	0000000000	000011111?	???111
Phallusia mammillata	0000000000	?010000000	0000000000	0000000001	0011000000	000011
Corella aequabilis	0000000000	?000000000	1000000000	0000000000	0000111110	000111
Plurella spec.	0000000000	?000000001	?000000000	0000000000	0000111110	000111
Polycarpa annandalei	0000000000	?00000?100	000000?0?0	0000000000	000000111?	???111
Polycarpa aurata	0000000000	?00000?000	000001?0?0	0000000000	00000000??	111111
Polycarpa cryptocarpa	0000000000	?00000?000	000001?0?0	0000000000	00000000??	111111
Polycarpa pedunculata	0000000000	?00000?000	000001?0?0	0000000000	00000000??	111111
Polycarpa nigricans	0000000000	?00000?000	000000?1?0	0000000000	000000002?1	111111
Styela palinorsa	0000000000	?00000?000	000001?0?0	0000000000	00000000??	111111
Styela whiteleggei	0000000000	?00000?000	000010?0?0	0000000000	00000000??	111111
Cynthia ritteri	0000000000	?00000?000	000001?0?0	0000000000	00000000??	111111
Cnemidocarpa pedata	0000000000	?00000?000	000001?0?0	0000000000	00000000??	111111
Pyura albanyensis	0000000000	?00000?000	000100?0?0	0000000000	000000002??	111111
Pyura lygnosa	0000000000	?000100000	0000000000	000000002?0	1111000000	000011
Pyura torpida	0000000000	?000010000	0000000000	0000000000	1111000000	000011
Pyura spec.	0000000000	?000010000	0000000000	0000000000	1111000000	000011
Pyura momus	0000000000	?00000?000	000011?0?0	0000000000	000000002??	111111

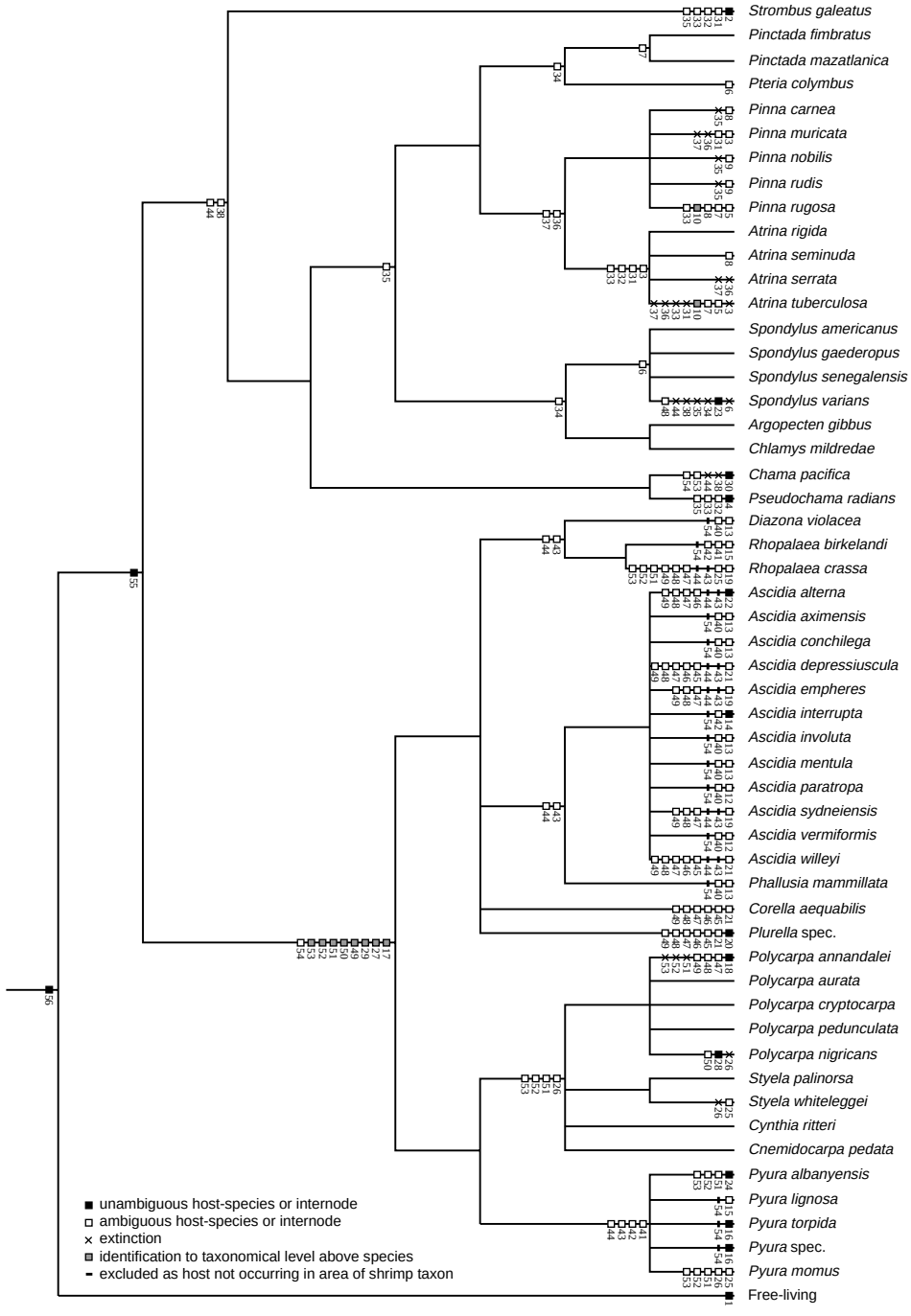


Fig. 35. Fit of the host-by-character matrix (table 15) on the hypothesized host cladogram at species level.

Table 16. Measures of fit of the host-by-character matrices (table 12-15) on hypothetical host cladograms (figs. 31-34). tl = tree length; CI = Consistency Index; HI = Homoplasy Index; RI = Retention Index; RC = Rescaled Consistency Index.

	host-taxa	tl	CI	HI	RI	RC
Order-level	7	28	0.714	0.286	0.714	0.510
Family-level	13	61	0.459	0.541	0.507	0.233
Genus-level	21	79	0.430	0.570	0.579	0.249
Species-level	55	181	0.199	0.801	0.372	0.074

caused by possible errors and inacurracy. A biological phenomenon contributing to the homoplasy is a high number of host-switches at a low taxonomic level. This is indicated by several shrimp species that have been recorded from multiple hosts. The homoplasy levels in the ascidian branch of the tree are lower than in the mollusc part. In this ascidian part of the tree the above mentioned causes for homoplasy seem to be more prominent (table 17).

Table 17. Measures of fit of the host-by-character matrix (table 15) on hypothetical host cladograms (figs. 34) for the molluscan and ascidian branch. tl = tree length; CI = Consistency Index; HI = Homoplasy Index; RI = Retention Index; RC = Rescaled Consistency Index.

	host-taxa	tl	CI	HI	RI	RC
Molluscan branch	22	54	0.296	0.704	0.333	0.099
Ascidian branch	32	124	0.177	0.823	0.227	0.040

7.4. Conclusion and discussion

The correlation between the topography of both trees of shrimps and hosts is clear above the species level of the hosts. Exceptions seem to be the incidental switches of *Pontonia chimaera*, *Dactylonia medipacifica* and *Bruceonia ardeae* to a host in another order. It is understandable that host-switches at a low taxonomic level are more common as the biological characteristics of closely related hosts are likely to be more similar to each other than those of distantly related hosts. As host-switching to closely related hosts followed by speciation could be involved, a high correlation between the trees would also be expected without involving coevolution. Thus the present results could indicate a much more recent diversification of the shrimps over the host taxa. Host shifts might be mediated by host characters strictly concordant with host phylogeny such that a recent diversification of the shrimps results in a phylogeny strictly congruent with the host phylogeny (Mitter et al., 1991). Switches at a higher taxonomic level of hosts indicate that the biological characteristics of these hosts, in relation to the shrimp biology, have much in common.

In the Indo-West Pacific several other pontoniine shrimp genera are known of which the species live in association with molluscan or ascidian hosts.

Dasella Lebour, 1945, comprises three species which are associated to solitary ascidians. *Amphipontonia* Bruce, 1991, is monospecific and only known from New Caledonia where it was found in or on an ascidian. Some representatives of the genus *Periclimenaeus* are living in association with colonial ascidians. As the biology of the association between shrimp and colonial ascidian is quite different from that

of shrimp and solitary ascidian, it is expected that this type of association has its own origin.

Seven genera comprising 26 species are exclusively associated with molluscs,: *Anchiopontonia* Bruce, 1992; *Anchistus* Borradaile, 1898; *Chernocaris* Johnson, 1967; *Conchodytes* Peters, 1852; *Neoanchistus* Bruce, 1975. Some of the bivalve genera hosting *Pontonia* in the Atlantic and East Pacific, host species belonging to the above mentioned pontoniine genera also in the Indo-West Pacific. As most of these bivalve genera are much older than the closure of the Tethys and have circumtropical distributions, the present allopatric distribution of the mollusc-associated shrimp genera can be explained by either 1) a separate origin after the closure of the Tethys Sea, or 2) as the result of competition for host genera in either basin resulting in the extinction of one or few genera in one or both basins. A phylogenetic analysis of all ascidian and mollusc-associated pontoniine genera, combined with a historical biogeographic and historical ecological analysis could bring more clarity in the present configuration of generic distributions and host-associations.

8. Systematic account

8.1. Key to the genera

The key to the genera is based on external morphological characters in adult specimens of both males and females. It can be used as an extension of the genus *Pontonia* in the keys to the genera of the subfamily Pontoniinae as published by Holthuis (1993).

Key to the genera of *Pontonia* sensu lato

1. Rostrum without or with one small subdistal dorsal tooth, with developed lateral carinae 2
- Rostrum with two or three distinct dorsal distal teeth, lateral carinae not developed ..... ***Rostronia*** gen. nov.
2. Medioventral tooth of basal antennular segment small 3
- Medioventral tooth of basal antennular segment strongly developed ..... ***Odontonia*** gen. nov.
3. Dactylus of ambulatory pereiopods with flexor margin entire; paragnath with two submedian carinae; rostrum without dorsal carina 4
- Dactylus of ambulatory pereiopods with row of tubercles on flexor margin; paragnath with one median carina; rostrum with dorsal carina ..... ***Dactylonia*** gen. nov.
4. Unguis of dactylus of ambulatory pereiopods simple; fourth thoracic sternite with triangular anteriorly produced plate 5
- Unguis of dactylus of ambulatory pereiopods with patch of distal scales; fourth thoracic sternite anteriorly rounded, not forming a produced plate ..... ***Bruceonia*** gen. nov.
5. Rostrum with subdistal ventral tooth; antennal spine distinctly separated from infraorbital margin, acute; scaphocerite with distolateral tooth less than 0.1 of length scaphocerite; submedian carinae of corpus of paragnath parallel, setose; alae of paragnath medially rounded; proximal pair of dorsal spines at 1/3 to 1/2

of telson length; distal pair of dorsal telson spines in distal third of telson .... ***Pontonia*** Latreille

- Rostrum without ventral teeth; antennal spine merged with inferior orbital angle, blunt (acute in *Ascidonia flavomaculata*); scaphocerite with distolateral tooth more than 0.2 of length scaphocerite; submedian carinae on corpus of paragnath oblique, non-setose; alae of paragnath medially bilobed or excavate; proximal pair of dorsal spines at 1/4 of telson length; distal pair of telson spines in proximal half of telson ..... ***Ascidonia*** gen. nov.

8.2. *Pontonia* Latreille, 1829

Alciope Rafinesque, 1814: 24. Type species, by monotypy: *Alciope heterochelus* Rafinesque, 1814: 24 (an invalid senior subjective synonym of *Pontonia flavomaculata* Heller, 1864: 51). Gender: feminine. Name suppressed for the purposes of the Principle of Priority, but not for those of the Principle of Homonymy, under the plenary power of the International Commission on Zoological Nomenclature and placed on the Official Index of Rejected and Invalid Generic Names in Zoology in Opinion 522, in 1958. Etymology (i): according to Agassiz (1846: 2) the name is derived from alke (Gr.),= strength, and opeo (Gr.),= see, but according to Backer (1936: 15) Alkiope (Gr., latinized to Alciope) is a figure from Greek mythology, who was a lover of the god Apollo, and mother of their son Celmisius.

Pontonie Latreille, 1825: 280. Vernacular name and nomen nudum.

Pontonia Berthold, 1827: 267. Nomen nudum.

Pontonia Latreille, 1829: 96.

Ponthonia Costa, 1840: 4. Erroneous spelling.

Panthonia Valdés Ragués, 1909: 181. Erroneous spelling.

Definition.— Medium sized shrimp of subcylindrical to depressed body form. Rostrum well developed, depressed; dorsally armed with one subdistal tooth; dorsal carina not developed; lateral carinae well developed; ventral margin with subdistal tooth. Carapace generally glabrous; inferior orbital angles produced; orbit feebly developed; supraorbital, epigastric and hepatic spines absent; antennal spine well developed, acute, separated from inferior orbital angle; anterolateral angle of branchiostegite rounded.

Eye normal, with hemispherical cornea.

Antennula normal, ventromedial tooth on basal segment small; distolateral angle of basal segment small or absent, not reaching beyond basal third of intermediate segment; anterior margin produced, reaching beyond distolateral tooth if present; flagella reduced.

Antenna with basicerite unarmed; scaphocerite well developed, with distolateral tooth less than 0.1 times length of scaphocerite or absent.

Epistome unarmed. Corpus of paragnaths with deep median longitudinal fissure bordered by setose parallel carinae; alae medially rounded.

Second thoracic sternite with anterior margin triangular, produced, forming a more or less developed plate.

Fourth thoracic sternite with low lateral carinae.

Fifth thoracic sternite with broad rectangular, medially blunt separate lateral plates.

Mandible robust, without palp, molar process stout, incisor process simple, with row of denticles along medioventral border.

Maxillula with bilobed palp, lower lacinia large, triangular, with many simple setae.

Maxilla with simple palp, bilobed endite, scaphognathite broad; basal endite with many setae on upper and lower lacinia, both laciniae well developed or fused (*P. chimaera*), as long as or longer than palp.

First maxilliped with slender palp, basal and coxal endites completely fused, with long setae along median margin, forming basket; exopod with well developed caridean lobe; flagellum broad, densely setose distally; epipod large, oval.

Second maxilliped with normal endopod, without distinct angle in median margin of basis, exopod with flagellum well developed, plumose setae distally; epipod large, triangular, without podobranch.

Third maxilliped with endopod ischiomerus fused to basis, as broad as or broader than penultimate segment; exopod well developed, with plumose setae distally; coxa with oval, lateral plate, without median process, arthrobranch rudimentary.

First pereiopods with chela simple.

Chelae of second pereiopods unequal in size, subequal in form, with one proximal tooth in dactylus and two in fixed finger; dactylus of major chela with or without medial carina; fixed finger of major chela with or without median fossa to receive proximal tooth of dactylus when fingers closed.

Ambulatory pereiopods slender, dactylus biunguiculate, without accessory teeth on flexor margin of corpus, flexor margin with scattered to dense pile of setae; unguis simple.

Abdomen smooth, posterior margins of pleura rounded, posterolateral angle of sixth segment blunt or acutely produced.

Uropod with protopodite feebly acute distally, exopod with distolateral margin with or without mobile spinule, feebly armed.

Telson with two pairs marginal dorsal spines between 0.01 to 0.33 of telson length; proximal pair at 1/3 or 1/2 of telson length; three pairs of posterior spines.

Type species.— The type species was designated under plenary powers by the International Commission on Zoological Nomenclature: *Palaemon pinnophylax* Otto, 1821. Name placed on the Official List of Generic Names in Zoology (with the officially designated type species) in Opinion 378, in 1956. Gender: feminine.

Etymology.— From pontus (L.),= sea, and the suffix -ia (L.),= of, pertaining to; evidently in reference to the marine habitat of the type species.

Distribution.— In shallow tropical and warm temperate waters of the Atlantic and East Pacific.

Hosts.— Associated with Mollusca.

Remarks.— Of *Pontonia longispina* the host is not known. Of the species retained in *Pontonia* it is morphologically most closely related to *Ascidonia* gen. nov. with which it forms a monophyletic group (see 5.3. Phylogenetic analysis). However, the number of character changes between this species and the *Ascidonia* gen. nov. clade is much larger than to the rest of the *Pontonia* clade. For reasons of convenience the species is retained in *Pontonia*. *Pontonia* is therefore paraphyletic in relation to *Ascidonia* gen. nov.

8.2.1. Key to the species of *Pontonia* Latreille

1. Body and appendages glabrous, without cover of setae 2
- Body and appendages covered with pile of short setae ..... ***P. pilosa*** spec. nov.
2. Dactylus of third pereiopod with scattered setae along flexor margin; dorsal telson

spines short, less than 0.15 times telson length; position of distal pair of dorsal spines in distal third of telson length 3
- Dactylus of third pereiopod with dense pile of setae along flexor margin; dorsal telson spines long, more than 0.3 of telson length; postition of distal pair of dorsal spines at 1/2 of telson length ..... ***P. longispina***

3. Dorsal telson spines small or minute; posterior pair at midlength of telson, distal pair in distal fourth of telson length 4
- Dorsal telson spines of moderate size; posterior pair at 1/3 of telson length, distal pair at 2/3 of telson length 6

4. Scaphocerite with distinct distalolateral tooth 5
- Scaphocerite without distal tooth; dactyli of third and fifth pereiopods different in shape ..... ***P. chimaera***

5. Dactyli of posterior three pereiopods very broad, with flexor margin convex; accessory spine subdistal ..... ***P. domestica***
- Dactyli of posterior three pereiopods slender, with flexor margin almost straight; accessory spine distal ..... ***P. pinnae***

6. Rostrum with one distinct subapical dorsal tooth, reaching end of basal segment antennular peduncle; flexor margin of dactyli of three posterior pereiopods convex; corpus of dactylus of third pereiopod less than 1.5 times as long as broad; accessory tooth of dactylus of third pereiopod more than half length of unguis 7
- Rostrum without subapical dorsal tooth, only shallow notch with few setae present, reaching distal end of second segment of antennular peduncle; flexor margin of dactyli of three posterior pereiopods concave; corpus of dactylus of third pereiopod more than twice as long as broad; accessory tooth of dactylus of third pereiopod less than third length of unguis 8

7. Basal segment of antennular peduncle with distolateral margin rounded; ultimate segment of antennular peduncle about 1.5 times as long as penultimate segment ..... ***P. margarita***
Basal segment of antennular peduncle with distolateral margin with tooth; ultimate segment of antennular peduncle as long as penultimate segment ..... ***P. manningi***

8. Accessory tooth of dactyli of ambulatory pereiopods small or absent, less than fourth of size of unguis, at right angles with flexor margin 9
- Accessory tooth of dactily of ambulatory pereiopods about third of size of unguis, slightly directed forward ..... ***P. mexicana***

9. Corpus of dactylus of third pereiopod 2.5-3.0 times longer than proximal width; second maxilliped with ischial and meral segments without median row of setae ..... ***P. simplex***
- Corpus of dactylus of third pereiopod 1.5-2.0 times longer than proximal width; second maxilliped with ischial and meral segments with median row of setae ..... ***P. pinnophylax***

8.2.2. *Pontonia chimaera* Holthuis, 1951
(figs. 36-41)

Pontonia chimaera Holthuis, 1951a: 125, pl. 39 figs. a-p; Holthuis, 1952: 15; Bruce, 1972: 222; Bruce, 1976: 86; Wicksten, 1983: 18; Müller, 1993: 122; Chace & Bruce, 1993: 61; Fransen, 1994b: 107, 111; Wicksten & Hernández, 2000: 97.

Material.— **East Pacific**: **Panama**.— USNM 85390: holotype male, pocl. 3.9 mm; W of Cocal, north side of Pedro Gonzales Island, Archipielago de las Perlas; 9.iii.1944; in mantle chamber of *Strombus galeatus* Swainson, 1823; leg. A. Wetmore & J.P. Morrison.— AHF 1652-1: 1 dry specimen, pocl. 2.5 mm; Mexico, Sonora, Bahia Venetia, ca. 30 miles N of Guaymas; in gastropod shell; 30.vi.1975; leg. R.C. Brusca & E. Stull (Wicksten: 1983: 18).

Redescription of holotype male.— Body subcylindrical, somewhat depressed. Carapace smooth. Rostrum well developed, reaching distal end of basal segment of antennular peduncle, distally ending in sharp point, strongly depressed, slender, without dorsal carina, with ventral carina in distal part, ventral margin straight; subdistal dorsal tooth with few long simple setae in front; subdistal ventral tooth distally of level of subdistal dorsal tooth. Inferior orbital angle slightly produced, angular. Antennal spine well-developed, rather blunt, marginal, extending to level of anterolateral margin, situated just below level of inferior orbital angle, not separated from inferior orbital angle by notch. Anterolateral angle of carapace produced, broadly rounded.

Abdomen smooth; sixth segment about 1.4 times longer than fifth, about 1.3 times wider than long, posteroventral and posterolateral angles acutely produced; pleura of first five segments broadly rounded.

Telson about 1.7 times as long as sixth abdominal segment, almost twice as long as its proximal width; lateral margins slightly convex, convergent; posterior border without median process; two pairs of very small dorsal spines at about 0.50 and 0.80 of the telson length, marginal, 0.02 of telson length; posterior margin with three pairs of spines, lateral spines minute, marginal, as long as dorsal spines, intermediate and submedian spines much larger than lateral spines, about 0.15 times telson length.

Eyestalk about as long as wide, cylindrical, somewhat swollen; stalk slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella well developed. Basal segment without distolateral tooth, distal margin not developed; small medioventral tubercle present, submarginal, situated just in front of middle of basal segment; stylocerite short, almost half length of basal segment, with distal acute tip; lateral margin with few short plumose setae. Intermediate segment about as long as wide. Distal segment slightly longer than wide. Upper flagellum well developed, biramous, with four or five proximal segments fused; short free ramus two-segmented; longer free ramus with about seven segments. Lower flagellum with six or seven segments.

Antenna with basicerite short, laterally unarmed, with antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite short, reaching 3/4 of lamella of scaphocerite, slender, about 4.3 times longer than distal width; flagellum short, slender, about as long as postorbital carapace length; scaphocerite with lamella about 2.3 times as long as central width, distal margin truncate, medial margin convex, lateral margin slightly convex without distolateral tooth.

Epistome with rounded anterior median carina; labrum oval.

Paragnath well developed, alae with large transverse rectangular distal lobes, and with small submedian more or less triangular ventral lobes; corpus of moderate length, narrow, with median groove, bordered laterally by parallel submedian setose carinae.

Second thoracic sternite formed into small triangular process, no setae observed.

Third thoracic sternite with low indistinct lateral carinae between third maxillipeds.

Fourth thoracic sternite with low indistinct lateral carinae posteromedial of first pereiopods; without transverse ridge between first pereiopods.

Fifth thoracic sternite with lateral plates posteromedial of second pereiopods with large excavation in between.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Fig. 36. *Pontonia chimaera* Holthuis, 1951, male holotype, pocl. 3.9 mm, USNM 85390. a, anterior appendages, dorsal view; b anterior appendages, lateral view. Scale = 1 mm.

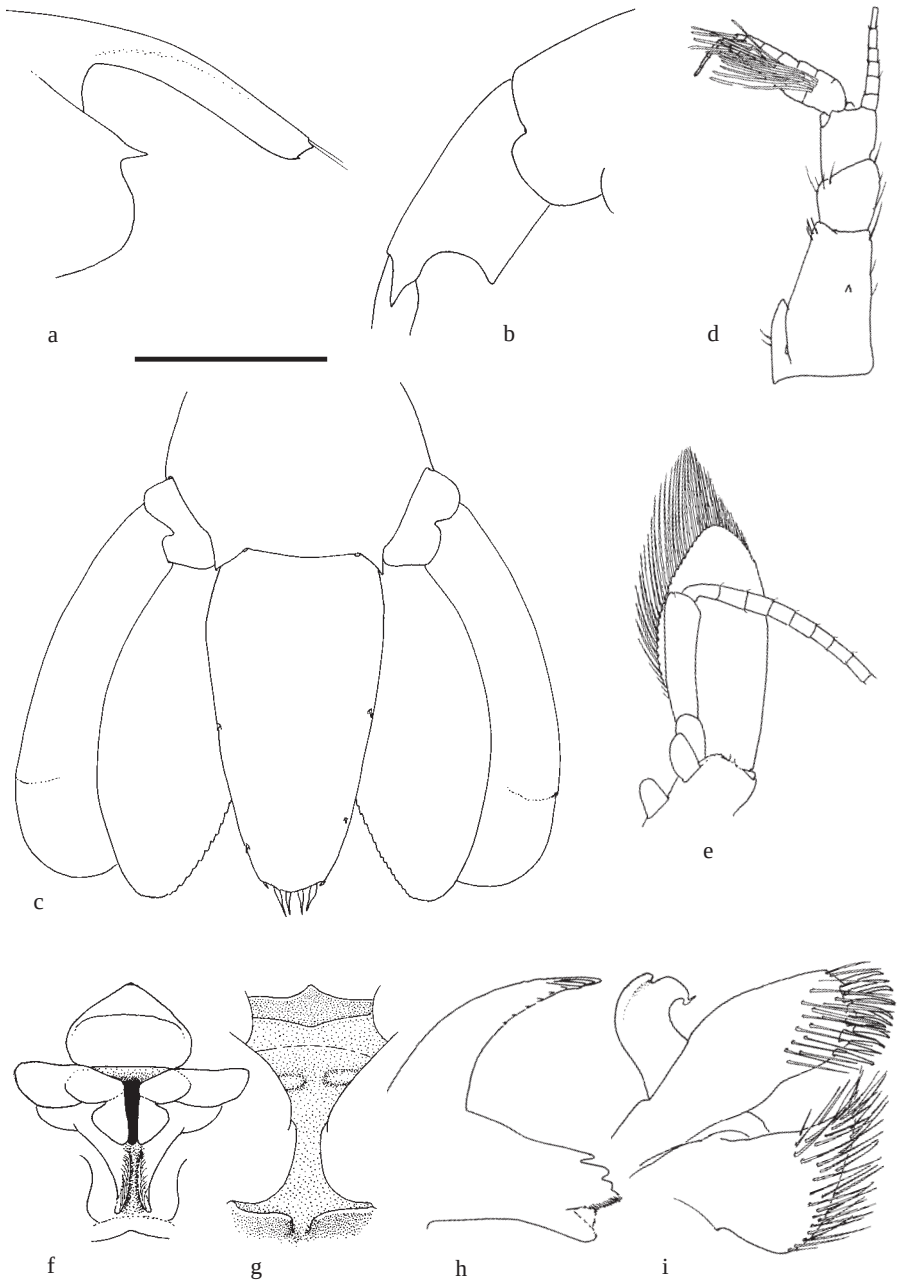


Fig. 37. *Pontonia chimaera* Holthuis, 1951, male holotype, pocl. 3.9 mm, USNM 85390. a, rostrum, lateral view; b, distal part abdomen, lateral view; c, telson and uropods, dorsal view; d, antennula, ventral view; e, antenna, ventral view; f, paragnath, ventral view; g, second to fifth thoracic sternites; h, mandible, ventral view; i, maxillula, ventral view. Scale: a-c, f, g = 1 mm; d, e = 1.5 mm; h, i = 0.6 mm.

Mandible with incisor process slender, with four distal teeth in right mandible and six in left mandible, with row of about six small teeth present on medioventral border; molar process stout, with four blunt distal teeth, some fringed with setal brushes.

Maxillula with upper and lower lacinia well developed, both with many simple setae in distal part; upper lacinia broad rectangular with two rows of about 12 serrulate spines and many long slender setae medially; lower lacinia very broad, densely setose distoventrally and marginally; palp bilobed, large lobe with small ventral tubercle.

Maxilla with basal endite well developed, not bilobed, only distal lobe developed, with about 12 long slender minutely serrulate setae along distomedian border, median border without setae; coxal endite obsolete, median margin convex, non-setose; scaphognathite large, 2.7 times longer than wide, posterior lobe large, 1.5 times longer than basal width, anterior lobe 1.25 times longer than basal width; palp simple, not overreaching distal lobe of basal endite, strongly expanded proximally, tapered distally, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite completely fused, large and broad, fringed with many long and finely serrulate setae along entire median margin, with more sparse long, simple submarginal setae ventrally; exopod well developed, flagellum with about ten long plumose setae distally; caridean lobe large; palp simple, slender, non-setose; epipod large, triangular, bilobed.

Second maxilliped with endopod normally developed; dactylar segment narrow, about four times as long as broad, densely fringed with coarsely serrulate spiniform, and long curled finely serrulate setae medially; propodal segment with row of long spines and simple and finely serrulate setae along distomedially produced margin, without setae along ventrolateral margin; carpal segment short, slightly broader than long, unarmed; meral segment without setae; basal and ischial segment fused, flattened medially not excavate, without setae; exopod normal, with about six long plumose setae distally; coxal segment not noticably produced medially, with few simple setae, triangular epipod laterally.

Third maxilliped with rather slender ischiomerus fused to basis, no suture visible, about 2.5 times longer than broad, slightly tapering distally, flattened, with many long slender, simple setae along median margin, ventral surface without setae, lateral margin with single row of long plumose setae; basal segment medially convex, with long finely serrulate setae on median margin; exopod well developed, as long as meral segment, with many long plumose setae distally; coxa without medial process, with large rounded lateral plate with few simple short setae; with obsolete rudimentary arthrobranch, filaments not visible; penultimate segment about twice as long as wide, about half of ischiomeral length, flattened, with groups of long, finely serrulate setae ventromedially; ultimate segment slightly shorter than penultimate segment, tapering distally, with groups of long coarsely serrulate setae medially and distally.

First pereiopods rather stout, compact, exceeding carpocerite by chela and carpus. Chela about 3.5 times longer than deep, subcylindrical; fingers longer than palm, with cutting edges entire, with groups of many strong, long, serrulate setae, with tip acute; carpus about 1.3 times as long as chela, about 4.5 times longer than distal width, somewhat tapering proximally, unarmed, with few long simple setae; with reduced cleaning organ on carpal-propodal joint; merus about as long as carpus, four times

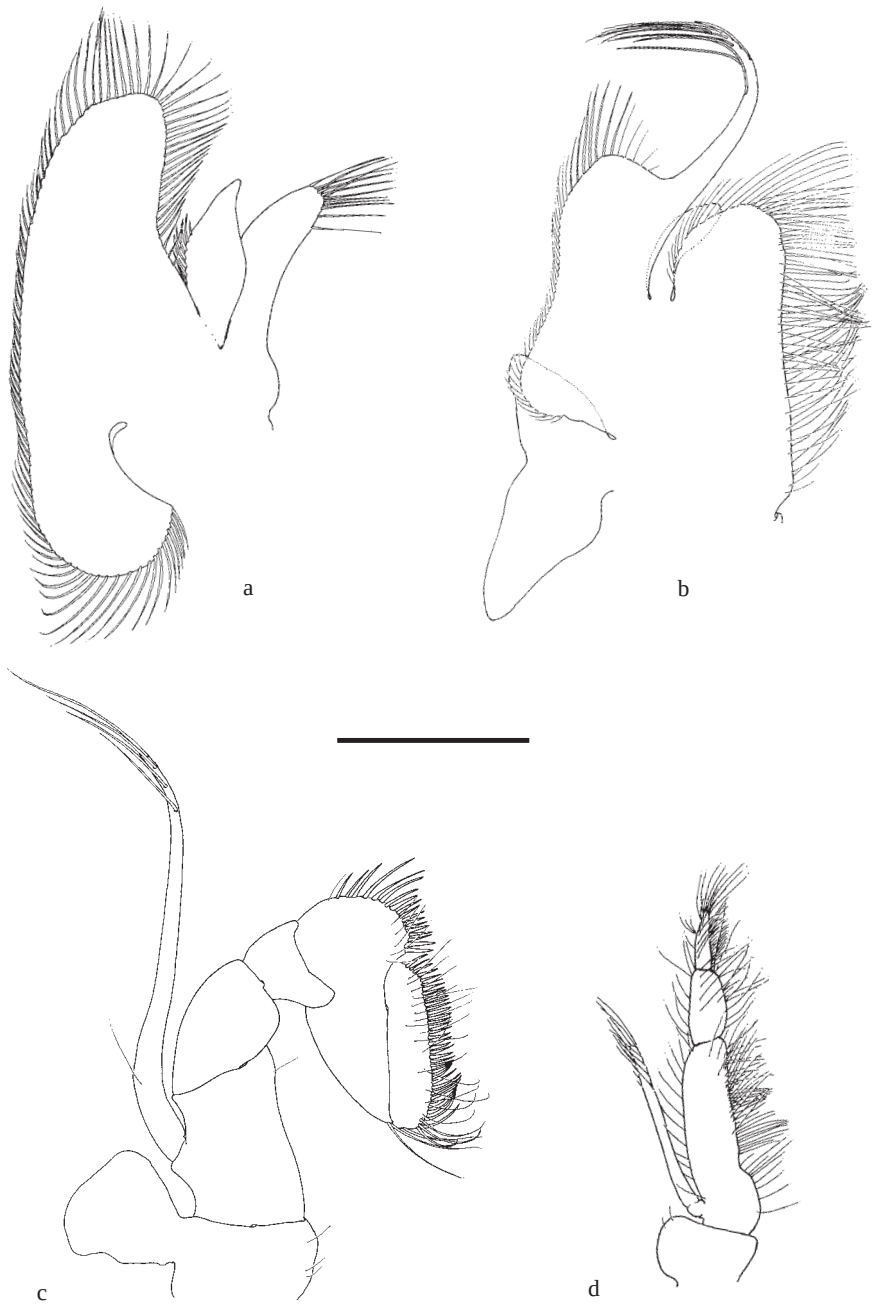


Fig. 38. *Pontonia chimaera* Holthuis, 1951, male holotype, pocl. 3.9 mm, USNM 85390. a, maxilla, ventral view; b, first maxilliped, ventral view; c, second maxilliped, ventral view; d, third maxilliped, ventral view. Scale: a-c = 0.75 mm; d = 1 mm.

longer than central width, unarmed, with few long simple setae along median margin; ischium 0.6 of merus length, medially slightly expanded, with long simple setae medially; basis about 0.5 times ischium length, with long simple setae medially; coxa with small round ventral lobe provided with few long simple setae.

Second pereiopods unequal, similar. Major chela about 1.7 times longer than postorbital carapace length, somewhat compressed, hirsute in distal part, with median margin rounded, entire; dactylus 0.5 times palm length, about 3.6 times longer than deep, with one large simple triangular proximal tooth, distal part entire, slightly concave, tip strongly hooked, without median carina; fixed finger about twice as long as deep, with blunt broad denticulate tooth just proximal of tooth on dactylus separated by notch from blunt triangular tooth just distal of tooth on dactylus, distal part of cutting edge entire, slightly concave, tip strongly hooked; median fossa for reception of dactylar tooth when fingers closed present; carpus short and stout, about 0.35 of palm length, expanding distally, as long as distal width, unarmed; merus as long as carpus, swollen, 1.3 times longer than central width, mediodistally excavate; ischium about as long as merus, tapering proximally, without distinctly produced mediodistal angle; basis and coxa without special features. Minor chela 1.2 times longer than postorbital carapace length, compressed, hirsute in distal part, with median margin rounded, entire; dactylus 0.7 times palm length, about 4.0 times longer than deep, with one small simple triangular proximal tooth, distal part entire, slightly concave, tip hooked; fixed finger about 2.4 times as long as deep, with broad denticulate tooth just proximal of tooth on dactylus separated by shallow notch from small acute triangular tooth just distal of tooth on dactylus, distal part of cutting edge entire, slightly concave, tip hooked; median fossa for reception of dactylar tooth when fingers closed not developed; carpus rather elongate, about 0.75 of palm length, slightly expanding distally, 2.3 times as long as distal width, unarmed; merus 0.7 times as long as carpus, swollen, 1.4 times longer than central width, mediodistally somewhat excavate; ischium slightly shorter than merus, tapering proximally, without distinctly produced mediodistal angle; basis and coxa without special features.

Ambulatory pereiopods rather compact. Dactylus of third pereiopod with corpus somewhat compressed, about 2.1 times longer than proximal width, corpus with few simple setae on dorsal surface, with many simple setae on flexor margin, ventral margin entire; recurved, accessory tooth situated at about 2/3 -3/4 of ventral margin; strongly curved, unguis, about 0.42 of corpus length, with minute serrations on dorsal margin; propodus about 3.8 times longer than dactylus, 5.6 times longer than proximal width, without spines along flexor margin, with two small ventrodistal spines, with many long simple setae on ventral and distal surfaces; carpus about 0.66 times propodus length, about 0.3 times longer than distal width, slightly tapering proximally, unarmed, with few simple setae; merus as long as propodus 3.4 times longer than central width, compressed, with few long simple setae along proximal part of medial margin; ischium about 0.6 of merus length, about 2.4 times longer than distal width, with few simple setae medially; basis and coxa without special features. Fourth and fifth pereiopods similar, shorter, more compact.

Female endopod of first pleopod unknown.

Male first pleopod with endopod about 4.5 times longer than proximal width, tapering distally; median margin slightly concave with row of eight short simple

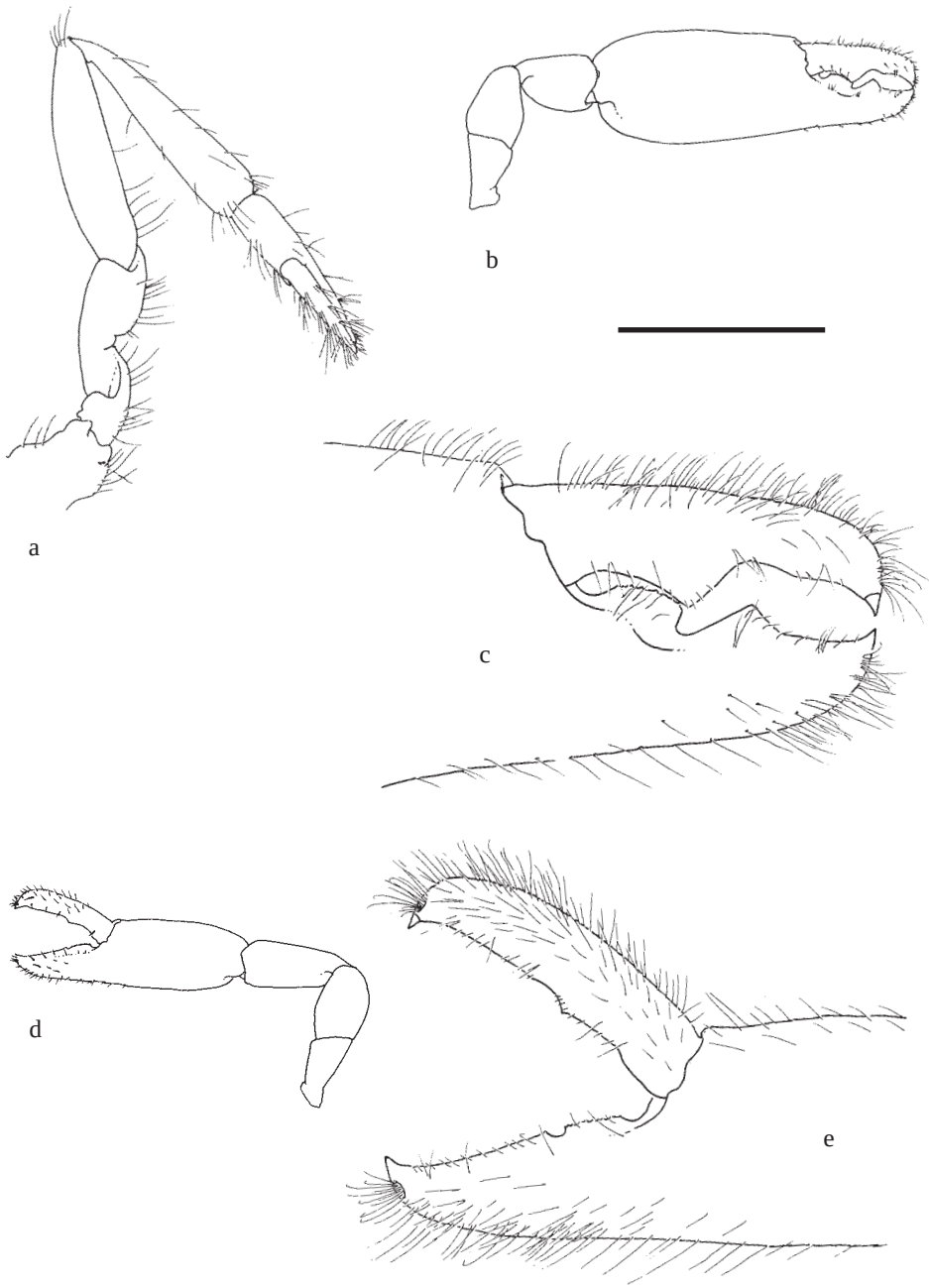


Fig. 39. *Pontonia chimaera* Holthuis, 1951, male holotype, pocl. 3.9 mm, USNM 85390. a, first pereiopod; b, major second pereiopod; c, idem, chela; d, minor second pereiopod; e, idem, chela. Scale: a, c, e = 1.5 mm; b, d = 4 mm.

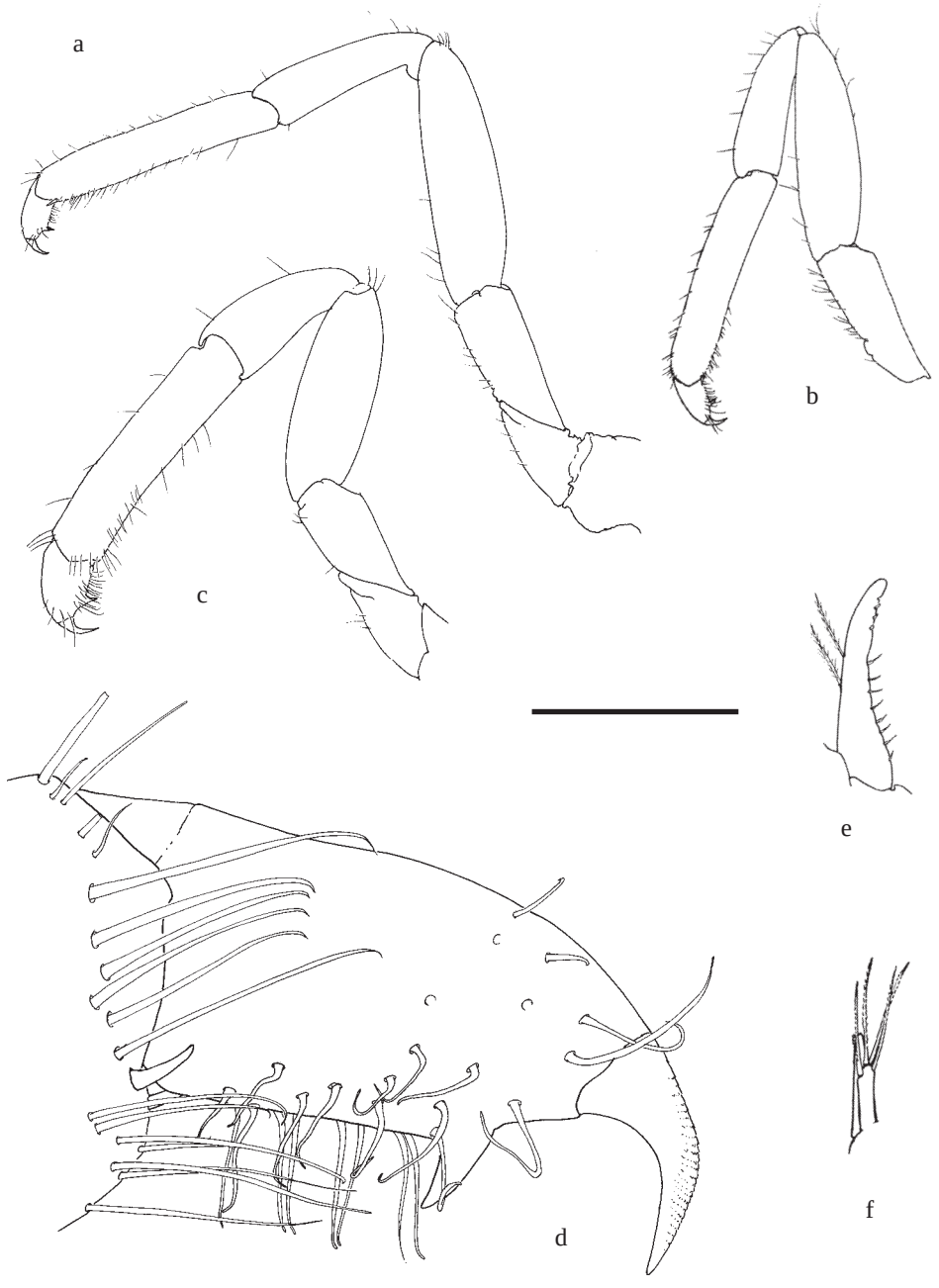


Fig. 40. *Pontonia chimaera* Holthuis, 1951, male holotype, pocl. 3.9 mm, USNM 85390. a, third pereiopod; b, fourth pereiopod; c, fifth pereiopod; d, dactylus third pereiopod; e, endopod male first pleopod; f, appendix interna and appendix masculina on second male pleopod. Scale: a-c = 1.5 mm; d = 0.15 mm; e, f = 0.6 mm.

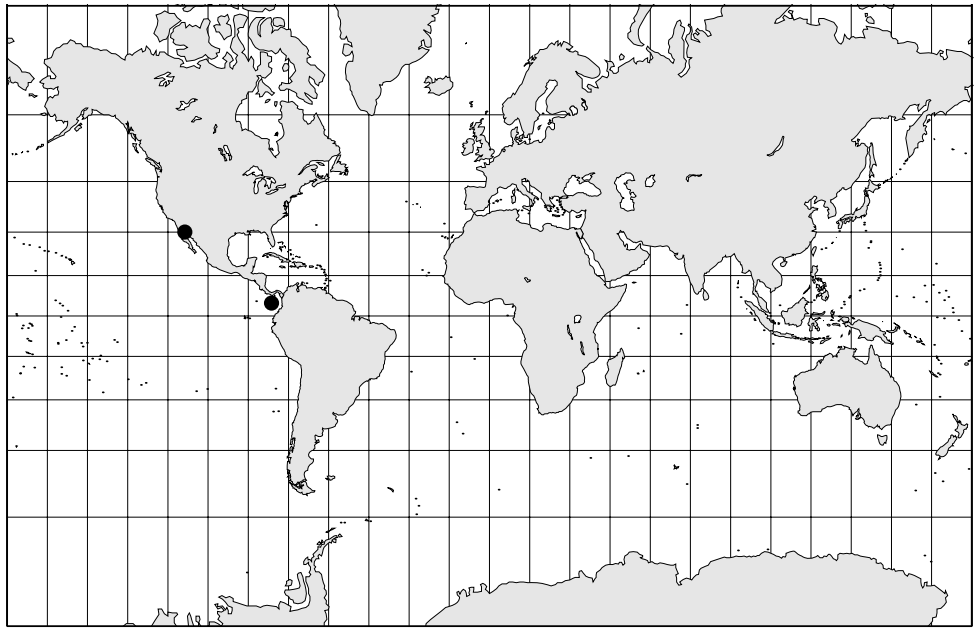


Fig. 41. Geographic distribution of *Pontonia chimaera* Holthuis, 1951.

setae, with few moderately long plumose setae in distal part and along lateral margin. Endopod of second pereiopod with short appendix masculina, equal to about 0.7 times length of appendix interna, with about four setulose setae in distal part.

Eggs unknown.

Size.— The male holotype measures: pocl. 3.9 mm.

Colouration.— Unknown.

Type.— Holotype: USNM Cat. no. 85390, male (total length 12 mm); W of Cocal, north side of Pedro Gonzales Island, Archipielago de las Perlas, Panama; intertidal; 9.iii.1944; in mantle chamber of *Strombus galeatus* Swainson, 1823.

Distribution.— EAST PACIFIC: Panama, Archipielago de las Perlas (Holthuis, 1951a); intertidal; Mexico, Gulf of California, Sonora, Bahía Venetia (Wicksten, 1983).

Host.— *Strombus galeatus* Swainson, 1823 (cf. Holthuis, 1951a); in shell of gastropod (Wicksten, 1983). This is the only pontonid known to live in association with a gastropod.

Remarks.— The material from Mexico is identical with holotype. Species only known from these two records.

8.2.3. *Pontonia domestica* Gibbes, 1850
(figs. 42-50)

Pontonia occidentalis Gibbes, 1848: xvi [nomen nudum].

Pontonia domestica Gibbes, 1850: 196; Kingsley, 1878a: 65; Kingsley, 1878b: 95; Howard, 1883: 294; Brooks & Herrick, 1893: 335, 371; Borradaile, 1898: 389; Kingsley, 1899: 718; Holthuis, 1951a: 122, pl. 38 figs. a-j; Holthuis, 1952: 15; Williams, 1965: 47, fig. 39; Dawson, 1965: 15; Godcharles, 1971:

27; Chace, 1972: 39; Bruce, 1972: 222; Godcharles & Jaap, 1973: 43; Young, 1978: 173; Courney & Couch, 1981: 49, fig. 1; Criales, 1984: 311; Britton & Morton, 1989: 245, 248, 349, fig. 10.2G; Manning & Chace, 1990: 74; Chace & Bruce, 1993: 61; Fransen, 1994b: 111; Strenth & Chace, 1995: ?; d'Udekem d'Acoz, 1996: 144; d'Udekem d'Acoz, 1999: 101.

Conchodytes domesticus; Cary & Spaulding, 1909: 11.

Conchodytes domestica; Rathbun, 1902: 122; ? Borradaile, 1917: 393.

Material.— **ATLANTIC**: **West Atlantic**: **U.S.A. Florida**.— USNM 6989: 2 specimens; Ferguson's Pass; out of *Pinna seminuda* [= *Atrina seminuda* (Lamarck, 1819)]; leg. H. Hemphill.— USNM 77481: 1 specimen; Port St. Joe, Eagle Harbor, Gulf coast; 25.i.1936; in *Pinna* spec.; leg. R.O. Smith.— USNM 53405: 1 male, pocl. 10.6 mm; West Coast of Florida, Caxambas; 12.ii.1919; leg. G. Mott.— USNM 89031: 1 specimen; off East Coast of Florida, 29°59'N 80°31'W; depth 23 fms.; try net; 27.iii.1940; "Pelican" station 201-2.— USNM 119501: 2 ovigerous females; Pensacola Beach; at beach; in *Atrina serrata* (Sowerby, 1825); leg. Pensacola Jr. & J.K. Haburay.— USNM 18064: 1 male, 1 ovigerous female; Pensacola beach; 14.ix.1979; in *Atrina rigida* (Lightfoot, 1786); leg. Couch & Courtney.— **U.S.A., Louisiana**.— USNM 107802: 1 non-ovigerous female; South of Houma; leg. H.Whitten, station H. 17; received from H. Whitten at 23.vi.1959.— USNM 187081: 1 specimen; South Timbalier Lease Area, 23 miles from shore, 500 m N of platform, 28°40'02"N 90°14'43"W; depth 32 m; 30 ft otter trawl; 29.v.1978.— USNM 33108: 1 specimen; St. Bernard Parish, Chandeleur Islands; leg. L.R. Cary.— **U.S.A., Texas**.— USNM 169538: 1 male, pocl. 7.6 mm; 1 non-ovigerous female, pocl. 8.3 mm; South Padre Island; 20.vi.1976; in *Atrina seminuda* (Lamarck, 1819); leg. N.E. Strenth (Strenth & Chace, 1995).

Description.— Body subcylindrical, somewhat depressed. Carapace smooth. Rostrum well developed, with anterior border ending in sharp point, reaching halfway second segment of antennular peduncle in adult male and female, triangular in dorsal view, without dorsal carina, with ventral carina in distal part; subdistal dorsal tooth very small, with few long simple setae in front; subdistal ventral tooth present, situated well in front of level of dorsal subdistal tooth; sometimes ventral tooth absent; ventral border straight. Inferior orbital angle produced, angular. Antennal spine well-developed, situated well below level of inferior orbital angle, as long as produced anterolateral margin, separated from inferior orbital angle by notch. Anterolateral margin of carapace produced, broadly rounded.

Abdomen smooth; sixth segment about 1.3 times longer than fifth, 1.3 times wider than long, posterolateral angle acutely produced, posteroventral angle spiniform; pleura of first five segments broadly rounded.

Telson about 1.4 times as long as sixth abdominal segment, almost twice as long as its proximal width; lateral margins convex, convergent; posterior border without median process; two pairs of minute dorsal spines at about 0.50 and 0.90 of the telson length, marginal; posterior margin with three pairs of spines, lateral spines minute, marginal, intermediate and submedian spines larger than lateral spines, about 0.10 times telson length.

Eyestalk about as long as wide, cylindrical, somewhat swollen; stalk slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella well developed. Basal segment without distolateral tooth, distal margin not developed; medioventral spine very small or absent, if present submarginal, situated halfway basal segment; stylocerite short, more than half length of basal segment, with distal tip blunt, lateral margin without plumose setae. Intermediate segment about as long as wide. Distal segment slightly longer than wide. Upper flagellum well developed, biramous, with seven to ten proxi-

mal segments fused; short free ramus with two or three segments; longer free ramus with about ten segments. Lower flagellum with about 10-20 segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite short reaching 2/3 of lamella of scaphocerite, slender, about 3.0 times longer than distal width; flagellum

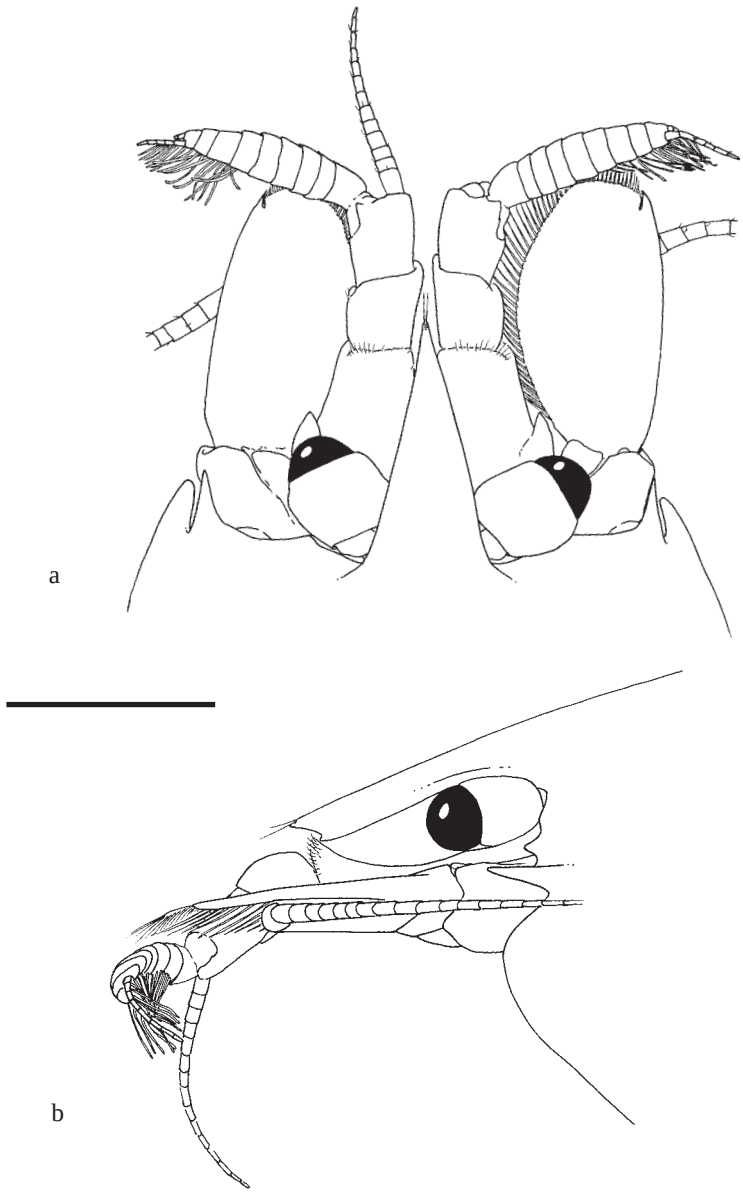


Fig. 42. *Pontonia domestica* Gibbes, 1850, non-ovigerous female, pocl. 8.3 mm, USNM 169538. a, anterior appendages, dorsal view; b anterior appendages, lateral view. Scale = 2 mm.

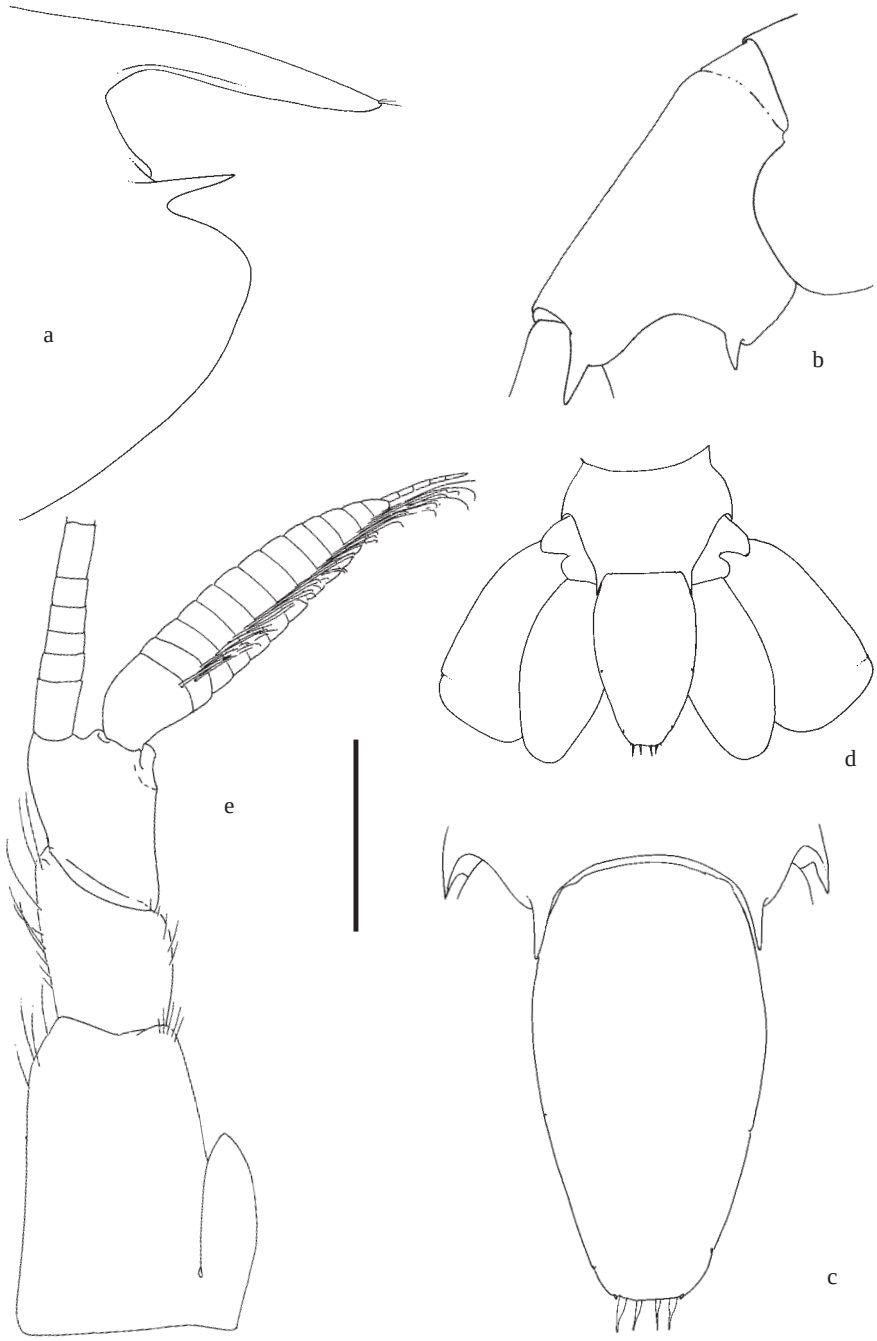


Fig. 43. *Pontonia domestica* Gibbes, 1850: male, pocl. 10.6 mm, USNM 53405. a, rostrum, lateral view; b, distal part abdomen, lateral view; c, telson, dorsal view; d, telson and uropods; e, antennula, ventral view. Scale: a-c = 2 mm; d = 4 mm; e = 1.5 mm.

short, slender, about 0.7 of postorbital carapace length; scaphocerite with lamella about 1.6 times as long as central width, anterior margin truncate, medial margin convex, lateral margin almost straight, with small distolateral tooth, about 0.05 of length of lamina, not reaching distal margin of lamella, incision between distolateral tooth and lamella indistinct.

Epistome with blunt anterior median carina; labrum large, oval.

Paragnath well developed, alae with large transverse rectangular distal lobes, and with more or less triangular submedian ventral lobes; corpus rather long, with median groove, bordered laterally by parallel submedian setose carinae.

Second thoracic sternite formed into broad, well-develloped, triangular, medially rounded process between second maxillipeds, with some setae medially.

Third thoracic sternite with low lateral carinae posteromedian of third maxillipeds.

Fourth thoracic sternite with low indistinct lateral carinae posteromedial of first pereiopods; with low transverse ridge between first pereiopods.

Fifth thoracic sternite with low lateral plates posteromedial of second pereiopods, with very broad medial excavation in between.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process slender, with four distal teeth in right mandible and five distal teeth in left mandible; with row of about six small teeth present on medioventral border; molar process robust, with four blunt distal teeth, some fringed with setal brushes.

Maxillula with upper lacinia broad with two rows of about 12 serrulate spines and many long slender setae medially, inner medial surface with several long simple setae; lower lacinia very broad, densely setose distoventrally and marginally, no differentiation in setae; palp bilobed, larger lobe with small ventral tubercle with single short recurved simple setae.

Maxilla with basal endite well developed, indistinctly bilobed; distal lobe well developed, with long slender minutely serrulate setae along distomedian border; proximal lobe indistinct, distomedian border with long slender minutely serrulate setae; coxal endite obsolete, median margin convex, without setae; scaphognathite large, 2.8 times longer than wide, posterior lobe large, 1.6 times longer than anterior width, anterior lobe 1.3 times longer than proximal width; palp simple, about as long as distal lobe of basal endite, strongly expanded proximally, tapered distally to rather acute tip, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite completely fused, large and broad, fringed with many simple, long and finely serrulate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod well developed, flagellum with about ten long, plumose setae distally; caridean lobe large, elongate, rather broad; epipod large, triangular, faintly bilobed; palp simple, slender, elongate, curved along distolateral margin of basal endite, non-setose.

Second maxilliped with endopod normally developed; dactylar segment narrow, 5.5 times longer than broad, densely fringed with coarsely serrulate, spiniform, and long curled finely serrulate setae medially; propodal segment with row of very long slender spines and simple and finely serrulate setae along small, expanded distomedial margin, with few finely serrulate setae in distal part of ventrolateral margin; carpal

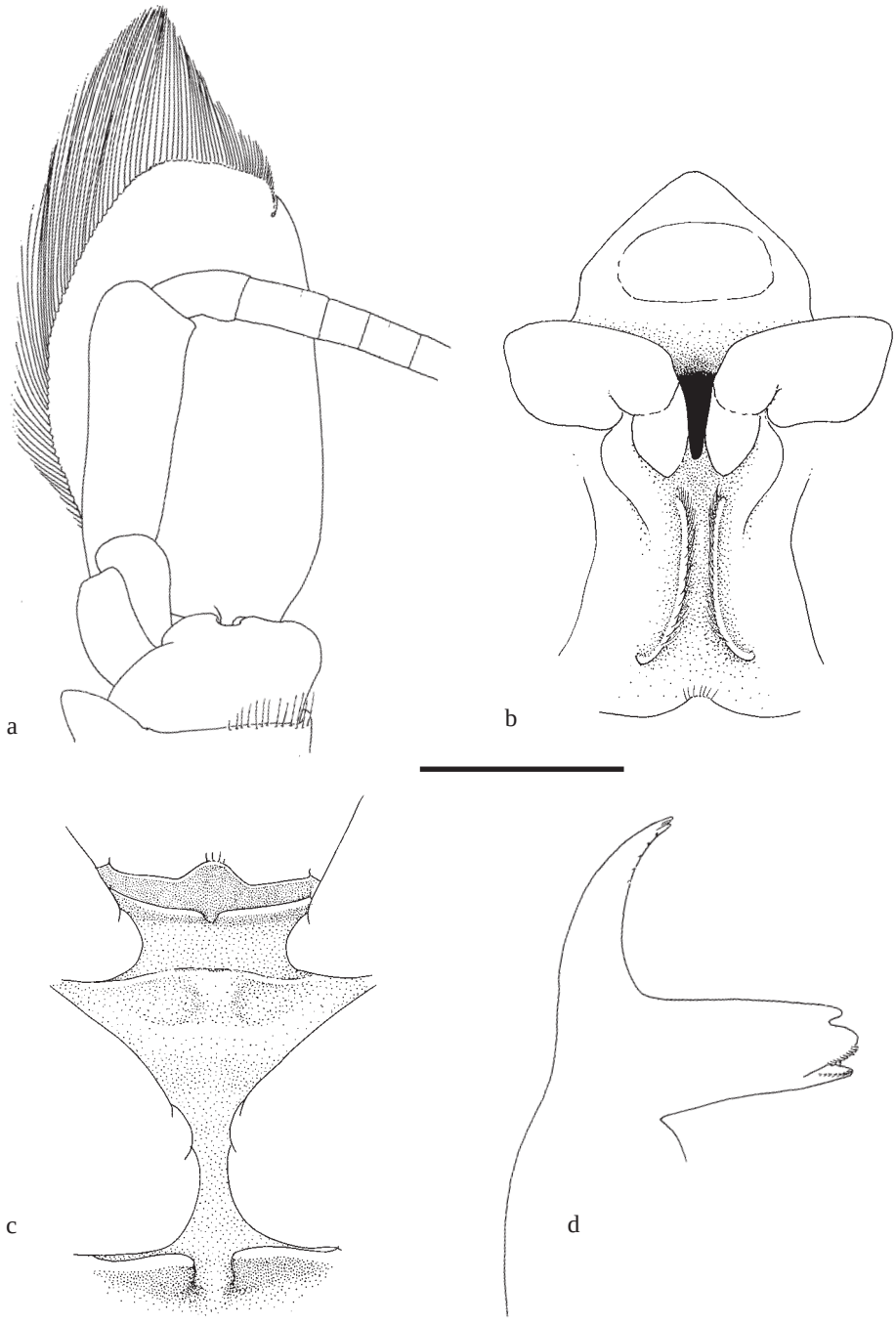


Fig. 44. *Pontonia domestica* Gibbes, 1850: male, pocl. 10.6 mm, USNM 53405. a, antenna, ventral view; b, paragnath, ventral view; c, second to fifth thoracic sternites; d, mandible, ventral view. Scale: a, d = 1.5 mm; b, c = 2 mm.

segment short, broader than long, unarmed; meral segment with row of long plumose setae medially, medially excavate; basal and ischial segment fused, both segments strongly excavate medially, with row of long plumose setae medially; basal segment with indistinct angular process medially; exopod normal, with many long plumose setae in distal fourth; coxal segment medially slightly produced, non-setose, with triangular epipod laterally.

Third maxilliped reaching with ultimate segment to distal margin of carpocerite; ischiomerus almost completely fused with basis, but with distinct suture, almost twice as long as broad, tapering distally, flattened, with many setae on median margin, few setae on ventral surface, lateral margin with single row of rather short plumose setae; basal segment medially convex, with many long finely serrulate setae on medial margin; exopod well developed, reaching halfway penultimate segment, with long plumose setae in distal fifth; coxa without medial process, with large lateral plate fringed with long simple setae, with small arthrobranch without distinct filaments; penultimate segment about 1.8 times longer than central width, about 2/3rd of ischiomeral length, medially expanded, flattened, with long finely serrulate setae along ventromedial and ventrolateral margins; ultimate segment slightly shorter than penultimate segment, tapering distally, with long finely and shorter, more coarsely serrulate setae along ventromedial, ventrolateral and distal margins.

First pereiopods slender exceeding carpocerite by chela and carpus. Chela about 3.5 times longer than deep, subcylindrical, slightly compressed; fingers longer than palm, with entire cutting edges, with groups of many strong, long, serrulate setae, tips acute, somewhat hooked; cleaning organ present on carpal-propodal joint; carpus about 1.6 times as long as chela, about 5.5 times longer than distal width, somewhat tapering proximally, unarmed, with few long simple setae; merus as long as carpus, 5.5 times longer than central width, unarmed, with few long simple setae along proximal part of median margin; ischium 0.6 times as long as merus, medially slightly expanded, with long simple setae medially; basis 0.6 of ischium length, with long simple setae medially; coxa with strongly developed, rounded, ventral lobe with long simple setae.

Second pereiopods similar in form, subequal in size. Major cheliped about 1.6 times postorbital carapace length in adult male and female, subcylindrical in proximal part, strongly compressed distally, with entire median carina in distal 2/3rds, smooth, with very few setae in distal part; dactylus about 0.5 times palm length, about 3.5 times longer than deep, with large simple triangular proximal tooth, distal part of cutting edge entire, concave, tip strongly hooked, with strongly developed median carina; fixed finger about 1.9 times longer than deep, with blunt, denticulate tooth just proximal of tooth on dactylus, separated from blunt triangular tooth just distal of dactylar tooth by deep notch, distal part of cutting edge entire, concave, tip strongly hooked, median fossa for reception of dactylar tooth when fingers closed indistinct; carpus short and stout about 0.37 of palm length, expanding distally, slightly longer than distal width, unarmed; merus about 1.2 times as long as carpus, about 1.6 times longer than central width, distomedially excavate; ischium almost as long as merus, strongly tapering proximally; basis and coxa without special features. Minor cheliped as major cheliped, about 1.5 times postorbital carapace length in both male and female; with palm subcylindrical in proximal part, strongly compressed in distal 2/3rd, with entire

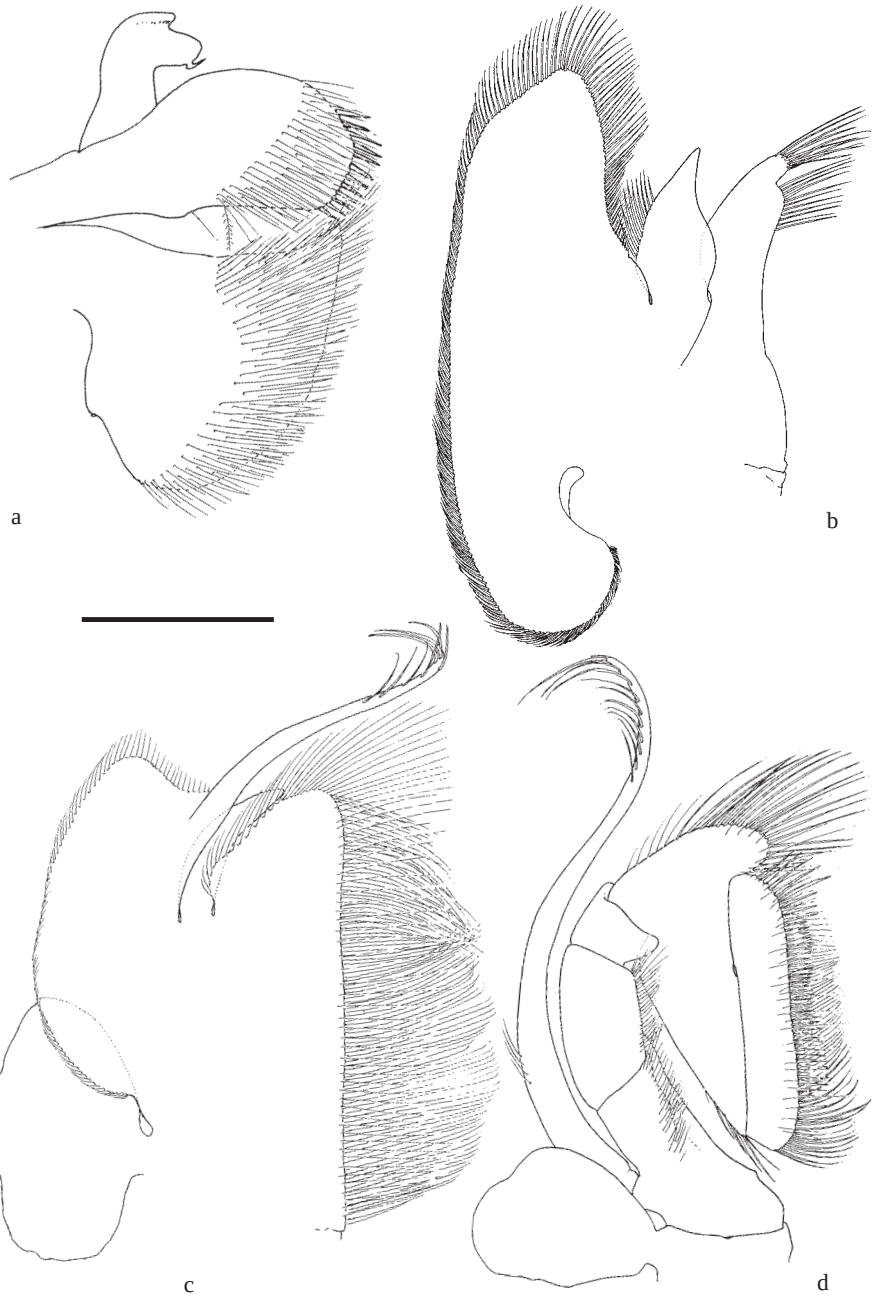


Fig. 45. *Pontonia domestica* Gibbes, 1850: male, pocl. 10.6 mm, USNM 53405. a, maxillula, ventral view; b, maxilla, ventral view; c, first maxilliped, ventral view; d, second maxilliped, ventral view. Scale: a = 1.5 mm; b-d = 1.9 mm.

Fig. 46. *Pontonia domestica* Gibbes, 1850: male, pocl. 10.6 mm, USNM 53405. a, third maxilliped, ventral view; b, first pereiopod. Scale: a = 1.9 mm; b = 2 mm.

median carina in distal 2/3rd, smooth, with few setae in distal part; fingers about 0.65 times palm length; teeth situated more proximally than in major cheliped.

Ambulatory pereiopods rather robust. Dactylus of third pereiopod slightly compressed ventrally, with corpus about as long as proximal width, with few simple setae on distal and ventral margins, accessory tooth well developed, acute, recurved, preterminal, ventral margin entire, slightly convex; unguis large, slender, acute, strongly recurved, about third of corpus length; propodus about 5.0 times longer than dactylus, about 4.5 times longer than proximal width, with one distoventral small spine, with few distoventral simple setae; carpus 0.6 of propodus length, 2.6 times longer than distal width, slightly tapering proximally, with indistinct distal lobe,

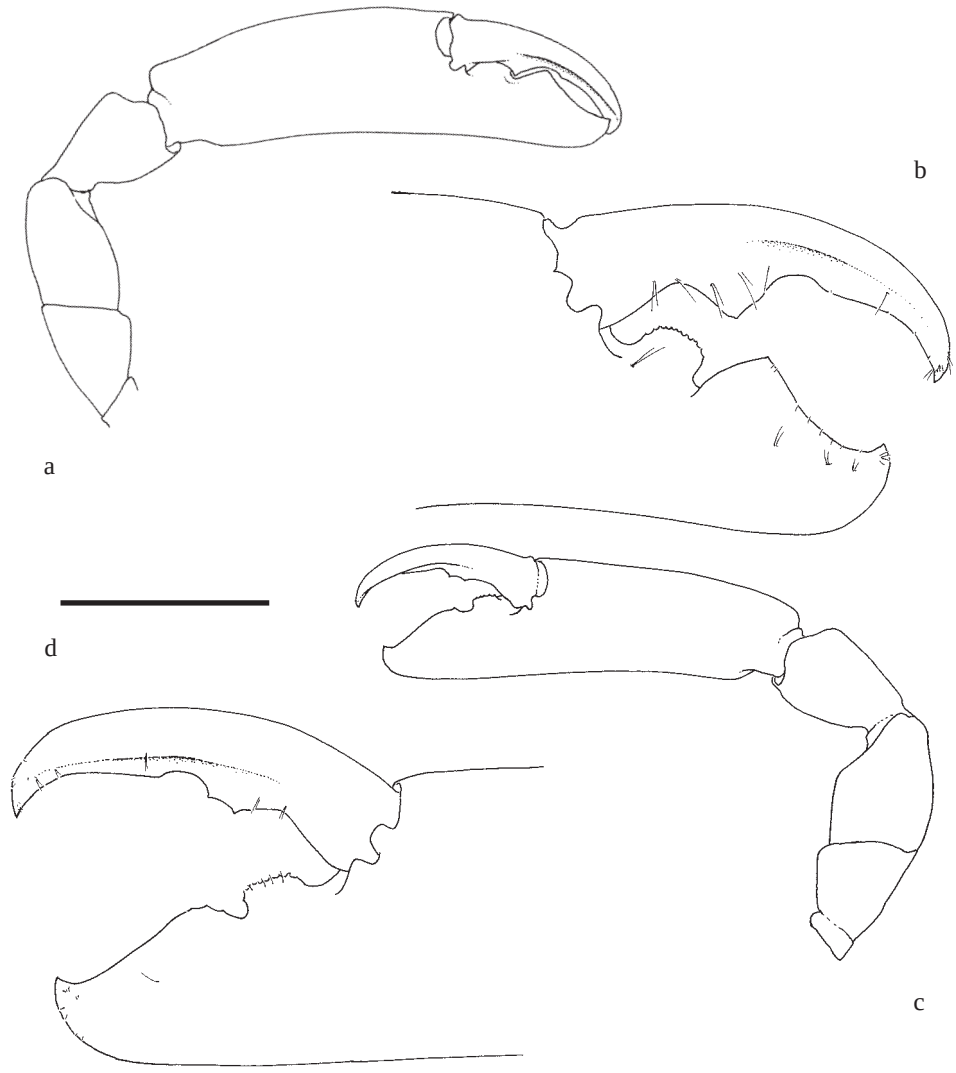


Fig. 47. *Pontonia domestica* Gibbes, 1850: male, pocl. 10.6 mm, USNM 53405. a, major second pereiopod; b, idem, chela; c, minor second pereiopod; d, idem, chela. Scale: a, c = 8 mm; b, d = 4 mm.

unarmed; merus slightly longer than propodus, about 4.3 times longer than central width, cylindrical, non-setose, unarmed; ischium about 0.63 of merus length, 2.8 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopods similar.

Male first pleopod with endopod about four times longer than proximal width, tapering distally; median margin straight with row of many short simple setae, with moderately long plumose setae along lateral margin, distal margin non-setose.

Endopod of second pereiopod with short appendix masculina, equal to about 0.7

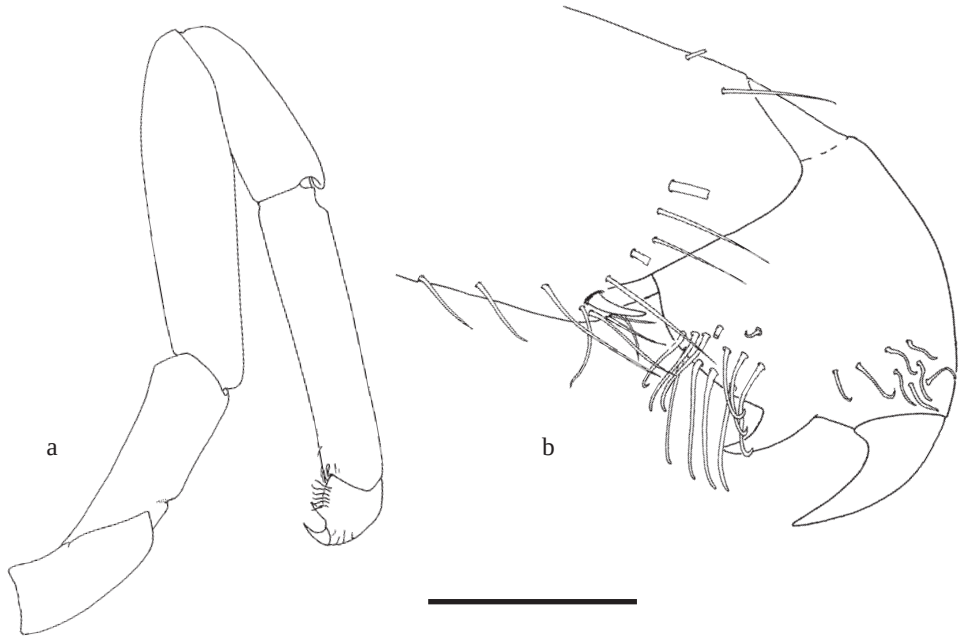


Fig. 48. *Pontonia domestica* Gibbes, 1850: male, pocl. 10.6 mm, USNM 53405.; a, third pereiopod; b, dactylus third pereiopod. Scale: a = 2 mm; b = 0.6 mm.

times length of appendix interna, with several rows of setulose setae in distal half.

First pleopod of female with slender endopod, about third length of exopod, with many long distal setae when female ovigerous, with row of long plumose setae on lateral margin and few simple setae in proximal part of medial margin.

Uropods with short stout unarmed protopodite; exopod broad, about 1.7 times as long as wide, with straight lateral margin, without distolateral tooth, with small distolateral spine, distal lamina truncate, almost straight; endopod slightly longer than exopod, about twice as long as wide, just extending beyond telson.

Ovigerous females carrying about 400-800 eggs. Egg-size about 0.6 mm.

Size.— Maximum total length in males 30.4 mm, in females 32.8 mm.

Colouration.— Translucent white (Williams, 1965).

Types.— Holotype, if extant, should be in the Charleston Museum, U.S.A. The type locality is “South Carolina”.

Distribution.— ATLANTIC: West Atlantic: U.S.A, South Carolina (Gibbes, 1848, 1850; Howard, 1883; Williams, 1965); Bahamas (Kingsley, 1878; Rathbun, 1902); Florida (Kingsley, 1878; Courtney & Couch, 1981); Chandeleur Islands, Louisiana (Cary & Spaulding, 1909); South Padre Islands, Texas, Gulf of Mexico (Strenth & Chace, 1995); Colombia, Concha Bay, depth 10 m (Criales, 1984).— East Atlantic: ? Madeira, Porto Santo (Borradaile, 1917).

Host.— *Atrina seminuda* (Lamarck, 1819) (cf. Gibbes, 1850; Holthuis, 1951a;

Fig. 49. *Pontonia domestica* Gibbes, 1850: male, pocl. 10.6 mm, USNM 53405. a, endopod female first pleopod; b, endopod male first pleopod; c, appendix interna and appendix masculina on second male pleopod. Scale: a, c = 0.6 mm; b = 1.5 mm.

Williams, 1965; Criales, 1984, Strenth & Chace, 1995); *Pinna muricata* Linnaeus, 1758 (cf. Gibbes, 1850; Cary & Spaulding, 1909); *Atrina rigida* (Lightfoot, 1786) (cf. Courtney & Couch, 1981); ? *Pecten* spec. (cf. Borradaile, 1917); *Atrina serrata* (Sowerby, 1825)(cf. Williams, 1965); *Pinna* spec. (cf. Rathbun, 1902; Holthuis, 1951a).

Courtney & Couch (1981) studied the association between the shrimp and the pen shell *Atrina rigida*. They found 86 shrimps in a total of 60 pen shells. 85% of the shells harbored shrimps: 37.2% one shrimp only, 56.9% two shrimps, and 5.9% three

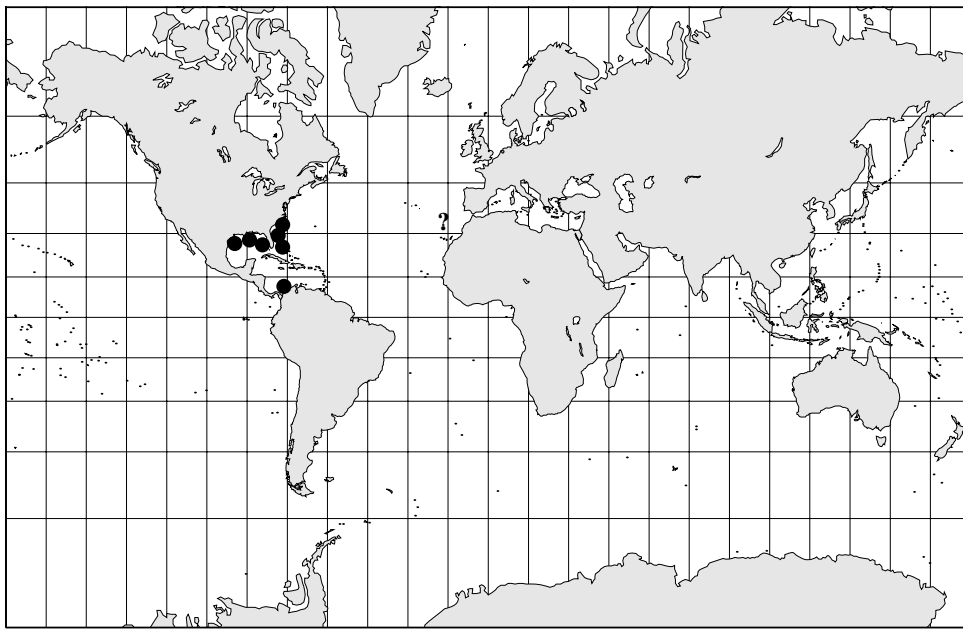


Fig. 50. Geographic distribution of *Pontonia domestica* Gibbes, 1850.

shrimps. In the case two shrimps were present then 93.1% were male/female pairs, when of the same sex they were both females. Courtney & Couch (1981) found that the majority of male shrimps were located in the shell cavity and periphery of the mantle cavity. Non ovigerous females were evenly distributed between shell cavity and branchial chamber, whereas ovigerous females showed preference for the branchial chamber, nested between the gill filaments.

Remarks.— Holthuis (1951: 125) writes: 'Gibbes (1848) in Tuomey's Geology of South Carolina gives a list of the Crustacea of that state. In this list he includes *Pontonia occidentalis*, without any description or remark. As, however, no other species of *Pontonia* is known from South Carolina and Gibbes himself is the author of the present species, it is certain that *Pontonia occidentalis* and *Pontonia domestica* belong to one species and that Gibbes changed his mind after 1848 in connection with the name he liked to give to the species.' Although another species of *Pontonia* (*P. manningi* Fransen, 2000) has been found along the coast of North Carolina it still remains most plausible that the specimens found by Gibbes are conspecific with later records of specimens referred to as *P. domestica* as they are associated with the same mollusk host genus *Atrina*, whereas *P. manningi* is associated with mollusks of the genera *Spondylus, Argopecten, Pteria* and *Chlamys*.

The identity of the specimen found in *Pecten* spec. from Porto Santo, Madeira by Borradaile, 1917 remains unclear. As all other records of the species are from *Pinna* and *Atrina* hosts, this *Pecten* associated specimen might well be an other species, possibly *P. manningi*. The specimen is not present anymore in The Natural History Museum, London (M. Lowe, pers. comm.).

The specimen described and figured by Holthuis (USNM 53405) is devoid of a

medioventral tooth on the basal segment of the antennular peduncle. In all other specimens at my disposal, however, a small tooth is present.

In the male specimen from Caxambas, Florida (USNM 53405) the ventral subdistal rostral tooth is absent.

8.2.4. *Pontonia longispina* Holthuis, 1951
(figs. 51-57)

Pontonia longispina Holthuis, 1951a: 128, pl. 40 figs. a-j; Holthuis, 1952: 15; Brusca, 1973: 213; Brusca, 1980: 250, fig. 14.6; Wicksten, 1983: 18; Rodriguez de la Cruz, 1987: 28; Müller, 1993: 123; Chace & Bruce, 1993: 61; Wicksten & Hernández, 2000: 97.

Material.— **EAST PACIFIC**.— AHF 402: ovigerous female holotype, pocl. 4.7 mm; Lower California, **Mexico**, Angel de la Guardia Island, Puerto Refugio; 27.i.1940; shore, rocky reef; Allan Hancock Expedition sta. 1049-40.— AHF 1092-40: non-ovigerous female paratype, only mouthparts and appendages; Mexico, Sonora, Bahia Catalina off Guaymas; 9.ii.1940; shore, shingle; Allan Hancock Expedition sta. 1092-40.

Description.— Body subcylindrical, somewhat depressed. Carapace smooth. Rostrum well developed, distally ending in sharp point, reaching about middle of second segment of antennular peduncle, slender, without dorsal carina, with ventral carina in distal part; subdistal dorsal tooth with few long setae in front; subdistal ventral tooth slightly posterior of level of subdistal tooth; ventral border straight. Inferior orbital angle produced, angular. Antennal spine well-developed, reaching beyond produced anterolateral margin of carapace, situated well below level of inferior orbital angle, separated from inferior orbital angle by notch. Anterolateral margin of carapace slightly produced, broadly rounded.

Abdomen smooth; sixth segment about 1.4 times longer than fifth, 1.4 times wider than long, posterolateral angle acutely produced, posteroventral angle spiniform; pleura of first five segments broadly rounded.

Telson about 1.7 times as long as sixth abdominal segment, twice as long as its proximal width; lateral margins convex, convergent; posterior border without median process; two pairs of large dorsal spines at about 0.33 and 0.55 of the telson length, marginal, about 0.33 of telson length; posterior margin with three pairs of spines, lateral spines rather small, about 0.05 of telson length, marginal, intermediate and submedian spines larger than lateral spines, about 1.3 times telson length (right marginal spine missing in holotype).

Eyestalk about as long as wide, cylindrical, posteriorly somewhat swollen; stalk slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella well developed. Basal segment with small distolateral tooth, distal margin slightly convex; medioventral tooth very small, submarginal, situated halfway basal segment; stylocerite short, half length of basal segment, with distal acute tip, lateral margin without plumose setae. Intermediate segment slightly longer than wide. Distal segment about as long as wide. Upper flagellum well developed, biramous, with six proximal segments fused; short free ramus one-segmented; longer free ramus with about five segments. Lower flagellum with 10-12 segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite short reaching 2/3 of

lamella of scaphocerite, moderately stout, about 2.9 times longer than distal width; flagellum broken in holotype; scaphocerite with lamella about 2.0 times as long as central width, anterior margin truncate, medial margin convex, lateral margin slightly convex with small, distolateral tooth, about 0.05 times length of lamina, not reaching anterior margin of lamella; incision between distolateral tooth and lamina indistinct.

Epistome with blunt anterior median carina; labrum large, oval.

Paragnath well developed, alae with large subcircular distal lobes, slightly excavate medially, and small oval ventromedial lobes; corpus moderately long, narrow, with median groove, bordered laterally by parallel submedian setose carinae.

Second thoracic sternite formed into a well developed, triangularly rounded protrusion between second maxillipeds, without setae medially.

Third thoracic sternite with low lateral carina with median shallow notch posteromedian of third maxillipeds.

Fourth thoracic sternite with low lateral carinae posteromedial of first pereiopods; with median triangular protrusion between first pereiopods.

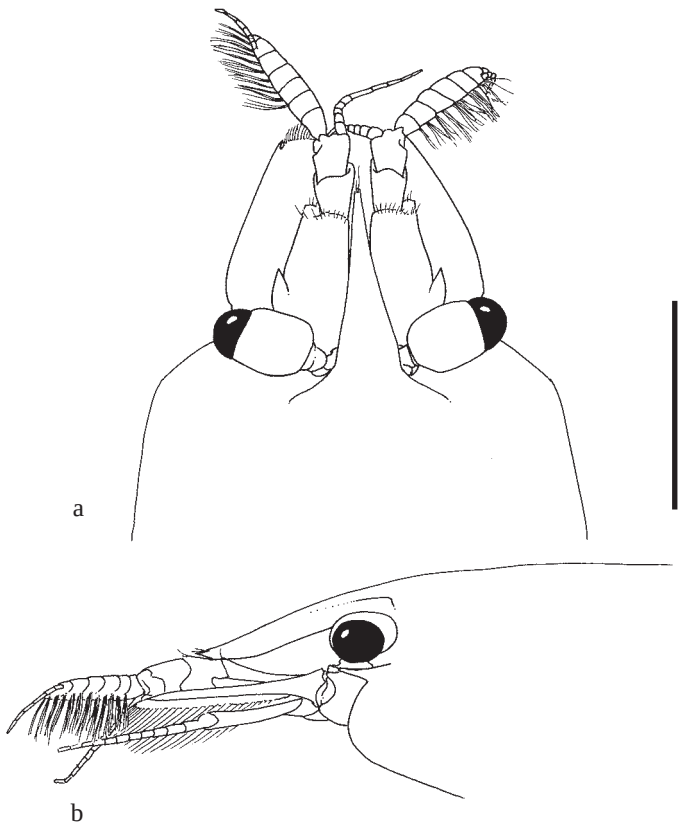


Fig. 51. *Pontonia longispina* Holthuis, 1951: ovigerous female holotype, pocl. 4.7 mm, AHF 402. a, anterior appendages, dorsal view; b, anterior appendages, lateral view. Scale = 2 mm.

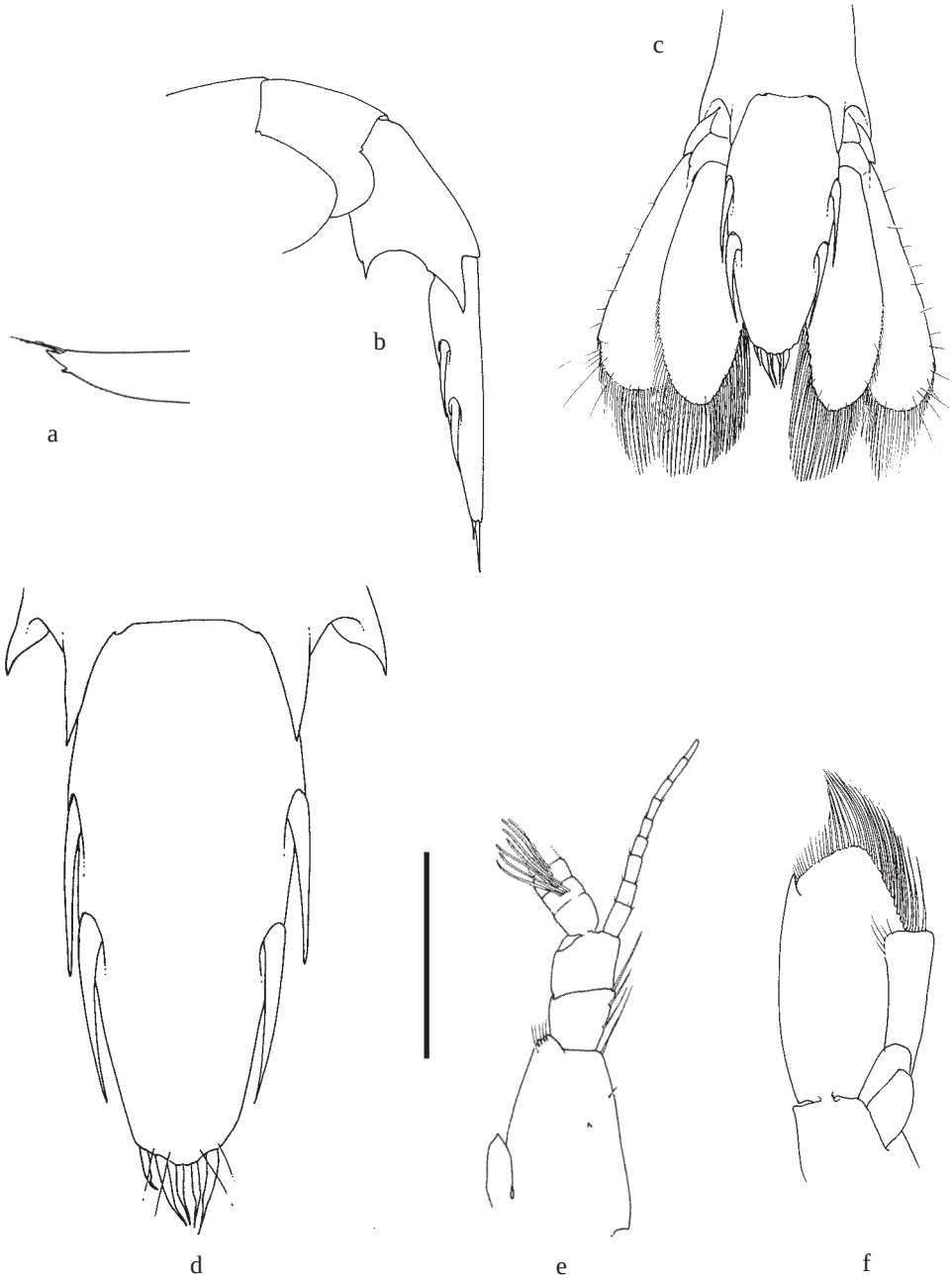


Fig. 52. *Pontonia longispina* Holthuis, 1951: ovigerous female holotype, pocl. 4.7 mm, AHF 402. a, rostrum, lateral view; b, distal part abdomen, lateral view; c, telson and uropods, dorsal view; d, telson, dorsal view; e, antennula, ventral view; f, antenna, ventral view. Scale: a = 1 mm; b, c = 2 mm; d = 4 mm; e, f = 1.5 mm.

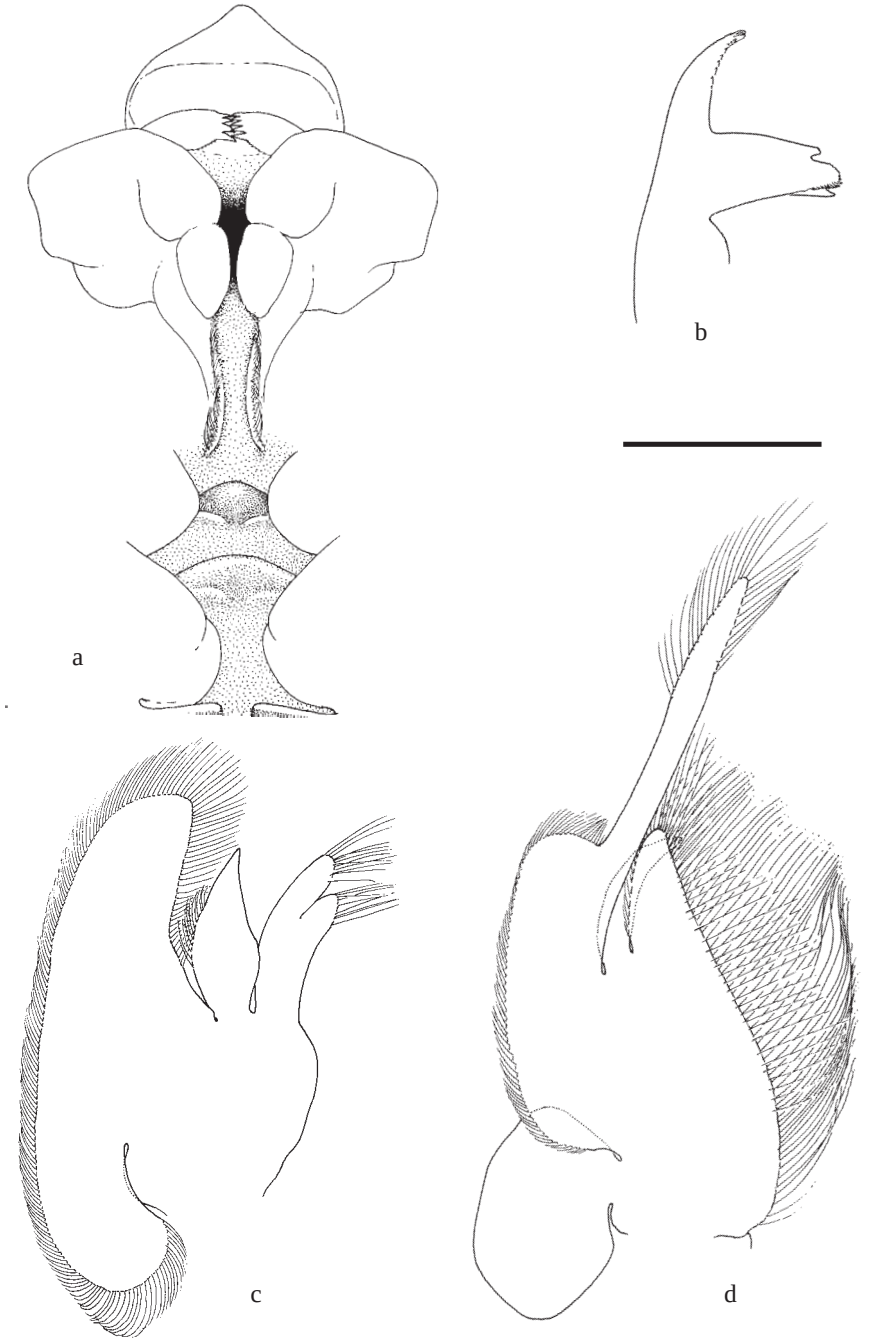


Fig. 53. *Pontonia longispina* Holthuis, 1951: ovigerous female holotype, pocl. 4.7 mm, AHF 402. a, paragnath to fifth thoracic sternite, ventral view; b, mandible, ventral view; c, maxilla, ventral view; d, first maxilliped, ventral view. Scale: a = 1 mm; b-d = 1.5 mm.

Fifth thoracic sternite with well developed lateral plates posteromedial of second pereiopods, with broad median notch.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process slender, with three (paratype) or five (holotype) distal teeth on right mandible, and four (holotype) on left mandible, both mandibles with row of about eigth small teeth on medioventral border; molar process robust, with four blunt distal teeth, some fringed with setal brushes.

Maxillula with upper lacinia broad with two rows of about 13 serrulate spines and many long slender setae medially, inner medial surface with several long simple setae; lower lacinia very broad, densely setose distoventrally and marginally, no differentiation in setae; palp bilobed, larger lobe with small ventral tubercle with single short recurved simple setae.

Maxilla with basal endite well developed, distinctly bilobed; distal lobe longer than proximal lobe, both with long slender minutely serrulate setae along distomedian border; coxal endite obsolete, median margin convex without setae; scaphognathite large, 3.0 times longer than wide, posterior lobe large, 1.7 times longer than anterior width, anterior lobe 1.3 times longer than proximal width; palp simple, about as long as distal lobe of basal endite, strongly expanded proximally, tapered distally to rather acute tip, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite completely fused, large and broad, fringed with many simple, long and finely serrulate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod well developed, flagellum with many long plumose setae in distal half; caridean lobe large, elongate, rather broad; epipod large, triangular, faintly bilobed; palp simple, slender, elongate, curved along distolateral margin of basal endite, non-setose.

Second maxilliped with endopod normally developed; dactylar segment narrow, 4.2 times longer than broad, densely fringed with coarsely serrulate, spiniform, and long curled finely serrulate setae medially; propodal segment with row of very long slender spines and simple and finely serrulate setae along rather broad, expanded distomedial margin, with row of finely serrulate setae along entire ventrolateral margin; carpal segment short, broader than long, unarmed; meral segment with row of long plumose setae medially, medially excavate; basal and ischial segment fused, both segments strongly excavate medially, with row of long plumose setae medially; exopod normal, with many long plumose setae in distal fourth; coxal segment medially slightly produced, non-setose, with triangular epipod laterally.

Third maxilliped reaching with ultimate segment to distal margin of carpocerite; ischiomerus almost completely fused with basis, but with distinct suture, more than three times longer than broad, tapering distally, flattened, with many setae on median margin, many setae in proximomedial part of ventral surface, lateral margin with single row of moderately long plumose setae; basal segment medially convex, with few long finely serrulate setae along median margin; exopod well developed, reaching just beyond distal margin of ischiomerus, with long plumose setae in distal half; coxa without medial process, with large lateral plate fringed with short simple setae, with small arthrobranch; penultimate segment about twice as long as central width, about half of ischiomeral length, medially expanded, flattened, with long finely serrulate setae along ventromedial and ventrolateral margins; ultimate segment slightly shorter

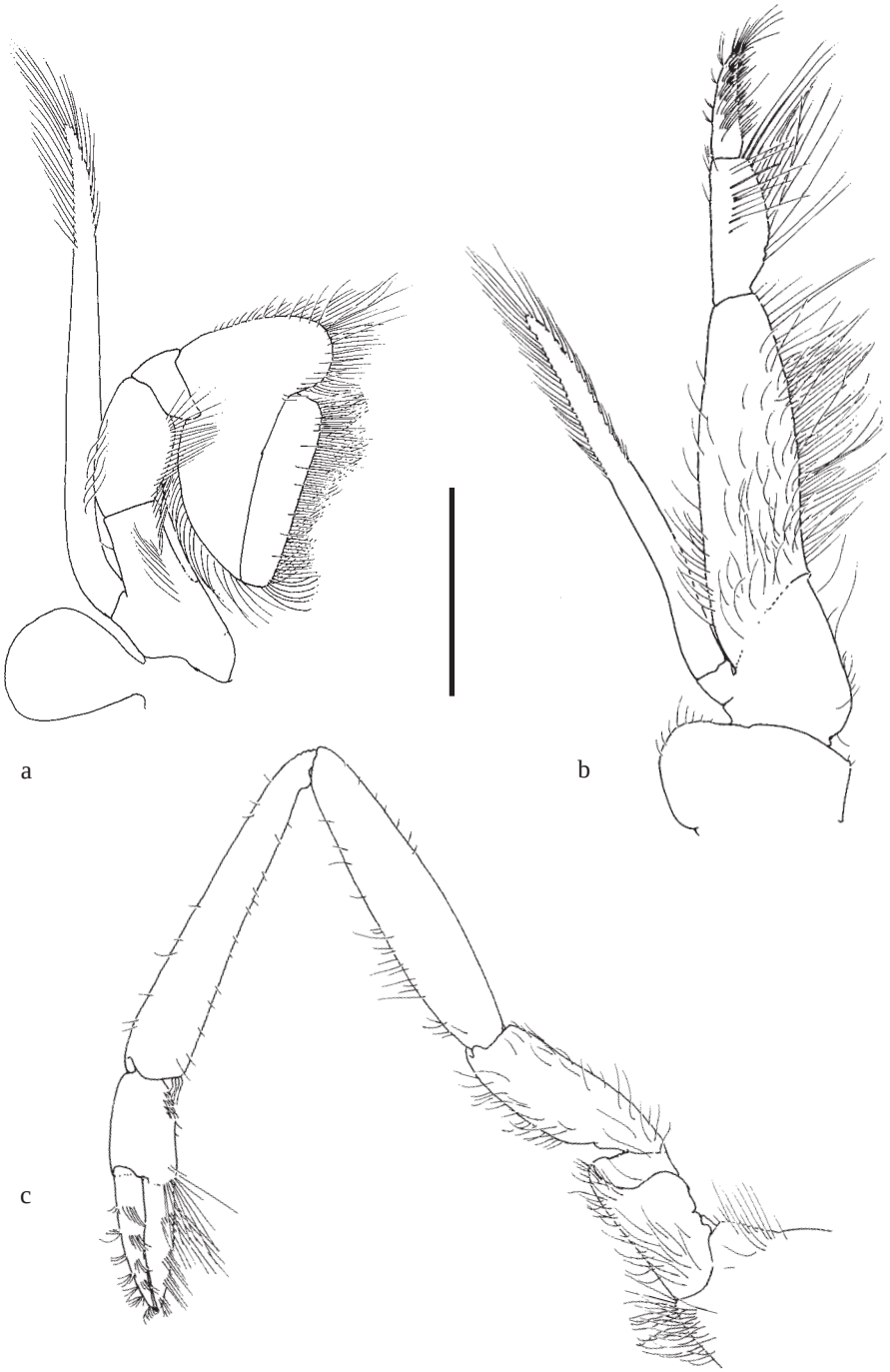


Fig. 54. *Pontonia longispina* Holthuis, 1951: ovigerous female holotype, pocl. 4.7 mm, AHF 402. a, second maxilliped, ventral view; b, third maxilliped, ventral view; c, first pereiopod. Scale: a-c = 1.5 mm.

than penultimate segment, tapering distally, with long, finely serrulate, and shorter, more coarsely serrulate setae along ventromedial, ventrolateral and distal margins.

First pereiopods slender, exceeding carpocerite by chela and carpus. Chela about 3.4 times longer than deep, subcylindrical, slightly compressed; fingers longer than palm, with entire cutting edges, with groups of many strong, long, serrulate setae, tips acute, somewhat hooked; cleaning organ present on carpal-propodal joint; carpus about 1.4 times as long as chela, about 5.6 times longer than distal width, somewhat tapering proximally, unarmed, with few long simple setae; merus slightly shorter than carpus, 4.6 times longer than central width, unarmed, with few moderately long simple setae along proximal part of median margin; ischium 0.6 times as long as merus, medially slightly expanded, with moderately long simple setae medially; basis 0.65 of ischium length, with moderately long simple setae medially; coxa with rounded ventral lobe with many long simple setae.

Second pereiopods similar in form, unequal in size. Major cheliped with chela about 1.8 times postorbital carapace length, with palm subcylindrical in proximal part, slightly compressed distally, without median carina, smooth, with very few setae; dactylus about 0.5 times palm length, about 3.4 times longer than deep, with large simple triangular proximal tooth, distal part of cutting edge entire, concave, tip strongly hooked, with strongly developed median carina; fixed finger about 1.6 times longer than deep, with blunt, denticulate tooth just proximal of tooth on dactylus, separated from blunt triangular tooth just distal of dactylar tooth by deep notch, distal part of cutting edge entire, concave, tip strongly hooked, median fossa for reception of dactylar tooth when fingers closed distinct; carpus short and stout, about 0.33 of palm length, expanding distally, slightly longer than distal width, unarmed; merus about 1.2 times as long as carpus, about 2.0 times longer than central width, distomedially excavate; ischium almost as long as merus, strongly tapering proximally; basis and coxa without special features. Minor cheliped more slender than major cheliped, about as long as postorbital carapace length; with palm somewhat flattened, increasingly compressed distally, with entire median carina in distal half, smooth, with many long setae; fingers about 0.80 times palm length, teeth situated more proximally than in major chela; dactylus with small tridentate proximal tooth, fixed finger with broad multidenticulate proximal tooth, without triangular tooth distally of proximal tooth.

Ambulatory pereiopods rather robust. Dactylus of third pereiopod slightly compressed ventrally, with corpus 2.4 times as long as proximal width, with many simple setae on distal and ventral margins, accessory tooth well developed, acute, not recurved, terminal, ventral margin entire, straight; unguis large, slender, acute, not recurved, about 0.45 of corpus length; propodus about 3.6 times longer than dactylus, about 6.3 times longer than proximal width, with three distoventral spines, with many distoventral simple setae; carpus 0.5 of propodus length, 2.8 times longer than distal width, slightly tapering proximally, with indistinct distal lobe, unarmed; merus slightly longer than propodus, about 3.9 times longer than central width, somewhat flattened, non-setose, unarmed; ischium about 0.57 of merus length, 2.4 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopods similar.

Male first and second pleopod not known.

First pleopod of female with slender endopod, about 2/5th length of exopod, with

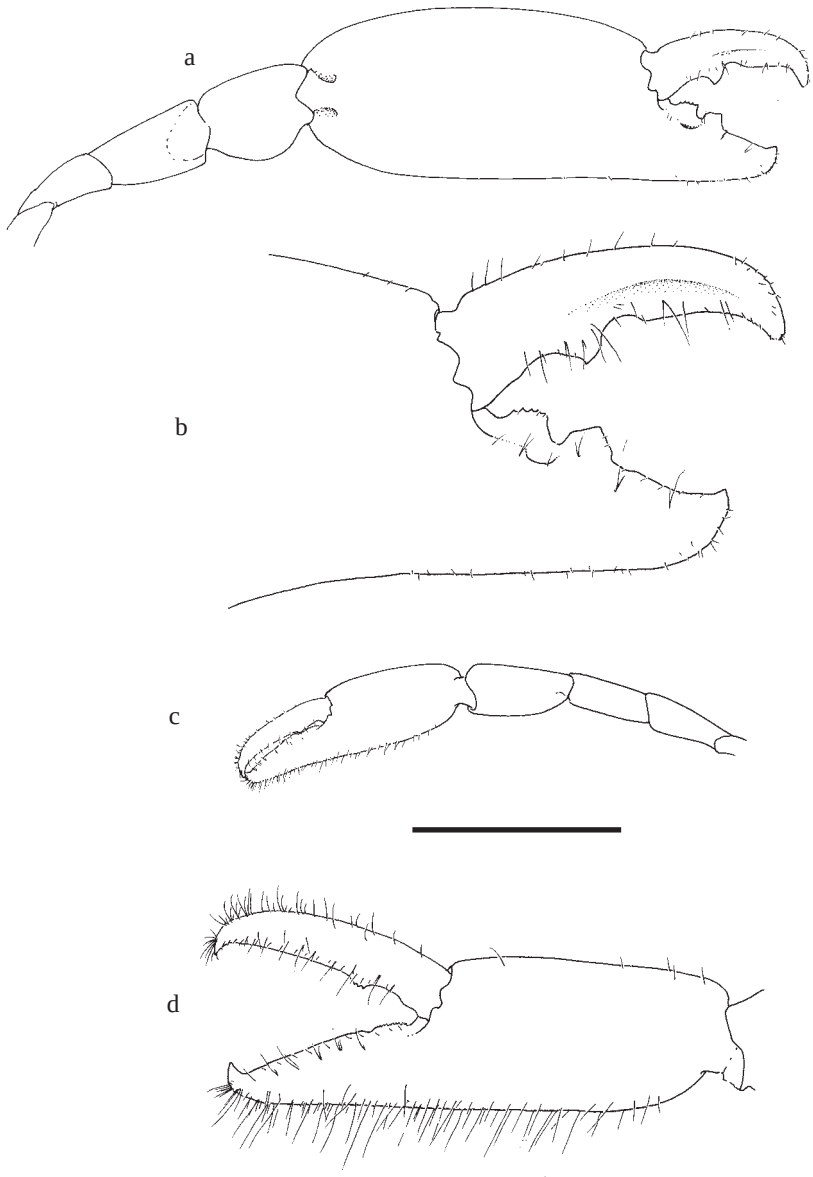


Fig. 55. *Pontonia longispina* Holthuis, 1951: ovigerous female holotype, pocl. 4.7 mm, AHF 402. a, major second pereiopod; b, idem, chela; c, minor second pereiopod; d, idem, chela. Scale: a, c = 4 mm; b, d = 2 mm.

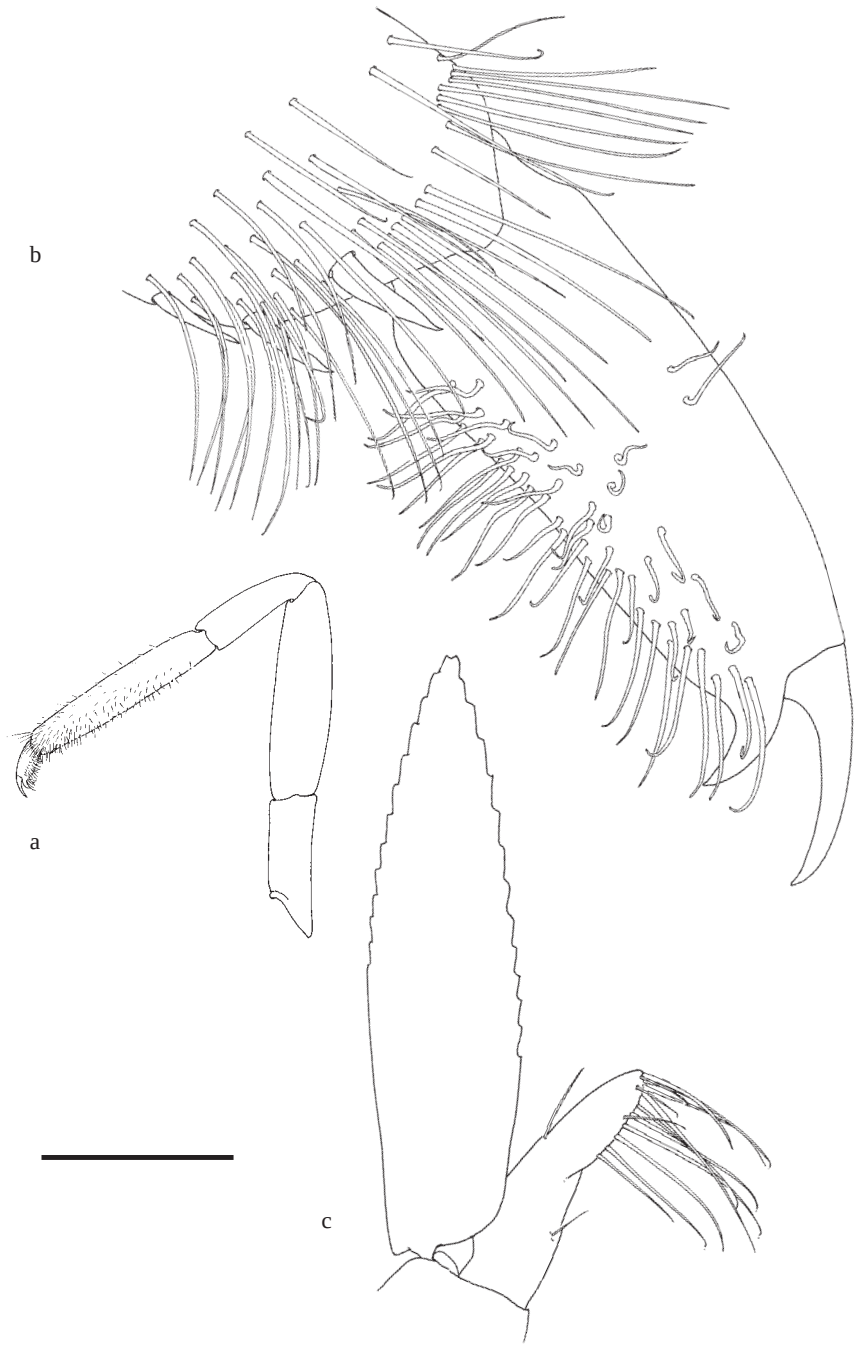


Fig. 56. *Pontonia longispina* Holthuis, 1951: ovigerous female holotype, pocl. 4.7 mm, AHF 402. a, third pereiopod; b, dactylus third pereiopod; c, endopod female first pleopod. Scale: a = 4 mm; b = 0.19 mm; c = 0.6 mm.

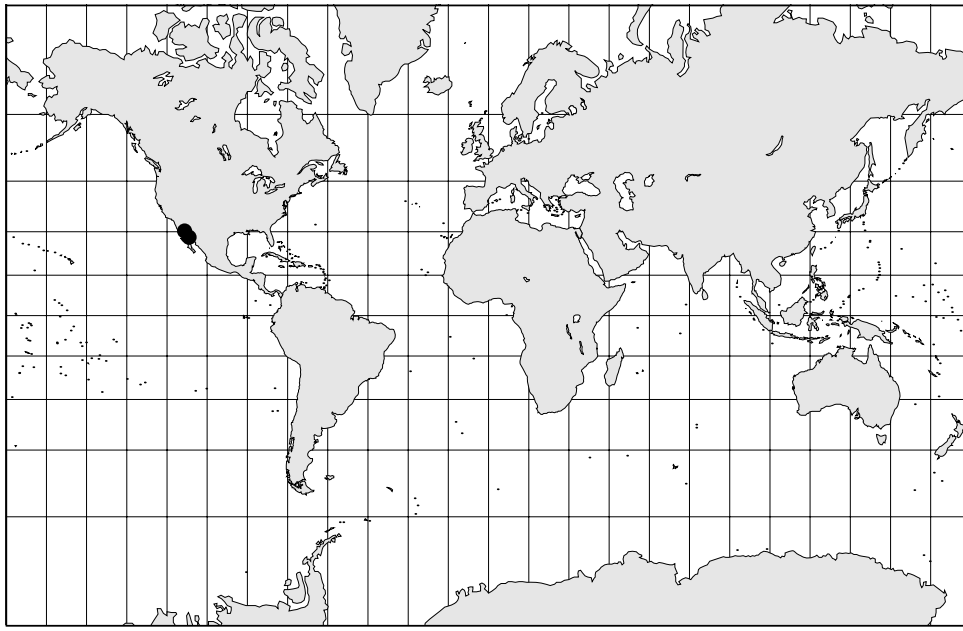


Fig. 57. Geographic distribution of *Pontonia longispina* Holthuis, 1951.

many long distal setae when ovigerous, without row of long plumose setae on lateral margin and few simple setae in proximal part of medial margin.

Uropods with short stout unarmed protopodite; exopod broad, about 2.0 times as long as wide, with straight lateral margin, without distolateral tooth, with small distolateral spine, distal lamina rounded; endopod slightly longer than exopod, more than twice as long as wide, just extending beyond telson.

Size.— Only known from ovigerous female holotype: pocl. 4.7 mm.

Colouration.— Unknown.

Types.— Holotype: AHF no. 402, ovigerous female, total length 17 mm; Angel de la Guardia Island, Puerto Refugio, Lower California, Mexico. Paratype: AHF 1092-40, ovigerous female; Sonora, Bahia Catalina off Guaymas, Mexico. Of this paratype only the right mouthparts (except the maxillula), one first pereiopod, one antenna, one damaged antennula, and an ambulatory pereiopod are present.

Distribution.— EAST PACIFIC: Mexico: Lower California and Sonora (Holthuis, 1951a).

Host.— Unknown.

Remarks.— The holotype is a complete female specimen. From the paratype one set of right mouthparts, one first pereiopod, one antenna, one damaged antennula, and an ambulatory pereiopod are present. The mouthparts, first pereiopod and ambulatory pereiopod in Holthuis Pl. 40 are likely drawn from the paratype material.

8.2.5. *Pontonia manningi* Fransen, 2000
(figs. 58-70, pl. 1)

Pontonia margarita; Holthuis, 1951: 137 (in part), pl. 44; Hulings, 1961: 217; Bullis & Thompson, 1965: 8; Williams, 1965: 48, 49 (in part); Wells & Wells, 1966: 57; Chace, 1972: 39 (in part); Markham, 1985:

46, 52, 128; Markham, 1988: 39; Williams et al., 1989: 15. (Not *Pontonia margarita* Smith, 1869).
Pontonia manningi Fransen, 2000: 101-108, figs. 1-4; Wirtz & d'Udekem-d'Acoz, 2001: 114.

Material.— **West Atlantic**: **Caribbean Sea**.— RMNH D 47999: 1 ovigerous female holotype, pocl. 5.7 mm; Caribbean Sea, 25 miles N of Margarita Island; depth 36.5 m; 9.xii.1954; leg. Teun Blok.— RMNH D 42635: paratypes; 2 ovigerous females, pocl. 5.3 mm; 1 non-ovigerous female, pocl. 3.3 mm; 4 males, pocl. 1.9, 2.6, 3.4, 3.6 mm; 1 damaged specimen, pocl. 2.4 mm; same locality data as holotype.— USNM 155653: 1 female; Netherlands West Indies, Bonaire; depth 42.5 m; 26.iv.1975; from hull of ship; in *Spondylus* sp. leg. R.V. Harrison.— **U.S.A.: North Carolina**.— USNM 91891: paratype, 1 male; Vicinity of Cape Lookout; 18.ii.1951; inside live scallop *Pecten gibbossus*; leg. C. Broad.— **U.S.A.: Georgia**.— USNM 214958: paratype, 1 specimen; off Georgia, 31°40.54'N 80°21.00'W; depth 27 m; 30.vii.1981.— **U.S.A.: Florida**.— RMNH D 35039: 1 dry male, pocl. 4.8 mm; Haulover, N of Miami, Dade County; ix.1976; leg. et don. R. Guest.— RMNH D 30418: paratype, 1 juvenile, pocl. 1.5 mm; Hollywood, N of Miami; ix.1974; leg. R. Guest.— RMNH D 42636: paratype, 1 male, pocl. 3.5 mm; Fort Lauderdale, off Spoil Island; depth 3.5 m; 6.i.1974; in *Chlamys mildredae* Bayer, 1941; leg. A. Calabrese.— RMNH D 42644: paratype, 1 male, pocl. 2.0 mm; N of Miami, third reef off Hollywood; depth 20-23 m; 18.v.1973; in *Spondylus americanus*.— USNM 107108: 2 males, 2 ovigerous females; off Fort Pierce; depth 31-36.5 m; 26.i.1961; from *Pecten gibbus*; "Silver Bay" stations 2702, 2703, 2704.— USNM 89030: paratype**s,** 3 specimens; off Melbourne, Brevard Co., E coast of Florida, 28°05'N 80°09'W; depth 53 m; 17.i.1940; "Pelican" station 168-1.— RMNH D 42579: 1 juvenile, pocl. 1.8 mm; Dade County, Haulover, N of Miami; depth 43 m; -.x.1976; in mantel cavity of *Spondylus americanus* Hermann, 1781; leg. R. Guest.— RMND D 42580: 1 juvenile, pocl. 2.1 mm; Hollywood, Broward County, N of Miami; depth 50 m; -.ix.1976; in mantel cavity of *Spondylus americanus* Hermann, 1781; leg. R. Guest.— **Gulf of Mexico**.— USNM 89029: paratype**,** 1 specimen; W coast of Florida, 30°06'N 85°45'W; depth 14.5 m; 10.iii.1939; "Pelican" station 152-H.— USNM 89028: paratypes**,** 5 specimens; W coast of Florida, 29°29'N 85°53'W; depth 34.5 m; 10.iii.1939; "Pelican" station 153-2.— USNM 101277: paratypes**,** 5 males, 6 ovigerous females, 1 non-ovigerous female; 30°03'N 87°12'W; depth 38.5 m; 13.ii.1957; 8' scallop dredge; "Oregon" station 1711 (Bullis & Thompson, 1965: 8, as *P. margarita*).— USNM (acc. no. 247946): paratypes**,** 11 specimens; "Oregon" station 3042, 26º06'N 96º25'W; depth 69.5 m; 13.x.1960; 71' bottom trawl; in *Aequipecten gibbus* (Linnaeus, 1758); [received 29.iv.1963, from Pascagoula Fisheries Station, Gulf and South Atlantic Fisheries Exploration, Pascagoula, Mississippi, through Dr R. Harvey, Bullis jr.].— **East Atlantic: Canary Islands**.— RMNH D 45622: paratype**,** 1 ovigerous female, pocl. 9.1 mm; Sta. CANCAP 2.D07, S coast of Hierro, W of Punta de los Saltos, Puerto de Naos, 27°39'N 18°00'W; rocky bottom; depth 10-15 m; scuba diving; 3,10.ix.1977; in *Spondylus gaederopus* Linnaeus, 1758.— **Cape Verde Islands**.— RMNH D 45623: paratype**,** 1 male, pocl. 3.3 mm; Sta. CANCAP 6.133, S of Sao Vicente, 16°47'N 25°02'W; depth 50-60 m; 19.vi.1982; sand, shells and calcareous algae; 1.2 m Agassiz trawl.— RMNH D 45624: paratype**,** 1 juvenile, pocl. 1.9 mm; Sta. CANCAP 6.109, S of Santa Luzia, 16°44'N 24°46'W; depth 55-80 m; 16.vi.1982; calcareous algae and epifauna, 1.2 m Agassiz trawl.— RMNH D 48667: 1 ovigerous female, pocl. 9.6 mm; 1 male, pocl. 4.8 mm; Cape Verde Islands, São Tiago, Tarreffal; ii.2000; scuba diving; 5-10 m depth; presumably in *Spondylus senegalensis* Schreibers, 1793, collected by P. Wirtz, photographed.

Description. — Body subcylindrical, somewhat depressed. Carapace smooth. Rostrum well developed, distally ending in sharp point, reaching halfway second segment of antennular peduncle, slender, triangular in dorsal view, without dorsal carina, with ventral carina in distal part; subdistal dorsal tooth with few long simple setae in front; subdistal ventral tooth situated just proximally or at level of subdistal dorsal tooth, slightly convex in lateral view. Inferior orbital angle slightly produced, angular. Antennal spine well developed, acute, reaching level of produced anterolateral margin, situated somewhat below level of inferior orbital angle. Anterolateral angle of carapace produced, broadly rounded.

Abdomen smooth; sixth abdominal segment 0.8 times length of fifth, 1.6 times

wider than long, posterolateral angle acutely produced, posteroventral angle spiniform; pleura of first five segments broadly rounded.

Telson 1.5-2.0 times as long as sixth abdominal segment, almost twice as long as its proximal width; lateral margins convex, convergent; posterior border without median process; two pair of rather large dorsal spines at about 0.35-0.45 and 0.60-0.73 of the telson length, marginal, 0.20-0.25 times as long as telson; posterior margin with three pairs of spines, lateral spines rather small, about 0.05 times telson length, marginal; intermediate and submedian spines larger than lateral spines, about as long as dorsal spines, submedian spines more slender than intermediate spines.

Eyestalk about as long as wide, cylindrical, posteriorly somewhat swollen; stalk slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella well developed. Basal segment with distinct acute distolateral tooth, not extending beyond proximal fourth of intermediate segment, distal margin small, slightly produced, sinuous; medioventral tooth small, submarginal, situated halfway basal segment; stylocerite short, small, less than half length of basal segment, with distal acute tip, lateral margin with few short plumose

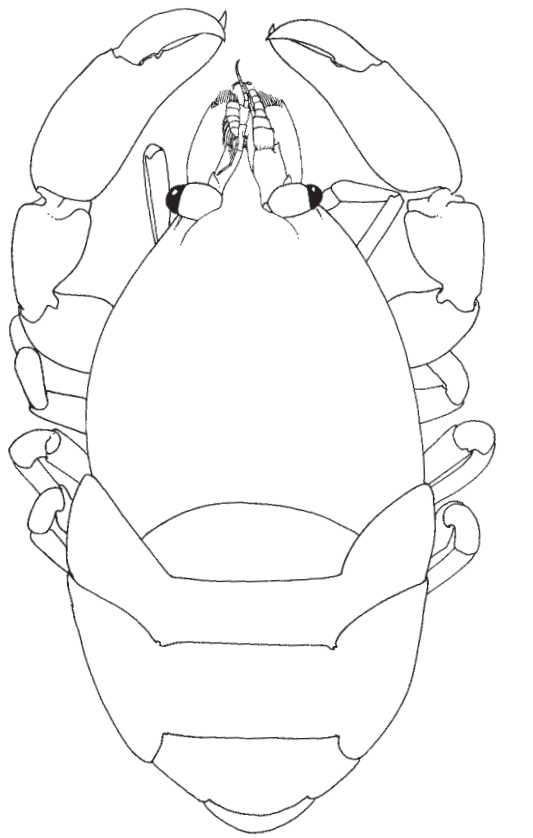


Fig. 58. *Pontonia manningi* Fransen, 2000: Margarita Island, Caribbean Sea, ovigerous female holotype, pocl. 5.7 mm, RMNH D 47999. Dorsal aspect. Scale = 4 mm.

setae. Intermediate segment slightly longer than wide. Distal segment slightly longer than wide. Upper flagellum well developed, biramous, with three to eight proximal segments fused; short free ramus one- or two-segmented; longer free ramus with five or six segments. Lower flagellum with eight to twelve segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite short, reaching 2/3 to 3/4 of lamella of scaphocerite, moderately stout, about 3.0 times longer than distal width; flagellum short, slightly longer than postorbital carapace length; scaphocerite with lamella about 2.0 times as long as central width, anterior margin truncate, medial margin convex, lateral margin slightly convex with small, slightly medially curved,

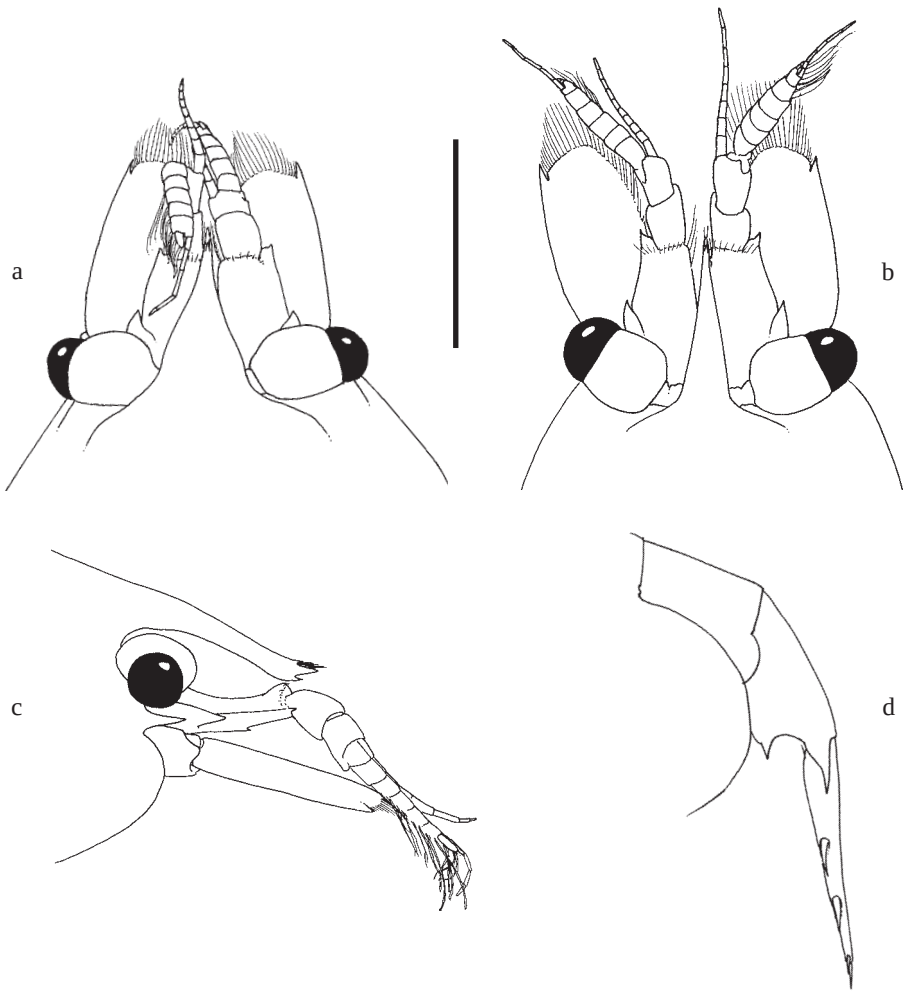


Fig. 59. *Pontonia manningi* Fransen, 2000: Margarita Island, Caribbean Sea, ovigerous female holotype, pocl. 5.7 mm, RMNH D 47999 (figs. a, c, d); male paratype, pocl. 3.4 mm, RMNH D 42635 (fig. b). a, anterior appendages, dorsal view, female; b, idem, male; c, anterior appendages, lateral view; d, distal part abdomen, lateral view. Scale = 2 mm.

distolateral tooth not reaching anterior margin of lamella, distolateral tooth about 0.05 times length of scaphocerite; incision between distolateral tooth and lamina indistinct.

Epistome and labrum normal.

Paragnath well developed, alae with large transverse rectangular distal lobes, and with more or less triangular submedian ventral lobes; corpus rather short, nar-

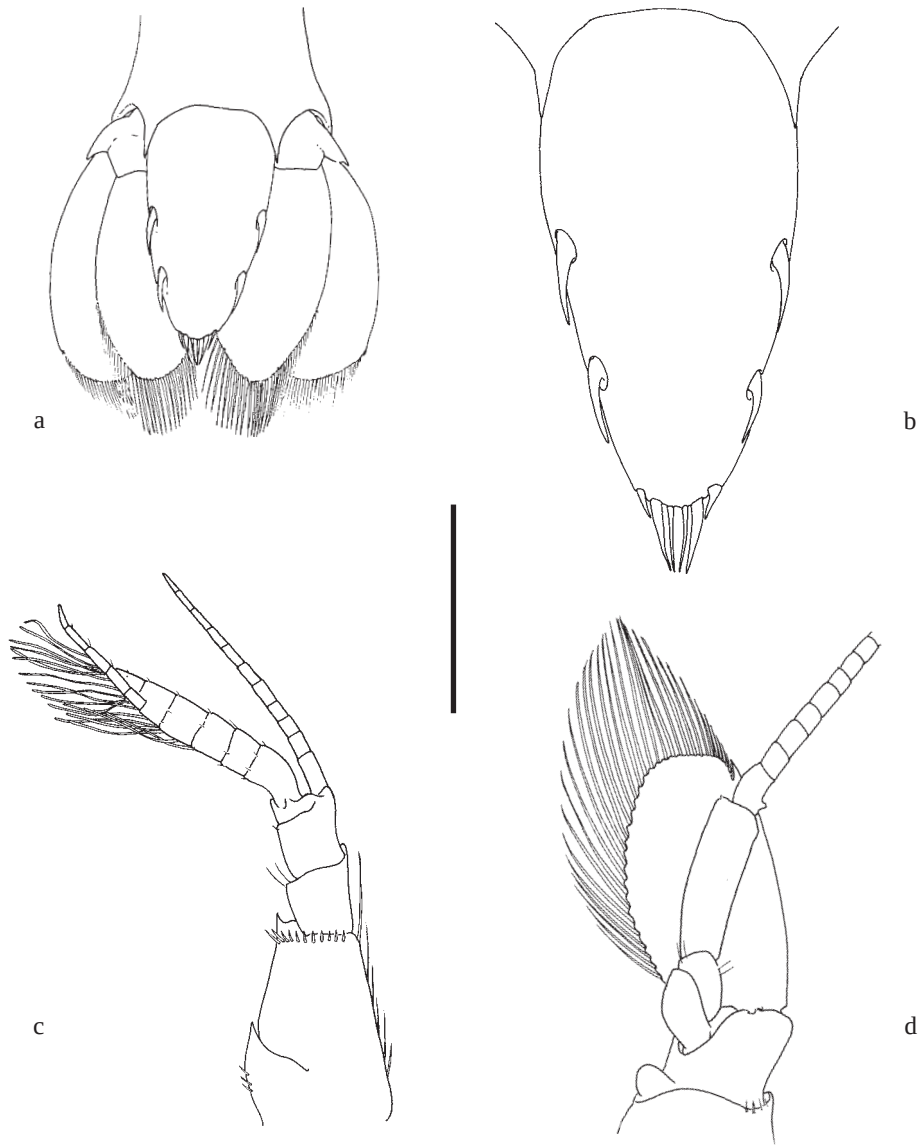


Fig. 60. *Pontonia manningi* Fransen, 2000: Margarita Island, Caribbean Sea, ovigerous female holotype, pocl. 5.7 mm, RMNH D 47999. a, telson and uropods, dorsal view; b, telson, dorsal view; c, antennula, ventral view; d, antenna, ventral view. Scale: a = 2 mm; b = 1 mm; c, d = 1.5 mm.

row, with median groove, bordered by slightly oblique setose carinae.

Second thoracic sternite formed into broad triangular medially rounded process between second maxillipeds, with some setae on medially rounded process.

Third thoracic sternite with low lateral carinae posteromedian of third maxillipeds, with shallow notch.

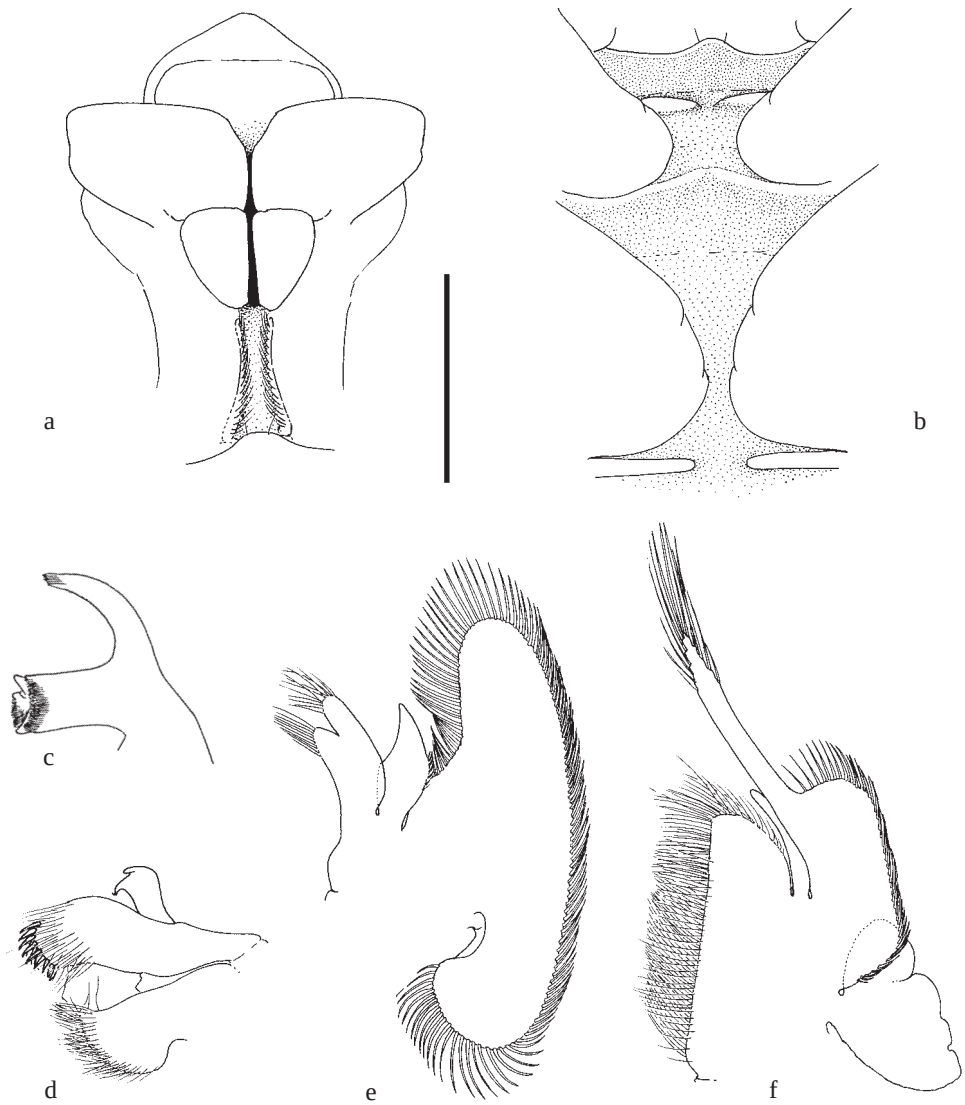


Fig. 61. *Pontonia manningi* Fransen, 2000: Margarita Island, Caribbean Sea, ovigerous female holotype, pocl. 5.7 mm, RMNH D 47999. a, paragnath, ventral view; b, second to fifth thoracic sternites; c, mandible, ventral view; d, maxillula, ventral view; e, maxilla, ventral view; f, first maxilliped, ventral view. Scale: a, b = 1 mm; c-f = 0.6 mm.

Fourth thoracic sternite with low lateral carinae posteromedian of first pereiopods, with shallow broad notch in between; with median triangular or broadly rounded ridge between the first pereiopods.

Fifth thoracic sternite with shallow lateral plates posteromedial of second pereiopods, with very broad medial excavation in between.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

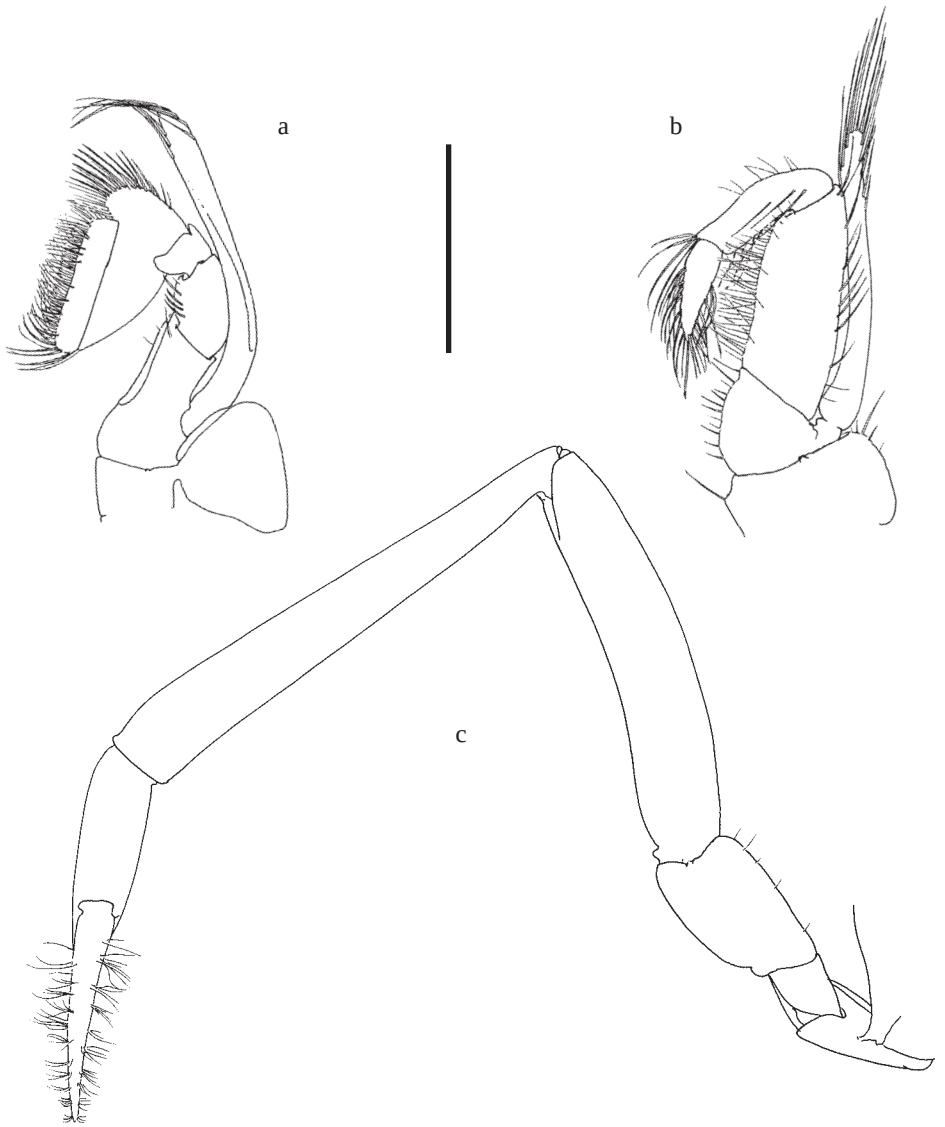


Fig. 62. *Pontonia manningi* Fransen, 2000: Margarita Island, Caribbean Sea, ovigerous female holotype, pocl. 5.7 mm, RMNH D 47999 (figs. a, b); ovigerous female paratype, pocl. 5.3 mm, RMNH D 42635 (fig. c). a, second maxilliped, ventral view; b, third maxilliped, ventral view; c, first pereiopod. Scale: a, b = 0.6 mm; c = 1.5 mm.

