Revision of the family Latreilliidae Stimpson, 1858 (Crustacea, Decapoda, Brachyura)

Peter CASTRO
Biological Sciences Department, California State Polytechnic University,
Pomona, California 91768-4032 (USA)
pcastro@csupomona.edu

Austin B. WILLIAMS
Deceased in 1999
National Marine Fisheries Service Systematics Laboratory,
National Museum of Natural History, Smithsonian Institution,
Washington DC 20560 (USA)

Lara L. COOPER
Biodiversity Science Branch, Fisheries and Oceans Canada
Ottawa, Ontario, KIA OE6 (Canada)

Castro P., Williams A. B. & Cooper L. L. 2003. — Revision of the family Latreilliidae Stimpson, 1858 (Crustacea, Decapoda, Brachyura). *Zoosystema* 25 (4): 601-634.

ABSTRACT
A study of specimens from around the world and the re-examination of additional material used by Williams for his revision of *Latreillia* Roux, 1830 have lead to a revision of the family Latreilliidae Stimpson, 1858 (Crustacea, Decapoda, Brachyura). The family now consists of two genera: *Latreillia*, with five species (*L. elegans* Roux, 1830, *L. metanesa* Williams, 1982, *L. pennifera* Alcock, 1900, *L. valida* de Haan, 1839, and *L. williamsi* Melo, 1990), and *Eplumula* Williams, 1982, with two species (*E. australiensis* (Henderson, 1888) and *E. phalangium* (de Haan, 1839)). *Latreillia manningi* Williams, 1982, which was described as a western Atlantic species distinct from the Mediterranean and eastern Atlantic populations of *L. elegans*, is now regarded as a very close geographical variant of *L. elegans* because the differences between the two populations are insignificant and overlapping. The revision has resulted in an updated and more detailed definition of the Latreilliidae with the addition of characters such as the type of abdominal holding system and the morphology of the coxae of the last pair of pereopods (P5) of males. The revision has also re-examined our current knowledge of the phylogeny and biogeography of the family. It also reviews carrying behaviour, the use of the P5 for carrying living organisms or non-living objects for camouflaging, among its member species.

KEY WORDS
Crustacea,
Decapoda,
Brachyura,
Latreilliidae,
biogeography,
carrying behaviour,
phylogeny,
revision.

RÉSUMÉ
Révision de la famille Latreilliidae Stimpson, 1858 (Crustacea, Decapoda, Brachyura).
L'examen de spécimens d'origines géographiques très diverses et le réexamen du matériel utilisé par Williams pour sa révision du genre *Latreillia* Roux, 1830 ont permis une révision de la famille Latreilliidae Stimpson, 1858 (Crustacea, Decapoda, Brachyura). Cette famille comprend maintenant deux genres : *Latreillia*, avec cinq espèces (*L. elegans* Roux, 1830, *L. metanesa* Williams, 1982, *L. pennifera* Alcock, 1900, *L. valida* de Haan, 1839 et *L. williamsi* Melo, 1990) et *Eplumula* Williams, 1982, avec deux espèces (*E. australiensis* (Henderson, 1888) et *E. phalangium* (de Haan, 1839)). *Latreillia manningi* Williams, 1982, décrite comme une espèce ouest-atlantique distincte des populations méditerranéennes et est-atlantiques de *L. elegans*, est maintenant considérée comme une variété géographique très proche de *L. elegans* car les différences observées sont minimes et se recouvrent partiellement. La révision a conduit à une mise à jour de la définition des Latreilliidae incorporant de nouveaux caractères, notamment le système de maintien de l'abdomen et la morphologie des coxae de la dernière paire de péréiopodes (P5) des mâles. Un réexamen de nos connaissances sur la phylogénie et la biogéographie de la famille est effectué, tandis que les techniques de camouflage utilisant des organismes vivants, portés grâce aux P5, sont passées en revue.

MOTS CLÉS
Crustacea,
Decapoda,
Brachyura,
Latreilliidae,
biogéographie,
camouflage,
phylogénie,
révision.

