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NEW SPECIES AND NEW RECORDS OF POLYCHELIDAE FROM AUSTRALIA (CRUSTACEA: DECAPODA)

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ABSTRACT. - Two new species and a new record of *Polycheles* are reported from Australia together with notes on the distribution of species around the continent. *Polycheles martini,* new species, differs from all known congeners by the combination of a spinose, faintly concave anterior carapace margin, a notched or crenulate median carina on abdominal tergites 2-5 and numerous large granules covering the entire carapace and abdomen. *Polycheles galil,* new species, closely resembles *P. phosphorus* (Alcock, 1894) with which it has been confused, but differs chiefly in bearing an antrorse median spine on abdominal tergites 1-5 instead of 1-4. In view of the similarity between *P. galil* and *P. phosphorus,* the latter species is redescribed based on type and topotypic material. *Polycheles kermadecensis* (Sund, 1920) is removed from the synonymy of *P. enthrix* (Bate, 1878), and reported for the first time from Australia. Range extensions within Australia are reported for *Pentacheles laevis* Bate, 1878, *Pentacheles validus* A. Milne Edwards, 1880, *Polycheles nanus* (Smith, 1884), and *Polycheles surdus* Galil, 2000. A key to the Polychelidae is provided.

KEY WORDS. - Crustacea, Decapoda, Polychelidae, *Pentacheles, Polycheles,* new species, Australia.

INTRODUCTION

In the most recent world revision of the Polychelidae, Galil (2000) recognised 32 species arrayed in five genera: *Willemoesia* Grote, 1873; *Cardus* Galil, .2000; *Pentacheles* Bate, 1878; *Homeryon* Galil, 2000; and *Polycheles* Heller, 1862. Galil (2000) recognised three genera and 14 species from Australia. Eleven of the 14 Australian polychelid species belong to *Polycheles* Heller, 1862: *P. aculeatus* Galil, 2000; *P. auriculatus* (Bate, 1878); *P. baccatus* Bate, 1878; *P. enthrix* (Bate,1878); *P. helleri* Bate, 1878; *P. nanus* (Smith, 1884); *P. phosphorus* (Alcock, 1894); *P. suhmi* (Bate, 1878); *P. sculptus* Smith, 1880; *P. surdus* Galil, 2000; and *P. typhlops* Heller, 1862. One species of *Willemoesia* Grote, 1873, *W. pacifica* Sund, 1920, and two species of *Pentacheles* Bate, 1878, *Pe. laevis* Bate, 1878 and *Pe. validus* A. Milne-Edwards, 1880, are known from Australia.

Although Griffin & Stoddart (1995) reported polychelids from eastern Australia collected by the FRV *Kapala*, specimens of an undescribed *P. baccatus*-like species were not included in their report. That species is described below. A second undescribed Indo-West Pacific species, identified with *P. phosphorus* by Galil (2000), was recognised in Australian collections and is also described herein. Owing to the confusion between the second new species and *P. phosphorus,* the latter is redescribed based on type and topotypic material.

Reexamination of Australian specimens identifiable with *P. enthrix* based on Galil (2000) revealed the presence of two species: *P. enthrix* sensu stricto and *P. kermadecensis* (Sund, 1920), regarded as a synonym of the former species by Galil (2000). *Polycheles kermadecensis* is removed from the synonymy of *P. enthrix* and reported for the first time from Australia. Confusion surrounding the identities of the type material of *P. enthrix, P. helleri* and *P. kermadecensis* is clarified and lectotypes are designated. We also take this opportunity to report range extensions of *Pentacheles validus, Pe. laevis, Polycheles nanus* and *P. surdus.* An identification key that distinguishes all known extant species of the Polychelidae is included.

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MATERIALS AND METHODS

Descriptive terminology generally follows Galil (2000). The sexual dimorphism in the chelation of pereiopod 5 of species of *Polycheles,* however, was given by Galil (2000) as 'chelate' in females and either 'simple' or 'subchelate' in males. Although the chelae of pereiopod 5 do exhibit sexual dimorphism, we regard the term 'subchelate' as applied to the male condition as misleading. Certainly, the term 'subchelate' has been used inconsistently in the carcinological literature. However, 'subchelate' typically indicates that the dactylus occludes with the lower margin of the propodus. The term 'chelate' is typically used to describe the condition in which the dactylus occludes with an extension of the propodus that is more or less in line with the longitudinal axis of the propodus – the pollex. In those species regarded by Galil (2000) as having a 'subchelate' pereiopod 5 in males, the dactylus is distinctly longer than the pollex. The longitudinal axis of the pollex, however, is always in line with the remainder of the propodus. The dactylus neither occludes with the ventral margin of the propodus nor does it bear against a ventrally directed tooth or projection. Therefore, we regard this condition as 'chelate'.

The original dorsal colour transparency of *P. baccatus* (AM P26649) was unfortunately incomplete along the left lower portion of the specimen owing to a faulty camera flash. The original colour pattern of the specimen was symmetrical. Therefore, to show the complete dorsal colour pattern (Fig. 1C), the entire left half of the specimen, to the left of the midline between the rostral spines and the apex of the telson is a computer generated 'mirror image' of the right half. It was produced by copying the right side and reflecting it along the midline using Adobe Photoshop®. Figure 1D shows the true left lateral side of the same *P. baccatus* specimen.

Measurements of specimens are in millimetres (mm) and refer to carapace length, measured medially from the tip of the rostral spines to the posterior margin of the carapace.

Most specimens used in this study were collected by Ken Graham (NSW Fisheries) on the FRV *Kapala.* All specimens listed with station data prefixed by a "K", e.g. K78-23-15, K75-08-03, are *Kapala* specimens collected by Graham. Therefore, for *Kapala* specimens in 'Material examined', to avoid repetition, the name of the vessel and collector are not listed. Specimens examined are deposited in the collections of the Australian Museum, Sydney (AM), Natural History Museum, London (NHM), Otago Museum, Dunedin, New Zealand (OM), South Australian Museum, Adelaide (SAM); Western Australian Museum, Perth (WAM), Zoological Museum, Amsterdam (ZMA) and the Zoological Reference Collection (ZRC) of the Raffles Museum, National University of Singapore. Other abbreviations used: Queensland (Qld), New South Wales (NSW), Victoria (Vic.), Tasmania (Tas.), South Australia (SA), Western Australia (WA).

SYSTEMATIC ACCOUNT

POLYCHELIDAE WOOD-MASON, 1874

Pentacheles Bate, 1878

Pentacheles laevis Bate, 1878
(Figs. 1A, B)

Pentacheles laevis Bate, 1878: 278 [type locality: Moluccas, Indonesia, 4°33'N, 127°06'E]. - Galil, 2000: 291 (key), 301-305, Fig. 7.

Pentacheles gracilis Bate, 1878: 279 [type locality: off Fiji, 19°07.50'S, 178°19.35'E].

Polycheles granulatus Faxon, 1893: 197 [type locality: off Panama, 4°03'N, 81°31'W]. - Griffin & Stoddart, 1995: 240, Figs. 4-5.

Pentacheles beaumontii Alcock, 1894: 236 [type locality: off Colombo, Sri Lanka].

Polycheles dubius Bouvier, 1905a: 480 [type locality: off the Azores, 44°04'N, 9°81'W].

Polycheles eryoniformis Bouvier, 1905b: 644 [type locality: Madeira].

Material examined. - 1 male (42.0 mm), (AM P61149), WA, 28° 30'S, 112° 55'E, 960 m, demersal trawl, coll. CSIRO, 29 Jan.1989; 1 juvenile female (32.5 mm), (AM P44900), SE of Point Hicks, Vic., K83-12-04, 27 Sep.1983; 3 males (41.0-46.0 mm), (AM P38503), 13 females (46.0-62.0 mm), E of Brisbane, Qld, trawled, 700-900 m, coll. Wood Fisheries Pty Ltd; 1 female (47.3 mm), (SAM), 222 km SW of Cape Adieu, SA, 33°58'S, 131°22'E, 1000 m, trawled, FV *Saxon Progress,* D. Wheenan, Nov. 1989; 1 male (33.4 mm), (SAM), 185 km SSE of Cape de Couedic, Kangaroo Island, SA, 900-1000 m, trawled, FV *Comet,* coll. G. Newton, 14-18 Feb.1988; 1 ovigerous female (58.3 mm), (SAM), between Esperance & Albany, 37 km SW of Cape Knob, WA, 34°44'S, 119°36'E, 880-1150 m, trawled, coll. S. Burnell, 29 Jul.1988; 3 males (26.1-38.9 mm), 1 female (28.0 mm), (SAM), 222 km SW of Cape Adieu, SA, 33°58'S, 131°22'E, 1000 m, trawled, FV *Saxon Progress,* coll. D. Wheenan, Nov.1989; 1 female (19.4 mm), (SAM), 85 km NE of Balil Island, Tas, 39°16.4'S, 145°49.8'E, 885-935 m, demersal trawl, RV Soela, S0389/46, 27 Apr.1989; 1 female (18.4 m), (SAM), 67 km SSE of South East Cape, Tas, 44°11.9'S, 147°04.7'E, 1116-1025 m, trawled, FV

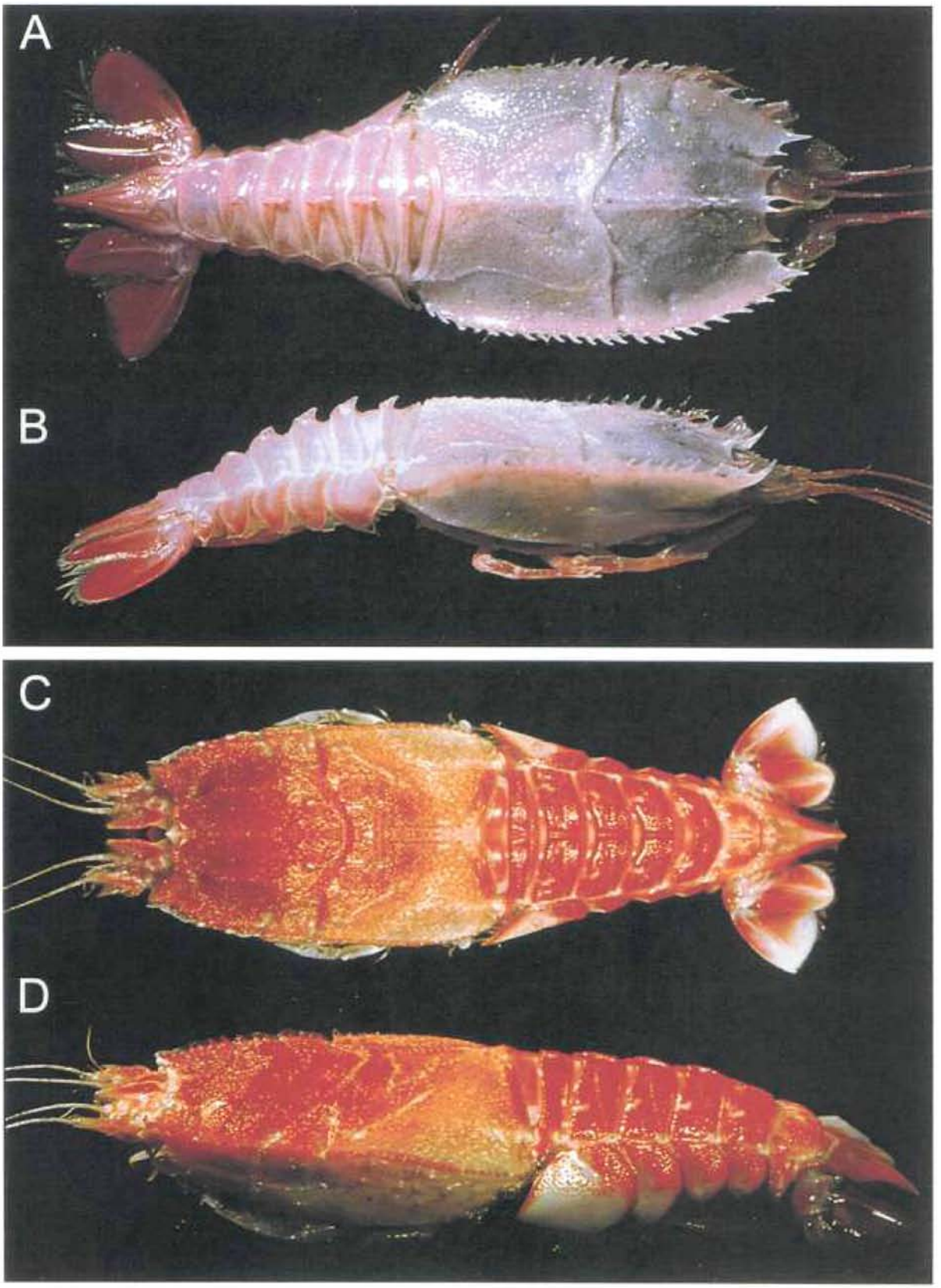

Fig. 1. *Pentacheles laevis* Bate, 1878, male (AM P25047): A, dorsal, B, right lateral. *Polycheles baccatus* Bate, 1878, female (AM P26649). C, dorsal, [Note: left half of specimen computer generated; see 'Materials and Methods']. D, left oblique lateral. (G. Millen & D. Brown).

Corvina, coll. K. Gowlett-Holmes, 8 Feb.1992; 1 male (44.4 m), (SAM), 69 km SSE of South East Cape, Tas, 44°10.6'S, 147°10.1'E, 1050-1100 m, trawled, FV *Belinda,* coll. K. Gowlett-Holmes, 12 Feb.1992; 1 male (36.1 m), (SAM), 69 km SSE of South East Cape, Tas, 44°11.8'S, 147°11.8'E, 787-1007 m, trawled, FV *Corvina,* coll. K. Gowlett-Holmes, 8 Feb.1992; 1 ovigerous female (49.0 mm), (SAM), 51 km NE of Cape Townville, Tas, 41°41.99-43.72'S, 148°39.0-38.5'E, 852-877 m, demersal trawl, 20 Apr.1989; 1 ovigerous female (51.7 mm), (ZRC), E of Crowdy Head, NSW, 31°56'S, 153°08'E, 925 m, K87-24-05, 9 Dec.1987.

Remarks. - The specimens agree well in most respects with Galil's (2000) account of the species. Galil (2000) reported a range for the lateral spination of *P. laevis* as 7-9:3-4:14-15. Our specimens, in addition to those reported by Griffin & Stoddart (1995) as *P. granulatus,* exhibit a slightly greater range of variation in carapace spination: 7-10:3-4:12-17 (usually 8-9:3-4:14-16).

Colour in life. - The colour description given by Griffin & Stoddart (1995), and quoted by Galil (2000), is based on specimen AM P25047 from eastern Australia shown in Figure 1A-B.

Distribution. - Worldwide, from the Indo-West Pacific, Eastern Pacific, Western and Eastern Atlantic; 347-2505 m (Galil, 2000). The known Australian range includes New South Wales, Tasmania, and now Victoria, South Australia, Western Australia and Queensland.

Pentacheles validus A. Milne-Edwards, 1880

Pentacheles validus A. Milne Edwards, 1880: 65 [type locality: off Bequia, Windward Islands, Antilles]. - Galil, 2000: 291 (key), 308-311, Fig. 10.

Pentacheles debilis Smith, 1884: 360 [type locality: off New England, United States of America].

Pentacheles debilis var. *armatus* Bouvier, 1905: 4 [type locality: off Canary Islands].

Polycheles demani Stebbing, 1917: 28 [type locality: off Cape Point Lighthouse, South Africa].

Polycheles chilensis Sund, 1920: 226 [type locality: off Juan Fernandez Islands].