Mandible with incisor process slender, with three to six distal teeth and without row of small teeth on medioventral border; molar process with three or four blunt distal teeth, some fringed with setal brushes.

Maxillula with upper lacinia broad with two rows of about twelve serrulate spines and many long slender setae medially; lower lacinia very broad, densely setose distoventrally and marginally, no differentiation in setae, without spines; palp bilobed, larger lobe with small ventral tubercle with single short recurved simple seta.

Maxilla with basal endite well developed, distinctly bilobed; distal lobe slightly longer than proximal lobe, both with long slender minutely serrate setae along distomedian borders, median border without setae; coxal endite obsolete, median margin convex, without setae; scaphognathite about 3.1 times longer than wide, posterior lobe rounded, large, twice as long as proximal width, anterior lobe 1.3 times longer than proximal width; palp well developed, simple, strongly expanded proximally, tapering distally to blunt tip, proximal part of lateral border with row of short plumose setae.

First maxilliped with coxal and basal endites completely fused, large and broad, fringed with many simple, long and finely serrate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod well developed, flagellum with about ten long plumose setae distally; caridean lobe large, rather broad; epipod large, triangular, bilobed, lower lobe larger than upper lobe; palp simple, slender, elongate, curved along distolateral margin of basal endite, non-setose.

Second maxilliped with endopod normally developed; with dactylar segment narrow, 4.5 times longer than broad, densely fringed with numerous coarsely serrulate, spiniform, and long curled finely serrulate setae medially; distomedial lobe of propodal segment slightly produced, rounded, with row of long slender spines and simple and finely serrulate setae, ventrolateral margin devoid of setae; carpal segment distomedially angular, without setae, unarmed; meral segment with median row of plumose setae, medially excavate; basal and ischial segments fused, both segments medially excavate with or without few distomedian setae; exopod normal, without proximal setae, with long plumose setae in distal part; coxal segment not produced medially, non-setose, with subtriangular epipod not bearing a podobranch.

Third maxilliped reaching with ultimate segment halfway carpocerite; ischiomerus partly fused with basis, about three times as long as broad, tapering distally, flattened, with many setae on median margin, few setae on ventral surface, lateral margin with single row of long plumose setae; basal segment medially convex, with many long, finely serrulate setae along median margin; exopod well developed, slightly longer than ischiomeral segment; coxal segment not produced medially, with well developed oval lateral plate fringed with few setae, without epipod nor arthrobranch; penultimate segment about three times longer than wide, slightly less than half ischiomeral length, medially somewhat expanded, flattened, with long finely serrulate setae along ventromedial and ventrolateral margins; ultimate segment slightly shorter than penultimate segment, tapering distally, with long, finely serrulate, and shorter, more coarsely serrulate setae along ventromedial, ventrolateral and distal margins.

First pereiopods slender, exceeding carpocerite with chela and carpus. Chela about 4.2 times longer than deep, subcylindrical, slightly compressed; fingers slightly longer than palm, slender, with several rows of finely serrate setae, cutting edges

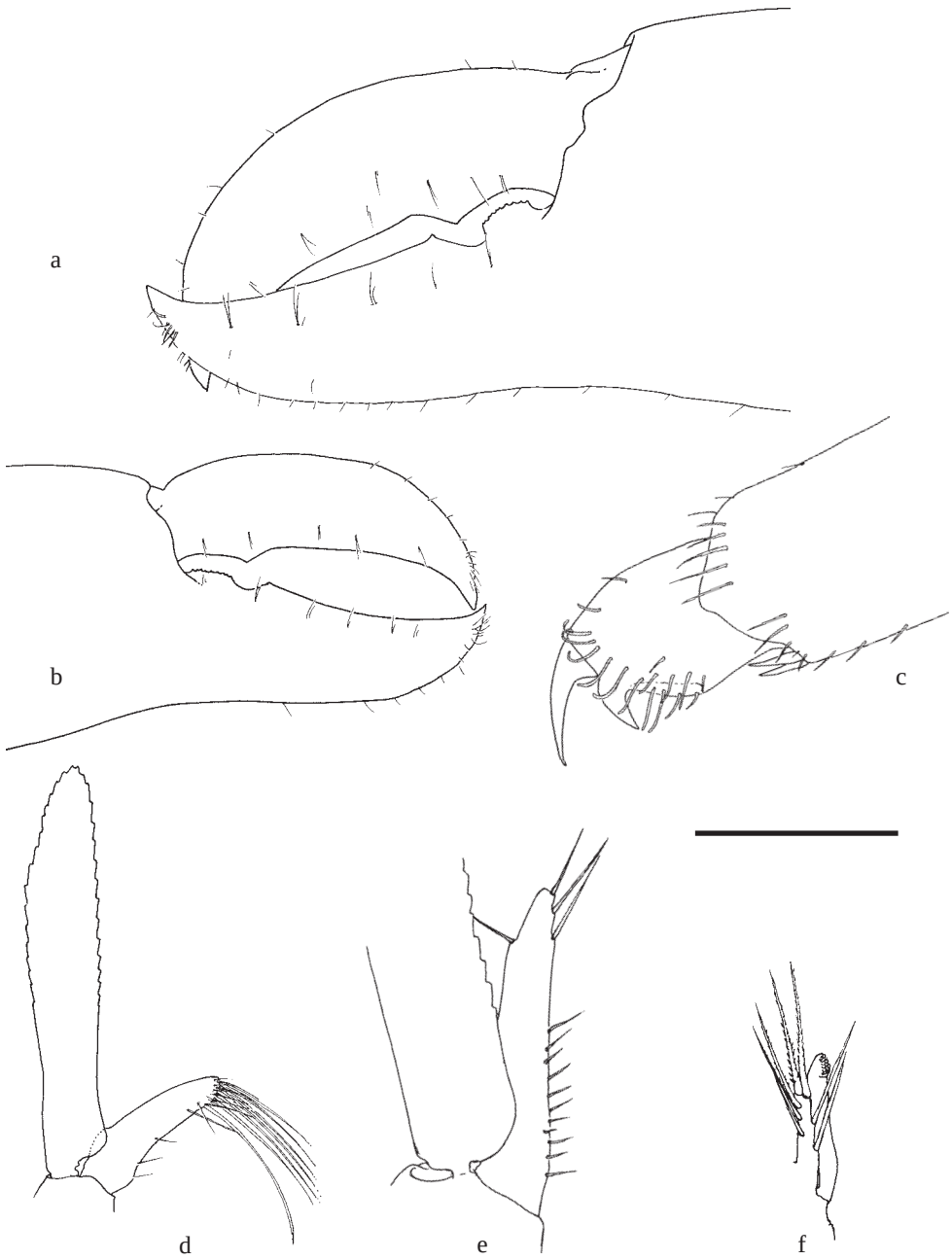


Fig. 63. *Pontonia manningi* Fransen, 2000: Margarita Island, Caribbean Sea, ovigerous female paratype, pocl. 5.3 mm, RMNH D 42635. a, major second pereiopod, chela; b, minor second pereiopod, chela; c, dactylus third pereiopod; d, endopod female first pleopod; e, endopod male first pleopod; f, appendix interna and appendix masculina on second male pleopod. Scale: a, b = 1 mm; c, e, f = 0.6 mm; d = 1.5 mm.

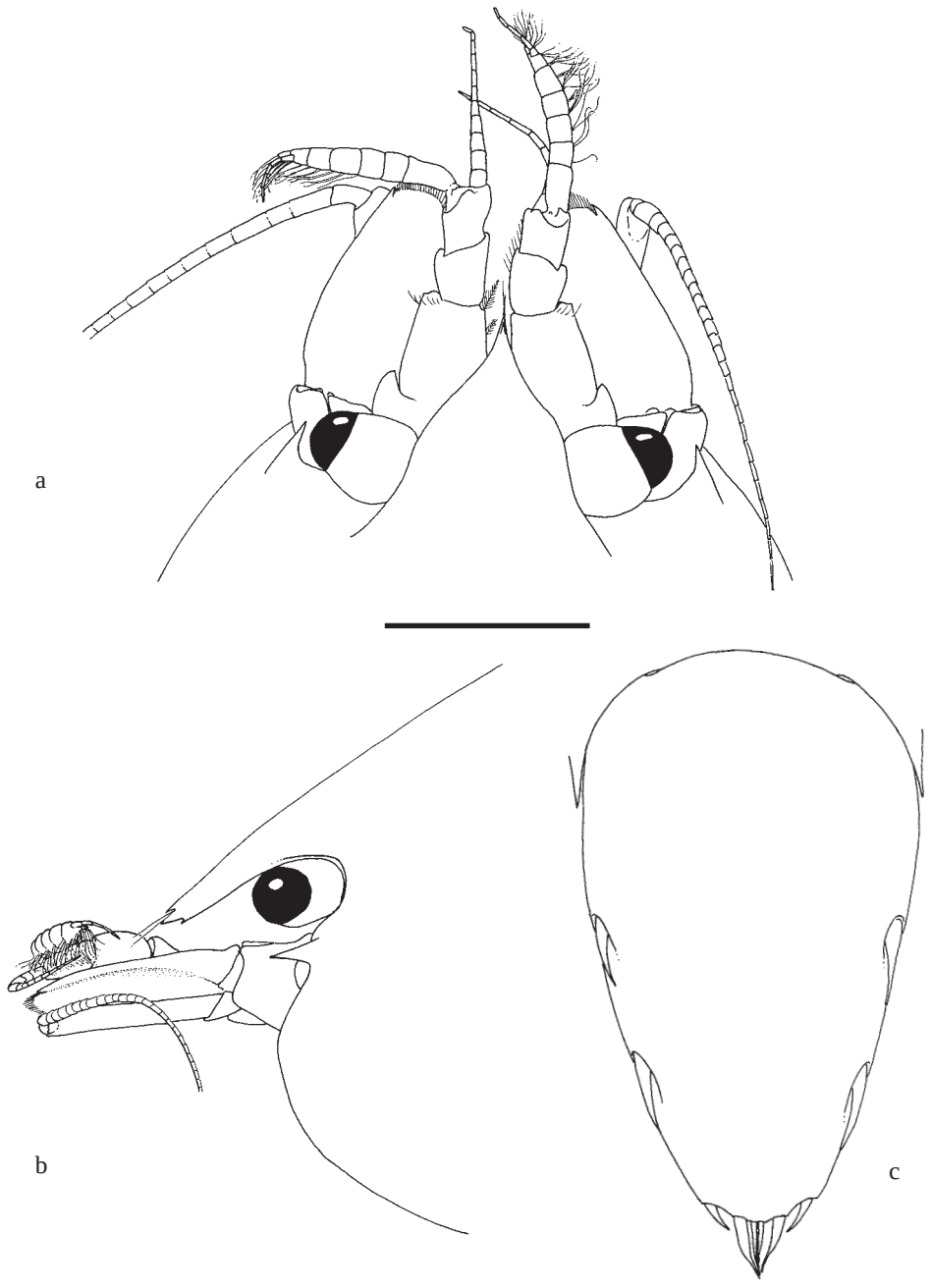


Fig. 64. *Pontonia manningi* Fransen, 2000: Canary Islands, ovigerous female, pocl. 9.1 mm, RMNH D 45622. a, anterior appendages, dorsal view, female; b, anterior appendages, lateral view; c, telson, dorsal view. Scale: a, b = 2 mm; c = 1 mm.

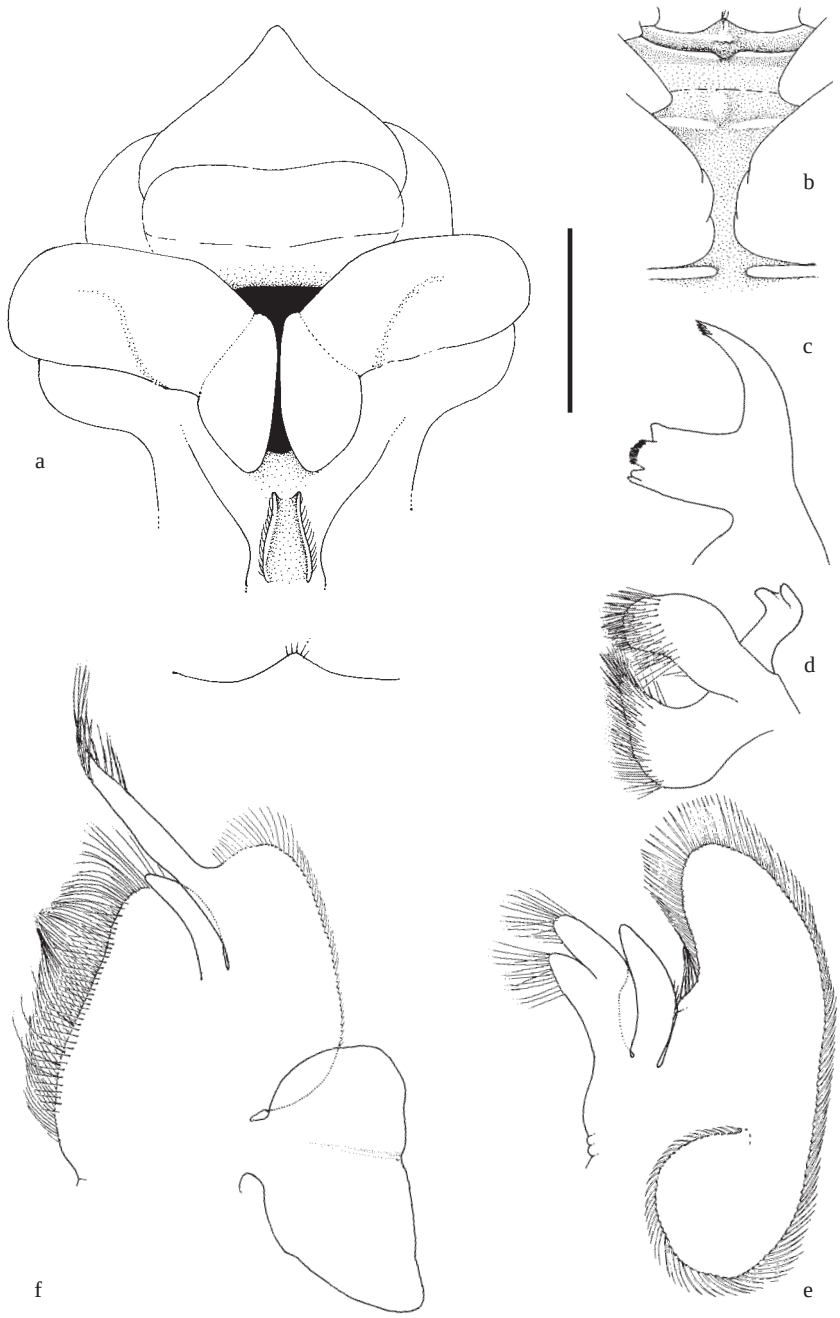


Fig. 65. *Pontonia manningi* Fransen, 2000: Canary Islands, ovigerous female, pocl. 9.1 mm, RMNH D 45622. a, paragnath, ventral view; b, second to fifth thoracic sternites; c, mandible, ventral view; d, maxillula, ventral view; e, maxilla, ventral view; f, first maxilliped, ventral view. Scale: a = 1 mm; b = 2 mm; c-f = 1.5 mm.

entire, somewhat gaping proximally, with groups of many strong, long, serrulate setae, tips acute, hooked; cleaning organ strongly reduced or absent on carpal-propodal joint; carpus 1.5 times longer than chela, about 7.0 times longer than distal width, somewhat tapering proximally, unarmed, without setae; merus 0.75 of carpus length, 5.4 times longer than central width, straight or slightly bowed, unarmed; ischium short, about 0.4 times merus length, with slightly expanded, non-setose medial margin, with few simple setae along lateral margin; basis about as long as ischium; coxa robust with sparsely setose ventromedial carina.

Second pereiopods similar in form, unequal in size. Major cheliped with chela small, 0.8-1.0 times as long as postorbital carapace length in adult females and about

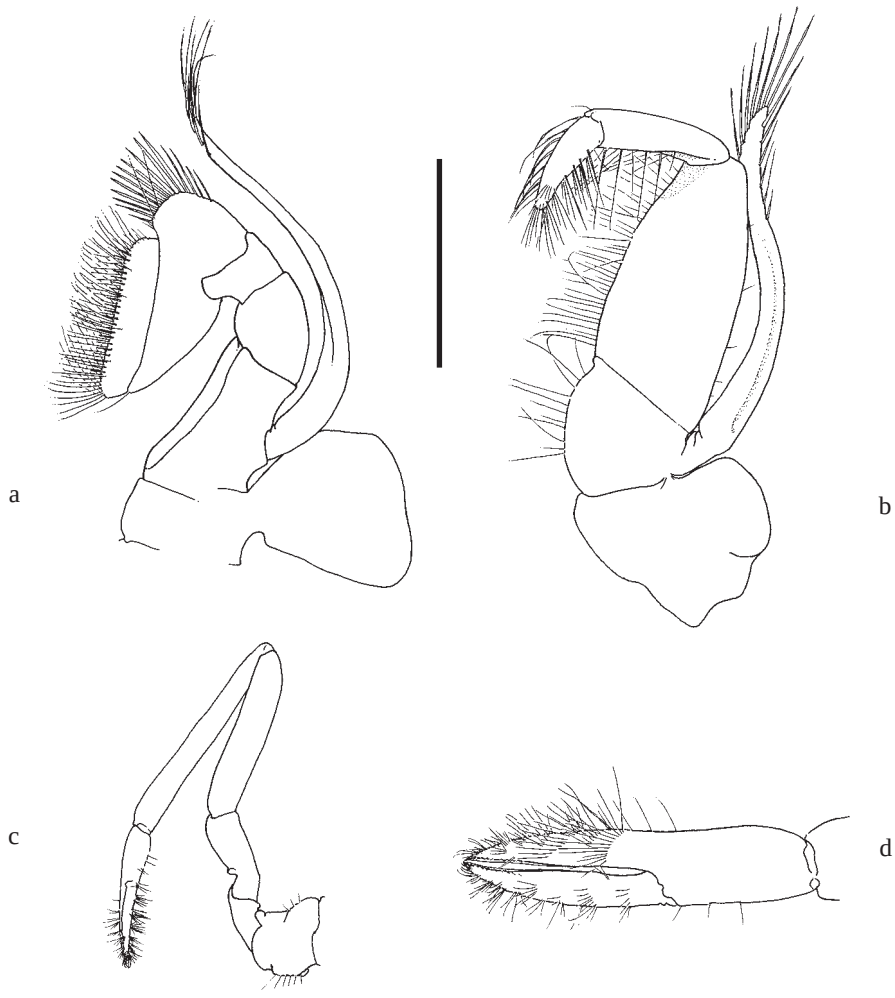


Fig. 66. *Pontonia manningi* Fransen, 2000: Canary Islands, ovigerous female, pocl. 9.1 mm, RMNH D 45622. a, second maxilliped, ventral view; b, third maxilliped, ventral view; c, first pereiopod; d, idem, detail chela. Scale: a, b, d = 1.5 mm; c = 4 mm.

Fig. 67. *Pontonia manningi* Fransen, 2000: Canary Islands, ovigerous female, pocl. 9.1 mm, RMNH D 45622. a, major second pereiopod; b, idem chela; c, third pereiopod; d, dactylus third pereiopod. Scale: a = 4 mm; b, c = 2 mm; d = 0.15 mm.

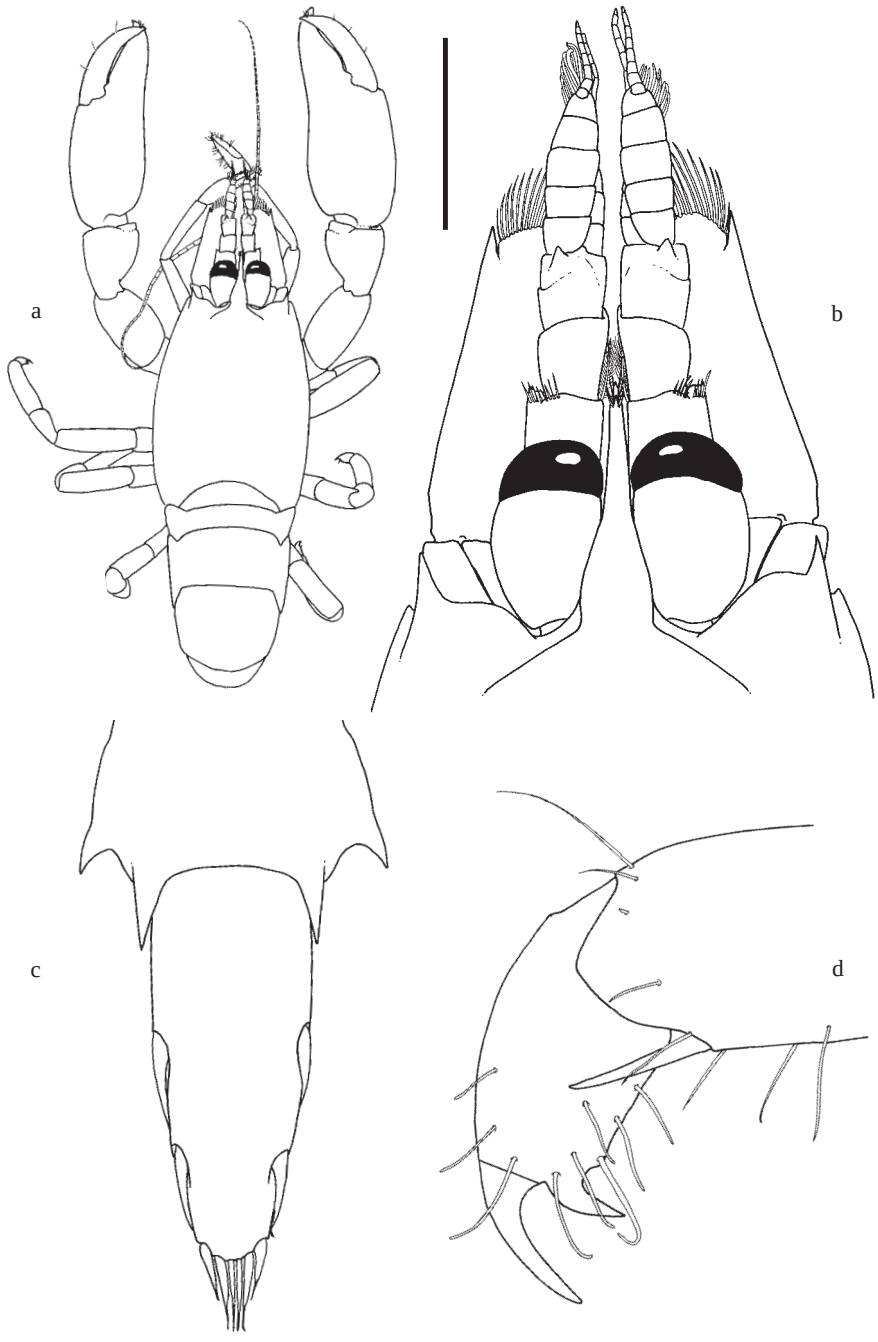


Fig. 68. *Pontonia manningi* Fransen, 2000: Cape Verde Islands, male, pocl. 3.3 mm, RMNH D 45623. a, dorsal aspect; b, anterior appendages, dorsal view, female; c, telson, dorsal view; d, dactylus third pereiopod. Scale: a = 4 mm, b, c = 1 mm; d = 0.6 mm.

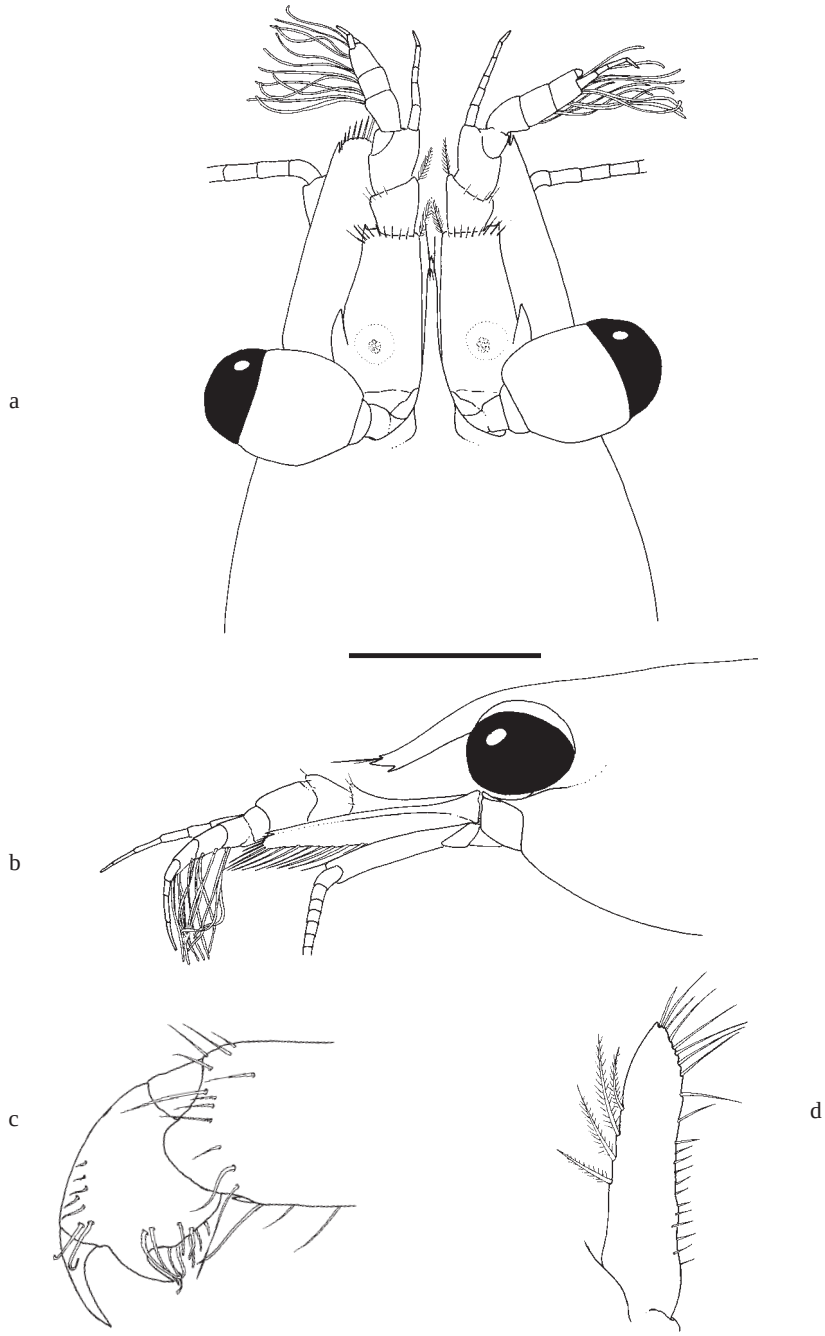


Fig. 69. *Pontonia manningi* Fransen, 2000: Cape Verde Islands, juvenile, pocl. 1.9 mm, RMNH D 45624 (figs. a-c); male, pocl. 4.8 mm, RMNH D 48667 (fig. d). a, anterior appendages, dorsal view; b, anterior appendages, lateral view; c, dactylus third pereiopod; d, male first pleopod. Scale: a, b = 1 mm; c = 0.15 mm; d = 0.6 mm.

1.5 times as long in males, with palm subcylindrical, without carinae, smooth, with few setae in distal part; dactylus about 0.65 times palm length, about 3.5 times longer than deep, with large simple triangular proximal tooth, distal part of cutting edge entire, tip strongly hooked, with median margin entire, not carinate; fixed finger about 2.3 times longer than deep, with blunt denticulate tooth just proximal of tooth on dactylus, separated from blunt triangular tooth just distal of tooth on dactylus by deep notch, distal part of cutting edge entire, slightly concave, tip strongly hooked, median fossa for reception of dactylar tooth when fingers closed absent; carpus short and stout, about 0.75 of palm length, expanding distally, slightly longer than distal width, unarmed, with distomedial excavation; merus short and stout, about as long as carpus, about 1.5 times longer than central width, distomedially excavate; ischium short and stout, about 0.7 times merus length, strongly tapering proximally, without distomedial protuberance; basis and coxa stout, without armature. Minor cheliped as major cheliped, with palm subcylindrical, without carinae, smooth, with few setae in distal part; fingers 0.7 times palm length; fingers as major cheliped, tooth on dactylus and median tooth on fixed finger may be crenulate as proximal truncate tooth on fixed finger.

Ambulatory pereiopods robust. Dactylus of third pereiopod with corpus strongly compressed ventrally, with corpus about as long as proximal width, with few simple setae on distal and ventral margins, accessory tooth large, strongly recurved, acute, preterminal, ventral margin entire, slightly convex; unguis simple, acute, curved, about 0.6 of corpus length; propodus about 4.4 times longer than dactylus, about 4.0 times longer than wide, with two distoventral short spines, with few distoventral short setae; carpus 0.66 propodus length, 2.8 times longer than distal width, slightly tapering proximally, with indistinct distal lobe, unarmed; merus slightly longer than propodus, about 3.4 times longer than central width, cylindrical, unarmed, non-setose; ischium about 0.75 of merus length, 2.6 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopod similar.

Male first pleopod with endopod about 4.5 times longer than proximal width, tapering distally; median margin straight with row of many short simple setae, with moderately long plumose setae along lateral margin, distal margin with few long simple setae.

Endopod of second pereiopod with short appendix masculina, equal to about 0.7 times length of appendix interna, with two rows of setulose setae in distal 2/3rd.

First pleopod of female with slender endopod, about third length of exopod, with many long distal setae when ovigerous, with few long plumose setae on lateral margin and few simple setae in proximal part of medial margin.

Uropods with short stout unarmed protopodite; exopod broad, about twice as long as wide, with lateral margin convex, without lateral tooth, with or without minute distolateral spine, distal lamina rounded or truncate; endopod extending well beyond exopod, longer than telson.

Ovigerous females carrying about 200-400 eggs. Egg-size about 0.6 mm.

Size.— Postorbital carapace length of adult specimens between 3.0-6.0 mm for the Caribbean specimens. The largest specimen encountered measures 9.6 mm pocl. This specimen was found at the Cape Verde Islands in a large specimen of *Spondylus senegalensis* Schreibers, 1793. Maximum size is probably related to the size of the host.

Colouration (based on specimen with registrationnumber RMNH D 48667, pl.

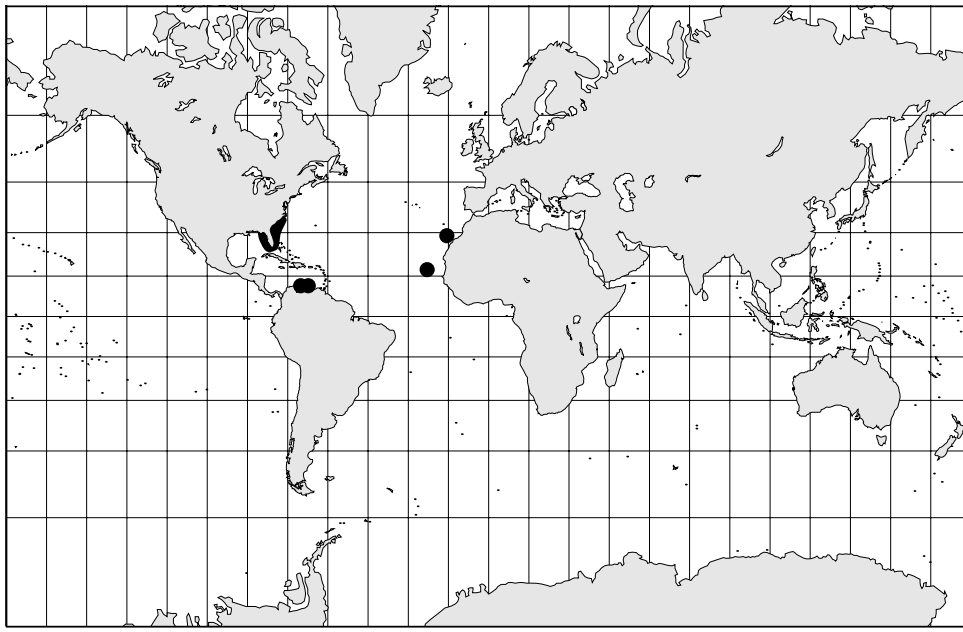


Fig. 70. Geographic distribution of *Pontonia manningi* Fransen, 2000.

1).— Translucent milky white over body and appendages, with distinct reticulate pattern of white lines over carapace and abdomen. Eyestalks with indistinct white longitudinal dorsal stripe, cornea white. Middorsal longitudinal indistinct white stripe from base of rostrum to midlength of carapace. Williams (1965: 49) describes the color of specimens from North Carolina: "Glassy, translucent; internal organs clearly visible; ovigerous females with two colors of eggs, one with light, muddy green eggs and ovarian ova of same color, another with pale orange eggs (from specimens taken in *Aequipecten gibbus* (Linnaeus, 1758) off Drum, Inlet, N.C., in 20-fathom water, April 14, 1960)."

Type.— Holotype: ovigerous female, pocl. 5.69 mm (RMNH D 47999); Caribbean Sea, 25 miles N of Margarita Island, depth 36.5 m, 9.xii.1954, leg. Teun Blok.

Distribution.— EAST ATLANTIC: from North Carolina to the Caribbean Sea and the Gulf of Mexico; West Atlantic Ocean, Cape Verde Islands (Fransen, 2000; Wirtz & d'Udekem d'Acoz, 2001). The species is now recorded for the first time from the Canary Islands.

It is presumed that those records of *P. margarita* from the East Atlantic in literature actually belong to the new species.

Hosts.— Mollusca: Lamellibranchia: *Argopecten gibbus* (Linnaeus, 1758) (cf. Williams, 1965; Wells & Wells, 1966; Fransen, 2000); *Pecten gibbossus* (cf. Fransen, 2000) [unclear which species is meant here, could be misspelling of *Argopecten gibbus* (Linnaeus, 1758) or *Plicatula gibosa* Lamarck, 1801]; *Spondylus americanus* Hermann, 1781 (Fransen, 2000); *Spondylus gaederopus* Linnaeus, 1758 (Fransen, 2000), *Spondylus senegalensis* Schreibers, 1793 (Wirtz & d'Udekem d'Acoz, 2001); *Pteria colymbus* (Roeding, 1798)(cf. Williams, 1965); *Chlamys mildredae* Bayer, 1941 (Fransen, 2000).

8.2.6. *Pontonia margarita* Smith, 1869
(figs. 71-79)

Pontonia margarita Smith, 1869: 245; Kingsley, 1878a: 65; Lockington, 1878: 163; Rathbun, 1904: 34; Coulon, 1907: 189; Kemp, 1922: 287; Boone, 1931: 180 [in part, not fig. 20]; Chace, 1937: 136; Holthuis, 1951a: 137-142, pl. 43 [in part, East Pacific material, not Pl. 44, = *P. manningi*]; Holthuis, 1952: 15 [in part]; Brusca, 1973: 213; [or referring to *P. manningi*] Young, 1978: 173; Brusca, 1980: 250, fig. 14.7; Van der Heiden & Hendrickx, 1982: 57; Hendrickx, Wicksten & v.d. Heiden, 1983: 70; Wicksten, 1983: 19; Harry, 1985: 111-112; Rodriguez de la Cruz, 1987: 28; [or referring to *P. manningi*] Reid & Corey, 1991: 314; Wicksten, 1991: 150; Müller, 1993: 123; Chace & Bruce, 1993: 62; Hendrickx, 1994: 21; Fransen, 1994: 111; Cabrera-Pena, J. & Y. Solano-Lopez, 1996: 915-917, illustr; Fransen, 2000: 101-108, fig. 4g-i; Wicksten & Hernández, 2000: 97; Hickman & Zimmerman, 2000: 26, colourfigs.

Coralliocaris Camerani Nobili, 1901: 3.

Coralliocaris camerani; Borradaile, 1917: 385.

Conchodytes margarita; Borradaile, 1917: 394.

not *Pontonia margarita*; Boone, 1930: 148, pl. 52 [= *Pontonia pinnae* Lockington, 1878].

not *Pontonia margarita*; Holthuis, 1951a: 137-142 [in part], pl. 44; Hulings, 1961: 217; Bullis & Thompson, 1965: 8; Williams, 1965: 48, 49 [in part]; Wells & Wells, 1966: 57; Chace, 1972: 39 [in part]; Markham, 1985: 46, 52, 128; Markham, 1988: 39 [= *Pontonia manningi*].

Material.— **East Pacific**: **U.S.A., California**.— RMNH D 4131: 1 male, pocl. 6.3 mm; in pearl oyster; leg. D.H. ten Kate.— **Mexico**.— USNM 25206: 2 specimens; southern part of Gulf of California; depth 10 fms; "Albatross" station 2828; from pearl oyster.— USNM 25208: 4 specimens; Gulf of California, Lower California, off San Gosef Island; depth 17 fms; "Albatross" station 3002.— USNM 25207: 1 specimen; Gulf of California, Lower California, off San Gosef Island; depth 33 fms; "Albatross" station 3001.— USNM 87438: 1 male, 1 ovigerous female; Point Escondido; from University of California; no further data.— USNM (acc. no. 207834): many specimens; Lower California, Espirito Santo Island; 12.ix.1931; common in pearl oysters, 2 specimens to each oyster; leg. S.A. Glassell.— AHF 602-36: 1 male; Lower California, Agua Verde Bay, south shore; diving and netting; 18.iii.1936; station 602-36.— AHF 652-37: 1 ovigerous female; Gulf of California, San Francisco; shore; 9.iii.1937; inside oyster; station 652-37.— AHF 518-36: 16 specimens; Gulf of California, North Bay of San Francisco Island; shore; 25.ii.1936.— AHF 510-36: 1 male; Gulf of California, Espirito Santo Island, Cove S of Ballenas Bay; shore, sand, rock; 22.ii.1936; station 510-36.— AHF 608-36: 3 males, 1 ovigerous female; Gulf of California, Espirito Santo Island, Ballenas Bay; shore, tide flats, sand, rock, in pearloysters; 21.iii.1936; station 608-36.— AHF 512-36: 1 male, 2 females; Gulf of California, Espirito Santo Island, Middle Point of Ballenas Bay; shore, rock; 23.ii.1936; station 512-36.— AHF 604-36: 1 ovigerous female; Gulf of California, Espirito Santo Island, San Gabriel Bay; shallow water, coral; 20.iii.1936; station 604-36.— AHF 591-36: 1 ovigerous female, 1 male, 1 juvenile; Gulf of California, Puerto Escondido; 16.iii.1936; shore; station 591-36.— RMNH D 42582: 8 males, pocl. 5.4-7.6 mm; 9 ovigerous females, pocl. 6.9-10.0 mm; 1 damaged specimen; Guaymas, Sonora; depth 30-40 ft; in *Pinctada mazatlanica* (Hanley, 1856); 28.vi.1981; leg. Alex Kerstitch; don. M. Wicksten, no. AK810628 (identified as *P. pinnae* Lockington, 1878 by M. Wicksten).— RMNH D 42583: 2 males, pocl. 5.6 and 7.6 mm; 1 ovigerous female, pocl. 8.7 mm; Guaymas, Sonora; depth 30 ft; rocks; 24.ii.1981; leg. Alex Kerstitch; don. M. Wicksten (identified as *P. pinnae* Lockington, 1878 by M. Wicksten).— MCZH: 2 ovigerous females, pocl. 8.1 and 8.4 mm; 2 males, pocl. 5.8 and 7.1 mm; Guaymas, Sonora, San Carlos Bay, near yacht club and motel; depth 15-20 ft; in *Pinctada mazatlanica* (Hanley, 1856); 15.viii.1962; leg. J.A. Beatty, Paul Dayton, A. Aschwanden.— USNM 62417: 4 specimens, 1927; received from Sec. Agricultura y Fomento.— USNM 85409: 11 specimens; Tres Marias Islands, María Madre; 1.v.1925; leg. California Academy of Science Expedition to Revillagigedo Islands.— USNM 85411; 1 specimen; Tres Marias Islands, María Madre; depth 4-10 fms; 13-24.v.1925; leg. California Academy of Science Expedition to Revillagigedo Islands.— USNM 85410: 1 specimen; Tres Marias Islands, María Madre; 17.v.1925; leg. California Academy of Science Expedition to Revillagigedo Islands.— USNM (acc. no. 247441): 1 specimen; Mazatlan; 12.viii.1962; leg. J. & J. Burch.— USNM: 5 specimens; Tenacatita Bay, 19°8'N 104°51'W; 4.xii.1937; in

pearl oyster; leg. F.E. Lewis & M.S. Stranger.— BMNH 1981.405: 1 male, pocl. 3.7 mm; 1 ovigerous female, pocl. 5.9 mm; Mazatlan; leg. D.I. Williamson.— **Costa Rica**.— RMNH D 10087: 2 ovigerous females, pocl. 7.50 and 8.1 mm; Puntarenas, Realejo; don. Museum Copenhagen through Oersted.— RMNH D 10088: 2 males, pocl. 7.3 and 7.1 mm; 3 ovigerous females, pocl. 7.9 (2x) and 8.5 mm; Puntarenas; don. Museum Copenhagen.— AHF 2441-2: 1 ovigerous female; 1 male; Isla Olarinta, Puntarenas; 21.i.1982; depth 20 ft; rocks; leg. R. Du Bois.— RMNH D 42581: 1 male, pocl. 4.3 mm; 1 ovigerous female, pocl. 6.1 mm; Golfo Dulce; sandy rocky bottom; depth 4-7 m;-.vi.1987; in *Pinctada mazatlanica* (Hanley); leg. Ingo Wehrtmann.— USNM 90182: 2 specimens; Port Parker; shore of small island at entrance; 9.ii.1935; leg. W.L. Schmitt, station 466-35.— USNM 90186: 1 specimen; Puerto Culebra; 24.ii.1934; shore collecting south of Mala Point, bayside; leg. W.L. Schmitt, station 256-34.— USNM 90188: 6 specimens; Playa Blancas; depth 15 fms; 8.ii.1935; along north point, mud, sand, algae; leg. W.L. Schmitt, station 461-35. USNM 90187; 1 specimen: Playa Blancas; 8.ii.1935; shore, shale beach between beach and rocky reef; leg. W.L. Schmitt, station 465-35.— USNM 64114: 2 specimens; Isla San Lucas; 15.i.1950; leg. M. Valerio.— **Panamá**.— MNHN-Na 1960: 2 males, pocl. 6.9 and 7.5 mm; collected by Smith, 1899.— RMNH D 9249: 3 ovigerous females, pocl. 5.6 and 6.6 (2x) mm; 1 male, pocl. 5.9 mm; Bahia Honda; 10.iii.1933; Allan Hancock expedition, n. 114-33.— RMNH D 10086: 5 ovigerous females, pocl. 5.9-7.7 mm; Taboga Island; -.x.1915; in pearl-oyster; Dr Th. Mortensen's Pacific expedition 1914-15.— USNM 90175: 5 specimens; Jicarita Island; 20.ii.1934; shore, rock, in pearl oyster; leg. W.L. Schmitt, station 243-34.—USNM 48806: 1 specimen; Canal Zone; -.i.1914; leg J. Zetek, station 230.— USNM 90180: 2 specimens; Secas Islands; 4.ii.1935; tidepool, shore, reef, each specimen in a separate pearl oyster; leg. W.L. Schmitt, station 446a-35.— USNM 90181: 6 specimens; Pinas Bay; depth 2-3 fms; tidepool, coral, from pearl oyster; 29.i.1935; leg. W.L. Schmitt, station 444-35.— USNM 90184: 5 specimens; Pinas Bay; shore rocks; 28.i.1935; leg. W.L. Schmitt, station 436-35.— USNM 90185: 2 specimens; Secas islands; 5.ii.1935; from pearl oysters; leg. W.L. Schmitt, station 452a-35.— USNM 90193: 12 specimens; AHF 114-33, 4 specimens: Bahia Honda; depth 2 fms; 10.iii.1933; in pearl oyster, coral from near east point; leg. W.L. Schmitt, station 114-33.— USNM 90194: 14 specimens; Panama Bay; 2.ii.1935; from pearl oyster; leg. W.L. Schmitt, station 445-35.— USNM (acc. no. 229243): 4 specimens; Saboga Island, Pearl Islands; P.S. Galtsoff coll. sta. 4 in pearl oysters; received 11.iii.1960 from A.G. Humes.— BMNH 1935.4.3.4-5: 2 ovigerous females, pocl. 7.5 and 8.4 mm; 1 female, pocl. 5.8 mm; Pearl Island; leg. Hurt, Peek & Howe.— **Colombia**: USNM 90174: 2 specimens; Octavia Bay; 27.i.1935; shore on island, shingle; leg. W.L. Schmitt, station AHF 433-35.— USNM 90178: 7 specimens; AHF 405a-35: 2 specimens; Gorgona Island; 22.i.1935; shore, rock and sand; leg. W.L. Schmitt, station AHF 405-35.— USNM 90177: 9 specimens; Port Utria; 24.i.1935; shallow water, coral, from pearl oyster; leg. W.L. Schmitt, station AHF 418-35.— USNM 90183: 5 specimens; Port Utria; shore, from pearl oysters, taken anomg rocks at low tide; 23.i.1935; leg. W.L. Schmitt, station AHF 413-35.— USNM 90179: 9 specimens; Cupica Bay; shore, west side, between second island and peninsula; 26.i.1935; from pearl oysters under rocks; leg. W.L. Schmitt, station AHF 427-35.— USNM 90192: 14 specimens; AHF 232-34: 4 specimens; Port Utria; 14.ii.1934; in pearl oyster; leg. W.L. Schmitt, station AHF 232-34.— AHF 239-34: 1 ovigerous female; Port Utria; shore; 14.ii.1934. — USNM 90195: Gorgona Island; 22.i.1935; shore, rock, from pearl oyster; leg. W.L. Schmitt, station AHF 405a-35.— **Galapagos Islands**.— USNM 85412: 3 specimens; N. Seymour Island; 11.vi.1932; Templeton Crocker Expedition, station 4.— USNM 90176: 2 specimens; Tower Island, Darwin Bay; 26.ii.1933; shore; in pearl oyster; leg. W.L. Schmitt, station AHF 101-34.

Other.— RMNH D 4754: 1 ovigerous female, pocl. 7.2 mm; 1 male, pocl. 4.2 mm; no further data.

Description.— Body subcylindrical, somewhat depressed. Carapace smooth. Rostrum well developed, distally ending in sharp point, reaching distal margin of basal segment to halfway second segment of antennular peduncle, triangular in dorsal view, slender in males, broad at base in larger females, without dorsal carina, with convex ventral lamina in distal part; distal lamina slightly increasing in height distal-

ly; subdistal dorsal tooth or notch with few long setae in front; subdistal ventral tooth in front of or at level of subdistal dorsal tooth, rarely obsolete or absent. Inferior orbital angle developed, angular. Antennal spine well developed, reaching level of anterior margin of carapace in lateral view, situated somewhat below level of rounded inferior orbital angle, separated from interior orbital angle by notch. Anterolateral margin of carapace strongly produced, broadly rounded.

Abdomen smooth; sixth abdominal segment 1.1 times longer than fifth, 1.6 times wider than long, posterolateral angle acutely produced, posteroventral angle spiniform; pleura of first five segments broadly rounded.

Telson twice as long as sixth abdominal segment, almost twice as long as its proximal width; lateral margins convex, convergent; posterior border without median process; two pair of rather large dorsal spines at about 0.35-0.45 and 0.60-0.70 of the telson length, marginal, about 0.20-0.25 of telson length; posterior margin with three

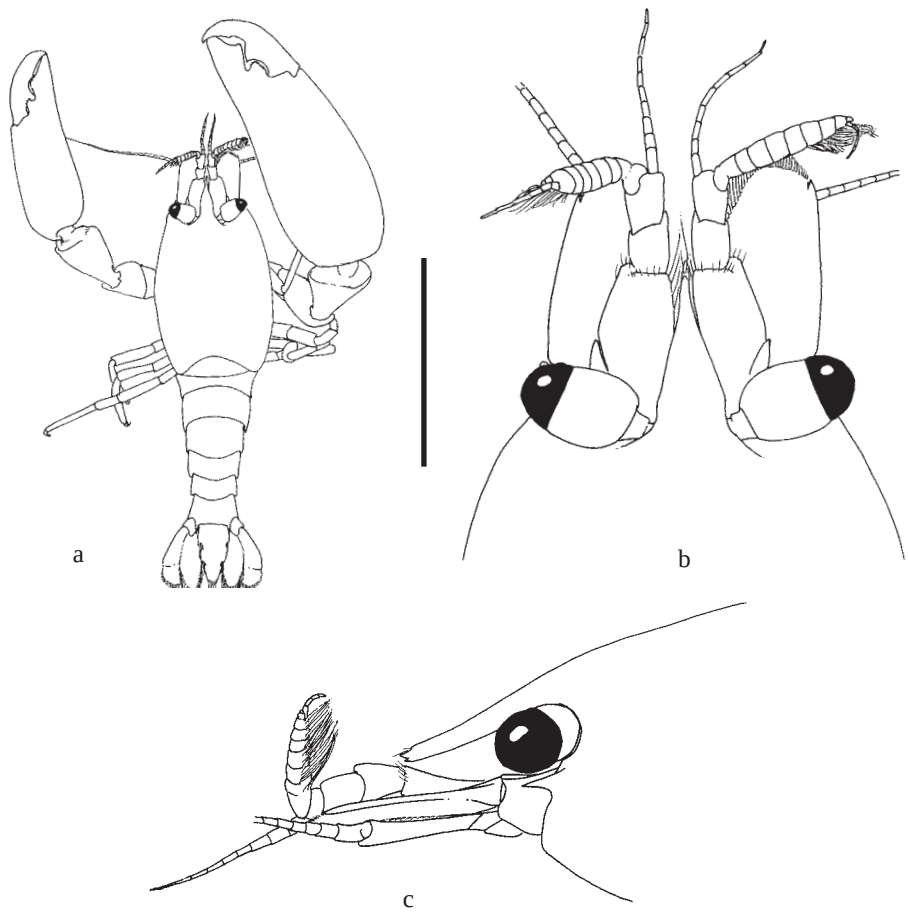


Fig. 71. *Pontonia margarita* Smith, 1869: male, pocl. 4.3 mm, RMNH D 42581. a, dorsal aspect; b, anterior appendages, dorsal view; c anterior appendages, lateral view. Scale: a = 8 mm; b, c = 4 mm.

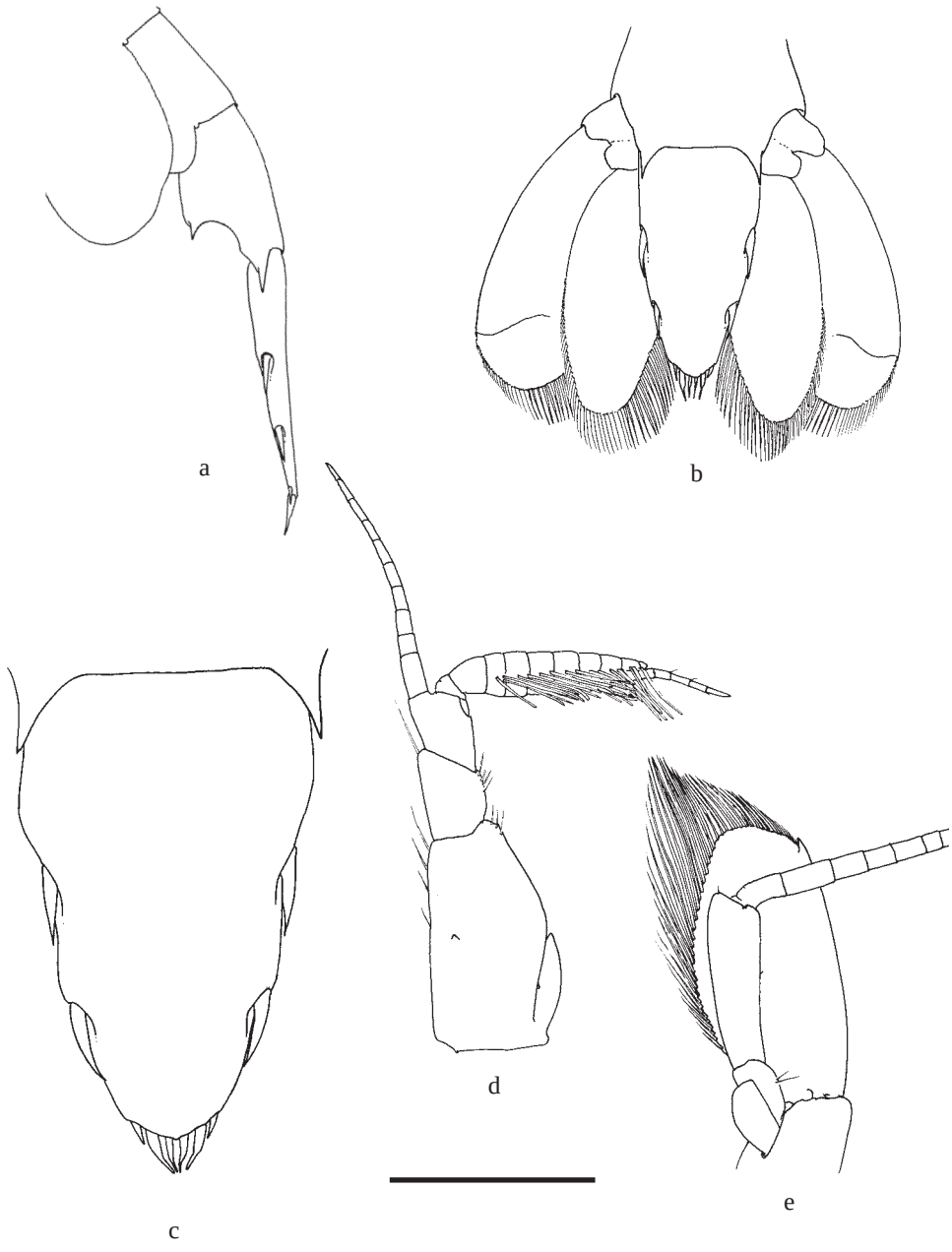


Fig. 72. *Pontonia margarita* Smith, 1869: male, pocl. 4.3 mm (figs. b-e), ovigerous female, pocl. 6.1 mm (fig. a), RMNH D 42581. a, distal part abdomen, lateral view; b, telson and uropods, dorsal view; c, telson, dorsal view; d, antennula, ventral view; e, antenna, ventral view. Scale a, b = 2 mm; c = 1 mm; d, e = 1.5 mm.

pairs of spines, lateral spines rather small, about 0.05 of telson length, marginal, intermediate and submedian spines larger than lateral spines, about half as long as dorsal spines and more slender.

Eyestalk slightly longer than wide, cylindrical, posteriorly somewhat swollen; stalk slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella well developed. Basal segment without distinct distolateral tooth, rounded or angular in smaller specimens, distal margin small, rounded or produced; medioventral spine small, acute, submarginal, situated halfway basal segment; stylocerite short, small, less than half length of basal segment, with distal angular tip, lateral margin without setae. Intermediate segment slightly longer than wide. Distal segment 1.5 times longer than wide. Upper flagellum well developed, biramous, with (5) 6-8 proximal segments fused; short free ramus two-segmented; longer free ramus with about five or six segments. Lower flagellum with about 9-11 segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite short reaching 2/3 of lamella of scaphocerite, moderately stout, 3.0 times longer than distal width; flagellum short, slender, about as long as postorbital carapace length; scaphocerite with lamella about 2.0 times as long as central width, distal margin truncate, medial margin convex, lateral margin slightly convex with small, strongly medially curved, distolateral tooth not reaching anterior margin of lamella, distolateral tooth about 0.05 times length of scaphocerite; incision between distolateral tooth and lamina indistinct.

Epistome with blunt anterior median carina; labrum large, oval.

Paragnath well developed, alae with large transverse rectangular distal lobes, with more or less triangular submedian ventral lobes; corpus rather long, narrow, with median groove, bordered by somewhat oblique setose carinae.

Second thoracic sternite formed into broad triangular process between second maxillipeds, with setae medially.

Third thoracic sternite not ornamented.

Fourth thoracic sternite with shallow lateral carinae posteromedian of first pereiopods, with shallow broad notch in between; with low transverse ridge between first pereiopods.

Fifth thoracic sternite with shallow lateral carinae posteromedian of second pereiopods, with broad medial excavation in between.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process slender, with four to six distal teeth and row of about five small teeth present on medioventral border; molar process robust, with three to four blunt distal teeth, some fringed with setal brushes.

Maxillula with upper lacinia broad with two rows of 13-15 serrulate spines and many long slender setae medially, inner medial surface with several long simple setae; lower lacinia very broad, densely setose distoventrally and marginally, no differentiation in setae; palp bilobed, large lobe with small ventral tubercle with single short recurved simple seta.

Maxilla with basal endite well developed, bilobed; distal lobe slightly longer than proximal lobe, both with many long slender minutely serrulate setae along distomedian border, median border without setae; coxal endite obsolete, median margin con-

vex, without setae; scaphognathite large, 2.8 times longer than wide, posterior lobe large, rounded, 1.8 times longer than anterior width, anterior lobe 1.1 times longer than proximal width; palp simple, about as long as distal lobe of basal endite, strongly expanded proximally, tapered distally to rather acute tip, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite completely fused, large and broad,

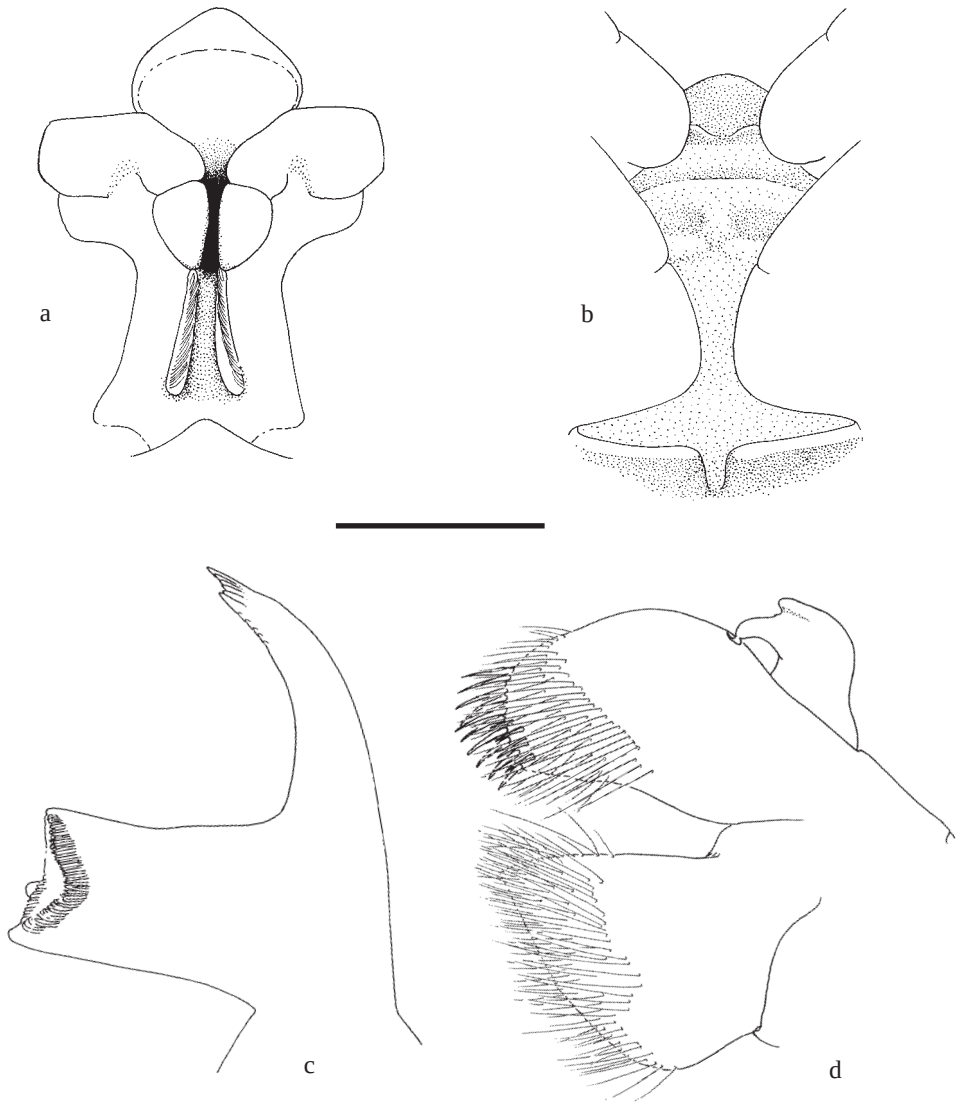


Fig. 73. *Pontonia margarita* Smith, 1869, male, pocl. 4.3 mm, RMNH D 42581. a, paragnath, ventral view; b, second to fifth thoracic sternites; c, mandible, ventral view; d, maxillula, ventral view. Scale: a, b = 1 mm; c, d = 0.6 mm.

fringed with many simple, long and finely serrulate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod well developed, flagellum with about ten long, plumose setae distally; caridean lobe large, elongate; epipod large, triangular, faintly bilobed; palp simple, slender, elongate, curved along distolateral margin of basal endite, non-setose.

Second maxilliped with endopod normally developed; dactylar segment narrow, 3.8 times longer than broad, with numerous coarsely serrulate, spiniform, and long curled, finely serrulate setae medially; distomedial lobe of propod produced, rounded with stout serrulate and long plumose marginal setae, ventrolateral margin without setae; carpal segment distomedially angular, unarmed; meral segment with long median plumose setae, medially excavated; basal and ischial segments almost completely fused, medially excavated, ischial part with distomedian row of plumose setae; exopod normal, with few long plumose setae in distal part; coxal segment medially slightly produced, with few simple setae, with large subtriangular epipod laterally, not bearing a podobranch.

Third maxilliped almost reaching with ultimate segment to distal margin of carpocerite; ischiocerite almost completely fused with basis, indicated by distinct suture, 2.3 times longer than broad, tapering distally, flattened, with many setae on median margin, ventral surface with few setae, lateral margin with single row of long, plumose setae; basal segment medially convex, with many long, finely serrulate setae on medial margin; exopod well developed, reaching halfway penultimate segment, with long plumose setae in distal fifth; coxa without medial process, with large lateral plate fringed with few long simple setae, with rudimentary arthrobranch; penultimate segment about twice as long as central width, about 0.5 length of ischiomeral segment, medially somewhat expanded, flattened, with long finely serrulate setae along ventromedial and ventrolateral margins; ultimate segment slightly shorter than penultimate segment, tapering distally, with long, finely serrulate, and shorter, more coarsely serrulate setae along ventromedial, vantrolateral and distal margins.

First pereiopods slender, exceeding carpocerite with chela and carpus. Chela about 3.9 times longer than deep, subcylindrical, slightly compressed; fingers slightly longer than palm, slender, with several rows of finely serrate setae, cutting edges entire, somewhat gaping proximally, with groups of many strong, long, serrulate setae, tips acute, hooked; cleaning organ strongly reduced or absent on carpal-propodal joint; carpus 1.5 times longer than chela, about 6.0 times longer than distal width, somewhat tapering proximally, unarmed, without setae; merus 0.83 of carpus length, 5.0 times longer than central width, straight, unarmed, with few long simple setae in proximal part of median margin; ischium short, about 0.4 times merus length, with slightly expanded medial margin, with few simple setae along median and lateral margins; basis about as long as ischium, with setae medially; coxa robust with setose ventromedial carina.

Second pereiopods similar in form, unequal in size. Major cheliped with chela large, about twice as long as postorbital carapace length in adult males and females, with palm subcylindrical, somewhat compressed, without carinae, smooth, with few short setae in distal part; dactylus about 0.65 times palm length, about 3.5 times longer than deep, with large simple triangular proximal tooth, distal part of cutting edge entire, tip strongly hooked, with median margin entire, not carinate; fixed finger about 2.0 times longer than deep, with blunt denticulate tooth just proximal of tooth on

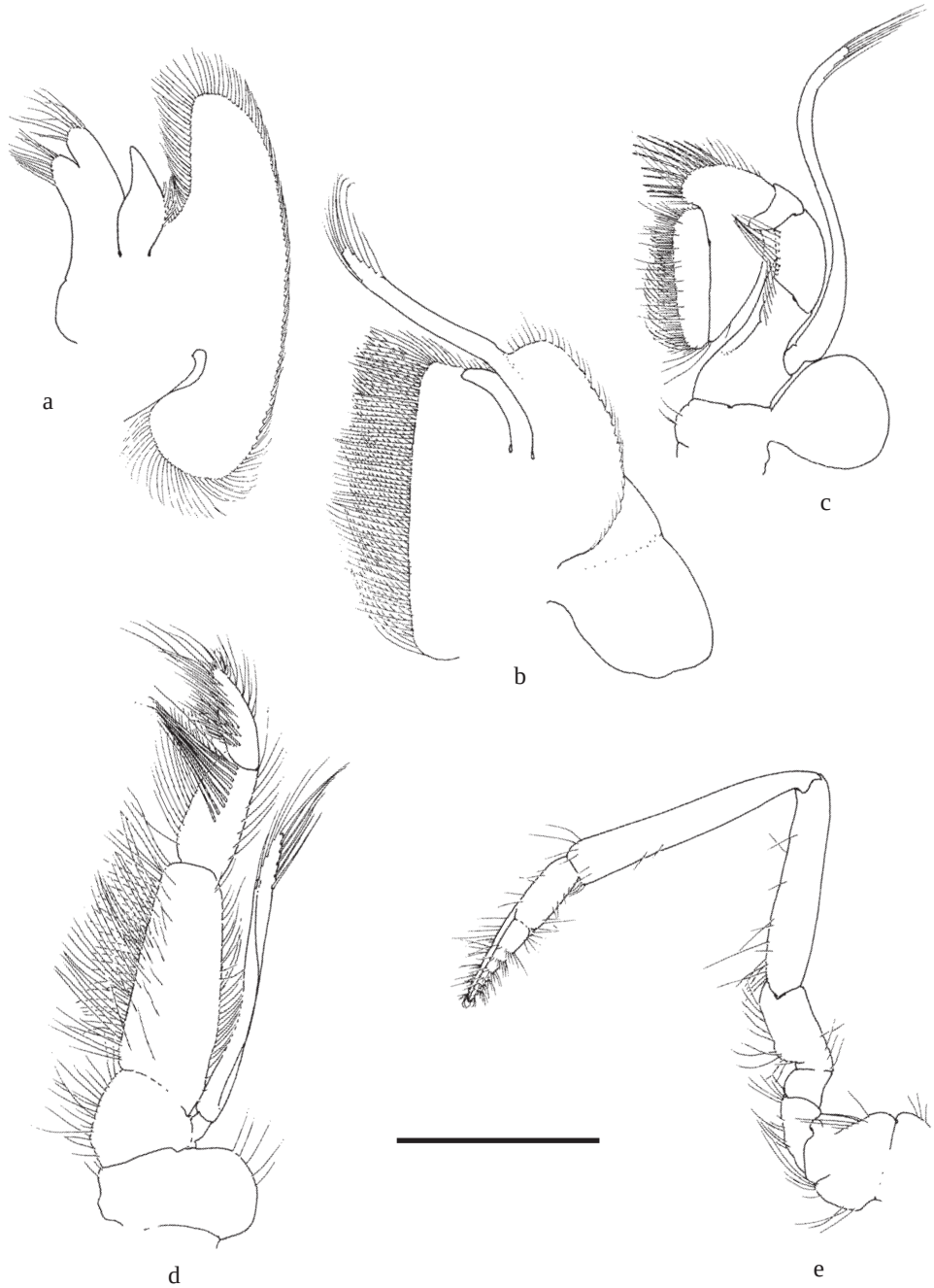


Fig. 74. *Pontonia margarita* Smith, 1869: male, pocl. 4.3 mm, RMNH D 42581. a, maxilla, ventral view; b, first maxilliped, ventral view; c, second maxilliped, ventral view; d, third maxilliped, ventral view; e, first pereiopod. Scale: a-d = 1.5 mm; e = 4 mm.

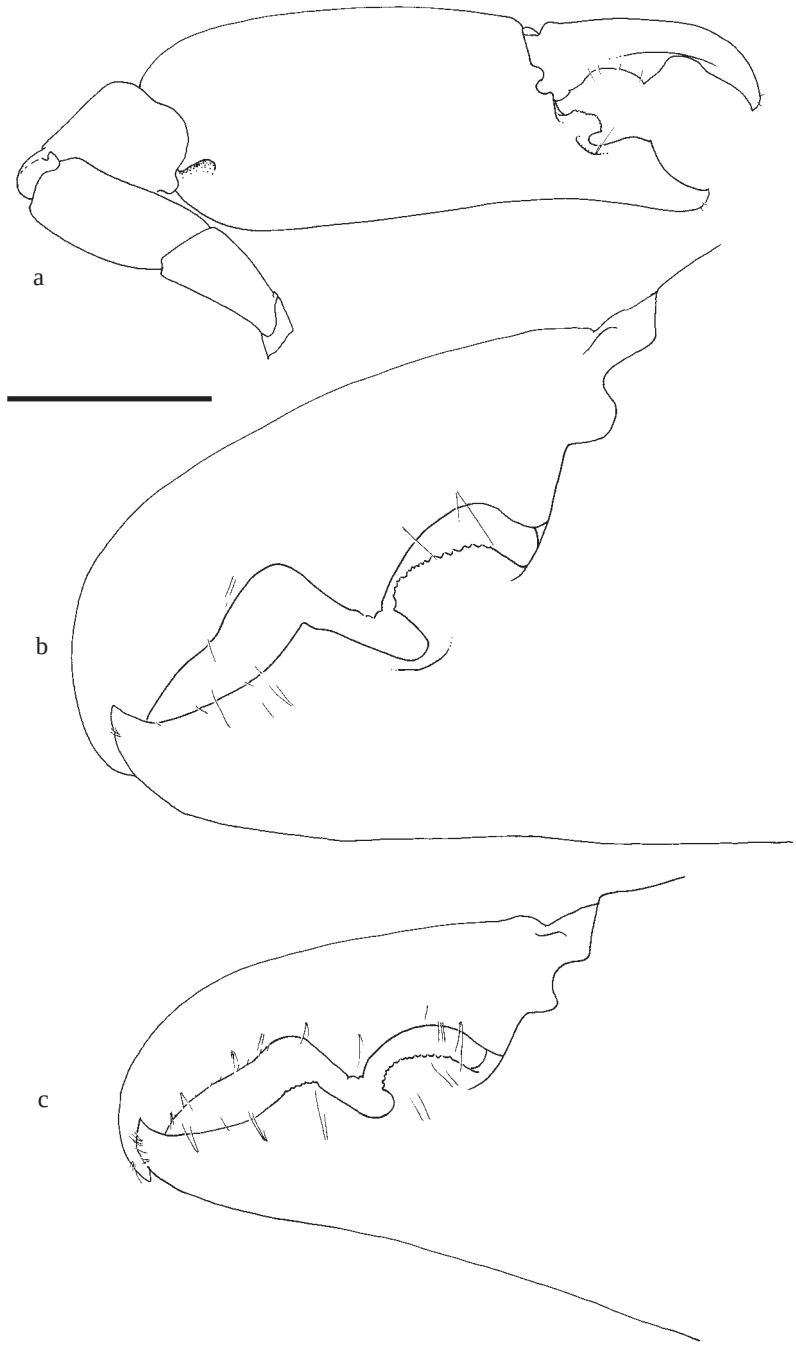


Fig. 75. *Pontonia margarita* Smith, 1869, ovigerous female, pocl. 6.1 mm (fig. a, b), RMNH D 42581; male, pocl. 7.6 mm, RMNH D 42583 (fig. c). a, major second pereiopod; b, c, idem chela. Scale: a = 4 mm; b, c = 2 mm.

dactylus, separated from blunt triangular tooth just distal of tooth on dactylus by deep notch, distal part of cutting edge entire, slightly concave, tip strongly hooked, median fossa for reception of dactylar tooth when fingers closed indistinct; carpus short and stout, about 0.42 of palm length, expanding distally, slightly longer than distal width, unarmed, with distomedial excavation; merus short and stout, about as long as carpus, about twice as long as central width, distomedially excavate; ischium short and stout, about 0.7 times merus length, tapering proximally, without distomedial protuberance; basis and coxa stout, without armature. Minor cheliped as major cheliped, with palm subcylindrical, without carinae, smooth, with few setae in distal part; fingers 0.7 times palm length; fingers as major cheliped, tooth on dactylus and median tooth on fixed finger may be crenulate as proximal truncate tooth on fixed finger.

Ambulatory pereiopods robust. Dactylus of third pereiopod with corpus strongly compressed ventrally, about as long as proximal width, with few simple setae on distal and ventral margins, accessory tooth large, strongly recurved, acute, preterminal, ventral margin entire, slightly convex; unguis simple, acute, curved, about 0.7 of corpus length; propodus about 3.1 times longer than dactylus, about 4.2 times longer than wide, with two rather short ventrodistal spines and one small median subdistal spine (rarely absent) on ventral margin, with few rather long setae; carpus 0.6 times

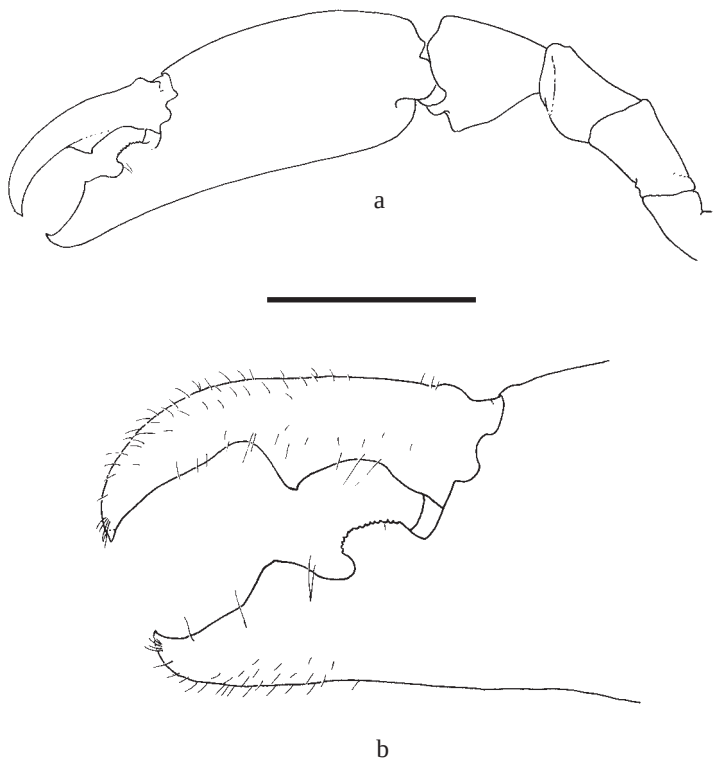


Fig. 76. *Pontonia margarita* Smith, 1869, ovigerous female, pocl. 6.1 mm (fig. a), RMNH D 42581; male, pocl. 7.6 mm, RMNH D 42583 (fig. b). a, minor second pereiopod; b, idem chela. Scale: a = 4 mm, b = 2 mm.

propodus length, 2.5 times longer than distal width, slightly tapering proximally, with distal lobe, unarmed; merus slightly longer than propodus, about 3.0 times longer than central width, subcylindrical, unarmed, non-setose; ischium about 0.70 of merus length, 2.0 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopod similar.

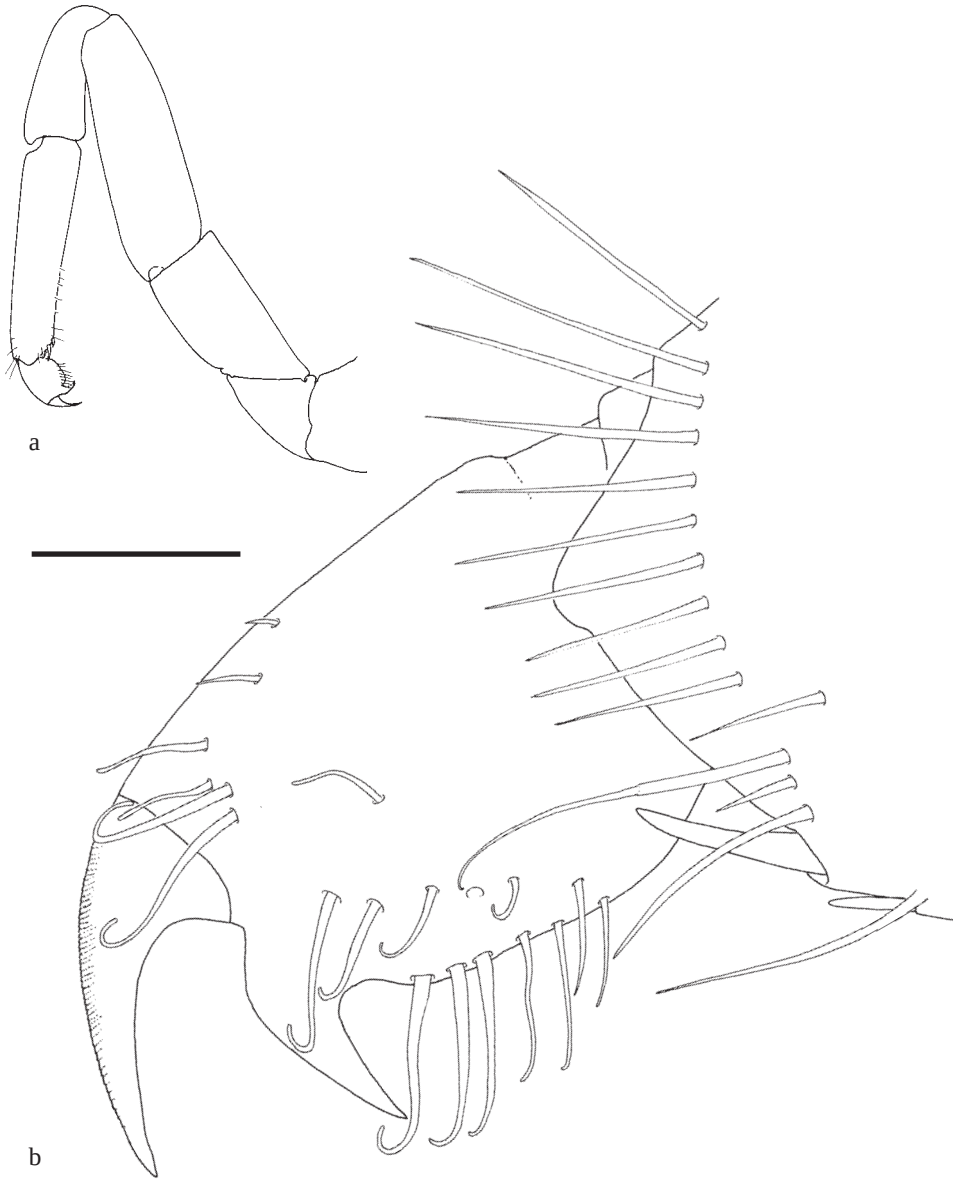


Fig. 77. *Pontonia margarita* Smith, 1869, ovigerous female, pocl. 6.1 mm, RMNH D 42581. a, third pereiopod; b, dactylus third pereiopod. Scale: a = 2 mm; b = 0.15 mm.

Male first pleopod with endopod about 4.0 times longer than proximal width, tapering distally; median margin straight with row of many short simple setae, with moderately long plumose setae along lateral margin, distal margin without setae, or with one or few simple long setae.

Endopod of second pereiopod with appendix masculina, 0.9-1.0 times length of appendix interna, with few long setulose long setae distally.

First pleopod of female with slender endopod, about third length of exopod, with many long distal setae when ovigerous, with few long plumose setae on lateral margin and few simple setae in proximal part of medial margin.

Uropods with short stout unarmed protopodite; exopod broad, about twice as long as wide, with lateral margin convex, without lateral tooth, with or without minute distolateral spine, distal lamina rounded or truncate; endopod extending well beyond exopod, as long as telson.

Size.— Maximum postorbital carapace length in males 7.5 mm, in females 8.5 mm. Minimum postorbital carapace length in ovigerous females 4.9 mm.

Colouration (based on Hickman & Zimmerman, 2000).— Translucent milky brownish white over body with distinct reticulate pattern of white lines on carapace and abdomen. Middorsal longitudinal indistinct white stripe from base of rostrum to midlength of carapace. Chelipeds milky white, yellowish orange at joints. Ambulatory pereiopods white. Eyestalks with indistinct white longitudinal dorsal stripe, cornea white.

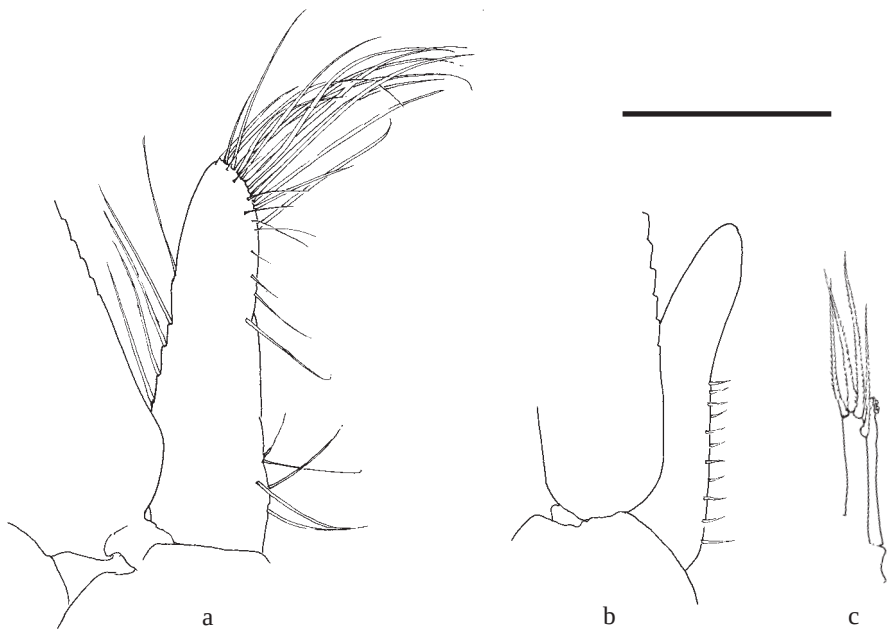


Fig. 78. *Pontonia margarita* Smith, 1869: male, pocl. 4.3 mm (figs. b, c), ovigerous female, pocl. 6.1 mm (fig. a), RMNH D 42581. a, endopod female first pleopod; b, endopod male first pleopod; c, appendix interna and appendix masculina on second male pleopod. Scale = 0.6 mm.

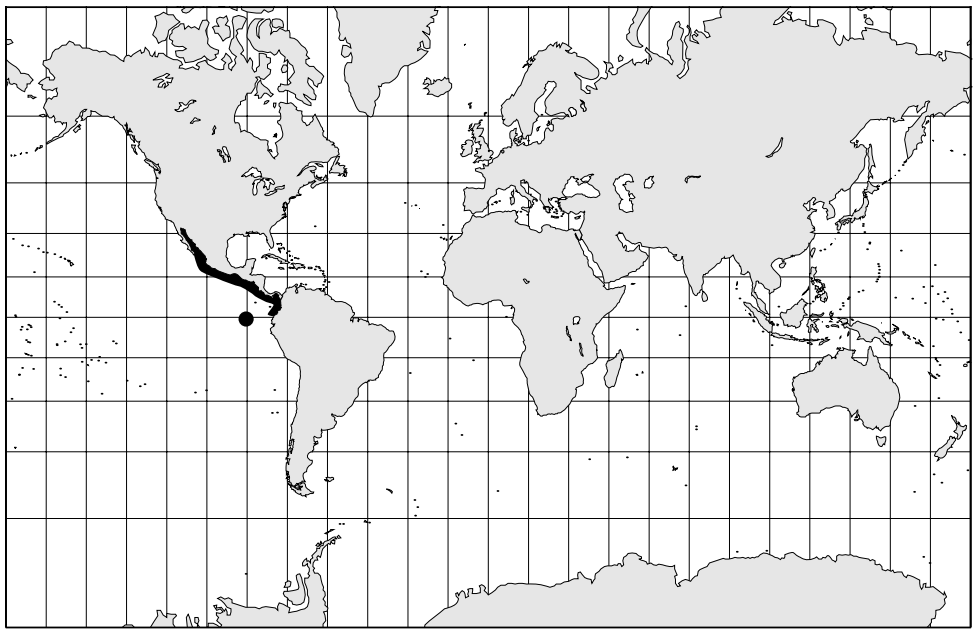


Fig. 79. Geographic distribution of *Pontonia margarita* Smith, 1869.

Types.— The specimens from MNHN-NA 1960, are labeled syntypes, with Panama as locality and Smith as collector. The date of collecting (1899) is probably wrong as the species was decribed in 1869. The label, however, is not original.

Distribution.— EAST PACIFIC: Known from shallow waters along the coast of California to Colombia and the Galapagos Islands; Costa Rica (Cabrera-Peña & Solano-López, 1996).

The records of the species from the West Atlantic (Holthuis, 1951a (in part); Hulings, 1961; Bullis & Thompson, 1965; Williams, 1965; Wells & Wells, 1966; Chace, 1972 (in part); Markham, 1985; Markham, 1988) refer to *P. manningi* Fransen, 2000.

Host.— The species is usually encountered in the pearl oyster *Pinctada fimbriata* (Dunker, 1852) (cf. Kemp, 1922; Boone, 1931; Chace, 1937; Holthuis, 1951; present records). It has also been recorded in *Pinctada mazatlanica* (Hanley, 1856) (cf. Wicksten, 1983 Cabrera-Peña & Solano-López, 1996; Hickman & Zimmerman, 2000; present records) and an unidentified *Pinna* (cf. Wicksten, 1983).

Remarks.— The basal segment of the antennular peduncle is produced in the ovigerous female of AHF 2441-2. The specimen with registration number AHF 652-37 has dorsal spines on telson relatively long. The juvenile specimen with registration number AHF 591-36 has the dorsal spines on the telson at about 0.50-0.75 of the telson length. The larger male (MNHN-Na 1960) has no ventral subdistal rostral tooth. The small male specimen from Sonora Mexico (MCZH) has no rostrum.

8.2.7. *Pontonia mexicana* Guérin, 1856
(figs. 80-90, pls. 2, 3)

Pontonia mexicana Guérin-Méneville, 1856: xix, pl. 2 fig. 12; Guérin-Méneville, 1857: lii, pl. 2 fig. 12; Rathbun, 1902: 122; Borradaile, 1917: 391; Holthuis, 1951a: 130, pl. 41 figs. a-k; Holthuis, 1952: 15; Chace, 1972: 39; Bruce, 1972b: 222; Zeiller, 1974: 73, 2 colourfigs.; Wilkens, 1980: 469; Rodriguez, 1980: 94, fig. 29; Kaplan, 1982: 155, fig. 46; Criales, 1984: 311; Kaplan, 1988: 305, fig. 126; Spamer & Bogan, 1992: 163: Fransen, 1994: 111.

Pontonia armata Sharp, 1893: 119 [non H. Milne Edwards, 1837, = *Paranchistus armatus*].

Pontonia grayi Rathbun, 1902 (p.p.): 122, fig. 25; Borradaile, 1917: 391; Bouvier, 1918: 6; Schmitt, 1924: 72: Schmitt, 1935: 166, fig. 29.

Panthonia mexicana; Valdés Ragués, 1909: 181.

Material.— **West Atlantic**: **Bahama Islands**.— RMNH D 9247: 2 ovigerous females, pocl. 6.1 and 7.4 mm; New Providence; 1886; "Albatross" Expedition.— RMNH D 42578: 1 ovigerous female, pocl. 6.6 mm; W side of Frozen Key, ca. 20 km N of Berry Island, 25°33'N 77°42'W; depth 1-2 m; in *Thalassia*; 23.ix.1980; in *Pinna* sp.; leg. R.W. Heard.— USNM 110571: 13 specimens; Exuma, Highbourne Cay; summer 1963; leg. D. Faulkner.— USNM 85386: 7 specimens; New Providence; 1886; "Albatross".— USNM (acc. no. 239841): 1 male, 1 ovigerous female; Lyford Cay, Clifton Bay; 14.viii.1961; depth 2-2.5 ft. low tide; in sandy area before turtle grass, in *Pinna*; leg. W.L. Schmitt sta. 29-61.— USNM (acc. no. 239841): 1 male, 1 ovigerous female; Lyford Cay, Clifton Bay; 7.viii.1961; from turtle grass flat; in *Pinna*; leg. W.L. Schmitt sta. 18-61.— USNM (acc. no. 239841): 1 male, 1 female; Lyford Cay, Clifton Bay, S end of beach near canal inlet; 16.viii.1961; leg. W.L. Schmitt sta. 33-61.— USNM 228045: 2 males, 2 females, 1 ovigerous female; Exuma Cays, off Lee Stocking Island; depth 8-15 feet; 14.vii.1984; in *Pinna carnea* (Gmelin, 1791) (4) gill cavities; leg. A.T. Jones.— **U.S.A., Florida**.— USNM 85385: 1 specimen; Tortugas; 7.vii.1932; found in one of 36 shells of *Pinna* spec. opened; don. A.A. Boyden.— **Mexico**.— USNM 135606: 1 male, 1 ovigerous female; Quintana Roo, Isla Cozumel, San Miguel, NW of main dock; depth 25-30 ft; 3.iv.1966; Smithsonian-Bredin Expedition, station 34-60.— **Cuba**.— MNHN-Na 8183: 1 male, pocl. 7.5 m; E. of Boury; collected in 1912 by Bouvier (specimen mentioned by Bouvier in 1918 as *P. grayi*).— **Jamaica**.— BMNH 1980.50.294D: 3 males, pocl. 4.4, 5.6, and 6.9 mm, 1 non-ovigerous female, pocl. 6.5 mm; 2 ovigerous females, pocl. 6.5 mm; Grand Cayman Island N. Sound; depth 2.8 m; in *Pinna carnea* (Gmelin, 1791); 4.xi.1974; leg. University of Southampton. — USNM 85384: 2 specimens; 1910; don. E.A. Andrews.— USNM 47356: 2 specimens; from Marine Biological Laboratory at Woods Hole.— **West Indies**.— RMNH D 42637: 1 ovigerous female, pocl. 6.9 mm; 2 males, pocl. 4.4 and 5.5 mm; Curaçao, entrance of Spaanse Water; 29.xii.1955; leg. Zaneveld.— RMNH D 42638: 1 ovigerous female, pocl. 5.6 mm; 2 males, pocl. 4.4 and 3.8 mm; Curaçao, mouth of Piscadera bay; depth 0-1 m; 22.xi.1956; in seagrass; in *Pinna* spec.; leg L.B. Holthuis, sta. 1010.— RMNH D 42639: 1 ovigerous female, pocl. 6.1 mm; 1 male, pocl. 6.9 mm; Curaçao, mouth of Piscadera bay; 31.i.1957; in *Pinna* spec.; leg L.B. Holthuis, sta. 1078.— RMNH D 42640: 1 ovigerous female, pocl. 6.7 mm; Curaçao, mouth of Piscadera bay; depth 0.5 m; 5.xii.1956; in *Pinna* spec.; leg. L.B. Holthuis, sta. 1020; specimen lilac coloured.— RMNH D 42641: 1 ovigerous female; pocl. 8.6 mm; 1 male, pocl. 7.5 mm; Curaçao, entrance of Piscadera bay; depth 0.25 m; 21.i.1957; in *Pinna* spec.; leg L.B. Holthuis, sta. 1055.— RMNH D 42642: 1 female, pocl. 6.5 mm; 1 male, pocl. 6.3 mm; Curaçao, entrance of Piscadera bay; 5.i.1956; in *Pinna* spec.; leg L.B. Holthuis, sta. 1002.— RMNH D 42643: 1 ovigerous female, pocl. 8.1 mm; Curaçao, Boca Wacao; 30.i.1955; under stone; leg. J.S. Zaneveld.— RMNH D 42645: 1 ovigerous female, pocl. 6.0 mm; 1 male, pocl. 4.5 mm; Curaçao, mouth of Piscadera bay; 4.i.1957; in *Pinna*; leg. L.B. Holthuis, no. 1040.— RMNH D 42646: 1 ovigerous female, pocl. 8.0 mm; 1 male, pocl. 7.6 mm; Curaçao, Nieuwpoort, at surface off small beach; 8.vii.1956; leg. L. Zaneveld.— RMNH D 42647: 1 ovigerous female, pocl. 8.4 mm; 1 male, pocl. 7.9 mm; Curaçao, Boca of Spaanse Baai; in *Pinna*; 13.viii.1949; leg. P. Wagenaar Hummelinck.— RMNH D 42648: 1 ovigerous female, pocl. 2.3 mm; Bonaire, roadstead of Kralendijk, two buoys; wood, abt, 4 years; depth 0-1.5 m; 21.ix.1948; leg. P. Wagenaar Hummelinck no. 1054.— RMNH D 26480: 2 males, pocl 7.8 mm; 1 ovigerous female, pocl. 10.0 mm; St. Louis, Marie-Galante near Martinique; 1953; leg. R. Pinchon.— RMNH D 30420: 4 males, pocl. 6.3-7.1 mm; 4 ovigerous females, pocl. 6.0-7.1 mm; Anguilla, Mundy's Bay; 7.xii.1973; depth 5 m; 'totally transparent, with a tracery of very fine shrimp pink"; in *Pinna carnea* (Gmelin, 1791); leg. C. Durham.— RMNH D 30421: 1 male, pocl. 7.4 mm; 1 ovigerous female, pocl. 5.9 mm; Virgin Islands, Beef Island; depth 2-2.3 m;

from *Pinna*; 18.vii.1972; leg. Jannie Kuick.— USNM 134769: 2 specimens; Virgin islands, St. John Island, Lameshur Bay; depth 70 feet; scuba diving; 11.iv.1965; in *Atrina seminuda* (Lamarck, 1819); leg. C. Mahnken.— USNM 134770: 1 ovigerous female; Virgin Islands, St. John Island, Concordia Bay; 23.iv.1969; scuba diving; leg. C. Davis.— AHF A41-39: 1 ovigerous female; Tobago Island, Buccoo Reef; shore, coral reef, male from *Pinna*; 20.iv.1939; station A41-39.— USNM 135607: 2 specimens; Windward Islands, St. Lucia Island, Marigot Bay, W side of North Peninsula; 15.iv.1959; in *Pinna* spec.; Smithsonian-Bredin Expedition. station 56-59.— **Brazil**.— RMNH D 18647: 1 juvenile, pocl. 1.4 mm; Trinidade Island, 1300 km E of Espiritu Santo; -.v.1950; W. Besnard. — **EXACT LOCALITY UNKNOWN.** — USNM 96307: 1 male, 1 ovigerous female; off beach at Boca Chica, D.R.; i.xi.1953; from inside of living *Atrina rigida* (Lightfoot, 1786); station 147.

Description.— Body subcylindrical, somewhat depressed. Carapace smooth. Rostrum well developed, distally ending in sharp point, almost reaching end of basal segment of antennular peduncle in large females to reaching distal end of second segment of antennular peduncle in males, slender, without dorsal carina, with straight or slightly convex ventral carina in distal part; subdistal dorsal tooth with few long setae in front; subdistal ventral tooth slightly posterior of level of subdistal dorsal tooth, sometimes indistinct, seldom absent. Inferior orbital angle produced, angular. Antennal spine well developed, reaching level of anterolateral margin in lateral view, situated below level of rounded inferior orbital angle, separated from inferior orbital angle by notch. Anterolateral margin of carapace slightly produced, broadly rounded.

Abdomen smooth; sixth segment about 1.4 times longer than fifth, 1.3 times wider than long, posterolateral angle acutely produced, posteroventral angle spiniform; pleura of first five segments broadly rounded.

Telson almost twice as long as sixth abdominal segment, about twice as long as its proximal width; lateral margins convex, convergent; posterior margin without median process; two pair of medium sized dorsal spines at about 0.33 and 0.60 of the telson length, marginal, about 0.10 of telson length; posterior margin with three pairs of spines, lateral spines rather small, about 0.05 of telson length, marginal, intermediate and submedian spines larger than lateral spines, about as long as dorsal spines but more slender.

Eyestalk about as long as wide, cylindrical, posteriorly somewhat swollen; stalk slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella well developed. Basal segment with or without small distolateral tooth reaching to 1/3rd of intermediate segment, anterior margin produced; medioventral tooth very small, acute, submarginal, situated halfway basal segment; stylocerite short, about half the length of basal segment, with distal blunt tip, lateral margin without plumose setae. Intermediate segment slightly longer than wide. Distal segment slightly longer than wide. Upper flagellum well developed, biramous, with seven or eight proximal segments fused; short free ramus two-segmented; longer free ramus with about six segments. Lower flagellum with about 12-20 segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite short reaching 2/3 of lamella of scaphocerite, moderately stout, about 3.0 times longer than distal width; flagellum short, slender, 0.7-1.2 times postorbital carapace length; scaphocerite with lamella about 1.7 times as long as central width, anterior margin truncate, medial margin convex, lateral margin slightly convex with small, medially curved, distolateral tooth not reaching anterior margin of lamella, distolateral tooth about 0.08 times

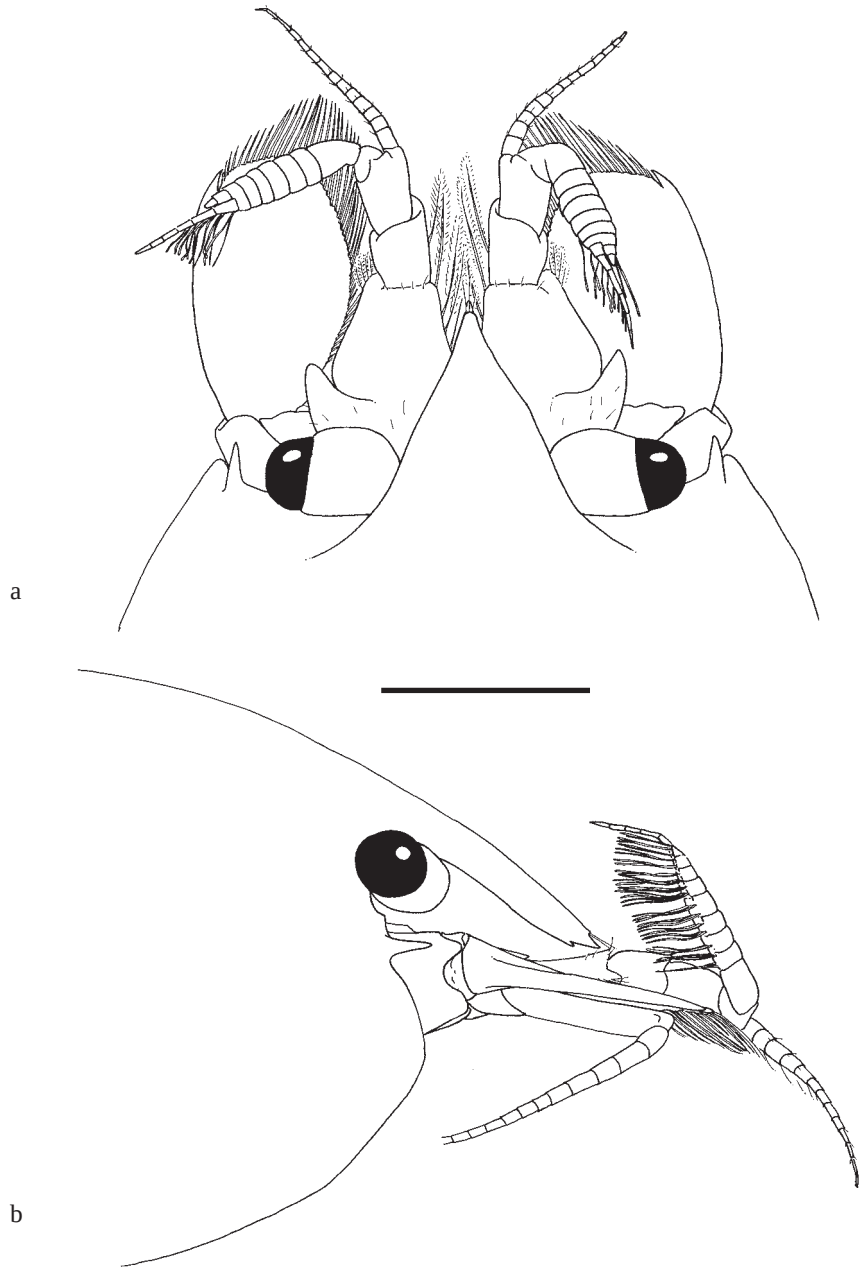


Fig. 80. *Pontonia mexicana* Guérin, 1856, ovigerous female, pocl. 8.6 mm, RMNH D 42641. a, anterior appendages ovigerous female, dorsal view; b, idem, lateral view. Scale = 2 mm.

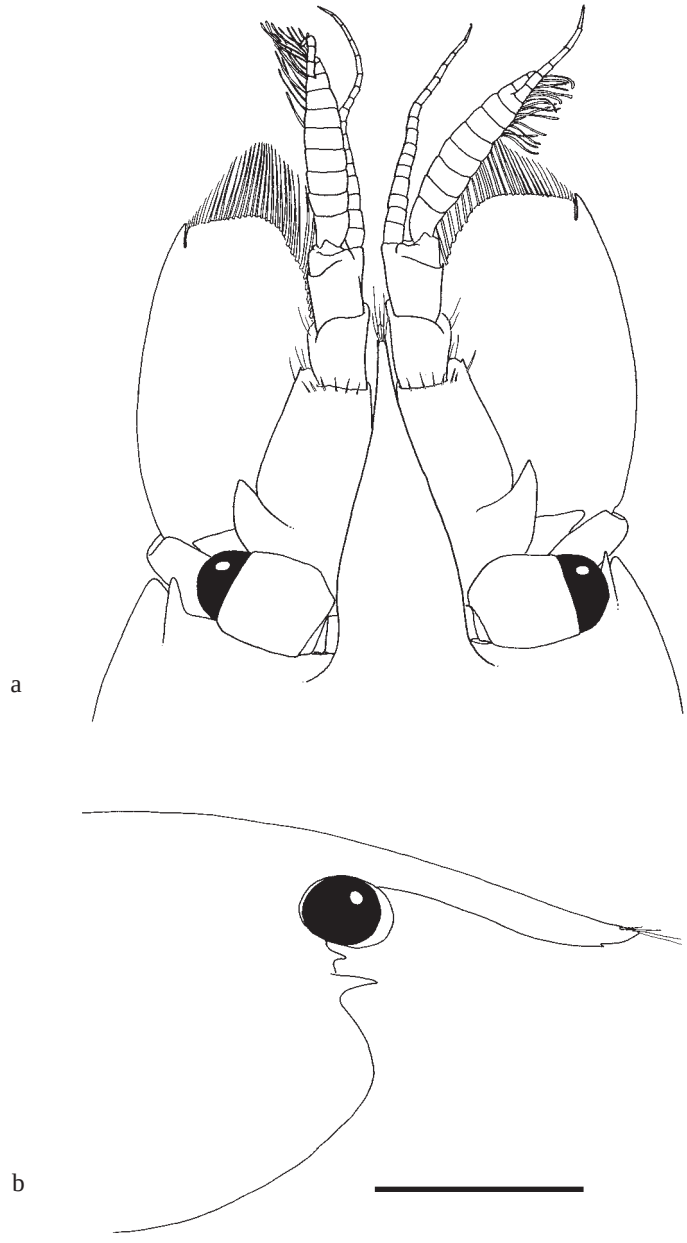


Fig. 81. *Pontonia mexicana* Guérin, 1856, male, pocl. 7.5 mm, RMNH D 42641. a, anterior appendages male, dorsal view; b, rostrum male, lateral view. Scale = 2 mm.

length of scaphocerite; incision between distolateral tooth and lamina indistinct.

Epistome with blunt anterior median carina; labrum large, oval.

Paragnath well developed, alae with large subcircular distal lobes, and round submedian ventral lobes; corpus long, with long median groove, bordered by parallel submedian setose carinae.

Second thoracic sternite formed into, shallow, triangular, medially pointed process between second maxillipeds, with many simple annulate setae medially.

Third thoracic sternite with shallow indistinct lateral carinae posteromedian of third maxillipeds.

Fourth thoracic sternite with shallow indistinct lateral carinae posteromedial of first pereiopods; with median ridge between first pereiopods.

Fifth thoracic sternite with well developed lateral plates posteromedial of second pereiopods, with deep narrow medial notch in between.

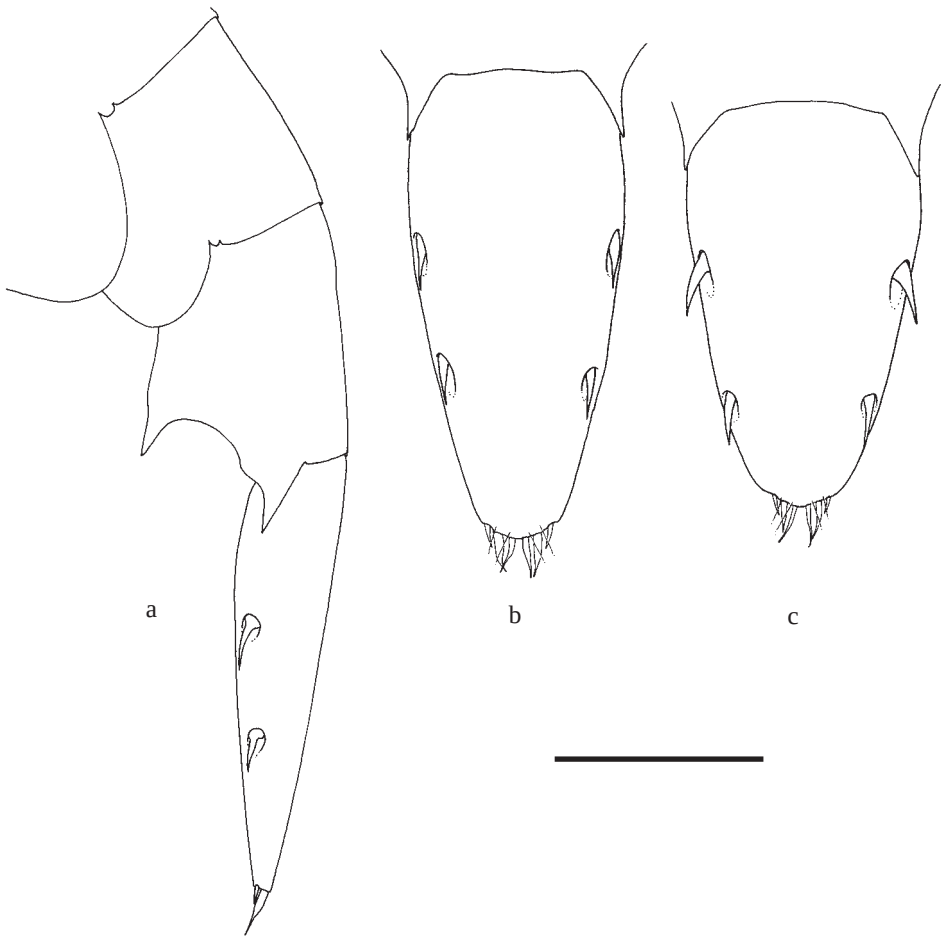


Fig. 82. *Pontonia mexicana* Guérin, 1856: ovigerous female, pocl. 8.6 mm (figs. a, b); male, pocl. 7.5 mm (fig. c), RMNH D 42641. a, distal part abdomen, lateral view; b, c, telson, dorsal view. Scale = 2 mm.

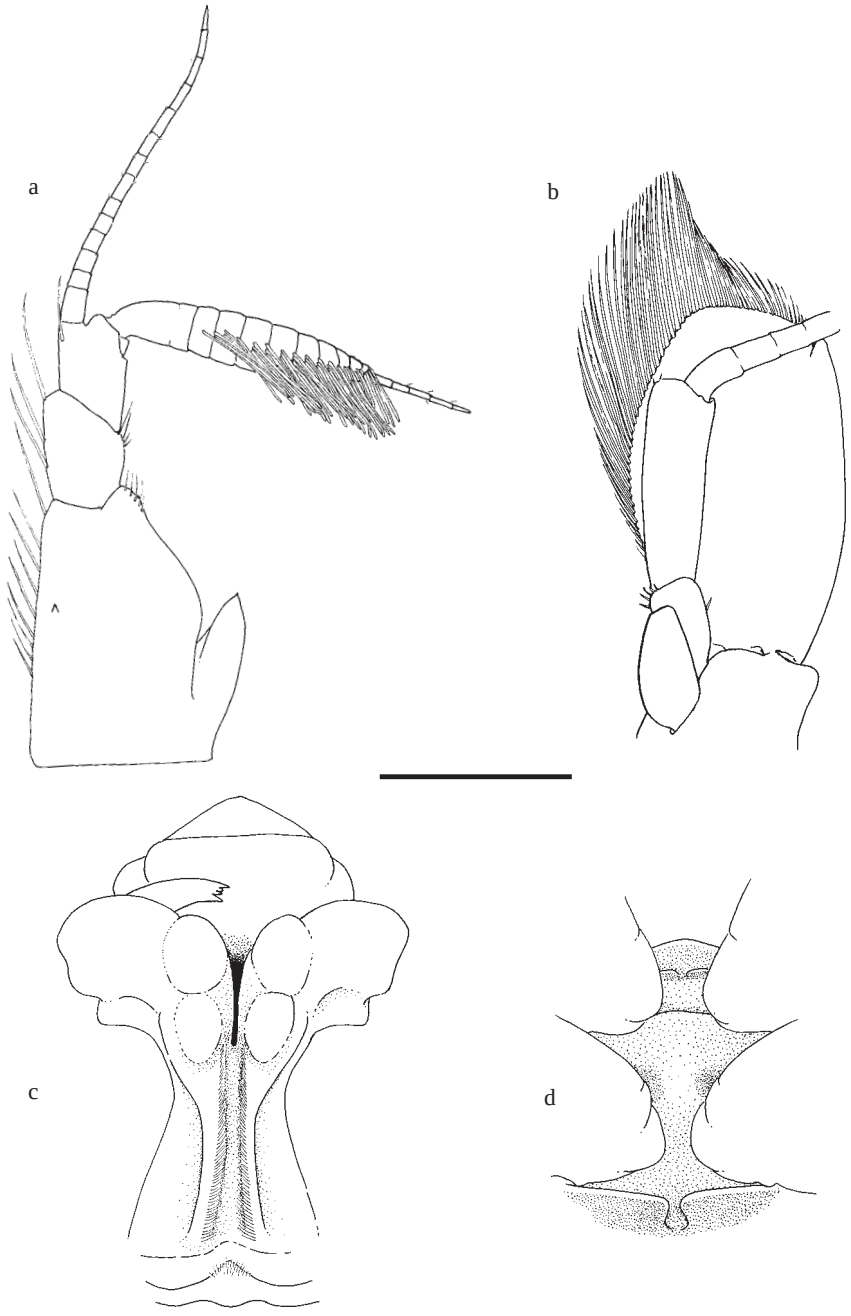


Fig. 83. *Pontonia mexicana* Guérin, 1856: ovigerous female, pocl. 8.6 mm, RMNH D 42641. a, antennula, ventral view; b, antenna, ventral view; c, paragnath, ventral view; d, second to fifth thoracic sternites. Scale: a, b = 1.5 mm; c, d = 2 mm.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process slender, with four to six distal teeth; with row of about ten small teeth on medioventral border; molar process robust, with four blunt teeth, some fringed with setal brushes.

Maxillula with upper lacinia broad with two rows of 12-15 serrulate spines and many long slender setae medially, inner medial surface with several long simple setae; lower lacinia very broad, densely setose distoventrally and marginally, no differentiation in setae; palp bilobed, larger lobe with small ventral tubercle with single short recurved simple seta.

Maxilla with basal endite well developed, bilobed; distal lobe longer and more slender than proximal lobe, both with long slender minutely serrulate setae along distomedian border, median border without setae, coxal endite obsolete, median margin convex, without setae; scaphognathite large, 2.7 times longer than wide, posterior lobe large, 1.7 times longer than anterior width, anterior lobe 1.3 times longer than proximal width; palp simple, slightly shorter than distal lobe of basal endite, strongly expanded proximally, tapered distally to rather acute tip, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite completely fused, large and broad, fringed with many simple, long and finely serrulate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod well developed, flagellum with many long, plumose setae in distal half; caridean lobe large, elongate; epipod large, triangular, faintly bilobed; palp simple, slender, elongate, curved along distolateral margin of basal endite, non-setose.

Second maxilliped with endopod normally developed; dactylar segment narrow, 6.4 times longer than broad, with numerous coarsely serrulate, spiniform, and long curled, finely serrulate setae medially; distomedial lobe of propod produced, rounded with stout serrulate and long plumose marginal setae, ventrolateral margin without setae; carpal segment distomedially angular, unarmed; meral segment with long median plumose setae, medially excavated; basal and ischial segments almost completely fused, medially excavated, ischial part with few distomedian, plumose setae; exopod normal, with many long plumose setae in distal fifth; coxal segment medially slightly produced, with few simple setae, with large subtriangular epipod laterally, not bearing a podobranch.

Third maxilliped almost reaching with ultimate segment to distal margin of carpocerite; ischiocerite almost completely fused with basis, indicated by distinct suture, 2.1 times longer than broad, tapering distally, flattened, with many setae on median margin, ventral surface with few setae, lateral margin with single row of long, plumose setae; basal segment medially convex, with many long, finely serrulate setae on medial margin; exopod well developed, reaching just beyond anterior margin of ischiomeral segment, with long plumose setae in distal third; coxa without medial process, with large lateral plate fringed with few short simple setae, with rudimentary arthrobranch; penultimate segment almost twice as long as central width, about 0.4 length of ischiomeral segment, medially expanded, flattened, with long finely serrulate setae along ventromedial and ventrolateral margins; ultimate segment slightly shorter than penultimate segment, tapering distally, with long, finely serrulate, and shorter, more coarsely serrulate setae along ventromedial, ventrolateral and distal margins.

Fig. 84. *Pontonia mexicana* Guérin, 1856: ovigerous female, pocl. 8.6 mm, RMNH D 42641. a, mandible, ventral view; b, maxillula, ventral view; c, maxilla, ventral view; d, first maxilliped, ventral view. Scale: a = 0.75 mm; b, c = 1.5 mm; d = 1.9 mm.

First pereiopods slender, exceeding carpocerite with chela and distal 2/3rd of carpus. Chela about 4.0 times longer than deep, subcylindrical, slightly compressed; fingers slightly longer than palm, slender, with several rows of finely serrate setae, cutting edges entire, somewhat gaping proximally, with groups of many strong, long, serrulate setae, tips acute, hooked; cleaning organ well developed on carpal-propodal joint; carpus 1.5 times longer than chela, about 6.0 times longer than distal width, somewhat tapering proximally, unarmed, without setae; merus as long as carpus, 5.0 times longer than central width, straight, unarmed, with few long simple setae in proximal part of median margin; ischium short, about 0.4 times merus length, with slightly expanded medial margin, with many simple setae along median and few along lateral margin; basis about as long as ischium, with many setae medially; coxa robust with setose ventromedial carina.

Second pereiopods similar in form, unequal in size. Major cheliped with chela large, about twice as long as postorbital carapace length in adult males, 1.2 times as long as postorbital carapace length in females, with palm subcylindrical, somewhat compressed, without carinae, smooth, with few short setae in distal part; dactylus about 0.55 times palm length, about 3.5 times longer than deep, with large simple triangular proximal tooth, distal part of cutting edge entire, tip strongly hooked, with median margin distinctly carinate; fixed finger about 2.0 times longer than deep, with blunt denticulate tooth just proximal of tooth on dactylus, separated from blunt triangular tooth just distal of tooth on dactylus by deep notch, distal part of cutting edge

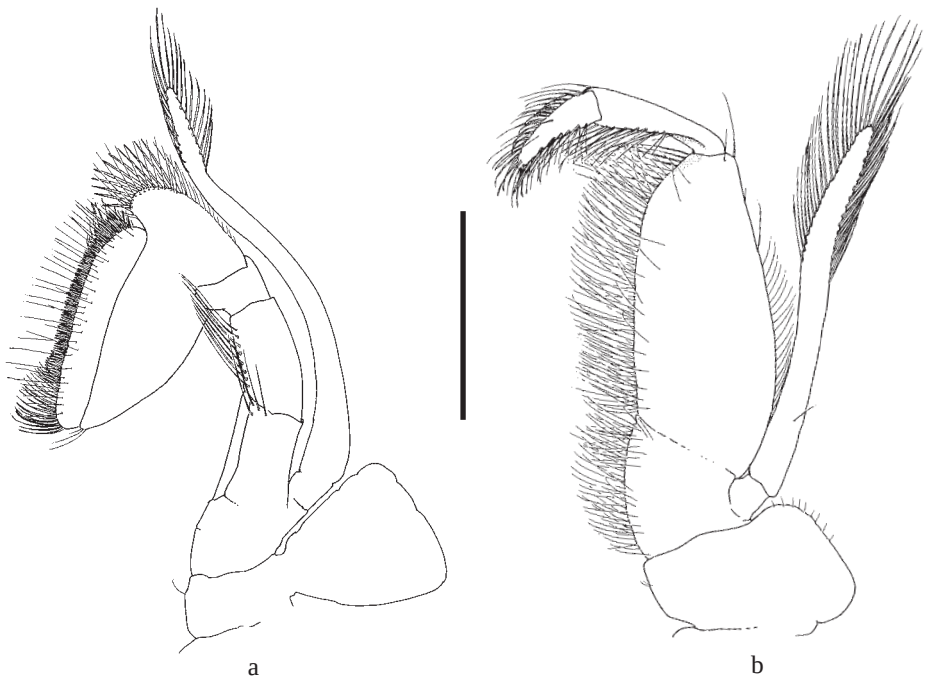


Fig. 85. *Pontonia mexicana* Guérin, 1856: ovigerous female, pocl. 8.6 mm, RMNH D 42641. a, second maxilliped, ventral view; b, third maxilliped, ventral view. Scale = 1.9 mm.

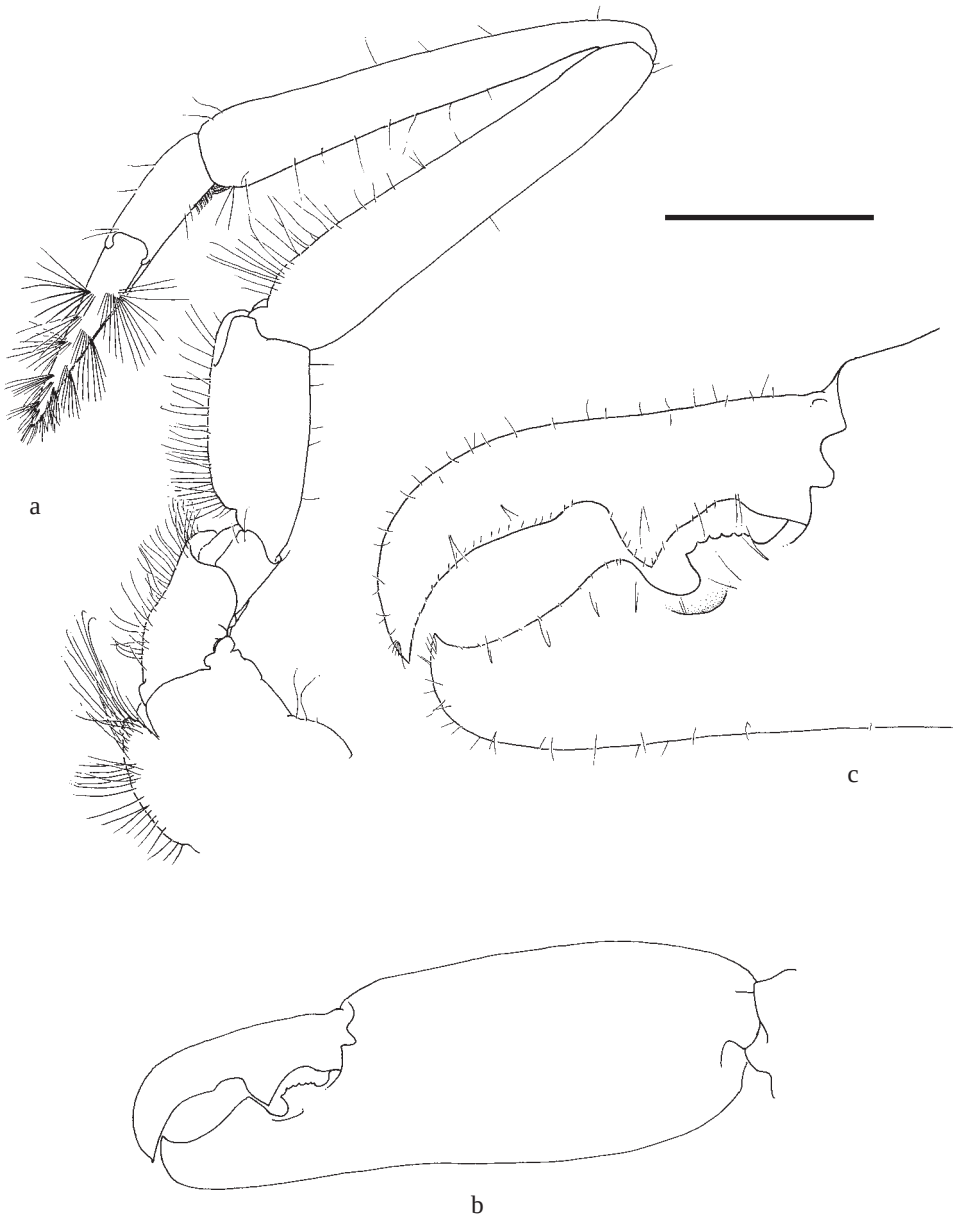


Fig. 86. *Pontonia mexicana* Guérin, 1856: ovigerous female, pocl. 8.6 mm, RMNH D 42641. a, first pereiopod; b, chela major second pereiopod; c, idem, detail fingers. Scale: a = 1.5 mm; b = 4 mm; c = 2 mm.

entire, slightly concave, tip strongly hooked, median fossa for reception of dactylar tooth when fingers closed well developed; carpus short and stout, about 0.38 of palm length, expanding distally, slightly longer than distal width, unarmed, with distomedial excavation; merus short and stout, 1.2 times as long as carpus, about twice as long as central width, distomedially excavate; ischium short and stout, about 0.6 times merus length, strongly tapering proximally, without distomedial protuberance; basis and coxa stout, without armature. Minor cheliped as major cheliped, with palm subcylindrical, without carinae, smooth, with few setae in distal part; fingers almost as long as palm; fingers as major cheliped, tooth on dactylus and median tooth on fixed finger may be crenulate as proximal truncate tooth on fixed finger.

Ambulatory pereiopods rather slender. Dactylus of third pereiopod with corpus strongly compressed ventrally, with corpus 1.8 times longer than proximal width, slightly tapering distally, with few simple setae on distal and ventral margins, accessory tooth small or absent, if present, acute, slightly curved, terminal, ventral margin entire, slightly concave; unguis simple, acute, slightly curved, about 0.45 of corpus length; propodus about 5.0 times longer than dactylus, about 6.7 times longer than wide, with two distoventral spines and one subdistal spine on ventral margin, rarely none or two, distoventral part with few simple setae, more dense in fifth pereiopod; carpus 0.6 times propodus length, 4.0 times longer than distal width, slightly tapering proximally, with distal lobe, unarmed; merus slightly longer than propodus, about 4.5 times longer than central width, subcylindrical, unarmed, non-setose; ischium about

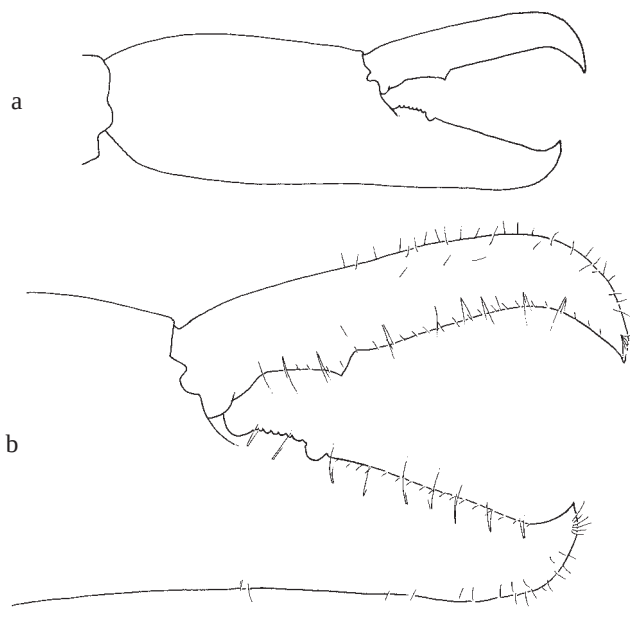


Fig. 87. *Pontonia mexicana* Guérin, 1856: ovigerous female, pocl. 8.6 mm, RMNH D 42641. a, chela minor second pereiopod; b, idem, detail fingers. Scale: a = 4 mm; b = 2 mm.

Fig. 88. *Pontonia mexicana* Guérin, 1856: ovigerous female, pocl. 8.6 mm, RMNH D 42641. a, third pereiopod; b, dactylus third pereiopod; c, dactylus fourth pereiopod. Scale: a = 2 mm; b, c = 0.19 mm.

0.55 of merus length, 2.8 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopod similar, merus more slender.

Male first pleopod with endopod about four times longer than proximal width, tapering distally; median margin straight with row of many short simple setae, with moderately long plumose setae along lateral margin, distal margin without setae.

Endopod of second pereiopod with appendix masculina, about 0.7 times length of appendix interna, with two rows of long setulose setae in distal 2/3rd.

First pleopod of female with slender endopod, about third length of exopod, with many long distal setae when ovigerous, with few long plumose setae on lateral margin and few simple setae in proximal part of medial margin.

Uropods with short stout unarmed protopodite; exopod broad, almost twice as long as wide, with lateral margin convex, without lateral tooth, with small distolateral spine, distal lamina rounded; endopod extending just beyond exopod, as long as telson.

Ovigerous females with maximum number of about 1000 eggs. Egg-size 0.5-0.6 mm. The ovigerous female with postorbital carapace length of 2.3 mm has about 50 eggs. The number of eggs is related to size.

Size.— Maximum postorbital carapace length 7.9 mm in males, 10.0 mm in females. Minimum postorbital carapace length in ovigerous female usually around 5.6

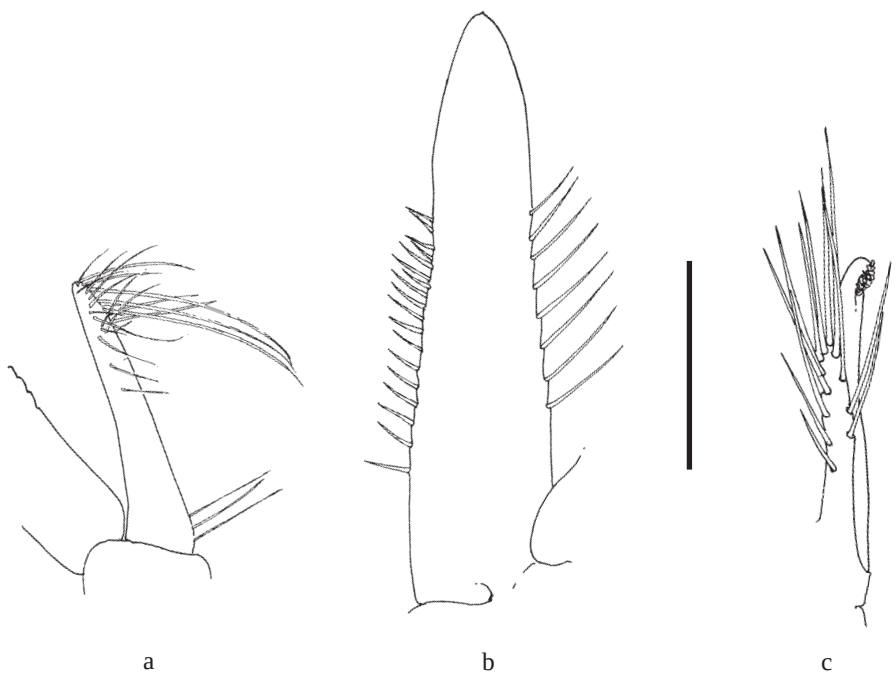


Fig. 89. *Pontonia mexicana* Guérin, 1856: ovigerous female, pocl. 8.6 mm (fig. a); male, pocl. 7.5 mm (figs. b, c), RMNH D 42641. a, endopod female first pleopod; b, endopod male first pleopod; c, appendix interna and appendix masculina on second male pleopod. Scale: a = 1.5 mm; b, c = 0.6 mm.

mm. One specimen ovigerous female (RMNH D 42648) with postorbital carapace length of 2.3 mm. Size probably related to size of host.

Colouration (pls. 2, 3).— Translucent with white reticulate pattern over body and appendages. Eyestalks with white longitudinal dorsal stripe. Antennula with white along joints and fused part of outer flagellum. Antenna with scaphocerite with white margins. Carapace with white lines encircling translucent areas; dorsal line from tip of rostrum to midlength of carapace. Abdominal somites with white lines along margins and middorsal line. Exopods of uropods with lateral and distal white margins; endopod of uropod with few white patches of distal white margin; telson with whitish tip. Second pereiopods with finely reticulate white pattern. First pereiopods with some white patches. Ambulatory pereiopods with some white lines especially at joints.

Holthuis (1951a: 133) mentioned the following colour notes by Mr Anker Petersen, artist of the Allan Hancock Foundation:“ Specimen clear and semitransparent. Dorsal surface of carapace and abdomen entirely overcast with minute bright red dots. Regions clearly outlined with a yellow rim. Chelipeds purplish lilac with open reticulations of pale yellow. Ambulatory legs without color, except for a few light touches of lilac at the joints. Entire ventral side pale cream color. Eggs dark dull-yellow.”

According to Criales (1984: 311): “The body color of the males was always translucent white, and that of the females was pale pink.”

On the labels of the specimens with registrationnumber RMNH D 30420 is written: ‘totally transparent, with a tracery of very fine shrimp pink”.

Types.— Holthuis (1951a: 134) studied one dry ovigerous female specimen originating from Mexico which formed part of the Guérin collection under number 307. It is registered under number 3136 in the collection of the Academy of Natural Sciences at Philadelphia.

Distribution.— WEST ATLANTIC: Mexico (Guérin, 1856, 1857); Cuba (Guérin, 1856, 1857; Sharp, 1893; Valdés Ragués, 1909; Bouvier, 1918); Jamaica (Schmitt, 1935); Porto Rico (Rathbun, 1902); Curaçao (Schmitt, 1924); Bonaire (Holthuis, 1951a); Tobago Island (Holthuis, 1951a); Isla Dos Mosquises, Venezuela (Rodriguez, 1980); Santa Maria, Colombia (Criales, 1984); Saint Lucia Island (Chace, 1972); Isla de Cozumel (Chace, 1972); Tortugas (Holthuis, 1951a); Bahama Islands (Holthuis, 1951a).

It is now recorded for the first time from the Virgin Islands and Anguilla. The record from the Brazilian Island Trinidade constitutes the southernmost record of the species.

Host.— Recorded inside the gill cavity of *Pinna carnea* (Gmelin, 1791) (cf. Criales, 1984; Rodriguez, 1980; present records), *Atrina seminuda* (Lamarck, 1819) (present record), *Pinna rigida* (Lightfoot, 1786) (present record), and from unidentified specimens of *Pinna* (cf. Holthuis, 1951a).

Holthuis (1951a: 134) mentions a female specimen with a total length of 17 mm that was found between the branches of a specimen of the Ophiuroid *Astrophyton muricatum* (Lamarck) at the Island Bonaire. This specimen could not be located in the RMNH collection.

Remarks.— In smaller specimens, the distolateral tooth of the basal segment of the antennular peduncle is usually present, disapearing in the larger specimens.

An ovigerous female (pocl. 4.65 mm) and male (pocl. 2.69 mm) from Grand Cay-

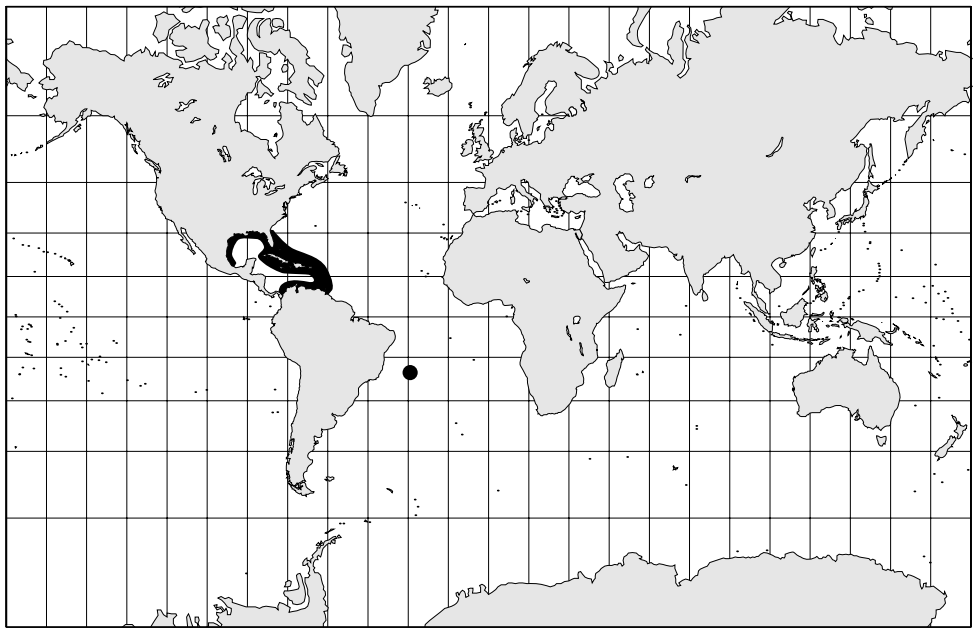


Fig. 90. Geographic distribution of *Pontonia mexicana* Guérin, 1856.

man Island (BMNH 1980.50.294D) differ from the other specimens in the same lot in having the ambulatory pereiopods rather short and stout, the propodus about 4 times longer than broad, the dactylus about 2 times as long as wide, the flexor margin slightly convex, the dorsal telson spines long, almost 1/4th of the telson length, and the fixed finger of the second chela without a socket.

Specimens from St. Louis, Marie-Galante near Martinique (RMNH D 26480), have the subdistal ventral rostral tooth absent or strongly reduced.

A small ovigerous female (pocl. 2.26 mm) from Bonaire (RMNH D 42648) has the rostrum with a well developed ventral distal lamina and a distinct ventrodistal tooth like in *P. manningi.* However the dactyli of the ambulatory pereiopods, and the distolateral angle of the basal segment of the antennular peduncle are as in *P. mexicana.*

P. mexicana is closely related to *P. pinnophylax*. Actually their is no clear distinction between the species regarding their morphology or in the colour pattern. In general it seems that specimens of *P. pinnophylax* can become slightly larger than *P. mexicana* specimens. This however, could be effected by the size of the host. The accessory tooth of the dactylus of the ambulatory pereiopods in *P. mexicana* is directed in an angle of about 110°-125° with the flexor margin of the corpus and are usually about 1/3 of the length of the unguis. In *P. pinnophylax* the accessory tooth is directed in an angle of about 90-100° with the flexor margin of the corpus, about $^{1}/_{4}$ - $^{1}/_{5}$ of the length of the unguis. In both species the accessory tooth can rarely be minute or absent.

The specimen from the Island Trinidade (Brazil) in the central part of the Atlantic is very small and could either be *P. mexicana* or *P. pinnophylax*.

8.2.8. *Pontonia pilosa* spec. nov.
(figs. 91-99, pl. 4)

Pontonia sp. nov. Wirtz & d'Udekem-d'Acoz, 2001: 114.

Material.— **East Atlantic**: **Cape Verde Islands**.— RMNH D 48677: holotype**,** ovigerous female, pocl. 4.3 mm; Sao Tiago Islands, Tarrafal; ii.2000; SCUBA diving; from *Pseudochama radians* (Lamarck, 1819); collected and donated by P. Wirtz, photo P. Wirtz.

Description.— Body subcylindrical, somewhat depressed, hirsute. Rostrum well developed, distally ending in sharp point, overreaching distal margin of basal segment of antennular peduncle, slender, without dorsal or lateral carinae, with straight ventral carina in distal part; subdistal dorsal notch with several long simple setae in front; distinct subdistal ventral tooth at level of subdistal dorsal notch. Inferior orbital

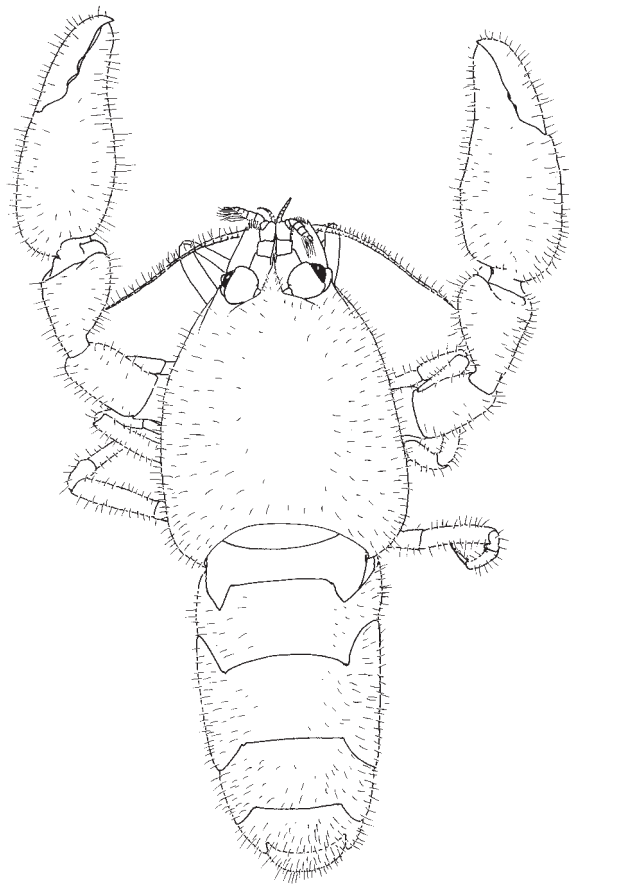


Fig. 91. *Pontonia pilosa* spec. nov.: ovigerous female, pocl. 4.3 mm, RMNH D 48677 dorsal aspect. Scale = 4 mm.

angle produced, angular. Antennal spine well developed, reaching beyond anterolateral margin of carapace, situated well below level of blunt inferior orbital angle. Anterolateral margin of carapace slightly produced, broadly rounded.

Abdomen hirsute; sixth segment about 1.1 times longer than fifth, 1.2 times wider than long, posterolateral angle acutely produced, posteroventral angle spiniform; pleura of first five segments broadly rounded.

Telson almost 1.6 times as long as sixth abdominal segment, slightly more than 1.6 times as long as its proximal width; lateral margins straight or slightly convex, convergent; posterior border without median process; two pair of medium sized curved,

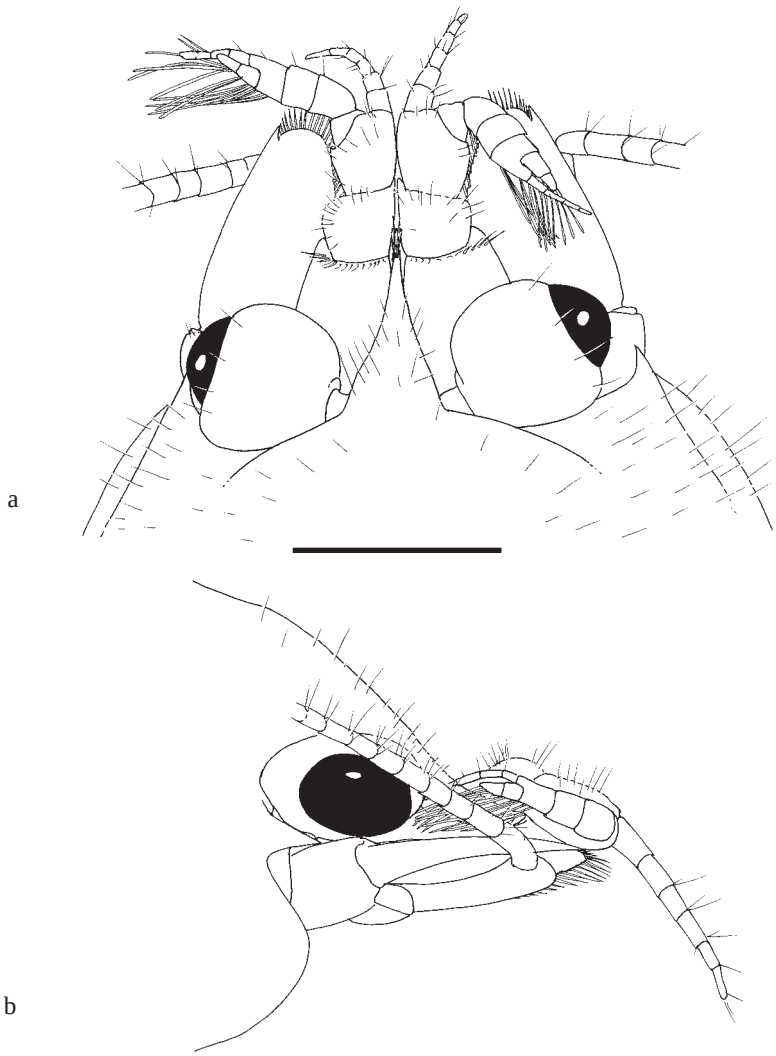


Fig. 92. *Pontonia pilosa* spec. nov.: ovigerous female, pocl. 4.3 mm, RMNH D 48677. a, anterior appendages, dorsal view; b, anterior appendages, lateral view. Scale = 1 mm.

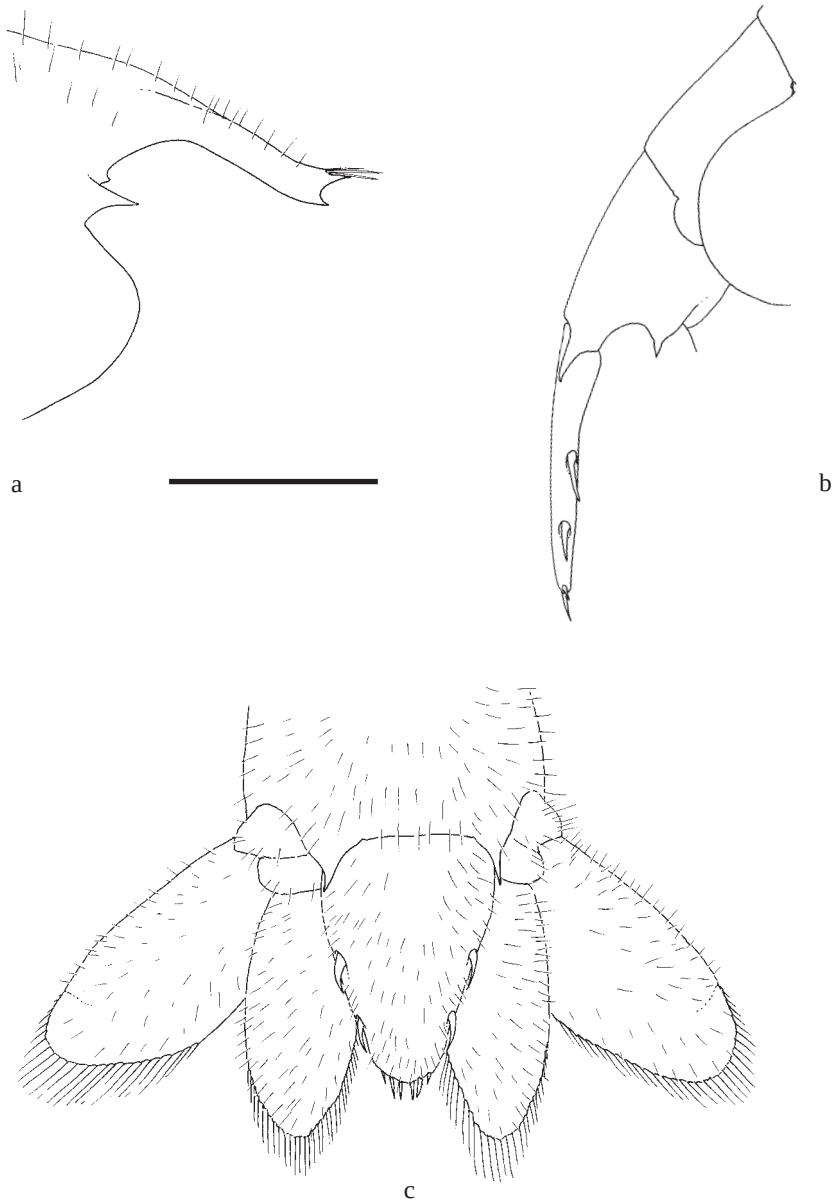


Fig. 93. *Pontonia pilosa* spec. nov.: ovigerous female, pocl. 4.3 mm, RMNH D 48677. a, rostrum, lateral view; b, distal part abdomen, lateral view; c, distal part abdomen, dorsal view. Scale = 1 mm.

dorsal spines at about 0.5 and 0.74 of the telson length, marginal, about 0.2 of telson length; posterior margin with three pairs of small spines, lateral spines 0.06 of telson length, marginal, intermediate and submedian spines larger than lateral spines, but shorter and more slender compared to dorsal spines.

Eyestalk about much wider than long, cylindrical, swollen, much broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella well developed. Basal segment without distolateral angle rounded; medioventral tooth small, submarginal, at distal third of basal segment; stylocerite short, half length of scaphocerite, with distal acute tip, lateral margin with few plumose setae. Intermediate segment about as long as wide; distal segment about 1.3 times longer than wide, distinctly longer than intermediate segment. Upper flagellum well developed, biramous, with three proximal segments fused; short free ramus one- or two-segmented, longer free ramus with four segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite short, reaching 3/4th of lamella of scaphocerite, moderately stout; scaphocerite with lamella about twice as long as central width, distal margin truncate, medial margin distally straight, proximally convex, lateral margin slightly convex with small, distolateral tooth reaching anterior margin of lamella, about 0.08 times length of scaphocerite; incision between distolateral tooth and lamina indistinct.

