

A world-wide review of species of the deep-water crangonid genus *Parapontophilus* Christoffersen, 1988 (Crustacea, Decapoda, Caridea), with descriptions of ten new species

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ABSTRACT

A review of species of the genus *Parapontophilus* Christoffersen, 1988 (Decapoda, Caridea, Crangonidae) from the world oceans is presented. This study is based on the large collection obtained during French expeditions in the eastern Atlantic, western Indian, and tropical western and southern Pacific oceans, and on additional material from various museums and institutions in the world. Eighteen species, including ten new species, are divided in two informal species groups, *P. gracilis* (Smith, 1882) group and *P. modumanuensis* (Rathbun, 1906) group. The first group contains 11 species: *P. gracilis* (type species of the genus), *P. abyssi* (Smith, 1884), *P. junceus* (Bate, 1888), *P. profundus* (Bate, 1888), *P. occidentalis* (Faxon, 1893), *P. talismani* (Crosnier & Forest, 1973), *P. cornutus* n. sp., *P. cyrton* n. sp., *P. difficilis* n. sp., *P. geminus* n. sp. and *P. longirostris* n. sp. The second group contains seven species: *P. modumanuensis* (Rathbun, 1906), *P. demani* (Chace, 1984), *P. caledonicus* n. sp., *P. juxta* n. sp., *P. psyllus* n. sp., *P. sibogae* n. sp. and *P. stenorhinus* n. sp. Six taxa originally described as full species by their authors and occasionally treated as subspecies, viz. *P. gracilis*, *P. abyssi*, *P. junceus*, *P. profundus*, *P. occidentalis*, and *P. talismani*, are here maintained as full species because of the existence of morphological differences and of the partial overlap of geographical or bathymetrical ranges. All species are diagnosed or rediagnosed, and illustrated. Synonymies of *Pontophilus challengeri* Ortmann, 1893 with *Parapontophilus abyssi* and of *Pontophilus occidentalis* var. *indica* de Man, 1918 with *Parapontophilus junceus* were confirmed. A key to aid in the identification of all *Parapontophilus* species is given, although it should be used with caution because of intraspecific variations exhibited by many of the species. Bathymetrical and geographical distributions of species are also summarized. All but *P. sibogae* n. sp. are exclusively found at more than 200 m depth, and particularly three species, *P. abyssi*, *P. occidentalis*, and *P. talismani*, occur at abyssal depths exceeding 3000 m. *Parapontophilus sibogae* inhabits shallow water, recorded at depth of 11 m in the type locality. Two species, *P. gracilis* and *P. talismani*, appear restricted to the Atlantic Ocean, although widely distributed there. Three species, *P. abyssi*, *P. longirostris* n. sp., and *P. juxta* n. sp. occur in the Indian Ocean; *P. abyssi* is also widely distributed in the Atlantic and *P. longirostris* extends to the central Pacific. *Parapontophilus occidentalis* appears restricted to the eastern Pacific. Other species are distributed in the range of the western Pacific to French Polynesia.

KEY WORDS

Crustacea,
Decapoda,
Caridea,
Crangonidae,
Parapontophilus,
taxonomic review,
new species.

RÉSUMÉ

Révision mondiale des espèces du genre d'eaux profondes Parapontophilus Christoffersen, 1988 (Crustacea, Decapoda, Caridea, Crangonidae), et description de dix nouvelles espèces.

Une révision mondiale des espèces du genre *Parapontophilus* Christoffersen, 1988 (Decapoda, Caridea, Crangonidae) est présentée. Cette étude est basée sur la grande collection rassemblée par les campagnes françaises dans l'Atlantique oriental, l'océan Indien occidental et le Sud-Ouest du Pacifique, ainsi que sur d'autres récoltes provenant de divers muséums et institutions dans le monde. Dix-huit espèces, comprenant dix espèces nouvelles, sont considérées; elles sont classées en deux groupes: le groupe *P. gracilis* (Smith, 1882) et le groupe *P. modumanuensis* (Rathbun, 1906). Le premier comprend 11 espèces: *P. gracilis* (espèce type du genre), *P. abyssi* (Smith, 1884), *P. junceus* (Bate, 1888), *P. profundus* (Bate, 1888), *P. occidentalis* (Faxon, 1893), *P. talismani* (Crosnier & Forest, 1973), *P. cornutus* n. sp., *P. cyrton* n. sp., *P. difficilis* n. sp., *P. geminus* n. sp., et *P. longirostris* n. sp. Le second regroupe sept espèces: *P. modumanuensis* (Rathbun, 1906), *P. demani* (Chace, 1984), *P. caledonicus* n. sp., *P. juxta* n. sp., *P. psyllus* n. sp., *P. sibogae* n. sp. et *P. stenorhinus* n. sp. Six taxons décrits comme espèces par leurs auteurs et occasionnellement traités comme sous-espèces de *P. gracilis*, à savoir: *P. gracilis*, *P. abyssi*, *P. junceus*, *P. profundus*, *P. occidentalis*, et *P. talismani*, sont ici maintenus au rang d'espèce du fait de l'existence de différences morphologiques et du recouvrement partiel de leurs répartitions géographiques ou bathymétriques. Toutes les espèces sont décrites et illustrées. Les synonymies de *Pontophilus challengeri* Ortmann, 1893 avec *Parapontophilus abyssi* et de *Pontophilus occidentalis* var. *indica* de Man, 1918 avec *Parapontophilus junceus* sont confirmées. Une clé d'identification pour toutes les espèces de *Parapontophilus* est proposée, mais elle devra être utilisée avec précaution à cause des variations intraspécifiques présentées par de nombreuses espèces. Les répartitions bathymétriques et géographiques sont également rassemblées. Toutes les espèces à l'exception de *P. sibogae* n. sp. se trouvent exclusivement à des profondeurs supérieures à 200 m et trois espèces, *P. abyssi*, *P. occidentalis*, et *P. talismani*, habitent des profondeurs abyssales supérieures à 3000 m. *Parapontophilus sibogae* habite les eaux côtières, les deux seuls exemplaires connus ayant été récoltés à 11 m de profondeur. Deux espèces, *P. gracilis* et *P. talismani*, paraissent limitées à l'Atlantique où elles sont largement répandues. Trois espèces, *P. abyssi*, *P. longirostris* n. sp. et *P. juxta* n. sp. se trouvent dans l'océan Indien, *P. abyssi* étant également largement répandu dans l'Atlantique et *P. longirostris* atteignant le Pacifique central. *Parapontophilus occidentalis* semble confiné à l'Est-Pacifique. Les autres espèces occupent l'Ouest du Pacifique jusqu'à la Polynésie.

MOTS CLÉS

Crustacea,
Decapoda,
Caridea,
Crangonidae,
Parapontophilus,
révision taxonomique,
espèces nouvelles.

INTRODUCTION

Species of the genus *Parapontophilus* Christoffersen, 1988 are particularly difficult to define among the family Crangonidae currently classified

in 22 genera (Holthuis 1993; Kim & Hayashi 2002; Komai 2004), although they are commonly found in benthos samples from deep-water in the temperate to tropical regions in the world oceans. *Parapontophilus* was established by Christoffersen

(1988) for species formerly assigned to the genus *Pontophilus* Leach, 1817. The latter genus is now restricted to three species exclusively distributed in the North Atlantic Ocean, *P. spinosus* (Leach, 1815), *P. norvegicus* M. Sars, 1861 and *P. brevisrostris* Smith, 1881. Morphologically, species of *Parapontophilus* are diagnosed by a suit of characters, including the possession of one or two pairs of lateral teeth on the rostrum, the presence of an orbital notch and a postorbital suture on the carapace, the presence of at most two lateral teeth on the carapace (hepatic tooth is always present, and one epibranchial tooth is present or absent according to species), the rudimentary exopod on the first pereopod, the short second pereopod, which does not reach the distal margin of the merus of the anteriorly extended first pereopod, and the appendix masculina on the male second pleopod being distinctly shorter than the appendix interna. Eight taxa have been described from the world, although the taxonomic ranking has been subject to disagreement. Chace (1984) treated *P. abyssi* (Smith, 1884), *P. occidentalis* (Faxon, 1893), *P. junceus* (Bate, 1888), *P. profundus* (Bate, 1888) and *P. talismani* (Crosnier & Forest, 1973) as subspecies of *P. gracilis*. Subsequent workers (Burukovsky 1990; Takeda & Hanamura 1994; Allen & Butler 1994; Hanamura & Evans 1996; Davie 2002) have followed Chace (1984). On the other hand, d'Udekem d'Acoz (1999) suggested that all of Chace's (1984) subspecies of *P. gracilis* should be elevated to full species rank.

During a study of the extensive material of crangonid shrimp collected by various French expeditions to the eastern Atlantic, western Indian, and the northwestern and southwestern Pacific oceans, 12 forms assignable to *Parapontophilus* were recognized. These forms can be classified in two informal species groups, and within each species group, distinguished by minor, sometimes variable morphological characters. Comparison with type material and supplemental specimens of previously known taxa deposited in various museums and institutions in the world confirmed that the six taxa that were ranked as subspecies of *P. gracilis* by Chace (1984) should be elevated to full species. Furthermore at least 11 undescribed species were recognized from the Indo-Pacific region. Because of the striking simi-

larities observed among species of this genus and frequently seen overlap of the ranges of variations, it became clear that there have been confusion in literature and that the descriptions of new species required detailed comparison with the previously described species. Therefore, a review of all species of the genus in the world oceans was necessary.

As result of the present study, 18 species of *Parapontophilus*, of which 10 are formally described as new, are now represented from the world oceans; one species remains undescribed because of the poor condition of the available material. Of the 18, two species occur exclusively in the Atlantic Ocean, and one species is widely distributed throughout the Atlantic and Indian oceans, and other 10 species in the Indo-West Pacific to central Pacific regions, and the last one exclusively in the eastern Pacific. Ten new species are: *P. cornutus* n. sp. from Austral Islands, French Polynesia, *P. caledonicus* n. sp. from New Caledonia, *P. cyrton* n. sp. from New Caledonia, *P. difficilis* n. sp. from the western Pacific, *P. geminus* n. sp. from the northwestern Pacific, *P. juxta* n. sp. from Réunion Island, western Indian Ocean, *P. longirostris* n. sp. from the western Indian Ocean to the central and southwestern Pacific, *P. psyllus* n. sp. from the northwestern Pacific, *P. sibogae* n. sp. from Indonesia and *P. stenorhinus* n. sp. from the southwestern Pacific.

MATERIAL AND METHODS

Specimens examined in this study are deposited in the following institutions: Muséum national d'Histoire naturelle, Paris (MNHN); Museum of Comparative Zoology, Harvard University, Cambridge Massachusetts (MZC); National Institute of Water & Atmospheric Research, Wellington (NIWA); National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM); National Taiwan Ocean University, Keelung (NTOU); Natural History Museum and Institute, Chiba (CBM); Natural History Museum, London (BMNH); and Zoological Museum, University of Amsterdam (ZMA).

In the lists of material examined the capital letters preceding the station numbers refer to the gear

used: BT, bottom trawl; CC, shrimp trawl; CD, otter trawl; CH, CP, beam trawl; CY, Blake trawl; DS, Sanders dredge; DE, epibenthic dredge; DW, Warén dredge; PCP, small beam trawl; and WS, Wormley sledge. Other abbreviations used are: CL, postorbital carapace length; and ovig., ovigerous.

Terminology and measurements used in the text are summarized in Figure 1. A pointed projection not articulated basally is referred to as a tooth, whereas a pointed projection movably attached with a distinct basal suture is referred to as a spine.

Species of *Parapontophilus* are generally very similar. In particular, general structures of most appendages are virtually identical in all species. In order to avoid unnecessary repetition, a full set of mouthparts and pereopods, and anterior two pleopods are illustrated from a single species, *P. difficilis* n. sp. For each species, a differential description associated with figures of the parts important for species recognition is given.

SYSTEMATICS

Family CRANGONIDAE Haworth, 1825

Genus *Parapontophilus* Christoffersen, 1988

Pontophilus—Kemp 1916: 355. — Barnard 1950: 805. — Crosnier & Forest 1973: 239 (in part). — Chace 1984: 45 (in part). Not *Pontophilus* Leach, 1817.

Parapontophilus Christoffersen, 1988: 46, 48. — Holthuis 1993: 295.

TYPE SPECIES. — *Pontophilus gracilis* Smith, 1882, original designation by monotypy.

GENDER. — Masculine.

SPECIES INCLUDED. — Eighteen species arranged in two informal species groups: *Parapontophilus gracilis* group (11 species): *P. abyssis* (Smith, 1884), *P. cornutus* n. sp., *P. cyrton* n. sp., *P. difficilis* n. sp., *P. geminus* n. sp., *P. gracilis* (Smith, 1882), *P. junceus* (Bate, 1888), *P. longirostris* n. sp., *P. occidentalis* (Faxon, 1893), *P. profundus* (Bate, 1888) and *P. talismani* (Crosnier & Forest, 1973).

P. modumanuensis group (seven species): *P. caledonicus* n. sp., *P. demani* (Chace, 1984), *P. juxta* n. sp., *P. modumanuensis* (Rathbun, 1906), *P. psyllus* n. sp., *P. sibogae* n. sp. and *P. stenorhinus* n. sp.

DIAGNOSIS. — Rostrum acuminate, with 1 or 2 pairs of lateral teeth; dorsal surface slightly concave in proximal part. Cephalothorax subcylindrical or slightly depressed dorsoventrally; carapace with 1-3 middorsal teeth, of them anterior 1 or 2 teeth situated on gastric region (= anterior and posterior epigastric teeth), posteriormost tooth, if present, situated posterior to midlength (= cardiac tooth); middorsal ridge usually present; postorbital suture extending from just mesial to base of antennal tooth to midlength of carapace; lateral surface with hepatic tooth and occasionally with 1 epibranchial tooth; orbital margin evenly concave, with distinct notch. Cornea not reduced in size. Second maxilliped with podobranch. First pereopod with rudimentary exopod; pollex immovably attached to palm. Second pereopod chelate, short, not reaching distal margin of merus of first pereopod. Dactyli of fourth and fifth pereopods slender, usually flattened dorsoventrally. One arthrobranch above base of third maxilliped; pleurobranches above first to fifth pereopods (fourth to eighth thoracic somites); ventral apices of pleurobranches directed backwards. Male second pleopod with appendix masculina shorter than appendix interna; second to fifth pleopods each with appendix interna in both male and female.

GENERAL DESCRIPTION

Body slender for crangonids. Integument of body not firm.

Rostrum acuminate, not exceeding beyond second segment of antennular peduncle, armed with 1 or 2 pairs of lateral teeth; dorsal surface usually shallowly concave at least in basal part; ventral surface with blunt median ridge. Carapace always longer than wide postorbitally, subcylindrical or slightly depressed dorsoventrally; surface smooth or with scattered very short setae; middorsal line usually sharply or bluntly carinate, with 1 or 2 epigastric teeth; cardiac tooth, if present, arising from 0.60-0.70 of carapace length; orbital margin evenly concave, with distinct notch posteriorly; anterolateral margin terraced anteriorly, with small antennal tooth, weak to moderately strong branchiostegal tooth and tiny pterygostomial tooth; antennal tooth directed forward; branchiostegal tooth also directed forward, usually falling short of or reaching dorsodistal margin of antennal basicerite, supported by blunt ridge extending to level of posterior margin of orbit; lateral surface of carapace always with hepatic tooth accompanied by shallow hepatic groove and very low, frequently obsolescent, postorbital ridge; postorbital tooth arising somewhat posterolateral

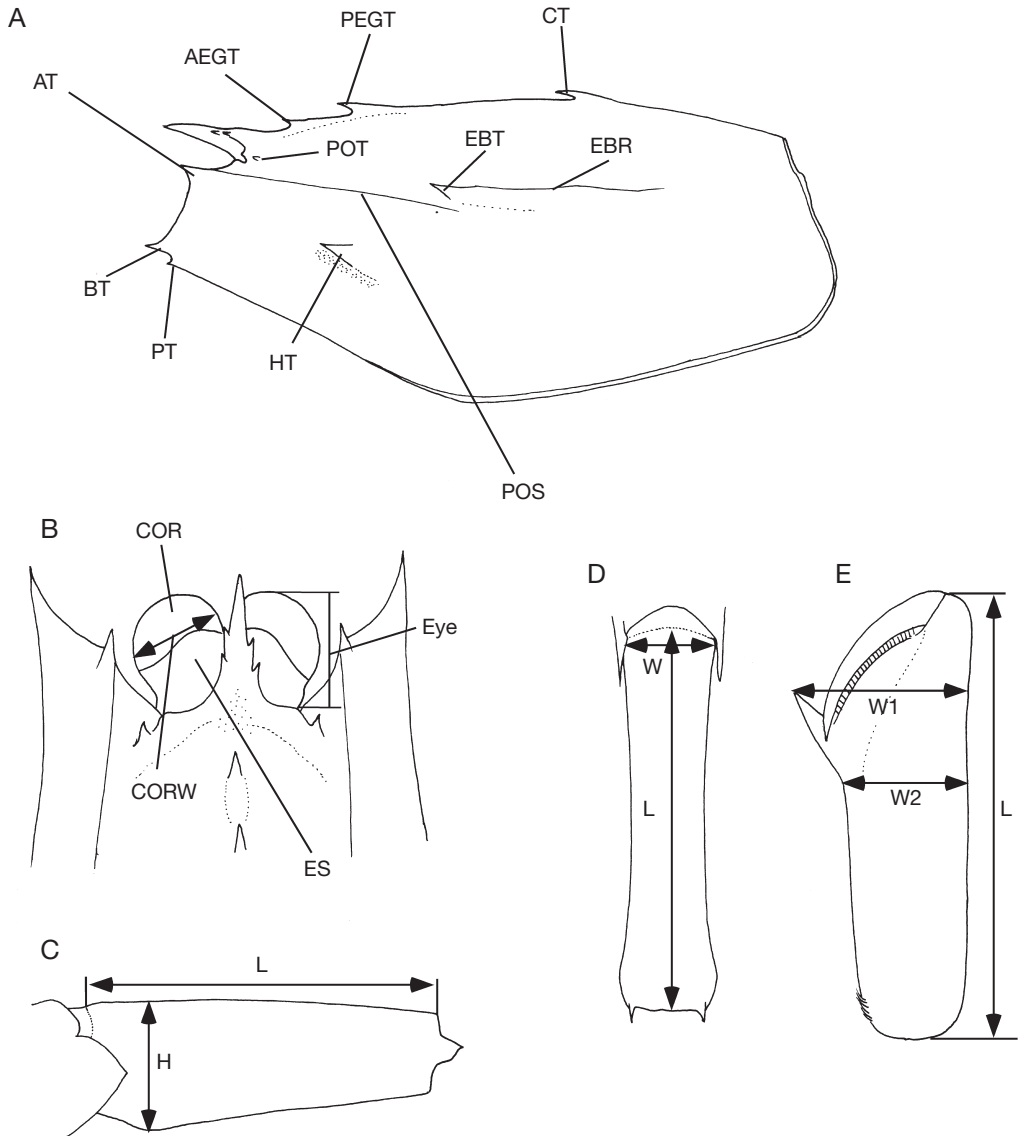


FIG. 1. — Terminology and measurements used in the text: **A**, carapace, lateral view; **B**, anterior carapace and ophthalmic appendages, dorsal view; **C**, sixth pleonal somite, lateral view; **D**, same, dorsal view; **E**, subchela of first pereopod. Abbreviations: **AEGT**, anterior epigastric tooth; **AT**, antennal tooth; **BT**, branchiostegal tooth; **COR**, cornea; **CORW**, corneal width; **CT**, cardiac tooth; **EBT**, epibranchial tooth; **EBR**, epibranchial ridge; **ES**, eye-stalk; **H**, height; **HT**, hepatic tooth; **L**, length; **PEGT**, posterior epigastric tooth; **POS**, postorbital suture; **POT**, postorbital tooth; **PT**, pterygostomial tooth; **W**, width; **W1**, width of palm including tip of pollex; **W2**, width of palm proximal to base of pollex.

to orbital notch, often reduced to minute tubercle or absent; epibranchial tooth, if present, usually followed by blunt epibranchial ridge; postorbital suture extending from mesial to base of antennal tooth to level of midlength of carapace.

Thoracic sternum widened posteriorly; in males (Fig. 15A) and non-spawning females, sternal plates on fifth to eighth thoracic somites each composed of convex median lobe with small anterior tooth or tubercle and rather flattened posterolateral lobes; posterolateral lobes of seventh somite prominent. In spawning females, thoracic sternum concave, lobes less clearly delimited.

Pleon with anterior four somites usually rounded on dorsal surface; fifth somites rounded dorsally or with low plateau; sixth somite rounded or with trace of submedian ridges and median sulcus. Pleura of anterior four somites broadly rounded, that of fifth somite usually with small posterolateral tooth. Sixth somite more than twice length of fifth somite, tapering posteriorly in lateral view; posterolateral process terminating in sharp tooth; posteroventral angle blunt or with small tooth; ventral surface rounded in anterior part, shallowly convex in posterior part. Telson (Fig. 11E) slender, tapering to sharply pointed posteromedian projection from anterior 0.25, armed with 2 pairs of dorsolateral spines on posterior half; dorsal surface shallowly sulcate medially; posterior margin with 1 lateral pair of minute spinules and 2 pairs of long, slender spines, flanking posteromedian projection.

Pleonal sternum narrow, first to third sternites unarmed, fourth to fifth sternites each with low median tubercle.

Eye rounded generally; cornea not reduced in size, but development of faceted structure on surface and pigmentation considerably varying according to species; mesial part of eye-stalk extended anteriorly, thus boundary between cornea and eye-stalk strongly oblique in dorsal view; no dorsal tubercle on eye-stalk, but with small, papilla-like projection on ventromesial face in *P. gracilis* group; such papilla-like projection absent in *P. modumanuensis* group.

Antennular peduncle not reaching midlength of antennal scale. First segment longer than distal two segments combined, dorsal surface deeply excavate

to receive ophthalmic appendage; ventral surface armed with small tooth on ventromesial ridge and slightly proximal to posterior margin of incision between basal segment and stylocerite respectively (Fig. 15B); stylocerite reaching or slightly overreaching distal margin of first segment, terminating in sharp tooth, with notably sinuous lateral margin. Second segment longer than wide, subcylindrical. Third segment shorter than second segment. Flagella sexually dimorphic as in other crangonids, lateral flagellum much stouter and longer and bearing much more numerous aesthetascs in males than in females (cf. Figs 12A, B; 18; 19A); both flagellum composed of more than 15 articles in both sexes, basal-most articles longest, occupying about 0.30 lengths of flagella.

Antenna (Fig. 15C) with second segment (= basicerite) stout, always with tooth at ventrolateral distal angle, dorsolateral distal margin occasionally with minute denticle; fifth segment (= carpocerite) subcylindrical, reaching midlength of antennal scale. Antennal scale well-developed, exceeding half length of carapace, bearing distinct distolateral tooth and broadly rounded distal lamella; dorsal surface with broad ridge along lateral margin and short, oblique median ridge extending from base of antennal scale.

Mandible (Fig. 15D) slender, divided distally in 2 principal teeth, margins of principal teeth minutely denticulate. Maxillule (Fig. 15E) with small, flat, subovate coxal endite bearing few long setae distally; basal endite somewhat curved mesially, with 6-8 long spines arranged in double row on truncate mesial margin; endopod directed laterally, nearly straight, bearing some bristle-like setae terminally. Maxilla (Fig. 15F) with rudimentary endites represented by broadly rounded lobe; palp relatively stout, weakly curved mesially; scaphognathite broad, anterior lobe triangular, posterior lobe subtriangular but not particularly elongate, fringed with setae noticeably elongate posteriorly. First maxilliped (Fig. 15G) with endites poorly developed; endopod not reaching distal margin of exopod, with row of sparse setae on mesial margin; exopod with narrow caridean lobe, and with well-developed flagellum; epipod large, subtriangular. Second maxilliped (Fig. 15H) with endopod composed of seven segments, but basis and

TABLE 1. — Branchial formula of the genus *Parapontophilus* Christoffersen, 1988. Abbreviation: r, rudimentary.

Thoracic somites	1	2	3	4	5	6	7	8
Appendages	Maxillipeds			Pereopods				
	1	2	3	1	2	3	4	5
Pleurobranchs	–	–	–	+	+	+	+	+
Arthrobranchs	–	–	1	–	–	–	–	–
Podobranchs	–	+	–	–	–	–	–	–
Epipods	+	+	r	–	–	–	–	–
Exopods	+	+	+	–	–	–	–	–
Setobranchs	–	–	–	–	–	–	–	–

ischium partially fused; dactylus small, obliquely articulated to propodus, armed with 2 long spines and some spinules; propodus elongate; exopod far overreaching carpus of flexed endopod, bearing well-developed flagellum; epipod elongate subrectangular, bearing well-developed podobranch consisting of 2 series of lamellae. Third maxilliped (Fig. 16B, C) rather slender, apparently 4-segmented (but fusion between ischium and basis incomplete, as suture visible on dorsal surface), overreaching antennal scale by half length of ultimate segment; distal two segments flattened dorsoventrally; ultimate segment tapering distally to blunt tip, with numerous setae on lateral margin and row of long spines partially obscured by setae on mesial margin; carpus subequal in length to ultimate segment, also with long setae on lateral margin and long spines and setae on mesial margin; antepenultimate segment subequal in length to distal 2 segments combined, sinuously curved, with subdistal spinule on lateral surface ventrally and oblique row of long setae on dorsal surface subterminally; coxa with rounded lateral process presumably originated from epipod; exopod reaching midlength of antepenultimate segment, bearing well-developed flagellum.

First pereopod (Fig. 16D) overreaching antennal scale; palm somewhat depressed dorsoventrally, distomesial spine (= pollex) always fixed, cutting edge oblique; carpus armed with 1 or 2 teeth on distolateral margin (dorsal tooth, if present, smaller than ventral tooth); merus with dorsodistal tooth, unarmed on ventral surface, distolateral margin occasionally with 1 denticle; exopod greatly reduced to rudimentary bud (Fig. 16E). Second pereopod (Fig. 16F) chelate, short, not reaching distal margin of merus of forwardly extended first pereopod; fingers (Fig. 16G) slightly

longer than palm, somewhat curved, thus leaving broad hiatus between them, each terminating in long, slender unguis (unguis of fixed finger longer than that of dactylus); cutting edges of fingers with row of sparse, short setae; carpus distinctly shorter than palm; merus subequal in length to chela and carpus combined; ischium longer than merus, strongly curved mesially; coxa devoid of lateral process. Third pereopod (Fig. 16H) very slender, overreaching antennal scale by length of dactylus, propodus and half of carpus; dactylus 0.50-0.60 length of propodus, apparently lacking terminal tuft of setae; carpus longer than distal 2 segments combined; merus slightly shorter than carpus; ischium slightly shorter than merus; coxa without lateral process. Fourth and fifth pereopods (Fig. 16I, J) similar, slender; dactyli usually flattened dorsoventrally, subspatulate, terminating in 2 unequal, slender unguis flanking microscopic spinule (Fig. 16K, L); dorsal surface convex, both lateral and mesial margins sharply edged, ventral surface concave; propodi with short setae distally; carpi shorter than propodi, lacking dorsodistal projection; meri longer than ischia.

Gill formula summarized in Table 1. One arthrobranch above base of third maxilliped; pleurobranchs above first to fifth pereopods (fourth to eighth thoracic somites); ventral apices of pleurobranchs directed backwards.

Male first pleopod (Fig. 15I, J) with endopod about half length of exopod, sinuously curved, distally divided in 2 rounded lobes (mesial lobe with cincinnuli); female first pleopod (Fig. 15K) with endopod about 0.60 length of exopod, occasionally curved mesially, tapering to blunt or subacute point. Male second pleopod with appendix

masculina stout, shorter than appendix interna, bearing several spines at rounded or subtruncate tip (Fig. 15L). Appendices internae on second to fifth pleopods well-developed in both male and female, tapering distally, each with cluster of cincinnuli at distomesial portion (Fig. 15L). Protopods of first to fifth pleopods each with 2 or 3 curved spines at distomesial and proximomesial angle in females (Fig. 15K), unarmed in males (Fig. 15I). Uropod (Fig. 15M) with endopod narrower than exopod; endopod with shallow depression bearing setae on dorsal surface proximally; exopod not reaching endopod, lateral margin nearly straight, terminating in small tooth; diaeresis on exopod clearly defined on dorsal surface, but obscure on ventral surface; protopod with small posterolateral tooth.

Eggs small, numerous.

REMARKS

Christoffersen (1988) proposed a new classification of Crangonidae based on an inferred phylogenetic pattern derived from a cladistic analysis of morphological and reproductive characters. He proposed a new genus, *Parapontophilus*, for eight taxa, which were placed in a sister group of an assemblage containing three species of *Pontophilus* s.s. Christoffersen (1988) did not identify autapomorphic features for *Parapontophilus*, although three homoplastic characters were indicated. My attempt to find out autapomorphic features for *Parapontophilus* has not been successful too. Nevertheless, *Parapontophilus* can be clearly distinguished from *Pontophilus* by a number of morphological characters. In *Parapontophilus*, the carapace bears at most one middorsal tooth posterior to the level of the midlength and one or two teeth on the lateral face (including a hepatic tooth and one epibranchial tooth, if the latter present), while it is armed with two middorsal teeth posterior to the level of the midlength and more than three or four teeth on the lateral face (including a hepatic tooth and two or three epibranchial teeth) in *Pontophilus*. The sixth pleonal somite is dorsally rounded, faintly sulcate medially, or at most provided with blunt submedian ridges on the dorsal surface in *Parapontophilus*, but that somite has two sharp submedian ridges

in *Pontophilus*. The appendix masculina of the male second pleopod is shorter than the appendix interna in *Parapontophilus*, rather than distinctly longer in *Pontophilus*. Therefore, *Parapontophilus* is regarded as a good genus in this study, although its monophyly remains to be fully assessed.

As Chace (1984) indicated, the genus *Parapontophilus* can be divided into two parts: the first is characterized by the possession of cardiac and epibranchial teeth, including *P. gracilis* and 10 closely related taxa, *P. abyssi*, *P. cornutus* n. sp., *P. cyrton* n. sp., *P. difficilis* n. sp., *P. geminus* n. sp., *P. junceus*, *P. longirostris* n. sp., *P. occidentalis*, *P. profundus* and *P. talismani* (*P. gracilis* species group); the second is characterized by the lack of cardiac or epibranchial teeth, including *P. demani*, *P. modumanuensis*, *P. caledonicus* n. sp., *P. juxta* n. sp., *P. psyllus* n. sp., *P. sibogae* n. sp. and *P. stenorhinus* n. sp. (*P. modumanuensis* species group). In addition to the characters of the carapace armature, the two informal species groups differ from each other in the following respects: in the *P. gracilis* group, the sixth pleonal somite is slightly constricted at the middle, and thus the profile of the lateral margin in dorsal view is concave, but in the *P. modumanuensis* group, the somite is hardly constricted with parallel lateral margins in dorsal view; the eye-stalk is provided with small papilla-like process on the ventromesial surface in the *P. gracilis* group, whereas such a process is absent in the *P. modumanuensis* group. At present, it is also difficult to confirm the monophyly of each group, because the assessment of the character polarity is not easy because of possible homoplasy (carapace armature and shape of the sixth pleonal somite) or of scarce information (process on the eye-stalk).

Developmental changes of the thoracic and pleonal sternites, which have been widely reported in Crangonidae (e.g., Chan 1996) are also seen in *Parapontophilus*.

Chace (1984) decided to adopt the suggestions by Faxon (1895) to treat *Parapontophilus gracilis* and its related taxa as a single species composed of geographical races (as *Pontophilus*), even though some of the resultant subspecies are sympatric geographically if not bathymetrically. Nevertheless, he suggested that the accumulation of additional

collections might eventually lead to an alternative conclusion. Analysis of the present extensive material confirms the suggestion by d'Udekem d'Acoz (1999) that Chace's subspecies should be raised to full species. Geographical distributions of the taxa sometimes overlap for each other (for example, *P. abyssi*, *P. gracilis* and *P. talismani*). Therefore, the subspecies concept is not fully warranted in the case of *P. gracilis* and its related taxa.

Taxa of both species groups are distinguished by a number of minor or subtle morphological differences. Particularly useful are characters of the rostrum (shape, length and armature), carapace (size and development of the anterior epigastric teeth), third pleonal somite (shape of the tergite and of the posterodorsal margin), fifth somite (conformation of the tergum), sixth ple-

onal somites (shape and conformation of the tergum), cornea and eye-stalk (size of cornea and structure of the corneal surface and of the eye-stalk), antennal scale (shape of the distal lamella), palm of the first pereopod (shape and size of the pollex), and dactyli of the fourth and fifth pereopods (length and structure). Colour of the cornea is also diagnostic in the *P. gracilis* species group, and it is particularly useful in identifying material recently preserved. However, this character should be used with caution because the pigmentation can be easily faded away due to the preservation condition.

The following key should be used with caution, because of the variability involved and of the fact that *P. modumanuensis* and *P. profundus* are represented only by the holotype, respectively.

Key to the species of *Parapontophilus* Christoffersen, 1988

1. Carapace with cardiac and epibranchial teeth (*P. gracilis* species group) 2
— Carapace without cardiac or epibranchial teeth ... (*P. modumanuensis* species group) 12
2. Cornea very large, its greatest width 0.25-0.30 of carapace length; corneal surface distinctly faceted 3
— Corneal width not exceeding 0.25 of carapace length; corneal surface distinctly faceted or non-faceted 4
3. Anterior epigastric tooth greatly reduced to microscopic denticle or completely absent; antennal scale less than 4.00 times longer than wide, lateral margin less concave
..... *P. gracilis* (p. 271)
— Anterior epigastric tooth small, but distinct; antennal scale 4.10 times longer than wide, lateral margin strongly concave *P. profundus* (p. 285)
4. Fifth pleonal somite with broad dorsal plateau depressed medially; sixth pleonal somite with distinct submedian ridges flanking shallow median sulcus; dactyli of fourth and fifth pereopods subconical, less than half of propodi in length; [cornea of eye always darkly pigmented, corneal surface distinctly faceted] *P. cornutus* n. sp. (p. 292)
— Fifth pleonal somite rounded on dorsal surface; sixth pleonal somite rounded or with trace of submedian ridges; dactyli of fourth and fifth pereopods more than half of propodi in length 5
5. Posterodorsal margin of third pleonal tergite strongly produced posteriorly, thus abdomen strongly geniculate; [anterior epigastric tooth small, but conspicuous; eye white or opaque, corneal surface not faceted] *P. cyrton* n. sp. (p. 295)
— Posterodorsal margin of third pleonal tergite moderately produced, abdomen not notably geniculate 6

6. Rostrum overreaching distal margins of corneas; sixth pleonal somite 3.00-3.30 times longer than deep; [cornea small, 0.12-0.13 of carapace length, distinctly faceted, pigmented with yellow or light brown; palm of first pereopod 4.00-4.80 times longer than wide]
P. longirostris n. sp. (p. 305)
 — Rostrum not reaching or reaching distal margins of corneas 7
7. Cornea darkly pigmented with black or dark gray in preservative, distinctly faceted entirely; anterior epigastric tooth absent or reduced to microscopic tubercle or denticle
P. junceus (p. 279)
 — Cornea white or opaque, surface faceted or non-faceted; anterior epigastric tooth usually conspicuous 8
8. Anterior epigastric tooth much smaller than posterior epigastric tooth, occasionally reduced to very small denticle; corneal surface faceted, partially with trace of pigmentation posterolaterally; palm of first pereopod 3.80-4.50 times longer than wide 9
 — Anterior epigastric tooth subequal to or slightly smaller than posterior epigastric tooth; corneal surface not faceted; palm of first pereopod 3.50-3.80 times longer than wide ... 10
9. Cornea small, its maximum width 0.14-0.16 of carapace length ... *P. geminus* n. sp. (p. 302)
 — Cornea moderately large, its maximum width 0.18-0.21 of carapace length
P. difficilis n. sp. (p. 297)
10. Rostrum falling short of distal margins of corneas, always armed with 1 pair of lateral teeth; cornea elongate longitudinally; sixth pleonal somite 3.00-3.20 times as long high.
P. talismani (p. 289)
 — Rostrum falling short of or reaching distal margins of corneas, usually armed with 2 pairs of lateral teeth; cornea of eye hemispherical, not elongate longitudinally; sixth pleonal somite 2.30-2.90 times as long as high 11
11. Rostrum nearly reaching to slightly overreaching distal margins of corneas; postorbital ridge on carapace obsolescent *P. abyssi* (p. 274)
 — Rostrum far falling short of distal margins of corneas; postorbital ridge on carapace conspicuous *P. occidentalis* (p. 287)
12. Rostrum overreaching distal margins of corneas; antennal scale about 5.00 times longer than wide, distolateral tooth distinctly overreaching distal lamella
P. modumanuensis (p. 309)
 — Rostrum not overreaching distal margins of corneas; antennal scale 2.50-3.50 times longer than wide, distolateral tooth falling short of distal lamella 13
13. Rostrum with 1 lateral tooth on either side 14
 — Rostrum with 2 lateral teeth at least on one side 15
14. Anterior epigastric tooth conspicuous *P. caledonicus* n. sp. (p. 313)
 — Anterior epigastric tooth absent or rudimentary *P. psyllus* n. sp. (p. 319)
15. Rostrum with anterior pair of lateral teeth arising at about midlength or posterior to it ... 16
 — Rostrum with anterior pair of lateral teeth arising anterior to midlength 17
16. Rostrum overreaching tips of antennal teeth on carapace *P. juxta* n. sp. (p. 316)
 — Rostrum not reaching or reaching tips of antennal teeth on carapace
P. caledonicus n. sp. (p. 313).

17. Rostrum with tiny, blunt lateral teeth; branchiostegal tooth short, not reaching dorsodistal margin of antennal basicerite; cornea 0.20-0.21 of carapace length *P. stenorhinus* n. sp. (p. 324)
 — Rostrum with moderately small, sharp lateral teeth; branchiostegal tooth nearly reaching or reaching dorsodistal margin of antennal basicerite; cornea 0.13-0.15 of carapace length 18
18. Rostrum 0.17-0.20 of carapace length, with relatively large lateral teeth (Fig. 22D); antennal scale 0.60-0.65 of carapace length, 2.90-3.10 times longer than wide, with distal lamella slightly overreaching distolateral tooth (Fig. 22H) *P. demani* (p. 310)
 — Rostrum less than 0.15 of carapace length, with relatively small lateral teeth (Fig. 30C); antennal scale 0.44-0.52 of carapace length, 2.50-2.60 times longer than wide, with distal lamella distinctly overreaching distolateral tooth (Fig. 30G) *P. sibogae* n. sp. (p. 322)

Parapontophilus gracilis species group

DIAGNOSIS. — Body slender. Carapace with cardiac and epibranchial teeth. Sixth pleonal somite slightly constricted in dorsal view. Telson subequal to or slightly shorter than sixth pleonal somite. Cornea variable in structure and pigmentation interspecifically; eye-stalk with small papilla-like projection on ventromesial surface. Second pereopod very short, reaching or not reaching midlength of merus of first pereopod.

Parapontophilus gracilis (Smith, 1882)
(Figs 2; 20A)

Pontophilus gracilis Smith, 1882: 36, pl. 7, figs 2, 2a-c, 3, 3a (type locality: two syntypes came from two different stations in the northwestern Atlantic: E of South Carolina, 225 fathoms; and off Martha's Vineyard, 458 fathoms); 1884: 196; 1886: 654, pl. 11, figs 1, 1a, 2. — Ortmann 1895: 183, 18. — Faxon 1896: 157. — Stebbing 1905: 94, pl. 25; 1910: 383. — Kemp 1916: 357. — De Man 1920: 260 (key), 264. — Barnard 1950: 806, fig. 153a-h. — Crosnier & Forest 1968: 1145; 1973: 242, fig. 79e, f. — Pequegnat 1970: 113. — Pequegnat *et al.* 1971: 10. — Kensley 1972: 64, fig. 30a, b. — Dardeau & Heard 1983: 24, figs 2c, 13. — Takeda & Okutani 1983: 72, unnumbered fig. — Macpherson 1983: 66. — Garcia Raso 1996: 736.