Material examined. - 1 female (17.2 mm), (AM P53218), Lord Howe Rise, Tasman Sea, NSW, 27°11.97'S, 160°37.80'E, 1960 m, pumice, FR0589-32, coll. J. Lowry et al., 7 May.1989; 1 female (18.3 mm), (AM P53219), Lord Howe Rise, Tasman Sea, NSW, 27°10.29'S, 160°29.78'E, 1590 m, pale grey ooze, FR0589-21, coll. J. Lowry et al., 4 May.1989; 1 female (59.5 mm), (AM P53221), NE of Broken Bay, NSW, 33°30'S, 152°13'E, K88-17-03, 1200 m, 31 Aug.1988; 1 female (64.2 mm), (SAM), 148 km SW of Cape de Couedic, Kangaroo Island, SA, 1000-1200 m, trawled, FV *Adelaide Pearl,* coll. K. J. Oisson, Aug.1988; 1 female (50.0 mm), (SAM), 57 km SW of Martin Lighthouse, Beachport, SA, 37°48.61'S, 139°29.74'E, 933-1098 m, trawled, FV *Silent Victory,* coll. K. Gowlett-Holmes et al., 11 Dec.1987; 1 ovigerous female (62.1 mm), (SAM), 57 km W of West Point, Tas, 41°19.16'S, 144°01.65'E, 1200 m, RV *Soela,* S0289/54, 11 Mar.1989.

Remarks. - The present specimens are the first records for New South Wales and include the most northerly Australian record. As found by Galil (2000), one or two spines are usually present on the outer angle of the dorsal orbit, and this number may vary from side to side. The lateral spination of the carapace in the present specimens, 7-8:3-4:23-30, is within the range reported by Galil (2000).

Distribution. - Worldwide, from the Indo-West Pacific, Eastern Pacific, Western and Eastern Atlantic; 914-3365 m (Galil, 2000). The Australian range includes South Australia, Tasmania and now New South Wales.

Polycheles Heller, 1862

Polycheles galil, new species
(Figs. 2, 3A, B)

Stereomastis andamanensis - de Man, 1916: Pl. 1 figs. 2-2b [excluding juvenile female]; Takeda & Hanamura, 1994: 31; Griffin & Stoddart, 1995: 244 [Coral Sea specimen, not *Stereomastis andamanensis* Alcock, 1894].

Stereomastis nana - George, 1983: 16 [not *Stereomastis nana* (Smith, 1884)].

Polycheles phosphorus - Galil, 2000: 336-339, Fig. 22 [part, not *Polycheles phosphorus* Alcock, 1894].

Material examined. - Holotype - male (44.8 mm), (WAM C13436), 258 km NW of Port Hedland, WA, 18°42'S, 116°21'E, 694-704 m, RV *Soela,* S023/02/82, coll. L. Marsh, 5 Apr.1982.

Paratype - 1 female (56.0 mm), (AM P62342), Rankin Bank, WA, 600 m, coll. D. Evans, Mar.1987.

Others - 1 male (34.5 mm), (AM P40367), Coral Sea, Qld, 10°34.28'S, 144°13.33'E, 815-825 m, RV *Franklin* 06/88 Stn 4, coll. P. Hutchings et al., 20-21 Aug.1988.

Diagnosis. - Basal antennular segment with single spine on outer proximal margin. Carapace with branchial carina indicated by distinct line of 7-8 well-spaced spines; branchial groove flanked by field of 5-6 spines. Median carina of abdominal tergites 1-5 with antrorse spine.

Description. - Carapace subrectangular, margins slightly convergent proximally; dorsal surface finely setose; gastro-orbital region with arcuate row of 5 spines; frontal margin with two rostral spines and spine on internal angle of orbital sinus, unarmed between rostral spines and internal orbital spine; lower anterior margin produced to acute point adjacent to antennal protopod; lower lateral margin with 2 spinulate carinae. Median submarginal tooth short, inconspicuous. Dorsal orbital sinus broadly U-shaped; outer margin rounded. Lateral margins of carapace with evenly graded spines, slightly decreasing in size posteriorly; spine formula 6-7:3-4:7. Cervical and postcervical incisions with smooth margins. Postcervical groove with antrorse spine on posterior margin between median carina and branchial carina. Median postrostral carina prominent, spine formula 1:1:2:1. Median postcervical carina prominent, irregular, spine formula 2:2. Postorbital carina ill-defined. Branchial carina slightly sinuous, indicated by distinct line of 7-8 well-spaced spines; branchial groove flanked by field of 5-6 spines. Dorsal posterior border of carapace smooth, with 2 antrorse submedian spines.

Abdominal tergites mesially carinate; tergites 1-5 with antrorse median spine, that of tergite 3 largest; tergite 6 with tuberculate U-shaped carina; tergite 1 with smooth dorsal surface, anterior margin with median spine and 2 antrorse spines laterally; surface of tergites 2-5 with deep oblique grooves. Pleuron 2 rounded anteriorly, with 1-2 anterior spines and denticulate ventral margin; surface with crescent-shaped carina. Telson with short proximal median carina and pair of low convergent carinae posteriorly. Pleura 3-6 becoming narrower posteriorly; margins with widely spaced granules; surface of pleura 3-4 with crescent shaped carina; surface of pleuron 5 with large, irregular tubercle; surface of pleuron 6 setose but smooth. Uropodal protopod irregular but without tubercles or granules, with small outer distal spine; endopod with blunt mid-rib, surface slightly wrinkled; exopod with median sulcus flanked by low carina, surface slightly wrinkled.

Eyestalk with small dorsal tubercle; apex tapering to rounded apex, recurved anterolaterally.

Basal antennular segment produced anteriorly to a sharp point, mesial margin unarmed, apex extending beyond distal segment of antennular peduncle; outer proximal margin rounded, with single spine; distal segment of antennular peduncle without inner distal spine.

Distal and proximal segments of antennal peduncle with small stout inner distal spine; scaphocerite lanceolate, margins unarmed, not extending anteriorly beyond base of distal proximal segment; antennal protopod without outer spine.

Maxilliped 3 epipod rudimentary, about 0.1 ischium length.

Pereiopod 1 (major cheliped) shorter than body length, when folded with merus not reaching beyond midlength of pleuron 2. Ischium and basis fused. Merus with 1 distal and 2 proximal spines; ventral margin sparsely denticulate. Carpus 0.65 merus length; dorsal margin smooth except for distal spine; ventral margin smooth, distally with spinule and blunt projection mesially. Propodus with smooth dorsal margin, ventral margin with 2 rows of widely spaced spinules, with spine above articulation of dactylus. Dactylus smooth dorsally, longer than palm.

Pereiopod 2 with basis, ischium and merus fused, with small dorsal distal spine and outer distal spine; with demarcation between ischium and basis indicated by distinct groove; carpus with large dorsal and smaller outer distal spine; dactylus and pollex with curved apices, opposable margins pectinate.

Pereiopod 3 and 4 with basis, ischium and merus fused; with demarcation between ischium and basis indicated by indistinct groove; segments unarmed, but with fine row of granules on dorsal margin of propodus and carpus; dactylus and pollex straight, opposable margins non-pectinate.

Pereiopod 5 with basis, ischium and merus fused, with demarcation between ischium and basis not indicated; males with dactylus slightly longer than pollex; females with dactylus and pollex of equal length; both sexes with anterior surfaces of dactylus and pollex slightly 'hollowed'.

Pleopod 1 uniramous, forming copulatory organ, comprising distal and proximal segments; proximal segment (basis) shorter than distal segment, outer margin setose; distal segment elongate, flattened, with appendix interna on inner subdistal margin, not distinctly projecting; inner proximal margin setose.

Colour in alcohol. - Completely faded.

Etymology. - Named in honour of Bella Galil, National Institute of Oceanography, Israel, for her comprehensive work on the Polychelidae; used as a noun in apposition.

Remarks. - *Polycheles galil,* new species, resembles *P. phosphorus* in almost every respect, but differs in bearing an antrorse dorsomedian spine on the first five instead of first four abdominal tergites and two instead of one row of spinules on the ventral margin of the propodus of the major chela. Galil (2000) reported a wide range for *P. phosphorus* from the Eastern Indian Ocean to New Caledonia and Japan. Aside from the *Investigator* specimens (referable to *P. phosphorus* sensu stricto) and Western Australian specimens (referable to *P. galil*), all other specimens examined by Galil (2000) were collected from Pacific localities. As remarked under the account of *P. phosphorus,* Galil's (2000) concept of *P. phosphorus* actually applies to *P. galil.* Therefore it appears that all specimens identified by Galil (2000) as *P. phosphorus* from Pacific localities are referable to *P. galil.* Presently, *Polycheles phosphorus* is known only from the northwestern Indian Ocean whereas *P. galil* ranges from the southeastern Indian Ocean to the western Pacific.

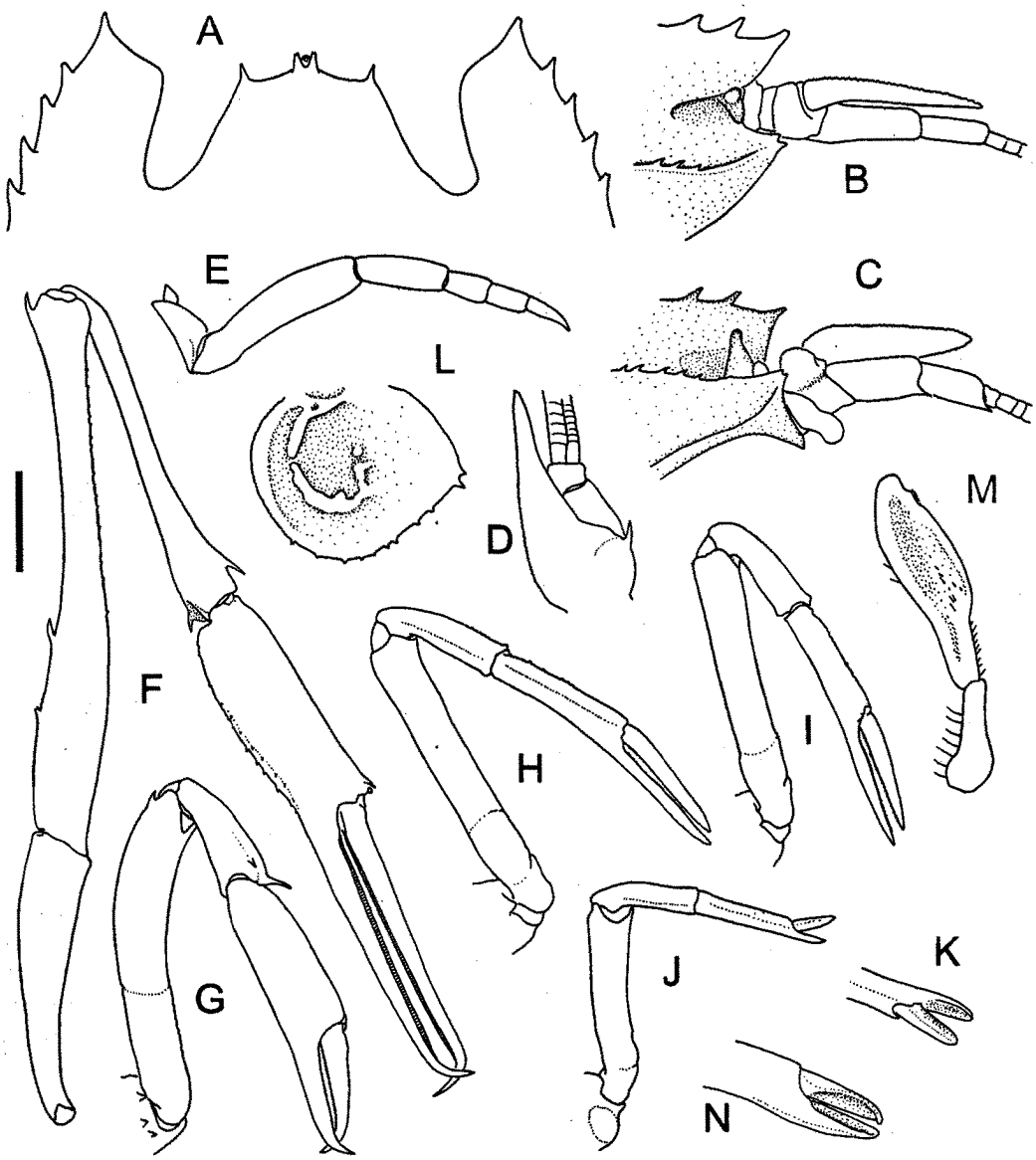

Fig. 2. *Polycheles galil,* new species, A-M, male holotype (WAM C13436). N, female paratype (AM P62342). A, anterior carapace margin, dorsal. B, anterior cephalon margin, right lateral. C, anterior cephalon, right ventral. D, antennule, right dorsal. E, maxilliped 3, right posterior. F, pereiopod 1, left mesial. G, pereiopod 2, right lateral. H, pereiopod 3, right lateral. I, pereiopod 4, right lateral. J, pereiopod 5, right lateral. K, distal portion of pereiopod 5, right mesial. L, abdominal pleuron 2, right lateral. M, pleopod 1, right posterior. N, pereiopod 5, left mesial. Scale A-J, L, M = 5 mm; K, N = 2.5 mm.

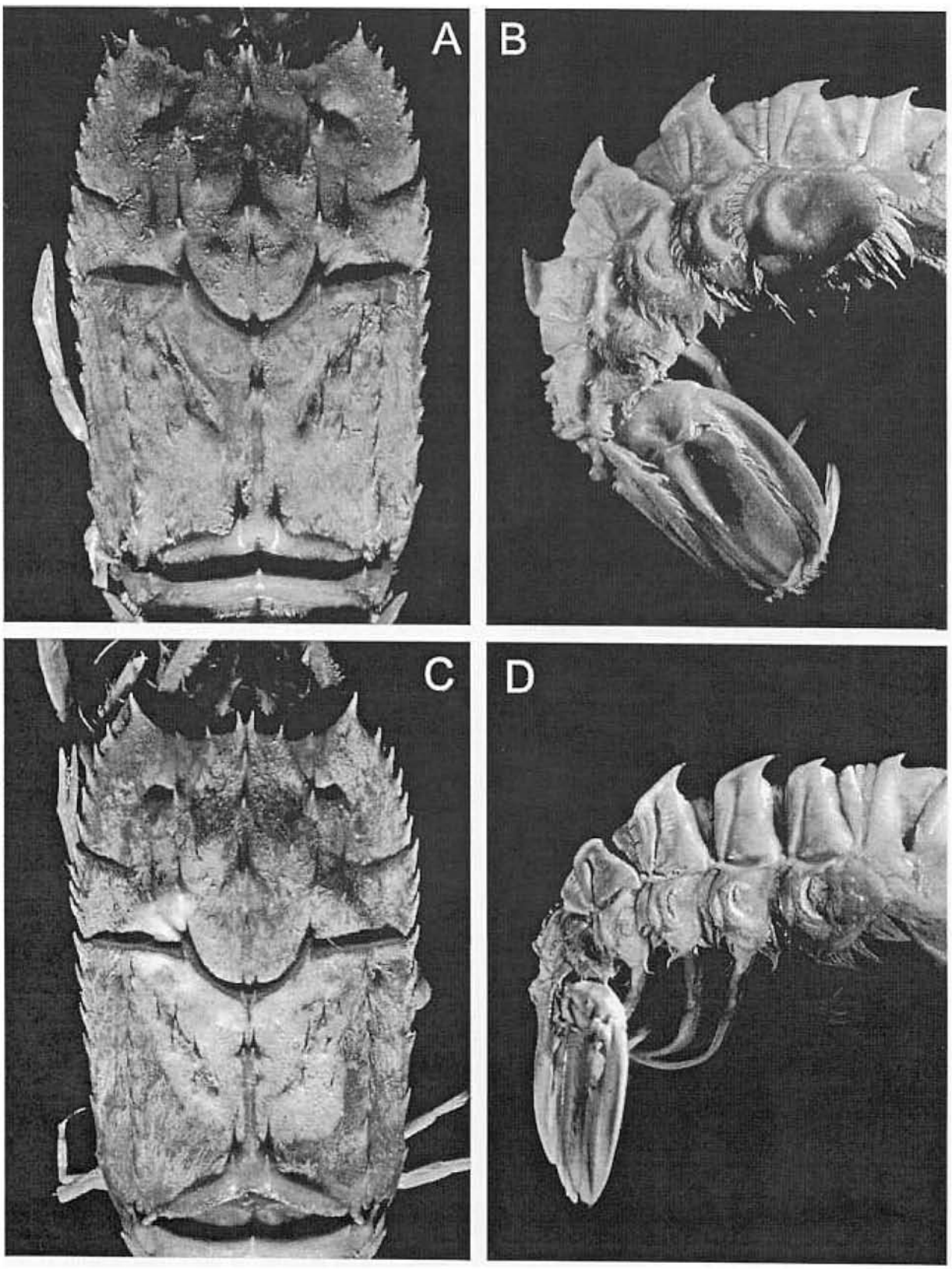

Fig. 3. *Polycheles galil,* new species, male holotype (WAM C13436): A, carapace dorsal; B, abdomen, right lateral. *Polycheles phosphorus* (Alcock, 1894), male paralectotype (AM G1477): C, carapace dorsal; D, abdomen, right lateral. (C. Bento).