INTRODUCTION

The family Latreilliidae Stimpson, 1858 is a small group of long-legged, spider-like brachyuran crabs found on soft bottoms at depths of up to 700 m in mostly tropical and subtemperate waters around the world. The family originally consisted of two genera, *Latreillia* Roux, 1830 and *Latreillopsis* Henderson, 1888. The later, however, is now placed in the Homolidae de Haan, 1839 (see Guinot 1978). Williams (1982) revised the five previously known species of *Latreillia* and described two new species and the genus *Eplumula* for two previously known species of *Latreillia*.

The untimely death of A. B. Williams in 1999 (see Lemaitre & Collette 2000) left unfinished his study of a large number of latreilliids collected by French expeditions across the Indo-west Pacific region. This work reports on the subsequent study of the entire French collection by the first author in addition to more recent French material that was never seen by A. B. Williams. The first author also studied material from around the world deposited at the National Natural History Museum, Smithsonian Institution, Washington DC, which represented the bulk of the specimens studied by Williams in his revision of *Latreillia* (Williams 1982). The study of the combined collections ultimately led to the revision of the family.

TERMINOLOGY AND PRESENTATION

The morphological terminology that is used mostly follows that of Williams (1982). Terms used to refer to the parts of the dorsal surface of the carapace and pereopods are indicated in Figure 1. The measurements given in the text, unless otherwise specified, refer to carapace length (cl) and carapace width (cw). Carapace length was measured across the middle of the carapace from the base of the rostrum to the middle portion of the posterior border of the carapace. The width of the carapace was measured across the

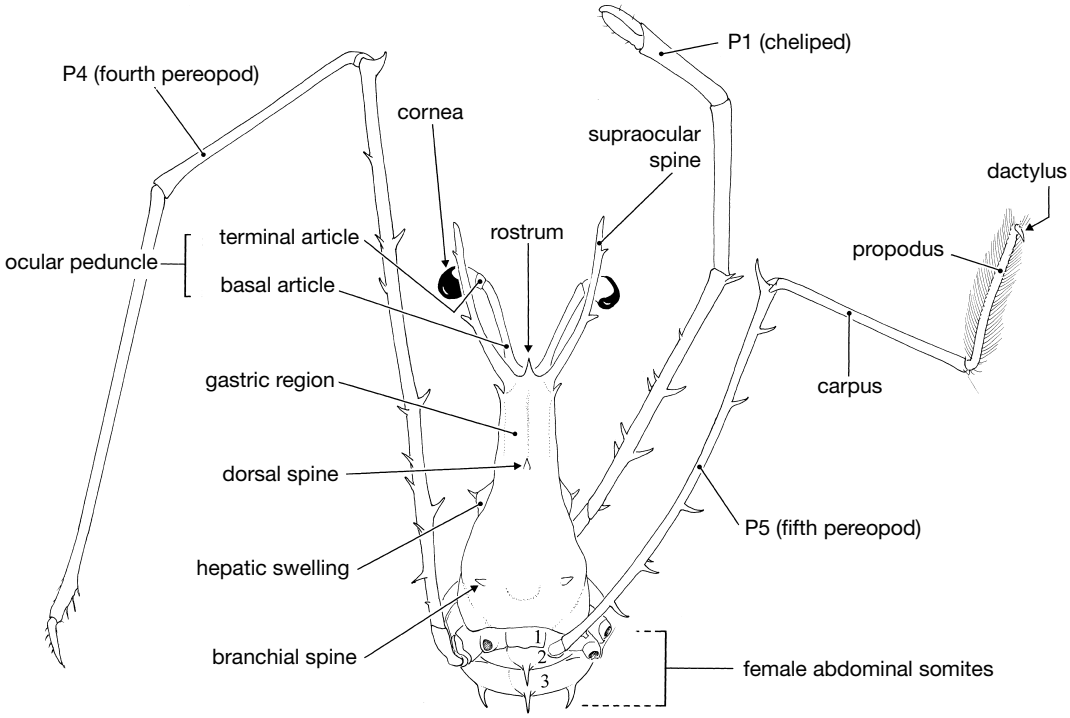

FIG. 1. — Terminology used to describe the carapace and pereopods in members of the family Latreilliidae.

widest breadth of the carapace below the gastric region, or "neck". The length of the gastric region was measured from the base of the rostrum to the point where the carapace expands into the two lateral hepatic swellings. The abdomen was treated as consisting of six somites and a telson.