Epistome with rather sharp anterior median carina; labrum large, oval.

Paragnath well developed, alae with large subcircular distal lobes, and round submedian ventral lobes; corpus of moderate length, with median groove, bordered by setose carinae.

Second thoracic sternite formed into shallow, triangular, process between second maxillipeds, without setae medially.

Third thoracic sternite with shallow lateral carinae with medial notch posteromedian of third maxillipeds.

Fourth thoracic sternite with shallow indistinct lateral carinae posteromedial of first pereiopods; with transverse ridge between first pereiopods.

Fifth thoracic sternite with well developed lateral plates posteromedial of second pereiopods, with deep rather narrow medial notch in between.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process slender, with six distal teeth and row of five to ten small teeth present on medioventral border; molar process robust, with four blunt distal teeth, some fringed by setal brushes.

Maxillula with upper lacinia moderately broad with two rows of about 15 serrulate spines and many long slender setae medially, inner median surface with several long simple setae; lower lacinia rather broad, densely setose distoventrally and marginally, no differentiation in setae; palp bilobed, large lobe with small tubercle with single short recurved simple setae.

Maxilla with basal endite well developed, bilobed; distal lobe longer and more slender than proximal lobe, both with long slender minutely serrulate setae along distomedian border, median border without setae, coxal endite obsolete, median margin convex, without setae; scaphognathite large, 2.9 times longer than wide, posterior lobe large, 1.8 times longer than anterior width, anterior lobe 1.4 times longer than proxi-

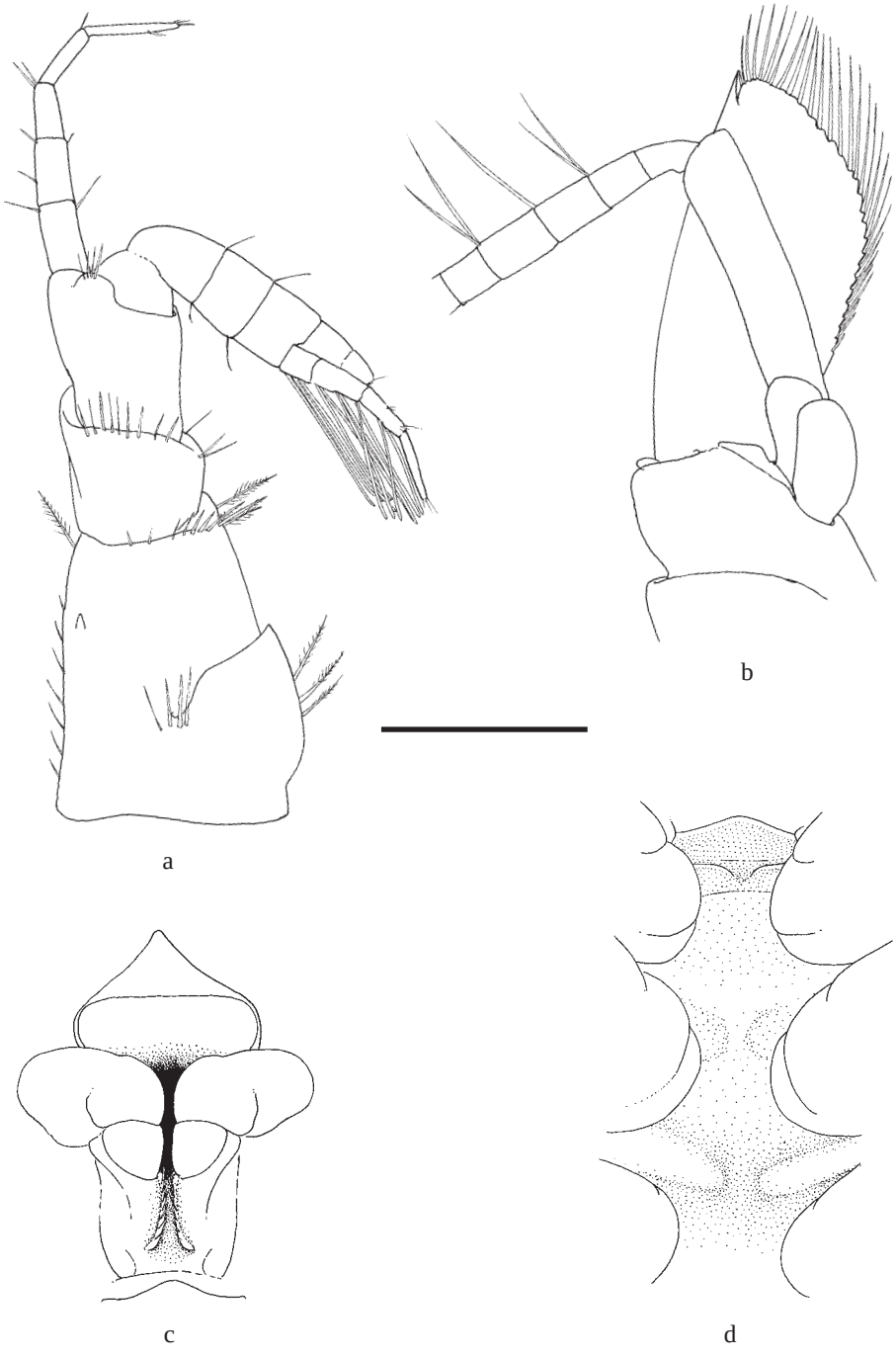


Fig. 94. *Pontonia pilosa* spec. nov.: ovigerous female, pocl. 4.3 mm, RMNH D 48677. a, antennula, ventral view; b, antenna, ventral view; c, paragnath, ventral view; d, second to fifth thoracic sternites. Scale: a, b = 0.6 mm; c, d = 1 mm.

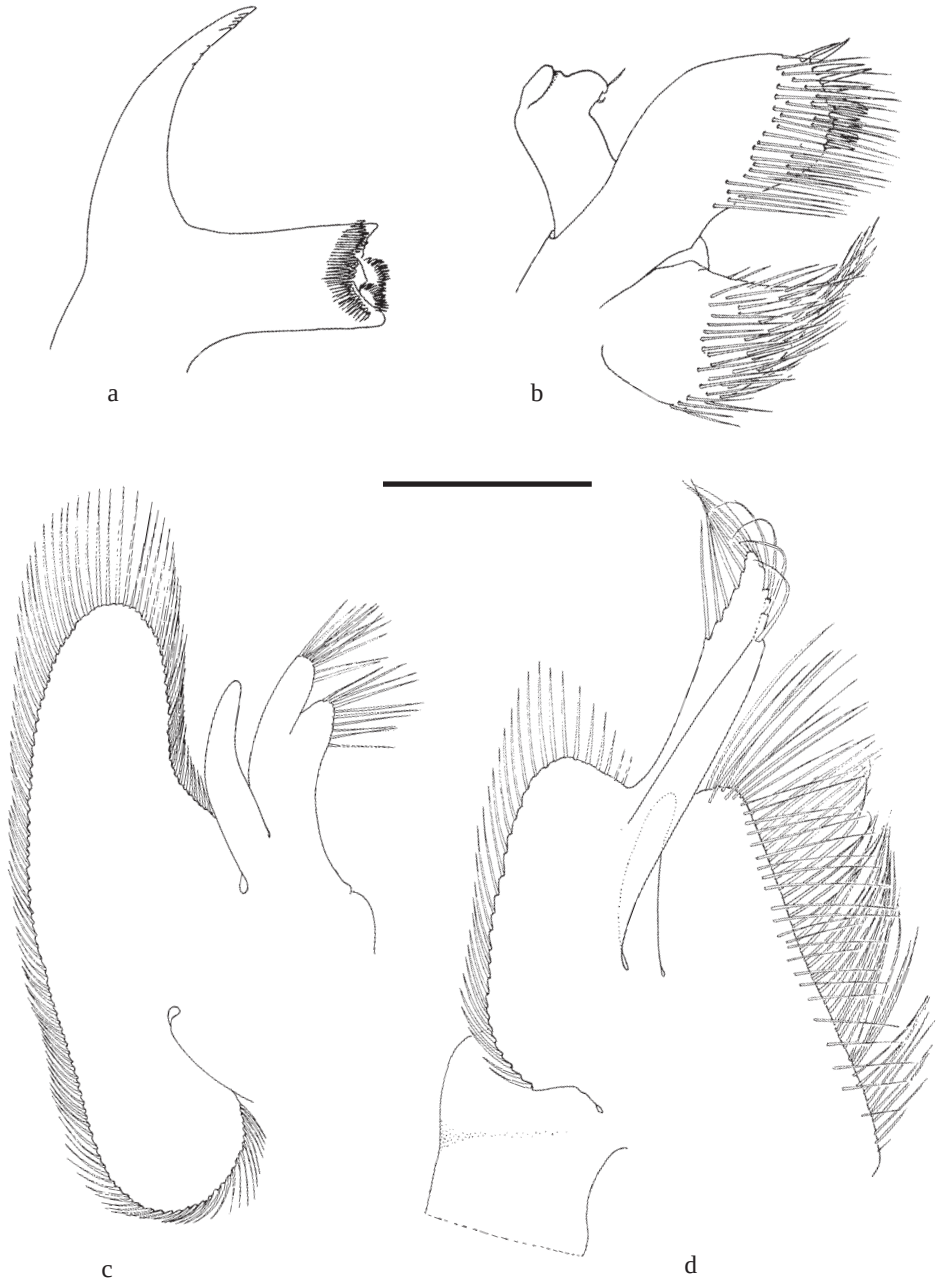


Fig. 95. *Pontonia pilosa* spec. nov.: ovigerous female, pocl. 4.3 mm, RMNH D 48677. a, mandible, ventral view; b, maxillula, ventral view; c, maxilla, ventral view; d, first maxilliped, ventral view. Scale = 0.6 mm.

mal width; palp simple, slightly shorter than distal lobe of basal endite, somewhat expanded proximally, tapered distally to blunt tip, without plumose setae along lateral margin.

First maxilliped with coxal and basal endite completely fused, large and broad, fringed with many simple, long and finely serrulate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod well developed, flagellum with many long, plumose setae in distal half; caridean lobe large, elongate; epipod large, triangular, faintly bilobed; palp simple, slender, elongate, curved along distolateral margin of basal endite, non-setose.

Second maxilliped with endopod normally developed; dactylar segment narrow, 4.7 times longer than broad, with numerous coarsely serrulate, spiniform, and long curled, finely serrulate setae medially; distomedial lobe of propod produced, rounded with stout serrulate and long simple marginal setae, ventrolateral margin with few long distal setae; carpal segment distomedially angular, unarmed; meral segment with few long median plumose setae along ventromedial margin, medially excavated; basal and ischial segments completely fused, medially excavated, with few distomedian, plumose setae; exopod normal, with many long plumose setae in distal sixth; coxal segment medially slightly produced, with few simple setae, with large subtriangular epipod laterally, not bearing a podobranch.

Third maxilliped reaching with ultimate segment to distal margin of carpocerite; ischiocerite almost completely fused with basis, indicated by distinct suture, 1.8 times longer than broad, tapering distally, flattened, with many setae on median margin, ventral surface with few setae, lateral margin with single row of long, plumose setae; basal segment medially convex, with many long, finely serrulate setae on medial margin; exopod well developed, reaching halfway penultimate segment, with long plumose setae in distal third; coxa without medial process, with large lateral plate fringed with few short simple setae, with rudimentary arthrobranch; penultimate segment almost twice as long as central width, about 0.5 length of ischiomeral segment, medially expanded, flattened, with long finely serrulate setae along ventromedial and ventrolateral margins; ultimate segment slightly shorter than penultimate segment, tapering distally, with long, finely serrulate, and shorter, more coarsely serrulate setae along ventromedial, ventrolateral and distal margins.

First pereiopods slender, exceeding carpocerite with chela and carpus. Chela about 4.0 times longer than deep, subcylindrical, slightly compressed; fingers slightly longer than palm, slender, with several rows of finely serrate setae, cutting edges entire, somewhat gaping proximally, with groups of many strong, long, serrulate setae, tips acute, hooked; cleaning organ well developed on carpal-propodal joint; carpus 1.4 times longer than chela, about 5.3 times longer than distal width, somewhat tapering proximally, unarmed, with many simple setae; merus slightly shorter than carpus, 3.8 times longer than central width, slightly bowed, unarmed, with long simple setae; ischium short, about 0.5 times merus length, with slightly expanded medial margin, with many simple setae along median and few along lateral margin; basis about as long as ischium, with many setae medially; coxa robust with setose ventromedial carina.

Second pereiopods similar in form, subequal in size. Chela large, 1.1 times as long as postorbital carapace length, palm compressed, without carinae, with many short

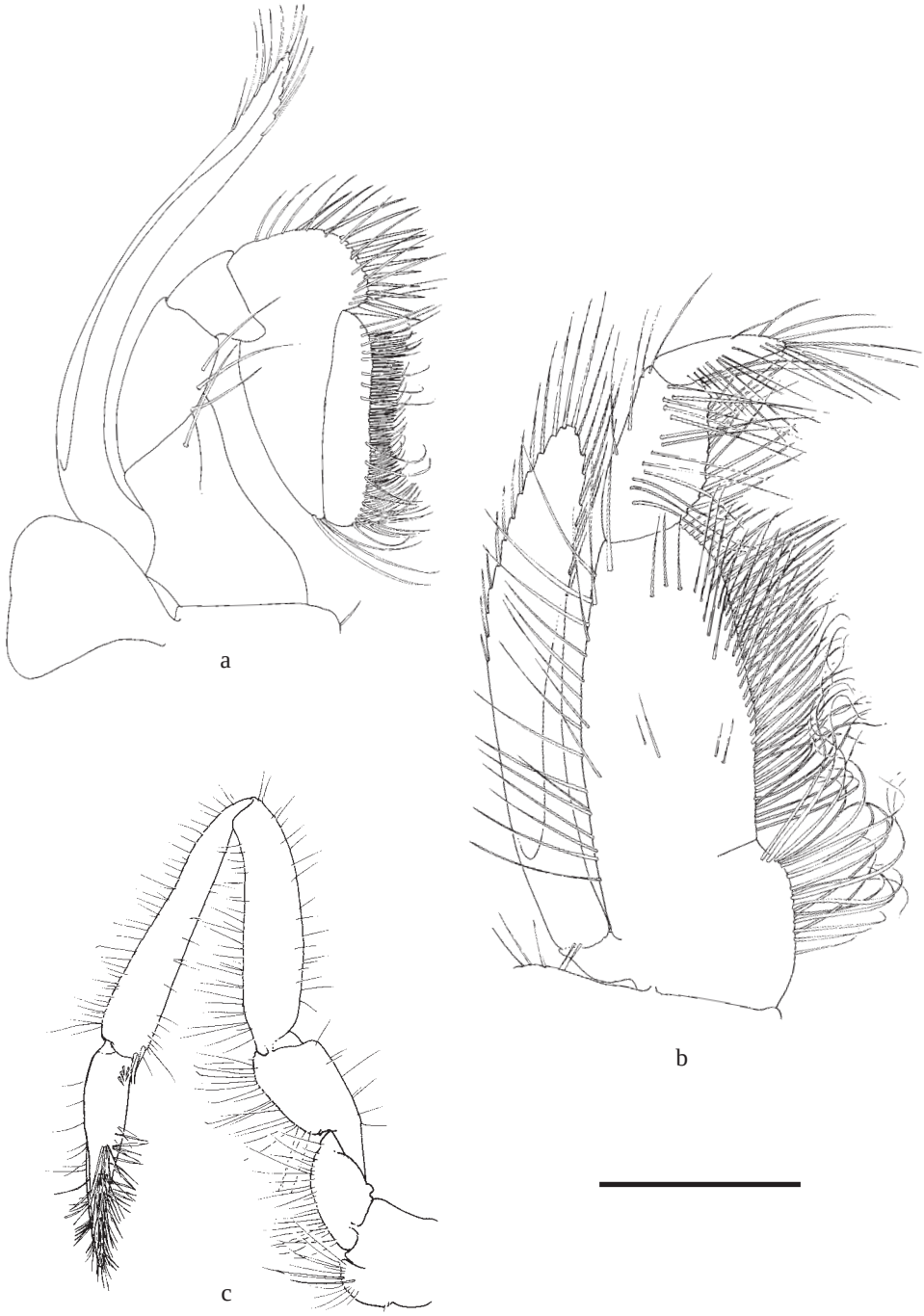


Fig. 96. *Pontonia pilosa* spec. nov.: ovigerous female, pocl. 4.3 mm, RMNH D 48677. a, second maxilliped, ventral view; b, third maxilliped, ventral view; c, first pereiopod. Scale: a, b = 0.6 mm; c = 1.9 mm.

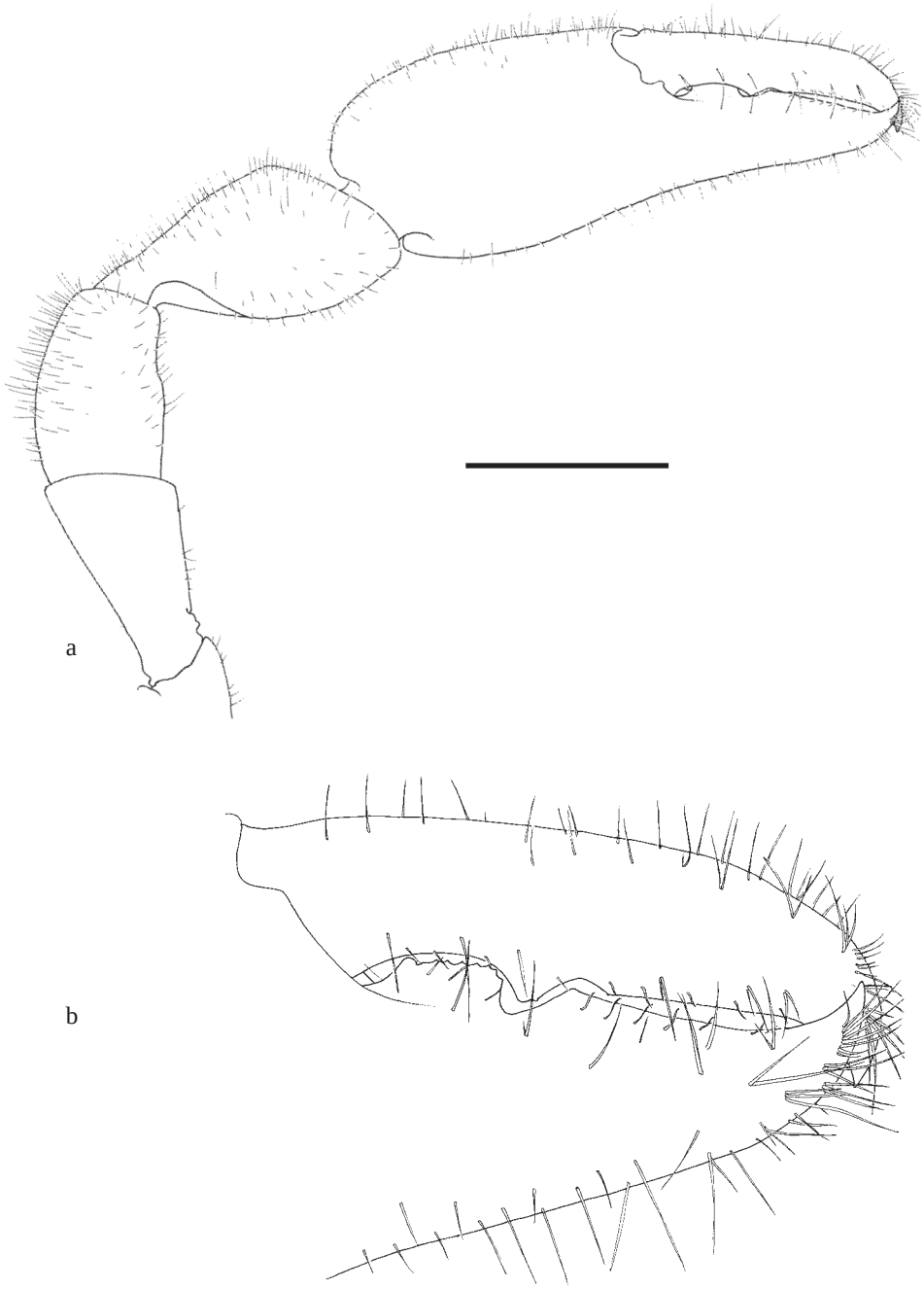


Fig. 97. *Pontonia pilosa* spec. nov.: ovigerous female, pocl. 4.3 mm, RMNH D 48677. a, right second pereiopod; b, idem, chela. Scale a = 1.9 mm; b = 0.75 mm.

setae; dactylus 0.7 times palm length, about 4.5 times longer than deep, with simple triangular proximal tooth and small simple tooth at midlength, distal part of cutting edge entire, tip strongly hooked, median margin not carinate; fixed finger 1.9 times longer than deep, with broad denticulate tooth just proximal of tooth on dactylus, separated from simple triangular tooth just distal of tooth on dactylus by deep notch, distal part of cutting edge entire, slightly concave, tip strongly hooked, median fossa for reception of dactylar tooth when fingers closed not developed; carpus short and stout, about 0.73 of palm length, expanding distally, slightly longer than distal width, unarmed, with distomedial excavation; merus short and stout, almost as long as carpus, 1.5 times as long as central width, distomedially somewhat excavate; ischium slightly longer than merus, tapering proximally, without distomedial protuberance; basis and coxa stout, without armature.

Ambulatory pereiopods rather slender, with distinct pubescence. Dactylus of third pereiopod with corpus compressed, almost three times longer than proximal width, ventral border with very small acute, slightly recurved subdistal accessory tooth, dorsal margin with few simple setae, flexor margin straight or slightly concave with many simple setae; unguis slightly curved, blunt, club-like, about 0.30 of corpus length, with concentric rows of spinules in distal half; propodus three times longer than dactylus, about 7.5 times as long as wide, without spines along ventral margin, distoventral part with few simple setae; carpus 0.6 times propodus length, 3.8 times longer than distal width, slightly tapering proximally, with distal lobe, unarmed; merus slightly shorter than propodus, 3.7 times longer than central width, subcylindrical, unarmed; ischium, basis and coxa without special features. Fourth and fifth pereiopods similar.

First pleopod of female with slender endopod, almost half length of exopod, with several long distal setae when ovigerous, with few long plumose setae on lateral margin and few simple setae in proximal part of medial margin.

Uropods with short stout unarmed protopodite; exopod broad, twice as long as wide, with lateral margin slightly convex, without lateral tooth, with minute distolateral spine, distal lamina rounded; endopod extending just beyond exopod, much longer than telson.

Ovigerous female with about 100 eggs. Egg-size 0.5-0.6 mm.

Size.— Postorbital carapace length 4.3 mm.

Colouration (based on specimens with registrationnumber RMNH D 48677, pl. 4).— Translucent milky white to yellow-orange over body and appendages, without distinct reticulate pattern, internal organs clearly visible, dark coloured. Cornea dark. Eggs brown.

Types.— Holotype: ovigerous female, pocl. 4.3 mm (RMNH D 48677): Cape Verde Islands, Sao Tiago Islands, Tarrafal; ii.2000; collected by P. Wirtz.

Distribution.— Only known from type-locality.

Host.— Bivalvia, Chamidae, *Pseudochama radians* (Lamarck, 1819).

Remarks.— This species is most closely related to *P. chimaera* and *P. domestica* with which it shares the absence of a distolateral tooth on the basal antennular segment. It can easily be distinguished from these species by its hairy appearance and the unique form of the dactylus of the ambulatory pereiopods.

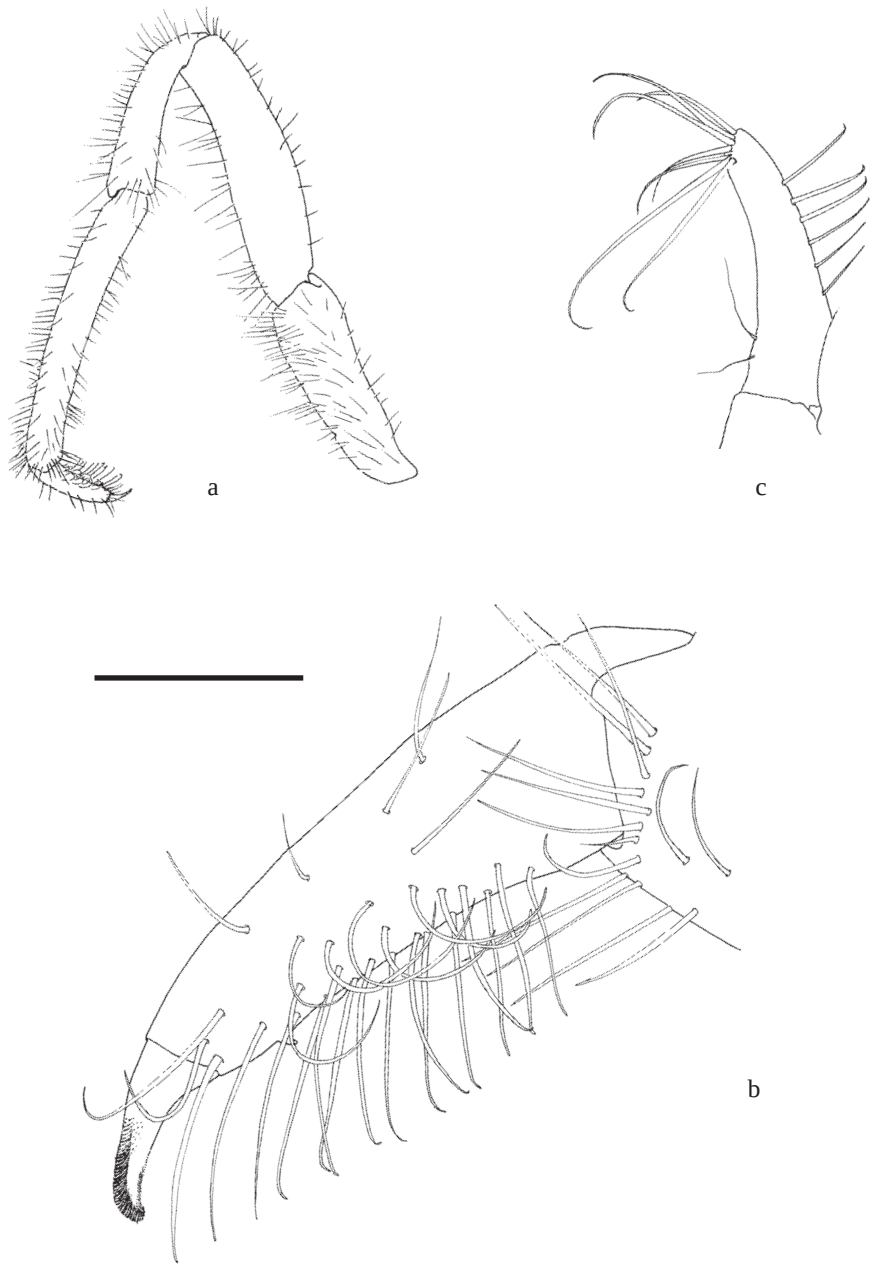


Fig. 98. *Pontonia pilosa* spec. nov. : ovigerous female, pocl. 4.3 mm, RMNH D 48677. a, third pereiopod; b, dactylus third pereiopod; c, endopod female first pleopod. Scale: a = 1.5 mm; b = 0.19 mm; c = 0.6 mm.

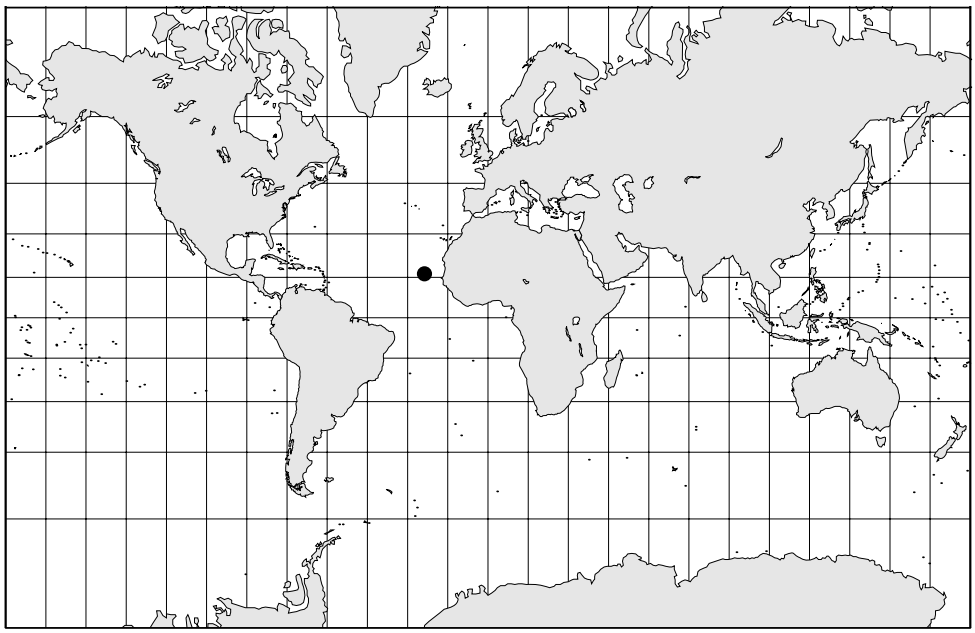


Fig. 99. Geographic distribution of *Pontonia pilosa* spec. nov.

8.2.9. *Pontonia pinnae* Lockington, 1878 (figs. 100-118)

Pontonia pinnae Lockington, 1878: 163; Kemp, 1922: 287; Steinbeck & Rickets, 1941: 446, pl. 21 fig. 5; Galtsoft, 1950: 42; Holthuis, 1951a: 118, pl. 36 figs. a-l, pl. 37 figs. a-i; Holthuis, 1952: 15; Rioja, 1950: 146; Bruce, 1972b: 222; Brusca, 1973: 212, 213, fig. 7.25; Luke, 1977: ?; Brusca, 1980: 250, fig. 14.5; Ingle, 1982: 437, colourfig.; Wicksten, 1983: 18; Rodriguez de la Cruz & Rodriguez de la Cruz, 1987: 29; Campos-González, 1988: 384-385; Kerstitch, 1989: 78, fig. 189 (colour); Campos, Campos & Ramirez, 1992: 753; Lemaitre & Alvarez Leon, 1992: 41; Müller, 1993: 124; Chace & Bruce, 1993: 62; Hendrickx, 1994: 21; Fransen, 1994: 111; Campos, Félix-Pico & García-Domínguez, 1995: 177; Wicksten & Hernández, 2000: 97.

Pontonia margarita; Boone, 1930: 148, pl. 52; Boone, 1931 (p.p.): 180, fig. 20.

Material.— **East Pacific**: **Mexico**.— USNM 81337: 2 specimens; Concepcion Bay; -.iii.1940; in *Pinna*; leg. E.F. Ricketts.— USNM 85388: 2 specimens; Lower California, La Paz Bay, sand flats on E side of El Mogote; 6.ii.1940; collected at low tide; in mantle cavity of *Pinna rugosa* Sowerby, 1835; don. R. Hawkings, station UH 04067.— MNHN-Na 1967: 2 males, pocl. 6.3 and 6.8 mm; 1 female, pocl. 6.6 mm: Lower California; collected by L. Diguet, identified by S.W. Kemp.— RMNH D 9250: 1 female, pocl. 14.3 mm; Sonora, San Ramón Bay near Empalme; leg. A. Sörensen N.6; received from U.S.N.M. in v.1936.— RMNH D 9477: 1 non-ovigerous female, pocl. 10.4 mm; 2 males, pocl. 9.7 mm; Sonora, Guaymas Bay; 31.i.1923; leg. B.F. Yost.— RMNH D 21754: 2 ovigerous females, pocl. 8.7 and 11.0 mm; 1 male, pocl. 5.7 mm; Gulf of California, Baja California, Isla Espiritu Santo; 19.viii.1965; leg. A. Villalobos & J.A. Cabrera.— RMNH D 46753: 1 ovigerous female, pocl. 7.5 mm; Gulf of California, Bahía Concepción, Playa Sentispac (ca. 30 km S of Mulegé); 0.2 m depth; muddy sand; 20.vi.1995; in *Pinna rugosa* Sowerby, 1835; leg. et don. G.C. Kroonenberg.— USNM 12469: 2 specimens; West coast

of Mexico; received through Department of Fishes in February 1887, without a label.— USNM 77502: 10 specimens; Guaymas Bay, Sonora; 31.i.1925; don. B.F. Yost.— USNM 85389: 4 specimens; Sonora, San Ramon Bay, near Empalme; in *Pinna*; received from A. Sorenson in May 1936.— USNM 89474: 1 male, 1 female; Guaymas, Miramar Beach, Lagoon; 9.ii.1948; leg. MacGinitie.— USNM 169695: 1 specimen; Baja California, San Philipe; 14.v.1934; in *Pinna* spec.; leg. S.A. Glassell.— USNM 143348: 1 specimen; Sonora, Puerto Penasco; intertidal; rocks; -.x.1970; leg. R. Brusca.— USNM (acc. no. 207834): 6 specimens; Concepcion Bay, Lower California, Mexico; 29.iii.1940; in *Pinna*; leg. E. Ricketts.— USNM (acc. no. 247441): 2 specimens; Mazatlan; 12.viii.1962; leg. J. & J. Burch.— MCZH: 2 ovigerous females, pocl. 10.5 and 5.3 mm; 1 male, pocl. 9.2 mm; Sonora, Guaymas, San Carlos Bay, near yacht club and motel; depth 15-20 ft; in *Pinna rugosa* Sowerby, 1835; 15.viii.1962; leg. J.A. Beatty, Paul Dayton, A. Aschwanden.— USNM: 1 specimen; Mexico, Espirito Santo Island, Point Lobos; 20.iii.1940; leg. E. Ricketts. USNM (acc. no. 207834): many specimens; Gulf of Mexico, Espirito Santo Island; 12/9/31; in *Pinna* sp. 2 to 3 specimens in each; leg. S.A. Glassell.— **Panama.—** USNM 85387: 2 specimens; Archipelago de las Perlas, Pedro Gonzalez Island, N side of island, near Cocal; 28.ii.1944; in mantle chamber of *Pinna*; leg. A. Wetmore & J.P.E. Morrison.— USNM 86026: 1 male, 1 ovigerous female; Gulf of Panama, Taboga Island; depth 4 fms; 29.ii.1948; leg, P.S. Galtsoff, station 11.— USNM 85391: 1 juvenile; Archipelago de las Perlas & Chame Point; -.i.1934; ? leg. W.L. Schmitt.— USNM 86027: 1 male, 1 ovigerous female; Gulf of Panama, Islas de Cañas; 29.ii.1948; in living *Pinna;* leg. P.S. Galtsoff, station 7.— USNM: 2 males, 2 ovigerous females; Taboguilla Island; depth 5 m; 30.iv.1969; in *Pinna rugosa* Sowerby, 1835; leg. N. Powell & A.H. Clarke.— USNM (acc. no. 284497): 1 specimen; Escandido Bay, Transect area; 14.xi.1968; Naval Electronics Laboratory Center, through E.G. Barham.

Description.— Body subcylindrical, somewhat depressed. Carapace smooth. Rostrum well developed, distally ending in sharp point, reaching from about midlength to distal end of second segment of antennular peduncle, slender to rather broad at base in large females, without dorsal and lateral carinae, with straight of slightly convex ventral carina in distal part; subdistal dorsal tooth with few long simple setae in front; subdistal ventral tooth at level of subdistal dorsal tooth. Inferior orbital angle produced, angular. Antennal spine well-developed, not reaching beyond produced anterolateral margin of carapace, situated somewhat below level of inferior orbital angle, separated from inferior orbital angle by notch. Anterolateral margin of carapace produced, broadly rounded.

Abdomen smooth; sixth abdominal segment about 1.3 times longer than fifth, about 1.6 times wider than long, posterolateral angle acutely produced, posteroventral angle spiniform; pleura of first five segments broadly rounded.

Telson almost 1.5 times as long as sixth abdominal segment, almost twice as long as its proximal width; lateral margins convex, convergent; posterior margin without median process; two pairs of rather small dorsal spines at about 0.45 and 0.85 of the telson length, marginal, about 0.08 of telson length; posterior margin with three pairs of spines, lateral spines minute, marginal, intermediate and submedian spines larger than lateral spines, about as long as dorsal spines but more slender.

Eyestalk about as long as wide, cylindrical, somewhat swollen; stalk slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella well developed. Basal segment with or without small indistinct distolateral tooth, distal margin not developed; medioventral tooth small, acute, submarginal, situated halfway basal segment; stylocerite short, almost half length of basal segment, with distal blunt or broadly acute tip, without or with one short plumose seta laterally. Intermediate segment slightly longer than wide.

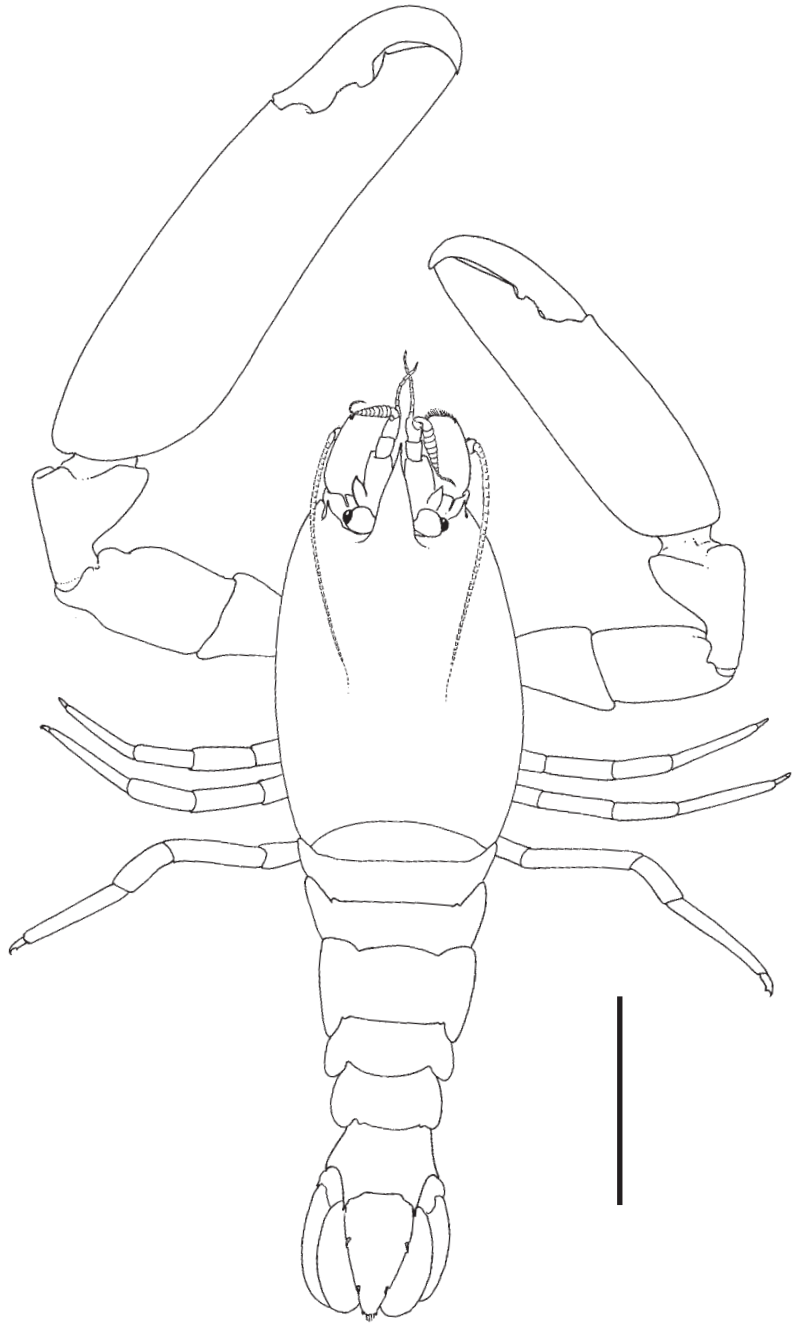


Fig. 100. *Pontonia pinnae* Lockington, 1878: male, pocl. 9.7 mm, RMNH D 9477. Dorsal aspect. Scale = 8 mm.

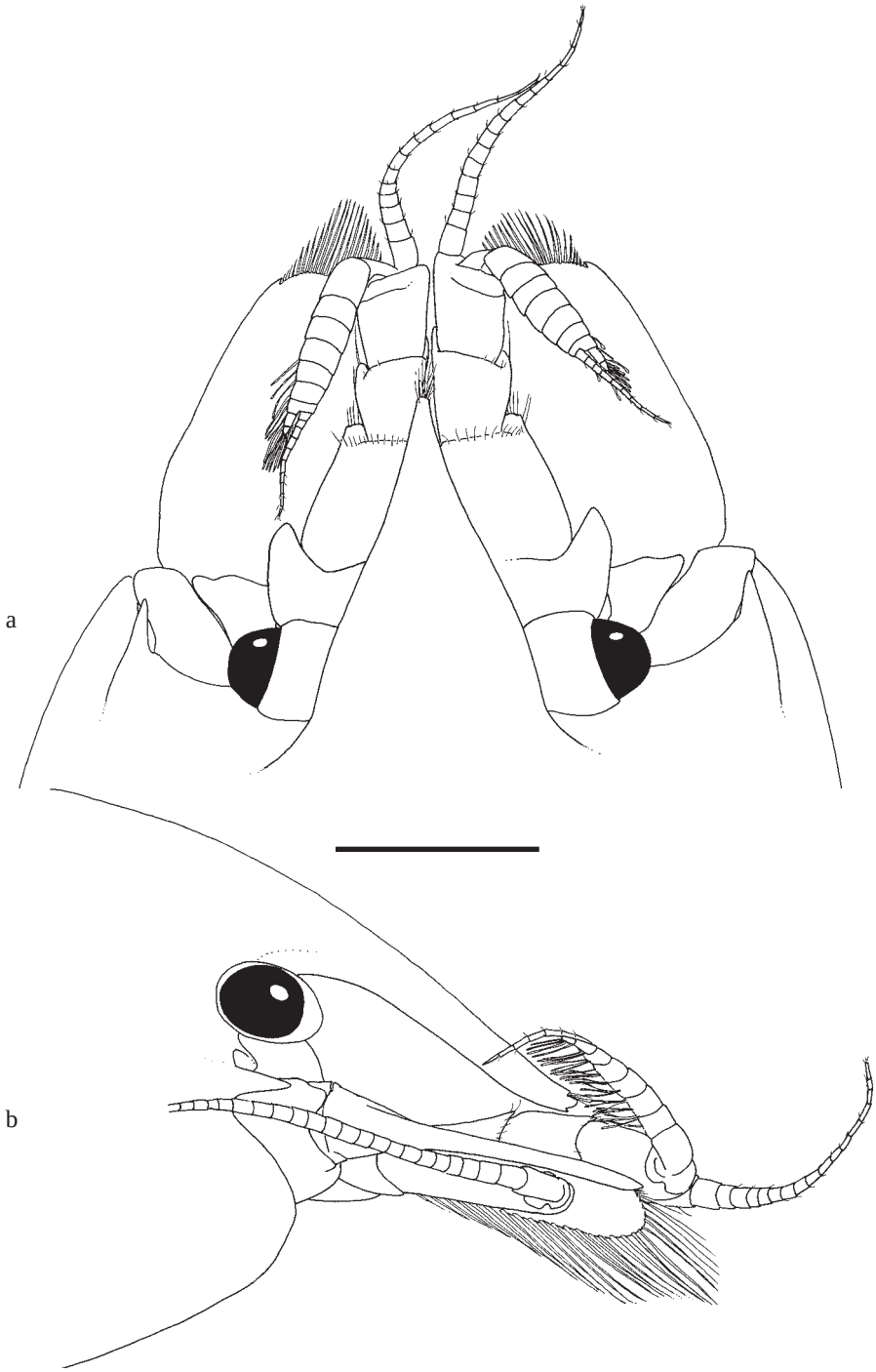


Fig. 101. *Pontonia pinnae* Lockington, 1878: non-ovigerous female, pocl. 10.4 mm, RMNH D 9477. a, anterior appendages, dorsal view; b, anterior appendages, lateral view. Scale = 2 mm.

Distal segment about 1.3 times longer than wide. Upper flagellum well-developed, biramous, with about six to eight proximal segments fused; short free ramus two-segmented; longer free ramus with about 7-10 segments. Lower flagellum with about 15-20 segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite short, reaching 3/4 of lamella of scaphocerite, moderately stout; flagellum short, slender, slightly shorter than to equal to postorbital carapace length; scaphocerite with lamella about 1.9 times as long as central width, anterior margin truncate, medial margin distally straight, proximally convex, lateral margin slightly convex with small, distolateral tooth, almost reaching anterior margin of lamella, distolateral tooth about 0.05 times length of scaphocerite; incision between distolateral tooth and lamina indistinct.

Epistome with blunt anterior median carina; labrum large, oval.

Paragnath well developed, alae with large subcircular distal lobes, and round submedian ventral lobes; corpus long, with long median groove, bordered by setose carinae.

Second thoracic sternite formed into, shallow, triangular, medially pointed process between second maxillipeds, with simple annulate setae medially.

Third thoracic sternite with shallow indistinct lateral carinae posteromedian of third maxillipeds.

Fourth thoracic sternite with shallow indistinct lateral carinae posteromedial of first pereiopods; with transverse ridge between first pereiopods.

Fifth thoracic sternite with well developed lateral plates posteromedial of second pereiopods, with deep rather narrow medial notch in between.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process slender, with about 4-5 distal teeth and row of about 16 small teeth present on medioventral border; molar process robust, with four blunt distal teeth, some fringed with setal brushes.

Maxillula with upper lacinia broad with two rows of serrulate spines and many long slender setae medially, inner medial surface with many long simple setae; lower lacinia very broad, densely setose distoventrally and marginally, no differentiation in setae; palp bilobed, larger lobe with small ventral tubercle with single short recurved simple seta.

Maxilla with basal endite well-developed, distincly bilobed; distal lobe slightly longer, but smaller than broad proximal lobe, both with long slender minutely serrulate setae along distomedian border, median border without setae; coxal endite obsolete, median margin convex, without setae; scaphognathite large, 2.7 times longer than wide, posterior lobe large, 1.7 times longer than anterior width, anterior lobe 1.4 times longer than proximal width; palp simple, about as long as distal lobe of basal endite, strongly expanded proximally, tapered distally to rather acute tip, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite completely fused, large and broad, fringed with many simple, long and finely serrulate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod well developed, flagellum with many long, plumose setae in distal half; caridean lobe large, elongate; epipod large, triangular, faintly bilobed; palp simple, slender, elon-

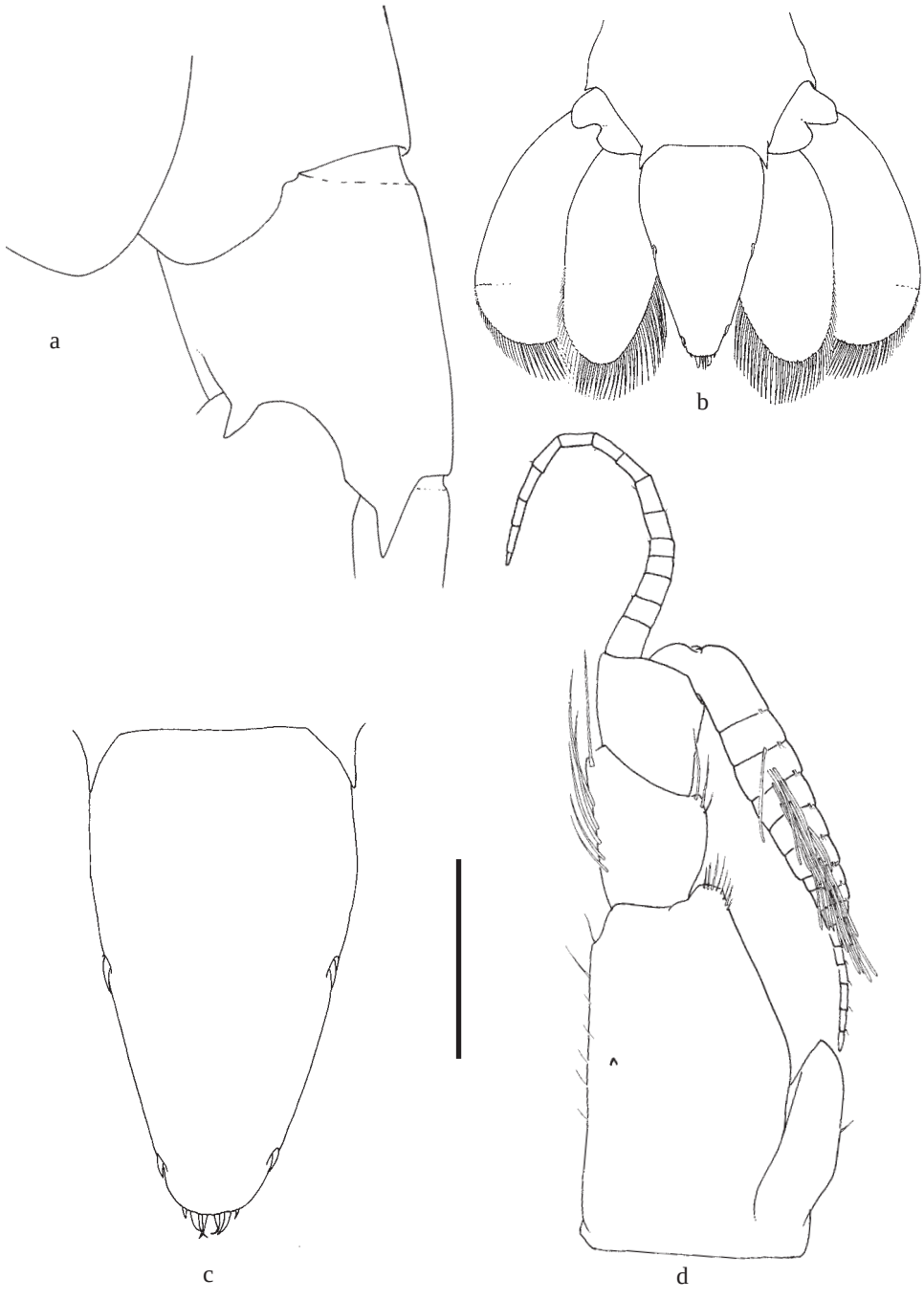


Fig. 102. *Pontonia pinnae* Lockington, 1878: non-ovigerous female, pocl. 10.4 mm, RMNH D 9477. a, distal part abdomen, lateral view; b, telson and uropods, dorsal view; c, telson, dorsal view; d, antennula, ventral view. Scale: a, c = 2 mm; b = 4 mm; d = 1.5 mm.

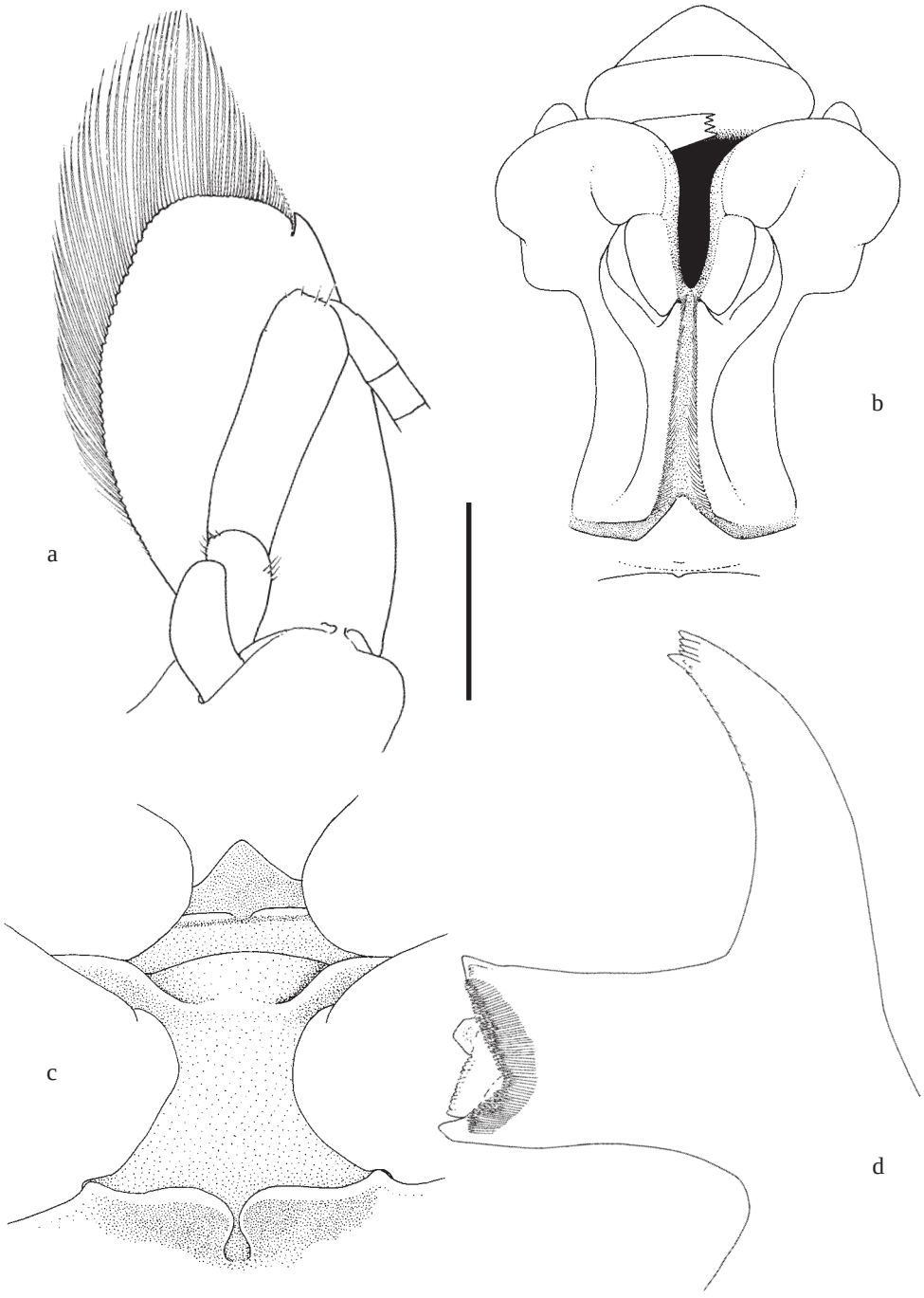


Fig. 103. *Pontonia pinnae* Lockington, 1878: non-ovigerous female, pocl. 10.4 mm, RMNH D 9477. a, antenna, ventral view; b, paragnath, ventral view; c, second to fifth thoracic sternites; d, mandible, ventral view. Scale: a = 1.5 mm; b, c = 2 mm; d = 0.75 mm.

Fig. 104. *Pontonia pinnae* Lockington, 1878: non-ovigerous female, pocl. 10.4 mm, RMNH D 9477. a, maxillula, ventral view; b, maxilla, ventral view; c, first maxilliped, ventral view. Scale: a, b = 1.9 mm; c = 2.5 mm.

gate, curved along distolateral margin of basal endite, non-setose.

Second maxilliped normally developed; dactylar segment narrow, 4.9 times longer than broad, densely fringed with coarsely serrulate, spiniform, and long, curled, finely serrulate setae medially; propodal segment with row of very long slender spines and simple and finely serrulate setae along small, expanded distomedial margin, with few finely serrulate setae in distal part of ventrolateral margin; carpal segment short, broader than long, unarmed; meral segment with row of long plumose setae medially, medially excavate; basal and ischial segments fused, ischial part excavate, with few plumose setae medially; basal segment straight medially; exopod normal, with many long plumose setae in distal fourth; coxal segment medially slightly produced, non-setose, with triangular epipod laterally.

Third maxilliped almost reaching with ultimate segment to distal margin of carpocerite; ischiocerite almost completely fused with basis, indicated by distinct suture, 2.0 times longer than broad, strongly tapering distally, flattened, with many setae on

Fig. 105. *Pontonia pinnae* Lockington, 1878: non-ovigerous female, pocl. 10.4 mm, RMNH D 9477. a, second maxilliped, ventral view; b, third maxilliped, ventral view. Scale = 2 mm.

median margin, ventral surface almost without setae, lateral margin with single row of rather short, plumose setae; basal segment medially strongly convex, with many long, finely serrulate setae on medial margin; exopod well developed, reaching just beyond anterior margin of ischiomeral segment, with long plumose setae in distal third; coxa without medial process, with large lateral plate fringed with rather long simple setae, with rudimentary arthrobranch; penultimate segment about 2.6 times as long as central width, about 0.45 length of ischiomeral segment, medially slightly expanded, flattened, with long finely serrulate setae along ventromedial and ventrolateral margins; ultimate segment slightly shorter than penultimate segment, slender, tapering distally, with long, finely serrulate, and shorter, more coarsely serrulate setae along ventromedial, ventrolateral and distal margins.

First pereiopods slender, exceeding carpocerite with chela and carpus. Chela about 5 times longer than deep, subcylindrical, slightly compressed; fingers slightly longer than palm, slender, with several rows of finely serrate setae, cutting edges entire, with groups of many strong, long, serrulate setae, tips acute, hooked; cleaning organ well developed on carpal-propodal joint; carpus 1.6 times longer than chela, about 6.9 times longer than distal width, somewhat tapering proximally, unarmed, with few setae; merus as long as carpus, 5.0 times longer than central width, straight, unarmed, with row of long simple setae in proximal part of median margin; ischium short, about 0.5 times merus length, with slightly expanded medial margin, with few short simple setae along median margin, without setae along lateral margin; basis slightly shorter than ischium, with many setae medially; coxa robust with setose ventromedial carina.

Second pereiopods similar in form, unequal in size. Major cheliped with chela large, about twice as long as postorbital carapace length in adult males, almost as long as postorbital carapace length in adult females, with palm subcylindrical, somewhat compressed, without carinae, smooth, with few short setae in distal part; dactylus about 0.5 times palm length, about 3.0 times longer than deep, with large simple triangular proximal tooth, distal part of cutting edge entire, tip strongly hooked, with median margin indistinctly carinate; fixed finger about 1.7 times longer than deep, with blunt denticulate tooth just proximal of tooth on dactylus, separated from blunt sometimes denticulate triangular tooth just distal of tooth on dactylus by deep notch, distal part of cutting edge entire, slightly concave, tip strongly hooked, median fossa for reception of dactylar tooth when fingers closed well-developed; carpus short and stout, about 0.26 of palm length, expanding distally, slightly longer than distal width, unarmed, with distomedial excavation; merus short and stout, 1.2 times as long as carpus, about 1.5 times as long as central width, distomedially excavate; ischium short and stout, about 0.6 times merus length, strongly tapering proximally, without distomedial protuberance; basis and coxa stout, without armature. Minor cheliped as major cheliped, with palm subcylindrical, without carinae, smooth, with few setae in distal part; fingers 0.6 times as long as palm; fingers as major cheliped, tooth on dactylus and median tooth on fixed finger may be crenulate as proximal truncate tooth on fixed finger, teeth situated somewhat more proximally in relation to major chela.

Ambulatory pereiopods robust. Dactylus of third pereiopod with corpus strongly compressed ventrally, with corpus 1.4 times longer than proximal width, slightly tapering distally, with few simple setae on distal and ventral margins, accessory tooth small, acute, slightly curved, terminal, ventral margin entire, straight; unguis simple,

acute, slightly curved, about 0.45 of corpus length; propodus about 5.2 times longer than dactylus, about 4.7 times longer than wide, propodus of third and fourth pereiopods with one subdistal ventral spine and two distal ventrolateral spines, of fifth with small subdistal ventral spine, without distal ventrolateral spines, with rather long distoventral setae, more dense in fifth pereiopod; carpus 0.5 times propodus length, 3 times longer than distal width, slightly tapering proximally, with distal lobe, unarmed; merus as long as propodus, about 2.6 times longer than central width,

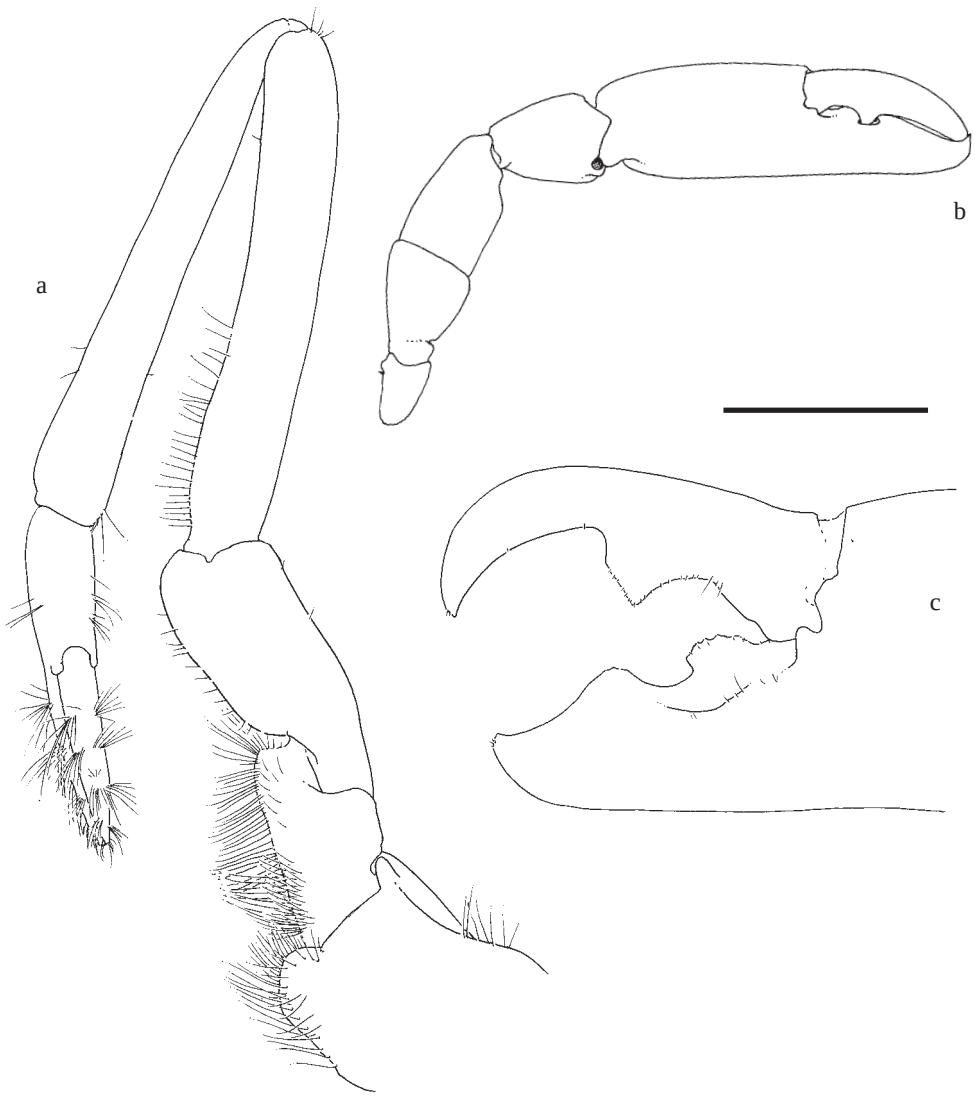


Fig. 106. *Pontonia pinnae* Lockington, 1878: male, pocl. 9.7 mm (fig. b), non-ovigerous female, pocl. 10.4 mm (figs. a, c), RMNH D 9477. a, first pereiopod; b, major second pereiopod; c, idem, chela. Scale: a = 2 mm; b = 8 mm; c = 4 mm.

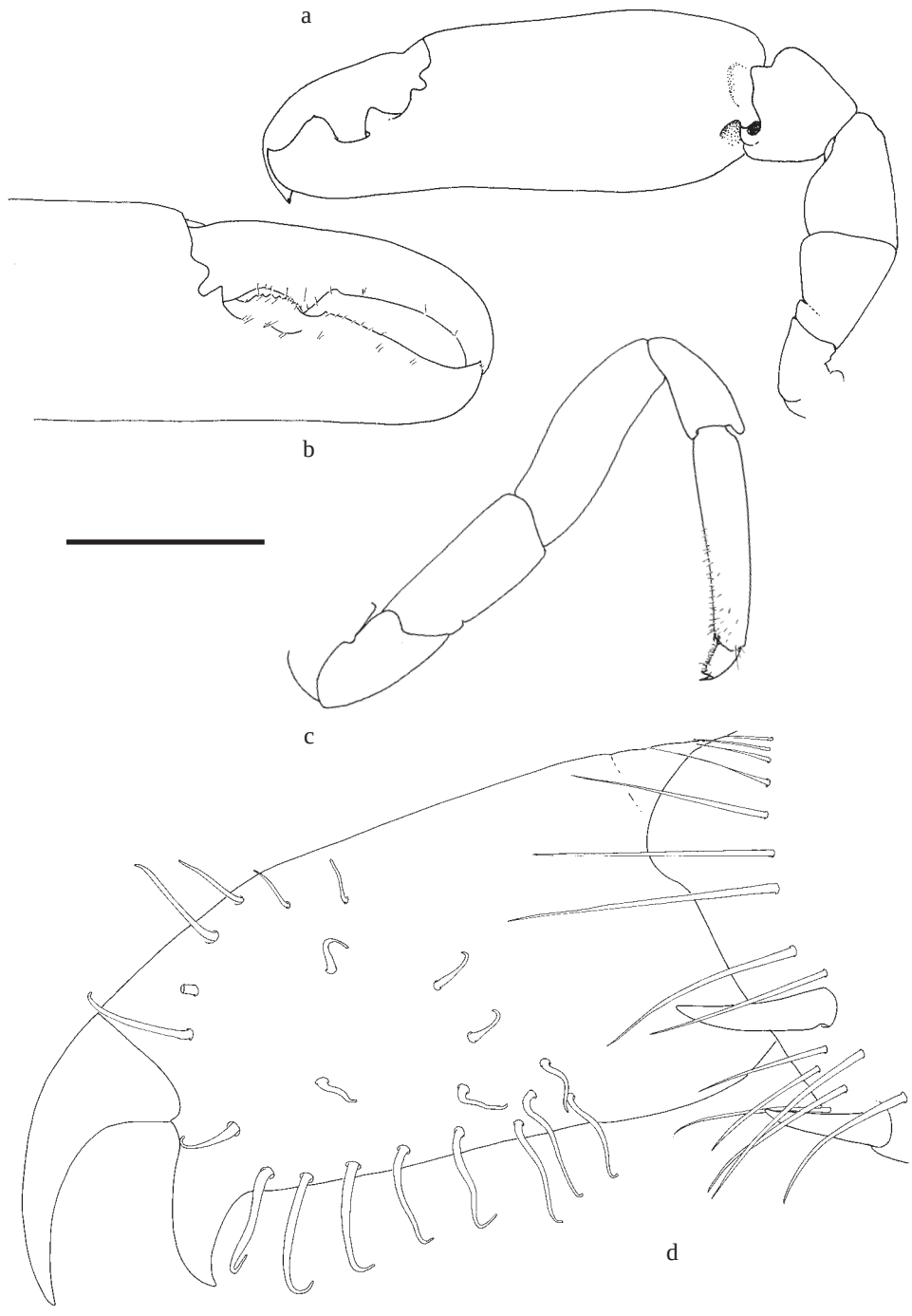


Fig. 107. *Pontonia pinnae* Lockington, 1878: male, pocl. 9.7 mm (figs. a, c), non-ovigerous female, pocl. 10.4 mm (figs. b, d), RMNH D 9477. a, minor second pereiopod; b, idem, chela; c, third pereiopod; d, dactylus third pereiopod. Scale: a = 8 mm; b, c = 4 mm; d = 0.19 mm.

subcylindrical, unarmed, non-setose; ischium about 0.7 of merus length, 1.8 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopod similar, merus more slender.

Male first pleopod with endopod more than four times longer than proximal width, tapering distally; median margin straight with rows of many short simple setae, with moderately long plumose setae along lateral margin, distal margin without setae.

Endopod of second pereiopod with appendix masculina about as long as appendix interna, with two or three rows of long setulose setae along entire length.

First pleopod of female with slender endopod, about one third length of exopod, with many long distal setae when ovigerous, with few long plumose setae on lateral margin and few simple setae in proximal part of medial margin.

Uropods with short stout unarmed protopodite; exopod broad, almost twice as long as wide, with lateral margin convex, without lateral tooth, with minute distolateral spine, distal lamina truncate; endopod extending just beyond exopod, as long as telson.

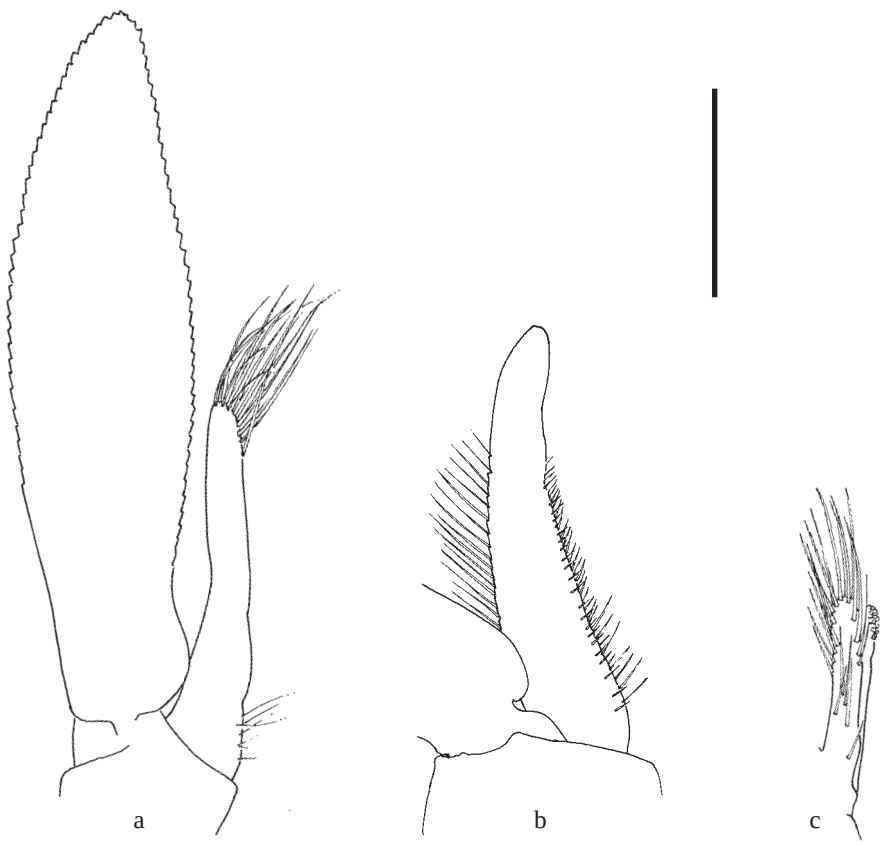


Fig. 108. *Pontonia pinnae* Lockington, 1878: male, pocl. 9.7 mm (figs. b, c), non-ovigerous female, pocl. 10.4 mm (fig. a), RMNH D 9477. a, endopod female first pleopod; b, endopod male first pleopod; c, appendix interna and appendix masculina on second male pleopod. Scale= 1.5 mm.

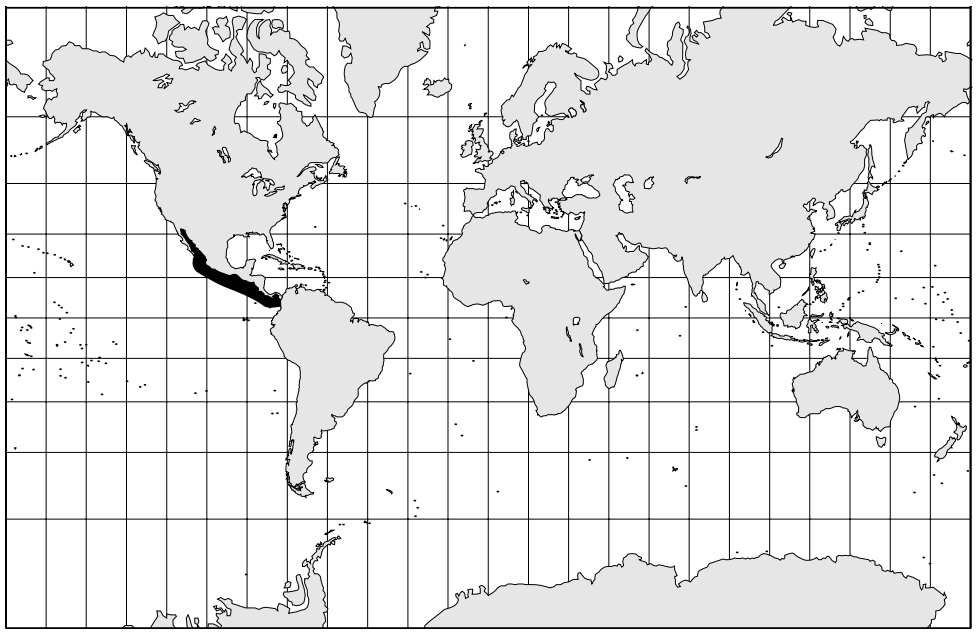


Fig. 109. Geographic distribution of *Pontonia pinnae* Lockington, 1878.

Ovigerous females with 100-300 eggs. Egg-size 0.50-0.55 mm.

Size.— Maximum postorbital carapace length in males 11.3 mm; in females 13.3 mm; smallest ovigerous female 7.8 mm.

Colouration.— Translucent with milky white reticulate pattern over body and appendages. Eyestalks with white longitudinal dorsal stripe. Antennula with white along joints and fused part of outer flagellum. Antenna with scaphocerite with white margins. Carapace with white lines encircling translucent areas; dorsal line from tip of rostrum to midlength of carapace. Abdominal somites with white lines along margins and middorsal line. Exopods of uropods with lateral and distal white margins; endopod of uropod with few white patches of distal white margin; telson with whitish tip. Second pereiopods with finely reticulate white pattern. First pereiopods with some white patches. Ambulatory pereiopods with some white lines especially at joints. (According to: Kerstitch, 1989: fig. 189; Ingle, 1982: 437, colourfig.): As *P. pinnophylax*.

Types.— Probably destroyed during the earthquake at San Francisco in 1906 (Holthuis, 1951a). Type-locality: from Angeles Bay, Muglege Bay and San José Island in the Gulf of California.

Distribution.— EAST PACIFIC: From the Gulf of California, Mexico, to the Gulf of Panama and Colombia: Mexico (Lockington, 1878; Kemp, 1922; Steinbeck & Ricketts, 1941; Rioja, 1950; Holthuis, 1951a; Wicksten, 1983; Rodríguez de la Cruz & Rodríguez de la Cruz, 1987; Campos-González, 1988; Campos, Campos & Ramirez, 1992; Hendrickx, 1994; Félix-Pico & García-Domínguez, 1995); Costa Rica (Boone, 1930, 1931); Panama (Boone, 1931; Galtsoff, 1950; Holthuis, 1951a); Colombia (Lemaitre & Alvarez-León: 1992).

Host.— Known from *Pinna rugosa* Sowerby, 1835 (cf. Wicksten, 1983); *Atrina tuberculosa* (Sowerby, 1835) (cf. Luke, 1977; Campos-González, 1988; Campos et al., 1992; Lemaitre & Alvarez-León, 1992); and unidentified species of *Pinna* (cf. Holthuis, 1951a; Wicksten, 1983). The species has once been recorded from a pearl oyster at Taboga Island, Gulf of Panama (Holthuis, 1951a). Juvenile specimens were found in the clam *Laevicardium elatum* (Sowerby, 1833) (Cardiidae) and *Megapitaria aurantiaca* (Sowerby, 1831) (Veneridae) by Campos, Félix-Pico & García-Domínguez (1995: 177) who suggested that these clams might serve as occasional hosts for juveniles of *P. pinnae*.

Remarks.— One specimen from Lower California (MNHN-Na 1976) has the distal dorsal telson spines absent. Specimens with small accessory teeth and oblong corpus, as in *P. simplex*.

8.2.10. *Pontonia pinnophylax* (Otto, 1821)
(figs. 110-119, pls. 5, 6)

"... a small carid..." Aristotle, ca. 350 B.C.: book V, chapter 15, p 547.

Squilla Cerutus & Chiocco, 1622: 95.

? *Scyllarus Pinnother* Sachs, 1665: 97.

Astacus minimus Hasselquist, 1757: 450

"Wagter"; Chemnitz, 1781: 1.

"Chevrettes"; Chandler, 1806: 156.

*Alpheus Tyrhenu*s Risso, 1816:94, pl. 2 fig. 2 [not *Cancer tyrrhenus* Petagna, 1792].

Autonomea Olivii Latreille, 1818: 336 fig. 10 [not *Autonomea Olivii* Risso, 1816].

Palaemon pinnophylax Otto, 1821: 12; Otto, 1821: (3); Holthuis, 1952: 271; Holthuis, 1955: 65; Hemming, 1956: 413.

Gnathophyllum Tyrhenus; Desmarest, 1823: 323; Desmarest, 1825: 229; Jarocki, 1825: 150.

Callianassa thyrenus; Risso, 1827: 54.

Alpheus pinnophylax Otto, 1828: 341, pl. 21 figs. 1,2; Otto, 1829: 301.

Pontonia tyrrhena; Latreille, 1829: 96; H. Milne Edwards, 1837: vol. 17: 142, vol. 18, pl. 52 fig. 4; H. Milne Edwards, 1837: 360; H. Milne Edwards, 1839: 387; Lucas, 1846: 40; Veranyi, 1846: 8; Lucas, 1851: 184; Heller, 1862: 447; Heller, 1863: 251, pl. 8 figs. 10, 11; Heller, 1864: 51; Stalio, 1877: 789; Neumann, 1878: 37; Haller, 1879: 206; Albert, 1883: 20; Albert, 1883: 462, pl. 29 fig. 32; Lo Bianco, 1888: 413; Ortmann, 1890: 509; Acloque, 1899: 161, fig. 78; Lo Bianco, 1899: 509; Norman, 1905: 9; Buen, 1905: 103; Nobili, 1906: 49; Coulon, 1907: 189; Lo Bianco, 1909: 614; Buen, 1916: 272, 280; Gibert i Olivé, 1920: 56: Caroli, 1926: 2; Schmitt, 1926: 40, fig. 66; J. Roux, 1927: 238; Perrier, R., L. Berland & L. Bertin, 1929: 194, fig.; Brian, 1932: 9, fig. 40; Arndt, 1933: 251; Hipeau-Jacquotte, 1972: 8; Drensky, 1951: 241.

Pontonia custos Guérin, 1829-1844: vol. 2 Crust. pl. 21 fig. 2, vol. 3 Crust.: 15; Guérin, 1832: 36, pl. 37 fig. 1; Lucas, 1839: 311; Costes, 1890: 557, 558; Sharp, 1893: 119; Borradaile, 1898: 388; Pruvot, 1898: 639; Car, 1901: 82; Magri, 1911: 24; Pesta, 1912: 101; Buen, 1916: 361; Bolivar, 1916: 251; Pesta, 1918: 128, fig. 43; Santucci, 1928: 349; Miranda y Rivera, 1933: 15; Buen, 1934: 32, 46; Zariquiey Alvarez, 1946: 88, pl. 2 fig.; Pérès & Picard, 1958: 264; Heegaard, 1963: 456, textfig. 15-26, pl. 17 figs. 5, 6; Tortonese, 1965: 86; Riedl, 1963: 275 fig. 92; Harris, 1982: 113.

Pontonia Thyrenus; Roux, 1831: 26.

Pontonia parasitica Roux, 1831: 26.

Alpheus thyrenus; Latreille, 1831: 73; Comte, 1832-1840: pl. 56.

Astacus thyrenus; Comte, 1832-1840: pl. 56.

Pontonia heterochelis Guérin, 1832: ?; Bory de St. Vincent, 1836: 92.

Astacus (P.) tyrrhenus; Voigt, 1836: 181.

Pontonia Tyrrhena; Hope, 1851: 16; Marion, 1879: 226.
Pontonia Tyrrhenia; A. Milne Edwards, 1882: 15.
Pontonia tyrrhenia; Gourret, 1884: 15.
Pontonia Pyrrhena; Van Beneden, 1900: 29.
Pontonia tyrrena; Magri, 1926: 90.
Pontonia thyrraena; Ninni, 1930.
Astacus tyrrhenus (Risso MS) Monod, 1931: 123.
Autonomea Olivii (Risso MS) Monod, 1931: 123, fig. 8.
Pontonia Custos; Zariquiey Cenarro, 1935: 96.
Pontonia pinnophylax; Holthuis, 1947: 319; Delamare Debouteville, 1948: 444; Zariquiey Alvarez, 1950: 81; Holthuis, 1951b: 160; Zariquiey Alvarez, 1952: 17; Holthuis, 1952: 15, 156, fig. 72; Holthuis, 1955: 65 figs. 37b, c; Zariquiey Alvarez, 1955: 401; Forest & Guinot, 1956: 31; Longhurst, 1958: 92; Bourdillon-Casanova, 1960: 67, figs. 22-24; Figueira, 1960: 3; Holthuis, 1961: 21; Rossignol, 1962: 130; Chace, 1966: 626, fig. 1; Zariquiey Alvares, R., 1968: 174-175, figs. 2c, 6c, 8c, 11b, 12d, 15b, 73a, b, 74; Stevcic, 1969: 127; Rubió Lois, 1971: 10; Bruce, 1972b: 222; Hipeau-Jacquotte, 1973: 104; Lagardère, 1973: 65, figs. 105, 106; Koukouras, 1973: 749; Koukouras & Kattoulas, 1974: 379; Pastore, 1976: 107, 110; Relini Orsi, Arata & Costa, 1976: 84; Lewinsohn, 1976: 241, 250; Holthuis, 1978: 48; Entrop & Faber, 1980: 45, fig.; Moncharmont, 1981: 60; Campbell, 1982: 202, fig.; Pretus, 1982: 247 fig. 68 no. 5; García Raso, 1982: 106; Calafiori, 1983: 3, 6; Campbell, 1983: 202-203, fig.; Riedl, 1983: 477, pl. 175; Brito, 1984: 55; Lewinsohn & Holthuis, 1986: 12; Garcia & Massuti, 1987: 74; Dufort, García V. & Sagrista, 1987: 483, figs. 1-7; Manning & Chace, 1990: 10; Stevcic, 1990: 203; Bruce, 1991: 616, figs. 7-13, 14E, F; Grippa, 1991: 344; Pérez, Sanchez & Moreno Batet, 1991: 134, fig.; Calafiore, Costanzo & Giacobbe, 1991: 52, figs. 1-16; Noël, 1992: 39; Sauer, 1992: 208, fig.; Göthel, 1992: 166, fig.; Noël, 1993: 61; Grippa, 1993: 227; Koukouras, Dounas & Eleftheriou, 1993: 195; Ugolini & Borgioli, 1993: 113; Chace & Bruce, 1993: 62; Fransen, 1994: 111; Bruce, 1994: 126; González Pérez, 1995: 72, colourfigs 15-17; Moosleitner & Patzner, 1995: 100, colourfig. Noël, 1995: 92; d'Udekem d'Acoz, 1996: 145; Richardson et al., 1997: 1227-1230, figs. 2, 3; d'Udekem d'Acoz, 1999: 102; Debelius, 1999: 31, colourfig.; Wirtz & d'Udekem-d'Acoz, 2001: 114.
Pontonia; Tortajada, 1949: 52.
Ponthonia custos; Rossignol, 1957: 112, fig. 20.
Pontonia syrrhena; Hanström, 1933: 443; Hanström, 1934: 5, 8; Sjögren, 1934: 156, fig. 5; Sawaya, 1939: 44.
Alpheus megacheles Simeonidis, 1995: 119, colourfig.

Material.— **East Atlantic: Mediterranean Sea**.— RMNH D 5995: 1 female, pocl. 6.7 mm; NE Spain, bay of Cadaqués; 6.viii.1949; in *Pinna nobilis* Linnaeus, 1758; leg. L.B. Holthuis, n. 24.— RMNH D 10085: 1 ovigerous female, pocl. 11.8 mm; Spain, NE coast, Cala Torta, S of Cabo de Creus; 12.viii.1954; leg. L.B. Holthuis, n. 164.— RMNH D 17044: 1 male, pocl. 6.3 mm; 1 ovigerous female, pocl. 11.4 mm; NE Spain, near Isla Massena near Cadaqués; 28.vii.1961; L.B. Holthuis.— RMNH D 27710: 1 female, pocl. 3.4 mm; NE Spain; 27.vii.1953; leg. R. Zariquiey Alvarez.— RMNH D 1059: 1 male, pocl. 10.0 mm; Italy, Naples; leg. A.A.W. Hubrecht.— RMNH D 5574: 1 dry male, pocl. 9.3 mm; 1 dry ovigerous female, pocl. 8.4 mm; 1827-1833; leg. F.J. Cantraine.— RMNH D 15167: 1 male, pocl. 6.6 mm; 1 ovigerous female, pocl. 6.9 mm; Italy, Gulf of Naples, off Posillipo; 5.vi.1957; leg. J.H. Stock; don. Zool. Museum Amsterdam.— RMNH D 30419: 1 ovigerous female, pocl. 12.0 mm; Italy, Elba, Bay of Lacona; 5.viii.1965; leg. R. Kinzelbach.— USNM 14534: 1 specimen; Italy, Naples; received in July 1889; leg. A.M. Norman.— RMNH D 23128: 1 dry male, pocl. 9.5 mm; 2 dry ovigerous females, pocl. 9.5 and 10.0 mm; Greece, Corfu, Beniza; iv.1935; from *Pinna* spec.; leg. H. Stradal; don. E. Gittenberger.— RMNH D 14060: 1 male, pocl. 5.3 mm; S coast of Turkey, near Selimiye, ca. 62 km E of S of Antalya; 23.iv.1959; Turkey expedition 1959; leg. C. Swennen n. 60.— RMNH D 26479: 1 ovigerous female, pocl. 10.4 mm; 2 males, pocl. 9.4 and 10.5 mm; Mediterranean Sea, Turkey, Çesme, W of Izmir; 15.ix.1968; A. Kocatas & R. Geldiay.— USNM 265819: 2 specimens; Tunesia, N coast, 3 km W of Bechateur, isolated beach; 8.vii.1973; in *Pinna* spec.; leg. Grimm, R.B. Manning and family.— USNM 105406: 1 male, 1 ovigerous female; Egypt; 18.i.1960; don. W. Banoub, no. 102; living inside *Pinna* spec.— BMNH 1940.2.28.1-2: 2 males, pocl. 7.8 and 9.0 mm; 1 ovigerous female, pocl. 9.6 mm; Greece, Crete, Suda Bay; H.M.S.

Barham; leg. A.J. Cobham.— BMNH 1898.5.7.978: 1 male, pocl. 10.6 mm; Italy, Naples, Zoological Station; collection Norman.— BMNH 1902.6.19.1-2: 1 male, pocl. 11.0 mm; 1 ovigerous female; pocl. 11.7 mm; France, Cannes; leg. W.H. St. Quintin.— BMNH 1911.11.8.1992: 1 male, pocl. 8.4 mm; 1 female, pocl. 5.0 mm; 1 ovigerous female, pocl. 10.3 mm; Italy, Naples, Zoological Station; collection Norman. — **Azores**.— RMNH D 42357: 1 specimen; sta. CANCAP 5.D03, E coast of Santa Maria, Baia de São Lourenço, 37°59'N 25°03'W; shallow coastal area near islet; depth to 15 m; scuba diving; 28.v.1981; from *Pinna rudis* Linnaeus, 1758.— RMNH D 42591: 1 ovigerous female, pocl. 8.1 mm; sta. CANCAP 5.D07, SE coast of Faial near Horta, 38°31'N 28°37'W; rocky coast, S of harbour; depth to 15 m; scuba diving; 1/3,5.vi.1981.— RMNH D 42592: 1 ovigerous female, pocl. 7.8 mm; 1 male, pocl. 7.1 mm; sta. CANCAP 5.D05, S coast of São Miguel, Ilhéu da Vila, 37°42'N 25°27'W; close to small outlying volcano; depth to 15 m; scuba diving; 31.v.1981.— RMNH D 42609: 1 male, pocl. 10.9 mm; sta. CANCAP 5.D09, E coast of Faial, near Almoxarife, 38°33'N 28°37'W; sheltered cove in large bay; depth to 15 m; scuba diving; 6.vi.1981; in *Pinna rudis* Linnaeus, 1758.— RMNH D 42616: 1 ovigerous female, pocl. 10.9 mm; 1 male, pocl. 9.5 mm; sta. CANCAP 5.D06, SE coast of Faial, Caldeira Inferno 38°31'N 28°38'W; in open crater of small volcano, shallow and sandy; depth to 10 m; scuba diving; 1.vi.1981.**— Selvagens Archipelago**.— RMNH D 42604: 1 male, pocl. 10.9 mm; sta. CANCAP 4.K25, Selvagem Grande, Enseada da Fonte das Galinhas, 30°08'N 15°52'W; rocky shore in bay; depth 0-6 m; 1-6.vi.1980; in *Pinna rudis* Linnaeus, 1758.— RMNH D 42613: 1 female, pocl. 4.9 mm; 2 males, pocl. 6.5 and 7.9 mm; sta. CANCAP 3.D07, E coast of Selvagem Pequena, 30°02'N 16°01'W; rocky littoral with pools in bay; depth to 20 m; scuba diving; 22.x.1978.— RMNH D 42614: 2 males, pocl. 8.8 and 10.6 mm; sta. CANCAP 3.D07, E coast of Selvagem Pequena, 30°02'N 16°01'W; rocky littoral with pools in bay; depth to 20 m; scuba diving; 22.x.1978.**— Madeira**.— RMNH D 31588: 2 males, pocl. 8.6 and 9.2 mm; 2 ovigerous females, pocl. 8.7 and 10.3 mm; sta. CANCAP 1.D58, SE coast, Ponta de São Lourenço, near Ponta das Galvotas, 32°44'N 12°42'W; depth 0-20 m; scuba diving; 12.iii.1976.**— Canary Islands**.— RMNH D 32452: 1 male, pocl. 7.5 mm; sta. CANCAP 2.D07; S coast of Hierro, W of Punta de los Saltos, Puerto de Naos, 27°39'N 18°00'W; rocky bottom; depth 10-15 m; scuba diving; 3,10.ix.1977.— RMNH D 32453: 1 male, pocl. 9.4 mm; 1 ovigerous female, pocl. 9.2 mm; sta. CANCAP 2.D02, SW coast of Fuerteventura, Punta de Jandia, 28°04'N 14°30'W; sandy bottom, seagrass, rocks; depth 10-15 m; scuba diving; 24,31.viii.1977.— RMNH D 42586: 2 ovigerous females, pocl. 7.6 and 9.6 mm; 2 males, pocl. 9.1 and 10.0 mm; sta. CANCAP 2.D08, SW of Hierro, off Faro de Orchilla, 27°42'N 18°08'W; rocky bottom with some sand; depth 8-10 m; scuba diving; 8.ix.1977.— RMNH D 42587: 1 ovigerous female, pocl. 11.9 mm; 1 male, pocl. 9.8 mm; sta. CANCAP 4.D03, S coast of Lanzarote, Arrecife, 28°57'N 13°33'W; rocky and sandy coast; depth to 15 m; scuba diving; 20,21.v.1980; in *Pinna rudis* Linnaeus, 1758.— RMNH D 42594: 1 male, pocl. 4.9; 1 male, pocl. 8.4 mm; NT Cr. 007715; 1 ovigerous female, pocl. 8.8 mm, NT Cr. 007716; 1 ovigerous female, pocl. 9.6 mm, NT Cr. 007717; sta. CANCAP 4.D01, S coast of Lanzarote, W of Punta Papagayo, 28°50'N 13°47'W; scuba diving and shore collecting in sheltered bay; depth to 15 m; 14/15.v.1980.— RMNH D 42600: 1 male, pocl. 6.4 mm; sta. CANCAP 2.D07, S coast of Hierro, W of Punta de los Saltos, Puerto de Naos, 27°39'N 18°00'W; rocky bottom; depth 10-15 m; scuba diving; 3,10.ix.1977.— RMNH D 42602: 1 male, pocl. 5.9 mm; sta. CANCAP 2.D08, SW of Hierro, off Faro de Orchilla, 27°42'N 18°08'W; rocky bottom with some sand; depth 5-25 m; scuba diving; 8.ix.1977; in *Pinna rudis* Linnaeus, 1758.— RMNH D 42612: 1 non-ovigerous female, pocl. 11.4 mm; sta. CANCAP 4.D02, S coast of Lanzarote, E of Punta Papagayo, 28°51'N 13°47'W; exposed rocky coast; depth to 15 m; scuba diving; 19.iii.1980.— RMNH D 42615: 1 ovigerous female, pocl. 8.0 mm; 1 male, pocl. 9.6 mm; sta. CANCAP 2.D08, SW of Hierro, off Faro de Orchilla, 27°42'N 18°08'W; rocky bottom with some sand; depth 5-25 m; scuba diving; 8.ix.1977.— RMNH D 42606: 1 ovigerous female, pocl. 8.1 mm; 1 male, pocl. 8.1 mm; sta. CANCAP 4.D04, E of Lanzarote, Rada de Arrieta, 29°09'N 13°26'W; rocky and sandy coast; depth to 15 m; scuba diving; 22.v.1980; in *Pinna rudis* Linnaeus, 1758.— RMNH D 42610: 1 ovigerous female, pocl. 10.4 mm; sta. CANCAP 4.K12, SW coast of Lanzarote, Arrecife; 28°57'N 13°33'W; rocky shore, tide pools, shallow sandy bay; depth ca. 3 m; 20,21.v.1980; in *Pinna rudis* Linnaeus, 1758; leg. J.C. den Hartog. — RMNH D 42611: 1 ovigerous female, pocl. 8.9 mm; 1 male, pocl. 8.9 mm; sta. CANCAP 2.D10, S coast of Hierro, W of Punta de los Saltos, Puerto de Naos, 27°39'N 18°00'W; rocky bottom; depth 10-15 m; scuba diving; in *Pinna rudis* Linnaeus, 1758; 3,10.ix.1977.— RMNH D 47423: 2 males, pocl. 8.8 and 8.9 mm; 2 ovigerous females, pocl. 9.1 and 9.7 mm; Sta. CAN-

CAP 2.D02, SW coast of Fuerteventura, Punta de Jandia, 28°04'N 14°30'W; sandy bottom, seagrass, rocks; depth 10-15 m; scuba diving; in *Pinna rudis* Linnaeus, 1758; 24,31.viii.1977.— BMNH 1956.5.2.125-128: 1 male, pocl. 8.8 mm; Lanzarote, Arrecife; leg. A.K. Totten.**— Cape Verde Islands**.— RMNH D 32451: 1 male, pocl. 5.0 mm; 1 ovigerous female, pocl. 5.0 mm; São Vicente, Porto Grande, NE of pier; in sand between rocks; depth 3-5 m; in *Pinna*; 1.ix.1979; leg. A. Edwards; Cambridge Expedition to St. Paul Rocks, Sta. 4-4a.— RMNH D 42588: 2 ovigerous females, pocl. 7.3 and 8.0 mm; 1 male, pocl. 7.1 mm; sta. CANCAP 6.D05, SE of Fogo, SE of São Filipe, 14°54'N 24°30'W; sandy and rocky bottom; depth to 15 m; scuba diving; 10.vi.1982.— RMNH D 42593: 1 male, pocl. 5.3 mm; sta. CANCAP 6.???, São Vicente. No further data.— RMNH D 42597: 1 ovigerous female, pocl. 6.8 mm; 1 male, pocl. 3.7 mm; sta. CANCAP 6.D05, SE of Fogo, SE of São Filipe, 14°54'N 24°30'W; sandy and rocky bottom; depth to 15 m; scuba diving; 10.vi.1982; in *Pinna rudis* Linnaeus, 1758.— RMNH D 42598: 1 ovigerous female, pocl. 7.1 mm; 1 male, pocl. 6.1 mm; sta. CANCAP 6.D06, SW coast of São Nicolau, Baia do Tarrafal, 16°35'N 24°22'W; rocky coast; depth to 15 m; scuba diving; 10.vi.1982; in *Pinna rudis* Linnaeus, 1758.— RMNH D 42599: 1 female, pocl. 5.3 mm; 1 male, pocl. 7.5 mm; sta. CANCAP 7.D08, Sal, S coast near Santa Maria, 16°35'N 22°55'W; depth 0-15 m; scuba diving; 29.viii.1986; in *Pinna rudis* Linnaeus, 1758.— RMNH D 42601: 1 ovigerous female, pocl. 4.1 mm; 1 male, pocl. 3.8 mm; sta. CANCAP 6.D02, W coast of São Tiago, Baia de Santa Clara, 15°01'N 23°44'W; depth to 20 m; sheltered bay, rocky coast; scuba diving; 6-7.vi.198; in *Pinna rudis* Linnaeus, 1758. — RMNH D 42603: 1 female, pocl. 3.6 mm; 1 male, pocl. 3.9 mm; sta. CANCAP 7.D03, Cima, SE coast, 14°57'N 24°39'W; rock platform in surge; scuba diving; 23,24.viii.1986; in *Pinna rudis* Linnaeus, 1758.— RMNH D 42607: 1 ovigerous female, pocl. 9.4 mm; 1 male, pocl. 6.9 mm; sta. CANCAP 6.D10, S coast of São Vicente, 16°28'N 25°01'W; rocky coast; depth 0-15 m; scuba diving; 9.vi.1982; in *Pinna rudis* Linnaeus, 1758.— RMNH D 42595: 1 ovigerous female, pocl. 4.8 mm; 2 males, pocl. 3.4 and 5.1 mm; sta. CANCAP 7.D01, São Tiago, SW coast near Ponta da Cidade, 14°54'N 23°38'W; loose boulders on coarse sand; depth to 22 m; scuba diving; 20,21.viii.1986.— RMNH D 42596: 1 ovigerous female, pocl. 5.9 mm; 1 male, pocl. 5.4 mm; 1 juvenile, pocl. 1.1 mm; sta. CANCAP 7.D07, Boa Vista, W coast near Sal Rei, 16°10'N 22°57'W; scuba diving; 28.viii.1986; in *Pinna rudis* Linnaeus, 1758.— RMNH D 42605: 1 ovigerous female, pocl. 10.0 mm; 1 male, pocl. 8.3 mm; sta. CANCAP 6.D07, SW coast of Santa Luzia 16°45'N 24°46'W; rocky and sandy coast; depth to 10 m; scuba diving; 6.vi.1982; in *Pinna rudis* Linnaeus, 1758.— RMNH D 42608: 1 female, pocl. 9.5 mm; 2 males, pocl. 8.0 and 8.4 mm; sta. CANCAP 7.D11, São Nicolau, SE coast, 16°34'N 24°17'W; scuba diving; 3.ix.1986; in *Pinna rudis* Linnaeus, 1758; photo.**— Senegal**.— RMNH D 42585: 4 ovigerous females, pocl. 7.0- 10.8 mm; 4 males, pocl. 5.3-9.6 mm; Gorée near Dakar; 11.viii.1950; in *Pinna rudis* Linnaeus, 1758; leg. Delais, no. 121. IFAN.— RMNH D 42589: 1 ovigerous female, pocl. 8.3 mm; 1 male, pocl. 7.1 mm; sta. SEN.08, southern tip of Cape Verde Peninsula, between Cap Manuel and Pointe Bernard; between concrete stairs and swimming pool of Lido Hotel, boulder beach down the cliffs, with submerged barrier of boulders, merging into sandy bottom at a depth of 4-6 m; depth 0.5-6 m; snorkeling; 2.vii.1982, 21/25.xi.1983.— RMNH D 42590: 2 ovigerous females, pocl. 11.0 and 12.5 mm; 2 males, pocl. 9.6 and 10.3 mm; sta. SEN.08, southern tip of Cape Verde Peninsula, between Cap Manuel and Pointe Bernard; between concrete stairs and swimming pool of Lido Hotel, boulder beach down the cliffs, with submerged barrier of boulders, merging into sandy bottom at a depth of 4-6 m; depth 0.5-6 m; snorkeling; 2.vii.1982, 21/25.xi.1983.— RMNH D 42617: 1 ovigerous female, pocl. 8.6 mm; 1 male, pocl. 6.4 mm; Anse Bernard; 28.x.1950; leg. M. Condamin; in *Pinna rudis* Linnaeus, 1758; IFAN.— RMNH D 42618: 1 ovigerous female, pocl. 12.3 mm; 1 male, pocl. 9.4 mm; N'Gaparo; 29.vi.1949; "Gerar Tréca"; leg. Orémouy; IFAN.— RMNH D 42619: 1 ovigerous female, pocl. 10.5 mm; 1 male 8.3 mm; Gorée; -.ix.1949; in *Pinna rudis*; IFAN.— RMNH D 42620: 1 ovigerous female, pocl. 9.6 mm; 1 male, pocl. 6.9 mm; Yoff; 16.vi.1951; in *Pinna rudis* Linnaeus, 1758; leg. M. Goudamin; IFAN.— RMNH D 42621; 1 male, pocl. 7.5 mm; Cap Rouge; Stn. 556.13, Chalut "Jacqueline"; trawl; depth 47 m; dans un bloc de calcaire trous à Lithodomes; leg. J.M. Marchad; IFAN.— RMNH D 42622: 1 male, pocl. 8.9 mm; N'Gor; -.iii.1948; in *Pinna rudis* Linnaeus, 1758; leg. J.C. Loiseaux; IFAN.— RMNH D 42623: 1 ovigerous female, pocl. 8.8 mm; 1 male, pocl. 7.3 mm; IFAN, no label, probably Senegal.— RMNH D 42624: 1 ovigerous female, pocl. 11.9 mm; 1 male, pocl. 8.5 mm; Dakar; 2.vi.1951; in *Pinna rudis* Linnaeus, 1758; leg. M. Condamin, no. 11; IFAN.— RMNH D 42625: 1 ovigerous female, pocl. 10.5 mm; 1 male, pocl. 8.3 mm; Senegal, Anse Bernard; 26.xi.1950; leg. M. Condamin;

in *Pinna rudis* Linnaeus, 1758; IFAN.— **Ascension Island**.— USNM 252246: 1 female; Lady's Loo, north coast of Ascension Island; depth 6 m; 28.x.1985; in *Pinna* spec.; leg. R. Irving.— USNM 252245: 1 female; ? Ascension Island, "China" wreck, off Georgetown; depth ? 10 m; 1985; ? in *Pinna* spec.; leg. C. Tebbs.— USNM 252250: 1 male, 1 female; Ascension Bay, Southwest Bay; depth 10 m; 16.iii.1963; in *Atrina rigida* (Lightfoot, 1786); leg. W. Vickrey.— USNM 252248: 4 males, 2 females, 1 ovigerous female; 24.viii.1971; in *Pinna* spec.— BMNH (unregistered): 9 ovigerous females, pocl. 5.2-11.8 mm; 9 males, pocl. 5.9-9.9 mm; xi.1972; leg. Mr Hannay, Fort Hayes Museum.— **St. Helena**.— USNM 273526: 3 specimens; -.iii.1965.— USNM 125504: 1 female; James Bay; 24.xii.1966; leg. A. Loveridge.— USNM 112517: 1 male, 1 female, 1 ovigerous female; James Bay; 7.ii.1964; in *Pinna rudis* Linnaeus, 1758; leg. A. Loveridge.— USNM 125505; 1 male, 1 female: James Bay; 2.xi.1964; leg. F.N. Martin.— USNM (acc. no. 336129): 1 female; -.iii.1965.— **Sierra Leone**.— RMNH D 26985: 1 male, pocl. 8.0 mm; 1 ovigerous female, pocl 10.5 mm; Banana Islands near Freetown; -.xii.1969; leg. W. Pfaff.— **Congo**.— USNM (acc. no. 214517): 8 specimens; Pointe-Noire; 6.v.1955; in mantle cavity of *Pinna rudis* Linnaeus, 1758; leg. A.G. Humes.— **Belgian Congo**.— USNM 57887: 1 male, 1 female; St. Paul de Loanda, 8°55'S 13°10'E; 22.ix.1915; inside *Pinna* spec.; leg. Congo Expedition; don. American Museum of Natural History.

Description.— Body subcylindrical, somewhat depressed. Carapace smooth. Rostrum well developed, distally ending in sharp point, overreaching distal margin of

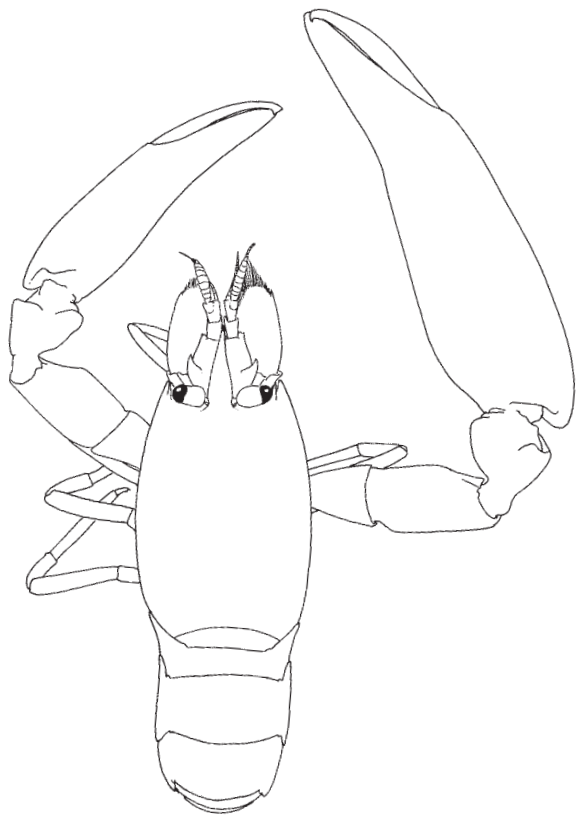


Fig. 110. *Pontonia pinnophylax* (Otto, 1821): male, pocl. 6.6 mm, RMNH D 15167. Dorsal aspect. Scale a = 8 mm.

basal segment to reaching or slightly overreaching distal margin of second segment of antennular peduncle, slender, without dorsal or lateral carinae, with straight or slightly convex ventral carina in distal part; subdistal dorsal notch with few long simple setae in front; subdistal ventral small tooth or notch posterior of level of subdistal notch, sometimes indistinct, seldom absent. Inferior orbital angle produced, angular. Antennal spine well developed, reaching beyond anterolateral margin of carapace, situated well below level of blunt inferior orbital angle. Anterolateral margin of carapace slightly produced, broadly rounded.

Abdomen smooth; sixth segment about 1.6 times longer than fifth, 1.3 times wider than long, posterolateral angle acutely produced, posteroventral angle spiniform; pleura of first five segments broadly rounded.

Telson almost twice as long as sixth abdominal segment, slightly more than twice as long as its proximal width; lateral margins straight or slightly convex, convergent; posterior border without median process; two pair of medium sized dorsal spines at about 0.34 and 0.60 of the telson length, marginal, about 0.1 of telson length; posterior margin with three pairs of spines, lateral spines rather small, about 0.06 of telson length, marginal, intermediate and submedian spines larger than lateral spines, about as long as dorsal spines but more slender.

Eyestalk about as long as wide, cylindrical, posteriorly somewhat swollen; stalk slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella well developed. Basal segment with small more or less pronounced blunt distolateral tooth reaching 1/3rd of intermediate segment, anterior margin slightly produced, convex; medioventral tooth small, acute, submarginal, situated halfway basal segment; stylocerite short, less than half length of scaphocerite, with distal blunt or acute tip, lateral margin without plumose setae. Intermediate segment slightly longer than wide, about as long as distal segment. Distal segment about 1.3 times longer than wide. Upper flagellum well developed, biramous, with 8-10 proximal segments fused; short free ramus one- or two-segmented, longer free ramus with 6-10 segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite short, reaching 2/3 of lamella of scaphocerite, moderately stout; scaphocerite with lamella about 1.8 times as long as central width, distal margin truncate, medial margin distally straight, proximally convex, lateral margin slightly convex with small, distolateral tooth, reaching anterior margin of lamella, distolateral tooth about 0.06 times length of scaphocerite; incision between distolateral tooth and lamina indistinct.

Epistome with blunt anterior median carina; labrum large, oval.

Paragnath well developed, alae with large subcircular distal lobes, and round submedian ventral lobes; corpus very long, with long median groove, bordered by setose carinae.

Second thoracic sternite formed into triangular, medially pointed, process between second maxillipeds, with simple setae medially.

Third thoracic sternite with prominent lateral carinae with medial notch posteromedian of third maxillipeds.

Fourth thoracic sternite with shallow indistinct lateral carinae posteromedial of first pereiopods; with transverse ridge between first pereiopods.

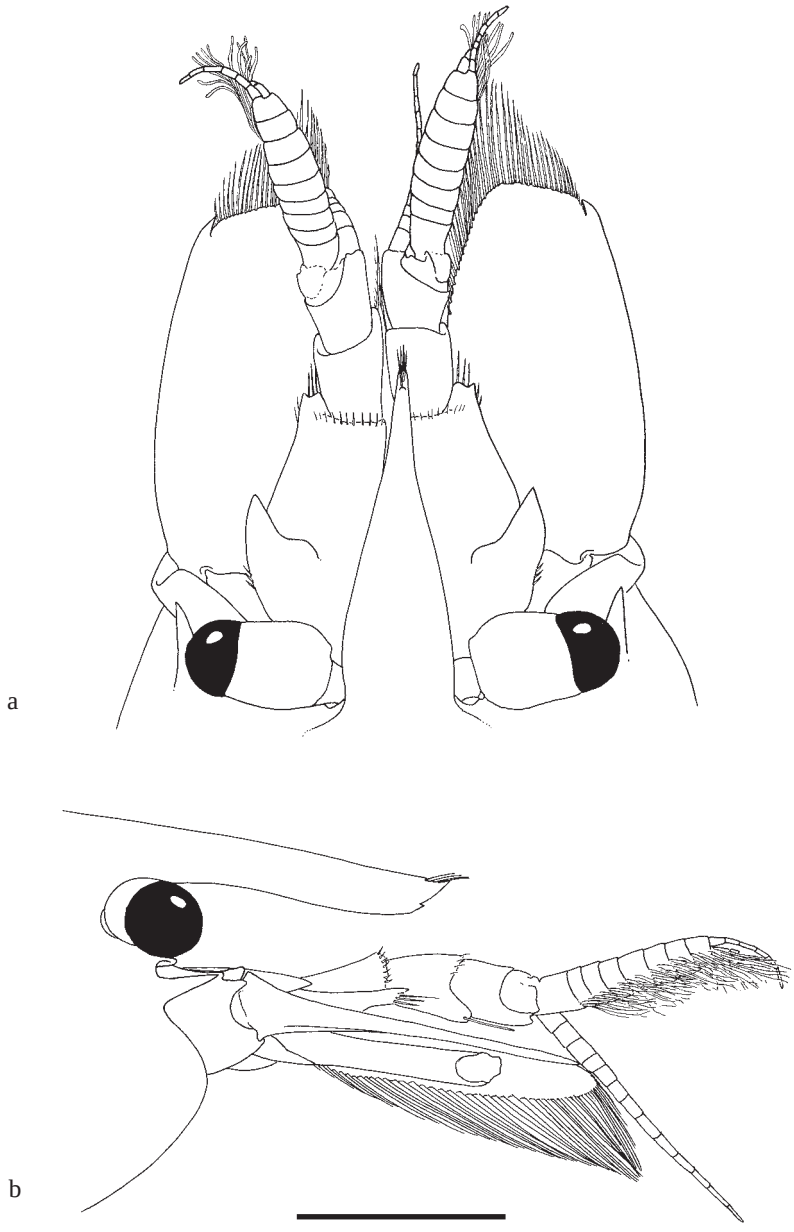


Fig. 111. *Pontonia pinnophylax* (Otto, 1821): male, pocl. 6.6 mm, RMNH D 15167. a, anterior appendages, dorsal view; b, anterior appendages, lateral view. Scale = 2 mm.

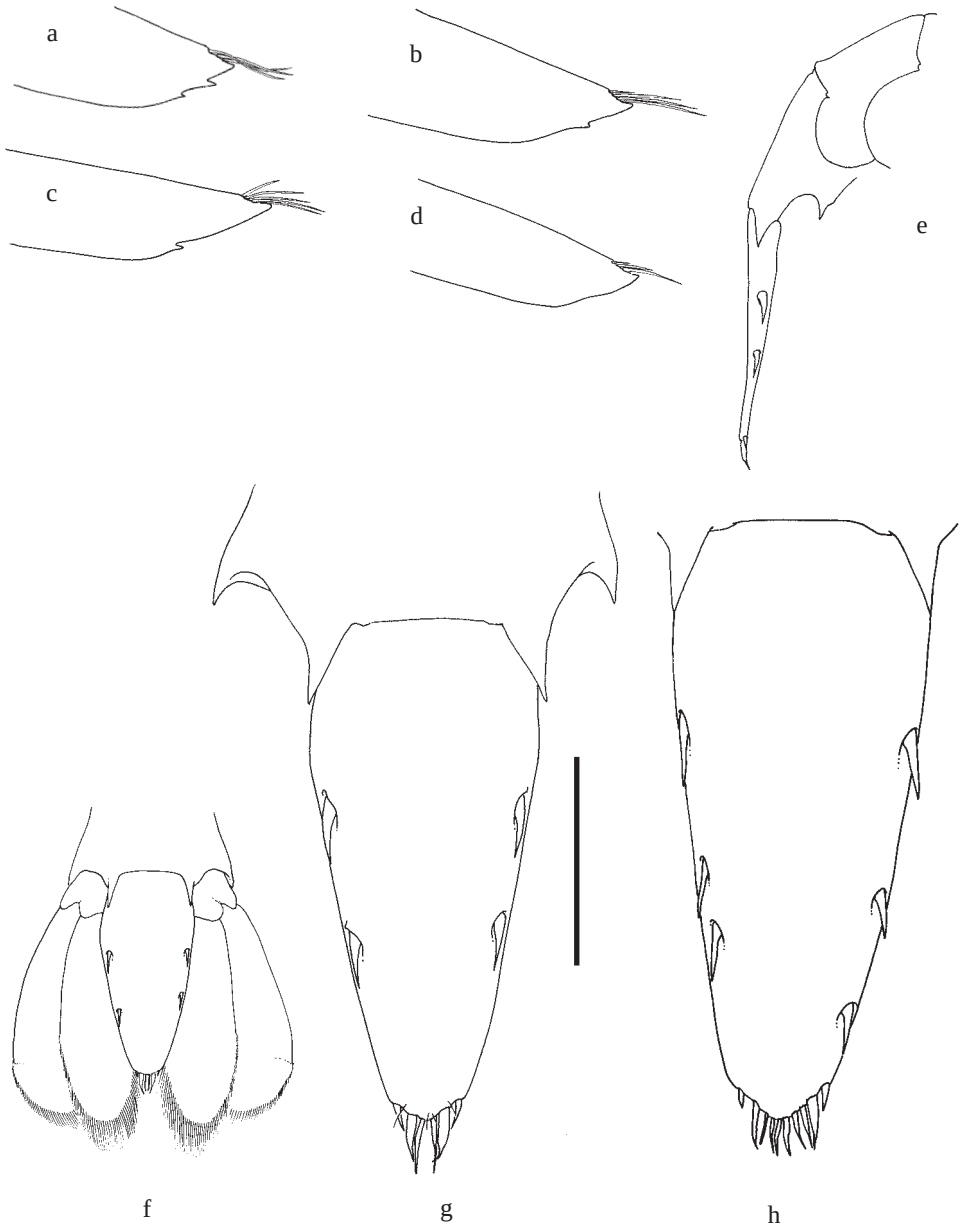


Fig. 112. *Pontonia pinnophylax* (Otto, 1821): ovigerous female, pocl. 10.4 mm (fig. a), male, pocl. 10.6 mm (fig. b), male, pocl. 9.4 mm (fig. c), RMNH D 26479; ovigerous female, pocl. 10.5 mm (fig. d), RMNH D 26985; male, pocl. 6.6 mm (figs. e, g), ovigerous female, pocl. 6.9 mm (fig. f), RMNH D 15167; USNM 273526 (fig. h). a-d, distal tip of rostrum, lateral view; e, distal part abdomen, lateral view; f, telson and uropods, dorsal view; g, h, telson, dorsal view. Scale: a-d = 1 mm; e, f = 4 mm; g, h = 2 mm.

Fifth thoracic sternite with well developed lateral plates posteromedial of second pereiopods, with deep rather narrow medial notch in between.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process slender, with five or six distal teeth and row of five to ten small teeth present on medioventral border.

Maxillula with upper lacinia broad with two rows of 15-20 serrulate spines and

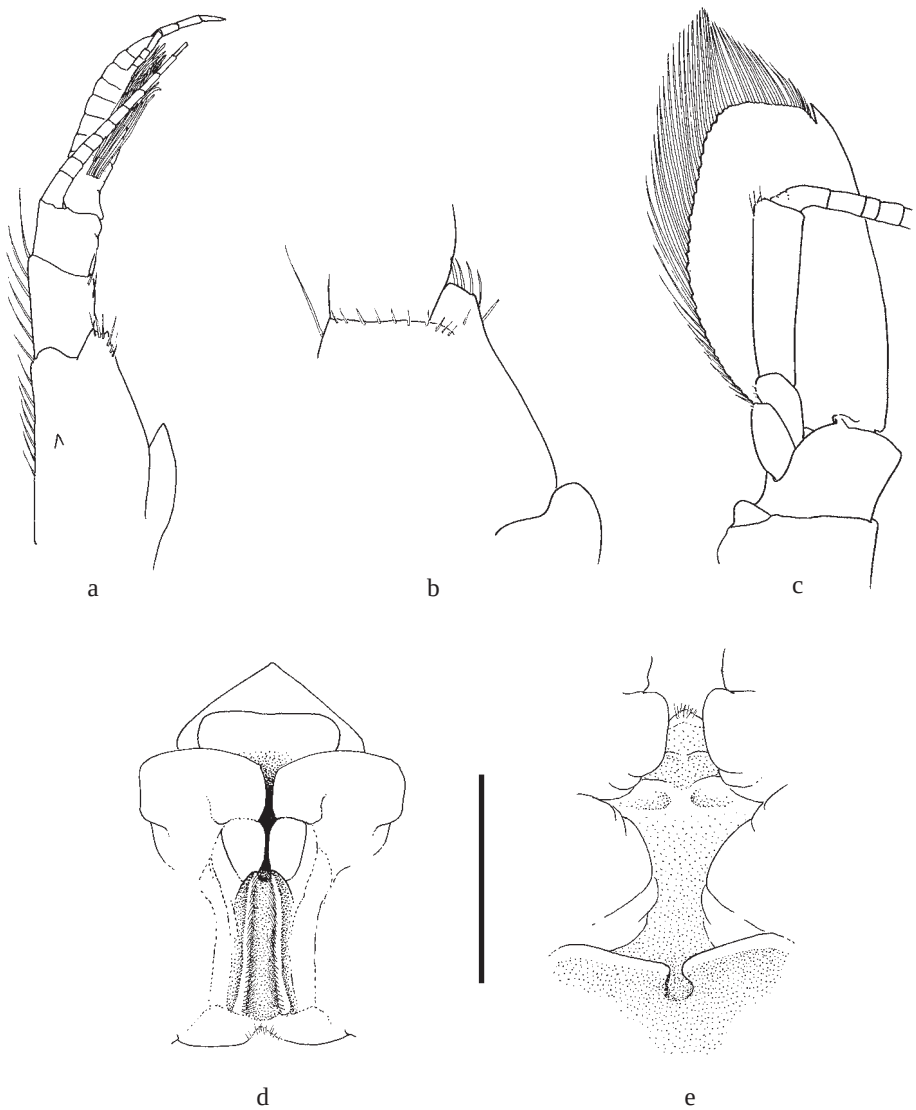


Fig. 113. *Pontonia pinnophylax* (Otto, 1821): male, pocl. 6.6 mm, RMNH D 15167. a, antennula, ventral view; b, antennula, detail distolateral tooth of basal segment, dorsal view; c, antenna, ventral view; d, paragnath, ventral view; e, second to fifth thoracic sternites. Scale: a, c-e = 2 mm; b = 1 mm.

many long slender setae medially, inner median surface with several long simple setae; lower lacinia very broad, densely setose distoventrally and marginally, no differentiation in setae; palp bilobed, large lobe with small tubercle with single short recurved simple seta.

Maxilla with basal endite well developed, bilobed; distal lobe longer and more slender than proximal lobe, both with long slender minutely serrulate setae along distomedian border, median border without setae, coxal endite obsolete, median margin convex, without setae; scaphognathite large, 2.7 times longer than wide, posterior lobe large, 1.7 times longer than anterior width, anterior lobe 1.3 times longer than proximal width; palp simple, slightly shorter than distal lobe of basal endite, strongly expanded proximally, tapered distally to blunt tip, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite completely fused, large and broad, fringed with many simple, long and finely serrulate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod well developed, flagellum with many long, plumose setae in distal half; caridean lobe large, elongate; epipod large, triangular, faintly bilobed; palp simple, slender, elongate, curved along distolateral margin of basal endite, non-setose.

Second maxilliped with endopod normally developed; dactylar segment narrow, 4.3 times longer than broad, with numerous coarsely serrulate, spiniform, and long curled, finely serrulate setae medially; distomedial lobe of propod produced, rounded with stout serrulate and long plumose marginal setae, ventrolateral margin without setae; carpal segment distomedially angular, unarmed; meral segment with long median plumose setae, medially excavated; basal and ischial segments almost completely fused, medially excavated, with median, plumose setae; exopod normal, with many long plumose setae in distal sixth; coxal segment medially slightly produced, with few simple setae, with large subtriangular epipod laterally, not bearing a podobranch.

Third maxilliped almost reaching with ultimate segment to distal margin of carpocerite; ischiocerite almost completely fused with basis, indicated by distinct suture, 2.2 times longer than broad, tapering distally, flattened, with many setae on median margin, ventral surface with few setae, lateral margin with single row of long, plumose setae; basal segment medially convex, with many long, finely serrulate setae on medial margin; exopod well developed, reaching just beyond anterior margin of ischiomeral segment, with long plumose setae in distal third; coxa without medial process, with large lateral plate fringed with few short simple setae, with rudimentary arthrobranch, with filaments; penultimate segment more than three times longer than central width, about 0.5 length of ischiomeral segment, medially expanded, flattened, with long finely serrulate setae along ventromedial and ventrolateral margins; ultimate segment slightly shorter than penultimate segment, tapering distally, with long, finely serrulate, and shorter, more coarsely serrulate setae along ventromedial, ventrolateral and distal margins.

First pereiopods slender, exceeding carpocerite with chela and distal 2/3rd of carpus. Chela about 4.0 times longer than deep, subcylindrical, slightly compressed; fingers slightly longer than palm, slender, with several rows of finely serrate setae, cutting edges entire, somewhat gaping proximally, with groups of many strong, long,

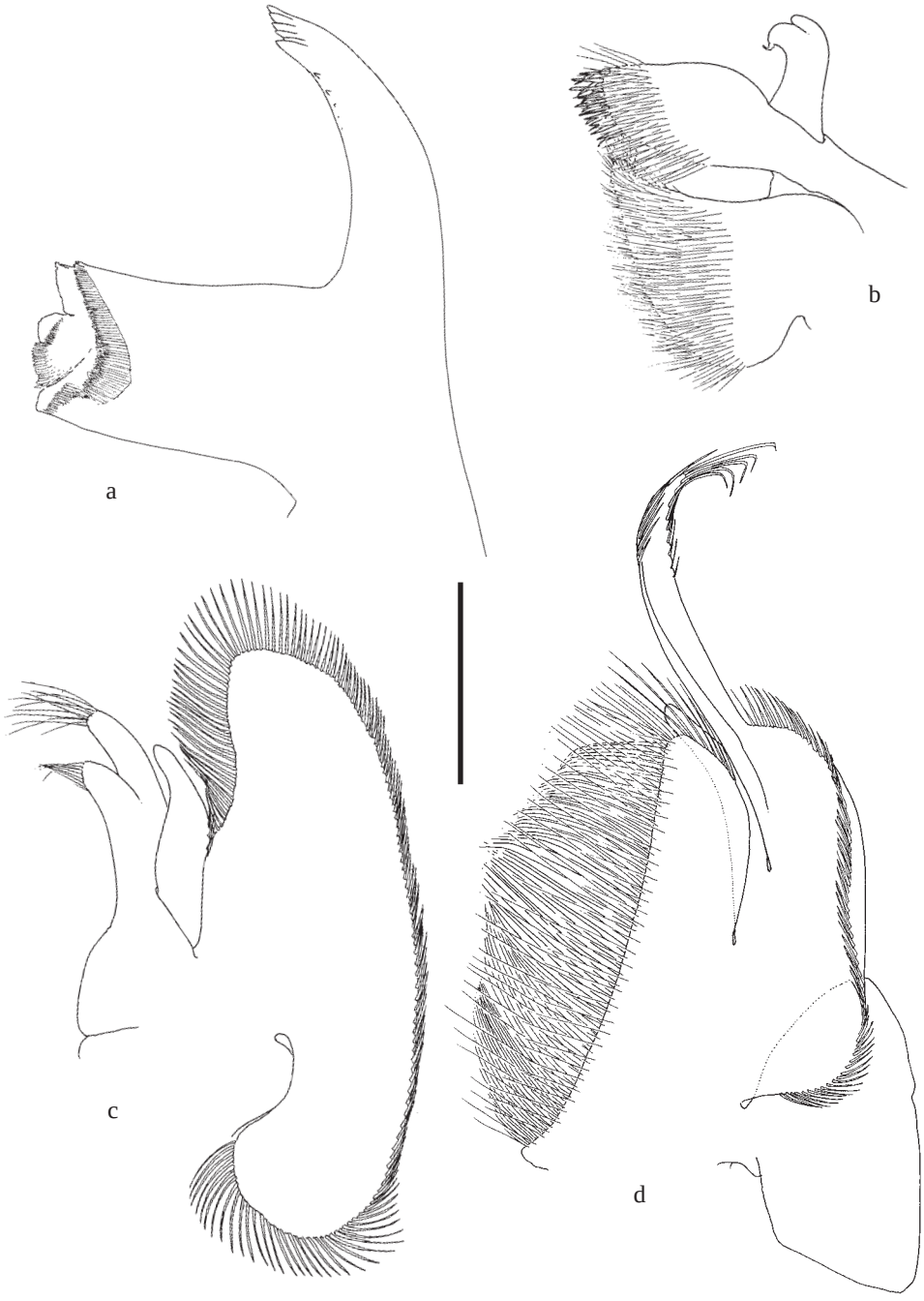


Fig. 114. *Pontonia pinnophylax* (Otto, 1821): male, pocl. 6.6 mm, RMNH D 15167. a, mandible, ventral view; b, maxillula, ventral view; c, maxilla, ventral view; d, first maxilliped, ventral view. Scale: a = 0.75 mm; b-d = 1.5 mm.

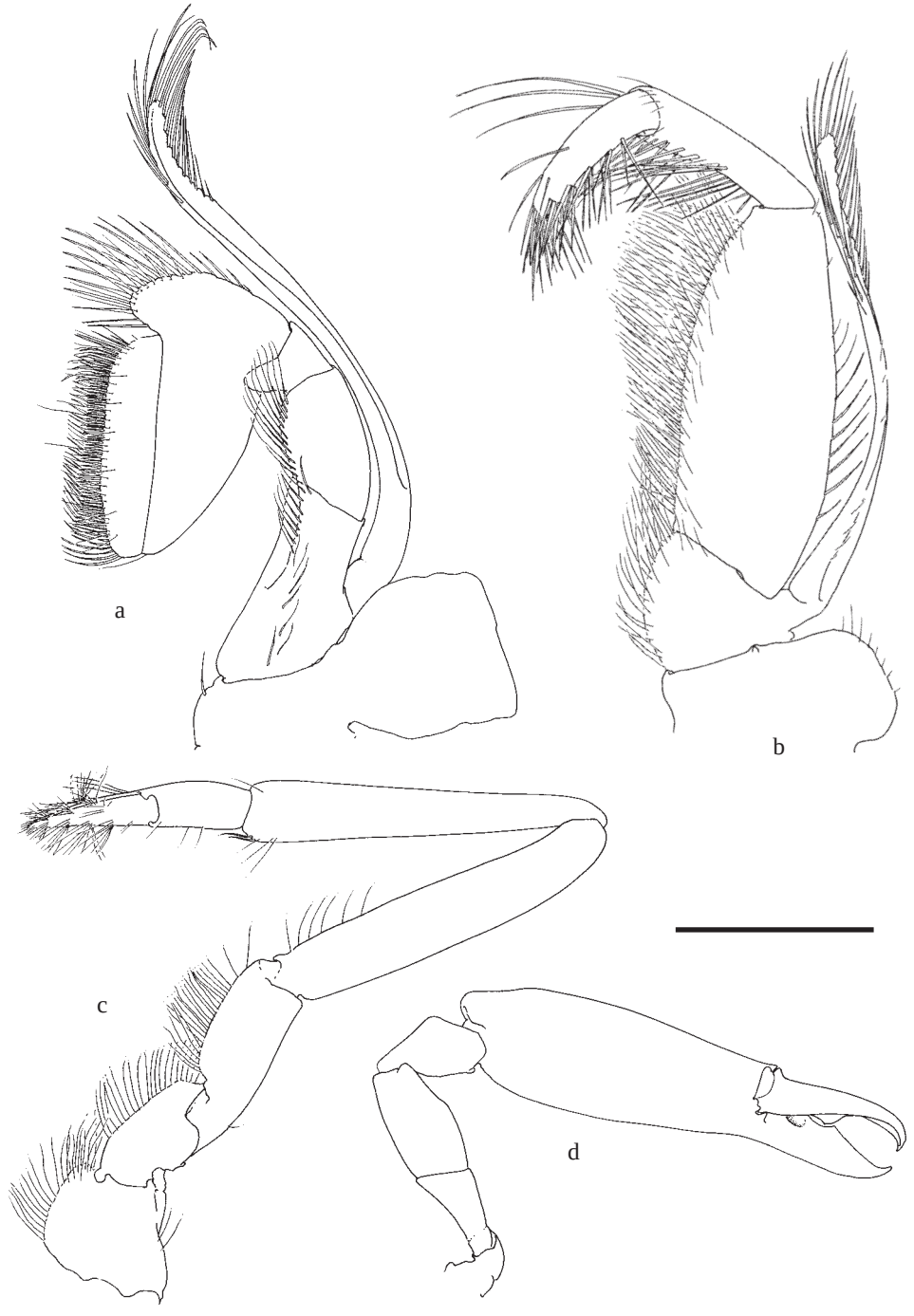


Fig. 115. *Pontonia pinnophylax* (Otto, 1821): male, pocl. 6.6 mm, RMNH D 15167. a, second maxilliped, ventral view; b, third maxilliped, ventral view; c, first pereiopod; d, major second pereiopod. Scale: a, b = 1.5 mm; c = 2 mm; d = 8 mm.

serrulate setae, tips acute, hooked; cleaning organ well developed on carpal-propodal joint; carpus 1.5 times longer than chela, about 6.0 times longer than distal width, somewhat tapering proximally, unarmed, without setae; merus as long as carpus, 5.0 times longer than central width, straight, unarmed, with few long simple setae in proximal part of median margin; ischium short, about 0.4 times merus length, with slightly expanded medial margin, with many simple setae along median and few along lateral margin; basis about as long as ischium, with many setae medially; coxa robust with setose ventromedial carina.

Second pereiopods similar in form, unequal in size. Major cheliped with chela large, about 2.3 times as long as postorbital carapace length in adult males, 1.5 times as long as postorbital carapace length in females, with palm subcylindrical, somewhat compressed, without carinae, smooth, without or with few short setae in distal part; dactylus about 0.53 times palm length, about 3.7 times longer than deep, with large simple triangular proximal tooth, distal part of cutting edge entire, tip strongly hooked, with median margin distinctly carinate; fixed finger about 2.0 times longer than deep, with blunt denticulate tooth just proximal of tooth on dactylus, separated from blunt triangular tooth just distal of tooth on dactylus by deep notch, distal part of cutting edge entire, slightly concave, tip strongly hooked, median fossa for reception of dactylar tooth when fingers closed well developed; carpus short and stout, about 0.30 of palm length, expanding distally, slightly longer than distal width, unarmed, with distomedial excavation; merus short and stout, about as long as carpus, almost twice as long as central width, distomedially excavate; ischium short and stout, about 0.8 times merus length, strongly tapering proximally, without distomedial protuberance; basis and coxa stout, without armature. Minor cheliped as major cheliped, with palm subcylindrical, without carinae, smooth, with few setae in distal part; fingers almost as long as palm; fingers as in major cheliped, tooth on dactylus and median tooth on fixed finger may be crenulate as proximal truncate tooth on fixed finger.

Ambulatory pereiopods rather stout. Dactylus of third pereiopod with corpus compressed ventrally, about 1.5-2.0 times longer than proximal width, dorsal and ventral margins almost parallel, ventral border with very small acute, slightly curved distal accessory tooth (sometimes missing) at right angle with flexor margin, dorsal margin with few simple setae, flexor margin straight or slightly concave with few simple setae; unguis slightly curved, simple, short, about 0.35 of corpus length, minutely denticulate dorsally; propodus 6.3 times longer than dactylus, about 6.0 times as long as wide, with two distoventral spines and one subdistal spine along ventral margin, rarely none, distoventral part with few simple setae, more dense in fifth pereiopod, rarely absent; carpus 0.6 times propodus length, 3.4 times longer than distal width, slightly tapering proximally, with distal lobe, unarmed; merus slightly longer than propodus, 5.0 times longer than central width, subcylindrical, unarmed, non-setose; ischium, basis and coxa without special features. Fourth and fifth pereiopods similar, merus more slender

Male first pleopod with endopod nearly four times longer than proximal width, tapering distally; median margin straight with row of many short simple setae, with moderately long plumose setae along lateral margin, distal margin without or with one or two simple setae.

Endopod of second pereiopod with appendix masculina, about 0.7 times length of appendix interna, with two rows of long setulose setae in distal 2/3rd.

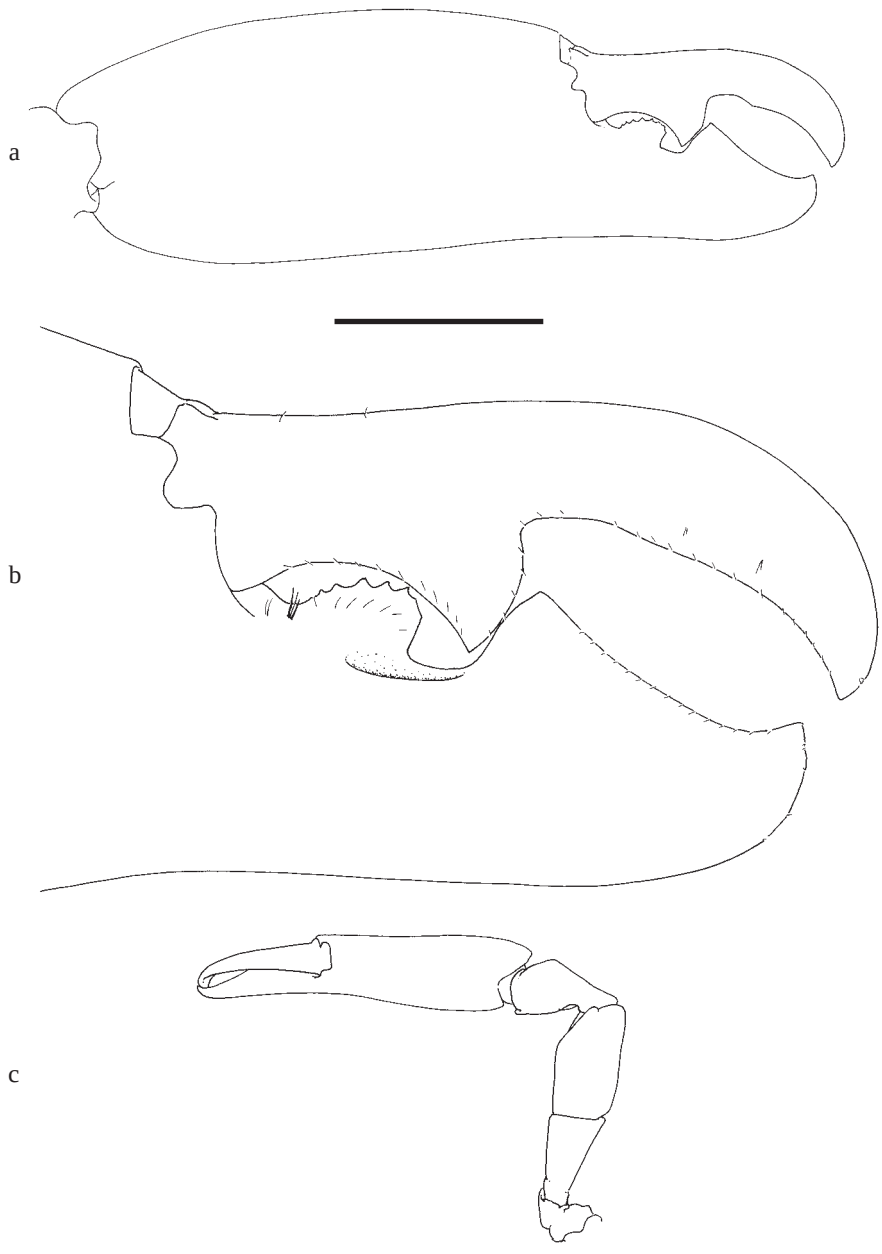


Fig. 116. *Pontonia pinnophylax* (Otto, 1821): male, pocl. 6.6 mm, RMNH D 15167. a, major second pereiopod, chela; b, idem, fingers; c, minor second pereiopod. Scale: a = 4 mm; b = 2 mm; c = 8 mm.

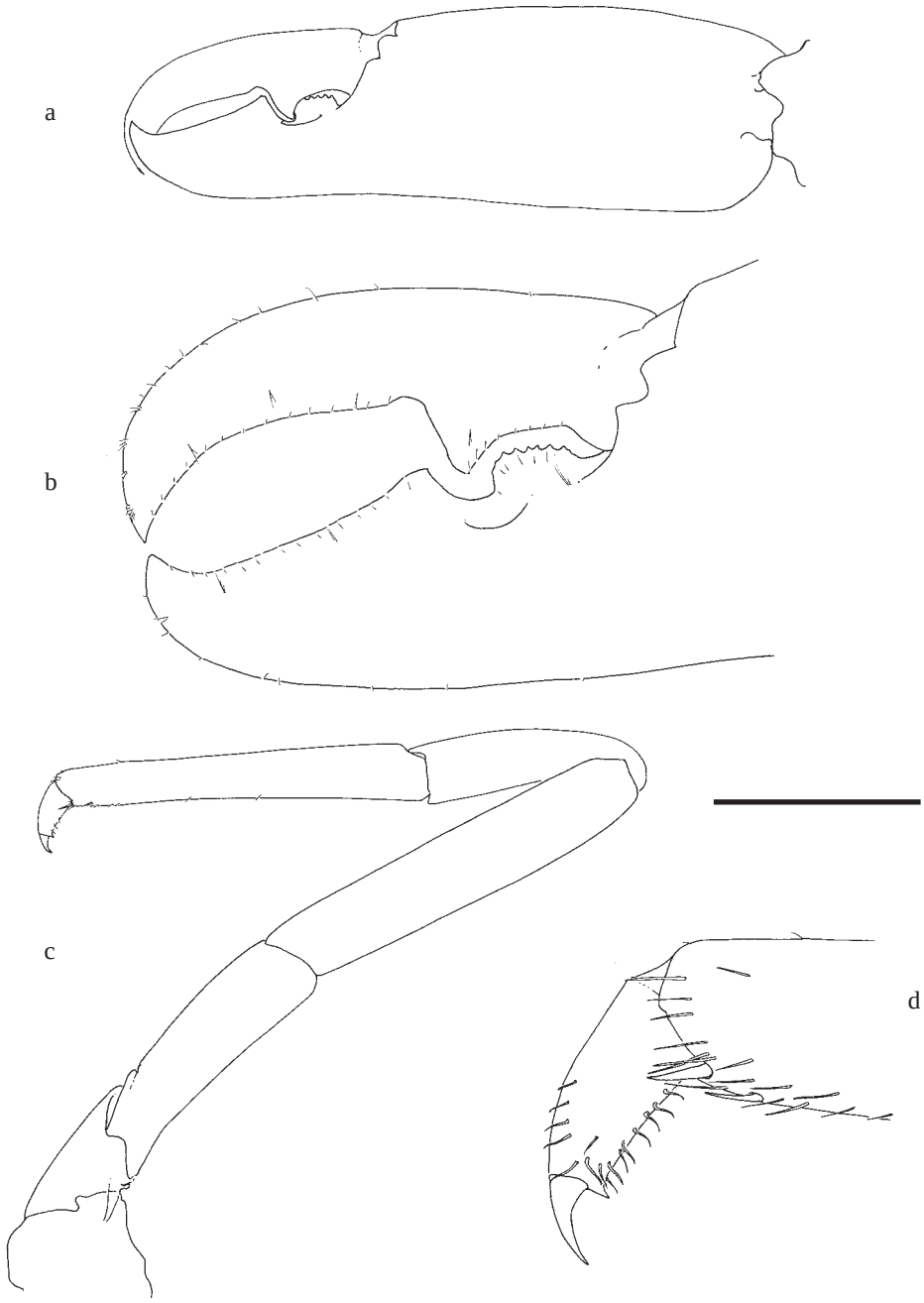


Fig. 117. *Pontonia pinnophylax* (Otto, 1821): male, pocl. 6.6 mm, RMNH D 15167. a, minor second pereiopod, chela; b, idem, fingers; c, third pereiopod; d, dactylus third pereiopod. Scale: a = 4 mm; b, c = 2 mm; d = 0.6 mm.

First pleopod of female with slender endopod, about third length of exopod, with many long distal setae when ovigerous, with few long plumose setae on lateral margin and few simple setae in proximal part of medial margin.

Uropods with short stout unarmed protopodite; exopod broad, almost twice as long as wide, with lateral margin convex, without lateral tooth, with minute distolateral spine, distal lamina rounded; endopod extending just beyond exopod, as long as telson.

Ovigerous females with maximum number of about 1000 eggs. Egg-size 0.5-0.6 mm. The number of eggs is related to size.

Size.— Maximum postorbital carapace length 11.0 mm in males, 12.5 mm in females. Minimum postorbital carapace length in ovigerous female 4.1 mm. Size related to size of host (see Richardson et al., 1997).

Colouration (based on specimens with registrationnumber RMNH D 42608, pls. 5, 6).— Translucent with white reticulate pattern over body and appendages. Eyestalks with white longitudinal dorsal stripe. Antennula with white along joints and fused part of outer flagellum. Antenna with scaphocerite with white margins. Carapace with white lines encircling translucent areas; dorsal line from tip of rostrum to midlength of carapace. Abdominal somites with white lines along margins and middorsal line. Exopods of uropods with lateral and distal white margins; endopod of uropod with few white patches of distal white margin; telson with whitish tip. Second pereiopods with finely reticulate white pattern. First pereiopods with some white patches. Ambulatory pereiopods with some white lines especially at joints. Colour photographs were published by González Pérez (1995) and Moosleitner, H. & R. Patzner (1995).

Types.— No longer extant (see Bruce, 1991: 625). Type locality: Mediteranean, Italy, Naples; in *Pinna nobilis* Linnaeus, 1758.

Distribution.— EAST ATLANTIC: Occuring in the Mediterranean from the east coast of Spain to Turkey, not recorded from the North African coast. In the Northeastern Atlantic it has been recorded from the Azores (Barrois, 1888; Paula et al., 1992; Debelius, 1999), Madeira (Figueira, 1960; Debelius, 1999), Canary Islands (Pérez Sánchez & Moreno Batet, 1991; González Pérez, 1995), the Cape Verde Islands (Türkay, 1982; Debelius, 1999), St. Helena (Chace, 1966), Ascension (Manning & Chace, 1990), Congo (Rossignol, 1957; 1962), Gabon (J. Roux, 1927; Delamare Debouteville, 1948), and Angola (Schmitt, 1926). There is a record of a specimen found on pilings at Ulnis an der Schlei, Germany, in the Baltic Sea (Bruce, 1991). This is very remarkable as the usual host of the species does not occur in this area. d'Udekem d'Acoz (1999) remarks that this specimen might have been escaped from an aquarium.

The species is now recorded from Senegal and Sierra Leone for the first time. The species has been encountered in depths from 0-137 m (Lewinsohn & Holthuis, 1986).

Host.— The regular host for this species is *Pinna nobilis* Linnaeus, 1758, in the Mediterranean Sea and *Pinna rudis* Linnaeus, 1758, in the eastern Atlantic and Mediterranean Sea. Specimens from Ascension were collected from *Atrina rigida* (Lightfoot, 1786). However, Manning & Chace (1990: 10) noted that this recorded host probably refers to *Pinna rudis* Linnaeus, 1758, which is the only Pinnid species known from Ascension (see Rosewater, 1975). The East Atlantic species *Atrina chautardi* Nicklés, 1953, occuring from Mauritania to Angola, has not been recorded as host of *P. pinnophylax* but may well be hosting this shrimp. The specimen from the Baltic was free-

living. Holthuis (1961) also reported a specimen from Turkey collected among stones.