Pontophilus gracilis gracilis – Chace 1984: 47 (key), fig. 23b.

Parapontophilus gracilis – d'Udekem d'Acoz 1999: 133. — Davie 2002: 239 (in part).

?*Pontophilus gracilis* – Wood-Mason *in* Wood-Mason & Alcock 1891: 361. — Alcock 1899: 75; 1901: 115. — Balss 1925: 296.

Not *Pontophilus gracilis* Bate, 1888: 487, pl. 87. See "Remarks" of *Parapontophilus abyssi* (Smith, 1884).

Not *Pontophilus gracilis* – Rathbun 1906: 910. See "Remarks".

TYPE MATERIAL. — Syntypes: *Blake*, stn 315, E of South Carolina, 32°18.20'N, 78°43'W, 225 fathoms (about 405 m), 1880, 1 ♀ 6.1 mm (MCZ); off Martha's Vineyard, *Albatross*, stn 1029, 485 fathoms (about 873 m), 1 ♂ (USNM). Not examined.

OTHER MATERIAL EXAMINED. — **Gulf of Mexico.** *Blake*, off St Vincent, 553 m, 1 ♂ 6.5 mm (MNHN-Na 1199). — Stn 43, S of Dry Toriugas, Antilles, 24°08'N, 82°51'W, 610 m, VIII.1877, 1 ♂ 6.4 mm, 4 ♀♀ 2.4-7.2 mm, 1 ovig. ♀ 5.4 mm (MNHN-Na 1189); 2 ♀♀ 5.2, 8.8 mm, 1 ovig. ♀ 6.1 mm (MNHN-Na 1198). — Stn 47, off mouth of the Mississippi, 28°42'S, 88°40'W, 578 m, VIII.1878, 6 ♂♂ 3.9-4.7 mm, 13 ♀♀ 4.3-5.5 mm (MNHN-Na 1194). — Stn 48, off mouth of Mississippi, 28°47.30'N, 88°41.30'W, 959 m, VIII.1878, 1 ♂ 4.4 mm (MNHN-Na 1200).

Northeastern Atlantic. Iberia-Morocco Gulf, *BALGIM RV Cryos*, stn CP 91, 34°22'N, 07°25'W, 948 m, 7.VI.1984, 1 ♀ 5.1 mm (MNHN-Na 11917). — Sahara, *Talisman*, stn 72, 882 m, 2 ♀♀ 6.3, 7.0 mm (MNHN-Na 1190). — Stn 76, 25°39'N, 16°06'W, 1435-1056 m, 9.VII.1883, 2 ♀♀ 7.1, 7.5 mm (MNHN-Na 1197). — Stn 83, 11.VII.1883, 930 m, 3 ♀♀ 7.9-11.3 mm (MNHN-Na 1193). — Stn 84, 22°54'N, 17°26'W, 860 m, 12.VII.1883, 3 ♀♀ 7.5-10.4 mm (MNHN-Na 1195). — Stn 88, 22°52'N, 17°23'W, 830 m, 12.VII.1882, 4 ♀♀ 7.8-11.0 mm (MNHN-Na 1192). — Senegal, 15°51'N, 17°05'W, 19.XII.1958, 2 ♂♂ 5.0, 5.1 mm, 6 ♀♀ 5.4-10.0 mm (MNHN-Na 5258).

Southeastern Atlantic. Congo, *Geronimo*, stn 2-240, 04°08'S, 10°08'E, 1134 m, 8.IX.1963, shrimp trawl, 2 ♀♀ 8.4, 9.0 mm (MNHN-Na 1187). — Cabinda, *Ombango*, 05°04'S, 10°13'E, 805 m, 17.III.1967, 1 ♀ 7.0 mm (MNHN-Na 16220). — Stn CH 394-53,

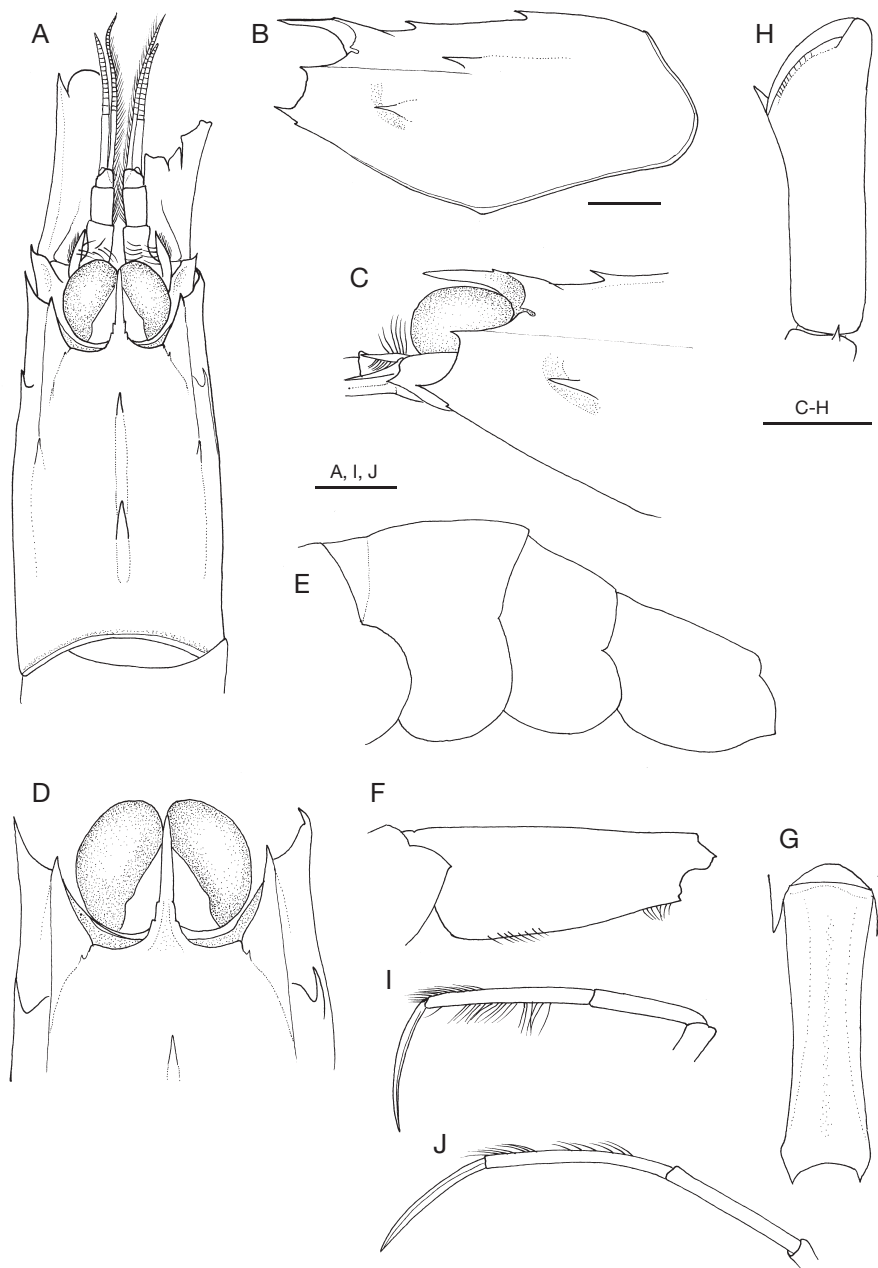


FIG. 2. — *Parapontophilus gracilis* (Smith, 1882): **A**, carapace and cephalic appendages, dorsal view (setae partially omitted); **B**, carapace, lateral view; **C**, anterior part of carapace, cornea, and basal part of antennae, lateral view; **D**, anterior part of carapace and ophthalmic appendages, dorsal view; **E**, third to fifth pleonal somites, lateral view; **F**, sixth pleonal somite, lateral view; **G**, same, dorsal view; **H**, subchela of left first pereopod, ventral view; **I**, dactylus, propodus and carpus of left fourth pereopod, lateral view; **J**, same segments of left fifth pereopod, lateral view. **A-E**, **I**, **J**, ♀ 8.6 mm, Senegal (MNHN-Na 5258); **F-H**, ♀ 7.9 mm, same lot. Scale bars: 2 mm.

05°08'S, 11°24'E, 600 m, 20.IX.1967, 1 ♀ (badly damaged) (MNHN-Na 16221). — Stn CH 394-55, 05°08'S, 11°22'E, 795-805 m, 20.IX.1967, 2 ♀♀ 8.3, 10.9 mm (MNHN-Na 16222). — Angola, *Ombango*, stn CH 398, 11°57'S, 13°15'E, 825-1000 m, 16.IV.1968, 1 ♀ crashed (MNHN-Na 16223); 4 ♀♀ 9.6-10.7 mm (MNHN-Na 16224). — Stn CH 417, 05°06'S, 11°18'E, 800-900 m, 18.XI.1969, 4 ♀♀ 7.8-9.2 mm (MNHN-Na 16225).

DISTRIBUTION. — Known with certainty only from the Atlantic Ocean (Fig. 34), 578-1435 m.

DESCRIPTION

Rostrum (Fig. 2A-D) very slender, nearly spiniform, 0.20-0.30 of carapace length, directed forward, overreaching midpoint of corneas, but not reaching distal margins of corneas; dorsal surface shallowly concave in proximal half; lateral margins armed with 1 or 2 tiny teeth on either side (lateral teeth occasionally rudimentary). Carapace (Fig. 2A-D) 1.30-1.40 times longer than wide, anterior epigastric tooth greatly reduced to minute denticle or absent; posterior epigastric and cardiac teeth moderately small, cardiac tooth arising from about two-thirds of carapace length; postorbital tooth minute, occasionally absent; epibranchial tooth moderately small; epibranchial ridge usually obsolescent; branchiostegal tooth slightly falling short of dorsodistal margin of antennal basicerite.

Third pleonal somite (Fig. 2E) with moderately convex tergum and moderately produced posterodorsal margin; fourth and fifth somites (Fig. 2E) rounded dorsally; sixth somite (Fig. 2F, G) 3.10-3.50 times longer than wide, 2.30-2.50 times as long as deep, about 1.60 length of fifth somite, with trace of median sulcus on dorsal surface.

Eye (Fig. 2A) generally bean-shaped; cornea darkly pigmented (colour entirely brown in preservative), maximal diameter 0.25-0.30 of carapace length; corneal surface well faceted (Fig. 20A), covered with fine lenses; boundary between cornea and eye-stalk clearly delineated; eye-stalk hardly constricted near base; papilla-like projection on mesial face small. Antennular peduncle reaching midlength of antennal scale. Antennal scale (Fig. 2A) 0.60-0.70 times as long as carapace, 3.10-3.50 times as long as wide; lateral margin concave, distolateral tooth nearly reaching distal margin of lamella.

Palm of first pereopod (Fig. 2H) 3.90-4.20 times longer than broad; cutting edge moderately oblique; pollex moderately large, width of palm including tip of pollex 1.40-1.50 of width of palm proximal to base of pollex; merus with relatively weak dorso-distal tooth. Second pereopod short, reaching or falling short of midlength of merus of first pereopod. Fourth pereopod (Fig. 2I) overreaching distal margin of antennal scale by full length of dactylus; dactylus subspatulate, 0.70-0.80 of propodal length; carpus 0.70-0.80 of propodal length. Fifth pereopod (Fig. 2J) similar to fourth, reaching distal margin of antennal scale by tip of dactylus. Appendix masculina of male second pleopod 0.60-0.70 length of appendix interna.

Coloration in life

Entirely light brown, darker on cephalothorax; corneas dark brown according to the colour photograph of Takeda & Okutani (1983).

Size

Males CL 3.9-6.5 mm; females CL 2.4-11.3 mm, ovigerous females CL 5.4-6.1 mm.

REMARKS

As noted under the account of *Parapontophilus abyssii*, *Pontophilus gracilis* Bate, 1888 is a junior homonym of *Pontophilus gracilis* Smith, 1882. Bate's (1888) taxon is identical with *Parapontophilus abyssii*.

Size and development of the lateral teeth on the rostrum varies individually. The anterior pair is occasionally absent, and even the posterior pair is sometimes very small.

Parapontophilus gracilis can be separated easily from most of the other congeners by the large eye. The maximal diameter of the cornea is 0.25-0.30 of the carapace length in *P. gracilis*, while in all other species but *P. profundus* it does not exceed 0.22. Differences between *P. gracilis* and *P. profundus* are discussed under account of the latter species. The rudimentary anterior epigastric tooth on the carapace and the well-pigmented and finely faceted cornea also separate *P. gracilis* from *P. abyssii*, *P. cyrtus* n. sp., *P. difficilis* n. sp., *P. longirostris* n. sp., and *P. talismani*.

This species has not been found in samples from localities outside the Atlantic Ocean during the

present study. Chace (1984) remarked that the specimens recorded as *Pontophilus gracilis* from Hawaii by Rathbun (1906) could not be separated from his *Pontophilus gracilis abyssi* (= *Parapontophilus geminus* n. sp.). This clearly suggests that Rathbun's (1906) Hawaiian material does not represent *Parapontophilus gracilis*. Nevertheless, it is still impossible to determine what species is actually represented by Rathbun's material without examination of her specimens. The records of this species from the Indian Oceans by Wood-Mason & Alcock (1891), Alcock (1899, 1901) and Balss (1925) also need to be verified.

Parapontophilus abyssi (Smith, 1884)
(Figs 3; 4A-D; 20B)

Pontophilus abyssi Smith, 1884: 363 (type locality: east of Chesapeake Bay, USA, 3506 and 4060 m); 1886: 653, pl. 11, figs 3, 3a, 4, 5. — de Saint Laurent 1985: 47. — Williams *et al.* 1989: 20 (list).

Pontophilus gracilis Bate, 1888: 487 (in part), pl. 87 (type locality: South Atlantic Ocean about 900 km WNW Tristan da Cunha, 3475 m). Not *Pontophilus gracilis* Smith, 1882.

Pontophilus challengerii Ortmann, 1893: 49 (substitute name for *Pontophilus gracilis* Bate, 1888); 1895: 185 (in part). — Kemp 1911: 12 (in part). — Holthuis 1951: 16. — Zarenkov 1969: 80 (list). — Crosnier & Forest 1973: 248, 249, fig. 80e-g.

Pontophilus batei Faxon, 1893: 200 (substitute name for *Pontophilus gracilis* Bate, 1888); 1895: 131 (in part).

Pontophilus indica – Calman 1939: 219 (in part).

Pontophilus occidentalis var. *indica* – Kensley 1968: 319, figs 18, 19; 1972: 64, fig. 30c, d. Not *Pontophilus occidentalis* var. *indica* de Man, 1918.

Pontophilus indicus – Zarenkov 1969: 80 (list; in part).

Pontophilus occidentalis – Kensley 1981: 28 (list). Not *Pontophilus occidentalis* Faxon, 1893.

Parapontophilus abyssi – d'Udekem d'Acoz 1999: 133.

?*Pontophilus challengerii* – Richardson & Yaldwyn 1958: 41, fig. 48. See "Remarks".

?*Parapontophilus gracilis abyssi* – Davie 2000: 240.

Not *Pontophilus gracilis abyssi* – Chace 1984: 47 (key), 49, figs 16, 17, 23c (= *Parapontophilus geminus* n. sp.).

Not *Pontophilus gracilis abyssi* – Allen & Butler 1994: 440 (= *Parapontophilus longirostris* n. sp.).

Not *Pontophilus* cf. *abyssi* – Garcia Raso 1996: 736.

TYPE MATERIAL. — Syntypes of *Pontophilus abyssi* Smith, 1884: *Albatross*, stn 2097, E of Chesapeake Bay, USA, 37°56.20'N, 70°57.30'W, 3451 m, 1.X.1883, 1 ♀ (USNM 7023); 1 ♂, 1 ovig. ♀ (USNM 7025). — Stn 2098, 37°40.30'N, 70°37.30'W, 3998 m, 01.X.1883, 1 ♂ (USNM 7024) 1 ovig. ♀ (10.8 mm; USNM 7025) has been examined.

Holotype of *Pontophilus gracilis* Bate, 1888: *Challenger*, stn 133, near Tristan da Cunha, Mid-Atlantic Ridge, 35°41'S, 20°55'W, 3420 m, 11.X.1873, ♀ 16.2 mm (BMNH 1888.22). Examined.

OTHER MATERIAL EXAMINED. — **Northwestern Atlantic.** *Albatross*, stn 2226, 37°00'N, 71°54'W, 3638 m, 1 ♂ 11.7 mm, 1 ovig. ♀ 15.0 mm (USNM 8600). — *Advance II*, stn EPA-78-1-13, off Virginia, 37°46.11'N, 70°27.50'W, 3920 m, 26.VI.1978, 2 ♂♂ c. 12.0, 12.1 mm, 4 ♀♀ 10.5-15.0 mm (USNM 222198).

Northeastern Atlantic. N of Azores, *Talisman* 1883, stn 133, 42°15'N, 23°17'W, 3965-4060 m, 24.VIII.1883, 1 ♂ (damaged), 1 ♀ 13.1 mm (MNHN-Na 4316). — Stn 135, 43°15'N, 19°20'W, 4165 m, 25.VIII.1883, 1 ♂ 12.0 mm (MNHN-Na 4317).

N of Madeira, *ABYPLAINE*, stn CP 11, 34°06.1'N, 17°06.3'W, 4270 m, 30.V.1981, 2 ♂♂ 11.8, 12.2 mm, 5 ♀♀ 9.7-13.0 mm (MNHN-Na 11026). — Stn CP 12, 34°05.2'N, 17°06.9'W, 4260 m, 30.V.1981, 2 ♂♂ 10.1, 10.6 mm, 1 ♀ 13.7 mm (MNHN-Na 11027).

Off France, *BIOGAS V*, stn 5 CP 06, 44°20'N, 04°54.3'W, 4460 m, 20.VI.1974, 2 ♂♂ 12.2, 13.2 mm (MNHN-Na 4322). — *INCAL*, stn WS 10, 47°27.3'N, 9°36.9'W, 4354 m, 11.VIII.1976, 1 ♀ 14.7 mm (MNHN-Na 4319). — Stn CP 15, 47°26.4'N, 9°35.3'W, 4201 m, 10.VIII.1976, 2 ♀♀ 14.3, 15.2 mm (MNHN-Na 4318).

Southeastern Atlantic. Gulf of Guinea, *WALDA*, stn CY 20, 02°39.5'S, 05°43.2'E, 4088 m, 27.VII.1971, 1 ♀ 12.3 mm (MNHN-Na 5259). — Data not indicated, 2 ♀♀ 13.9, 14.4 mm (MNHN-Na 4323).

Western Indian Ocean. Geyser Bank, Glorieuses Islands, *BENTHEDI*, *Suroit*, stn CH 82, 11°59.8'S, 45°42.6'E, 3450 m, 1.IV.1997, 1 ♀ 16.2 mm (MNHN-Na 16081). — Stn CH 87, 11°44'S, 47°35'E, 3716 m, 3.IV.1977, 6 ♀♀ 13.1-17.8 mm (MNHN-Na 16082). — Stn CH 90, 11°44'S, 47°30'E, 3700 m, 4.IV.1977, 1 ♂ (not measured) (MNHN-Na 9876).

Natal and South Madagascar basins, *SAFARI* 1, stn 06, CP 02, 30°25.3'S, 39°49.8'E, 4905 m, 24.VIII.1979, 1 ♀ 14.4 mm (MNHN-Na 9791). — Stn 18, CP 10, 29°50.9'S, 48°35.5'E, 3668-3800 m, 4.IX.1979, 2 ♂♂ 12.8, 13.4 mm, 3 ♀♀ 13.7-15.6 mm (MNHN-Na 9813).

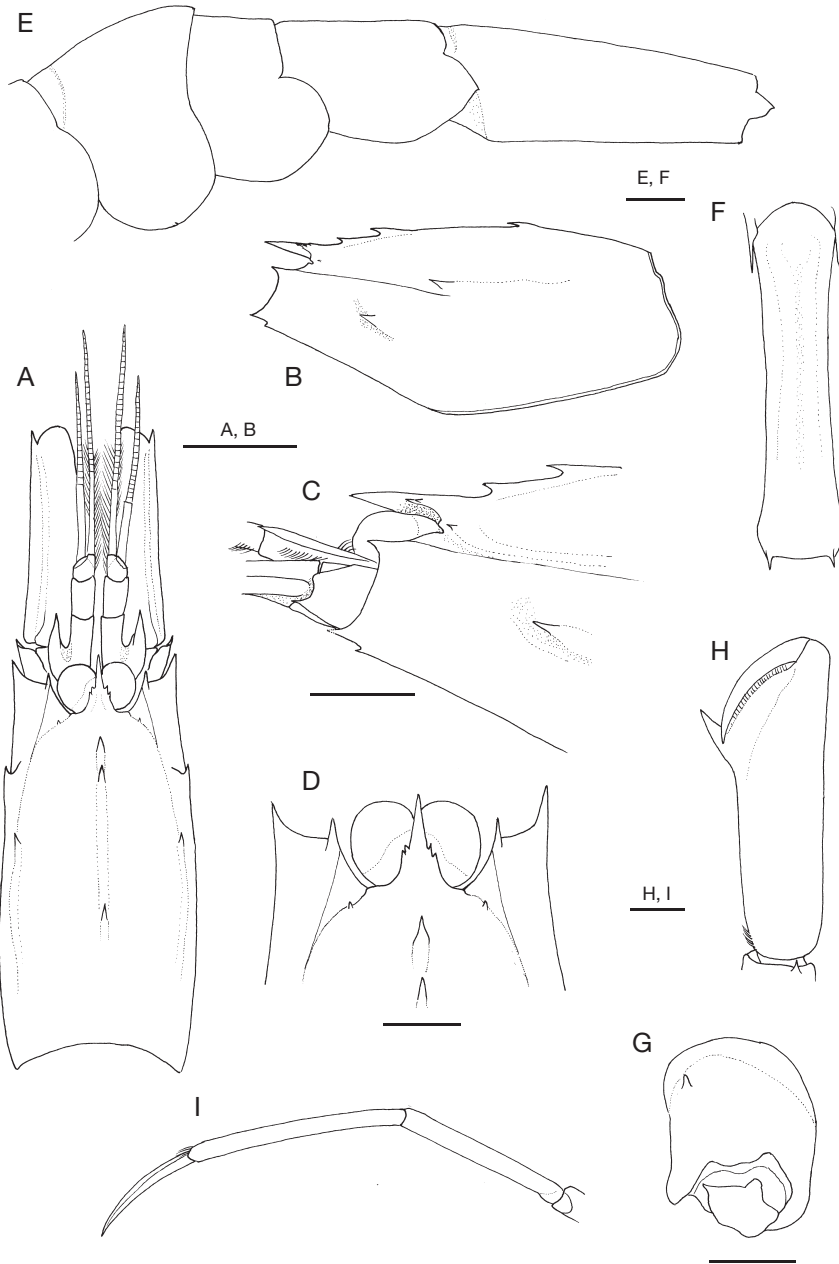


FIG. 3. — *Parapontophilus abyssus* (Smith, 1884): **A**, carapace and cephalic appendages, dorsal view (setae partially omitted); **B**, carapace, lateral view; **C**, anterior part of carapace, cornea and basal part of antennae, lateral view; **D**, anterior part of carapace and eyes, dorsal view; **E**, third to sixth pleonal somites, lateral view (setae omitted); **F**, sixth pleonal somite, dorsal view; **G**, left eye, ventromesial view; **H**, subchela of left first pereopod, ventral view; **I**, dactylus, propodus and carpus of left fourth pereopod, lateral view; **A-F**, **H**, **I**, ♀ 15.2 mm, northeastern Atlantic (INCAL, stn CP 15) (MNHN-Na 4318); **G**, ♀ 14.7 mm, northeastern Atlantic (INCAL, stn WS 10) (MNHN-Na 4319). Scale bars: A, B, 5 mm; C-F, H, I, 2 mm; G, 1 mm.

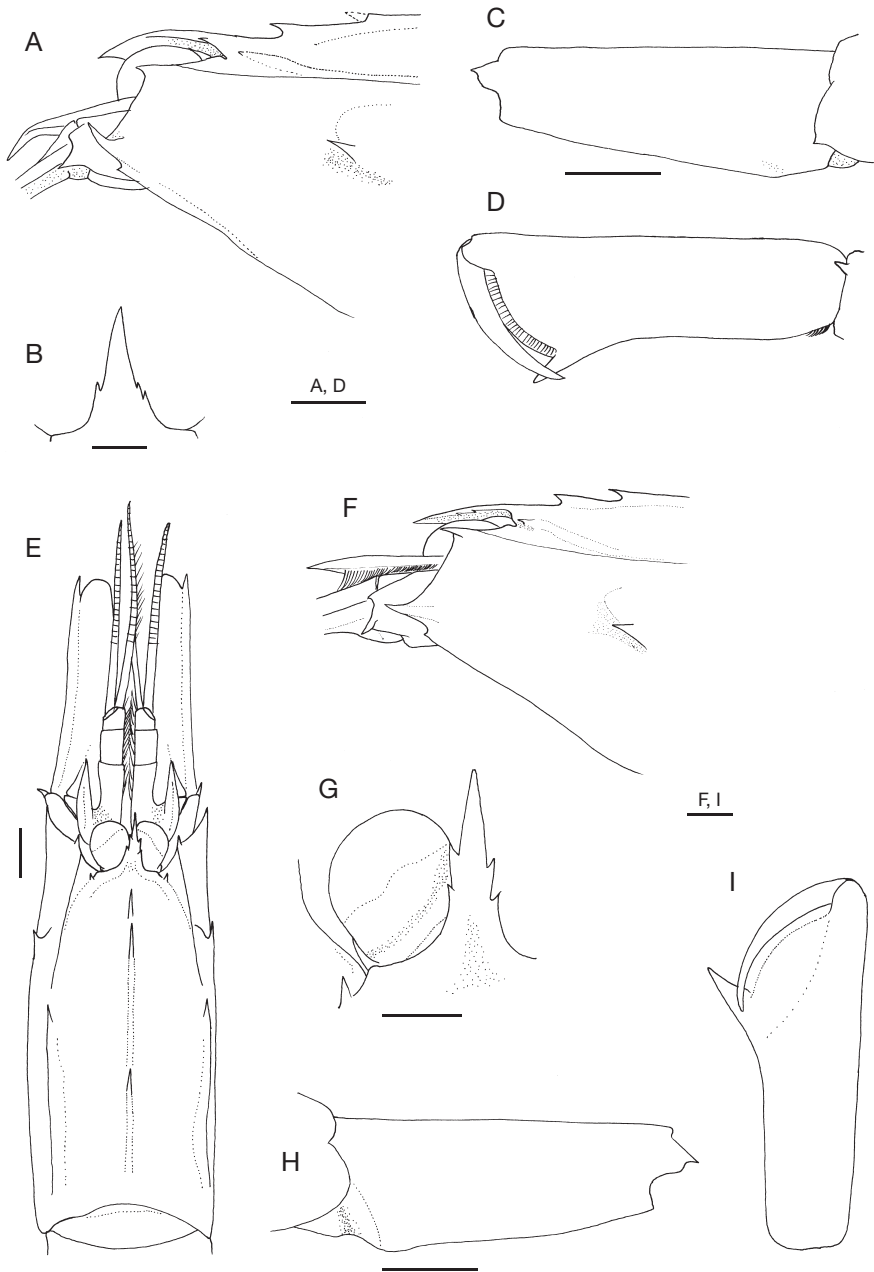


FIG. 4. — **A-D**, *Parapontophilus abyssii* (Smith, 1884), ♀ 16.2 mm, holotype of *Pontophilus gracilis* Bate, 1888, near Tristan da Cunha, southwestern Atlantic (Challenger, stn 133) (BMNH 1888.22); **A**, anterior part of carapace, cornea and basal part of antennae, lateral view; **B**, sixth pleonal somite, lateral view; **C**, subchela of left first pereopod, ventral view; **D**, rostrum, dorsal view; **E-I**, *Parapontophilus* sp., ♀ 10.8 mm, paratype of *Pontophilus challengerii* Ortmann, 1893, Celebes Sea (*Challenger*, stn 198) (BMNH 1888.22); **E**, carapace and cephalic appendages, dorsal view; **F**, anterior part of carapace, cornea and basal part of antennae, lateral view; **G**, rostrum and left eye, dorsal view; **H**, sixth pleonal somite, lateral view; **I**, subchela of first pereopod, ventral view. Scale bars: A, B, D, E, 2 mm; C, H, 5 mm; F, G, I, 1 mm.

Madagascar (NW coast), *Vauban*, stn CH 138, 13°48.8'S, 47°29.4'E, 1800-2000 m, 27.II.1975, 1 ovig. ♀ 10.3 mm (MNHN-Na 16083).

Mid-Indian Basin. SAFARI 2, stn 02, CP 03, 05°48'N, 78°43'E, 3450 m, 1 ♀ 19.0 mm (MNHN-Na 9836). — Stn 03, CP 04, 07°07'N, 79°00'E, 2475 m, 1 ♀ 12.0 mm (MNHN-Na 9837). — Stn 17, CP 15, 06°17'S, 89°11'E, 2895-3000 m, 1 ♀ 12.0 mm (MNHN-Na 9839).

DISTRIBUTION. — Temperate to tropical regions in the Atlantic Ocean and Indian Ocean (Figs 34; 35), 1800-5852 m.

DESCRIPTION

Rostrum (Figs 3A-D; 4D) moderately broad, triangular in dorsal view, 0.15-0.20 of carapace length, directed slightly upward or forward, reaching or slightly overreaching anterior margins of corneas; dorsal surface shallowly concave in basal half; lateral margins armed with 1 or 2 small teeth proximal to midlength. Carapace (Fig. 3A-D) 1.60-1.70 times as long as wide, with 1 anterior epigastric tooth being subequal to or slightly smaller than posterior epigastric tooth; posterior epigastric and cardiac teeth moderately large, latter arising from 0.60-0.70 of carapace length; postorbital tooth very small; epibranchial ridge low, occasionally obsolete; branchiostegal tooth usually falling short of dorsodistal margin of antennal basicerite.

Third pleonal somite (Fig. 3E) with moderately convex tergum and moderately produced postero-dorsal margin; fifth somite rounded dorsally; sixth somite (Fig. 3E, F) 3.50-3.90 times longer than wide, 2.60-2.80 times longer than deep; dorsal surface (Fig. 3F) with trace of submedian ridges and faint median sulcus.

Eye (Fig. 3A, G) generally bean-shaped; cornea opaque or light yellow, maximal diameter 0.15-0.17 of carapace length; corneal surface not faceted (Fig. 20B), but white granules possibly representing remnants of lenses visible through integument of cornea; boundary between corneal region and eye-stalk obsolescent; eye-stalk not markedly constricted; papilla-like projection on mesial face small. Antennular peduncle (Fig. 3A) falling short of midlength of antennal scale. Antennal scale (Fig. 3A) 0.60-0.70 of carapace length, 3.80-4.10 times longer than wide; lateral margin slightly concave

or nearly straight, distolateral tooth nearly reaching distal margin of lamella.

Palm of first pereopod (Fig. 3H) 3.50-3.80 times longer than wide; cutting edge moderately oblique; pollex relatively large, width of palm including tip of pollex 1.40-1.50 of width proximal to base of pollex; merus with relatively weak dorsodistal tooth. Second pereopod short, reaching or falling short of midlength of merus of first pereopod. Fourth pereopod (Fig. 3I) overreaching distal margin of antennal scale by half to full length of dactylus; dactylus subspatulate, 0.55-0.60 of propodal length; carpus about 0.80 of propodal length. Fifth pereopod similar to fourth pereopod, slightly falling short of distal margin of antennal scale. Appendix masculina of male second pleopod 0.60-0.70 length of appendix interna.

Coloration in life

Unknown.

Size

Males CL 11.7-13.2 mm; females CL 9.7-17.8 mm, ovigerous females CL 10.8-15.0 mm.

REMARKS

The anterior pair of the lateral teeth on the rostrum is sometimes absent, although the posterior pair is always distinct in all the specimens examined.

Parapontophilus abyssi closely resembles two other abyssal congeners, *P. occidentalis* and *P. talismani*. Differences among the three species are discussed under "Remarks" of *P. talismani*.

Specimens from various localities in the Atlantic and Indian oceans are consistent in every diagnostic features. The synonymy of the two replacement names for *P. gracilis* Bate, 1888, *Pontophilus challengerii* Ortmann, 1893 and *Pontophilus batei* Faxon, 1893, with *Parapontophilus abyssi*, proposed by Chace (1984), was confirmed (for detail of the publication date of the two names, see Chace [1984: 50]), because the holotype of the taxon established by Bate (1888) and the syntypes of *P. abyssi* are undoubtedly conspecific. Reexamination of the type series of *Pontophilus challengerii* has revealed that four species are confounded in the type series. The true *P. abyssi* is represented

only by the holotype from the southwestern Atlantic near Tristan da Cunha (*Challenger*, stn 133) (Fig. 4A-D). The six paratypes from off New Zealand (*Challenger*, stn 168, 40°28'S, 177°43'E, 1980 m, 8.VII.1874, 2 ♂♂ 9.8, 10.4 mm, 4 ♀♀ 9.3-11.3 mm, BMNH 1888.22) cannot be referred to any species treated in this paper. This undescribed species can be distinguished from other species of the genus by a suite of characters, including the small but conspicuous anterior epigastric tooth on the carapace, the noticeably concave lateral margin of the antennal scale and the strongly produced lamella of the antennal scale, which overreaches the distolateral tooth. Chace (1984) noted that the cornea was relatively small and spherical in the six paratypes from New Zealand. Unfortunately, these six paratype specimens are now in poor condition, because they once had once dried. Therefore, formal description of a new species is delayed in the hope that an additional material will be obtained in the future. The paratype from the Torres Strait in Indonesia (*Challenger*, stn 184) is referred to *P. geminus* n. sp., as the specimen shows all diagnostic features of the latter new species. The two paratypes from the Celebes Sea (*Challenger*, stn 198) are very similar to *P. abyssii* (Fig. 4E-I). However, the structure of the eye of those two specimens is different from that of *P. abyssii*. In the former, the cornea is relatively small, the diameter is 0.13 of the carapace length, in contrast 0.15-0.17 in *P. abyssii*; the boundary between the cornea and eye-stalk is less oblique in the two paratypes of *P. challengerii* from the Celebes Sea than in *P. abyssii*; the proximolateral angle of the eye-stalk is slightly expanded in a flange in the two paratypes of *P. challengerii* from the Celebes Sea (Fig. 4G), but such a flange is not seen in the specimens identified with *P. abyssii* (Fig. 3D, G). There would seem to be little doubt that the two specimens from the Celebes Sea represent a species other than *P. abyssii*. However, more specimens are needed to draw out definite conclusion on the taxonomic identity of these two specimens.

Calman (1939) identified specimens from a wide bathymetric range in the western Indian Ocean (494-2926 m) collected during John Murray Expedition with *Pontophilus indicus* established by de Man

(1918). He clearly mentioned that the variation in the size of the anterior epigastric tooth and of the corneal colour depends of the depths. Although Calman's specimens have not been examined, there is little doubt that specimens from abyssal depths greater than 2000 m (stn 26, 2312 m; stn 185, 2000 m; stn 120, 2926 m; stn 155, 2249 m; and stn 162, 1829-2051 m) represent *Parapontophilus abyssii*.

Richardson & Yaldwyn (1958) mentioned the presence of *Pontophilus challengerii* in waters around New Zealand. Although the given illustration is rather diagrammatic, a well-developed anterior epigastric tooth is clearly depicted in the illustration (Richardson & Yaldwyn 1958: fig. 48). However, the shape of the corneas illustrated by the authors is quite different from those of *Parapontophilus abyssii*. In all probability, *Pontophilus challengerii* mentioned by Richardson & Yaldwyn (1958) is the undescribed species represented by six paratype specimens of *P. challengerii* from off New Zealand.

Chace (1984) reported *Pontophilus gracilis abyssii* from Indonesia based on three *Albatross* specimens. The diagnosis and illustrations given by Chace (1984) agree closely with *P. geminus* n. sp. in every aspect, including the relatively small corneas and the relatively short branchiostegal tooth.

Allen & Butler (1994) reported *Parapontophilus abyssii* (as *Pontophilus*) from Sio Guyot, Mid-Pacific mountains. Examination of the three specimens in the collection of CBM has shown the existence of *P. longirostris* n. sp. on the same sea mountain where Allen & Butler (1994) recorded *P. abyssii*. Therefore, the record of Allen & Butler (1994) is referred to *P. longirostris* n. sp.

A specimen from the Ibero-Moroccan waters in the eastern Atlantic, provisionally identified with *Pontophilus abyssii* by Garcia Raso (1996), has been reexamined. It does not represent *Parapontophilus abyssii*, but a species closely resembling *P. longirostris* n. sp. In this specimen, the rostrum is abnormally missing. Therefore, final determination of its specific identity is deferred in the hope that additional specimens from the Atlantic Ocean will become available.

Davie (2002) cited a record of *Parapontophilus gracilis abyssii* from Queensland, Australia, but no

information on the morphology is provided. During this study, the occurrence of *P. abyssi* from the western Pacific has not been confirmed. Therefore, Davie's record is questionably included in the synonymy.

Parapontophilus junceus (Bate, 1888)
(Figs 5; 6A, B; 20C)

Pontophilus junceus Bate, 1888: 491, pl. 88, figs 2-4 (type locality: Moro Gulf, east of Basilan Strait, Mindanao, Philippines, 457 m).

Pontophilus occidentalis var. *indica* de Man, 1918: 161 (in part) (type locality: Bali Sea, Indonesia, 538 m; here restricted by lectotype designation); 1920: 264 (in part).

Pontophilus indicus – Calman 1939: 219 (in part). — Zarenkov 1969: 80 (list; in part).

Pontophilus gracilis junceus – Chace 1984: 47 (key), 53 (in part). — Takeda & Hanamura 1994: 30. — Sakaji 2001: 211.

?*Parapontophilus gracilis junceus* – Hanamura & Evans 1996: 15. — Davie 2002: 240.

?*Pontophilus junceus* – Balss 1925: 296.

?*Pontophilus indicus* – Richardson & Yaldwyn 1958: 41, fig. 46.

?*Pontophilus gracilis junceus* – Burukovsky 1990: 209.

Not *Pontophilus occidentalis* var. *indica* – Kensley 1968: 319, figs 18, 19; 1972: 64, fig. 30c, d (= *Parapontophilus abyssi* (Smith, 1884)).

Not *Pontophilus gracilis junceus* – Chace 1984: figs 20-22, 23d (= *Parapontophilus difficilis* n. sp.).

TYPE MATERIAL. — Holotype of *Pontophilus junceus* Bate, 1888: *Challenger*, stn 200, Moro Gulf, Mindanao, Philippines, 06°47'N, 122°28'E, 457 m, 20.X.1874, ♀ 8.2 mm (BMNH 1888.22). Examined.

Lectotype of *Pontophilus occidentalis* var. *indica* de Man, 1918 (herein selected): *Siboga*, stn 316, Bali Sea, Indonesia, 07°19.4'S, 116°49.5'E, 538 m, 19.II.1900, ovig. ♀ 8.7 mm (ZMA). Examined.

Paralectotypes of *Pontophilus occidentalis* var. *indica*: *Siboga*, stn 45, Flores Sea, 07°24'S, 118°15.2'E, 794 m, 6.IV.1899, 1 ♀ 6.3 mm, 2 ovig. ♀♀ 7.6, 8.3 mm (ZMA). — Same data as lectotype, 2 ♀♀ 6.1, 7.2 mm,

3 ovig. ♀♀ 8.7, 9.9 mm (one individual badly damaged) (ZMA). Examined.

OTHER MATERIAL EXAMINED. — **Japan.** Off Wabuka, Kushimoto, Kii Peninsula, 550 m, 20.X.1994, dredge, coll. S. Nagai, 1 ♂ 5.8 mm (CBM-ZC 3027).

East China. RV *Yoko-maru* 1993 cruise, 30°26.8'N, 128°18.6'E, 693 m, 7.IX.1993, trawl, 2 ♂♂ 6.2, 6.4 mm, 1 ♀ 7.9 mm (CBM-ZC 3028).