The lists of synonyms and references that are given for genera and species are only intended to update the lists given by Williams (1982) and to add any missing references. References that contain complete synonymies and/or list of references are identified as such in parentheses.

Additional information on the stations from which most of the material examined was collected is available in the following publications: BATHUS 1 to BATHUS 4, HALIPRO 1, and SMIB 8 (Richer de Forges & Chevillon 1996); BERYX 11 (Lehodey *et al.* 1992); BIOCAL, CHALCAL 2, MUSORSTOM 4 to MUSORSTOM 6, SMIB 4, and *Vauban* trawlings (Richer de Forges 1990); BORDAU 1 (Richer de Forges *et al.* 2000b); CORINDON (Moosa 1984); KARUBAR (Crosnier *et al.* 1997); LAGON and SMIB 5 (Richer de Forges 1991); MUSORSTOM 1 (Forest 1981); MUSORSTOM 2 (Forest 1985); MUSORSTOM 3 (Forest 1989); MUSORSTOM 5 (Richer de Forges *et al.* 1986); MUSORSTOM 8 (Richer de Forges *et al.* 1996); MUSORSTOM 10 (Richer de Forges *et al.* 2000a); and VOLSMAR (Laboute *et al.* 1989). All depth measurements originally given in the English system were converted into meters. Informations about the French cruises in Indo-Pacific are also available on line:
http://www.tropicaldeepseabenthos.org

The material examined is deposited in the following museums: Muséum national d'Histoire naturelle, Paris (MNHN); Nationaal Natuurhistorisch Museum (formerly Rijksmuseum van Natuurlijke Historie), Leiden (RMNH); National Museum of Natural History, Smithsonian Institution,

Washington DC (USNM); The Natural History Museum, London (BMNH); South African Museum, Cape Town (SAM); Western Australian Museum, Perth (WAM); and Zoological Museum, Moscow State University (ZMMU).
Many of the drawings included herein were done by K. H. Moore under the direction of A. Williams. Unfortunately, station data and other information on the identity of most of the specimens that were drawn were lost so no measurements or scale bars could be given in Figures 1, 2, 6, and 10. This information is also missing from most of the specimens from which the scanning electron micrographs of the third maxillipeds (Fig. 3) were prepared.

SYSTEMATICS

Family LATREILLIIDAE Stimpson, 1858

Latreillidea Stimpson, 1858: 226 (corrected to Latreilliidae by Stebbing [1902], see Holthuis [1962: 248]).

Latreilliidae – Stebbing 1902: 23; 1910: 347. — Rathbun 1937: 62, 73. — Barnard 1950: 306, 342. — Zariquiey Álvarez 1968: 307. — Wright & Collins 1972: 31. — Guinot 1978: 235, 236; 1991: 589. — Williams 1982: 228; 1984: 262. — Guinot & Bouchard 1998: 638. — Guinot & Tavares 2001: fig. 16. — Martin & Davis 2001: 74.

Latreillidae – Alcock 1900b: 130, 165. — Borradaile 1903: 576. — Serène 1968: 37. — Sakai 1976: 44. — Dai *et al.* 1986: 34. — Dai & Yang 1991: 39. — Guinot & Richer de Forges 1995: 292. — Konishi *et al.* 1995: 75.

Homolidae (part) – Henderson 1888: ix, 23. — Ihle 1913: 52. — Balss 1957: 107. — Serène & Lohavanijaya 1973: 21, 24.

Thelxiopidae (part) – Gordon 1950: 202, 232. — Monod 1956: 73.

TYPE GENUS. — *Latreillia* Roux, 1830.

GENERA INCLUDED. — *Latreillia* Roux, 1830 and *Eplumula* Williams, 1982.