Richardson et al. (1997) found that the size of the shrimp is positively related to the size of the host. They found an infestation rate of 55% among a *Pinna nobilis* Linnaeus, 1758, population associated with *Posidonia oceanica* sea grass meadows in the south-eastern Spanish Mediterranean. They suggested that the shell profits from the aggressive or defensive behaviour of the shrimp at the shell margin which could act as a deterrent to any inquisitive predatory fish. According to Richardson et al. (1997) the shrimps receive sustenance, shelter and assistance with brooding and larval develop-

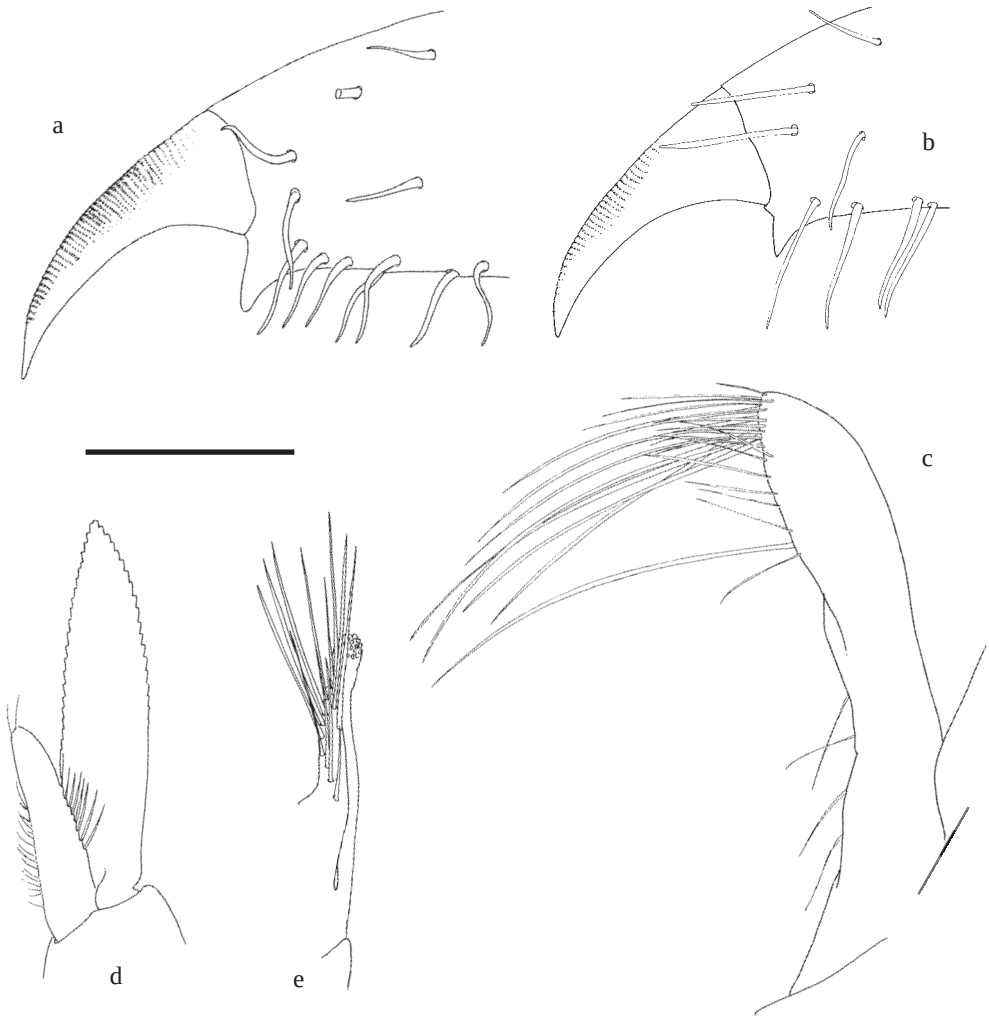


Fig. 118. *Pontonia pinnophylax* (Otto, 1821): male, pocl. 6.6 mm (figs. b, d, e), RMNH D 17044; ovigerous female, pocl. 6.9 mm (figs. a, c), RMNH D 15167. a, b, third pereiopod, detail unguis; c, endopod female first pleopod; d, endopod male first pleopod; e, appendix interna and appendix masculina on second male pleopod. Scale: a, b = 0.15 mm; c = 1.5 mm; d, e = 0.6 mm.

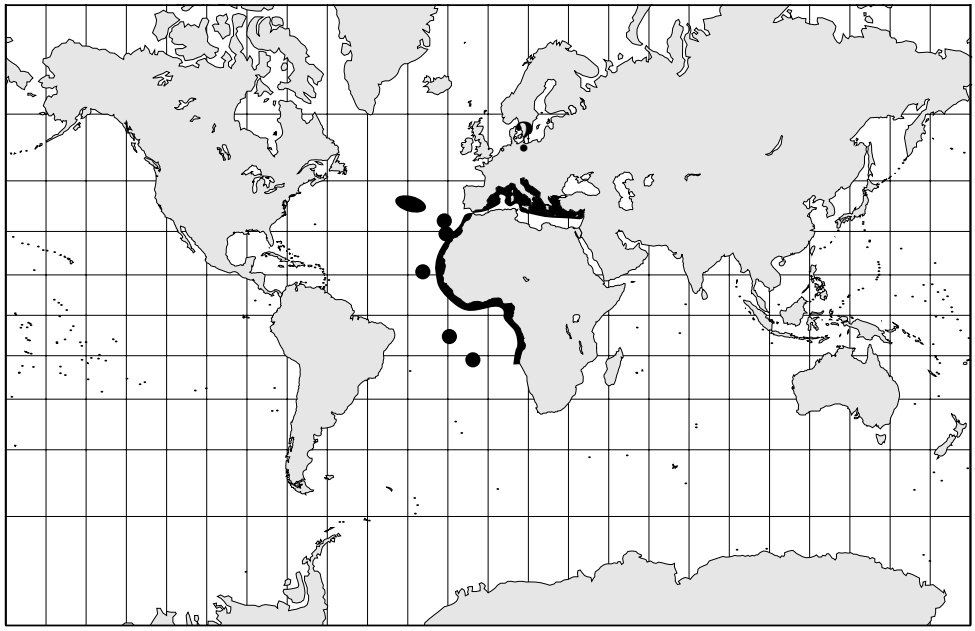


Fig. 119. Geographic distribution of *Pontonia pinnophylax* (Otto, 1821).

ment from the shell. Microscopical analysis of the gut contents of the shrimps showed them to contain amorphous detrital material with occasional unidentified plant material and crustacean exuviae which might be consumed by the shrimps within the mantle cavity of the mollusc. Calafiore et al. (1991) suggested that the life cycle of both shrimp and bivalve might be linked as the development from zoea stage VIII to the post-larval stage of the shrimp only occurred in the presence of adult mussels. In the absence of *Pinna*, the zoea continued to grow, but does not moult into a juvenile shrimp.

Remarks.— A specimen from St. Helena has an aberrant telson with 3 pairs of dorsal spines and a row of 6 median spines (fig. 112h).

Specimens from Ascension have dactyli of P3-5 clearly different from both those of the true *P. pinnophylax* and *P. mexicana*. The accessory tooth is more robust than in *P. pinnophylax* and *P. mexicana* and curves in a right angle towards the flexor margin of the corpus. The outer margin of the corpus bears minute transverse ridges.

Specimens from Senegal and Congo have the distolateral margin of the basal segment of the antennular peduncle without or with a very small tooth.

The larval development was described by Calafiore et al. (1991). They could rear and identify eight zoeal and one post-larval stage. This complete development took 28-30 days from the time of hatching. The metamorphosis to the first post-larva could only be obtained in the presence of the host *Pinna nobilis* Linnaeus, 1758. In absence of *Pinna nobilis* the last zoea stages augmented their dimensions considerably, but still maintained the larval habitus. It is interesting to note that supraorbital spines are present in zoea II and VIII, disappearing in the post-larva. This indicates that presence of supraorbital spines is a plesiomorphic character state which is reversed in this species in the adult stage.

8.2.11. *Pontonia simplex* Holthuis, 1951
(figs. 120-128)

Pontonia simplex Holthuis, 1951a: 135, pl. 42 figs. a-m; Holthuis, 1952: 16; Wicksten, 1983: 19; Müller, 1993: 125; Chace & Bruce, 1993: 62; Fransen, 1994: 111; Wicksten & Hernández, 2000: 97.

Material.— **East Pacific: Mexico**.— USNM 90153: 1 male, holotype, pocl. 4.9 mm; 3 non-ovigerous females, paratypes, pocl. 3.8-4.6 mm; 2 males, paratypes, pocl. 2.8 and 4.0 mm; AHF 487-35: 2 non-ovigerous females, paratypes, pocl. 2.8 and 3.4 mm; Jalisco Province, Tenacatita Bay; 15.ii.1935; lagoon, in *Pinna* spec.; Allan Hancock Expedition, station 487-35.— **Panama**.— RMNH D 19738: 1 non-ovigerous female, pocl. 4.6 mm; Canal zone, Perico Island, Fort Amadon; 2.i.1964; R.W & F.M. Bayer & R.H. Chesher.

Description.— Body subcylindrical, somewhat depressed. Carapace smooth. Rostrum well developed, distally ending in sharp point, reaching about middle of second segment of antennular peduncle, slender, without dorsal or lateral carinae, with straight ventral carina in distal part; subdistal dorsal notch with few long simple setae in front; subdistal ventral tooth or notch slightly posterior of level of subdistal tooth. Inferior orbital angle slightly produced, angular. Antennal spine well developed, reaching beyond anterolateral margin of carapace, situated well below level of blunt inferior orbital angle. Anterolateral margin of carapace slightly produced, broadly rounded.

Abdomen smooth; sixth segment about 1.4 times longer than fifth, 1.3 times wider than long, posterolateral angle acutely produced, posteroventral angle acute, spiniform; pleura of first five segments broadly rounded.

Telson almost twice as long as sixth abdominal segment, slightly more than twice as long as its proximal width; lateral margins straight, convergent; posterior border without median process; two pair of medium sized dorsal spines at 0.37 and 0.66 of the telson length, marginal, about 0.15 of telson length; posterior margin with three pairs of spines, lateral spines rather small, about 0.07 of telson length, marginal, intermediate and submedian spines larger than lateral spines, about as long as dorsal spines but more slender.

Eyestalk about as long as wide, cylindrical, posteriorly somewhat swollen; stalk slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella well developed; basal segment with small acute distolateral tooth reaching 1/3rd of intermediate segment, anterior margin produced; medioventral tooth small, acute, submarginal, situated halfway basal segment; stylocerite short, half length of scaphocerite, with distal acute tip. Intermediate segment slightly longer than wide. Distal segment about 1.5 times longer than wide. Upper flagellum well developed, biramous, with about five or six proximal segments fused; short free ramus two-segmented; longer free ramus with about seven segments. Lower flagellum with 10-15 segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite short reaching 2/3 of lamella of scaphocerite, moderately stout, about 2.7 times longer than distal width; flagellum short, slender, slightly longer than postorbital carapace length; scaphocerite with lamella about 1.9 times as long as central width, distal margin truncate, medial margin distally straight, proximally convex, lateral margin slightly convex with small,

distolateral tooth, not reaching anterior margin of lamella, distolateral tooth about 0.05 times length of scaphocerite; incision between distolateral tooth and lamina indistinct.

Epistome with blunt anterior median carina; labrum large, oval.

Paragnath well developed, alae with large subcircular distal lobes, and round submedian ventral lobes; corpus very long, with long median groove, bordered by setose carinae.

Second thoracic sternite formed into triangular, medially pointed process between second maxillipeds, with simple setae medially.

Third thoracic sternite with shallow lateral carinae with medial notch posteromedian of third maxillipeds.

Fourth thoracic sternite with shallow indistinct lateral carinae posteromedial of first pereiopods; with transverse ridge between first pereiopods.

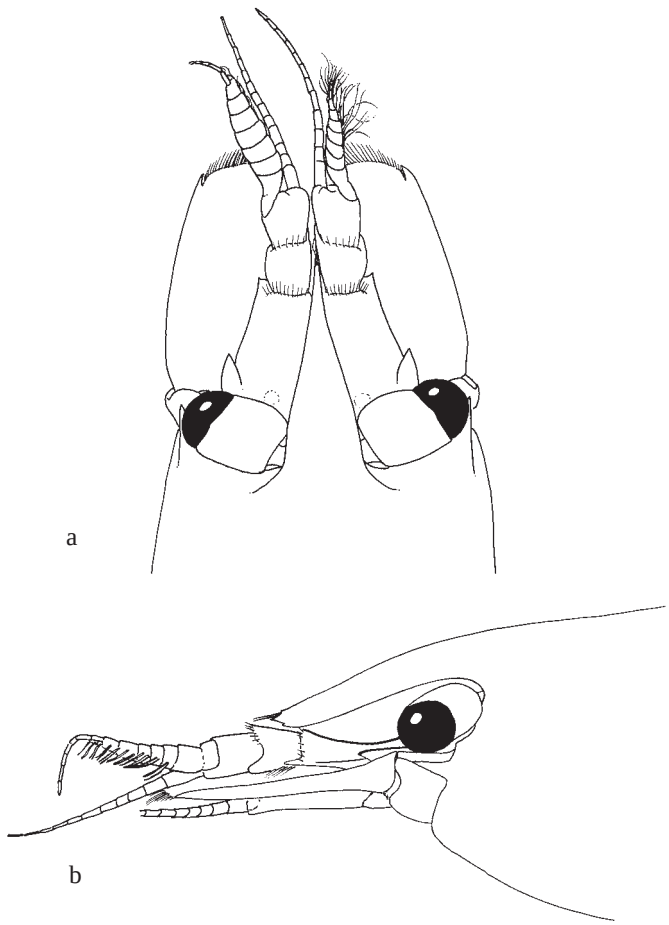


Fig. 120. *Pontonia simplex* Holthuis, 1951: male holotype, pocl. 4.9 mm, USNM 90153. a, anterior appendages, dorsal view; b, anterior appendages, lateral view. Scale = 4 mm.

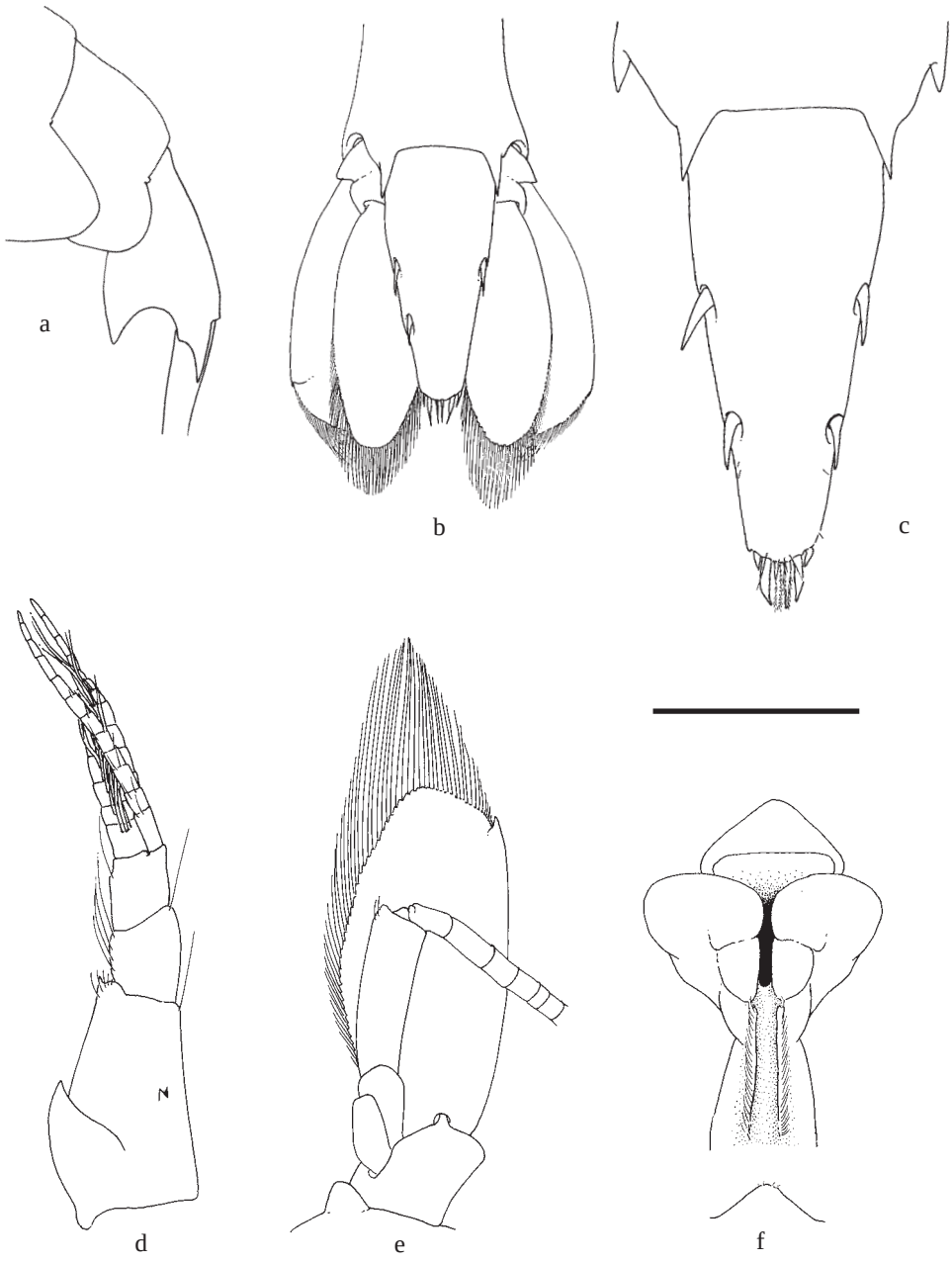


Fig. 121. *Pontonia simplex* Holthuis, 1951: male holotype, pocl. 4.9 mm (figs. a, c); non-ovigerous female paratypes, pocl. 4.6 mm (figs. d-f), male, pocl. 4.0 mm (fig. b), USNM 90153. a, distal part abdomen, lateral view; b, telson and uropods, dorsal view; c, telson, dorsal view; d, antennula, ventral view; e, antenna, ventral view; f, paragnath, ventral view. Scale: a = 4 mm; b = 2 mm; c-e = 1.5 mm; f = 1 mm.

Fig. 122. *Pontonia simplex* Holthuis, 1951: non-ovigerous female paratypes, pocl. 4.6 mm, USNM 90153. a, second to fifth thoracic sternites; b, mandible, ventral view; c, maxillula, ventral view; d, maxilla, ventral view. Scale: a = 1 mm; b, c = 0.6 mm; d = 0.75 mm.

Fifth thoracic sternite with well developed lateral plates posteromedial of second pereiopods, with deep rather narrow medial notch in between.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process slender, with 4-6 distal teeth, with row of about 6-7 small teeth on medioventral border.

Maxillula with upper lacinia broad with two rows of 12-15 serrulate spines and many long slender setae medially, inner surface with several long simple setae; lower lacinia very broad, densely setose distoventrally and marginally, no differentiation in setae; palp bilobed, larger lobe with small ventral tubercle with single short recurved simple seta.

Maxilla with basal endite well developed, bilobed; distal lobe longer than proximal lobe, both with long slender minutely serrulate setae along distomedian border, median border without setae; coxal endite obsolete, median margin convex, without setae; scaphognathite large, 2.6 times longer than wide, posterior lobe large, 1.6 times longer than anterior width, anterior lobe 1.3 times longer than proximal width; palp simple, about as long as proximal lobe of basal endite, strongly expanded proximally, tapered distally to rather acute tip, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite completely fused, large and broad, fringed with many simple, long and finely serrulate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod well developed, flagellum with many long, plumose setae in distal half; caridean lobe large, elongate; epipod large, triangular, faintly bilobed; palp simple, slender, elongate, curved along distolateral margin of basal endite, non-setose.

Second maxilliped with endopod normally developed; dactylar segment narrow, 4.4 times longer than broad, with numerous coarsely serrulate, spiniform, and long curled, finely serrulate setae medially; distomedial lobe of propod produced, rounded with stout serrulate and long plumose marginal setae, ventrolateral margin without setae; carpal segment distomedially angular, unarmed; meral segment without long median plumose setae, medially excavated; basal and ischial segments not completely fused, medially excavated, without median, plumose setae; exopod normal, with many long plumose setae in distal sixth; coxal segment medially slightly produced, without or with few simple setae, with large subtriangular epipod laterally, not bearing a podobranch.

Third maxilliped reaching with ultimate segment to 2/3rd of carpocerite; ischiocerite not fused with basis, indicated by distinct suture, 2.5 times longer than broad, tapering distally, flattened, with many setae on median margin, ventral surface with few setae, lateral margin with single row of long, plumose setae; basal segment medially convex, with many long, finely serrulate setae on medial margin; exopod well developed, not reaching beyond anterior margin of ischiomeral segment, with long plumose setae in distal fourth; coxa without medial process, with large lateral plate fringed with few rather short simple setae, with rudimentary arthrobranch, without filaments developed; penultimate segment more than twice as long as central width, about 0.5 length of ischiomeral segment, medially expanded, flattened, with long finely serrulate setae along ventromedial and ventrolateral margins; ultimate segment slightly shorter than penultimate segment, tapering distally, with long, finely serru-

Fig. 123. *Pontonia simplex* Holthuis, 1951: male holotype, pocl. 4.9 mm (fig. a); non-ovigerous female paratype, pocl. 4.6 mm (fig. b), USNM 90153. a, first maxilliped, ventral view; b, second maxilliped, ventral view. Scale = 0.75 mm.

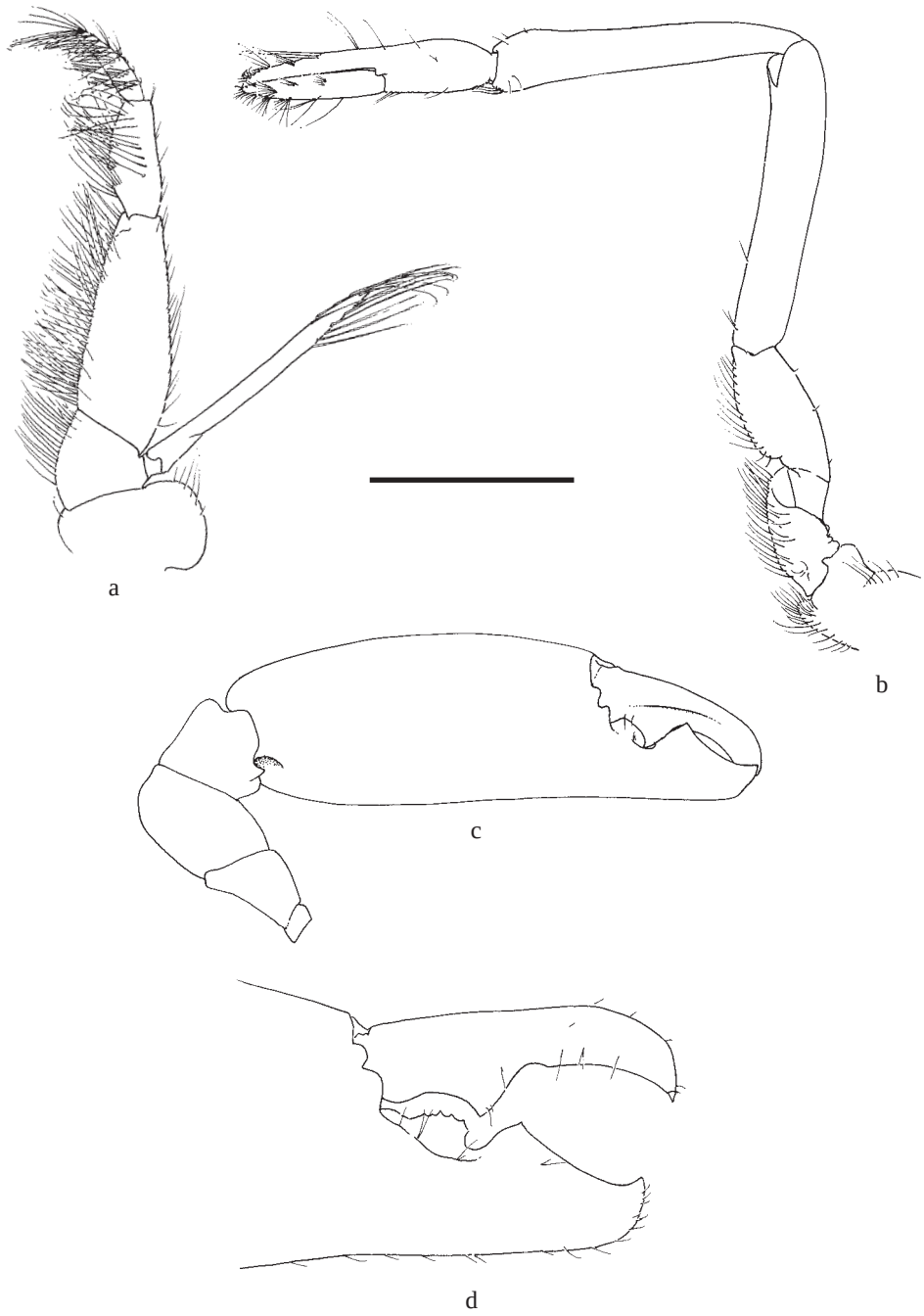


Fig. 124. *Pontonia simplex* Holthuis, 1951: non-ovigerous female paratype, pocl. 4.6 mm (figs. a, b, d); male holotype, pocl. 4.9 mm (fig. c), USNM 90153. a, third maxilliped, ventral view; b, first pereiopod; c, major second pereiopod; d, idem, chela. Scale: a, b = 1.5 mm; c = 4 mm; d = 2 mm.

late, and shorter, more coarsely serrulate setae along ventromedial, ventrolateral and distal margins.

First pereiopods slender, exceeding carpocerite with chela and distal 2/3rd of carpus. Chela almost five times longer than deep, subcylindrical, slightly compressed; fingers slightly longer than palm, slender, with several rows of finely serrate setae, cutting edges entire, somewhat gaping proximally, with groups of many strong, long, serrulate setae, tips acute, hooked; cleaning organ well developed on carpal-propodal joint; carpus 1.2 times longer than chela, about five times longer than distal width, somewhat tapering proximally, unarmed, without setae; merus as long as carpus, almost six times longer than central width, straight, unarmed, with few short simple setae in proximal part of median margin; ischium short, about 0.4 times merus length, with slightly expanded medial margin, with many simple setae along median and few short setae along lateral margin; basis about as long as ischium, with many setae medially ; coxa robust with setose ventromedial carina.

Second pereiopods similar in form, unequal in size. Major cheliped with chela large, about 2.1 times as long as postorbital carapace length in males, about 1.7 times as long in females, palm subcylindrical, compressed, without carinae, smooth, with few short setae in distal part; dactylus about 0.45 times palm length, about 4.3 times longer than deep, with large simple triangular proximal tooth, distal part of cutting edge entire, tip strongly hooked, with median margin distinctly carinate; fixed finger about 2.0 times longer than deep, with blunt denticulate tooth just proximal of tooth on dactylus, separated from acute triangular tooth just distal of tooth on dactylus by deep notch, distal part of cutting edge entire, slightly concave, tip strongly hooked, median fossa for reception of dactylar tooth when fingers closed well developed; carpus very short and stout, about 0.25 of palm length, expanding distally, about as long

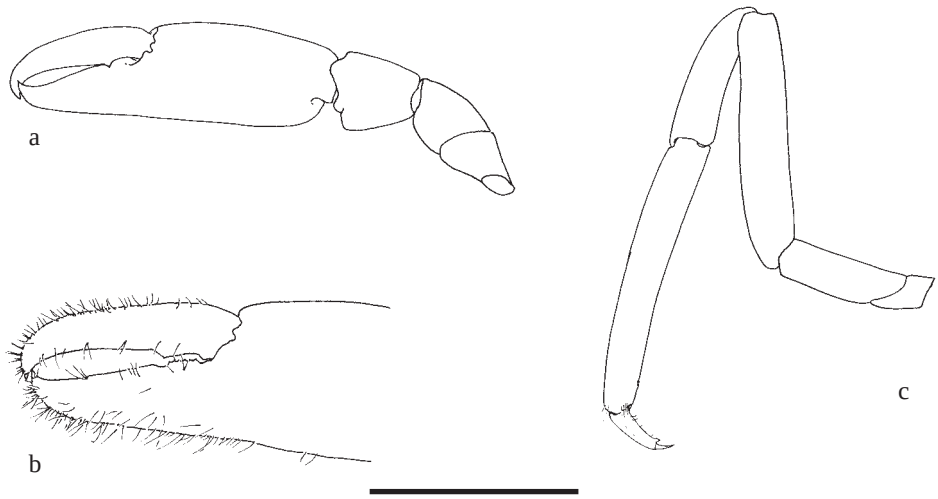


Fig. 125. *Pontonia simplex* Holthuis, 1951: male holotype, pocl. 4.9 mm (fig. a); non-ovigerous female paratypes, pocl. 4.6 mm (figs. b, c), USNM 90153. a, minor second pereiopod; b, idem, chela; c, third pereiopod. Scale: a, c = 4 mm; b = 2 mm.

Fig. 126. *Pontonia simplex* Holthuis, 1951: non-ovigerous female paratypes, pocl. 4.6 mm (figs. a, b); male holotype, pocl. 4.9 mm (fig. c), USNM 90153. a, b, dactylus third pereiopod; c, dactylus fifth pereiopod. Scale a, b = 0.15 mm; c = 0.19 mm.

as distal width, unarmed, with distomedial excavation; merus short, about 1.3 times longer than carpus, twice as long as central width, distomedially excavate; ischium short and stout, about 0.9 times merus length, tapering proximally, without distomedial protuberance; basis and coxa stout, without armature. Minor cheliped as major cheliped, with palm subcylindrical, without carinae, smooth, with many more setae in distal part than in major chela; fingers 0.75 of palm length; fingers as in major cheliped with teeth more proximally.

Ambulatory pereiopods rather stout. Dactylus of third pereiopod with corpus compressed ventrally, 2.5-3.0 times longer than proximal width, dorsal and ventral margins almost parallel, ventral border without or sometimes with very small acute, slightly curved distal accessory tooth at right angle with flexor margin, dorsal margin with few simple setae, flexor margin straight or slightly concave with few simple setae; unguis slightly curved, simple, slender, about 0.33 of corpus length, minutely

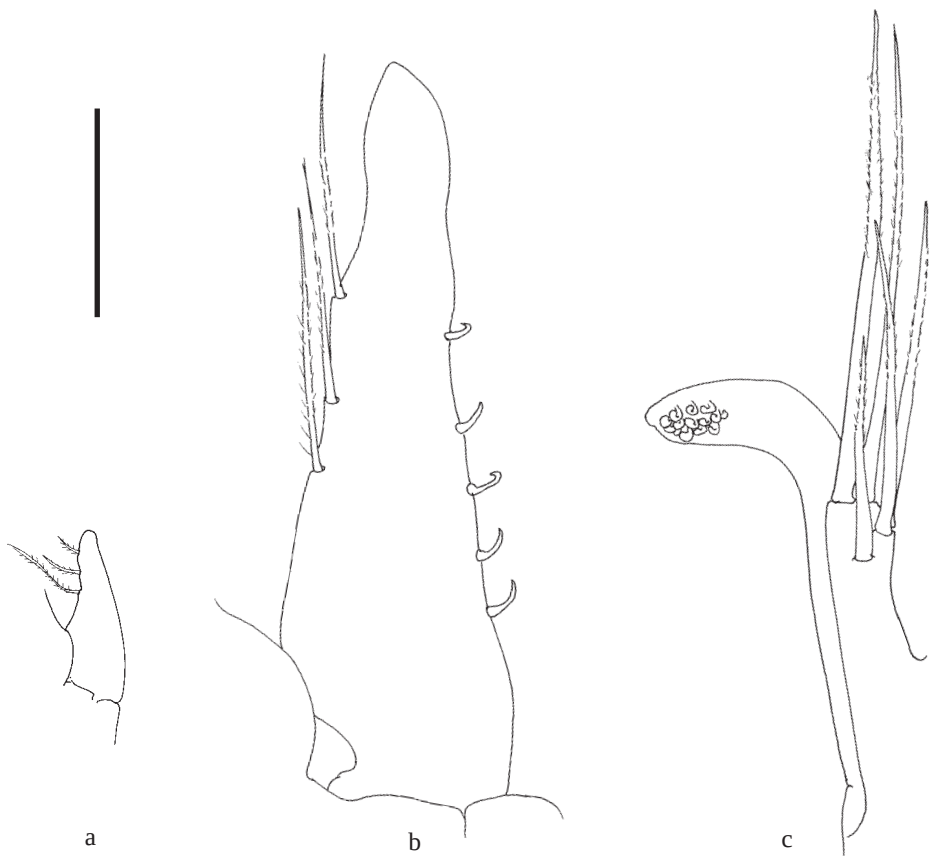


Fig. 127. *Pontonia simplex* Holthuis, 1951: non-ovigerous female paratype, pocl. 3.4 mm (fig. a), AHF 487-35; male paratype, pocl. 2.8 mm (fig. b), male, pocl. 4.0 mm (fig. c), USNM 90153. a, endopod female first pleopod; b, endopod male first pleopod; c, apendix masculina and appendix interna on second male pleopod. Scale: a = 0.6 mm; b, c = 0.15 mm.

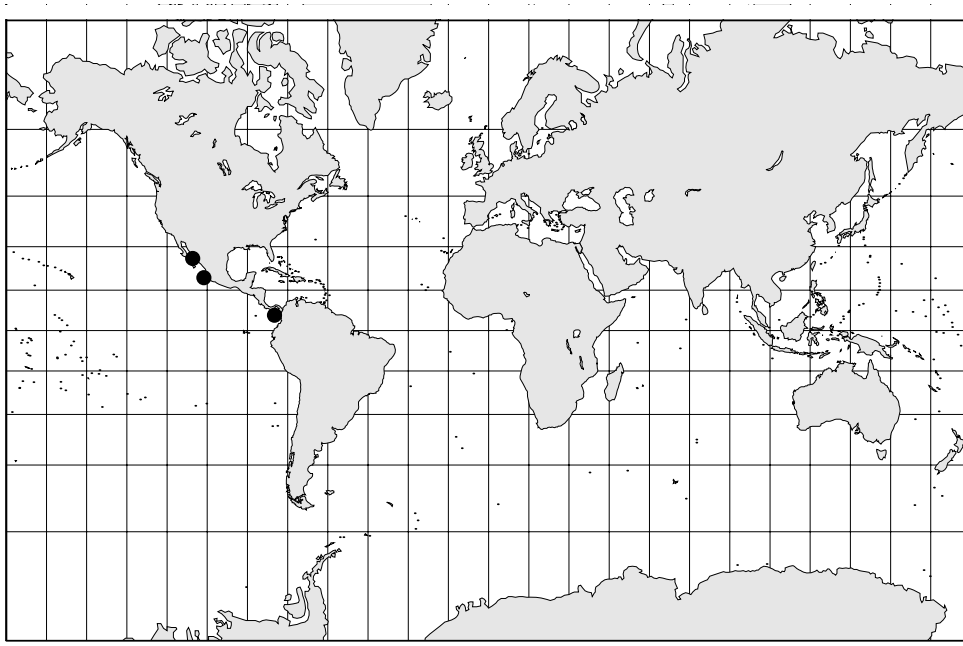


Fig. 128. Geographic distribution of *Pontonia simplex* Holthuis, 1951.

denticulate dorsally; propodus 4.0 times longer than dactylus, about 6.5 times as long as wide, with two distoventral spines, without subdistal spine along ventral margin, distoventral part with few simple setae, more dense in fifth pereiopod; carpus 0.6 times propodus length, 3.7 times longer than distal width, slightly tapering proximally, with distal lobe, unarmed; merus slightly longer than propodus, 4.5 times longer than central width, subcylindrical, unarmed, non-setose; ischium, basis and coxa without special features. Fourth and fifth pereiopods similar, merus more slender.

Male first pleopod with endopod nearly four times longer than proximal width, tapering distally; median margin straight with row of many short simple setae, with moderately long plumose setae along lateral margin, distal margin without or with one or two simple setae.

Endopod of second pereiopod with appendix masculina, about 0.7 times length of appendix interna, with two rows of long setulose setae in distal 2/3rd.

First pleopod of female with slender endopod, about third length of exopod, without long distal setae (non-ovigerous females only), with few long plumose setae on lateral margin and few simple setae in proximal part of medial margin.

Uropods with short stout unarmed protopodite; exopod broad, almost twice as long as wide, with lateral margin convex, without lateral tooth with minute distolateral spine, distal lamina rounded; endopod as long as exopod, overreaching telson.

Ovigerous females are not known.

Size.— Rather small-sized species. Maximum postorbital carapace length 4.9 mm in males, 4.6 mm in females.

Colouration.— Not known. Probably similar to *P. pinnophylax* and *P. mexicana.*

Type.— Holotype: male, total length 18 mm (USNM 90153); Mexico, Jalisco,

Tenacatita Bay; in *Pinna*; 15.ii.1935; Allan Hancock Expedition sta. 487-35.

Distribution.— EAST PACIFIC: Mexico: Tenacatita Bay, in *Pinna* (Holthuis, 1951a); Gulf of California, Puerto Escondido, among *Pinna* (Wicksten, 1983). Panama: Canal Zone (present record).

Host.— Recorded from unidentified *Pinna* species.

Remarks.— Differing from *Pontonia mexicana* and *P. pinnophylax* in its much smaller size. Differing from *P. mexicana* in having the dactyli of the ambulatory pereiopods usually without or with a very small accessory tooth; only in one or two dactyli (from about 30) the accessory tooth slightly stronger. Differing from *P. pinnophylax* in the length / width ratio of the dactyli of the ambulatory pereiopods. In *P. simplex* this ratio is between 2.5-3.0 while between 1.5-2.0 in *P. pinnophylax*.

The female paratype with pocl. 4.0 mm has the telson aberrant, lacking the right distal dorsal spine (fig. 121b).

8.3. *Ascidonia* gen. nov.

Definition.— Small to medium sized shrimp of subcylindrical body form. Rostrum well developed, depressed; dorsally unarmed or armed with one subdistal tooth; dorsal carina absent; lateral carinae well developed; ventral margin without subdistal tooth. Carapace smooth; inferior orbital angle not developed; orbit feebly developed; supraorbital, epigastric and hepatic spines absent; antennal spine blunt or acute, not separated from inferior orbital angle; anterolateral angle of branchiostegite rounded or produced.

Eye normal, with hemispherical cornea.

Antennula normal, ventromedial tooth on basal segment small; distolateral angle of basal segment well developed; flagella reduced.

Antenna with basicerite unarmed; scaphocerite well developed, with distolateral tooth more than 0.2 times length of scaphocerite.

Epistome unarmed. Corpus of paragnaths with deep median longitudinal fissure bordered by short, oblique, non-setose carinae.

Second thoracic sternite with anterior margin triangular, strongly produced, forming a plate.

Fourth thoracic sternite with shallow lateral carinae.

Fifth thoracic sternite with broad rectangular, medially blunt separate lateral plates.

Mandible robust, without palp, molar process stout, incisor process simple, with row of denticles along medioventral border.

Maxillula with bilobed palp, lower lacinia large, triangular, with many simple setae.

Maxilla with simple palp, bilobed endite, scaphognathite broad; basal endite with many setae on upper and lower lacinia, both laciniae well developed, longer than palp.

First maxilliped with slender palp, basal and coxal endites completely fused, with long setae along median margin, forming basket; exopod with well developed caridean lobe; flagellum broad, densely setose distally; epipod large, oval.

Second maxilliped with normal endopod, without distinct angle in median margin of basis, exopod with flagellum well developed, plumose setae distally; epipod large, triangular, without podobranch.

Third maxilliped with ischiomerus of endopod fused to basis, broader than penulti-

mate segment; exopod well developed, with plumose setae distally; coxa with oval, lateral plate, without median process, arthrobranch rudimentary.

First pereiopods with chela simple.

Chelae of second pereiopods unequal in size, and form.

Ambulatory pereiopods slender to robust, dactylus biunguiculate, without accessory teeth on flexor margin of corpus, flexor margin with dense pile or setae, unguis simple.

Abdomen smooth; posterior margins of pleura rounded, posterolateral angle of sixth segment blunt or acutely produced.

Uropod with protopodite feebly acute distally, exopod with distolateral margin with or without mobile spinule, feebly armed.

Telson with two pairs of large marginal dorsal spines, three pairs of posterior spines.

Type-species.— *Pontonia flavomaculata* Heller, 1864, by present designation.

Etymology.— The name is composed of the first part of the name of the host group of the genus: Ascidiacea. The last part of the name is the same as the last part of the genus from which it is split off: *Pontonia.* Gender: feminine.

Distribution.— In shallow tropical and warm temperate waters of the Atlantic and East Pacific.

Host.— Associated with Ascidiacea.

8.3.1. Key to the species of *Ascidonia* gen. nov.

1. Minor chela of second pereiopod with more than 10 denticles on cutting edges; sixth abdominal segment with posterolateral angle acutely produced; distal and proximal pair of dorsal telson spines of equal size 2
- Minor chela of second pereiopod with 7 or less denticles on cutting edges; sixth abdominal segment with posterolateral angle blunt, not produced; distal pair of dorsal telson spines longer than proximal pair 3
2. Antennal spine blunt; dorsal spines on telson at 0.22 and 0.45 of telson length; proximal pair overreaching distal pair with about 0.00-0.25 of its length; lateral margin of scaphocerite convex, distolateral tooth curving mediad; distal margin lamina broadly rounded; ambulatory pereiopods with flexor margin of dactylus with relatively few setae; flexor margin of distal part of propodus with many long setae; second thoracic sternite bluntly rounded anteriorly ..... ***A. californiensis***
- Antennal spine acute; dorsal spines of telson at 0.20 and 0.35 of telson length; proximal pair overreaching distal pair with about 0.50-0.60 of its length; lateral margin of scaphocerite almost straight, distolateral tooth not distinctly curving mediad; distal margin lamina straight oblique; ambulatory pereiopods with flexor margin of dactylus with many setae; flexor margin of distal part of propodus with many very short setae; second thoracic sternite triangularly produced ..... ***A. flavomaculata***
3. Rostrum less than twice as long as broad in dorsal view, tip rounded; telson with dorsal spines of moderate length, anterior pair reaching no more than halfway to bases of posterior pair; ischiomeral segment of third maxilliped not expanded, as broad as penultimate segment 4
- Rostrum nearly three times as long as broad in dorsal view, acuminate; telson

with dorsal spines very long, anterior pair reaching to bases of posterior pair; ischiomeral segment of third maxilliped expanded, much broader than penultimate segment ..... ***A. miserabilis***

4. Posterior pair of dorsal telson spines at about midlength of the telson; lateral pair of terminal spines on telson minute; rostrum reaching distal end of antennular peduncle; distolateral lamina of basal segment of antennular peduncle strongly produced, reaching distal end of second segment of antennular peduncle ..... ***A. pusilla***

\- Posterior pair of dorsal telson spines at about the proximal third of the telson; lateral pair of terminal spines on telson about a third of the length of the two other pairs of terminal spines; rostrum reaching distal end of second segment of antennular peduncle; distolateral lamina of basal segment of antennular peduncle produced, reaching halfway second segment of antennular peduncle ..... ***A. quasipusilla***

8.3.2. *Ascidonia californiensis* (Rathbun, 1902) comb. nov.
(figs. 129-138)

Pontonia californiensis Rathbun, 1902: 902; Rathbun, 1904: 33, fig. 11; Ritter, 1913: 497; Borradaile, 1917: 391; Schmitt, 1921: 38, fig. 23; Holthuis, 1951a: 145, pl. 46 figs. a-i, pl. 47 figs. a-c; Holthuis, 1952: 15; Neushul, Clarke & Brown, 1967: 55; Word & Charwat: 170, textfig.; Straughan & Klink, 1980: 203; Standing, 1981: 778; Müller, 1993: 122; Chace & Bruce, 1993: 61.

Material.— **East Pacific**: **California, U.S.A.**— USNM 25282: 1 non-ovigerous female, holotype**,** pocl. 4.9 mm; Santa Cruz Island; depth 30 fms; 6.ii.1889 "Albatross" station 2945.— USNM 45610: 1 non-ovigerous female, pocl. 5.2 mm; off Santa Cruz island; depth 30 fms; 6.ii.1889; "Albatross" station 2945; in *Ascidia vermiformis* (Ritter, 1913) [used for drawings, mouthparts already dissected].— USNM 109652: 1 male; 1 non-ovigerous female; 1 mile off shore Naples, Santa Barbara County, Southern California, 34°25'20"N 119°57'00"W; depth 45 feet; 11.iii.1963; leg. E.E. Ebert & C.H. Turner; in branchial cavity of *Ascidia vermicornis* (Ritter, 1913).— USNM 170570: 1 male, pocl. 5.0 mm; 1 ovigerous female, pocl. 8.1 mm; off Point Dume, Los Angeles County; depth 30 feet; diving; -.iv.1977; in *Ascidia vermiformis* (Ritter, 1913); leg. J.Q. Word [used for drawings].

Description.— Body subcylindrical, somewhat depressed. Carapace smooth. Rostrum well developed, reaching about middle of basal segment of antennular peduncle in large females to about middle of second antennular segment of antennular peduncle in males, slender, distally ending in sharp point, without dorsal carina, with ventral carina in distal part, ventral margin straight; subdistal dorsal tooth with few long simple setae in front; subdistal ventral tooth absent. Inferior orbital angle not produced, rounded. Antennal spine reduced, blunt, short, marginal, extending beyond inferior orbital angle, not extending beyond anterolateral angle, not separated from inferior orbital angle by notch. Anterolateral margin of carapace strongly produced, reaching beyond carpocerite of antenna, broadly rounded.

Abdomen smooth; sixth segment about 1.4-1.5 times longer than fifth, about 1.3 times wider than long, posteroventral and posterolateral angles acutely produced; pleura of first five segments broadly rounded.

Telson almost twice as long as sixth abdominal segment, about twice as long as its proximal width; lateral margins convex, convergent; posterior border without median process; two pairs of very large and slender dorsal spines at 0.20 and 0.44 of the telson length, proximal pair marginal, distal pair submarginal, proximal pair slightly longer

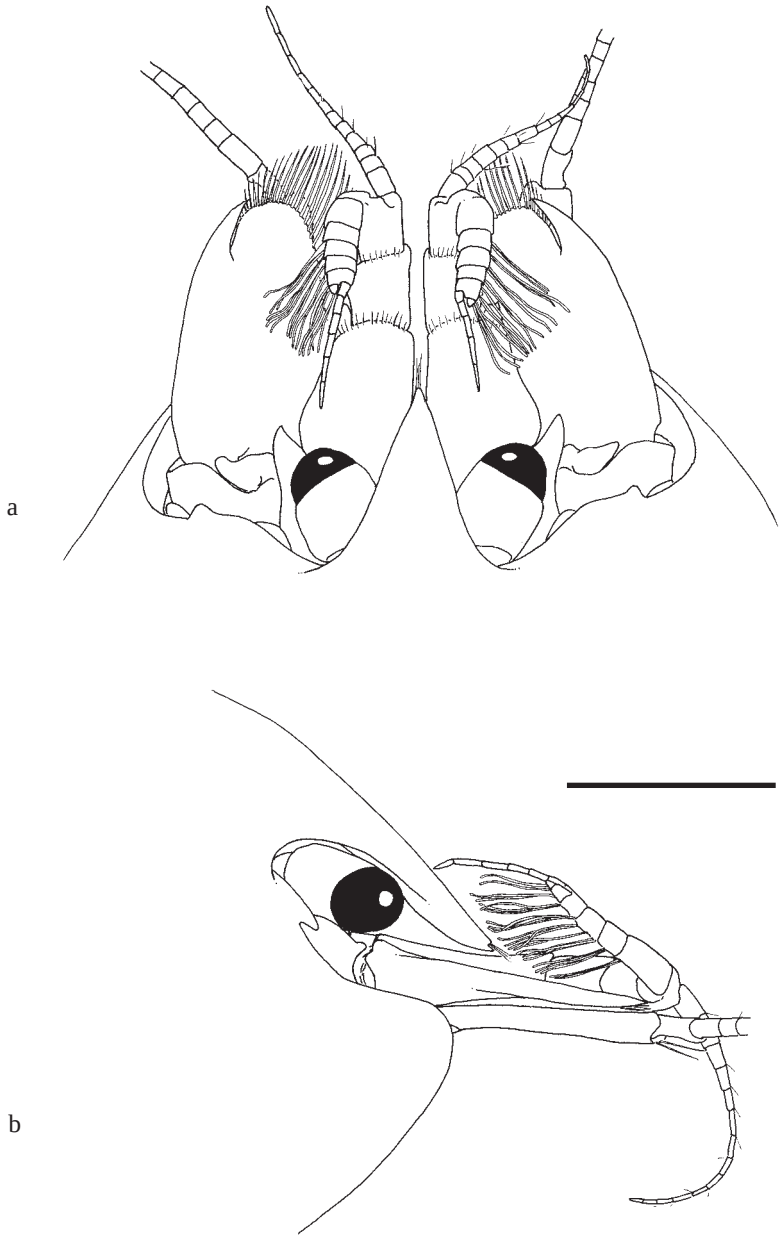


Fig. 129. *Ascidonia californiensis* (Rathbun, 1902): ovigerous female, pocl. 8.1 mm. a, anterior appendages, dorsal view; b, anterior appendages, lateral view. Scale = 2 mm.

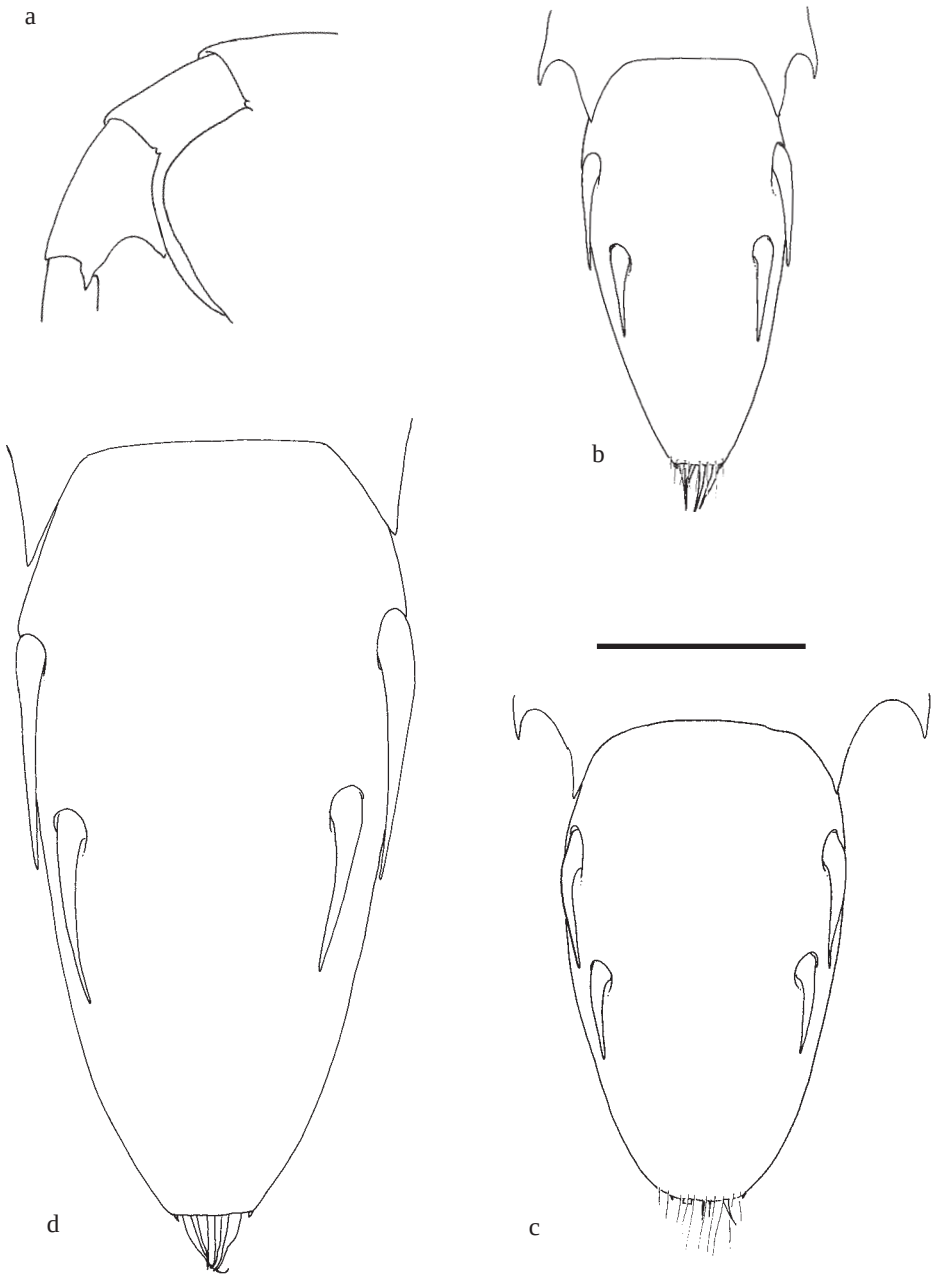


Fig. 130. *Ascidonia californiensis* (Rathbun, 1902): ovigerous female, pocl. 8.1 mm (figs. a, c), male, pocl. 5.0 mm; (fig. b), USNM 170570; non-ovigerous female, pocl. 5.2 mm (fig. d), USNM 45610. a, distal part abdomen, lateral view; b-d, telson, dorsal view. Scale: a = 4 mm; b, d = 2 mm; c = 1 mm.

than distal pair, about 0.30 of telson length; posterior margin with three pairs of spines, lateral spines small, marginal, intermediate and submedian spines larger than lateral spines, but much smaller than dorsal spines.

Eyestalk about twice as long as wide, cylindrical, medially somewhat swollen, slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella well developed; basal segment with small distolateral tooth reaching 1/4th of intermediate segment of antennular peduncle; anterior margin small, sinuous, not extending beyond distolateral tooth; ventralmedial tooth small, acute, submarginal, situated halfway basal segment; stylocerite short, less than half length of scaphocerite, with distal blunt tip, lateral margin with about three rather long plumose setae. Intermediate segment slightly longer than wide. Distal segment about as long as broad. Upper flagellum short, biramous, with four proximal segments fused; short free ramus with one or two segments; longer free ramus with about five to six segments. Lower flagellum with about 10-12 segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; carpocerite extending just beyond lamella of scaphocerite, slender, about five times longer than distal width; flagellum short, about as long as postorbital carapace length; scaphocerite with lamella about 1.8 times as long as central width, anterior margin slightly convex, medial margin convex, lateral margin slightly convex with strong medially curved distolateral tooth extending to level of anterior margin of lamella, about 0.20-0.25 of lamina length; incision between distolateral tooth and lamina deep.

Epistome with distinct, acute, anterior median carina; labrum small, round.

Paragnath well developed, alae with subcircular, medially bilobed distal lobes, and small rounded oval ventromesial lobes; corpus with shallow median groove, bordered laterally by non-setose broad, rather indistinct carinae.

Second thoracic sternite with large triangular, medially rounded plate, with a row of simple short setae along its anterior margin.

Third thoracic sternite small, not ornamented.

Fourth thoracic sternite with lateral shallow carinae with shallow median notch posteromedial of first pereiopods; no ridge between first pereiopods.

Fifth thoracic sternite with well developed lateral plates posteromedial to second pereiopod coxae.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process slender, with five or six distal teeth in left mandible and four in right mandible and row of about six to eight small teeth present on medioventral border; molar process stout, with four blunt distal teeth, some fringed with setal brushes.

Maxillula with upper lacinia broad, rectangular, with two rows of about 20 serrulate spines and many long slender setae medially; lower lacinia triangular, curled inward, densely setose distoventrally and marginally, without spines; palp bilobed, larger lobe with small ventral tubercle with single short recurved simple seta.

Maxilla with basal endite well developed, bilobed; distal lobe longer than proximal lobe, with about ten long slender minutely serrulate setae along distomedian border, proximal lobe with about 6 long slender minutely serrulate setae along distomedian border; coxal endite obsolete, median margin slightly convex, non-setose;

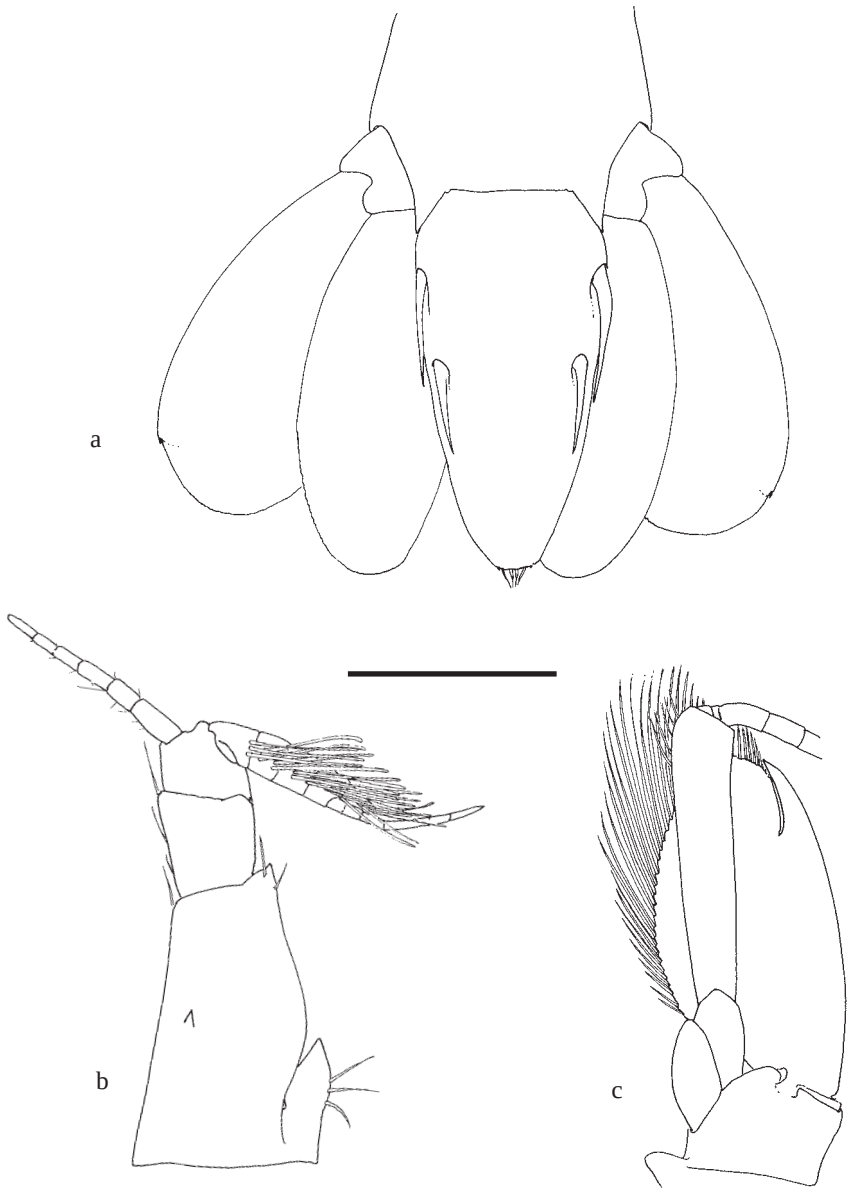


Fig. 131. *Ascidonia californiensis* (Rathbun, 1902): non-ovigerous female, pocl. 5.2 mm, USNM 45610. a, telson and uropods, dorsal view; b, antennula, ventral view; c, antenna, ventral view. Scale: a = 2 mm; b, c = 1.5 mm.

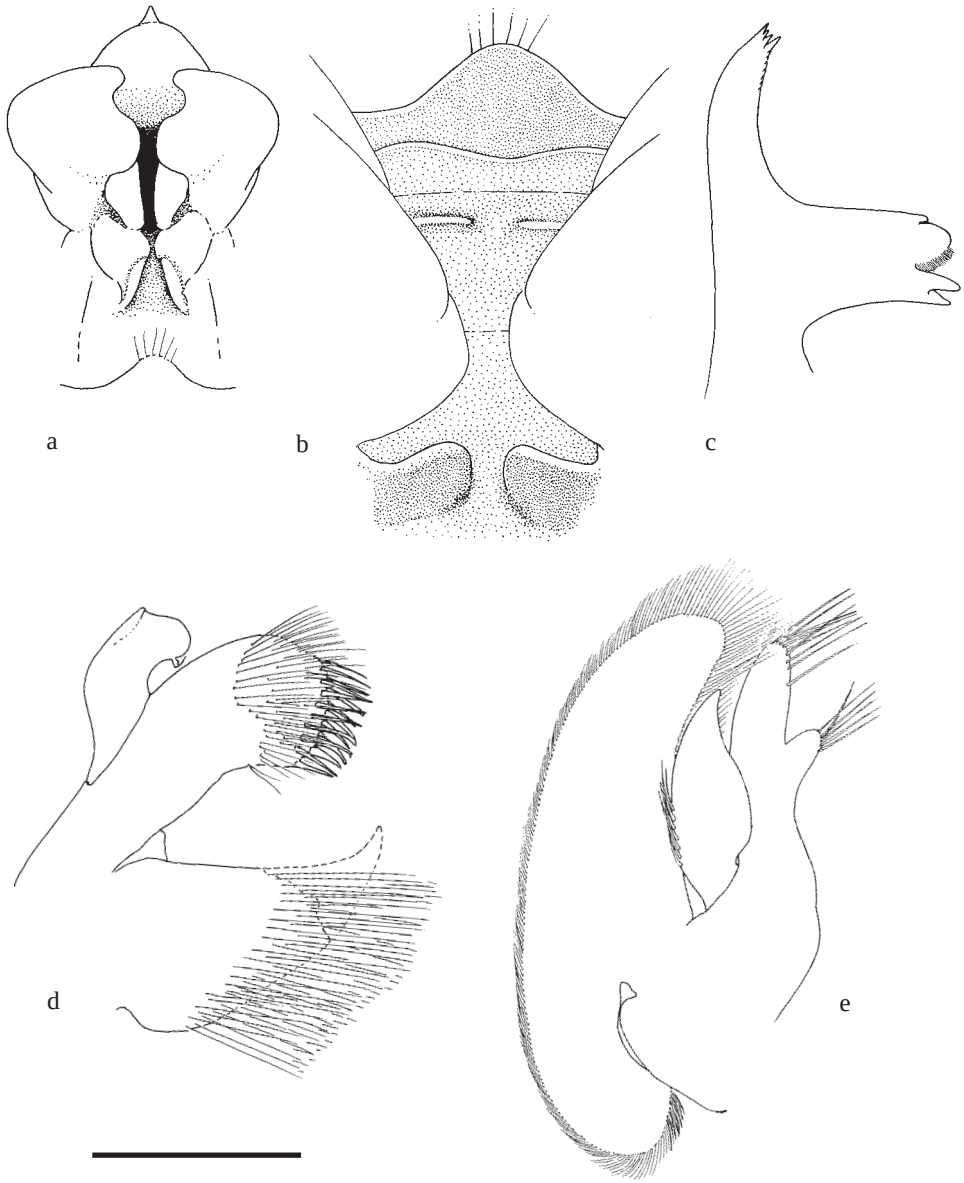


Fig. 132. *Ascidonia californiensis* (Rathbun, 1902): non-ovigerous female, pocl. 5.2 mm, USNM 45610. a, paragnath, ventral view; b, second to fifth thoracic sternites; c, mandible, ventral view; d, maxillula, ventral view; e, maxilla, ventral view. Scale: a = 2 mm; b-d = 1.5 mm; e = 1.9 mm.

scaphognathite large, 3.3 times longer than wide, posterior lobe large, 1.7 times longer than wide, anterior lobe 1.8 times longer than wide; palp simple, about 0.8 of length of distal lobe of basal endite, strongly expanded proximally, tapering distally to rather acute tip, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite completely fused, large and broad, fringed with many, long and finely serrulate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod well developed, flagellum with about 10 long, plumose setae distally; caridean lobe large, elongate, narrow; epipod large triangular, faintly bilobed; palp slender, simple, non-setose.

Second maxilliped with endopod well-developed; dactylar segment about 4.0 times longer than broad, densely fringed with coarsely serrulate spiniform, and long curled, finely serrulate setae medially; propodal segment with row of long spines and simple and finely serrulate setae along distomedian margin, distomedial lobe produced; ventro-lateral margin devoid of setae; carpal segment short, broader than long, unarmed; meral segment with row of long plumose setae medially; basal and ischial segment not completely fused, with disto-median row of plumose setae, ischial segment strongly excavate medially, basal segment excavate in distal part of medial margin; exopod normal, with about ten long plumose setae distally; coxal segment medially produced, with few simple setae, with rectangular epipod laterally.

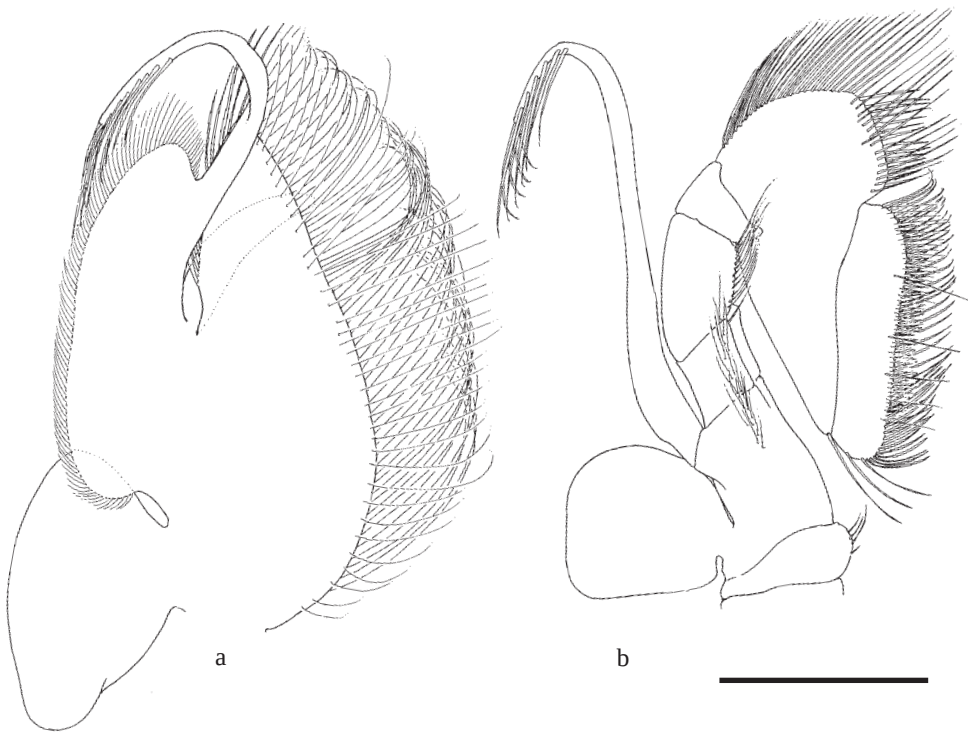


Fig. 133. *Ascidonia californiensis* (Rathbun, 1902): non-ovigerous female, pocl. 5.2 mm, USNM 45610. a, first maxilliped, ventral view; b, second maxilliped, ventral view. Scale = 1.9 mm.

Third maxilliped with broad ischiomerus, partly fused to basis, with indistinct suture, about 2.4 times longer than broad, tapering distally, flattened, with dense cover of setae on median and ventral surface, lateral margin with long plumose setae; basal segment medially convex, with many long finely serrulate setae on median surface; exopod well developed, almost reaching distal margin of penultimate segment, with many long plumose setae along distal 2/3rd; coxa without medial process, with large lateral plate; with rudimentary arthrobranch with filaments; penultimate segment about twice as long as broad, compressed, with groups of long, finely serrulate setae ventromedially; ultimate segment slightly shorter than penultimate segment, tapering distally, with groups of long coarsely serrulate setae distally.

First pereiopods slender, extending beyond scaphocerite by chela and carpus. Chela about 4.5 times longer than deep, subcylindrical; fingers slightly longer than palm, slender, with groups of many strong, long, serrulate setae, cutting edges entire, with acute tips; cleaning organ present on carpal-propodal joint; carpus 1.25 times as long as chela, about 6.2 times longer than distal width, slightly tapering proximally, unarmed, with scattered long simple setae; merus about as long as carpus, 6.5 times

Fig. 134. *Ascidonia californiensis* (Rathbun, 1902): non-ovigerous female, pocl. 5.2 mm, USNM 45610. a, third maxilliped, ventral view; b, first pereiopod. Scale = 1.9 mm.

longer than central width, unarmed, with many long simple setae along median margin; ischium 0.5 times merus length, with few long simple setae medially; basis short, 0.4 of ischium length, with many long simple setae medially; coxa with rounded ventral lobe with many long simple setae.

Second pereiopods very unequal and dissimilar. Major chela about 1.6 times as long as postorbital carapace length in adult females; palm slightly compressed, with finely serrulate, carinate, median margin with many short slender setae; fingers 0.5 times palm length; dactylus about twice as long as deep, with large triangular proximal tooth, simple or with few denticles, at 1/3 and small simple triangular distal tooth at 2/3 of cutting edge, distal part of cutting edge entire or with minute teeth in proximal part, concave, tip strongly hooked, distolateral border with many long slender simple setae, without median carinae; fixed finger about 1.5 times longer than deep, with blunt denticulate tooth just proximal of tooth on dactylus and large triangular tooth just distal of tooth on dactylus, distal part of cutting edge entire, tip strongly hooked; median fossa for reception of dactylar tooth when fingers closed not developed, tip strongly hooked; carpus short and stout, about 0.45 of palm length, strongly tapering proximally, about as long as distal width, unarmed; merus short, slightly longer than carpus, somewhat swollen, about 1.2 times longer than central width; ischium as long as merus, somewhat tapering proximally, without distinctly produced distomedial angle; basis and coxa without special features. Minor chela about as long as postorbital carapace length in adult females, about 1.3 times as long as postorbital carapace length in adult males, somewhat compressed, with finely serrulate, carinate, median margin with many long slender setae; fingers about as long as palm, gaping, with many long slender simple or minutely serrulate setae along cutting edges, tips strongly hooked; dactylus about 4.5 times longer than deep, with many teeth along cutting edges, decreasing in size distally; fixed finger about twice as long as deep, with many teeth along cutting edges, decreasing in size distally; carpus 0.7 of palm length, as in major cheliped; merus, ischium, basis and coxa as in major cheliped.

Ambulatory pereiopods similar. Dactylus of third pereiopod with corpus compressed, about three times longer than proximal width, ventral border with acute strongly curved distal accessory tooth, dorsal border with few simple short setae, flexor margin straight, with many simple setae; unguis simple, slightly curved, about 0.37 of corpus length; propodus about 4.7 times longer than dactylus, about 7.4 times longer than proximal width, slightly compressed, with three or four large spines in distal 2/5th of flexor margin, and with two strong spines ventrodistally with many simple short and moderately long setae, increasing in density ventrodistally; carpus about 0.5 of propodus length, 3.5 times longer than distal width, with indistinct distal lobe, unarmed; merus slightly shorter than propodus, about 4.5 times longer than central width, with very few setae along ventral margin, unarmed; ischium about 0.5 of merus length, slightly tapering proximally, about 2.4 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopods similar. Both with merus slightly shorter, less robust; fifth with propodus relatively long and slender.

Male first pleopod with endopod about four times longer than proximal width, tapering distally; median margin slightly concave with row of about 12 short simple setae, with moderately long plumose setae in distal part and along lateral margin.

Endopod of second pereiopod with short appendix masculina, equal to about 0.7

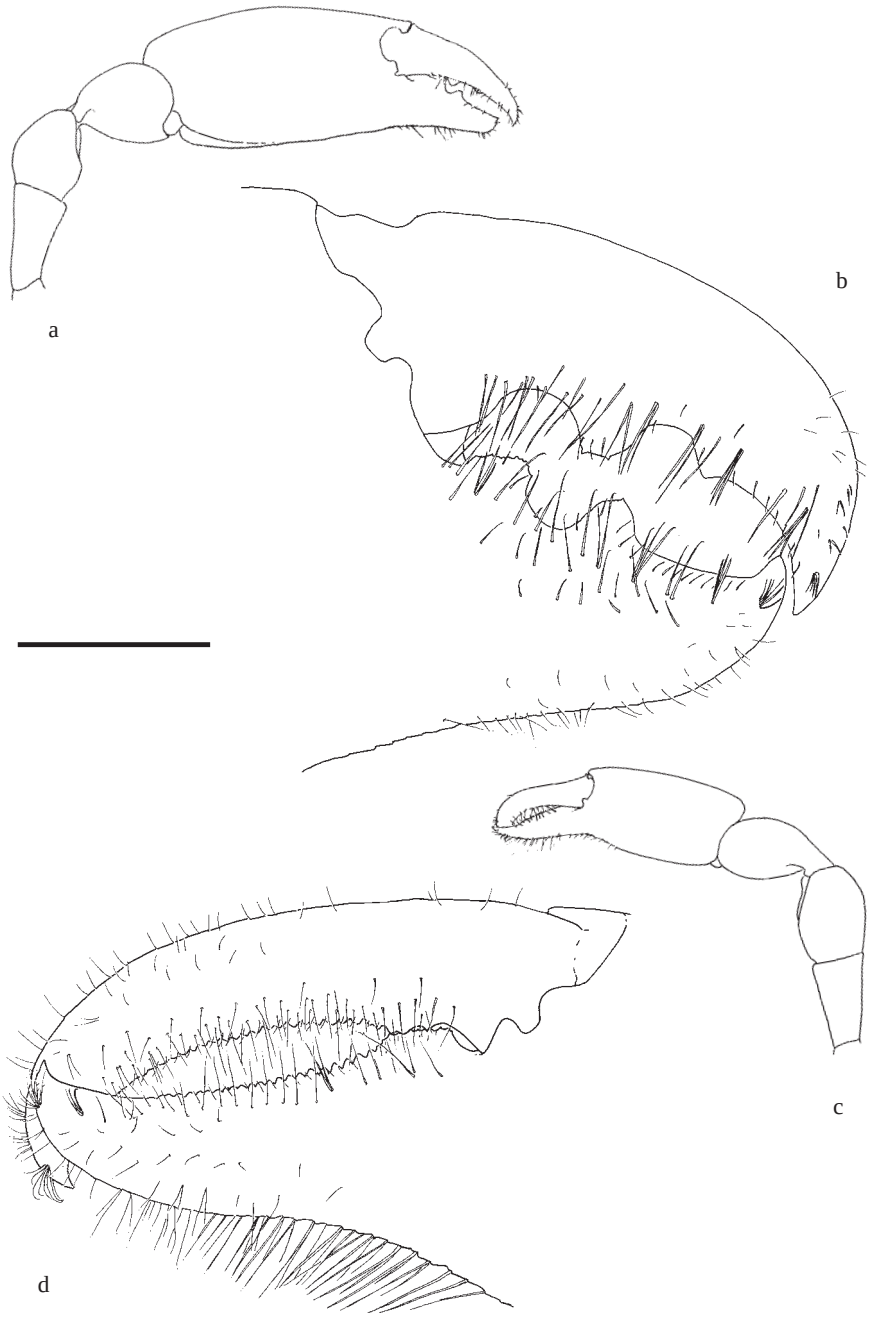


Fig. 135. *Ascidonia californiensis* (Rathbun, 1902): ovigerous female, pocl. 8.1 mm, USNM 170570. a, major second pereiopod; b, idem, chela; c, minor second pereiopod; d, idem, chela; Scale: a, c = 8 mm; b, d = 2 mm.

Fig. 136. *Ascidonia californiensis* (Rathbun, 1902): non-ovigerous female, pocl. 5.2 mm, USNM 45610. a, third pereiopod; b, dactylus third pereiopod. Scale: a = 1.5 mm; b = 0.15 mm.

times length of appendix interna, with several rows of setulose setae in distal half.

First pleopod of female with slender endopod, less than third length of exopod, with many long simple distal setae when ovigerous, with row of long plumose setae on lateral margin and few simple setae in proximal part of medial margin.

Uropods normal, with short stout unarmed protopodite; exopod broad, about 1.7 times as long as wide, with convex lateral margin, without distolateral tooth, with small distolateral spine; endopod slightly longer than exopod, about twice as long as wide, just extending beyond telson.

Ovigerous females carrying about 300 eggs. Egg-size about 0.6 mm.

Size.— Maximum postorbital carapace length 5.0 mm in males, 8.1 mm in females. Only one ovigerous female known with postorbital carapace length of 8.1 mm. Size probably related to size of host.

Colouration.— Unknown.

Type.— Holotype: female, pocl. 4.9 mm (USNM 25282); off Santa Cruz Island, California, U.S.A.; depth 30 fms; "Albatross" station 2945.

Distribution.— EAST PACIFIC: California, U.S.A.: Santa Cruz Island, 30 fms (cf. Rathbun, 1902; Ritter, 1913); Santa Rosa Island, 15-16 fms (Holthuis, 1951a); Engels Bank; depth 26 m (Word & Charwat, 1976); off San Jose Creek Beach, Carmel, depth 43 m (Standing, 1981).

Host.— Recorded from *Ascidia vermiformis* (Ritter, 1913) (cf. Ritter, 1913) and *Ascidia paratropa* (Huntsman, 1912) (cf. Standing, 1981).

Fig. 137. *Ascidonia californiensis* (Rathbun, 1902): ovigerous female, pocl. 8.1 mm (fig. a), male, pocl. 5.0 mm; (figs. b, c), USNM 170570. a, endopod female first pleopod; b, endopod male first pleopod; c, appendix interna and appendix masculina on second male pleopod. Scale = 0.6 mm.

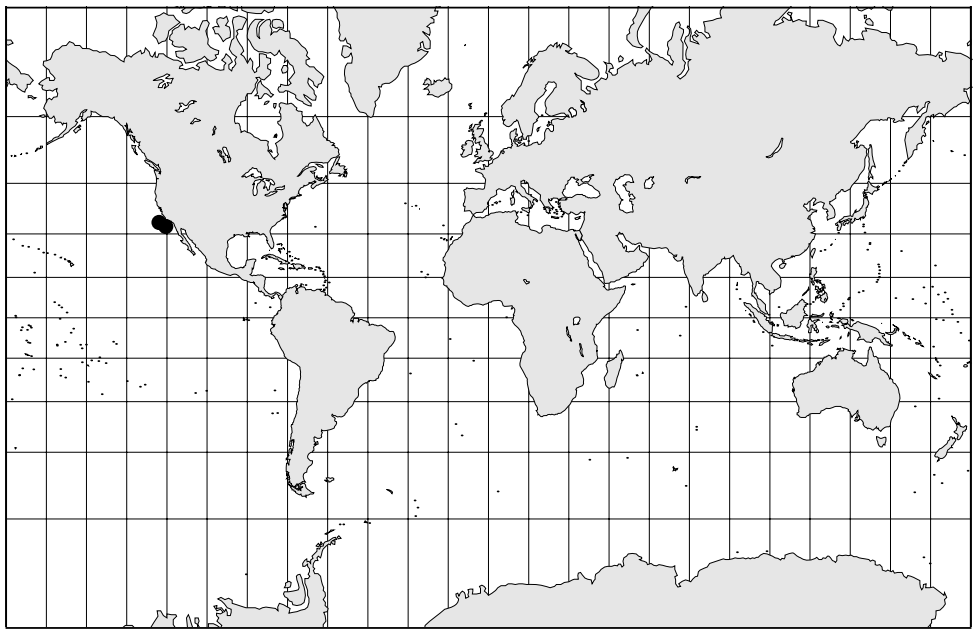


Fig. 138. Geographic distribution of *Ascidonia californiensis* (Rathbun, 1902).

Remarks.— Most closely related to *Ascidonia flavomaculata* Heller, 1864. It differs from this species in having: 1) the antennal spine blunt in stead of acute, 2) the dorsal telson spines at 0.22 and 0.45 of the telson length while 0.20 and 0.35 in *A. flavomaculata*, 3) the lateral margin of the scaphocerite convex while almost straight in *A. flavomaculata*, 4) the distolateral tooth strongly curving mediad while only slightly so in *A. flavomaculata*, 5) the flexor margin of the dactylus of the third pereiopod with relatively fewer setae than in *A. flavomaculata*, 6) the second thoracic sternite bluntly rounded anteriorly while triangularly produced in *A. flavomaculata.*

8.3.3. *Ascidonia flavomaculata* (Heller, 1864) comb. nov.
(figs. 139-147, pls. 7, 8)

Alciope heterochelus Rafinesque, 1814: 24; Roux, 1830: 38; Hemming, 1958: 212; Rafinesque, 1990: 50.

Pontonia flavomaculata Heller, 1864: 51; Giesbrecht, 1882: 295; Carus, 1885: 475; Ortmann, 1890: 509; Pruvot, 1898: 639; Norman, 1905: 9; Quintaret, 1908: 34; Pesta, 1912: 101; Borradaile, 1917: 391; Pesta, 1918: 130, fig. 43 left; De Man, 1926: 67, figs. 1-7; Sluiter, 1927: 76; Harant, 1931: 368; Nouvel, 1939: 2; Burollet, 1940: 199; Zariquiey, 1950: 80; Drensky, 1951: 241; Holthuis, 1951b: 160; Holthuis, 1952: 15; Holthuis, 1954: 20; Holthuis, 1955: 64; Zariquiey, 1955: 401; Bourdillon, 1956: 31 figs. 1-12; Holthuis, 1956: 228, 230, 231; Hemming, 1958: 215; Bourdillon-Casanova, 1960: 66, fig. 21; Zariquiey Alvarez, 1968: 175; Stevcic, 1969: 127; Lagardère, 1973: 66, figs. 107-110; Monod & Hureau, 1974: 20; Holthuis, 1978: 48; Koukouras, 1979: 50, 51; Moncharmont, 1981: 60; García Raso, 1982: 106; Manning & Stevcic, 1982: 300; Paula, 1987: 269, 270; Garcia & Garcia, 1988: 50; Stevcic, 1990: 202; Grippa, 1991: 344; Pérez Sanchez & Moreno Batet, 1991: 135, coloured fig.; Noël, 1992: 61; Noël, 1993: 39; Grippa, 1993: 227; Koukouras, Dounas & Eleftheriou, 1993: 195; Chace &

Bruce, 1993: 61; González Pérez, 1995: 72; d'Udekem d'Acoz, 1996: 144; Costanzo Calafiore & Crescenti, 1996: 733-781, figs. 1-5; d'Udekem d'Acoz, 1999: 102.

Pontonia Phallusiae Marion, 1879: 226; Gourret, 1884: 15; Gourret, 1887: 187; Gourret, 1888a: 39; Gourret, 1888b: 4, pl. 1, 2 figs. 1-3; Koehler, 1890: 138.

Pontonia Diazonae Joliet, 1882: 118.

Pontonia phallusiae; Marion, 1883: 68; Norman, 1905: 9; Lo Bianco, 1888: 412; Lo Bianco, 1899: 509; Lo Bianco, 1909: 614; Cerutti, 1921: 237; Patwardhan, 1935: 693.

"Un Alphaeus en una Phallusia"; Buen, 1916: 276.

Ponthonia Phallusiae; Colombo, 1885: 23, 27.

Pontonia elegans Sarato, 1885: 2 [nomen nudum]; Monod & Hureau, 1974: 20, 29.

Ponthonia phallusiae; Colombo, 1888: 92.

Material.— **Atlantic Ocean**: **Mediterranean Sea.** — RMNH D 303: 1 male, pocl. 7.3 mm; 2 non-ovigerous females, pocl. 3.7 and 7.2 mm; Italy, Naples; 1884; in *Ascidia mentula* O.F. Müller, 1776; leg. A.A.W. Hubrecht.— RMNH D 3570: 2 males, pocl. 4.3 and 4.7 mm; 1 ovigerous female, pocl. 5.0 mm; Italy, Naples; 10.vi.1934; in *Ascidia mentula* O.F. Müller, 1776; leg. G. Stiasny.— RMNH D 5996: 1 non-ovigerous female, pocl. 3.6 mm; Spain, near Cadaqués; 12.viii.1949; from fishermen; in *Ascidia mammillata* Cuvier, 1815 [= *Phallusia mammillata*]; leg. L.B. Holthuis.— RMNH D 6528: 2 males, pocl. 5,3 and 6.5 mm; Italy, Naples, Pozzuoli; depth 35-40 m; 2.v.1950; in *Ascidia mentula* O.F. Müller, 1776; leg. L.B. Holthuis, n. 73.— RMNH D 6729: 1 ovigerous female, pocl. 4.8 mm; Spain, Bay of Cadaqués; 3-17.viii.1950; from fishermen; don. L.B. Holthuis.— RMNH D 11032: 1 male, pocl. 5.2 mm; Yugoslavia, Kolocepski Canal, N of Otok Lopud, 42°43'N 17°57'E; 17.v.1954; depth 30-40 m; trawl on bottom with sand and shells; among gills of *Ascidia mentula* O.F. Müller, 1776; exc. Zool. Museum Amsterdam, station 46.— RMNH D 11033: 1 male, pocl. 2.9 mm; Yugoslavia, Kolocepski Canal, N of Otok Lopud, 42°43'N 17°57'E; 17.v.1954; depth 30-40 m; trawl on bottom with sand and shells; in *Ascidia mammillata* Cuvier, 1815 [= *Phallusia mammillata*]; exc. Zool. Museum Amsterdam, station 46.— RMNH D 19219: 7 males, pocl. 4.1-5.8 mm; 4 non-ovigerous females, pocl. 3.9-5.1 mm; 1 ovigerous female, pocl. 5.3 mm; Yugoslavia, Splitski Kanal between Soltra Island and Brat near Split; 15.vi.1962; depth ca. 50 m; in *Ascidia* spec.; Excursion Leiden Biologists.— RMNH D 19220: 6 males, pocl. 3.1-6.6 mm; 1 non-ovigerous female, pocl. 4.4 mm; 6 ovigerous females, pocl. 5.0-6.3 mm; Yugoslavia, Splitski Kanal between Soltra Island and Brat near Split; 14.vi.1962; depth 60 m; in various ascidians; Excursion Leiden Biologists.— RMNH D 34468: 34 males, pocl. 3.1 (v-vi.1936), 3.2 (1937), 3.4 (5.v.1936), 3.6 (2x, 1.v.1935), 3.9 (v-vi.1936), 4.0 (in *Ascidia mentula* O.F. Müller, 1776, 10.iii.1937), 4.3 (1937), 4.5 (1937), 4.3 (vi.1937), 4.5 (1.v.1935), 4.5 (1937), 4.6 (5.v.1935), 4.8 (1.v.1935), 4.9 (v-vi.1936), 5.0 (v-vi.1936), 5.5 (1.v.1935), 5.6 (v-vi.1936), 5.9 (1.v.1935), 6.0 (1.v.1935), 6.1 (1.vi.1935), 6.2 (v-vi.1936), 6.2 (1937), 6.3 (v-vi.1936), 6.3 (1937), 6.4 (1937), 6.4 (in *Ascidia mentula* O.F. Müller, 1776, 10.iii.1937), 6.5 (v-vi.1936), 6.6 (v-vi.1936), 6.6 (v-vi.1936), 6.8 (v-vi.1936), 6.9 (v-vi.1936), 6.9 (1937), 6.9 (v-vi.1936) mm; 16 non-ovigerous females, pocl. 3.4 (v-vi.1936), 3.4 (v-vi.1936), 4.1 (in *Ascidia mentula* O.F. Müller, 1776, 10.iii.1937), 4.4 (3x, 1.v.1935), 4.6 (v-vi.1936), 4.9 (1.v.1935), 4.9 (1.v.1935), 5.3 (1.v.1935), 5.3 (Collection de S.A.S. le Prince de Monaco, 1907), 5.8 (1937), 6.1 (1937), 6.6 (1.v.1935), 6.6 (Collection de S.A.S. le Prince de Monaco, Station G. & Menton, 12.iii.1913, grand chalut, depth 100 m), 6.7 (v-vi.1936), 6.7 (1.v.1935), 7.0 (1.v.1935) mm; 19 ovigerous females, pocl. 4.1 (1937), 4.4 (in *Ascidia mentula* O.F. Müller, 1776, 2.vii.1936), 4.7 (1937), 5.3 (v-vi.1936), 5.4 (v-vi.1936), 5.8 (19.v.1937), 5.9 (v-vi.1936), 5.9 (1.v.1935); 5.9 (1.v.1935), 6.1 (vi.1937), 6.3 (1937), 6.3 (vi.1937), 6.3 (in *Ascidia mentula* O.F. Müller, 1776, 2.vii.1936), 6.4 (v-vi.1936), 6.8 (v-vi.1936), 6.9 (v-vi.1936), 7.2 (v-vi.1936), 7.2 (1937), 7.2 (1937) mm; 1 male moult (1937); Monaco; 1907-1937; leg. H. Nouvel.— RMNH D 38430: 1 non-ovigerous female, pocl. 4.0 mm; SPMOPO1974 sta.006, Mediterranean Sea, harbour of Blanes, between end of pier and rocky point in harbour entrance; from large rock caught in nets of fishermen; depth about 20 m; 8.x.1974; Exc. RMNH 1974; photograph.— BMNH 1911.11.8.1989-1990: 1 ovigerous female, pocl. 7.2 mm; 2 males, pocl. 5.4 and 6.3 mm; Italy, Naples, Zoological Station; collection A.M. Norman.— USNM 23203: 1 male; Naples, Zoological Station.— MNHN: 1 female, pocl. 4.7 mm; France, Corsica, Gulf of Porto Vecchio; in *Ascidia* spec.; -.vii.1990; leg. CF. & Cl. Monniot.— USNM 14535: 2 ovigerous females; leg. A.M. Norman.— NTM Cr. 009219; 1 male, pocl. 2.7 mm; 1 non-ovigerous female, pocl. 5.6 mm; Italy, Sicily, Messina, Gulf of Potti; no further data.—

Canary Islands.— RMNH D 45616: 1 ovigerous female, pocl. 4.8 mm; sta. CANCAP 2.D03, SW coast of Fuerteventura, near Punta de Gran Tarajal, 28°12'N 14°01'W; rocky bottom and sand; depth 5-15 m; scuba diving; 27.viii.1977; in tunicate.— **Cape Verde Islands**.— RMNH D 45617: 1 male, pocl. 2.7 mm; sta. CANCAP 7.D08, Sal, S coast near Santa Maria, 16°35'N 22°55'W; depth 0-15 m; scuba diving; 29.viii.1986; in tunicate.— RMNH D 45618: 2 males, pocl. 1.2 and 1.4 mm; sta. CANCAP 7.D14, Branco, S coast near Ponta de Parede, 16°39'N 24°41'W; sandy bottom, rock ledges; depth 12-15 m; scuba diving; 4,5.ix.1986; in tunicate.— **Sierra Leone**.— MNHN: 2 males, pocl. 2.8 and 3.0 mm; in *Ascidia aximensis* Millar, 1953; Camp. Sea Diver 3-X-90-3; leg. F. & Cl. Monniot.— MNHN: 1 male, pocl. 3.6 mm; 1 ovigerous female, pocl. 4.0 mm; in *Ascidia involuta* Heller, 1875; leg. F. & Cl. Monniot.— MNHN: 1 male, pocl. 4.7 mm; Sea Diver n° 4/X/90 - 2; in *Ascidia involuta* Heller, 1875; leg. F. & Cl. Monniot.
OTHER.— RMNH D 4811: 1 ovigerous female, pocl. 4.9 mm; 1 non-ovigerous female, pocl. 5.1 mm; locality unknown; identified by J.G. de Man; Zoological Museum Utrecht.

Description.— Body subcylindrical, somewhat depressed. Carapace smooth. Rostrum well developed, distally ending in sharp point, almost reaching distal margin of basal segment to distal margin of intermediate segment of antennular peduncle, slender, without dorsal carina, with ventral carina in distal part, slightly convex in lateral view; subdistal dorsal tooth with few long setae in front; subdistal ventral tooth absent. Inferior

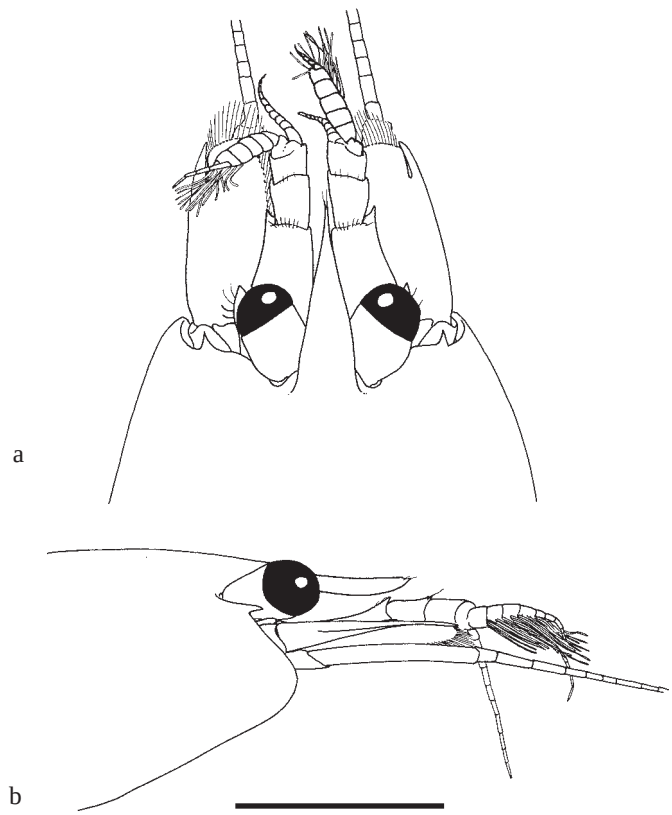


Fig. 139. *Ascidonia flavomaculata* (Heller, 1864): ovigerous female, pocl. 4.8 mm, RMNH D 45616. a, anterior appendages, dorsal view; b, anterior appendages, lateral view. Scale = 2 mm.

orbital angle not developed, rounded. Antennal spine well developed, acute, marginal, short, not extending beyond anterolateral angle, situated at level of rounded inferior orbital angle in lateral view. Anterolateral angle of carapace produced, broadly rounded.

Abdomen smooth; sixth segment about 1.2 times longer than fifth, 0.7 times as long as wide, posteroventral and posterolateral angles acutely produced; pleura of first five segments broadly rounded.

Telson 1.6 times longer than sixth abdominal segment, twice as long as its proximal width; lateral margins slightly convex, convergent; posterior border without median process; two pairs of very large and slender dorsal spines at 0.19 and 0.34 of the telson length, proximal pair marginal, about 0.35 of telson length, distal pair submarginal, about 0.29 of telson length; posterior margin with three pairs of spines, lateral spines small, marginal, intermediate and submedian spines larger than lateral spines, but much smaller than dorsal spines.

Eyestalk about twice as long as wide, cylindrical, medially somewhat swollen; stalk slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella well developed. Basal segment with distinct, acute, distolateral tooth reaching 1/3rd of intermediate segment, distal margin small, oblique, slightly sinuous, not extending beyond distolateral tooth; ventromedial tooth small, acute, submarginal, situated halfway basal segment; stylocerite short, less than half the length of the scaphocerite, with distal acute tip, lateral margin with about five long plumose setae. Intermediate segment slightly longer than wide. Distal segment about as long as wide. Upper flagellum short, biramous, with five proximal segments fused; short free ramus unsegmented; longer free ramus with five segments. Lower flagellum with 10 to 12 segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite extending just beyond lamella of scaphocerite, slender, about 6.0 times longer than distal width; flagellum slender, about 1.7 times postorbital carapace length; scaphocerite with lamella about twice as long as central width, anterior border rounded, slightly truncate, lateral margin straight; distolateral tooth large, about 0.2 of length of lamina, extending as far as anterior margin of lamella; incision between distolateral tooth and lamina deep.

Epistome with acute anterior median carina; labrum rather small, round.

Paragnath well developed, alae with large subcircular, medially bilobed distal lobes, and small rounded oval ventromesial lobes; corpus with shallow median groove, bordered laterally by non-setose broad, rather indistinct carinae.

Second thoracic sternite with large triangular, medially rounded plate, with a row of simple annulate short setae along its margin.

Third thoracic sternite with shallow lateral carinae between third maxillipeds.

Fourth thoracic sternite with lateral shallow carinae with shallow median notch posteromedial of first pereiopods; no ridge between first pereiopods.

Fifth thoracic sternite with well developed lateral plates posteromedial to second pereiopod coxae.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process slender, with four to six distal teeth and row of about 13 small teeth present on medioventral border; molar process robust, with four blunt distal teeth, some fringed with setal brushes.

Maxillula with upper lacinia broad, rectangular, with two rows of about 18 serrulate spines and many long slender setae medially; lower lacinia curled inward, densely setose distoventrally and marginally; palp bilobed, larger lobe with small ventral tubercle with single short recurved simple seta.

Maxilla with basal endite well developed, bilobed; distal lobe longer than proximal lobe, both with long slender minutely serrulate setae along distomedian border, median border without setae; coxal endite obsolete, median margin convex, nonsetose; scaphognathite large, 3.0 times longer than wide, posterior lobe large, 1.8 times

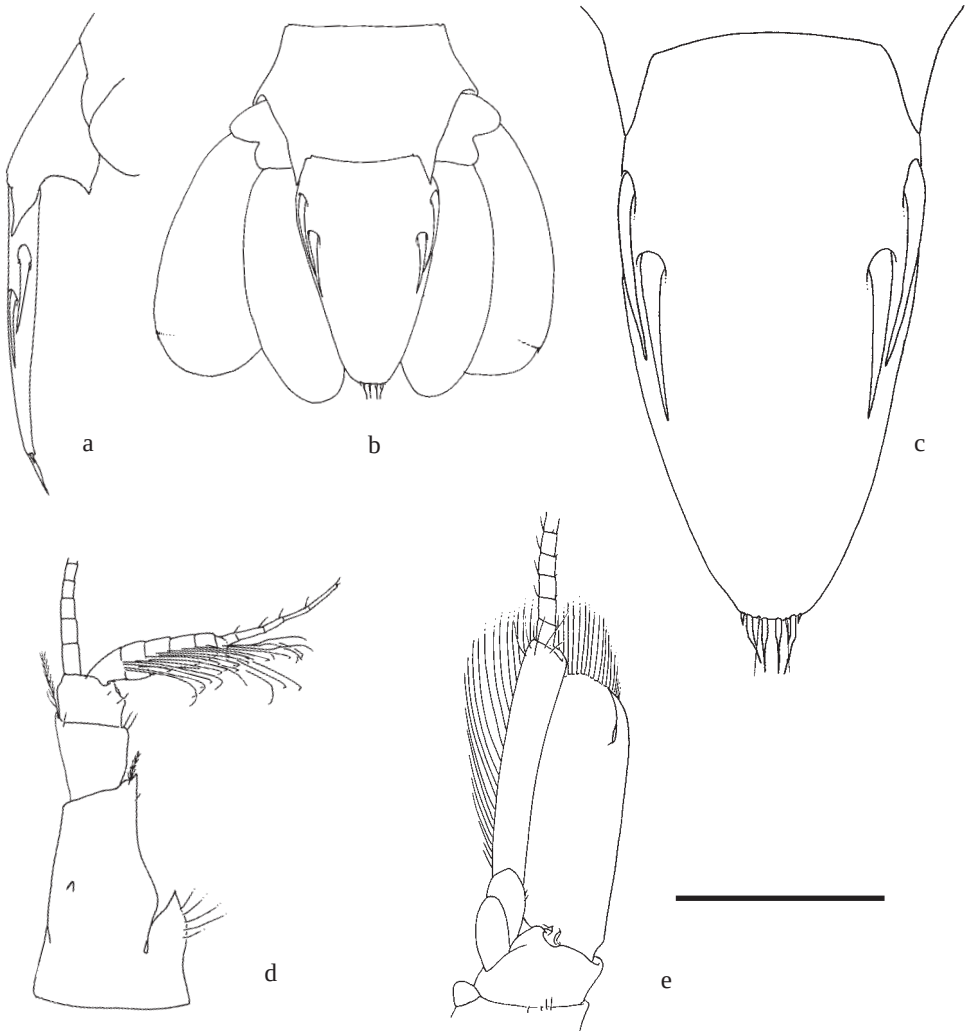


Fig. 140. *Ascidonia flavomaculata* (Heller, 1864): ovigerous female, pocl. 4.8 mm, RMNH D 45616. a, distal part abdomen, lateral view; b, telson and uropods, dorsal view; c, telson, dorsal view; d, antennula, ventral view; e, antenna, ventral view. Scale: a, b = 2 mm; c = 1 mm; d, e = 1.5 mm.

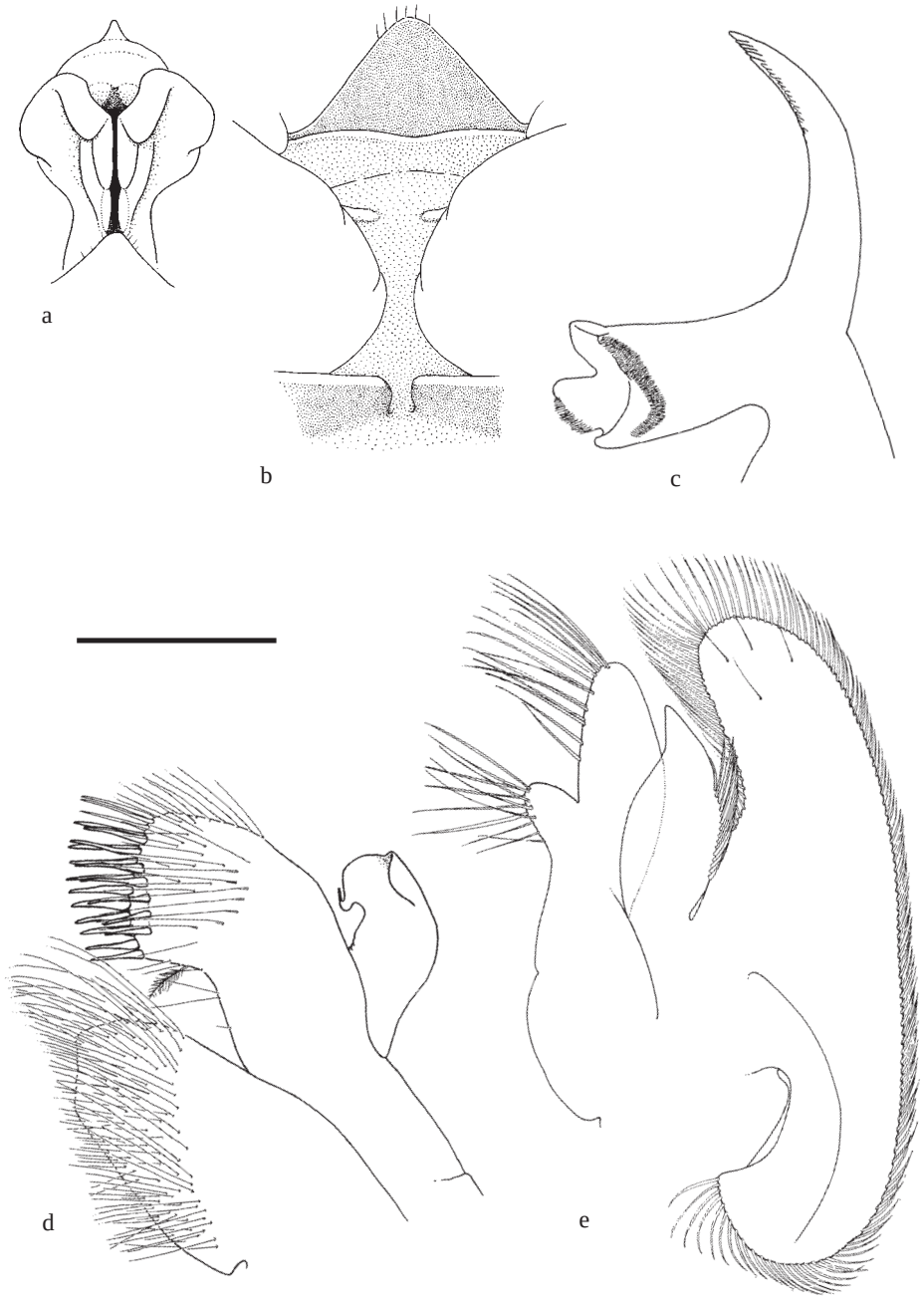


Fig. 141. *Ascidonia flavomaculata* (Heller, 1864): ovigerous female, pocl. 4.8 mm, RMNH D 45616. a, paragnath, ventral view; b, second to fifth thoracic sternites; c, mandible, ventral view; d, maxillula, ventral view; e, maxilla, ventral view. Scale: a = 2 mm; b = 1 mm; c, d = 0.6 mm; e = 0.75 mm.

longer than wide, anterior lobe 1.4 times longer than wide; palp simple, falling short of distal lamina of basal endite, strongly expanded proximally, strongly tapered distally, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite completely fused, large and broad, fringed with many long, finely serrulate setae along entire median margin, with row of more sparse, long, simple, submarginal setae ventrally; exopod well developed, flagellum with about ten long, plumose setae distally; caridean lobe large, elongate, narrow; epipod large, triangular, distinctly bilobed; palp simple, slender, elongate, curved along distolateral margin of basal endite, non-setose.

Second maxilliped with endopod very large; dactylar segment narrow, about 5.5 times longer than broad, densely fringed with coarsely serrulate, spiniform, and long, curled, finely serrulate setae medially; propodal segment with row of spines and long, simple, and finely serrulate setae along expanded distomedian margin, with row of long serrulate setae along ventrolateral margin; carpal segment short, broader than long, unarmed; meral segment with row of long plumose setae medially; basal and ischial segment partly fused, with distinct suture ventrally, both segments medially strongly excavate, both with rows of long plumose setae medially; exopod normal, with about 12 long plumose setae distally; coxal segment medially produced, with few simple setae, with trapezoidal epipod laterally.

Third maxilliped reaching with ultimate segment to distal margin of carpocerite, or falling just short of it; ischiomerus almost completely fused with basis, suture medially visible; ischiomerus almost twice as long as broad, somewhat tapering distally, flattened, lateral margin with long plumose setae; basal segment medially convex; both ischiomeral and basal segments with dense cover of curled setae along median margin and on ventral surface; exopod well developed, not reaching beyond ischiomeral segment, with many long plumose setae along entire length; coxa without median process, with large lateral plate with few simple short setae; with rudimentary arthrobranch with filaments; ultimate and penultimate segments with dense cover of simple and serrulate setae; penultimate segment about twice as long as broad, about third of ischiomeral length; ultimate segment slightly shorter than penultimate segment, tapering distally.

First pereiopods slender, extending beyond carpocerite with chela only to chela and entire carpus. Chela about 4.5 times longer than deep, subcylindrical; fingers slender, slightly longer than palm, with entire cutting edges, with groups of many, strong, long, serrulate setae, tips acute, hooked; cleaning organ on carpal-propodal joint distinct; carpus 1.0-1.3 chela length, about six times longer than distal width, slightly tapering proximally, unarmed, with scattered, long, simple setae; merus subequal to carpus, about six times longer than central width, unarmed, with many long simple setae, especially along median margin; ischium 0.5-0.6 times merus length, not expanded medially, with scattered long simple setae; basis 0.5-0.6 of ischium length, with many long simple setae; coxa with large rounded ventral lobe with many long simple setae.

Second pereiopods unequal, dissimilar. Major chela about 1.5 times postorbital carapace length in adult females, to 1.7 in adult males; palm strongly compressed, with serrate, carinate, median border with many long slender setae, lateral border carinate in distal 2/3rd; fingers 0.5 times palm length; dactylus about 3.4 times longer than deep, with large simple triangular proximal and small simple triangular medial

tooth, separated by notch, distal part entire, sometimes minutely denticulate, concave, tip strongly hooked, distolateral border serrulate with many long slender simple setae, without median carina; fixed finger about 1.5 times longer than deep, with blunt denticulate tooth just proximal of tooth on dactylus and acute triangular tooth just distal of tooth on dactylus, distal part of cutting edge entire, sometimes minutely denticulate,

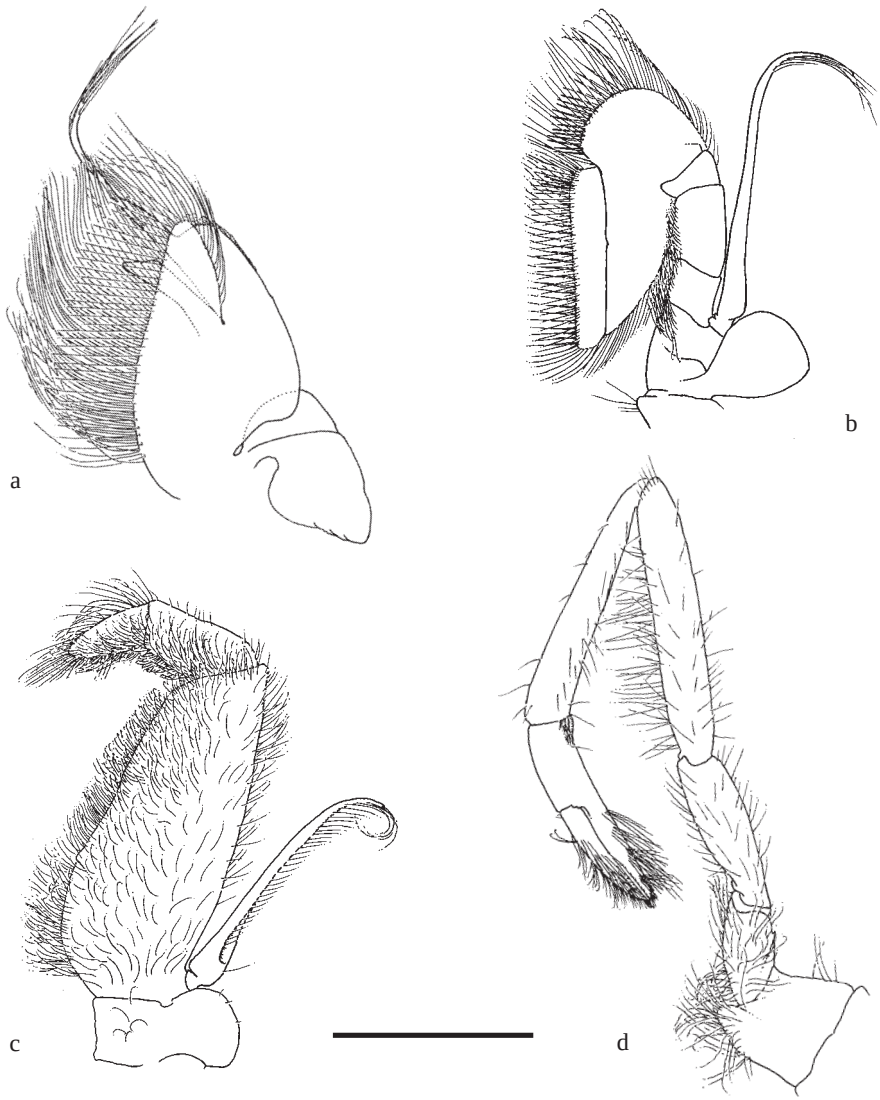


Fig. 142. *Ascidonia flavomaculata* (Heller, 1864): ovigerous female, pocl. 4.8 mm, RMNH D 45616. a, first maxilliped, ventral view; b, second maxilliped, ventral view; c, third maxilliped, ventral view; d, first pereiopod. Scale = 1.5 mm.

concave, tip strongly hooked, median fossa for reception of dactylar tooth when fingers closed indistinct; carpus short and stout, 0.38 of palm length, expanding distally, 1.5 times as long as distal width, unarmed; merus about as long as carpus, 1.75 times longer than central width, distomedial border excavate; ischium about as long as merus, without distomedial protuberance; basis and coxa without special features. Minor chela 1.2

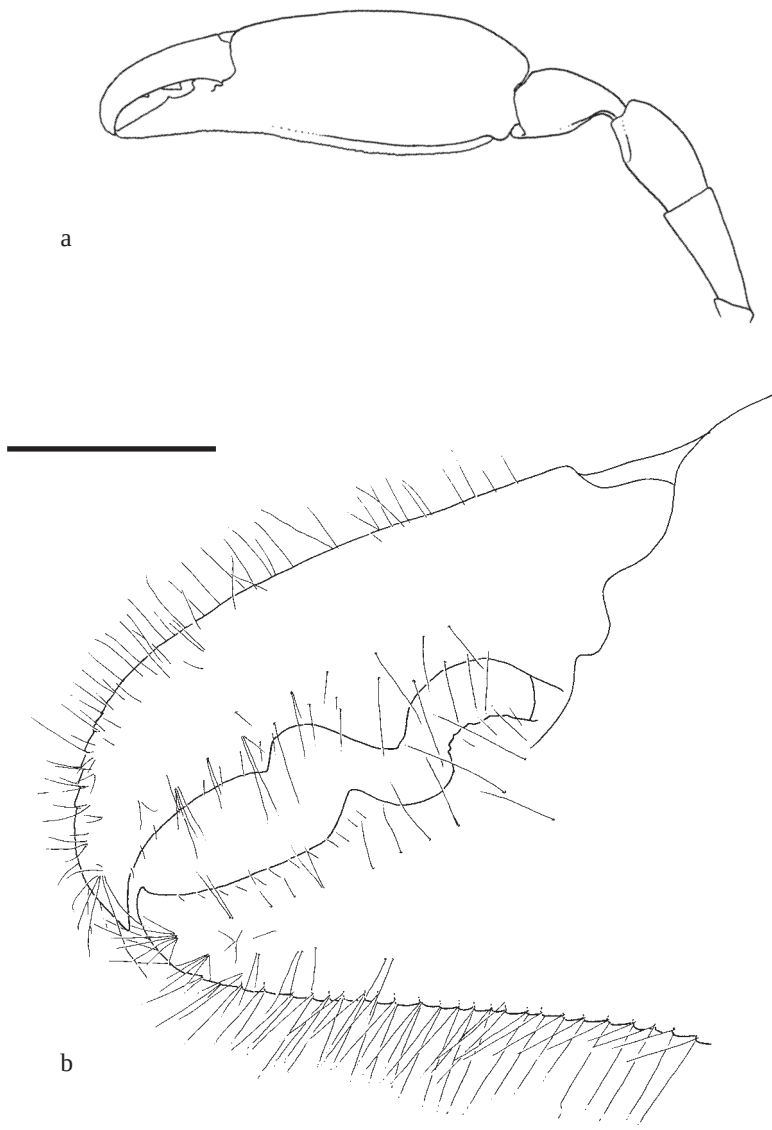


Fig. 143. *Ascidonia flavomaculata* (Heller, 1864): ovigerous female, pocl. 4.8 mm, RMNH D 45616. a, major second pereiopod; b, idem, chela. Scale: a = 4 mm; b = 1 mm.

times longer than postorbital carapace length in adult females to 1.3 times in adult males, strongly compressed, with finely serrulate, carinate, median border with many long slender setae, lateral border carinate; fingers 0.7-1.0 times palm length, tips strongly hooked, with many long slender simple or minutely serrulate setae; dactylus 5.5 times longer than deep, with small triangular, anteriorly denticulate tooth in proximal part and row of small teeth along strongly concave cutting edge, decreasing in size distally; fixed finger 2.3 times longer than deep, with broad, blunt, denticulate tooth in proximal part and row of small teeth along strongly concave cutting edge, decreasing in size distally; carpus, merus, ischium, basis and coxa as major cheliped.

Ambulatory pereiopods similar; dactylus of third pereiopod compressed, corpus about twice as long as proximal width, with few simple setae on dorsal surface and dense cover of simple setae along slightly convex ventral border, accessory tooth acute, slightly curved, terminal; unguis slender, acute, slightly curved, simple, about 0.58 of corpus length; propodus 4.5 times longer than dactylus, five to six times as long as wide, with two distoventral spines and two to four spines along ventral margin, distoventral part with dense cover of short simple setae on lateral surface mainly; carpus 0.5 times propodus length, unarmed; merus slightly shorter than propodus, about 5.1 times longer than central width, unarmed; ischium about 0.7 times merus length, 4.0 times longer than distal width; basis and coxa without

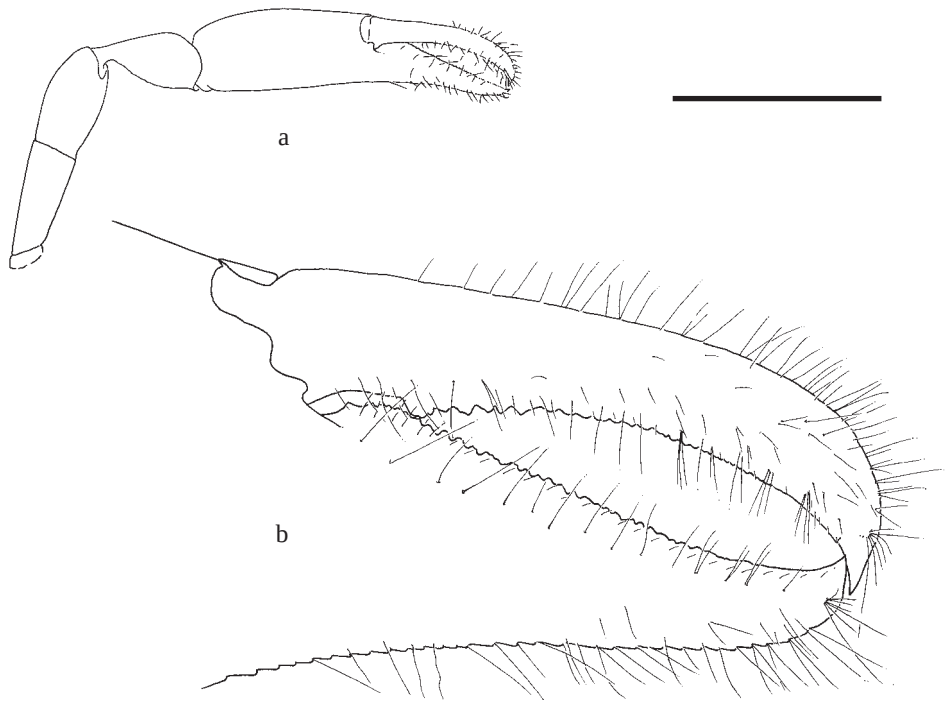


Fig. 144. *Ascidonia flavomaculata* (Heller, 1864): ovigerous female, pocl. 4.8 mm, RMNH D 45616. a, minor second pereiopod; b, idem, chela. Scale: a = 4 mm; b = 1 mm.

special features. Fourth and fifth pereiopod similar, merus more slender.

Male first pleopod with endopod about four times longer than proximal width, tapering distally; median margin almost straight with row of about ten short simple setae, with moderately long plumose setae in distal part and along lateral margin.

Endopod of second pereiopod with short appendix masculina, equal to about 0.7 times length of appendix interna, with long robust distal setulose setae and row of setulose setae along lateral margin.

First pleopod of female with slender endopod, about third of exopod length, with many long simple distal setae when ovigerous, with row of few long plumose setae on lateral margin and few simple setae along medial margin.

Uropods with protopod posterolaterally blunt; exopod almost twice as long as central width, lateral margin convex, with small mobile spine posteriorly, without

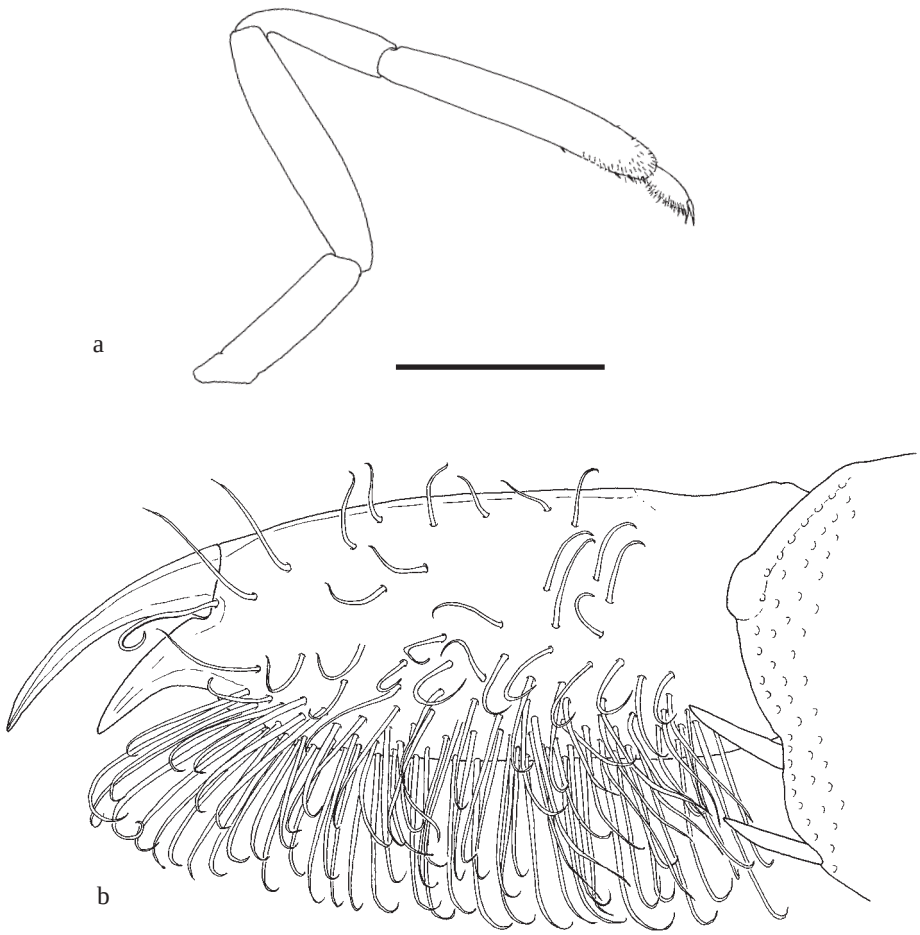


Fig. 145. *Ascidonia flavomaculata* (Heller, 1864): ovigerous female, pocl. 4.8 mm, RMNH D 45616. a, third pereiopod; b, dactylus third pereiopod. Scale: a = 2 mm; b = 0.15 mm.

posterolateral tooth, distal margin broadly rounded; endopod extending beyond exopod slightly more than twice as long as central width, slightly longer than telson.

Ovigerous females with 300-500 eggs. Embryo on point of hatching about 0.7-0.8 mm long.

Size.— Maximum postorbital carapace length 7.2 mm in males, 7.3 mm in females. Minimum postorbital carapace length in ovigerous female 4.0 mm. Size probably related to size of host.

Colouration (pls. 7, 8).— Translucent with few large yellow to orange chromathophores scattered over body and appendages. Eggs in female greenish. For pattern see Gourret, 1888b: pl. 1 figs. 1, 2; Pérez Sanchez & Moreno Batet, 1991: 135, colourfig.

Type.— Type-locality: Mediterranean, Adriatic Sea, Dalmatian coast, in *Phallusia mammillata* (Cuvier, 1815). Type should be present in the Naturhistorisches Museum in Vienna.

Distribution.— Known from the Mediterranean: Alboran Sea (García Raso, 1982), western Mediterranean (Zariquiey Alvarez, 1968; Moncharmont, 1979; Grippa, 1993), Adriatic Sea (Pesta, 1918; Stevcic, 1990), Ionian Sea (d'Udekem d'Acoz, 1999); Aegean Sea (Koukouras, 1979); the NE Atlantic from Morocco (De Man, 1926; Lagardère, 1973) to the Gulf of Guinea (Holthuis, 1951b); the Canary Islands (Pérez Sánchez & Moreno Batet, 1991; González Pérez, 1995). This is the first record of the species from the Cape Verde Islands.

Host.— Several species of solitary ascidians of the family Ascidiidae have been

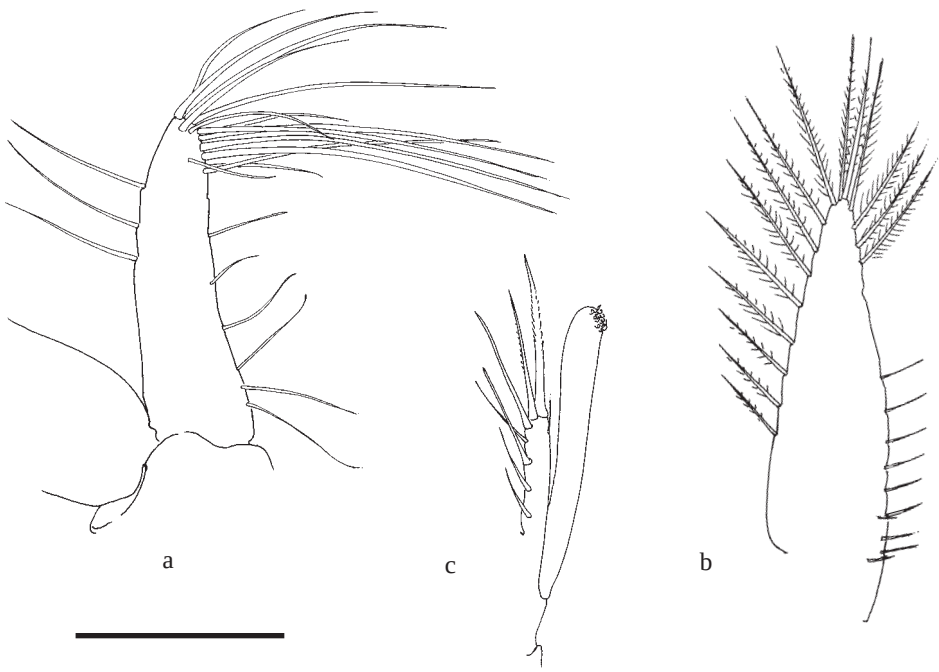


Fig. 146. *Ascidonia flavomaculata* (Heller, 1864): ovigerous female, pocl. 4.8 mm, RMNH D 45616. a, endopod female first pleopod; b, endopod male first pleopod; c, appendix interna and appendix masculina on second male pleopod. Scale = 0.6 mm.

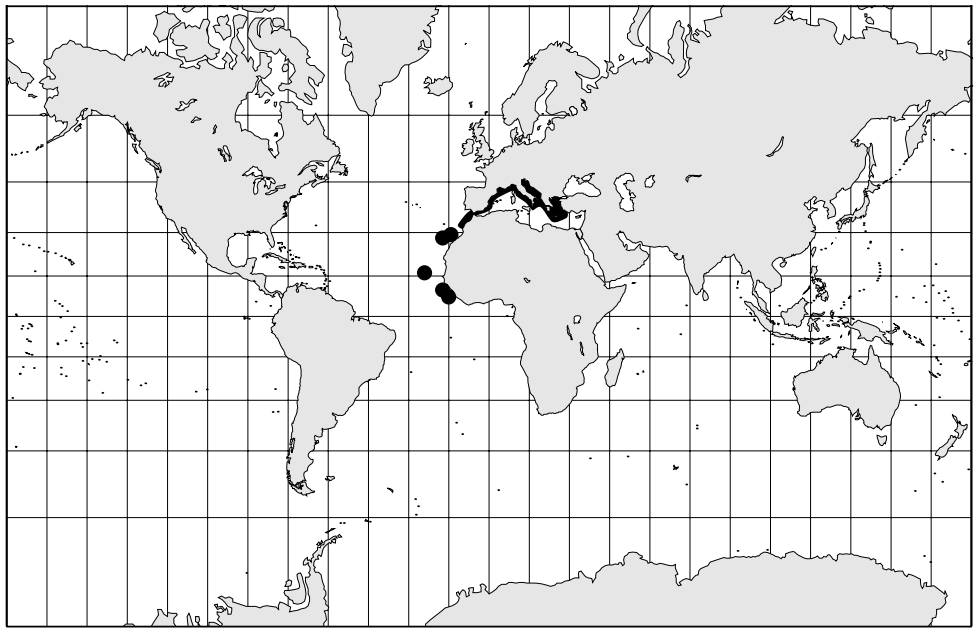


Fig. 147. Geographic distribution of *Ascidonia flavomaculata* (Heller, 1864).

recorded as host: *Ascidia mentula* O.F. Müller, 1776; *A. conchilega* Müller, 1776; *Phallusia mammillata* (Cuvier, 1815) (cf. Heller, 1864; Costanzo, Calafiore & Crescenti, 1996). Also the solitary ascidian of the family Cionidae, *Diazona violacea* Savigny, 1816, is known as host. *Ascidia aximensis* Millar, 1954, and *Ascidia involuta* Heller, 1875, are now recorded as hosts for the first time.

8.3.4. *Ascidonia miserabilis* (Holthuis, 1951) comb. nov.
(figs. 148-154)

Pontonia grayi; Rathbun, 1902 (p.p.): 122 [non fig. 25].
Pontonia miserabilis Holthuis, 1951a: 148, pl. 47 figs. d-i; Holthuis, 1952: 15; Chace, 1972: 40, 41, fig. 9; ? Criales, 1984: 311; Chace & Bruce, 1993: 62.
Pontonia micerabilis; Cabrera-Peña & Solano-López, 1996: 916.

Material.— **West Atlantic**: **Caribbean Sea**.— USNM 24669: 1 ovigerous female, holotype**,** total length 8 mm: Puerto Rico, off Vieques; depth 16 fms; 8.ii.1899; "Fish Hawk" R/V, station 164(6092); previously identified as *Pontonia grayi* (Rathbun).— USNM 135608: 1 male, 1 ovigerous female; Leeward Islands, Antigua Island, English Harbor, Charlotte Point; 2.iv.1956; Smithsonian-Bredin Expedition, station 73-56 (cf. Chace, 1972: 40).— USNM 135609: 1 male; Leeward Islands, Antigua Island, English Harbor, Dockyard sea wall; 29.iv.1959; Smithsonian-Bredin Expedition, station 105-59 (cf. Chace, 1972; 40).— MNHN: 1 ovigerous female, pocl. 2.7 mm; Martinique, port de Case Pilote; depth 0.1 m; in *Ascidia interrupta* Heller, 1878; 1986; leg. F. & Cl. Moniot.— MNHN: 1 female, pocl. 1.6 mm; Martinique, Pointe des Salines; depth 1 m; in *Ascidia interrupta* Heller, 1878; 1986; leg. F. & Cl. Monniot.

Description.— Body subcylindrical, slightly depressed. Carapace smooth. Rostrum well developed, toothless, depressed, reaching beyond first segment of antennular

peduncle, falling short of distal margin of scaphocerite, without dorsal carina, with straight ventral carina in distal part; distal end blunt in lateral view, acute in dorsal view, slightly broadened at base, with few simple setae subdistally on dorsal side. Inferior orbital angle not produced, broadly rounded. Antennal spine reduced to blunt protrusion. Anterolateral margin straight, anterolateral angle produced, rounded.

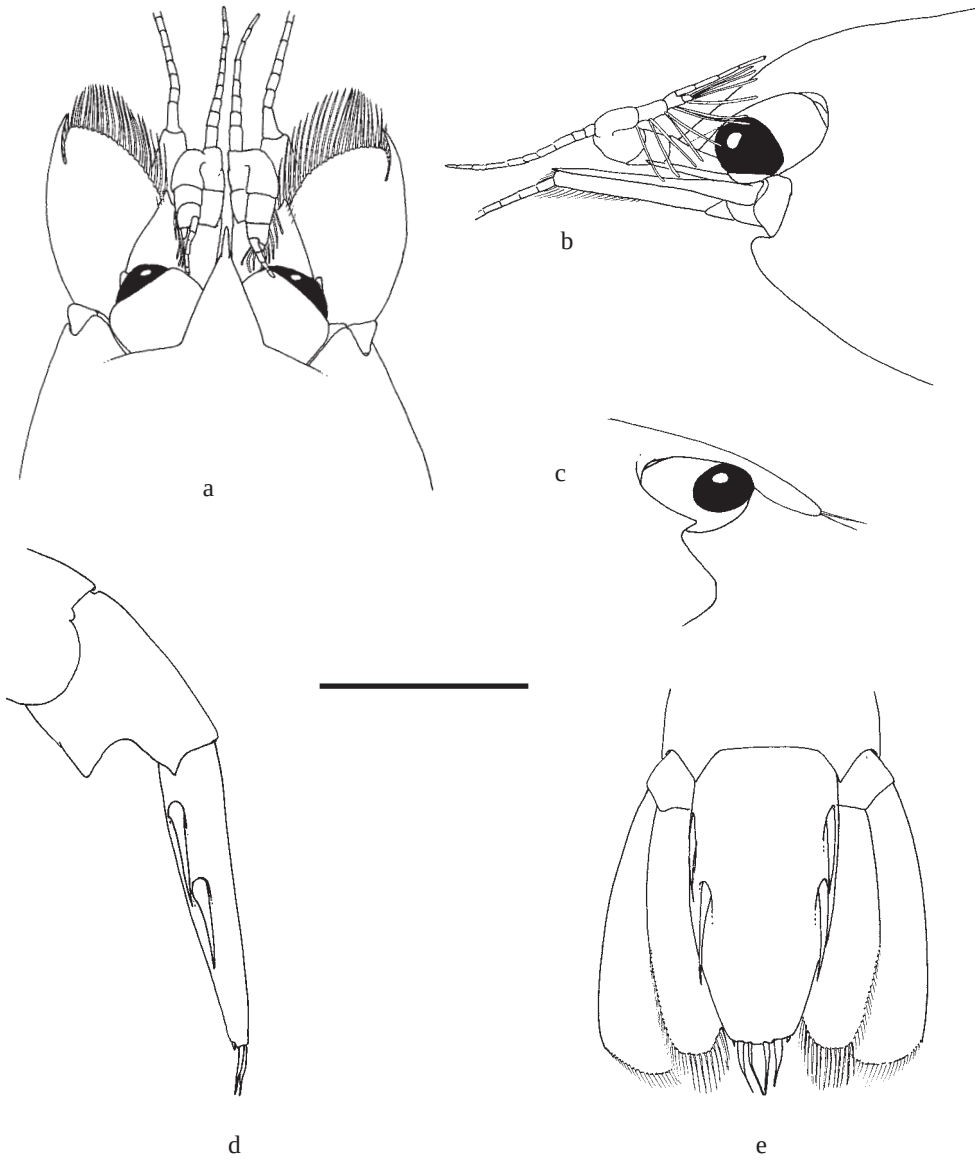


Fig. 148. *Ascidonia miserabilis* (Holthuis, 1951): ovigerous female, pocl. 2.7 mm, MNHN. a, anterior appendages, dorsal view; b, anterior appendages, lateral view; c, rostrum, lateral view; d, distal part abdomen, lateral view; e, telson and uropods, dorsal view. Scale = 1 mm.

Abdomen smooth; sixth segment about 1.2 times longer than fifth, 0.7 times as long as wide, posteroventral and posterolateral angles angular; pleura of first five segments broadly rounded.

Telson 1.6 times longer than sixth abdominal segment, about 1.85 times as long as proximal width, lateral margins convex, convergent; posterior border without median process; two pairs of large submarginal dorsal spines at about 0.22 and 0.50 of telson length; distal and proximal pair of spines of equal length, about 0.27 of telson length; posterior margin with three pairs of spines, lateral spines minute, marginal; submedian and intermediate spines of equal length; somewhat shorter than dorsal spines, more slender.

Eyestalk short, about as long as broad, slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella short. Basal segment about 1.6 times as long as proximal width, with acute produced distolateral tooth just overreaching middle of intermediate segment; anterior margin slightly developed; medioventral tooth small, acute, submarginal, situated just distally of midlength of basal segment; stylocerite short, less than half length of basal segment, broad with acute tip, lateral margin without plumose setae. Intermediate segment about as wide as long. Distal segment wider than long. Upper flagellum short, biramous, with three or four segments fused; short free ramus with one segment; longer free ramus with four or five segments. Lower flagellum with about seven segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite about as long as scaphocerite, about 4.2 times longer than distal width; flagellum long and slender, 1.5-2.0 times as long as postorbital carapace length; scaphocerite with lamina about twice as long as central width, anterior margin small, rounded, lateral margin broadly convex; distolateral tooth robust, about 0.22 length of lamina (incl. distolateral tooth) overreaching distal lamina by distal 3rd; incision between distolateral tooth and lamina rather deep.

Epistome with acute anterior median carina; labrum rather small, round.

Paragnath well developed, alae with large subcircular, medially excavated distal lobes, and small rounded oval ventromesial lobes; corpus with median groove, bordered laterally by non-setose, oblique, carinae.

Second thoracic sternite with very large rounded plate, with a row of simple annulate short setae along its margin.

Third thoracic sternite without ornamentation.

Fourth thoracic sternite with indistinct lateral shallow carinae posteromedial of first pereiopods; without ridge between first pereiopods.

Fifth thoracic sternite with well developed lateral plates posteromedial to second pereiopod coxae, with excavation in between.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process with five or six acute distal teeth, row of 4-8 small denticles along medioventral margin, some denticles may also be present along dorsodistal margin; molar process robust, with three blunt distal teeth, some fringed with setal brushes.

Maxillula with upper lacinia rather small, rectangular, with two rows of 13-15 spines and few simple slender setae in distal part; lower lacinia of moderate size,

blunt triangular, densely setose distoventrally and marginally; palp bilobed, larger lobe with small ventral tubercle with single short recurved simple setae.

Maxilla with basal endite well developed, bilobed; distal lobe longer than proximal lobe, both with 5-10 long slender minutely serrulate setae along distomedian border, median border without setae; coxal endite obsolete, median margin convex, nonsetose; scaphognathite large, 3.4 times longer than wide, posterior lobe large, 1.9 times

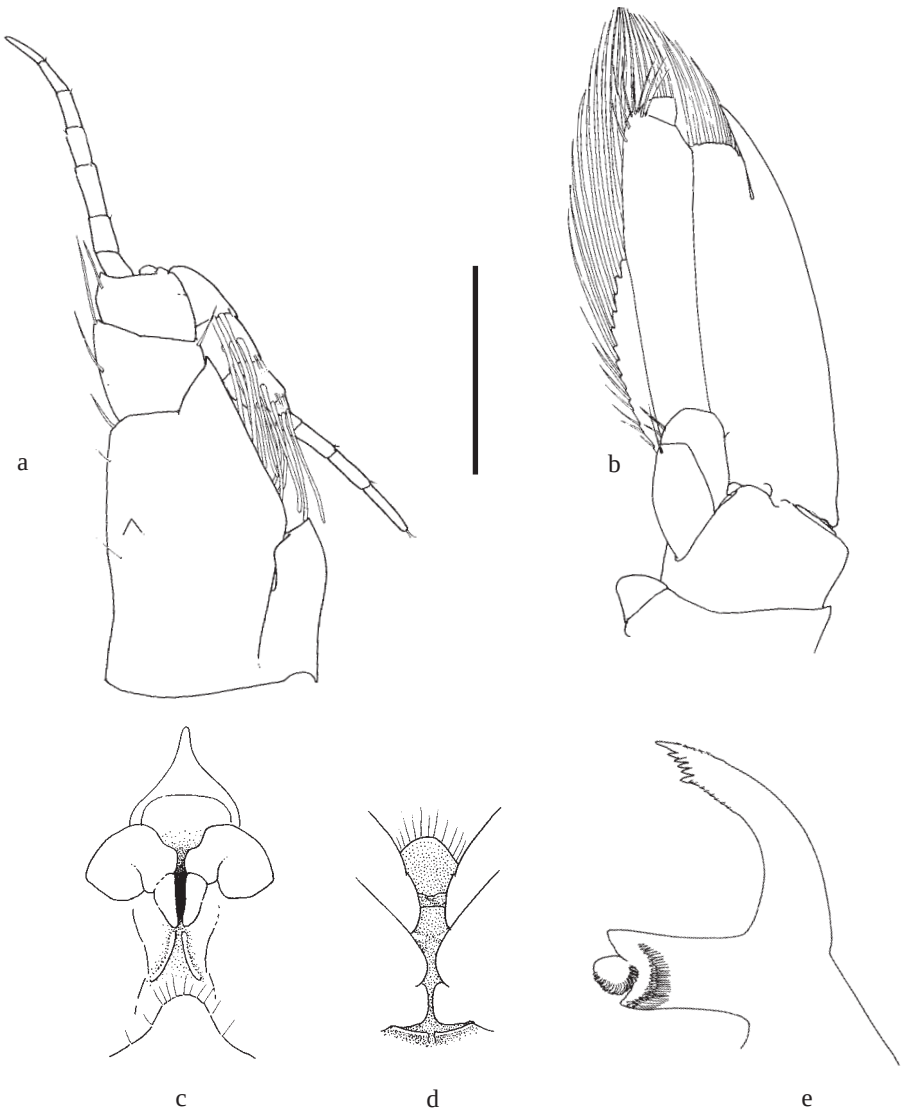


Fig. 149. *Ascidonia miserabilis* (Holthuis, 1951): ovigerous female, pocl. 2.7 mm, MNHN. a, antennula, ventral view; b, antenna, ventral view; c, paragnath, ventral view; d, second to fifth thoracic sternites; e, mandible, ventral view. Scale: a, b = 0.6 mm; c, d = 1 mm; e = 0.6 mm.

Fig. 150. *Ascidonia miserabilis* (Holthuis, 1951): ovigerous female, pocl. 2.7 mm, MNHN. a, maxillula, ventral view; b, maxilla, ventral view; c, first maxilliped, ventral view; d, second maxilliped, ventral view. Scale: a, b = 0.6 mm; c, d = 0.75 mm.

longer than wide, anterior lobe 1.5 times longer than wide; palp simple, falling short of distal lamina of basal endite, strongly expanded proximally, strongly tapered distally, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite completely fused, large and broad, fringed with many long, finely serrulate setae along entire median margin, with row of more sparse, long, simple, submarginal setae ventrally; exopod well developed, flagellum with about six long, plumose setae distally; caridean lobe large, elongate, narrow; epipod large, triangular, distinctly bilobed; palp simple, slender, elongate, curved along distolateral margin of basal endite, non-setose.

Second maxilliped with endopod very large; dactylar segment narrow, about 5.5 times longer than broad, densely fringed with coarsely serrulate, spiniform, and long, curled, finely serrulate setae medially; propodal segment with row of spines and long, simple, and finely serrulate setae along expanded distomedian margin, with one long serrulate seta at distal part of ventrolateral margin; carpal segment short, broader than long, unarmed; meral segment with row of long plumose setae medially; basal and ischial segment partly fused, with distinct suture ventrally, both segments medially somewhat excavate, both with rows of long plumose setae medially; exopod normal, with about 6 long plumose setae distally; coxal segment not medially produced, with few simple setae, with trapezoidal epipod laterally.

Third maxilliped reaching with ultimate segment to distal margin of carpocerite, or falling just short of it; ischiomerus almost completely fused with basis, suture medially visible; ischiomerus almost twice as long as broad, somewhat tapering distally, flattened, lateral margin with long plumose setae; basal segment medially convex; both ischiomeral and basal segments with dense cover of curled setae along median margin and on ventral surface; exopod well developed, not reaching beyond ischiomeral segment, with many long plumose setae in distal half; coxa without median process, with large lateral plate without setae; with rudimentary arthrobranch, no filaments visible; ultimate and penultimate segments with dense cover of simple and serrulate setae; penultimate segment about twice as long as broad, about third of ischiomeral length; ultimate segment slightly shorter than penultimate segment, tapering distally.

First pereiopods slender, extending beyond carpocerite with chela and entire carpus. Chela about 3.8 times longer than deep, subcylindrical; fingers slender, as long as palm, with entire cutting edges, with groups of many, strong, long, serrulate setae, tips acute, hooked; cleaning organ on carpal-propodal joint distinct; carpus as long as chela, about 3.5 times longer than distal width, slightly tapering proximally, unarmed, with scattered, long, simple setae; merus slightly longer than carpus, about 4.3 times longer than central width, unarmed, with many simple setae, especially along median margin; ischium 0.6-0.7 times merus length, not expanded medially, with scattered short simple setae; basis 0.5 of ischium length, with many simple setae medially; coxa with large rounded ventral lobe with many simple setae.

Second pereiopods unequal, dissimilar. Major chela about 1.2 times postorbital carapace length in adult females, to 2.0 in adult males; palm strongly compressed, with proximally entire, distally indistinctly serrate, carinate, median border with slender setae in distal part, not carinate, lateral border not carinate; fingers 0.5 times palm length; dactylus about 4.3 times longer than deep, with large simple triangular tooth at proximal third of cutting edge, distal part entire, straight or slightly concave, tip

strongly hooked, distolateral border entire with many slender simple setae, without median carina; fixed finger about 1.6 times longer than deep, with acute tooth just proximal of tooth on dactylus and acute triangular tooth just distal of tooth on dactylus, distal part of cutting edge entire, concave, tip strongly hooked, median fossa for reception of dactylar tooth when fingers closed absent; carpus short and stout, 0.6 of palm length, expanding distally, 1.8 times as long as distal width, unarmed; merus about as long as carpus, 1.8 times longer than central width, distomedial border excavate; ischium slightly longer than merus, without distomedial protuberance; basis and coxa without special features. Minor chela 1.3 times longer than postorbital carapace length in adult females to 1.5 times in adult males, strongly compressed, with entire, carinate, median border with many long slender setae, lateral border not carinate; fingers almost as long as palm, with several indistinct small teeth in proximal part of concave cutting edges, tips strongly hooked, with many long slender simple or

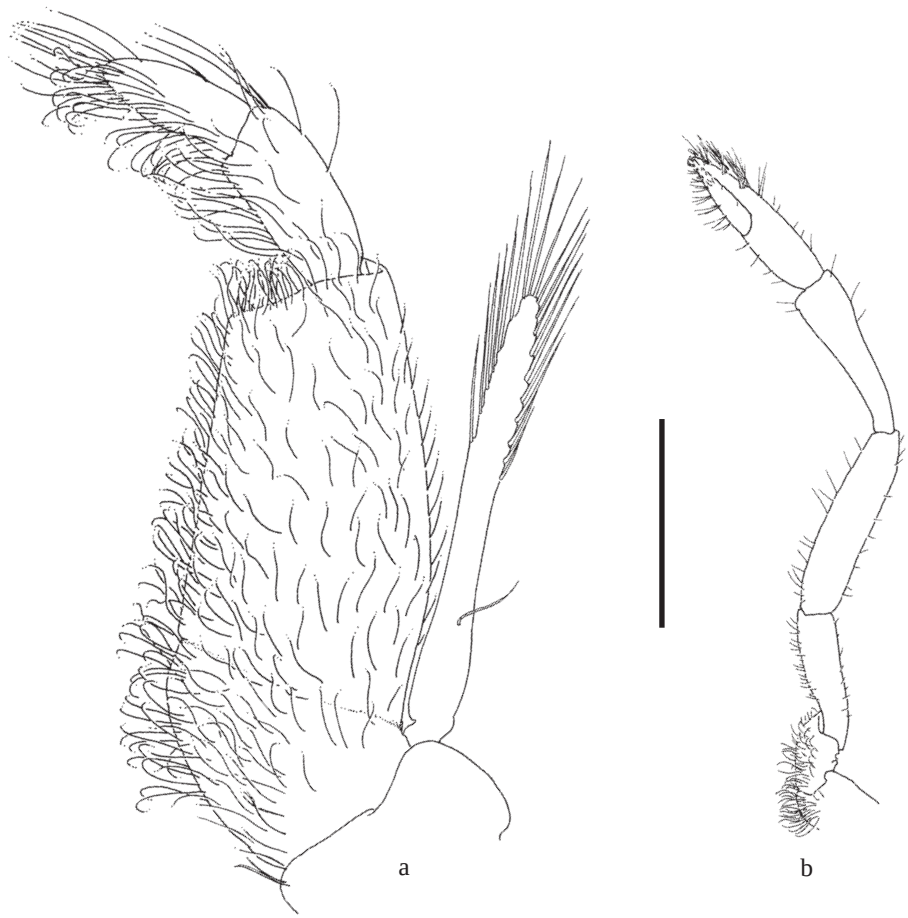


Fig. 151. *Ascidonia miserabilis* (Holthuis, 1951): ovigerous female, pocl. 2.7 mm, MNHN. a, third maxilliped, ventral view; b, first pereiopod. Scale: a = 0.6 mm; b = 1.5 mm.

minutely serrulate setae; dactylus 5.0 times longer than deep, fixed finger 2.1 times longer than deep; carpus, merus, ischium, basis and coxa as in major cheliped.