Taiwan. TAIWAN 2001, stn CP 108, 24°48.2'N, 122°07.7'E, 295-337 m, 20.V.2002, 1 ovig. ♀ 6.4 mm (MNHN-Na 16084). — Stn CP 115, 24°53.87'N, 122°02.05'E, 381-440 m, 21.V.2001, 1 ♂ 7.2 mm (NTOU). — Stn CP 132, 22°20.98'N, 120°06.73'E, 690-700 m, 21.XI.2001, 4 ♀♀ 7.4-8.4 mm (NTOU). — Stn CD 134, 22°16.56'N, 120°06.11'E, 736-1040 m, 22.XI.2001, 1 ♀ 7.9 mm (NTOU). — Stn CD 137, 22°12.92'N, 120°25.93'E, 316-477 m, 23.XI.2001, 4 ♂♂ 4.0-7.0 mm, 3 ♀♀ 6.2-7.4 mm (NTOU). — Stn CP 139, 22°10.7'N, 120°14.1'E, 718-852 m, 23.XI.2001, 1 ♀ 8.0 mm (NTOU). — Stn CD 140, 22°11.40'N, 120°22.58'E, 452-280 m, 24.XI.2001, 2 ♂♂ 5.4, 5.9 mm, 2 ♀♀ 6.8, 7.2 mm (NTOU).

TAIWAN 2003, stn CD 210, 24°28.99'N, 122°12.79'E, 500-1183 m, 1.VI.2003, 2 ♀♀ 7.3 mm (one individual damaged) (NTOU). — Stn CD 230, 22°19.32'N, 120°30.30'E, 795-840 m, 30.VIII.2003, 1 ♂ 5.7 mm (NTOU).

TAIWAN 2004, stn CP 271, 20°20.19'N, 120°7.02'E, 703-785 m, 28.XII.2004, 1 ♀ 8.7 mm (NTOU).

TAIWAN 2005, stn CP 299, 22°16.25'N, 120°03.08'E, 806-835 m, 11.VIII.2005, 1 ♀ 6.3 mm (NTOU). — Stn CP 324, 20°37.53'N, 117°50.62'E, 1293-1499 m, 20.VIII.2005, 2 ♀♀ 7.6, 8.5 mm (NTOU). — Stn PCP 332, 22°13.97'N, 120°00.22'E, 961-1026 m, 5.X.2005, 4 ♀♀ 7.6-8.5 mm (NTOU). — Stn PCP 333, 22°13.61'N, 120°01.91'E, 889-1037 m, 5.X.2005, 4 ♀♀ 6.9-8.2 mm (NTOU). — Stn PCP 334, 22°14.16'N, 119°59.25'E, 994-975 m, 5.X.2005, 4 ♀♀ 6.6-7.6 mm (NTOU). — Stn PCP 342, 1 ♀ 7.1 mm (NTOU).

TAIWAN 2006, stn PCP 341, 6 ♀♀ 7.1-8.2 mm (NTOU). — Stn PCP 343, 2 ♀♀ 7.4 mm, damaged (NTOU). — Stn CP 362, 1 ♀ 7.5 mm (NTOU).

Philippines. MUSORSTOM 2, stn CP 25, 13°39.0'N, 120°42.6'E, 550-520 m, 23.XI.1980, 1 ♀ 9.1 mm (MNHN-Na 5315). — Stn CP 78, 13°49.1'N, 120°28.0'E, 441-550 m, 1.XII.1980, 1 ♀ 7.1 mm (MNHN-Na 5319).

MUSORSTOM 3, stn CP 118, 11°58'N, 121°06'E, 448-466 m, 3.VI.1985, 1 ♀ 8.0 mm (MNHN-Na 16085).

PANGLAO 2005, Bohol Sea, stn CP 2333, Maribojoc Bay, 09°38.2'N, 123°43.5'E, 596-566 m, mud, 22.V.2005, 3 ♀♀ 6.1-7.0 mm (NTOU). — Stn CP 2334, similar locality, 09°37.46'N, 123°40.22'E, 631-659 m, sand, 22.V.2005, 5 ♀♀ 3.9-7.1 mm (NTOU). — Stn

CP 2388, 09°26.9'N, 123°34.5'E, 762-767 m, sand-mud, 30.V.2005, 1 ♀ 6.1 mm (NTOU). — Stn CP 2394, off Balicasag Island, 09°28.6'N, 123°40.0'E, 566-787 m, sand-mud, 2 ♀♀ 4.5, 7.0 mm (NTOU). — Stn CP 2398, similar locality, 09°32.6'N, 123°40.5'E, 731-741 m, sand, 31.V.2005, 1 ♀ 6.3 mm (NTOU).

Indonesia. KARUBAR, Kai Islands, stn CP 17, 05°15'S, 133°01'E, 459-439 m, 24.X.1991, 2 ♀♀ 7.9, 8.3 mm (MNHN-Na 16086). — Stn CP 19, 05°15'S, 133°01'E, 605-576 m, 25.X.1991, 1 ♀ 7.6 mm (MNHN-Na 16087). — Stn CP 20, 05°15'S, 132°59'E, 769-809 m, 25.X.1991, 5 ♂♂ 5.2-7.4 mm, 25 ♀♀ 6.6-8.6 mm (MNHN-Na 16088); 1 ♂ 7.3 mm (infested by bopyrid) (MNHN-Na). — Stn CC 21, 05°14'S, 133°00'E, 688-694 m, 25.X.1991, 2 ♂♂ 6.0, 7.0 mm, 3 ♀♀ 7.6-10.6 mm (MNHN-Na 16089). — Stn CP 35, 06°08'S, 132°45'E, 390-502 m, 27.X.1991, 1 ♀ 7.4 mm (MNHN-Na 16090). — Tanimbar Islands, stn CC 57, 08°19'S, 131°53'E, 603-620 m, 31.X.1991, 5 ♂♂ 6.3-6.7 mm, 10 ♀♀ 7.1-8.4 mm (MNHN-Na 16091); same data, 1 ♀ 7.5 mm, infested by bopyrid (MNHN-Na). — Stn CP 38, 07°40'S, 132°27'E, 620-666 m, 28.X.1991, 3 ♂♂ 6.1-6.5 mm, 10 ♀♀ 3.6-8.2 mm (MNHN-Na 16092). — Stn CP 59, 08°20'S, 132°11'E, 405-399 m, 31.X.1991, 1 ♀ 8.4 mm (MNHN-Na 16093). — Stn CP 69, 08°42'S, 131°53'E, 356-368 m, 2.XI.1991, 2 ♀♀ 7.8, 8.2 mm (MNHN-Na 16094). — Stn CP 71, 08°38'S, 131°44'E, 477-480 m, 2.XI.1991, 2 ♀♀ 8.4, 9.2 mm (MNHN-Na 19095).

New Caledonia. MUSORSTOM 4, stn 242, 22°05.8'S, 167°10.3'E, 500-550 m, 3.X.1985, 2 ♀♀ 4.6, 5.6 mm (MNHN-Na 16096).

BIOCAL, stn CP 75, 22°19'S, 167°23'E, 825-860 m, 4.IX.1985, 3 ♀♀ 5.3, 6.0 mm (largest specimen damaged) (MNHN-Na 16103).

BATHUS 1, stn CP 663, 20°58.66'S, 165°38.27'E, 730-780 m, 13.III.1993, 1 ♀ 8.5 mm (MNHN-Na 16104). — Stn CP 709, 21°41.78'S, 166°37.88'E, 650-800 m, 19.III.1993, 1 ♀ 6.6 mm (MNHN-Na 16105); 1 ♀ 6.6 mm, infested by bopyrid (MNHN-Na). — Stn CP 765, 22°09.6'S, 166°02.8'E, 600-630 m, 17.III.1993, 2 ♀♀ 8.0, 8.2 mm (MNHN-Na).

BATHUS 2, stn CP 743, 22°35.6'S, 166°26.2'E, 713-950 m, 14.V.1993, 1 ♀ 8.0 mm (MNHN-Na 16106). — Stn CP 765, 22°09.6'S, 166°02.8'E, 600-630 m, 17.V.1993, 2 ♀♀ 8.0, 8.1 mm (MNHN-Na 16107). — Stn CP 771, 22°09.52'S, 166°01.75'E, 610-800 m, 18.V.1993, 1 ♀ 7.0 mm (MNHN-Na 16108).

HALIPRO 1, stn CP 866, 21°26.91'S, 166°17.23'E, 550-600 m, 22.III.1994, 1 ♀ 7.0 mm (MNHN-Na 16111).

BATHUS 4, stn CP 913, 18°56.23'S, 163°04.86'E, 777-820 m, 5.VIII.1994, 1 ♀ 7.5 mm (MNHN-Na 16109). — Stn CP 950, 20°31.93'S, 164°56.11'E, 705-750 m, 10.VIII.1994, 4 ovig. ♀♀ 8.0-8.4 mm

(MNHN-Na 16110).

Loyalty Islands. MUSORSTOM 6, stn CP 438, 20°23.00'S, 166°29.10'E, 780 m, 18.II.1989, 1 ♀ 8.0 mm (MNHN-Na 16102).

Chesterfield Islands. MUSORSTOM 5, stn 323, 21°18.52'S, 157°57.62'E, 970 m, 14.X.1986, 1 ♀ 12.8 mm (MNHN-Na 16097). — Stn CC 384, 19°42.40'S, 158°50.80'E, 772-756 m, 21.X.1986, 1 ♀ 7.7 mm (MNHN-Na 16098). — Stn CP 386, 20°56.21'S, 160°51.12'E, 770-755 m, 22.X.1986, 1 ♂ 6.7 mm, 2 ♀♀ 5.4, 6.2 mm (MNHN-Na 16099). — Stn CP 387, 20°53.41'S, 160°52.14'E, 650-660 m, 22.X.1986, 1 ♂ 5.0 mm, 1 ♀ 7.0 mm, 1 juvenile 4.1 mm (MNHN-Na 16100). — Stn CC 390, 21°00.90'S, 160°50.30'E, 745-825 m, 22.X.1985, 1 ♀ 7.0 mm (MNHN-Na 16101).

Vanuatu. MUSORSTOM 8, stn CP 992, 18°52.34'S, 168°55.16'E, 775-748 m, 24.IX.1994, 1 ♀ 6.5 mm, 1 ovig. ♀♀ 8.4 mm (MNHN-Na 16112). — Stn CP 993, 18°48.78'S, 168°54.04'E, 780-783 m, 24.IX.1994, 3 ♀♀ 6.2-7.6 mm (MNHN-Na 16113). — Stn CP 994, 18°47.72'S, 168°56.17'E, 649-641 m, 24.IX.1994, 1 ♀ 8.2 mm (MNHN-Na 16114). — Stn CC 996, 18°52.41'S, 168°55.73'E, 764-786 m, 24.IX.1994, 1 ♀ 10.2 mm (MNHN-Na 16115). — Stn CP 1028, 17°54.01'S, 168°40.42'S, 624-668 m, 20.IX.1994, 2 ovig. ♀♀ 7.0, 8.0 mm (MNHN-Na 16116). — Stn CP 1035, 17°56.02'S, 168°44.06'E, 765-780 m, 29.IX.1994, 1 ovig. ♀ 9.3 mm (MNHN-Na 16117). — Stn CP 1055, 16°30.11'S, 167°55.13'E, 572-580 m, 1.X.1994, 3 ♀♀ 6.6-7.2 mm, 3 ovig. ♀♀ 8.2-8.6 mm (MNHN-Na 16118).

Tonga. BORDAU 2, stn CP 1556, 20°11'S, 174°45'W, 589-591 m, 7.VI.2000, 1 ♀ 7.3 mm (MNHN-Na 16119). — Stn CP 1565, NW of Tongatapu, 20°58'S, 175°16'W, 869-880 m, 9.VI.2000, 2 ♀♀ 5.8, 7.3 mm (MNHN-Na 16120); 2 ovig. ♀♀ 10.6, 11.1 mm (MNHN-Na 16121); 1 ♀ 11.2 mm (photographed) (MNHN-Na 16122). — Stn CP 1640, 21°09'S, 175°24'W, 564-569 m, 21.VII.2000, 1 ♀ 7.2 mm (MNHN-Na 16123).

Solomon Islands. SALOMON 1, stn CP 1749, 09°20.9'S, 159°56.2'E, 582-594 m, 25.IX.2001, 1 ♀ 7.6 mm (MNHN-Na 16124). — Stn CP 1783, 08°32.8'S, 160°41.7'E, 399-700 m, 29.IX.2001, 2 ♀♀ 7.2, 7.6 mm (MNHN-Na 16125). — Stn DW 1772, 08°15.8'S, 160°40.4'E, 570-756 m, 28.IX.2001, 1 ♀ 9.6 mm (MNHN-Na 16126). — Stn CP 1794, 09°16.1'S, 160°07.7'E, 494-504 m, 30.IX.2001, 1 ♀ 7.2 mm (MNHN-Na 16127). — Stn CP 1806, 09°37.9'S, 160°49.7'E, 621-708 m, 2.X.2001, 1 ♀ 8.0 mm (MNHN-Na 16128). — Stn CP 1808, 09°45.5'S, 160°52.5'E, 611-636 m, 2.X.2001, 1 ♀ 7.2 mm (MNHN-Na 16129). — Stn 1859, 09°32.6'S, 160°37.3'E, 283-305 m, 7.X.2001, 1 ♀ 7.5 mm (MNHN-Na 16130).

SALOMON 2, SW Russel Island, stn CP 2175, 09°05.8'S, 158°59.9'E, 579-585 m, 21.X.2004,

3 ♀♀ 8.8-9.3 mm (MNHN-Na 16131). — Stn CP 2176, 09°09.4'S, 158°59.2'E, 600-875 m, 21.X.2004, 2 ♀♀ 7.6, 8.3 mm (MNHN-Na 16132). — Off St Isabel Island, stn CP 2182, 08°47.0'S, 159°37.9'E, 762-1060 m, 22.X.2004, 1 ♂ 4.2 mm (MNHN-Na 16133). — Stn CP 2184, 08°16.9'S, 159°59.7'E, 464-523 m, 23.X.2004, 2 ♀♀ 7.9, 9.4 mm (MNHN-Na 16134). — Stn CP 2186, 08°17'S, 160°00.0'E, 487-541 m, 23.XI.2004, 1 ovig. ♀ 10.0 mm (MNHN-Na 16135). — Stn CP 2187, 08°17.5'S, 159°59.8'E, 482-604 m, 23.X.2004, 1 ♂ 7.3 mm, 2 ♀♀ 9.1, 9.8 mm (MNHN-Na 16136). — Stn CP 2188, 08°17.9'S, 160°01.3'E, 495-677 m, 23.X.2004, 6 ♀♀ 8.1-11.8 mm (MNHN-Na 16137). — Stn CP 2189, 08°19.6'S, 160°01.9'E, 660-854 m, 23.X.2004, 5 ♀♀ 7.7-9.8 mm (MNHN-Na 16138). — Stn CP 2206, 07°43.4', 158°29.0'E, 391-623 m, 25.X.2004, 1 ♀ 7.4 mm, 1 ovig. ♀ 10.0 mm (MNHN-Na 16139). — Off Choiseul Island, stn CP 2213, 07°38.7'S, 157°42.9'E, 495-650 m, 26.X.2004, 1 ♀ 9.2 mm (MNHN-Na 16140). — Off New Georgia Island, stn CP 2220, 632 m, 27.X.2004, 2 ♂♂ 5.7, 7.0 mm (MNHN-Na 16141). — Off Choiseul Island, stn CP 2226, 06°39.0'S, 156°14.3'E, 490-520 m, 28.X.2004, 1 ♂ 6.7 mm (MNHN-Na 16142). — Stn CP 2227, 06°37.2'S, 156°12.7'E, 508-522 m, 28.X.2004, 1 ♀ 8.2 mm (MNHN-Na 16143). — Stn CP 2228, 06°34.7'S, 156°10.5'E, 609-625 m, 28.X.2004, 4 ♀♀ 8.4-10.0 mm, 1 ovig. ♀ 8.3 mm (CBM-ZC 8603). — Off Vella Lavella Island, stn CP 2244, 07°45.0'S, 156°26.7'E, 554-586 m, 1.XI.2004, 6 ♀♀ 7.9-10.9 mm, 7 ovig. ♀♀ 8.0-11.3 mm (MNHN-Na 16144). — Stn CP 2245, 07°43.1'S, 156°26.0'E, 582-609 m, 1.XI.2004, 1 ♀ 9.7 mm, 3 ovig. ♀♀ 7.9-11.2 mm (MNHN-Na 16145). — Stn CP 2246, 07°42.6'S, 156°24.6'E, 664-682 m, 1.XI.2004, 2 ♀♀ 7.5, 10.1 mm, 2 ovig. ♀♀ 7.7, 10.6 mm (MNHN-Na 16146). — Stn CP 2247, 07°44.9'S, 156°24.7'E, 686-690 m, 1.XI.2004, 3 ♀♀ 7.5-9.0 mm (one infested by bopyrid) (MNHN-Na 16147). — Stn CP 2248, 07°42.5'S, 156°24.8'E, 650-673 m, 1.XI.2004, 2 ♀♀ 8.2, 10.4 mm (MNHN-Na 16148). — Vella Gulf, stn CP 2262, 07°56.4'S, 156°51.2'E, 460-487 m, 3.XI.2004, 2 ovig. ♀♀ 8.2, 8.9 mm (MNHN-Na 16149). — Off Tetepare Island, stn CP 2291, 08°39.2'S, 157°26.6'E, 408-470 m, 7.XI.2004, 1 ♀ 7.1 mm (MNHN-Na 16150). — Off Gatokae Island, stn CP 2297, 09°08.8'S, 158°16.0'E, 728-777 m, 8.XI.2004, 1 ovig. ♀ 9.1 mm (MNHN-Na 16151).

Polynesia (Austral Islands). BENTHAUS. Marotiri Island, stn DW 1881, 27°54.6'S, 143°28.5'W, 112-121 m, 6.XI.2002, 1 ♀ 6.5 mm (MNHN-Na 16152). — E of Rapa Island, stn DW 1889, 27°36.8'N, 144°15.7'W, 600-620 m, 7.XI.2002, 2 ♀♀ 4.6 mm, 6.1 mm (larger one photographed) (MNHN-Na 16153). — Stn CP 1891, 27°37.1'S, 144°15.4'E, 800-850 m, 7.XI.2002,

4 ♀♀ (not measured) (MNHN-Na 16154). — Stn CP 1892, 27°38.8'S, 144°15.6'W, 742-1000 m, 7.XI.2002, 1 ♀ 5.7 mm (MNHN-Na 16155). — Tubuai Islands, stn DW 1955, 23°18.6'S, 149°25.7'W, 750-850 m, 18.XI.2002, 3 ♀♀ 5.8-6.1 mm (MNHN-Na 16156). — Stn CP 1965, 23°21.3'S, 149°33.9'W, 19.XI.2002, 1 ♂ 4.9 mm, 8 ♀♀ 4.8-7.5 mm, 1 juvenile 3.2 mm (MNHN-Na 16157). — Stn CP 1967, 23°21.4'S, 149°34.2'W, 600-1200 m, 19.XI.2002, 10 ♂♂ 4.6-6.4 mm, 13 ♀♀ 4.4-7.0 mm (MNHN-Na 16158).

New Zealand. RV *Tangaroa*, stn 0413/127, 37°19.51'S, 177°05.42'E, 638-542 m, 14.XI.2004, 1 ♀ 8.3 mm (NIWA 13713).

DISTRIBUTION. — Widely distributed in the tropical to subtropical regions in the Indo-West Pacific: Zanzibar, Maldives, southern Japan, Taiwan, Philippines, Indonesia, Solomon Islands, New Caledonia, Vanuatu, Tonga, Austral Islands in French Polynesia (Fig. 35); 112-970 m, but abundant at depths of 500-800 m.

DESCRIPTION

Rostrum (Fig. 5A-D) narrow triangular in dorsal view, 0.18-0.23 of carapace length, directed forward or slightly upward, straight, usually reaching or slightly overreaching distal margins of corneas; dorsal surface concave in proximal half; lateral margins usually armed with 2 pairs of small teeth, anterior pair usually arising from midlength of rostrum. Carapace (Fig. 5A-D) 1.60-1.80 times as long as wide; anterior epigastric tooth absent or greatly reduced to minute denticle or tubercle; posterior epigastric and cardiac teeth moderately small, cardiac tooth arising from two-thirds of carapace length; postorbital tooth showing as minute tubercle; epibranchial ridge weak, occasionally obsolescent; branchiostegal tooth moderately long, usually falling short of dorsodistal margin of antennal basicerite.

Third pleonal somite (Fig. 5E) with moderately convex tergum and moderately produced postero-dorsal margin; fifth somite (Fig. 5E, F) rounded dorsally; sixth somite (Fig. 5E, F) 3.50-3.70 times longer than wide, 2.30-2.90 times longer than deep; dorsal surface rounded or faintly sulcate medially.

Eye (Fig. 5A, D, G) generally bean-shaped; cornea darkly pigmented (general colour gray to black), maximal diameter 0.18-0.21 of carapace length; corneal surface distinctly faceted with moderately large lenses (Fig. 20C); boundary between cornea

and eye-stalk clearly delineated; eye-stalk only slightly constricted near base; papilla-like projection small. Antennular peduncle (Fig. 5A) falling short of midlength of antennal scale. Antennal scale (Fig. 5A) 0.60-0.75 of carapace length; lateral margin slightly concave or nearly straight, distolateral tooth slightly falling short of or nearly reaching distal margin of lamella.

Palm of first pereopod (Fig. 5H) 3.80-4.30 times longer than wide; cutting edge strongly oblique; pollex small, width including tip of pollex 1.20-1.25 of width proximal to base of pollex; merus with relatively weak dorsodistal tooth. Second pereopod short, reaching or falling short of midlength of merus of first pereopod. Fourth pereopod (Fig. 5I) overreaching distal margin of antennal scale by half to full length of dactylus; dactylus subspatulate, 0.60-0.70 of propodal length; carpus 0.70-0.80 of propodal length. Fifth pereopod (Fig. 5J) similar to fourth, slightly falling short of distal margin of antennal scale. Appendix masculina 0.50-0.70 length of appendix interna.

Coloration in life

Body and appendages generally light reddish-brown.

Size

Males CL 4.0-7.4 mm; females CL 4.4-11.3 mm, ovigerous females CL 8.0-11.3 mm.

REMARKS

The rostrum is usually armed with two pairs of lateral teeth, but either or both of the anterior pairs are rarely missing. The anterior epigastric tooth is minute or completely reduced.

During this study, two very similar but distinct forms were recognized in the material from the western Pacific. These two forms, having distinctly faceted cornea in common, differ from each other in the colour of the cornea, the length of the rostrum, the size of the anterior epigastric tooth, and the overall body size. The first form is characterized by the darkly pigmented cornea, the greatly reduced anterior epigastric tooth, which is occasionally completely absent, and the relatively small body size (the largest specimen is 12.8 mm in CL;

the ovigerous specimens are 6.4-11.3 mm in CL); the second form is characterized by the opaque or lightly pigmented cornea, the possession of tiny but conspicuous anterior epigastric tooth and the relatively large size (the largest specimen is 14.0 mm in CL; the ovigerous females are 9.8-13.0 mm). Furthermore, these two forms are bathymetrically separated for the most part, although their bathymetrical ranges partially overlap at depths of 700-900 m. Literature survey showed that the two forms should correspond to *Parapontophilus junceus* described by Bate (1888) and *Pontophilus occidentalis* var. *indica* de Man, 1918, of which the latter has been placed in the synonymy of *Parapontophilus junceus* (see Chace 1984).

As Chace (1984) remarked, Bate's (1888: fig. 3) illustration of *Parapontophilus junceus* is considerably different from the extant holotype (Fig. 6A). The rostrum of the holotype is now partially damaged with a distal part broken off and the colour of the cornea is possibly faded away during about 130 years after capture. Nevertheless, the anterior epigastric tooth is minute; the reconstructed rostrum slightly overreaches the distal margins of the corneas. Therefore, the holotype of *P. junceus* well corresponds to the first form. Reexamination of the type series of *Pontophilus occidentalis* var. *indica*, consisting of 16 specimens from six different stations of the *Siboga*, has revealed that two forms, corresponding to those recognized in the other material, are included. Chace (1984) seems to believe that one of the six specimens from the *Siboga* station 316 in the Bali Sea represented a name-bearing type of de Man's taxon, as he suggested that the type locality of it is restricted to the *Siboga* station 316 in the Bali Sea. However, de Man (1918, 1920) did not designate a holotype for his taxon, or nobody has selected a lectotype for it. Therefore, the type series of *P. occidentalis* var. *indica* should be syntypes. In the interest of nomenclatural stability, I selected the ovigerous female (9.0 mm) from the *Siboga* station 316 in the Bali Sea as a lectotype of *Pontophilus occidentalis* var. *indica*, because de Man (1920) stated that "The 6 females from Stat. 316 are considered as the typical representatives of this new variety *indica*." This lectotype (Fig. 6B) agrees quite well with the holotype of *Parapontophilus junceus* in

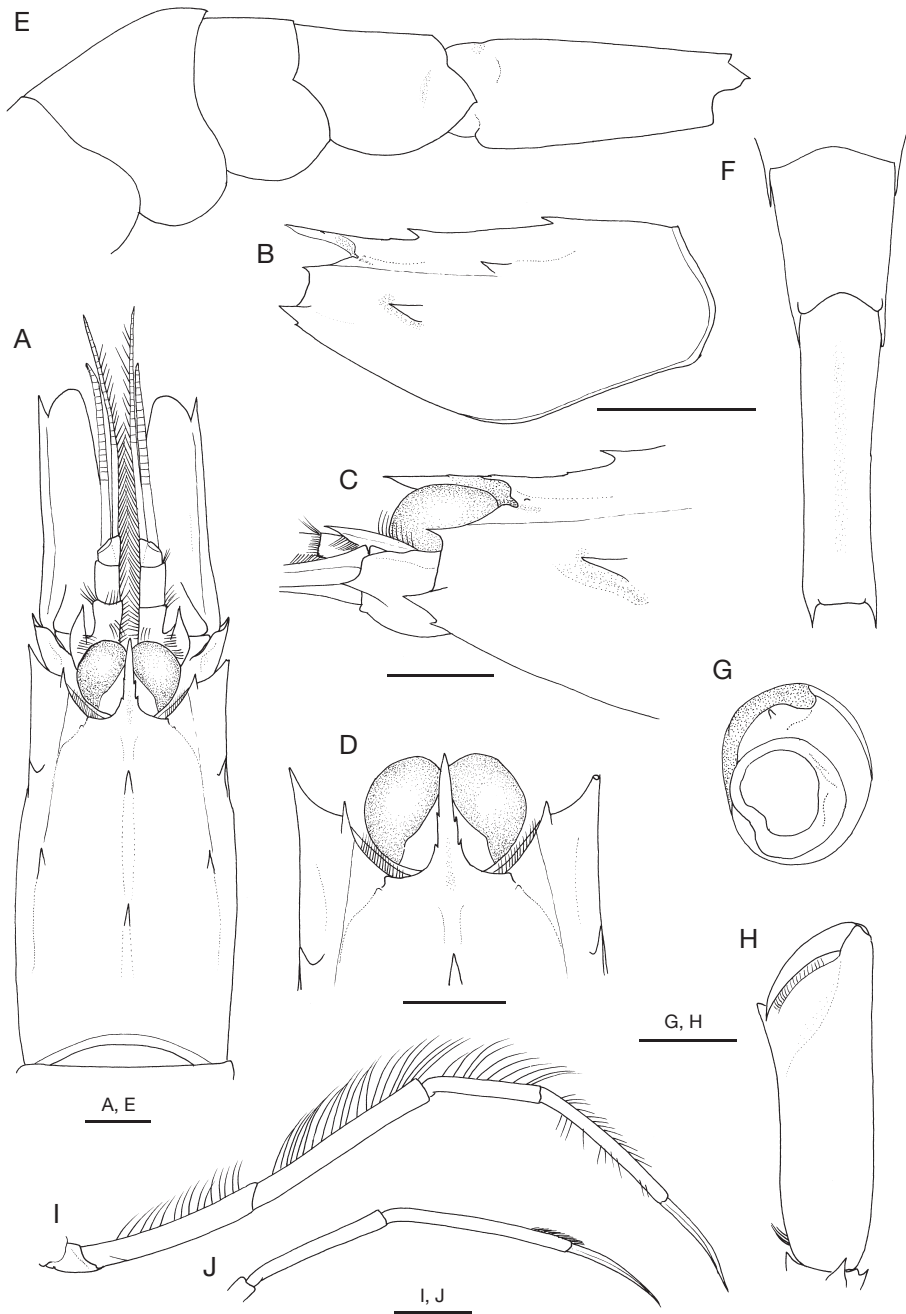


FIG. 5. — *Parapontophilus junceus* (Bate, 1888): **A**, carapace and cephalic appendages, dorsal view (setae partially omitted); **B**, carapace, lateral view; **C**, anterior part of carapace, cornea, and basal part of antennae, lateral view; **D**, anterior part of carapace, eyes, dorsal view; **E**, second to sixth pleonal somites, lateral view; **F**, fifth and sixth pleonal somites, dorsal view; **G**, eye, ventromesial view; **H**, subchela of left first pereopod, ventral view; **I**, right fourth pereopod, lateral view; **J**, dactylus, propodus and carpus of right fifth pereopod, lateral view; **A-F**, **H-J**, ovig. ♀ 10.2 mm, Solomon Islands (SALOMON 2, stn CP 2244) (MNHN-Na 16144); **G**, ovig. ♀ 8.4 mm, Vanuatu (MUSORSTOM 8, stn CP 992) (MNHN-Na 16112). Scale bars: A, D-J, 2 mm; B, C, 5 mm.

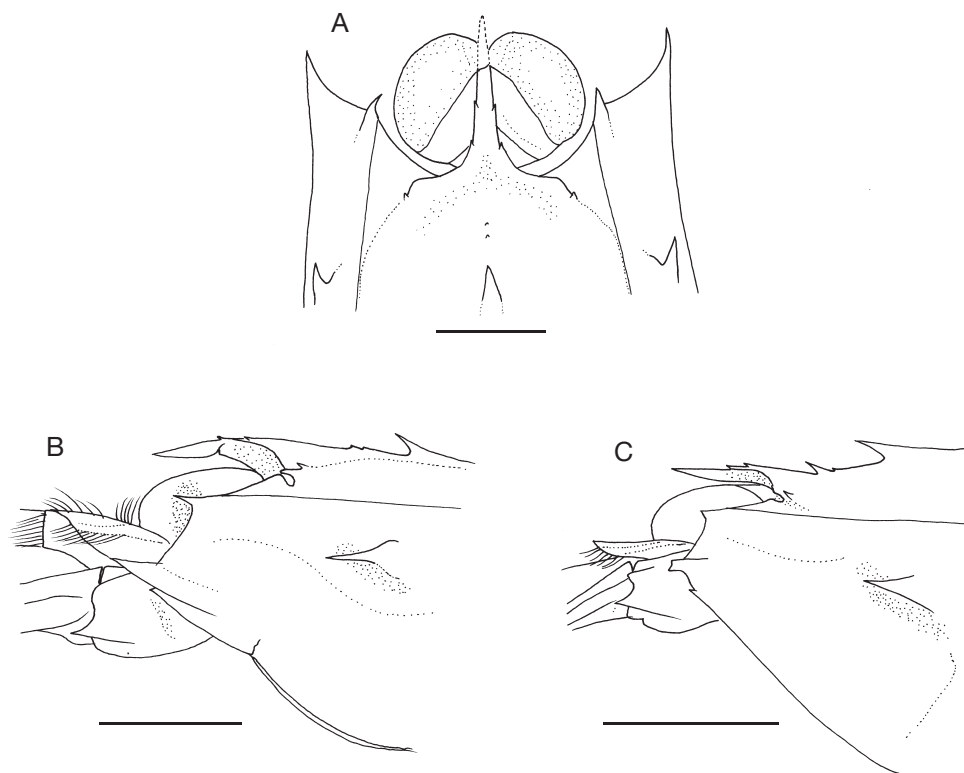


FIG. 6. — **A, B**, *Parapontophilus junceus* (Bate, 1888); **C**, *Parapontophilus difficilis* n. sp.; **A**, ♀ 8.2 mm, holotype of *Pontophilus junceus* Bate, 1888, Moro Gulf, Mindanao, Philippines (*Challenger*, stn 200) (NMH 1888.22), anterior part of carapace and eyes, dorsal view (distal part of rostrum broken off; dotted line showing reconstruction); **B**, ♀ 8.6 mm, lectotype of *Pontophilus occidentalis* var. *indica* de Man, 1918, Bali Sea, Indonesia (*Siboga*, stn 316) (ZMA), anterior part of carapace, eye and basal part of antennae, lateral view; **C**, ♀ 7.0 mm, paralectotype of *Pontophilus occidentalis* var. *indica* de Man, 1918, 7.0 mm, east of Saleyer Island (*Siboga*, stn 211) (ZMA), same part. Scale bars: 2 mm.

every diagnostic aspect. Therefore, de Man's taxon becomes a junior subjective synonym of *P. junceus*. Thus the second form is described as a new species, *P. difficilis* n. sp., in this study. Specimens from the other five *Siboga* stations (45, 88, 178, 211 and 300) are all referred to *P. difficilis* n. sp. In fact, de Man (1920) reported for these specimens that the colour of the eye was light, though coloration and pattern were reportedly variable, and that the anterior epigastric tooth is usually conspicuous.

Calman (1939) identified specimens from the western Indian Ocean collected during John Murray Expedition with *Pontophilus indicus*, although the depth range of the sampling sites was very wide: 494–2926 m. As mentioned before, speci-

mens from depths greater than 2000 m (stn 26, 2312 m; stn 185, 2000 m; sn 120, 2926 m; stn 155, 2249 m; and stn 162, 1829–2051 m) are most probable *P. abyssi*. Calman clearly stated that “In some the anterior gastric spine of the carapace is distinct although small (as in de Man's fig. 63e), while in others it is represented by a microscopic granule (with a still smaller one immediately behind it)”, and therefore at least a part of specimens, collected from shallower depths (stn 109, 640 m; stn 115, 640–659 m; and stn 145, 494 m) could be referred to *Parapontophilus junceus*. This assumption is supported by Calman's statement that “all the specimens from 494 to 658 m have the eyes uniformly pigmented”. Other specimens

from two stations (stn 34, 1022 m; and stn 193, 1061-1080 m) might represent *P. difficilis* n. sp., although it needs to be verified.

The specimens identified by Kensley (1968, 1972) with *Pontophilus occidentalis* var. *indica* were not available during this study. However, Kensley (1968) clearly mentioned the presence of conspicuous anterior epigastric tooth on the carapace. Furthermore, his specimens came from abyssal depths of 2525-3148 m. The occurrence of *Parapontophilus abyssi* in the western Indian Ocean has been confirmed during this study, and therefore, Kensley's (1968, 1972) records are referred to *P. abyssi*.

Chace (1984) reported *Parapontophilus junceus* from the Philippines and Indonesia (as *Pontophilus gracilis junceus*). The illustrated male agrees rather well with *P. difficilis* n. sp. in the possession of two tiny but distinct anterior epigastric teeth. Considering the given bathymetrical range, there is little doubt that two species, *P. junceus* and *P. difficilis*, are actually represented in his material.

The records by Balss (1925) from the western Indian Ocean (as *Pontophilus junceus*), Hanamura & Evans (1996) from Australia (as *Parapontophilus gracilis junceus*), and Burukovsky (1990) from the Sala-y-Gomez and Nazka ridges in the southeastern Pacific (*Pontophilus junceus*) need to be verified. Therefore these references are questionably included in the synonymy.

Parapontophilus profundus (Bate, 1888)
(Fig. 7)

Pontophilus profundus Bate, 1888: 490, pl. 88, fig. 1 (type locality: off Sydney, eastern Australia, 2600 fathoms). — Ortmann 1895: 186. — Zarenkov 1969: 80 (list).

Pontophilus gracilis profundus – Chace 1984: 47 (key), 51, fig. 19.

Parapontophilus gracilis profundus – Davie 2002: 240.

TYPE MATERIAL. — Holotype: *Challenger*, stn 165, off Sydney, Tasman Sea, 4755 m (?), juvenile, 3.1 mm (BMNH 1888.22). Examined.

DISTRIBUTION. — Known only from the type locality in the Tasman Sea (Fig. 35). The depth of the collecting site

was recorded as 4755 m, but the record is questionable (see Remarks).

DESCRIPTION

Rostrum (Fig. 7A, B) slender in dorsal view, nearly spiniform, 0.32 of carapace length, directed forward, overreaching distal margins of corneas; dorsal surface slightly concave in basal 0.40; lateral margins armed with 2 small teeth in proximal 0.40. Carapace (Fig. 7A, B) about 1.60 times as long as wide; anterior epigastric tooth small, but conspicuous; posterior epigastric and cardiac teeth moderately small; postorbital tooth tiny, but acute; postorbital ridge inconspicuous; epibranchial ridge low, only reaching level of cardiac tooth; branchiostegal tooth reaching dorsodistal margin of antennal basicerite.

Third pleonal somite with moderately convex tergum and moderately produced posterodorsal margin; fifth somite rounded dorsally; sixth somite (Fig. 7C) 3.40 times longer than deep, with trace of median sulcus on dorsal surface.

Eye generally bean-shaped; cornea (Fig. 7A, B) entirely dark brown in preservative, maximal diameter 0.26 of carapace length; corneal surface distinctly faceted with relatively large lenses; boundary between cornea and eye-stalk clearly delineated; eye-stalk only slightly constricted near base. Antennular peduncle (Fig. 7A) falling short of midlength of antennal scale. Antennal scale (Fig. 7A) about 0.80 of carapace length, 4.90 times longer than wide; lateral margin noticeably concave, distolateral tooth slightly falling short of distal margin of lamella.

Palm of first pereopod 3.90 times longer than wide; cutting edge moderately oblique; pollex relatively large, width of palm including tip of pollex about 1.40 of width proximal to base of pollex; merus with relatively weak dorsodistal tooth. Fourth and fifth pereopods broken; dactyli about 0.60 length of propodi.

Coloration in life
Unknown.

Size

This species is represented only by the juvenile holotype CL 3.1 mm.

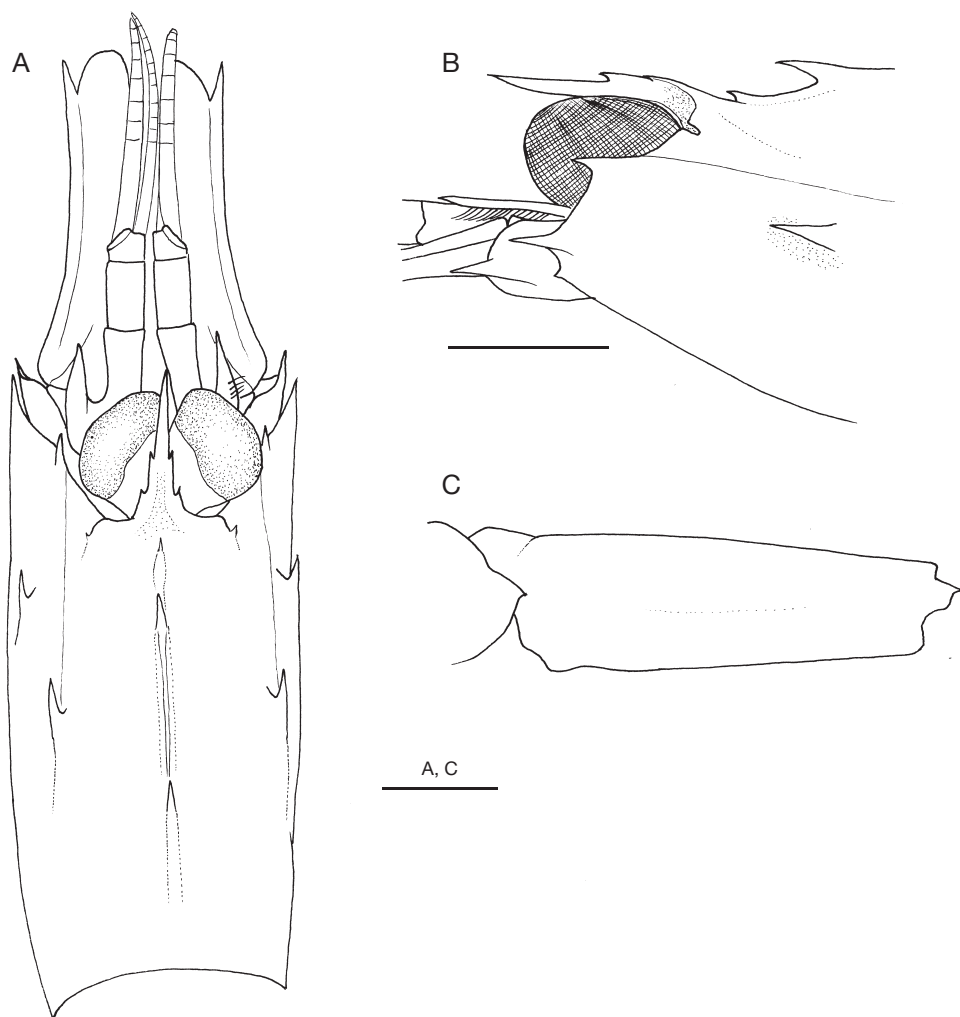


FIG. 7. — *Parapontophilus profundus* (Bate, 1888), ♀, 3.1 mm, holotype, off Sydney, Tasman Sea (*Challenger*, stn 165) (BMNH 1888.22): **A**, carapace and cephalic appendages, dorsal view (setae omitted); **B**, anterior part of carapace, cornea and basal part of antennae, lateral view; **C**, sixth pleonal somite, lateral view. Scale bars: 1 mm.