The two Australian specimens reported by Galil (2000) as *P. phosphorus* (AM P40367, WAM C13436) are referable to *P. galil*. The Coral Sea specimen (AM P40367), reported also by Griffin & Stoddart (1995) as *Stereomastis andamanensis*, is aberrant in bearing one outer proximal spine on the left basal segment of the antennular peduncle and two on the right side. The additional spine on the right basal segment of the antennular segment is smaller and located on the anterior margin of the proximal expansion of the basal antennular segment. In all other respects, the Coral Sea specimen agrees well with the type series of *P. galil*. Galil's (2000) Western Australian specimen of *'P. phosphorus'* (WAM C13436) is the holotype of *P. galil*. The holotype of *P. galil* is also one of the specimens reported by George (1983) from northwestern Australia as *Stereomastis nana* (= *P. nanus*). George (1983) reported *P. nanus* (as *S. nana*) from six stations along the coast of northwestern Australia. We have examined specimens from two stations of which one is the holotype of *P. galil* and the other is referable to *P. auriculatus* (WAM 249-82). Galil (2000) also studied specimens of George's *'S. nana'* (WAM C13433, C13434, C13435, C23583) from four stations of which one specimen was collected with the holotype of *P. galil*. Aside from the holotype of *P. galil*, the specimens studied by Galil (2000) are referable to *P. auriculatus*. Thus, recent restudy of specimens from five of six stations identified as *P. nanus* by George (1983) show that none represent that species.

Distribution. - Southeastern Indian Ocean to the western Pacific Ocean. Galil (2000) reported the Pacific range of *P. galil* (as *P. phosphorus*) to include Vanuatu, New Caledonia, Australia, Japan, the South and East China Sea, Indonesia and the Philippines. Galil (2000) reported a bathymetric range of 200-1354 m (as *P. phosphorus*).

Polycheles martini, new species
(Figs. 4, 5)

Material examined. - Holotype - male (40.5 mm), (AM P21697), NE of Sugerloaf Point, NSW, 32°22.17'S, 152°58.01'E, 450-477m, trawl, K75-08-03, 2 Oct.1975.

Paratypes - 1 male (44.2 mm), (AM P39739), SE of Yamba, NSW, 29°40'S, 153°47'E, 475 m, trawl, K78-23-15, 7 Nov.1978; 1 male (44.0 mm), 1 female (46.7 mm), (AM P62380), off Coff's Harbour, NSW, 256 m, deepwater trawl, per T. Nyssen, 7 Sep.1992.

***Comparative material of Polycheles baccatus* Bate, 1878.** - Lectotype male (27.8 mm), (NHM 1888.22), off Matuka, Fiji, 19°09.35'S, 179°41.50'E, 567-576 m, HMS *Challenger* Stn 173.

Paralectotypes - 2 males (not measured), 3 females (not measured), off Matuka, Fiji, 19°09.35'S, 179°41.50'E, 567-576 m, HMS *Challenger* Stn 173.

Others - 1 fragmented male (25.0 mm), (AM P21766), NE of Wooli, NSW, 29°52-46' S, 153°43-45' E, 505 m, K75-09-03, 10 Oct.1975; 1 male (36.5 mm), (AM P26549), E of Wooli, NSW, 29°52-55'S, 153°43-42'E, 495 m, K77-13-12, 23 Aug.1977; 1 female (43 mm), (AM P26649), E of Wooli, NSW, 29°52-51'S, 153°43-43'E, 495 m, K77-13-10, 23 Aug.1977; 1 ovigerous female (34.5 mm), (AM P40372), NE of Solitary Island, NSW, 29°53-50'S, 153°42-43'E, 457 m, K78-06-07, 26 Apr.1978; 3 ovigerous females (40.7-42.4 mm), (AM P44748), NE of Solitary Island, NSW, 29°53-50'S, 153°42-43'E, 457 m, K78-06-07, 26 Apr.1978; 1 female (33.5 mm), (AM P44749), SE of Cape Byron, 28°37'S, 153°50'E, 502 m, K78-17-21, 19 Aug.1978; 1 male (33.7 mm), (AM P60834), off Bulli, NSW, 34°23'S, 151°22'E, 488 m, K86-27-04, 9 Oct.1986; 1 male (26.5 mm), 1 female (26.5 mm), (ZMA), 7°35.4' S, 117°28.6' E Bali Sea, 730-915 m, *Siboga* Expedition.

Diagnosis. - Carapace dorsal surface entirely covered with large granules, sparsely setose; frontal margin faintly concave, lined with spinules and strong granules; with two rostral spines. Median submarginal tooth short, inconspicuous. Outer angle of dorsal orbital sinus spinose. Outer proximal margin of basal antennular segment with two spinules of which the distal most is largest. Lateral margins of the carapace with spine formula 8-10:4-5:15-18. Abdominal tergites 2-5 with notched or distinctly crenulate median carina; tergites 1-3 with antrorse median spine. Abdominal pleura with granulate to serrate dorsal margins, ventral margins smooth or crenulate. Pereiopod 1 merus with 2 small, distal spines.

Description. - Carapace subrectangular, margins slightly convergent proximally; dorsal surface sparsely setose, entirely covered with large granules; lateral surface densely setose; frontal margin faintly concave, lined with blunt spinules extending to inner angle of dorsal orbital sinus; inner margin of dorsal orbital sinus smooth or with 1-2 blunt spinules or projections; with two rostral spines; lower anterior margin with 2 spines below level of lateral orbital sinus, without row of denticles extending posteriorly behind dorsal spine. Median submarginal tooth short, inconspicuous. Dorsal orbital sinus broadly triangular; outer angle lined with 4-6 small, blunt teeth. Lateral margins of the carapace with evenly graded spines, slightly decreasing in size posteriorly; spine formula 8-10:4-5:15-18. Cervical and postcervical incisions with granulate margins.

Median postrostral carina prominent, lined with prominent blunt and sharp granules. Postorbital and branchial carinae prominent, sinuous, indicated by acute antrorse granules. Dorsal posterior border of carapace strongly granulate, with granules decreasing in size laterally.

Abdominal tergites strongly granulate, mesially carinate; tergites 2-5 with deep, oblique submedian grooves and with notched or distinctly crenulate median carina; tergites 1-3 with small, antrorse median spine, that of tergites 2 & 3 subequal; tergites 4-5 without median spine; tergite 6 with median "V" shaped, granulate carina. Pleuron 2 rounded anteriorly; dorsal margin granulate to serrate; ventral margin faintly sinuous, serrate in males, smooth in female. Telson granular anterolaterally; with prominent proximal tubercle flanked anterolaterally by 1-2 smaller tubercles; with median field of low granules and convergent submedian row of larger granules. Pleura 3-6 becoming narrower posteriorly; with dorsal portion granulate; ventral portion smooth; ventral margins granulate to serrate in males, smooth in female. Uropodal protopod smooth; endopod with blunt mid-rib, surface slightly wrinkled; exopod with median sulcus, surface slightly wrinkled.

Eyestalk with prominent, sharp, proximal dorsal tubercle; apex subglobular, directed laterally.

Basal antennular segment produced anteriorly to a sharp point, mesial margin with 5-8 widely spaced denticles, apex extending slightly beyond bases of antennular flagellae; outer proximal margin rounded, margin armed with two spines of which the distal most is largest. Distal segment of antenular peduncle with stout inner spine.

Distal and proximal segments of antennal peduncle with stout inner distal spine; scaphocerite lanceolate, extending anteriorly to base of antennal flagella.

Maxilliped 3 epipod rudimentary, about 0.2 ischium length.

Pereiopod 1 (major cheliped) shorter than the body length; ischium and basis fused. Merus with 2 curved spines on dorsal distal margin; distal half sparsely serrate dorsally and ventrally; proximally with smooth dorsal and ventral margins. Carpus 0.6 merus length; with 2 rows of irregular denticles or spinules on dorsal surface; ventral distal surface with spinule and blunt projection mesially. Propodus with entire dorsal margin denticulate, ventral distal margin finely serrate. Dactylus with finely granulate dorsal margin, longer than palm.

Pereiopod 2 with ischium and basis fused, articulating with merus; merus and ischiobasis granulate; carpus with dorsal margin granulate and distal spine; dactylus and pollex with curved apices, opposable margins pectinate. Pereiopods 3-5 with merus, ischium and basis fused, granulate. Pereiopod 5 simple in male, chelate in female.

Pleopod 1 uniramous, forming copulatory organ, comprising distal and proximal segments; proximal segment (basis) shorter than distal segment, outer margin setose; distal elongate, spatulate, slightly sulcate distally, with appendix interna on inner subdistal margin; outer distal margin and inner proximal margin setose.

Colour in life. - (Fig. 4). Dorsal surface of the carapace and abdomen deep red-orange. Lower lateral surfaces of carapace and lower half of the abdominal pleura white. Abdominal tergites with dorsal grooves and anterior margins white. Telson red. Uropods pinkish-red proximally, white distally. Antennae and antennules red. First pereiopod (major chela) with ischium and proximal third of merus pink; carpus, propodus and dactylus red with white articulations. Second to fifth pereopods white; chelae of second and third pereiopods pinkish-red. (Based on holotype AM P21697).

Etymology. - Named in honour of Brian Martin, University of Wollongong, New South Wales, for his contributions on power and suppression in science.

Remarks. - According to Galil (2000), *P. martini,* new species, will key out to *P. enthrix* owing to the presence of a small instead of prominent frontal submarginal carapace tooth and spinules on the frontal margin of the carapace lateral to the rostral spines. Otherwise, *Polycheles martini* bears only a superficial resemblance to *P. enthrix* in the ornamentation of the frontal margin of the carapace. Of the known species of *Polycheles*, the new species most closely resembles *P. baccatus* (Fig. 6) and *P. coccifer. Polycheles martini* differs from both *P. baccatus* and *P. coccifer* not only by the smaller submarginal tooth of the carapace, but in 1) the notched or crenulate instead of entire dorsomedian carina of abdominal tergites 2-5; 2) in having a relatively straight or faintly concave instead of strongly concave frontal carapace margin; 3) in having the entire frontal margin tuberculate or

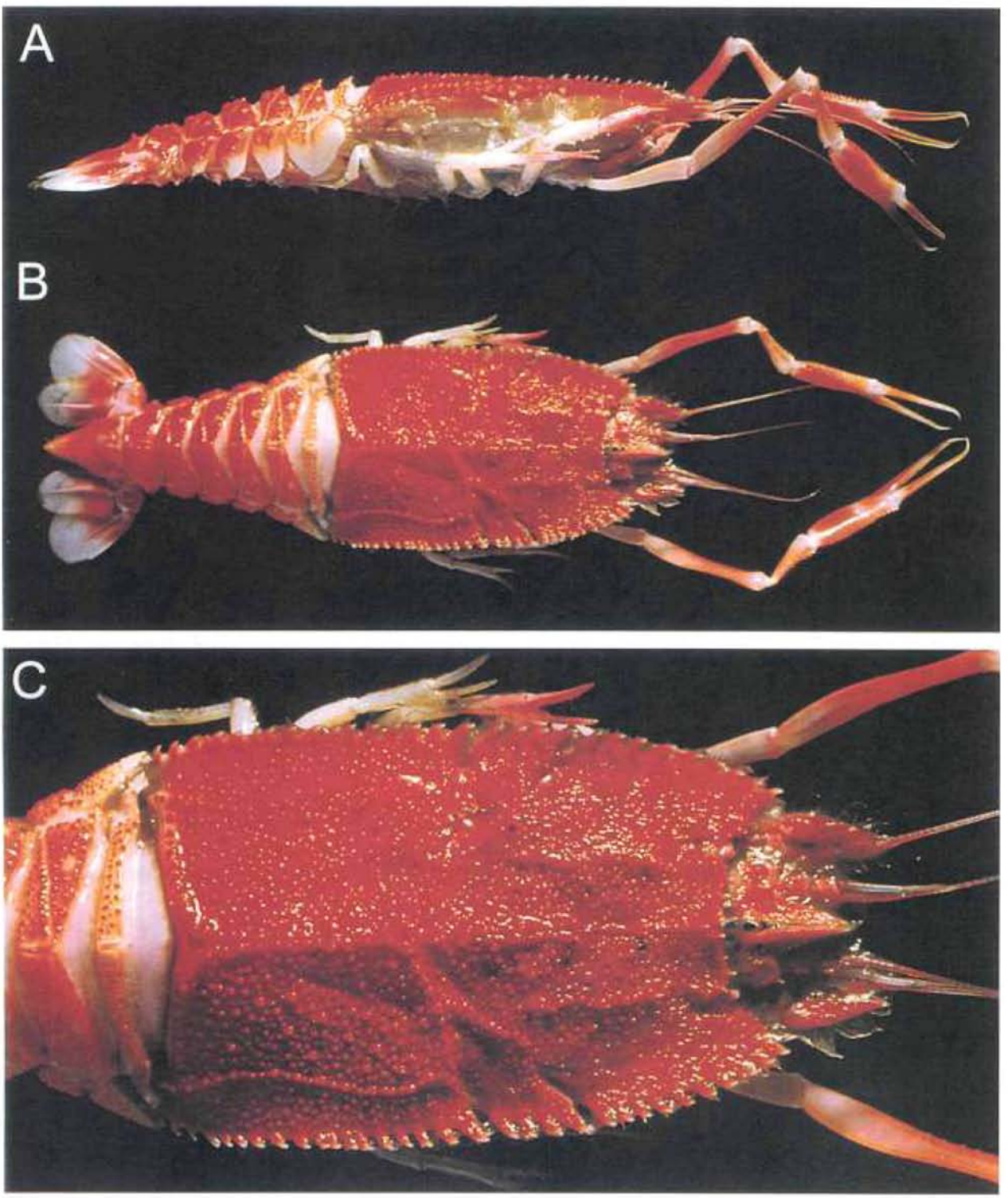

Fig. 4. *Polycheles martini,* new species, male holotype (AM P21697). A, right lateral. B, dorsal. C, carapace, dorsal. (H. McLennan & D. Brown).