Ambulatory pereiopods similar; dactylus of third pereiopod compressed, corpus about twice as long as proximal width, with few simple setae on dorsal surface and dense cover of simple setae along slightly convex ventral border, accessory tooth

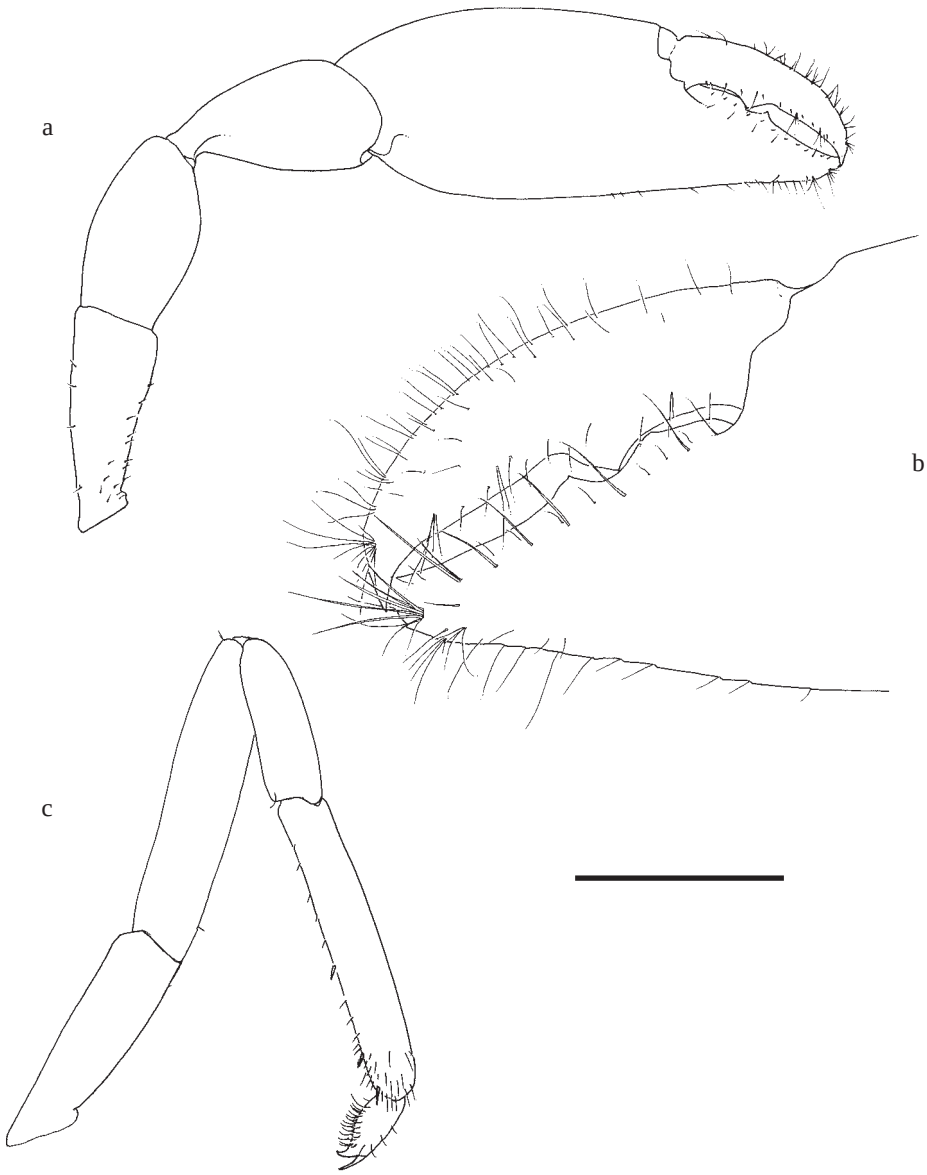


Fig. 152. *Ascidonia miserabilis* (Holthuis, 1951): ovigerous female, pocl. 2.7 mm, MNHN. a, major second pereiopod; b, idem, chela; c, third pereiopod. Scale: a, c = 1.5 mm; b = 0.6 mm.

acute, strongly curved, terminal, with minute denticulation; unguis slender, acute, slightly curved, simple, about 0.45 of corpus length, indistinctly denticulate dorsally; propodus 3.5 times longer than dactylus, almost six times as long as wide, with two distoventral spines and two spines along ventral margin, the proximal spine at midlength, distoventral part with dense cover of short simple setae; carpus 0.5 times propodus length, unarmed; merus as long as propodus, four times longer than central width, unarmed; ischium about 0.6 times merus length, 2.8 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopod similar.

Male first pleopod with endopod about three times longer than proximal width, tapering distally; median margin almost straight with row of about short simple setae, with moderately long plumose setae in distal part and along lateral margin.

Endopod of second pereiopod with appendix masculina as long as appendix interna, with few long robust distally setulose setae in distal half of lateral margin.

First pleopod of female with slender endopod, about third of exopod length, with several long simple distal setae when ovigerous, with row of few long plumose setae on lateral margin and one simple seta along medial margin.

Uropods with protopod posterolaterally blunt; exopod almost twice as long as central width, lateral margin convex, with small mobile spine posteriorly, without posterolateral tooth, distal margin broadly rounded; endopod extending beyond exopod slightly more than twice as long as central width, slightly longer than telson.

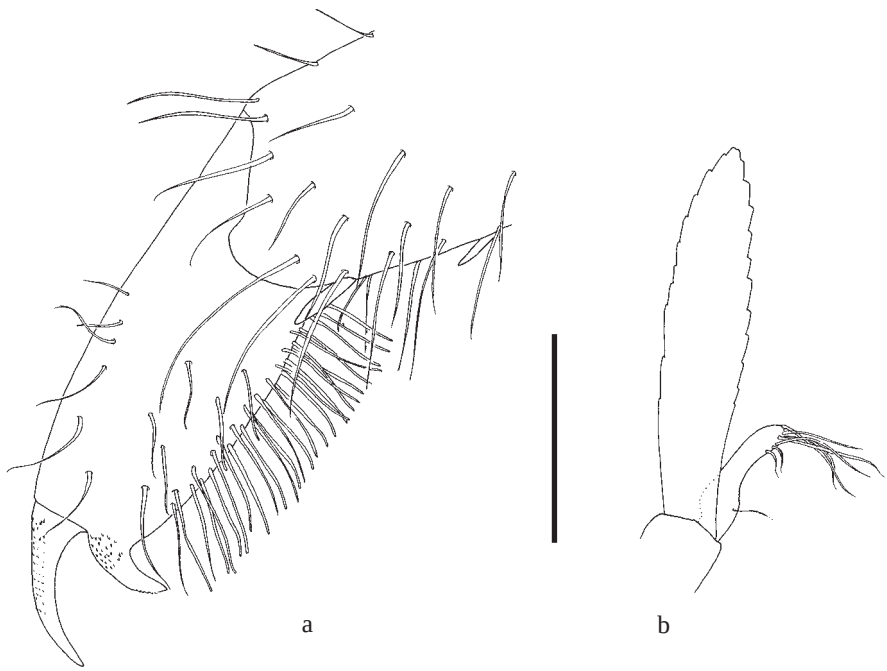


Fig. 153. *Ascidonia miserabilis* (Holthuis, 1951): ovigerous female, pocl. 2.7 mm, MNHN. a, dactylus third pereiopod; b, endopod female first pleopod. Scale: a = 0.15 mm; b = 0.6 mm.

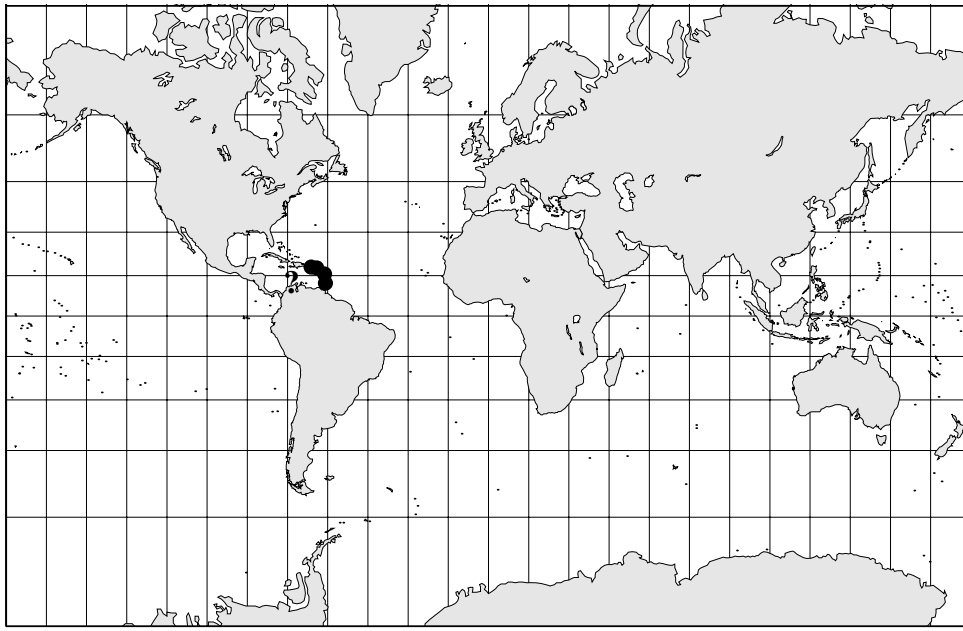


Fig. 154. Geographic distribution of *Ascidonia miserabilis* (Holthuis, 1951).

Ovigerous females with 50-100 eggs. Embryo on point of hatching about 0.5-0.6 mm long.

Size.— Small sized species. Maximum postorbital carapace length 2.0 mm in males, 2.7 mm in females. Minimum postorbital carapace length in ovigerous female 2.6 mm.

Colouration.— Unknown.

Type.— Holotype: ovigerous female, total length 8 mm (U.S.N.M. Cat. no. 24669): off Vieques Island, Porto Rico; depth 29 m; coral, tangle; 8.ii.1899.

Distribution.— WEST ATLANTIC: Caribbean Sea: Vieques Island, Porto Rico (Holthuis, 1951a); Antigua Island (Chace, 1972); Martinique (present study); Colombia: ? Santa Marta, depth 10 m (Criales, 1984).

Host.— Until now the host-species was not known. It is now recorded for the first time as *Ascidia interrupta* Heller, 1878. The specimen found by Criales (1984) in *Spondylus americanus* Hermann, 1781, might be misidentified. The host indicates that it might be *P. manningi* Fransen, 2000.

8.3.5. *Ascidonia pusilla* (Holthuis, 1951) comb. nov.
(figs. 155-162)

Pontonia pusilla Holthuis, 1951a: 142, pl. 45 figs. a-k; Holthuis, 1952: 16; Chace & Bruce, 1993: 62; Müller, 1993: 124; Wicksten & Hernández, 2000: 97.

Pontonia spighti Fujino, 1972: 293, figs. 1-3; Chace & Bruce, 1993: 62; Wicksten & Hernández, 2000: 97.

Material.— **EAST PACIFIC**: **Ecuador**.— USNM 90159: 1 ovigerous female, holotype**,** total length 7 mm; 1 non-ovigerous female, paratype; Salango Island; depth 3 fms; 18.i.1935; sand; leg. W.L. Schmitt, station 398-35.— **Panama**.— USNM 90161: 1 non-ovigerous female, paratype; Bahia Honda; 10.iii.1933; shallow water, coral; leg. W.L. Schmitt, station 114-33.— USNM 90160: 1 non-ovigerous female, paratype:

Secos Island; depth 14 fms; 5.ii.1935; leg. W.L. Schmitt, station 450-35.— MNHN: 1 male, pocl. 3.8 mm; 1 ovigerous female, pocl. 5.3 mm; Pearl Islands; in *Pyura lignosa* Michaelsen, 1908; leg. F. & Cl. Monniot.— MNHN-Na 11266: 1 ovigerous female, pocl. 1.8 mm; Galapagos Islands; littoral.

Description.— Body subcylindrical, slightly depressed. Carapace smooth. Rostrum well developed, reaching distal end of antennular peduncle, and distal margin of scaphocerite, without dorsal nor lateral carinae, with straight ventral carina in distal part; distal end blunt in lateral view, without small ventro-distal tooth, with few long simple distal setae, bluntly acute in dorsal view, slightly broadened at base. Inferior orbital angle strongly produced, blunt in lateral view. Antennal spine reduced to blunt protrusion. Anterolateral margin straight or slightly concave, anterolateral angle produced.

Abdomen smooth; sixth segment about 1.25 times longer than fifth, 0.8 times as long as wide, posteroventral and posterolateral angles blunt; pleura of first five segments broadly rounded.

Telson 1.7 times longer than sixth abdominal segment, about 1.85 times as long as proximal width, lateral margins convex, convergent; posterior border without median process; two pairs of large submarginal dorsal spines at about 0.12 and 0.35 of telson length; distal pair of spines distinctly longer than proximal pair of spines, 0.20 of telson length; posterior margin with three pairs of spines, lateral spines very small, marginal; submedian and intermediate spines of equal length; about as long as proximal dorsal spines, but more slender.

Eyestalk short, about as long as broad, slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella short. Basal segment about 1.4 times as long as proximal width, with blunt strongly produced distolateral tooth reaching distal margin of intermediate segment, anterior margin not developed, oblique; medioventral tooth acute, small, submarginal, situated at 2/3rd of basal segment; stylocerite short, about half length of basal segment, broad with broad blunt tip, lateral margin with plumose setae. Intermediate segment twice as broad as long. Distal segment about 1.5 times broader than long. Upper flagellum short, biramous, with three or four segments fused; short free ramus one-segmented; longer free ramus with 5 segments. Lower flagellum with six to eight segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite extending well beyond distolateral tooth of scaphocerite, three times as long as distal width; flagellum short, slender, slightly shorter than postorbital carapace length; scaphocerite with lamina about 1.8 times as long as wide, anterior margin rounded, lateral margin broadly convex; distolateral tooth robust, about 0.36 length of lamina (incl. distolateral tooth) overreaching distal lamina by distal 3rd; incision between distolateral tooth and lamina very deep.

Epistome with rather acute anterior median carina; labrum large, broad, oval.

Paragnath well developed, alae with large subcircular, medially excavated distal lobes, and small rounded oval ventromesial lobes; corpus with median groove, bordered laterally by non-setose, oblique, carinae.

Second thoracic sternite with median triangular, distally rounded setose process.

Third thoracic sternite with indistinct shallow lateral carinae between third maxillipeds.

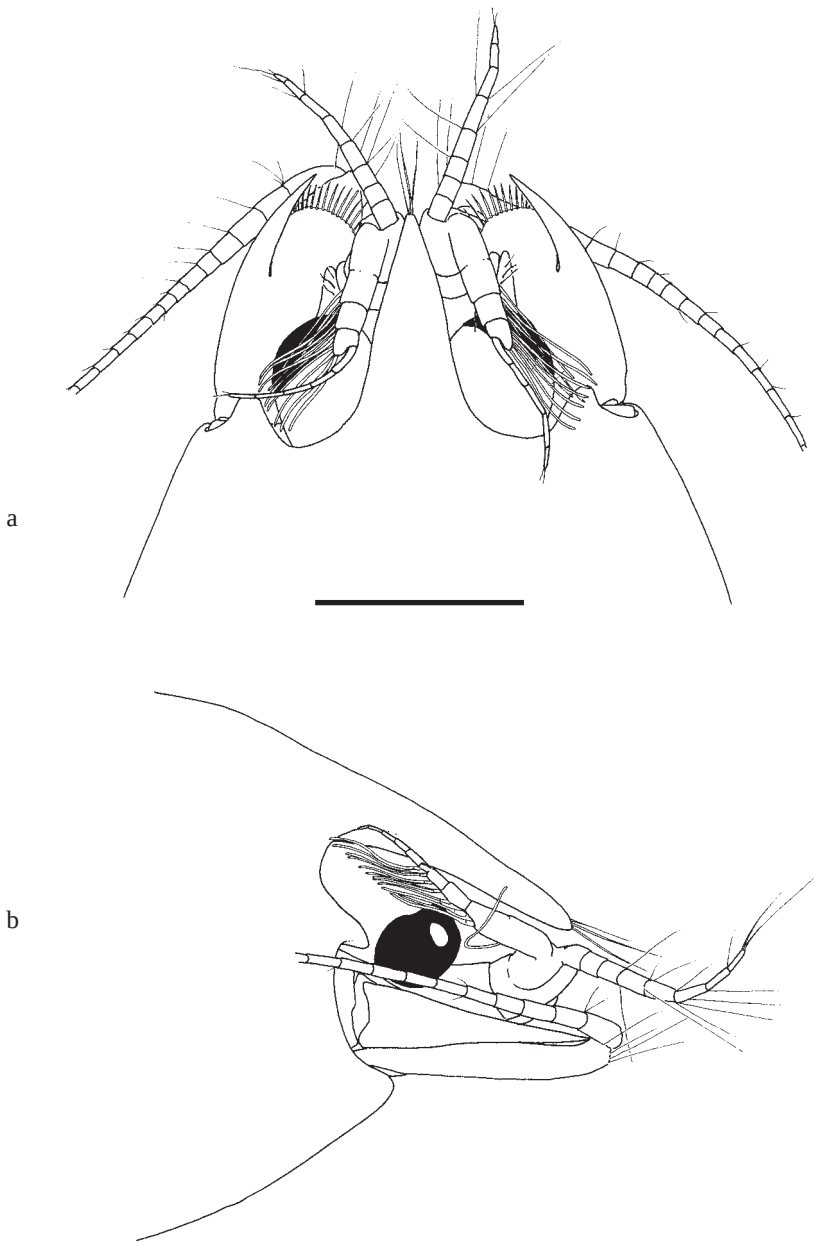


Fig. 155. *Ascidonia pusilla* (Holthuis, 1951): male, pocl. 3.8 mm, MNHN. a, anterior appendages, dorsal view; b anterior appendages, lateral view. Scale = 1 mm.

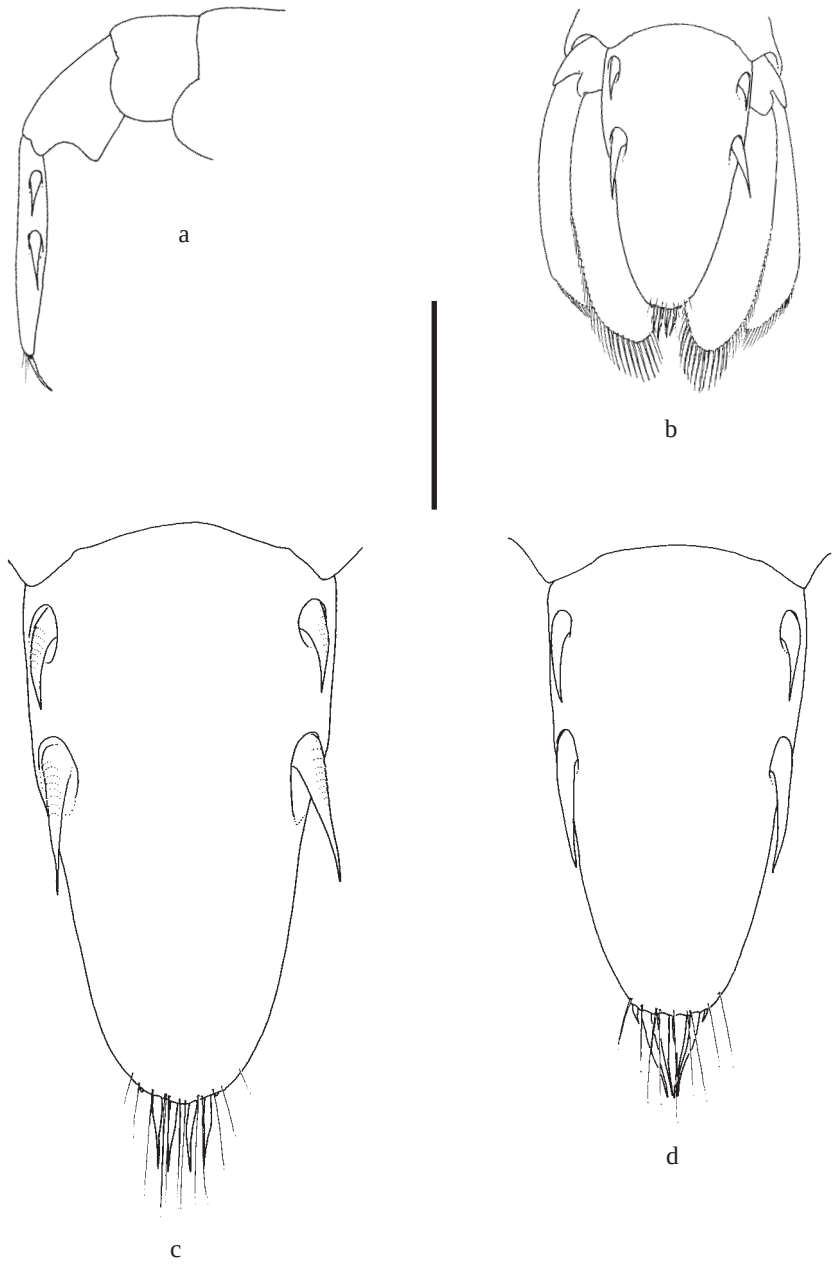


Fig. 156. *Ascidonia pusilla* (Holthuis, 1951): male, pocl. 3.8 mm (figs. a, c); ovigerous female, pocl. 5.3 mm (figs. b, d), MNHN. a, distal part abdomen, lateral view; b, telson and uropods, dorsal view; c, male telson, dorsal view; d, female telson, dorsal view. Scale: a, b = 2 mm; c, d = 1 mm.

Fourth thoracic sternite with indistinct lateral carinae with median broad shallow notch posteromedial of first pereiopods; without transverse ridge between first pereiopods.

Fifth thoracic sternite with well developed lateral plates with medial deep slit, posteromedial to second pereiopod coxae.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process with five to seven acute distal teeth, with row of about eight small denticles along ventromedial margin; molar process robust, with four blunt teeth, some fringed with setal brushes.

Maxillula with upper lacinia rectangular with two rows of about 13 spines and few setae distally; ventral lacinia triangular, with many setae distoventrally and marginally, no differentiation in setae; palp bilobed, larger lobe with small ventral tubercle with single, short, recurved, simple setae.

Maxilla with basal endite well developed, bilobed; distal lobe longer and broader than proximal lobe, both with long, slender, minutely serrulate setae along distomedian margins, median margin without setae; coxal endite obsolete; median margin convex, without setae; scaphognathite large, 3.0 times longer than wide, posterior lobe twice as long as anterior width, anterior lobe 1.5 times longer than proximal width; palp simple, slightly shorter than distal lobe of basal endite, strongly expanded proximally, tapered distally to rather acute tip, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite completely fused, large and broad, fringed with many long, finely serrulate setae along entire median margin, with row of more sparse, long, simple, submarginal setae ventrally; exopod well developed, flagellum with eight to ten long, plumose setae distally; caridean lobe large, elongate; epipod large, triangular, distinctly bilobed; palp simple, slender, elongate, curved along distolateral margin of basal endite, non-setose.

Second maxilliped with endopod very large; dactylar segment narrow, about 4.5 times longer than broad, densely fringed with coarsely serrulate, spiniform, and long, curled, finely serrulate setae medially; propodal segment with row of spines and long, simple, and finely serrulate setae along expanded distomedian margin, with one long serrulate seta at distal part of ventrolateral margin; carpal segment short, broader than long, unarmed; meral segment without plumose setae medially; basal and ischial segment completely fused, both segments medially flat, not excavate, without setae medially; exopod normal, with about eight to ten long plumose setae distally; coxal segment not medially produced, with few simple setae, with trapezoidal epipod laterally.

Third maxilliped reaching with ultimate segment halfway carpocerite; ischiomerus almost completely fused with basis, suture medially visible; ischiomerus 2.5 times as long as broad, somewhat tapering distally, flattened, lateral margin with row of few setae; basal segment medially convex; both ischiomeral and basal segments with long simple setae along median margin, only few in disto-median part of ventral surface; exopod well developed, about as long as ischiomeral segment, with several long plumose setae in distal fourth and few short simple setae more proximally; coxa without median process, with large lateral plate with few short simple setae, with rudimentary arthrobranch, no filaments visible; ultimate and penultimate segments with simple and serrulate setae; penultimate segment almost as long as broad, expanded

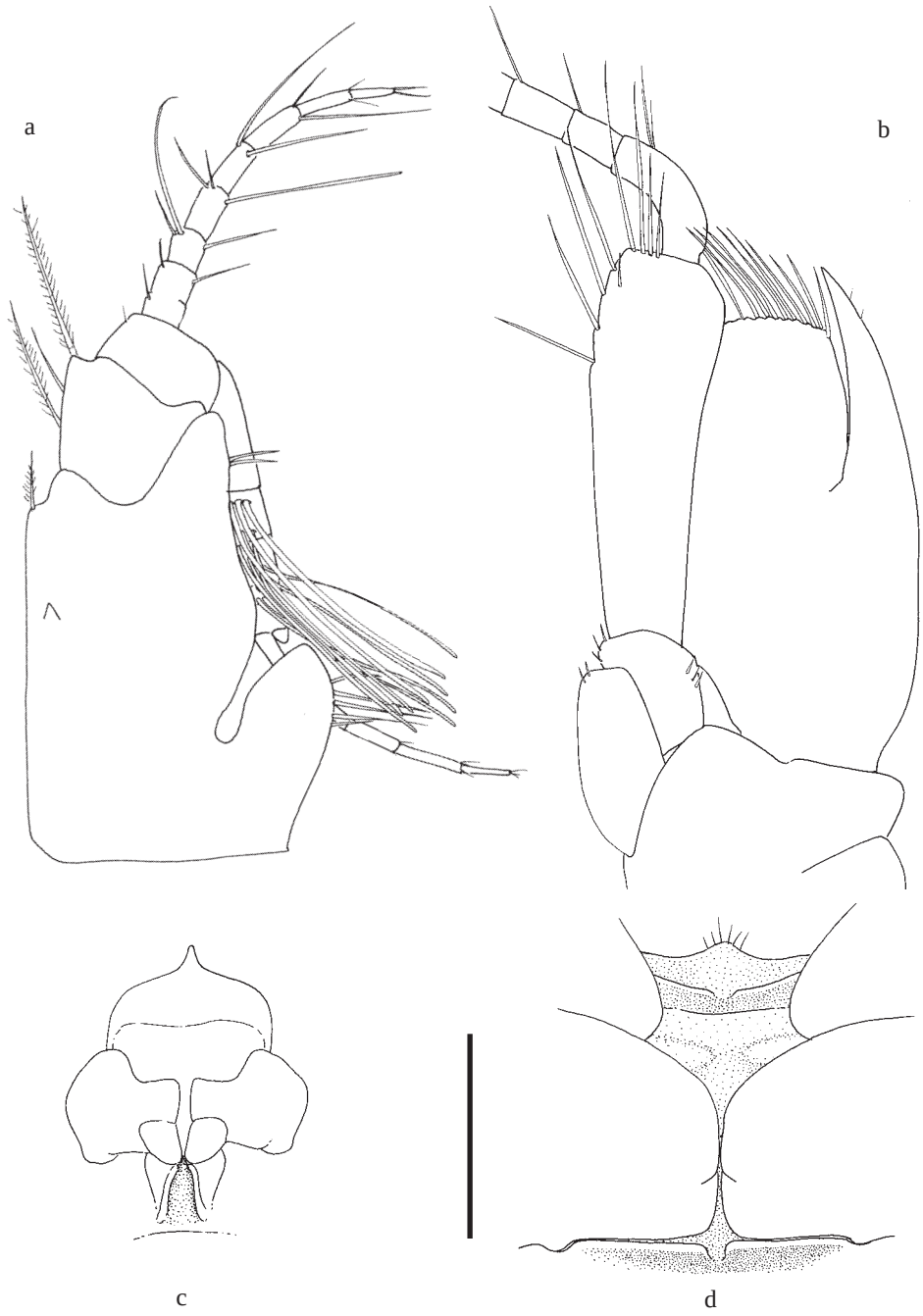


Fig. 157. *Ascidonia pusilla* (Holthuis, 1951): male, pocl. 3.8 mm (figs. a-c); ovigerous female, pocl. 5.3 mm (fig. d), MNHN. a, antennula, ventral view; b, antenna, ventral view; c, paragnath, ventral view; d, second to fifth thoracic sternites. Scale: a, b = 0.6 mm; c, d = 1 mm.

medially, about 0.4 of ischiomeral length; ultimate segment as long as penultimate segment, more slender, tapering distally.

First pereiopods moderately slender, extending beyond carpocerite with chela and entire carpus. Chela about four times longer than deep, subcylindrical; fingers slender, as long as palm, with entire cutting edges, with groups of many, strong, long, serrulate setae, tips acute, hooked; cleaning organ on carpal-propodal joint distinct; carpus 1.2 times as long as chela, about five times longer than distal width, slightly tapering proximally, unarmed, with scattered, simple setae; merus slightly shorter than carpus, about 4.3 times longer than central width, unarmed, with many

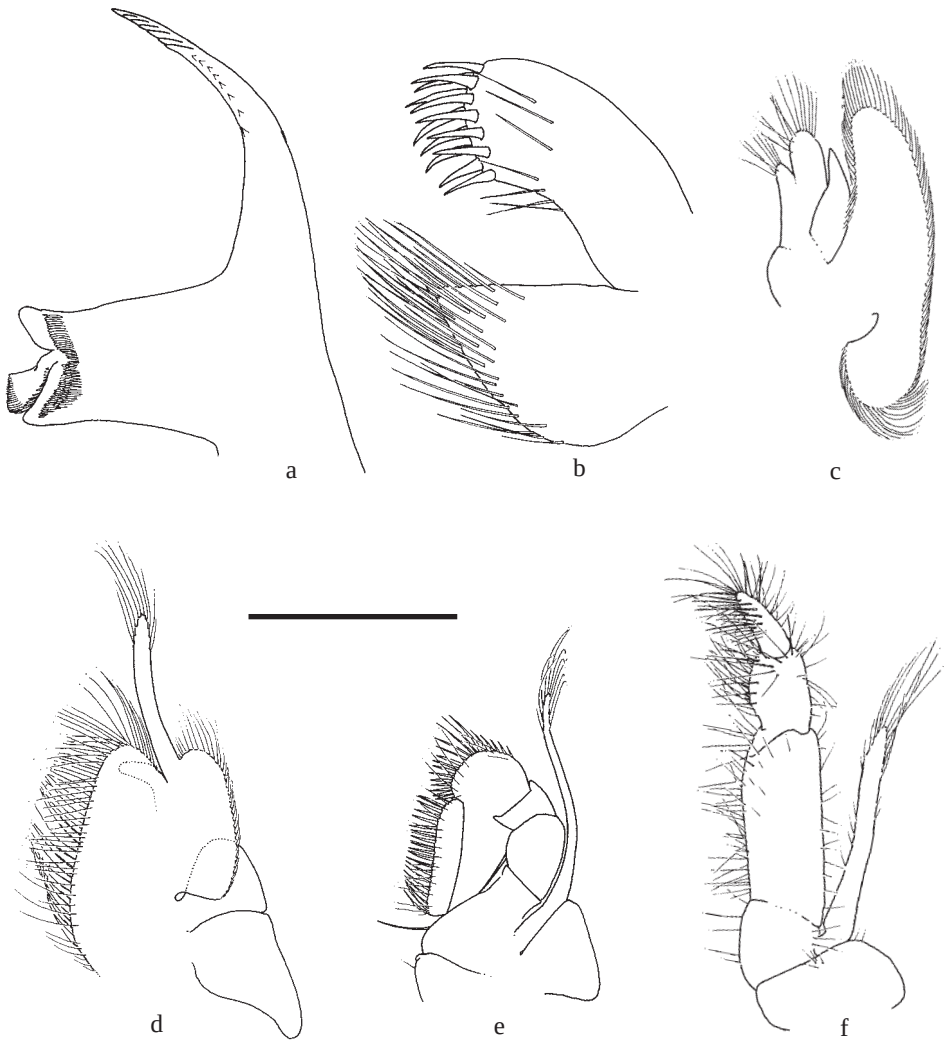


Fig. 158. *Ascidonia pusilla* (Holthuis, 1951): male, pocl. 3.8 mm, MNHN. a, mandible, ventral view; b, maxillula, ventral view; c, maxilla, ventral view; d, first maxilliped, ventral view; e, second maxilliped, ventral view; f, third maxilliped, ventral view. Scale: a, b = 0.6 mm; c-f = 1.5 mm.

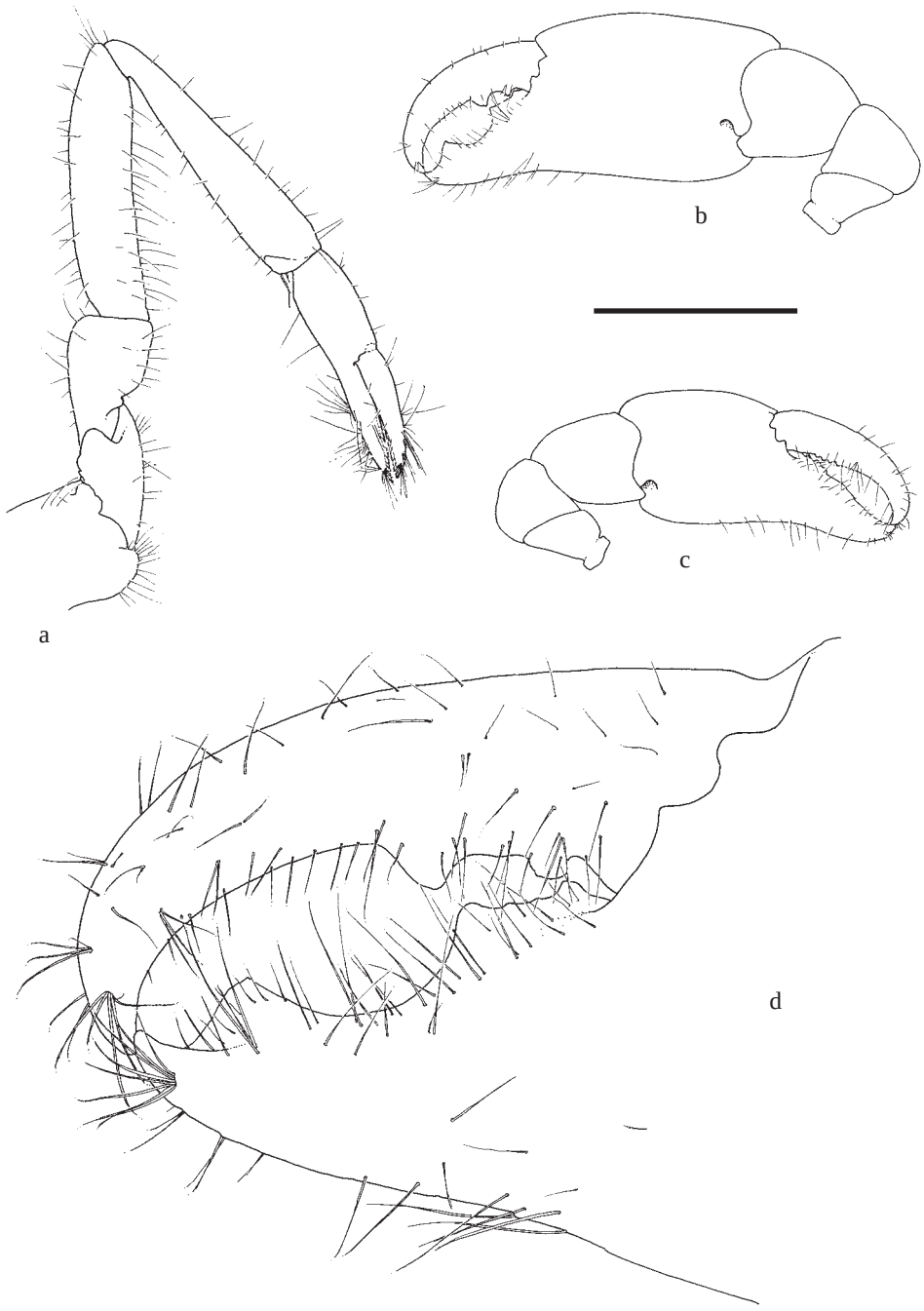


Fig. 159. *Ascidonia pusilla* (Holthuis, 1951): male, pocl. 3.8 mm, MNHN. a, first pereiopod; b, major second pereiopod; c, idem, chela; d, minor second pereiopod. Scale a = 1.5 mm; b, d = 4 mm; c = 1 mm.

simple setae, especially along median margin; ischium 0.5-0.6 times merus length, not expanded medially, with scattered short simple setae; basis about as long as ischium, with simple setae medially; coxa with large rounded ventral lobe with many simple setae.

Second pereiopods subequal in size and form. Major chela about 1.1 times postorbital carapace length in adult females, to 1.7 in adult males; palm strongly compressed, with proximally entire, carinate, median border with slender setae in distal part, lateral border not carinate; fingers 0.6 times palm length; dactylus about four times longer than deep, with large blunt, simple tooth at proximal third and smaller blunt tooth at proximal fifth of cutting edge, distal part entire, concave, tip strongly hooked, distolateral border entire with many slender simple setae, without medial carina; fixed finger about 1.3 times longer than deep, with irregular broad tooth just proximal of tooth on dactylus and acute triangular tooth at distal fourth, separated by broad concavity, distal part of cutting edge entire, tip strongly hooked, median fossa for reception of dactylar tooth when fingers closed absent; carpus short and stout, 0.5 of palm length, expanding distally, about as long as distal width, unarmed; merus about as long as carpus, about as long as central width, distomedial border excavate; ischium shorter than merus, without distomedial protuberance, strongly tapering proximally; basis and coxa without special features. Minor chela as long as postorbital carapace length in adult females to 1.4 times in adult males, strongly compressed, with entire, carinate, median border with many long slender setae, lateral border not carinate; fingers almost as long as palm, with five to seven irregular teeth on dactylus and four or five on fixed finger, distal half of cutting edges entire, strongly concave, tips strongly hooked, with many long slender simple or minutely serrulate setae; dactylus four times longer than deep, fixed finger twice as long as deep; carpus, merus, ischium, basis and coxa as major cheliped.

Ambulatory pereiopods similar; dactylus of third pereiopod compressed, corpus about 1.5 times as long as proximal width, with few simple setae on dorsal surface and many simple setae along convex ventral border, accessory tooth acute, straight, perpendicular to corpus length, terminal, entire; unguis slender, acute, slightly curved, simple, about 0.5 of corpus length, indistinctly denticulate dorsally; propodus 3.5 times longer than dactylus, four times as long as wide, with two small subdistal ventral spines and one or two even smaller spines along ventral margin, proximal spine at distal 2/3rd of length, distoventral part with some short simple setae; carpus 0.6 times propodus length, unarmed, with small distal lobe; merus slightly shorter than propodus, swollen, less than three times as long as wide, unarmed; ischium about 0.5 times merus length, 1.7 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopod similar but less robust; propodus of fourth and fifth pereiopod with one to three small ventral spines in distal third and two more robust ventral distolateral spines.

Male first pleopod with endopod about four times longer than proximal width, tapering distally; median margin almost straight with row of about five short simple setae, with moderately long plumose setae in distal part and along lateral margin.

Endopod of second pereiopod with appendix masculina slightly shorter than appendix interna, with robust distally setulose setae in distal half of lateral margin.

First pleopod of female with slender endopod, about third of exopod length, with

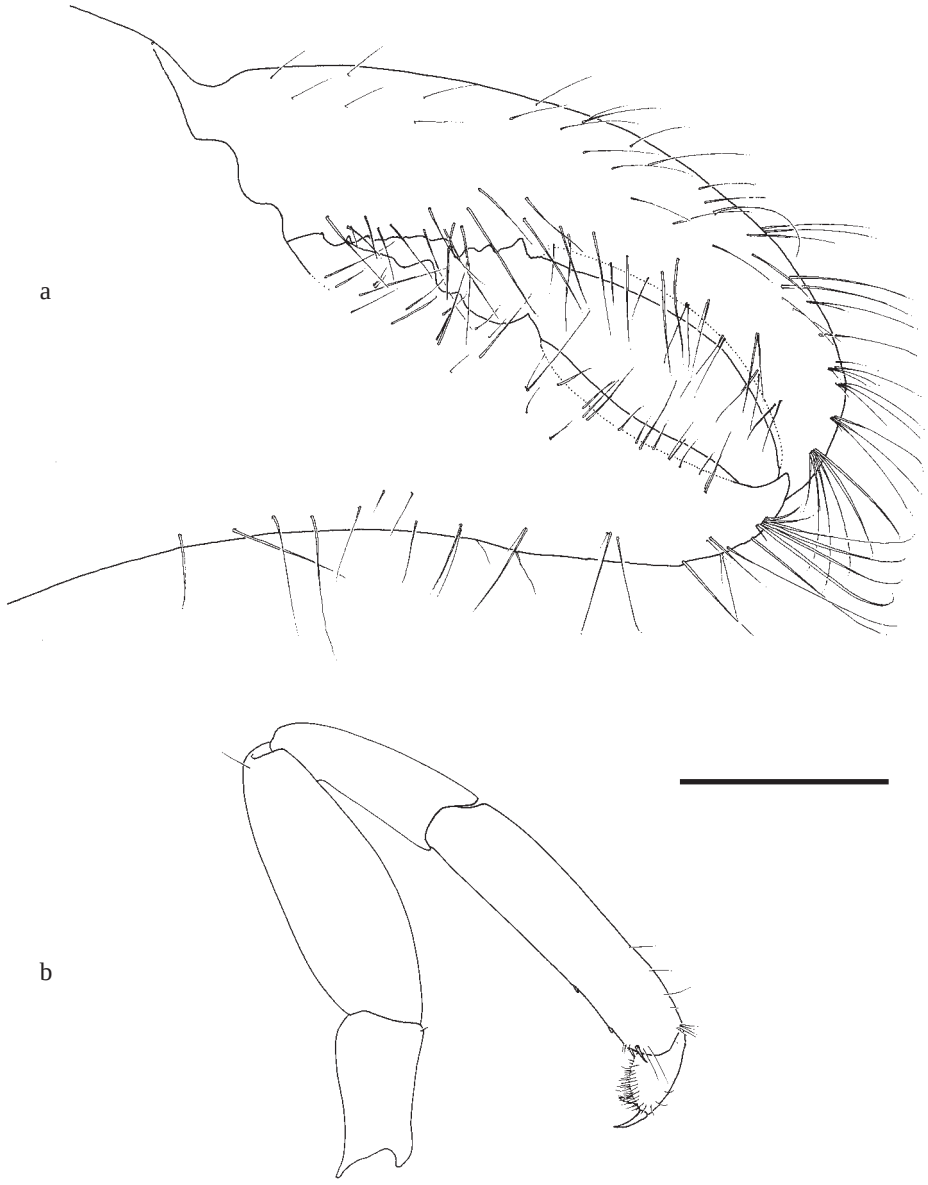


Fig. 160. *Ascidonia pusilla* (Holthuis, 1951): male, pocl. 3.8 mm, MNHN. a, minor second pereiopod, chela; b, fifth pereiopod. Scale: a = 1 mm; b = 1.5 mm.

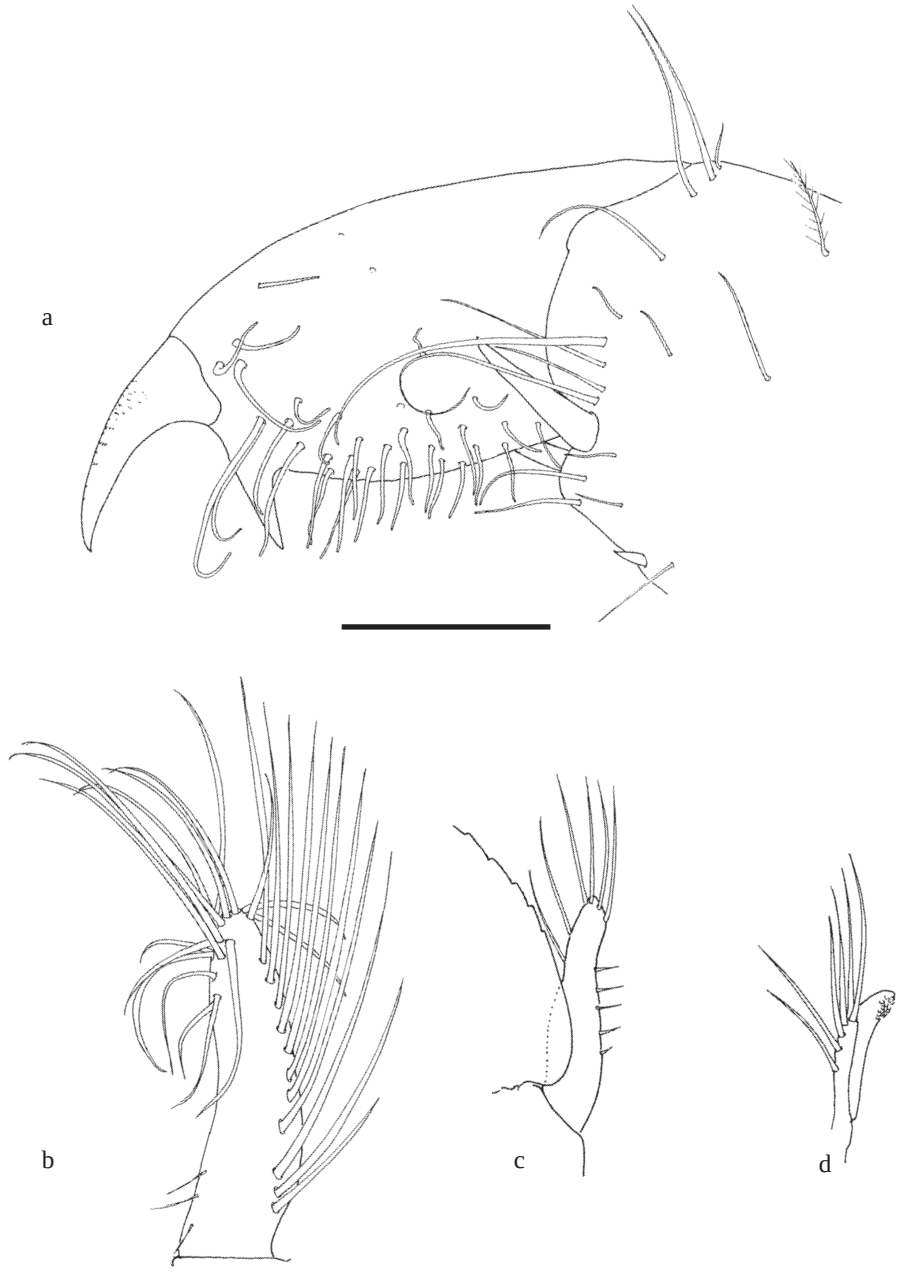


Fig. 161. *Ascidonia pusilla* (Holthuis, 1951): male, pocl. 3.8 mm (figs. a, c, d); ovigerous female, pocl. 5.3 mm (fig. b), MNHN. a, dactylus third pereiopod; b, endopod female first pleopod; c, endopod male first pleopod; d, appendix interna and appendix masculina on second male pleopod. Scale: a = 0.19 mm; b-d = 0.6 mm.

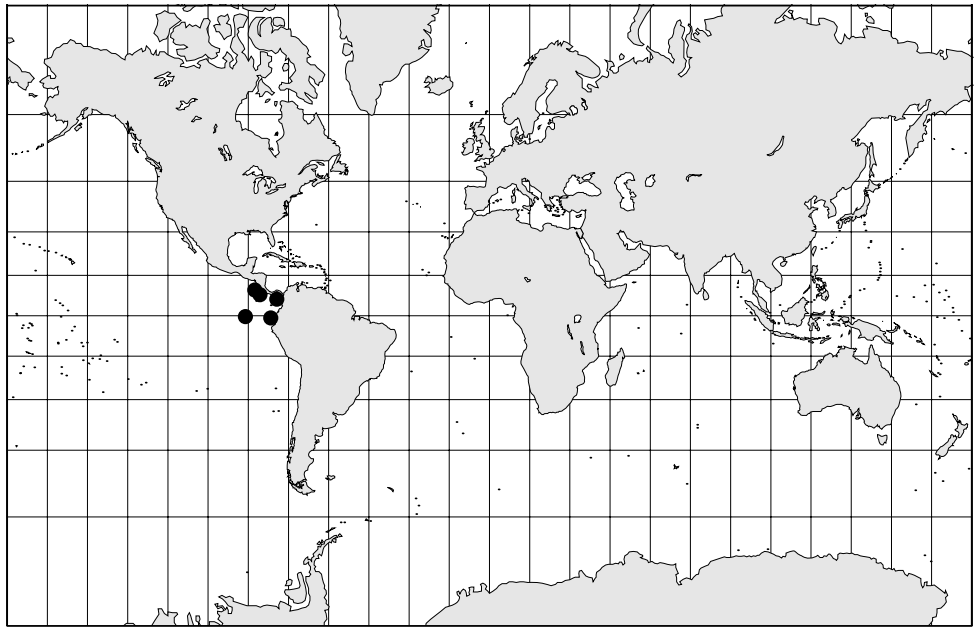


Fig. 162. Geographic distribution of *Ascidonia pusilla* (Holthuis, 1951).

several long simple distal setae when ovigerous, with row of few long plumose setae on lateral margin without setae along medial margin.

Uropods with protopod posterolaterally blunt; exopod almost twice as long as central width, lateral margin convex, with small mobile spine posteriorly, without posterolateral tooth, distal margin broadly rounded; endopod extending beyond exopod slightly more than twice as long as central width, slightly longer than telson.

Ovigerous females with 300-500 eggs. Egg-size 0.45-0.50 mm.

Size.— A small sized species. Maximum postorbital carapace length 3.8 mm in males, 5.3 mm in females. Minimum postorbital carapace length in ovigerous female 1.8 mm.

Colouration.— Not known.

Type.— Holotype: female, total length 7 mm (USNM Cat. no. 90159); Ecuador, Salango Island, depth 6 m; 18.i.1935; Allan Hancock Expedition sta. 398.

Distribution.— EAST PACIFIC: Panama: Secas Island, (Holthuis, 1951a); Bahia Honda, (Holthuis, 1951a). Costa Rica: Playas del Coco (Fujino, 1972, as *Pontonia spighti*). Ecuador: Salango Island (Holthuis, 1951a). The species is now recorded from the Galapagos and Pearl Islands for the first time.

Host.— The species is known from the ascidian *Rhopalaea birkelandi* Tokioka, 1971 (cf. Fujino, 1972). It is now recorded from *Pyura lignosa* Michaelsen, 1908, for the first time.

Remarks.— The specimen from the Galapagos Islands has the distal pair of dorsal telson spines twice as long as the proximal pair.

Pontonia spighti was described on the bases of a single ovigerous female (pocl. 2.3 mm, holotype in collection of Seto Marine Biological Laboratory, SMBL type no. 239) from Playas dec Coco, Costa Rica. Fujino notes six differences between *P. spighti* Fujino,

1972, and *P. pusilla* Holthuis, 1951. After comparison of the type-material and some additional specimens of *A. pusilla* (Holthuis, 1951) with the detailed description of *P. spighti* Fujino, 1972, it is concluded that the noted differences between the species by Fujino (1972) fall within the infra-specific variation of *A. pusilla* (Holthuis, 1951*). P. spighti* Fujino, 1972, is therefore regarded a junior synonym of *A. pusilla* (Holthuis, 1951).

8.3.6. *Ascidonia quasipusilla* (Chace, 1972) comb. nov.
(figs. 163-170, pls. 9, 10)

Pontonia quasipusilla Chace, 1972: 41-43, fig. 10; Cabrera-Peña & Solano-López, 1996: 916.

Material.— **West Atlantic**: **Caribbean Sea**.— USNM 135346: 1 ovigerous female, holotype**,** pocl. 2.8 mm; Antigua, English Harbor, Charlotte Point; 2.iv.1956; leg. Smithsonian-Bredin Expedition, station 73-56.— MNHN: 1 non-ovigerous female, pocl. 1.4 mm; Martinique, Anse Dufour; in *Pyura torpida* (Sluiter, 1898); 1986; leg. F. & Cl. Monniot.— **East Atlantic: Mauritania**.— RMNH D 45619: 1 ovigerous female, pocl. 5.1 mm; sta. MAU.098, off Banc d'Arguin, 19°24'N 16°48'W; depth 26 m; muddy sand, small catch: gorgonians, *Pyura*, hermit crabs, tubeworms; van Veen grab (4x); 16.vi.1988; in *Pyura*; photo.— RMNH D 45620: 1 male, pocl. 3.2 mm; 1 ovigerous female, pocl. 5.8 mm; sta. MAU.122, Mauritania, off Banc d'Arguin, 20°27'N 17°15'W; depth 32 m; shell gravel and bivalve shells, hermit crabs (many with *Suberites*), *Pyura*; 3.5 m Agassiz trawl; 19.vi.1988; in *Pyura*; photo.— RMNH D 45621: 1 non-ovigerous female, pocl. 3.7 mm; sta. MAU.114, Mauritania, off Banc d'Arguin, 20°29'N 17°14'W; depth 36 m; shell gravel with tubeworms (*Lanice*), octopods, gastropods, small crabs, hermit crabs, *Pyura*, flatfish (soleids), *Syngnathus*; 2.4 m Agassiz trawl; 18.vi.1988.

Description.— Body subcylindrical, slightly depressed. Carapace smooth. Rostrum well developed, reaching distal margin of second segment of antennular peduncle, just falling short of distal margin of scaphocerite, without dorsal nor lateral carinae, with straight ventral carina in distal part; distal end blunt in lateral view, without small ventrodistal tooth, with few long simple distal setae, bluntly acute in dorsal view, slightly broadened at base. Inferior orbital angle strongly produced, blunt in lateral view. Antennal spine reduced to blunt protrusion. Anterolateral margin straight or slightly concave, anterolateral angle produced.

Abdomen smooth; sixth segment about 1.25 times longer than fifth, 0.8 times as long as wide, posteroventral and posterolateral angles blunt; pleura of first five segments broadly rounded.

Telson 1.6 times longer than sixth abdominal segment, almost twice as long as proximal width, lateral margins convex, convergent; posterior border without median process; two pairs of large submarginal dorsal spines at about 0.20 and 0.51 of telson length; distal pair of spines distinctly longer than proximal pair of spines, about 0.27 of telson length; posterior margin with three pairs of spines, lateral spines small, about 0.05 times telson length, marginal; submedian and intermediate spines of equal length; about as long as proximal dorsal spines, but more slender.

Eyestalk short, about as long as broad, slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella short. Basal segment about 1.4 times as long as proximal width, with blunt strongly produced distolateral tooth reaching 2/3rd of length of intermediate segment, anterior margin not developed, oblique; medioventral tooth acute, small, submarginal, situated at 2/3rd of basal segment; stylocerite short,

about half length of basal segment, broad with broad blunt tip, lateral margin with plumose setae. Intermediate segment twice as broad as long. Distal segment about 1.5 times broader than long. Upper flagellum short, biramous, with three segments fused; short free ramus one-segmented; longer free ramus with four to six segments. Lower flagellum with about six segments.

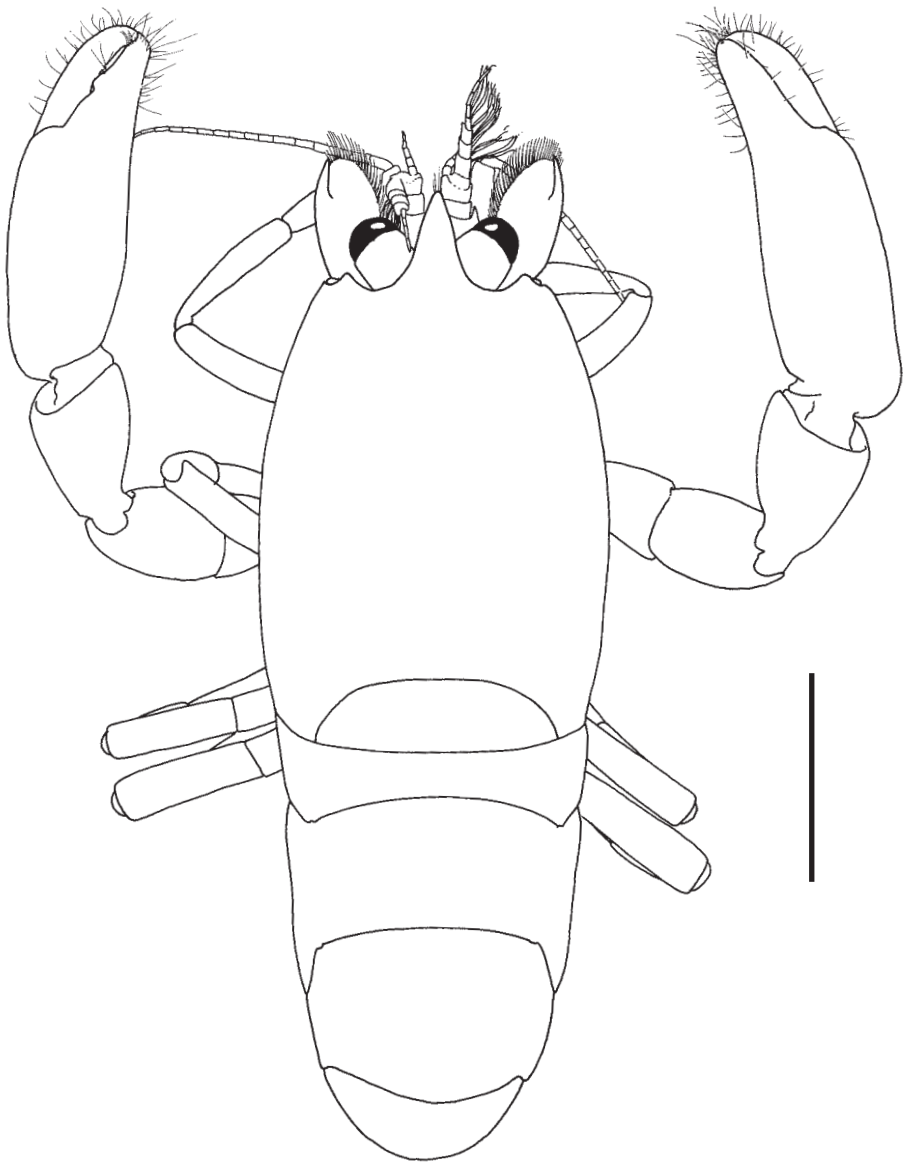


Fig. 163. *Ascidonia quasipusilla* (Chace, 1972): non-ovigerous female, pocl. 3.7 mm, RMNH D 45621, dorsal aspect. Scale = 2 mm.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite reaching distal margin of lamina of scaphocerite, four times as long as distal width; flagellum short, slender, slightly shorter than postorbital carapace length; scaphocerite with lamina about 1.65 times as long as wide, anterior margin rounded, lateral margin broadly

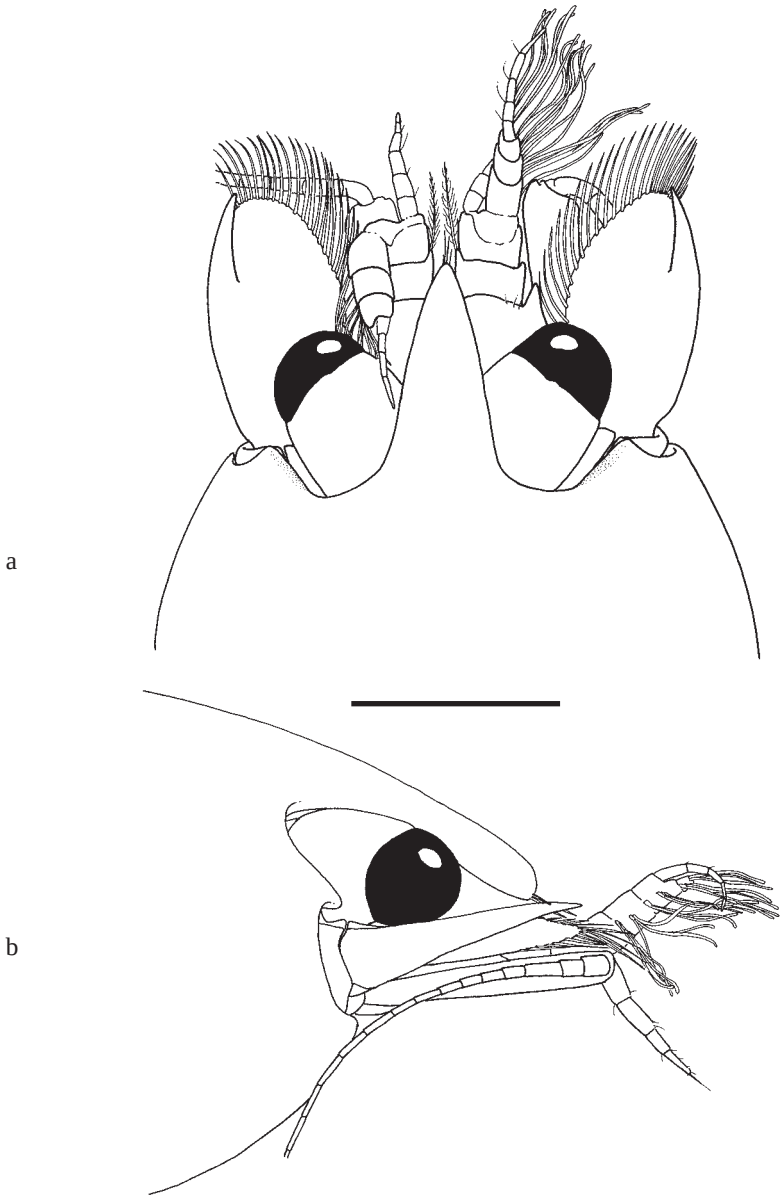


Fig. 164. *Ascidonia quasipusilla* (Chace, 1972): non-ovigerous female, pocl. 3.7 mm, RMNH D 45621. a, anterior appendages, dorsal view; b, anterior appendages, lateral view. Scale = 1 mm.

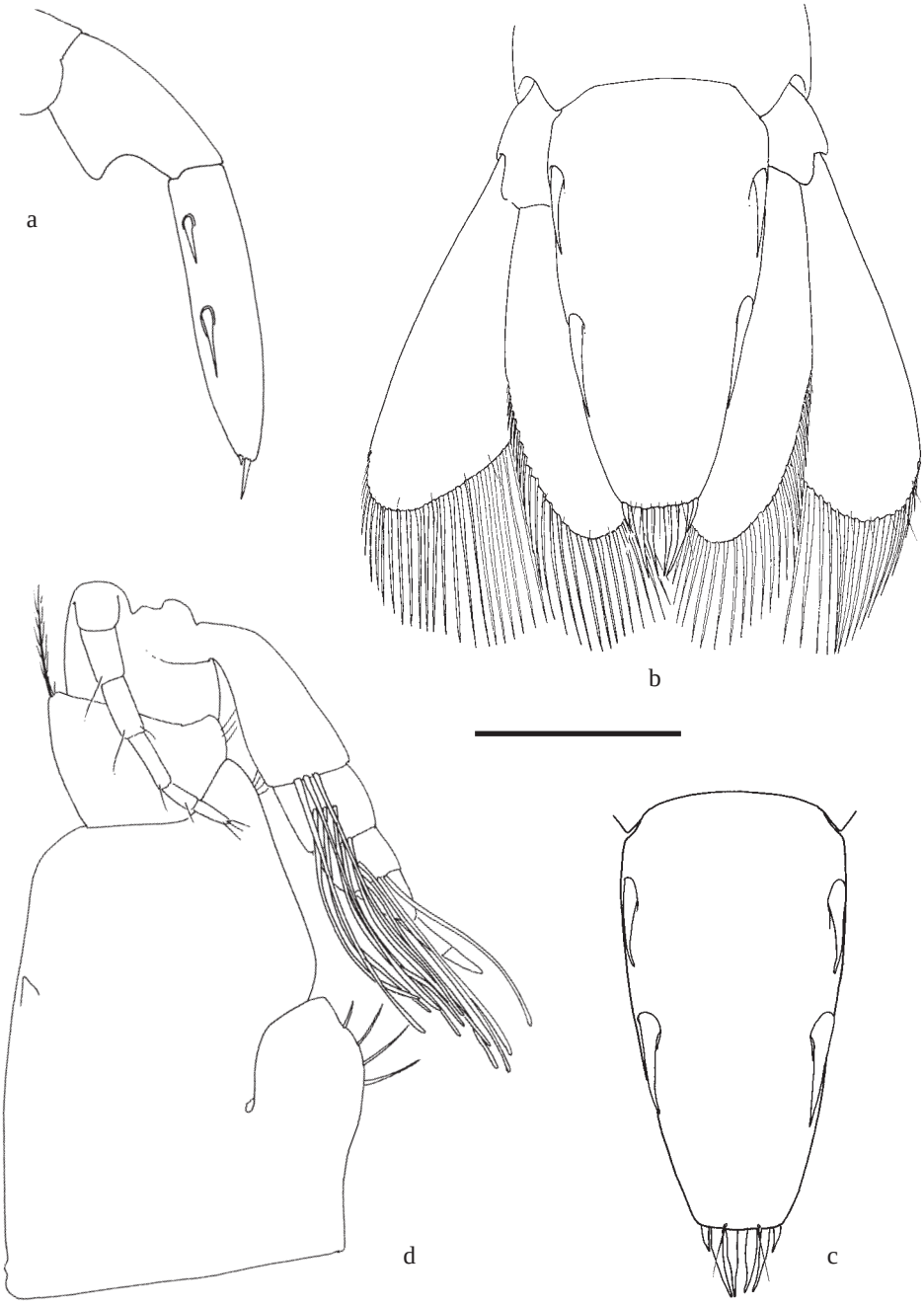


Fig. 165. *Ascidonia quasipusilla* (Chace, 1972): ovigerous female, pocl. 5.8 mm (figs. a, c-d), RMNH D 45620; non-ovigerous female, pocl. 3.7 mm, RMNH D 45621 (fig. b). a, distal part abdomen, lateral view; b, telson and uropods, dorsal view; c, telson, dorsal view; d, antennula, ventral view. Scale: a = 2 mm; b, c = 1 mm; d = 0.6 mm.

convex; distolateral tooth robust, 0.31 length of lamina (incl. distolateral tooth), slightly overreaching distal margin of lamina; incision between distolateral tooth and lamina very deep.

Epistome with rather acute anterior median carina; labrum large, broad, oval.

Paragnath well developed, alae with broad transverse more or less rectangular distal lobes, and small rounded ventromesial lobes; corpus very short, with shallow median excavation, bordered laterally by non-setose, oblique, carinae.

Second thoracic sternite with median triangular, distally rounded setose process.

Third thoracic sternite unarmed.

Fourth thoracic sternite with indistinct lateral carinae with median broad shallow notch posteromedial of first pereiopods; without transverse ridge between first pereiopods.

Fifth thoracic sternite with moderately developed lateral plates with medial broad notch, posteromedial to second pereiopod coxae.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process with six acute distal teeth, with row of about five small denticles along ventromedial margin; molar process robust, with four blunt teeth, some fringed with setal brushes.

Maxillula with upper lacinia rectangular with two rows of about 13 spines and few setae distally; ventral lacinia triangular, with many setae distoventrally and marginally, no differentiation in setae; palp bilobed, larger lobe with one short seta and one recurved, simple seta.

Maxilla with basal endite well developed, bilobed; distal lobe longer and broader than proximal lobe, both with long, slender, minutely serrulate setae along distomedian margins, median margin without setae; coxal endite obsolete; median margin convex, without setae; scaphognathite large, 3.0 times longer than wide, posterior lobe almost twice as long as anterior width, anterior lobe 1.5 times longer than proximal width; palp simple, slightly shorter than distal lobe of basal endite, strongly expanded proximally, tapered distally to rather acute tip, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite completely fused, large and broad, fringed with many long, finely serrulate setae along entire median margin, with row of more sparse, long, simple, submarginal setae ventrally; exopod well developed, flagellum with eight to ten long, plumose setae distally; caridean lobe large, elongate; epipod large, triangular, distinctly bilobed; palp simple, slender, short, curved along distolateral margin of basal endite, non-setose.

Second maxilliped with endopod very large; dactylar segment narrow, about 4.5 times longer than broad, densely fringed with coarsely serrulate, spiniform, and long, curled, finely serrulate setae medially; propodal segment with row of spines and long, simple, and finely serrulate setae along expanded distomedian margin, with one long serrulate setae at distal part of ventrolateral margin; carpal segment short, broader than long, unarmed; meral segment without plumose setae medially; basal and ischial segment completely fused, both segments medially flat, not excavate, without setae medially; exopod normal, with about eight to ten long plumose setae distally; coxal segment not medially produced, with few simple setae, with trapezoidal epipod laterally.

Third maxilliped reaching with ultimate segment to proximal third of carpocerite;

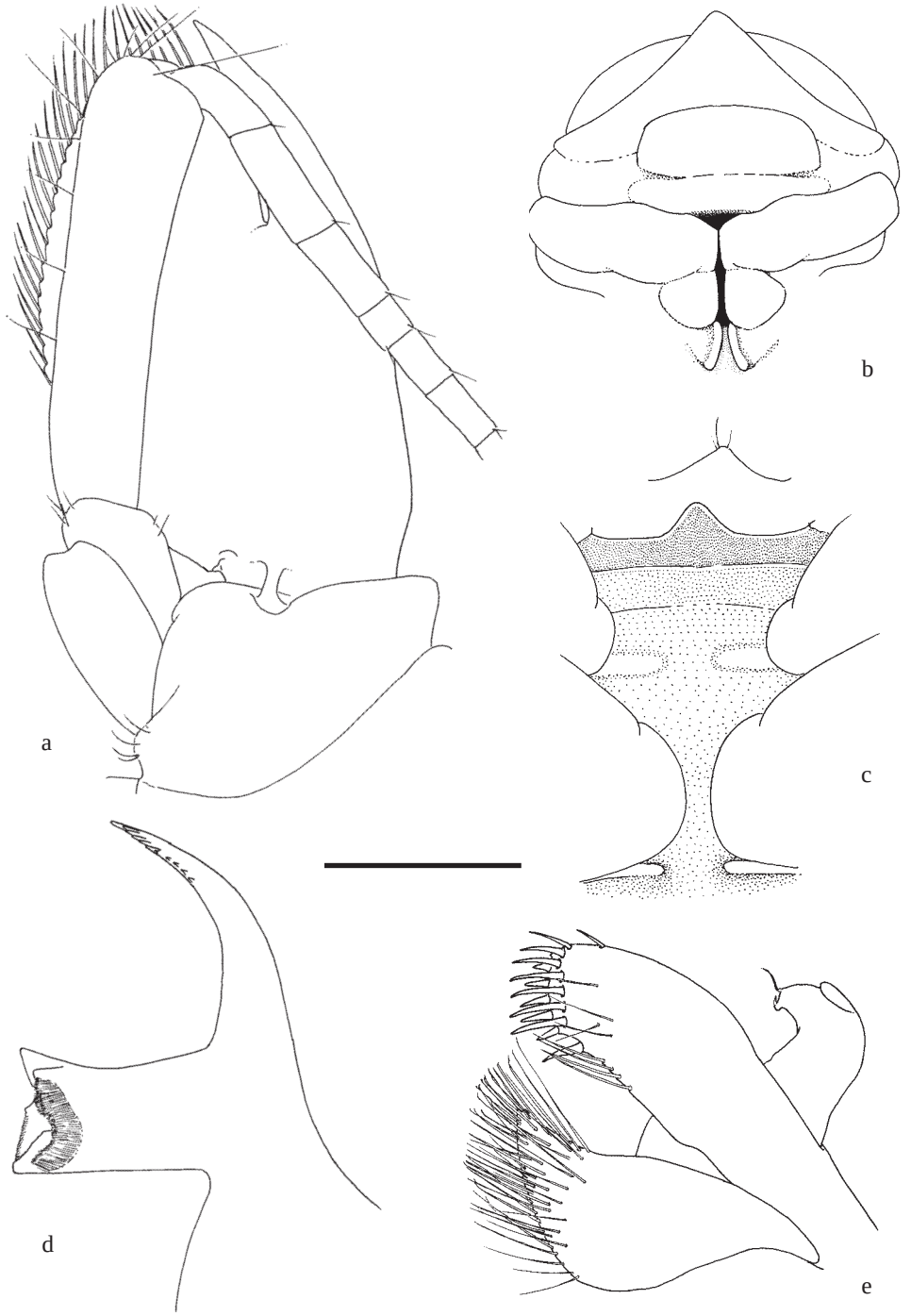


Fig. 166. *Ascidonia quasipusilla* (Chace, 1972): ovigerous female, pocl. 5.8 mm, RMNH D 45620. a, antenna, ventral view; b, paragnath, ventral view; c, second to fifth thoracic sternites; d, mandible, ventral view; e, maxillula, ventral view. Scale: a, d, e = 0.6 mm; b, c = 1 mm.

ischiomerus almost completely fused with basis, suture medially visible; ischiomerus twice as long as broad, not tapering distally, flattened, lateral margin with row of few setae; basal segment medially convex; both ischiomeral and basal segments with long simple setae along median margin, few in disto-median part of ventral surface; exopod well developed, extending beyond ischiomeral segment, with several long plumose setae in distal third; coxa without median process, with large lateral plate

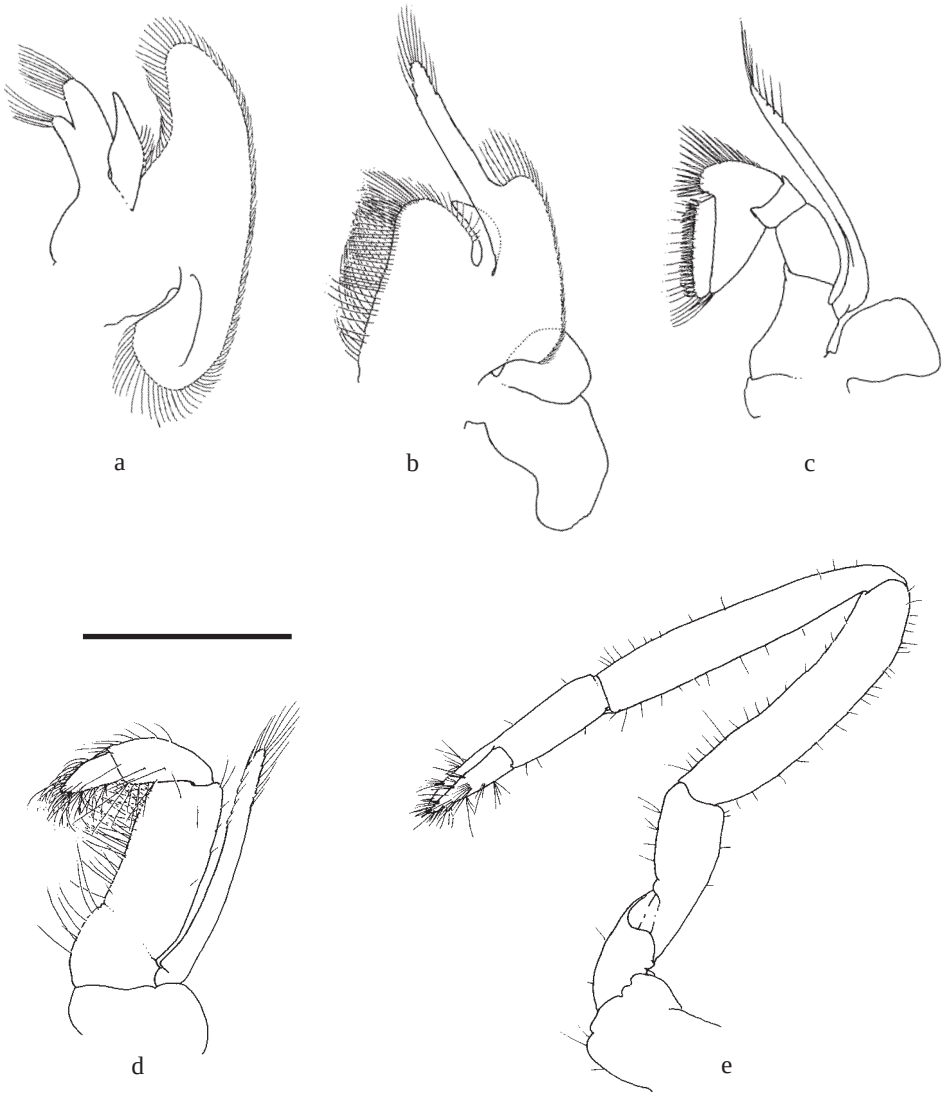


Fig. 167. *Ascidonia quasipusilla* (Chace, 1972): ovigerous female, pocl. 5.8 mm, RMNH D 45620. a, maxilla, ventral view; b, first maxilliped, ventral view; c, second maxilliped, ventral view; d, third maxilliped, ventral view; e, first pereiopod. Scale = 1.5 mm.

without setae; without rudimentary arthrobranch; ultimate and penultimate segments with simple and serrulate setae; penultimate segment almost as long as broad, expanded medially, about 0.4 of ischiomeral length; ultimate segment slightly shorter than penultimate segment, more slender, tapering distally.

First pereiopods moderately slender, extending beyond carpocerite with chela and distal 2/3rd of carpus. Chela about 3.5 times longer than deep, subcylindrical; fingers slender, as long as palm, with entire cutting edges, with groups of many, strong, long, serrulate setae, tips acute, hooked; cleaning organ on carpal-propodal joint distinct; carpus 1.5 times as long as chela, about six times longer than distal width, slightly tapering proximally, unarmed, with scattered, simple, short setae; merus slightly shorter than carpus, about 5.3 times longer than central width, unarmed, with many simple setae; ischium half as long as merus, not expanded medially, with scattered short simple setae; basis about 0.6 times as long as ischium, with few simple setae medially; coxa with rounded ventral lobe with some simple setae.

Second pereiopods subequal in size and form. Major chela 0.8-0.9 times as long as postorbital carapace length in adult females, 1.0-1.1 in males; palm somewhat compressed, with proximally entire, non-carinate, median border with slender setae in distal part, lateral border non-carinate; fingers 0.5 times palm length; dactylus about three times longer than deep, with two or three large blunt, simple teeth in proximal

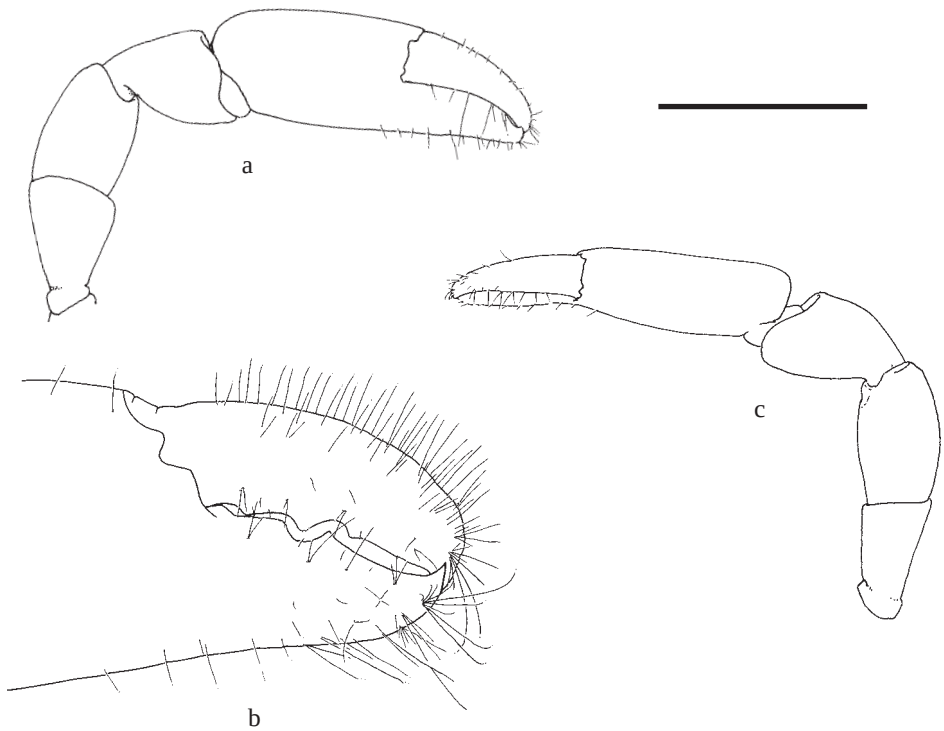


Fig. 168. *Ascidonia quasipusilla* (Chace, 1972): male, pocl. 3.2 mm, RMNH D 45620. a, rigth second pereiopod; b, idem, chela; c, left second pereiopod. Scale: a, c = 2 mm; b = 1 mm.

half of cutting edge, distal part entire, straight, tip strongly hooked, distolateral border entire with many slender simple setae, without medial carina; fixed finger about 1.7 times longer than deep, with one broad irregular tooth proximally and one acute triangular tooth at midlength, separated by deep notch, distal part of cutting edge entire, slightly concave, tip strongly hooked, median fossa for reception of dactylar tooth when fingers closed absent; carpus short and stout, 0.4 of palm length, expanding distally, slightly longer than distal width, unarmed; merus about as long as carpus, slightly longer than central width, distomedial border excavate; ischium 0.6 of merus length, without distomedial protuberance, strongly tapering proximally; basis and coxa without special features. Minor chela similar to major chela, as long as postorbital carapace length in both males and adult females; fingers slightly more than half as long as palm.

Ambulatory pereiopods similar; dactylus of third pereiopod compressed, corpus about 1.7 times as long as proximal width, with few simple setae on dorsal surface and many simple setae along convex ventral border, accessory tooth acute, straight, perpendicular to corpus length, terminal, entire; unguis short, slender, acute, slightly curved, simple, about 0.4 of corpus length, indistinctly denticulate dorsally; propodus 3.5 times longer than dactylus, four times as long as wide, with two small subdistal ventral spines and one even smaller spine along ventral margin, distoventral part with some short simple setae; carpus 0.6 times propodus length, unarmed, with small distal lobe; merus slightly shorter than propodus, swollen, three times as long as central width, unarmed; ischium about 0.7 times merus length, 2.6 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopod similar but less robust.

Male first pleopod with endopod about three times longer than proximal width, tapering distally; median margin almost straight with row of about four short simple setae, with long plumose setae in distal part and along lateral margin, distalmost plumose setae longest.

Endopod of second pereiopod with appendix masculina half length of appendix interna, with one robust distally setulose very long setae distally.

First pleopod of female with slender endopod, about third of exopod length, with several long simple distal setae when ovigerous, with row of few long plumose setae on lateral margin without setae along medial margin.

Uropods with protopod posterolaterally blunt; exopod almost twice as long as central width, lateral margin convex, with small mobile spine posteriorly, without posterolateral tooth, distal margin broadly rounded; endopod extending beyond exopod slightly more than twice as long as central width, slightly longer than telson.

Ovigerous females with 100-200 eggs. Egg-size 0.6-0.7 mm.

Size.— A small sized species. Maximum postorbital carapace length 3.2 mm in males, 5.8 mm in females. Minimum postorbital carapace length in ovigerous female 2.8 mm.

Colouration (based on slides of specimens with registrationnumbers RMNH D 45620, pls. 9, 10).— Translucent with milky white irregular pattern with small red chromatophores scattered over body and appendages. Whitish pattern on chela reticulate in larger specimens. Larger yellow chromatophores mainly on joints of appendages. Abdominal somites with faint white areas along margins and middorsal line. Exopods of uropods with lateral white margins and some large white chro-

Fig. 169. *Ascidonia quasipusilla* (Chace, 1972): male, pocl. 3.2 mm (figs. a, b, d, e), RMNH D 45620; non-ovigerous female, pocl. 3.7 mm, RMNH D 45621 (fig. c). a, third pereiopod; b, dactylus third pereiopod; c, endopod female first pleopod; d, endopod male first pleopod; e, appendix interna and appendix masculina on second male pleopod. Scale: a = 1 mm; b = 0.19 mm; c, d = 0.6 mm; e = 0.15 mm.

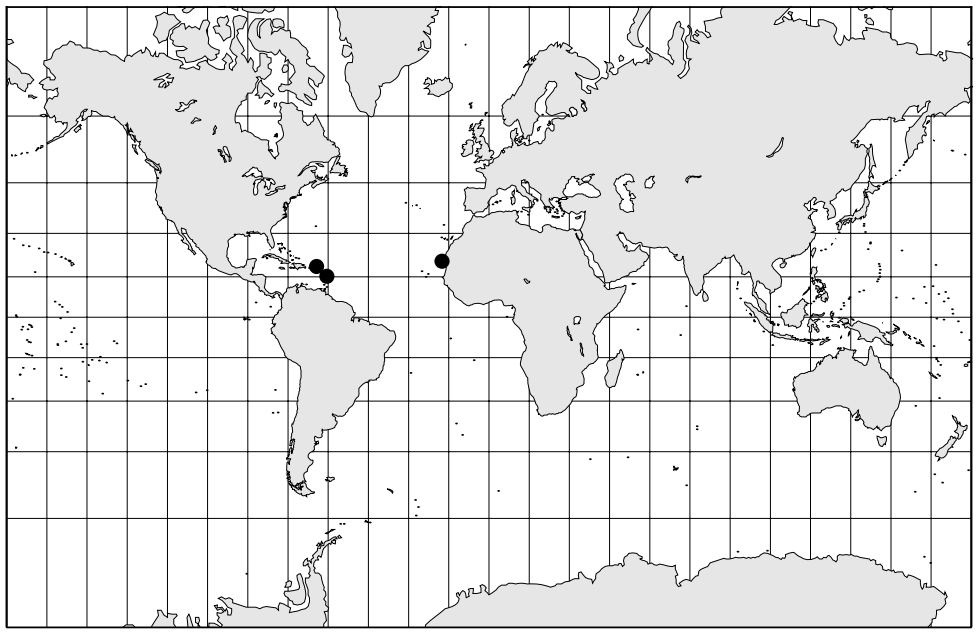


Fig. 170. Geographic distribution of *Ascidonia quasipusilla* (Chace, 1972).

matophores distally; endopod of uropod with few white patches distally.

Type.— Holotype: ovigerous female, pocl. 2.8 mm (USNM 135346); West Indies, Antigua Island, English Harbour, shallow water.

Distribution.— WEST ATLANTIC: Caribbean, Antigua Island, shallow water (Chace, 1972); Martinique (present record); EAST ATLANTIC: Mauritania, depth 26-36 m, in *Pyura* (present record).

Host.— Host now recorded for the first time. Specimens were collected from the ascidian *Pyura torpida* (Sluiter, 1898). The Mauritanian *Pyura* has not been identified to species level.

Remarks.— As few specimens are available from both the East and West Atlantic not much is known about the intra-specific variation of both populations. They are here regarded as belonging to one species. When more material comes available from both sides of the Atlantic a more definite answer can be given to the question of the conspecificity of the two populations.

8.4. *Rostronia* gen. nov.

Definition.— Small to medium sized shrimp of subcylindrical body form. Rostrum well developed, compressed; dorsally armed with few subdistal teeth; dorsal carina distinct; lateral carinae not developed; ventral margin without subdistal tooth. Carapace smooth; inferior orbital angles feebly developed; orbit feebly developed; supraorbital, epigastric and hepatic spines absent; antennal spine well developed, acute, separated from the inferior orbital angle; anterolateral angle of branchiostegite rounded, not strongly produced.

Eye normal, with hemispherical cornea.

Antennula normal, ventromedial tooth on basal segment small; distolateral tooth of basal segment well developed, reaching beyond midlength of intermediate segment, anterior margin sinuous, not extending beyond distolateral tooth; flagella reduced.

Antenna with basicerite unarmed; scaphocerite well developed, with distolateral tooth well developed but less than 0.1 times length of scaphocerite.

Epistome unarmed. Corpus of paragnaths with two short submedian oblique non-setose carinae with distinct median groove.

Second thoracic sternite with anterior margin broadly rounded, not produced.

Fourth thoracic sternite without medially developed centrally notched lateral plates.

Fifth thoracic sternite with broad rectangular, medially blunt, separate lateral plates.

Mandible robust, without palp, molar process stout, incisor process simple, with row of denticles along medioventral border.

Maxillula with bilobed palp, lower lacinia small, slender, with few setae.

Maxilla with simple palp, bilobed endite, scaphognathite broad; basal endite with many setae on upper and lower lacinia, upper lacinia well developed, lower lacinia reduced; basal endite shorter than palp.

First maxilliped with slender palp; basal and coxal endites partly fused, with few short setae along median margin, not forming basket; exopod with well developed caridean lobe, flagellum broad, densely setose distally, epipod large, oval.

Second maxilliped with normal endopod, without distinct angle in median margin of basis, exopod with flagellum well developed, plumose setae distally; epipod a small rounded, curled lobe; without podobranch.

Third maxilliped with ischiomerus of endopod partly fused to basis, slender, as broad as penultimate segment; exopod well developed, with plumose setae distally; coxa with oval, lateral plate, without median process, arthrobranch absent.

First pereiopods with chela simple.

Chelae unequal in size, and form; major chela with one proximal tooth on dactylus and two on fixed finger; dactylus with median carina; fixed finger with median fossa to receive proximal tooth of dactylus when fingers closed; minor chela with row of small teeth in proximal part of both fingers; fingers gaping.

Ambulatory pereiopods slender, dactylus biunguiculate, with accessory teeth on flexor margin of corpus increasing in size distally; flexor margin with scattered setae; unguis distally bifid.

Abdomen smooth; posterior margins of pleura rounded, posterolateral angle of sixth segment acutely produced.

Uropod with protopodite feebly acute distally, exopod with distolateral margin with mobile spinule, feebly armed.

Telson with two pairs of large submarginal dorsal spines, three pairs of posterior spines.

Type species.— *Pontonia stylirostris* Holthuis, 1952, by present designation.

Etymology.— The name is composed of ‘rostrum’ and the last part of the name *Pontonia*, from which the genus was split off. Gender: feminine.

Distribution.— See under *Rostronia stylirostris* (Holthuis, 1952).

Hosts.— Associated with Ascidiacea.

8.4.1. *Rostronia stylirostris* (Holthuis, 1952) comb. nov.
(Figs. 171-177)

Pontonia stylirostris Holthuis, 1952: 16, 169, figs. 82-84; Bruce, 1972a: 185; Bruce, 1976: 483; Holthuis, 1986: 270; Hogarth, 1989: 111, 112; Bruce, 1990: 13; Müller, 1993: 125; Chace & Bruce, 1993: 62.

Material.— **INDO-WEST PACIFIC**: **Indonesia**.— ZMA: 1 non-ovigerous female, holotype, pocl. 3.8 mm; between Misool and New Guinea, 1°42'5 S 130°47'5 E; dredge; depth 32 m; bottom sand, small stones and shells; 20.viii.1899; Siboga Exp. station 164.— **Australia**.— NTM Cr008252: 1 male, pocl. 2.7 mm; Queensland, Coral Sea, 18°42'S 147°01'E; 4.vii.1979; depth 42-26 m; leg. RA. Birtles, stn. no. RAB / 15(497) — **Red Sea**.— RMNH D 42566: 1 male, pocl. 2.6 mm; off David Bay, Entedebir Island; ISRSE E62 / 1341; 15.iii.1962; depth 2-3 m; in black ascidian together with *D. ascidicola* female.— RMNH D 42567: 1 ovigerous female, pocl. 4.2 mm; 1 male, pocl. 2.8 mm; Sheikh Said Channel (MAS-SAWA); ISRSE E62 / 1017b; 8.iv.1962; depth 1-3 m; in black ascidian.— **Oman**.— RMNH D 42575: 1 non-ovigerous female, pocl. 4.0 mm; Wadi Haart, 5 km NE of Sudh, Dhofar, 17°04'15"N 55° 06'E; 16.iv.1983; leg. P.J. Hogarth no. 116, Site 2J4a, XXVII.

Description.— Body bilaterally compressed to almost subcylindrical. Carapace smooth. Rostrum well developed, with distally ending in a sharp point, reaching distal end of second segment of antennular peduncle, oblong, without lateral carinae, with convex ventral carina in distal part; with two or three distinct, acute, subdistal dorsal teeth, with simple setae in between. Inferior orbital angle slightly produced, blunt in lateral view. Antennal spine well developed, reaching beyond anterolateral margin of carapace, situated just below inferior orbital angle. Anterolateral margin of carapace straight or slightly concave, anterolateral angle of carapace not produced, bluntly rounded.

Abdomen smooth; sixth segment about 1.4 times longer than fifth, about as wide as long; posterolateral angle acutely produced, posteroventral angle produced, acute, not spiniform; pleura of first five segments broadly rounded.

Telson 1.8 times longer than sixth abdominal segment, about 2.5 times its proximal width; lateral margins almost straight, convergent; posterior border without median process; two pairs of large submarginal dorsal spines at 0.24 and 0.50 of telson length; distal and proximal pairs of spines of equal length, 0.2 of telson length; posterior margin with three pairs of spines, lateral spines small, marginal, intermediate and submedian spines long, slender dorsal spines of intermediate length.

Eyestalk slightly longer than broad, slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella of normal length. Basal segment about 2.5 times as long as width, with acute distolateral tooth reaching just beyond middle of intermediate segment, anterior margin not developed, oblique, slightly sinuous; medioventral tooth small, acute, submarginal, situated halfway basal segment; stylocerite short, reaching halfway basal segment, with acute tip, with few plumose setae laterally. Intermediate segment short, slightly longer than broad. Distal segment about 1.5 times as long as broad. Upper flagellum short, biramous, with five proximal segments fused; short free ramus with one to three segments; longer free ramus with five to seven segments. Lower flagellum with about ten segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite small; carpocerite reaching distal end of lami-

Fig. 171. *Rostronia stylirostris* (Holthuis, 1951): male, pocl. 2.6 mm, RMNH D 42566. a, anterior appendages, dorsal view; b, anterior appendages, lateral view. Scale = 1 mm.

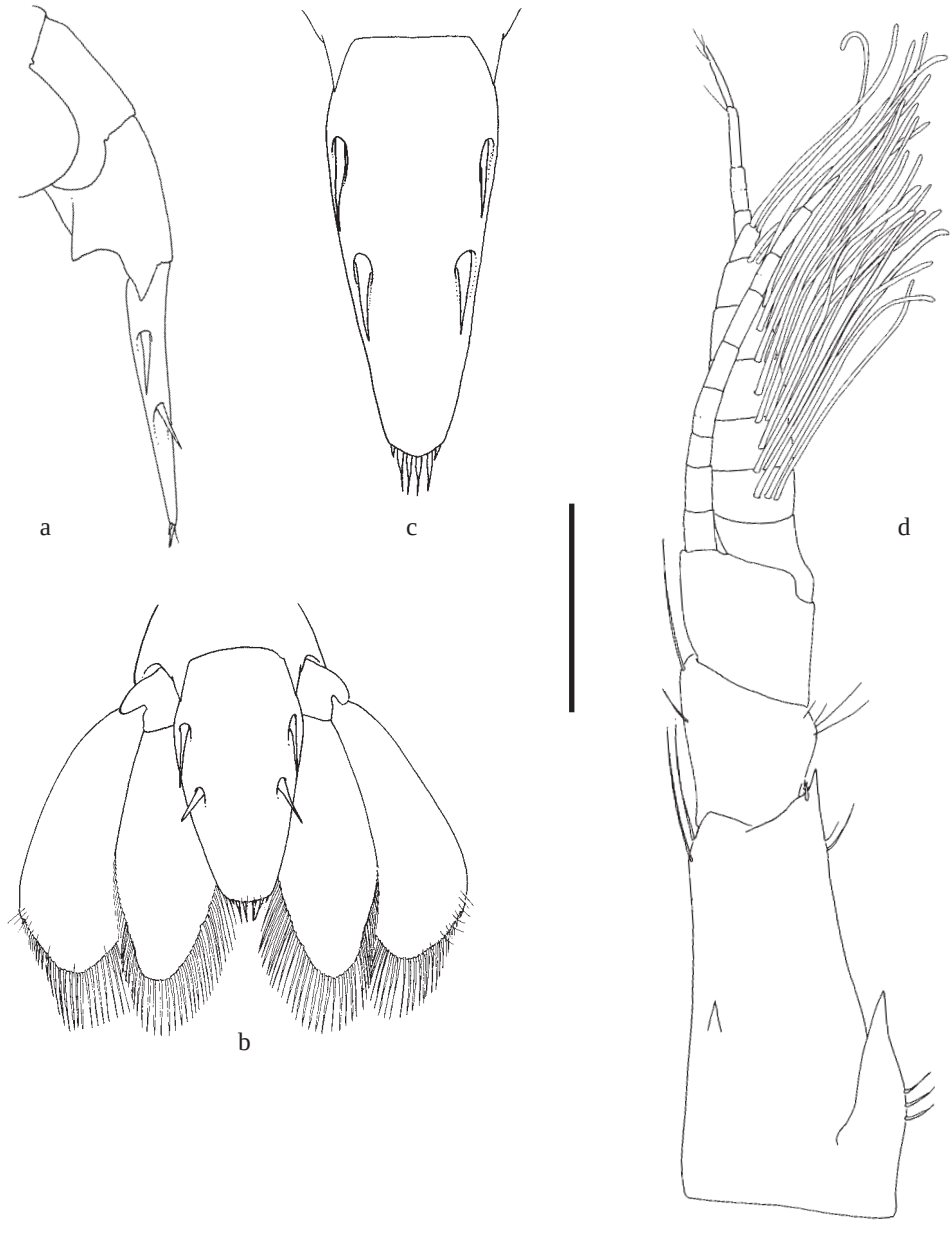


Fig. 172. *Rostronia stylirostris* (Holthuis, 1951): male, pocl. 2.6 mm, RMNH D 42566 (figs. c, d); ovigerous female, pocl. 4.2 mm (fig. a, b), RMNH D 42567. a, distal part abdomen, lateral view; b, telson and uropods, dorsal view; c, telson, dorsal view; d, antennula, ventral view. Scale: a, b = 2 mm; c = 1 mm; d = 0.6 mm.

na of scaphocerite, slender, almost six times longer than distal width; flagellum slender, about 1.5 times postorbital carapace length; scaphocerite with lamina about 3.0-3.5 times longer than wide, anterior margin truncate, lateral margin almost straight; distolateral tooth small, about 0.05 length of lamina, not reaching distal margin of lamina; incision between distolateral tooth and lamina not deep.

Epistome with anterior median carina distinct; labrum large, oval.

Paragnath well developed, alae with large transverse more or less oval distal lobes, and oval ventromedial lobes; corpus short, narrow, with median excavation, bordered by non-setose oblique carinae.

Second thoracic sternite formed into swollen, rounded process between second maxillipeds, without setae.

Third thoracic sternite with distinct lateral carinae with medial notch posteromedian of third maxillipeds.

Fourth thoracic sternite with shallow indistinct lateral carinae posteromedial of first pereiopods; with indistinct transverse ridge between first pereiopods.

Fifth thoracic sternite with well developed lateral plates posteromedial of second pereiopods, with deep rather broad medial notch in between.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process slender, with four to eight acute distal teeth, and row of about three to five small denticles along medioventral margin; molar process robust, with four blunt teeth, some fringed with setal brushes.

Maxillula with upper lacinia small, rectangular, with two rows of about 13 serrulate spines and very few slender setae medially; lower lacinia slender, with few simple setae in distal part, no differentiation in setae; palp bilobed, larger lobe with small ventral tubercle with single short recurved simple setae.

Maxilla with basal endite well developed, bilobed; distal lobe longer and broader than proximal lobe, both with many long, slender, minutely serrulate setae along distomedian margin, median margin without setae; coxal endite obsolete, median margin convex, without setae; scaphognathite slightly more than three times longer than wide, posterior lobe 1.7 times longer than anterior width, anterior lobe 1.6 times longer than proximal width; palm simple, slightly shorter than distal lobe of basal segment, somewhat expanded proximally, tapered distally to rather acute tip, with few plumose setae along proximal part of lateral margin.

First maxilliped with coxal endite partly fused to broad basal endite, rather small, fringed with few simple setae; basal endite with few scattered simple setae, and several long, finely serrulate setae along median margin; exopod well developed, flagellum with few plumose setae distally; caridean lobe well developed, elongate; epipod large, triangular, distinctly bilobed; palp simple, slender, elongate, curved along distolateral margin of basal endite, non-setose.

Second maxilliped with endopod normally developed; dactylar segment 4.3 times longer than broad, densely fringed with coarsely serrulate spiniform, and long curled finely serrulate setae medially; propodal segment with row of long spines and simple and finely serrulate setae along distomedian margin, with few finely serrulate setae in distal part of ventrolateral margin; carpal segment short, broader than long, unarmed; meral segment without row of long plumose setae medially; basal and ischial segment almost completely fused, both segments medially strongly excavate, without setae

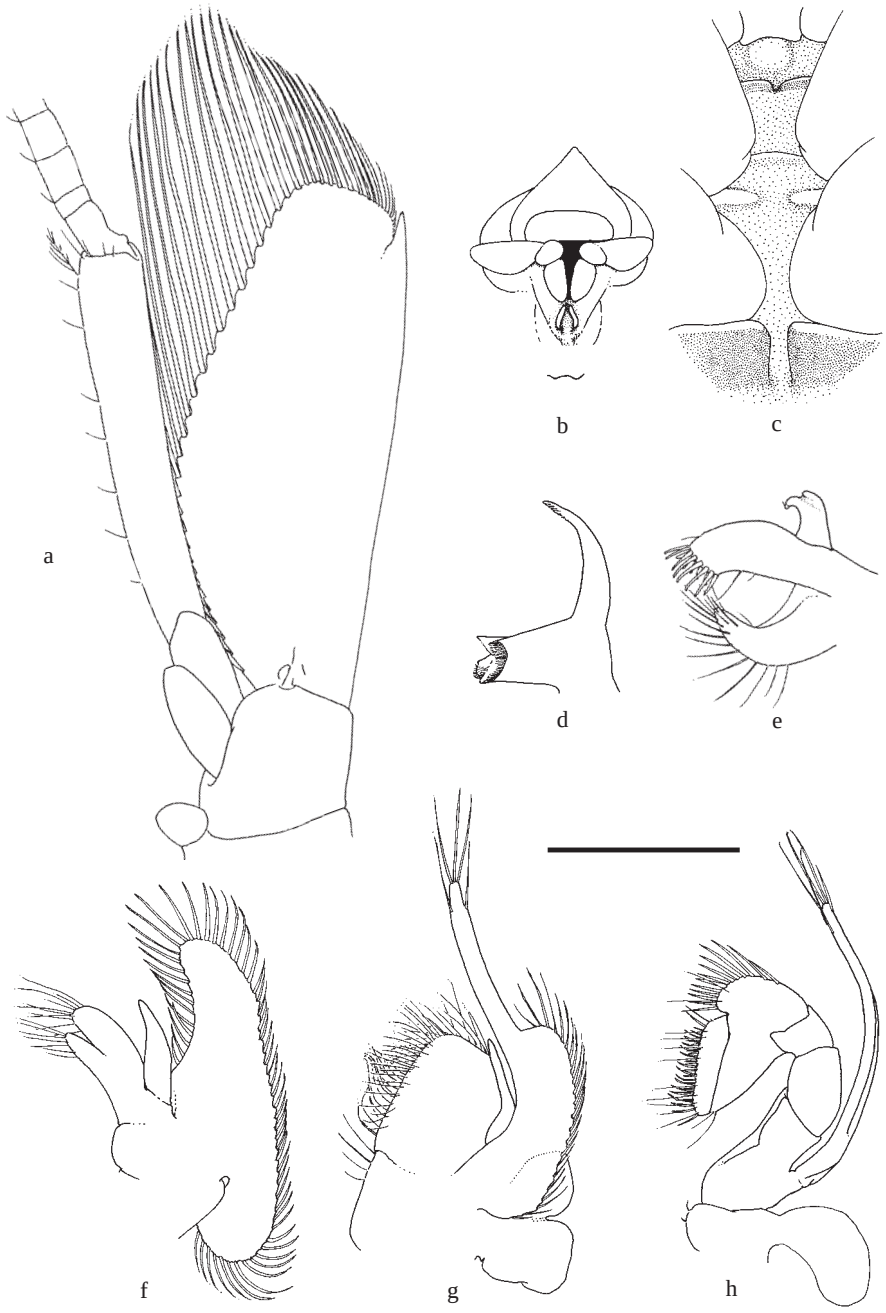


Fig. 173. *Rostronia stylirostris* (Holthuis, 1951): male, pocl. 2.6 mm, RMNH D 42566 (figs. a, b, d-h); ovigerous female, pocl. 4.2 mm (fig. c), RMNH D 42567. a, antenna, ventral view; b, paragnath, ventral view; c, second to fifth thoracic sternites; d, mandible, ventral view; e, maxillula, ventral view; f, maxilla, ventral view; g, first maxilliped, ventral view; h, second maxilliped, ventral view. Scale: a, d-h = 0.6 mm; b, c = 1 mm.

medially; exopod normal, with about six long, plumose setae distally; coxal segment medially produced, with few short setae, with trapezoidal, proximally expanded epipod, laterally.

Third maxilliped reaching with ultimate segment to proximal third of carpocerite; ischiomerus partly fused to basis, but with distinct suture, three times as long as broad, slightly tapering distally, flattened, with many long setae on median margin, with few shorter setae on ventral surface, lateral margin with single row of few short setae; basal segment medially convex, with many long finely serrulate setae on median margin; exopod well developed, slightly longer than ischiomeral segment, with about six long plumose setae distally; coxa without medial process, with large non-setose lateral plate, without arthrobranch; penultimate segment three times longer than broad, twice as long as ischiomeral segment, subcylindrical, with groups of long, finely serrulate setae ventromedially; ultimate segment slightly shorter than penultimate segment, tapering distally, with groups of long coarsely serrulate setae distally.

First pereiopods rather slender, exceeding carpocerite by chela. Chela three times longer than deep, slightly compressed; fingers slightly longer than palm, with entire cutting edges; fixed finger with groups of many strong, long, serrulate setae, tip with two small distal spines; dactylus with groups of moderately longer, finely serrulate and simple setae, tip acute with single small spine; cleaning organ present on carpal-propodal joint; carpus slightly shorter than chela, about 3.8 times distal width, tapering proximally, unarmed, with few long simple setae; merus slightly longer than carpus, 5.5 times longer than central width, unarmed, with few simple setae; ischium 0.5 times merus length, medially slightly expanded, with long simple setae medially; basis 0.8 times ischium length, with long simple setae medially; coxa with small rounded ventral lobe with long simple setae.

Second pereiopods dissimilar in size and form. Major pereiopod with chela large, 1.8-2.0 times as long as postorbital carapace length; palm strongly compressed distally, swollen proximally, with median margin distally concave, carinate, indistinctly serrate, and slightly convex proximally, provided with row of long simple setae, lateral margin not carinate, with few short simple setae; dactylus 0.5 times length of palm, about four times longer than deep, with one large triangular tooth in proximal part of cutting edge, distal part of cutting edge entire, slightly concave, tip hooked, median margin not carinate, with many long simple setae distally; fixed finger about 1.7 times longer than deep, with large triangular tooth at midlength of cutting edge, separated by notch from proximal, broad denticulate tooth, distal part of cutting edge entire, straight, median fossa for reception of dactylar tooth when fingers closed not developed or indistinct, tip hooked; carpus about third of palm length, strongly tapering proximally, about 1.5 times longer than distal width; merus 1.4 times longer than carpus, twice as long as its central width, distomedially slightly excavate; ischium 0.7 times merus length, somewhat tapering proximally; basis and coxa without special features. Minor second pereiopod more slender than major second pereiopod, chela 1.5 times longer than postorbital carapace length, somewhat compressed, with serrulate, carinate median margin provided with row of very long simple setae; dactylus 0.7-1.1 times longer than palm, 6.5 times longer than deep, with entire cutting edges in distal 2/3 and row of 5-8 teeth in proximal 3rd, strongly concave, with many long

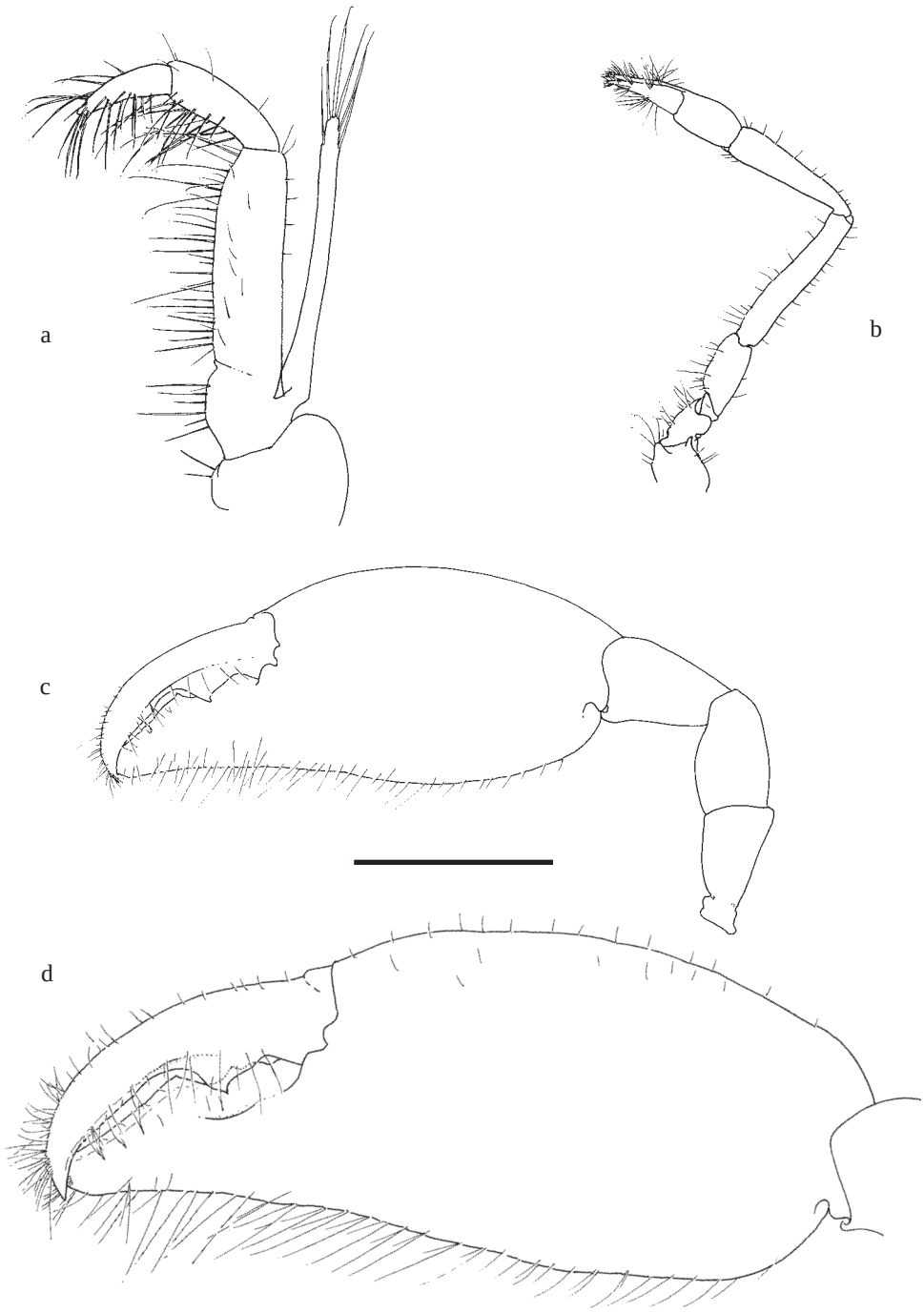


Fig. 174. *Rostronia stylirostris* (Holthuis, 1951): male, pocl. 2.6 mm, RMNH D 42566. a, third maxilliped, ventral view; b, first pereiopod; c, major second pereiopod; d, idem, chela. Scale: a = 0.6 mm; b, d = 1.5 mm; c = 2 mm.

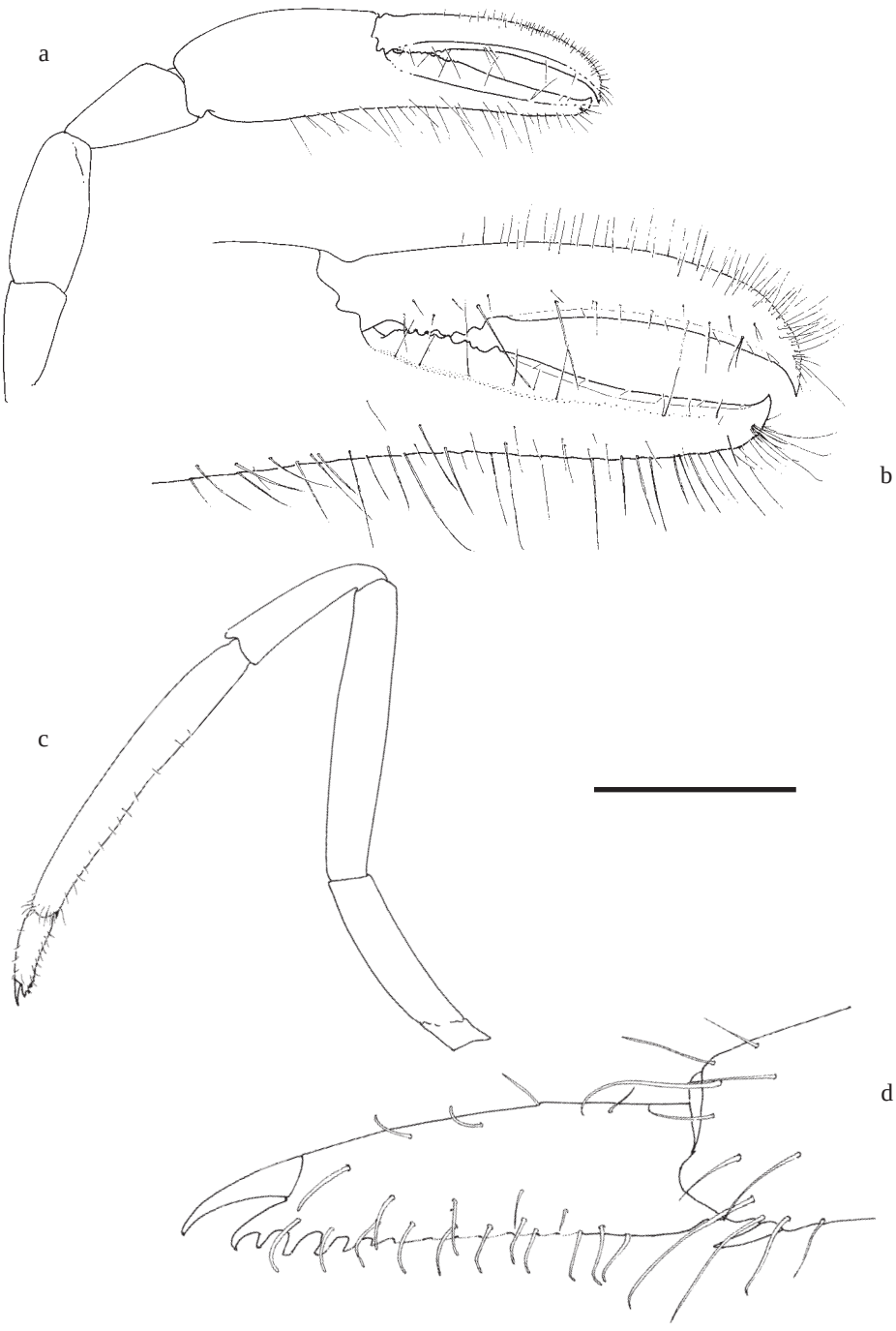


Fig. 175. *Rostronia stylirostris* (Holthuis, 1951): male, pocl. 2.6 mm, RMNH D 42566. a, minor second pereiopod; b, idem, chela; c, third pereiopod; d, dactylus third pereiopod. Scale: a = 2 mm; b, c = 1 mm; d = 0.15 mm.

median simple setae, tip strongly hooked; fixed finger about 3.5 times longer than deep, with entire cutting edges in distal 2/3 and row of 5-8 teeth in proximal 3rd, strongly concave, with many long median simple setae, tip hooked; carpus about 0.6 times palm length, tapering proximally, almost twice as long as distal width; merus, ischium, basis and coxa as in major cheliped, more slender.

Ambulatory pereiopods slender. Dactylus of third pereiopod compressed, with corpus about 3.0 times longer than proximal width, with few simple setae, accessory tooth acute, directed distally, terminal, with minutely denticulate tip, ventral margin with about five rather acute slender teeth, decreasing in size proximally followed proximally with about seven more shallow tubercles, both teeth and tubercles with fine distal denticulation; unguis large, curved, about 0.37 of corpus length, distally bifid, distally minutely denticulate; propodus about four times longer than dactylus, eight times longer than width, with two spines in distal part of flexor margin, and two ventrodistal spines, few rather long setae along ventral and distal margins; carpus about 0.5 of propodus length, 4.0 times longer than distal width, slightly tapering proximally, with distinct distal lobe, unarmed; merus about as long as propodus, 5.7 times longer than central width, slightly compressed, with few long setae on ventral

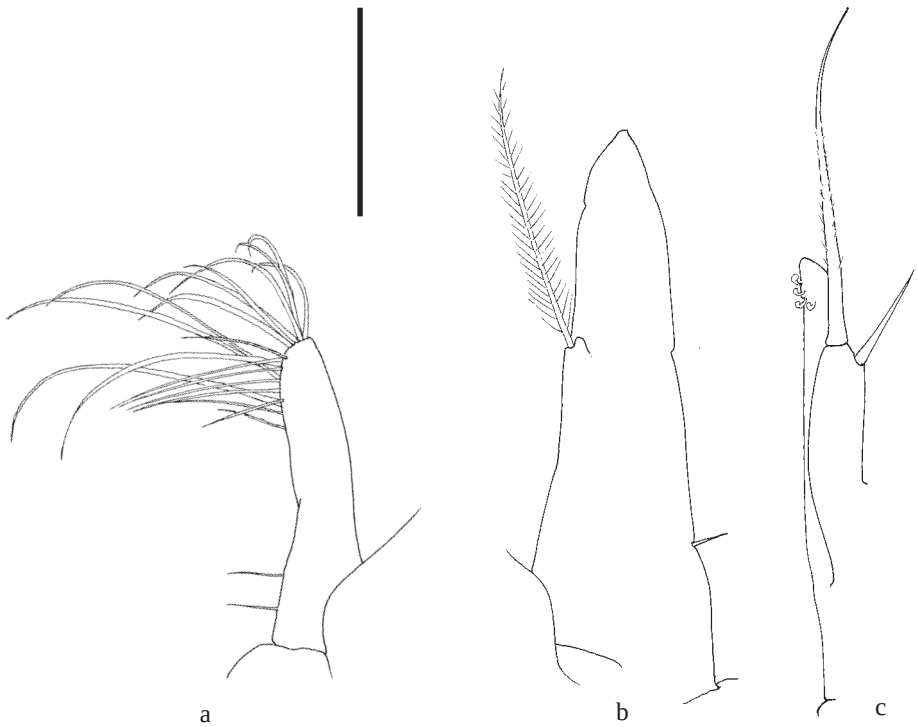


Fig. 176. *Rostronia stylirostris* (Holthuis, 1951): ovigerous female, pocl. 4.2 mm (fig. a), RMNH D 42567; male, pocl. 2.6 mm, RMNH D 42566 (figs. b, c). a, endopod female first pleopod; b, endopod male first pleopod; c, appendix interna and appendix masculina on second male pleopod. Scale: a = 0.6 mm; b, c = 0.15 mm.

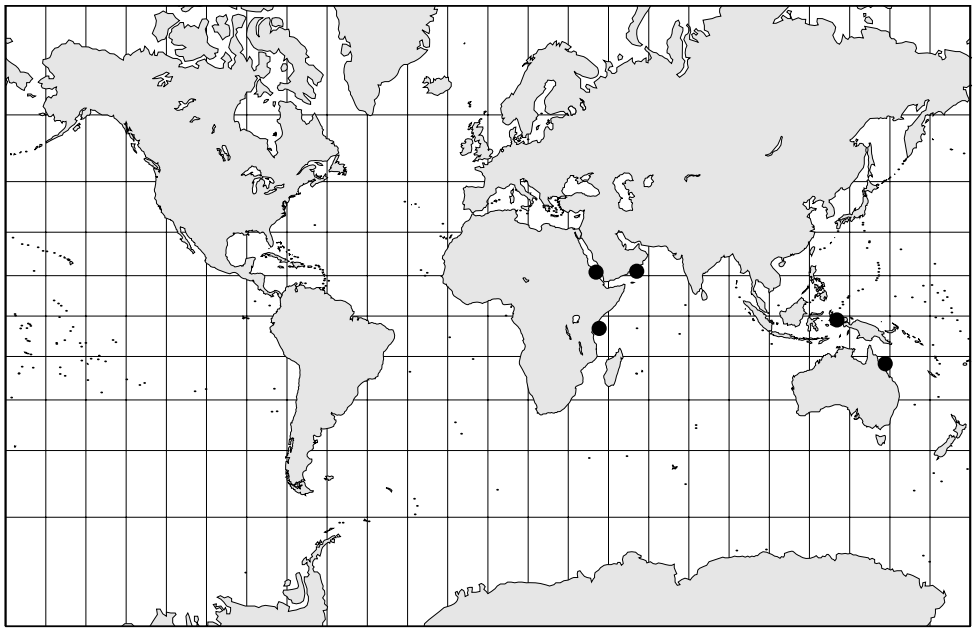


Fig. 177. Geographic distibution of *Rostronia stylirostris* (Holthuis, 1951).

margin, unarmed; ischium about 0.5 of merus length, 3.5 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopods similar.

First pleopod of female with slender endopod, about third of exopod length, few simple setae along median margin, many long simple distal setae, with row of long plumose setae on lateral margin.

Male first pleopod with small endopod, about 4.5 times longer than proximal width, tapering distally; median margin slightly concave with row of few short simple setae, without setae in distal part, with one long plumose seta at lateral margin.

Endopod of second pereiopod with short appendix masculina, equal to about 0.7 times length of appendix interna, with 2-4 long setulose terminal setae.

Uropods normal, with short stout unarmed protopodite; exopod broad, about 1.7 times as long as wide, with convex lateral margin, without or with minute distolateral mobile spine, without distolateral tooth; endopod slightly longer than exopod, about 3.0 times longer than wide, extending beyond telson.

Number of eggs ca. 100, probably increasing with the size of the female. Embryo at point of hatching about 0.7 mm long.

Size.— This is a rather small sized species. The maximum pocl. is 4.2 mm in adult females, 2.8 mm in males. The only ovigerous female known has a pocl. of 4.2 mm.

Colouration.— Not known.

Type.— Holotype: non-ovigerous female, pocl. 3.8 mm (ZMA); between Misool and New Guinea, 1°42'5 S 130°47'5 E; dredge; depth 32 m; bottom sand, small stones and shells; 20.viii.1899; Siboga Exp. station 164.

Distribution.— The species has been recorded from: Indonesia, between Misool and New Guinea (Holthuis, 1952), Tanganyika (Bruce, 1976), Australia, Queensland

(Bruce, 1990), Oman (Holthuis, 1986; Hogarth, 1989), and the Red Sea (present study).

Host.— The species is now recorded for the first time from a 'black ascidian' collected in the Red Sea. No host-species were recorded previously.

8.5. *Dactylonia* gen. nov.

Definition.— Small to medium sized shrimp of subcylindrical body form. Rostrum reduced to well developed, depressed; dorsally unarmed; dorsal carina formed by distinct, sharply defined ridge bordered by lateral depressions; lateral carinae well developed; ventral margin with or without small subdistal tooth. Carapace smooth; inferior orbital angles feebly developed; orbit feebly developed; supraorbital, epigastric and hepatic spines absent; antennal spine well developed, acute, separated from the inferior orbital angle; anterolateral angle of branchiostegite rounded, not strongly produced.

Eye normal, with hemispherical cornea.

Antennula normal, ventromedial tooth on basal segment small; distolateral tooth of basal segment well developed, reaching beyond midlength of intermediate segment, anterior margin sinuous, not extending beyond distolateral tooth; flagella reduced.

Antenna with basicerite unarmed; scaphocerite well developed, with distolateral tooth well developed but less than 0.1 times length of scaphocerite.

Epistome unarmed. Corpus of paragnaths with single median non-setose carina, or two almost completely fused parallel submedian non-setose carinae.

Second thoracic sternite with anterior margin broadly rounded, not produced.

Fourth thoracic sternite with or without medially developed centrally notched lateral plates.

Fifth thoracic sternite with broad rectangular, medially blunt, separate lateral plates.

Mandible robust, without palp, molar process stout, incisor process simple, with row of denticles along medioventral border.

Maxillula with bilobed palp, lower lacinia large, triangular, with many simple setae and few robust, long setae at tip.

Maxilla with simple palp; bilobed endite; scaphognathite broad; basal endite with one or few setae on upper and lower lacinia, upper lacinia well developed, lower lacinia reduced; basal endite shorter than palp.

First maxilliped with slender palp, basal and coxal endites partly fused, with long setae along median margin, forming basket; exopod with well developed caridean lobe; flagellum broad, densely setose distally; epipod large, oval.

Second maxilliped with normal endopod, without distinct angle in median margin of basis, exopod with flagellum well developed, plumose setae distally; epipod a small rounded, curled lobe; without podobranch.

Third maxilliped with ischiomerus of endopod partly fused to basis, much broader than penultimate segment; exopod well developed, with plumose setae distally; coxa with oval, lateral plate, without median process, arthrobranch absent.

First pereiopods with chela simple.

Chelae unequal in size, and form; major chela with one proximal tooth on dactylus and two on fixed finger; dactylus without median carina; fixed finger without median fossa to receive dactylar tooth when fingers closed; minor chela with small teeth in proximal part of both fingers; fingers gaping.

Ambulatory pereiopods slender, dactylus biunguiculate, with accessory teeth on flexor margin of corpus increasing in size distally; flexor margin with scattered setae; unguis with distal scales.

Abdomen smooth, posterior margins of pleura rounded, posterolateral angle of sixth segment blunt or rounded.

Uropod with protopodite feebly acute distally, exopod with distolateral margin with mobile spinule, feebly armed.

Telson with two pairs of large submarginal dorsal spines, three pairs of posterior spines.

Type species.— Type species *Pontonia ascidicola* Borradaile, 1898, by present designation.

Etymology.— The name is composed of 'dactylus', referring to the special feature of the dactylus of the ambulatory legs, and the last part of *Pontonia*, the genus from which it is split of. Gender: feminine.

Distribution.— Known from shallow waters of the Indo-West Pacific.

Hosts.— Associated with Ascidiacea.

8.5.1. Key to the species of *Dactylonia* gen. nov.

1. Paragnath with one median oblong carina; rostrum exceeding proximal border of antennal peduncle; flexor margin of dactyli of ambulatory pereiopods with row of distally denticulate processes 2
- Paragnath with two submedian carinae; rostrum not exceeding proximal border of antennal peduncle; flexor margin of dactyli of ambulatory pereiopods with row of blunt, non-denticulate tubercles ..... ***D. medipacifica***
2. Flexor margin of dactyli of ambulatory pereiopods with 7-14 processes; fingers of minor second chela with short setae 3
- Flexor margin of dactyli of ambulatory pereiopods with 4-6 processes; finger of minor second chela with long setae ..... ***D. anachoreta***
3. Third maxilliped long, reaching beyond scaphocerite; carpus of first pereiopod slightly shorter than chela 4
- Third maxilliped short, reaching halfway scaphocerite; carpus of first pereiopod slightly longer than chela ..... ***D. ascidicola***
4. Penultimate segment of third maxilliped about four times as long as broad; ultimate segment less than half length of penultimate segment ..... ***D. okai***
- Penultimate segment of third maxilliped about twice as long as broad; ultimate segment somewhat shorter than penultimate segment 5
5. Rostrum with subdistal ventral tooth; dactylus of ambulatory pereiopods relatively long with about 13 tubercles on flexor margin ..... ***D. monnioti***
- Rostrum without subdistal ventral tooth; dactylus of ambulatory pereiopods relatively short, with eight tubercles on flexor margin ..... ***D. holthuisi*** spec. nov.

8.5.2. *Dactylonia anachoreta* (Kemp, 1922) comb. nov.
(Figs. 178-184)

Pontonia anachoreta Kemp, 1922: 264, figs. 93-95; Harant, 1931: 368; Calman, 1939: 215-216; Holthuis, 1952: 15; Bruce, 1972: 185; Bruce, 1976a: 482; Bruce, 1976b: 54, fig. 11j; Müller, 1993: 121; Chace & Bruce,

1993: 61; Bruce, 1994: 126; Fransen, 1994c: 134, 152, figs. 103-105; Bruce, 1996: 241, figs. 14g-h, 29i.
Pontonia anchoreta; Bruce, 1994: 126.
Macrurous Crustacea; Oka, 1915: 20.

Material.— **Indo-West Pacific**: **Red Sea**.— RMNH D 46784: 1 ovigerous female, pocl. 3.3 mm; South Red Sea; 8.ii.1958; trawl; leg. O.H. Oren, E58/280,7.— **Gulf of Aden**.— BMNH 1939.10.9.307: 1 non-ovigerous female, pocl. 2.1 mm; 1 ovigerous female, pocl. 2.5 mm; John Murray Expedition station 27; 12.x.1933; depth 37-91 m; trawl (Calman, 1939: 215-216).— **Seychelles**.— RMNH D 42556: 1 non-ovigerous female, pocl. 2.0 mm; NIOP-E, Sta. 705, NW of Praslin Island, 4°16'S 55°40'E; depth: 25 m; rectangular dredge; 17.xii.1992; photo: 1/12-17.— RMNH D 42557: 1 non-ovigerous female, pocl. 3.3 mm; NIOP-E, Sta. 609, Mahé, NW coast, Vista Do Mar, 04°34'S 55°26'E; depth 5 m; beach with beachrock and granitic boulders, sandy bottom at 4-9 m; snorkeling & scuba diving; 11.xii.1992; leg. C.H.J.M. Fransen (Fransen, 1994c: 134, 152, figs. 103-105).

Description based on females only.— Body subcylindrical. Carapace smooth. Rostrum well developed, reaching end of stylocerite, depressed, broad triangular in dorsal aspect, distally ending in sharp point, with shallow but distinct dorsal carina over entire length, with distinct ventral carina in distal part, ventral border straight or slightly concave in lateral view; subdistal dorsal tooth minute, with few simple annulate setae between subdistal tooth and tip; subdistal ventral tooth absent. Inferior orbital angle slightly produced, blunt in lateral view. Antennal spine well developed, acute, marginal, extending beyond slightly protruded inferior orbital and anterolateral angle, situated well below inferior orbital angle, separated from inferior orbital angle by notch. Anterolateral angle of carapace slightly produced, bluntly rounded.

Abdomen smooth; sixth segment about 1.5 times longer than fifth, slightly longer than wide, posteroventral and posterolateral angles acutely produced; pleura of first five segments broadly rounded.

Telson longer than sixth abdominal segment, about 2.0 times its proximal width; lateral margins straight, convergent; posterior border without median process; two pairs of large submarginal dorsal spines at 0.20 and 0.50 of telson length; distal and proximal pairs of spines of equal length, 0.23 of telson length; posterior margin with three pairs of spines, lateral spines small and marginal, intermediate and submedian spines as long as dorsal spines but more slender.

Eyestalk slightly longer than broad, about 1.5 times as broad as diameter of hemispherical cornea.

Antennula with peduncle and flagella rather short. Basal segment with distolateral tooth well developed, acute, reaching to about midlength of intermediate segment of antennular peduncle; anterior margin oblique, faintly sinuous, not extending beyond distolateral tooth; ventromedial tooth of moderate size, acute, marginal, situated halfway basal segment; stylocerite short, reaching halfway basal segment, tip acute, lateral margin with one or few short plumose setae. Intermediate segment short, slightly broader than long. Distal segment about as long as broad. Upper flagellum short, biramous, with four or five proximal segments fused; short free ramus with one or two segments; longer free ramus with about five to seven segments. Lower flagellum short, with about 15 segments.

Antenna with basicerite short, laterally unarmed, with small antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite extending just beyond lamina of scaphocerite, slender, about 2.5 times longer than distal width; flagellum

short, slender, about as long as postorbital carapace length; scaphocerite with lamella about 1.6 times longer than wide, anterior margin broadly rounded, lateral margin slightly convex, almost straight, as long as antennal peduncle; distolateral tooth small, about 0.05 length of lamina, reaching distal margin of lamina; incision between distolateral tooth and lamina shallow.

Epistome with blunt anterior median carina; labrum large, oval.

Paragnath with alae formed by transverse oval distal lobes and small oblong oval ventromesial lobes; corpus rather narrow, with prominent single longitudinal median carina, devoid of setae.

Second thoracic sternite with shallow, non-setose, triangular process between second maxillipeds.

Third thoracic sternite with shallow lateral carinae posteromedial of third maxillipeds.

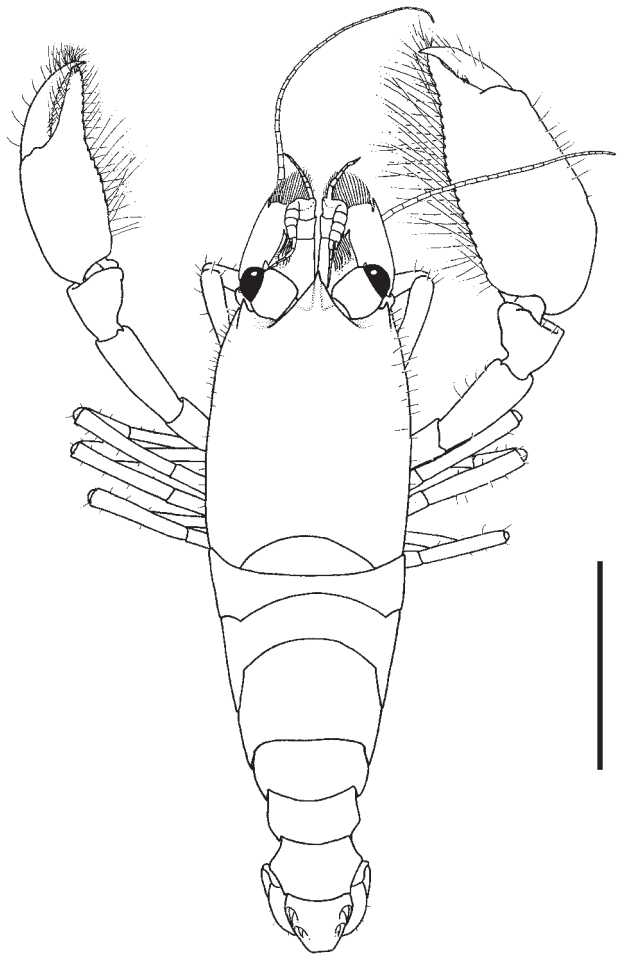


Fig. 178. *Dactylonia anachoreta* (Kemp, 1922): non-ovigerous female, pocl. 2.0 mm, RMNH D 42556. Dorsal aspect. Scale = 2 mm.

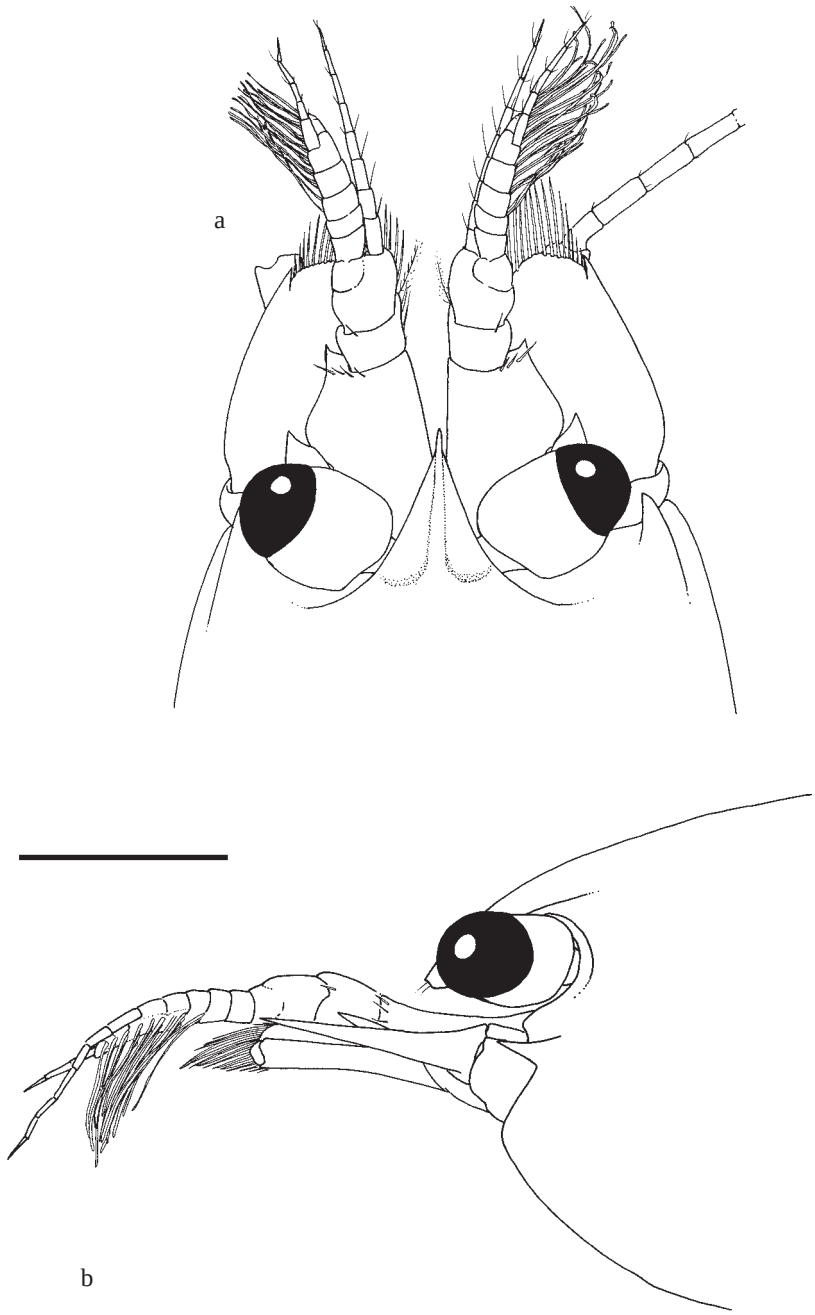


Fig. 179. *Dactylonia anachoreta* (Kemp, 1922): non-ovigerous female, pocl. 3.3 mm, RMNH D 42557. a, anterior appendages, dorsal view; b, anterior appendages, lateral view. Scale = 1 mm.

Fourth thoracic sternite with large triangular, medially notched plate posteromedian between first pereiopod coxae; no ridge between first pereiopods.

Fifth thoracic sternite with blunt lateral plates posteromedian of second pereiopod coxae, with broad notch in between.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process with four distal teeth; row of about six small denticles along medioventral margin; molar process robust, with four blunt distal teeth, some fringed with setal brushes.

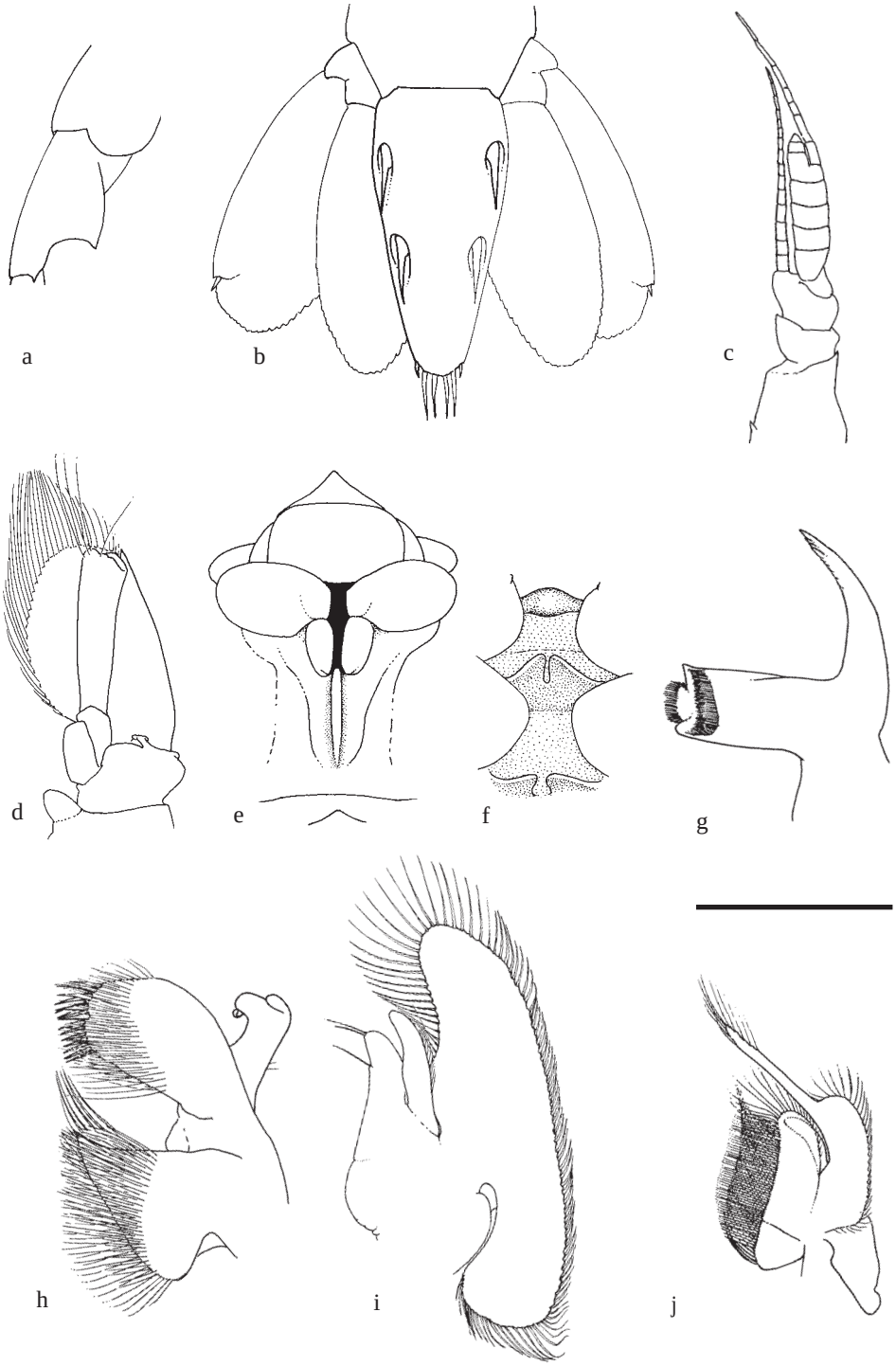
Maxillula with upper and lower lacinia well developed, both with many simple setae in distal half; upper lacinia broad rectangular with two rows of about 14 stout distal spines; lower lacinia triangular, curled inward, with long serrulate stout setae along distal margin; palp feebly bilobed, larger lobe with small ventral tubercle with single short recurved simple seta.

Maxilla with basal endite well developed; distal lobe well developed, with one or two long simple distal setae, proximal lobe not developed, single long simple setae at distal part of proximal lobe; coxal endite obsolete, median margin convex, non-setose; scaphognathite large, 3.5 times longer than wide, posterior lobe large, 1.5 times longer than wide, anterior lobe 1.7 times longer than wide; palp simple, just overreaching distal lobe of basal endite, slightly expanded proximally, tapered distally, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite partly fused, large and broad, fringed with many, long and finely serrulate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod well developed, flagellum with about ten long, plumose setae distally; caridean lobe large, elongate, narrow; epipod large, triangular, faintly bilobed; palp simple, slender, elongate, curved along distolateral margin of basal endite, non-setose.

Second maxilliped with endopod normally developed; dactylar segment about 5.0 times longer than broad, densely fringed with coarsely serrulate spiniform, and long curled finely serrulate setae medially; propodal segment with row of long spines and simple and finely serrulate setae along distomedian margin, with few finely serrulate setae along ventrolateral margin; carpal segment short, broader than long, unarmed; meral segment with row of long plumose setae medially; basal and ischial segment almost completely fused, both segments medially strongly excavate; ischial segment with row of long plumose setae medially; exopod normal, with about ten long plumose setae distally; coxal segment medially produced, non-setose, with trapezoidal, proximally expanded epipod, laterally.

Third maxilliped reaching with ultimate segment from proximal half of carpocerite to distal margin carpocerite; ischiomerus partly fused to basis, but with distinct suture, almost twice as long as broad, tapering distally, flattened, with many setae on median margin and ventral surface, lateral margin with single row of long plumose setae; basal segment medially convex, with many long finely serrulate setae on median and ventral surfaces; exopod well developed, slightly longer than ischiomeral segment, with many long plumose setae distally; coxa without medial process, with large lateral plate with few simple short setae, without arthrobranch; ultimate and penultimate segments of equal length; penultimate segment about 2.5 times as long as broad, subcylindrical, with groups of long, finely serrulate setae ven-


a
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tromedially; ultimate segment tapering distally, with groups of long coarsely serrulate setae distally.

First pereiopods rather slender, exceeding carpocerite by chela. Chela slightly more than three times longer than deep, slightly compressed; fingers as long as, though more often slightly longer, than palm, with entire cutting edges; fixed finger with groups of many strong, long, serrulate setae, tip with two small distal spines; dactylus with groups of moderately longer, finely serrulate and simple setae, tip acute with single small spine; cleaning organ absent on carpal-propodal joint; carpus about 1.1 times chela length, about 3.8 times distal width, tapering proximally, unarmed, with few long simple setae; merus subequal to carpus length, 5.5 times longer than central width, unarmed, with few long simple setae along median margin; ischium 0.5 times merus length, medially expanded, with long simple setae medially; basis 0.6 times ischium length, with long simple setae medially; coxa with rounded ventral lobe with long simple setae.