REMARKS

The depth of the collecting site, where the holotype of *P. profundus* was taken, was indicated as 4755 m (Bate 1888). However, the structure of the cornea of the holotype of *P. profundus* is very similar to that of other species inhabiting upper bathyal zone, i.e. *P. gracilis* and *P. junceus*. The cornea of these three species is darkly pigmented and its surface is distinctly faceted. On the other

hand, in other species inhabiting abyssal zone comparable to that recorded for *P. profundus*, *P. abyssi*, *P. cyrton* n. sp., *P. occidentalis*, and *P. talismani*, the eye is opaque or light yellow, and the corneal surface is not faceted. Furthermore, Bate (1888) noted that the jar containing the holotype of *P. profundus* also included a detached second pereopod of a *Lysmata* species (Hippolytidae), of which almost all known species inhabit shallow to

upper bathyal waters. These elements suggest that the depth record of the holotype of *P. profundus* is incorrect, and that the holotype actually came from shallower depth.

Parapontophilus profundus, represented only by the small holotype measuring 3.1 mm in the post-orbital carapace length, is similar to *P. gracilis*, particularly in the very large eye. There is little doubt that the holotype is a juvenile. Nevertheless, comparison with small specimens of *P. gracilis* has revealed some minor but distinct differences. The rostrum is longer in *P. profundus* than in *P. gracilis*. It overreaches the corneas in *P. profundus*, rather than falling short of them in *P. gracilis*. The anterior epigastric tooth of *P. profundus* is small, but still conspicuous, while that of *P. gracilis* is greatly reduced in microscopic spinule or tubercle or completely absent. The lateral margin of the antennal scale is concave in both species, but the degree is stronger in *P. profundus* than in *P. gracilis*. The sixth pleonal somite is relatively slender in *P. profundus* than in *P. gracilis* (3.40 times as long as high versus 2.30–2.50 times as long). Because of these differences, I regard *P. profundus* as a distinct species.

In the original description, Bate (1888) mentioned that the posterodorsal margin of the third pleonal somite of the holotype was produced posteriorly and partially covered the fourth pleonal somite. However, reexamination of the holotype suggests that Bate (1888) misinterpreted the somewhat damaged abdomen as such.

Parapontophilus occidentalis (Faxon, 1893)
(Figs 8; 20D)

Pontophilus occidentalis Faxon, 1893: 200 (type locality: the syntypes came from eight stations in the eastern Pacific: off Ecuador, 01°07.0'N, 80°21.0'W, 2831 m; Gulf of Panama, 02°34.0'N, 92°06.0'W, 2448 m; Gulf of Panama, 04°56.0'N, 80°52.30'W, 3243 m; Gulf of Panama, 05°43.0'N, 85°50.0'W, 1760 m; Gulf of Panama, 06°10.0'N, 83°06.0'W, 2648 m; Gulf of Panama, 06°21.0'N, 80°41.0'W, 3281 m; Gulf of Panama, 07°05.30'N, 79°40.0'W, 2286 m; off Costa Rica, 10°14.0'N, 96°28.0'W, 4018 m; off Guatemala, 14°46.0'N, 98°40.0'W, 3190 m); 1895: 131, pl. D, fig. 2-2d. — Ortmann 1895: 185. — Zarenkov 1976:

14, fig. 6. — Wicksten 1977: 963. — Retamal 1981: 105 (list). — Mèndez 1981: 121, fig. 351.

Pontophilus gracilis occidentalis – Chace 1984: 48 (key), fig. 23j. — Wicksten 1989: 305 (list), 313 (list). — Wicksten & Hendrickx 1992: 6 (list).

Not *Pontophilus occidentalis* – Kensley 1981: 28 (list) (= *Parapontophilus abyssii* (Smith, 1884)).

TYPE MATERIAL. — The following syntypes of *Pontophilus occidentalis* Faxon, 1893, were examined: *Albatross*, stn 3381, Gulf of Panama, 04°56.0'N, 80°52.30'W, 3243 m, 6.III.1891, 4 ♀♀ 12.0–17.6 mm (MCZ 4583). — Stn 3382, Gulf of Panama, 06°21.0'N, 80°41.0'W, 3281 m, 7.III.1891, 5 ♀♀ 11.0–17.0 mm (MCZ 4584).

In addition to the 2 lots above cited, the following specimens in 8 lots are considered to be syntypes of *Pontophilus occidentalis*: *Albatross*, stn 3361, Gulf of Panama, 06°10.0'N, 83°06.0'W, 2648 m, 25.II.1891, 2 specimens (MCZ). — Stn 3363, Gulf of Panama, 05°43.0'N, 85°50.0'W, 1760 m, 27.II.1891, 2 specimens (MCZ). — Stn 3392, Gulf of Panama, 07°05.30'N, 79°40.0'W, 2286 m, 10.III.1891, 1 specimen (MCZ). — Stn 3398, off Ecuador, 01°07.0'N, 80°21.0'W, 2831 m, 23.III.1891, 2 specimens (MCZ). — Stn 3413, Gulf of Panama, 02°34.0'N, 92°06.0'W, 2448 m, 5.IV.1891, 4 specimens (MCZ). — Stn 3414, off Costa Rica, 10°14.0'N, 96°28.0'W, 4018 m, 8.IV.1891, 1 specimen (MCZ). — Stn 3415, off Guatemala, 14°46.0'N, 98°40.0'W, 3190 m, 10.IV.1891, 2 specimens (MCZ).

DISTRIBUTION. — Eastern Pacific, off San Clemente Island, California, to northern Chile (Figs 34; 35), 1760–4018 m.

DESCRIPTION

Rostrum (Fig. 8A–D) moderately broad, triangular in dorsal view, 0.10–0.15 of carapace length, directed forward and slightly curved ventrally, far falling short of distal margins of corneas; dorsal surface shallowly concave in proximal half; lateral margins always armed with 2 pairs of small lateral teeth proximal to midlength. Carapace (Fig. 8A–D) about 1.70 times longer than wide; anterior epigastric tooth subequal to or slightly smaller than posterior epigastric tooth; posterior epigastric and cardiac teeth relatively small for genus; postorbital tooth small; postorbital and epibranchial ridges conspicuous; branchiostegal tooth relatively small, not reaching dorsodistal margin of antennal basiscerite.

Third pleonal somite (Fig. 8E) with moderately convex tergum and moderately produced

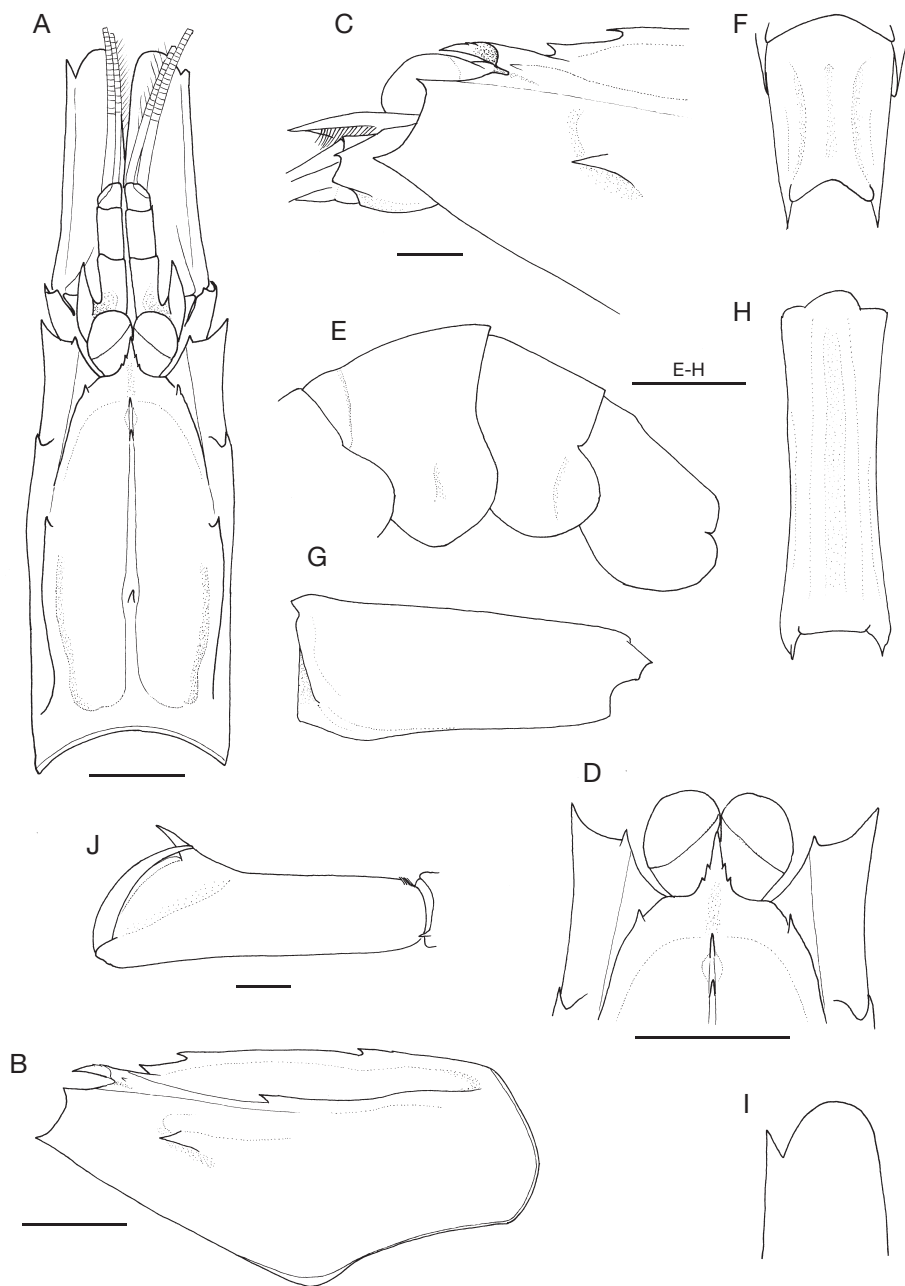


FIG. 8. — *Parapontophilus occidentalis* (Faxon, 1893), ♀, 18.5 mm, syntype, Gulf of Panama, eastern Pacific (*Albatross*, stn 3382) (MZC 4584): **A**, carapace and cephalic appendages, dorsal view (setae partially omitted); **B**, carapace, lateral view; **C**, anterior part of carapace, cornea, and basal part of antennae, lateral view; **D**, anterior part of carapace and eye, dorsal view; **E**, third to fifth pleonal somite, lateral view; **F**, fifth pleonal somite, dorsal view; **G**, sixth pleonal somite, lateral view; **H**, same, dorsal view; **I**, distal part of left antennal scale, dorsal view; **J**, subchela of right first pereopod, ventral view. Scale bars: A, B, D-H, 5 mm; C, I, J, 2 mm.

posterodorsal margin; fifth somite with very low plateau bearing shallow median sulcus (Fig. 8F); sixth somite (Fig. 8G, H) 3.10–3.50 times longer than wide, 2.30–2.50 times longer than deep; dorsal surface with faint submedian ridges flanking very shallow median sulcus.

Eye (Figs 8A, D) rather subpyriform; cornea non-pigmented (colour generally opaque or light yellow in preservative), maximal diameter 0.15–0.17 of carapace length; corneal surface not faceted (Fig. 20D), but white granules possibly representing remnants of lenses visible through integument of cornea; boundary between corneal region and eye-stalk clearly delineated; eye-stalk only slightly constricted near base; papilla-like projection on mesial face small. Antennular peduncle (Fig. 8A) falling short of midlength of antennal scale. Antennal scale (Fig. 8A) 0.65–0.80 of carapace length, 4.00–4.50 times longer than wide; lateral margin slightly concave or nearly straight, distolateral tooth distinctly falling short of distal margin of lamella (Fig. 8I).

Palm of first pereopod (Fig. 8J) 3.90–4.20 longer than wide; cutting edge moderately oblique; pollex relatively large, width of palm including tip of pollex 1.45–1.94 of width proximal to base of pollex; merus with relatively weak dorsodistal tooth. Second pereopod short, reaching or falling short of midlength of merus of first pereopod. Fourth and fifth pereopods broken in all specimens examined.

Coloration in life

Cephalothorax dark brown, otherwise reddish-brown; corneas opaque (according to the colour figure of Faxon [1895]).

Size

Males unavailable; females CL 11.0–17.6 mm.

REMARKS

The rostrum constantly bears two pairs of lateral teeth in the specimens examined, but this consistency may only reflect the small number of the specimens.

This species appears close to the other two abyssal species, *P. abyssii* and *P. talismani*. Differences among the three species are discussed under the account of *P. talismani*. *Pontophilus occidentalis* var. *indica* de Man, 1918 is placed in the synonymy of *Parapon-*

tophilus junceus (see Remarks of *P. junceus*). Kensley (1981) listed *Pontophilus occidentalis* from southern African waters, but this merely reflects his previous identification of specimens from the region with *Pontophilus occidentalis indica* (cf. Kensley 1968). As discussed before, the southern African population having been referred to *P. occidentalis* or *P. occidentalis indica* is actually *Parapontophilus abyssii*.

Parapontophilus talismani

(Crosnier & Forest, 1973)

(Fig. 9)

Pontophilus talismani Crosnier & Forest, 1973: 240 (key), 245, fig. 80a–d. — Dardeau & Heard 1983: 5, 27, figs 2e, 14. — de Saint Laurent 1985: 475. — Gore 1985: 270.

Pontophilus gracilis talismani — Chace 1984: 48 (key).

Parapontophilus talismani — d'Udekem d'Acoz 1999: 133.

TYPE MATERIAL. — Holotype: **Off Mauritania**. *Talisman*, stn 105, 16°38'N, 18°24'W, 3200 m, 18.VII.1883, ovig. ♀ 10.3 mm (MNHN-Na 1025).

Paratype: same data as holotype, 1 ovig. ♀ 9.7 mm (MNHN-Na 16226). Examined.

OTHER MATERIAL EXAMINED. — **Caribbean Sea**. USNS *Bartlett*, Cruise 1301-82, stn 93, Venezuela Basin, 13°32.30'N, 64°40.90'W, 3411–3459 m, 28.XI.1981, 1 ♀ 11.5 mm (BMNH 1983-1984.59).

Northeastern Atlantic. W of Ireland, INCAL, stn CP 3, 56°38.0'N, 11°06.4'W, 2466 m, 17.VII.1976, 1 ♀ 13.0 mm (MNHN-Na 4320).

Bay of Biscay, BIOGAS 3, stn 2, CV 26, 47°33.9'N, 9°05.3'W, 2822 m, VIII.1973, 2 ♂♂ 9.4, 9.6 mm, 2 ovig. ♀♀ 9.0, 9.8 mm (MNHN-Na 4325).

BIOGAS 6, stn 2, CP 11, 47°30'N, 9°07.4'W, 3056 m, X.1974, 1 ♀ 11.1 mm (MNHN-Na 4328); 1 ♀ 10.3 mm (MNHN-Na 4329). — Stn 2, CP 12, 47°32.5'N, 9°11.6'W, 2925 m, X.1974, 1 ♀ 11.8 mm (MNHN-Na 4327).

POLYGAS, stn 2, CV 12, 47°32.5'N, 9°06.2'W, 2775 m, X.1972, 3 ovig. ♀♀ 9.0–10.6 mm (MNHN-Na 4324). —

Stn 18, 47°32.2'N, 08°44.9'W, 2138 m, X.1972, 1 ♀ 12.1 mm (MNHN-Na 4326). — EPI I, stn CH 38, 47°33.75'N, 08°42.15'W, 2100 m, 29.III.1984, 1 ♀ 9.0 mm (MNHN-Na 10521).

DISTRIBUTION. — Caribbean Sea and northeastern Atlantic from off Ireland to off Senegal (Fig. 34), 2100–3459 m.

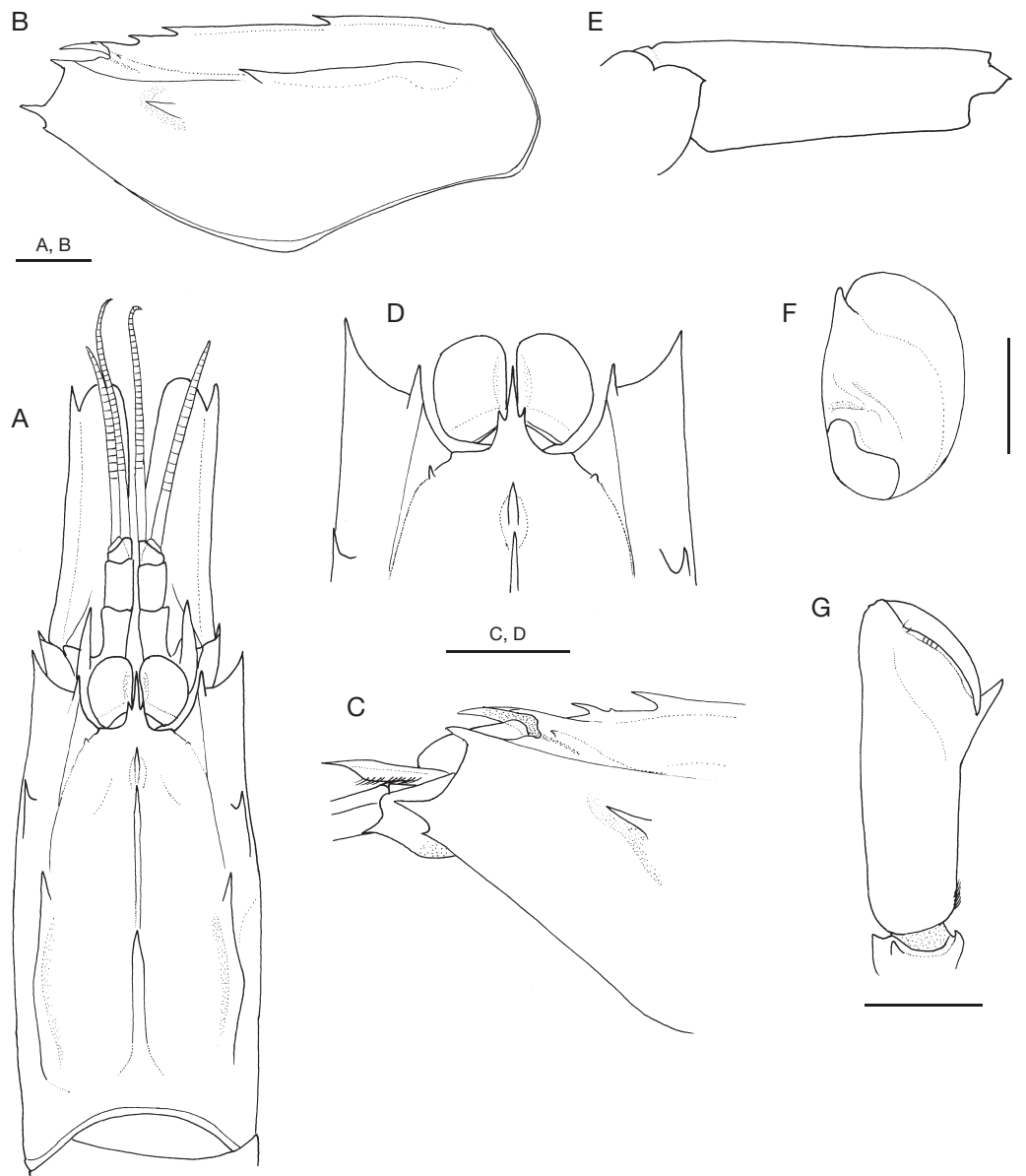


FIG. 9. — *Parapontophilus talismani* (Crosnier & Forest, 1973): **A**, carapace and cephalic appendages, dorsal view (setae partially omitted); **B**, carapace, lateral view; **C**, anterior part of carapace, cornea and basal part of antennae, lateral view; **D**, anterior part of carapace and eyes, dorsal view; **E**, sixth pleonal somite, lateral view; **F**, left eye, ventromesial view; **G**, subchela of right first pereopod, ventral view; **A-E**, **G**, ovig. ♀ 9.8 mm, Bay of Biscay (BIOGAS, stn CV 26) (MNHN-Na 4325); **F**, ovig. ♀ 9.0 mm, Bay of Biscay (POLYGAS, stn CV 12) (MNHN-Na 4324). Scale bars: A-E, G, 2 mm; F, 1 mm.

DESCRIPTION

Rostrum (Fig. 9A-D) narrow triangular in dorsal view, 0.10-0.15 of carapace length, directed forward and slightly curved ventrally, not reaching distal margins of corneas; dorsal surface shallowly concave in proximal half; lateral margins always armed with 1 pair of lateral teeth proximal to mid-length. Carapace (Fig. 9A-D) 1.50-1.70 longer than wide, with 1 anterior epigastric tooth being subequal to or slightly smaller than posterior epigastric tooth; posterior epigastric and cardiac teeth moderately small for genus; postorbital tooth very small; postorbital and epibranchial ridges often clearly delimited; branchiostegal tooth nearly reaching dorsodistal margin of antennal basicerite.

Third pleonal somite with moderately convex tergum and moderately produced posterodorsal margin. Fifth somite smooth, rounded dorsally. Sixth somite (Fig. 9E) 3.50-3.80 times longer than wide, 3.00-3.20 times longer than deep; dorsal surface flat or with trace of median sulcus.

Eye (Fig. 9D, F) generally bean-shaped; cornea opaque or white in preservative, slightly elongate longitudinally; corneal surface not faceted, but white granules possibly representing remnants of lenses visible throughout integument of cornea; maximal diameter of cornea 0.17-0.20 of carapace length; boundary between cornea and eye-stalk obscure; no constriction near base of eye-stalk. Antennular peduncle (Fig. 9A) falling short of midlength of antennal scale. Antennal scale (Fig. 9A) 0.70-0.80 length of carapace, 4.00-4.50 times longer than wide; lateral margin slightly concave or nearly straight, distolateral tooth slightly falling short of or nearly reaching distal margin of lamella.

Palm of first pereopod (Fig. 9G) 3.20-3.50 times longer than wide; cutting edge moderately oblique; pollex relatively large, width of palm including tip of pollex 1.45-1.50 of width proximal to base of pollex; merus with relatively weak dorsodistal tooth. Fourth pereopod overreaching distal margin of antennal scale by half to full length of dactylus; dactylus subspatulate, 0.50-0.60 of propodal length; carpus 0.70-0.80

of propodal length. Fifth pereopod similar to fourth, slightly falling short of distal margin of antennal scale.

Coloration in life

Unknown.

Size

Males CL 9.4-9.6 mm; females CL 9.0-13.0 mm, ovig, females CL 9.0-10.3 mm.

REMARKS

The three abyssal species, *Parapontophilus abyssi*, *P. occidentalis* and *P. talismani*, are very similar to one another, and it is likely that they constitute a monophyletic assemblage. Shared characters include the anterior epigastric tooth being subequal to or slightly smaller than the posterior epigastric tooth and the non-faceted cornea of the eye. The morphology of the eyes is different for one another among the three species: the cornea is slightly elongate in *P. talismani*, rather non-elongate in the other two species; the boundary between the cornea and eye-stalk is not clearly delineated in *P. abyssi* and *P. talismani*, while it is distinct in *P. occidentalis*. The sixth pleonal somite is more slender in *P. talismani* than in *P. abyssi* and *P. occidentalis* (3.00-3.20 times longer than deep versus 2.60-2.90). The characters of the rostrum are also helpful in discriminating these three species, although varying in *P. abyssi*. The rostrum does not reach the anterior margins of the corneas in *P. talismani* and *P. occidentalis*, rather than usually reaching in *P. abyssi*. *Parapontophilus talismani* has always only one pair of lateral teeth on the rostrum, but *P. abyssi* and *P. occidentalis* have usually two pairs of lateral rostral teeth, though either pair is occasionally absent in the latter two species. The conspicuous postorbital and epibranchial ridges and the presence of a low dorsal plateau on the fifth pleonal somite separate *P. occidentalis* from *P. abyssi* and *P. talismani*. *Parapontophilus cyrton* n. sp. is similar to these three species in the non-faceted structure of the cornea, but as discussed in the Remarks of the latter species, it is characteristic in having the noticeably geniculate pleon.

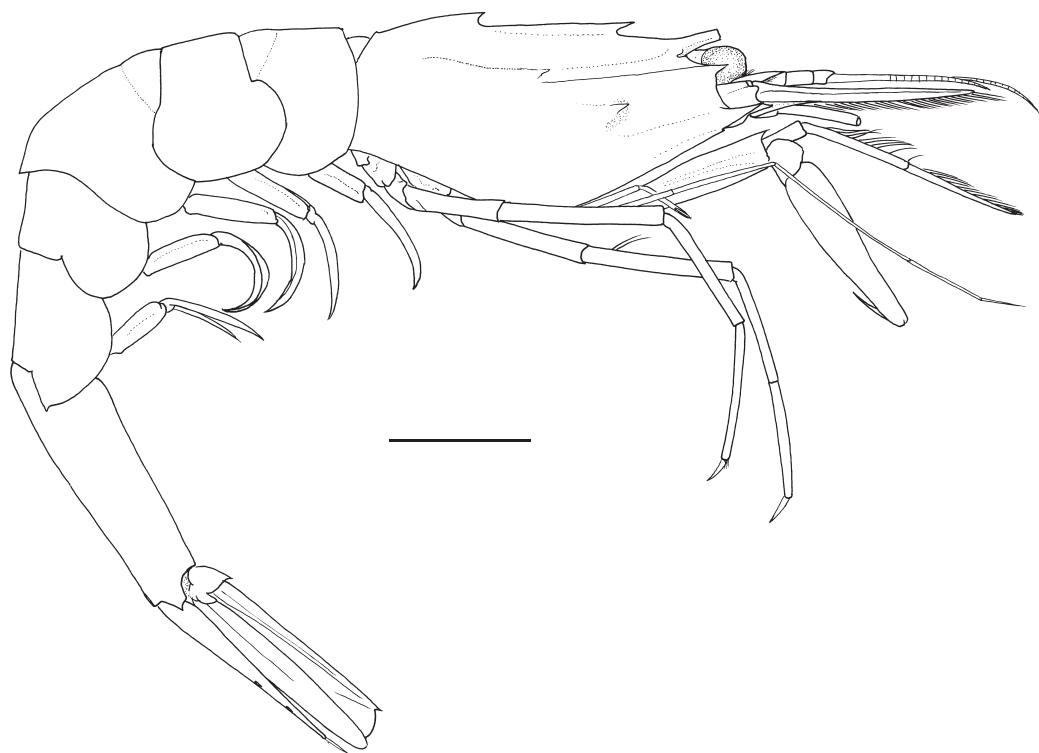


FIG. 10. — *Parapontophilus cornutus* n. sp., habitus (rostrum broken off, setae partially omitted), ♀, 9.7 mm, holotype, Tubuai Island, Austral Islands, French Polynesia (BENTHAUS, stn CP 1965) (MNHN-Na 16159). Scale bar: 5 mm.

Parapontophilus cornutus n. sp.
(Figs 10-12; 35)

TYPE MATERIAL. — Holotype: **Austral Islands**. BENTHAUS, stn CP 1965, Tubuai Island, 23°21.3'S, 149°33.9'W, 500-1200 m, 19.XI.2002, ♀ 9.7 mm (MNHN-Na 16159).

Paratypes: BENTHAUS, same data as holotype, 1 ♂ 8.0 mm (MNHN-Na 16160). — Stn CP 1966, 23°21.3'S, 149°34'W, 636-1200 m, 19.XI.2002, 1 ♀ 7.6 mm (MNHN-Na 16161).

ETYMOLOGY. — From the Latin *cornutus*, meaning horn, in reference to the characteristic horn-like rostrum of the new species.

DISTRIBUTION. — So far known only from the Austral Islands in French Polynesia (Fig. 35). Actual bathymetric range of this new species remains unclear, as the present

specimens were collected from very steep slopes ranging from 500 to 1200 m.

DESCRIPTION

Rostrum (Figs 11C; 12A, B) slender, elongate subconical, 0.25-0.40 of carapace length, somewhat directed upward, distinctly overreaching distal margins of corneas; lateral margins with 2 pairs of minute teeth closely appressed to rostrum. Carapace (Figs 10; 11A, B; 12) about 1.50 times longer than wide; anterior epigastric tooth absent; posterior epigastric and cardiac teeth moderately small; postorbital tooth absent; postorbital ridge very low, obsolete; epibranchial ridge low, but well-marked; branchiostegal tooth relatively strong, reaching or slightly overreaching dorsodistal margin of antennal basicerite.

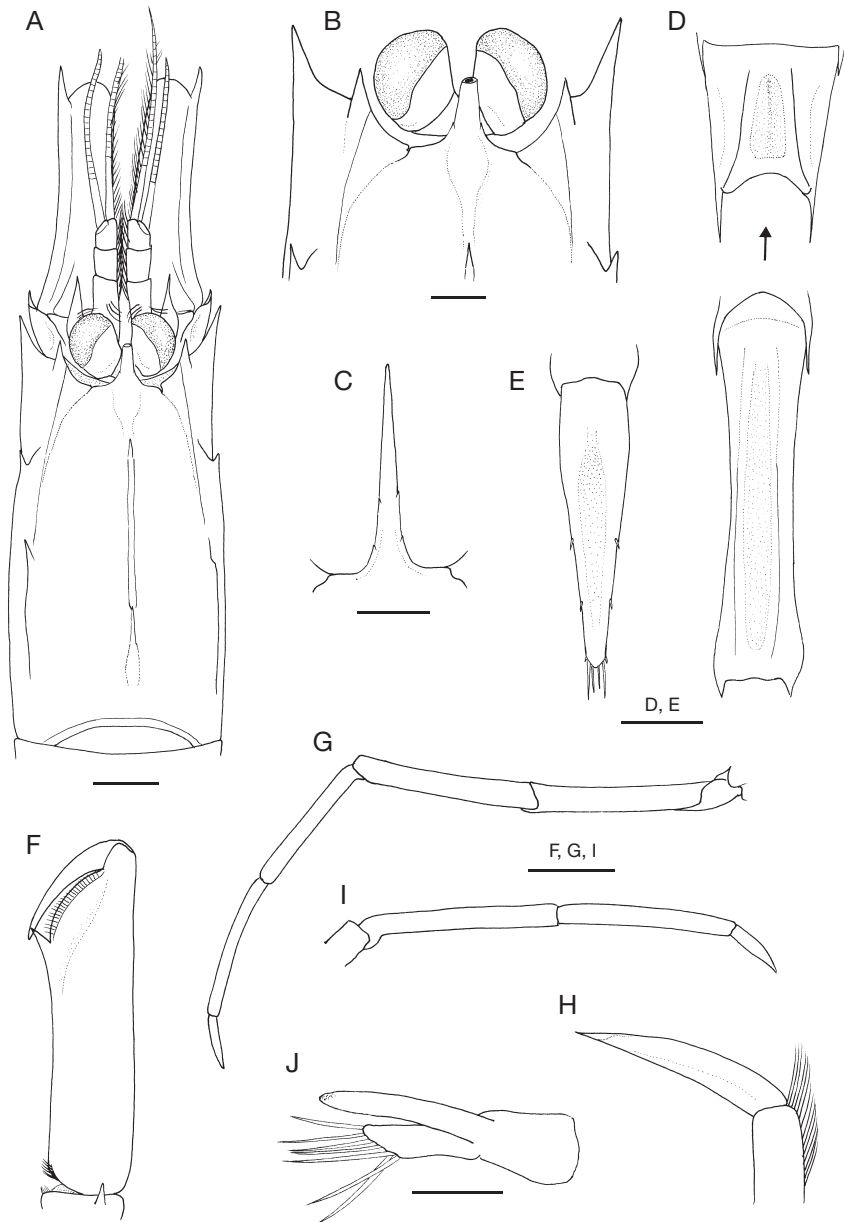


FIG. 11. — *Parapontophilus cornutus* n. sp.: **A**, carapace and cephalic appendages, dorsal view; **B**, anterior part of carapace and eyes, dorsal view; **C**, rostrum, dorsal view; **D**, fifth and sixth pleonal somites, dorsal view; **E**, telson, dorsal view; **F**, subchela of left first pereopod, ventral view; **G**, left fourth pereopod, lateral view (setae omitted); **H**, same, dactylus and distal part of propodus, lateral view; **I**, dactylus, propodus and carpus of right fifth pereopod, lateral view; **J**, appendices masculina and interna of left second pleopod, mesial view; **A**, **B**, **D-I**, ♀ 9.7 mm, holotype, off Tubuai Island, Austral Islands, French Polynesia (BENTHAUS, stn CP 1965) (MNHN-Na 16159); **C**, ♀ 7.6 mm, paratype, same data as holotype (MNHN-Na 16161); **J**, ♂ 8.0 mm, paratype, same lot. Scale bars: **A**, **D-G**, **I**, 2 mm; **B**, **C**, 1 mm; **H**, **J**, 0.5 mm.

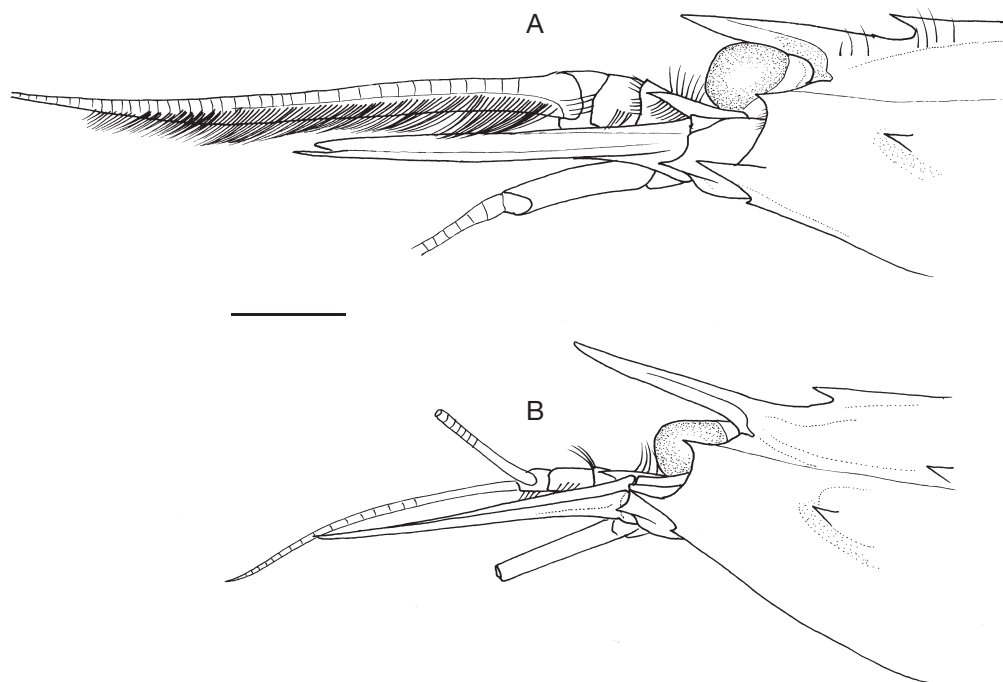


FIG. 12. — *Parapontophilus cornutus* n. sp.: anterior part of carapace and cephalic appendages, lateral view (setae partially omitted): **A**, ♂ 8.0 mm, paratype, Tubuai Island, Austral Islands, French Polynesia (BENTHAUS, stn CP 1965) (MNHN-Na 16160); **B**, ♀ 7.6 mm, paratype, same locality (BENTHAUS, stn CP 1966) (MNHN-Na 16161). Scale bar: 2 mm.

Third pleonal somite (Fig. 10) with moderately convex tergum and with somewhat produced posterodorsal margin. Fifth somite (Fig. 11D) with low, posteriorly widened plateau on dorsal surface, median part of plateau shallowly sulcate. Sixth somite (Figs 10; 11D) about 4.10 times longer than wide, 3.20-3.30 times longer than deep; dorsal surface with low, blunt submedian ridges flanking shallow median sulcus. Telson (Fig. 11E) shorter than sixth pleonal somite.

Eye (Fig. 11A, B) generally bean-shaped; cornea pigmented with light brown or gray in preservative; corneal surface distinctly faceted with moderately small lenses as in *P. junceus*; maximal diameter of cornea 0.17-0.20 of carapace length; eye-stalk slightly constricted near base; papilla-like projection on mesial face small. Antennular peduncle (Fig. 11A) falling short of midlength of antennal scale. Antennal scale (Fig. 11A) about 0.70 of carapace length, 3.90-4.10 times long-

er than wide; lateral margin noticeably concave, distolateral tooth overreaching distal margin of lamella.

Palm of first pereopod (Fig. 11F) about 4.20 times longer than wide; cutting edge moderately oblique; pollex relatively small, width of palm including tip of pollex about 1.25 of width proximal to base of pollex; merus with relatively weak dorsodistal tooth. Second pereopod short, reaching or falling short of midlength of merus of first pereopod. Fourth pereopod (Fig. 11G) overreaching distal margin of antennal scale by half to full length of dactylus; dactylus (Fig. 11H) not flattened with rounded dorsal surface, 0.30-0.40 of propodal length; carpus 1.0-1.12 of propodal length. Fifth pereopod (Fig. 11I) similar to fourth, slightly falling short of distal margin of antennal scale. Appendix masculina of male second pleopod (Fig. 11J) about 0.70 length of appendix interna, bearing 7 long spiniform setae.

Coloration in life

Unknown.

Size

Male CL 8.0 mm; females CL 7.6-9.7 mm.

REMARKS

The length of the rostrum shows substantial variation, although only three specimens are available for study. In the male paratype, the rostrum slightly overreaches the corneas, whereas it far exceeds them in the female paratype.

This new species is distinctive in having a number of unique characters within the species group, including the elongate, conical rostrum, the tiny, appressed lateral teeth on the rostrum, the presence of a distinct, broad plateau on the tergum of the fifth pleonal somite, the distinct submedian ridges on the sixth pleonal somite, the short, subconical dactyli of the fourth and fifth pereopods being less than half length of the propodi, and the carpi of those pereopods being subequal or longer than the propodi. The well-developed distolateral tooth of the antennal scale, which distinctly overreaches the distal lamella, distinguished *Parapontophilus cornutus* from most other species of the group except for *P. cyrton* n. sp.

Parapontophilus cyrton n. sp.

(Fig. 13)

TYPE MATERIAL. — Holotype: New Caledonia. BIOCAL, stn CP 69, 23°52'S, 167°58'E, 1220-1225 m, 3.IX.1985, ♀ 12.6 mm (MNHN-Na 16162).