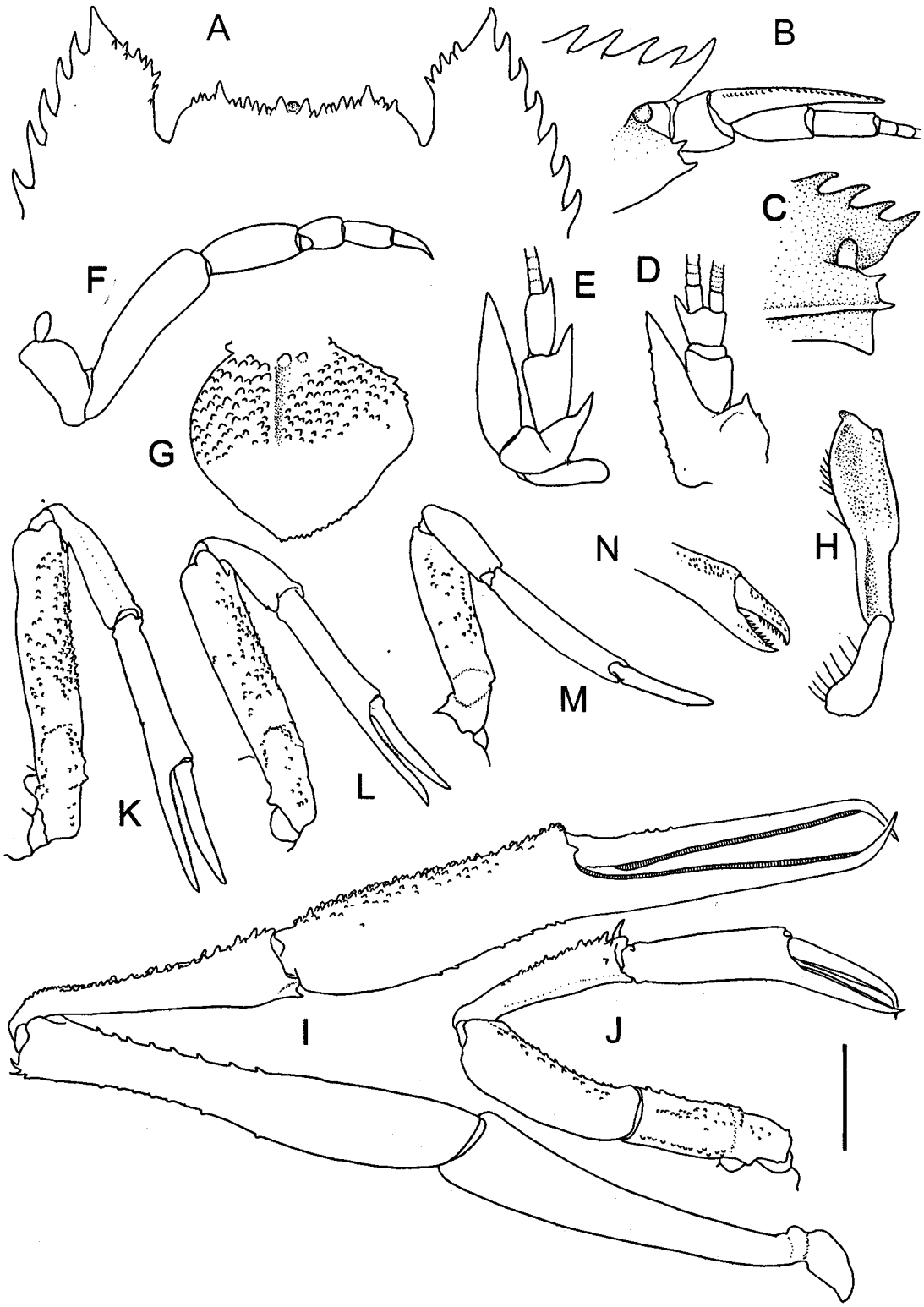

Fig. 5. *Polycheles martini,* new species, A-M, male holotype (AM P21697). N, female paratype (AM P62380). A, anterior cephalon margin, dorsal. B, anterior carapace margin, right lateral. C, anterior carapace, right ventral. D, antennule, right dorsal. E, antenna, right ventral. F, maxilliped 3, right posterior. G, abdominal pleuron 2, right lateral. H, pleopod 1, right posterior. I, pereiopod 1, right lateral. J, pereiopod 2, right lateral. K, pereiopod 3, right lateral. L, pereiopod 4, right lateral. M, pereiopod 5, right ventral. N, distal portion of pereiopod 5, right lateral. Scale A-M = 5 mm, N = 2.5 mm.

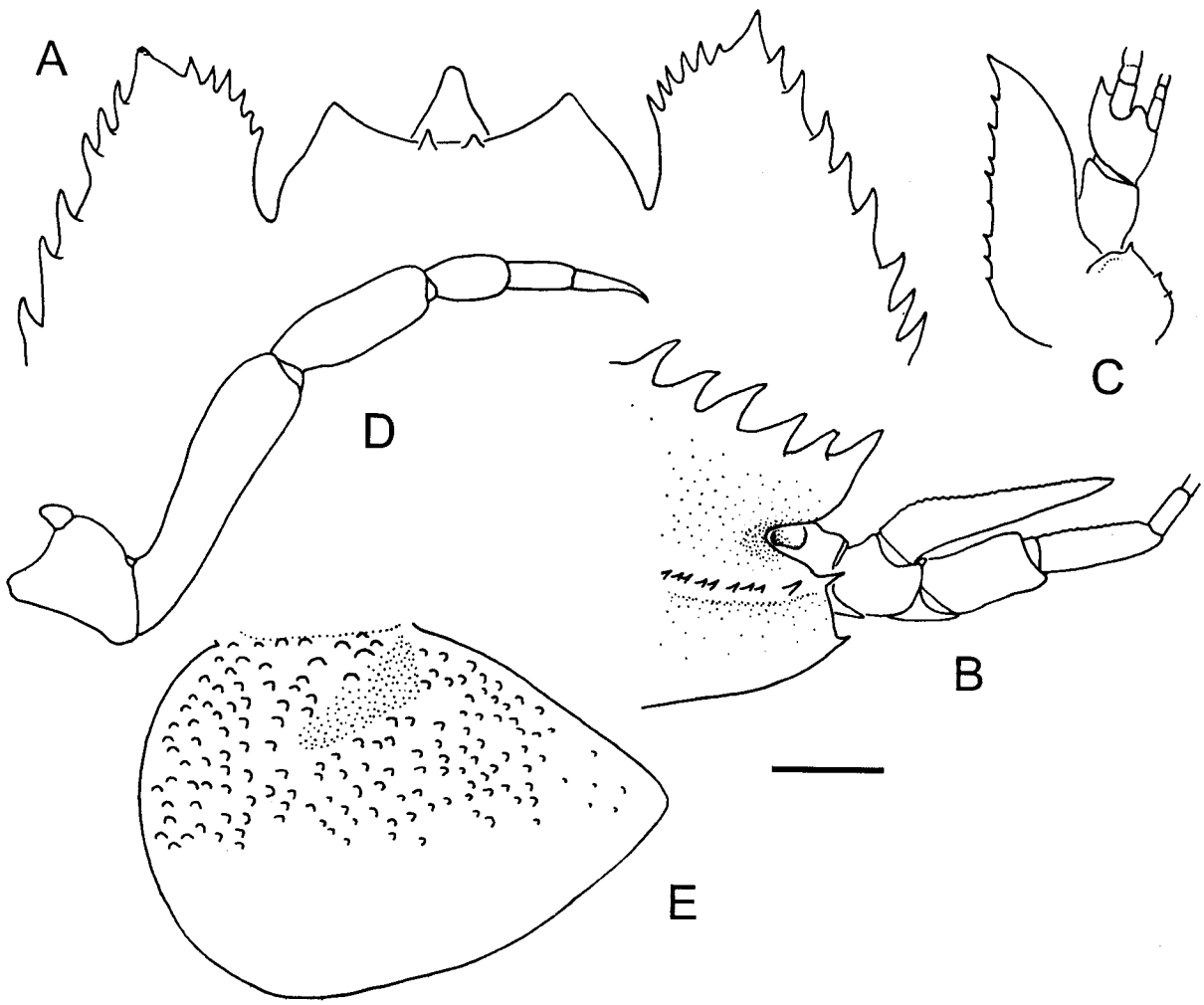

Fig. 6. *Polycheles baccatus* Bate, 1878, female (AM P40372). A, anterior carapace, dorsal. B, anterior cephalon, right lateral. C, antennule, right dorsal. D, maxilliped 3, right posterior. E, abdominal pleuron 2, right lateral. Scale = 2.5 mm.

spinulate instead of smooth; 4) in having a considerably larger distal spine on the outer proximal margin of the antennular segment; 5) in having larger and more numerous tubercles on the carapace, in having fewer lateral carapace spines (8-10: 4-5: 15-18 vs 10-12: 4-6: 25-26 and 6-7: 4-6: 20-23 respectively); 6) in lacking a row of denticles on the lower lateral margin of the carapace commencing below the lateral orbital sinus; 7) in having the anterior margin of the second abdominal pleuron rounded instead of acutely pointed; 8) in having the margins of the second abdominal pleuron granulate to serrate instead of smooth in males and 9) in bearing two instead of one subdistal spine on the merus of pereiopod 1.

The type series of *P. martini* is morphologically uniform in most features. As in several other species of *Polycheles,* however, the fifth pereiopod is simple in males and chelate in females. The female also differs from the males having smooth instead of crenulate or serrate margins of the abdominal pleura; whether this reflects sexual dimorphism remains to be determined from study of additional females. The basal antennular segment in the female bears two outer proximal spines on the right side and on one the left; the second spine on the left side appears to have been broken off.

The colour in life of *P. martini* (Fig. 4) is similar to *P. baccatus* (Figs 1C, D). Both *P. martini* and *P. baccatus* are a rich orange-red colour, but the former is more uniformly coloured. In *P. baccatus,* the posterior half of the carapace is relatively pale instead of uniformly orange-red, the oblique grooves of the abdominal terga are red instead of white, and the proximal portion of the basal antennular segment is mostly white instead of red. It should be noted that the description of the colour-in-

life of *P. baccatus* given by Griffin & Stoddart (1995) and subsequently cited by Galil (2000) is based on the holotype of *P. martini* (AM P21697) rather than the cited specimen of *P. baccatus* (AM P21766).

Distribution. - Southeastern Australia between Yamba and Sugarloaf Point, New South Wales from depths between 256 and 477 m.

Polycheles enthrix (Bate, 1878)
(Figs. 7C-D)

Willemoesia euthrix Willemoes Suhm, 1875: xxxiii [*nomen nudum*].
Pentacheles enthrix Bate, 1878: 280, Pl. 13 figs. 1-3 [type locality: Fiji, restricted by present lectotype designation].
Pentacheles euthrix - Bate, 1888: 149-154, Figs. 14-27, 33-36, Pl. 17.
Polycheles euthrix - Griffin & Stoddart, 1995: 239 [part].
Polycheles enthrix - Galil, 2000: 322-325, Fig. 16 [part].

Material examined. - Lectotype - male (27.4 mm), (NHM 1888.22), off Matuka Islands, Fiji, 19°09.35'S, 179°41.50'E, 576 m, *Challenger* Stn 173, 24 Jul.1874.

Others - female (22.0 mm), (NHM 1888.22), Kermadec Islands, 29°45'S, 178°11'E, 1152 m, *Challenger* Stn 170A, 14 Jul.1874; 1 male (36.6 mm), (AM P39743), E of Broken Bay, NSW, 33°34-38'S, 152°05-01'E, 814-832 m, K84-16-05, 25 Sep.1984; 1 female (56.6 mm), (AM P44752), NE of Tweed Heads, NSW, 28°01'S, 154°00'E, 549 m, K78-17-10, 17 Aug.1978; 1 female (55.8 mm), (ZRC), NE of Tweed Heads, NSW, 28°01'S, 154°00'E, 549 m, K78-17-10, 17 Aug.1978; 1 male (42.3 mm), (AM P44753), SE of Tweed Heads, NSW, 28°12'S, 153°53'E, 229 m, K78-23-05, 2 Nov. 1978; 1 male (40.2 mm), (AM P44756), E of Crowdy Head, NSW, 31°56'S, 153°08'E, 485-925 m, K87-24-05, 9 Dec.1987; 1 ovigerous female (52.4 mm), (AM P26754), SE of Newcastle, NSW, 33°11'S, 152°24'E, K77-23-10, 732 m, 7 Dec. 1977; 3 ovigerous females (46.2-49.0 mm), (AM P26755), SE of Newcastle, NSW, 33°11'S, 152°24'E, K77-23-10, 732 m, 7 Dec.1977; 1 ovigerous female (51.8 mm), (AM P39742), E of Hawkes Nest, NSW, 32°45'S, 152°49'E, 710-780 m, K89-11-03, 8 Jun.1989.

Colour in life. - (Figs. 7C, D). Entire dorsal surface of carapace and abdomen uniformly bright red-orange including basal antennular segment, antennal scaphocerite and eye-stalk; antenna and antennules pink; apices of anterolateral spines white; lower lateral carapace margins white. Pleura of abdominal tergites 2-6 red-orange, grading to pink distally. Uropodal protopod red-orange basally, grading to white distally; exopod and endopod pink. Pereiopod 1 pink-red; dactylus and pollex white. Pereiopods 2-5 white. (Based on AM P26754).

Remarks. - Galil (2000) synonymised *P. kermadecensis* with *P. enthrix,* but both species are distinct based on comparison of type material and collections from southeastern Australia. Part of the confusion over the validity of the two species stems from their close morphological similarity and uncertainty about the number and identities of the type specimens of *P. enthrix, P. kermadecensis* and *P. helleri,* most of which were collected from the same *Challenger* station - Stn 170.

Bate (1878) described *P. enthrix* on the basis of specimens from two "*Challenger*" stations (Kermadec Islands, 29°55'S, 178°14'W at 520 fathoms; and Fiji, 19°10'S, 179°40'E at 315 fathoms) corresponding explicitly to Stns 170 and 173 respectively without mentioning the number or sex of specimens. In the same paper, Bate (1878) described *P. helleri* on the basis of a specimen each from *Challenger* Stn 170 and Stn 218. As remarked by Sund (1920) and Galil (2000), only two polychelid specimens from the Kermadec Islands are extant in the collections of the NHM: a 15.3 mm female from Stn 170 and a 22 mm female from Stn 170A. The Stn 170 female specimen is the syntype of *P. helleri* figured by Bate (1888, Pl. 15 fig. 1) and was designated by Sund (1920) as the holotype of *P. kermadecensis.* In revising the Polychelidae, however, Galil (2000) assumed that Bate (1878) used the *P. helleri* syntype from Stn 170 also as a syntype of *P. enthrix.* Although not stated by Galil (2000), this assumption appears to stem from the presence of only one polychelid specimen from Stn 170 in the collections of the NHM and the general similarity of *P. enthrix* to *P. kermadecensis.* This would mean that the Stn 170 specimen was simultaneously a syntype of *P. enthrix,* a syntype of *P. helleri* and the holotype of *P. kermadecensis.* Consequently, in designating the extant Stn 170 specimen as the lectotype of *P. enthrix,* Galil (2000) supposedly made *P. enthrix* an objective senior synonym of *P. kermadecensis* and potentially also a senior objective synonym of *P. helleri.*

The assumption, however, that Bate (1878) used the same specimen from Stn 170 as a syntype of both *P. enthrix* and *P. helleri* is unjustified. The summary of crustacean species collected at each *Challenger* Station explicitly lists the presence of both *P. enthrix* and *P. helleri* at Stn 170 (Bate, 1888: lviii). Bate's (1888) separate species accounts of *P. helleri* and *P. enthrix* also list a specimen of each from Stn 170. Moreover, in the *Challenger* summary of results, Thomson (1895) also listed the presence of both *P. helleri* and *P. enthrix* at Stn 170. Although, not all of the original *Challenger* specimens are extant, all

published accounts unambiguously show that at least two polychelid specimens were collected at Stn 170, representing both *P. enthrix* and *P. helleri*. Therefore, the fact that only one specimen from Stn 170 remains in the NHM does not support the assertion that Bate (1878) originally had only one polychelid from Stn 170 which he would have then used a syntype of two species.

Additional evidence to show that Bate (1878, 1888) did not confuse *P. enthrix* with *P. helleri* is in the species accounts themselves. Bate's (1878, 1888) accounts of *P. enthrix* attribute 8 spines to the anterior division of the lateral carapace spines whereas the Stn 170 syntype of *P. helleri* bears 7 spines. If Bate (1878, 1888) used the same specimen in accounts of both species, then those very accounts would reveal overlap in the reported range of carapace spines. Bate's (1878, 1888) reported ranges for the anterior division of the lateral carapace spines in *P. enthrix* and *P. helleri* do not overlap. In addition, the fact that Bate (1888) took care to detail and illustrate the differences between the two *P. helleri* syntypes (Stns 218 and 170) suggests that he did not somehow also regard the Stn 170 syntype as *P. enthrix*.