Second pereiopods unequal, dissimilar. Major chela about 1.3 times carapace length; palm strongly compressed, with serrate, carinate, slightly convex median margin provided with row of very long simple setae; dactylus 0.4 times length of palm, about 3.3 times longer than deep, with one large triangular tooth in proximal part of cutting edge, distal part of cutting edge entire, slightly concave, tip hooked, without medial carina; fixed finger about 1.5 times longer than deep, with two large triangular teeth at about 1/3rd and 2/3rds of cutting edge, proximalmost tooth without fine denticulation, distal part of cutting edge entire, slightly concave, median fossa for reception of dactylar tooth when fingers closed not developed, tip hooked; carpus about 0.25 of palm length, strongly tapering proximally, about as long as distal width; merus almost twice as long as carpus, about 2.3 times its central width, distomedially excavate; ischium almost als long as merus, somewhat tapering proximally; basis and coxa without special features. Minor chela about as long as carapace, strongly compressed, with serrulate, carinate median margin provided with row of very long simple setae; dactylus 0.75-1.00 times as long as palm, about 5.7 times longer than deep, with one small blunt proximal tooth, rest of cutting edge entire, strongly concave, with many long median simple setae, tip hooked; fixed finger about 3.0 times longer than deep, with two small blunt teeth proximally, rest of cutting edge entire, strongly concave, with many long median simple setae, tip hooked; carpus about 0.5 times palm length, strongly tapering proximally, about as long as distal width; merus, ischium, basis and coxa as in major cheliped, more slender.

Ambulatory pereiopods slender. Dactylus of third pereiopod compressed, with corpus about 2.3 times longer than proximal width, with few simple setae, accessory tooth acute, recurved, terminal, with bifid tip, ventral margin with six, seven, or eight rather acute slender teeth, decreasing in size proximally, with fine distal denticula-

◀ Fig. 180. *Dactylonia anachoreta* (Kemp, 1922): non-ovigerous female, pocl. 2.0 mm, RMNH D 42556 (figs. a, b); non-ovigerous female, pocl. 3.3 mm, RMNH D 42557 (figs. c-e, g-j); ovigerous female, pocl. 3.3 mm, RMNH D 46784 (fig. f). a, distal part abdomen, lateral view; b, telson, dorsal view; c, antennula, ventral view; d, antenna, ventral view; e, paragnath, ventral view; f, second to fifth thoracic sternites; g, mandible, ventral view; h, maxillula, ventral view; i, maxilla, ventral view; j, first maxilliped, ventral view. Scale: a-f = 1 mm; g-i = 0.6 mm; j = 1.5 mm.

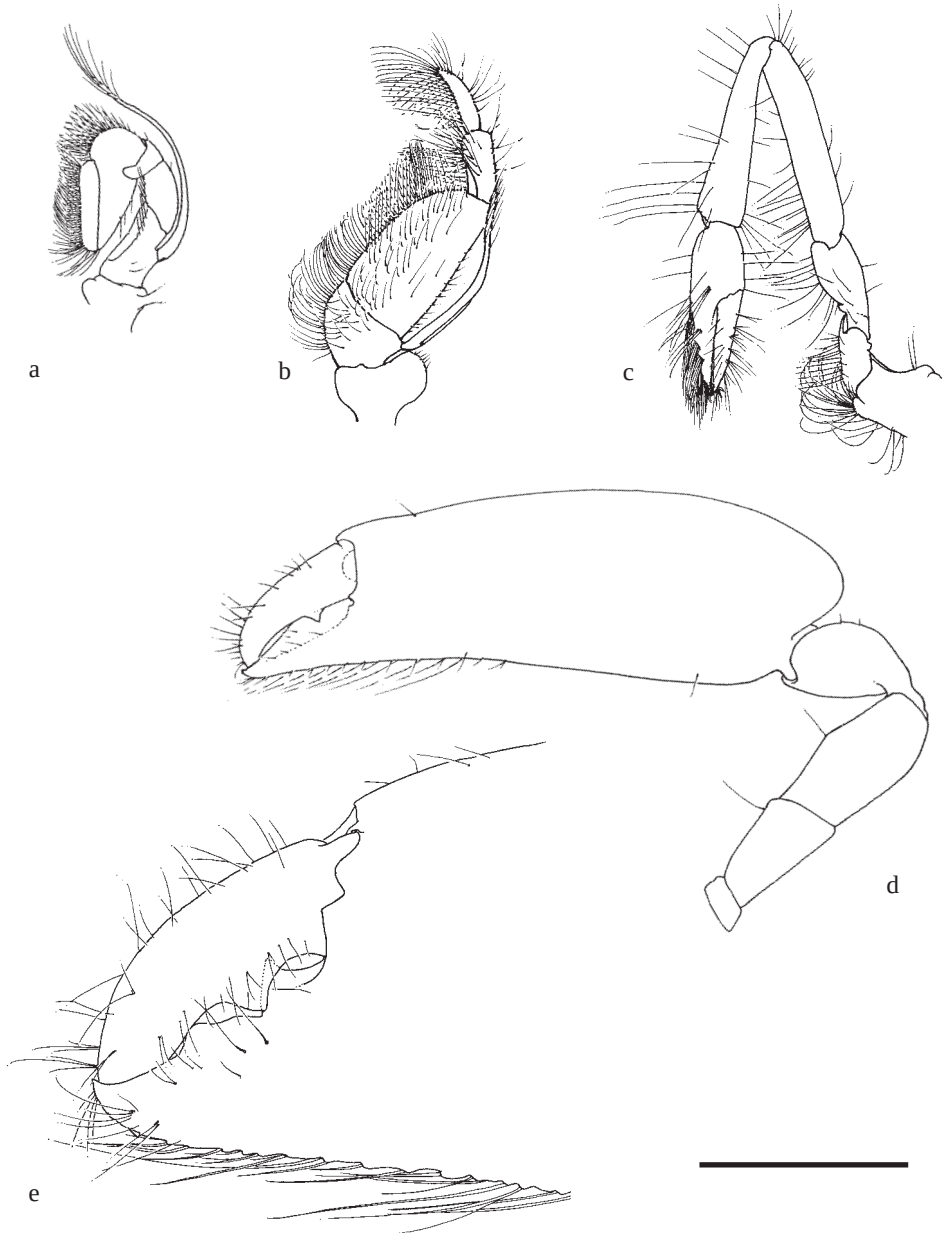

Fig. 181. *Dactylonia anachoreta* (Kemp, 1922): non-ovigerous female, pocl. 3.3 mm, RMNH D 42557. a, second maxilliped, ventral view; b, third maxilliped, ventral view; c, first pereiopod; d, major second pereiopod; e, idem, chela. Scale: a-c = 1.5 mm; d = 2 mm; e = 0.6 mm.

tions; unguis large, recurved, about 0.48 of corpus length, distally bifid; propodus about 5.5 times longer than dactylus, 5.9 times longer than proximal width, with two large spines in distal third of flexor margin, and two strong ventrodistal spines, few rather long setae along ventral and distal margins; carpus about 0.57 of propodus length, 3.0 times longer than distal width, slightly tapering proximally, with indistinct distal lobe, unarmed; merus about as long as propodus, 4.3 times longer than central width, slightly compressed, with few long setae on ventral margin, unarmed; ischium about 0.8 of merus length, 3.7 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopods similar.

Male pleopods not studied.

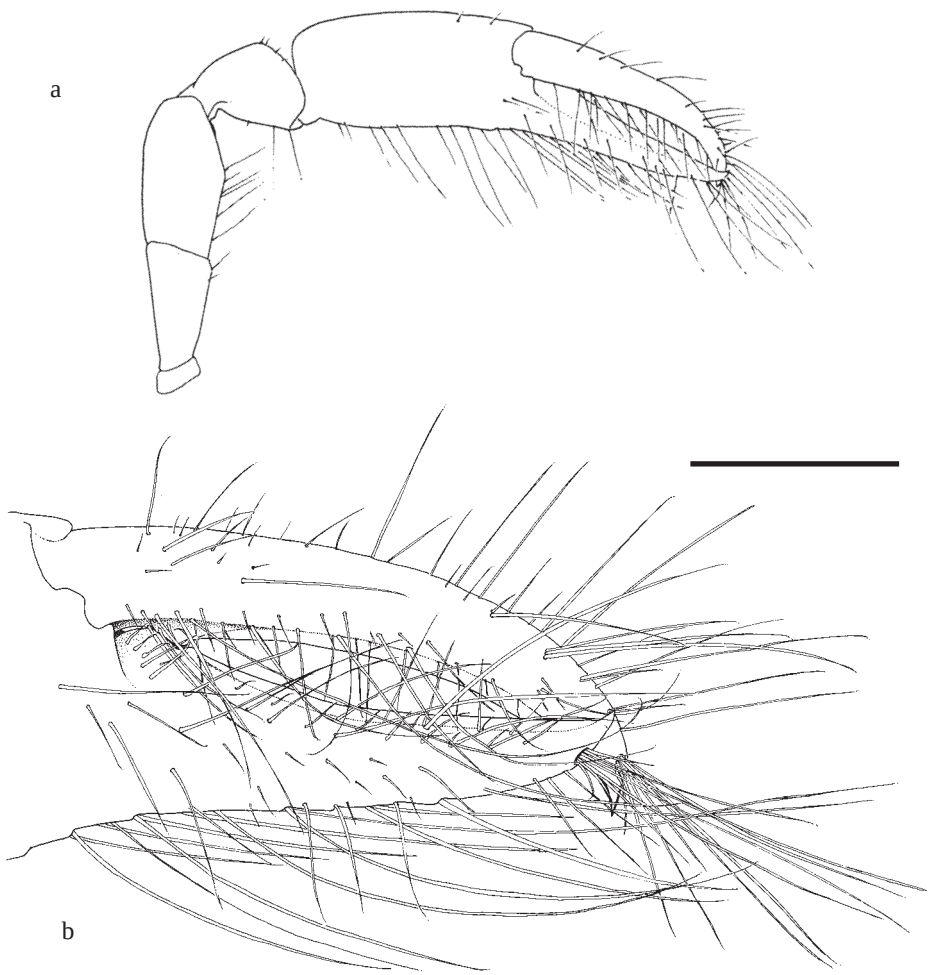

Fig. 182. *Dactylonia anachoreta* (Kemp, 1922): non-ovigerous female, pocl. 3.3 mm, RMNH D 42557. a, minor second pereiopod; b, idem, chela. Scale: a = 2 mm; b = 0.6 mm.

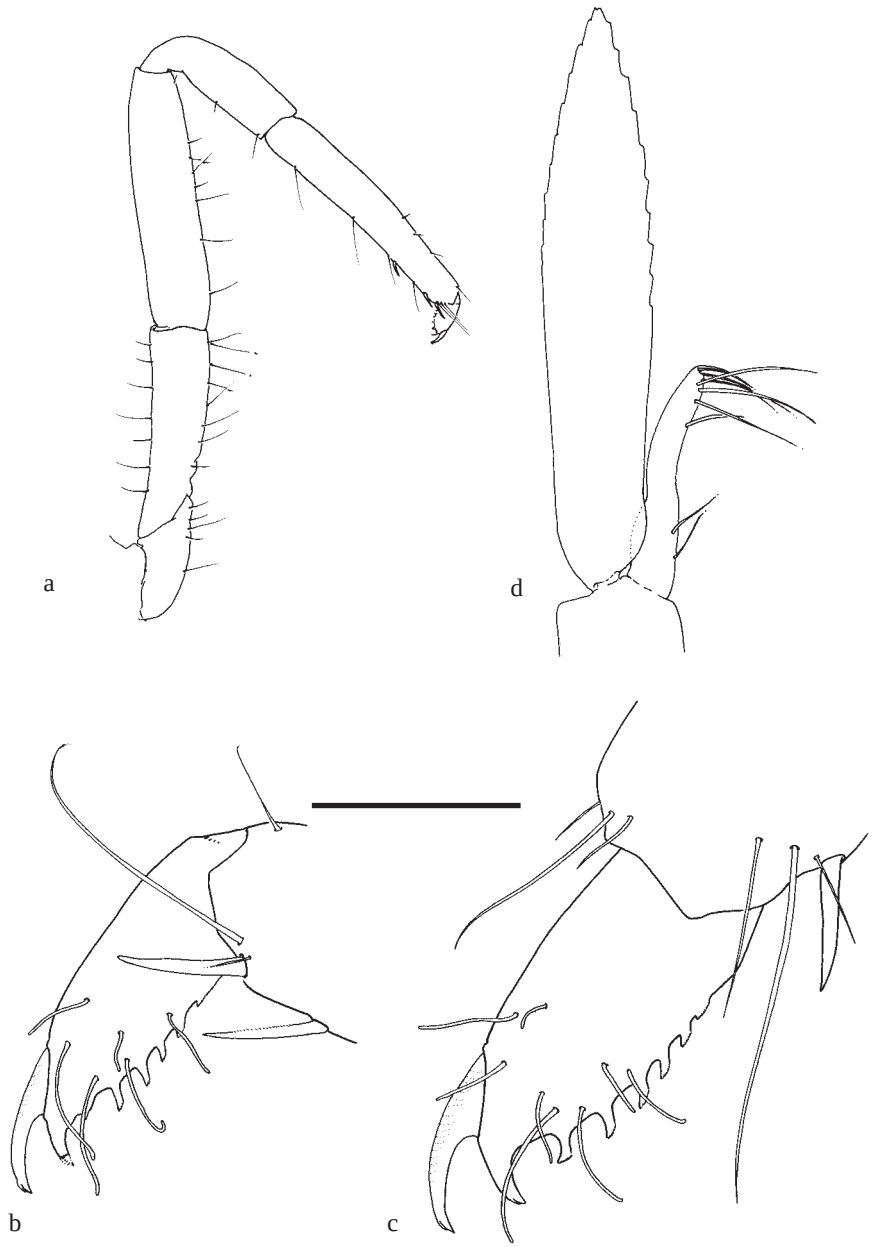

Fig. 183. *Dactylonia anachoreta* (Kemp, 1922): non-ovigerous female, pocl. 2.0 mm, RMNH D 42556 (fig. b); non-ovigerous female, pocl. 3.3 mm, RMNH D 42557 (figs. a, c, d). a, third pereiopod; b, dactylus third pereiopod; c, idem; d, endopod female first pleopod. Scale: a = 1.5 mm; b, c = 0.15 mm; d = 0.6 mm.

First pleopod of female with slender endopod, less than half length of exopod, with ca. 10 long distal setae when ovigerous, with row of long plumose setae on lateral margin and few simple setae in proximal part of medial margin.

Uropods normal, with short unarmed protopodite; exopod broad, about twice as long as wide, with convex lateral margin, without distolateral tooth, with distinct distolateral spine; endopod slightly longer than exopod, about 2.5 times longer than wide, about as long as telson.

Number of eggs between 40-50. Embryo on point of hatching about 0.5 mm long.

Sexual dimorphism.— Males generally similar to females, of smaller size, with relatively larger chela on second pereiopods.

Size.— This is a rather small sized species. The maximum pocl. is 3.3 mm in adult females. The only male recorded by Kemp (1922: 265) has a total body length of 6.5 mm, the pocl. of this specimen will be around 2.2 mm. The minimum pocl. of ovigerous females is 2.5 mm.

Colouration (based on slides of a specimen with registrationnumber RMNH D 42556).— Body translucent with scattered yellow chromatophores. Eyestalks without chromatophores, cornea golden-brownish. Antennulae and scaphocerite with yellow chromatophores. Second pereiopods with scattered yellow chromatophores. First pereiopods and ambulatory pereiopods with few yellow chromatophores in distal part of proximal joints. Abdominal pleura with yellow chromatophores. Tail-fan with large yellow chromatophores proximally and distally.

Bruce (1996) noted that the cornea "has a golden colouration".

Types.— 1 female (total length 10 mm, 1 male (total length 6.5 mm); off Madras coast, India; depth 39 m; in *Polycarpa annandalei* Oka, 1915; 'Investigator'. Specimens are present in the Zoological Survey of India, Calcutta (B. Galil, pers. comm.). However, efforts to obtain the type-specimens for comparison were unsuccessful.

Distribution.— INDO-WEST PACIFIC: Indian Ocean: India, off Madras, 39 m (Oka, 1915; Kemp, 1922); South Red Sea, (present record); Gulf of Aden (Calman, 1939); Yemen (Bruce, 1996); Kenya, Ras Iwatine (Bruce, 1976); Seychelles (Fransen, 1994c); occurring in shallow water.

Host.— Living in ascidians. *Polycarpa annandalei* Oka, 1915 (cf. Oka, 1915; Kemp, 1922); *Polycarpa* sp., aff. *anguinea* (Sluiter, 1897)(cf. Bruce, 1996); 'unidentified ascidian' (Bruce, 1976).

Remarks.— Calman observed several differences in his material from the Gulf of Aden compared with the description of the species by Kemp. The differences between Calman's specimens and the description of *Dactylonia anachoreta* by Kemp (1922) are: 1) rostrum acute in Calman's material while blunt in Kemp's description; 2) antennal scale twice as long as wide in Calman's material while clearly less than twice as long as wide in Kemp's description; 3) distolateral tooth on the antennal scale overreaching the lamina in Calman's material while not overreaching the lamina in Kemp's description. 4) antepenultimate segment of the third maxilliped less than twice as long as wide in Calman's material while slightly more than twice as long as wide in Kemp's description; 5) penultimate segment more than twice as long as wide, and longer than the ultimate segment in Calman's material while about 1.7 times as long as wide, and shorter than the ultimate segment in Kemp's description.

In both specimens the rostrum is identical with the one described by Kemp,

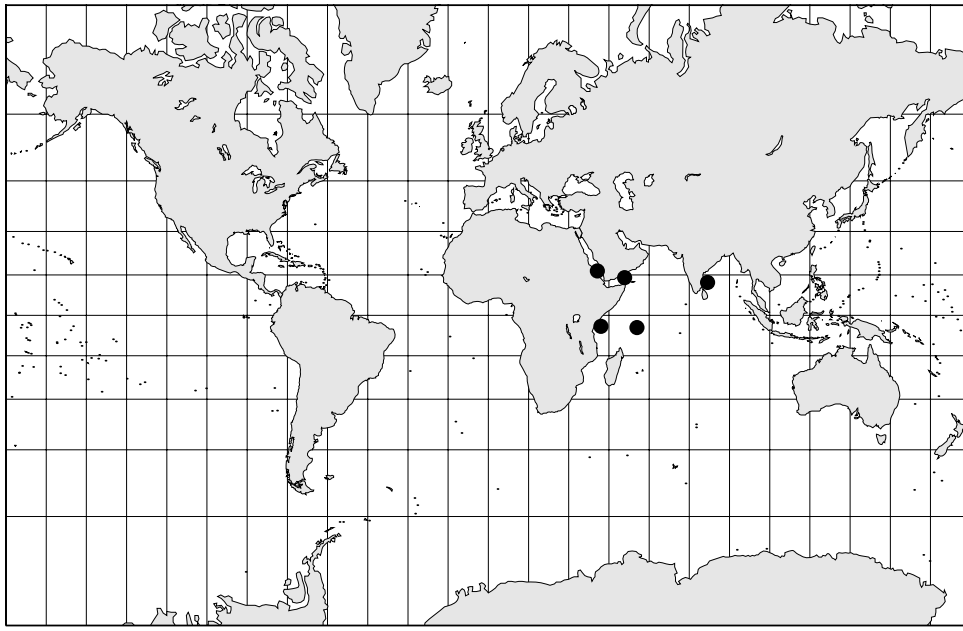

Fig. 184. Geographic distribution of *Dactylonia anachoreta* (Kemp, 1922).

including a small ventral subdistal tooth and some distal setae. The chela of the minor second pereiopod which is present in the ovigerous female has the long simple setae as described for *Dactylonia anachoreta*. Both specimens have long simple setae present on the ischium, merus and carpus of the first pereiopod which are also present in material from the Red Sea and Seychelles. The identity of Calman's material is herewith confirmed as belonging to *Dactylonia anachoreta*.

The material from the Seychelles only differs from the type material in the following character: both Kemp (1922) and Bruce (1996) figure the dactylus of the third ambulatory pereiopod with the ventral teeth on the corpus drawn distally acute and entire. In the present material a minute ventral denticulation is present on these teeth. (fig. 183b, c).

8.5.3. *Dactylonia ascidicola* (Borradaile, 1898) comb. nov.
(figs. 185-193, pls. 11, 12)

Pontonia ascidicola Borradaile, 1898: 389; Borradaile, 1899: 409, pl. 36 fig. 6; Borradaile, 1917: 391; Kemp, 1922: 261; Harant, 1931: 368; Calman, 1939: 216; Dawydoff, 1952: 136; Holthuis, 1952: 15, 165, figs. 79-81; Holthuis, 1958: 10; Hipeau-Jacquotte, 1972: 8; Hipeau-Jacquotte, 1973: 104; Bruce, 1972: 185; Bruce, 1978: 287; Bruce, 1980: 232; Bruce, 1990: 19; Müller, 1993: 121; Chace & Bruce, 1993: 61, 129; Bruce, 1994: 126; Bruce, 1996: 241-242, figs. 29g-h.

Material.— **Indo-West Pacific**: **Red Sea**.— RMNH D 15165: 1 male, pocl. 2.9 mm; Israel, Gulf of Akaba, near Eylath; 8.vi.1956; leg. H. Steinitz; E 56/136.— RMNH D 42565: 1 ovigerous female, pocl. 2.5 mm; off David Bay, Entedebir Island; ISRSE E62/1341; 15.iii.1962; depth 2-3 m; in black ascidian together with *P. stylirostris* male.— **Indonesia**.— RMNH D 42562: 1 male, pocl. 3.3 mm; 1 ovigerous female, pocl. 4.06 mm; Sta. RBE.27, Moluccas, Ambon, Leitimur, S coast, Hutumuri; depth 25 m; scuba

diving; 26/27.xi.1990; in fleshy red *Ascidia* spec.; leg. C.H.J.M. Fransen; Photo M. Lavaleye.— RMNH D 42564: male, pocl. 3.8 mm; Sta. RBE.27, Moluccas, Ambon, Leitimur, S coast, Hutumuri; depth 20-25 m; scuba diving; 26/27.xi.1990; in fleshy red transparent *Ascidia* spec.; leg. C.H.J.M. Fransen; Photo M. Lavaleye.— RMNH D 46785: 1 male, pocl. 2.3 mm; SW Sulawesi, Spermonde archipelago, Samelona, S side; depth 10 m; 10.x.1994; scuba diving; in blue ascidian, *Rhopalaea crassa* (Herdman, 1880); leg. C.H.J.M. Fransen, photo NNM 18.— RMNH D 46786: 1 male, pocl. 4.8 mm; 1 ovigerous female, pocl. 5.8 mm; SUL.18, N Sulawesi, Selat Lembeh, near Tandarusa, Sarena Kecil West, 01°27'N 125°13'E; coral covered slope, much rubble in shallow parts; scuba diving; depth 25 m; 31.x.1994; in translucent *Ascidia* spec.; leg. C.H.J.M. Fransen.— RMNH D 46787: 1 male, pocl. 2.6 mm; 1 ovigerous female, pocl. 3.1 mm; SUL.04, N Sulawesi, Selat Lembeh, bay S of Pulau Putus, 01°31'N 125°16'E; coral cover from shore to more than 20 m; seagrass on N-side; scuba-diving; depth 15 m; 27.x.1994; in translucent *Ascidia* spec.; leg. B.W. Hoeksema.— RMNH D 46788: 1 male, pocl. 3.1 mm; SW Sulawesi, Spermonde archipelago, Samelona, NW side; depth 15 m; 21.ix.1994; scuba diving; in blue ascidian, *Rhopalaea crassa* (Herdman, 1880); leg. C.H.J.M. Fransen, photo NNM 1, CF 1.— RMNH D 46789: 1 male, pocl. 3.3 mm; 1 ovigerous female, pocl. 4.7 mm; SUL.17, N Sulawesi, Selat Lembeh, between Tanjungnanas and Teluk Kungkungan, 01°28'N 125°14'E; steep rocky shore, rockface down to 16 m; snorkeling; depth 1-1.5 m; 28.x.1994; in translucent *Ascidia* spec.; leg. J.C. den Hartog; photo NNM 28/34-36.— RMNH D 46790: 1 male, pocl. 2.4 mm; 1 ovigerous female, pocl. 2.9 mm; SUL.04, N Sulawesi, Selat Lembeh, bay S of Pulau Putus, 01°31'N 125°16'E; rocky shore and small sandy beach, coral cover from shore to more than 20 m; scuba-diving; depth 15 m; 14.x.1994; in ascidian; leg. C.H.J.M. Fransen.— RMNH D 47578: 1 male, pocl. 1.8 mm; 1 non-ovigerous female, pocl. 3.6 mm; MAL.05, Ambon, N coast, Manuala beach, W of Hila, 03°35'S 128°05'E; 7.xi.1996; depth ca. 10 m; diving; in *Ascidia* spec.; leg. C.H.J.M. Fransen.— RMNH D 47584: 1 male, pocl. 3.1 mm; 1 non-ovigerous female, pocl. 3.6 mm; MAL.24, Ambon, S coast, Seri bay, 03°45'S 128°09'E; 22.xi.1996; depth 15 m; diving; in large transparent ascidian, *Ascidia* spec.; leg. C.H.J.M. Fransen; photo.— RMNH D 47585: 1 male, pocl. 2.8 mm; 1 non-ovigerous female, pocl. 4.6 mm; MAL.15, Ambon, Ambon Bay, S coast , cape W of Amahusu, 03°44'S 128°08'E; 16.xi.1996; depth 25 m; diving; in large transparent solitary ascidean, *Ascidia* spec.; leg. C.H.J.M. Fransen.— RMNH D 47588: 1 male, pocl. 1.8 mm; MAL.12, Ambon, N coast near Morela, 03°33'S 128°12'E; 13/14.xi.1996; depth 40 m; diving; in large transparent solitary ascidean, *Ascidia* spec.; leg. C.H.J.M. Fransen.— ZMA: 2 males, pocl. 1.8 mm; SE Sulawesi, anchorage off Pasirpandjang, westcoast of Binongko; in *Ascidia empheres* Sluiter; Hensen vertical net; depth 278 m; bottom coral sand; 1-3.xi.1899; Siboga Exp. station 220.— RMNH D 48678: 1 ovigerous female, pocl. 3.2 mm; Sta. BAL.23: Bali, Tulamben area, bay S of 'Emerald Hotel'; 08°17'05''S 115°36'11''E; deep reef slope with dense coral cover; scuba-diving; 30 m depth; 15.iv.2001; in translucent *Ascidia*; collected by C.H.J.M. Fransen.— RMNH D 48679: 1 non-ovigerous female, pocl. 2.5 mm; Sta. BAL.12: E-side Nusa Dua, off Club Med Hotel, N of channel; 08°47'06''S 115°13'57''E; slowly declining reef slope, sandy base; scuba-diving to 20 m depth; 4.iv.2001; in unidentified ascidian; collected by C.H.J.M. Fransen.— **Malaysia**.— NTM Cr.010143: 1 ovigerous female, pocl. 3.6 mm; Borneo, Sipadan Reefs, near Sabah, 03°00.0'N 120°00.0'E; -.v.1992; collected by D. Lane.— **Papua New Guinea**.— KBIN IG 28056/NAT272: 1 male, pocl. 2.3 mm; Laing Island, eastern side; 13.x.1993; from coral rock fragments encrusted with ascidians and sponges; leg. S. de Grave, field no. S93/108.— **Philippines**.— RMNH D 48503: 1 ovigerous female, pocl. 4.1 mm; Sta. CEB.01: Philippines, Cebu strait, Olango Channel, E side of Olango Island; 10°15.54'N 124°04.17'E; gentle reef slope, poor coral cover with algae and rubble; scuba; 4.xi.1999; depth 5 m; in *Ascidia* spec.; leg. C.H.J.M. Fransen.— RMNH D 48504: 1 ovigerous female, pocl. 5.5 mm; 1 non-ovigerous female, pocl. 3.4 mm; 1 male, pocl. 3.3 mm; Sta. CEB.06: Philippines, Cebu Strait, W of Bohol, N side of Cabilao Island, near Looc; 9°53.49'N 123°46.53'E; steep, unevenly structured slope; scuba; 9.xi.1999; depth 8 m; in *Ascidia* spec; leg. C.H.J.M. Fransen.— RMNH D 48505: 1 ovigerous female, pocl. 7.0 mm; Sta. CEB.06: Philippines, Cebu Strait, W of Bohol, N side of Cabilao Island, near Looc; 9°53.49'N 123°46.53'E; steep, unevenly structured slope; scuba; 9.xi.1999; depth 8 m; in *Ascidia*; leg. C.H.J.M. Fransen; photo 5/30-36.— RMNH D 48506: 2 ovigerous females, pocl. 5.0 and 3.9 mm; 1 male, pocl. 3.9 mm; Sta. CEB.07: Philippines, Cebu Strait, W of Bohol, NW side of Cabilao Island, Baluarte Point; 9°53.39'N 123°45.51'E; gentle slope, solid substrate few boulders; scuba; 10.xi.1999; depth 20 m; in *Ascidia*; leg. C.H.J.M. Fransen.— RMNH D 48507: 1 male, pocl. 4.2 mm; Sta. CEB.08: Philippines, Cebu Strait, W of Bohol, S

side of Cabilao Island, Cabacungan Point; 9°51.55'N 123°45.95'E; overhanging wall with caves; scuba; 11.xi.1999; depth 20 m; in *Ascidia* spec.; leg. C.H.J.M. Fransen.— **Guam**.— RMNH D 48066: 1 male, pocl. 2.3 mm; 1 ovigerous female, pocl. 3.2 mm; Piti power plant intake channel; from tunicate; donated by G. Aulay, 1999.— **New Caledonia**.— MNHN-Na 12889: 1 male, pocl. 1.3 mm; Neokumbi Reef, outer slope; 20-40 m, SCUBA diving; 9.iii.1987; in *Ascidia sydneiensis* Stimpson, 1854; coll. C. Monniot (Bruce, 1996: 241-242).

Description.— Body subcylindrical. Carapace smooth. Rostrum well developed, reaching just beyond stylocerite, depressed, triangular in dorsal aspect, distally ending in sharp point; with shallow but distinct dorsal carina over entire length; with distinct ventral carina in distal part, ventral margin concave; with minute distal dorsal

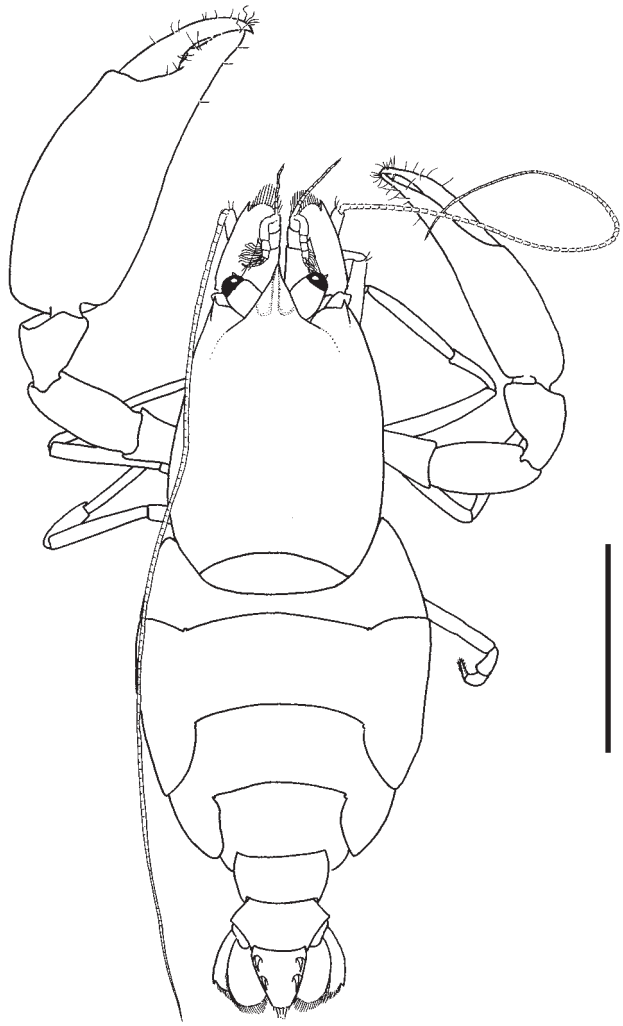

Fig. 185. *Dactylonia ascidicola* (Borradaile, 1898): 1 ovigerous female, pocl. 4.06 mm, RMNH D 42562. Dorsal aspect. Scale = 4 mm.

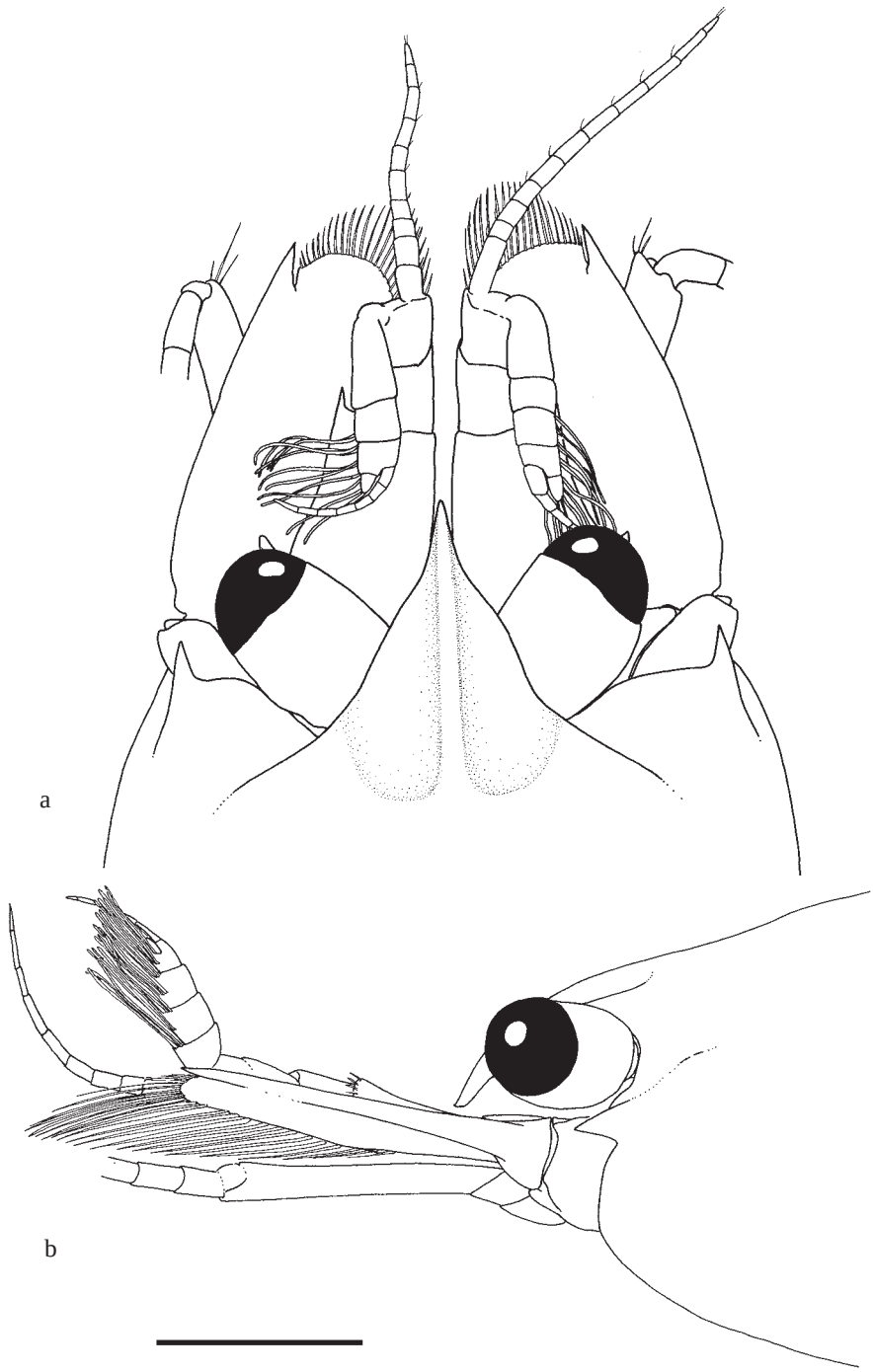

Fig. 186. *Dactylonia ascidicola* (Borradaile, 1898): 1 ovigerous female, pocl. 4.06 mm, RMNH D 42562 (fig. a); 1 male, pocl. 3.3 mm, RMNH D 46789 (fig. b). a, anterior appendages, dorsal view; b, anterior appendages, lateral view. Scale = 1 mm.

tooth, without distal setae; without subdistal ventral tooth. Inferior orbital angle rounded, not produced. Antennal spine well developed, acute, proximally broad, marginal, extending beyond inferior orbital angle and beyond anterolateral margin of carapace, situated just below inferior orbital angle, separated from inferior orbital angle by notch. Anterolateral angle of carapace slightly produced, broadly rounded.

Abdomen smooth; sixth segment about 1.6 times longer than fifth, slightly longer than wide, posteroventral and posterolateral angles acute; pleura of first five segments broadly rounded.

Telson longer than sixth abdominal segment, almost 2.0 times its proximal width; lateral margins almost straight, convergent; posterior border without median process; two pairs of large submarginal dorsal spines at about 0.17 and 0.46 of telson length; distal and proximal pairs of spines of equal length, about 0.30 of telson length; posterior margin with three pairs of spines, lateral spines small and marginal, intermediate and submedian spines slightly shorter and more slender than dorsal spines.

Eyestalk slightly longer than broad, slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella rather short. Basal segment with distolateral tooth well developed, acute, reaching to about midlength of intermediate segment of antennular peduncle; anterior margin small, rather straight, not extending beyond distolateral tooth; ventromedial tooth of moderate size, acute, submarginal, situated halfway basal segment; stylocerite short, reaching halfway basal segment, with tip rather acute, lateral margin with row of few plumose setae. Intermediate segment short, slightly broader than long. Distal segment about as long as broad. Upper flagellum short, biramous, with three to four proximal segments fused; short free ramus with one segment; longer free ramus with about seven segments. Lower flagellum with about 10 to 12 segments.

Antenna with basicerite short, laterally unarmed, with antennal gland tubercle medially; carpocerite extending to level of distal margin of lamina of scaphocerite, about 4.2 times longer than distal width; flagellum long, slender, more than three times as long as postorbital carapace length; scaphocerite with lamella about 1.5 times longer than wide, anterior margin broadly rounded, lateral margin slightly convex, almost straight; distolateral tooth small, about 0.10 length of lamina, reaching slightly beyond distal margin of lamina; incision between distolateral tooth and lamina shallow.

Epistome with blunt anterior median carina; labrum normal.

Paragnath with alae formed by large transverse suboval distal lobes and small round triangular ventromesial lobes; corpus rather narrow, with prominent longitudinal median carina, without setae.

Second thoracic sternite with shallow triangular medially rounded process between second maxillipeds, without setae.

Third thoracic sternite with transverse carina between third maxillipeds.

Fourth thoracic sternite with large triangular, medially notched plate posteromedian between first pereiopods; no ridge between first pereiopods.

Fifth thoracic sternite with blunt lateral plates posteromedian of second pereiopods, with broad notch in between.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

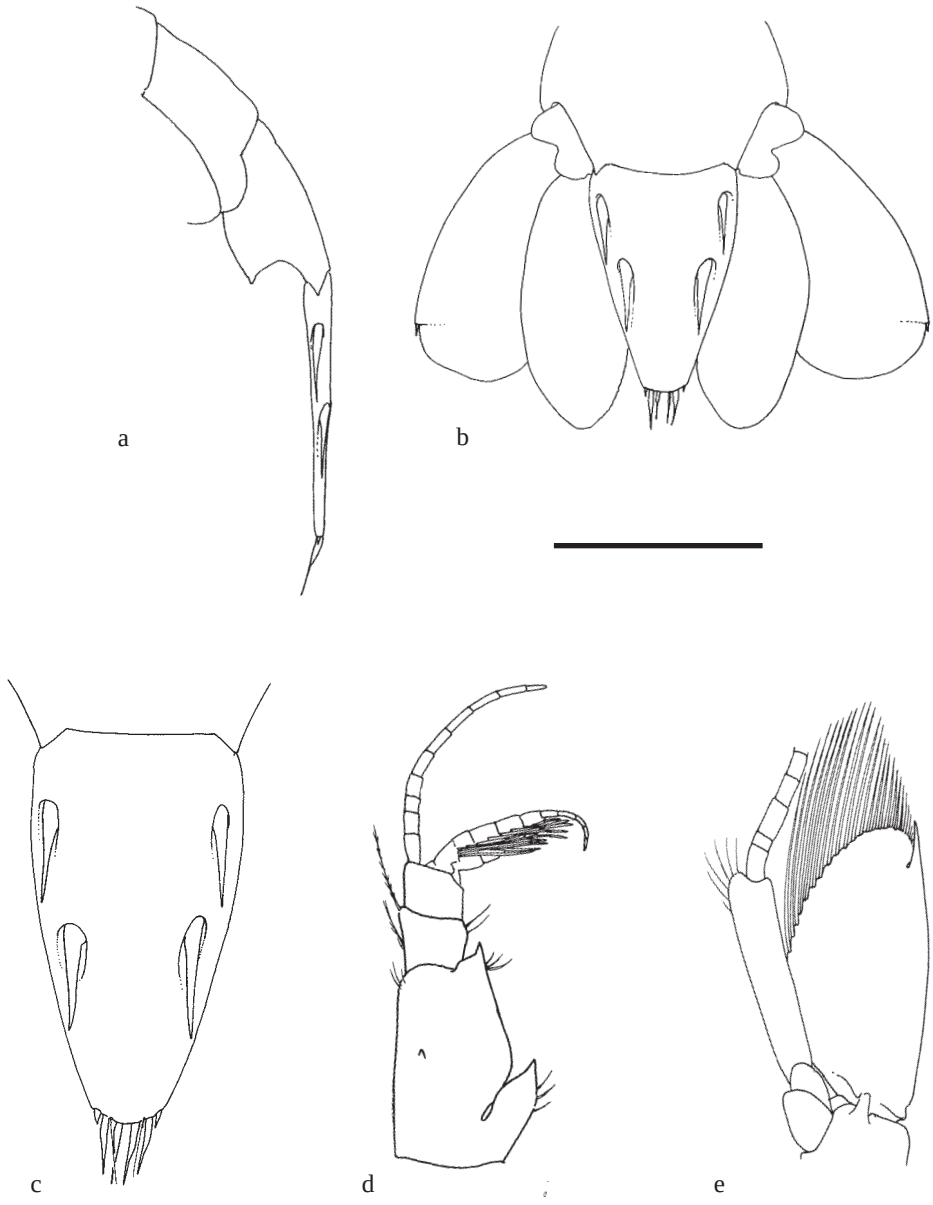

Fig. 187. *Dactylonia ascidicola* (Borradaile, 1898): 1 male, pocl. 3.3 mm (figs. c-e); ovigerous female, pocl. 4.7 mm (figs. a, b), RMNH D 46789. a, distal part abdomen, lateral view; b, telson and uropods, dorsal view; c, telson, dorsal view; d, antennula, ventral view; e, antenna, ventral view. Scale: a, b = 2 mm; c = 1 mm; d, e = 1.5 mm.

Mandible with incisor process with five or six acute distal teeth, and row of about five small denticles along medioventral margin; molar process stout, with four blunt distal teeth, some fringed with setal brushes.

Maxillula with upper and lower lacinia well developed, both with many simple setae in distal half; upper lacinia broad rectangular with two rows of about 12 distal spines; lower lacinia triangular, curled inward, with long serrulate stout setae along distal margin; palp feebly bilobed, larger lobe with small ventral tubercle with single, short, recurved, simple seta.

Maxilla with basal endite well developed; distal lobe well developed, with one or two long simple distal setae, proximal lobe not developed, one or two long simple setae at distal part of proximal lobe; coxal endite obsolete, median margin convex, non-setose; scaphognathite large, 3.5 times longer than wide, posterior lobe large, 1.5 times longer than wide, anterior lobe 1.7 times longer than wide; palp simple, just overreaching distal lobe of basal endite, slightly expanded proximally, tapered distally, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite partly fused, large and broad, fringed with many long and finely serrulate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod well developed, flagellum with about six long plumose setae distally; caridean lobe large, elongate, narrow; palp simple, slender, elongate, curved along distolateral margin of basal endite, non-setose; epipod large, triangular, faintly bilobed.

Second maxilliped with endopod normally developed; dactylar segment about 5.0 times longer than broad, densely fringed with coarsely serrulate spiniform, and long curled finely serrulate setae medially; propodal segment with row of long spines and setae along expanded disto-median margin, with row of long finely serrulate setae along ventrolateral margin; carpal segment short, broader than long, subtriangular, unarmed; meral segment with row of long plumose setae medially; basal and ischial segment completely fused, ischial part medially excavate, with row of long plumose setae medially, basal part without protuberance medially; exopod normal, with about six to eight long plumose setae distally; coxal segment medially produced, non-setose, with trapezoidal, proximally expanded epipod laterally.

Third maxilliped reaching with ultimate segment from proximal third of scaphocerite to distal margin scaphocerite; with broad ischiomerus, partly fused to basis, but with distinct suture, almost twice as long as broad, tapering distally, flattened, with many short curled setae on median margin and ventral surface, lateral margin with single row of long plumose setae; basal segment medially convex, with many long curled setae on median and ventral surfaces; exopod well developed, as long as ischiomeral segment, with many long plumose setae distally; coxa without medial process, with large lateral plate with few simple short setae, without arthrobranch; penultimate segment slender, 1.0-2.0 times as long as ultimate segment, about 2.0-3.0 times as long as broad, subcylindrical, with groups of finely serrulate setae ventromedially; ultimate segment about 3.0 times al long as broad, slightly tapering distally, with groups of long serrulate setae distally.

First pereiopods slender exceeding carpocerite by chela and half of carpus. Chela slightly more then three times longer than deep, slightly compressed; fingers as long as or slightly shorter than palm, with entire cutting edges; fixed finger with groups of

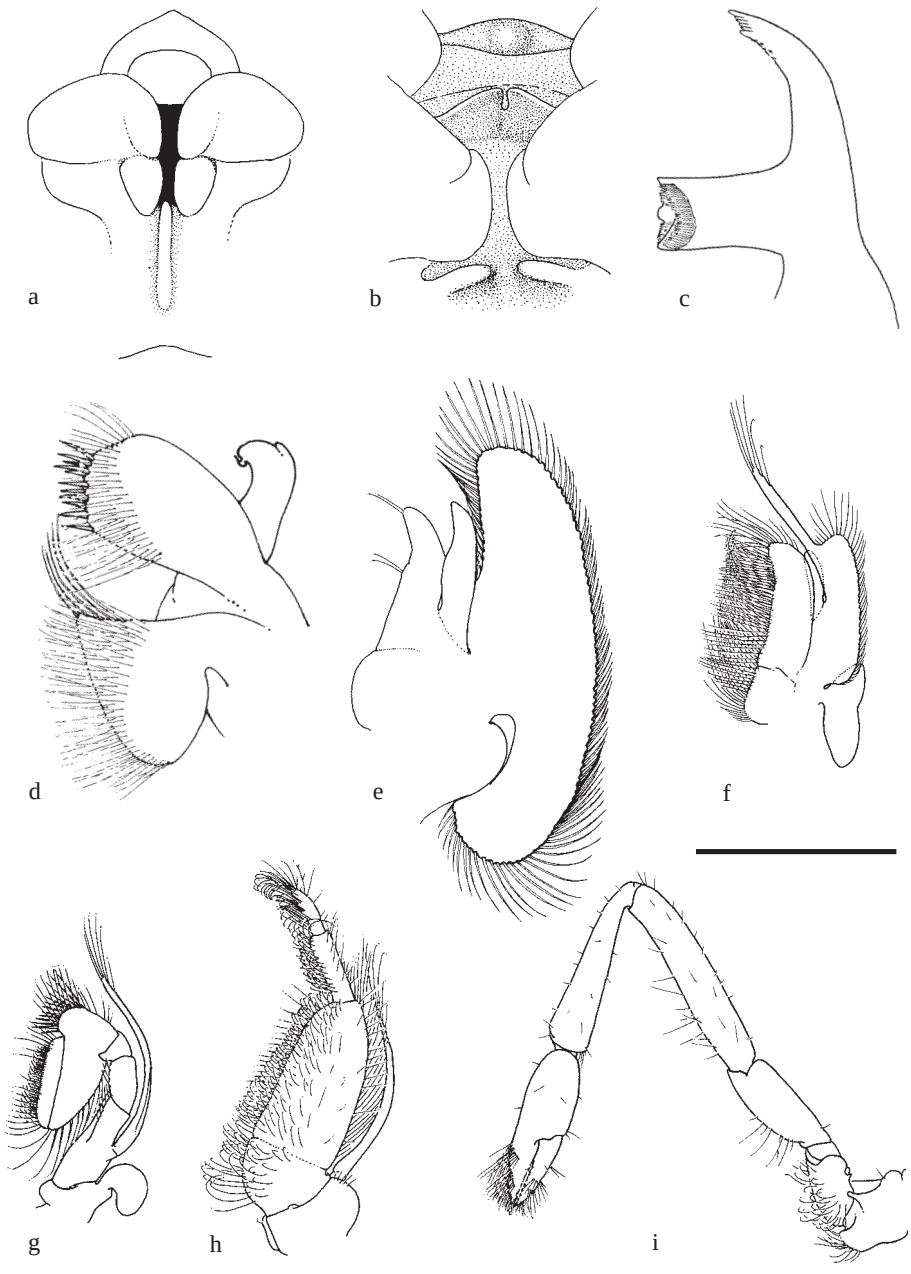

Fig. 188. *Dactylonia ascidicola* (Borradaile, 1898): 1 male, pocl. 3.3 mm (figs. a, c-i), RMNH D 46789; male, pocl. 3.8 mm (fig. b), RMNH D 42564. a, paragnath, ventral view; b, second to fifth thoracic sternites; c, mandible, ventral view; d, maxillula, ventral view; e, maxilla, ventral view; f, first maxilliped, ventral view; g, second maxilliped, ventral view; h, third maxilliped, ventral view; i, first pereiopod. Scale: a, b = 1 mm; c-e = 0.6 mm; f-i = 1.5 mm.

many strong, long, serrulate setae, tip with two small distal spines; dactylus with few groups of moderately long, finely serrulate and simple setae, tip acute with single small spine; cleaning organ present on carpal-propodal joint; carpus 1.0-1.6 times longer than chela, about four times longer than distal width, tapering proximally, unarmed, with few short simple setae; merus slightly longer than carpus, about 5.5 times longer than central width, unarmed, with few short simple setae laterally and few long simple setae in proximal part of median margin; ischium 0.5 times merus length, medially slightly expanded, with long simple setae medially; basis 0.6 times ischium length, with many long simple curled setae medially; coxa with rounded ventral lobe, with long simple setae.

Second pereiopods unequal, dissimilar. Major chela about 1.5 times postorbital carapace length in adult females, more than twice postorbital carapace length in males; palm strongly compressed, median margin entire, slightly convex proximally, slightly concave, carinate, and indistinctly serrate distally, provided with few short simple setae; dactylus 0.4-0.6 times length of palm, about 3.4 times longer than deep, with one large triangular tooth in proximal part of cutting edge, distal part of cutting edge slightly con-

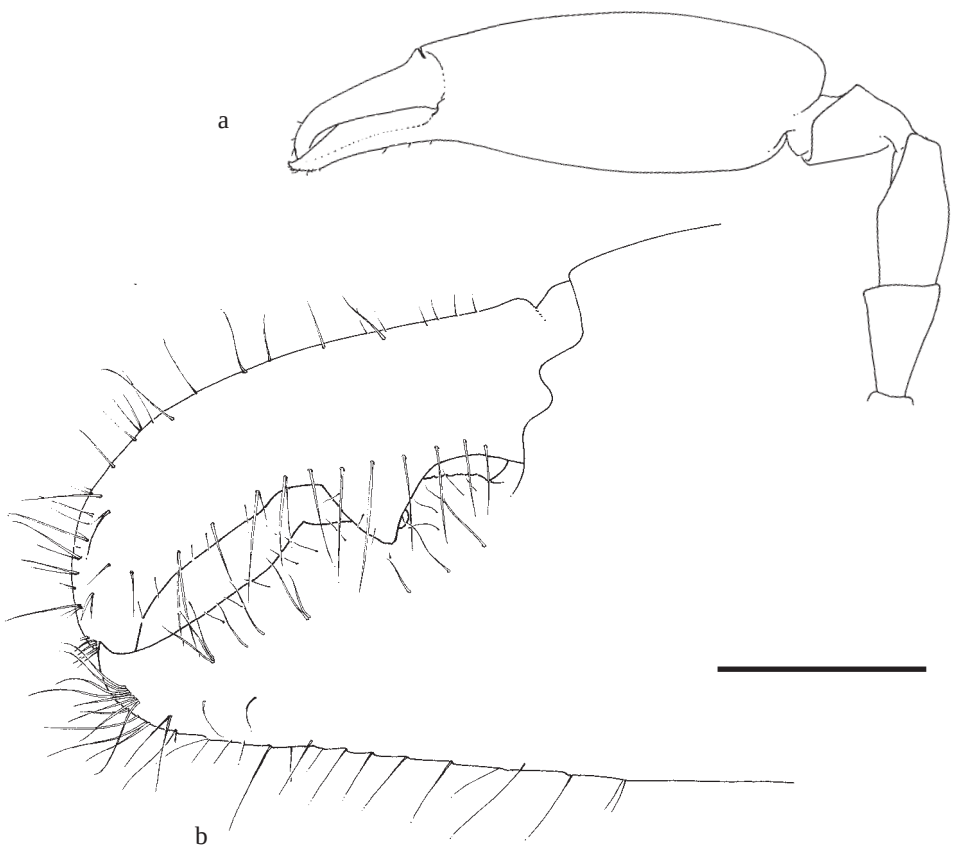

Fig. 189. *Dactylonia ascidicola* (Borradaile, 1898): ovigerous female, pocl. 4.7 mm (fig. a), 1 male, pocl. 3.3 mm (fig. b), RMNH D 46789. a, major second pereiopod; b, idem, chela. Scale: a = 4 mm; b = 1 mm.

cave, tip strongly hooked; fixed finger about 1.4 times longer than deep, with small triangular tooth at midlength proximally separated from broad, finely denticulate tooth by a deep notch, distal part of cutting edge entire, slightly concave, median fossa for reception of dactylar tooth when fingers closed not developed, tip strongly hooked; carpus about 0.35 of palm length in females, about 0.20 in males, strongly tapering proximally, slightly longer than distal width; merus about 1.5-1.7 times longer than carpus, about twice its central width, distomedially strongly excavate; ischium almost as long as merus, with prominent distomedian protruding angle, strongly tapering proximally; basis and coxa without special features. Minor chela slightly longer than postorbital carapace length in females, almost twice postorbital carapace length in males, strongly compressed, median margin entire, slightly convex proximally, slightly concave, carinate, and indistinctly serrate distally; dactylus almost as long as palm, about 5.0 times longer than deep, with one acute triangular tooth in proximal part, rest of cutting edge entire, concave, with moderately long simple setae, tip hooked; fixed finger about 2.1 times longer than deep, with small triangular tooth at proximal fourth, proximally separated from broad, finely denticulate tooth by small notch, distal part of cutting edge entire, concave, with moderately long simple setae, tip hooked; carpus about 0.5 times palm length, strongly tapering proximally, slightly longer than distal width; merus, ischium, basis and coxa as in major cheliped, but more slender.

Ambulatory pereiopods slender. Dactylus of third pereiopod with corpus compressed, about 3.3 times longer than proximal width, with few simple setae; accessory tooth acute, terminally recurved, with serrate tip; ventral margin with 9 to 14 club-like teeth, decreasing in size proximally, with fine distal denticulations; unguis large,

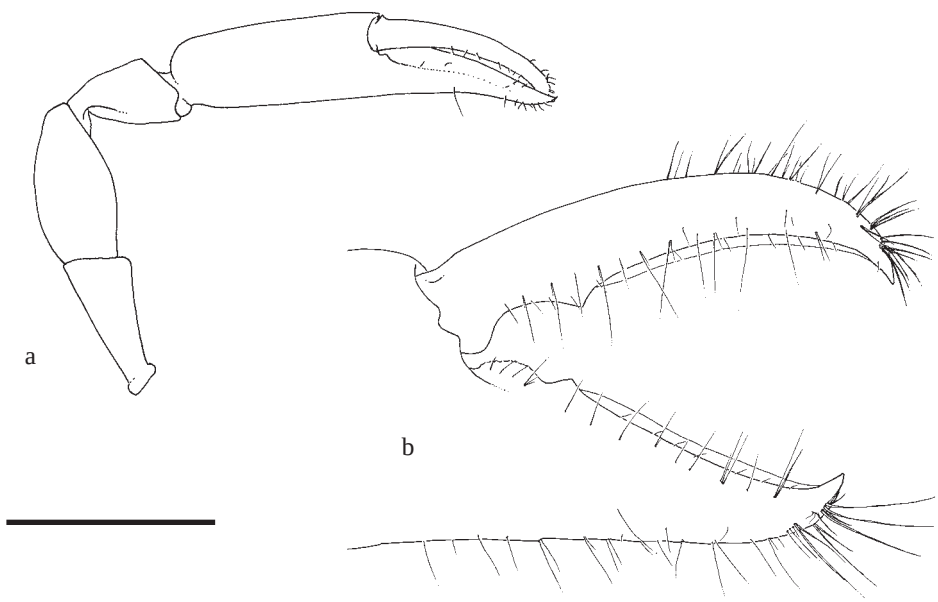

Fig. 190. *Dactylonia ascidicola* (Borradaile, 1898): ovigerous female, pocl. 4.7 mm (fig. a), 1 male, pocl. 3.3 mm (fig. b); RMNH D 46789. a, minor second pereiopod; b, idem, chela. Scale: a = 4 mm; b = 1.2 mm.

Fig. 191. *Dactylonia ascidicola* (Borradaile, 1898): 1 male, pocl. 3.3 mm (fig. b), RMNH D 42562; 1 male, pocl. 3.3 mm (fig. a), RMNH D 46789; ovigerous female, pocl. 2.5 mm, RMNH D 42565 (figs. c, d). a, third pereiopod; b, dactylus third pereiopod; c, idem; d, idem, detail unguis. Scale: a = 1.5 mm; b, c = 0.15 mm; d = 0.06 mm.

curved, about 0.3 of corpus length, distally with one or few scales; propodus about 5.6 times longer than dactylus, about 10 times longer than proximal width, with two or three spines in distal third to fourth of flexor margin, with two ventrodistal spines, few setae along ventral and distal margins; carpus about 0.47 of propodus length, 4.5 times longer than distal width, slightly tapering proximally, with distinct distal lobe, unarmed; merus 0.85 of propodus length, 5.9 times longer than central width, slightly compressed, almost without setae, unarmed; ischium about 0.81 of merus length, 4.7 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopods similar.

First pleopod of female with slender endopod, about third of exopod length, few simple setae along median margin, many long simple distal setae when ovigerous, with row of long plumose setae on lateral margin.

Male first pleopod with small endopod, about 4.5 times longer than proximal width, tapering distally; median margin slightly concave with row of about 14 short simple setae, without setae in distal part, with long plumose setae along lateral margin.

Endopod of second pereiopod with short appendix masculina, equal to about 0.5 times length of appendix interna, with about four long setulose terminal setae.

Uropods normal, with short stout unarmed protopodite; exopod broad, about 1.7 times as long as wide, with convex lateral margin, without distolateral tooth, with distinct distolateral spine; endopod 1.2 length of exopod, about 3.0 times longer than wide, extending beyond telson.

Number of eggs between 300-600, depending on the size of the female. Embryo at

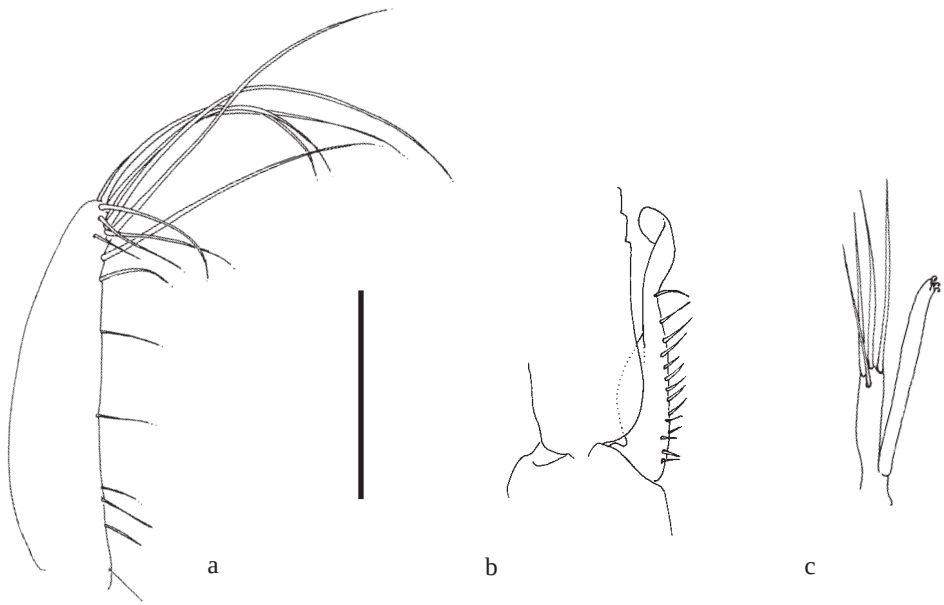

Fig. 192. *Dactylonia ascidicola* (Borradaile, 1898): 1 male, pocl. 3.3 mm (figs. b, c); ovigerous female, pocl. 4.7 mm (fig. a), RMNH D 46789. a, endopod female first pleopod; b, endopod male first pleopod; c, appendix interna and appendix masculina on second male pleopod. Scale: a = 0.15 mm; b, c = 0.6 mm.

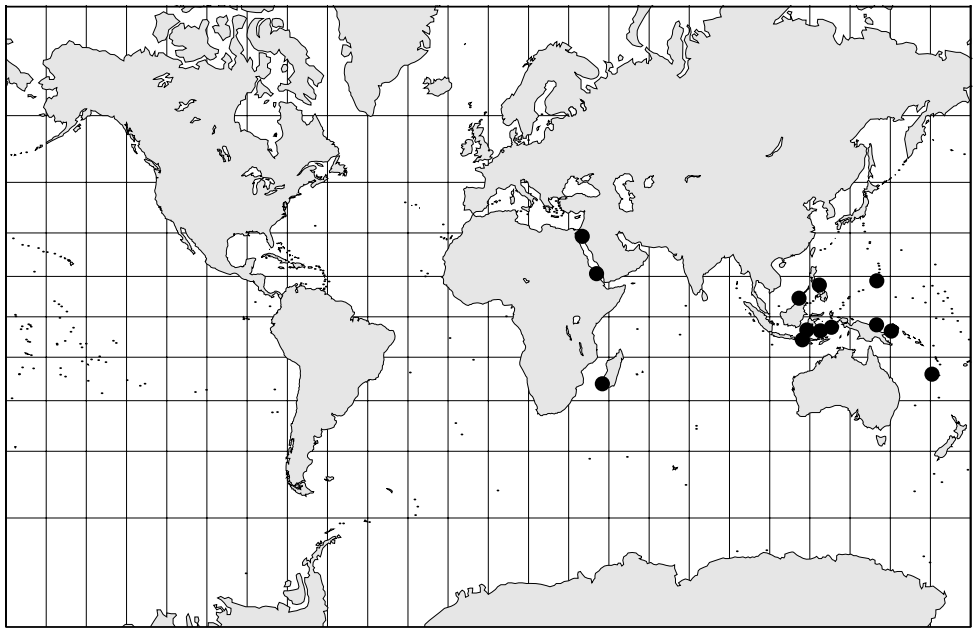

Fig. 193. Geographic distribution of *Dactylonia ascidicola* (Borradaile, 1898).

point of hatching about 0.7 mm long.

Size.— This is a rather large sized species. The maximum pocl. in adult females is 7.0 mm, 4.8 in males. Minimum postorbital carapace length of an ovigerous female is 2.5 mm.

Colouration (based on slides of specimens with registrationnumbers RMNH D 42562, 42564, 46785, 46789, 47584, pl. 11, 12).— Body translucent with scattered white chromatophores. Carapace with white chromatophore at base of rostrum and white chromatophores on lateral and dorsal surfaces. Eyestalks with series of three dorsal white chromatophores; cornea white. Antennulae and scaphocerite with yellow chromatophores. Second pereiopods with scattered yellow chromatophores. First pereiopods and ambulatory pereiopods with white chromatophores in distal part of proximal joints. Abdominal pleura scattered with many white chromatophores. Exopods of uropods with large white spot distally and few smaller spots proximally; endopod with few small white chromatophores; telson with one small distal white spot.

Types.— Syntypes: 1 male, 1 female, 13 mm; Blanche Bay, New Britain, Bismarck Archipelago. Whereabouts of the types not known. The syntypes are not present in The Natural History Museum, London (M. Lowe, pers. comm.).

Distribution.— INDO-WEST PACIFIC: Southern Red Sea and Gulf of Aqaba, 2-3 m (RMNH collection & Holthuis, 1958); Madagascar, Tuléar (Hipeau-Jacquotte, 1972; 1973a); Indonesia: Binongko, SE Sulawesi (Holthuis, 1952); Sumbawa, Ambon, Sulawesi, Bali (present record); Philippines (present record); Papua New Guinea (present record); Bismarck Archipelago, New Britain (Borradaile, 1898); New Caledonia (Bruce, 1996); Guam (present record).

Host.— Black ascidian (cf. Holthuis, 1958); *Ascidia* spec. (present records); *Ascidia*

empheres Sluiter, 1895 (cf. Holthuis, 1952); *Ascidia sydneiensis* Stimpson, 1854 (cf. Bruce, 1996); *Rhopalaea crassa* (Herdman, 1880) (present records). Other records are from unidentified ascidians. Although nothing about a host is mentioned in Borradaile, 1898 and 1899, he writes 'in ascidian' in his paper of 1917.

Remarks.— Males have relatively larger second chela than females in relation to carapace length.

In small specimens the chela of the first pereiopods are slightly longer than the carpus. In larger specimens this ratio decreases to about 0.6.

In small specimens the third maxilliped reaches to the proximal third of the scaphocerite, in large specimens it almost reaches the distal margin of the scaphocerite.

8.5.4. *Dactylonia holthuisi* spec. nov.
(figs. 194-201; pl. 13A)

Material.— **INDO-WEST PACIFIC: Indonesia**.— RMNH D 47586: 1 ovigerous female, holotype, pocl. 1.8 mm; paratypes: 1 ovigerous female, pocl. 1.8 mm; 4 non-ovigerous females, pocl. 1.6-1.9 mm; 3 males, pocl. 1.3-1.6 mm; MAL.24: Ambon, S coast, Seri bay, 03°45'S 128°09'E; 22.xi.1996; depth 25 m; diving; in colony of *Plurella* spec.; leg. C.H.J.M. Fransen; photo.— RMNH D 48681: paratypes; 10 males, pocl. 1.3-1.9 mm; 7 ovigerous females, pocl. 2.0-2.6 mm; 9 non-ovigerous females, pocl. 1.3-2.2 mm; Sta. BAL.23: Bali, Tulamben area, bay S of 'Emerald Hotel'; 08°17'05''S 115°36'11''E; deep reef slope with dense coral cover; scuba-diving; 30 m depth; 15.iv.2001; in *Plurella* spec. on sand; collected by C.H.J.M. Fransen, photo.— RMNH D 48682: paratypes; 7 males, pocl. 1.3-1.9 mm; 5 non-ovigerous females, pocl. 1.5-1.8 mm; 4 ovigerous females, pocl. 1.6-1.9 mm; 2 juveniles, pocl. 1.0 and 1.2 mm; BAL.25: Bali, NW of Nusa Lembongan, Lembongan Bay, Bali Hai pontoon, off Desa Jungutbatu; 08°40'25''S 115°26'18''E; shallow bay with few patches of coral; scuba-diving to 12 m depth; 17.iv.2001; in *Plurella* spec. on sand; collected by C.H.J.M. Fransen; photo.

Description.— Body subcylindrical. Carapace smooth. Rostrum well developed, with anterior border acute in both dorsal and lateral aspect, far overreaching stylocerite, almost reaching distal margin of basal segment of antennular peduncle, slightly depressed, narrow triangular in dorsal view, with distinct dorsal carina over entire length, with acute lateral carinae extending as a postorbital ridge on the carapace, with slightly concave ventral carina in distal part, without subdistal tooth, without distal setae. Inferior orbital angle not produced, broadly rounded. Antennal spine well developed, reaching or almost reaching level of anterolateral margin of carapace, situated just below inferior orbital angle. Anterolateral margin of carapace broadly rounded.

Abdomen smooth; sixth segment about 1.5 times longer than fifth, about as long as deep, posterolateral angle small, acute, posteroventral angle expanded, acute; pleura of first five segments broadly rounded.

Telson 1.35 times longer than sixth abdominal segment, about twice its proximal width, lateral margins slightly convex, convergent; posterior border without median process; two pairs of large submarginal dorsal spines at 0.22 and 0.50 of telson length; distal and proximal pair of spines of equal length, 0.25 of telson length; posterior margin with three pairs of spines, lateral spines small, marginal, intermediate and submedian spines long, longer than dorsal spines but more slender.

Eyestalk slightly longer than broad, slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella of normal length. Basal segment of peduncle

with acute strongly developed distolateral tooth just overreaching midlength of intermediate segment; anterior margin not developed, sinuous; medioventral tooth small, acute, submarginal, just distally of midlength of basal segment; stylocerite reaching halfway basal segment, tip acute, with row of plumose setae laterally. Intermediate segment short, slightly broader than long. Distal segment about as long as broad reaching level of distolateral tooth of scaphocerite. Upper flagellum short, biramous, with three or four proximal segments fused; short free ramus one-segmented; longer free ramus with four or five segments. Lower flagellum with about five segments.

Antenna with basicerite short, laterally rounded, with large antennal gland tuber-

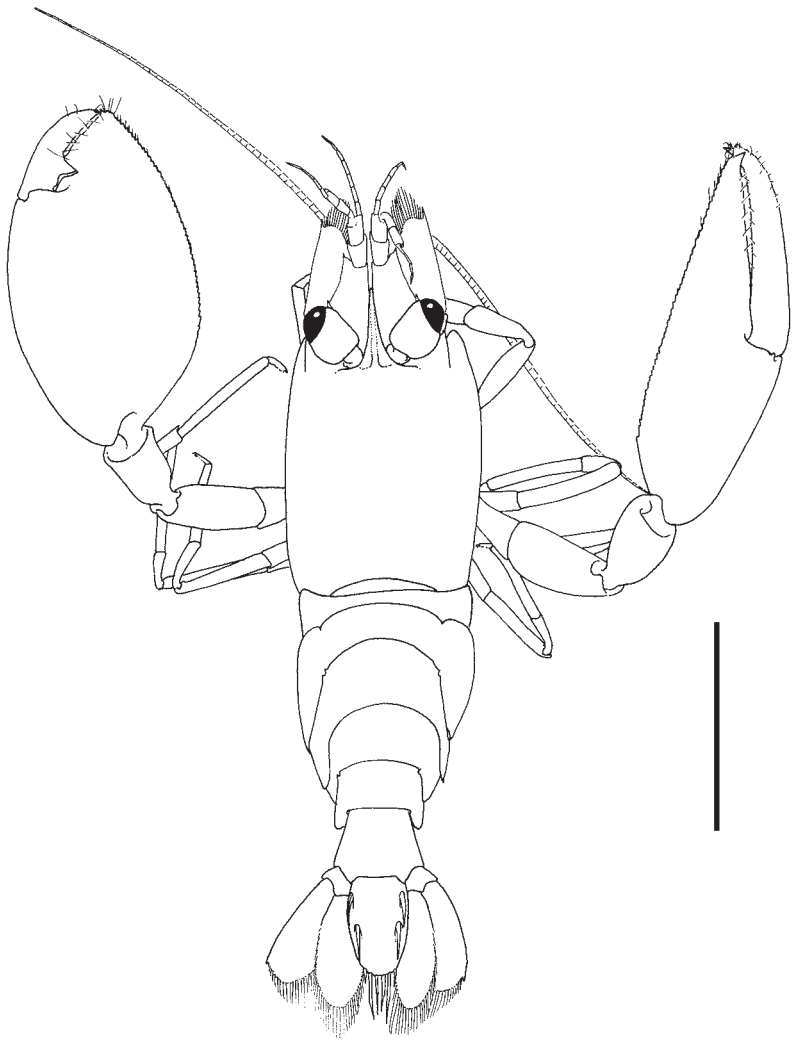

Fig. 194. *Dactylonia holthuisi* spec. nov.: ovigerous female holotype, pocl. 1.8 mm, RMNH D 47586. Dorsal aspect. Scale = 2 mm.

cle medially; ischiocerite and merocerite normal; carpocerite extending to about 4/5th of lamina of scaphocerite, rather slender, almost four times longer than distal width; flagellum long and slender, about 1.5 times postorbital carapace length; scaphocerite with lamella about 2.3 times longer than wide, anterior margin straight, lateral margin slightly convex; distolateral tooth small, about 0.10 length of lamina, overreaching distal margin of lamina with 3/4th of its length; incision between distolateral tooth and lamina shallow.

Epistome with blunt anterior carina. Labrum normal.

Paragnath with alae formed by large transverse suboval distal lobes and small round triangular ventromesial lobes; corpus rather narrow, with prominent longitudinal median carina, without setae.

Second thoracic sternite with broadly rounded anterior margin, without setae;

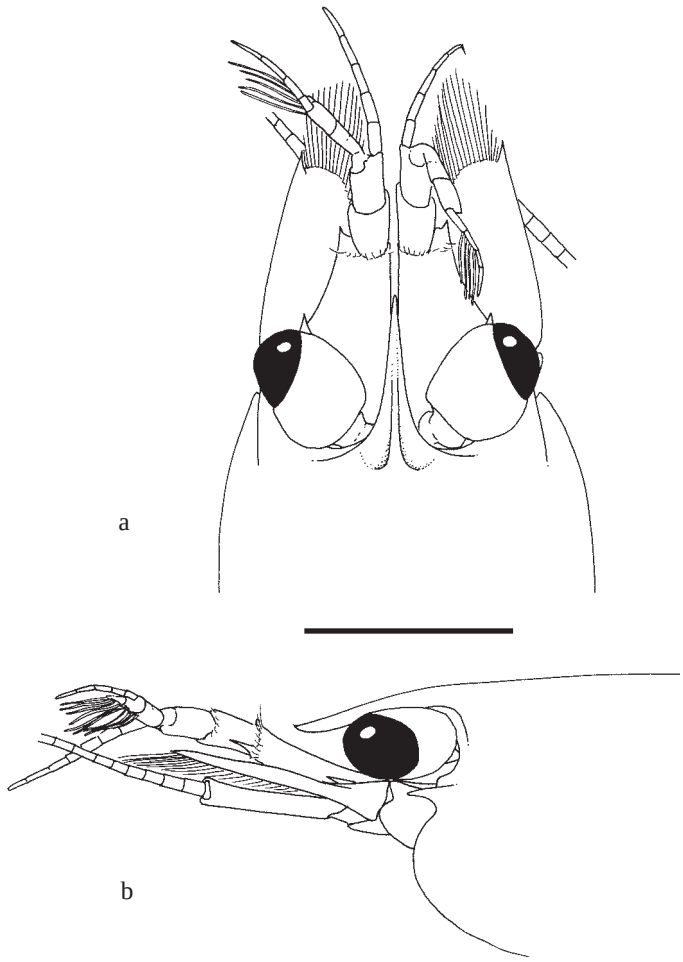

Fig. 195. *Dactylonia holthuisi* spec. nov.: ovigerous female holotype, pocl. 1.8 mm, RMNH D 47586. a, anterior appendages, dorsal view; b, anterior appendages, lateral view. Scale = 1 mm.

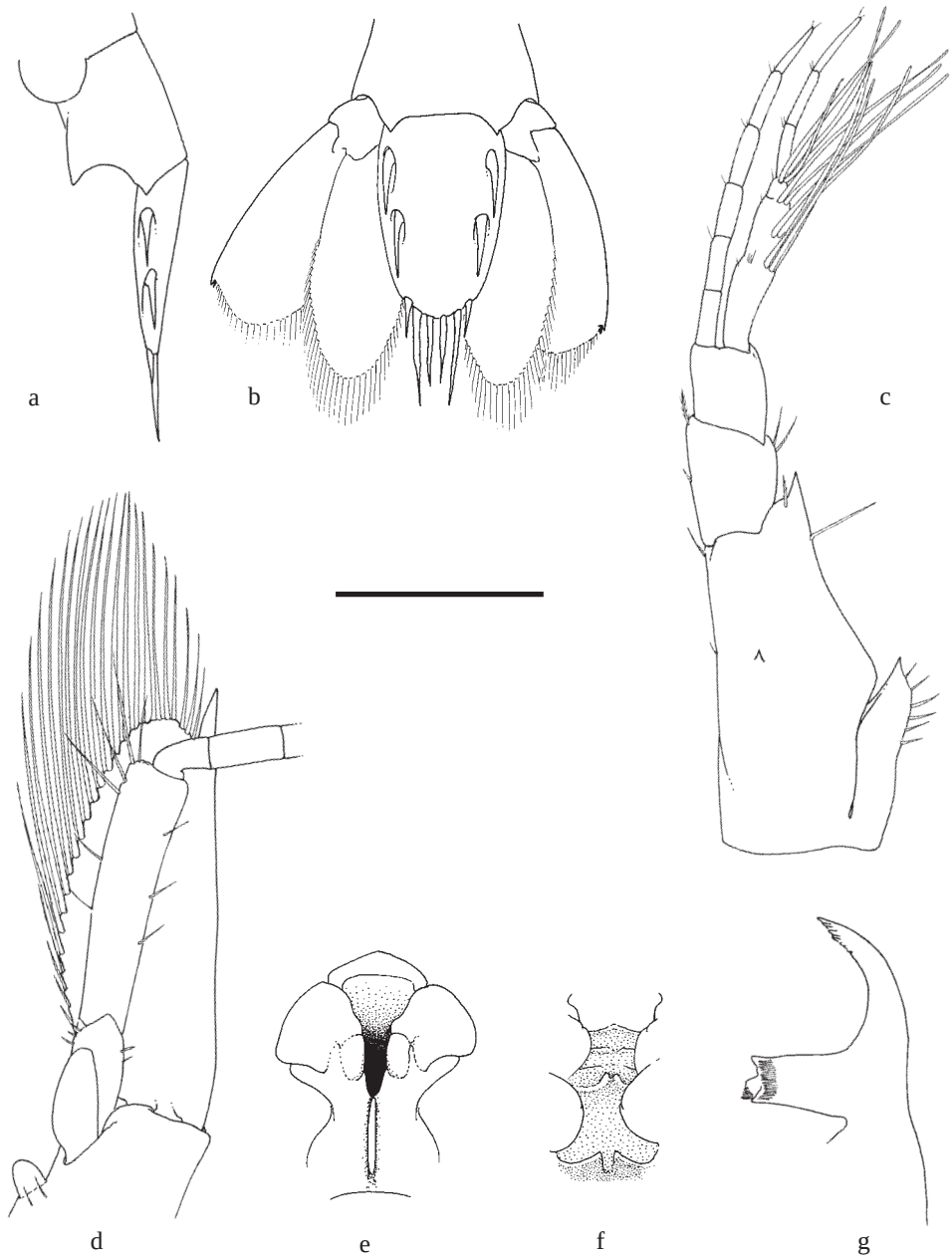

Fig. 196. *Dactylonia holthuisi* spec. nov.: ovigerous female holotype, pocl. 1.8 mm, RMNH D 47586. a, distal part abdomen, lateral view; b, telson and uropods, dorsal view; c, antennula, ventral view; d, antenna, ventral view; e, paragnath, ventral view; f, second to fifth thoracic sternites; g, mandible, ventral view. Scale a, b, e, f = 1 mm; c, d, g = 0.6 mm.

without median ventrally directed tubercle.

Third thoracic sternite with transverse carina between third maxillipeds.

Fourth thoracic sternite with large triangular, medially notched plate placed posteromedian between first pereiopods; no ridge between first pereiopods.

Fifth thoracic sternite with blunt lateral plates placed posteromedian of second pereiopods, with broad notch in between.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process with 5-6 acute distal teeth, and row of about 3-5 small denticles along ventrodistal margin; molar process robust, with four blunt teeth, some fringed with setal brushes.

Maxillula with upper lacinia broad, rectangular, with two rows of 13- 15 serrulate spines and many long slender setae medially, inner medial surface with several long simple setae on carina; lower lacinia triangular with many long simple setae distoventrally and marginally, with long serrate setae distally; palp faintly bilobed, larger lobe with small ventral tubercle with single short curved simple seta.

Maxilla with basal endite well developed; distal lobe broad, with one distal long simple seta, proximal lobe reduced, with one long simple setae distally, median margin without setae; coxal endite obsolete, median margin convex, without setae; scaphognathite normal, 3.4 times longer than wide, posterior lobe 2.1 times longer than broad, anterior lobe large, broad, 1.8 times longer than wide; palp simple, much longer than distal lobe of basal endite, not expanded proximally, distally blunt, with few plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite partly fused, fringed with many long and finely serrulate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod well developed, flagellum with four or five long plumose setae distally; caridean lobe large, elongate, narrow; palp simple, slender, elongate, with one long plumose seta distally, curved along distolateral margin of basal endite; epipod large, triangular, faintly bilobed.

Second maxilliped with endopod long; dactylar segment about 4.5 times longer than broad, densely fringed with coarsely serrulate spiniform, and long curled finely serrulate setae medially; propodal segment with row of long spines and setae along distomedian margin, with row of long finely serrulate setae along distal part of ventrolateral margin; carpal segment short, broader than long, subtriangular, unarmed; meral segment without long plumose setae medially; basal and ischial segment fused, straight, ischium and distal half basis medially excavate, with row of long plumose setae medially, basal part without protuberance medially; exopod normal, with about four to six long plumose setae distally; coxal segment not produced medially, non-setose, with trapezoidal, proximally expanded epipod laterally, not bearing podobranch.

Third maxilliped long, overreaching distal margin of scaphocerite with ultimate segment and distal part of penultimate segment in large specimens, with part of ultimate segment in small specimens. Ischiomerus four times as long as proximal width, partly fused to basis, longer than lengths of ultimate and penultimate segments together; with several rows of strongly curled plumose setae along median margin, ventral surface with few setae, lateral margin with row of long simple setae. Exopod 0.75 of ischiomerus length. Penultimate segment slightly more than twice as long as ultimate segment, penultimate segment about three times al long as maximum width, median

Fig. 197. *Dactylonia holthuisi* spec. nov.: ovigerous female holotype, pocl. 1.8 mm, RMNH D 47586. a, maxillula, ventral view; b, maxilla, ventral view; c, first maxilliped, ventral view; d, second maxilliped, ventral view. Scale = 0.6 mm.

Fig. 198. *Dactylonia holthuisi* spec. nov.: ovigerous female holotype, pocl. 1.8 mm, RMNH D 47586. a, third maxilliped, ventral view; b, first pereiopod. Scale 0.6 mm.

margin with strongly curled plumose setae, lateral margin with row of long plumose setae. Ultimate segment rounded distally. Penultimate and ultimate segment do not fold back, both third maxillipeds form a funnel from above the mouthparts forward.

First pereiopods short, rather robust exceeding carpocerite by chela only. Chela 2.5 times longer than deep, compressed; fingers as long as palm, with entire cutting edges; fixed finger with groups of many strong, long, serrulate setae, tip hooked; dactylus with simple setae distally, tip acute, hooked; cleaning organ present on carpal-propodal joint; carpus 0.75 of chela length, 2.5 times longer than distal width, tapering proximally, unarmed, with few short simple setae; merus 1.4 times longer than carpus, 5.0 times longer than central width, unarmed, with few short simple setae; ischium 0.55 of merus length, not expanded medially, with few simple setae medially; basis short, 0.5 times as long as ischium, with medial simple setae; coxa with ventromedial lobe with many long, curled setae.

Second pereiopods unequal, dissimilar. Major chela 2.0-2.2 times postorbital carapace length in adult males, 1.6 times postorbital carapace length in adult females; palm strongly compressed, median margin carinate and strongly serrate, strongly convex, provided with few short simple setae, 1.5 times longer than wide; dactylus 0.43 times length of palm, almost four times longer than deep, with one large, triangular, acute, tooth in proximal part of cutting edge, distal part of cutting edge straight, tip strongly hooked, without medial carina; fixed finger about as long as deep, with one triangular, blunt tooth at midlength, proximally separated from large, triangular tooth by a deep notch, distal part of cutting edge entire, straight, median fossa for reception of dactylar tooth when fingers closed not developed, tip strongly hooked; carpus about 0.33 of palm length, strongly tapering proximally, 1.4 times longer than distal width; merus almost twice as long as carpus, about 3.0 times its central width, slightly swollen centrally; ischium 0.7 times as long as merus, without distomedian protruding angle, tapering proximally; basis and coxa without special features. Minor chela 1.8 times postorbital carapace length in adult males, strongly compressed; palm 1.7 times longer than deep, median margin straight, serrate, and carinate; dactylus 0.9-1.2 times palm length, 7.1 times longer than deep, with longitudinal carina along median surface, cutting edge convex in proximal part, concave in distal 3/4th; fixed finger 2.7 times longer than deep, with deep excavation along median margin of cutting edge, cutting edge proximally convex, concave in distal 3/4th, without proximal teeth; fingers strongly gaping, tip of fingers strongly hooked; carpus, merus, ischium, basis and coxa similar to major cheliped, more slender.

Ambulatory pereiopods slender. Dactylus of third pereiopod with corpus compressed, about 2.3 times longer than proximal width, with few simple setae along ventral margin and even less along dorsal margin; accessory tooth acute, terminally, slightly curved, distally minutely denticulate; ventral margin with 8-9 rather acute, slender teeth in distal 2/3rd, slightly decreasing in size proximally, with fine distal denticulations; unguis short, slender, somewhat curved, 0.30 of corpus length, distally with few scales; propodus about four to five times longer than dactylus, about 7.8 times longer than proximal width, with four to six spines in distal part of ventral margin, with two ventrodistal spines, simple setae along ventral and distal margins; carpus about 0.5 of propodus length, 4.2 times longer than distal width, slightly tapering

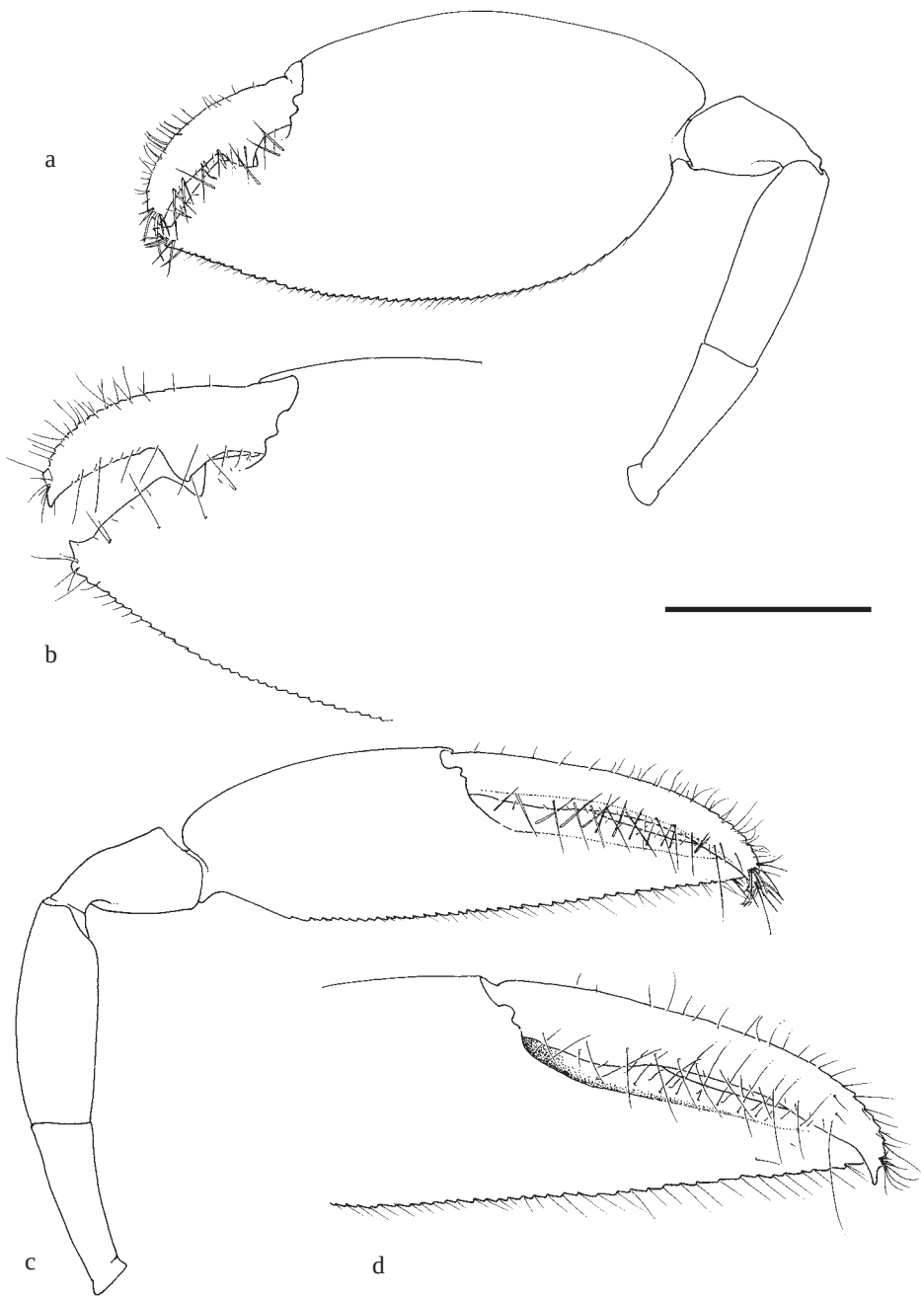

Fig. 199. *Dactylonia holthuisi* spec. nov.: ovigerous female holotype, pocl. 1.8 mm, RMNH D 47586. a, major second pereiopod; b, idem, chela; c, minor second pereiopod; d, minor second pereiopod, chela. Scale: a, c = 0.6 mm; b, d = 1 mm.

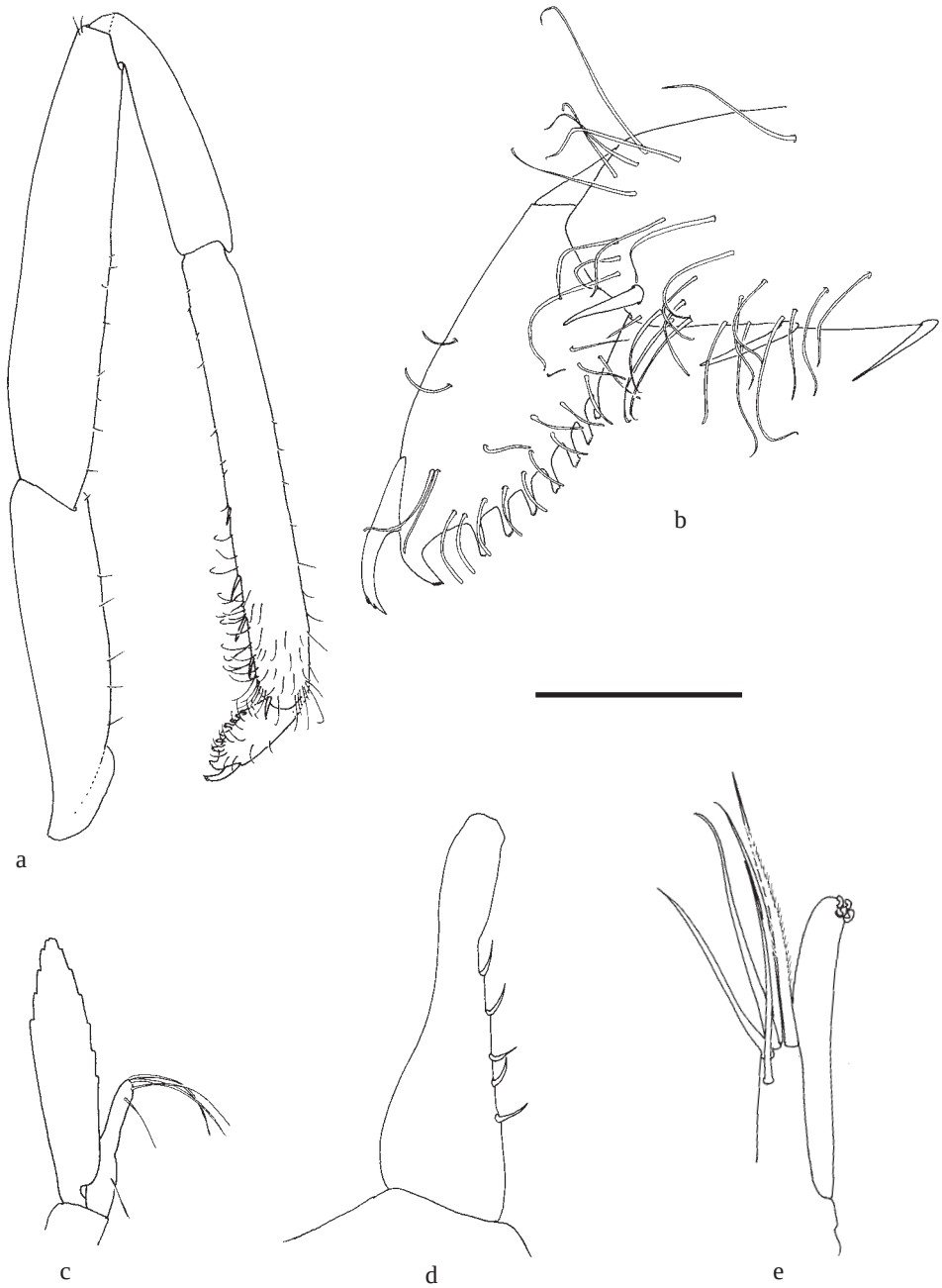

Fig. 200. *Dactylonia holthuisi* spec. nov.: ovigerous female holotype, pocl. 1.8 mm (figs. a-c); male paratype, pocl. 1.6 mm (figs. d, e), RMNH D 47586. a, third pereiopod; b, dactylus third pereiopod; c, endopod female first pleopod; d, endopod male first pleopod; e, appendix interna and appendix masculina on second male pleopod. Scale: a = 1 mm; c = 0.6 mm; b, d, e = 0.15 mm.

proximally, with small distal lobe, unarmed; merus subequal to propodus length, 5.2 times longer than central width, slightly compressed, almost without setae, unarmed; ischium 0.65 of merus length, 3.5 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopods similar.

First pleopod of female with slender endopod, about half of exopod length, few simple setae along median margin and distal margin when ovigerous, with row of long plumose setae on lateral margin.

Male first pleopod with endopod about three times longer than proximal width in adult males, distal half curled, slender; median margin straight with row of short setae, without setae in distal part, without setae along lateral margin.

Endopod of second pereiopod with short appendix masculina, equal to about 0.5 times length of appendix interna, with several long setulose setae distally.

Uropods normal, with short stout unarmed protopodite; exopod broad, about 2.2 times as long as wide, with slightly convex lateral margin, with small distolateral tooth, with small mobile distolateral spine, distal lamina reduced; endopod about as long as exopod, about 2.7 times longer than wide, extending beyond telson.

Ovigerous females with 20-30 eggs. Egg-size ca. 0.55 mm.

Size.— This is a small sized species. The maximum pocl. is 1.9 mm in adult females, 1.6 mm in adult males. The minimal size of an ovigerous female is 1.8 mm.

Colouration (based on slides of specimens with registrationnumbers RMNH D 47586, pl. 13A).— Body translucent with small red-brown chromatophores and scattered large white chromatophores. Carapace with white spot at base of rostrum, centrolateral and proximolateral; hepatopancreas whitish. Eyestalks with two white chromatophores on the dorsal surface; cornea white. Antennulae with distal segment of peduncle white. Second pereiopods with scattered large white chromatophores. First pereiopods and ambulatory pereiopods with one or few white chromatophores in proximal joints. Abdominal pleura with white chromatophores dorsally and laterally. Tail-fan with large white chromatophores in proximal and distal parts.

Type.— Holotype: ovigerous female, pocl. 1.8 mm (RMNH D 47586); MAL.24: Ambon, S coast, Seri bay, 03°45'S 128°09'E; 22.xi.1996; depth 25 m; diving; in *Plurella* spec.

Distributon.— Known from Ambon and Bali.

Hosts.— Collected from an aggregate of ascidians of *Plurella* spec. (Styelidae). The *Plurella* spec. colony was covered with sand, almost burried in the sand, only showing the distinctly yellow to light green siphons.

Remarks.— These specimens were collected from the same host as specimens of *Dactylonia okai* (RMNH D 47587). The specimens of both species show constant morphological differences which are not related to sex or size. The colour patterns of the species are similar but show some small differences. One could speculate about different morphs belonging to the same species with special functions in a social context of the species. In that case one expects to find both morphs always together. However, specimens of *Dactylonia holthuisi* spec. nov. were not found among the 22 specimens of *Dactylonia okai*, collected from the same host at another locality (RMNH D 47590), and the specimens of *Dactylonia holthuisi* spec. nov. from Bali were not found in combination with *Dactylonia okai*. For this reason the specimens are here treated as belonging to different species.

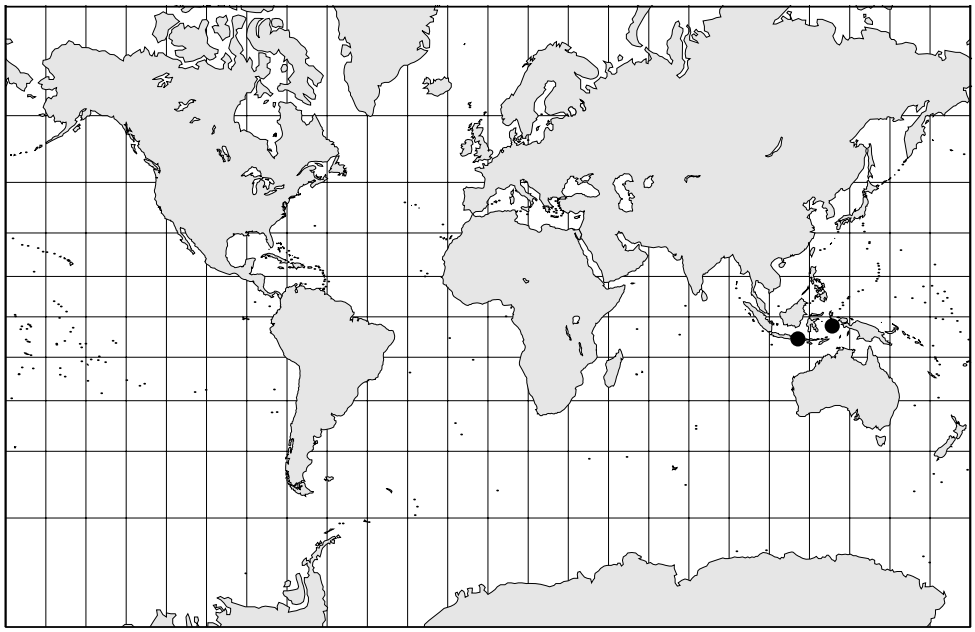

Fig. 201. Geographic distribution of *Dactylonia holthuisi* spec. nov.

Dactylonia holthuisi spec. nov. is most closely related to *Dactylonia monnioti*. It may be distinguished from this species by the following features: 1) The rostrum is without a subdistal ventral tooth; 2) the carpocerite of the antenna is stouter and shorter; 3) the medial carina on the distal lacinia of the maxilla carina is not pronounced and bears two long simple setae whereas it is prominent bearing seven setae in *Dactylonia monnioti*; 4) the first pereipods are short, with the chela longer than the carpus; 5) the fixed finger of the second pereiopods is without a small intermediate triangular tooth; 6) the dactylus of the ambulatory pereiopods is relatively short, with eight tubercles on the ventral margin whereas they are long with about 13 tubercles in *Dactylonia monnioti*; 8) the lateral terminal spines of the telson are much longer than in *Dactylonia monnioti.*

Dactylonia holthuisi spec. nov. differs from *Dactylonia okai* in the following features: 1) the rostrum is much more slender in dorsal aspect, reaching beyond the eyes whereas broad triangular and shorter than the eyes in *Dactylonia okai*; 2) the disolateral tooth of the scaphocerite exceeds the distal lamina with 3/4th of its length, in *Dactylonia okai* only by the distal half; 3) the palm of the second pereiopods much more compressed, the medial margin of the major chela is strongly convex and distinctly serrate while straight and non- or indistinctly serrate in *Dactylonia okai*; 4) the fixed finger of the minor second pereiopod has a deep excavation along median margin of cutting edge which is indistinct in *Dactylonia okai*; 5) length of the corpus of the dactyli of the ambulatory pereiopods 0.16 in relation to the propodus length, with 8-9 tubercles along flexor margin while 0.23 of propodus length and with 12-16 tubercles along flexor margin in *Dactylonia okai.*

8.5.5. *Dactylonia medipacifica* (Edmondson, 1935) comb. nov. (figs. 202-208)

Pontonia medipacifica Edmondson, 1935: 6, fig. 2; Holthuis, 1952: 15; Eldredge, 1965: 13; Bruce, 1980: 225, figs. 1-4; Chace & Bruce, 1993: 62; Müller, 1993: 123; Cabrera-Peña & Solano-López, 1996: 916.

Material.— **INDO-WEST PACIFIC**: **Indonesia**.— RMNH D 47462: 1 male, pocl. 2.3 mm; 1 ovigerous female, pocl. 2.8 mm; MAL.17, Ambon, Ambon bay, N coast near Laha, 03°42'S 128°06'E; 18.xi.1996; depth 2-5 m; snorkeling; in *Spondylus varians* Sowerby, 1847; leg. J.C. den Hartog.— **Pacific Ocean**.— USNM 155153: 1 ovigerous female, pocl. 4.8 mm; Caroline Islands, Ifaluk Atoll, Falarik, reef opposite the Fan Nap; 16.x.1953; in *Spondylus*; leg. F.M. Bayer.— USNM 155154: 1 male, pocl. 3.1 mm; Caroline Islands, Ifaluk Atoll, lagoon reef off middle of Ella; 18.x.1953; in *Spondylus*; leg. F.M. Bayer.— USNM 155155: 1 ovigerous female, pocl. 3.5 mm; Caroline Islands, Ifaluk Atoll, Falarik, reef opposite the Fan Nap; 17.x.1953; in *Spondylus*; leg. D.P. Abbott.— USNM 155156: 6 males, pocl. 2.9-3.4 mm; 6 ovigerous females, pocl. 3.8-5.4 mm (one specimen with bopyrid on right side under carapace); Caroline Islands, Ifaluk Atoll, lagoon shelf off middle of Ella; depth 2.5 fm; 22.x.1953; in *Spondylus*; leg. Tawaitiu.

Description.— Body subcylindrical, slightly depressed. Carapace smooth. Rostrum very short, triangular in dorsal view, distally ending in a sharp point, reaching halfway eyestalk, with prominent dorsal carina over entire length, lateral carina present, ventral carina convex; no subdistal ventral tooth present; few short simple subdistal setae below tip. Inferior orbital angle indistinct, rounded. Antennal spine small, acute, not reaching level of anterolateral margin in lateral view, situated below inferior orbital angle. Anterolateral margin of carapace straight, anterolateral angle of carapace slightly produced, bluntly rounded.

Abdomen smooth; sixth segment about 1.4 times longer than fifth, about as wide as long, posterolateral angle not produced, posteroventral angle angular, not spiniform; pleura of first five segments broadly rounded.

Telson 1.4 times longer than sixth abdominal segment, about twice as long as its proximal width; lateral margins convex, convergent; posterior margin without median process; two pairs of large submarginal dorsal spines at about 0.1 and 0.3 of telson length; distal pair of spines slightly longer than proximal pair, about 0.38 of telson length; posterior margin with three pairs of spines, lateral spines marginal, subdistal, about 0.1 times length of telson, intermediate and submedian spines longer than lateral spines but distinctly shorter and more slender than dorsal spines.

Eyestalk about as long as broad, slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella rather short. Basal segment about 1.7 times as long as width, with acute distolateral tooth reaching halfway intermediate segment, anterior margin small, oblique medioventral tooth very small, submarginal, situated halfway basal segment, or absent; stylocerite short, reaching half length of basal segment, with acute tip, lateral margin with few plumose setae. Intermediate segment short, about as broad as long. Distal segment about as long as broad. Upper flagellum short, biramous, with three or four proximal segments fused; short free ramus with one segment; longer free ramus with five to seven segments. Lower flagellum with 7-12 segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite small; carpocerite not reaching distal margin

of lamina of scaphocerite, short and slender, about four times longer than distal width; flagellum long and slender, about twice as long as postorbital carapace length; scaphocerite with lamina about 2.3 times longer than wide, anterior margin rounded, lateral margin convex, median margin rounded; distolateral tooth small, about 0.1 length of lamina, not overreaching distal margin of lamina; incision between distolateral tooth and lamina not deep.

Epistome with blunt anterior median carina; labrum oval.

Paragnath with alae formed by large transverse suboval distal lobes and small rounded triangular ventromesial lobes; corpus rather short and narrow, with two

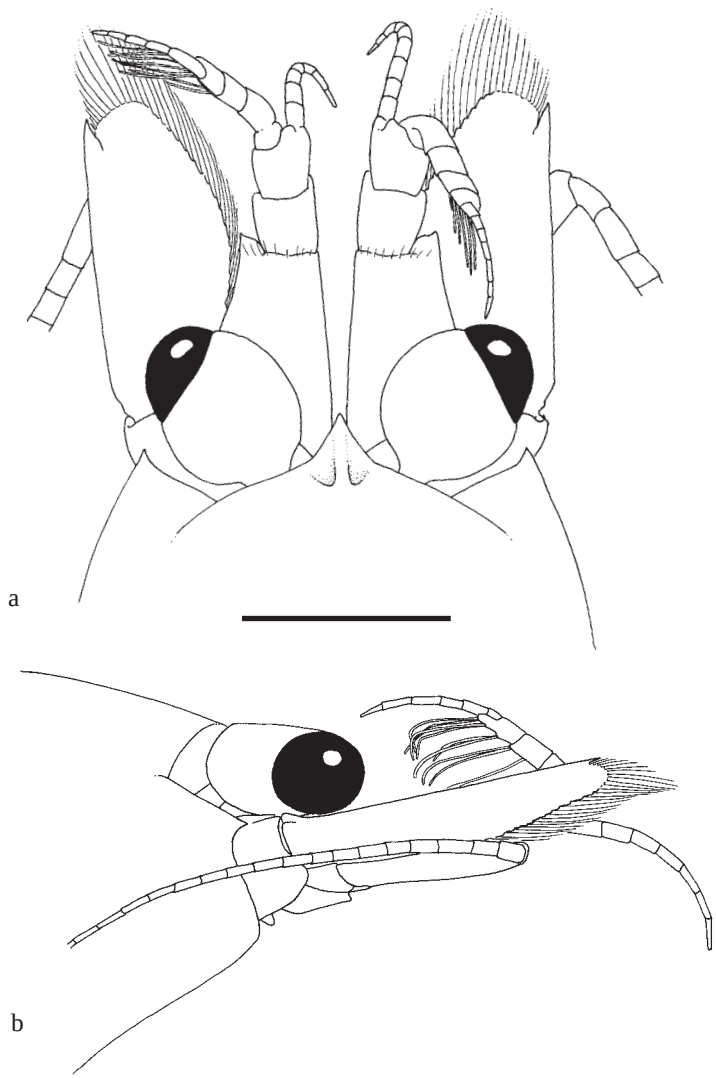

Fig. 202. *Dactylonia medipacifica* (Edmondson, 1935): ovigerous female, pocl. 2.8 mm, RMNH D 47462. a, anterior appendages, dorsal view; b, anterior appendages, lateral view. Scale = 1 mm.

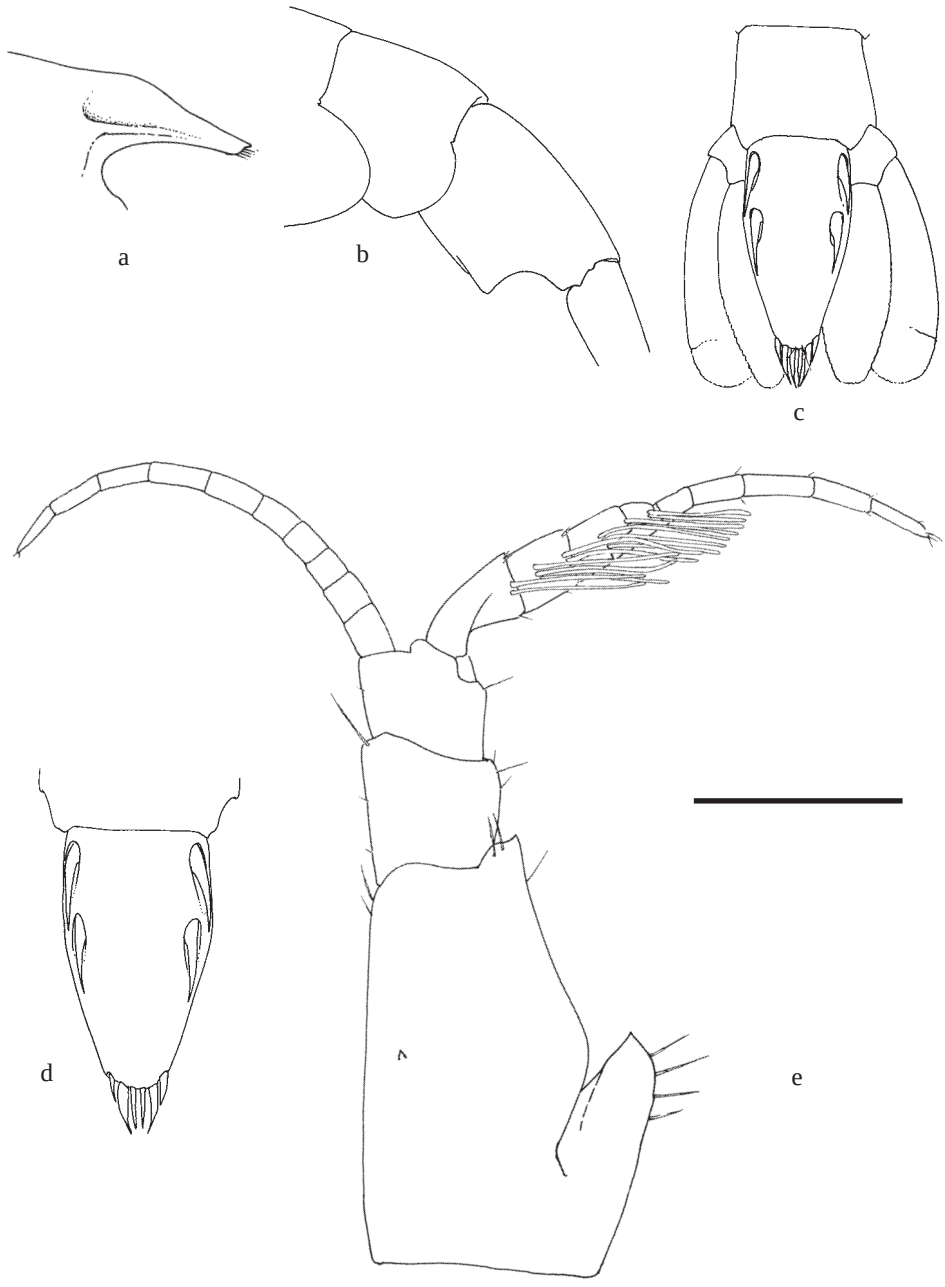

Fig. 203. *Dactylonia medipacifica* (Edmondson, 1935): ovigerous female, pocl. 2.8 mm (figs. b-g), RMNH D 47462; ovigerous female, pocl. 4.8 mm, USNM 155153 (fig. a). a, rostrum, lateral view; b, distal part abdomen, lateral view; c, telson and uropods in dorsal view; d, telson, dorsal view; e, antennula, ventral view. Scale: a-d = 1 mm; e = 0.6 mm.

parallel, closely set longitudinal median carina, without setae.

Second thoracic sternite with shallow triangular medially rounded process between second maxillipeds, without setae.

Third thoracic sternite with transverse carina between third maxillipeds.

Fourth thoracic sternite with large triangular, medially notched shallow plate posteromedian between first pereiopods; no ridge between first pereiopods.

Fifth thoracic sternite with blunt lateral plates posteromedian of second pereiopods, with broad notch in between.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process with four acute distal teeth, and row of two small denticles along medioventral margin; molar process stout, with four blunt teeth, some fringed with setal brushes.

Maxillula with upper lacinia rather broad, subrectangular with two rows of about 13 serrulate spines and many long slender setae medially, inner medial surface with several long simple setae; lower lacinia broad, triangular, with dense cover of long simple setae distoventrally and marginally, with long serrulate stout setae along distal margin; palp feebly bilobed, larger lobe with small ventral tubercle with single, short, recurved, simple seta.

Maxilla with basal endite well developed; distal lobe well developed, rather slender, slightly longer than proximal lobe when present, with one long simple distal seta, proximal lobe well developed with one distal seta or reduced, without setae; coxal endite obsolete, median margin slightly to moderately convex, non-setose; scaphognathite about three times longer than wide, posterior lobe large, 1.9 times longer than wide, anterior lobe 1.6 times longer than wide; palp simple, just overreaching distal lobe of basal endite, slightly expanded proximally, tapered distally, with few plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite partly fused, large and broad, fringed with many long and finely serrulate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod with relatively short flagellum with about four long plumose setae distally; caridean lobe rather small, elongate, narrow; palp simple, slender, rather short, curved along distolateral margin of basal endite, non-setose; epipod large, elongate, faintly bilobed.

Second maxilliped with endopod normally developed; dactylar segment about 4.0 times longer than broad, densely fringed with coarsely serrulate spiniform, and long curled finely serrulate setae medially; propodal segment with row of long spines and setae along slightly expanded disto-median margin, with one long finely serrulate seta in distal part of ventrolateral margin; carpal segment short, broader than long, subtriangular, unarmed; meral segment with row of few long plumose setae medially; basal and ischial segment completely fused, straight, ischial part medially excavate, with row of few long plumose setae medially, basal part without protuberance medially; exopod normal, with about four long plumose setae distally; coxal segment medially produced, non-setose, with trapezoidal, proximally expanded epipod laterally, not bearing podobranch.

Third maxilliped almost reaching with ultimate segment to distal margin scaphocerite; with slightly expanded ischiomerus, partly fused to basis, but with distinct suture, 2.3 times as long as broad, somewhat tapering in distal half, flattened, with

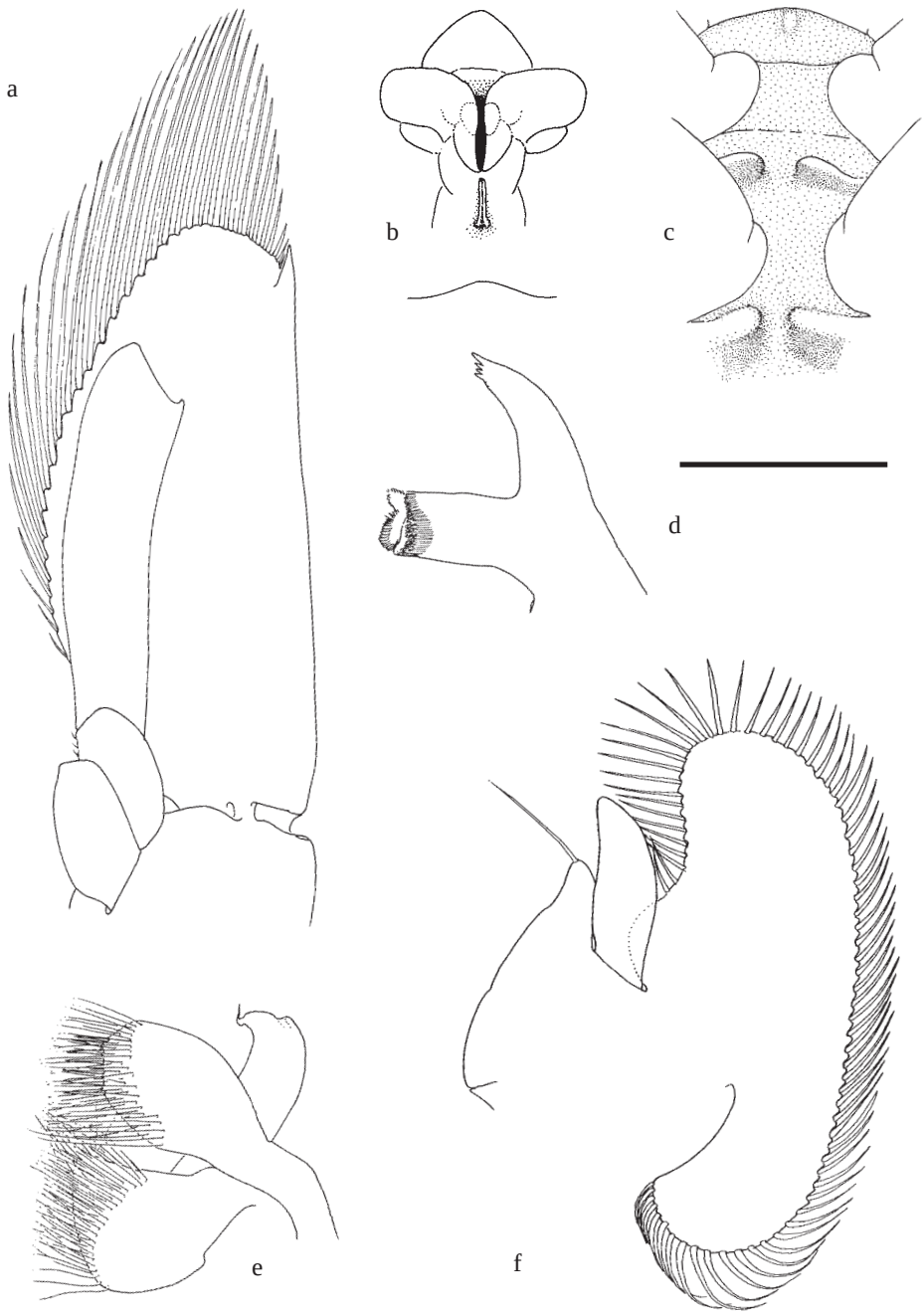

Fig. 204. *Dactylonia medipacifica* (Edmondson, 1935): ovigerous female, pocl. 2.8 mm (figs. a, b, d-f), RMNH D 47462; ovigerous female, pocl. 4.8 mm, USNM 155153 (fig. c). a, antenna, ventral view; b, paragnath, ventral view; c, second to fifth thoracic sternites; d, mandible, ventral view; e, maxillula, ventral view; f, maxilla, ventral view. Scale: a, e, f = 0.6 mm; b-d = 1 mm.

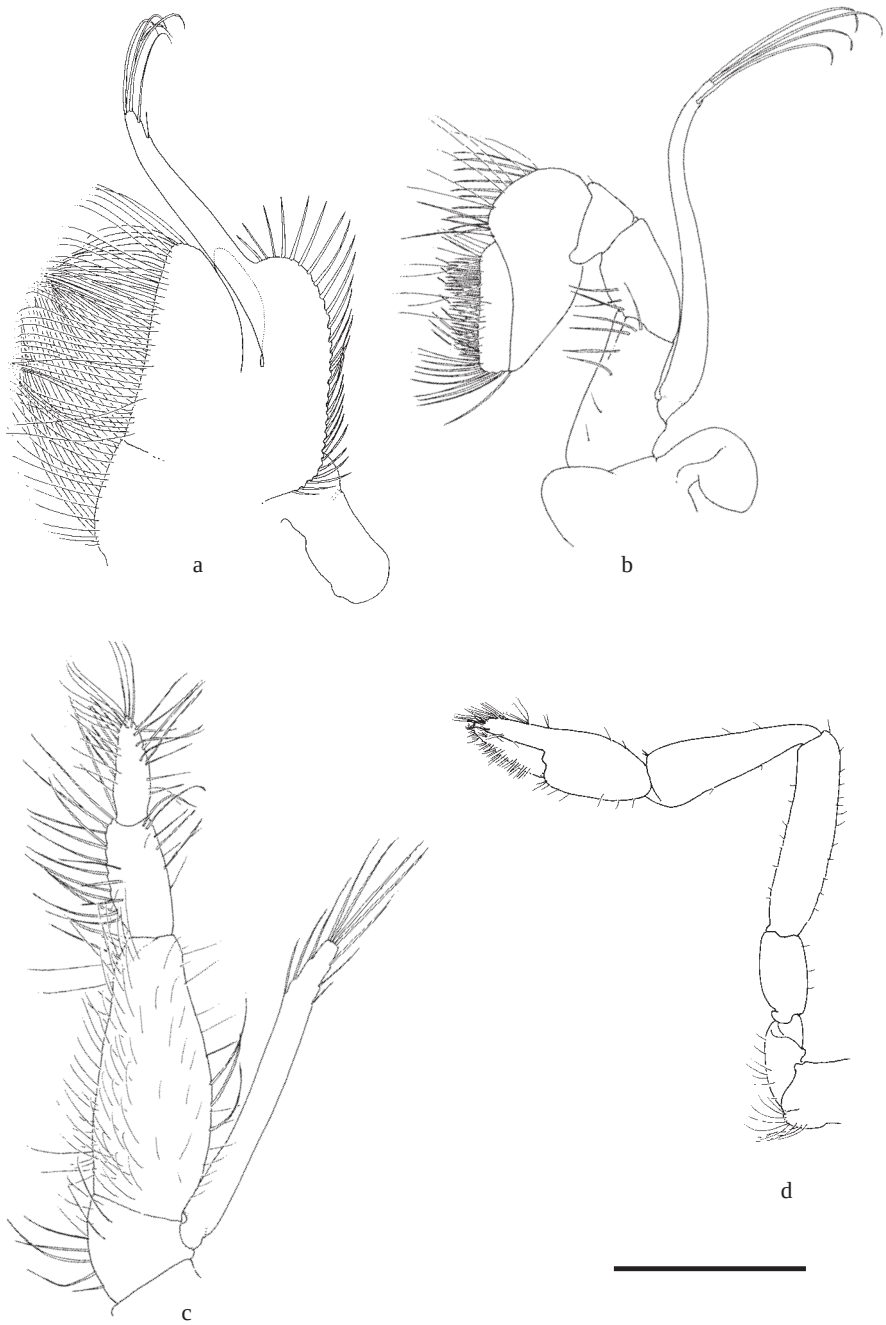

Fig. 205. *Dactylonia medipacifica* (Edmondson, 1935): ovigerous female, pocl. 2.8 mm, RMNH D 47462. a, first maxilliped, ventral view b, second maxilliped, ventral view; c, third maxilliped, ventral view; d, first pereiopod. Scale: a-c = 0.75 mm; d = 1.5 mm.

many short setae on median margin and ventral surface, lateral margin with single row of long plumose setae; basal segment medially convex, with several long setae on median and ventral surfaces; exopod well developed, slightly longer than ischiomeral segment, with about ten long plumose setae distally; coxa without medial process, with large lateral plate with few simple short setae, without arthrobranch; penultimate segment slightly expanded medially, slightly longer than ultimate segment, about twice as long as broad, flattened, with groups of finely serrulate setae ventromedially; ultimate segment about three times as long as broad, slightly tapering distally, with groups of long serrulate setae distally.

First pereiopods slender, exceeding carpocerite by chela and half of carpus. Chela 2.5 times longer than deep, slightly compressed; palm 1.3 times as long as fingers, fingers with entire cutting edges; fixed finger with groups of many strong, long, serrulate setae, tip with two small distal spines; dactylus with many simple setae, tip acute with single small spine; cleaning organ on carpal-propodal joint not developed, consisting of 4-6 setae on carpus only; carpus about as long as chela, three times longer than distal width, tapering proximally, unarmed, with few short simple setae; merus slightly longer than carpus, about four times longer than central width, unarmed, with few short simple setae laterally and few long simple setae in proximal part of median margin; ischium 0.4 times merus length, not expanded medially, without setae medially; basis as long as ischium, with several long simple setae medially; coxa with rounded ventral lobe, with long simple setae.

Second pereiopods subequal. Major chela as long as postorbital carapace length in adult females, 1.4 times postorbital carapace length in males; palm slightly compressed, median margin entire, not carinate, indistinctly serrate distally, provided with few short simple setae; dactylus 0.5 times length of palm, three times longer than deep, with one large triangular tooth in proximal part of cutting edge, distal part of cutting edge straight, tip strongly hooked, without medial carina; fixed finger about twice as long as deep; fixed finger with two teeth at about 0.25 and 0.50 of cutting edge, distal half of cutting edge straight, entire, median fossa for reception of dactylar tooth when fingers closed not developed, tip strongly hooked; carpus about 0.3 of palm length, strongly tapering proximally, slightly longer than distal width; merus about 1.2 times longer than carpus, almost three times its central width, not excavate distomedially; ischium almost as long as merus, with distomedian angle not protruding, tapering proximally; basis and coxa without special features. Minor pereiopod with dactylus 0.6 times as long as palm; fingers slightly gaping, cutting edges entire except for one proximal small tooth on dactylus and two small proximal teeth on fixed finger, tip strongly hooked.

Ambulatory pereiopods slender. Dactylus of third pereiopod with corpus moderately compressed, 2.3 times longer than proximal width, with few simple setae along dorsal, slightly more along distal and ventral margins; accessory tooth blunt, slightly recurved, terminal, minutely dentate; ventral margin convex, with about 12-13 blunt club-like teeth, decreasing in size proximally, without fine distal denticulation; unguis short, curved, about 0.3 of corpus length, minutely dentate; propodus about 3.8-4.5 times longer than dactylus, about 6-7 times longer than proximal width, with two ventrodistal spines, few setae along ventral and distal margins; carpus about 0.6 of propodus length, 4.0 times longer than distal width, slightly tapering proximally, with

distinct distal lobe, unarmed; merus about as long as propodus, 4.5 times longer than central width, slightly compressed, almost without setae, unarmed; ischium about 0.7 of merus length, four times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopods similar.

First pleopod of female with slender endopod, about third of exopod length, few simple setae along median margin, many long simple setae distally when ovigerous, with row of long plumose setae on lateral margin.

Male first pleopod with small endopod, about 3.5 times longer than proximal width, tapering distally; median margin slightly concave with row of 10-12 short simple setae, without or with one long seta in distal part, without setae along lateral margin.

Endopod of second pereiopod with short appendix masculina, equal to about 0.7 times length of appendix interna, with 2-5 long setulose setae distally.

Uropods normal, with short stout unarmed protopodite; exopod broad, about

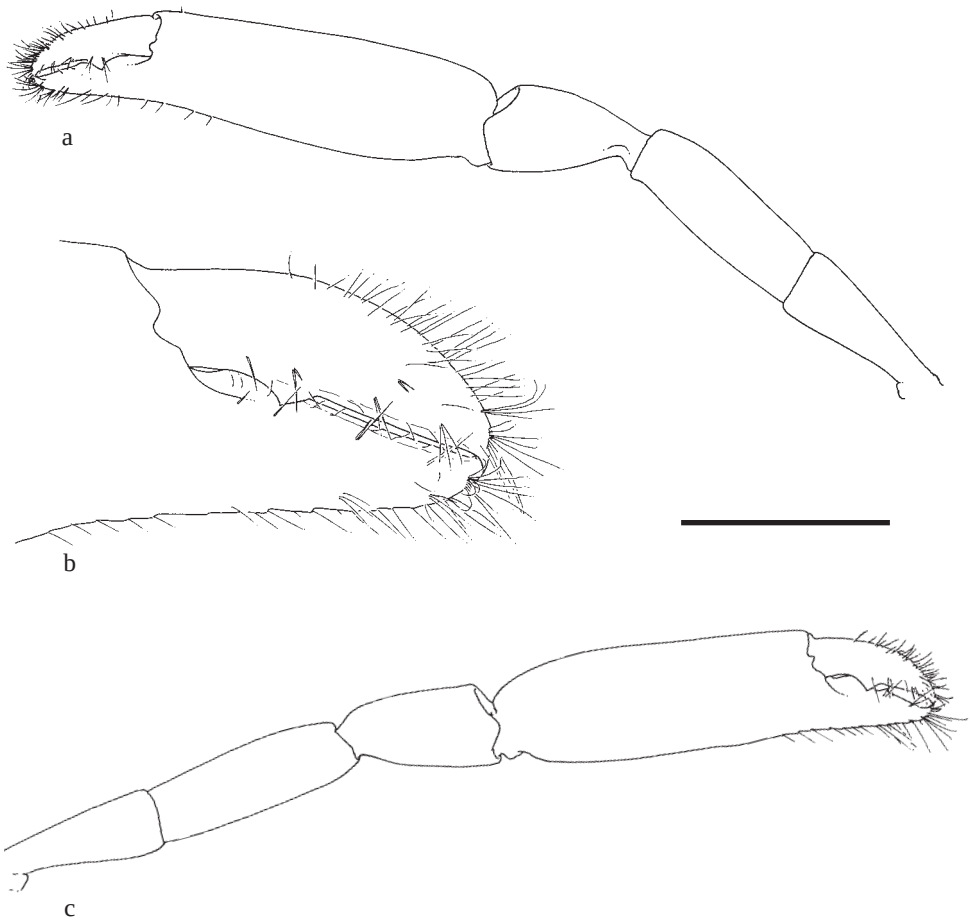

Fig. 206. *Dactylonia medipacifica* (Edmondson, 1935): ovigerous female, pocl. 2.8 mm, RMNH D 47462. a, right second pereiopod; b, idem, chela; c, left second pereiopod. Scale: a, c = 1.5 mm; b = 0.6 mm.

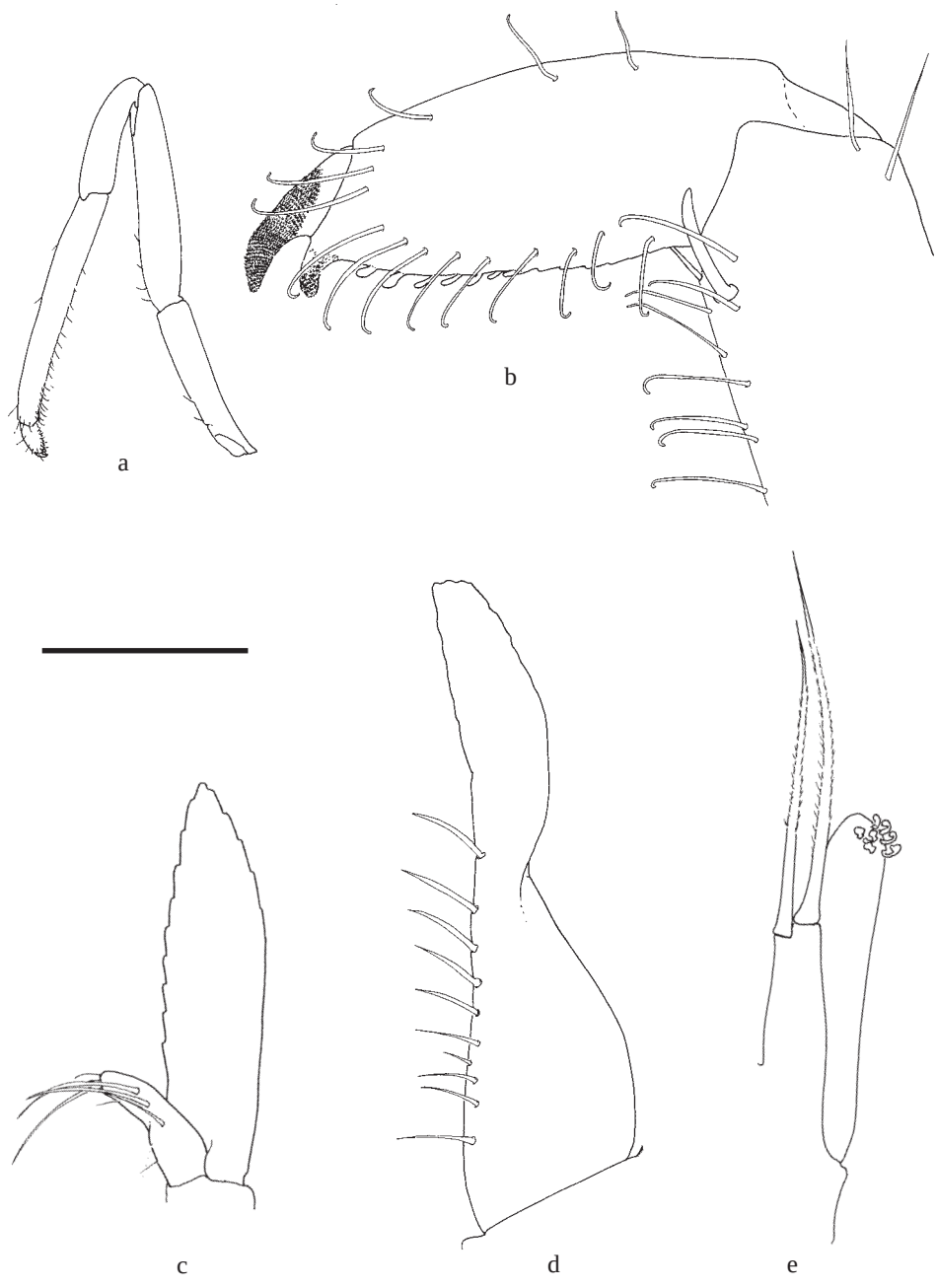

Fig. 207. *Dactylonia medipacifica* (Edmondson, 1935): ovigerous female, pocl. 2.8 mm (figs. a-c), male, pocl. 2.3 mm (figs. d, e), RMNH D 47462. a, third pereiopod; b, dactylus third pereiopod; c, endopod female first pleopod; d, endopod male first pleopod; e, appendix interna and appendix masculina on second male pleopod. Scale: a = 1.5 mm; b, d, e = 0.15 mm; c = 0.6 mm.

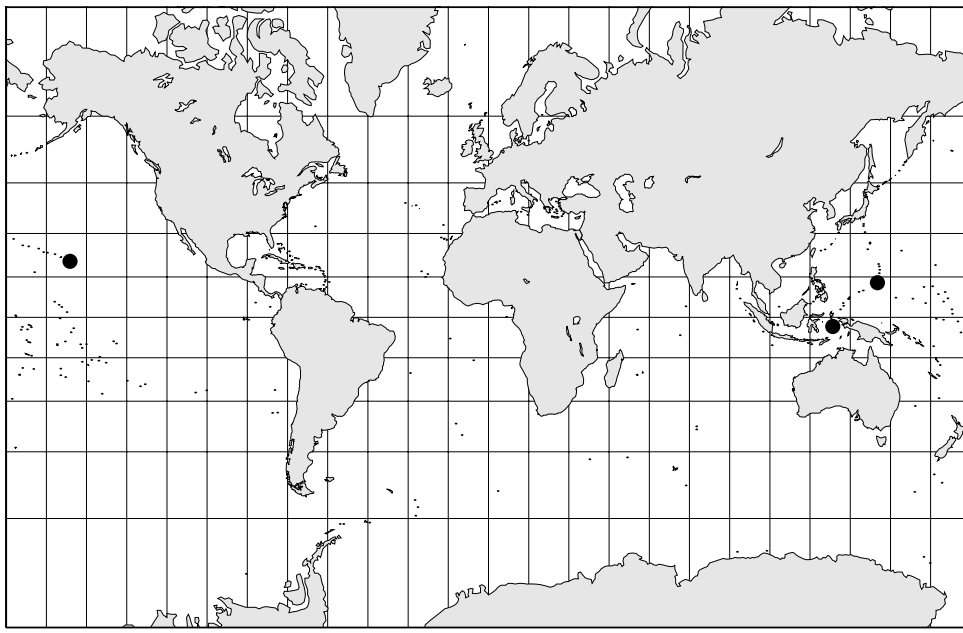

Fig. 208. Geographic distribution of *Dactylonia medipacifica* (Edmondson, 1935).

twice as long as wide, with slightly convex lateral margin, without distolateral tooth, with very small distolateral spine; endopod slightly longer than exopod, about 2.7 times longer than wide, extending beyond telson.

Ovigerous females carrying 15-200 eggs. Egg-size 0.5-0.6 mm.

Size.— This is a small sized species. Maximum postorbital carapace length in adult females is 6.1 mm, 3.4 in males. The minimum postorbital carapace length in ovigerous females is 3.5 mm.

Colouration.— Unknown.

Type.— Holotype: ovigerous female, pocl. 6.1 mm (Bishop Museum catalogue number S 3845); Midway Island, Hawaiian Islands.

Distribution.— Formely only known from the Hawaiian Islands. Now recorded for the first time from the Caroline Islands in the Pacific, and from Ambon Island, Indonesia.

Host.— A host-species is now recorded for the first time, being bivalves of the genus *Spondylus varians* Sowerby, 1847.

Remarks.— The maxilla in the specimens from Ambon has the basal endite not bilobate as in the holotype. The proximal lobe seems to be reduced.

In one large ovigerous female (cl. 4.5 mm) USNM 155156 the rostrum lacks the distal tooth, it is rounded in lateral view

Bruce (1980) notes the absence of a medioventral tooth on the basal segment of the antennula. This was also found in a male from USNM 155156. In the specimen from USNM 155154, and 2 specimens of USNM 155156 the tooth is minute and blunt. A small acute tooth is present in the specimens from USNM 155153, 155155, and 10 specimens from USNM 155156.

8.5.6. *Dactylonia monnioti* (Bruce, 1990) comb. nov.
(figs. 209, 210)

Pontonia monnioti Bruce, 1990: 183, figs. 21-24, 38e-h, 39i, j; Bruce, 1991: 381; Chace & Bruce, 1993: 62: Müller, 1993: 123; Bruce, 1994: 125, fig. 58.

Material.— **INDO-WEST PACIFIC**: **New Caledonia**.— MNHN-NA 11157: 1 male, holotype, pocl. 2.45 mm; 1 female, allotype**,** pocl. 3.10 mm; Chesterfield Island, 24°46.6'S 159°40.3'E; depth 185 m; 9.x.1985; MUSORSTOM 5 station CP 275.

Description.— Body subcylindrical. Carapace smooth. Rostrum well developed, distally ending in sharp point, far overreaching stylocerite, almost reaching end of basal segment of antennular peduncle, depressed, narrowly triangular in dorsal view, with prominent dorsal carina over entire length and acute lateral carinae, slightly concave ventral carina present; small subdistal ventral tooth present, without setae at tip. Inferior orbital angle acutely produced in lateral view. Antennal spine well developed, situated just below inferior orbital angle, reaching level of anterolateral angle. Anterolateral margin of carapace straight, anterolateral angle of carapace slightly produced, bluntly rounded.

Abdomen smooth; sixth segment about 1.4 times longer than fifth, 1.85 times longer than anterior depth, posterolateral angle small, acute, posteroventral angle expanded, acute; pleura of first five segments broadly rounded.

Telson more than twice as long as sixth abdominal segment, about 2.4 times its proximal width; lateral margins convex, convergent; posterior border without median

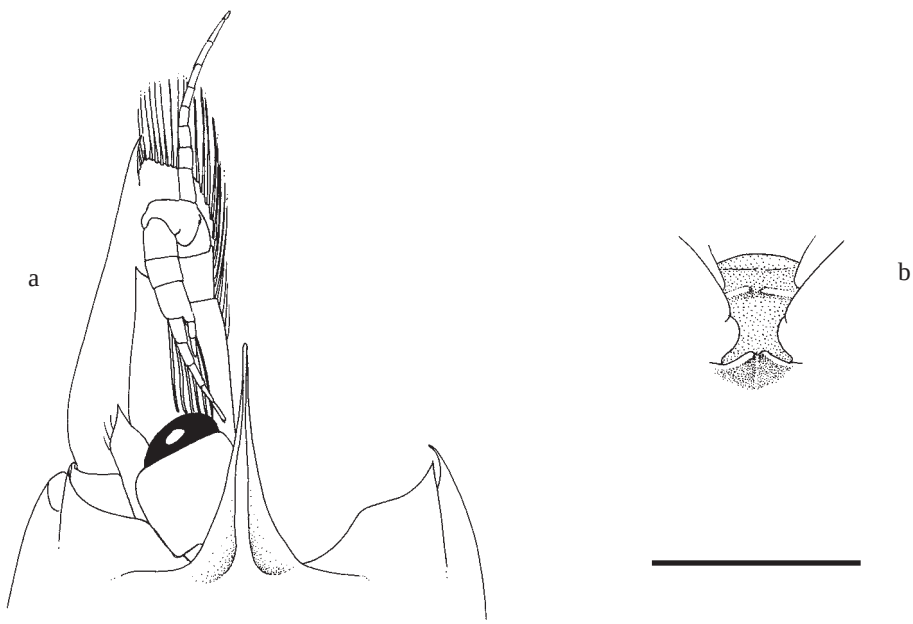

Fig. 209. *Dactylonia monnioti* (Bruce, 1990): male holotype, pocl. 2.5 mm (MNHN-NA 11157). a, anterior appendages, dorsal view; b, second to fifth thoracic sternites. Scale = 1 mm.

process; two pairs of large submarginal dorsal spines at 0.28 and 0.50 of telson length; distal and proximal pair of spines of equal length, 0.29 of telson length; posterior margin with three pairs of spines, lateral spines minute, marginal, intermediate and submedian spines long, almost as long as dorsal spines but more slender.

Eyestalk about as long as broad, about as broad as diameter of hemispherical cornea.

Antennula with peduncle and flagella rather short. Basal segment with acute distolateral tooth, reaching halfway intermediate segment; anterior margin not developed, oblique; medioventral tooth small, acute, submarginal, situated halfway basal segment; stylocerite short, reaching 0.4 of length of basal segment, with acute tip, with row of plumose setae laterally. Intermediate segment short, slightly broader than long. Distal segment about as long as broad. Upper flagellum short biramous, with three proximal segments fused, short free ramus with two segments, longer free ramus with about six segments. Lower flagellum with nine segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and mericerite small; carpocerite almost reaching distal margin of lamina of scaphocerite, long and slender, about six times longer than distal width; flagellum long and slender, about twice postorbital carapace length; scaphocerite with lamina about twice as long as wide, anterior margin broadly rounded, lateral margin convex; distolateral tooth moderately long, straight, about 0.11 length of lamina, far overreaching distal margin of lamina; incision between distolateral tooth and lamina not deep.

Epistome with very low carina. Labrum large, oval.

Paragnath with alae formed by large transverse suboval distal lobes and small round triangular ventromesial lobes; corpus rather narrow, with prominent longitudinal median carina, without setae.

Second thoracic sternite with broadly rounded anterior margin, almost straight; ventral surface without median ventrally directed tubercle.

Third thoracic sternite with broad triangular anterior margin.

Fourth thoracic sternite with very shallow lateral carinae.

Fifth thoracic sternite with shallow lateral carina.

Sixth to eigtht thoracic sternites without ornamentation.

Mandible with incisor process with five acute distal teeth of which outer ones largest, and row of three small denticles along ventrodistal margin; molar process with three blunt teeth, some fringed with setal brushes.

Maxillula with upper lacinia broad, rectangular, with two rows of about 15 serrulate spines and many long slender setae medially, inner medial surface with several long simple setae on strong carina; lower lacinia slender, triangular with many long simple setae distoventrally and marginally, with long serrate setae distally; palp faintly bilobed, larger lobe with small ventral tubercle with single short curved simple seta.

Maxilla with basal endite well developed; distal lobe slender, longer than proximal lobe, with one distal long simple seta, proximal lobe strongly tapering distally, with two long simple setae distally, median margin without setae; coxal endite obsolete, median margin convex, without setae; scaphognathite normal, 3.5 times longer than wide, posterior lobe 2.0 times longer than broad, anterior lobe large, broad, 2.0

times longer than wide; palp simple, about as long as distal lobe of basal endite, not expanded proximally, distally blunt, with few plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite partly fused, fringed with many long and finely serrulate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod well developed, flagellum with about four long plumose setae distally; caridean lobe large, elongate, narrow; palp simple, slender, elongate, curved along distolateral margin of basal endite, with some setae in distal part; epipod large, triangular, faintly bilobed.

Second maxilliped with endopod long; dactylar segment about 4.5 times longer than broad, densely fringed with coarsely serrulate spiniform, and long curled finely serrulate setae medially; propodal segment with row of long spines and setae along distomedian margin, with row of long finely serrulate setae along distal part of ventrolateral margin; carpal segment short, broader than long, subtriangular, unarmed; meral segment without long plumose setae medially; basal and ischial segment completely fused, straight, ischial part medially excavate, with row of few long plumose setae medially, basal part without protuberance medially; exopod normal, with about four long plumose setae distally; coxal segment medially produced, non-setose, with trapezoidal, proximally expanded epipod laterally, not bearing podobranch.

Third maxilliped almost reaching with ultimate segment beyond distal margin scaphocerite; with slightly expanded, long ischiomerus, partly fused to basis, but with distinct suture, 2.5 times as long as broad, somewhat tapering in distal half, flattened, with row of many short setae along median margin, lateral margin with single row of long plumose setae, distoventral surface with several rows of strong serrate setae; basal segment medially convex, with several long setae on median margin; exopod well developed, reaching 3/4th of ischiomeral segment, with about twelve long plumose setae in distal third; coxa without medial process, with large lateral plate without setae, without arthrobranch; penultimate segment slightly flattened, not expanded medially, about as long as ultimate segment, about twice as long as broad, flattened, with groups of finely serrulate setae ventromedially; ultimate segment about three times as long as broad, slightly tapering distally, with groups of long serrulate setae distally.