Paratypes: New Caledonia. BIOCAL, stn CP 27, 23°06'S, 166°26'E, 1850-1900 m, 28.VIII.1985, 1 ♀ 6.7 mm (MNHN-Na 16163). — Stn CP 57, 23°44'S, 166°58'E, 1490-1620 m, 1.IX.1985, 1 ♂ 6.2 mm, 1 ♀ 10.2 mm (MNHN-Na 16164). — Stn CP 58, 23°56'S, 166°41'E, 2660-2750 m, 1.IX.1985, 2 ♀♀ 9.0, 10.4 mm (MNHN-Na 16165). — Stn CP 60, 24°01'S, 167°08'E, 1480-1530 m, 2.IX.1985, 1 ♂ 6.0 mm, 4 ♀♀ 7.1-10.0 mm (MNHN-Na 16166). — Stn CP 62, 24°19'S, 167°49'E, 1395-1410 m, 2.IX.1985, 2 ♀♀ 9.5, 12.5 mm (MNHN-Na 16167). — Stn CP 69, 23°52'S, 167°58'E, 1220-1225 m, 3.IX.1985, 1 ♀ 10.6 mm (MNHN-Na.16168). — Stn CP 72, 22°10'S, 167°33'E, 2100-2110 m, 4.IX.1985, 3 ♀♀ 5.7-7.5 mm

(MNHN-Na 16169).

BIOGEOCAL, stn CP 214, 22°43.09'S, 166°27.19'E, 1665-1590 m, 9.IV.1987, 2 ♂♂ 7.1, 9.0 mm, 2 ♀♀ 7.7, 9.7 mm (MNHN-Na 16170). — Stn CP 265, 21°04.09'S, 167°00.40'E, 1760-1870 m, 18.IV.1987, 1 ♂ 8.1 mm, 1 ♀ 8.1 mm (MNHN-Na 16171). — Stn CP 272, 21°00.04'S, 166°56.94'E, 1615-1710 m, 20.IV.1987, 1 ♀ 11.1 mm (MNHN-Na 16172).

HALIPRO 2, stn BT 77, Norfolk Ridge, 24°09'S, 167°47'E, 1349-1350 m, 21.XI.1996, 1 ♀ 11.0 mm (MNHN-Na 16173).

ETYMOLOGY. — The Greek *kyrton* (humpback) refers to the strongly geniculate pleon, showing a humpback appearance.

DISTRIBUTION. — Known only from waters around New Caledonia (Fig. 35), 1220-2750 m.

DESCRIPTION

Rostrum (Fig. 13A-D) moderately broad, triangular in dorsal view, 0.15-0.18 of carapace length, directed forward and straight, slightly falling short of or reaching distal margins of corneas; dorsal surface shallowly concave in proximal half; lateral margins armed with 1 or 2 pairs of lateral teeth proximal to midlength. Carapace (Fig. 13A-D) 1.50-1.70 longer than wide; anterior epigastric tooth distinctly smaller than posterior epigastric tooth; posterior epigastric and cardiac teeth moderately small; postorbital tooth very small, occasionally reduced to minute tubercle; postorbital ridge low, sometimes obsolete; epibranchial ridge low, but usually well-marked; branchiostegal tooth nearly reaching dorsodistal margin of antennal basiscerite.

Third pleonal somite (Fig. 13E) with tergum somewhat elevated in midline in posterior part and with posterodorsal margin strongly produced, and thus pleon markedly geniculate. Fifth pleonal somite (Fig. 13E) smooth on dorsal surface. Sixth pleonal somite (Fig. 13E, F) 3.50-3.80 times longer than wide, 2.60-2.90 times longer than deep, dorsal surface with trace of submedian ridges and faint median sulcus; lateral margins slightly concave.

Eye (Fig. 13D) generally bean-shaped; cornea white or opaque in preservative, semispherical; corneal surface not faceted, but white granules possibly representing remnants of lenses visible throughout integument of cornea as in *P. abyssii*; maximal diameter of cornea 0.15-0.18 of carapace

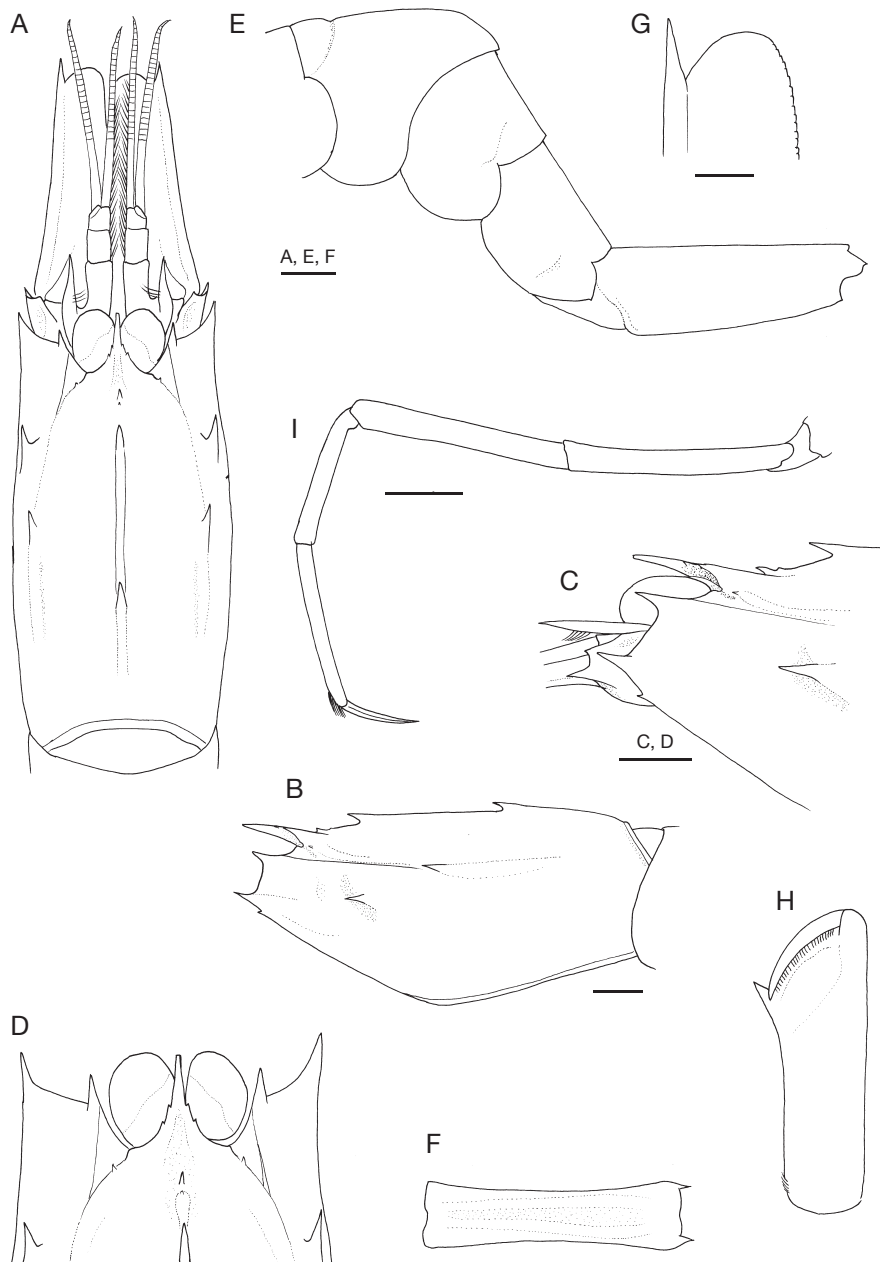


FIG. 13. — *Parapontophilus cyrton* n. sp., ♀ 12.6 mm, holotype, New Caledonia (BIOCAL, stn CP 69) (MNHN-Na 16162): **A**, carapace and cephalic appendages, dorsal view; **B**, carapace, lateral view; **C**, anterior part of carapace, cornea and basal part of antennae, lateral view; **D**, anterior part of carapace and eyes, dorsal view; **E**, third to sixth pleonal somites, lateral view; **F**, sixth pleonal somite, dorsal view; **G**, distal part of left antennal scale, dorsal view. Scale bars: A-F, H, 2 mm; G, 1 mm.

length; boundary between cornea and eye-stalk obscurely delineated; eye-stalk slightly constricted near base. Antennular peduncle (Fig. 13A) falling short of midlength of antennal scale. Antennal scale (Fig. 13A) 0.70-0.80 of carapace length, 4.00-4.50 times longer than wide; lateral margin slightly concave or nearly straight, distolateral tooth reaching or slightly overreaching distal margin of lamella (Fig. 13G).

First pereopod overreaching distal margin of antennal scale by 0.15-0.20 length of palm; palm (Fig. 13H) 3.80-4.00 times longer than wide; cutting edge moderately oblique; pollex moderately small, width including tip of pollex 1.30-1.40 of width proximal to base of pollex; merus with relatively weak dorsodistal tooth. Second pereopod short, reaching or falling short of midlength of merus of first pereopod. Fourth pereopod (Fig. 13I) overreaching distal margin of antennal scale by half to full length of dactylus; dactylus subspatulate, 0.50-0.60 of propodal length; carpus 0.80-0.85 of propodal length. Fifth pereopod similar to fourth, slightly falling short of distal margin of antennal scale. Appendix masculina of male second pleopod 0.70-0.80 of appendix interna.

Coloration in life

Body and pereopods entirely pale reddish-brown.

Size

Males CL 6.0-9.0 mm; females CL 5.7-11.1 mm.

REMARKS

The rostrum is usually armed with two pairs of lateral teeth, but either or both of the anterior pairs are rarely missing.

This new species appears close to *Parapontophilus abyssis*, *P. occidentalis* and *P. talismani*. These four species have a conspicuous anterior epigastric tooth and the non-faceted cornea. *Parapontophilus cyrton* n. sp. is characteristic in having the strongly produced posterodorsal margin of the third pleonal tergite. This makes a condition that the pleon is strongly geniculate. The pollex of the first pereopod is less produced in *P. cyrton* n. sp. than in the other three species (cf. Fig. 13H and Figs 4I, 8J, 9G). Furthermore, the anterior epigastric tooth

on the carapace is distinctly smaller than the posterior epigastric tooth in *P. cyrton* n. sp., rather than usually subequal in the latter three species. The distolateral tooth of the antennal scale slightly overreaches the distal margin of the lamella in *P. cyrton* n. sp., rather than falling short of or nearly reaching it in the other three species. The present new species is also similar to *P. difficilis* n. sp. in having opaque or yellowish eyes and a small anterior epigastric tooth on the carapace. However, the structure of the third pleonal tergite and the non-faceted cornea distinguish *P. cyrton* n. sp. from *P. difficilis* n. sp. In *P. difficilis* n. sp., the posterodorsal margin of the third pleonal tergite is moderately produced; the cornea of the eye is distinctly faceted. The more produced distolateral tooth of the antennal scale also distinguishes *P. cyrton* n. sp. from *P. difficilis* n. sp.

Parapontophilus difficilis n. sp.

(Figs 6C; 14-16; 20E)

Pontophilus occidentalis var. *indica* de Man, 1918: 161 (part); 1920: 264 (part), pl. 20, fig. 63, 63a, pl. 21, fig. 63b-v.

Pontophilus gracilis junceus – Chace 1984: 49 (part), figs 16, 17.

TYPE MATERIAL. — Holotype: **Vanuatu**. MUSORSTOM 8, stn CP 1129, 16°00.73'S, 166°39.94'E, 1014-1050 m, 10.X.1994, ♀ 13.3 mm (MNHN-Na 16174).

Paratypes: **Vanuatu**. MUSORSTOM 8, stn CP 990, 18°51.63'S, 168°50.98'E, 980-990 m, 24.IX.1994, 1 ♀ 12.0 mm (MNHN-Na 16175). — Stn CP 991, 18°51.26'S, 168°52.19'E, 936-910 m, 24.IX.1994, 8 ♀♀ 9.1-12.6 mm (MNHN-Na 16176). — Stn CP 1008, 18°53.29'S, 168°52.65'E, 919-1000 m, 25.IX.1994, 2 ♂♂ 8.4, 8.4 mm (MNHN-Na 16177). — Stn CP 1036, 18°01.00'S, 168°48.20'E, 920-950 m, 29.IX.1994, 1 ♂ 8.1 mm (MNHN-Na 16178). — Stn CP 1074, 15°48.42'S, 167°24.27'E, 775-798 m, 4.X.1994, 2 ♀♀ 11.1, 12.7 mm (MNHN-Na 16179). — Stn CP 1075, 15°53.26'S, 167°27.21'E, 956-944 m, 4.X.1994, 1 ♂ 9.3 mm, 3 ♀♀ 10.0-13.6 mm (MNHN-Na 16180). — Stn CP 1076, 15°53.81'S, 167°30.42'E, 1100-1191 m, 4.X.1994, 1 ♂ 9.2 mm, 1 ♀ 13.0 mm (MNHN-Na 16181). — Stn CP 1080, 15°57.30'S, 167°27.37'E, 799-850 m, 5.X.1994, 1 ♂ 9.3 mm, 4 ♀♀ 9.5-9.7 mm, 4 ovig. ♀♀ 12.4-13.0 mm (MNHN-Na 16182). — Stn CP

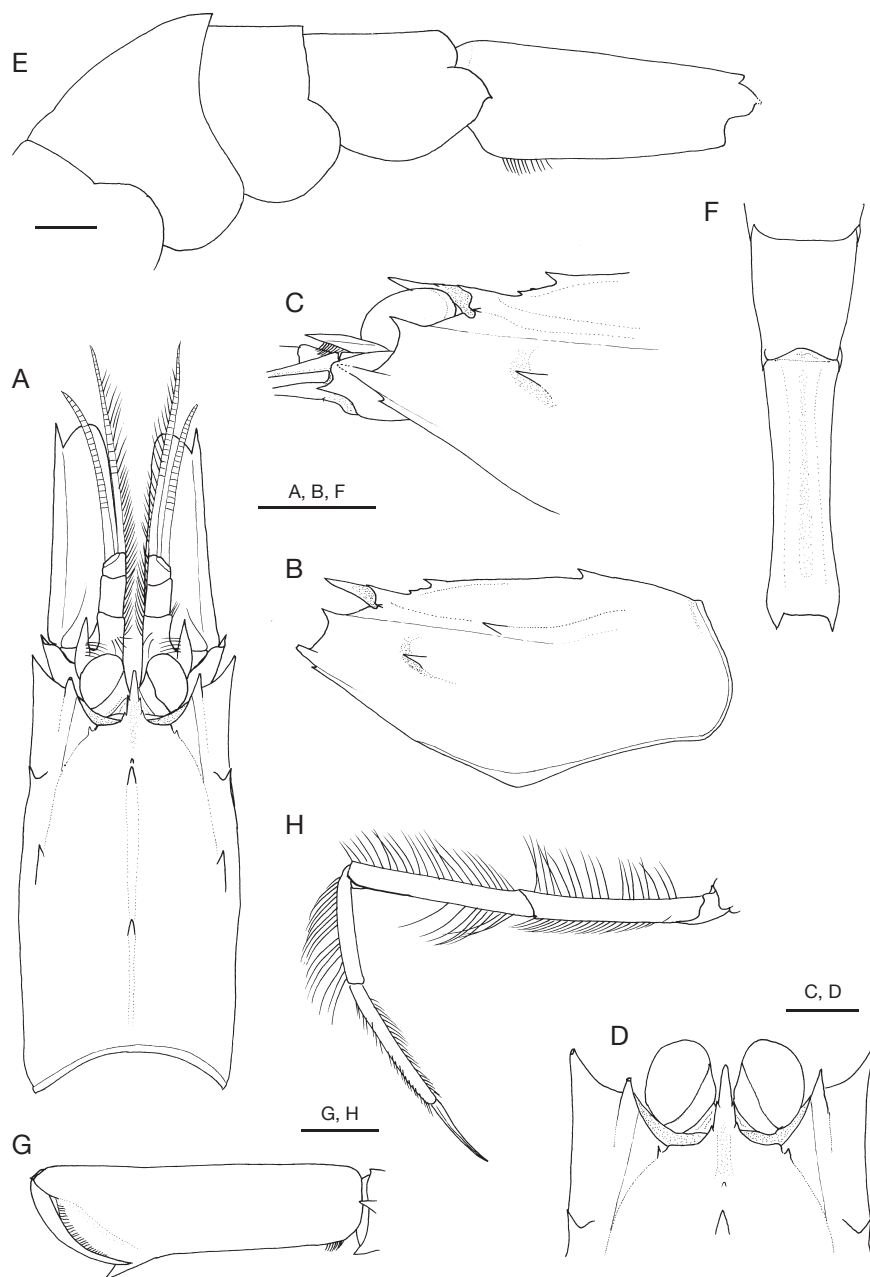


FIG. 14. — *Parapontophilus difficilis* n. sp.: **A**, carapace and cephalic appendages, dorsal view; **B**, carapace, lateral view; **C**, anterior part of carapace, cornea and basal part of antennae, lateral view; **D**, anterior part of carapace and eyes, dorsal view; **E**, second to sixth pleonal somites, lateral view; **F**, fifth and sixth pleonal somites, dorsal view; **G**, subchela of left first pereopod, ventral view; **H**, left fourth pereopod, lateral view; **A-D**, **F-H**, ♀ 13.3 mm, holotype, Vanuatu (MUSORSTOM 8, stn CP 1129) (MNHN-Na 16174); **E**, ♀ 13.8 mm, paratype, Solomon Islands (SALOMON 2, stn CP 2230) (MNHN-Na 16196). Scale bars: A, B, F, 5 mm; C-E, G, H, 2 mm.

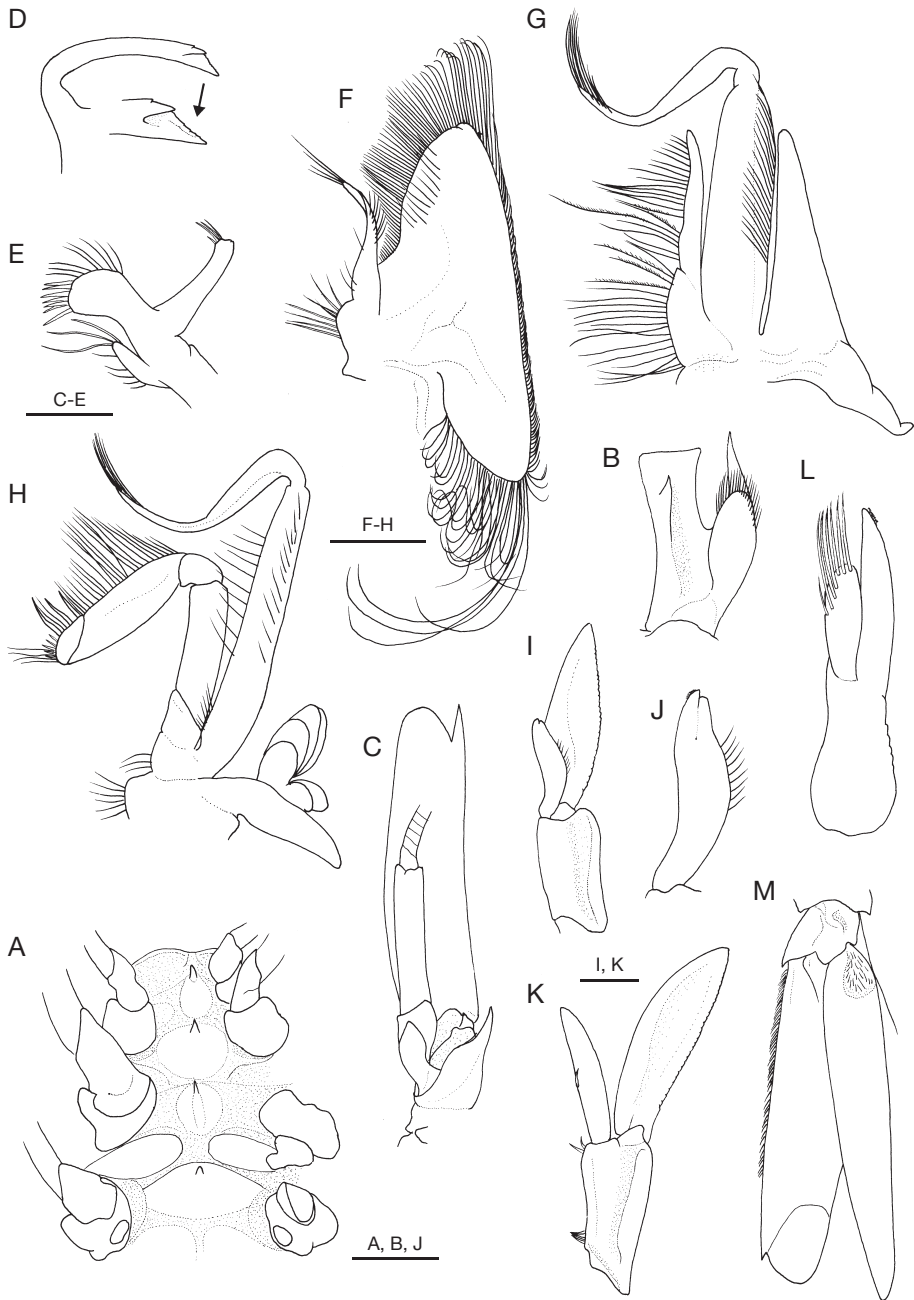


FIG. 15. — *Parapontophilus difficilis* n. sp.: **A**, thoracic sternum, ventral view (setae omitted); **B**, first segment of left antennular peduncle, ventral view; **C**, left antenna, ventral view; **D**, left mandible, inner view; inset, details of distal part; **E**, left maxillule, outer view; **F**, left maxilla, outer view; **G**, left first maxilliped, outer view; **H**, left second maxilliped, outer view; **I**, **K**, left first pleopod, ventral view; **J**, endopod of left first pleopod, ventral view; **L**, appendix masculina and appendix interna of left second pleopod, mesial view; **M**, left uropod, dorsal view; **A**, **I**, **J**, **L**, ♂ 9.8 mm, paratype, Solomon Islands (SALOMON 1, stn CP 1807) (MNHN-Na 16192); **B**-**H**, **K**, **M**, ♀ 11.1 mm, paratype, same lot. Scale bars: **A**, **B**, **F**-**I**, **K**, 1mm; **C**, **M**, 2 mm; **D**, **E**, **J**, **L**, 0.5 mm.

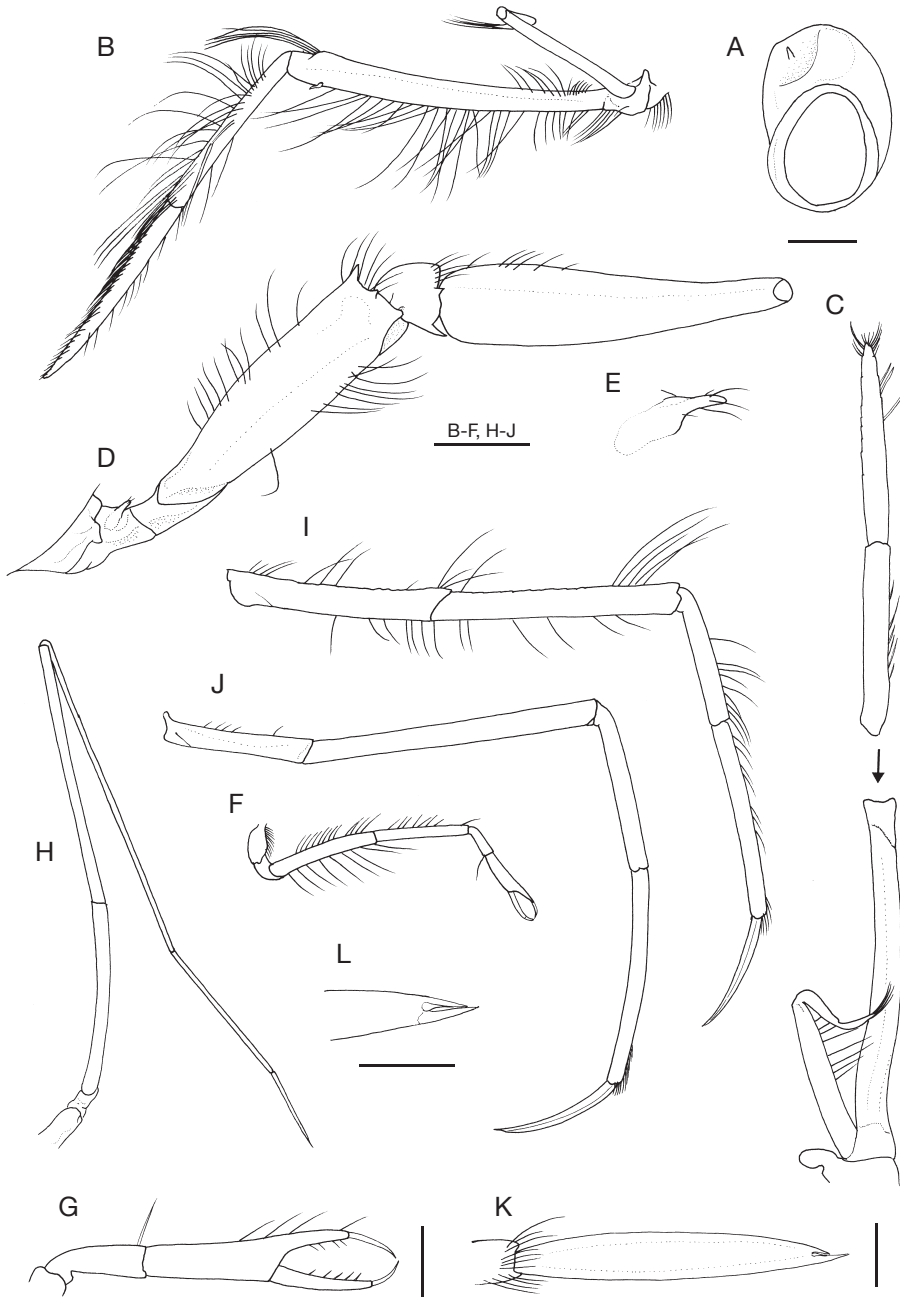


FIG. 16. — *Parapontophilus difficilis* n. sp., ♀ 11.1 mm, paratype, Solomon Islands (SALOMON 1, stn CP 1807) (MNHN-Na 16192): **A**, left eye, ventromesial view; **B**, left third maxilliped, lateral view; **C**, same, dorsal view (most setae omitted); **D**, right first pereopod, lateral view; **E**, rudimentary exopod of third maxilliped; **F**, right second pereopod, lateral view; **G**, same, chela and carpus, lateral view; **H**, right third pereopod, lateral view; **I**, right fourth pereopod, lateral view; **J**, right fifth pereopod, lateral view; **K**, dactylus of right fourth pereopod, dorsal view; **L**, same, details of tip. Scale bars: A, 1 mm; B-D, F, H-J, 2 mm; E, G, K, L, 0.5 mm.

1125, 15°57.63'S, 166°38.43'E, 1160-1220 m, 10.X.1994, 3 ♂♂ 7.7-9.2 mm, 4 ♀♀ 6.1-12.5 mm (MNHN-Na 16183). — Stn CP 1126, 15°58.35'S, 166°39.98'E, 1210-1260 m, 10.X.1994, 3 ♂♂ 8.0-8.8 mm, 7 ♀♀ 6.0-13.7 mm (MNHN-Na 16184). — Stn CP 1129, 16°00.73'S, 166°39.94'E, 1014-1050 m, 10.X.1994, 7 ♂♂ 8.4-8.6 mm, 6 ♀♀ 6.4-13.3 mm, 1 ovig. ♀ 10.8 mm (MNHN-Na 16185).

Solomon Islands. SALOMON 1, stn CP 1752, 09°06.9'S, 159°53.2'E, 896-912 m, 25.IX.2001, 1 ♂ 8.8 mm (MNHN-Na 16186). — Stn CP 1754, 09°00.1'S, 159°49.0'E, 1169-1203 m, 26.IX.2001, 1 ♀ 10.6 mm (MNHN-Na 16187). — Stn CP 1755, 8°58.2'S, 159°41.6'E, 1288-1313 m, 26.IX.2001, 1 ♀ 9.1 mm (photographed specimen) (MNHN-Na 16188). — Stn CP 1755, 08°58.2'S, 159°41.6'E, 1288-1313 m, 26.IX.2001, 1 ♂ 9.2 mm, 1 ♀ 11.3 mm (MNHN-Na 16189). — Stn CP 1764, 08°36.6'S, 160°07.4'E, 1327-1598 m, 27.IX.2001, 1 ♂ 8.1 mm (MNHN-Na 16190). — Stn CP 1781, 08°31.2'S, 160°37.7'E, 1036-1138 m, 29.IX.2001, 1 ♂ 9.0 mm, 3 ♀♀ 10.4-11.2 mm (MNHN-Na 16191). — Stn CP 1807, 09°42.2'S, 160°52.8'E, 1077-1135 m, 2.X.2001, 12 ♂♂ 7.7-9.8 mm, 4 ♀♀ 9.1-14.0 mm (MNHN-Na 16192). — Stn CP 1858, 09°37.0'S, 160°41.7'E, 435-451 m, 7.X.2001, 2 ♂♂ 7.8, 8.3 mm (MNHN-Na 16193).

SALOMON 2, Off Santa Isabel Island, stn CP 2182, 08°47.0'S, 159°37.9'E, 762-1060 m, 22.X.2004, 3 ♀♀ 7.5-11.2 mm (MNHN-Na 16194). — Stn CP 2197, 08°24.4'S, 159°22.5'E, 897-1057 m, 24.X.2004, 1 ♂ 9.1 mm, 5 ♀♀ 8.7-13.1 mm (CBM-ZC 8604). — Stn CP 2216, 07°45.3'S, 157°39.4'E, 930-977 m, 27.X.2004, 1 ♀ 8.1 mm (MNHN-Na 16195). — Stn CP 2230, 06°27.8'S, 156°24.3'E, 837-945 m, 29.X.2004, 2 ♀♀ 11.9, 13.8 mm (MNHN-Na 16196). — Off Choiseul Island, stn CP 2232, 06°24.1'S, 156°20.4'E, 1045-1207 m, 29.X.2004, 1 ♀ 12.3 mm (MNHN-Na 16197). — South of Taylor reefs, stn CP 2241, 06°55.3'S, 156°21.2'E, 815-1000 m, 30.X.2004, 1 ♀ 10.6 mm (MNHN-Na 16198). — Off Vella Lavella Island, stn CP 2251, 07°27.9'S, 156°14.0'E, 1000-1050 m, 2.XI.2004, 1 ♀ 13.5 mm (MNHN-Na 16199). — Stn CP 2253, 07°26.5'S, 156°15.0'E, 1200-1218 m, 2.XI.2004, 1 ♂ 9.9 mm (MNHN-Na 16200).

OTHER MATERIAL EXAMINED. — **Taiwan.** TAIWAN 2000, stn CP 32, 22°01.7'N, 120°16.4'E, 904 m, 30.VII.2000, 1 ♂ 8.6 mm (NTOU). — TAIWAN 2002, stn CD 199, 24°19.27'N, 122°04.21'E, 1138-1187 m, 12.IX.2002, 1 ♂ 8.4 mm, 1 ♀ 15.2 mm (NTOU). — TAIWAN 2005, stn CP 300, 22°14.55'N, 119°58.71'E, 960-972 m, 11.VIII.2005, 1 ♂ 9.0 mm (NTOU).

Philippines. MUSORSTOM 1, stn CP 49, 13°49.1'N, 119°59.8'E, 925-750 m, 25.III.1976, 1 ♀ 10.2 mm (MNHN-Na 5314). — MUSORSTOM 2, stn CP 50,

13°36.7'N, 120°33.7'E, 810-820 m, 27.XI.1980, 2 ♀♀ 9.6, 10.6 mm (MNHN-Na 5317). — Stn CP 55, 13°53.7'N, 119°58.5'E, 865-866 m, 27.XI.1980, 1 ♀ 11.1 mm, 1 ovig. ♀ 12.6 mm (MNHN-Na 5318).

Indonesia. *Siboga*, stn 88, northern part of Makassar Strait, 00°34.6'N, 119°08.5'E, 1301 m, 20.VI.1899, 2 ♀♀ 6.0, 10.0 mm paralectotypes of *Pontophilus occidentalis* var. *indica* de Man, 1918 (ZMA). — Stn 178, Ceram Sea, 02°40'S, 128°37.5'E, 835 m, 2.IX.1899, 1 ♀ 5.3 mm (ZMA). — Stn 211, east of Saleyer Island, 05°40.7'S, 120°45.5'E, 1158 m, 25.IX.1899, 1 ♀ 7.0 mm (ZMA). — CORINDON 2 (Makassar Strait), stn CP 231, 00°04.9'N, 119°47.8'E, 1080-980 m, 4.XI.1980, 1 ♂ 7.6 mm, 4 ♀♀ 5.0-10.7 mm (MNHN-Na 5322). — Stn CP 240, 00°37.6'S, 119°33.5'E, 675 m, 5.XI.1980, 1 ♀ 8.6 mm (MNHN-Na 5323). — Stn CP 241, 00°57.7'S, 119°15.3'E, 1550-1525 m, 6.XI.1980, 1 ♂ 9.0 mm, 3 ♀♀ 8.6-9.4 mm (MNHN-Na 5324). — Stn CP 280, 01°59.0'S, 119°09.9'E, 800-715 m, 8.XI.1980, 1 ♀ 10.2 mm (MNHN-Na 5325). — Stn CP 281, 01°57.5'S, 119°02.0'E, 1150-1120 m, 8.XI.1980, 1 ♀ 9.5 mm (MNHN-Na 5326).

KARUBAR, Tanimbar Islands, stn CP 52, 08°03'S, 131°48'E, 1244-1266 m, 30.X.1991, 3 ♀♀ 10.4-12.3 mm (MNHN-Na 16202). — Stn CP 87, 08°47'S, 130°49'E, 1017-1024 m, 5.XI.1991, 5 ♀♀ 11.8-13.0 mm (MNHN-Na 16203). — Stn CP 91, 08°44'S, 131°05'E, 884-891 m, 5.XI.1991, 1 ♀ 10.0 mm (MNHN-Na 16204).

New Caledonia. BIOCAL, stn CP 75, 22°19'S, 167°23'E, 825-860 m, 4.IX.1985, 1 ♀ 11.0 mm, 2 ovig. ♀♀ 9.8, 11.0 mm (MNHN-Na 16205).

BATHUS 1, stn CP 651, 21°41.80'S, 166°40.10'E, 1080-1180 m, 11.III.1993, 2 ♂♂ 7.0, 7.3 mm, 2 ♀♀ 9.0, 10.2 mm (MNHN-Na 16206). — Stn CP 660, 21°10.48'S, 165°53.19'E, 786-800 m, 13.III.1993, 3 ♀♀ 10.0-12.1 mm (MNHN-Na 16207). — Stn CP 661, 21°05'S, 165°50'E, 960-1100 m, 13.III.1993, 1 ♂ 7.7 mm, 1 ♀ 8.4 mm (MNHN-Na 16208).

Tonga. BORDAU 2, stn CP 1565, NW of Tongatapu, 20°58'S, 175°16'W, 869-880 m, 9.VI.2000, 1 ♀ 10.3 mm (MNHN-Na 16209).

ETYMOLOGY. — The specific name *difficilis* is Latin, meaning difficult, in reference to the difficulty in defining species of the genus.

DISTRIBUTION. — Western Pacific: Taiwan, the Philippines, Indonesia, New Caledonia, Vanuatu and Solomon Islands (Fig. 35), 435-1598 m, and abundant at 800-1100 m.

DESCRIPTION

Rostrum (Fig. 14A-D) moderately narrow triangular, 0.15-0.17 of carapace length, directed forward

or slightly upward, straight, usually not reaching distal margins of corneas; dorsal surface faintly to shallowly concave in proximal half; lateral margins armed with 1 or 2 pairs of small teeth, anterior pair, if present, arising at about midlength of rostrum. Carapace (Fig. 14A-D) 1.50-1.80 times longer than wide, with 1 or 2 very small anterior epigastric teeth or denticles; posterior epigastric and cardiac teeth moderately small for genus; postorbital tooth very small, occasionally reduced to minute tubercle; postorbital ridge obsolete; epibranchial ridge low, but usually well-marked; branchiostegal tooth moderately long, slightly falling short of or reaching dorsodistal margin of antennal basicerite.

Third pleonal somite (Fig. 14E) with tergum moderately convex and with posterodorsal margin moderately produced. Fifth somite (Fig. 14F) rounded on dorsal surface. Sixth somite (Fig. 14E, F) 3.30-3.50 times longer than wide, 2.60-2.90 times longer than deep; dorsal surface with trace of submedian ridges flanking faint median sulcus.

Eye (Figs 14A, D; 16A) generally bean-shaped; cornea usually light yellow or opaque, rarely pale brown or gray in preservative; corneal surface distinctly faceted with very small lenses (Fig. 20E); maximal diameter of cornea 0.18-0.20 of carapace length; boundary between corneal region and eye-stalk rather distinct; eye-stalk slightly constricted near base. Antennular peduncle (Fig. 14A) falling short of midlength of antennal scale. Antennal scale (Fig. 14A) 0.60-0.80 of carapace length; lateral margin slightly sinuous or slightly concave, distolateral tooth slightly falling short of or reaching distal margin of lamella.

Palm of first pereopod (Figs 14G, 16D) 3.80-4.00 times longer than wide; cutting edge moderately oblique; pollex relatively small, width including tip of pollex 1.30-1.40 of width proximal to base of pollex; merus with relatively weak dorsodistal tooth. Second pereopod (Fig. 16F) short, reaching or falling short of midlength of merus of first pereopod. Fourth pereopod (Figs 14H; 16I) overreaching distal margin of antennal scale by half to full length of dactylus; dactylus subspatulate, 0.50-0.65 of propodal length; carpus 0.70-0.80 of propodal length. Fifth pereopod (Fig. 16J) similar to fourth, slightly falling short of distal margin of

antennal scale. Appendix masculina of male second pleopod (Fig. 15L) 0.50-0.70 length of appendix interna.

Coloration in life

Body entirely reddish-brown, occasionally slightly darker in anterior part of carapace and first pereopods. Cornea of eye gold.

Size

Males CL 6.4-13.3 mm; females CL 5.0-14.0 mm, ovigerous females CL 9.8-13.0 mm.

REMARKS

The rostrum is usually armed with two pairs of lateral teeth, but either or both of the anterior pairs are sometimes missing like in most of the other species of the group.

This new species appears close to *Parapontophilus junceus* and *P. geminus* n. sp. Differentiating characters among the three species are discussed under Remarks of the latter respective species.

For the discussion on the synonymy, see the Remarks of *P. junceus*.

Parapontophilus geminus n. sp.

(Figs 17; 20F)

Pontophilus gracilis abyssii – Chace 1984: 47 (key), 49, figs 16, 17, 23c.

TYPE MATERIAL. — Holotype: **Japan**. RV *Tansei-maru*, KT05-30 cruise, stn HB, Hyuga Basin, 32°22.58'N, 132°30.54'E, 1644-1657 m, 22.XI.2005, beam trawl, coll. H. Karasawa, ♀ 11.1 mm (CBM-ZC 8764).

Paratypes: **Japan**. Same data as holotype, 1 ♂ 9.8 mm (CBM-ZC 8765).

Taiwan. TAIWAN 2002, stn CP 184, 21°51.5'N, 119°27.63'E, 2542-2516 m, 26.VIII.2002, 1 ♀ 11.1 mm (NTOU). — Stn CP 185, 22°00.54'N, 119°27.94 E, 2334-2543 m, 26.VIII.2002, 3 ♀♀ 12.0-13.3 mm (NTOU). — Stn CP 189, 21°39.91'N, 118°20.94'E, 1649-1629 m, 27.VIII.2002, 2 ♀♀ 12.4, 13.0 mm (NTOU).

TAIWAN 2003, stn CP 285, 24°16.09'N, 122°11.52'E, 2268-2426 m, 16.VI.2003, 2 ♂♂ 9.3 mm, not measured (damaged), 1 ♀ 12.6 mm (NTOU).

TAIWAN 2005, stn CD 325, 20°44.79'N, 117°59.65'E, 1982-1794 m, 20.VIII.2005, 1 ♂ 9.4 mm, 1 ♀ 10.0 mm (NTOU). — Stn CP 363, 1 ♀ 12.3 mm (NTOU).