Galil (2000) remarked that Sund (1920) was confused over the "number of *enthrix* specimens available to Bate". Sund (1920) concluded that Bate (1888) studied four specimens of *P. enthrix* of which only two are now extant. Bate (1888) lists at least four specimens of *P. enthrix:* at least one specimen from Stn 170, two specimens from Stn 170A, and one specimen from Stn 173. However, several specimens of *P. enthrix* were collected by the *Challenger* in addition to those listed by Bate (1888) but were evidently not used in any of his accounts. Thomson's (1895) summary of results records not one but "several specimens" of *P. enthrix* from Stn 173 (p. 633) and "two specimens" of *P. enthrix* from Stn 174C (p. 639). Therefore, at least seven specimens of *P. enthrix* were collected by the *Challenger* of which only two are extant.

Thus, on the basis of the published accounts discussed and the details from the specimen in question, Bate (1878) had type material of both *P. enthrix* (now lost) and *P. helleri* from Stn 170. Galil's (2000) assumption that Bate used the same specimen from Stn 170 as a syntype of both *P. helleri* and *P. enthrix* can now be discounted. Therefore, Galil's (2000) lectotype designation for *P. enthrix* using the Stn 170 specimen (*P. helleri* syntype) is invalid because the action was not based on one of the original syntypes of *P. enthrix*. Moreover, it is fortunate that Galil's (2000) lectotype designation is invalid because the holotype of *P. kermadecensis* (= Stn 170 syntype of *P. helleri*) is not conspecific with the extant syntype of *P. enthrix* (from Fiji). To fix the identity of *P. enthrix,* the female syntype from Fiji (Stn 173) is herein selected as the lectotype. Because, the syntypic material of *P. helleri* comprises two species, the identity of the species is unstable. The larger syntype of *P. helleri* (Stn 218) represents the species commonly known as *P. helleri* whereas the smaller syntype of *P. helleri* (Stn 170) is the holotype of *P. kermadecensis*. Therefore, to fix the identity of *P. helleri* in accord with the common usage of the species, we herein designate the larger syntype from New Guinea (Stn 218) as lectotype of the species. The holotype of *P. kermadecensis* becomes a paralectotype of *P. helleri*.

Whereas the identity and type status of polychelids collected at *Challenger* Stn 170 is now clear, the status of a specimen collected from a nearby locality, Stn 170A, is less clear. Galil (2000) regarded this specimen of *P. enthrix* from Stn 170A as a syntype. Whilst Bate (1888) listed specimens of *P. enthrix* from Station 170A, the station data he provides in the 1878 account corresponds to Stns 170 and 173 only. Certainly, it could be argued that Bate (1878) might have used composite data from more than one station. For instance, Bate's (1878) given coordinates for the holotype of *Pentacheles gracilis* correspond to Stn 174 ("19°10'S, 179°10'E") and the depth range encompasses Stns 174C-D (ie. "210 to 610 fathoms"). Yet, the holotype of *Pentacheles gracilis,* according to Bate (1888), was actually collected at Stn 174C, 19°07'50"S, 174°19'35"E, at 610 fathoms. However, in the case of *P. enthrix,* the data given by Bate (1878) for his material explicitly correspond to Stns 170 and 173 only, including latitude, longitude and depth. With the present designation of a lectotype for *P. enthrix,* the specimen from Stn 170A should be regarded at most as a possible paralectotype. It should be noted that the *P. enthrix* specimen collected at Stn 170A appears to have been erroneously omitted from Thomson's (1895) summary of results.

Differences between *P. enthrix* and *P. kermadecensis* are detailed under the account of the latter. Although Galil (2000) listed specimens of *P. kermadecensis* among her study material, her description of the species nevertheless accurately represents *P. enthrix* sensu stricto, agreeing well with the Australian material. Therefore, *P. enthrix* is not redescribed herein.

Distribution. - Reported from Melanesia and Fiji to the Kermadec Islands, Australia, Taiwan and Japan; 229-1152 m.

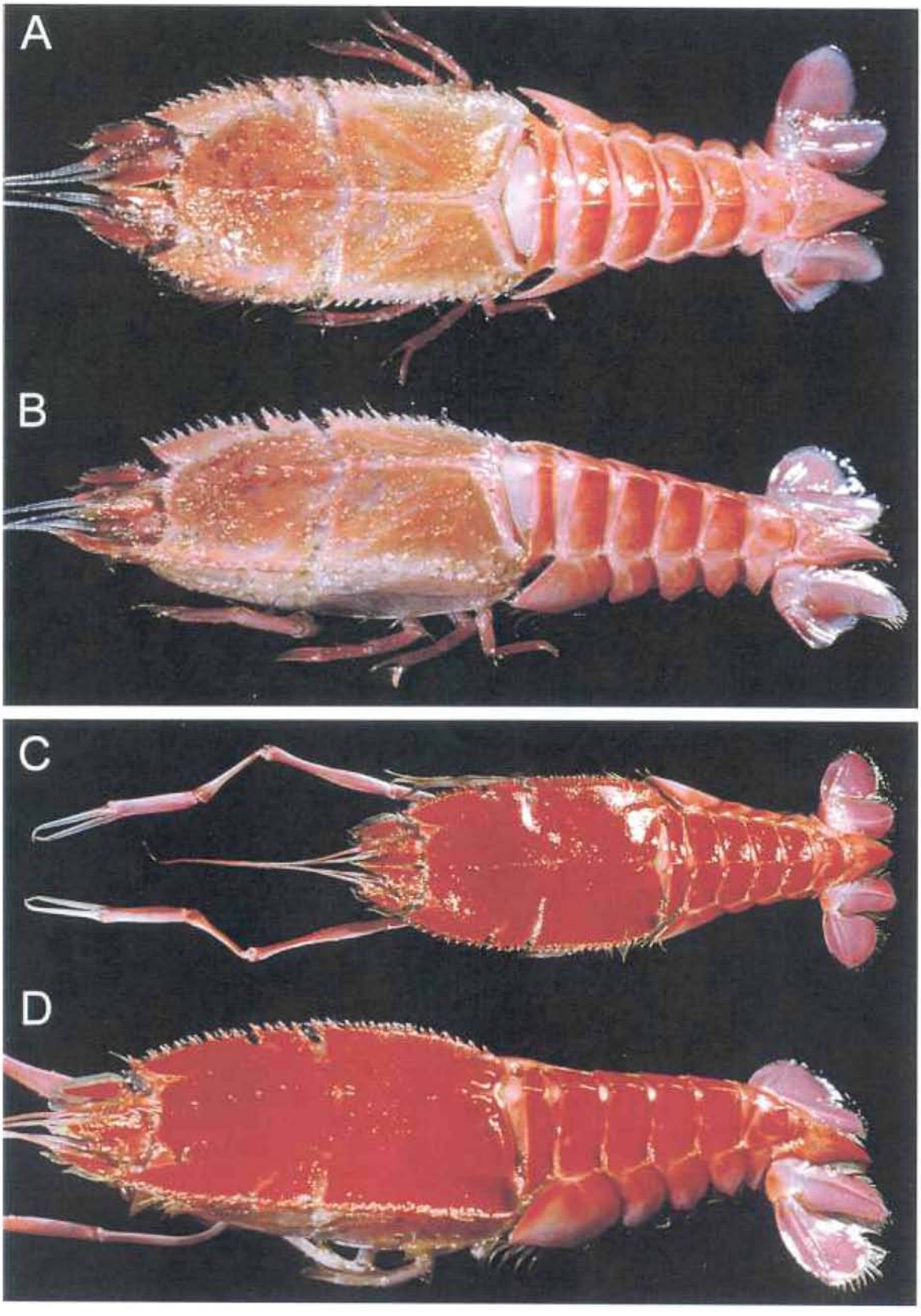

Fig. 7. *Polycheles kermadecensis* (Sund, 1920), male (AM P26753): A, dorsal; B, left oblique lateral. *Polycheles enthrix* (Bate, 1878), female (AM P26754): C, dorsal; D, left oblique lateral. (G. Millen & D. Brown).

Polycheles kermadecensis (Sund, 1920)

(Figs. 7A-B, 8, 9)

Stereomastis kermadecensis Sund, 1920: 224 [type locality: Kermadec Islands, 29°55'S, 178°14'E, 951 m].

Polycheles helleri - Bate, 1878: 277-278, 281 [part, Kermadec Islands specimen only][not *P. helleri* Bate, 1878].

Pentacheles helleri - Bate, 1888: 138, 140-142, Pl. 15 fig. 1 [part, Kermadec Island specimen only] [not *P. helleri Bate,* 1878].

Polycheles euthrix - Griffin & Stoddart, 1995: 239-240, Figs 2, 3 [part, not *Polycheles enthrix* (Bate, 1878)].

Polycheles enthrix - Galil, 2000: 324 [part, not *Polycheles enthrix* (Bate, 1878)].

Material examined. - Holotype - female (15.3 mm), (NHM 1888.22), Kermadec Islands, 29°55'S, 178°14'E, 951 m, *Challenger* Stn 170, 14 Jul.1874 (= paralectotype of *P. helleri* by present lectotype designation).

Others - 1 male (21.8 mm), 1 female (18.3 mm), (AM P44758), E of Dunk Island, off Palm Passage, Qld, 18°07.76'S, 147°30.07'E, 932 m, RV *Franklin,* coll. P. Hutchings et al., 25 Aug.1988; 1 female (74.7 mm), (AM P44750), NE of Point Danger, NSW, 28°02'S, 153°59'E, 549 m, K78-09-05, 2 Jun.1978; 1 female (31.4 mm), (AM P60972), E of Point Danger, NSW, 28°01'S, 154°00'E, 549 m, K78-17-10, 17 Aug.1978; 1 female (64.7 mm), (ZRC), E of Point Danger, NSW, 28°01'S, 154°00'E, 549 m, K78-17-10, 17 Aug.1978; 1 male (32.2 mm), (AM P26753), SE of Newcastle, NSW, 33°11-09'S, 152°24-25'E, 732 m, K77-23-10, 7 Dec.1977; 1 male (39.8 mm), (AM P17910), SE of Port Stephens, NSW, 32°46-51'S, 152°46-42'E, 586-595 m, 7 May.1971; 1 female (57.3 mm), (AM P44755), NE of Point Danger, NSW, 27°5'S, 154°03'E, 549 m, K78-23-09, 6 Nov. 1978; 1 female (50.1 mm), (AM P60970), SE of Newcastle, NSW, 33°11-09'S, 152°24-25'E, 732 m, K77-23-10, 7 Dec. 1977; 1 female (58.4 mm), (AM P60971), E of Crowdy Head, NSW, 31°56'S, 153°08'E, 925 m, K87-24-05, 9 Dec.1987; 2 males (63.2-70.4 mm), 1 female (51.2 mm), (AM P44754), NE of Point Danger, NSW, 28°03'S, 154°04'E, 732 m, K78-23-08, 6 Nov.1978; 1 female (32.4 mm), (SAM), 46 km E of Stradbroke Island, Qld, 27°13.55'S, 154°01'E, 710-730 m, trawled, coll. P. Briggs, Sep-Oct.1988.

Diagnosis. - Carapace frontal margin with two rostral spines and several spinules on either side; frontal submarginal tooth shorter than rostral spines; inner angle of dorsal orbital sinus spinose. Outer proximal margin of basal antennular segment with 2 spines. Gastric region of carapace covered by numerous spines of similar size to spines of median carina; branchial carinae indicated by row of 4-6 spines; branchial groove flanked by row of 4-5 small spines; postcervical groove with antrorse spine on posterior margin between median carina and branchial carina. Median carina of abdominal tergites 1-4 entire, with short antrorse tooth on tergites 1-3 or 4, without posterior unpright tooth. Abdominal tergites 2-5 relatively smooth, without distinct oblique grooves.

Description. - Carapace subrectangular, margins slightly convergent proximally; dorsal surface sparsely setose, faintly punctate; gastric region distinctly spinose, spines of similar size to larger spines on median carina; lateral surface densely setose; frontal margin slightly sinuous, lined with spines extending to internal angle of orbital sinus; with two rostral spines, but frequently with smaller median spine in larger specimens; lower anterior margin with 2 small spines adjacent to antennal protopod. Median submarginal tooth short, inconspicuous. Dorsal orbital sinus broadly triangular; outer angle of orbital sinus produced anteriorly, margin unarmed. Lateral margins of carapace with evenly graded spines, slightly decreasing in size posteriorly; spine formula 7-11: 4-5: 12-17. Cervical and postcervical incisions with smooth margins. Postcervical groove with antrorse spine on posterior margin between median carina and branchial carina. Median postrostral carina prominent, spine formula variable, usually 1:1:2:1. Median postcervical carina prominent, irregular, spine formula variable, usually 2: 2. Postorbital carina ill-defined. Branchial carina sinuous, indicated by distinct line of 4-7 well-spaced spines. Row of 3-4 spines parallel to branchial groove. Dorsal posterior border of carapace smooth, with 3-5 pairs of antrorse spines.

Abdominal tergites smooth, punctate, mesially carinate; without oblique grooves; tergites 1-3 or 4 with short antrorse median tooth, shorter and blunter posteriorly; tergite 5 with blunt median carina; tergite 6 without median carina. Pleuron 2 pointed anteriorly; surface smooth; margins setose but not granulate or denticulate; lower margin faintly concave. Telson with prominent low, obsolete proximal swelling; without granules. Pleura 3-6 becoming narrower posteriorly; margins smooth, without denticles or tubercles. Uropodal protopod without tubercles or granules; endopod with blunt mid-rib, surface slightly wrinkled; exopod with median sulcus, surface slightly wrinkled.

Eyestalk with small dorsal spine; apex slender, recurved anterolaterally.

Basal antennular segment produced anteriorly to a sharp point, mesial margin with 6-12 teeth, apex extending beyond distal segment of antennular peduncle; outer proximal margin rounded, with two spines of which the distal most is largest. Distal segment of antennular peduncle with stout inner tooth.

Distal and proximal segments of antennal peduncle with stout inner distal spine; scaphocerite lanceolate, not extending anteriorly beyond distal segment.

Maxilliped 3 epipod rudimentary, about 0.2 ischium length.

Pereiopod 1 (major cheliped) as long as (largest specimens) or longer than the body length (smallest specimens). Merus with 1 curved spine on dorsal distal margin; dorsal and ventral margins spinose, with spines on dorsal margin more widely spaced. Carpus 0.67-0.75 merus length; adults with 2 rows of irregular spinules on dorsal proximal surface; ventral surface smooth, distally with spinule and blunt projection mesially. Dactylus dorsally sulcate, as long as or longer than palm; propodus with entire dorsal margin spinulate, ventral margin denticulate.

Pereiopod 2 with ischium and basis fused; ischiobasis articulating with merus; merus and ischiobasis unarmed; carpus with dorsal distal spine; propodus dorsally cristate; dactylus and pollex with curved apices, opposable margins pectinate.

Pereiopods 3-5 with merus and ischium fused, articulating with basis. Pereiopod 5 in males with pollex about half length of dactylus; females with pollex and dactylus of equal length.

Pleopod 1 uniramous, forming copulatory organ, comprising distal and proximal segments; proximal segment (basis) shorter than distal segment, outer margin setose; distal elongate, spatulate, with appendix interna on inner subdistal margin; outer distal margin and inner proximal margin sparsely setose.

Colour in life. - (Figs. 7A,B). Dorsal surface of carapace pink with inner gastric, cardiac and branchial regions dark pink, anterolateral spines pale pink, with tips white; posterior carapace edge and spines pale pink; cervical and branchial grooves whitish. Lower lateral surfaces of carapace pale pink. Abdominal tergites dark pink, abdominal interspaces pale pink to white, pleura lighter pink, telson dark pink, uropodal exopod and endopods light pink with darker diffuse patches. Antennal and antennular flagellae light pink-white. Eye stalk white. Pereiopod 1 colour unknown. Pereiopods 2-5, basal antennular segment and antennal scaphocerite dark pink. (Based on AM P26753).