DIAGNOSIS. — Carapace pyriform, much narrowed anteriorly to form elongated gastric region, or "neck" (Fig. 1). Basal article of ocular peduncle much longer than basal peduncle; rostrum spiniform, short, ventrally deflexed, flanked on each side by long, divergent (horn-like) supraocular spine. *Linea homolica* absent. Eight gills on each side of carapace: one each on epipodites of maxillipeds 1-3, podobranch on maxilliped 2, pleurobranchs on P2-4 (see Balss 1957). Pereopods very elongated and slender, coxae not covered by carapace; last pair (P5) shorter than two preceding pairs, positioned dorsally, adapted in at least some species for carrying camouflaging organisms, each dactylus forming subchela against subdistal spinules on propodus or trailing without forming subchela. Third maxillipeds each with narrow, elongated ischium and merus. Genital openings coxal in both sexes; female with paired spermathecae at level of sternal sutures 7/8. Abdomen of adult females with somites 4-6 fused forming plate; abdomen of males with all somites distinct except *Latreillia williamsi* Melo, 1990, where somites 4-5 fused. Abdominal holding system of males and immature females consisting of distal portion of abdomen fitting into sterno-abdominal depression, tip of telson fitting into horseshoe-shaped sternites 1-2, and homoloid press-button (serrated sternal crest, deep abdominal socket) (see Guinot & Bouchard 1998: figs 9D, 10B; Bouchard 2000: 121, 122, 160, fig. 39F). Male first pleopods very similar in all species, proximally broad, each with one large opening (foramen), outer (dorsal) margin curved, tip narrow, rounded (see Williams 1982: fig. 3). Male second pleopods about 3/4 total length of first pleopods, wide basal opening, slightly curved, cylindrical in cross section, slightly expanded at distal end (not filiform nor styliform). Male P5 coxae rounded, not elongated, similar to female coxae; penis as relatively long, soft papilla.

KEY TO GENERA AND SPECIES OF LATREILLIIDAE STIMPSON, 1858

1. Last pair of pereopods (P5) smooth, without conspicuous setae on propodus (Fig. 2); propodus of P5 half or less than half total length of carpus ..... *Eplumula* (2)

— Last pair of pereopods (P5) with conspicuous setae along full length of propodus, giving it feather-like appearance (Fig. 1); propodus of P5 clearly more than half total length of carpus ..... *Latreillia* (3)

2. Absence of spine on each branchial region of carapace of adults. Dorsal surface of gastric region of carapace ("neck") without a spine except in large females; ventral surface of meri of third maxillipeds without a spine or tubercle (Fig. 3A) except some large females; Australia, New Caledonia, and New Zealand..... *E. australiensis*

— Acute spine on each branchial region of carapace of adult females. Dorsal surface of gastric region of carapace ("neck") always with a spine; ventral surface of meri of third maxillipeds with an acute spine, particularly in females; acute spine on each branchial region of adult females; Japan to the Philippine Islands ..... *E. phalangium*

3. Dactyli of last pair of pereopods (P5) trail, not forming subchelae (Figs 10; 12) 4

— Dactyli of last pair of pereopods (P5) forming subchelae by closing against distal portion of propodi, which have spinules (Fig. 6) 5

4. Dorsal surface of gastric region of carapace with spine. Gastric region short in relation to rest of body, its length less than 0.35 of carapace length (Fig. 12); Indo-west Pacific region ..... *L. valida*

— Dorsal surface of gastric region of carapace without spine (prominence may be present). Gastric region slender in relation to rest of body, its length more than 0.35 of carapace length (Fig. 10); Indian Ocean and western Pacific ..... *L. pennifera*

5. Abdominal somites 4-5 of males fused; Atlantic coast of southern South America .... *L. williamsi*

— Abdominal somites 4-5 of males distinct, not fused..... 6

6. Dorsal surface of gastric region of carapace with well defined spine in juveniles and many small adults; Indo-west Pacific and eastern Pacific regions ..... *L. metanesa*

— Dorsal surface of gastric region of carapace without well defined spine, rarely in juveniles and small adults, although prominence may be present; Mediterranean Sea and eastern and western Atlantic Ocean..... *L. elegans*

Genus *Eplumula* Williams, 1982

Eplumula Williams, 1982: 229.

Eplumura [sic] – Takeda 1995: 138.

Eplumra [sic] – Gosliner *et al.* 1996: 235. — Minemizu 2000: 187.