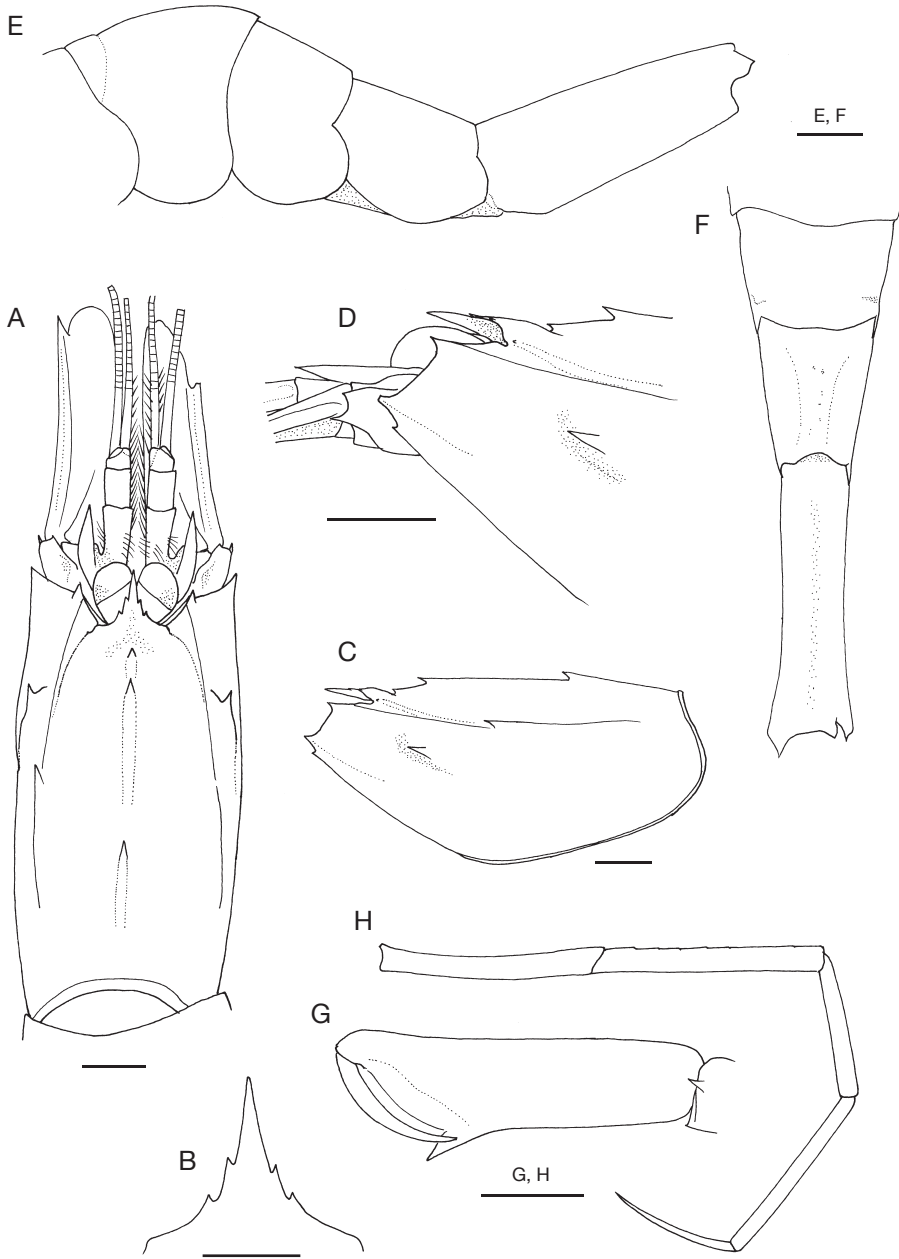


FIG. 17. — *Parapontophilus geminus* n. sp., ♀ 11.2 mm, holotype, Hyuga-nada Sea, Japan (RV *Tansei-maru*, KT05-30, stn HB) (CBM-ZC 8764): **A**, carapace and cephalic appendages, dorsal view; **B**, rostrum, dorsal view; **C**, carapace, lateral view; **D**, anterior part of carapace, cornea, and basal part of antennae, lateral view; **E**, third to sixth pleonal somites, lateral view; **F**, fourth to sixth pleonal somites, dorsal view; **G**, subchela of left first pereopod, ventral view; **H**, right fourth pereopod, lateral view. Scale bars: A, C-H, 2 mm; B, 1 mm.

OTHER MATERIAL EXAMINED. — **Taiwan.** TAIWAN 2003, stn CP 284, 24°16.34'N, 122°11.67'E, 16.VI.2003, 1 ♂ 12.6 mm (badly damaged) (NTOU).

Philippines. ESTASE 2, stn CP 2, 14°05.40'N, 120°02.46'E, 2050 m, 14.XI.1984, 1 ♀ 11.0 mm (MNHN-Na 16201).

Indonesia. *Challenger*, stn 184, Torres Strait, 12°08'S, 145°10'E, 2520 m, 29.VIII.1874, 1 ♂ 12.2 mm, paratype of *Pontophilus gracilis* Bate, 1888 (BMNH 1888.22). CORINDON 2 (Makassar Strait), stn CP 220, 00°13.6'N, 118°12.3'E, 2340 m, 2.XI.1980, 2 ♀♀ not measured (MNHN-Na 5320).

ETYMOLOGY. — From the Latin *geminus*, meaning twin, in reference to the close similarity of this new species to *P. difficilis* n. sp.

DISTRIBUTION. — Japan, Taiwan, Philippines and Makassar Strait in Indonesia (Fig. 35), 1644–2520 m.

DESCRIPTION

Rostrum (Fig. 17A–D) moderately broad triangular in dorsal view, 0.16 of carapace length, directed forward, not reaching distal margins of corneas; dorsal surface faintly concave in proximal half; lateral margins armed with 2 pairs of small teeth, anterior pair arising proximal to midlength. Carapace (Fig. 17A, C, D) 1.60 times longer than wide; anterior epigastric tooth smaller than posterior epigastric tooth; posterior epigastric and cardiac teeth moderately small; postorbital tooth minute; postorbital and epibranchial ridges low, but discernible; branchiostegal tooth not reaching dorsodistal margin of antennal basicerite.

Third pleonal somite (Fig. 17E) with moderately convex tergum and moderately produced posterodorsal margin. Fifth somite (Fig. 17E, F) rounded on dorsal surface. Sixth somite (Figs 17; 18E, F) 3.70–4.00 times longer than wide, 2.50–2.60 times as long as deep; dorsal surface rounded.

Eye (Fig. 17A) rounded; cornea lightly pigmented in preservative (colour opaque with tinge of brown posterolaterally on dorsal surface); corneal surface distinctly faceted with comparatively small lenses (Fig. 20F); maximal diameter of cornea 0.14–0.15 of carapace length; boundary between cornea and eye-stalk clearly delineated; eye-stalk not constricted; papilla-like projection on mesial face small. Antennular peduncle (Fig. 17A) falling short of midlength

of antennal scale. Antennal scale (Fig. 17A) 0.65 of carapace length, 3.90 times longer than wide; lateral margin slightly concave, distolateral tooth slightly falling short of distal margin of lamella.

Palm of first pereopod (Fig. 17G) rather elongate, 4.00–4.50 times longer than wide; cutting edge strongly oblique; pollex moderately small, width of palm including tip of pollex 1.40 of width proximal to base of pollex; merus with relatively weak dorsodistal tooth. Second pereopod short, reaching or falling short of midlength of merus of first pereopod. Fourth pereopod (Fig. 17H) relatively slender; dactylus subspatulate, 0.62 of propodal length; carpus 0.75 of propodal length. Fifth pereopod similar to fourth, slightly falling short of distal margin of antennal scale.

Appendix masculina of male second pleopod 0.70 length of appendix interna.

Coloration in life

Unknown.

In preservative, carapace, cephalic and thoracic appendages generally light reddish-brown; eyes opaque; abdomen entirely white.

Size

Males CL 9.3–11.0 mm; females CL 10.0–13.3 mm.

REMARKS

Parapontophilus geminus n. sp. is morphologically very similar to *P. difficilis* n. sp. Particularly, the structure of the cornea is similar between the two species. Nevertheless, the cornea is distinctly smaller in *P. geminus* n. sp. than in *P. difficilis* n. sp. (the maximal diameter is 0.14–0.15 of the carapace length versus 0.18–0.20). The shape of the rostrum is also different between the two. In *P. geminus* n. sp., the rostrum is more strongly narrowed distally with distinctly concave lateral margins (Fig. 17B). In contrast, the rostrum of *P. difficilis* n. sp. tapers gradually toward the tip with nearly straight lateral margins (Fig. 14D).

As discussed before, specimens from the Philippines, referred to *Pontophilus gracilis abyssii* by Chace (1984), most probably represent *P. geminus* n. sp.

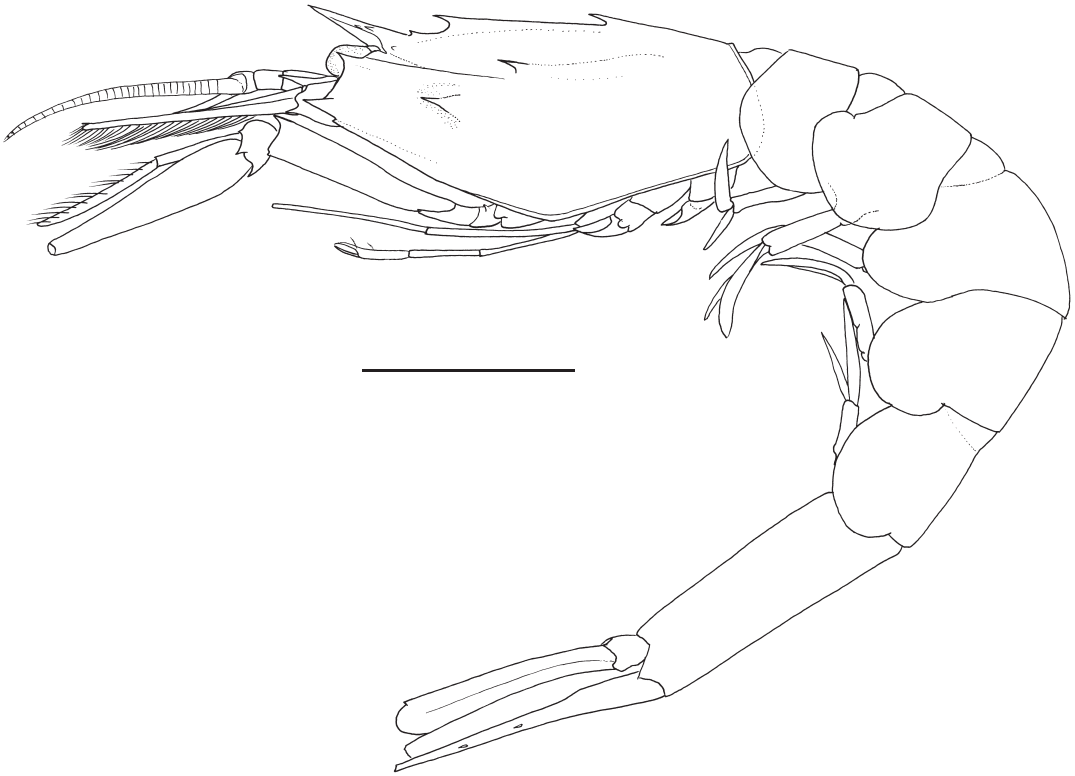


FIG. 18. — *Parapontophilus longirostris* n. sp., habitus, lateral view, ♂ 7.8 mm, non-type, off Réunion Island, western Indian Ocean (MD 32, stn DS 139) (MNHN-Na 16215). Scale bar: 5 mm.

Parapontophilus longirostris n. sp.
(Figs 18; 19; 21A)

Pontophilus gracilis abyssi – Allen & Butler 1994: 440.
Not *Pontophilus gracilis abyssi* Smith, 1884.

TYPE MATERIAL. — Holotype: **Austral Islands**. BENTHAUS, stn CP 1965, Tubuai Island, 23°21.3'S, 149°33.9'W, 19.XI.2002, 1 ♀ 8.5 mm (MNHN-Na 16210).

Paratypes: **Austral Islands**. BENTHAUS, same data as holotype, 4 ♂♂ 7.1–8.0 mm, 2 ♀♀ 7.6–8.6 mm (MNHN-Na 16211). — Stn CP 1892, E of Rapa Island, 27°38.8'S, 144°15.6'W, 742–1000 m, 7.XI.2002, 1 ♂ 5.8 mm, 3 ♀♀ 6.3–6.5 mm (MNHN-Na 16212). — Stn CP 1909, E of Rapa Island, 27°38.6'S, 144°15.6'W, 783–1000 m, 13.XI.2002, 1 ♂ 5.8 mm, 1 ♀ 6.1 mm (MNHN-Na 16213).

OTHER MATERIAL EXAMINED. — **Western Indian Ocean**. Comoros Islands (Mayotte), BENTHEDI, stn CH 31,

12°37.4'S, 45°25.2'E, 1800 m, 25.III.1977, 1 ♂ 7.3 mm (MNHN-Na 16214).

Réunion Island, *Marion Dufresne*, cruise MD 32, stn DS 139, 1600–1575 m, 3.IX.1982, 4 ♂♂ 6.7–8.0 mm, 2 ♀♀ 6.0, 7.2 mm (MNHN-Na 16215). — Stn CP 140, 20°41.2'S, 55°38.2'E, 1612–1680 m, 3.IX.1982, 1 ♀ 8.9 mm (MNHN-Na 16216).

Japan. TV *Toyoshio-maru*, 1996–5 cruise, stn 5, off Cape Toi, Miyazaki Prefecture, 31°17.74'N, 131°53.2'E, 1160–1114 m, mud bottom, 1.VI.1996, ORI net accidentally on bottom, coll. T. Komai, 1 ♀ 8.9 mm (CBM-ZC 8184).

Taiwan. TAIWAN 2005, stn CP 281, 24°24.08'N, 122°14.06'E, 1173–1248 m, 15.VI.2005, 1 ♀ 7.6 mm (NTOU).

New Caledonia. BIOCAL, stn CP 61, 24°11'S, 167°32'E, 1070 m, 2.IX.1985, 1 ♀ 7.3 mm (MNHN-Na 16217).

Vanuatu. MUSORSTOM 8, stn CP 956, 20°33.41'S,

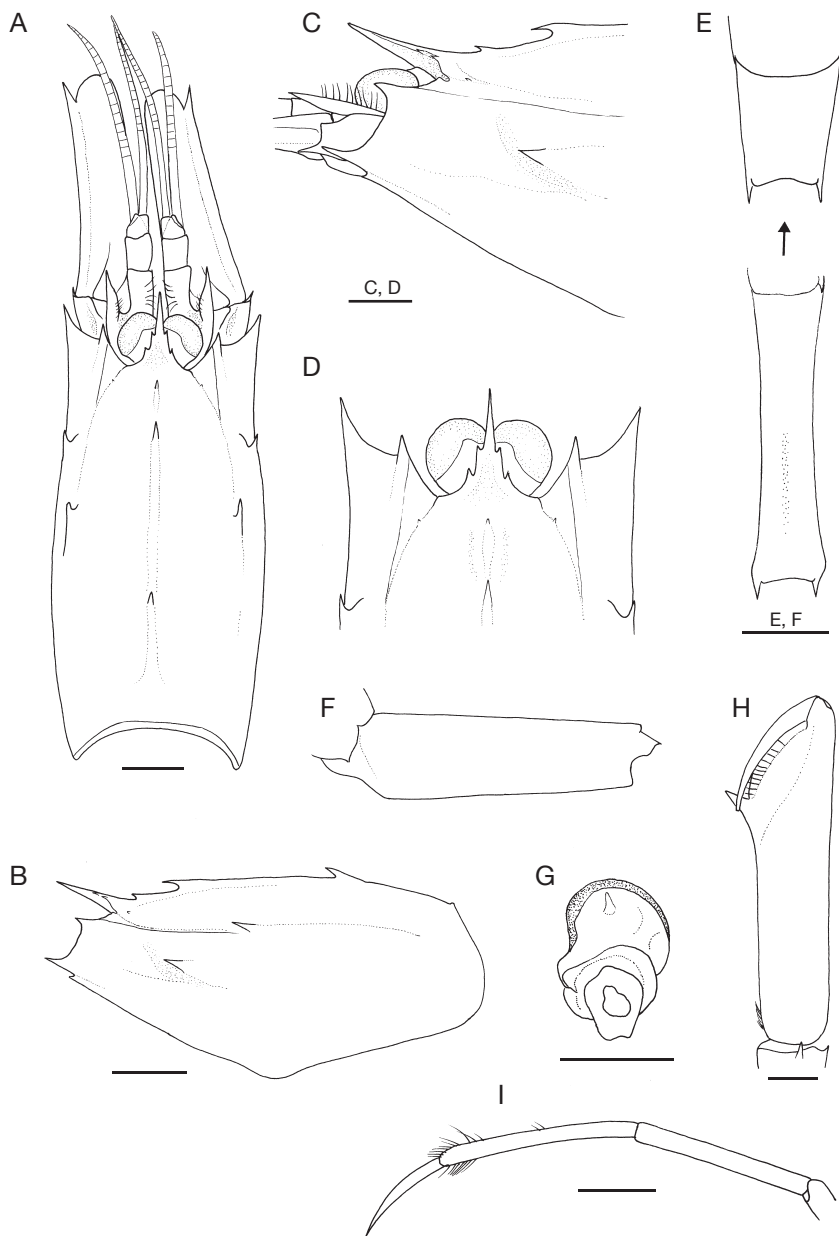


FIG. 19. — *Parapontophilus longirostris* n. sp., ♀ 8.5 mm, holotype, Tubuai Island, Austral Islands, French Polynesia (BENTHAUS, stn CP 1965) (MNHN-Na 16210): **A**, carapace and cephalic appendages, dorsal view; **B**, carapace, lateral view; **C**, anterior part of carapace, cornea and basal part of antennae, lateral view; **D**, anterior part of carapace and eyes, dorsal view; **E**, fifth and sixth pleonal somites, dorsal view; **F**, sixth pleonal somite, lateral view; **G**, eye, ventromesial view; **H**, subchela of left first pereopod, ventral view; **I**, dactylus, propodus and carpus of left fourth pereopod, lateral view. Scale bars: A, B, E, F, 2 mm; C, D, G-I, 1 mm.

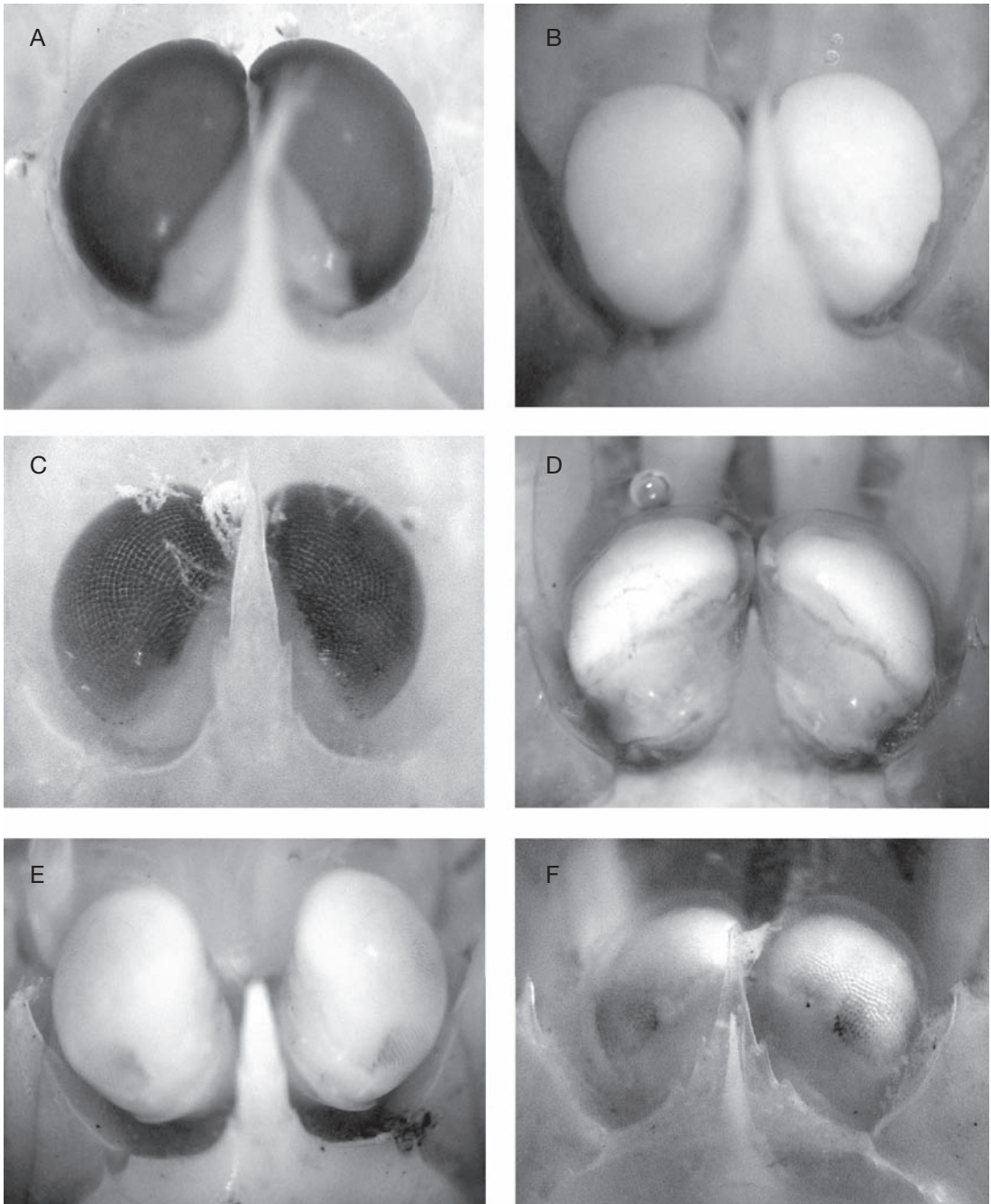


FIG. 20. — Eyes of selected species of the *Parapontophilus gracilis* group: **A**, *P. gracilis* (Smith, 1882), ♀ 8.6 mm, Senegal, west Africa (MNHN-Na 5258); **B**, *P. abyssi* (Smith, 1884), ♀ 15.2 mm, northeastern Atlantic (INCAL, stn CP 15) (MNHN-Na 4318); **C**, *P. junceus* (Bate, 1888), ♀ 7.4 mm, Austral Islands, French Polynesia (BENTHAUS, stn CP 1967) (MNHN-Na 16156); **D**, *P. occidentalis* (Faxon, 1893), syntype ♀ 18.5 mm, Gulf of Panama, eastern Pacific (*Albatross*, stn 3382) (MZC 4584); **E**, *P. difficilis* n. sp., holotype ♀ 13.3 mm, Vanuatu (MUSORSTOM 8, stn CP 1129) (MNHN-Na 16174); **F**, *P. geminus* n. sp., holotype ♀ 11.1 mm, Hyuga-nada, Japan (*Tansei-maru*, KT05-30, stn HB) (CBM-ZC 8764).

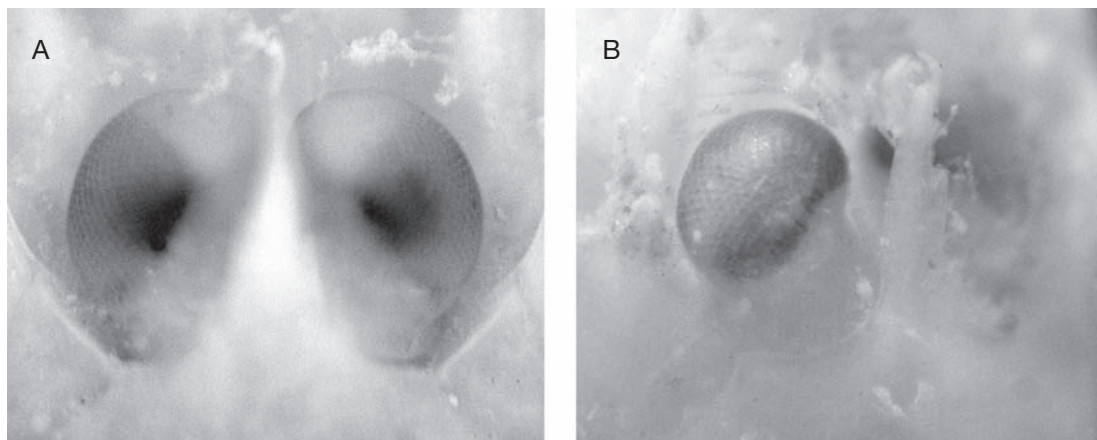


FIG. 21. — Eyes of selected species of *Parapontophilus*: **A**, *P. longirostris* n. sp., holotype ♀ 8.5 mm, Tubuai Island, Austral Islands, French Polynesia (BENTHAUS, stn CP 1965) (MNHN-Na 16210); **B**, *P. demani* (Chace, 1984), ♀ 4.9 mm, off Shionomisaki, Kii Peninsula, Japan (CBM-ZC 8648).

169°35.95'E, 1175-1210 m, 20.IX.1994, 1 ♀ (crashed) (MNHN-Na 16218).

Marquesas Islands. MUSORSTOM 9, stn CP 1278, Eiao Island, 07°52'S, 140°39'W, 1000 m, 5.IX.1997, 1 ♂ 7.6 mm, 4 ♀♀ (all crashed) (MNHN-Na 16219).

Mid-Pacific mountains. RV *Hakuho-maru*, KH93-1 cruise, stn 7, Sio Guyot, 18°16.05'N, 171°20.99'E, 1300-1312 m, 31.I.1993, beam trawl with 4 m span opening, coll. I. Takeuchi, 3 ♀♀ 6.5-7.7 mm (CBM-ZC 8761).

ETYMOLOGY. — Combination of the Latin words *longus* (long) and *rostellum* (beaked), alluding to the comparatively long rostrum of this new species.

DISTRIBUTION. — Comoros and Réunion islands in the western Indian Ocean, Japan, Taiwan, New Caledonia, Vanuatu, French Polynesia and Mid-Pacific mountains in the Pacific Ocean (Fig. 35), 742-1800 m.

DESCRIPTION

Rostrum (Fig. 19A-D) narrow triangular in dorsal view, 0.20-0.25 of carapace length, usually somewhat directed upward, overreaching distal margins of corneas; dorsal surface flat or faintly concave in proximal half; lateral margins armed with 1 or 2 small teeth proximal to midlength. Carapace (Figs 18; 19A-D) 1.70-1.80 times longer than wide, with 1 or 2 tiny anterior epigastric teeth; posterior epigastric and cardiac teeth moderately small; postorbital tooth minute, occasionally absent; epibranchial ridge low,

sometimes obsolete; branchiostegal tooth usually reaching dorsodistal margin of antennal basicerite.

Third pleonal somite (Fig. 18) with moderately convex tergum and moderately produced postero-dorsal margin. Fifth somite (Fig. 19E) rounded on dorsal surface. Sixth somite (Figs 18; 19E, F) 4.00-4.10 times longer than wide, 3.00-3.30 times as long as greatest depth; dorsal surface rounded.

Eye (Fig. 19A, D, G) subpyriform; cornea lightly pigmented in preservative (colour generally yellow or light brown, usually with darker brown patch on dorsal surface); corneal surface distinctly faceted with comparatively large lenses (Fig. 21A); maximal diameter of cornea 0.12-0.13 of carapace length; boundary between cornea and eye-stalk clearly delineated; eye-stalk noticeably constricted; papilla-like projection on mesial face relatively large (Fig. 19G). Antennular peduncle (Fig. 19A) falling short of midlength of antennal scale. Antennal scale (Fig. 19A) 0.60-0.70 of carapace length, 3.90-4.10 times longer than wide; lateral margin slightly concave, distolateral tooth reaching distal margin of lamella.

Palm of first pereopod (Fig. 19H) elongate, 4.00-4.80 longer than wide; cutting edge strongly oblique; pollex moderately small, width of palm including tip of pollex 1.40-1.50 of width proximal

to base of pollex; merus with relatively weak dorsodistal tooth. Second pereopod short, reaching or falling short of midlength of merus of first pereopod (Fig. 18). Fourth pereopod (Fig. 19I) overreaching distal margin of antennal scale by half to full length of dactylus; dactylus subspatulate, 0.50-0.60 of propodal length; carpus 0.80-0.90 of propodal length. Fifth pereopod similar to fourth, slightly falling short of distal margin of antennal scale.

Appendix masculina of male second pleopod 0.60-0.70 length of appendix interna.

Coloration in life

Unknown.

Size

Males CL 5.8-8.0 mm; females CL 6.0-8.9 mm.

REMARKS

Specimens from various localities are generally similar, and I could not find any morphological differences associated with geographical pattern. The rostrum is usually armed with two pairs of lateral teeth, but one or both of the anterior pairs occasionally missing like in other congeneric species.

This new species can be easily distinguished from the other species of the *Parapontophilus gracilis* group by the rostrum clearly overreaching the anterior margins of the corneas, the elongate sixth pleonal somite (3.00-3.30 times longer than deep), the comparatively small corneas (the maximum diameter of the cornea is 0.12-0.13 of the carapace length) with a distinctly faceted corneal surface, the noticeably constricted eye-stalk, and the elongate palm of the first pereopod (4.00-4.80 times as long as wide).

Allen & Butler (1994) recorded *Pontophilus gracilis abyssii* from the Mid-Pacific mountains, although they did not provide information on morphology of their specimens. The present material contains three specimens from SIO Guyot, Mid-Pacific mountains. Therefore I assume that Allen & Butler's (1994) specimens may actually represent the present new species. The occurrence of the true *P. abyssii* in the Pacific Ocean has not been confirmed during this study.

Parapontophilus modumanuensis species group

DIAGNOSIS. — Body moderately slender. Carapace lacking cardiac and epibranchial teeth. Sixth pleonal somite not constricted in dorsal view. Telson longer than sixth pleonal somite. Cornea pigmented, surface always well faceted; eye-stalk devoid of papilla-like projection on ventromesial surface. Second pereopod overreaching midlength of merus of first pereopod.

Parapontophilus modumanuensis (Rathbun, 1906)

Pontophilus modumanuensis Rathbun, 1906: 910, fig. 63. — Chace 1984: 48, fig. 15.

TYPE MATERIAL. — Holotype: Hawaii. *Albatross*, stn 4166, off Nihoa (Modu Manu), 536-1463 m, 1 ♀ 4.0 mm (USNM). Not examined.

DISTRIBUTION. — Known only from the type locality in Hawaii (Fig. 36), 536-1463 m.

DIAGNOSIS (derived from literature). — Rostrum narrow triangular in dorsal view, 0.25 of carapace length, directed forward, straight, slightly overreaching distal margins of corneas; lateral margins armed with 2 pairs of small teeth, both arising proximal to midlength. Carapace about 1.80 times longer than wide; anterior epigastric tooth small; posterior epigastric tooth distinctly larger than anterior epigastric tooth; postorbital tooth absent; postorbital and epibranchial ridges obsolescent; branchiostegal tooth relatively strong, overreaching dorsodistal margin of antennal basicerite. Pleon missing. Cornea darkly pigmented entirely, distinctly faceted; maximal diameter of cornea about 0.14 of carapace length. Antennal scale 0.70 of carapace length, 4.40 times as long as wide; lateral margin strongly concave, distolateral tooth overreaching moderately produced lamella. Pereopods missing. Male unknown.

Coloration in life

Unknown.

Size

Female holotype 4.0 mm in CL.

REMARKS

This species is so far represented only by the holotype from Hawaii (see Remarks of *P. demani*). As Chace (1984) discussed, *P. modumanuensis* differs from *P. demani* in the characters of the rostrum and the antennal scale. The rostrum of *P. modumanuensis* overreaches the anterior margins of the corneas and bears the anterior pair of lateral tooth arising in the proximal half of its length. In contrast, the rostrum of *P. demani* only reaches the anterior margins of the corneas and the anterior pair of lateral teeth arises in the distal half of the rostral length. The antennal scale is proportionally narrower in *P. modumanuensis* than in *P. demani* (4.40 times longer than wide versus 2.90–3.10). The distolateral tooth of the antennal scale overreaches the distal margin of the lamella in *P. modumanuensis*, vice versa in *P. demani*. Furthermore, the postorbital tooth on the carapace is absent in *P. modumanuensis*, whereas the tooth is clearly discernible in all specimens of *P. demani* examined in this study. These characters are also useful in distinguishing *P. modumanuensis* from other five species of the *P. modumanuensis* group, described as new in this study.

Parapontophilus demani Chace, 1984
(Figs 21B; 22; 23)

Pontophilus modumanuensis – De Man 1920: 270 (in part), pl. 21, fig. 64–64e, pl. 22, fig. 64f. Not *Pontophilus modumanuensis* Rathbun, 1906.

Pontophilus demani Chace, 1984: 48. — Sakaji 2001: 211.

TYPE MATERIAL. — Holotype: **Indonesia**. *Siboga*, stn 297, Selat Roti, Lesser Sunda Islands, 10°39'S, 123°40'E, 520 m, 27.I.1900, ovig. ♀ 5.1 mm (ZMA). Examined.

OTHER MATERIAL EXAMINED. — **Japan**. Off Shionomisaki, Kii Peninsula, 450 m, 10.XII.1990, 1 ♂ 4.2 mm, 1 ♀ 4.2 mm (CBM-ZC 1203). — Same locality, 9.II.1993, dredge, coll. S. Nagai, 2 ♂♂ 3.7, 5.4 mm, 3 ♀♀ 3.9–4.5 mm (CBM-ZC 3030). — Same locality, 350 m, 21.I.1990, coll. S. Nagai, dredge, 1 ♀ 5.0 mm (CBM-ZC 3031). — Off Wabuka, Kushimoto, Kii Peninsula, 700 m, 4.XI.1992, dredge, coll. S. Nagai, 1 ♀ 5.5 mm (CBM-ZC 5463). — Off Shionomisaki, 450 m, 14.XII.1990, 1 ♀ 4.9 mm (CBM-ZC 8648).

New Caledonia. BIOCAL, stn CP 52, 23°06'S, 167°47'E, 540–600 m, 31.VIII.1985, 1 ♀ 4.4 mm (MNHN-Na).

Austral Islands. BENTHAUS, stn CP 1965, Tubuai Island, 23°21.3'S, 149°33.9'W, 500–1200 m, 19.XI.2002, 1 ♂ 4.5 mm (MNHN-Na).

DISTRIBUTION. — Japan, Lesser Sunda Islands, Indonesia, New Caledonia, and Austral Islands, French Polynesia (Fig. 36), 350–700 m.

DESCRIPTION

Rostrum (Fig. 22A–D) narrow triangular in dorsal view, 0.17–0.20 of carapace length, directed slightly upward, straight, slightly falling short of or reaching distal margins of corneas; lateral margins armed with 2 pairs of relatively large teeth, anterior pair arising distal to midlength of rostrum. Carapace (Figs 22A–D; 23A) 1.20–1.40 times longer than wide; anterior epigastric tooth relatively large (distinctly smaller than posterior epigastric tooth); posterior epigastric tooth relatively large, supported by middorsal ridge reaching beyond midlength of carapace; cardiac tooth absent; postorbital tooth small, but conspicuous; epibranchial tooth absent; epibranchial ridge obsolete or absent; branchiostegal tooth moderately large, reaching or slightly overreaching dorsodistal margin of antennal basiscrite.

Third pleonal somite (Fig. 22F) with moderately convex tergum and with moderately produced posterodorsal margin. Fifth somite (Fig. 22F, G) rounded dorsally. Sixth somite (Fig. 22F, G) about 3.00 times longer than wide, 2.20–2.57 times longer than deep, 1.60–1.70 length of fifth somite; dorsal surface rounded.

Eye (Fig. 22C) subpyriform; cornea pigmented with light brown or gray in preservative; corneal surface distinctly faceted with moderately small lenses (Fig. 21B); maximal diameter of cornea 0.13–0.15 of carapace length; eye-stalk constricted near base; ventromesial face without papilla-like projection. Antennular peduncle (Fig. 22A) reaching midlength of antennal scale. Antennal scale (Fig. 22A, H) 0.58–0.60 of carapace length and 2.90–3.10 times longer than wide; lateral margin weakly concave, lamella somewhat produced, slightly overreaching distolateral tooth.

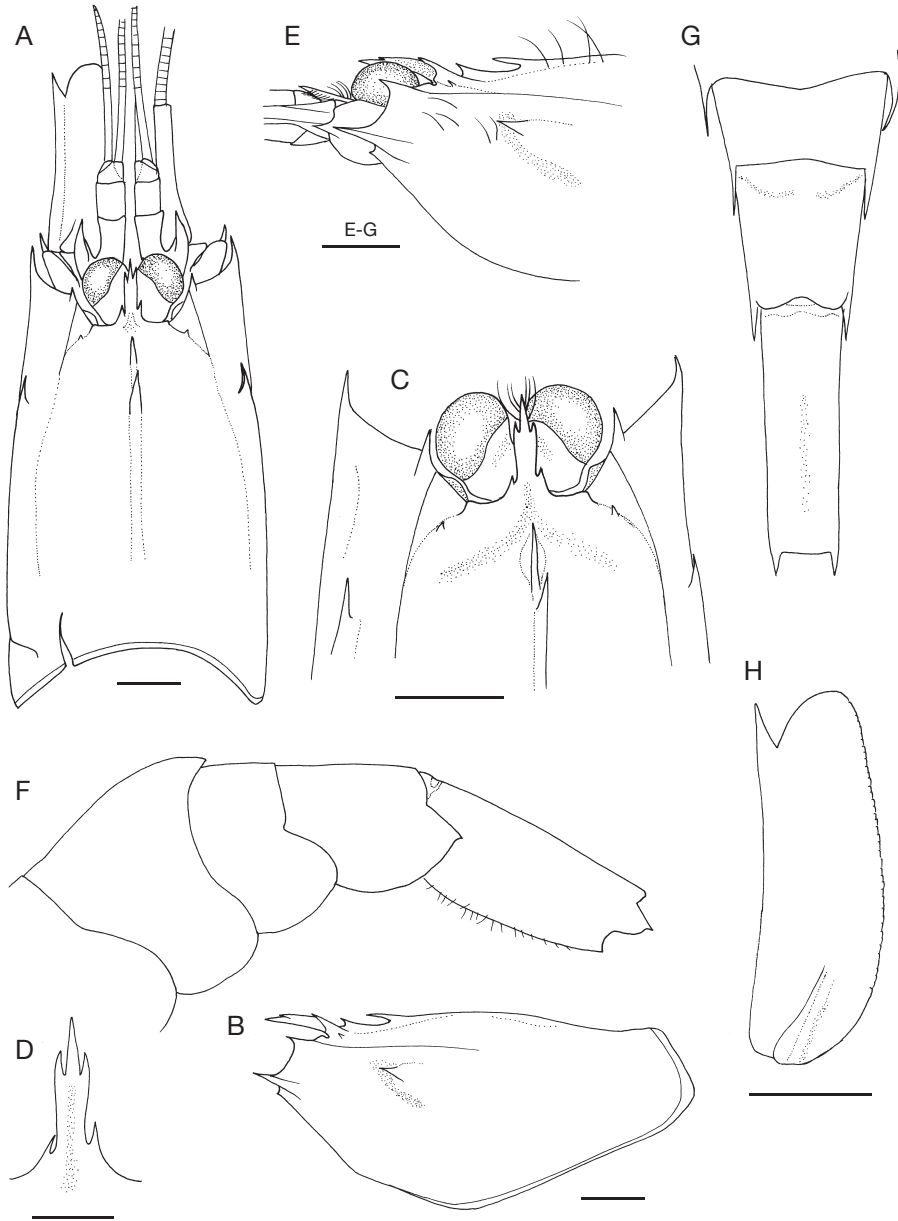


FIG. 22. — *Parapontophilus demani* (Chace, 1984), ovig. ♀ 5.1 mm, holotype, Selat Roti, Lesser Sunda Islands, Indonesia (*Siboga*, stn 297) (ZMA): **A**, carapace and cephalic appendages, dorsal view (right antennal scale missing); **B**, carapace, lateral view; **C**, anterior part of carapace and eyes, dorsal view; **D**, rostrum, dorsal view; **E**, anterior part of carapace, cornea and basal part of antennae, lateral view; **F**, third to sixth pleonal somites, lateral view; **G**, fourth to sixth pleonal somites, dorsal view; **H**, left ophthalmic appendage, ventromesial view; **I**, left antennal scale, dorsal view. Scale bars: A-C, E-H, 1 mm; D, 0.5 mm.