Remarks. - *Polycheles kermadecensis* most closely resembles *P. enthrix* but differs chiefly in having a distinctly more spinose carapace, a spinose upper margin on the propodus of pereiopod 1, and in coloration (pink with diffuse darker patches and whitish carapace grooves vs. solid, deep red-orange; *Fig. 7). Unlike P. enthrix, P. kermadecensis* bears a row of spines parallel to the branchial groove, the branchial carina is indicated by a row of spines and an antrorse spine is present on the posterior margin of the postcervical groove. It is the presence of these dorsal carapace spines that probably led Bate (1888) to identify his smaller syntype of *P. helleri* (holotype of *P. kermadecensis*) with the larger syntype (now lectotype) of *P. helleri.* In other respects, *P. kermadecensis* closely resembles *P. enthrix. Polycheles enthrix* lacks the spines on the postcervical groove as well as the row of spines parallel to the branchial groove and the spines of the branchial carina. In *P. enthrix,* the gastric region may bear one or two spines but not the field of spines distributed over gastric region as in *P. kermadecensis.* The upper margin of the propodus of the first pereiopod is distinctly spinular in *P. kermadecensis,* whereas in *P. enthrix,* the dorsal margin is at most irregularly or minutely dentate. Also, the spination and shape of the median carina of the abdominal tergites differs subtly between between adults of *P. enthrix* and *P. kermadecensis.* In adult *P. enthrix,* the median carina of abdominal tergites 1-5 are relatively higher and more slender than in *P. kermadecensis,* and the antrose spines on tergites 1-3 are sharper in the former species. The antrorse median tooth on abdominal tergite 4 is blunt in both species, but may be obsolete in the largest specimens of *P. kermadecensis.* The first pleopod in male *P. kermadecensis* differs subtly from that of P. enthrix in having setae on the outer distal margin of the distal segment, the appendix interna is situated more proximally and the apex of the distal segment is relatively less sulcate. The length of pereiopod 1 changes allometrically, varying from being longer than the body length in the smallest specimens to subequal to body length in the largest specimens.

Galil (2000) reported a wide distribution for *P. enthrix* - Melanesia and Fiji to the Kermadec Islands, Australia, Taiwan and Japan. Recognition of *P. kermadecensis* as a distinct species suggests that all previous records of *P. enthrix* require verification, particularly those from the southwestern Pacific. Australian specimens of *P. kermadecensis* were frequently taken with *P. aculeatus, P. enthrix, P. suhmi, P. surdus* and *Pe. laevis,* suggesting that they may often be sympatric. The holotype of *P. kermadecensis* was taken at 951 m and the known bathymetric range of *P. kermadecensis* from Australia is 549-932 m.

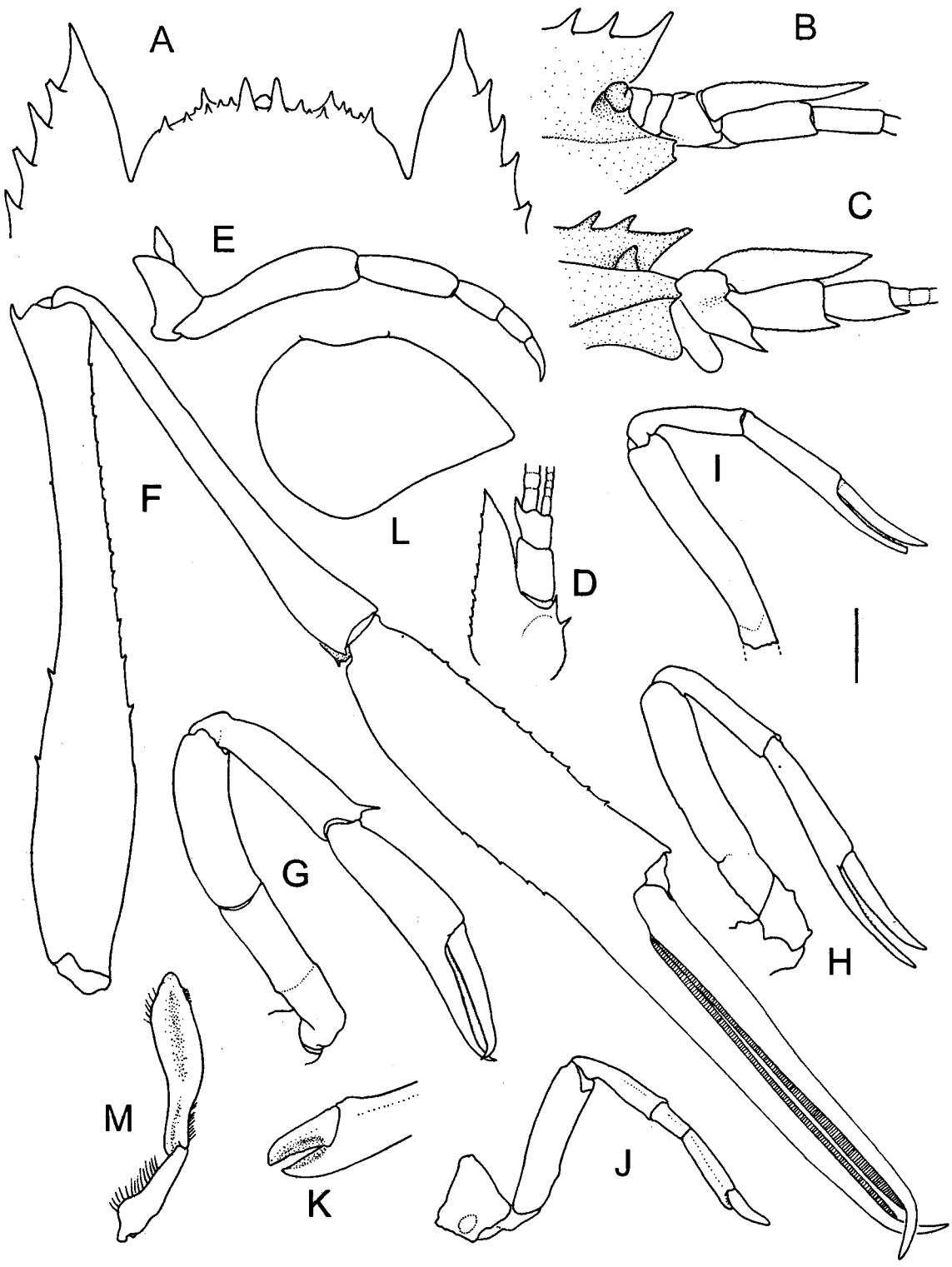

Fig. 8. *Polycheles kermadecensis* (Sund, 1920). A-J, male (AM P44758). K, female (AM P44755). M, male (AM P17910). A, anterior carapace margin, dorsal. B, anterior cephalon margin, right lateral. C, anterior cephalon, right ventral. D, antennule, right dorsal. E, maxilliped 3, right posterior. F, pereiopod 1, left mesial. G, pereiopod 2, right lateral. H, pereiopod 3, right lateral. I, pereiopod 4, right lateral. J, pereiopod 5, right lateral. K, distal portion of pereiopod 5, right mesial. L, abdominal pleuron 2, right lateral. M, pleopod 1, right posterior. Scale A-L = 5 mm; M = 2.5 mm.

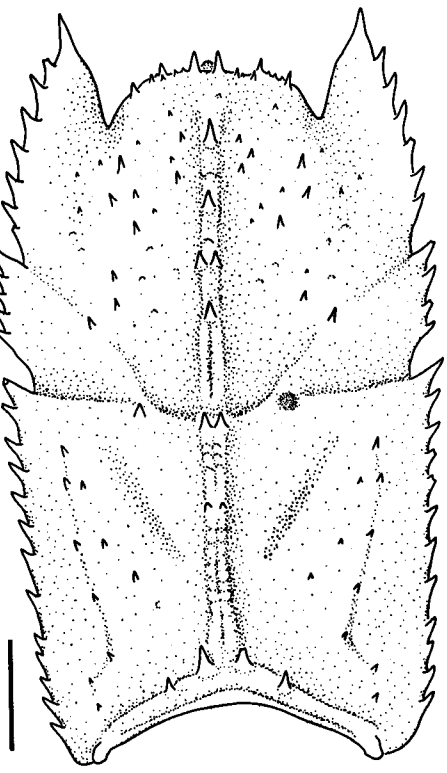

Fig. 9. *Polycheles kermadecensis* (Sund, 1920), male (AM P44758). Carapace, dorsal. Scale = 2 mm.

Distribution. - Known with certainty from the Kermadec Islands, New Zealand, and eastern Australia from central Queensland to the vicinity of Newcastle, New South Wales, at depths between 549 and 951 m.

Polycheles nanus (Smith, 1884)

Polycheles nanus Smith, 1884: 359 [type locality: northeastern America, 38°44'N, 72°38'W]
Pentacheles andamanensis Alcock, 1894: 239 [type locality: off Cape Comorin, 7°04'N, 76°34'15"E]
Polycheles grimaldii Bouvier, 1905a: 481 [type locality: off Senegal, 17°16'N, 19°19'W]
Stereomastis andamanensis - Griffin & Stoddart, 1995: 244-245 [part, NSW specimens only].

Material examined. - SAM, 1 female (43.0 mm), 57 km W of West Point, Tasmania, 41°19.16'S, 144°01.65'E, 1200 m, RV *Soela*, S0289/54, 11 Mar.1989.

Remarks. - The lateral carapace spination, 5-6:3:6 is within the range reported for *P. nanus* (see Galil, 2000). The specimen of *Stereomastis andamanensis* (= *P. nanus*) (AM P40367) reported from the Coral Sea by Griffin & Stoddart (1995) is referable to *P. galil*, new species. Similarly, records of *P. nanus* from Western Australia by George (1983) are based on *P. galil* and *P. auriculatus*.

Distribution. - Widely distributed throughout the Indo-West Pacific and Atlantic Oceans at depths of 300-4000 m. The Australian range includes New South Wales and now Tasmania.

Polycheles phosphorus (Alcock, 1894)
(Figs. 3C-D, 10, 11)

Pentacheles phosphorus Alcock, 1894: 240 [type locality: Bay of Bengal, 13°47'30"N, 92°36'E, *Investigator* Stn 112]; Wood-Mason & Alcock, 1894, Pl. 8 fig. 2; Alcock & Anderson, 1894: 165; - Anderson, 1896: 98; - Alcock, 1901a: 74; Lloyd, 1907: 6.
Polycheles phosphorus - Alcock, 1899: 33; 1901b: 167-169; Galil, 2000: 336-339 [part, northeastern Indian Ocean specimens only].

Material examined. - Paralectotype - 1 male (30.6 mm), (AM G1477, exZSI 6876/9), Andaman Sea, 11°25'5"N, 92°47'6"E, 741 m, *Investigator*, Stn 116, 9 Dec.1890.

Others - 1 dry female (24.8 mm), (SAM C22, exZSI 6879/9), Andaman Sea, 677-915 m, *Investigator* (possible paralectotype); 1 male (30.7 mm), (AM P2683, exZSI 1391/10), Andaman Sea, 677-915 m, *Investigator*; 1 male (27.0 mm), (NHM, exZSI 8838/9), 12 km E of North Cinque Island, Andaman Sea, 897 m, *Investigator*, Stn 10, 12Apr.1888; 1 female (32.8 mm), (OM B399), Arabian Sea, 9°34'57"N, 75°36'30"E, 743 m, green mud, *Investigator*, Stn 197, 20 Jan.1895.

Diagnosis. - Basal antennular segment with single spine on outer proximal margin. Carapace with branchial carina indicated by distinct line of 7-8 well-spaced spines; branchial groove flanked by field of 4-7 spines. Median carina of abdominal tergites 1-4 with antrorse spine.

Description. - Carapace subrectangular, margins slightly convergent proximally; dorsal surface finely setose; gastro-orbital region with arcuate row of 5 spines; frontal margin with two rostral spines and spine on inner angle of orbital sinus, unarmed between rostral spines and inner orbital spine; lower anterior margin produced to acute point adjacent to antennal protopod; lower lateral margin with 2 spinulate carinae. Median submarginal tooth short, inconspicuous. Dorsal orbital sinus U-shaped, margins slightly divergent; external angle of orbital sinus produced anteriorly, margin unarmed. Lateral margins of carapace with evenly graded spines, slightly decreasing in size posteriorly; spine formula 6-7:3-4:6-7. Cervical and postcervical incisions with smooth margins. Postcervical groove with antrorse spine on posterior margin between median carina and branchial carina. Median postrostral carina prominent, spine

formula 1:1:2:1. Median postcervical carina prominent, irregular, spine formula 2:2. Postorbital carina ill-defined. Branchial carina slightly sinuous, indicated by distinct line of 7-8 well-spaced spines; branchial groove flanked by field of 4-7 spines. Dorsal posterior border of carapace with pair of submedian spines.

Abdominal tergites mesially carinate; tergites 1-4 with antrorse median spine, increasing in size posteriorly; tergite 5 with blunt median carina; tergite 6 with tuberculate U-shaped carina; tergite 1 with smooth dorsal surface; anterior margin of tergite 1 with median spine and 2 antrorse spines laterally; surface of tergites 2-5 with deep oblique grooves. Pleuron 2 rounded anteriorly, with 1-2 anterior spines and denticulate lower margin; surface with crescent-shaped carina. Telson with short proximal median carina and pair of low convergent carinae posteriorly. Pleura 3-6 becoming narrower posteriorly; margins with widely spaced granules; surface of pleura 3-5 with crescent shaped carina; surface of pleuron 6 smooth but setose. Uropodal protopod irregular but without tubercles or granules, with small outer distal spine; endopod with blunt mid-rib, surface slightly wrinkled; exopod with median sulcus flanked by low carina, surface slightly wrinkled.

Eyestalk with small dorsal spinule; apex subglobular, recurved anterolaterally.

Basal antennular segment produced anteriorly to a sharp point, mesial margin unarmed, apex extending beyond distal segment of antennular peduncle; outer proximal margin rounded, with single spine; distal segment of antennular peduncle without inner distal spine.

Distal and proximal segments of antennal peduncle with small stout inner distal spine; scaphocerite lanceolate, with or without outer subdistal spine, not extending anteriorly beyond distal segment; antennal protopod without outer spine.

Maxilliped 3 epipod rudimentary, about 0.1 ischium length.

Pereiopod 1 (major cheliped) longer than body length; ischium and basis fused. Dorsal margin of merus with 1 distal and 2 proximal spines; ventral margin sparsely denticulate. Propodus with smooth upper margin and dorsal distal spine; ventral margin with single row of 6-10 widely spaced spinules. Carpus 0.60-0.62 merus length; dorsal margin smooth except for distal spine; ventral margin smooth, with lateral distal with spine and blunt mesial projection. Dactylus smooth dorsally, longer than palm.

Pereiopod 2 with ischium, basis and merus fused with small dorsal distal spine; with demarcation between ischium and basis indicated by distinct groove; carpus with large dorsal and minute outer distal spine; dactylus and pollex with curved apices, opposable margins minutely pectinate.

Pereiopods 3 and 4 with ischium, basis and merus fused, with demarcation between ischium and basis indicated by indistinct groove; segments unarmed; dactylus and pollex with opposable margins minutely pectinate. Pereiopod 5 with ischium, basis and merus fused, with demarcation between ischium and basis not indicated; males with dactylus about twice length of pollex, opposable margins smooth; anterior surfaces of dactylus and pollex slightly 'hollowed'.

Pleopod 1 uniramous, forming copulatory organ, comprising distal and proximal segments; proximal segment (basis) shorter than distal segment, outer margin setose; distal segment elongate, relatively flattened, with appendix interna on inner subdistal margin, projecting; inner proximal margin setose.

Colour in life. - According to Alcock (1894: 241), *P. phosphorus* is "bright pink".