TYPE SPECIES. — *Latreillia phalangium* de Haan, 1839 by original designation (Williams 1982: 229). Gender: feminine.

DIAGNOSIS. — Last pair of pereopods (P5) conspicuously short, total length of each appendage shorter than merus of third pair (P4) (Fig. 2); each propodus of P5 half or less that half length of carpus of P5; without conspicuous, feather-like setae on sides, distally flattened, broadened, often distally spinose; dactyli forming subchelae (Fig. 2; see also Williams 1982: fig. 1a).

REMARKS

Williams (1982) proposed *Eplumula* on the basis of the characteristic nature of the last pair of pereopods (P5) of two species of *Latreillia*: *L. australiensis* Henderson, 1888 and *L. phalangium* de Haan, 1839. The P5 are shorter than the merus of the P4, their propodi are distally flattened and broadened, and lack the feather-like setae of *Latreillia*.

Eplumula australiensis (Henderson, 1888) (Figs 2; 3A; 4)

Latreillia australiensis Henderson, 1888: 24, pl. 2, fig. 4, 4a, 4b. — Dell 1968: 23. — Campbell 1971: 30. — Rice 1981: fig. 2b. — Wear & Fielder 1985: 20, figs 43-48.

Eplumula australiensis – Williams 1982: 230, fig. 8 (references). — McLay 1988: 76, fig. 12. — Muraoka 1992: fig. 2C, D. — Davie 2002: 250.

TYPE MATERIAL. — Lectotype: 1 ♀ 10.2 × 6.2 mm, *Challenger*, stn 163A (BMNH 1888.33); paralectotypes: 1 ♀ 9.7 × 5.4 mm, *Challenger*, stn 163A; 1 ♂ 6.6 × 4.0 mm; 1 ♀ 6.7 × 4.0 mm, *Challenger*, off Port Jackson (BMNH 1888.33). Henderson (1888: 25), however, mentioned material from stn 163A of the *Challenger* as "two adult specimens, male and female, the latter bearing ova, and the remains of a third immature individual". The four specimens used by Henderson in his description represent the syntypes. One of the four syntypes, the largest and only complete female from stn 163A, is hereby designated as the lectotype, and the remaining three specimens, the second female from stn 163A and the male and female from the Port Jackson station, as the paralectotypes.

TYPE LOCALITY. — Australia, New South Wales, Twofold Bay, *Challenger*, stn 163A, 274 m.