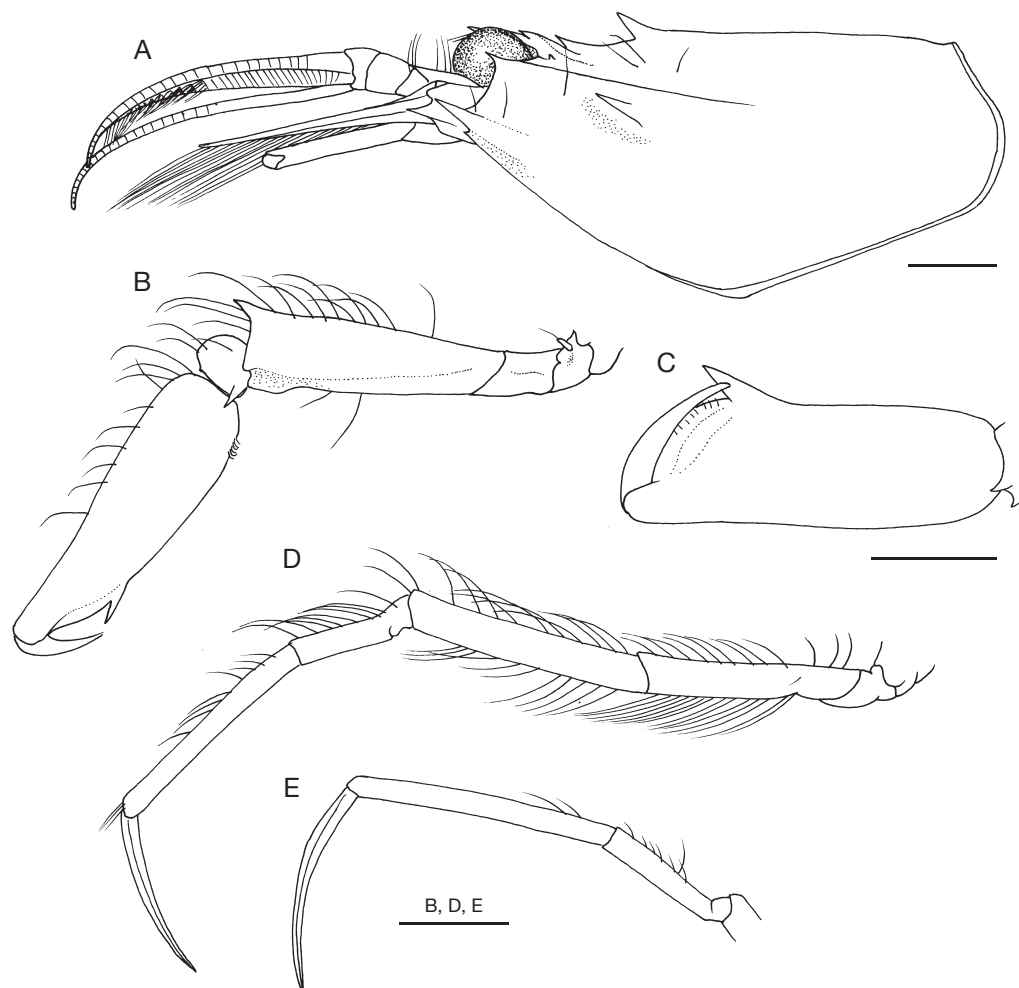


FIG. 23. — *Parapontophilus demani* (Chace, 1984): **A**, carapace and cephalic appendages, lateral view; **B**, left first pereopod, lateral view; **C**, same, subchela, ventral view; **D**, left fourth pereopod, lateral view; **E**, dactylus, propodus and carpus of fifth pereopod, lateral view; **A**, ♂ 4.2 mm, off Shionomisaki, Kii Peninsula, Japan (CBM-ZC 1203); **B**, **C**, ♀ 5.0 mm from same locality (CBM-ZC 3031); **D**, **E**, ovig. ♀ 5.1 mm, holotype, Selat Roti, Lesser Sunda Islands, Indonesia (*Siboga*, stn 297) (ZMA). Scale bars: 1 mm.

Palm of first pereopod (Fig. 23C) 2.90-3.10 times longer than wide; pollex moderately small, width of palm including tip of pollex about 1.30 of width proximal to base of pollex; cutting edge moderately oblique; merus (Fig. 23B) with relatively strong dorsodistal tooth. Second pereopod relatively long for genus, overreaching midlength of merus of first pereopod. Fourth pereopod (Fig. 23D) overreach-

ing distal margin of antennal scale by half to full length of dactylus; dactylus elongate, subspatulate, 0.70-0.80 of propodal length; carpus 0.50-0.60 of propodal length. Fifth pereopod (Fig. 23E) similar to fourth, slightly falling short of distal margin of antennal scale.

Appendix masculina of male second pleopod 0.85-0.90 length of appendix interna.

TABLE 2. — Comparison of six species of the *Parapontophilus modumanuensis* group.

	<i>P. demani</i> Kemp, 1915	<i>P. caledonicus</i> n. sp.	<i>P. juxta</i> n. sp.	<i>P. psyllus</i> n. sp.	<i>P. sibogae</i> n. sp.	<i>P. stenorhinus</i> n. sp.
Extension of rostrum against cornea	nearly reaching distal margin	reaching midpoint	nearly reaching distal margin	not reaching distal margin	not reaching distal margin	not reaching
Lateral teeth of rostrum	2 pairs	1 or 2 pairs	2 pairs	1 pair	2 pairs	2 pairs
Position of anterior pair of lateral teeth on rostrum	distal to midlength		midlength	midlength	midlength	distal to midlength
Anterior gastric tooth	present, large	present, small	present, small	absent or rudimentary	present, small	present, small
Posterior gastric tooth	relatively large	moderately small	moderately small	moderately small	moderately small	small
Postorbital tooth	present	present	present	absent	present	rudimentary
Extension of branchiostegal tooth against antennal basicerite	reaching	reaching	not reaching	not reaching (females) reaching (males)	reaching	not reaching
Sixth pleonal somite length/fifth somite length	1.70-1.90	2.00	2.30-2.40	2.00	2.20	—
Corneal width/carapace length	0.13-0.15	0.16-0.18	0.15-0.17	0.15-0.17	0.13	0.20-0.21
Antennal scale length/carapace length	0.58-0.60	0.58-0.60	0.60-0.65	0.60-0.65	0.44-0.52	0.65
Antennal scale length/width	2.90-3.10		2.70		2.90-3.20	
Distal lamella of antennal scale	slightly exceeding distolateral tooth	distinctly exceeding distolateral tooth	distinctly exceeding distolateral tooth	distinctly exceeding distolateral tooth	distinctly exceeding distolateral tooth	distinctly exceeding distolateral tooth
Fourth pereopod dactyl length/propod length	0.70-0.80	0.95-1.05	0.85-0.95	0.80-0.95	0.88-0.94	0.95

Coloration in life

Unknown.

Size

Males CL 3.7-5.4 mm; females CL 3.9-5.5 mm, ovigerous female CL 5.1 mm.

REMARKS

Chace (1984) described *Parapontophilus demani* (as *Pontophilus*) based on a single ovigerous female from the *Siboga* station 297, off Lesser Sunda Islands, which was identified initially by de Man (1920) as *Pontophilus modumanuensis*. De Man (1920) remarked that the ovigerous female from the station 297 and the two other ovigerous specimens from the station 89 in the Celebes Sea differed from each other in some minor points. This was one of the reasons why Chace (1984) purposely excluded the latter two specimens from the type series of *Parapontophilus demani*. The present study has revealed that the differences observed between

the holotype of *P. demani* and the two specimens from the station 89 are species diagnostic, and a new species *P. sibogae* n. sp. is described for the latter two specimens.

Parapontophilus demani and five new species of the species group described in this study are very similar to one another. Differences among these species are summarized in Table 2. *Parapontophilus demani* appears closest to *P. sibogae* n. sp. in the armament of the rostrum, better developed branchiostegal tooth of the carapace and the shape of the cornea. Differences between the two species are fully discussed under account of *P. sibogae* n. sp.

Parapontophilus caledonicus n. sp.

(Figs 24; 25)

TYPE MATERIAL. — Holotype: BATHUS 1, stn DE 694, 20°35.9'S, 164°58.3'E, 400-500 m, 17.III.1993, ♀ 2.5 mm, (MNHN-Na 16077).

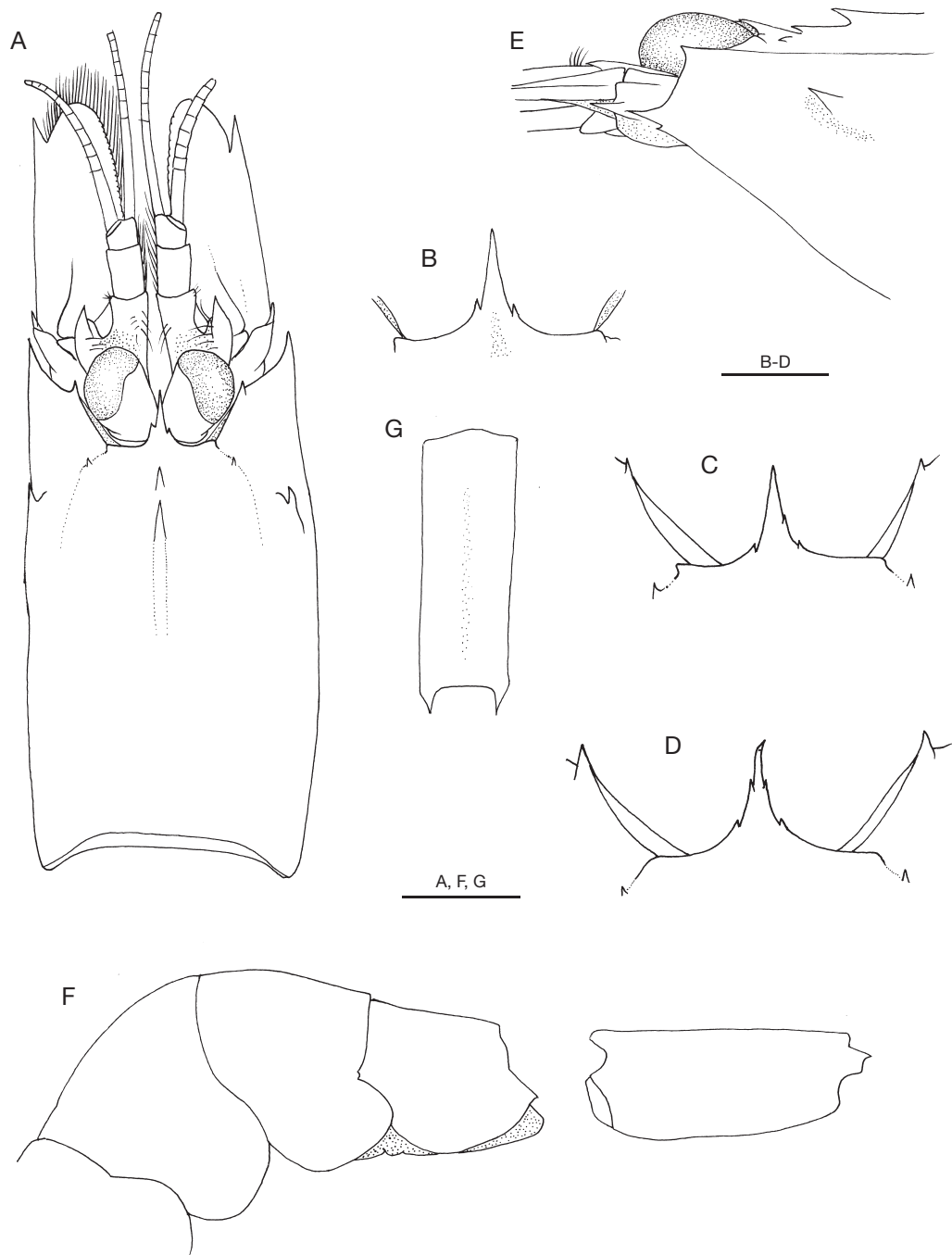


FIG. 24. — *Parapontophilus caledonicus* n. sp: **A**, carapace and cephalic appendages, lateral view; **B**, rostrum, dorsal view; **C, D**, rostrum and orbital region of carapace, dorsal view; **E**, anterior part of carapace, cornea and basal part of antennae, lateral view; **F**, third to sixth pleonal somites, lateral view; **G**, sixth pleonal somite, dorsal view; **A, B, E-G**, ♀ 2.5 mm, holotype, New Caledonia (BATHUS 1, stn DE 694) (MNHN-Na 16077); **C**, ♂ 3.5 mm, paratype, same data as holotype (MNHN-Na 16077b); **D**, ♀ 3.3 mm, paratype, same data as holotype (MNHN-Na 16077b). Scale bars: A, E-G, 1 mm; B-D, 0.5 mm.

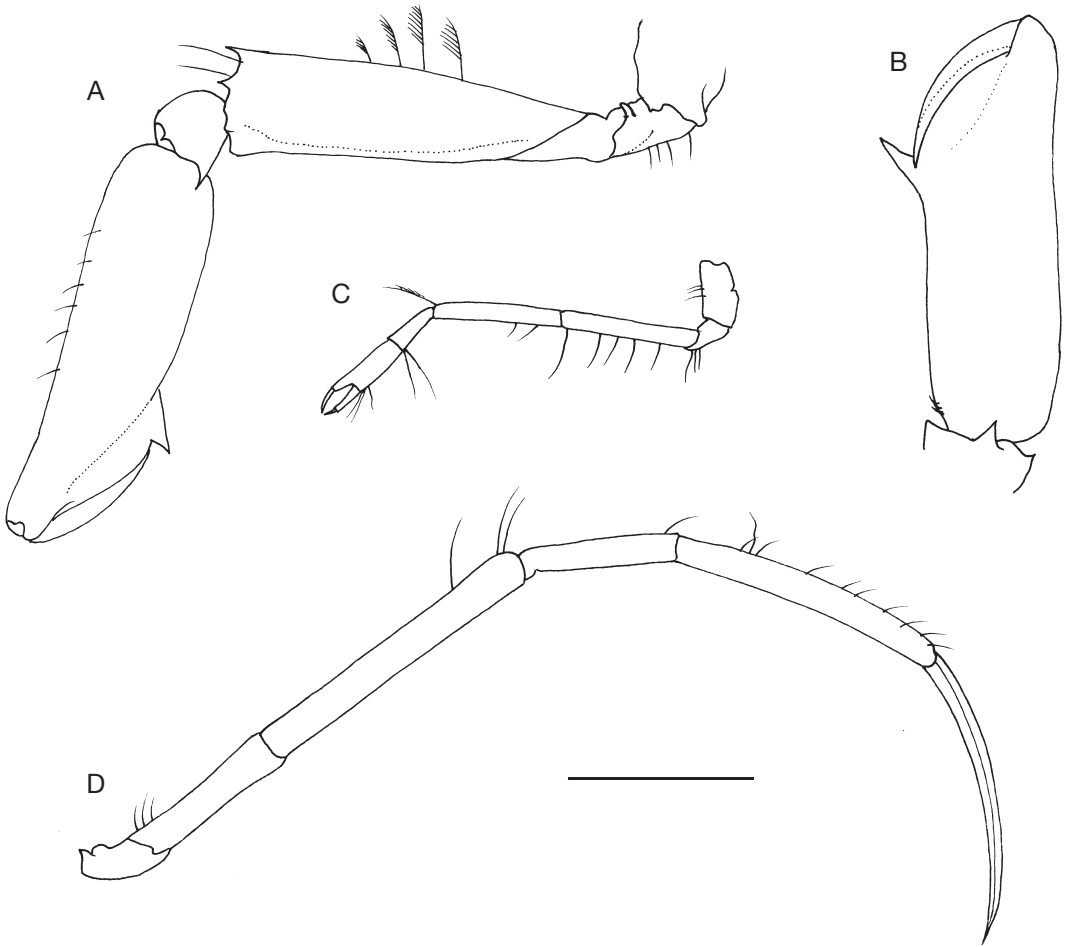


FIG. 25. — *Parapontophilus caledonicus* n. sp., ♀ 2.5 mm, holotype, New Caledonia (BATHUS 1, stn DE 694) (MNHN-Na 16077): **A**, left first pereopod, lateral view; **B**, chela of left first pereopod, ventral view; **C**, left second pereopod, lateral view; **D**, right fifth pereopod, lateral view. Scale bar: 1 mm.

Paratypes: same data as holotype, 1 ♂ 3.5 mm, 2 ♀♀ 2.3, 3.3 mm (MNHN-Na 16077b).

ETYMOLOGY. — Named after the type locality, New Caledonia.

DISTRIBUTION. — Known only from the type locality in New Caledonia (Fig. 36), 400-500 m.

DESCRIPTION

Rostrum (Fig. 24A-D) relatively short, narrow triangular in dorsal view, 0.14)-0.15 of carapace

length, directed forward, straight, falling short of or reaching tips of antennal teeth; lateral margins armed with 1 or 2 tiny teeth on either side, anterior pair, if present, arising at about midlength of rostrum. Carapace (Fig. 24A, B, D) 1.40-1.50 times longer than wide; anterior epigastric tooth small, but clearly recognizable; posterior epigastric tooth moderately small, followed by weak middorsal ridge reaching beyond midlength of carapace; cardiac tooth absent; postorbital tooth very small; epibranchial tooth

absent; epibranchial ridge absent; branchiostegal tooth moderately small, reaching dorsodistal margin of antennal basicerite.

Third pleonal somite (Fig. 24F) with moderately convex tergum and with moderately produced posterodorsal margin. Fifth somite (Fig. 24F) rounded dorsally. Sixth somite (Fig. 24F, G) 2.90-3.00 times longer than wide, 2.30-2.50 times longer than deep, about 2.00 times longer than fifth somite; dorsal surface rounded.

Ophthalmic appendage (Fig. 24A, E) subpyriform; cornea pigmented with brownish gray; corneal surface distinctly faceted with moderately small lenses; maximal diameter of cornea 0.16-0.18 of carapace length; eye-stalk slightly constricted at base; ventromesial face without papilla-like projection. Antennular peduncle (Fig. 24A) reaching midlength of antennal scale. Antennal scale (Fig. 24A) 0.58-0.60 of carapace length and 2.60-2.80 times longer than wide; lateral margin straight, lamella somewhat produced, distinctly overreaching distolateral tooth.

Palm of first pereopod (Fig. 25A, B) 3.30-3.50 times longer than wide; pollex moderately small, width of palm including tip of pollex about 1.30 of width proximal to base of pollex; cutting edge moderately oblique; merus with relatively weak dorsodistal tooth. Second pereopod (Fig. 25C) overreaching midlength of merus of first pereopod. Fourth pereopod (Fig. 25D) overreaching distal margin of antennal scale by half to full length of dactylus; dactylus elongate, subspatulate, 0.95-1.05 of propodal length; carpus 0.55-0.65 of propodal length. Fifth pereopod similar to fourth, slightly falling short of distal margin of antennal scale.

Appendix masculina of male second pleopod about 0.80 length of appendix interna.

Coloration in life

Unknown.

Size

Male CL 3.5 mm; females CL 2.5-3.3 mm.

REMARKS

The number of lateral rostral teeth is variable in the present new species, although in other species

of the group, the number of teeth is constant. In the holotype and the smaller female paratype, the rostrum bears only one pair of lateral teeth; the male paratype has two pairs of lateral teeth, and the other, larger female paratype, have one left and two right teeth.

Morphological similarity suggests that the closest relative of *Parapontophilus caledonicus* n. sp. is *P. juxta* n. sp. Nevertheless, *P. caledonicus* n. sp. is characteristic in having a short rostrum, which only reaches the level of the antennal spines of the carapace. In *P. demani* and other four new species, the rostrum distinctly overreaches the level of the antennal spines. The dactyli of the fourth and fifth pereopods may be proportionally longer in *P. caledonicus* n. sp. than in *P. demani* and other four new species. Furthermore, the sixth abdominal somite seems to be proportionally shorter in *P. caledonicus* n. sp. than in *P. juxta*.

Parapontophilus juxta n. sp. (Figs 26; 27)

TYPE MATERIAL. — Holotype: Western Indian Ocean *Marion Dufresne*, cruise MD 32, stn DS 178, off Réunion Island, 21°03.6'S, 55°09.8'E, 412-460 m, 8.IX.1982, ovig. ♀ 3.8 mm (MNHN-Na 16074a).

Paratypes: western Indian Ocean. *Marion Dufresne*, cruise MD 32, stn DS 142, off Réunion Island, 20°50.3'S, 55°36.2'E, 480-675 m, 4.IX.1982, 1 ♂ 3.6 mm, 10 ♀♀ 3.4-4.1 mm (MNHN-Na 16073). — Same data as holotype, 2 ♂♂ 3.0, 3.1 mm, 4 ♀♀ 2.5-3.6 mm (MNHN-Na 16074b).

ETYMOLOGY. — The Latin *juxta* (= close) reflects the close similarity of this new species to other species of the *Parapontophilus modumanuensis* group.

DISTRIBUTION. — Off Réunion Island, western Indian Ocean (Fig. 36), 412-675 m.

DESCRIPTION

Rostrum (Fig. 26A-C) narrow triangular in dorsal view, about 0.17-0.20 of carapace length, directed forward, straight, slightly falling short of distal margins of corneas, but overreaching tips

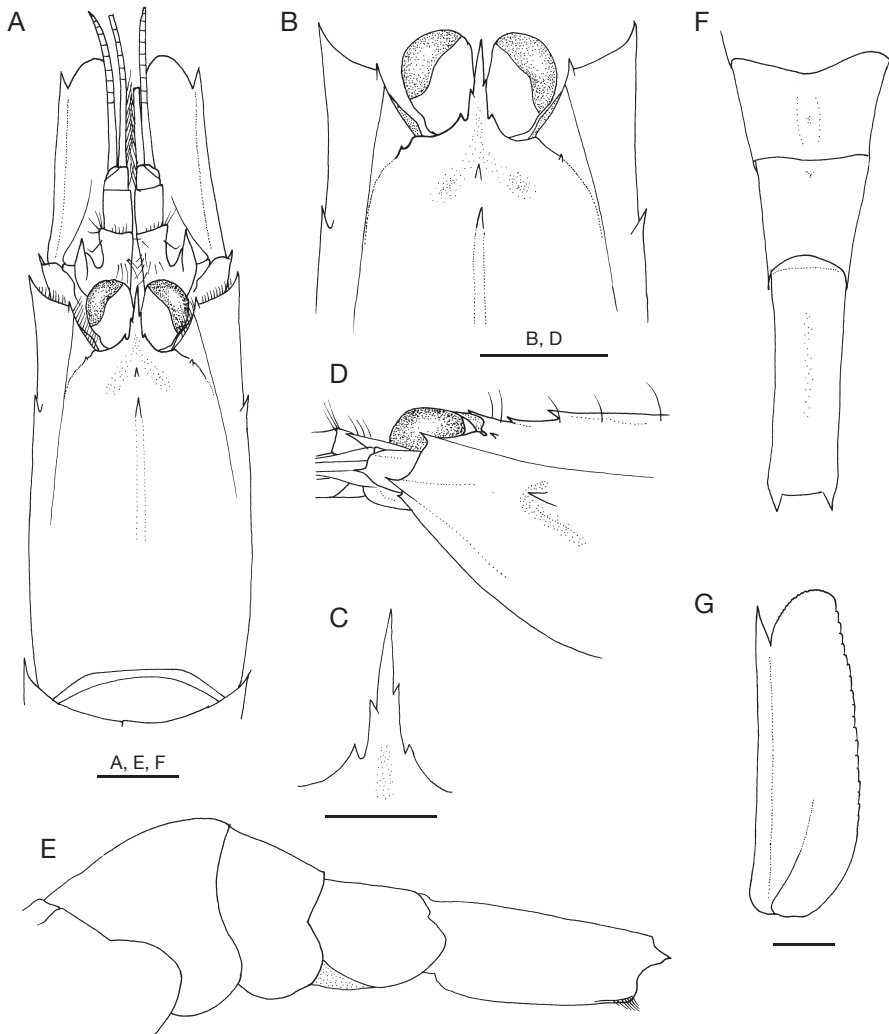


FIG. 26. — *Parapontophilus juxta* n. sp., ovig. ♀ 3.8 mm, holotype, off Réunion Island, western Indian Ocean (MD 32, stn DS 178) (MNHN-Na 16704a): **A**, carapace and cephalic appendages, dorsal view; **B**, anterior part of carapace and eyes, dorsal view; **C**, rostrum dorsal view; **D**, anterior part of carapace, ophthalmic appendage and basal part of antennae, lateral view; **E**, third to sixth pleonal somites, lateral view; **F**, fourth to sixth pleonal somites, dorsal view; **G**, left antennal scale, dorsal view. Scale bars: A, B, D-F, 1 mm; C, G, 0.5 mm.

of antennal teeth; lateral margins armed with 2 pairs of small teeth, anterior pair arising at about midlength of rostrum. Carapace (Fig. 26A, B, D) 1.40–1.50 times longer than wide; anterior epigastric tooth small, but conspicuous; posterior epigastric tooth moderately small, followed by weak middorsal ridge reaching beyond midlength

of carapace; cardiac tooth absent; postorbital tooth very small; epibranchial tooth absent; epibranchial ridge obsolete or absent; branchiostegal tooth relatively small, falling short of dorsodistal margin of antennal basicerite.

Third pleonal somite (Fig. 26E) with moderately convex tergum and with moderately produced

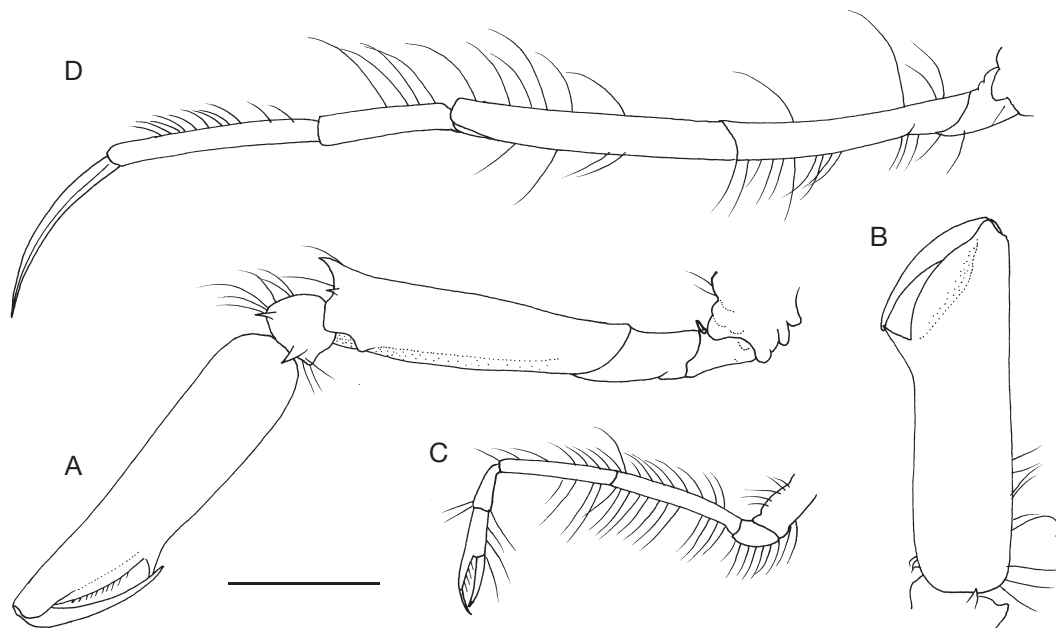


FIG. 27. — *Parapontophilus juxta* n. sp., ovig. ♀ 3.8 mm, holotype, off Réunion Island, western Indian Ocean (MD 32, stn DS 178) (MNHN-Na 16704a): **A**, left first pereopod, lateral view; **B**, same, subchela, ventral view; **C**, left second pereopod, lateral view; **D**, left fourth pereopod, lateral view. Scale bar: 1 mm.

posterodorsal margin. Fifth somite (Fig. 26E, F) rounded dorsally. Sixth somite (Fig. 26E, F) 2.90-3.00 times longer than wide, 2.30-2.50 times longer than deep, about 2.30 times longer than fifth somite; dorsal surface rounded.

Eye (Fig. 26A, B) subpyriform; cornea pigmented with light yellowish brown; corneal surface distinctly faceted with moderately small lenses; maximal diameter of cornea 0.15-0.17 of carapace length; eye-stalk slightly constricted; ventromesial face without papilla-like projection. Antennular peduncle (Fig. 26A) reaching midlength of antennal scale. Antennal scale (Fig. 26A, G) 0.60-0.65 of carapace length and 2.90-3.20 times longer than wide; lateral margin nearly straight, lamella somewhat produced, distinctly overreaching distolateral tooth.

Palm of first pereopod (Fig. 27A, B) 3.00-3.80

times longer than wide; pollex moderately small, width of palm including tip of pollex about 1.30 of width proximal to base of pollex; cutting edge moderately oblique; merus with relatively strong dorsodistal tooth. Second pereopod (Fig. 27C) relatively long for genus, overreaching midlength of merus of first pereopod. Fourth pereopod (Fig. 27D) overreaching distal margin of antennal scale by half to full length of dactylus; dactylus elongate, subspatulate, 0.85-0.95 of propodal length; carpus 0.55-0.65 of propodal length. Fifth pereopod similar to fourth, slightly falling short of distal margin of antennal scale.

Appendix masculina of male second pleopod 0.85-0.90 length of appendix interna.

Coloration in life
Unknown.

Size

Males CL 3.0-3.6 mm; females CL 2.5-4.1 mm, ovigerous female CL 3.8 mm.

REMARKS

Parapontophilus juxta n. sp. appears closest to *P. caledonicus* n. sp., as noted in the account of the latter species. It is also similar to *P. demani* and *P. sibogae* n. sp., but it can be distinguished from the latter two species by the shorter branchiostegal tooth not reaching the dorsodistal margin of the antennal basicerite and the more elongate sixth pleonal somite (2.30-2.40 times as long as the fifth somite in *P. juxta* n. sp. versus 1.70-1.90 in *P. demani* and 2.20 in *P. sibogae* n. sp.). Furthermore, the lateral rostral and the epigastric teeth are smaller in *P. juxta* n. sp. than in *P. demani* (cf. Figs 26C and 22D for the rostral teeth, Figs 26D and 22E for the anterior epigastric tooth). This new species, as well as *P. psyllus* n. sp., is one of the smallest species in the genus.

Parapontophilus psyllus n. sp.
(Figs 28; 29)

TYPE MATERIAL. — Holotype: **Japan.** TV *Toyoshio-maru*, 2005-04 cruise, stn 6, off Nago, Okinawa Island, Ryukyu Islands, 26°32.90'N, 127°43.94'E, 396-407 m, 22.V.2005, beam trawl, coll. T. Komai, ovig. ♀ 4.6 mm (CBM-ZC 8762).

Paratypes: **Japan.** TV *Toyoshio-maru*, 2002-05 cruise, stn 11, off Nago Bay, Okinawa Island, Ryukyu Islands, 26°32.18'N, 127°43.96'E, 404-394 m, 27.V.2002, coll. H. Komatsu, 5 ♂♂ 3.7-3.8 mm, 11 ovig. ♀♀ 3.7-4.0 mm (CBM-ZC 8028). — Same data as holotype, 7 ♂♂ 3.7-3.9 mm, 6 ovig. ♀♀ 3.7-4.2 mm (CBM-ZC 8763).

Taiwan. TAIWAN 2001, stn CC 63, 24°55.05'N, 122°03.20'E, 240-350 m, 5.V.2001, 1 ♀ 4.2 mm (NTOU).

OTHER MATERIAL EXAMINED. — **Philippines.** MUSORSTOM 1, stn CP 20, 13°59.2'S, 120°20.3'E, 208-222 m, 21.III.1976, 1 ovig. ♀ 4.2 mm (MNHN-Na 16075).

Solomon Islands. SALOMON 1, stn CP 1860, 09°22'S, 160°31'E, 620 m, 7.X.2001, 1 ♂ 3.9 mm (MNHN-Na 16079).

ETYMOLOGY. — From the Greek *psyllus*, flea, in reference to the small size of this new species. The name is considered as a substantive in apposition.

DISTRIBUTION. — Ryukyu Islands, Taiwan, the Philippines and Solomon Islands (Fig. 36), 208-620 m.

DESCRIPTION

Rostrum (Fig. 28A-C) narrow triangular in dorsal view, 0.15-0.18 of carapace length, directed forward, straight, slightly falling short of distal margins of corneas, but slightly overreaching tips of antennal teeth; lateral margins always armed with 1 pair of small to tiny teeth arising at about midlength of rostrum. Carapace (Fig. 28A, B, D) 1.30-1.40 times longer than wide; anterior epigastric tooth greatly reduced to minute denticle or absent; posterior epigastric tooth small, supported by blunt middorsal ridge reaching beyond midlength of carapace; cardiac tooth absent; postorbital tooth reduced to minute tubercle or absent; epibranchial tooth absent; epibranchial ridge obsolete or absent; branchiostegal tooth small, not reaching dorsodistal margin of antennal basicerite.

Third pleonal somite (Fig. 28E) with moderately convex tergum and with moderately produced posterodorsal margin. Fifth somite (Fig. 28E, F) rounded dorsally. Sixth somite (Fig. 28E, F) 2.90-3.00 times longer than wide, 2.20-2.50 times longer than deep, 2.00-2.20 length of fifth somite; dorsal surface rounded.

Ophthalmic appendage (Fig. 28A) subpyriform; cornea pigmented with light brown or gray in preservative; corneal surface distinctly faceted with moderately small lenses; maximal diameter of cornea 0.15-0.17 of carapace length; eye-stalk constricted near base; mesial face without papilla-like projection. Antennular peduncle (Fig. 28A) reaching midlength of antennal scale. Antennal scale (Fig. 28A) about 0.60-0.65 of carapace length and 2.72-2.90 times longer than wide; lateral margin nearly straight or slightly concave, lamella strongly produced, distinctly overreaching distolateral tooth.

Palm of first pereopod (Fig. 29A, B) 3.10-3.40 times longer than wide; pollex moderately produced, width including tip of pollex about 1.30 of width of palm proper; cutting edge moderately oblique; merus with relatively weak dorsodistal tooth. Second pereopod (Fig. 29C) relatively long for genus, overreaching midlength of merus of first

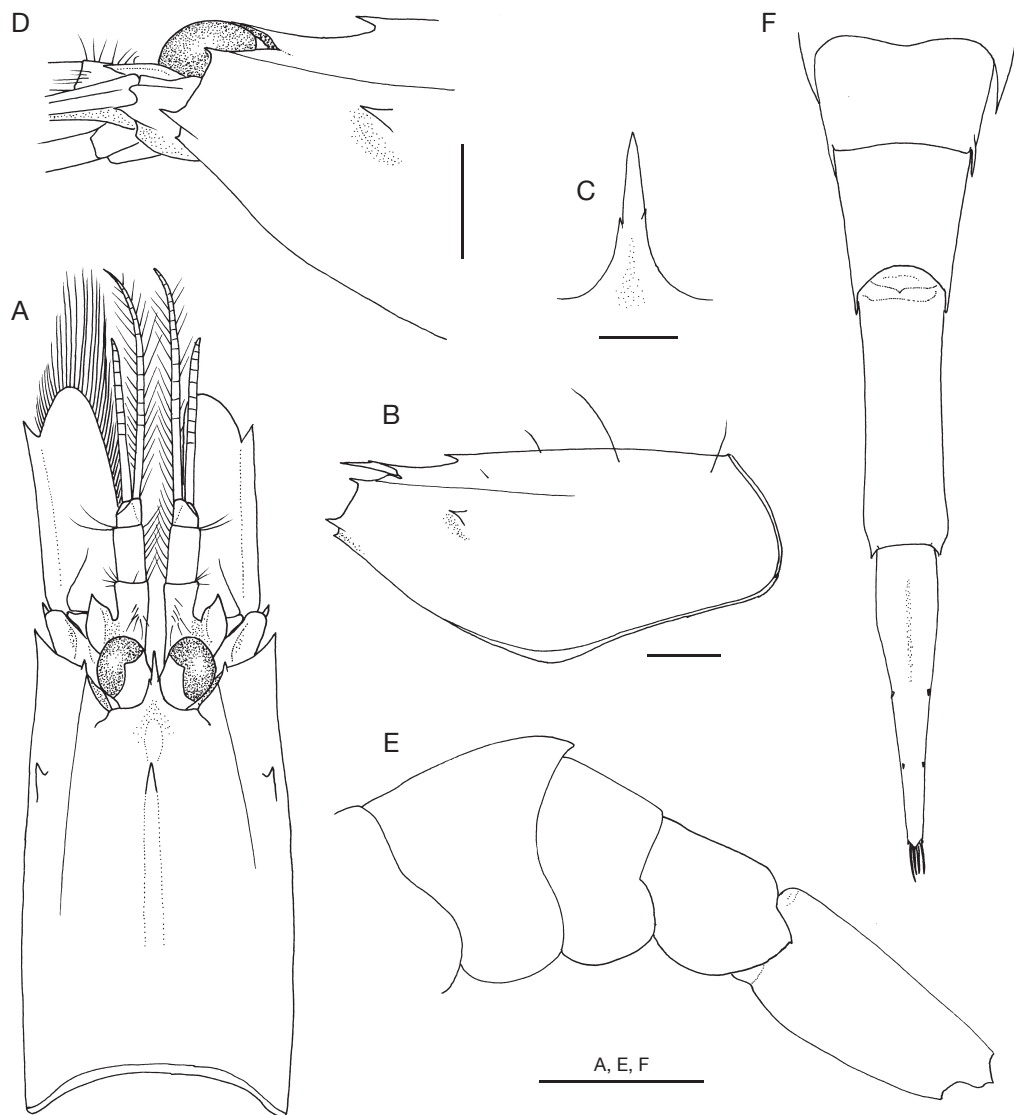


FIG. 28. — *Parapontophilus psyllus* n. sp., ovig. ♀ 4.6 mm, holotype, off Nago, Okinawa Island, Ryukyu Islands (TV *Toyoshio-maru*, 2005-04 cruise, stn 6) (CBM-ZC 8762): **A**, carapace and cephalic appendages, dorsal view; **B**, carapace, lateral view; **C**, rostrum dorsal view; **D**, anterior part of carapace, eye and basal part of antennae, lateral view; **E**, third to sixth pleonal somites, lateral view; **F**, fourth to sixth pleonal somites and telson, dorsal view. Scale bars: A, B, D-F, 1 mm; C, 0.5 mm.

pereopod. Fourth pereopod (Fig. 29E) overreaching distal margin of antennal scale by half to full length of dactylus; dactylus elongate, subspatulate, 0.80-0.95 of propodal length; carpus 0.50-0.65 of

propodal length. Fifth pereopod similar to fourth, slightly falling short of distal margin of antennal scale. Appendix masculina of male second pleopod (Fig. 29F) 0.85-0.90 length of appendix interna.