Remarks. - Galil (2000) characterised *P. phosphorus* as a species bearing a single outer spine on the basal antennular segment and an antrorse median spine on the first five abdominal tergites. She was quite correct to emphasise the systematic importance of the single outer spine on the basal antennular segment, a feature that was not appreciated by previous workers (e.g. de Man, 1916; Takeda & Hamano, 1994; and Griffin & Stoddart, 1995). Alcock's (1894) original account of *P. phosphorus* from the northeastern Indian Ocean, however, is unambiguous in attributing an antrorse median spine to the first four abdominal tergites only, in addition to the single outer spine on the basal antennular segment. All specimens that we have examined from the northwestern Indian Ocean, namely *Investigator* specimens in the Natural History Museum, London, the Australian Museum, the Otago Museum and South Australian Museum, agree in all respects with Alcock's account. Additionally, the lectotype of *P. phosphorus* in the Zoological Survey of India (ZSI 6873/9, *Investigator* Stn 112) was examined for us in July 2001 by D. Yeo (Raffles Museum, National University of Singapore). As described and

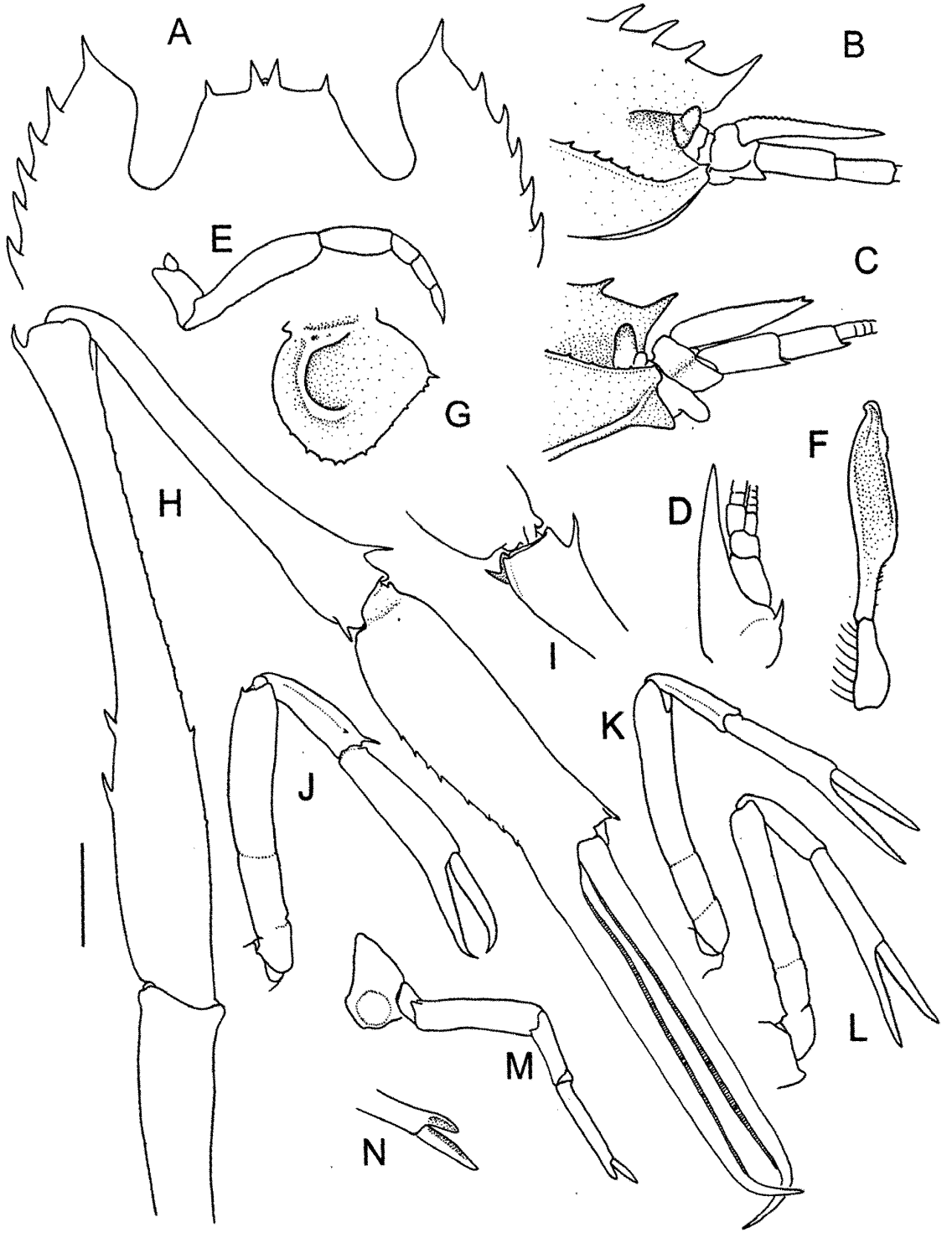

Fig. 10. *Polycheles phosphorus* (Alcock, 1894), paralectotype male (AM G1477). A, anterior carapace margin, dorsal. B, anterior cephalon margin, right lateral. C, anterior cephalon, right ventral. D, antennule, right dorsal. E, maxilliped 3, right posterior. F, pleopod 1, right posterior. G, abdominal pleuron 2, right lateral. H, pereiopod 1, right lateral. I, pereiopod 1, propodal-carpal articulation, right mesial. J, pereiopod 2, right lateral. K, pereiopod 3, right lateral. L, pereiopod 4, right lateral. M, pereiopod 5, right lateral. N, distal portion of pereiopod 5, right mesial. Scale A-M = 4 mm, N = 2 mm.

illustrated by Alcock (1894, 1901) and Wood-Mason & Alcock (1894, Pl. 8 fig. 2), the lectotype bears the antrorse median spine on the first four abdominal tergites only and the single spine on the basal antennular segment (Fig. 11). The species referred to as *P. phosphorus* by Galil (2000), bearing the antrorse median spine on the first five abdominal tergites and single outer spine on the basal antennular segment, represents a separate species named for her above.

Polycheles phosphorus possesses the following unique combination of characters: a single spine on the outer proximal margin of the antennular segment, a spinose branchial carina, a spinose branchial region of the carapace, and an antrorse spine on the anterior four abdominal somites. *Polycheles galil,* new species, and *P. politus* Galil, 2000, are the only other species of the genus with a single spine on the outer proximal margin of the antennular segment. *Polycheles galil* differs from *P. phosphorus* chiefly in bearing an antrorse median spine also on the first fifth abdominal tergite and *P. politus* differs by lacking a spinose branchial region or spined branchial carina.

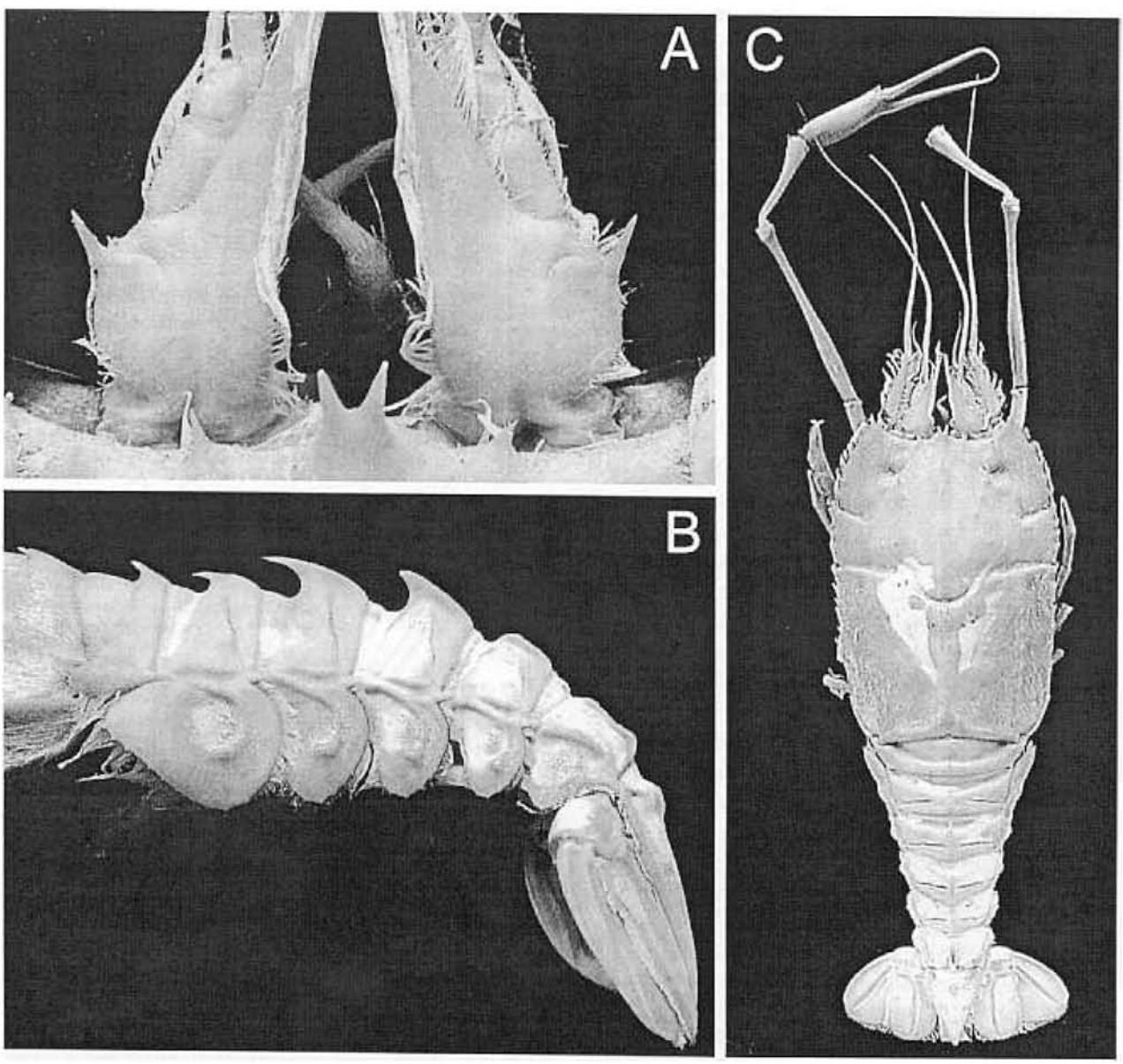

Fig. 11. *Polycheles phosphorus* (Alcock, 1894), lectotype female (ZSI 6873/9). A, frontal region and antennules, dorsal. B, abdomen, left lateral. C, dorsal (D. Yeo).

Table 1. Geographical distribution of polychelids around Australia according to States and Territories (+ indicates presence). NSW = New South Wales, NT = Northern Territory, QLD = Queensland, SA = South Australia, TAS = Tasmania, VIC = Victoria, WA = Western Australia.

	QLD	NSW	VIC	TAS	SA	WA	NT
P. aculeatus Galil, 2000	+	+				+	
P. auriculatus (Bate, 1878)	+					+	
P. baccatus Bate, 1878	+	+					
P. galil, new species	+					+	
P. enthrix (Bate,1878)	+	+					
P. helleri Bate, 1878	+						
P. kermadecensis (Sund, 1920)	+	+					
P. martini, new species		+					
P. nanus (Smith, 1884)		+		+			
P. sculptus Smith, 1880		+					
P. suhmi (Bate, 1878)		+					
P. surdus Galil, 2000		+	+				
P. typhlops Heller, 1862	+	+				+	
Pe. laevis Bate, 1878	+	+	+	+	+	+	
Pe. validus A. Milne-Edwards, 1880		+		+	+		
W. pacifica Sund, 1920					+		

Alcock (1894) did not designate a unique type in the original account of *P. phosphorus* but listed as his material the specimens collected at *Investigator* stations 112 and 116. Consequently, all specimens of *P. phosphorus* studied by Alcock from *Investigator* stations 112 and 116 were syntypes. In a more complete account of *P. phosphorus,* however, Alcock (1901) listed the illustrated syntype specimen as the "Type of the species", constituting a lectotype designation. Therefore, the remaining specimens of *P. phosphorus* from stations 112 and 116, including the Australian Museum specimen, are paralectotypes. The South Australian Museum specimen is possibly a paralectotype. Unfortunately, the locality data accompanying the *Investigator* specimen in the South Australian Museum is not sufficiently specific. The old registration number of the specimen (ZSI 6879/9) is close to the lectotype and paralectotype and depth range given of "370-500 fm" encompasses that of the stations 112 and 116. On present information, however, the specimen cannot be definitely tied to either of these stations. Examination of the old specimen registers at the Zoological Survey of India might yield further information. Presently, the South Australian Museum specimen must be regarded at most a possible paralectotype.

Galil (2000) showed that Pacific records of *P. phosphorus* by Rathbun (1906) and Griffin & Stoddart (1995) are based on *P. aculeatus, P. auriculatus* and *P. surdus.* Galil's (2000) records of *P. phosphorus* from the Pacific and Western Australia, however, are referable to *P. galil. Polycheles phosphorus* is presently known only from the northeastern Indian Ocean and its distribution in comparison to *P. galil* parallels that of the stomatopod *Squilloides tenuispinis* and *S. leptosquilla.* As in *P. phosphorus, S. tenuispinis* is known only from the northeastern Indian Ocean whereas *S. leptosquilla* like *P. galil* ranges from the western Indian Ocean to the Western Pacific (Ahyong, 2001).

Distribution. - The northeastern Indian Ocean, from the Arabian Sea, Bay of Bengal and Andaman Sea; 366-1354 m (Alcock, 1901).

Polycheles surdus Galil, 2000

Polycheles surdus Galil, 2000: 347-349, Fig. 26 [type locality: off Mozambique, 18°14'S, 37°31'E].

Stereomastis phosphorus - Griffin & Stoddart, 1995: 246 [part, not *S. phosphorus* Alcock, 1894].

Material examined. - 1 ovigerous female (43.0 mm), (AM P60471), E of Gabo Island, Vic, 37°42-39'S, 150°17-18'E, 604-617 m, K97-01-02, 16 Apr.1997; 1 ovigerous female (48.2 mm), (AM P61070), off Bermagui, NSW, 36°12'S, 150°24'E, 494 m, coll. K. Graham, 24 Aug.1999; 1 female (46.6 mm), (ZRC), SE of Bermagui, NSW, 36°43'S, 150°21'E, 521-567 m, FV *Shelley H*, coll. K. Graham, 15 Feb.2000.

Remarks. - The present specimens represent the most southerly records for the species and the first record of the species in Victorian waters. As indicated by Galil (2000), specimens attributed to *P. phosphorus* by

Griffin & Stoddart (1995) are based on *P. aculeatus, P. auriculatus* and *P. surdus*.

Distribution. - Western Indian Ocean to Australia, New Zealand, New Caledonia, Hawaii, French Polynesia and the Nazca Ridge, southeast Pacific; 350-1525 m (Galil, 2000). The Australian range includes New South Wales and Victoria.

DISCUSSION

Galil (2000) listed 14 polychelid species from Australia. As shown above, Galil's (2000) records of *P. phosphorus* from Australia and the Pacific are referable to *P. galil,* new species. With the addition also of *P. martini,* new species, and *P. kermadecensis,* 16 polychelid species are now known from Australia. For convenience, the geographical distributions of polychelids around Australia are tabulated according to Australian States and Territories (Table 1). As shown in the table, most records of Australian polychelids (15 out of 16) are from the east coast (Queensland and particularly New South Wales). Five species are presently known from northwestern Australia (Western Australia). In addition, George (1983) reported *P. nanus* (as *Stereomastis nana*) from Western Australia and his record is perpetuated by Galil (2000). As remarked under the account of *P. galil*, records of *P. nanus* are based on *P. auriculatus* and *P. galil.* Therefore, *P. nanus* is presently excluded from the known fauna of Western Australia.

Two polychelid species are known from Victoria, three from Tasmania and South Australia, and none are yet recorded from the Northern Territory. The disproportionate number of polychelid species known only from New South Wales probably owes largely to the intensive sampling conducted over the past three decades by FRV *Kapala* (formerly NSW Fisheries). Further sampling from outer-shelf habitats around the country will almost certainly yield additional distribution records, if not undescribed species. Most polychelids known from Australia have a wider Indo-West Pacific distribution. Moreover, several species in the Australian fauna are believed to have cosmopolitan distributions, namely: *P. nanus, P. sculptus, P. suhmi, P. typhlops, Pe. laevis* and *Pe. validus* (see Galil, 2000). *Polycheles martini,* however, is presently known only from southeastern Australia and *P. kermadecensis* is known only from eastern Australia and New Zealand.