First pereiopods slender exceeding carpocerite by chela and carpus. Chela 3.5 times longer than deep, slightly compressed; fingers 1.5 times as long as palm, with entire cutting edges; fixed finger with groups of many strong, long, serrulate setae, tip hooked; dactylus with simple setae distally, tip acute, hooked; cleaning organ present on carpal-propodal joint; carpus about as long as chela, four times longer than distal width, tapering proximally, unarmed, with few short simple setae; merus 1.25 times longer than carpus, 5.5 times longer than central width, unarmed, with few short simple setae; ischium 0.7 times merus length, not expanded medially, without setae medially; basis short, 0.3 times as long as ischium; coxa without ventromedial lobe.

Second pereiopods unequal, dissimilar. Major chela slightly more than twice postorbital carapace length in males, 1.4 times postorbital carapace length in female; palm strongly compressed, median margin carinate and serrate, almost straight, provided

with few short simple setae, 1.9 times longer than wide; dactylus 0.4 times length of palm, about four times longer than deep, with one large, triangular, acute, tooth in proximal part of cutting edge, distal part of cutting edge straight, tip strongly hooked, without medial carina; fixed finger about 1.2 times longer than deep, with small, triangular, blunt tooth at midlength proximally separated from larger triangular blunt tooth by a deep notch, distal part of cutting edge entire, slightly concave, median fossa for reception of dactylar tooth when fingers closed not developed, tip strongly hooked; carpus about 0.3 of palm length, strongly tapering proximally, 1.7 times longer than distal width; merus almost twice as long as carpus, merus about 2.3 times its central width, slightly swollen centrally; ischium 0.7 times as long as merus, without distomedian protruding angle, tapering proximally; basis and coxa without special features. Minor chela 1.7 times postorbital carapace length in males, strongly compressed; palm 1.85 times longer than deep, median margin straight, serrate, and carinate; dactylus slightly longer than palm, 5.5 times longer than deep, with two shallow, blunt teeth in proximal part, distal part of cutting edge entire, concave, with moderately long simple setae, tip hooked; fixed finger about 2.3 times longer than deep, with shallow broad proximal tooth, distal part of cutting edge entire, concave, with moderately long simple setae, tip hooked; carpus, merus, ischium, basis and coxa similar to major cheliped, more slender.

Ambulatory pereiopods slender. Dactylus of third pereiopod with corpus compressed, about 3.6 times longer than proximal width, with many simple setae along ventral margin and few along dorsal margin; accessory tooth acute, terminal, slightly curved, entire; ventral margin with 13 rather acute, slender teeth in distal 2/3, decreasing in size proximally, with fine distal denticulations; unguis short, curved, 0.28 of corpus length, distally with few scales; propodus about four times longer than dactylus, about 13 times longer than proximal width, with three spines in distal part of ventral margin, with two ventrodistal spines, few setae along ventral and distal margins; carpus about 0.5 of propodus length, 4.5 times longer than distal width, slightly tapering proximally, with distinct distal lobe, unarmed; merus subequal to propodus length, 6.0 times longer than central width, slightly compressed, almost without setae, unarmed; ischium 0.7 of merus length, 5.0 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopods similar.

First pleopod of female with slender endopod, about third of exopod length, few simple setae along median margin, many long, simple, distal setae when ovigerous, with row of long plumose setae on lateral margin.

Male first pleopod with endopod about 4.0 times longer than proximal width, tapering distally; median margin slightly concave with row of about eight short simple setae, without setae in distal part, without setae along lateral margin.

Endopod of second pereiopod with short appendix masculina, equal to about 0.5 times length of appendix interna, with about five long setulose setae distally.

Uropods normal, with short stout unarmed protopodite; exopod broad, about 2.2 times as long as wide, with convex lateral margin, without distolateral tooth, with small mobile distolateral spine, distal lamina reduced; endopod about as long as exopod, about 2.6 times longer than wide, extending beyond telson.

Number and size of eggs not known.

Size.— Probably a small sized species. The only female known has a postorbital cara-

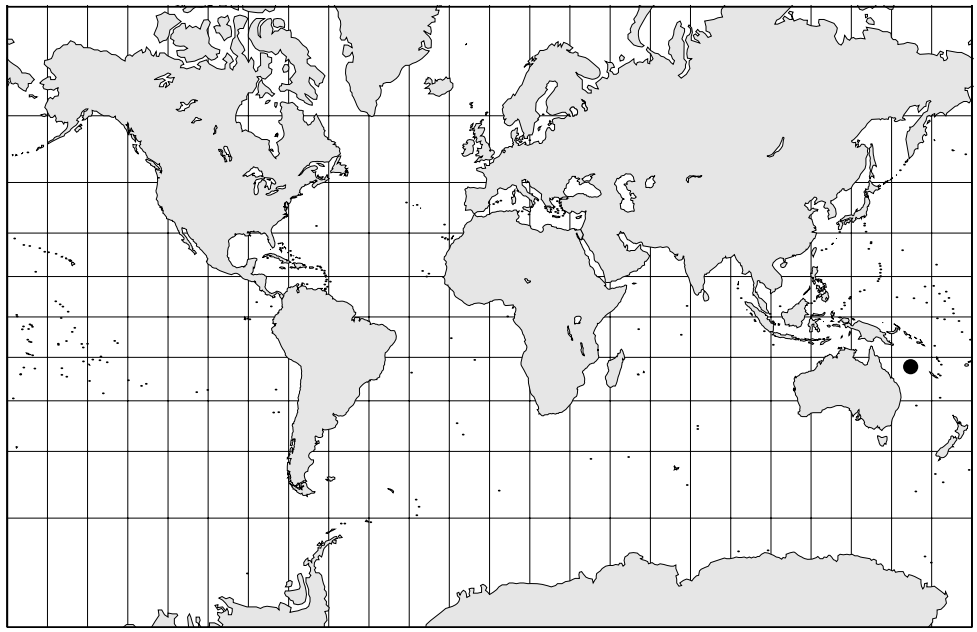

Fig. 210. Geographic distribution of *Dactylonia monnioti* (Bruce, 1990).

pace length of 3.1 mm, the only male known has a postorbital carapace length of 2.5 mm.

Colouration.— Unknown.

Types.— Holotype: male, pocl. 2.5 mm; allotype female pocl. 3.1 mm (MNHN-NA 11157): New Caledonia, Chesterfiel Islands, MUSORSTOM 5 stn CP 275, 24°46.6'S 159°40.3'E; depth 185 m; 9.x.1985.

Distribution.— INDO-WEST PACIFIC: New Caledonia, Chesterfield Islands (Bruce, 1990; Bruce, 1991).

Host.— *Ascidia alterna* Monniot & Monniot, 1991.

Remarks.— The allotype female has the stylocerite acute (fig. 209a). Also the male holotype left stylocerite is acute, without setae. Only the dissected right male antennula has the rounded stylocerite as depicted by Bruce (1990: fig. 22e). This feature is regarded aberrant.

The species is closely related to *Dactylonia ascidicola* and *D. okai*. Bruce (1990: 190) enumerates the differences between *D. ascidicola* and *D. monnioti*. Two additional distinguishing characters can be added: 1) median carinate margin of the palm and fixed finger of the second pereiopods is serrate in *Dactylonia monnioti* whereas entire in *D. ascidicola* or only indistinctly serrate in the distal part of the fixed finger; 2) the fixed finger of the second pereiopods has a small intermediate triangular tooth which is absent in *D. ascidicola*. *Dactylonia monnioti* may be distinguished from *D. okai* by the following features: 1) longer and more slender rostrum, with small preterminal ventral tooth, far exceeding anterior margin of cornea; 2) telson with much smaller lateral terminal spines; 3) third maxilliped with shorter penultimate segment, about as long as ultimate segment whereas it is twice as long in *D. okai*.

8.5.7. *Dactylonia okai* (Kemp, 1922) comb. nov.
(figs. 211-218, pl. 13B, C, 14)

Pontonia okai Kemp, 1922: 261, figs. 89-92; Holthuis, 1952: 15, 164, fig. 78; Harant, 1931: 368; Bruce, 1972a: 185; Bruce, 1976b: 58; Bruce, 1978: 483; Bruce, 1979: 234; Bruce, 1981b: 22; Bruce, 1983: 212; Bruce, 1990b: 17, 19; Müller, 1993: 123; Chace & Bruce, 1993: 62, 129; Bruce, 1994: 126.

Material.— **INDO-WEST PACIFIC: Philippines**.— USNM 253026: 1 male, 1 ovigerous female; Sulu Archipelago, 5°51'33"N 121°01'00"E; depth 27 m; 18.ix.1909; in *Ascidia depressiuscula* Heller; "Albatross", station 5558 (Chace & Bruce, 1993: 162). **Indonesia**.— ZMA: 1 juvenile, pocl. 1.3 mm; Sape Strait, 8°23'5 S 119°4'6 E; in branchial sac of *Corella aequabilis* Sluiter, 1904; dredge; depth 69 m; bottom coral and shells; 14.iv.1899; Siboga Exp. station 49a. (Holthuis, 1952: 164, 165).— RMNH D 42577: 1 ovigerous female, pocl. 2.9 mm; sta. Snellius 4.114, W of Sumbawa, Bay of Sanggar, 8°19.2'S 118° 14.4'E; snorkeling; scuba diving; lagoon side of reef barrier; 21/22.ix.1984.— RMNH D 47587: 3 ovigerous females, pocl. 1.6-2.0 mm; 2 non-ovigerous females, pocl. 1.7 (with abdominal bopyrid) and 2.1 mm; 5 males, pocl. 1.1- 2.0 mm; MAL.24, Ambon, S coast, Seri bay, 03°45'S 128°09'E; 22.xi.1996; depth 25 m; diving; in *Plurella* spec; leg. C.H.J.M. Fransen; photo.— RMNH D 47590: 6 ovigerous females, pocl. 2.0-2.4 mm; 9 non-ovigerous females, pocl. 1.1-2.4 mm (with abdominal bopyrid); 10 males, pocl. 1.1-2.2 mm, 3 specimens with abdominal bopyrid; MAL.22, Ambon, SW coast, E of Cape Nusanive, 03°44'S 128°02'E; 21.xi.1996; depth 10 m; diving; in *Plurella* spec; leg. C.H.J.M. Fransen.— RMNH D 48680: 1 ovigerous female, pocl. 2.0 mm; BAL.16, Bali, SE-side Pulau Serangan; 08°44'48''S 115°14'26''E; slowly declining shallow reef slope, sandy base; scuba-diving; 10-12 m depth; 6.iv.2001; in conglomerate of ascidians; collected by C.H.J.M. Fransen; film 10.

Description.— Body subcylindrical. Carapace smooth. Rostrum well developed, with anterior border blunt, reaching end of stylocerite, depressed, triangular in dorsal view, with distinct dorsal carina over entire length, with acute lateral carinae, with indistinct, slightly concave ventral carina in distal part; without subdistal tooth, without distal setae. Inferior orbital angle not produced, broadly rounded. Antennal spine well developed, reaching level of anterolateral margin of carapace, situated just below inferior orbital angle. Anterolateral margin of carapace straight, anterolateral angle of carapace slightly produced, bluntly rounded.

Abdomen smooth; sixth segment about 1.5 times longer than fifth, about as long as depth, posterolateral angle small, acute, posteroventral angle expanded, acute; pleura of first five segments broadly rounded.

Telson 1.25 times longer than sixth abdominal segment, about twice its proximal width, lateral margins slightly convex, convergent; posterior border without median process; two pairs of large submarginal dorsal spines at 0.22 and 0.50 of telson length; distal and proximal pair of spines of equal length, 0.25 of telson length; posterior margin with three pairs of spines, lateral spines small, marginal, intermediate and submedian spines long, as long as dorsal spines but more slender.

Eyestalk slightly longer than broad, slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella of normal length. Basal segment of peduncle with acute strongly developed distolateral tooth just overreaching midlength of intermediate segment; anterior margin not developed, oblique; medioventral tooth small, acute, submarginal, situated halfway basal segment; stylocerite short, reaching halfway basal segment, with acute tip; with row of five

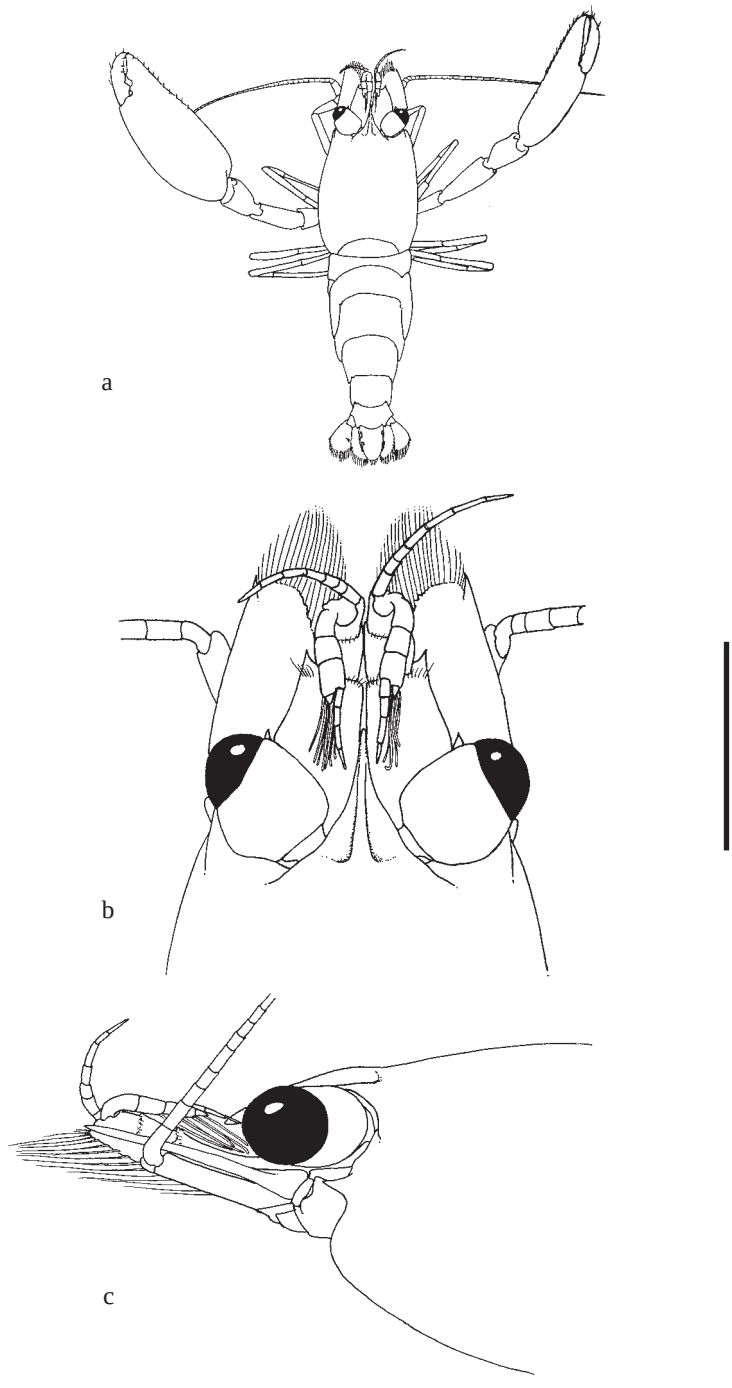

Fig. 211. *Dactylonia okai* (Kemp, 1922): ovigerous female, pocl. 2.0 mm, RMNH D 47590. a, dorsal aspect; b, anterior appendages, dorsal view; c, anterior appendages, lateral view. Scale: a = 4 mm; b, c = 1 mm.

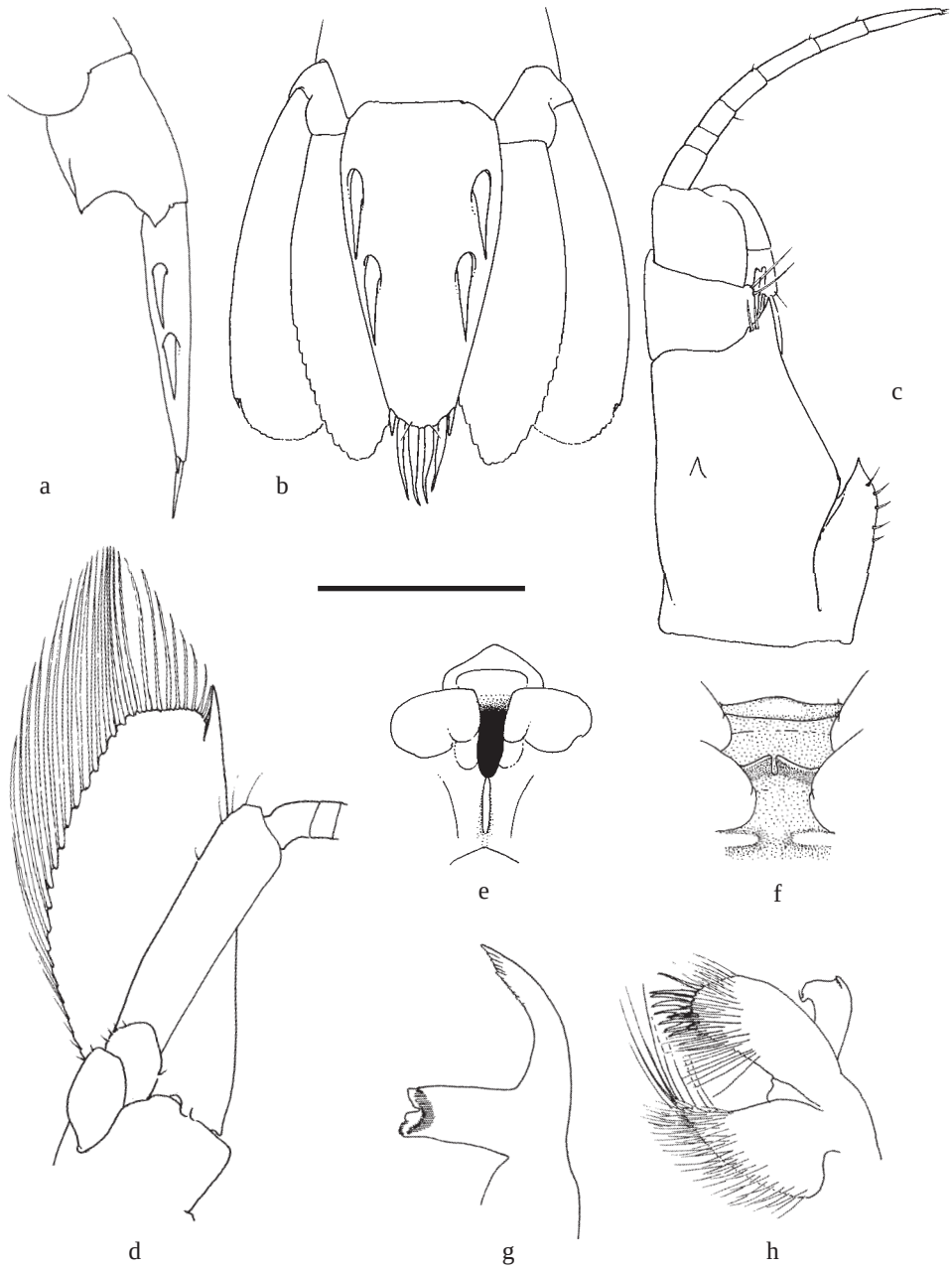

Fig. 212. *Dactylonia okai* (Kemp, 1922): ovigerous female, pocl. 2.0 mm, RMNH D 47590. a, distal part abdomen, lateral view; b, telson and uropods, dorsal view; c, antennula, ventral view; d, antenna, ventral view; e, paragnath, ventral view; f, second to fifth thoracic sternites; g, mandible, ventral view; h, maxillula, ventral view. Scale: a, b, e, f = 1 mm; c, d, g, h = 0.6 mm.

plumose setae laterally. Intermediate segment short, slightly broader than long. Distal segment about as long as broad. Upper flagellum short biramous, with three to five proximal segments fused; short free ramus one- or two-segmented; longer free ramus with four or five segments. Lower flagellum with about seven or eight segments.

Antenna with basicerite short, laterally rounded, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite extending to about $^{2}/_{3}$ of lamina of scaphocerite, moderately stout, about 3.5 times longer than distal width; flagellum long and slender, about twice postorbital carapace length; scaphocerite with lamella about 2.3 times longer than wide, anterior margin broadly rounded, lateral margin convex; distolateral tooth small, about 0.08 length of lamina, overreaching distal margin of lamina; incision between distolateral tooth and lamina not deep.

Epistome with blunt anterior carina. Labrum normal.

Paragnath with alae formed by large transverse suboval distal lobes and small round triangular ventromesial lobes; corpus rather narrow, with prominent longitudinal median carina, without setae.

Second thoracic sternite with broadly rounded anterior margin, without setae; without median ventrally directed tubercle.

Third thoracic sternite with transverse carina between third maxillipeds.

Fourth thoracic sternite with large triangular, medially notched plate posteromedian between first pereiopods; no ridge between first pereiopods.

Fifth thoracic sternite with blunt lateral plates posteromedian of second pereiopods, with broad notch in between.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process with 5-6 acute distal teeth, and row of about 3-6 small denticles along ventrodistal margin; molar process robust, with four blunt teeth, some fringed with setal brushes.

Maxillula with upper lacinia broad, rectangular, with two rows of 13-15 serrulate spines and many long slender setae medially, inner medial surface with several long simple setae on strong carina; lower lacinia slender, triangular with many long simple setae distoventrally and marginally, with long serrate setae distally; palp faintly bilobed, larger lobe with small ventral tubercle with single short curved simple seta.

Maxilla with basal endite well developed; distal lobe broad, with 1-3 distal long simple setae, proximal lobe reduced, with 1-3 long simple setae distally, median margin without setae; coxal endite obsolete, median margin convex, without setae; scaphognathite normal, 4.3 times longer than wide, posterior lobe 2.7 times longer than broad, anterior lobe large, broad, 2.3 times longer than wide; palp simple, much longer than distal lobe of basal endite, not expanded proximally, distally blunt, with few plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite partly fused, fringed with many long and finely serrulate setae along entire median margin, with row of more sparse, longer, simple submarginal setae ventrally; exopod well developed, flagellum with four or five long plumose setae distally; caridean lobe large, elongate, narrow; palp simple, slender, elongate, with one long plumose seta distally, curved along distolateral margin of basal endite; epipod large, triangular, faintly bilobed.

Second maxilliped with endopod long; dactylar segment about 4.5 times longer than broad, densely fringed with coarsely serrulate spiniform, and long curled finely serrulate setae medially; propodal segment with row of long spines and setae along distomedian margin, with row of long finely serrulate setae along distal part of ventrolateral margin; carpal segment short, broader than long, subtriangular, unarmed; meral segment without long plumose setae medially; basal and ischial segment not fused, straight, ischium and distal half basis medially excavate, with row of long plumose setae medially, basal part without protuberance medially; exopod normal, with about four to six long plumose setae distally; coxal segment medially produced, non-setose, with trapezoidal, proximally expanded epipod laterally, not bearing podobranch.

Third maxilliped almost reaching with ultimate segment 1/2-3/4th length of scaphocerite; with slightly expanded, long ischiomerus, partly fused to basis, but with distinct suture, 2.5 times as long as broad, somewhat tapering in distal half, flattened, with several rows of strongly curled plumose setae along median margin, ventral surface with few setae, lateral margin with single row of long plumose setae; basal segment medially convex, with several long, curled, plumose setae on median margin; exopod well developed, reaching 3/4th of ischiomeral segment, with about eight long

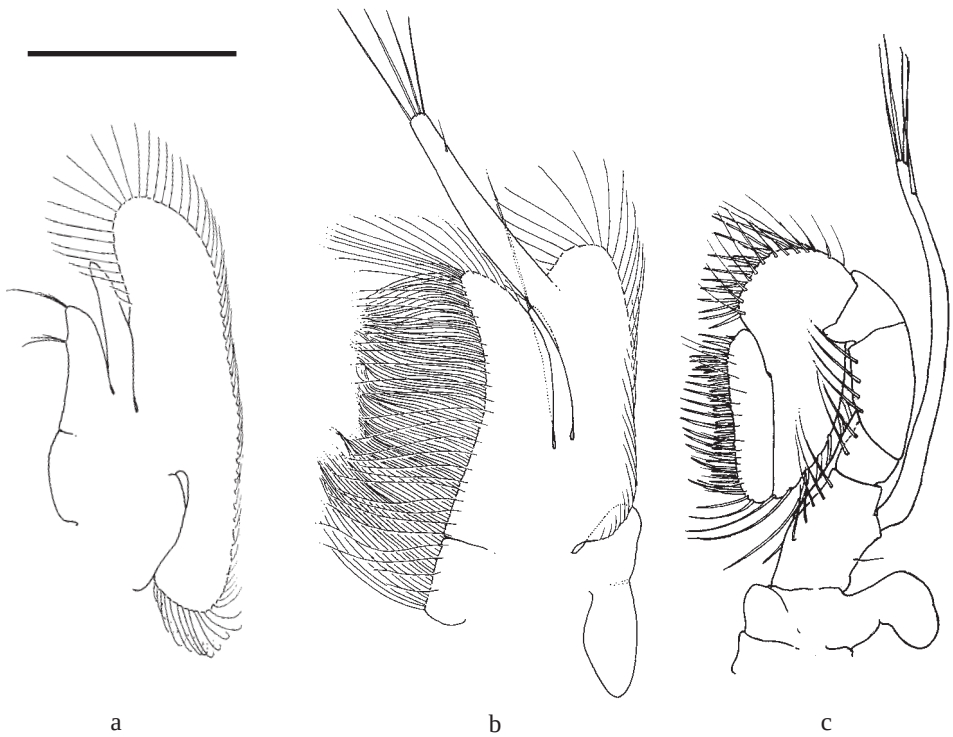

Fig. 213. *Dactylonia okai* (Kemp, 1922): ovigerous female, pocl. 2.0 mm, RMNH D 47590. a, maxilla, ventral view; b, first maxilliped, ventral view; c, second maxilliped, ventral view. Scale = 0.6 mm.

plumose setae in distal third; coxa without medial process, with large lateral plate with few short, simple, setae, without arthrobranch; penultimate segment subcylindrical, almost four times as long as broad, median margin with strongly curled plumose setae; ultimate segment half length of penultimate segment, more slender than penultimate segment, tapering distally.

First pereiopods short, rather robust, exceeding carpocerite by chela only. Chela 2.7 times longer than deep, compressed; fingers as long as palm, with entire cutting edges; fixed finger with groups of many strong, long, serrulate setae, tip hooked; dactylus with simple setae distally, tip acute, hooked; cleaning organ present on carpal-propodal joint; carpus slightly shorter than chela, three times longer than distal width, tapering proximally, unarmed, with few short simple setae; merus 1.4 times

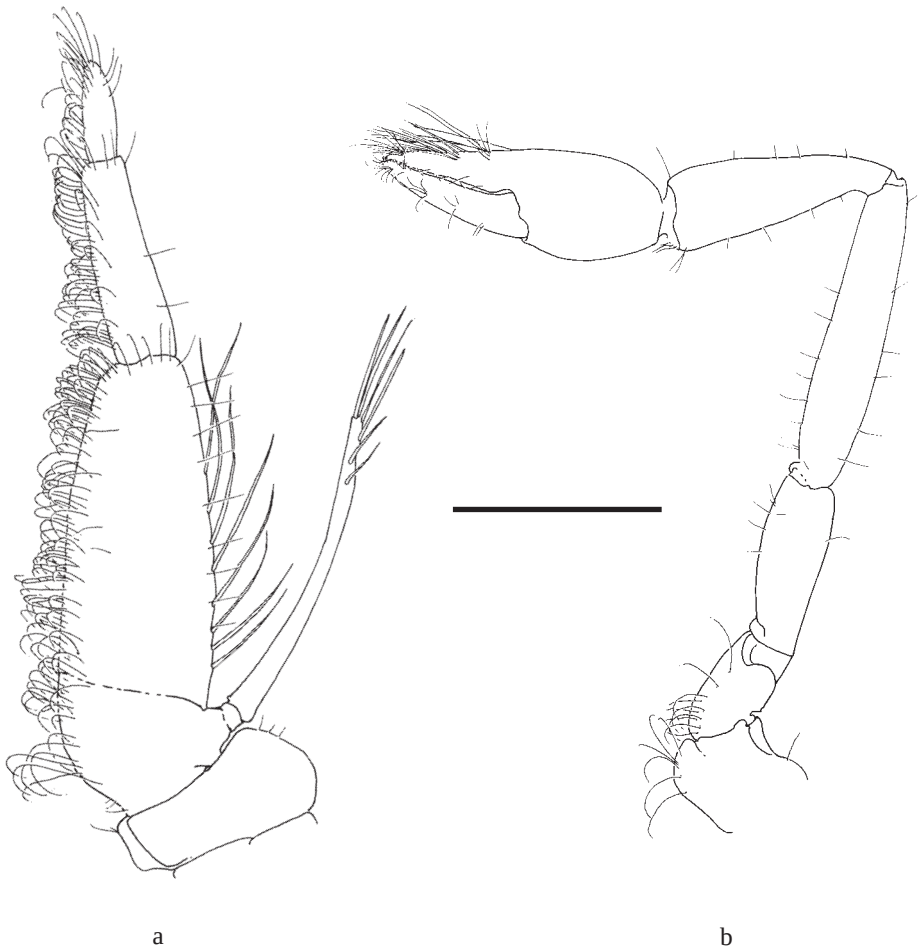

Fig. 214. *Dactylonia okai* (Kemp, 1922): ovigerous female, pocl. 2.0 mm, RMNH D 47590. a, third maxilliped, ventral view; b, first pereiopod. Scale: a = 0.6 mm; b = 0.75 mm.

longer than carpus, 5.2 times longer than central width, unarmed, with few short simple setae; ischium half of merus length, not expanded medially, with few simple setae medially; basis short, 0.5 times as long as ischium, with medial simple setae; coxa with small ventromedial lobe with few long, simple setae.

Second pereiopods unequal, dissimilar. Major chela 2.1 times postorbital carapace length in adult males, 1.6 times postorbital carapace length in adult females; palm compressed, median distal margin carinate and serrate, almost straight, provided with few short simple setae, 2.1 times longer than wide; dactylus 0.5 times length of palm, about three times longer than deep, with one large, triangular, acute tooth in proximal part of cutting edge, distal part of cutting edge straight, tip strongly hooked, without medial carina; fixed finger about 1.6 times longer than deep, with two small, triangular, blunt teeth at midlength proximally separated from larger broad, blunt, indistinctly denticulate tooth by a deep notch, distal part of cutting edge entire, slightly concave, median fossa for reception of dactylar tooth when fingers closed not developed, tip strongly hooked; carpus about 0.27 of palm length, strongly tapering proximally, 1.2 times longer than distal width; merus almost twice as long as carpus, about 2.5 times its central width, slightly swollen centrally; ischium 0.7 times as long as merus, without distomedian protruding angle, tapering proximally; basis and coxa without special features. Minor chela 1.3 times postorbital carapace length in males, strongly compressed; palm 2.4 times longer than deep, median margin straight, serrate, and carinate in distal half; dactylus about 0.6 times palm length, 4.8 times longer than deep, with one small tooth in proximal part, distal part of cutting edge entire, slightly concave, with moderately long simple setae, tip hooked; fixed finger 2.0 times longer than deep, with shallow, broad, denticulate, proximal tooth, and small, acute triangular tooth just distally of proximal tooth, distal part of cutting edge entire, slightly concave, with moderately long simple setae, tip hooked; carpus, merus, ischium, basis and coxa similar to major cheliped, more slender.

Ambulatory pereiopods slender. Dactylus of third pereiopod with corpus compressed, about 2.8 times longer than proximal width, with few simple setae along ventral margin and even less along dorsal margin; accessory tooth acute, terminally, slightly curved, distally minutely denticulate; ventral margin with 12-16 rather acute, slender teeth in distal 2/3rd, decreasing in size proximally, with fine distal denticulations; unguis short, curved, 0.30 of corpus length, distally with few scales; propodus about five times longer than dactylus, about 8.5 times longer than proximal width, with three spines in distal part of ventral margin, with two ventrodistal spines, few setae along ventral and distal margins; carpus about 0.5 of propodus length, 4.4 times longer than distal width, slightly tapering proximally, with small distal lobe, unarmed; merus subequal to propodus length, 7.5 times longer than central width, slightly compressed, almost without setae, unarmed; ischium 0.75 of merus length, 5.3 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopods similar.

First pleopod of female with slender endopod, about third of exopod length, few simple setae along median margin and distal margin when ovigerous, with row of long plumose setae on lateral margin.

Male first pleopod with endopod about five times longer than proximal width in adult males, distal half curled, slender; median margin straight with row of about 4-14

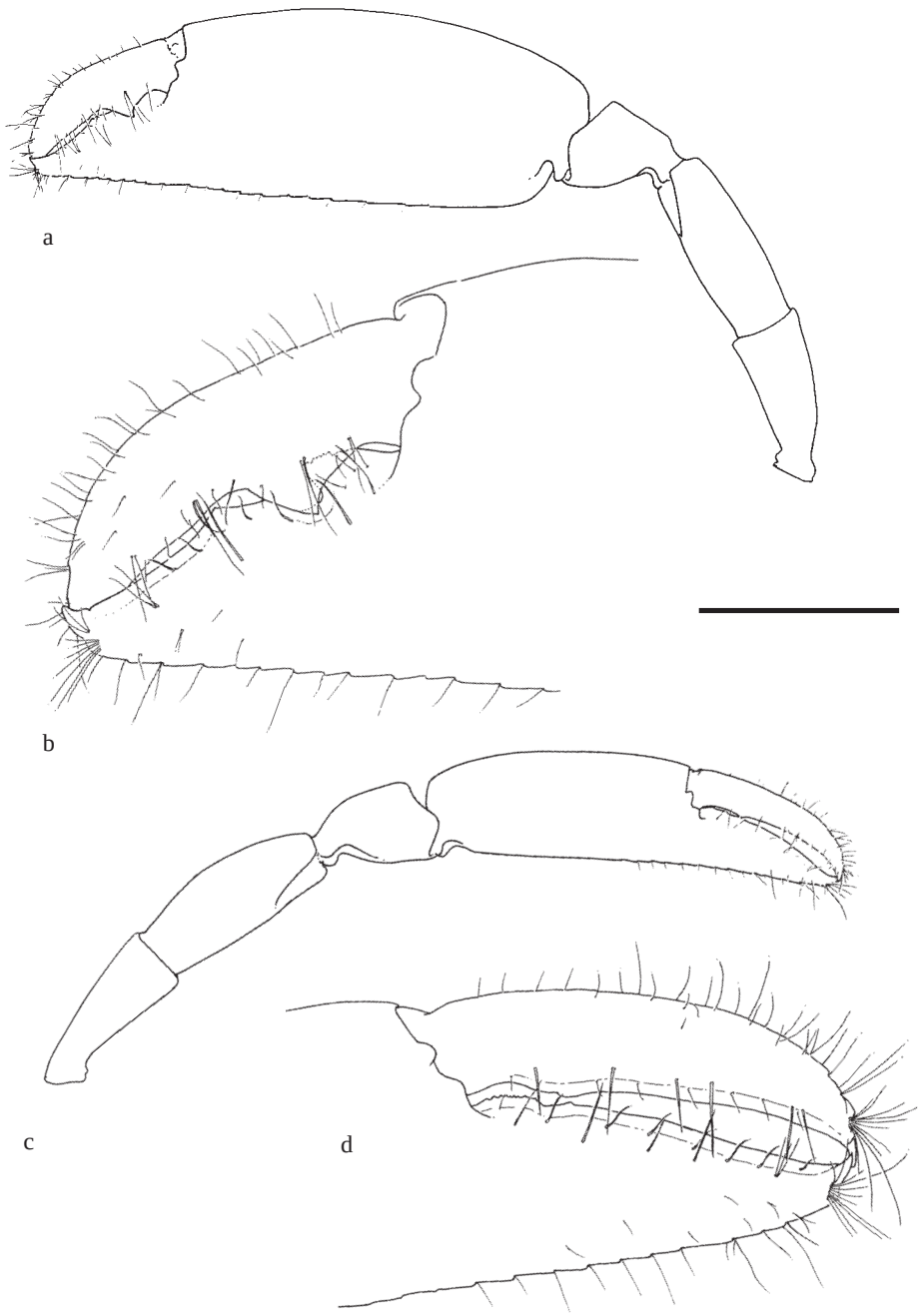

Fig. 215. *Dactylonia okai* (Kemp, 1922): ovigerous female, pocl. 2.0 mm, RMNH D 47590. a, major second pereiopod; b, idem, chela; c, minor second pereiopod; d, minor second pereiopod, chela. Scale: a, c = 1.5 mm; b, d = 0.6 mm.

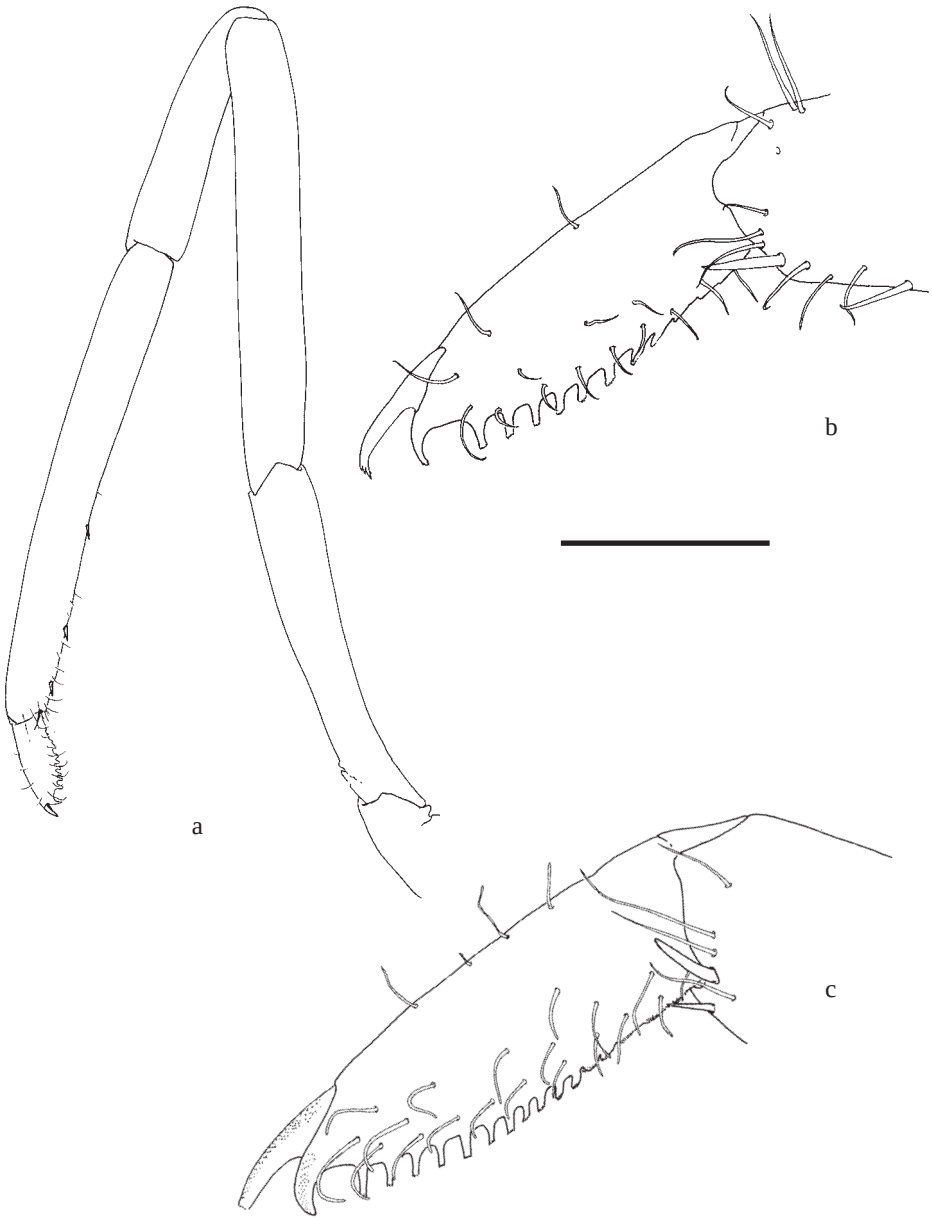

Fig. 216. *Dactylonia okai* (Kemp, 1922): ovigerous female, pocl. 2.0 mm (figs. a, b), RMNH D 47590; ovigerous female, pocl. 2.9 mm, RMNH D 42577 (fig. c). a, third pereiopod; b, c, dactylus third pereiopod. Scale: a = 0.6 mm; b, c = 0.15 mm.

short setae, without setae in distal part, without setae along lateral margin.

Endopod of second pereiopod with short appendix masculina, equal to about 0.5 times length of appendix interna, with several long setulose setae distally.

Uropods normal, with short stout unarmed protopodite; exopod broad, about 2.2 times as long as wide, with slightly convex lateral margin, without distolateral tooth, with small mobile distolateral spine, distal lamina reduced; endopod about as long as exopod, about 2.7 times longer than wide, extending beyond telson.

Ovigerous females with 30-40 eggs. Egg diameter 0.55-0.65 mm.

Size.— This is a small sized species. The maximum pocl. is 2.9 mm in adult females, 2.2 mm in adult males. The minimal pocl. of an ovigerous female is 1.63 mm. The type-specimens of the species have a total length of 8.0 and 8.5 mm. The postorbital carapace length is ca. 1/4th of the total length. Thus the type-specimens have a pocl. of about 2.0 mm.

Colouration (based on slides of specimens with registrationnumbers RMNH D 47587).— Body with small red-brown chromatophores and scattered large yellow and white chromatophores. Carapace with or without small white chromatophore at base of rostrum; centrolateral and proximolateral large yellow chromatophores are present; hepatopancreas with irregular whitish pattern. Eyestalks with two small white chromatophores on the dorsal surface; cornea light brown to white. Antennulae with yellow or white chromatophores in distal parts of segments. Second pereiopods with scattered small and large yellow chromatophores. First pereiopods and ambulatory pereiopods with one or few yellow chromatophores in proximal joints. Abdominal pleura with yellow and white chromatophores dorsally and laterally. Tail-fan with

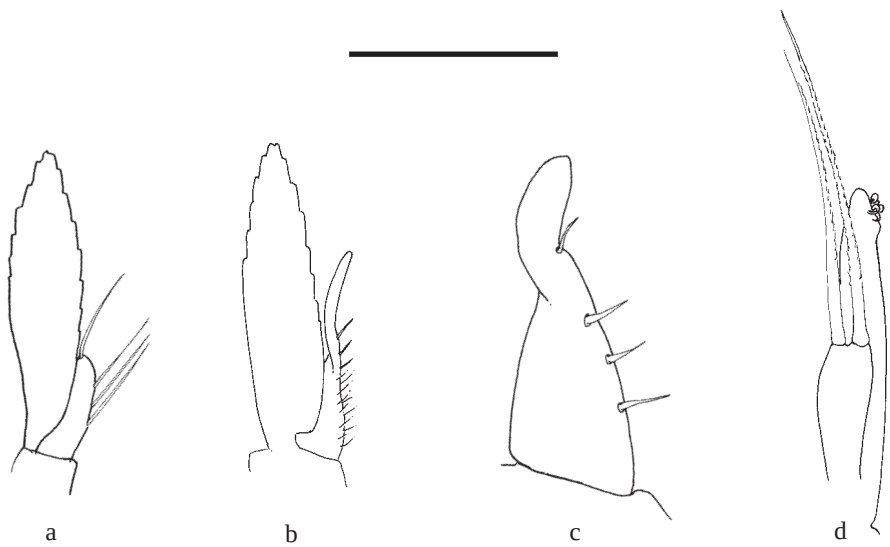

Fig. 217. *Dactylonia okai* (Kemp, 1922): overigous female, pocl. 2.0 mm; male, pocl. 2.2 mm (fig. b); male, pocl. 1.1 mm (figs. c, d), RMNH D 47590. a, endopod female first pleopod; b, c, endopod male first pleopod; d, appendix interna and appendix masculina on second male pleopod. Scale: a, b = 0.6 mm; c, d = 0.15 mm.

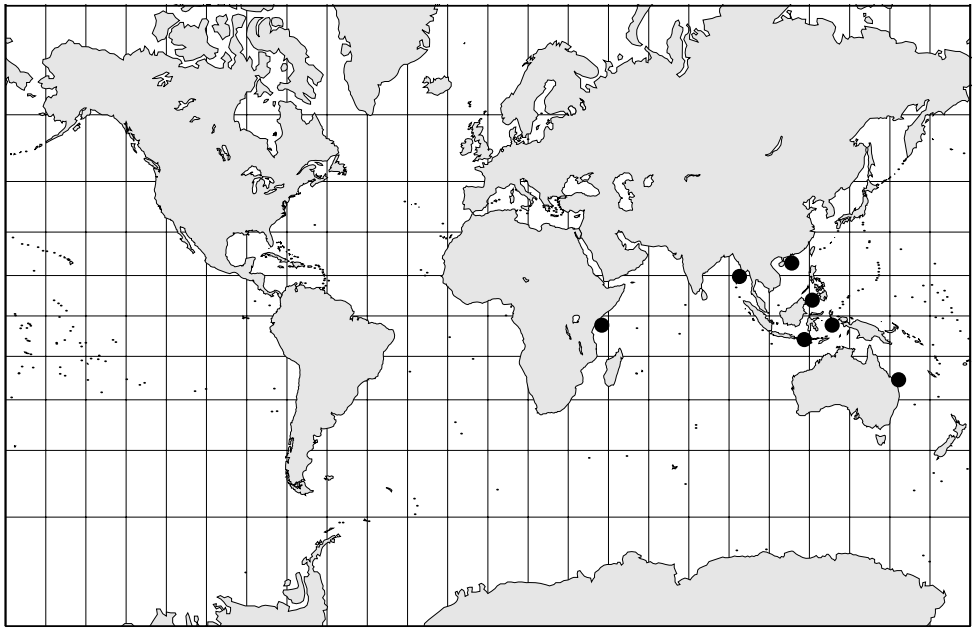

Fig. 218. Geographic distribution of *Dactylonia okai* (Kemp, 1922).

large yellow or white spots proximally and distally, with many dark-red chromatophores in between.

Types.— Syntypes: 1 male, total length 8.0 mm, 1 female, total length 8.5 mm; C 421/1: Burma, off Cape Negrais, 15°25'N 93°45'E; depth 73-126 m; -.xi.1909; "Investigator"; in *Ascidia.* Specimens are present in the Zoological Survey of India, Calcutta (B. Galil, pers. comm.). However, efforts to obtain the specimens for comparison were unsuccessful.

Distribution.— INDO-WEST PACIFIC: Kenya, Mombassa, depth 6 m, in ascidian (Bruce, 1976); Burma, off Cape Negrais, depth 73-126 m (Kemp, 1922); South China Sea; 50 fms (cf. Bruce, 1979); Indonesia, Lesser Sunda Islands, Sape Strait, depth 69 m (cf. Holthuis, 1952); Bali, Ambon and Sumbawa (present records); Philippines, Sulu Archipelago, depth 27 m (cf. Chace & Bruce, 1993); Australia, Queensland, depth 15 m (Bruce, 1981, 1983).

Hosts.— Unidentified ascidian (cf. Bruce, 1981, 1983); *Ascidia* spec. (cf. Kemp, 1922); *Ascidia willeyi* Oka, 1915 (cf. Bruce, 1979); *Ascidia depressiuscula* Heller, 1878 (cf. Chace & Bruce, 1993); *Corella aequabilis* Sluiter, 1904 (cf. Holthuis, 1952; Bruce, 1979); aggregate of *Plurella* spec. (present study).

Remarks.— Kemp (1922: 264) discusses the differences between *Dactylonia okai* and the description of *D. ascidicola* by Borradaile (1898 and 1899): "The species [*D. okai*] is related to Borradaile's *P. ascidicola,* the description of which is very meagre, but differs conspicuously in [1] the proportions of the two ultimate segments of the third maxilliped. [2] In *P. ascidicola,* also, the carpus of the first leg is longer than the chela and [3] the fingers of the smaller second leg are said to be provided with teeth just as in the larger limb of the pair."

Part of the differences in these three characters fall within the range these characters show in *Dactylonia ascidicola*. 1) The relation between the length of the chela and carpus of the first pereiopod seems to be related to size as noted for *D. ascidicola*. The larger the specimen the smaller the ratio will be. 2) The penultimate segment of the third maxilliped is more than twice as long as the ultimate segment in the holotype of *Dactylonia okai*. In the type of *Dactylonia ascidicola* it is 1.6 times as long as the ultimate segment (Borradaile, 1899: fig. 6b). In specimens of *Dactylonia ascidicola* seen, this ratio is between 1.0 and 1.6. 3) The presence of distinct or indistinct teeth on the cutting edges of the fingers of the minor second chela can also be related to size; the teeth become more prominent in larger specimens.

Dactylonia okai is a small-sized species with maximum pocl. nearly 3 mm in which females can be ovigerous when reaching a pocl. of 1.6 mm. Specimens of *Dactylonia ascidicola* are much larger, their maximum pocl. is 7.0 mm and females can be ovigerous when reaching 3.1 mm pocl.

There are small but constant differences in the colourpatterns of both species.

8.6. *Odontonia* gen. nov.

Definition.— Small sized shrimp of subcylindrical body form. Rostrum well developed, depressed; dorsally unarmed; dorsal carina formed by shallow broad central elevation, bordered by lateral depressions; lateral carinae well developed; ventral margin with or without small subdistal tooth. Carapace smooth; inferior orbital angles broadly rounded; orbit feebly developed; supraorbital, epigastric and hepatic spines absent; antennal spine blunt, rounded, not separated from the inferior orbital angle; anterolateral angle of branchiostegite rounded, not strongly produced.

Eye normal, with hemispherical cornea.

Antennula normal, ventromedial tooth on basal segment large; distolateral tooth of basal segment well developed, reaching distal margin of intermediate segment, anterior margin oblique, not extending beyond distolateral tooth; flagella strongly reduced.

Antenna with basicerite unarmed; scaphocerite well developed, with distolateral tooth strongly developed, bent inward, more than 0.2 times length of scaphocerite.

Epistome unarmed. Corpus of paragnaths with two submedian, oblique nonsetose carinae.

Second thoracic sternite with anterior margin broadly rounded, not produced.

Fourth thoracic sternite with medially developed centrally slightly notched or completely fused lateral plates.

Fifth thoracic sternite with broad rectangular, medially blunt, partly fused lateral plates.

Mandible robust, without palp, molar process stout, incisor process simple, with or without row of denticles along medioventral border.

Maxillula with bilobed palp, lower lacinia small, slender with few simple setae.

Maxilla with simple palp; bilobed endite; scaphognathite broad; basal endite with many simple setae on upper and lower lacinia, both laciniae well developed; basal endite shorter than palp.

First maxilliped with slender palp, basal and coxal endites partly fused, with few short setae along median margin, not forming basket; exopod with well devel-

oped caridean lobe; flagellum broad, densely setose distally; epipod large, oval.

Second maxilliped with distinct angle in median margin of basis of endopod; exopod with flagellum well developed, plumose setae distally; epipod a small rounded, curled lobe; without podobranch.

Third maxilliped with ischiomerus of endopod partly fused to basis, as broad as penultimate segment; exopod well developed, with plumose setae distally; coxa with oval, lateral plate, without median process, arthrobranch absent.

First pereiopods with chela simple.

Chelae unequal in size, subequal in form; major and minor chelae with one proximal tooth on dactylus and two on fixed finger, dactylus without median carina; fixed finger without median fossa to receive dactylar tooth when fingers closed; fingers not gaping.

Ambulatory pereiopods stout, dactylus simple or biunguiculate, with or without accessory teeth on flexor margin of corpus; flexor margin with scattered setae; unguis with or without distal scales.

Abdomen smooth; posterior margins of pleura rounded, posterolateral angle of sixth segment blunt or rounded.

Uropod with protopodite feebly acute distally, exopod with distolateral margin with mobile spinule, feebly armed.

Telson with two pairs of large submarginal dorsal spines, three pairs of posterior spines.

Type species.— The type species: *Pontonia katoi* Kubo, 1940, by present designation.

Etymology.— The name is composed of the greek 'odous', referring to the large ventromedial tooth on the basal segment of the antennular peduncle, and the last part of the name *Pontonia*, the genus from which it is split off. Gender: feminine.

Distribution.— Known from shallow coastal waters of the Indo-West Pacific.

Hosts.— Associated with Ascidiacea.

8.6.1. Key to the species of *Odontonia* gen. nov.

1. Dactylus of ambulatory pereiopods without accessory tooth 2
- Dactylus of ambulatory pereiopods with accessory tooth 3
2. Flexor margin of dactylus of ambulatory pereiopods with several small denticles; rostrum without distal teeth or setae ..... ***O. simplicipes***
- Flexor margin of dactylus of ambulatory pereiopods entire; rostrum with small distal tooth and few distal setae ..... ***O. seychellensis*** spec. nov**.**
3. Telson with two pairs of dorsal spines 4
- Telson with 5 pairs of dorsal spines ..... ***O. sibogae***
4. Distolateral tooth of scaphocerite large, 0.25-0.30 of scaphocerite length; ventral tooth of rostrum very strong, reaching tip or beyond tip of rostrum; medioventral tooth of basal antennular segment very strongly developed; unguis of dactylus of ambulatory pereiopods with one or two distal scales 5
- Distolateral tooth of scaphocerite small, ca. 0.20 of scaphocerite length; ventral tooth of rostrum small, subdistal, not reaching beyond tip of rostrum; medioventral tooth of basal antennular segment moderately strongly developed; unguis of

dactylus of ambulatory pereiopods with about eight distal scales ..... ***O. rufopunctata*** spec. nov.

5 Dorsal telson spines at 0.1-0.2 and 0.6 of telson length..... ***O. katoi***

\- Dorsal telson spines at 0.6 and 0.8 of telson length..... ***O. compacta***

8.6.2. *Odontonia compacta* (Bruce, 1996) comb. nov.
(figs. 219, 248)

Pontonia compacta Bruce, 1996: 242-247, figs. 15-18.

Material.— **INDO-WEST PACIFIC**: **New Caledonia**.— MNHN-Na 12851: 1 male, holotype, pocl. 2.5 mm; Lagoon: stn. 415, 22º36.3'S 167º14.2'E; depth 10-60 m, 24.i.1985; collected by B. Richer de Forges.

Description of male holotype.— Body depressed. Carapace smooth. Rostrum well developed, distally rounded, proximally broad, overreaching antennular peduncle, reaching beyond distal margin of scaphocerite, with broad, shallow dorsal carina over entire length, with acute lateral carinae, with ventral carina in distal part; distal end rather swollen, rounded in lateral view, with small ventrodistal tooth and few short simple distal setae. Inferior orbital angle strongly produced, blunt in lateral view. Antennal spine reduced, blunt, rounded, not separated from inferior angle by notch. Anterolateral margin straight, anterolateral angle produced, rounded.

Abdomen smooth; sixth segment about 1.6 times longer than fifth, about twice as wide as long, posteroventral and posterolateral angles rounded; pleura of first five segments broadly rounded.

Telson longer than sixth abdominal segment, about 2.0 times as long as proximal width; lateral margins straight, convergent; posterior border without median process; two pairs of submarginal dorsal spines at about 0.56 and 0.75 of telson length on left side, at 0.36 and 0.75 of telson length; distal and proximal pair of spines of equal length, about 0.10 of telson length; posterior margin with three pairs of spines, lateral spines small, marginal, about 0.03 times telson length; submedian spines as long as intermediate spines; both intermediate and submedian spines longer than dorsal spines, submedian spines more slender than dorsal and intermediate spines.

Eyestalk short, about as long as broad, slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella short. Basal segment about 1.1 times as long as proximal width, with acute produced distolateral tooth reaching distal margin of intermediate segment, anterior margin not developed; very large ventromedial tooth, submarginal, at proximal third of basal segment; stylocerite short, reaching halfway basal segment, tip acute, with few short plumose setae laterally. Intermediate segment short, slightly broader than long. Distal segment broader than long. Upper flagellum short, biramous, with three proximal segments fused; short free ramus with one segment; longer free ramus with four segments. Lower flagellum with about seven segments.

Antenna with basicerite short, laterally unarmed, with small antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite extending beyond distolateral tooth of scaphocerite, about four times longer than distal width; flagellum

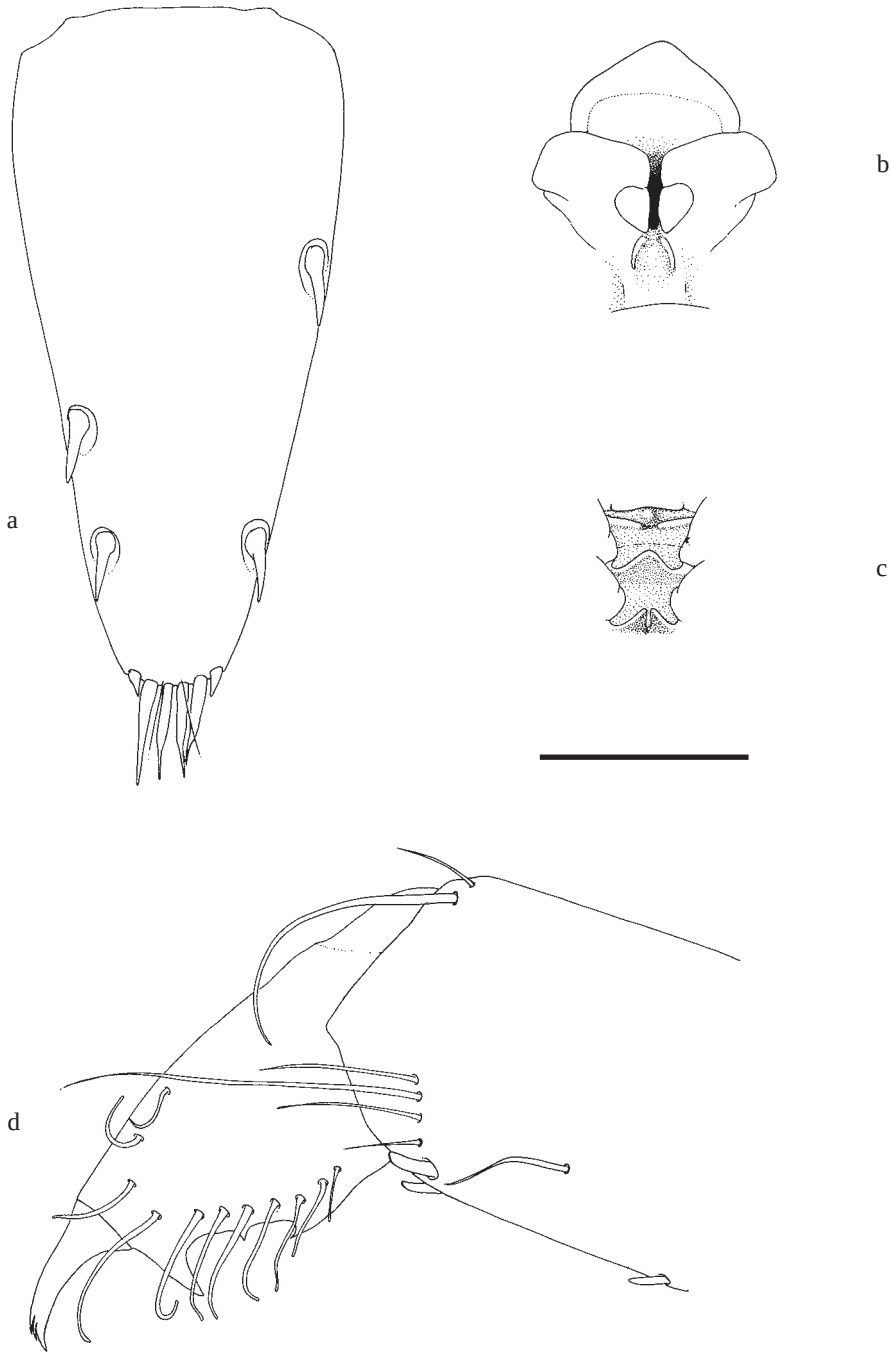

Fig. 219. *Odontonia compacta* (Bruce, 1996), male holotype, pocl. 2.5 mm, MNHN-Na 12851. a, telson, dorsal view; b, paragnath, ventral view; c, second to fifth thoracic sternites; d, dactylus third pereiopod. Scale: a-c = 1 mm; d = 0.15 mm.

slightly longer than postorbital carapace length, slender; scaphocerite with lamina 1.6 times as long as wide, anterior margin broadly rounded, lateral margin broadly convex; distolateral tooth robust, proximally broad, curved inward, about 0.25 length of lamina (incl. distolateral tooth) twice as long as distal lamina; incision between distolateral tooth and lamina moderately deep.

Epistome with broadly rounded anterior median carina; labrum large, oval.

Paragnath short with distal lobes of alae short and rounded, ventromesial lobes small, triangular; corpus short, broad, with short oblique carinae without setae.

Second thoracic sternite with anterior margin rounded; without median tubercle, without setae.

Third thoracic sternite with indistinct shallow lateral carinae.

Fourth thoracic sternite with medial triangular plate formed by the fused lateral carinae.

Fifth thoracic sternite with well developed lateral plates with deep central slit posteromedial to second pereiopod coxae; coxae almost against each other in larger specimens.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process with seven acute distal teeth, with one or two small denticles along ventrodistal margin; molar process stout, with four blunt distal teeth, some fringed with setal brushes.

Maxillula with upper and lower lacinia rather small, with relatively few spines and setae in distal part; upper lacinia rectangular with two rows of about ten stout distal spines; lower lacinia slender, pointed, curled inward; palp feebly bilobed, larger lobe with small ventral tubercle with single short recurved simple seta.

Maxilla with basal endite well developed, bilobate; distal lobe well developed, with about three distal simple setae, proximal lobe more slender, with three distal simple setae; coxal endite obsolete, slightly convex, non-setose; scaphognathite large, about 4.5 times longer than wide, posterior lobe very long, about 3.7 times longer than basal width, anterior lobe about 1.6 times longer than basal width; palp simple, clearly overreaching distal lobe of basal endite, almost as long as anterior lobe of scaphognathite, slightly expanded proximally, tapered distally, with rounded tip, row of plumose setae in proximal part of lateral margin.

First maxilliped with coxal and basal endite partly fused, with clear suture separating them; basal endite broad, with many finely serrate and simple setae along medial and ventromedial margin; coxal endite separated from basal endite by notch, medial border straight, with very few setae in distal part; exopod well developed, flagellum with about six long plumose setae distally; caridean lobe large, broad; palp simple, rather short, non-setose; epipod large, triangular, distinctly bilobed.

Second maxilliped with endopod normal; dactylar segment about four times longer than broad, fringed with coarsely serrulate spiniform, and long curled finely serrulate setae medially; propodal segment with row of long spines and simple and finely serrulate setae along protruding distomedian margin, without setae along ventrolateral margin; carpal segment short, unarmed, broader than long; meral segment without plumose setae; basal and ischial segment completely fused, without plumose setae, moderate medial excavation, blunt proximal medial angle in basal part; exopod normal, with six long plumose setae distally; coxal segment slightly produced feebly

bilobed, without setae, with triangular, feebly bilobed epipod laterally.

Third maxilliped short, reaching to about 0.3 of carpocerite length, with ischiomerus partly fused to basis, but with distinct suture, rather slender, about 2.5 times as long as broad, expanding distally, somewhat flattened, with row of long simple setae along median margin, lateral margin with few simple setae; basal segment medially strongly convex, with several long finely serrulate setae on median border; exopod well developed, slightly longer than meral segment, with about five long plumose setae distally; coxa without medial process, with large rounded lateral plate, non-setose; without arthrobranch; ultimate segment much shorter than penultimate segment; penultimate segment broad, swollen, about 1.6 times as long as broad, with long finely serrulate setae medially; ultimate segment tapering distally, with groups of coarsely serrulate setae medially and distally.

First pereiopod short, stout, exceeding carpocerite by chela and carpus. Chela almost three times longer than deep, compressed; fingers about 0.9 of palm length, similar, tapering distally, with entire cutting edges, with groups of serrulate setae in distal part, tip acute, hooked; cleaning organ on carpal-propodal joint reduced; carpus 1.3 times as long as chela, about 3.75 times longer than distal width, slightly tapering proximally, unarmed, almost devoid of setae; merus stout, bowed, as long as carpus, 3.4 times longer than central width, with few short simple setae in proximal part of medial margin; ischium about 0.6 of merus length, non-setose; basis slightly shorter than ischium, non-setose; coxa with small ventral lobe, without setae.

Second pereiopods missing in holotype.

Ambulatory pereiopods short, stout. Dactylus of third pereiopod with corpus moderately compressed, about 1.6 times as long as proximal width; with single row of seven setae along both sides of flexor margin, and five single setae on each lateral surface distodorsally, flexor margin convex with one anteriorly directed prominent tooth at midpoint, and one small denticle between latter tooth and accessory tooth; accessory tooth smaller than unguis, slightly recurved, acute, preterminal; unguis rather straight, slender, about 0.4 of corpus length, with few terminal scales; propodus three times as long as dactylus, three times as long as proximal width, with two small blunt spines in distal third of flexor margin, with single small ventrodistal spine, few simple setae distally; carpus 0.8 of propodus length, 2.4 times longer than distal width, not tapering proximally, unarmed, without setae; merus 1.25 times as long as propodus, 2.75 times longer than central width, slightly compressed; ischium about 0.75 of merus length, 2.2 times longer than distal width, slightly tapering proximally; coxa and basis without special features. Fourth pereiopod similar; fifth pereiopod missing.

Male and female pleopods not known.

Uropods normal, with short unarmed protopodite; exopod broad, 2.0 times longer than central width, lateral margin feebly convex, without distolateral tooth, with minute spinule distolaterally; endopod far exceeding exopod, 1.1 times exopod length, 2.8 times longer than wide.

Size.— Only known from holotype male, pocl. 2.5 mm.

Colouration.— Unknown.

Type.— Holotype: male, pocl. 2.5 mm (MNHN-Na 12851); New Caledonia, Lagoon stn. 415, 22°36.3'S, 167°14.2'E, 10-60 m; 24.i.1985; in *Pyura albanyensis* Michaelsen, 1927.

Distribution.— Only known from the type-locality.

Hosts.— *Pyura albanyensis* Michaelsen, 1927.

Remarks.— The species is closely related to *Odontonia katoi* Kubo, 1940, as indicated by Bruce (1996: 247). The specimen also very much resembles *Odontonia sibogae*. The dactyli of the pereiopods are exactly the same in both species. The only difference with *Odontonia sibogae* can be found in the dorsal spines of the telson. As in the holotype of *Odontonia compacta*, the left and right pair of spines have different locations, this might indicate an aberrant development of the telson. As noted under *Odontonia sibogae*, there is some variation in the number and position of the dorsal telson spines in this species, and the holotype of *O. compacta* could wel turn out to be an atypic specimen of *O. sibogae*.

8.6.3. *Odontonia katoi* (Kubo, 1940) comb. nov.
(figs. 220-228, pls. 15, 16)

Pontonia katoi Kubo, 1940: 55, figs. 21-23; Holthuis, 1952: 15 (p.p.), 158, figs. 73c,d, 74a, 75c, 76a,b,d,e, 77b,d; Anonymus, 1954: 766, fig. 2209; Bruce, 1972: 185; Hipeau-Jacquotte, 1973: 104; Bruce, 1976: 482; Bruce, 1978: 178, fig. 9; Bruce, 1978: 287; Kikuchi & Miyake, 1978: 21; Bruce, 1980: 34, fig. 13i,j, 14; Bruce, 1980: 40, 48, colourfig.; Bruce, 1980: 276; Miyake, 1982: 37, pl. 13 fig. 5; Bruce, 1983: 894; Bruce, 1991: 623, fig. 14C; Chace & Bruce, 1993: 61, 129; Müller, 1993: 122; Bruce, 1994: 126.

Material.— **INDO-WEST PACIFIC**: **Indonesia**.— RMNH D 42568: 3 ovigerous females, pocl. 3.4-3.7 mm; 1 male, pocl. 1.5 mm; 1 juvenile, pocl. 0.9 mm; sta. RBE.18, Moluccas, Ambon, Hitu, Ambon Bay, outer bay, E-side of Laha, up to and including Tawiri; snorkeling; depth ca. 2 m; 19.xi.1990; leg. M. Lavaleye & A. Fortuin; in *Polycarpa aurata* (Quoy & Gaimard, 1834).— RMNH D 42569: 5 non-ovigerous females, pocl. 1.2-2.9 mm; sta. RBE.18, Moluccas, Ambon, Hitu, Ambon Bay, outer bay, E-side of Laha, up to and including Tawiri; snorkeling; depth 2-3 m; 24.xi.1990; in *Polycarpa aurata* (Quoy & Gaimard, 1834), in 8 ascideans; leg. J. van Egmond.— RMNH D 42570: 1 ovigerous female, pocl. 4.1 mm; 1 male, pocl. 2.6 mm; sta. RBE.20, Moluccas, Ambon, Hitu, N coast, Hitulama; snorkeling; depth 2-4 m; in brown ascidian, *Polycarpa* spec., 2 specimens in one ascidian out of 12, with mollusc *Musculus*; 20.xi.1990; leg. C.H.J.M. Fransen.— RMNH D 42571: 1 male, pocl. 2.8 mm; sta. RBE.27, Moluccas, Ambon, Leitimur, S coast, Hutumuri; depth 25 m; scuba diving; in ascidian *Pyura momus* (Savigny, 1816); 26.xi.1990; leg. J. van Egmond.— RMNH D 42572: 10 males, pocl. 1.8-3.0 mm; 3 ovigerous females, pocl. 3.3-3.8 mm; 1 non-ovigerous female (pocl. 2.0, 2.5 mm); sta. RBE.03, Moluccas, Ambon, Leitimur, Ambon Bay, outer bay, Batumerah (near Ambon city); depth 3-6 m; scuba diving; in ascidian *Polycarpa aurata* (Quoy & Gaimard, 1834); 8.xi.1990; leg. C.H.J.M. Fransen.— RMNH D 42573: 1 ovigerous female, pocl. 3.4 mm; 1 non-ovigerous female, pocl. 3.2 mm; sta. RBE.03, Moluccas, Ambon, Leitimur, Ambon Bay, outer bay, Batumerah (near Ambon city); depth 6 m; scuba diving; in ascidian *Pyura momus* (Savigny, 1816); 7.xi.1990; leg. C.H.J.M. Fransen. Photo ML 9/12-17.— RMNH D 42574: 1 male, pocl. 2.8 mm; sta. RBE.03, Indonesia, Moluccas, Ambon, Leitimur, Ambon Bay, outer bay, Batumerah (near Ambon city); depth 3-6 m; scuba diving; in ascidian *Pyura momus*; 9.xi.1990; leg. C.H.J.M. Fransen.— RMNH D 46700: 1 ovigerous female, pocl. 3.8 mm; SUL.05, N Sulawesi, Selat Lembeh, Pulau Lembeh, cape N of Mawali, 01°27'N 125°14'E; sandy bottom with patch reefs up to 1.5 m high, much coral rubble; snorkeling; 15.x.1994; in ascidian; leg. I.J. Smit; photo 19/5-10.— RMNH D 46701: 1 juvenile, pocl. 1.3 mm; 2 ovigerous females, pocl. 3.5 and 3.8 mm; 2 males, pocl. 2.5 and 2.9 mm; 2 non-ovigerous females, pocl. 2.5 and 3.1 mm; SW Sulawesi, Spermonde Archipelago, Samelona, NW side; depth 5-18 m; scuba diving; 21.ix.1994; in *Polycarpa aurata* (Quoy & Gaimard, 1834); leg. C.H.J.M. Fransen & J.C. den Hartog.— RMNH D 47576: 1 ovigerous female, pocl. 3.3 mm; 1 male, pocl. 2.0 mm; MAL.03, Ambon, Outer bay, N coast W of Sahuru, 03°40'S 128°09'E; 5.xi.1996; depth 8 m; diving; in *Polycarpa aurata* (Quoy & Gaimard, 1834); leg. C.H.J.M. Fransen; photo.— RMNH D 47649: 1 male, pocl. 1.4 mm; MAL.29, NW Seram, Kotania bay, NE of Pulau Marsegu, 03°00'S 128°03'E;

11.xi.1996; depth 10-30 m; diving; in ascidian; leg. C.H.J.M. Fransen.— ZMA: 1 ovigerous female, pocl 3.1 mm; Pepela Bay, eastcoast of Roti, 10°38'S 123°25'2 E; in *Styela palinorsa* (Sluiter, 1895); dredged in 27-45 m and reef exploration; bottom mud, coral and *Lithothamnion*; 30.i-1.ii.1900; Siboga Exp. station 301 (*Pontonia styela* Holthuis MS).— RMNH D 48683: 1 non-ovigerous female, pocl. 1.4 mm; Sta. BAL.19, Padang Bay, E-side Tanjung Sari; 08°31'46''S 115°30'47''E; shallow reef flat and slope, sandy slope; scuba-diving; 10 m depth; 8.iv.2001; in *Polycarpa aurata*; collected by C.H.J.M. Fransen.— RMNH D 48684: 1 juvenile with moult, pocl. 1.3 mm; Sta. BAL.19, Padang Bay, E-side Tanjung Sari; 08°31'46''S 115°30'47''E; shallow reef flat and slope, sandy slope; scuba-diving; 10 m depth; in *Polycarpa aurata*; 8.iv.2001; collected by C.H.J.M. Fransen; film 14.— RMNH D 48685: 1 ovigerous female, pocl. 3.8 mm; Sta. BAL.20: Tulamben beach, 'Coral Garden' off hotel area; 08°16'36''S 115°35'37''E; shallow reef flat and slope, sandy slope; scuba-diving; 5 m depth; 12.iv.2001; in *Polycarpa aurata*; collected by C.H.J.M. Fransen; film. 22.— RMNH D 48686: 1 non-ovigerous female, pocl. 2.5 mm; Sta. BAL.20, Tulamben beach, 'Coral Garden' off hotel area; 08°16'36''S 115°35'37''E; shallow reef flat and slope, sandy slope; scuba-diving; 5 m depth; 9.iv.2001; in *Polycarpa aurata*; collected by C.H.J.M. Fransen.— RMNH D 48687: 1 ovigerous female, pocl. 3.6 mm; Sta. BAL.21, Tulamben beach, 'Liberty wreck'; 08°16'26''S 115°35'28''E; wreck with shallow reef flat and slope, sandy slope; scuba-diving; 10 m depth; 10.iv.2001; in *Polycarpa aurata*; collected by C.H.J.M. Fransen.— RMNH D 48688: 1 ovigerous female, pocl. 3.4 mm; Sta. BAL.22, SE-end Tulamben beach; 08°16'40''S 115°35'45''E; reef flat with drop-off and slope, sandy base; scuba-diving; 10 m depth; 11.iv.2001; in *Polycarpa aurata*; collected by C.H.J.M. Fransen; film 19.— RMNH D 48689: 1 ovigerous female, pocl. 3.2 mm; Sta. BAL.20, Tulamben beach, 'Coral Garden' off hotel area; 08°16'36''S 115°35'37''E; shallow reef flat and slope, sandy slope; scuba-diving; 10-20 m depth; 9.iv.2001; in *Polycarpa aurata*; collected by C.H.J.M. Fransen; film 15.— **Palau Islands**.— USNM 106015: 1 specimen; Iwayama Bay, E side of mouth of Kakisuido (Oyster Bay) between XXIX and SE of Koror, 7°18'57"N 134°30'09"E; depth 3-20 ft; 12.x.1955; leg. F.M. Bayer, et al.; in branchial sac of *Polycarpa cryptocarpa* (Sluiter, 1885).— **New Caledonia**.— MNHN-Na 3714: 1 male, pocl. 3.5 mm; 1 non-ovigerous female, pocl. 3.7 mm; Noumea, st. 203; x.1978; depth 20 m.— **Philippines**.— RMNH D 48508: 2 non-ovigerous females, pocl. 2.9 and 3.0 mm; 1 male, pocl. 3.0 mm; 1 juvenile, pocl. 1.6 mm; Sta. CEB.05, Philippines, Cebu Strait, W of Bohol, W side of Cabilao Island, S side fish sanctuary; 9°52.60'N 123°45.61'E; vertical wall with caves to 45 m; scuba; 8.xi.1999; depth 15 m; in *Polycarpa aurata* (Quoy & Gaimard, 1834); leg. C.H.J.M. Fransen.— RMNH D 48509: 1 ovigerous female, pocl. 3.5 mm; 1 male, pocl. 3.2 mm; Sta. CEB.08, Philippines, Cebu Strait, W of Bohol, S side of Cabilao Island, Cabacungan Point; 9°51.55'N 123°45.95'E; overhanging wall with caves; scuba; 11.xi.1999; depth 5-10 m; in *Polycarpa aurata* (Quoy & Gaimard, 1834); leg. C.H.J.M. Fransen.— RMNH D 48510: 1 ovigerous female, pocl. 3.6 mm; 1 male, pocl. 2.5 mm; Sta. CEB.17, Philippines, Cebu Strait, W of Bohol, SW side of Sandingan Island; 9°50.55'N 123°47.37'E; gentle, sandy reef slope with coral patches below 25 m; scuba; 18.xi.1999; depth 10 m; in *Pyura momus* (Savigny, 1816); leg. B.W. Hoeksema.

Description.— Body depressed. Carapace smooth. Rostrum well developed, without dorsal teeth, overreaching antennular peduncle, reaching level of distal margin of scaphocerite, with broad, indistinct, shallow dorsal elevation over entire length and acute lateral carinae, with convex ventral carina in distal part; distal end obtuse in lateral view, with small ventrodistal tooth and few distal setae, blunt in dorsal view, broadened at base. Inferior orbital angle produced, directed inward. Antennal spine blunt, protruding rounded process, not separated by notch from inferior orbital angle. Anterolateral margin straight, anterolateral angle produced.

Abdomen smooth; sixth segment about 1.5 times longer than fifth, 1.3 times broader than long, posteroventral angle acute, posterolateral angle feebly produced, blunt; pleura of first five segments broadly rounded.

Telson longer than sixth abdominal segment, about 2.25 times as long as proximal width; lateral margins slightly convex, almost straight, convergent; posterior border

without median process; two pairs of submarginal dorsal spines at about 0.13-0.27 and 0.50-0.66 of telson length; distal and proximal pair of spines of equal length, about 0.13 of telson length; posterior margin with three pairs of spines, lateral spines small, marginal, about 1/3 of length of intermediate spines; submedian spines slightly longer than intermediate spines; both intermediate and submedian spines about as long as dorsal spines, but more slender.

Eyestalk short, about as long as broad, as broad as diameter of hemispherical cornea.

Antennula with peduncle and flagella short. Basal segment about 1.2 times as long as proximal width, with acutely produced distolateral tooth reaching distal margin of intermediate segment, anterior margin not developed, oblique; ventromedial tooth very large, acute, at proximal third of basal segment, submarginal; stylocerite short, reaching halfway basal segment, with blunt tip, lateral margin with about four short plumose setae. Intermediate segment short, slightly broader than long. Distal segment broader than long. Upper flagellum short, biramous, with four segments fused; short

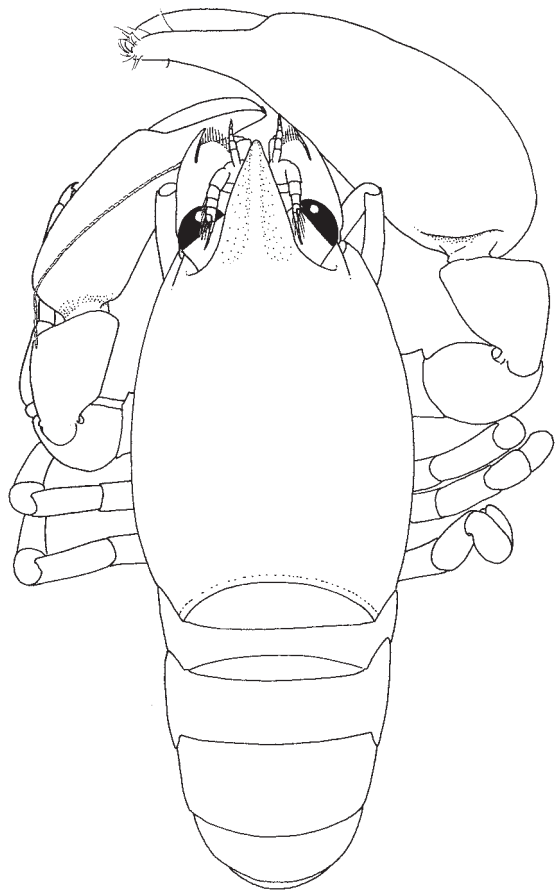

Fig. 220. *Odontonia katoi* (Kubo, 1940): male, pocl. 2.6 mm, RMNH D 42570. Dorsal aspect. Scale = 2 mm.

free ramus with one or two segments; longer free ramus with three or four segments. Lower flagellum with about seven segments.

Antenna with basicerite short, laterally unarmed, with large rounded antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite extending just beyond distal margin of lamina of scaphocerite, slender, 4.0 times longer than distal width; flagellum slightly longer than postorbital carapace length; scaphocerite with lamina almost twice as long as wide, anterior margin narrow, rounded, lateral margin broadly convex; distolateral tooth robust, about 0.30 length of lamina (incl. distolateral tooth) twice as long as distal lamina, somewhat curved inward; incision between distolateral tooth and lamina deep.

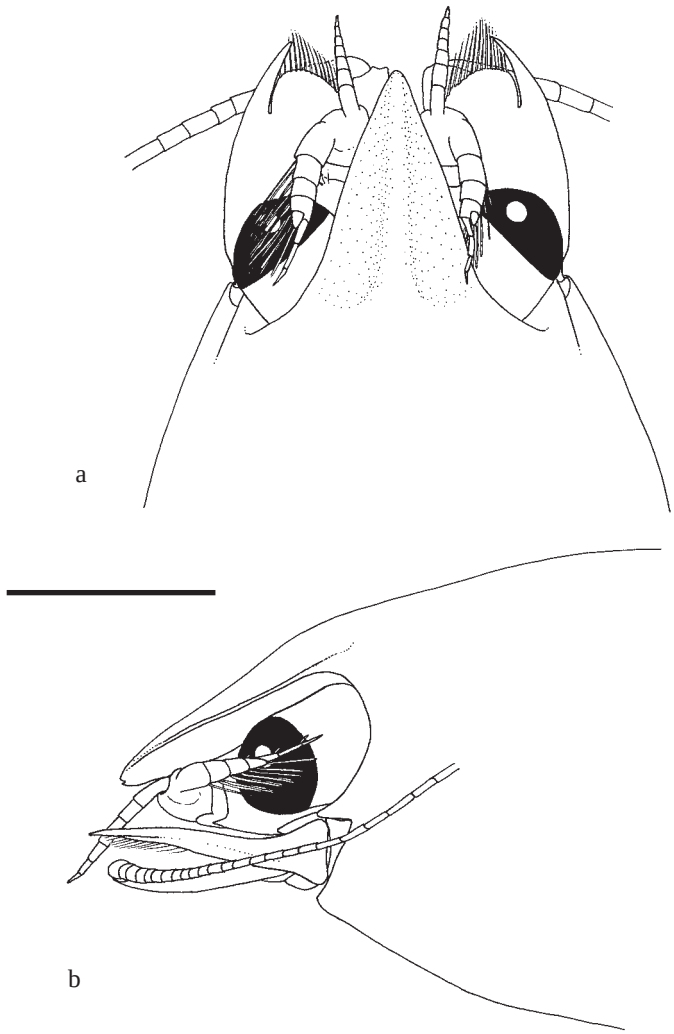

Fig. 221. *Odontonia katoi* (Kubo, 1940): male, pocl. 2.6 mm, RMNH D 42570. a, anterior appendages, dorsal view; b, anterior appendages, lateral view. Scale = 1 mm.

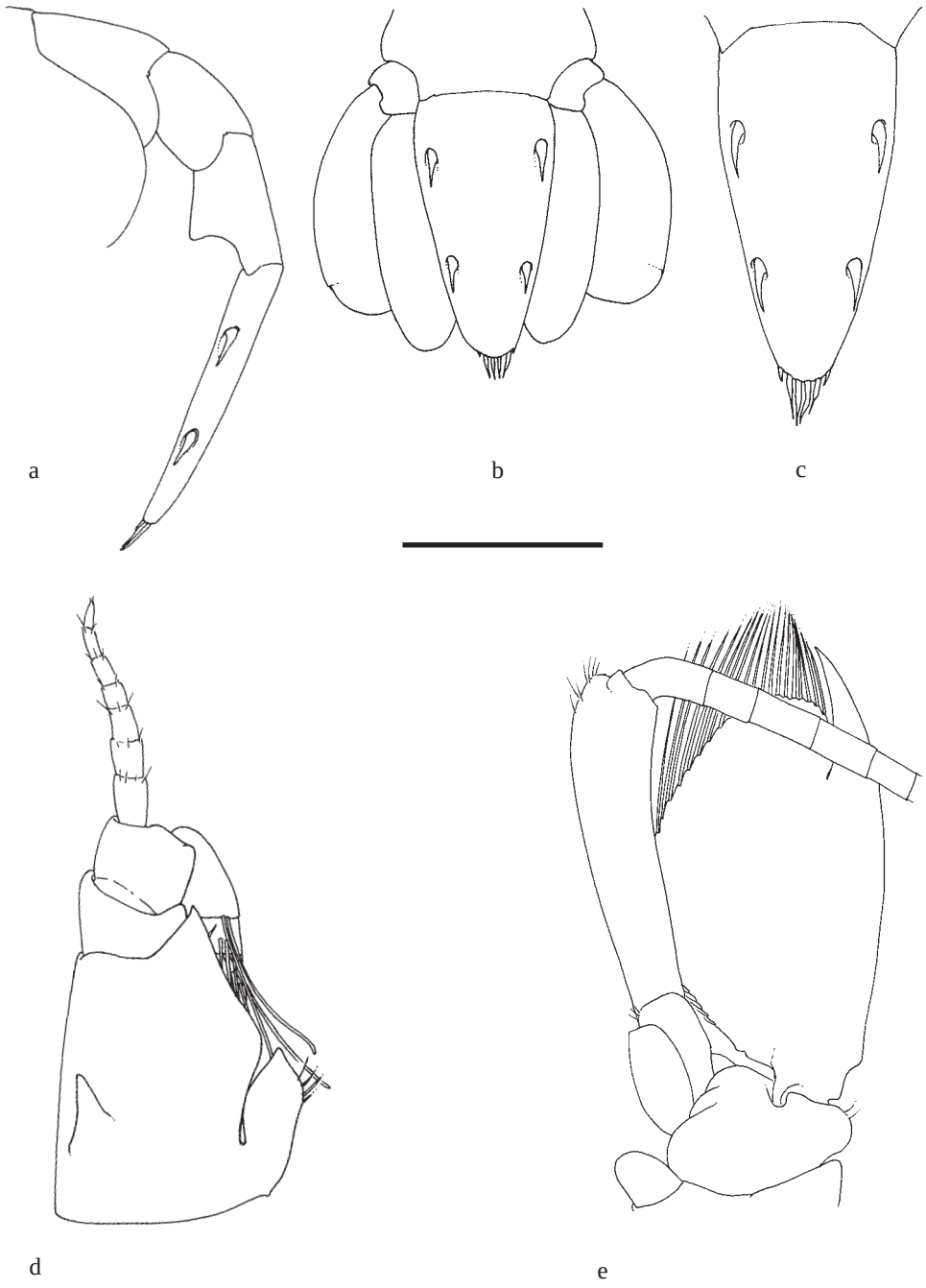

Fig. 222. *Odontonia katoi* (Kubo, 1940): male, pocl. 2.6 mm, RMNH D 42570. a, distal part abdomen, lateral view; b, telson and uropods, dorsal view; c, telson, dorsal view; d, antennula, ventral view; e, antenna, ventral view. Scale: a, c = 1 mm; b = 2 mm; d, e = 0.6 mm.

Epistome with blunt anterior median carina; labrum normal, oval.

Paragnath well developed, alae with broad transverse more or less rectangular distal lobes, and small rounded more or less triangular ventromesial lobes; corpus very short, with shallow median excavation, bordered laterally by non-setose, oblique, carinae.

Second thoracic sternite with shallow indistinct rounded median tubercle, without setae.

Third thoracic sternite unarmed.

Fourth thoracic sternite with shallow developed medially notched triangular plate formed by the fused lateral carinae.

Fifth thoracic sternite with well developed lateral plates with deep central slit posteromedial to second pereiopod coxae; coxae almost against each other in larger specimens.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process with six acute distal teeth, row of two or three small denticles along medioventral margin; molar process robust with several blunt teeth, some fringed with setal brushes.

Maxillula with upper and lower lacinia rather small; distal lacinia rectangular with two rows of about 15 stout distal spines, almost devoid of setae; lower lacinia slender, triangular, with few short serrulate setae in distal part; palp feebly bilobed, large lobe with small ventral tubercle with single short recurved seta.

Maxilla with basal endite well developed, bilobate; distal lobe well developed, with about several long simple distal setae, proximal lobe slightly shorter, more slender, with fewer long simple distal setae; coxal endite obsolete, median margin convex, non-setose; scaphognathite of moderate size, 3.1 times longer than wide, posterior lobe 1.5 times longer than wide, anterior lobe 1.4 times longer than proximal width; palp simple, much longer than distal lobe of basal endite, slightly expanded proximally, blunt distally, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal and basal endite partly fused, broad; basal endite fringed with scattered, rather short simple and finely serrulate setae along median and distal margins; coxal endite convex, distinctly separated from basal endite, with few simple setae medially; exopod well developed, flagellum with about five long, plumose setae distally; caridean lobe rather small, narrow; epipod triangular, lobate; palp simple, rather short, non-setose.

Second maxilliped with endopod short, compact; dactylar segment about 4.2 times longer than broad, fringed with short, coarsely serrulate, spiniform, and longer curled, finely serrulate setae medially; propodal segment with row of robust spines and few simple setae along expanded distomedian margin; few or no setae along ventrolateral margin; carpal segment short, broader than long, unarmed; meral segment without setae; ischial and basal segment completely fused, medially strongly excavate, without long plumose setae, basal part with strong angular process medially; exopod long, with about six long plumose setae distally; coxal segment medially slightly produced, non-setose, with proximally expanded epipod laterally.

Third maxilliped short, reaching with ultimate segment to distal margin of merocerite; with ischiomerus partly fused to basis, but with distinct suture, not broadened, about three times as long as broad, not tapered distally, somewhat flattened, with row

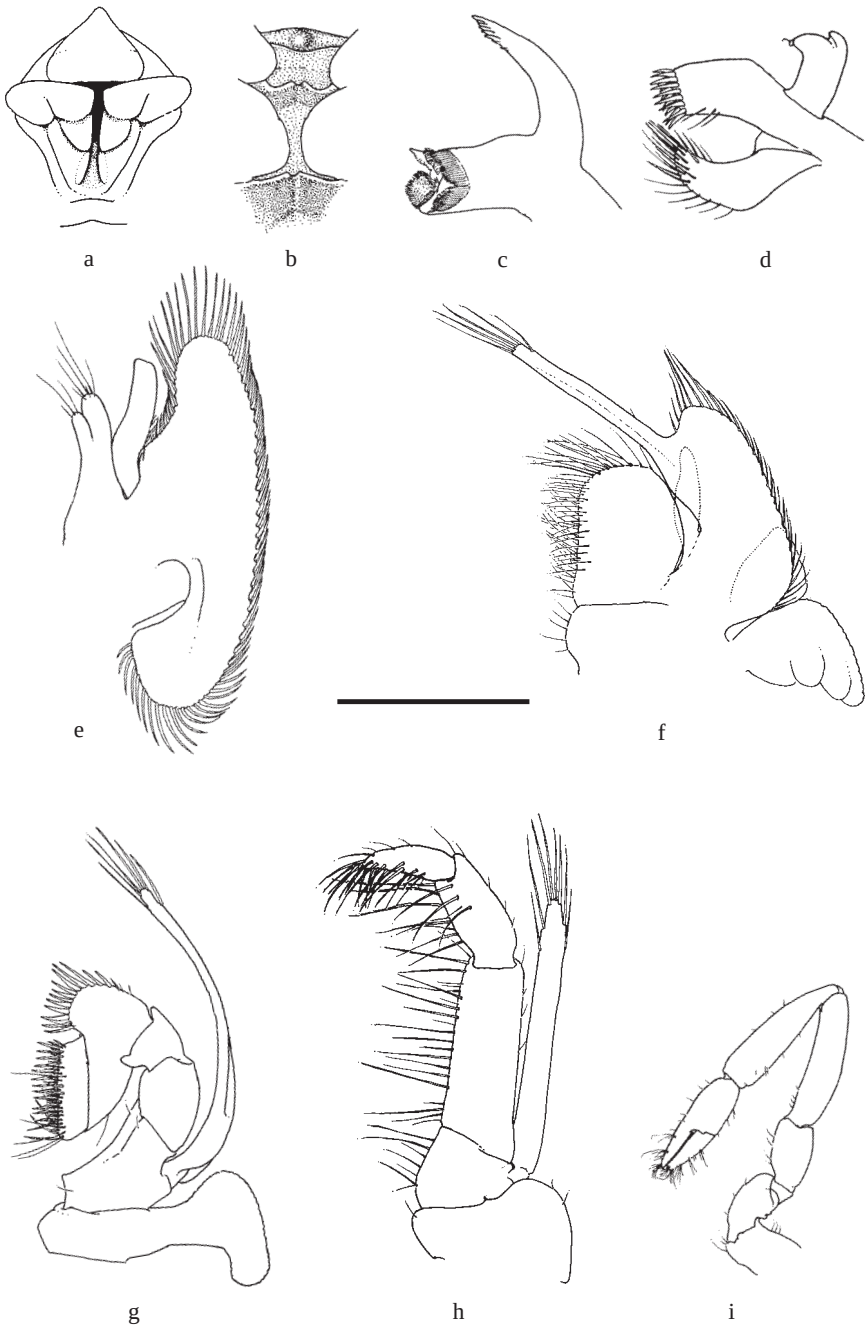

Fig. 223. *Odontonia katoi* (Kubo, 1940): male, pocl. 2.6 mm, RMNH D 42570. a, paragnath, ventral view; b, second to fifth thoracic sternites; c, mandible, ventral view; d, maxillula, ventral view; e, maxilla, ventral view; f, first maxilliped, ventral view; g, second maxilliped, ventral view; h, third maxilliped, ventral view; i, first pereiopod. Scale: a, b = 1 mm; c-h = 0.6 mm; i = 1.5 mm.

of long simple setae along median margin, lateral margin with few simple setae; basal segment medially convex with few long simple setae on medial margin; exopod well developed, reaching halfway penultimate segment, with about eight long plumose setae in distal part; coxal segment without median process, with large lateral plate with few simple short setae; without arthrobranch; ultimate and penultimate segments of equal length; penultimate segment about twice as long as broad, somewhat flattened, with few long finely serrulate setae ventromedially; ultimate segment more slender, with groups of long coarsely serrulate setae ventromedially and distally.

First pereiopod stout, exceeding carpocerite with chela and 2/3rd of carpus. Chela 3.2 times longer than deep, slightly compressed; fingers as long as or slightly longer than palm, cutting edges entire, with groups of many serrulate setae, tips slightly hooked; cleaning organ reduced, only some serrulate setae in distal part of carpus; carpus about 1.25 length of chela, four times longer than distal width, tapering proximally, unarmed, with few short simple setae; merus as long as carpus, four times longer than central width, somewhat curved, with few simple short setae in proximal

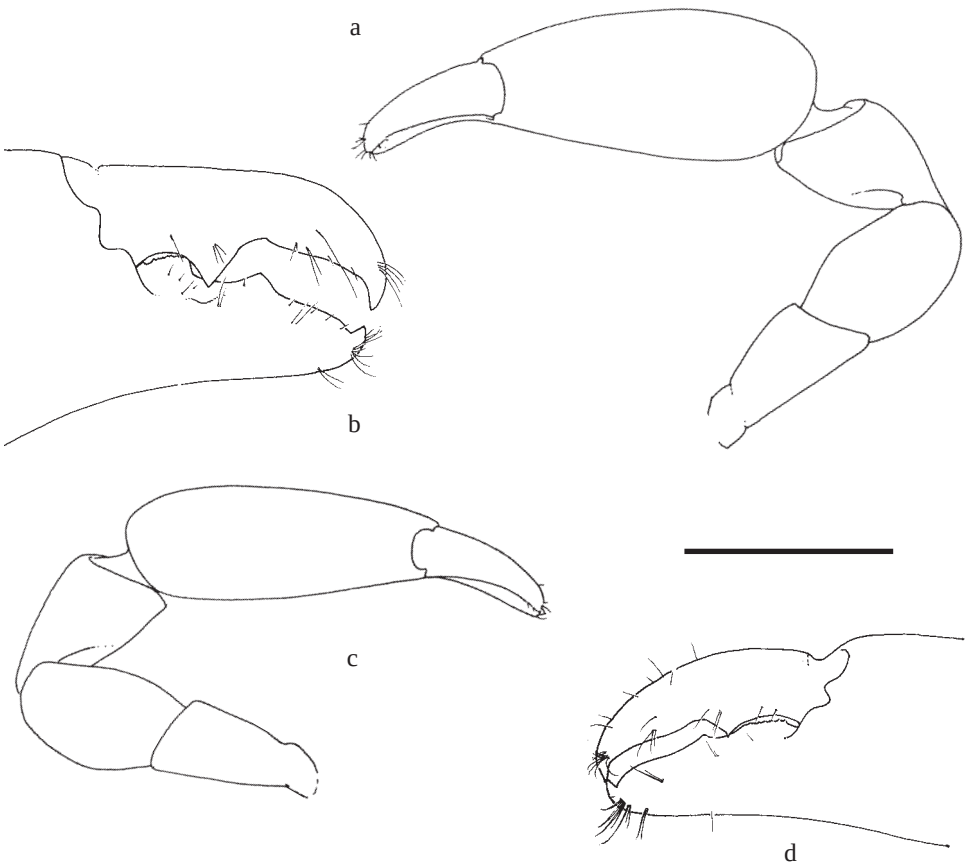

Fig. 224. *Odontonia katoi* (Kubo, 1940): male, pocl. 2.6 mm, RMNH D 42570. a, major second pereiopod; b, idem, chela; c, minor second pereiopod; d, idem, chela. Scale: a, c = 2 mm; b, d = 1 mm.

part of median margin; ischium 0.5 times merus length, slightly expanded medially, with few simple setae medially; basis slightly longer than ischium, with short simple setae medially; coxa without small ventral lobe with few long simple setae.

Second pereiopods subequal, similar. Major chela about 1.4 times postorbital carapace length in females, about 1.6 times postorbital carapace length in males, palm swollen, slightly compressed, without carinae, non-setose; fingers with few simple setae in distal part; dactylus 0.4-0.5 of palm length, about 3.5 times longer than deep, with one large triangular tooth at 1/3 of cutting edge, distal part of cutting edge entire, straight, tip strongly hooked; fixed finger about twice as long as deep, with broad flattened tooth with row of small denticles in proximal part, separated by shallow notch from prominent, triangular, acute tooth at midpoint of cutting edge, distal

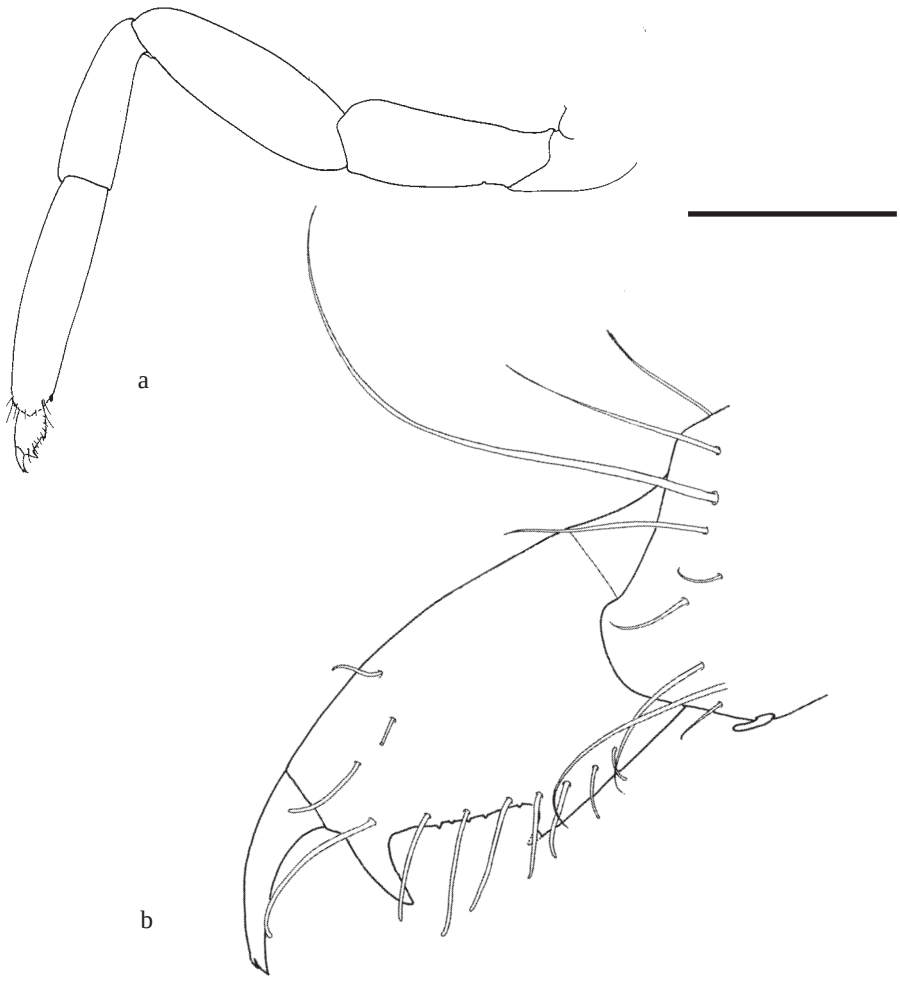

Fig. 225. *Odontonia katoi* (Kubo, 1940): male, pocl. 2.6 mm, RMNH D 42570. a, third pereiopod; b, dactylus third pereiopod. Scale: a = 1 mm; b = 0.15 mm.

part of cutting edge entire, straight or slightly convex, tip strongly hooked, median fossa for reception of dactylar tooth shallow; carpus about 0.5 of palm length, about 1.4 times longer than distal width, strongly tapering proximally; merus as long as carpus, about 1.4 times longer than central width, distomedially excavate; ischium as long as merus, somewhat tapering proximally, with slightly protruded distomedial angle; basis and coxa without special features. Minor cheliped similar, dactylus slightly longer in relation to palm than in major chela; palm less swollen than in major chela.

Fig. 226. *Odontonia katoi* (Kubo, 1940), ovigerous female, pocl. 4.1 mm (fig. a); male, pocl. 2.6 mm (figs. b, c), RMNH D 42570. a, endopod female first pleopod; b, endopod male first pleopod; c, appendix interna and appendix masculina on second male pleopod. Scale: a = 0.6 mm; b, c = 0.15 mm.

Ambulatory pereiopods short, stout. Dactylus of third pereiopod with corpus moderately compressed, about 1.4 times longer than proximal width, with single row of few simple setae along ventral margin and in distal part, accessory tooth terminal, acute, perpendicular to flexor margin, ventral margin with one large forward directed tooth at midpoint, with or without row of up to five denticles between central tooth and accessory tooth; unguis strongly curved, about 0.5 or corpus length, distally with one or two large scales; propodus about 4.3 times dactylus length, about 4.3 times longer than proximal width, with one small spine in distal part of flexor margin, with few long slender simple setae distally; carpus about 0.68 of propodus length, about 3.0 times longer than distal width, slightly tapering proximally, with indistinct distal lobe, unarmed; merus about as long as propodus, swollen, about 3.0 times longer than central width, cylindrical, without setae; ischium about 0.84 of merus length, 2.2 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopods similar.

First pleopod of female with short endopod, less than third of exopod length, with about ten long distal setae when ovigerous, with row of long plumose setae on lateral margin.

Male first pleopod with small endopod, about 3.0 times longer than proximal width, somewhat tapering distally; median margin almost straight with row of about 11 short simple setae, with plumose long setae in distal part and along lateral margin. Endopod of second pereiopod with short appendix masculina, equal to about 0.75 times length of appendix interna, with about six long setulose setae in distal half.

Uropods normal, with short unarmed protopodite; exopod broad, 2.0 times longer than central width, lateral margin strongly convex, without distolateral tooth, with minute spinule distolaterally; endopod exceeding exopod, 1.1 times exopod length, about as long as telson or slightly longer, 2.8 times longer than wide.

Number of eggs between 200-500, depending on the size of the female. Embryo at point of hatching about 0.6 mm long.

Sexual dimorphism.— Males generally similar to females, usually of smaller size, with relatively large chela on second pereiopods.

Size.— This is a small sized species. The maximum pocl. is 4.6 mm in adult females, 3.5 mm in adult males. The minimal pocl. of ovigerous females is 3.1 mm.

Colouration (based on slides of specimens with registrationnumbers RMNH D 42573, 47576, 48689, pl. 15, 16).— Body with small white and red chromatophores and scattered larger white spots. Carapace with small white spots at base of rostrum, on dorsal carina, and lateral margins of rostrum. Large specimens with two submedian dorsal white spots which can be centrally pinkish and large broad dorsal posterior spot which can also be centrally pinkish. Laterally with three large spots of which central one largest; these spots may be centrally pinkish. Eyestalks with dorsal white stripe or two or three large white spots, cornea with white spots. Antennula with scattered small white chromatophores and large white spots in distal parts of segments. Second pereiopods with scattered small white chromatophores on ischium and merus; with white bands at joints. Carpus and chela with white bands in proximal, central and distal part of segment; palm with large white chromatophores between bands; fingers with small and large white chromatophores. First pereiopods and ambulatory pereiopods with many small white chromatophores, with white bands at joints.

Abdominal pleura with many small white chromatophores and large white spots at fixed distances dorsally and laterally.

Type.— Holotype: male, total length 12.0 mm; off Simoda, Siduoka Prefecture, Honshu, Japan; in *Cynthia ritteri* Oka, 1915.

Distribution.— INDO-WEST PACIFIC: Indian Ocean: Ras Mkumbe, Tanganyika, depth 18.5 m (Bruce, 1976). Indonesia: Roti, Lesser Sunda Islands; 27-45 m (Holthuis,

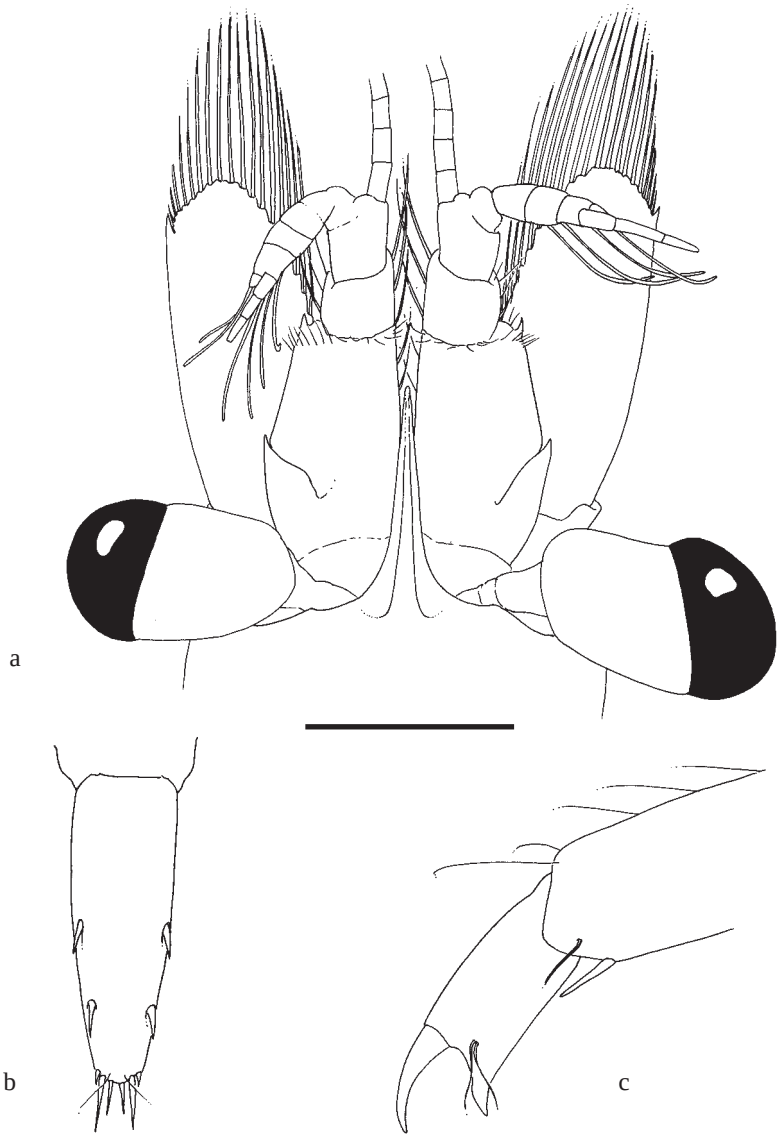

Fig. 227. *Odontonia katoi* (Kubo, 1940): juvenile, pocl. 0.9 mm, RMNH D 42568. a, anterior appendages, dorsal view; b, telson, dorsal view; c, third pereiopod, dactylus. Scale: a, b = 0.6 mm; c = 0.15 mm.

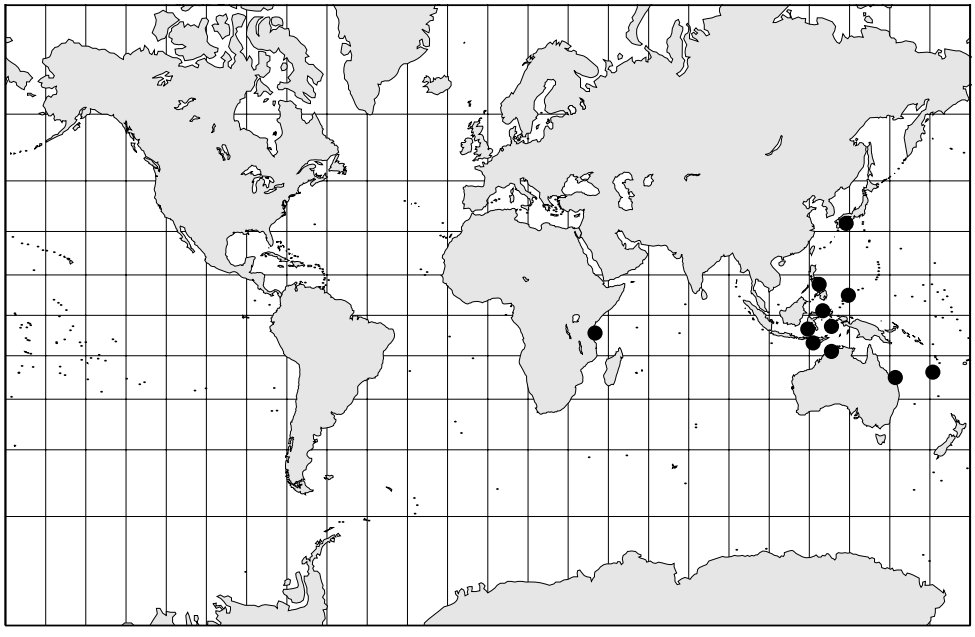

Fig. 228. Geographic distribution of *Odontonia katoi* (Kubo, 1940).

1952); Sulawesi, Ambon, Seram, Bali (present records). Philippines: Cebu Strait (present study). Australia: Coil Reef, Queensland; depth 18 m (Bruce, 1977); Wistari Reef, Heron Island, Queensland (Bruce, 1981); Lizard Island, Queensland (Bruce, 1983); Cockburn Sound, Western Australia (Bruce, 1983). Japan: Honshu (Kubo, 1940). New Caledonia: Noumea; depth 20 m (Bruce, 1979). Palau Island: SE of Koror (present study). The species is now recorded for the first time from the Philippines, Sulawesi, Ambon, Seram and Palau Islands.

Host.— Ascidians: *Cynthia ritteri* Oka, 1915 (cf. Kubo, 1940); *Styela palinorsa* (Sluiter, 1895) (cf. Holthuis, 1952); *Pyura momus* (Savigny, 1816)(cf. Bruce, 1977); *Cnemidocarpa pedata* (Herdman, 1881) (cf. Bruce, 1981); *Styela* spec., *Polycarpa* spec. (cf. Bruce, 1981); *Polycarpa cryptocarpa* (Sluiter, 1885) (cf. Bruce, 1976); *Polycarpa aurata* (Quoy & Gaimard, 1834) (cf. Bruce, 1979, 1983); *Polycarpa pedunculata* (Heller, 1878) (cf. Bruce, 1983).

Remarks.— The shallow process of the fourth thoracic sternite is triangular (as in *Odontonia sibogae*) in the females (RMNH D 42573, 42570) while usually notched.

In a very small juvenile specimen (RMNH D 42568, pocl. 0.9 mm) several characters differ from those in adult specimens. The rostrum is more slender, the lateral carinae are not developed, and the dorsal carina of the rostrum is more prominent (fig. 227a). The slit between the lamina and distolateral tooth of the scaphocerite is less deep, ca. 0.1 times the scaphocerite length. The medioventral tooth on the basal segment of the antennular peduncle is small. The length of the antennal peduncle is less than half the length of the scaphocerite. The dactylus of the third pereiopod is biunguiculate, without ornamentation on the flexor margin of the corpus, nor are setae present except for the one distal seta. The tip of the unguis is acute, without scales or spine-like structures. It seems that the juveniles very much resemble a *Palae-*

monella-like shrimp. This indicates that during ontogeny many adaptive structures become more prominent.

Specimen of RMNH D 42572 has a bopyrid isopod parasite under the carapace.

8.6.4. *Odontonia rufopunctata* spec. nov.
(figs. 229-234, 248, pl. 17)

Material.— **INDO-WEST PACIFIC**: **Indonesia**.— RMNH D 46702: 1 ovigerous female, holotype, pocl. 4.0 mm; 1 male, paratype**,** pocl. 3.2 mm; SW Sulawesi, Spermonde Archipelago, Kudingareng Keke; depth 20 m; scuba diving; 5.x.1994; in ascidian; leg. C.H.J.M. Fransen, photo NNM 13/21-28.— RMNH D 48694: 1 male, paratype, pocl. 1.6 mm; Sta. BAL.05, Sanur, Penjor Point; 08°41'36''S 115°16'20''E; slowly declining reef slope, sandy base; scuba-diving: 15 m depth; 1.iv.2001; in *Polycarpa* non *aurata*; collected by C.H.J.M. Fransen.

Description.— Body subcylindrical, somewhat depressed. Carapace smooth. Rostrum well developed, without dorsal teeth, overreaching antennular peduncle, reaching level of distal margin of scaphocerite, with broad, indistinct, shallow dorsal elevation over entire length and acute lateral carinae, with slightly concave ventral carina in distal part; distal end acute in lateral view, with small subdistal ventral tooth and few distal setae, blunt in dorsal view, broadened at base. Inferior orbital angle produced, directed inward. Antennal spine blunt, protruding rounded process, not separated by notch from inferior orbital angle. Anterolateral margin slightly produced, anterolateral angle not produced.

Abdomen smooth; sixth segment about 1.3 times longer than fifth, 1.3 times broader than long, posteroventral angle acute, posterolateral angle feebly produced, blunt; pleura of first five segments broadly rounded.

Telson twice as long as sixth abdominal segment, about twice as long as proximal width; lateral margins slightly convex, almost straight, convergent; posterior border without median process; two pairs of submarginal dorsal spines at about 0.2 and 0.6 of telson length; distal and proximal pair of spines of equal length, about 0.14 of telson length; posterior margin with three pairs of spines, lateral spines small, marginal, about 1/3 of length of intermediate spines; submedian spines slightly longer than intermediate spines; both intermediate and submedian spines about as long as dorsal spines, but more slender.

Eyestalk short, about as long as broad, broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella short. Basal segment about 1.2 times as long as proximal width, with acute produced distolateral tooth reaching distal margin of intermediate segment, anterior margin slightly developed, sinuous; ventromedial tooth large, acute, just proximal of midlength of basal segment, submarginal; statocerite short, reaching halfway basal segment, tip acite, lateral margin with three short plumose setae. Intermediate segment short, slightly broader than long. Distal segment broader than long. Upper flagellum short, biramous, with four segments fused; short free ramus two-segmented; longer free ramus four-segmented. Lower flagellum with about six segments.

Antenna with basicerite short, laterally unarmed, with large rounded antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite extending

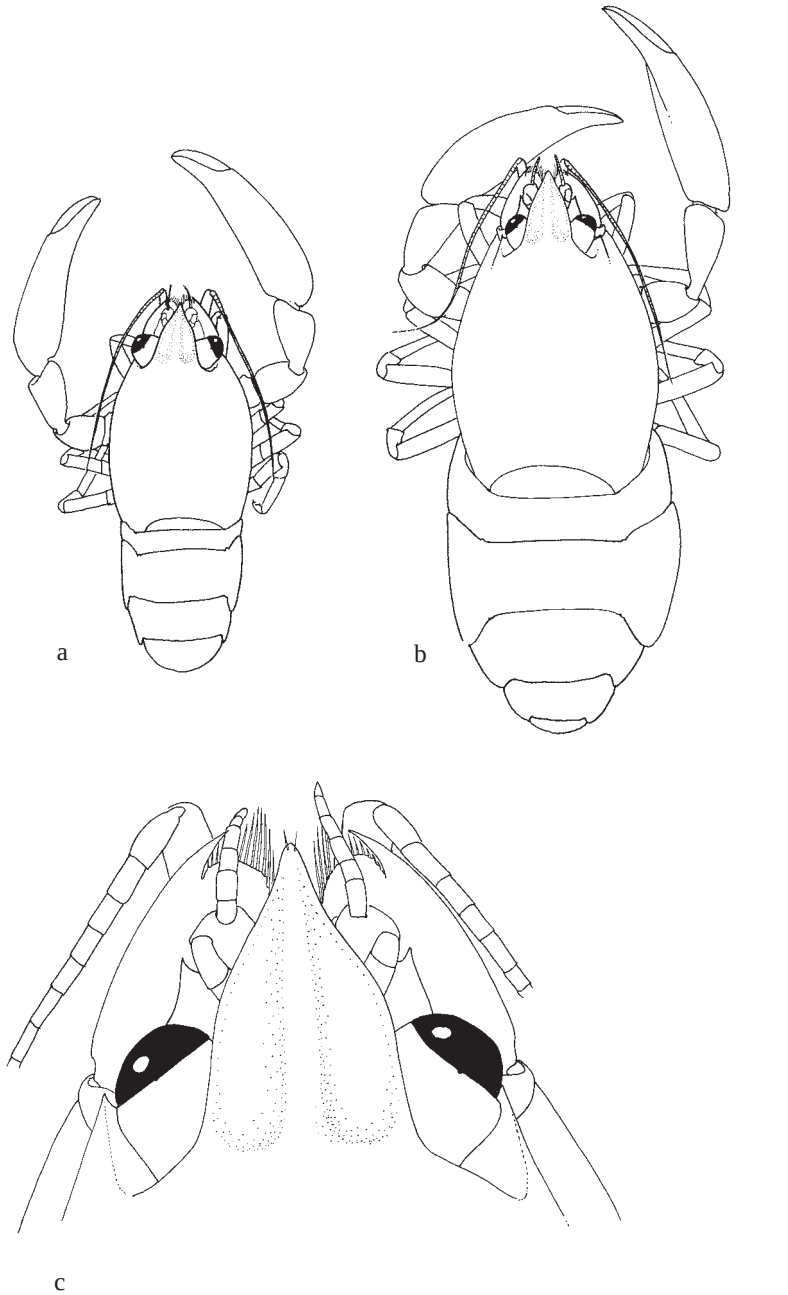

Fig. 229. *Odontonia rufopunctata* spec. nov.: ovigerous female holotype, pocl. 4.0 mm (figs. a, c); male paratype, pocl. 3.2 mm (fig. b), RMNH D 46702. a, dorsal aspect ovigerous female; b, dorsal aspect male; c, anterior appendages, dorsal view. Scale: a, b = 4 mm; c = 1 mm.

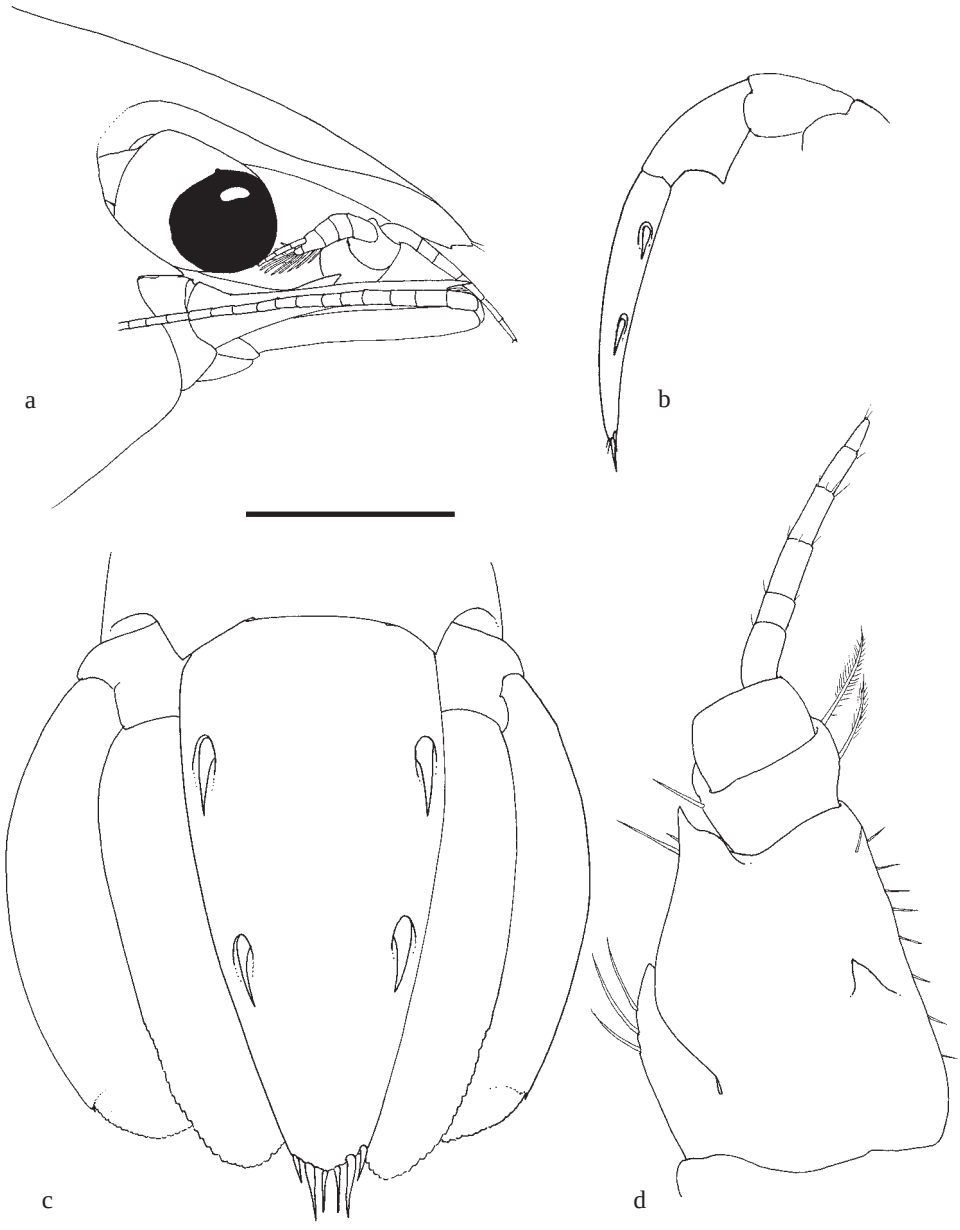

Fig. 230. *Odontonia rufopunctata* spec. nov.: ovigerous female holotype, pocl. 4.0 mm, RMNH D 46702. a, anterior appendages, lateral view; b, distal part abdomen, lateral view; c, telson and uropods, dorsal view; d, antennula, ventral view. Scale: a, c = 1 mm; b = 2 mm; d = 0.6 mm.

beyond distal margin of lamina of scaphocerite, slender, 4.8 times longer than distal width; flagellum slightly longer than postorbital carapace length; scaphocerite with lamina 1.5 times as long as wide, anterior margin narrow, rounded, lateral margin broadly convex; distolateral tooth robust, about 0.21 length of lamina (incl. distolateral tooth) almost twice as long as distal lamina, somewhat curved inward; incision between distolateral tooth and lamina rather deep.

Epistome with blunt anterior median carina; labrum normal, oval.

Paragnath well developed, alae with broad transverse more or less rectangular distal lobes, and small rounded more or less triangular ventromesial lobes; corpus very short, with shallow median excavation, bordered laterally by non-setose, oblique, carinae.

Second thoracic sternite with shallow indistinct rounded median elevation, without setae.

Third thoracic sternite unarmed.

Fourth thoracic sternite with low, medially notched, triangular plate formed by the fused lateral carinae.

Fifth thoracic sternite with well developed lateral plates with shallow central slit posteromedial to second pereiopod coxae; coxae almost against each other in larger specimens.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process with six or seven acute distal teeth, row of two or three small denticles along medioventral margin; molar process robust with several blunt teeth, some fringed with setal brushes.

Maxillula with upper and lower lacinia rather small; distal lacinia rectangular with two rows of about 18 stout distal spines, almost devoid of setae; lower lacinia slender, triangular, with few short serrulate setae in distal part; palp feebly bilobed, large lobe with small ventral tubercle with single short recurved seta.

Maxilla with basal endite well developed; distal lobe and proximal lobe completely fused with two groups of about five long, simple distal setae; coxal endite obsolete, median margin convex, non-setose; scaphognathite of moderate size, 2.8 times longer than wide, posterior lobe 1.9 times longer than wide, anterior lobe 1.4 times longer than proximal width; palp simple, longer than basal endite, slightly expanded proximally, blunt distally, without row of setae along lateral margin.

First maxilliped with coxal and basal endite partly fused, broad; basal endite fringed with scattered, rather short simple and finely serrulate setae along median and distal margins; coxal endite convex, distinctly separated from basal endite, with few simple setae medially; exopod well developed, flagellum with about five long, plumose setae distally; caridean lobe rather small, narrow; epipod triangular, lobate; palp simple, rather short, non-setose.

Second maxilliped with endopod short, compact; dactylar segment about 2.6 times longer than broad, fringed with short, coarsely serrulate, spiniform, and longer curled, finely serrulate setae medially; propodal segment with row of robust spines and few simple setae along expanded distomedian margin; one seta in distal part of ventrolateral margin; carpal segment short, broader than long, unarmed; meral segment without setae; ischial and basal segment completely fused, medially strongly excavate, without long plumose setae, basal part strongly convex medially; exopod

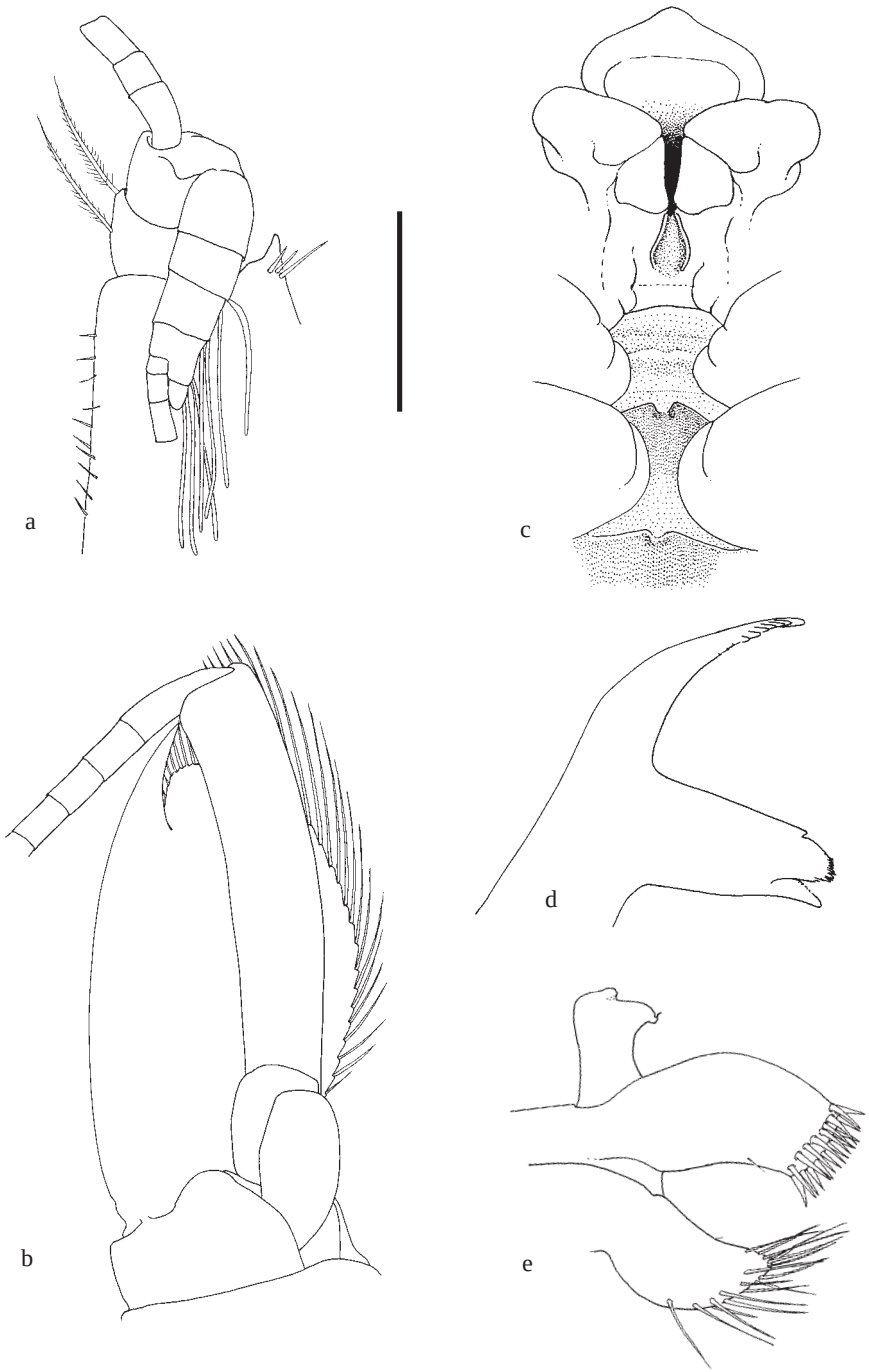

Fig. 231. *Odontonia rufopunctata* spec. nov.: ovigerous female holotype, pocl. 4.0 mm, RMNH D 46702. a, antennula, dorsal aspect of distal part; b, antenna, ventral view; c, paragnath and second to fifth thoracic sternites; d, mandible, ventral view; e, maxillula, ventral view. Scale: a, b, d, e = 0.6 mm; c = 1 mm.

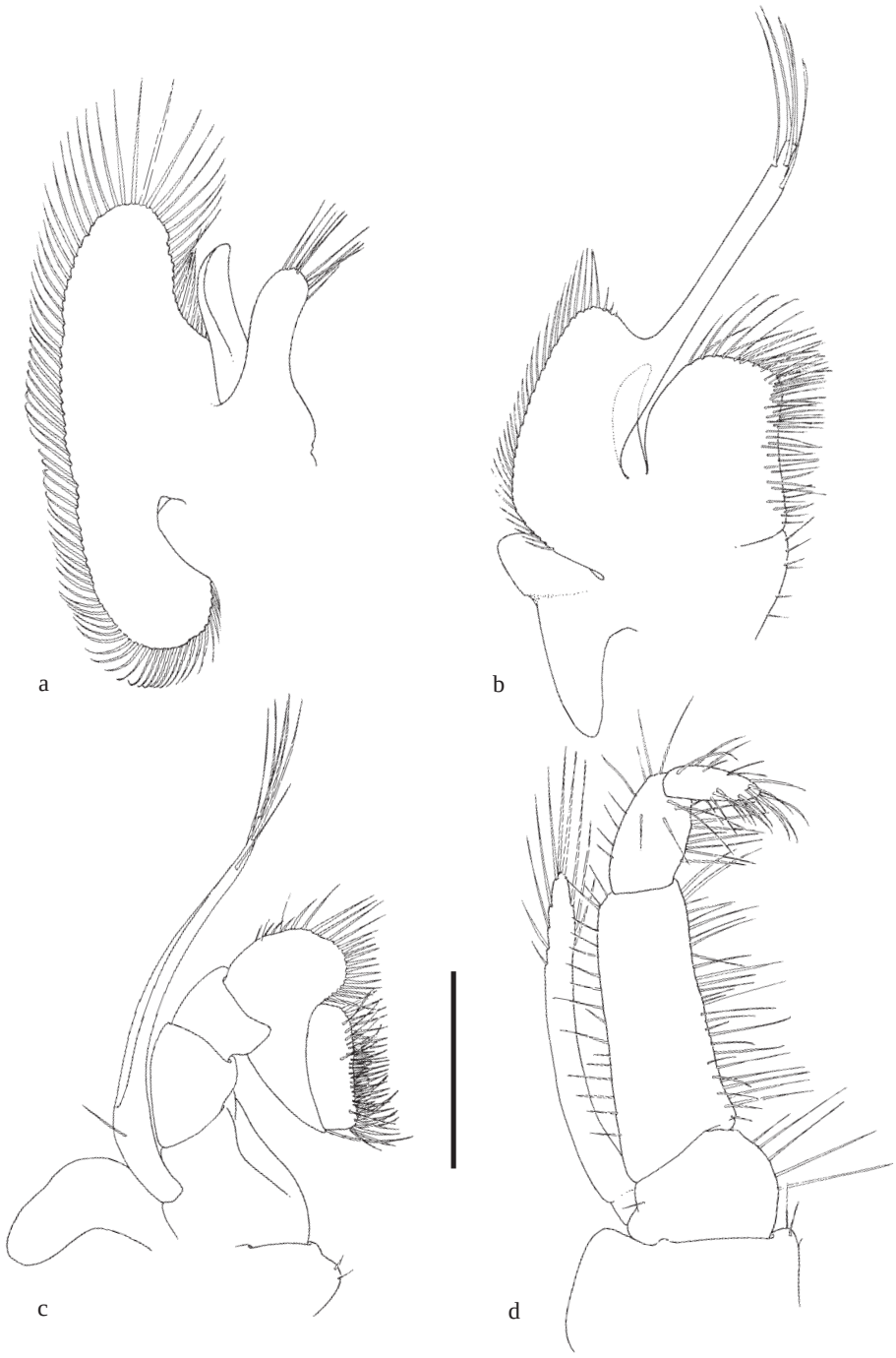

Fig. 232. *Odontonia rufopunctata* spec. nov.: ovigerous female holotype, pocl. 4.0 mm, RMNH D 46702. a, maxilla, ventral view; b, first maxilliped, ventral view; c, second maxilliped, ventral view; d, third maxilliped, ventral view. Scale = 0.75 mm.

long, with about six long plumose setae distally; coxal segment medially slightly produced, with few short simple setae, with proximally expanded epipod laterally.

Third maxilliped short, reaching with ultimate segment to distal margin of merocerite; with ischiomerus partly fused to basis, but with distinct suture, not broadened, about 2.3 times as long as broad, not tapered distally, somewhat flattened, with row of long simple setae along median margin, lateral margin with few simple setae; basal segment medially convex with few long simple setae on medial margin; exopod well developed, reaching just beyond distal margin of ischiomerus, with about ten long plumose setae in distal part; coxal segment with small median process, with large lateral plate without setae laterally; without arthrobranch; ultimate and penultimate segments of equal length; penultimate segment almost twice as long as broad, somewhat flattened, with few long finely serrulate setae ventromedially; ultimate segment more slender, with groups of long coarsely serrulate setae ventromedially and distally.

First pereiopod stout, exceeding carpocerite with chela and 2/3rd of carpus; chela 2.5 times longer than deep, slightly compressed; fingers as long as palm, cutting edges entire, with groups of many serrulate setae, tips slightly hooked; cleaning organ present, few serrulate setae in distal part of carpus and several short setae in proximal part of palm; carpus about 1.5 length of chela, 4.7 times longer than distal width, tapering proximally, unarmed; merus slightly longer than carpus, 4.4 times longer than central width, somewhat curved, without setae; ischium 0.4 times merus length, slightly expanded medially, without setae medially; basis as long as ischium, without setae medially; coxa with small ventral lobe with few short simple setae.

Second pereiopods subequal, similar. Major chela about 1.1 times postorbital carapace length in female, about 1.4 times postorbital carapace length in males, palm slightly swollen, slightly compressed, without carinae, non-setose; fingers with few simple setae in distal part; dactylus 0.42 of palm length, about 3.9 times longer than deep, with one large triangular tooth at 1/3 of cutting edge, distal part of cutting edge entire, straight, tip strongly hooked; fixed finger 2.4 times as long as deep, with broad flattened tooth with row of small denticles in proximal part, separated by shallow notch from triangular, acute tooth at midpoint of cutting edge, distal part of cutting edge entire, straight, tip strongly hooked, median fossa for reception of dactylar tooth not developed; carpus about 0.5 of palm length, about 2.0 times longer than distal width, strongly tapering proximally; merus as long as carpus, about 1.7 times longer than central width, distomedially excavate; ischium as long as merus, somewhat tapering proximally, with slightly protruded distomedial angle; basis and coxa without special features. Minor cheliped similar, dactylus slightly longer in relation to palm than in major chela; palm less swollen than in major chela.

Ambulatory pereiopods short, stout. Dactylus of third pereiopod with corpus moderately compressed, about 1.6 times longer than proximal width, with single row of few simple setae along ventral margin and in distal part, accessory tooth terminal, acute, perpendicular to flexor margin, ventral margin with one large forward directed tooth at 2/3rd of ventral margin, without denticles between ventral tooth and accessory tooth; unguis strongly curved, about 0.5 or corpus length, distally with about eight large scales; propodus about 4.0 times dactylus length, about 5.8 times longer than proximal width, with two short, blunt, spines in distal part of flexor margin, with few long slender simple setae distally; carpus about 0.65 of propodus length, about 3.0

times longer than distal width, slightly tapering proximally, with indistinct distal lobe, unarmed; merus about as long as propodus, slightly swollen, about 3.3 times longer than central width, cylindrical, without setae; ischium about 0.83 of merus length, 2.5 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopods similar.

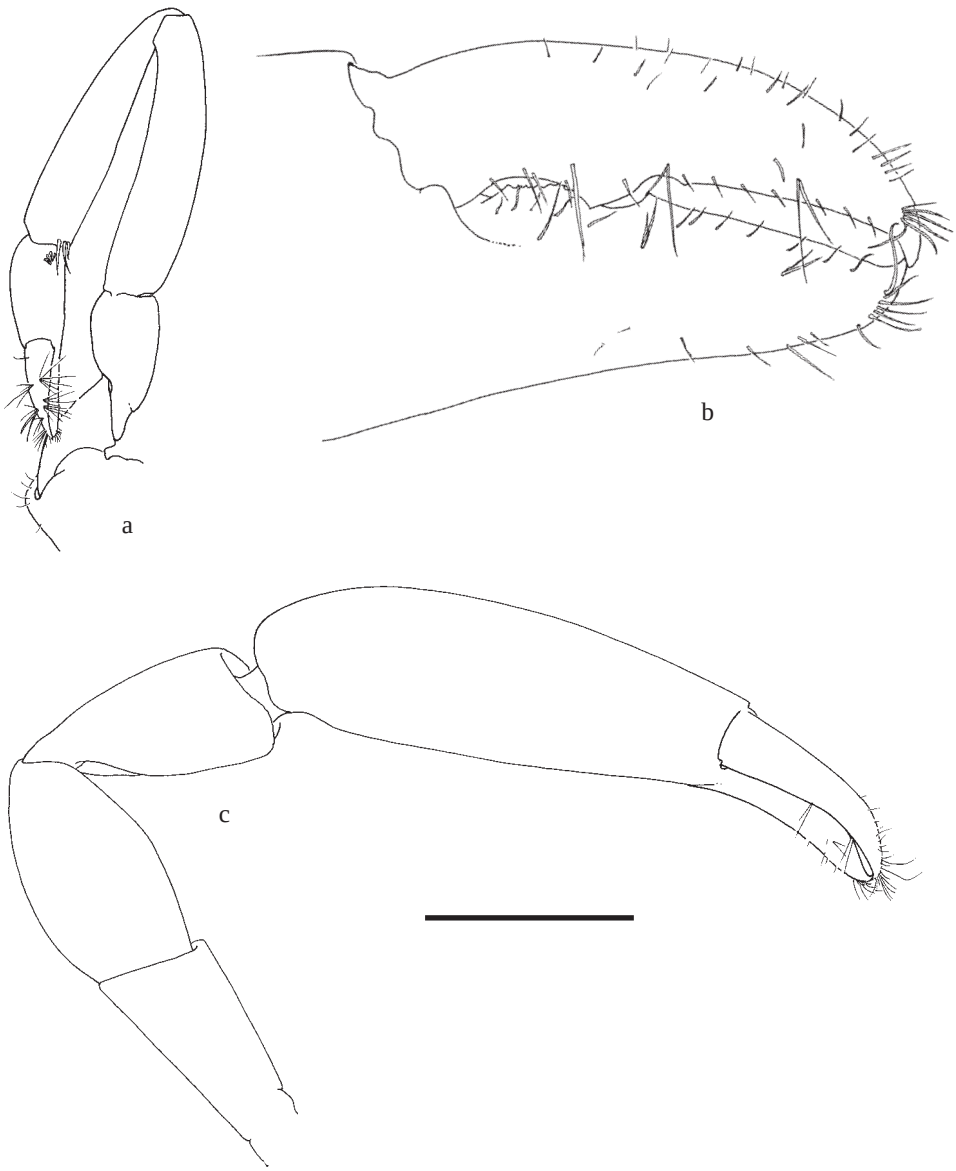

Fig. 233. *Odontonia rufopunctata* spec. nov.: ovigerous female holotype, pocl. 4.0 mm, RMNH D 46702. a, first pereiopod; b, right second pereiopod; c, idem, chela. Scale: a, b = 1.5 mm ; c = 0.6 mm.

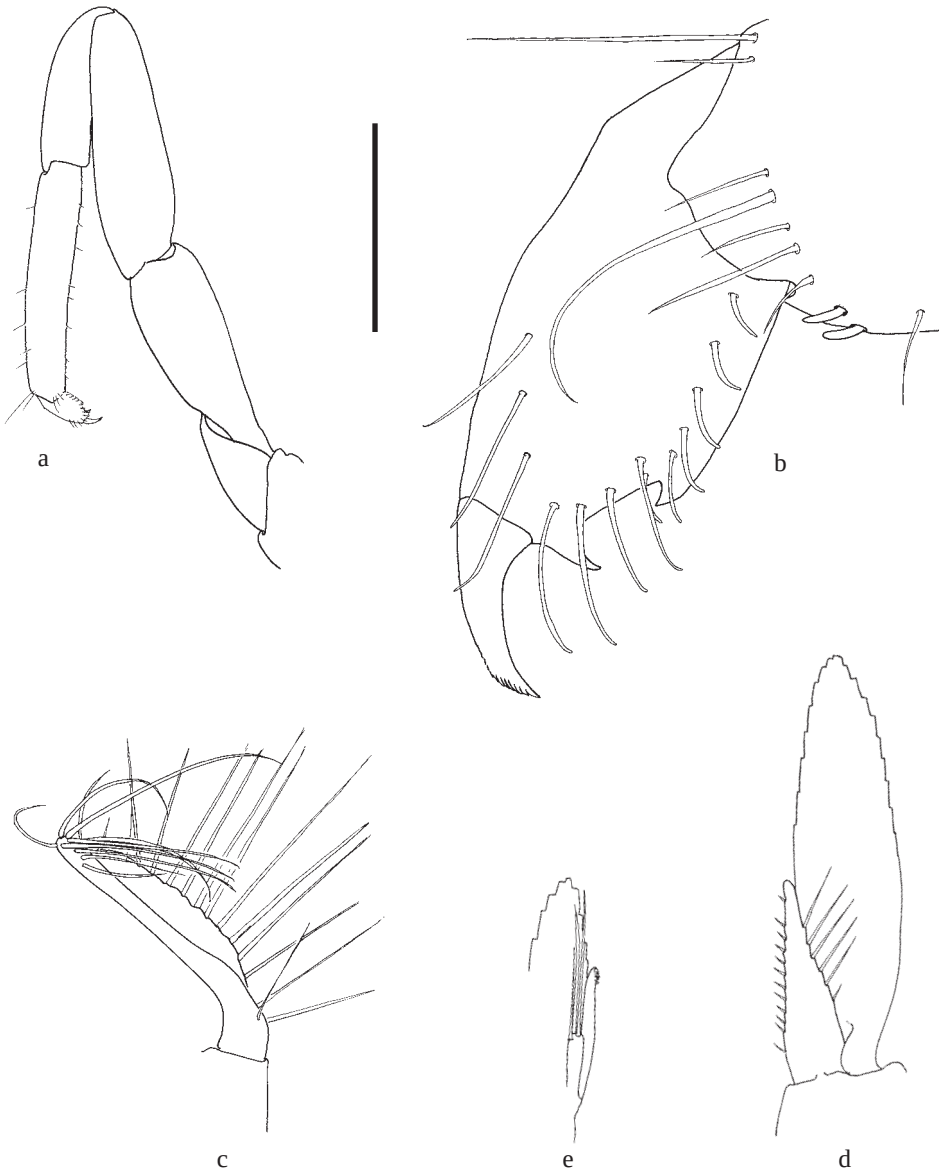

Fig. 234. *Odontonia rufopunctata* spec. nov.: ovigerous female holotype, pocl. 4.0 mm (figs. a-c); male paratype, pocl. 3.2 mm (figs. d, e), RMNH D 46702. a, third pereiopod; b, dactylus third pereiopod; c, endopod female first pleopod; d, endopod male first pleopod; e, appendix interna and appendix masculina on second male pleopod. Scale: a = 1.5 mm; b = 0.15 mm; c-e = 0.6 mm.

First pleopod of female with endopod, half as long as exopod, with about ten long distal setae when ovigerous, with row of long plumose setae on lateral margin.

Male first pleopod with endopod about three times longer than proximal width, somewhat tapering distally; median margin straight with row of 12 short simple setae, with plumose long setae along lateral margin, distal part devoid of setae.