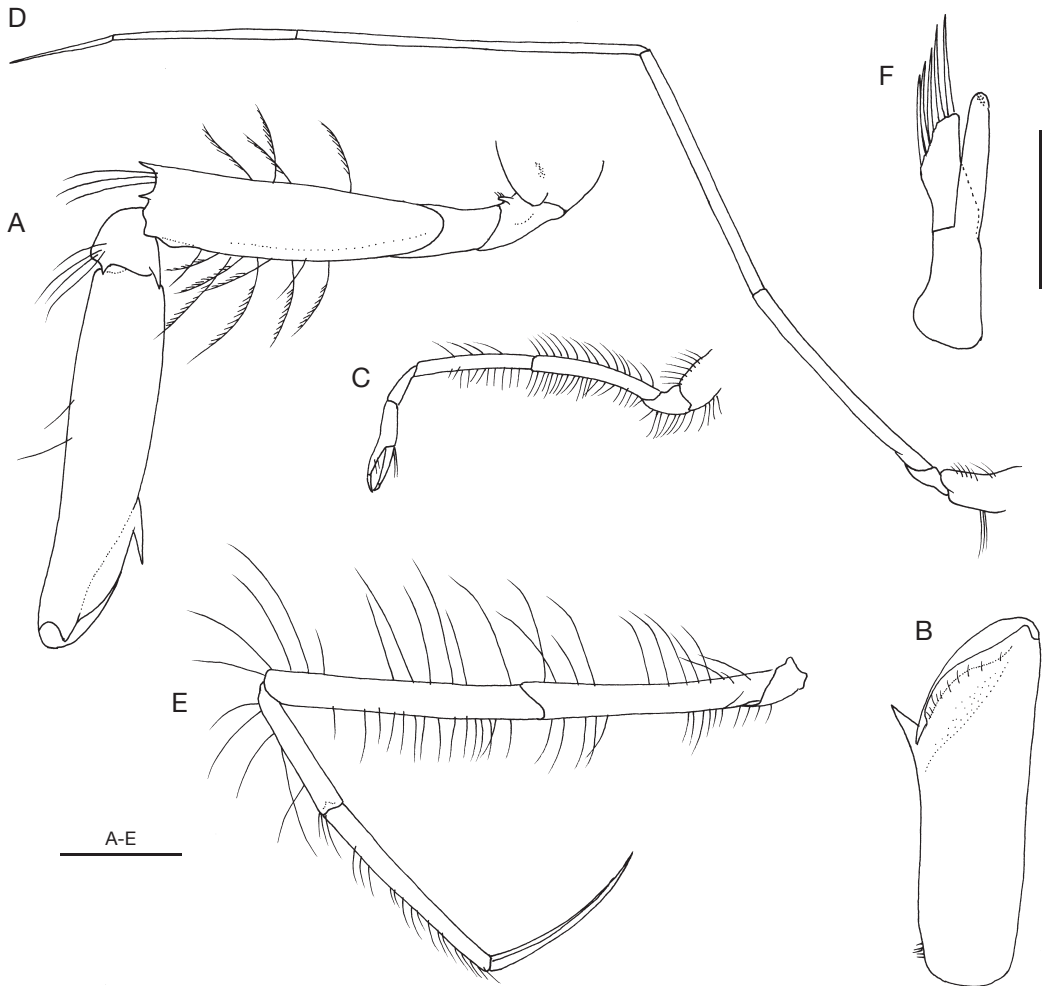


FIG. 29. — *Parapontophilus psyllus* n. sp., left appendages: **A**, first pereopod, lateral view; **B**, same, subchela, ventral view; **C**, second pereopod, lateral view; **D**, third pereopod, lateral view; **E**, fourth pereopod, lateral view; **F**, appendix masculina and appendix interna of left second pleopod, mesial view; **A-E**, ovig. ♀ 4.6 mm, holotype, off Nago, Okinawa Island, Ryukyu Islands (TV *Toyoshio-maru*, 2005-04 cruise, stn 6) (CBM-ZC 8762); **F**, ♂ 3.8 mm, paratype, same data as holotype (CBM-ZC 8763). Scale bars: A-E, 1 mm; F, 0.5 mm.

Coloration in life

Body entirely light reddish-brown; corneas dark gray (based on field note by the author).

Size

Males CL 3.7-3.9 mm; females CL 3.7-4.6 mm, ovigerous females CL 3.7-4.6 mm.

REMARKS

In *P. psyllus* n. sp., the size of the branchiostegal tooth of the carapace seems to be different between male and female. In males, this tooth nearly reaches the dorsodistal margin of the antennal basiscerite, whereas in females, it falls short of that.

This new species is characteristic within the species group in the possession of only one pair of lateral teeth on the rostrum, rather than two pairs in the other species of the group (Table 2). Furthermore, in *P. psyllus* n. sp., the anterior epigastric tooth is absent or rudimentary and the postorbital tooth is absent. In the other species of the group, the anterior epigastric and postorbital teeth are conspicuous, although the sizes of these teeth are different according to species.

Parapontophilus sibogae n. sp.
(Figs 30; 31; 36)

Pontophilus modumanuensis – De Man 1920: 270 (in part), pl. 21, fig. 64f-j. Not *Pontophilus modumanuensis* Rathbun, 1906.

TYPE MATERIAL. — Holotype: **Indonesia**. *Siboga*, stn 89, Pulu Kaniungan Ketjil, 11 m, coral bottom, 21.VI.1899, ovig. ♀ 5.9 mm (ZMA).

Paratype: same data as holotype, 1 ovig. ♀ 5.9 mm (ZMA).

ETYMOLOGY. — The specific name is derived from the research vessel name, *Siboga*.

DISTRIBUTION. — Known only from Pulu Kaniungan Ketjil, Celebes Sea (Fig. 36), 11 m.

DESCRIPTION

Rostrum (Fig. 30A-C) narrow triangular in dorsal view, 0.14 of carapace length, directed forward, straight, falling short of distal margins of corneas; lateral margins armed with 2 pairs of small teeth, anterior pair arising distal to midlength of rostrum. Carapace (Fig. 30A, B, D) 1.30 times longer than wide; anterior epigastric tiny tooth, with minute accessory denticle; posterior epigastric tooth moderately small, supported by middorsal ridge reaching beyond midlength of carapace; cardiac tooth absent; postorbital tooth very small; epibranchial tooth absent; epibranchial ridge obsolete; branchiostegal tooth moderately large, reaching dorsodistal margin of antennal basicerite.

Third pleonal somite (Fig. 30E) with moderately convex tergum and with moderately produced posterodorsal margin. Fifth somite (Fig. 30E, F)

rounded dorsally. Sixth somite (Fig. 30E, F) 2.30 times longer than wide, 2.00 times longer than deep, 2.30 length of fifth somite; dorsal surface rounded.

Eye (Fig. 30A) subpyriform; cornea light yellow in preservative; corneal surface distinctly faceted with moderately small lenses; maximal diameter of cornea 0.13 of carapace length; eye-stalk weakly constricted; mesial face without papilla-like projection. Antennular peduncle (Fig. 30A) reaching midlength of antennal scale. Antennal scale (Fig. 30A, G) 0.44-0.52 of carapace length and 2.50-2.60 times longer than wide; lateral margin straight, lamella strongly produced, distinctly overreaching distolateral tooth.

Palm of first pereopod (Fig. 31A, B) 3.30-3.50 times longer than wide; pollex moderately small, width of palm including tip of pollex about 1.20-1.30 of width proximal to base of pollex; cutting edge moderately oblique; merus with relatively weak dorsodistal tooth. Second pereopod slightly overreaching midlength of merus of first pereopod. Fourth pereopod (Fig. 31C) overreaching distal margin of antennal scale by half to full length of dactylus; dactylus elongate, subspatulate, 0.88-0.94 or propodal length; carpus about 0.60 of propodal length. Fifth pereopod (Fig. 31D) similar to fourth, slightly falling short of distal margin of antennal scale.

Male unknown.

Coloration in life
Unknown.

Size
Males unavailable; ovigerous females CL 5.9 mm.

REMARKS

As mentioned before, *P. sibogae* n. sp. appears closest to *P. demani*. Nevertheless, *P. sibogae* n. sp. is characteristic within the species group in having a proportionally shorter and broader antennal scale (Table 2). Furthermore, *P. sibogae* n. sp. is distinguished from *P. demani* by the proportionally shorter rostrum, the smaller anterior epigastric tooth of the carapace (cf. Figs 30D and 22E), the more strongly produced distal lamella of the antennal scale (cf. Figs 30G; 22I)

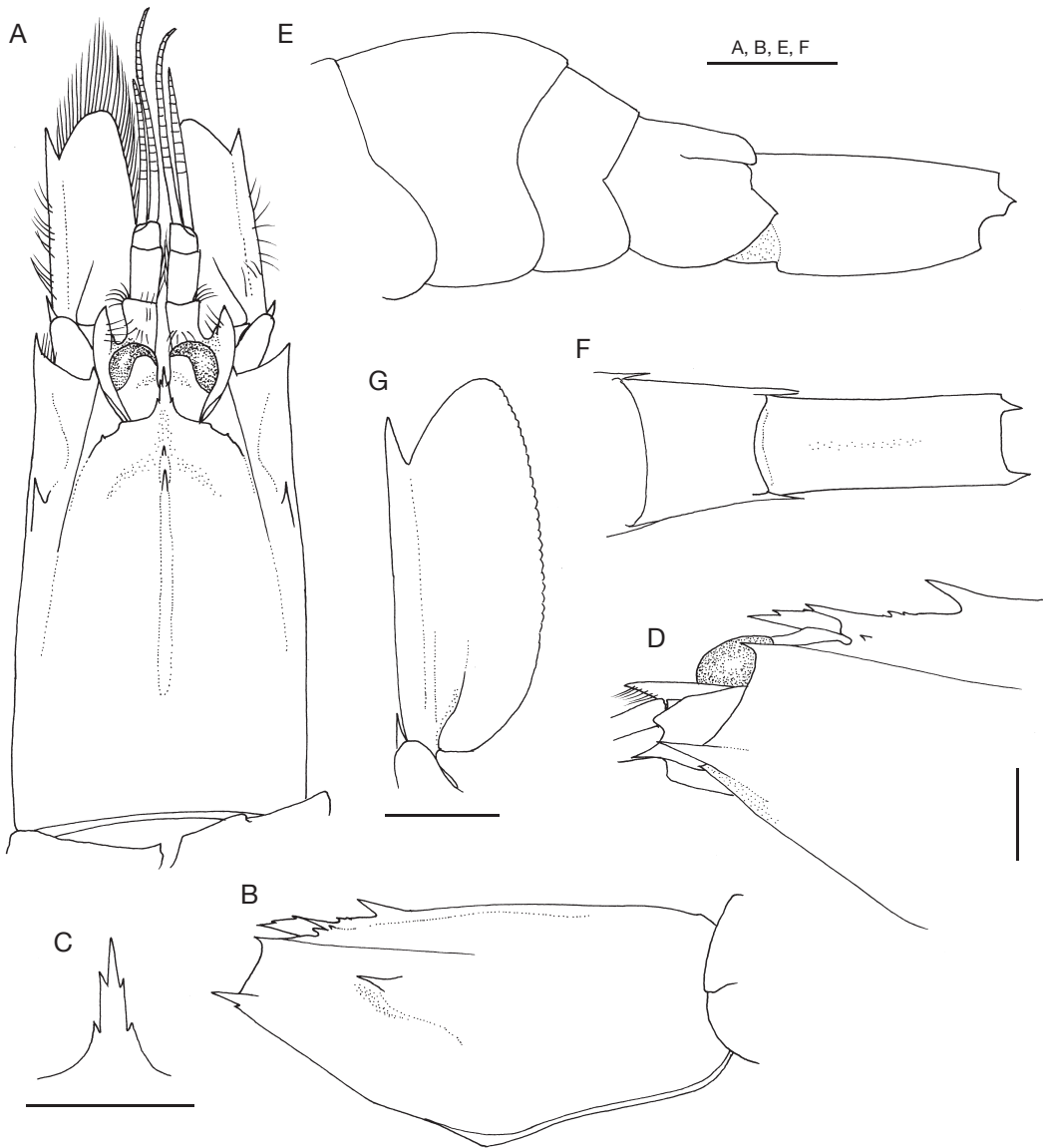


FIG. 30. — *Parapontophilus sibogae* n. sp., ovig. ♀ 5.9 mm, holotype, Pulu Kaniungan Ketjil, Indonesia (*Siboga*, stn 89) (ZMA): **A**, carapace and cephalic appendages, dorsal view; **B**, carapace, lateral view; **C**, rostrum dorsal view; **D**, anterior part of carapace, eye and basal part of antennae, lateral view; **E**, third to sixth pleonal somites, lateral view; **F**, fifth and sixth pleonal somites, dorsal view; **G**, left antennal scale, dorsal view. Scale bars: A, B, E, F, 2 mm; C, D, G, 1 mm.

and the proportionally longer dactylus of the fourth pereopod (cf. Figs 31C; 23D) (Table 2).

The two type specimens were initially identified

by de Man (1920) as *Pontophilus modumanuensis*. The bathymetrical record of this new species is exceptionally shallow for the genus, and it remains

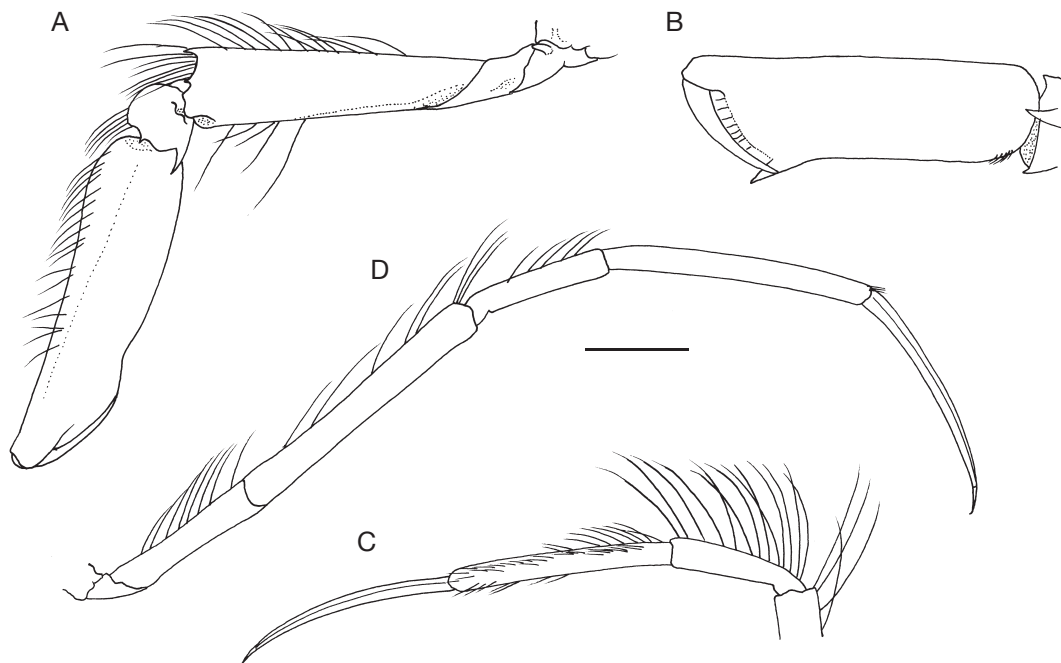


FIG. 31. — *Parapontophilus sibogae* n. sp.: **A**, left first pereopod, lateral view; **B**, same, subchela, ventral view; **C**, dactylus, propodus and carpus of left fourth pereopod, lateral view; **D**, right fifth pereopod, lateral view; **A, B, D**, ovig. ♀ 5.9 mm, holotype, Pulu Kaniungan Ketjil, Indonesia (*Siboga*, stn 89) (ZMA); **C**, ovig. ♀ 5.9 mm, paratype, same data as holotype (ZMA). Scale bar: 1 mm.

unclear that *P. sibogae* n. sp. is really an inhabitant of shallow water.

Parapontophilus stenorhinus n. sp.
(Figs 32; 33)

TYPE MATERIAL. — Holotype: **Tonga**. BORDAU 2, stn DW 1508, 21°02'S, 175°19'W, 555–581 m, 31.V.2000, 1 ♀ 5.0 mm (MNHN-Na 16078).

Paratypes: **Indonesia**. KARUBAR, stn DW 08, Banda Sea, 05°20'S, 132°31'E, 358–360 m, 23.X.1991, 1 ♀ 3.7 mm (MNHN-Na). — Stn CP 09, Kai Islands, 05°23'S, 132°29'E, 368–389 m, 23.X.1991, 1 ♀ 5.6 mm (MNHN-Na 16076). — Stn CC 21, Kai Islands, 05°14'S, 133°00'E, 688–694 m, 25.X.1991, 1 ♂ 4.5 mm (MNHN-Na).

ETYMOLOGY. — The specific name is formed by a combination of the Greek *stenus*, narrow, and *rhinos*, nose, in reference to the narrow rostrum of this new species.

DISTRIBUTION. — Tonga and Banda Sea, Indonesia (Fig. 36), 368–694 m.

DESCRIPTION

Rostrum (Fig. 32A–C) slender, 0.20 of carapace length, directed slightly upward, straight, falling short of distal margins of corneas; lateral margins armed with 2 pairs of very small, subacute teeth, anterior pair arising distal to midlength of rostrum. Carapace (Fig. 32A, B, D) 1.30 times longer than wide; anterior epigastric tooth tiny, posterior epigastric tooth relatively small, supported by weak middorsal ridge reaching beyond midlength of carapace; cardiac tooth absent; postorbital tooth very small, blunt; epibranchial tooth absent; epibranchial ridge absent; branchiostegal tooth relatively small, falling short of dorsodistal margin of antennal basicerite.

Third pleonal somite (Fig. 32E) with moderately convex tergum and with moderately produced posterodorsal margin. Fifth somite rounded dorsally. Sixth somite (Fig. 32F, G) about 3.00 times longer than wide, about 2.20 times longer than deep; dorsal surface rounded.

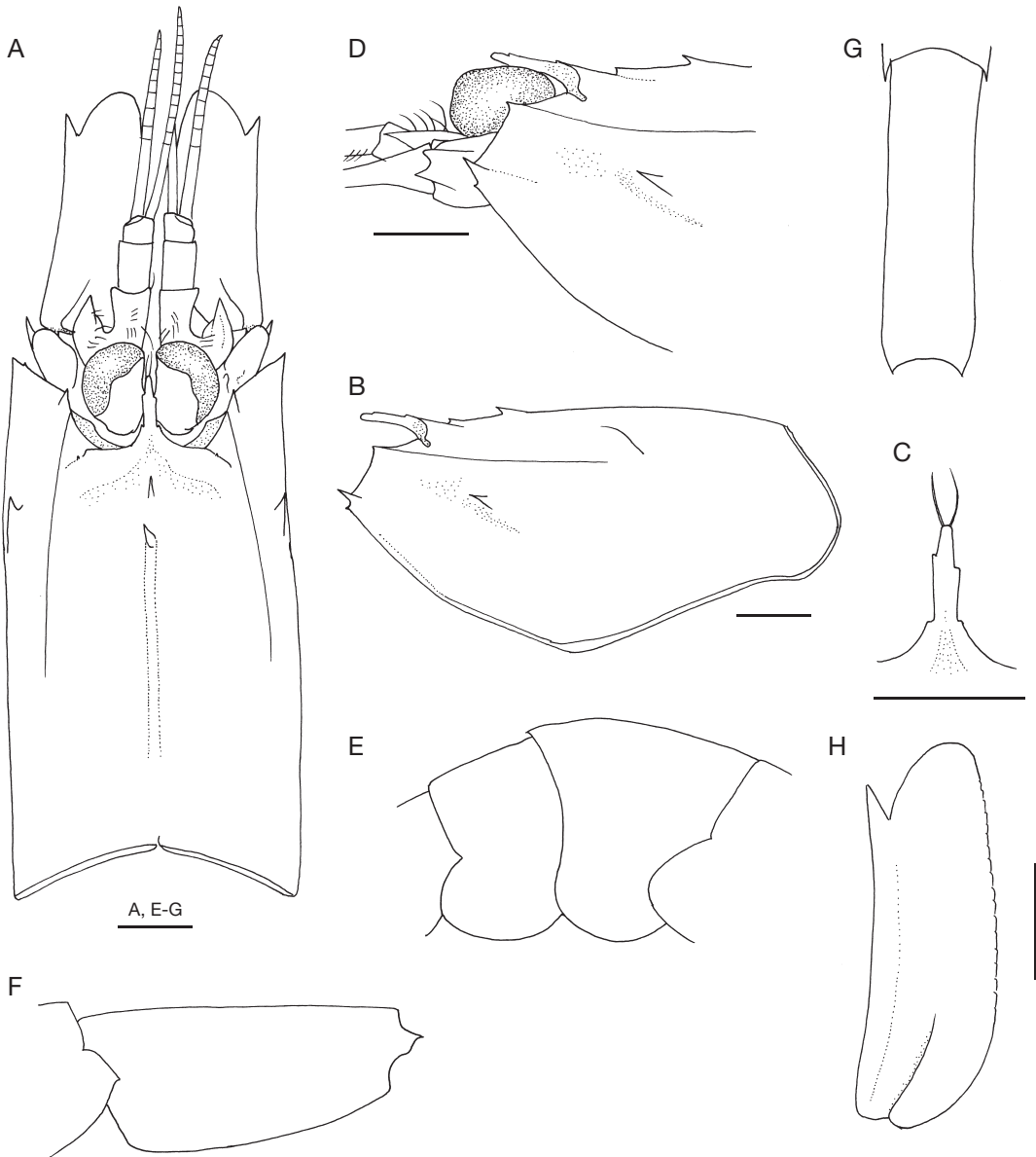


FIG. 32. — *Parapontophilus stenorhinus* n. sp.: **A**, carapace and cephalic appendages, dorsal view; **B**, carapace, lateral view; **C**, rostrum dorsal view; **D**, anterior part of carapace, eye and basal part of antennae, lateral view; **E**, third and fourth pleonal somites, lateral view; **F**, sixth pleonal somite, dorsal view; **G**, same, dorsal view; **H**, left antennal scale, dorsal view; **A-E, H**, ♀ 5.0 mm, holotype, Tonga (BORDAU 2, stn DW 1508) (MNHN-Na 16078); **F, G**, ♀ 5.6 mm, Banda Sea, Indonesia (KARUBAR, stn CP 09) (MNHN-Na 16076). Scale bars: 1 mm.

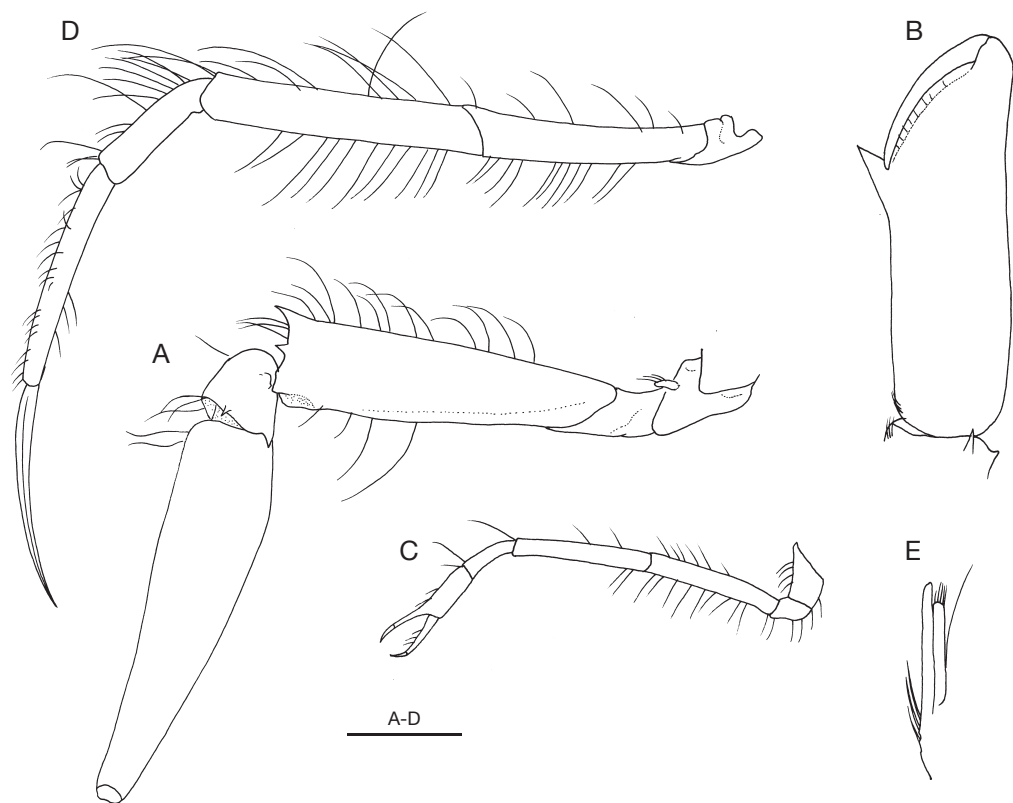


FIG. 33. — *Parapontophilus stenorhinus* n. sp., left appendages. **A**, first pereopod, lateral view; **B**, same, subchela, ventral view; **C**, second pereopod, lateral view; **D**, fourth pereopod, lateral view; **E**, appendix masculina and appendix interna of left second pleopod, mesial view; **A-D**, ♀ 5.0 mm, holotype, from Tonga (BORDAU 2, stn DW 1508) (MNHN-Na 16078); **E**, ♂ 4.5 mm, paratype, Banda Sea, Indonesia (KARUBAR, stn CC 21) (MNHN-Na). Scale bars: A-D, 1 mm; E, 0.5 mm.

Eye (Fig. 32A) nearly subpyriform; cornea pigmented with gray in preservative, distinctly faceted with moderately small lenses; maximal diameter of cornea 0.21 of carapace length; eye-stalk slightly constricted; mesial face without papilla-like projection. Antennular peduncle (Fig. 32A) reaching mid-length of antennal scale. Antennal scale (Fig. 32A, H) 0.65 of carapace length and 2.80 times longer than wide; lateral margin slightly concave, lamella strongly produced, distinctly overreaching distolateral tooth.

Palm of first pereopod (Fig. 33A, B) 2.39 times longer than wide; pollex moderately small, width of palm including tip of pollex 1.25-1.30

of width proximal to base of pollex; cutting edge moderately oblique; merus with relatively strong dorsodistal tooth. Second pereopod (Fig. 33C) slightly overreaching midlength of merus of first pereopod. Fourth pereopod (Fig. 33D) overreaching distal margin of antennal scale by half to full length of dactylus; dactylus elongate, subspatulate, 0.95 of propodal length; carpus about 0.60 of propodal length. Fifth pereopod similar to fourth, slightly falling short of distal margin of antennal scale.

Appendix masculina apparently not fully developed, about 0.85 length of appendix interna, with several short stiff setae distally (Fig. 33E).

Coloration in life
Unknown.

Size

Male CL 4.5 mm; females CL 3.7-5.6 mm.

REMARKS

The present new species appears closest to *P. juxta* n. sp. in the development of the armament of the carapace and the shape of the antennal scale and of the dactylus of the fourth pereopod. Nevertheless, *P. stenorhinus* n. sp. is characteristic within the species group in the relatively large cornea (Table 2) and the relatively narrow rostrum armed with two pairs of tiny blunt teeth (Fig. 32C). Furthermore, the presence of lateral teeth distal to the midlength of the rostrum distinguishes *P. stenorhinus* n. sp. from *P. juxta* n. sp. From *P. demani* and *P. sibogae* n. sp., the present new species differs in the less developed branchiostegal tooth of the carapace. The epigastric teeth are distinctly smaller in *P. stenorhinus* n. sp. than in *P. demani* (cf. Fig. 32D and Fig. 22E). The antennal scale is proportionally longer and narrower in *P. stenorhinus* than in *P. sibogae* n. sp. (Table 2).

BATHYMETRIC AND GEOGRAPHIC
DISTRIBUTION OF *PARAPONTOPHILUS*
SPECIES

Compared with other crangonids, species of *Parapontophilus* generally occur at greater depths. All but *P. sibogae* n. sp. are found at bathyal depths greater than 200 m (Table 3). Five species of the *P. modumanuensis* group (*P. juxta* n. sp., *P. caledonicus* n. sp., *P. demani*, *P. psyllus* n. sp. and *P. stenorhinus* n. sp.) and *P. junceus* are found in upper to middle bathyal zone between 200 and 1000 m, and appear most abundant between 300 and 700 m; *P. gracilis* ranges from 405 to 1435 m, but appears most abundant between 600 and 1000 m; *P. difficilis* n. sp. ranges from 435 to 2340 m, but is most abundant between 800 and 1200 m; other six species, *P. abyssi*, *P. cyrton* n. sp., *P. geminus* n. sp., *P. occidentalis*, *P. longirostris* n. sp. and *P. talismani* occur below 1000 m, particularly *P. abyssi*, *P. occidentalis* and

TABLE 3. — Summary of bathymetric range of species of *Parapontophilus* Christoffersen, 1988.

Species group/species	Depths range (m)
<i>P. gracilis</i> group	
<i>P. abyssi</i>	1800-5852
<i>P. cornutus</i> n. sp.	500-1200
<i>P. cyrton</i> n. sp.	1220-2750
<i>P. difficilis</i> n. sp.	435-2340
<i>P. geminus</i> n. sp.	1644-1657
<i>P. gracilis</i>	405-1435
<i>P. junceus</i>	112-970
<i>P. longirostris</i> n. sp.	1070-1800
<i>P. occidentalis</i>	1760-4018
<i>P. profundus</i>	4755 (?)
<i>P. talismani</i>	2100-3459
<i>P. modumanuensis</i> group	
<i>P. caledonicus</i> n. sp.	400-500
<i>P. demani</i>	350-700
<i>P. juxta</i> n. sp.	412-675
<i>P. modumanuensis</i>	536-1463
<i>P. psyllus</i> n. sp.	208-620
<i>P. sibogae</i> n. sp.	11
<i>P. stenorhinus</i> n. sp.	368-581

P. talismani chiefly inhabit in abyssal zone deeper than 3000 m. Real bathymetric ranges of *P. modumanuensis* and *P. cornutus* n. sp. are unclear, because the specimens of the two species were collected from very steep slopes (536-1463 m for the holotype of *P. modumanuensis*; and 500-1200 m for the type specimens of *P. cornutus* n. sp.). As mentioned before, the depth record of the only known specimen of *P. profundus* is questionable. The known shallowest depth where *Parapontophilus* has been found is 11 m (*P. sibogae* n. sp.); and the deepest is 5852 m (*P. abyssi*). It is remarkable that species of the *P. gracilis* group extend to abyssal zone, whereas species of the *P. modumanuensis* group are restricted to the upper bathyal zone except for the shallow water inhabitant *P. sibogae* n. sp. It is noteworthy that the structure of the cornea seems to correlate to the depth range in the genus. Species occurring in bathyal zone (*P. gracilis*, *P. junceus*, *P. cornutus*, *P. longirostris* n. sp. and members of the *P. modumanuensis* group) all possess normally developed cornea, whereas species inhabiting lower bathyal to abyssal zone, i.e. *P. abyssi*, *P. cyrton* n. sp., *P. occidentalis*, and *P. talismani* have lightly pigmented, non-faceted cornea, although notable reduction of its size is not found. Species occurring

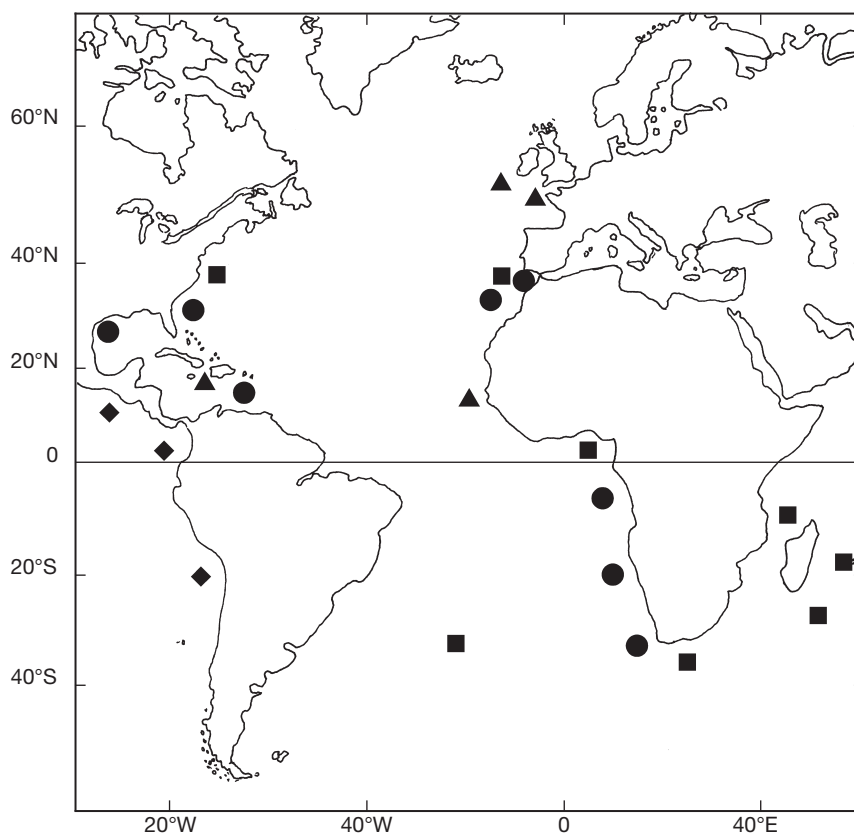


FIG. 34. — Geographic distribution of *Parapontophilus abyssi* (Smith, 1884) (■), *P. gracilis* (Smith, 1882) (●), *P. occidentalis* (Faxon, 1893) (◆) and *P. talismani* (Crosnier & Forest, 1973) (▲).

in intermediate zone (about 1000-2000 m), i.e. *P. difficilis* n. sp. and *P. geminus* n. sp., have lightly pigmented corneas with distinctly delineated facets. Comparison with other crangonid genera suggests that the reduction of the faceted structure and loss of pigment are apomorphic. Nevertheless, it is still unclear that the evolutionary trend toward the reduction of the corneal structure is phylogenetic or adaptive, since the phylogenetic relationship of species of *Parapontophilus* is still unclear.

The geographic distribution of the 18 species treated in this study is summarized in Figures 34-36. It is remarkable that the *P. gracilis* group ranges world wide, whereas the *P. modumauensis* group is confined to the Indo-West Pacific. This may suggest that the evolutionary history is considerably

different between the two groups. *Parapontophilus gracilis* and *P. talismani* are restricted to the Atlantic Ocean, although they show wide distributions in that ocean. *Parapontophilus abyssi* is also widely distributed in the Atlantic Ocean, and further extends to the Indian Ocean. *Parapontophilus occidentalis* is confined to the eastern Pacific, ranging from California to northern Chile. Other species are found in the Indo-Pacific region, although the distributional patterns are different according to species. *Parapontophilus longirostris* n. sp. has a wide distribution across the western Indian Ocean to the central Pacific and French Polynesia. Two species, *P. difficilis* n. sp. and *P. junceus*, occur in the western Pacific, including Taiwan, the Philippines, Indonesia, and South Pacific islands, and the latter extends

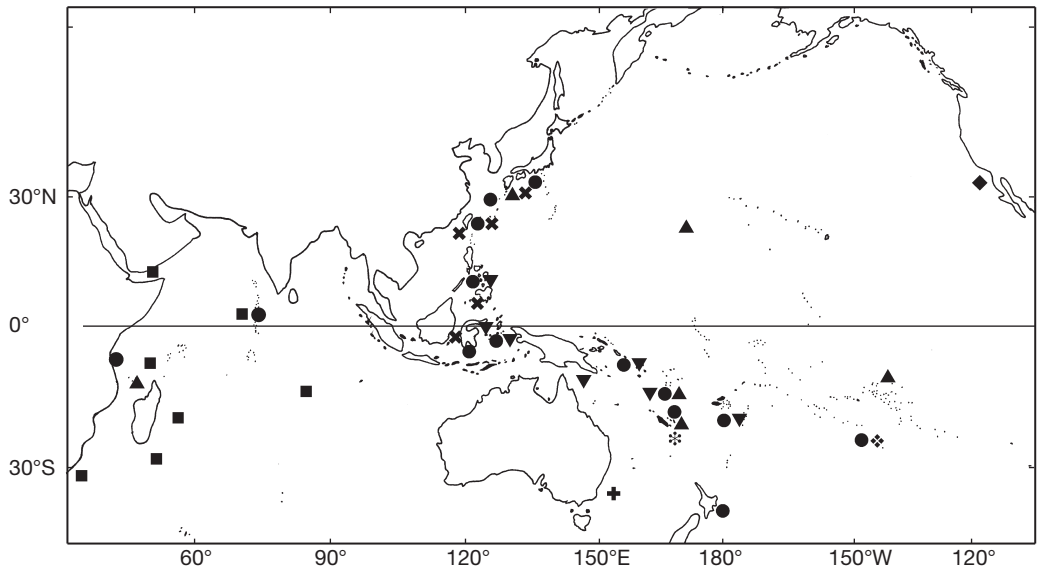


FIG. 35. — Geographic distribution of *Parapontophilus abyssi* (Smith, 1884) (■), *P. cornutus* n. sp. (◆), *P. cyrtus* n. sp. (*), *P. difficilis* n. sp. (▼), *P. geminus* n. sp. (✱), *P. junceus* (Bate, 1888) (●), *P. longirostris* n. sp. (▲), *P. occidentalis* (◆) and *P. profundus* (Bate, 1888) (✚).

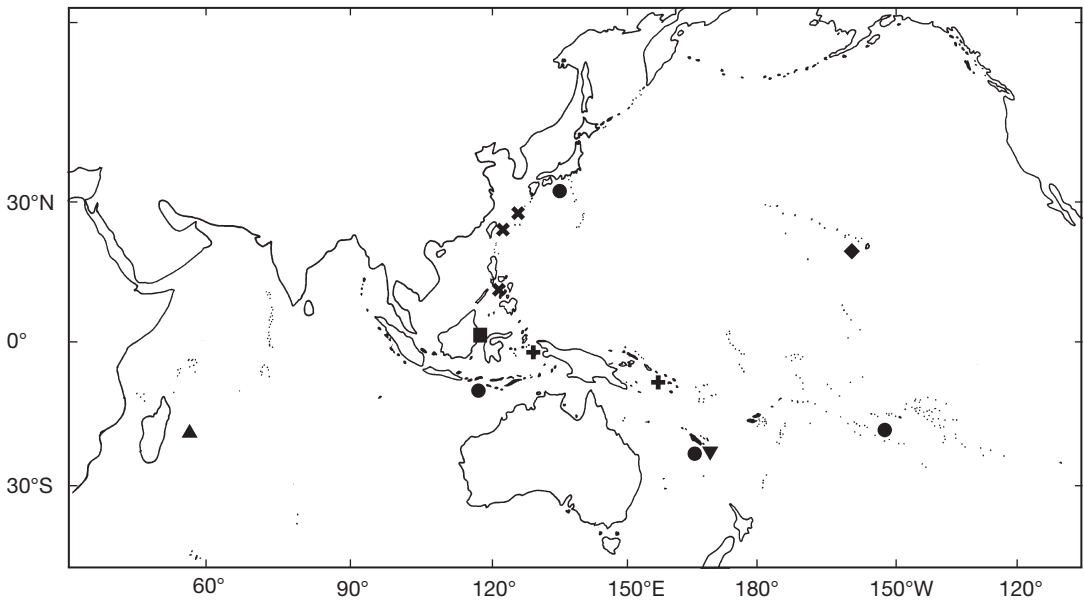


FIG. 36. — Geographic distribution of *Parapontophilus demani* (Chace, 1984) (●), *P. caledonicus* n. sp. (▼), *P. juxta* n. sp. (▲), *P. modu-manuensis* (Rathbun, 1906) (◆), *P. psyllus* n. sp. (✱), *P. sibogae* n. sp. (■), and *P. stenorhinus* n. sp. (✚).

to Japan and to French Polynesia. *Parapontophilus geminus* n. sp. also occurs in the western Pacific, although so far it is known only from Japan, Taiwan and Makassar Strait in Indonesia. *Parapontophilus demani* and *P. psyllus* n. sp. are found in the north-western Pacific, but the former ranges from Japan to French Polynesia, and the latter is found in the Ryukyu Islands, Taiwan and the Philippines. So far, *P. juxta* n. sp. is known only from off Réunion Island in the western Indian Ocean. Two species, *P. sibogae* n. sp. and *P. stenorhinus* n. sp. are known only from the type locality in the Celebes Sea, and the Banda Sea and Tonga, respectively. Similarly, *P. cornutus* is represented only by the three specimens from the Austral Islands in French Polynesia. *Parapontophilus cyrtus* n. sp. appears to be restricted to waters around New Caledonia. Two species, *P. modumanuensis* and *P. profundus*, are represented respectively only by the holotype, the former from Hawaii and the latter from southeastern Australia. Real distributional ranges of many species still remain unclear.

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