Key to Species of the Polychelidae
(Modified after Galil (2000))

1. Frontal margin of carapace without dorsal orbital sinus *WILLEMOESIA* 5
- Frontal margin of carapace with dorsal orbital sinus 2

2. Carapace ovate; postorbital and postcervical carinae swollen. Dactyl of pereiopod 5 simple in both sexes ..... *CARDUS* (monotypic: *C. crucifer*)
- Carapace ovate or subrectangular; postorbital and postcervical carinae well-defined or obscure, never swollen. Dactyl of pereiopod 5 simple or chelate in male, always chelate in female 3

3. Epipod of maxilliped 3 longer than ischium. ..... *PENTACHELES* 8
- Epipod of maxilliped 3 shorter than ischium 4

4. Epipod of maxilliped 3 half as long as ischium. Basal antennular segment proximally squat ..... *HOMERYON* 34
- Epipod of maxilliped 3 rudimentary. Basal antennular segment proximally rounded ..... *POLYCHELES* 12

5. Abdominal tergite 6 sculptured 6
- Abdominal tergite 6 nearly smooth 7

6. Lateral margins of carapace posterior to postcervical incision with 10 or fewer spines. Dorsal margin of chela of pereiopod 1 with 2 files of spines ..... *W. inornata*
- Lateral margins of carapace posterior to postcervical incision with 15 or more spines. Dorsal margin of chela of pereiopod 1 with several files of spines ..... *W. leptodactyla*

7. Lateral margins of carapace anterior to cervical incision with 15-19 spines. Abdominal tergites 2-5 with deep oblique grooves. Telson with rounded apex ..... *W. forceps*
- Lateral margins of carapace anterior to cervical incision with 6-10 spines. Abdominal tergites smooth, without deep oblique grooves. Telson with acuminate apex ..... *W. pacifica*

8. Inner angle of dorsal orbital sinus unarmed 9
- Inner angle of dorsal orbital sinus spinose 10

9. Carapace depressed. Abdominal tergites and pleura nearly smooth ..... *Pe. obscurus*
- Carapace convex. Abdominal tergites and pleura set with conical tubercles ..... *Pe. gibbus*

10. Abdominal tergites 1-3 with distinct antrorse tooth ..... *Pe. laevis*
- Abdominal tergites 1-3 without antrorse tooth, at most with blunt rounded prominence 11

11. Outer angle of dorsal orbit unarmed or at most with 2 spines ..... *Pe. validus*
- Anterior margin of carapace between outer orbital

angle and anterolateral spine lined with 3 or 4 spines.. ..... *Pe. snyderi*

12. One rostral spine 13
- Two rostral spines 14

13. Abdominal pleuron 2 trianguloid anteriorly with rounded apex. Uropodal exopod ventrally bicarinate .. .. *P. typhlops*
- Abdominal pleuron 2 semicircular anteriorly, evenly rounded. Uropodal exopod ventrally tricarinate .... *P. perarmatus*

14. Outer proximal margin of basal antennular segment with 1 spine 15
- Outer proximal margin of basal antennular segment with 2 or more spines or acute tubercles 17

15. Median carina of abdominal tergites 1-5 with antrorse spine ..... *P. galil*
- Median carina of abdominal tergites 1-4 with antrorse spine 16

16. Dorsum of carapace between branchial and median postcervical carinae unarmed; branchial carina obsolescent ..... *P. politus*
- Dorsum of carapace between branchial and median postcervical carinae with antrorse spine; branchial carina indicated by row of spines ..... *P. phosphorus*

17. Frontal submarginal tooth prominent, longer than separate rostral spines 18
- Frontal submarginal tooth shorter than rostrum, or rostrum bifid 19

18. Gastro-orbital region bispinose; median postrostral and postcervical carinae irregularly granulate. Abdominal pleuron 2 with broadly convex anteroventral margin. Dorsal margin of first chela prominently spinulose ..... *P. baccatus*
Gastro-orbital region quadrispinose; median postrostral and postcervical carinae set with antrorse tubercles. Abdominal pleuron 2 with concave anteroventral margin. Dorsal margin of first chela granulose ..... *P. coccifer*

19. Inner angle of dorsal orbital sinus unarmed 20
- Inner angle of dorsal orbital sinus spinose 21

20. Antrorse spine on abdominal tergite 5 large, overhanging anterior margin of fourth tergite .... *P. ceratus*
- Antrorse spine on abdominal tergite 5 not as above .... *P. helleri*

21. Median carina on abdominal tergite 5 (usually also tergites 2-4) with short, upright posterior tooth in addition to strong antrorse spine ..... *P. suhmi*
- Median carina on abdominal tergites 2-5 without short, upright posterior tooth 22

22. Frontal margin of carapace with several spinules on either side of rostral spines 23
- Frontal margin of carapace with single spine on inner angle of dorsal orbital sinus 25

23. Median carina on abdominal tergites 2-5 notched or crenulate. Abdominal tergites 2-5 with distinct oblique grooves. Dorsal surface of carapace strongly granulate ..... *P. martini*
- Median carina on abdominal tergites 2-5 entire, without median notch. Abdominal tergites 2-5 relatively smooth, without distinct oblique grooves. Dorsal surface of carapace smooth or spinose but not strongly granulate 24

24. Branchial carinae indicated at most by low granules; branchial groove not flanked by row of spines; gastric region of carapace with 1 or 2 spines of similar size to spines of median carina; postcervical groove without antrorse spine on posterior margin between median carina and branchial carina ..... *P. enthrix*
- Branchial carinae indicated row of 4-6 spines; branchial groove flanked by row of 4-5 small spines; gastric region of carapace covered by numerous spines of similar size to spines of median carina; postcervical groove with antrorse spine on posterior margin between median carina and branchial carina .... *P. kermadecensis*

25. Pereiopod 1 (major cheliped) with carpus one third as long as merus ..... *P. tanneri*
- Pereiopod 1 (major cheliped) with carpus half or more than half as long as merus 26

26. Branchial groove with 1 or more anterior spines 27
- Branchial groove unarmed 30

27. Median carina on abdominal tergite 5 without antrorse spine 28
- Median carina on abdominal tergite 5 with antrorse spine 29

28. Median carina on abdominal tergite 4 with strong antrorse spine. Region of carapace between branchial and median postcervical carinae unarmed posteriorly. ..... *P. pacificus*
- Median carina on abdominal tergite 3 bearing long antrorse spine; median carina on abdominal tergite 4 unarmed anteriorly. Region of carapace between branchial and median postcervical carinae posteriorly spinose. ..... *P. trispinosus*

29. Antrorse spine on abdominal tergite 3 largest; lyre-shaped carina on sixth abdominal tergite prominently denticulate; basal tubercle on telson pointed .... *P. nanus*
- Antrorse spine on abdominal tergite 5 largest; lyre-shaped carina on sixth abdominal tergite smooth; basal tubercle on telson blunt ..... *P. evexus*

30. Median carina of abdominal tergite 5 with antrorse spine 31
- Median carina of abdominal tergite 5 without antrorse spine 32

31. Abdominal tergite 6 bearing denticulate, lyre-shaped, mesial carinae. Lateral margins of carapace posterior to postcervical incision with 8-10 spines .....*P. talismani*
- Abdominal tergite 6 bearing parallel rounded carinae, confluent anteriorly and posteriorly. Lateral margins of carapace posterior to postcervical incision with 6-7 spines .....*P. sculptus*

32. Abdominal pleuron 2 with anterior spine. Posterior margin of cervical groove with single antrorse spine midway between median postcervical and branchial carinae. Frontal submarginal tooth prominent, visible in dorsal view. .....*P. aculeatus*
- Abdominal pleuron 2 without anterior spine. Posterior margin of cervical groove with 2-4 (usually 3-4) antrorse spines midway between median postcervical and branchial carinae. Frontal submarginal tooth small. 33

33. Lateral margins of carapace posterior to postcervical incision with 7-8 spines. Submedian grooves on abdominal terga marked; lyre-shaped carina on sixth tergite prominent .....*P. auriculatus*
- Lateral margins of carapace posterior to postcervical incision with 10-14 spines. Submedian grooves on abdominal tergites obsolescent; lyre-shaped carina on sixth tergite obscure.....*P. surdus*

34. Lateral margins of carapace posterior to postcervical incision cristate, serrulate. Median abdominal carinae blunt. Abdominal pleuron 2 cordiform. Uropods smooth .....*H. asper*
- Lateral margins of carapace posterior to postcervical incision rounded, bearing rows of antrorse spinules. Median abdominal carinae with distinct notch. Abdominal pleuron 2 reniform. Uropods granulate..... .....*H. armarium*

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LITERATURE CITED

Ahyong, S. T., 2001. Revision of the Australian stomatopod Crustacea. *Records of the Australian Museum, Supplement* 26: 1-326.

Alcock, A., 1894. Natural History notes from H. M. Indian marine survey steamer *Investigator,* Commander R. F. Hoskyn, R. N., commanding. Series II, number 1. On the results of deep-sea dredging during the season 1890-91. *Annals and Magazine of Natural History* (6) **13**: 225-245.

Alcock, A., 1899. A summary of the deep-sea zoological work of the Royal Indian Marine Survey Ship *Investigator* from 1884 to 1897. *Scientific Memoirs by Medical Officers of the Army of India,* Calcutta **11**: 1-49.

Alcock, A., 1901a. Zoological gleanings from the Royal Indian Marine Survey Ship *Investigator. Scientific Memoirs by Medical Officers of the Army of India,* Calcutta **12**: 1-76.

Alcock, A., 1901b. *Descriptive catalogue of the Indian Deep Sea Crustacea Decapoda Macrura and Anomura in the Indian Museum. Being a revised account of the deep-sea species collected by the Royal Indian Marine Survey Ship* Investigator. Trustees of the Indian Museum, Calcutta. Pp. 1-286, pls 1-3.

Alcock, A., 1902. *A Naturalist in Indian Seas.* John Murray, London. xxiv + 1-328 pp, Figs 1-98, 1 map.

Alcock, A. & A. R. S. Anderson, 1894. Natural history notes from the H.M. Indian marine survey steamer *Investigator,* Commander C.F. Oldham, R.N., commanding. Series II, No. 14. An account of a recent collection of deep sea Crustacea from the Bay of Bengal and Laccadive Sea. *Journal of the Asiatic Society of Bengal,* Calcutta **63**(2): 141-185.

Anderson, A. R. S., 1896. Natural history notes from the R.I.M. survey steamer *Investigator,* Commander C.F. Oldham, R.N., commanding. Series II, No. 21. An account of the deep sea Crustacea collected during the season 1894-95. *Journal of the Asiatic Society of Bengal,* Calcutta **65**(2): 88-106.

Bage, F., 1938. Crustacea Decapoda (Natantia and Reptania in part). *Australasian Antarctic Expedition 1911-14, Scientific Reports,* Series C, **2**(6): 5-13, Pl. 4.

Bate, C. S., 1878. XXXII. On the *Willemoesia* group of Crustacea. *Annals and Magazine of Natural History,* London, **5**(2): 273-283, Pl. 13.

Bate, C. S., 1888. Report on the Crustacea Macrura dredged by H.M.S. *Challenger* during the years 1873-1876. *Report on the Scientific Results of the Voyage of H.M.S.* Challenger *during the years 1873-76, Zoology,* **24**: 1-942, Pls. 1-154

Bouvier, E. L., 1905a. Sur les Palinurides et les Eryonides recuellis dans l'Atlantique orientale par les expéditions françaises et monégasques. *Comptes Rendus des Séances de l'Académie des Sciences,* Paris **140**: 479-482.

Bouvier, E. L., 1905b. Sur les Crustacés Décapodes (abstraction faite des Carides) recueillis par le yacht *Princesse Alice* au cours de la campagne de 1905. *Comptes rendus des Séances de l'Académie de Sciences,* Paris **141**: 644-647.

Faxon, W., 1893. No. 7. Reports on the dredging operations off the West Coast of Central America to the Galapagos by the *Albatross*. VI. Preliminary descriptions of new species of Crustacea. *Bulletin of the Museum of Comparative Zoology of Harvard College,* Cambridge, Mass., **24**: 149-220.

Firth, R. W. & W. E. Pequegnat, 1971. *Deep sea lobsters of the families Polychelidae and Nephropidae (Crustacea, Decapoda) in the Gulf of Mexico and Carribean Sea.* Texas A & M University, Texas. Pp. 1-106.

George, R. W., 1983. New finds of deepwater "lobsters" on the Northwest Shelf. *Fins* (The fishing Industry News Service, Fisheries Department, Western Australia), **16**(1): 16-20.

Griffin, D. J. G. & H. E. Stoddart, 1995. Deepwater Decapod Crustacea from eastern Australia: Lobsters of the families Nephropidae, Palinuridae, Polychelidae and Scyllaridae, *Records of the Australian Museum* **47**(3): 231-263, Figs 1-17.

Galil, B. S., 2000. Crustacea Decapoda: Review of the genera and species of the family Polychelidae Wood-Mason, 1874. In: A. Crosnier (ed.), Résultats des Campagnes Musorstom, Volume. 21. *Mémoires du Muséum national d'Histoire naturelle*, **184**: 285-387. Figs 1-34, Paris.

Grote, A. R., 1873. "Deidamia". *Nature,* London **8**: 485.

Heller, C., 1862. Beiträge zur näheren Kenntnis der Macrouren. *Sitzungsberichte der Akademie der Wissenschaften in Wien, mathematisch-physikalische Klasse* **45**(1): 389-426.

Lloyd, R. E., 1907. Contributions to the fauna of the Arabian Sea, with descriptions of new Fishes and Crustacea. *Records of the Indian Museum* **1**: 1-12.

Man, J. G. de, 1916. The Decapoda of the Siboga Expedition. Part III. Families Eryonidae, Palinuridae, Scyllaridae and Nephropsidae. *Siboga-Expeditie Monograph,* **39** A2: 1-122.

Milne-Edwards, A., 1880. No.1. Reports on the results of dredging under the supervision of Alexander Agassiz, in the Gulf of Mexico, and in the Caribbean Sea, 1877, 78,79, by the MS coast survey steamer *Blake*. VIII. Études préliminaries sur les Crustacés. *Bulletin of the Museum of Comparative Zoology of Harvard College,* Cambridge, Massachuessetts, **8**: 1-68, pls 1-2.

Rathbun, M. J., 1906. The Brachyura and Macrura of the Hawaiian Islands. *Bulletin of the United States Fish Commission,* Washington **23**(3): 827-930, Pls. 1-24.

Smith, S. I., 1880. Notice of a new species of the "*Willemoesia* Group of Crustacea", recent Eryontidae. *Proceedings of the United States National Museum* **2**: 345-353, Pl. 7.

Smith, S. I., 1884. XV. Report on the Decapod Crustacea of the *Albatross* Dredgings off the East-coast of the United States in 1883. *Report of the United States Fish Commission* **10**(1882): 345-426, Pls. 1-10.

Stebbing, T. R. R., 1917. IX. South African Crustacea. *Annals of the South African Museum,* Cape Town, **17**(1): 23-46, Pls. 1-8.

Sund, O., 1920. The *Challenger* Eryonidea (Crustacea). *Annals and Magazine of Natural History* (9), **6**: 220-226.

Takeda, M. & Y. Hanamura, 1994. Deep-sea shrimps and lobsters from the Flores Sea collected by the R.V. *Hakuho-Maru* during KH-85-1 cruise. *Bulletin of the National Science Museum, series A (Zoology)* **20**(1): 1-37.

Thomson, F. T., 1895. A summary of the scientific results, first part. *Report on the Scientific Results of the Voyage of H.M.S. Challenger during the years 1873-76.* i-xxxi + 1-804.

Willemoes-Suhm, R. von, 1875. Von der *Challenger Expedition. Zeitschrift für Wissenschaftliche Zoologie,* Leipzig **25**: xxv-xlvi.

Wood-Mason, J. & A. Alcock, 1894. *Illustrations of the Zoology of the Royal Indian Marine Surveying Steamer Investigator, under the command of Commander A. Carpenter, R.N., D.S.O., Crustacea Part II.* Pls 6-8. Government Printer, Calcutta.