Endopod of second pereiopod with short appendix masculina, equal to about half length of appendix interna, with four very long setulose setae distally.

Uropods normal, with short unarmed protopodite; exopod broad, 2.0 times longer than central width, lateral margin strongly convex, without distolateral tooth, with minute spinule distolaterally; endopod exceeding exopod, about as long as telson, 2.8 times longer than wide.

Number of eggs ca. 100. Embryo at point of hatching about 0.7 mm long.

Sexual dimorphism.— Males generally similar to females, usually of smaller size, with relatively large chela on second pereiopods.

Size.— This is a small sized species. The ovigerous female pocl. is 4.0 mm, 3.2 mm in the male.

Colouration (based on slides of specimens with registration numbers RMNH D 46702, pl. 17).— Whole body covered with rather small red chromatophores and few scattered smaller white chromatophores. Sowewhat more white chromatophores at joints of pereiopods and antennula. Eyestalk with few white chromatophores dorsally.

Type.— Holotype: ovigerous female, pocl. 4.0 mm (RMNH D 46702); SW Sulawesi, Spermonde Archipelago, Kudingareng Keke; depth 20 m; scuba diving; 5.x.1994; in ascidian; leg. C.H.J.M. Fransen.

Host.— Unidentified solitary ascidian.

Distribution.— INDO-WEST PACIFIC: Known from Sulawesi and Bali, Indonesia.

Etymology.— The latin ‘rufopunctata’ refers to the red chromatophores covering the body.

Remarks.— The present species is most closely related to *Odontonia katoi*. From this species it differs in the following characters: 1) the ventral subdistal tooth of the rostrum is situated more proximal; 2) the medioventral tooth of the basal segment of the antennular peduncle is much smaller; 3) the distolateral tooth of scaphocerite is much smaller and the incision between tooth and lamina less deep; 4) the distal and proximal laminae of the basal endite of the maxillula are fused; 5) the medial margin of the basal segment of the second maxilliped is broadly rounded while angular in *Odontonia katoi*; 6) the unguis of the third pereiopod has about eight distal scales while one or two in *O. katoi*; 7) the colourpattern is dominated by equally sized red chromatophores over the entire body, while dominated by small and large white patches in *O. katoi*.

8.6.5. *Odontonia seychellensis* spec. nov.
(figs. 235-240, 248, pl. 18)

Pontonia spec. Fransen, 1994c: 135-136, figs. 107-112, pl. 4C.

Material.— **INDO-WEST PACIFIC**: **Seychelles**.— RMNH D 42558: 1 male, holotype**,** pocl. 2.6 mm; 1 female, paratype**,** pocl. 3.5 mm; NIOP-E, Sta. SEY.723, Bird Island, off N coast; 3°42’S 55°12’E; coral reef, near drop-off, depth 20 m; scuba diving; in Ascidiidae; 21.xii.1992; leg. C.H.J.M. Fransen, photo

9/8-17.— RMNH D 42762: 1 male, paratype**,** pocl. 2.75 mm; NIOP-E, Sta. SEY.748, E of Mahé, E coast of Sainte Anne Island; 4°37'S 55°31'E; depth: 10 m; scuba diving; in Ascidiidae; 25.xii.1992; leg. C.H.J.M. Fransen.

Description.— Body subcylindrical, slightly depressed. Carapace smooth. Rostrum well developed, toothless, as long as antennular peduncle, falling short of distal margin of scaphocerite, with broad shallow indistinct dorsal carina, with acute lateral carinae, with straight ventral carina; with small distal ventral tooth, with distal setae; bluntly acute in dorsal view, broadened at base. Inferior orbital angle not produced, straight. Antennal spine absent, reduced to blunt process. Anterolateral margin of carapace straight or slightly convex, anterolateral angle slightly produced, rounded.

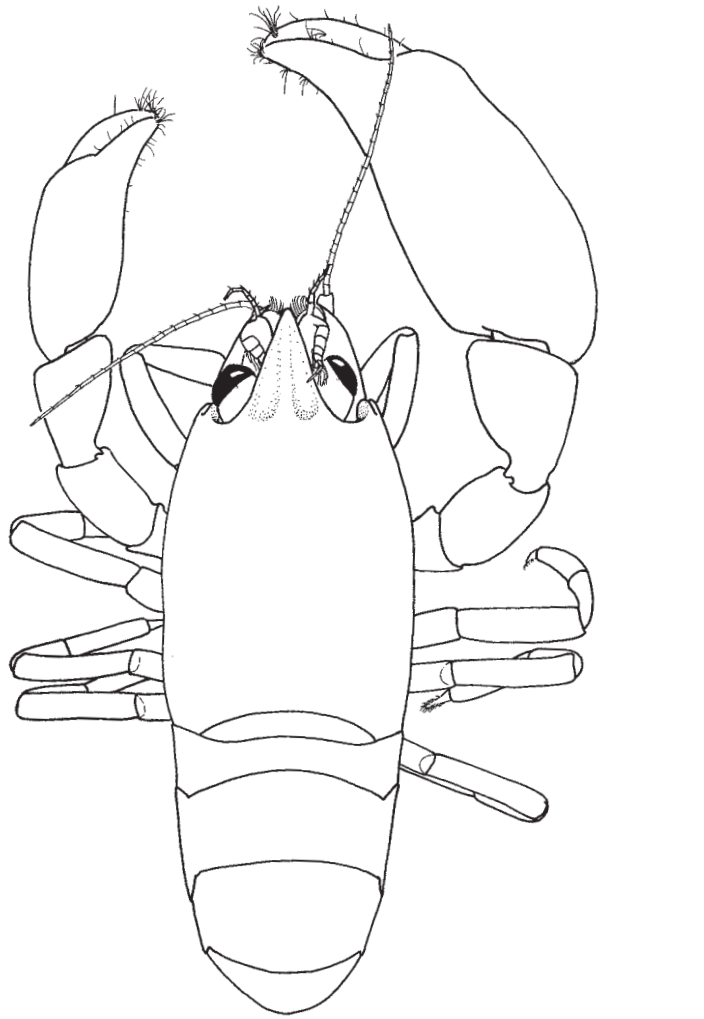

Fig. 235. *Odontonia seychellensis* spec. nov.: male holotype, pocl. 2.6 mm, RMNH D 42558. Dorsal aspect. Scale = 2 mm.

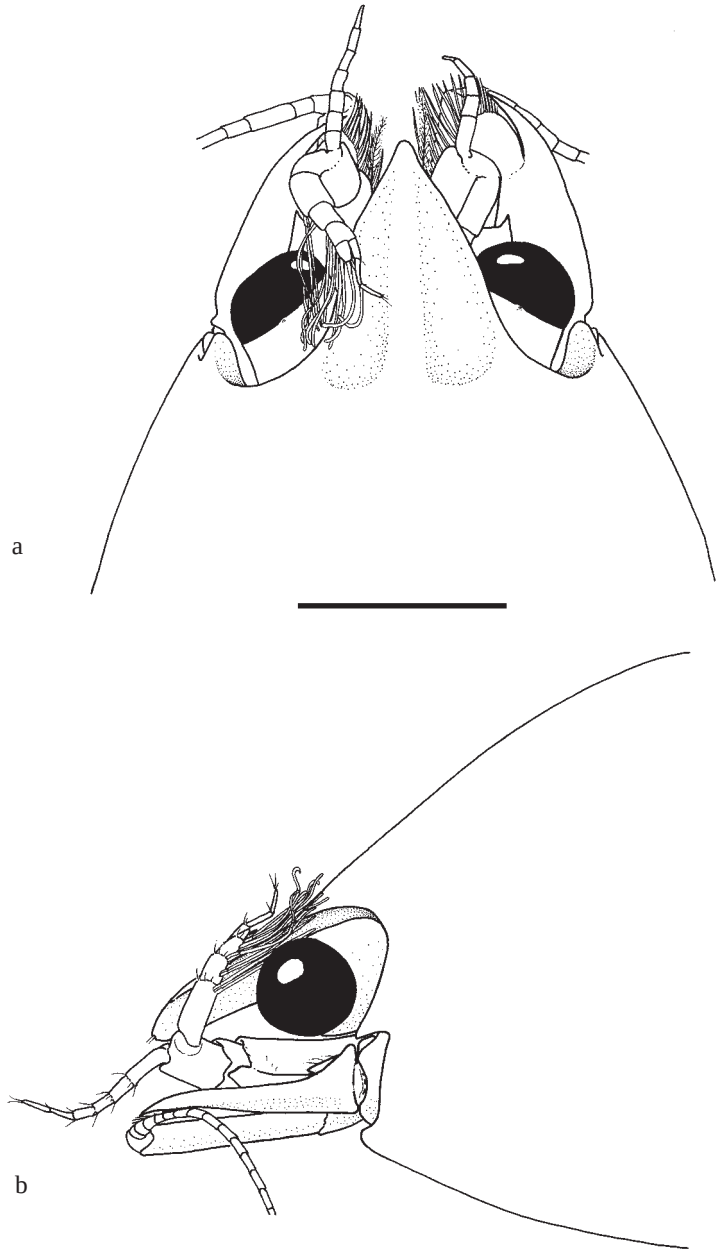

Fig. 236. *Odontonia seychellensis* spec. nov.: male holotype, pocl. 2.6 mm, RMNH D 42558. a, anterior appendages, dorsal view; b, anterior appendages, lateral view. Scale = 1 mm.

Abdomen smooth; sixth segment about 1.4 times longer than fifth, 1.4 times wider than long, posterolateral angle blunt, slightly produced, posteroventral angle blunt, not produced; pleura of first five segments broadly rounded.

Telson 1.9 times as long as sixth abdominal segment, about 2.0 times as long as proximal width; lateral margins almost straight, convergent; posterior border without median process; two pairs of medium-sized submarginal dorsal spines at 0.21 and 0.59 of telson length; distal and proximal pair of spines of equal length, about 0.12 of telson length; posterior margin with three pairs of spines, lateral spines small, marginal, 0.03 times telson length; submedian spines slightly shorter than intermediate spines, lateral spines about 1/4th of submedian and intermediate spines; both intermediate and submedian spines about twice as long as dorsal spines, but more slender.

Eyestalk short, broader than long, slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella short. Basal segment almost as long as proximal width, with acute produced distolateral tooth reaching distal margin of intermediate segment, anterior margin not developed, oblique; medioventral tooth strongly developed, acute, submarginal, situated halfway basal segment; stylocerite short, reaching halfway basal segment, with acute tip, lateral margin with few plumose setae. Intermediate segment short, broader than long. Distal segment broader than long. Upper flagellum short, biramous, with three segments fused; short free ramus one-segmented; longer free ramus with three or four segments. Lower flagellum with five to seven segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite extending to distal end of distolateral tooth of scaphocerite, rather slender, about 4.5 times longer than distal width; flagellum short, slender, about as long as postorbital carapace length; scaphocerite with lamina about twice as long as wide, anterior margin small, rounded, lateral margin broadly convex; distolateral tooth robust, about 0.30 length of lamina (incl. distolateral tooth) reaching beyond lamina, curved medially; incision between distolateral tooth and lamina deep.

Epistome with sharp anterior carina; labrum broad, oval.

Paragnath well developed, alae with broad transverse more or less rectangular distal lobes, and small rounded more or less triangular ventromesial lobes; corpus very short, with shallow median excavation, bordered laterally by non-setose, small, oblique, carinae.

Second thoracic sternite with broadly rounded anterior margin, without median process forming a round tubercle.

Third thoracic sternite with indistinct shallow lateral carinae.

Fourth thoracic sternite with shallow developed medially notched plate formed by the lateral carinae.

Fifth thoracic sternite with well developed lateral plates with medial deep slit, posteromedial to second pereiopod coxae.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process with six terminal teeth and few ventromedial denticles; molar process robust, with four blunt teeth, some fringed with setal brushes.

Maxillula with upper lacinia rather small, rectangular with about 11 distal spines

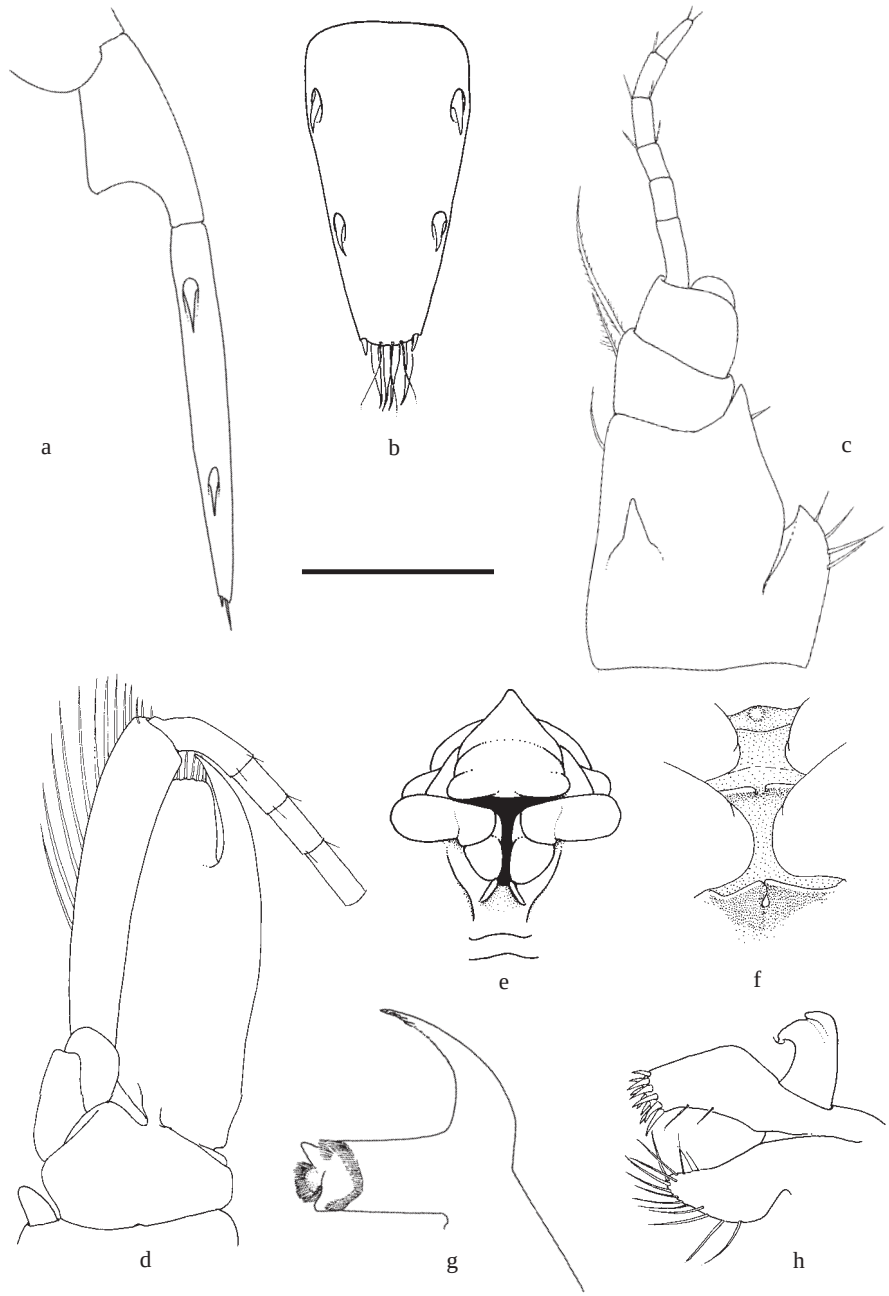

Fig. 237. *Odontonia seychellensis* spec. nov.: male holotype, pocl. 2.6 mm (fig. b), non-ovigerous female paratype, pocl. 3.5 mm (figs. a, c-h), RMNH D 42558. a, distal part abdomen, lateral view; b, telson, dorsal view; c, antennula, ventral view; d, antenna, ventral view; e, paragnath, ventral view; f, second to fifth thoracic sternites; g, mandible, ventral view; h, maxillula, ventral view. Scale: a, b, e, f = 1 mm; c, d, g, h = 0.6 mm.

in two rows, with only few simple setae in distal part; lower lacinia slender, triangular, with few simple distal setae, no differentiation in setae; palp bilobed, larger lobe with small ventral tubercle with single short recurved simple seta.

Maxilla with basal endite well developed, bilobate, distal and proximal lobe short, both with three or four distal setae; coxal endite obsolete, median margin convex, without setae; scaphognathite large, 2.9 times longer than wide, posterior lobe large, twice as long as anterior width, anterior lobe 1.4 times longer than proximal width; palp simple, much longer than basal endite, not expanded proximally, without row of plumose setae along lateral margin.

First maxilliped with coxal and basal endite partly fused, broad; basal endite fringed with scattered, rather short simple and finely serrulate setae along median and distal margins; coxal endite convex, distinctly separated from basal endite, with few simple setae medially; exopod well developed, flagellum with about six long, plumose setae distally; caridean lobe rather small, narrow; epipod triangular, lobate; palp simple, rather short, non-setose.

Second maxilliped with endopod short, compact; dactylar segment about 2.5 times longer than broad, fringed with short, coarsely serrulate, spiniform, and longer curled, finely serrulate setae medially; propodal segment with row of robust spines and few simple setae along expanded distomedian margin; one seta in distal part of ventrolateral margin; carpal segment short, broader than long, unarmed; meral segment without setae; ischial and basal segment completely fused, medially strongly excavate, without long plumose setae, with few short simple setae, basal part angular produced medially; exopod long, with about five long plumose setae distally; coxal segment not medially produced, without setae, with proximally expanded epipod laterally.

Third maxilliped short, reaching with ultimate segment to distal margin of merocerite; with ischiomerus partly fused to basis, but with distinct suture, not broadened, about 2.5 times as long as broad, not tapered distally, somewhat flattened, with row of long simple setae along median margin, lateral margin with few simple setae; basal segment medially convex with few long simple setae on medial margin; exopod well developed, reaching just beyond distal margin of ischiomerus, with about eight long plumose setae in distal part; coxal segment with small median process, with large lateral plate without setae laterally; without arthrobranch; ultimate segment slightly shorter than penultimate segment; penultimate segment almost twice as long as broad, somewhat flattened, with few long finely serrulate setae ventromedially; ultimate segment more slender, with groups of long coarsely serrulate setae ventromedially and distally.

First pereiopod stout, exceeding carpocerite with chela and carpus; chela 2.5 times longer than deep, slightly compressed; fingers slightly shorter than palm, cutting edges entire, with groups of many serrulate setae, tips slightly hooked; cleaning organ reduced, few serrulate setae in distal part of carpus, no setae in proximal part of palm; carpus about 1.5 length of chela, 5.3 times longer than distal width, tapering proximally, unarmed; merus as long as carpus, 4.6 times longer than central width, somewhat bowed, without setae; ischium 0.43 times merus length, slightly expanded medially, with few simple setae medially; basis as long as ischium, with few simple setae medially; coxa with small ventral lobe with few short simple setae.

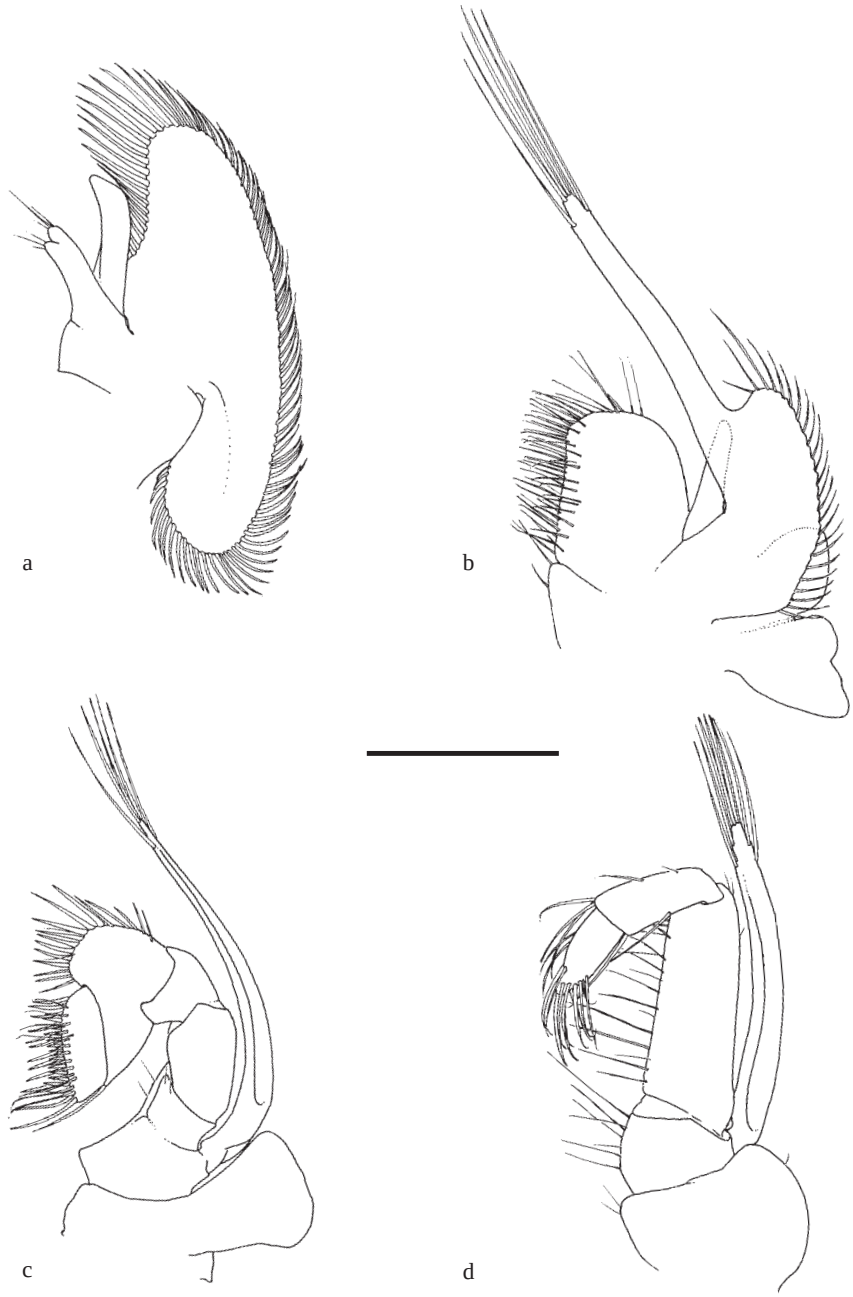

Fig. 238. *Odontonia seychellensis* spec. nov.: non-ovigerous female paratype, pocl. 3.5 mm, RMNH D 42558. a, maxilla, ventral view; b, first maxilliped, ventral view; c, second maxilliped, ventral view; d, third maxilliped, ventral view. Scale = 0.6 mm.

Second pereiopods subequal, similar. Major chela about 1.0 times postorbital carapace length in female, about 1.5 times postorbital carapace length in males, palm swollen, slightly compressed, without carinae, non-setose; fingers with few simple setae in distal part; dactylus 0.38 of palm length, about 2.7 times longer than deep, with one large triangular tooth at 1/3 of cutting edge, distal part of cutting edge entire, concave, tip strongly hooked; fixed finger almost twice as long as deep, with broad flattened tooth with row of small denticles in proximal part, separated by shallow notch from, triangular, acute tooth at 2/3rd of cutting edge, distal part of cutting edge entire, straight, tip strongly hooked, median fossa for reception of dactylar tooth

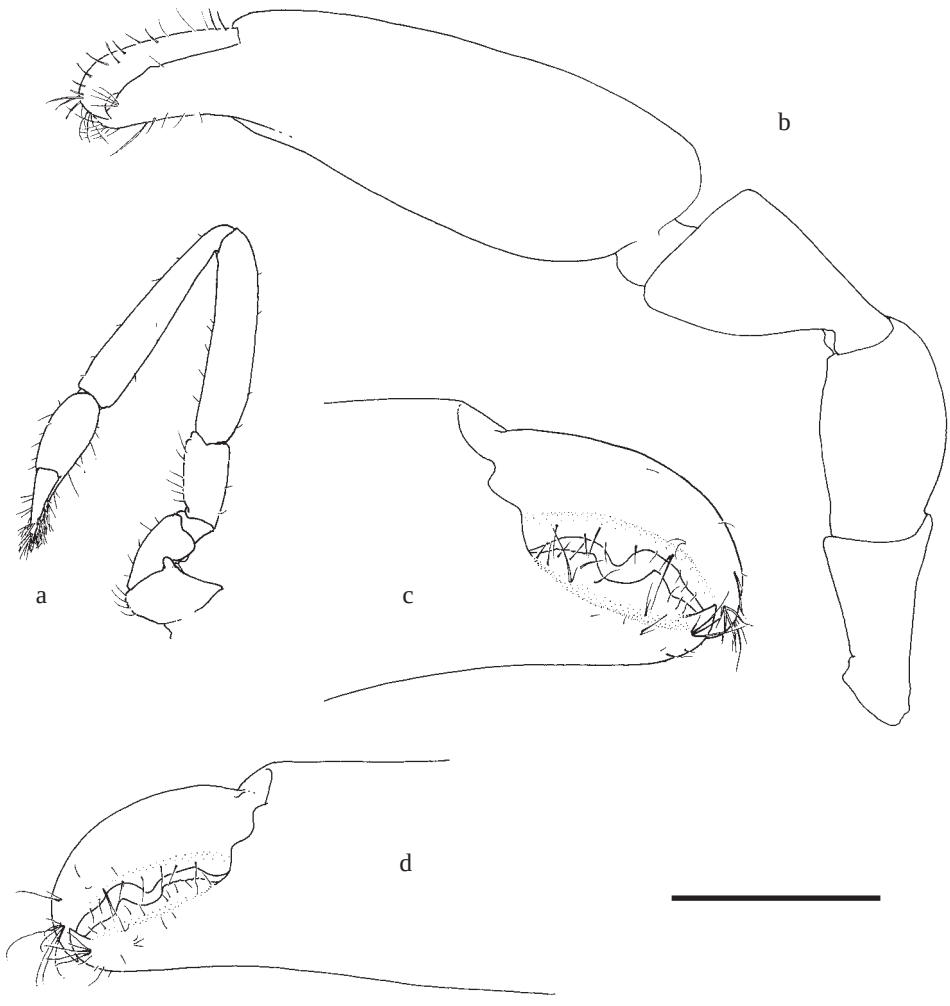

Fig. 239. *Odontonia seychellensis* spec. nov.: non-ovigerous female paratype, pocl. 3.5 mm, RMNH D 42558. a, first pereiopod; b, major second pereiopod; c, idem, chela; d, minor second pereiopod, chela. Scale: a, b = 1.5 mm; c, d = 1 mm.

not developed; carpus about 0.5 of palm length, about 1.5 times longer than distal width, strongly tapering proximally; merus as long as carpus, about 1.6 times longer than central width, distomedially excavate; ischium slightly shorter than merus, somewhat tapering proximally, with slightly protruded distomedial angle; basis and coxa without special features. Minor cheliped similar, dactylus slightly longer in relation to palm than in major chela; palm less swollen than in major chela.

Ambulatory pereiopods short, stout. Dactylus of third pereiopod with corpus cylindrical, slightly compressed, about 2.5 times longer than proximal width, with single row of many simple setae along ventral margin and fewer along dorsal margin, accessory tooth absent, flexor margin slightly concave; unguis strongly curved, short, entire, about 0.2 of corpus length; propodus about 3.4 times dactylus length, about 4.6 times longer than proximal width, with two short, blunt, spines in distal part of flexor margin, with few long slender simple setae distally; carpus about 0.62 of propodus length, about 2.8 times longer than distal width, slightly tapering proximally, with indistinct distal lobe, unarmed; merus about as long as propodus, slightly swollen, about 4.0 times longer than central width, cylindrical, without setae; ischium about 0.80 of merus length, 3.0 times longer than distal width; basis and coxa without special features. Fourth and fifth pereiopods similar.

First pleopod of female with endopod, almost 1/3rd as long as exopod, with about ten long distal setae when ovigerous, with row of long plumose setae on lateral margin.

Male first pleopod with endopod about four times longer than proximal width, somewhat tapering distally; median margin straight with row of five short simple setae, with plumose long setae along lateral and distal margin.

Endopod of second pereiopod with appendix masculina about 2/3rd length of appendix interna, with three very long setulose setae distally.

Uropods normal, with short unarmed protopodite; exopod broad, 2.0 times longer than central width, lateral margin strongly convex, without distolateral tooth, with minute spinule distolaterally; endopod exceeding exopod, about as long as telson, 2.8 times longer than wide.

Number of eggs ca. 100. Embryo at point of hatching about 0.7 mm long.

Sexual dimorphism.— Males generally similar to females, usually of smaller size, with relatively large chela on second pereiopods.

Size.— This is a small sized species. The postorbital carapace length of the female is 3.5 mm, of the males 2.6 and 2.8 mm.

Colouration (based on slides of specimens with registrationnumber RMNH D 42558, pl. 18).— Body with small white chromatophores and scattered larger white spots. Carapace with large white chromatophores at base of rostrum, in central part and in posterior part. Laterally there are three areas with white chromatophores spots, anterior, central and posterior, central are with largest white spots. Eyestalks with some dorsal white spots, cornea with white spots. Antennular peduncle with large white spots distally. Pereiopods without small white chromatophores, with white spots at joints. Palm of chela of second pereiopods with scattered white spots. Abdominal pleura with many small white chromatophores and large white spots dorsally and laterally at fixed distances. Tailfan without chromatophores.

Type.— Holotype: male, pocl. 2.6 mm (RMNH D 42558); NIOP-E, Sta. SEY.723:

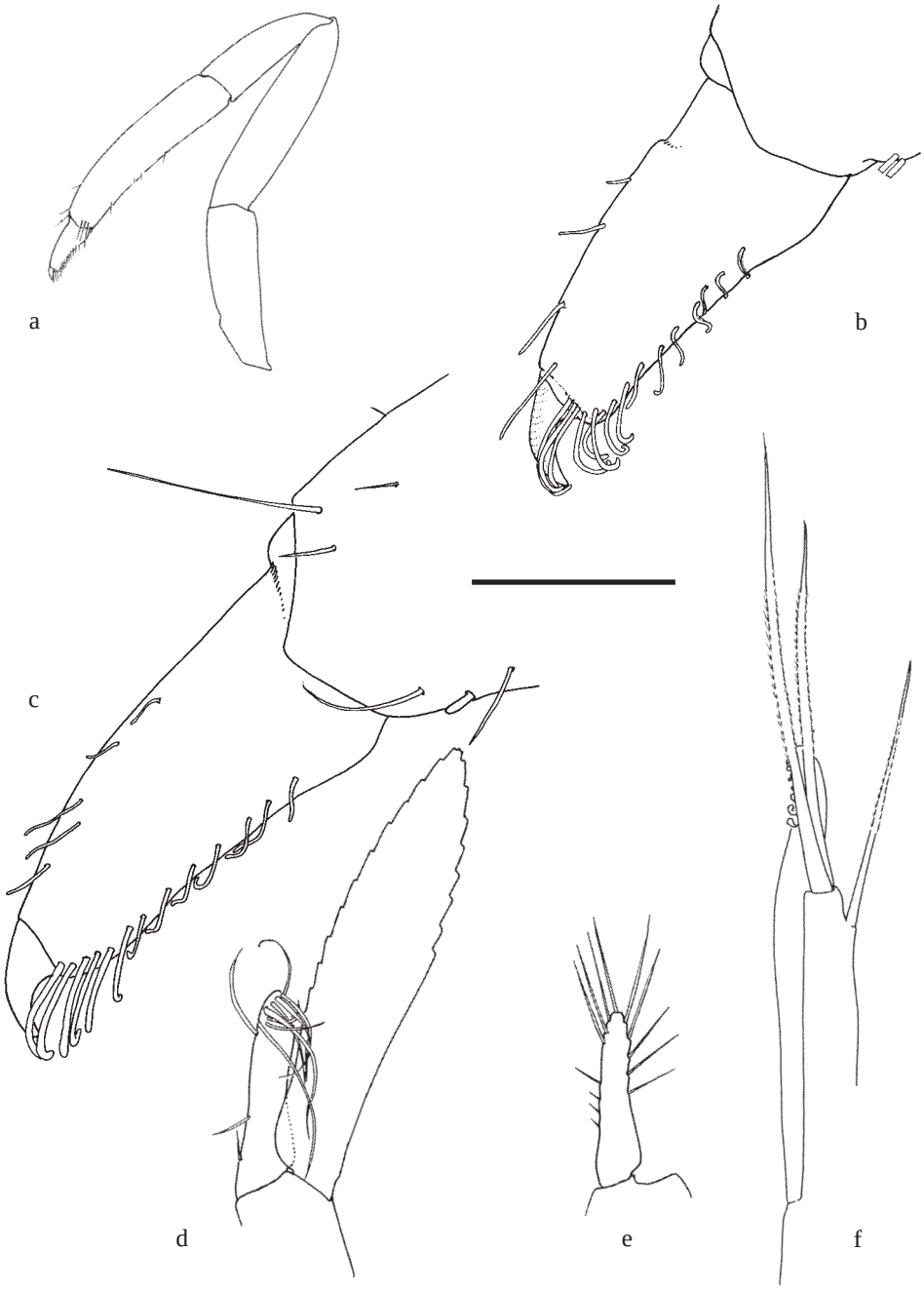

Fig. 240. *Odontonia seychellensis* spec. nov.: male holotype, pocl. 2.6 mm (figs. c, e, f), non-ovigerous female paratype, pocl. 3.5 mm (figs. a, b, d), RMNH D 42558. a, third pereiopod; b, dactylus third pereiopod male; c, dactylus third pereiopod female; d, endopod female first pleopod; e, endopod male first pleopod; f, appendix interna and appendix masculina on second male pleopod. Scale: a = 1.5 mm; b, c, f = 0.15 mm; d, e = 0.6 mm.

Bird Island, off N coast; 3°42'S 55°12'E; coral reef, near drop-off, depth 20 m; scuba diving; in Ascidiidae; 21.xii.1992; leg. C.H.J.M. Fransen.

Host.— Unidentified solitary ascidian.

Distribution.— INDO-WEST PACIFIC: Only known from the Seychelles (Fransen, 1994c).

Etymology.— The species is named 'seychellensis', after the locality where it was first recorded.

Remarks.— The present species differs in several aspects from the closely related species *O. simplicipes* (Bruce, 1996): 1) the rostrum bears a minute distal ventral tooth with several simple small setae dorsally, both absent in *O. simplicipes*; 2) the distolateral tooth of the scaphocerite is about 0.30 times the lamina length while 0.23 in *O. simplicipes*; 3) the penultimate segment of the third maxilliped is longer than broad while broader than long in *O. simplicipes*; 4) the ambulatory pereiopods have the corpus of the dactylus subcylindrical, about 2.5 times as long as its proximal width, with the flexor margin entire, slightly concave, distally bluntly rounded, with the unguis short in relation to the corpus, in *O. simplicipes* the corpus is compressed, about 1.7 times as long as its proximal width, the flexor margin convex, distally broadly rounded, has about three small proximal forwardly directed teeth and the unguis long and slender.

8.6.6. *Odontonia sibogae* (Bruce, 1972) comb. nov.
(figs. 241-246, pl. 19)

Pontonia katoi; Holthuis, 1952 (p.p.): 158, figs. 73a,b, 74b, 75a,b,d-f, 76c,f,g, 77a,e,f [not *P. katoi* Kubo, 1940].

Pontonia sibogae Bruce, 1972a: 183, 185, fig. 1; Bruce, 1978a: 179, fig. 10; Bruce, 1978b: 280; Holthuis, 1986: 270; Hogarth, 1989: 111; ? Monniot, Monniot & Laboute, 1991: 112, colourfig.; Müller, 1993: 124; Chace & Bruce, 1993: 62, 129; Jones & Morgan 1994: 69, colourfig.; Bruce, 1994: 126; Fransen, 1994c: 134, 152, fig. 106.

Material.— **INDO-WEST PACIFIC**: **Seychelles**.— RMNH D 42554: 1 non-ovigerous female, pocl. 1.6 mm; NIOP-E, Sta. 792, Seychelles, St François atoll, W rim, 7°05'S 52°44'E; outer slope down to 27 m depth; scuba-diving; in Ascidiacea; 5/6.i.93; leg. C.H.J.M. Fransen; colourphoto.— RMNH D 42555: 1 ovigerous female, pocl. 1.6 mm; NIOP-E, Sta. 602, Mahé, SW coast, Baie Lazare/Anse Gaulettes, 04°46'S 55°29'E; sandy bay with calcareous barrier; depth 2-4 m; snorkeling; 6.xii.1992; in Ascidiacea; leg. C.H.J.M. Fransen.— **Oman**.— RMNH D 42576: 1 male, pocl. 5.5 mm; 1 ovigerous female, pocl. 6.0 mm; Dhofar, Mirbat, South Fort, 16°58'20"N 54°41'40"E; 21.iv.1983; leg. P.J. Hogarth, no. 63A, Site 2F9.— **Indonesia**.— RMNH D 46697: 1 ovigerous female, pocl. 5.2 mm; 1 male, pocl. 5.0 mm; SUL.04, NE Sulawesi, Selat Lembeh, bay S of Pulau Putus, 01°31'N 125°16'E; rocky shore and small sandy beach, coral cover from shore to more than 20 m; diving; 14.x.1994; in ascidian; leg. C.H.J.M. Fransen.— RMNH D 46699: 1 non-ovigerous female, pocl. 2.7 mm; SUL.04, NE Sulawesi, Selat Lembeh, bay S of Pulau Putus, 01°31'N 125°16'E; rocky shore and small sandy beach, coral cover from shore to more than 20 m; depth 10 m; diving; 14.x.1994; in ascidian; leg. C.H.J.M. Fransen.— RMNH D 46698: 1 non-ovigerous female, pocl. 2.0 mm; SW Sulawesi, Spermonde Archipelago, Kudingareng Keke, S side; depth 15 m; scuba diving; 26.ix.1994; in blue *Rhopalaea crassa* (Herdman, 1880); leg. C.H.J.M. Fransen; photo NNM 2/34-37.— RMNH D 47670: 1 male, pocl. 4.4 mm; 1 ovigerous female, pocl. 4.6 mm; MAL.29, NW Seram, Kotania bay, NE of Pulau Marsegu, 03°00'S 128°03'E; 11.xi.1996; depth 0-30 m; diving; in ascidian; leg. C.H.J.M. Fransen.— RMNH D 47581: 1 male, pocl. 5.1 mm; 1 ovigerous female, pocl. 5.2 mm; MAL.32, Ambon, E coast, close to Cape Meriam, 03°38'S 128°01'E; 23.xi.1996; depth 10 m; diving; in *Polycarpa* spec.; leg. C.H.J.M. Fransen.— RMNH D 47583: 1 ovigerous female, pocl. 3.8 mm; MAL.24, Ambon, S coast, Seri bay, 03°45'S 128°09'E; 22.xi.1996; depth 15 m; diving; from solitary

ascidean. *Pyura momus* (Savigny, 1816); leg. C.H.J.M. Fransen.— ZMA: male, **?** paratype**,** pocl. 3.4 mm; anchorage N of Damar Island (= Salomake); dredge, townet and reef exploration; depth 45 m; coral bottom and *Lithothamnion*; 7-9.viii.1899; Siboga Exp. Station 144 (*Pontonia styela* Holthuis MS; published by Holthuis, 1952 as *P. katoi* Kubo, 1940).— RMNH D 48690: 1 male, pocl. 3.2 mm; Sta. BAL.12, E-side Nusa Dua, off Club Med Hotel, N of channel; 08°47'06''S 115°13'57''E; slowly declining reef slope, sandy base; scuba-diving; 18m depth; 4.iv.2001; in unidentified solitary ascidian; collected by C.H.J.M. Fransen.— RMNH D 48691: 1 male, pocl. 4.4 mm; 1 ovigerous female, pocl. 4.6 mm; Sta. BAL.05, Sanur, Penjor Point; 08°41'36''S 115°16'20''E; slowly declining reef slope, sandy base; scuba-diving; 15 m depth; 1.iv.2001; in *Polycarpa* non *aurata*; collected by C.H.J.M. Fransen; photo C.H.J.M. Fransen.— RMNH D 48692: 1 male, pocl. 3.9 mm; Sta. BAL.05, Sanur, Penjor Point; 08°41'36''S 115°16'20''E; slowly declining reef slope, sandy base; scuba-diving to 16 m depth; 1.iv.2001; in *Polycarpa* non *aurata*; collected by C.H.J.M. Fransen; photo C.H.J.M. Fransen.— RMNH D 48693: 1 male, pocl. 3.1 mm; Sta. BAL.22, SE-end Tulamben beach; 08°16'40''S 115°35'45''E; reef flat with drop-off and slope, sandy base; scuba-diving; 10 m depth; 14.iv.2001; in *Polycarpa* non *aurata*, possibly *Herdmania*; collected by C.H.J.M. Fransen.— **Papua New Guinea**.— KBIN IG 28056/NAT273: 1 non-ovigerous female, pocl. 1.10 mm; Laing Island, eastern side; 23.ix.1993; from unidentified solitary ascidian; leg. S. de Grave, field no. S93/3.— **Australia**.— Australian Museum, Sydney P.15362: 1 ovigerous female, holotype**,** pocl. 5.9 mm; 1 male, paratype**,** pocl. 5.1 mm; Australia, Queensland, Port Curtis, Curtis Channel; depth 42 m; dredge; 30.viii.1946; collected by J.S. Hynd.— NTM Cr010416: 1 male, pocl. 5.0 mm; West Australia, North West Shelf, 19°30.6'S 118°49.4'E; depth 38 m; 28.vi.1983; FRV "Soela" stn. 0383 B7; identified by A.J. Bruce.— NTM Cr010414: 1 ovigerous female, pocl. 7.4 mm; West Australia, North West Shelf, 19°29.6'S 118°52.2'E; depth 36 m; 25.x.1983; FRV "Soela" stn. 0583 D5; identified by A.J. Bruce.— NTM Cr010413: 1 non-ovigerous female, pocl. 5.7 mm; West Australia, North West Shelf, 19°29.4'S 118°51.5'E; depth 40 m; 25.x.1983; FRV "Soela" stn. 0583 D7; identified by A.J. Bruce.— NTM Cr010415: 2 males, pocl. 5.6 and 5.9 mm; West Australia, North West Shelf, 19°30.6'S 118°49.4'E; depth 38 m; 28.vi.1983; FRV "Soela" stn. 0383 B7; identified by A.J. Bruce.

Description.— Body subcylindrical, slightly depressed. Carapace smooth. Rostrum well developed, reaching distal end of antennular peduncle, with broad, shallow dorsal and acute lateral carinae, with slightly concave ventral carina in distal part; distal end rather swollen, with small ventrodistal tooth and few distal simple setae, blunt in dorsal view, broadened at base. Inferior orbital angle not produced, broadly rounded. Antennal spine blunt, protruding rounded process, not separated by notch from inferior orbital angle. Anterolateral margin straight or convex, anterolateral angle produced.

Abdomen smooth; sixth segment about 1.5 times longer than fifth, 1.3 times broader than long, posteroventral angle acute, posterolateral angle feebly produced, blunt; pleura of first five segments broadly rounded.

Telson 2.5 times longer than sixth abdominal segment, about 2.10 times as long as proximal width; posterior border without median process; five pairs of submarginal dorsal spines at regular distances, all of equal length, about 0.13 of telson length; posterior margin with three pairs of spines, lateral spines small, marginal, about 0.03 of telson length; submedian spines as long as intermediate spines; both intermediate and submedian spines slightly longer than dorsal spines, but more slender.

Eyestalk short, about as long as broad, as broad as diameter of hemispherical cornea.

Antennula with peduncle and flagella short. Basal segment about 1.5 times as long as proximal width, with acutely produced distolateral tooth reaching distal margin of intermediate segment, anterior margin slightly developed; medioventral acute strongly developed, submarginal, situated halfway basal segment; stylocerite short, about half length of basal segment, distally blunt or rounded, lateral margin with few short

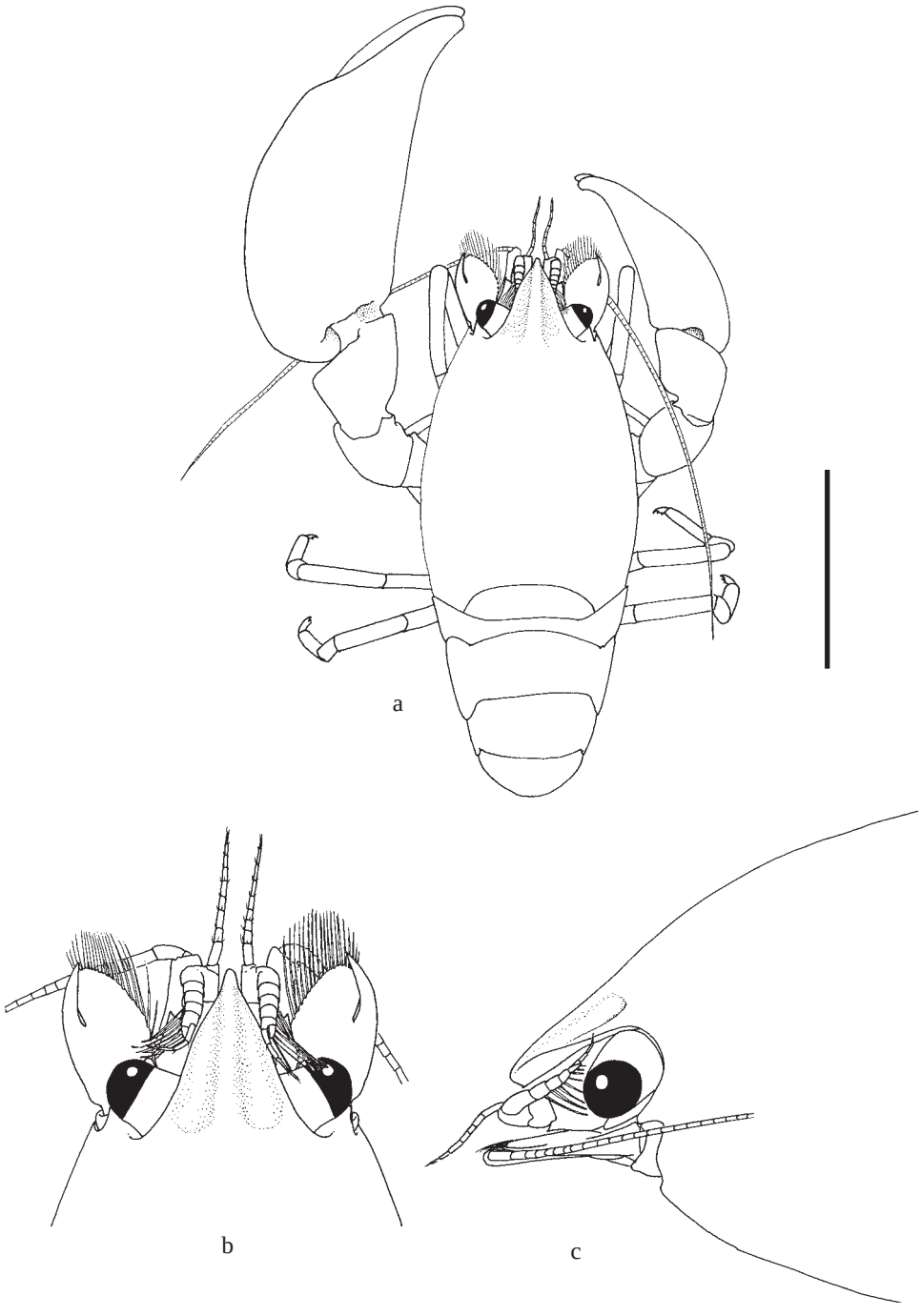

Fig. 241. *Odontonia sibogae* (Bruce, 1972): ovigerous female, pocl. 5.2 mm (fig. c), male, pocl. 5.0 mm (figs. a, b), RMNH D 46697. a, dorsal aspect; b, anterior appendages, dorsal view; c, anterior appendages, lateral view. Scale: a = 4 mm; b, c = 2 mm.

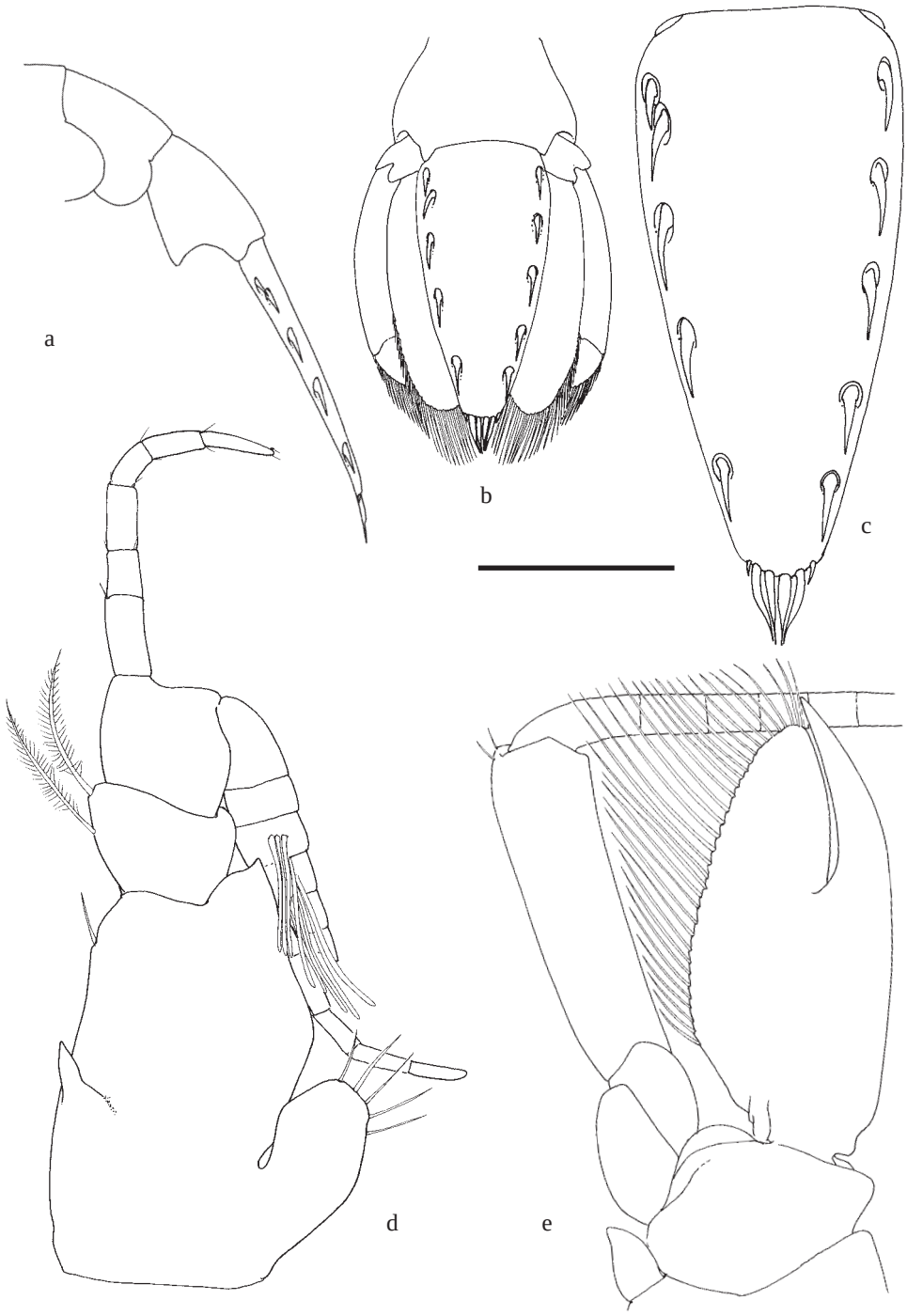

Fig. 242. *Odontonia sibogae* (Bruce, 1972): male, pocl. 5.0 mm, RMNH D 46697. a, distal part abdomen, lateral view; b, telson and uropods, dorsal view; c, telson, dorsal view; d, antennula, ventral view; e, antenna, ventral view. Scale: a, b = 2 mm; c = 1 mm; d, e = 0.6 mm.

plumose setae. Intermediate segment short, broader than long. Distal segment broader than long. Upper flagellum short, biramous, with five proximal segments fused; short free ramus one-segmented; longer free ramus with four segments. Lower flagellum with 7-10 segments.

Antenna with basicerite short, laterally unarmed, with large antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite slender, extending just beyond distal lamina of scaphocerite, about six times longer than distal width; flagellum slender, about twice as long as postorbital carapace length; scaphocerite with lamina almost twice as long as wide, anterior margin small, rounded, lateral margin broadly convex; distolateral tooth robust strongly curved inward, about 0.50 length of lamina (incl. distolateral tooth) overreaching distal lamina; incision between distolateral tooth and lamina very deep.

Epistome with sharp anterior carina; labrum broad, oval.

Paragnath well developed, alae with broad transverse more or less rectangular distal lobes, and small rounded more or less triangular ventromesial lobes; corpus very short, with shallow median excavation, bordered laterally by non-setose, oblique, carinae.

Second thoracic sternite with shallow rounded median tubercle, without setae.

Third thoracic sternite not ornamented.

Fourth thoracic sternite with well developed triangular plate formed by the medially fused lateral carinae.

Fifth thoracic sternite with well developed lateral plates medially fused leaving a shallow medial notch, forming a large plate posteromedial to second pereiopod coxae.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process slender, with five to seven acute distal teeth, without row of small denticles along ventromedial margin; molar process robust, with four blunt teeth, some fringed with setal brushes.

Maxillula with upper lacinia rather small, rectangular with about 13 distal spines in two rows, with only few simple setae in distal part; lower lacinia slender, triangular, with few simple distal setae, no differentiation in setae; palp bilobed, larger lobe with small ventral tubercle with single short recurved simple seta.

Maxilla with basal endite well developed, bilobate, distal lobe broad with about ten simple setae distally, proximal lobe slender with about four distal setae; coxal endite obsolete, median margin slightly convex, without setae; scaphognathite large, 2.9 times longer than wide, posterior lobe large, twice as long as anterior width, anterior lobe 1.4 times longer than proximal width; palp simple, much longer than basal endite, not expanded proximally, with row of plumose setae along lateral margin.

First maxilliped with coxal and basal endite almost completely fused, broad; basal endite fringed with scattered, rather short simple and finely serrulate setae along median and distal margins; coxal endite slightly convex, indistinctly separated from basal endite, with few simple setae medially; exopod well developed, flagellum with about ten long, plumose setae distally; caridean lobe rather small, narrow; epipod triangular, lobate; palp simple, rather short, non-setose.

Second maxilliped with endopod short, compact; dactylar segment about 2.6 times longer than broad, fringed with short, coarsely serrulate, spiniform, and longer curled, finely serrulate setae medially; propodal segment with row of robust spines

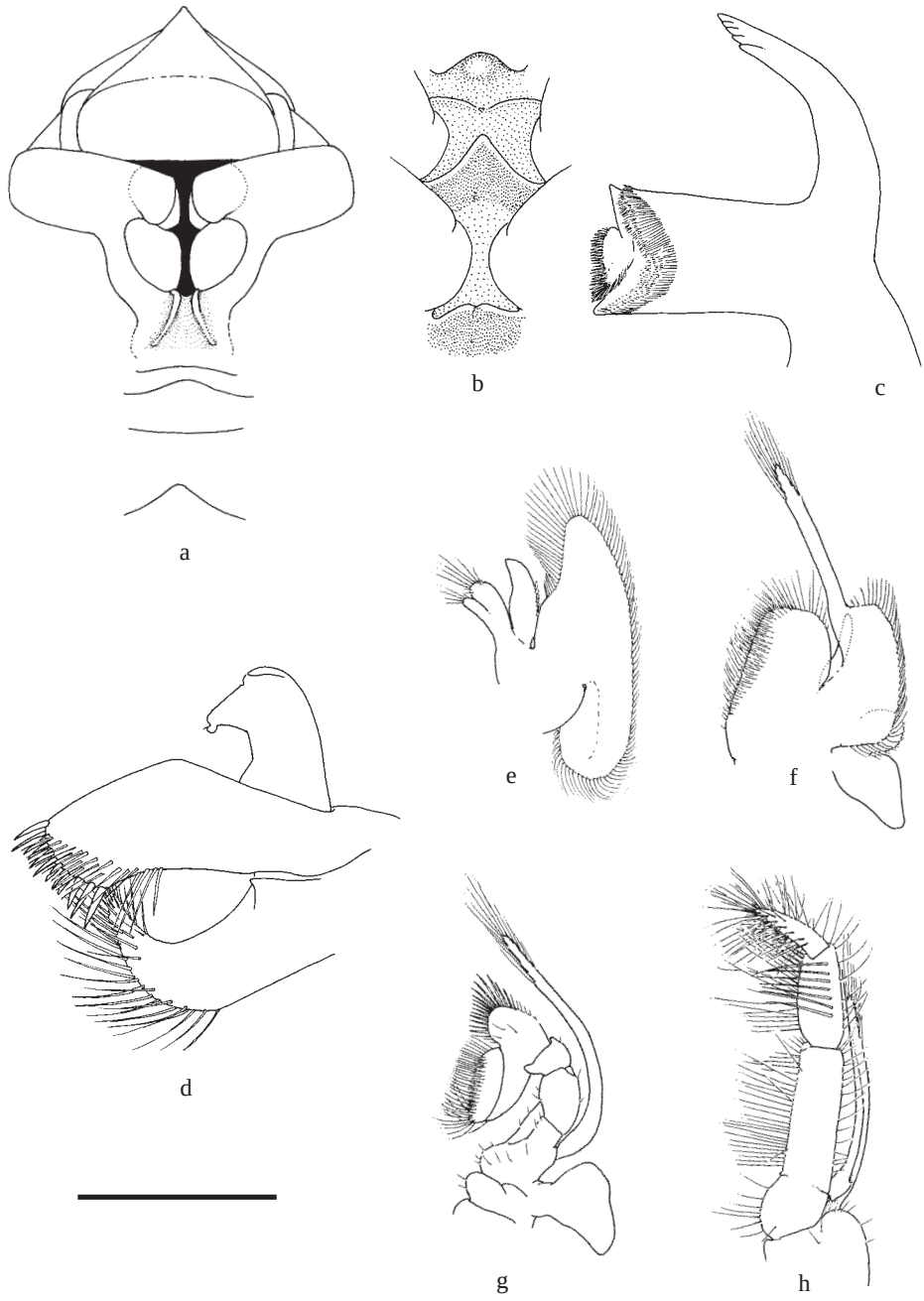

Fig. 243. *Odontonia sibogae* (Bruce, 1972): ovigerous female, pocl. 5.2 mm (fig. b); male, pocl. 5.0 mm (figs. a, c-h), RMNH D 46697. a, paragnath, ventral view; b, second to fifth thoracic sternites; c, mandible, ventral view; d, maxillula, ventral view; e, maxilla, ventral view; f, first maxilliped, ventral view; g, second maxilliped, ventral view; h, third maxilliped, ventral view. Scale: a, b = 1 mm; c, d = 0.6 mm; e-h = 1.5 mm.

and few simple setae along strongly expanded distomedian margin; one seta in distal part of ventrolateral margin; carpal segment short, broader than long, unarmed; meral segment without plumose setae; ischial and basal segment completely fused, medially strongly excavate, without long plumose setae, with few short simple setae, basal part angular produced medially; exopod long, with about ten long plumose setae distally; coxal segment medially produced, with few simple setae, with proximally expanded epipod laterally.

Third maxilliped short, reaching with ultimate segment just beyond merocerite; with ischiomerus partly fused to basis, but with distinct suture, not broadened, about 3.0 times as long as broad, not tapered distally, somewhat flattened, with row of long simple setae along median margin, lateral margin with few simple setae; basal segment medially convex with few long simple setae on medial margin; exopod well developed, reaching well beyond distal margin of ischiomerus, with about twelve long plumose setae in distal part; coxal segment with small median process, with large lateral plate with few simple setae laterally; without arthrobranch; ultimate segment slightly shorter than penultimate segment; penultimate segment twice as long as broad, somewhat flattened, with few long finely serrulate setae ventromedially; ultimate segment more slender, with groups of long coarsely serrulate setae ventromedially and distally.

First pereiopod rather slender, exceeding carpocerite with chela and distal 3/4th of carpus; chela 3.5 times longer than deep, slightly compressed; fingers slightly longer than palm, cutting edges entire, with groups of many serrulate setae, tips slightly hooked; cleaning organ present, few serrulate setae in distal part of carpus, few setae in proximal part of palm; carpus about 1.6 length of chela, 5.6 times longer than distal width, tapering proximally, unarmed; merus almost as long as carpus, 5.0 times longer than central width, somewhat bowed, with few simple setae; ischium 0.40 times merus length, slightly expanded medially, with few simple setae medially; basis as long as ischium, with few simple setae medially; coxa with small ventral lobe with few short simple setae.

Second pereiopods similar in form, unequal in size. Major chela 1.0-1.4 times postorbital carapace length in female, about 1.5-1.7 times postorbital carapace length in males, palm swollen, slightly compressed, without carinae, non-setose; fingers with few simple setae in distal part; dactylus 0.4-0.5 of palm length, about 3.3 times longer than deep, with one large triangular tooth at 1/3 of cutting edge, distal part of cutting edge entire, concave, tip strongly hooked; fixed finger almost twice as long as deep, with broad flattened tooth with row of small denticles in proximal part, separated by shallow notch from, triangular, acute tooth at midlength of cutting edge, distal part of cutting edge entire, straight, tip strongly hooked, median fossa for reception of dactylar tooth not developed; carpus short, about 0.3 of palm length, about as long as distal width, strongly tapering proximally; merus as long as carpus, about 1.6 times longer than central width, distomedially excavate; ischium slightly shorter than merus, somewhat tapering proximally, with protruded distomedial angle; basis and coxa without special features. Minor cheliped similar, dactylus slightly longer in relation to palm than in major chela; palm less swollen than in major chela.

Ambulatory pereiopods rather robust. Dactylus of third pereiopod with corpus moderately compressed, about 1.5 times longer than proximal width, with single row

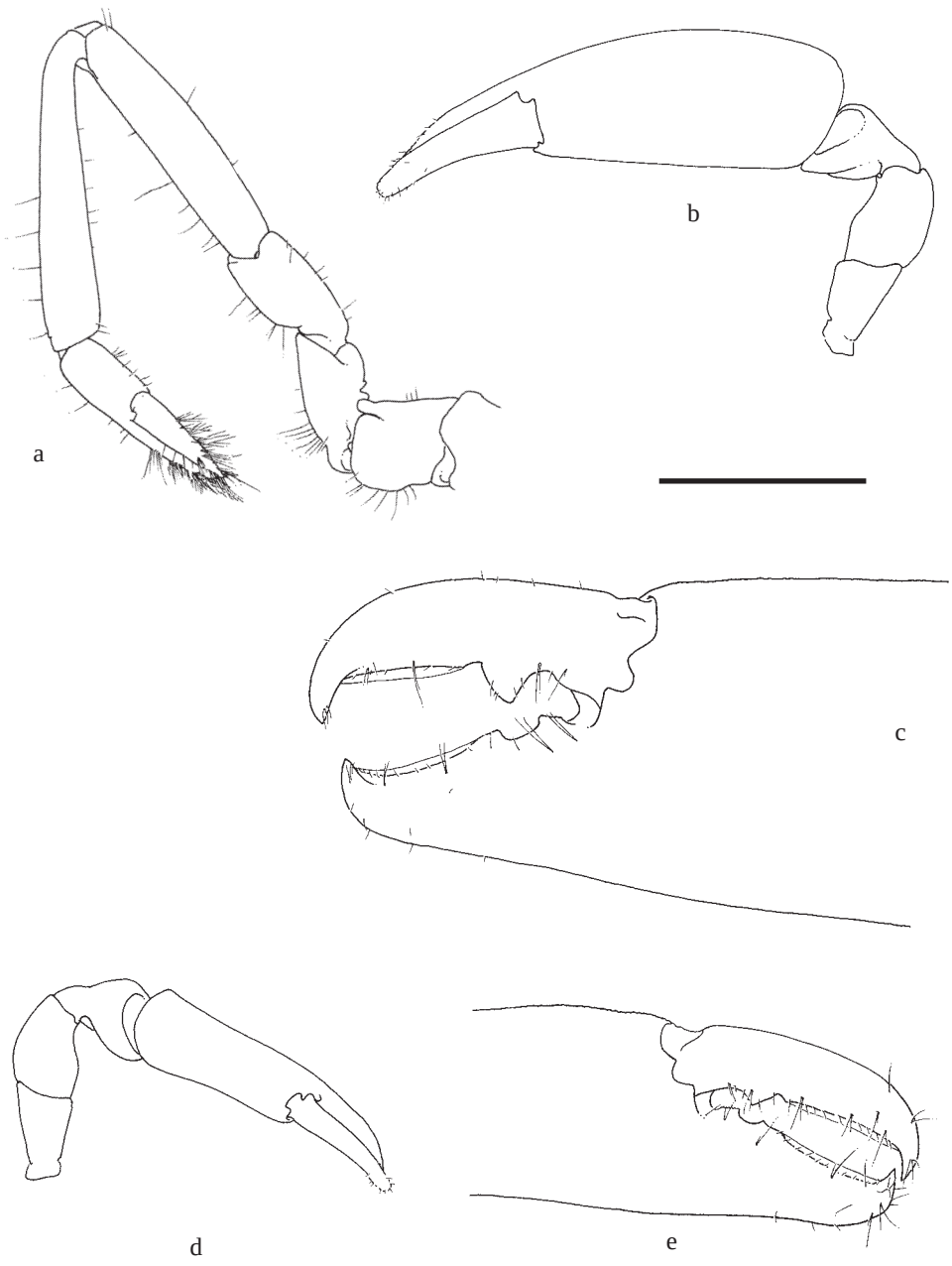

Fig. 244. *Odontonia sibogae* (Bruce, 1972): male, pocl. 5.0 mm, RMNH D 46697. a, first pereiopod; b, major second pereiopod; c, idem, chela; d, minor second pereiopod; e, idem, chela. Scale: a = 1.5 mm; b, d = 4 mm; c, e = 2 mm.

of few simple setae along ventral margin and in distal part, accessory tooth terminal, acute, perpendicular to flexor margin, ventral margin with one large forward directed tooth at midpoint, and one single denticle between central tooth and accessory tooth or none; unguis slightly curved, about 0.55 of corpus length, distally with about three large scales; propodus about 3.6 times dactylus length, about 3.6 times longer than proximal width, with one ventral small spine in distal part of flexor margin and one small distoventral spine, with few slender simple setae distally; carpus about 0.66 of propodus length, about 3.0 times longer than distal width, slightly tapering proximally, with indistinct distal lobe, unarmed; merus 1.2 times propodus length, somewhat swollen, about 4.0 times longer than central width, cylindrical, without setae; ischium about 0.76 of merus length, 3.2 times longer than distal width, slightly tapering proximally; basis and coxa without special features. Fourth and fifth pereiopods similar.

First pleopod of female with endopod 2/5th of exopod length, with about eight long distal setae when ovigerous, with row of long plumose setae on lateral margin.

Male first pleopod with small endopod, about 3.0 times longer than proximal width, somewhat tapering distally; median margin straight with row of about 14 short simple setae, with plumose long setae in distal part and along lateral margin.

Endopod of second pereiopod with short appendix masculina, equal to about 0.55 times length of appendix interna, with about eleven long setulose setae mainly in distal part.

Uropods normal, with short unarmed protopodite; exopod broad, 2.0 times longer than central width, lateral margin strongly convex, without distolateral tooth, with minute spinule distolaterally; endopod exceeding exopod, 1.1 times exopod length, about as long as telson or slightly longer, 2.8 times longer than wide.

Number of eggs between 200-500, depending on the size of the female. Embryo at point of hatching about 0.6 mm long.

Size.— This is a medium sized species. The maximum pocl. is 7.4 mm in adult females, 5.5 mm in adult males. The minimal size of ovigerous females is 1.6 mm.

Colouration (based on slides of specimens with registration numbers RMNH D 42554 and 45698, pl. 19).— Body with small white and yellow chromatophores and scattered larger white spots. Carapace with small white spots at base of rostrum. Eyestalks with dorsal white stripe or two or three large white spots, cornea with white spots. Antennula with scattered small white chromatophores and large white spots in distal parts of segments. Second pereiopods with scattered small white chromatophores on ischium and merus; with white bands at joints. Carpus and chela with white bands in proximal, central and distal part of segment; palm with large white chromatophores between bands; fingers with small and large white chromatophores. First pereiopods and ambulatory pereiopods with small white chromatophores, with white bands at joints. Abdominal pleura translucent.

The specimen which was photographed in New Caledonian waters has a different pattern and could be a different species (Monniot, Monniot & Laboute, 1991: 112).

Type.— Holotype: ovigerous female, pocl. 5.9 mm, Australian Museum, Sydney P.15362; Australia, Queensland, Port Curtis, Curtis Channel, depth 42 m, 30.viii.1946.

Distribution.— INDO-WEST PACIFIC: Indian Ocean: Arabian Sea, Oman (Holthuis, 1986); Seychelles, depth 2-27 m (Fransen, 1994c); Madagascar, Nosy Bé, shallow water (Bruce, 1978a, 1987b). Indonesia: Sulawesi (present report); Moluccas, off Damar

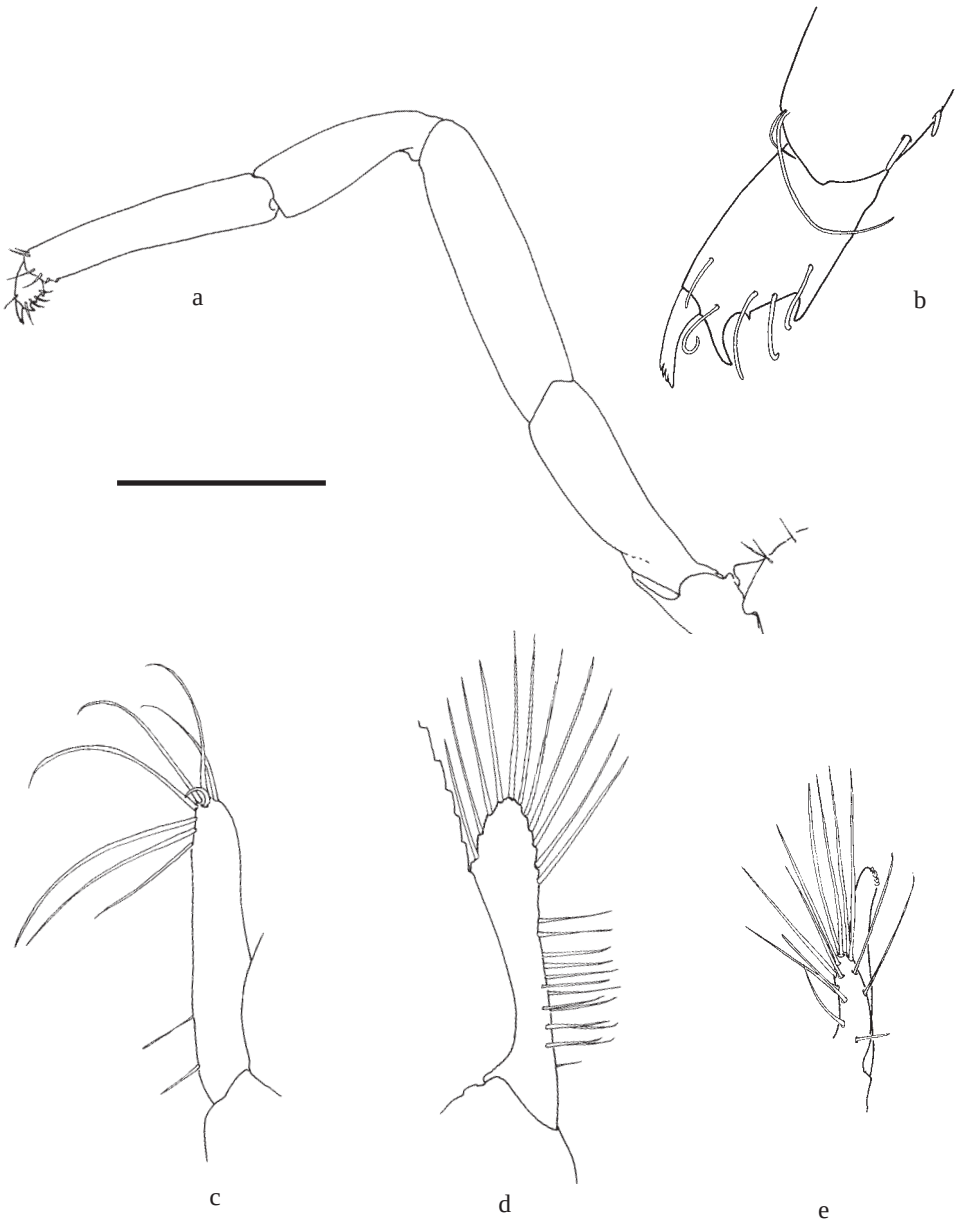

Fig. 245. *Odontonia sibogae* (Bruce, 1972): ovigerous female, pocl. 5.2 mm (fig. c); male, pocl. 5.0 mm (figs. a, d, e), RMNH D 46697; non-ovigerous female, pocl. 1.6 mm (fig. b). a, third pereiopod; b, dactylus third pereiopod; c, endopod female first pleopod; d, endopod male first pleopod; e, appendix interna and appendix masculina on second male pleopod. Scale: a = 1.5 mm; b = 0.15 mm; c-e = 0.6 mm.

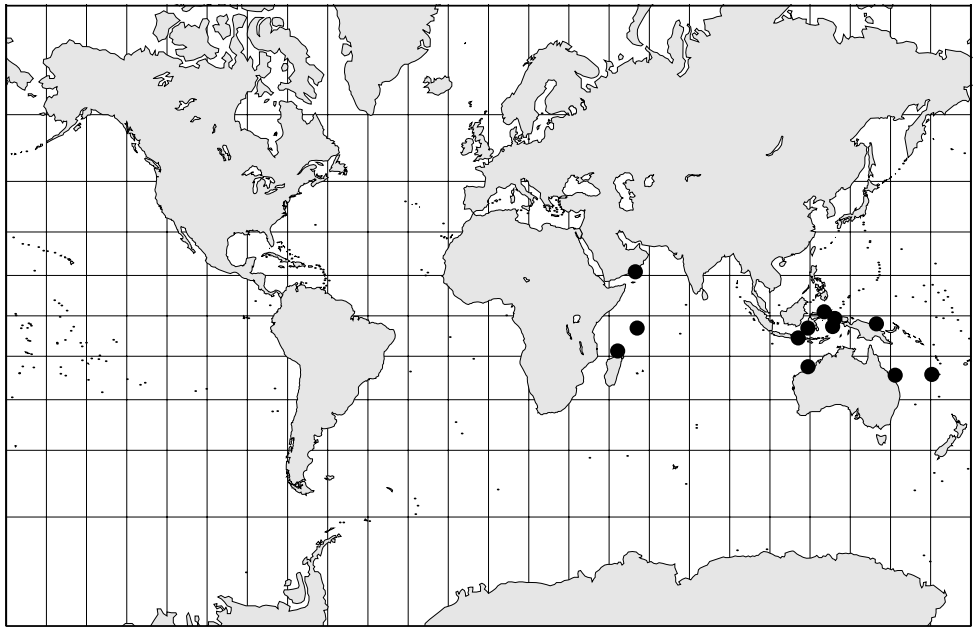

Fig. 246. Geographic distribution of *Odontonia sibogae* (Bruce, 1972).

Island, depth 45 m (Holthuis, 1952, in part); Ambon, Seram, Bali (present report). Australia: Queensland, depth 23 fms (Bruce, 1973; Bruce, 1977); Western Australia (present record). New Caledonia (Monniot, Monniot & Laboute, 1991).

Host.— In ascidians; *Styela whiteleggei* (Herdman, 1899) (cf. Bruce, 1973); *Pyura momus* (Savigny, 1816) (cf. Monniot, Monniot & Laboute, 1991; present study); *Rhopalaea crassa* (Herdman, 1880) (present study); *Polycarpa* spec. (present study). Some specimens were not collected from an ascidian host and could have been free-living. The Indonesian specimens described by Holthuis (1952) were collected at 45 m from a coral bottom; the specimen from Nosy Bé, Madagascar (Bruce, 1987a, 1987b) was 'captured free, from coral rock and 25 m'; and the specimens from southern Oman (Holthuis, 1986) were found "under boulders at about mid tide level'.

Remarks.— The male specimen (RMNH D 46697), as well as the small specimen (RMNH D 46698) from Sulawesi, have four dorsal spines on the telson on the left side, and five on the right side. Both male and ovigerous female specimens from Oman (RMNH D 42576) have six spines on the right side and five on the left side.

The small specimen (RMNH D 46698) has the median triangular process of the fourth thoracic sternite less prominent than in the larger specimens. The lateral plates of the fifth thoracic sternite are usually fused, leaving a shallow medial notch. In one specimen from Western Australia (NT Cr. 010413) the lateral plates are completely fused without a trace of a medial notch.

The subdistal ventral tooth on the rostrum is present in all specimens, although sometimes indistinct.

The stylocerite is usually blunt but sometimes completely rounded as in the specimens from Sulawesi (RMNH D 46697) and a female from Ambon (RMNH D 47581).

Usually a small denticle is present on the flexor margin of the corpus of the ambulatory pereiopods between the accessory tooth and the forward directed tooth at midpoint of the flexor margin. In some specimens from Western Australia (NT Cr. 010413-010416) this denticle is reduced or absent. As noted by Bruce (1977) most specimens from Queensland have the distolateral scales on the unguis of the ambulatory pereiopods feebly developed. This is also found in the specimens from Western Australia.

The merus of the ambulatory pereiopods is more swollen in Western Australian specimens than in those from other regions.

8.6.7. *Odontonia simplicipes* (Bruce, 1996) comb. nov.
(figs. 247, 248)

Pontonia simplicipes Bruce, 1996: 247-250, figs. 19-20, 29i.

Material.— **Indo-West Pacific**: **Chesterfield Islands**.— MNHN-Na 12844: 1 female, holotype, pocl. 1.33 mm; Corail 2 stn. DW 163, 19°15.15'S 158°47.73'E; depth 71 m; 24.viii.1988; in *Polycarpa nigricans* Heller, 1878.

Description.— Body subcylindrical. Carapace smooth. Rostrum well developed, about 0.65 of carapace length, toothless, overreaching antennular peduncle, reaching beyond distal margin of scaphocerite, without dorsal carina, with acute lateral carinae, with slightly convex ventral carina; distal end rounded in lateral view, without ventrodistal tooth nor distal setae, bluntly acute in dorsal view, broadened at base. Inferior orbital angle not produced, straight. Antennal spine reduced to blunt process. Anterolateral margin of carapace straight or slightly convex, anterolateral angle slightly produced, rounded.

Abdomen smooth; sixth segment about 1.5 times longer than fifth, 1.3 times broader than long, posteroventral angle blunt, posterolateral angle feebly produced, blunt; pleura of first five segments broadly rounded.

Telson longer than sixth abdominal segment, about 2.4 times as long as proximal width, as long as uropods; posterior border without median process; two pairs of submarginal dorsal spines at about 0.25 and 0.63 of telson length; distal and proximal pair of spines of equal length, about 0.12 of telson length; posterior margin with three pairs of spines, lateral spines small, marginal, 0.03 times telson length; submedian spines slightly shorter than intermediate spines; both intermediate and submedian spines about twice as long as dorsal spines, but more slender.

Eyestalk short, broader than long, slightly broader than diameter of hemispherical cornea.

Antennula with peduncle and flagella short. Basal segment about as long as wide, with acute produced distolateral tooth reaching distal margin of intermediate segment, anterior margin not developed, oblique; medioventral tooth well developed, acute, submarginal, situated halfway basal segment; stylocerite short, reaching halfway basal segment, with acute tip, with few short plumose setae laterally. Intermediate segment short, broader than long. Distal segment broader than long. Upper flagellum short, biramous, with three segments fused; short free ramus one-segmented; longer free ramus with three or four segments. Lower flagellum with five segments.

Antenna with basicerite short, laterally unarmed, with antennal gland tubercle medially; ischiocerite and merocerite normal; carpocerite slender, about 5.5 times longer than distal width, extending beyond distal end of distolateral tooth of scaphocerite; flagellum slender, longer than postorbital carapace length; scaphocerite with lamina about 2.5 as long as wide, anterior margin small, rounded, lateral margin broadly convex; distolateral tooth robust, about 0.23 length of lamina (incl. distolateral tooth) reaching just beyond lamina, curved medially; incision between distolateral tooth and lamina deep.

Epistome with rather acute anterior carina; labrum normal.

Paragnath well developed, alae with broad transverse more or less rectangular distal lobes, and small rounded more or less triangular ventromesial lobes; corpus very short, with shallow median excavation, bordered laterally by non-setose, oblique, carinae.

Second thoracic sternite with anterior margin broadly rounded; without median process forming round tubercle.

Third thoracic sternite with indistinct shallow lateral carinae.

Fourth thoracic sternite with shallowly developed, medially notched plate formed by the lateral carinae.

Fifth thoracic sternite with well developed lateral plates with medial deep slit, posteromedial to second pereiopod coxae.

Sixth to eighth thoracic sternites unarmed, broadening posteriorly.

Mandible with incisor process with six terminal teeth and few ventromedial denticles; molar process robust, with four blunt teeth, some fringed with setal brushes.

Maxillula with upper lacinia rather small, rectangular, with two rows of about 11-13 spines and few simple setae medially; lower lacinia slender triangular, distally setose, no differentiation in setae; palp bilobed, larger lobe with small ventral tubercle with single short recurved simple seta.

Maxilla with basal endite well developed, bilobed; distal lobe slightly longer and broader than proximal lobe, both with few simple setae distally, median border without setae; coxal endite obsolete, median margin strongly convex, without setae; scaphognathite 2.7 times longer than wide, posterior lobe 3.0 times longer than anterior width, anterior lobe 1.3 times longer than proximal width; palp simple, much longer than distal lobe of basal endite, slightly expanded proximally, distally blunt.

First maxilliped with coxal and basal endite partly fused; basal endite small, rounded, fringed with relatively few rather short simple and finely serrulate setae along median and distal margins; coxal endite very small, strongly convex, with few simple setae medially; exopod well developed, flagellum with about six plumose setae distally; caridean lobe small, rounded; epipod small, triangular, bilobed; palp simple, short, non-setose.

Second maxilliped with endopod normally developed; dactylar segment 3.0 times longer than broad, with coarsely serrulate, spiniform, and several long, curled, finely serrulate setae medially; distomedial lobe of propod slightly produced, rounded, with row of stout serrulate setae, ventrolateral margin without setae; carpal segment triangular, unarmed; meral segment without plumose setae; ischial and basal segment completely fused, medially excavate, without long plumose setae, basal part strongly angular produced medially; exopod long, with about six long plumose setae distally; coxal segment not medially produced, without setae, with proximally expanded epipod laterally.

Third maxilliped short, reaching with ultimate segment to distal margin of merocerite; ischiomerus not fused to basis, slightly broadened, about 2.5 times as long as broad with row of long simple setae along median margin, lateral margin without setae; basal segment medially straight, without setae; exopod well developed, reaching anterior margin of ischiomeral segment, with about five long plumose setae distally; coxa without medial process, with non-setose lateral plate, without arthrobranch; penultimate segment as long as central width, about 0.3 times length of ischiomeral segment, with few long robust setae medially; ultimate segment 1.5 times longer than penultimate segment, tapering distally, with few finely serrulate and coarsely serrulate setae along ventromedial, ventrolateral and distal margins.

First pereiopod rather stout, exceeding carpocerite with chela and part of carpus. Chela about 4.0 times longer than deep, subcylindrical, slightly compressed; fingers about as long as palm, with several rows of finely serrate setae, cutting edges entire, tips acute, hooked; cleaning organ on carpal-propodal joint present; carpus 1.2 times as long as chela, 4.4 times longer than distal width; merus 1.1 times length of carpus, 4.5 times longer than central width, slightly bowed; ischium about 0.6 times meral length, not expanded medially; basis and coxa normal, with few simple setae medially.

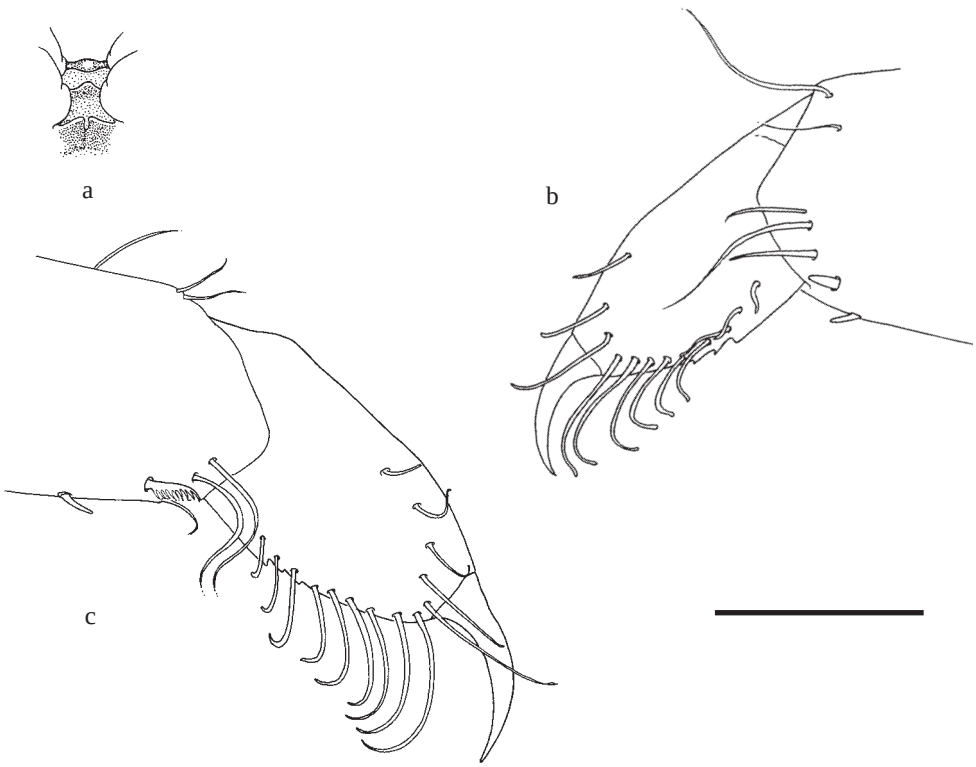

Fig. 247. *Odontonia simplicipes* (Bruce, 1996): female holotype, pocl. 1.33 mm, MNHN-Na 12844. a, second to fifth thoracic sternites; b, dactylus third pereiopod; c, dactylus fifth pereiopod. Scale: a = 1 mm; b, c = 0.15 mm.

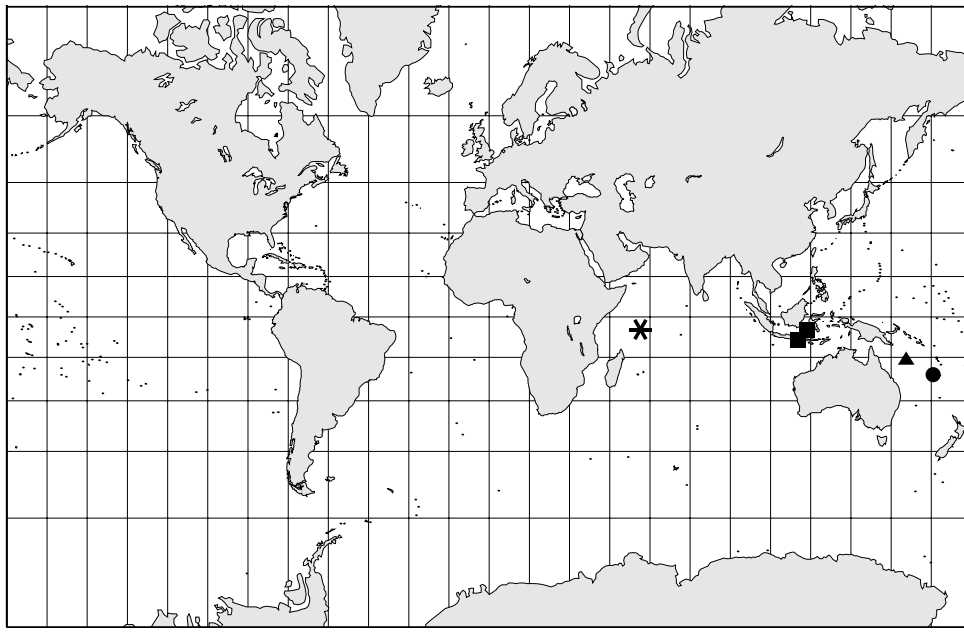

Fig. 248. Geographic distribution of *Odontonia compacta* (Bruce, 1996)(●), *Odontonia rufopunctata* spec. nov. (■), *Odontonia seychellensis* spec. nov. (✱), and *Odontonia simplicipes* (Bruce, 1996) (▲).

Second pereiopods similar is shape, subequal in size. Chela 1.15 times postorbital carapace length, palm compressed, about 3.0 times longer than deep, without carinae, smooth; dactylus 0.55 of palm length, 3.3 times longer than proximal depth, with one large triangular tooth at proximal third of cutting edge, distal part of cutting edge entire, tip strongly hooked; fixed finger about 1.7 times longer than deep, with two low, subacute teeth centrally, distal cutting edge entire, tip strongly hooked, median fossa for reception of dactylar tooth when fingers closed not developed; carpus about half of palm length, 2.5 times longer than distal width, feebly swollen centrally, unarmed; merus slightly longer than carpus, 2.0 times longer than central width, distomedially excavate; ischium slightly shorter than merus, 2.5 times longer than distal width, tapering proximally, without distomedian protuberance; basis and coxa normal.

Ambulatory pereiopods short, stout. Dactylus of third pereiopod with corpus compressed, about 1.9 times as long as its proximal width, with flexor margin convex, broadly rounded, with about three small proximal forwardly directed teeth, without accessory tooth, with few simple setae along dorsal margin, with row of simple short setae along flexor margin; unguis long and slender, acute, about 0.45 of corpus length, without terminal scales; propodus stout, compressed, about 3.0 times length of dactylus, about 4.0 times longer than deep, with minute lateral distoventral spinules and distal ventral spinule, with sparse simple setae; carpus about 0.55 of propodus length, unarmed; merus subequal to propodus length, 4.0 times longer than central depth, unarmed; ischium 0.6 of merus length, slightly tapering proximally; basis and coxa without special features. Fourth and fifth pereiopods similar.

Size.— The only female specimen known has a postorbital carapace length of 1.33 mm.

Colouration.— Not known.

Type.— Holotype: female MNHN-Na 12844 (pocl. 1.33 mm); Chesterfield Islands, Corail 2 stn. DW 163, 19°15.15'S 158°47.73'E; depth 71 m; 24.viii.1988; in *Polycarpa nigricans* Heller, 1878.

Distribution.— INDO-WEST PACIFIC: Chesterfield Islands (Bruce, 1996).

Host.— *Polycarpa nigricans* Heller, 1878 (cf. Bruce, 1996).

Remarks.— This species is closely related to *O. seychellensis*. For differences see under *O. seychellensis*.

8.7. *Bruceonia* gen. nov.

Definition.— Small sized shrimp of moderately depressed body form. Rostrum short, blunt, depressed; dorsally unarmed; dorsal carina absent; lateral carinae well developed; ventral margin without small subdistal tooth. Carapace pubescent; inferior orbital angles broadly rounded; orbit feebly developed; supraorbital, epigastric and hepatic spines absent; antennal spine blunt, rounded, not separated from the inferior orbital angle; anterolateral angle of branchiostegite rounded, not strongly produced.

Eye normal, with hemispherical cornea.

Antennula normal, ventromedial tooth on basal segment small; distolateral tooth of basal segment well developed, reaching beyond midlength of intermediate segment, anterior margin oblique, not extending beyond distolateral tooth; flagella strongly reduced.

Antenna with basicerite unarmed; scaphocerite well developed, with distolateral tooth strongly developed, more than 0.2 times length of scaphocerite.

Epistome unarmed. Corpus of paragnaths with two submedian, oblique non-setose carinae.

Second thoracic sternite with anterior margin broadly rounded, not produced.

Fourth thoracic sternite with medially developed partly fused lateral plates.

Fifth thoracic sternite with broad rectangular, medially blunt, partly fused lateral plates.

Mandible robust, without palp, molar process stout, incisor process simple, without row of denticles along medioventral border.

Maxillula with bilobed palp, lower lacinia small, slender with few simple setae.

Maxilla with simple palp; bilobed endite; scaphognathite broad; basal endite with many simple setae on upper and lower lacinia, upper lacinia broader than lower lacinia, almost fused; basal endite shorter than palp.

First maxilliped with slender palp, basal and coxal endites partly fused, with few short setae along median margin, not forming basket; exopod with well developed caridean lobe; flagellum broad, densely setose distally; epipod large, oval.

Second maxilliped with distinct angle in median margin of basis of endopod; exopod with flagellum well developed, plumose setae distally; epipod a small rounded, curled lobe; without podobranch.

Third maxilliped with ischiomerus of endopod partly fused to basis, as broad as penultimate segment; exopod well developed, with plumose setae distally; coxa

with oval, lateral plate, without median process, arthrobranch absent.

First pereiopods with chela simple.

Chelae of second pereiopods unequal in size, subequal in form; major and minor chelae with one proximal tooth on dactylus and two on fixed finger; fingers not gaping.

Ambulatory pereiopods stout, dactylus biunguiculate, without accessory teeth on flexor margin of corpus; flexor margin with dense pile of setae; unguis with distal scales.

Abdomen smooth; posterior margins of pleura rounded, posterolateral angle of sixth segment blunt or rounded.

Uropod with protopodite feebly acute distally, exopod with distolateral margin with mobile spinule, feebly armed.

Telson with two pairs of large submarginal dorsal spines, three pairs of posterior spines.

Type species.— *Pontonia ardeae* Bruce, 1981, by present designation.

Etymology.— The name is composed from and in recognision of A.J. Bruce, whoms efforts contributed enormously to the knowledge of especially the Pontoninae, and the last part of the genus name *Pontonia*, from which it was split off. Gender: feminine.

Distribution.— See under *Bruceonia ardeae* (Bruce, 1981).

Host.— See under *Bruceonia ardeae* (Bruce, 1981).

8.7.1. *Bruceonia ardeae* (Bruce, 1981) comb. nov.
(figs. 249-257)

Pontonia ardeae Bruce, 1980: 48 (nomen nudum); Bruce, 1981b: 22 (nomen nudum).

Pontonia ardeae Bruce, 1981a: 113, figs. 1-8; Bruce, 1981b: 22; Bruce, 1983: 211; Bruce, 1986: 167, colour-fig. 8; Bruce, 1990a; 17, 19; Müller, 1993: 121; Chace & Bruce, 1993: 61; Bruce, 1994: 126; Fransen, 1994b: 111.

Material.— **INDO-WEST PACIFIC**: **Australia**.— RMNH D 32303: paratypes; 1 male, pocl. 2.6 mm; 1 ovigerous female, pocl. 4.0 mm; Queensland, Wistari Reef, Heron Island, 23°27.5'S 151°55.0'E; depth 18 m; 3.v.1979; from *Chama pacifica* Broderip, 1835; leg. L. Owens & L. Thompson Heron Island Research Station, stn. 78.— USNM 181656: paratypes; 1 male, pocl. 2.7 mm; 1 ovigerous female, pocl. 5.0 mm; same locality data as RMNH D 32303.

Description.— Body moderately depressed. Carapace smooth, covered with scattered short simple setae. Rostrum short, stout, slightly depressed, broadened at base, toothless, slimmer and less truncate in males than in females; distal end rather swollen, truncate in dorsal view, almost reaching level or just overreaching level of anterior margin of first segment of antennular peduncle (in males only); without dorsal, nor lateral carinae, with ventral margin convex. Inferior orbital angle produced, rather acute in lateral view. Antennal spine reduced, blunt, rounded, not separated from anterior orbital angle by notch. Anterolateral margin straight, slightly produced, anterolateral angle bluntly rounded.

Abdomen smooth; sixth segment about 1.5 times longer than fifth, about 1.4 times longer than wide, posteroventral and posterolateral angles small and bluntly rounded.

Telson almost twice as long as sixth abdominal segment, and about 2.25 times as long as proximal width; posterior border without median process; two pairs of submarginal dorsal spines at 0.30 and 0.75 of telson length; distal and proximal pairs of spines of equal length, about 0.07 of telson length; posterior margin with three pairs of spines, lateral spines small and marginal, about 1/3 of length of intermediate spines; submedian spines slightly longer than intermediate spines.

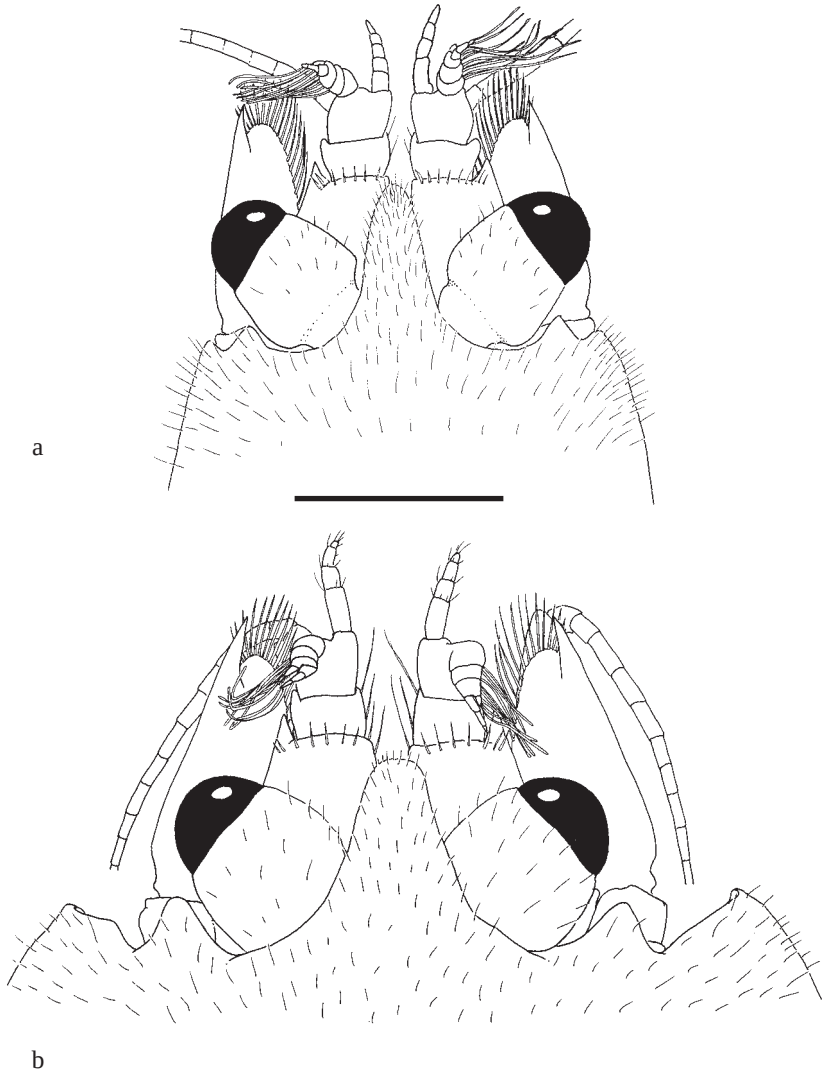

Fig. 249. *Bruceonia ardeae* (Bruce, 1981): male, pocl. 2.6 mm (fig. a); ovigerous female, pocl. 4.0 mm (fig. b); RMNH D 32303. a, anterior appendages, dorsal view, male; b, anterior appendages, dorsal view, female. Scale = 1 mm.

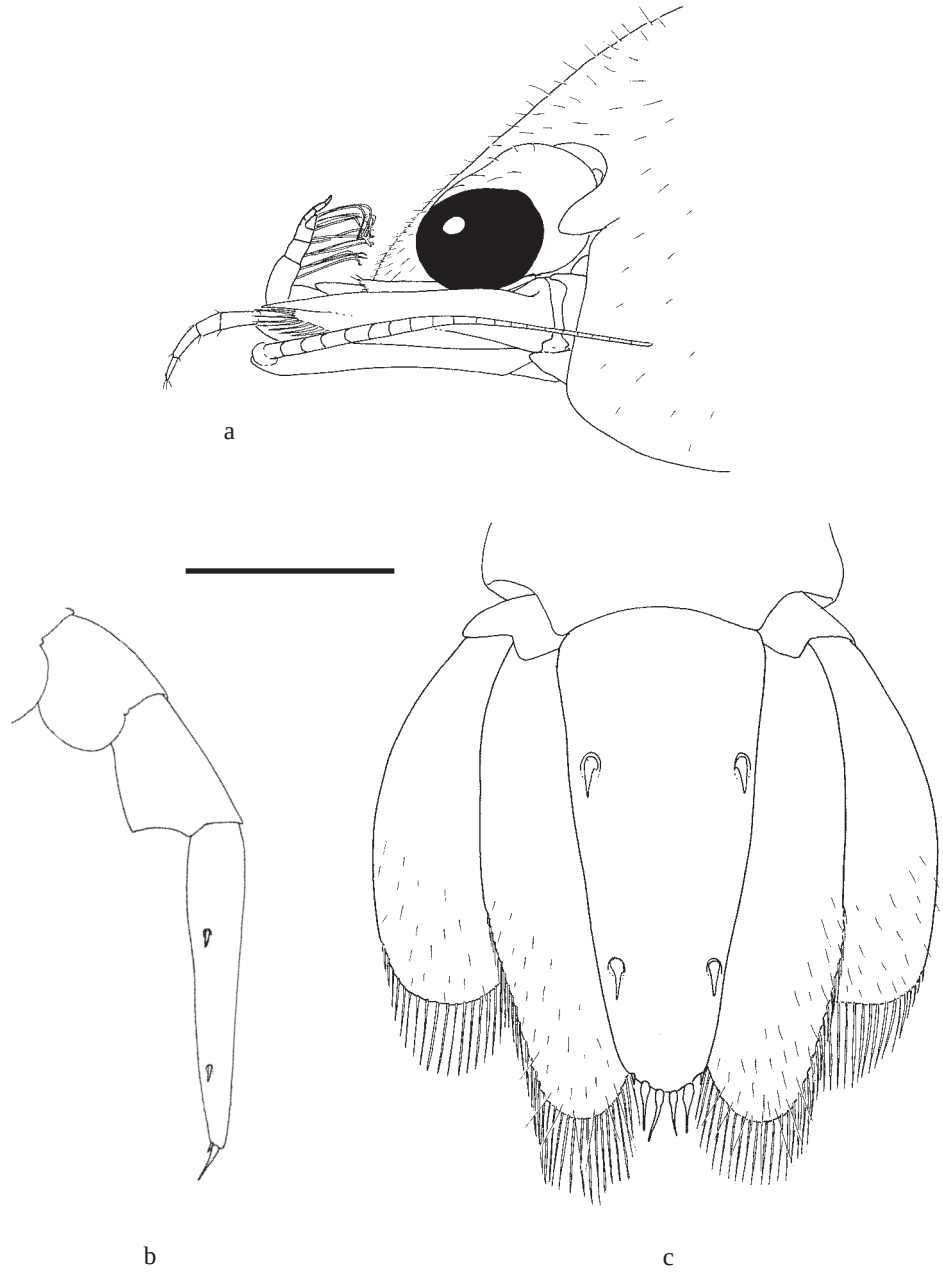

Fig. 250. *Bruceonia ardeae* (Bruce, 1981): male, pocl. 2.6 mm (fig. b); ovigerous female, pocl. 4.0 mm (figs. a, c); RMNH D 32303. a, anterior appendages, lateral view; b, distal part abdomen, lateral view; c, telson and uropods, dorsal view. Scale: a, c = 1 mm; b = 2 mm.

Eyestalk short, about 1.2 times as long as broad, twice as broad as diameter of hemispherical cornea.

Antennula with peduncle and flagella short. Basal segment about 1.2 times as long as proximal width, with strongly produced distolateral tooth almost reaching distal margin of intermediate segment, anterior margin not developed, oblique; ventromedial tooth, small, acute, submarginal; stylocerite short, reaching halfway basal segment, with moderately acute tip, lateral margin with about 5 plumose setae. Intermediate segment short, slightly broader than long. Distal segment about as broad as long. Upper flagellum short, biramous, with three proximal segments fused; short free ramus with one segment; longer free ramus with two or three segments. Lower flagellum short with four to six segments.

Antenna with basicerite short, laterally unarmed, with medial antennal gland tubercle large and acute; ischiocerite and merocerite normal, rather short; carpocerite extending just beyond distal-lateral tooth of scaphocerite, slender, about 5.5-6.0 times longer than distal width; flagellum short, slender, about 0.5 of postorbital carapace length; scaphocerite with lamina twice as long as wide, anterior margin narrow, rounded, lateral margin broadly convex; distolateral tooth robust about 0.23 length of lamina (incl. distolateral tooth), overreaching lamina with more than half its length; incision between distolateral tooth and lamina moderately deep.

Epistome with blunt anterior median carina; labrum oval.

Paragnath with alae formed by large transverse rectangular distal lobes and small rounded triangular ventromesial lobes; corpus short, rather broad, with two oblique carinae and median groove, carinae without setae.

Second thoracic sternite with shallow round tubercle, without setae between second maxillipeds.

Third thoracic sternite rather broad with shallow lateral carinae posteromedial of third maxillipeds.

Fourth thoracic sternite with shallow lateral, medially notched carinae, posteromedian between first pereiopods; no ridge between first pereiopods.

Fifth thoracic sternite with blunt shallow lateral plates posteromedian of second pereiopods, with broad V-shaped notch in between.

Sixth to eighth thoracic sternites unarmed, broad.

Mandible with incisor process with seven or eight small acute distal teeth, no row of small denticles along ventromedial margin; molar process moderately robust with four blunt distal teeth, some fringed with setal brushes.

Maxillula with upper and lower lacinia rather small, with relatively few spines and setae in distal part; upper lacinia rectangular with two rows of about 12 stout simple distal spines; ventral lacinia slender, distally acute, with relatively few long slender simple setae; palp feebly bilobed, larger lobe with or without one slender medial seta, with small ventral tubercle with single short recurved simple seta.

Maxilla with basal endite well developed, indistinctly bilobate; distal lobe with about eight to ten long simple distal setae, smaller proximal lobe with six to eight long simple setae; coxal endite obsolete, median margin convex, non-setose; scaphognathite large, 3.0-3.2 times longer than wide, posterior lobe large, about 2.0 times longer than wide, anterior lobe 1.3 times longer than proximal width; palp slender, just overreaching distal lobe of basal endite, with row of few plumose setae along lateral margin;

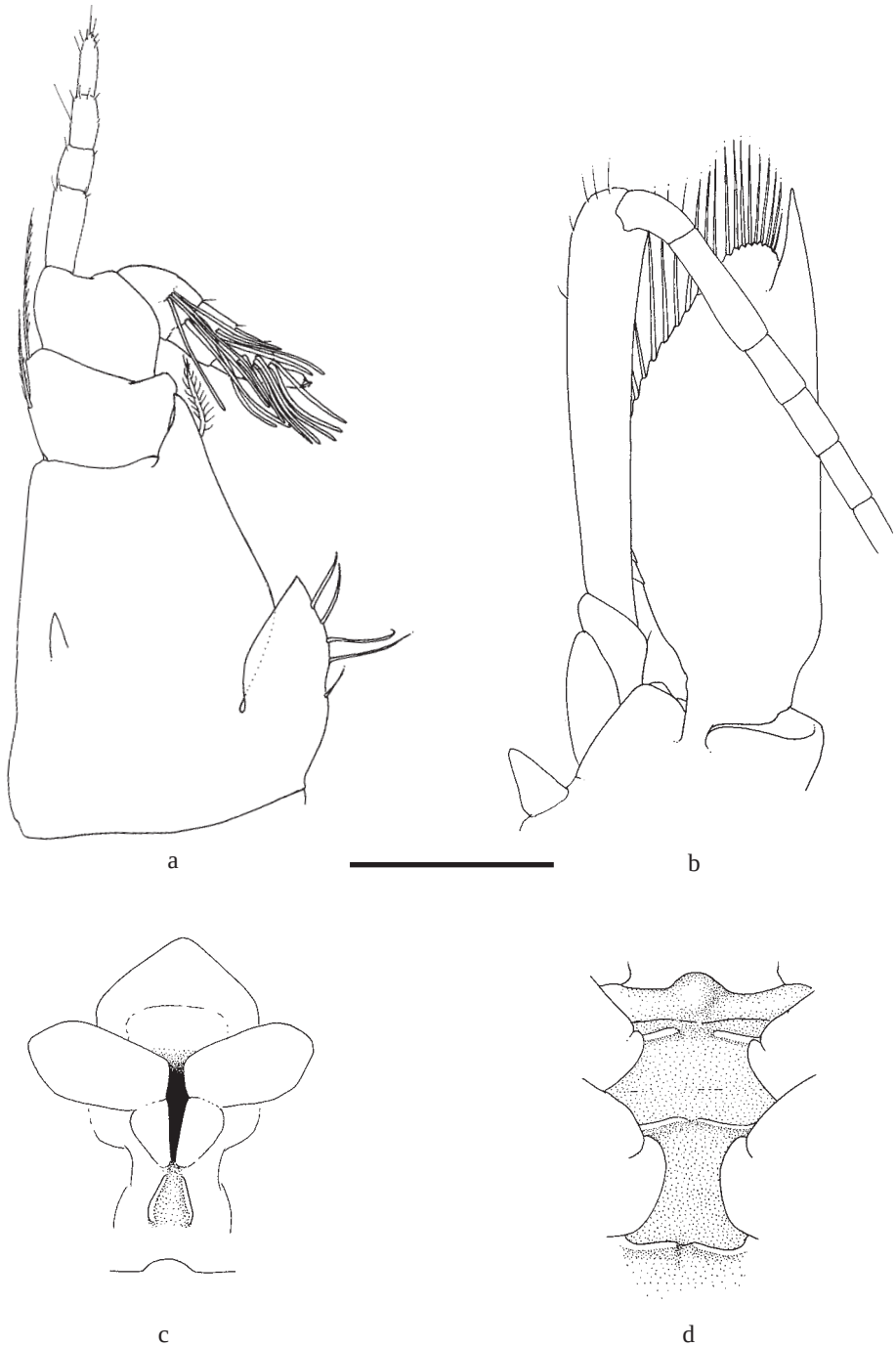

Fig. 251. *Bruceonia ardeae* (Bruce, 1981): ovigerous female, pocl. 4.0 mm, RMNH D 32303. a, antennula, ventral view; b, antenna, ventral view; c, paragnath, ventral view; d, second to fifth thoracic sternites. Scale: a, b = 0.6 mm; c, d = 1 mm.

palp simple, with row of plumose setae along proximal part of lateral margin.

First maxilliped with coxal endite small, slightly produced, with few setae, partly fused to basal endite; basal endite broad and rounded, with relatively few scattered simple setae along median and distal margins; exopod well developed, flagellum with six or seven long plumose setae distally; caridean lobe distally well developed, narrow; palp simple, short, not overreaching basal endite, non-setose; epipod large, triangular, distinctly bilobed.

Second maxilliped with typical endopod; dactylar segment about 3.5 times longer than broad, fringed with coarsely serrulate spiniform, and long curled finely serrulate setae medially; propodal segment with row of long spines and simple and finely serrulate setae along protruding distomedian margin, without setae along ventrolateral margin; carpal segment short, triangular, unarmed; meral segment without plumose setae; basal and ischial segment completely fused, without plumose setae, moderate medial excavation in ischial part, bluntly rounded proximal medial angle in basal part; exopod normal, with about six or seven long plumose setae distally; coxal segment slightly produced, without or with few simple setae, with trapezoidal, proximally expanded, epipod laterally.

Third maxilliped with rather slender ischiomerus almost completely fused to basis, but with distinct suture, slightly more than twice as long as broad, not tapering distally, somewhat flattened, with scattered long simple setae along median margin, and very few on ventral surface, lateral margin with few short setae; basal segment medially produced, broadly rounded, with few long simple setae along medial margin; exopod well developed, slightly longer than ischiomeral segment, with about ten long plumose setae distally; coxal segment without medial process, with large lateral plate with few short setae, without arthrobranch; ultimate and penultimate segments of equal length, penultimate segment about 1.7 times as long as broad, subcylindrical, with groups of long, finely serrulate setae ventromedially; terminal segment tapering distally, with groups of long coarsely serrulate setae distally.

First pereiopod moderately slender in females, shorter and more compact in males, extending anteriorly beyond carpocerite by half length of carpus and chela, beset with many short simple setae. Chela about 3.3 times longer than deep, slightly compressed; fingers slightly longer than palm in females, about as long as palm in males, with entire cutting edges, with groups of long, serrulate setae in distal part, tips acute; cleaning organ absent on carpal-propodal joint; carpus 1.4-1.5 times longer than chela, 4.3-5.0 times longer than distal width in females, 1.1 times longer than chela and about 3.3 times longer than distal width in males, tapering proximally, unarmed; merus about as long as carpus in females, slightly longer than carpus in males, about five times longer than central width, slightly curved; ischium 0.4 times merus length, medially slightly expanded with long simple setae medially; basis as long as ischium, slender; coxa with rounded ventral lobe with long simple setae.

Second pereiopods small, robust, subequal and similar, beset with many short simple setae. Chelae about 0.75 of postorbital carapace length in females, about as long as postorbital carapace length in males, moderately compressed, subcylindrical, without carinate or serrate margins; dactylus about 0.6 times palm length, about 3.5 times longer than deep, distal cutting edge straight, entire, small acute tooth just distal

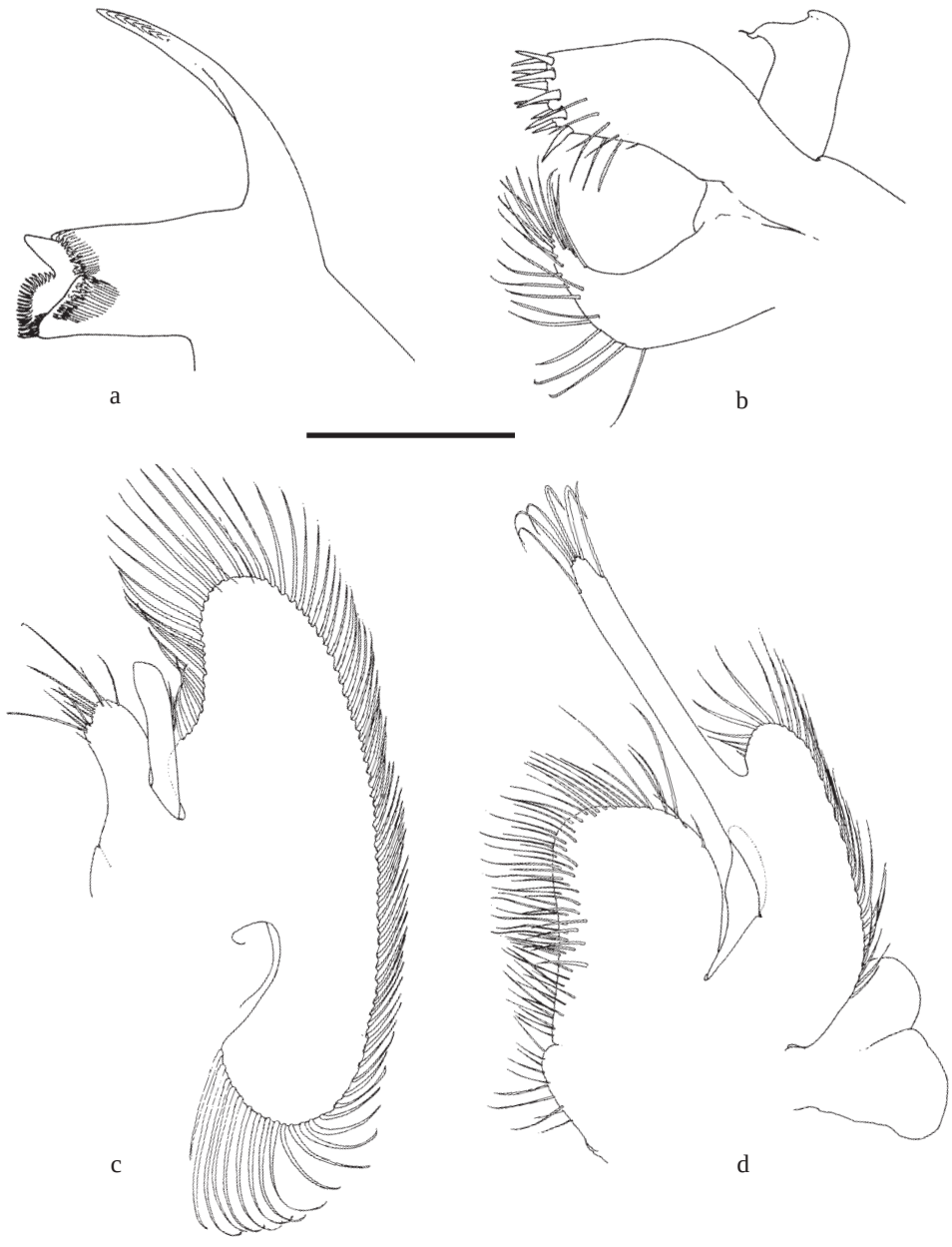

Fig. 252. *Bruceonia ardeae* (Bruce, 1981): ovigerous female, pocl. 4.0 mm, RMNH D 32303. a, mandible, ventral view; b, maxillula, ventral view; c, maxilla, ventral view; d, first maxilliped, ventral view. Scale: a, b = 0.6 mm; c, d = 0.75 mm.

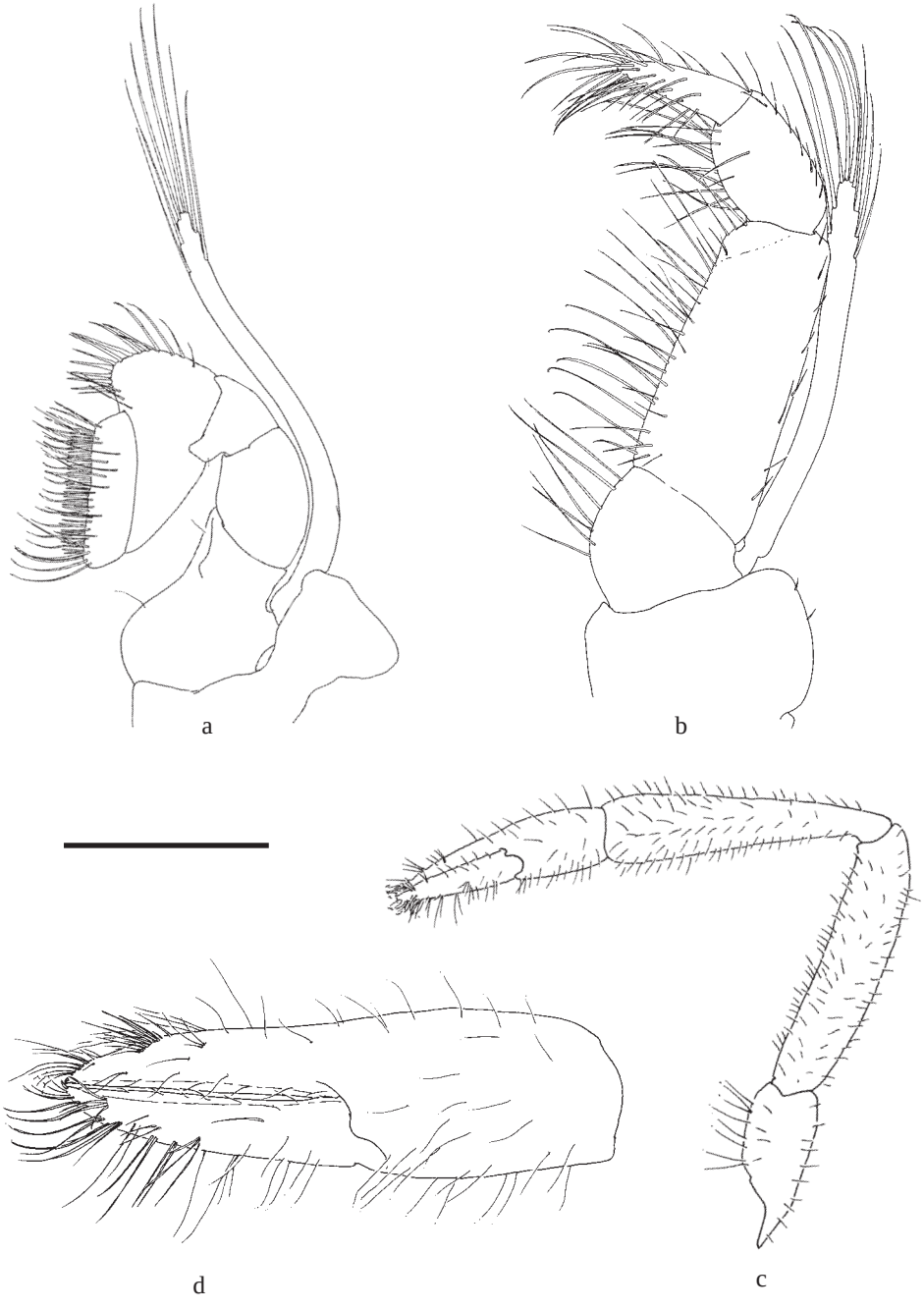

Fig. 253. *Bruceonia ardeae* (Bruce, 1981): ovigerous female, pocl. 4.0 mm, RMNH D 32303. a, second maxilliped, ventral view; b, third maxilliped, ventral view; c, first pereiopod; d, detail chela first pereiopod. Scale: a, b = 0.75 mm; c = 1.5 mm; d = 0.6 mm.

of midpoint (sometimes missing), separated by notch from large triangular tooth just proximal of midpoint, tip of dactylus strongly hooked; fixed finger about 3.5 times longer than deep, distal cutting edge straight, entire, small acute tooth at midpoint, separated by notch from broad tooth with row of about small acute denticles proximally, median fossa for reception of dactylar tooth when fingers closed not developed, tip strongly hooked; carpus about as long as palm in females, slightly shorter than palm in males, slightly tapering proximally, about 2.7 times longer than distal width; merus 0.7 times carpus length, 2.2 times longer than central width, distomedi-

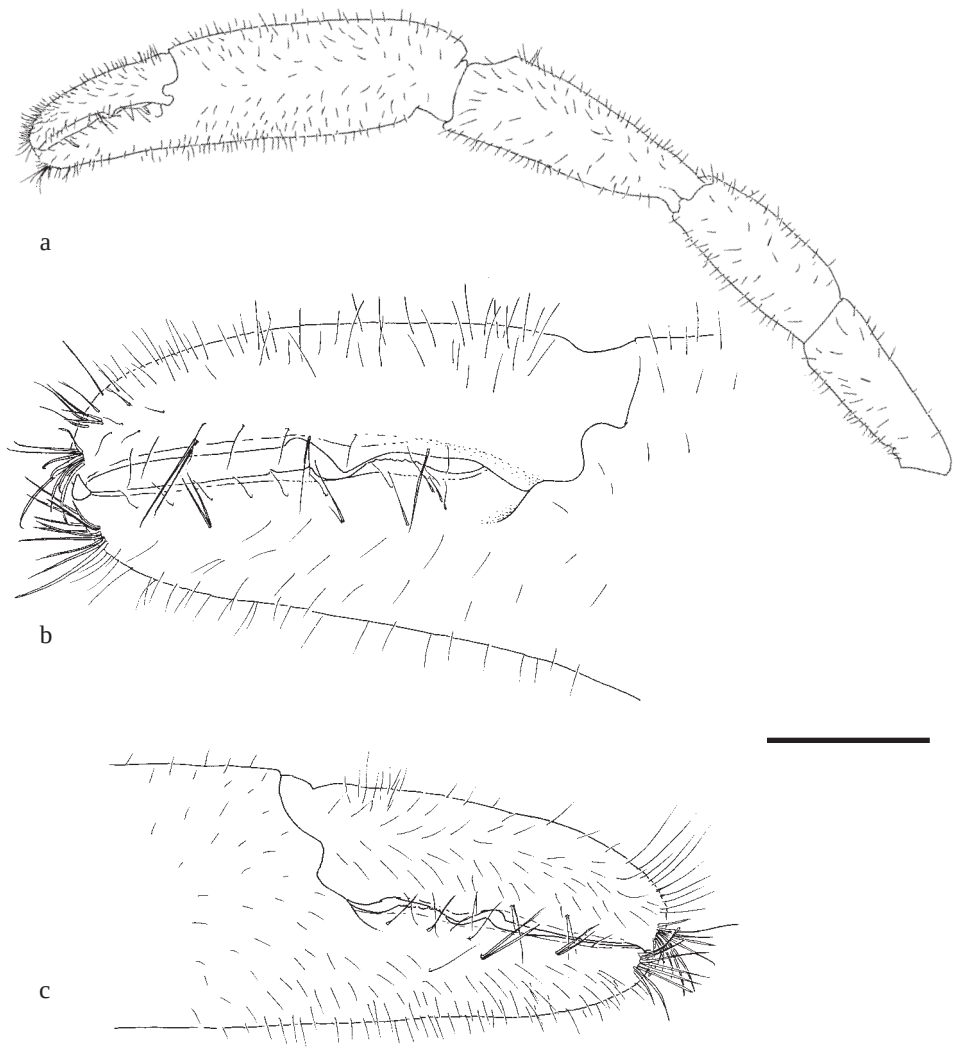

Fig. 254. *Bruceonia ardeae* (Bruce, 1981): ovigerous female, pocl. 4.0 mm (figs. a, b); male, pocl. 2.6 mm (fig. c), RMNH D 32303. a, left second pereiopod; b, idem, left chela; c, right second pereiopod, chela. Scale: a = 1.5 mm; b, c = 0.6 mm.

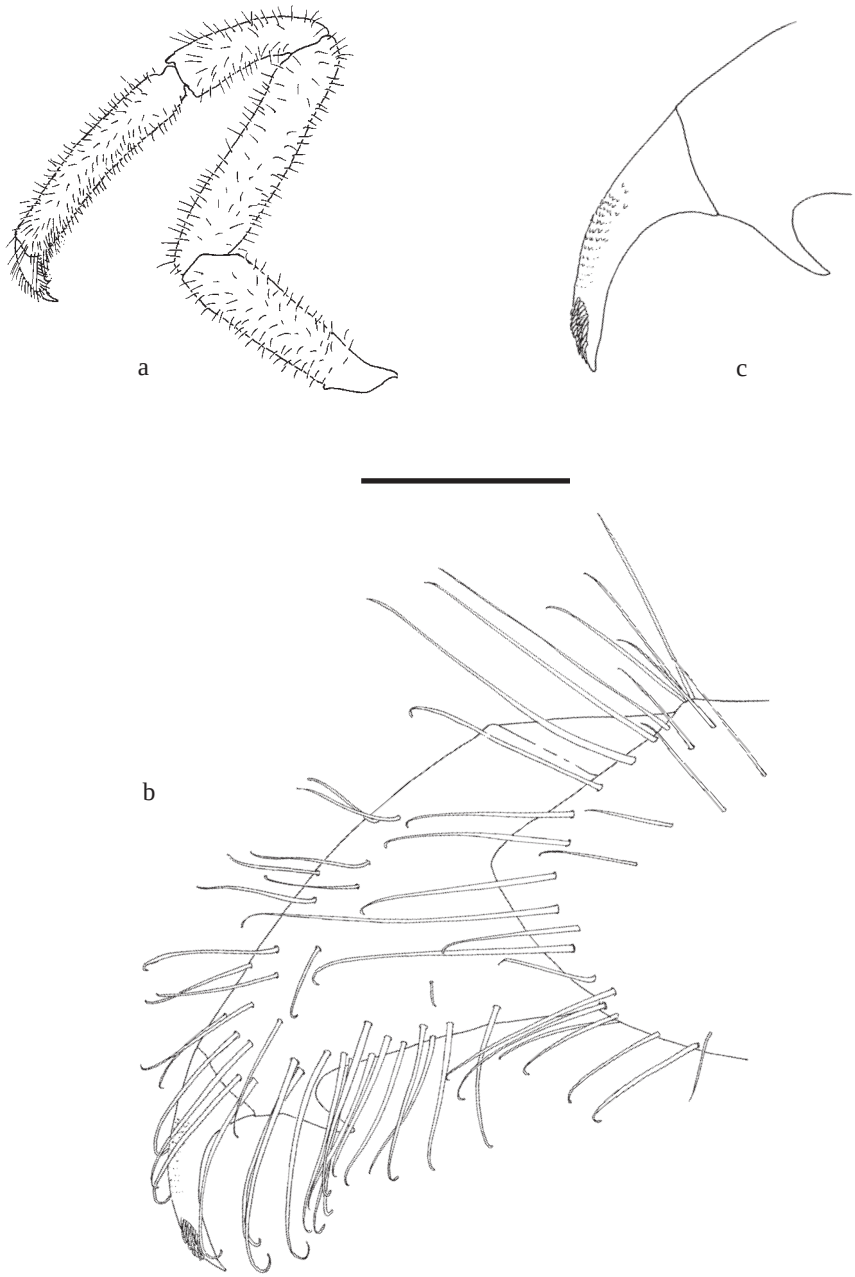

Fig. 255. *Bruceonia ardeae* (Bruce, 1981): ovigerous female, pocl. 4.0 mm, RMNH D 32303. a, third pereiopod; b, dactylus third pereiopod; c, idem, detail unguis. Scale: a = 1.5 mm; b = 0.19 mm; c = 0.15 mm.

ally excavate; ischium as long as merus, somewhat tapering proximally; basis and coxa without special features.

Ambulatory pereiopods moderately slender, densely covered with short simple setae. Dactylus of third pereiopod with corpus moderately compressed, about 2.5 times longer than proximal width, densely covered with many simple setae, with accessory tooth acute, recurved, subterminal, ventral margin entire; unguis robust, about 0.5 times corpus length, strongly curved, acute, with patch of strong distodorsal scales and dorsomedial ridges of indistinct spinules; propodus about 4.0 times longer than dactylus, 5.7 times longer than proximal width, without spines on flexor margin; carpus 0.66 of propodus length, 2.8 times longer than distal width, slightly tapering proximally, with indistinct distal lobe, unarmed; merus slightly longer than propodus, 4.0 times longer than central width, slightly compressed; ischium about 0.85 of merus length, 3.8 times longer than distal width, slightly tapering proximally; basis and coxa without special features. Fourth and fifth pereiopods similar. Dactylus of fifth pereiopod longer and stouter than that of third. Propodus of fourth shorter that that of third,

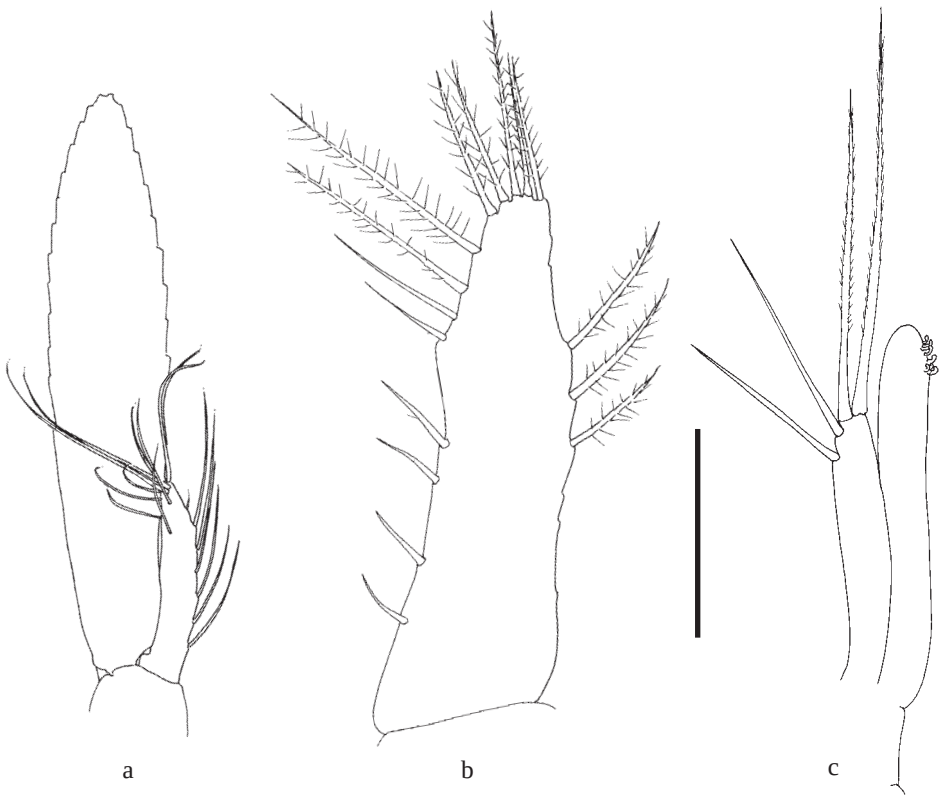

Fig. 256. *Bruceonia ardeae* (Bruce, 1981): male, pocl. 2.6 mm (figs. b, c); ovigerous female, pocl. 4.0 mm (fig. a); RMNH D 32303. a, endopod female first pleopod; b, endopod male first pleopod; c, appendix interna and appendix masculina on second male pleopod. Scale: a = 0.75 mm; b, c = 0.19 mm.

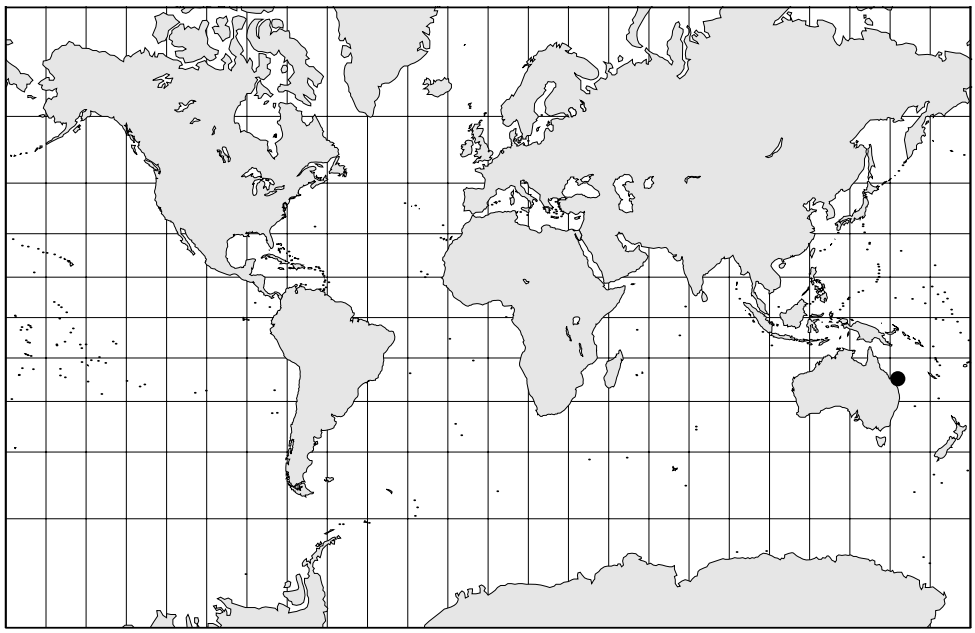

Fig. 257. Geographic distribution of *Bruceonia ardeae* (Bruce, 1981).

propodus of fifth longer than that of fourth. Merus of fourth pereiopod subequal to third, merus of fifth longer than that of fourth.

First pleopod of female with slender endopod, about third of exopod length, with about ten long distal setae when ovigerous, with row of long plumose setae on lateral margin.

Male first pleopod with small endopod, about four times longer than proximal width, tapering distally; median margin slightly concave with four short simple setae, with moderately long plumose setae in distal part and along lateral margin. Endopod of second pereiopod with short appendix masculina, equal to about 0.6-0.7 times length of appendix interna, with one or two long setulose terminal setae, a few simple long subdistal setae.

Uropods normal, with short stout unarmed protopodite; exopod broad, about twice as long as wide, with convex lateral margin lacking distolateral spine and tooth; endopod 1.25 length of exopod, about 2.6 times longer than wide, extending beyond telson.

Number of eggs about 400; embryo on point of hatching about 0.7 mm long.

Size.— This is a small sized species. The maximum pocl. is 5.2 mm in adult females, 2.7 mm in adult males. The minimal pocl. of ovigerous females is 4.0 mm.

Colouration (Bruce, 1981: 122-123, fig. 8; Bruce, 1986: 167, colourfig. 8).— General appearance of the ovigerous female is bright orange due to large ovary filling of most of the thorax and abdomen, and the mass of bright orange ova in marsupial chamber. The body and appendages are heavily spotted with scattered, variably sized diffuse white dots. The males are similarly but less heavily dotted.

Type.— Holotype: ovigerous female, pocl. 5.2 mm (Australian Museum P29542); Australia, Queensland, Heron Island, Wistari reef, stn. 78, 23°27.5'S 151°55.0'E;

depth 18 m; 3.v.1979; from *Chama pacifica* Broderip; leg. L. Owen, L. Thompson.

Distribution.— INDO-WEST PACIFIC: only known from the type-locality.

Host.— *Chama pacifica* Broderip, 1835 (Bivalvia, Chamidae).

Remarks.— Rumphius (1705: 26 (Boek I, Hooftdeel 23)) described a small shrimp living inside the bivalve *Tapes litteratus* (Linnaeus, 1758): "*In de Letterschulpen heb ik, Oogstmaand 1638, tweederlei Wagtertjes gevonden, de eerste was een Garneeltje ter lengte van eenen vingernagel, hoog oranje, geel en half doorschynend, met dunne witte pootjes*." In translation: "In the Lettered Venus I found, harvest-month 1638, two kinds of watchman, the first was a small shrimp with the length of a fingernail, bright orange, yellow and semi-translucent, with slender white legs". The colour description of Rumphius matches the one of the female *Bruceonia ardea*e. This together with the small bivalve host makes it plausible that Rumphius here describes *Bruceonia ardeae*. Bruce (1994) suggested that the Rumphius shrimp might be a representative of a new genus, or a species of *Neoanchistus*, which is at present the only genus known to be associated with a burrowing lamellibranch.

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* not seen

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Plate 1. *Pontonia manningi* Fransen, 2000. Ovigerous female, pocl. 9.6 mm, RMNH D 48667: Cape Verde Islands, São Tiago, Tarreffal; in *Spondylus senegalensis* Schreibers, 1793, photographed by P. Wirtz.

Plate 2. *Pontonia mexicana* Guérin, 1856. Male, Miami, Florida, U.S.A.

Plate 3. *Pontonia mexicana* Guérin, 1856. Female, Miami, Florida, U.S.A.

Plate 4. *Pontonia pilosa* spec. nov. Ovigerous female holotype, pocl. 4.3 mm, RMNH D 48677: Cape Verde Islands, Sao Tiago Islands, Tarrafal; in *Pseudochama radians* (Lamarck, 1819); photographed by P. Wirtz.

Plate 5. *Pontonia pinnophylax* (Otto, 1821). Male, pocl. 8.4 mm, RMNH D 42608; sta. CANCAP 7.D11, Cape Verde Islands, São Nicolau, SE coast, 16°34'N 24°17'W.

Plate 6. *Pontonia pinnophylax* (Otto, 1821). Female, pocl. 9.5 mm, RMNH D 42608; sta. CANCAP 7.D11, São Nicolau, SE coast, 16°34'N 24°17'W.

Plate 7. *Ascidonia flavomaculata* (Heller, 1864), dorsal aspect. Greece, photographed by C. d'Udekem d'Acoz, 1993.

Plate 8. *Ascidonia flavomaculata* (Heller, 1864), lateral aspect. Greece, photographed by C. d'Udekem d'Acoz, 1993.

Plate 9. *Ascidonia quasipusilla* (Chace, 1972). Ovigerous female, pocl. 5.8 mm, RMNH D 45620, sta. MAU.122, Mauritania, off Banc d'Arguin.

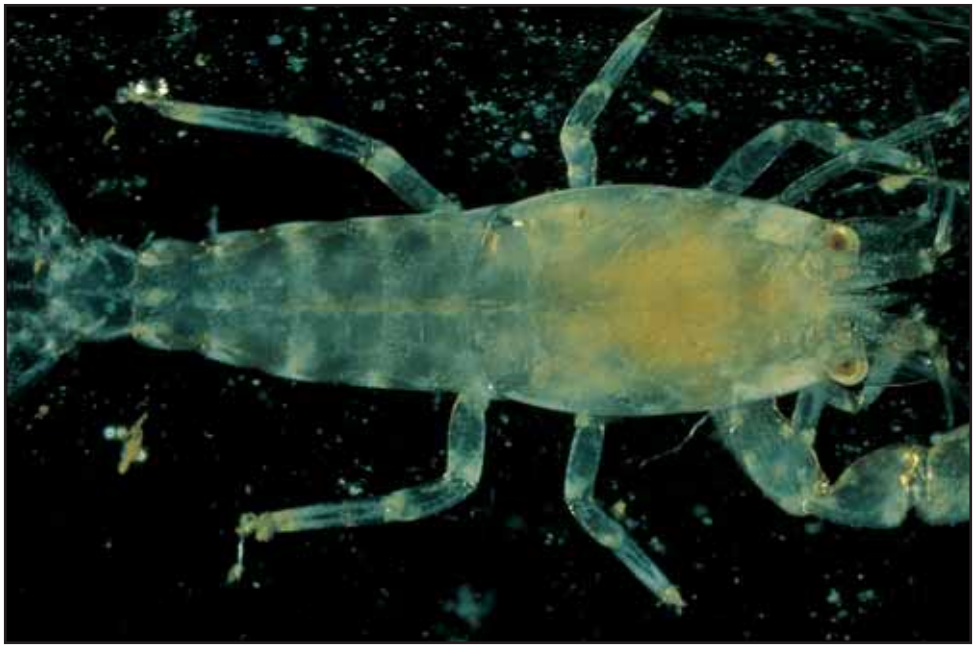

Plate 10. *Ascidonia quasipusilla* (Chace, 1972). Male, pocl. 3.2 mm, RMNH D 45620, sta. MAU.122, Mauritania, off Banc d'Arguin.

Plate 11. *Dactylonia ascidicola* (Borradaile, 1898). Male, pocl. 3.3 mm, and ovigerous female, pocl. 4.7 mm, on *Ascidia* spec., RMNH D 46789, SUL.17, Indonesia, N Sulawesi, Selat Lembeh, between Tanjungnanas and Teluk Kungkungan.

Plate 12. *Dactylonia ascidicola* (Borradaile, 1898). Male, pocl. 2.3 mm, RMNH D 46785, SW Sulawesi, Spermonde archipelago, Samelona.

Plate 13. A, *Dactylonia holthuisi* spec. nov., RMNH D 47586; B, C, *Dactylonia okai* (Kemp, 1922),. RMNH D 47587. MAL.24, Indonesia, Ambon, S coast, Seri bay.

Plate 14. *Dactylonia okai* (Kemp, 1922). Ovigerous female, pocl. 2.0 mm, RMNH D 48680: Sta. BAL. 16, Indonesia, Bali, SE-side Palau Serangan.

Plate 15. *Odontonia katoi* (Kubo, 1940). Ovigerous female, pocl. 3.4 mm, RMNH D 42573, sta. RBE.03, Indonesia, Moluccas, Ambon, Leitimur, Ambon Bay, outer bay, Batumerah (near Ambon city), photo M. Lavaleye.

Plate 16. *Odontonia katoi* (Kubo, 1940). Ovigerous female, pocl. 3.2 mm, RMNH D 48689: Sta. BAL.20: Indonesia, Bali,Tulamben beach, 'Coral Garden' off hotel area, on *Polycarpa aurita.*

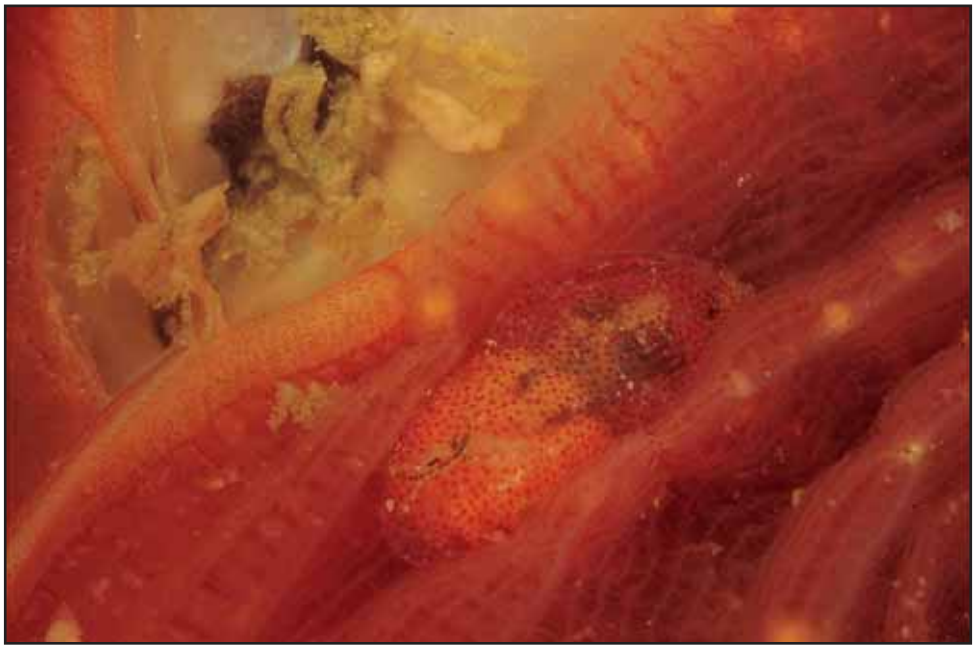

Plate 17. *Odontonia rufopunctata* spec. nov. Ovigerous female holotype, pocl. 4.0 mm, RMNH D 46702, Indonesia, SW Sulawesi, Spermonde Archipelago, Kuningareng Keke; in ascidian.

Plate 18. *Odontonia seychellensis* spec. nov. Non-ovigerous female, pocl. 3.5 mm, RMNH D 42558, NIOP-E, Sta. SEY.723, Seychelles, Bird Island, off N coast.

Plate 19. *Odontonia sibogae* (Bruce, 1972). Non-ovigerous female, pocl. 2.0 mm, RMNH D 46698, SW Sulawesi, Spermonde Archipelago, Kudingareng Keke.

11. Taxonomic Index

(Genera in bold, higher taxa in small caps)