MATERIAL EXAMINED. — **Western Australia.** Bluefin, W Rottnest I., 146 m, 10.VIII.1962, R. W. George coll., 3 ♂♂ (WAM C28957). — W Rottnest I., 155-174 m, 12.VIII.1962, R. W. George coll., 1 ovig. ♀ (WAM C28930). — NW Rottnest I., 154-162 m, 15.VIII.1962, R. W. George coll., 1 undet. sex (WAM C28948).
CSIRO, stn 131, 27°40'S, 113°02'E, 128 m, 22.VIII.1962, 2 ♂♂, 1 ovig. ♀ (WAM C28962).
Off Cape Naturaliste, CSIRO, stn 134, 137-155 m, 20.VIII.1963, 1 ♂, 1 ovig. ♀, 1 undet. sex (WAM C28947). — W. Rottnest I., stn 144, 110 m, 1963, 3 ♂♂, 3 ♀♀, 4 ovig. ♀♀ (WAM C28946). — Stn 178, 22°52'S, 113°29'E, 135 m, 6.X.1963, 1 ♂ (WAM C28945). — Stn 187, 23°39'S, 113°11'E, 134 m, 7.X.1963, 2 ♂♂ (WAM C28937), 1 ♂, 1 ♀, 2 ovig. ♀♀ (WAM C28938). — Stn 192, 24°04'S, 112°52'E, 137 m, 8.X.1963, 7 ♂♂, 2 ♀♀, 9 ovig. ♀♀ (WAM C28954). — Stn 197, 24°59'S, 112°27'E, 130 m, 8.X.1963, 1 juv. ♀ (WAM C28953). — Stn 199, 25°30'S, 112°08'E, 200 m, 8.X.1963, 1 ♀ (WAM C28943). — Stn 200, 25°31'S, 112°29'E, 130 m, 9.X.1963, 2 ♀♀ (WAM C28944). — Stn 204, 27°18'S, 113°16'E, 99 m, 9.X.1963, 1 ♂, 1 ovig. ♀ (WAM C28952). — Stn 208, 27°40'S, 113°20'E, 18 m, 10.X.1963, 1 ovig. ♀, 1 undet. sex (WAM C28950), 1 ovig. ♀ (WAM C28949), 1 ovig. ♀ (WAM C28933). — Stn 225, 32°00'S, 115°16'E, 137-143 m, 12.X.1963, 3 ♂♂, 4 juv. ♀♀, 3 ♀♀, 4 ovig. ♀♀, 1 undet. sex (WAM C28935), 1 ♂ (WAM C28951).
CSIRO, stn 12, 24°58'S, 112°30'E, 130 m, 30.I.1964, 1 ovig. ♀ (WAM C28939). — Stn 17, 22°59'S, 113°25'E, 130 m, 31.I.1964, 1 ovig. ♀ (WAM C28934). — Stn 29, 24°00'S, 112°51'E, 128-130 m, 2.II.1964, 1 ♂ (WAM C28942). — Stn 40, 28°14'S, 113°28'E, 101 m, 4.II.1964, 3 ♂♂, 1 ovig. ♀ (WAM C28941). — Stn 46, 31°05'S, 114°55'E, 113-141 m, 5.II.1964, 1 ovig. ♀ (WAM C28928). — Stn 50, 32°03'S, 114°20'E, 113-135 m, 15.II.1964, 1 juv. ♀ (WAM C28956), 2 ♂♂ (WAM C28940). — Stn 54, 29°05'S, 113°56'E, 130-148 m, 16.II.1964, 1 ♂, 2 juv. ♀♀ (WAM C28936).
Diamantina, cruise 1/70, stn 4, 32°33'S, 115°04'E, 110 m, 23.XI.1970, 1 ovig. ♀ (WAM C17632). — Stn 17, 34°04'S, 114°40.2'E, 146 m, 24.XI.1970, 1 ♂ (WAM C17520). — Stn 37, 30°55'S, 114°48'E, 146 m, 27.XI.1970, 1 ♂ (WAM C28929). — Stn 55, 31°30'S, 115°08'E, 110 m, 28.XI.1970, 1 ovig. ♀ (WAM C17628). — Stn 106, 29°31'S, 114°10'E, 219 m, 8.XII.1970, 1 ♂ (WAM C17625).
Diamantina, cruise 1/72, stn 2, 32°24.6'S, 115°07'E, 219 m, 14.III.1972, 2 ♂♂, 2 juv. ♀♀, 1 ovig. ♀ (WAM C17332). — Stn 4, 32°24.5'S, 115°07'E, 146 m, 15.III.1972, 1 ♂ (WAM C17181). — Stn 5, 33°S, 114°38'E, 256 m, 15.III.1972, 1 juv. ♂ (WAM C17457). — Stn 8, 32°57'S, 114°48'E, 139-122 m, 15.III.1972, 2 ♂♂ (WAM C17180). — Stn 9, 33°30'S, 114°31'E, 250-237 m, 15.III.1972, 1 ovig. ♀ (WAM C17182). — Stn 20, 34°10'S, 114°31'E, 148 m, 16.III.1972, 1 ovig. ♀ (WAM C17192). — Stn 21, 33°44.5'S, 114°26.1'E, 238-183 m, 16.III.1972, 1 ovig. ♀ (WAM C17186). — Stn 35, 31°45'S, 115°02'E, 265-276 m, 18.III.1972, 1 ♂, 4 ovig. ♀♀ (WAM C17268). — Stn 42, 30°58'S, 114°47'E, 289 m, 18.III.1972, 1 ♂ (WAM C17449). — Stn 48, 30°10'S, 114°13'E, 174-179 m, 19.III.1972, 1 ♂ (WAM C17389), 1 ♂ (WAM C17389), 1 ♂ (WAM C17388). — Stn 51, 29°33'S, 114°19.5'E, 152-157 m, 19.III.1972, 1 ovig. ♀ (WAM C17519). — Stn 54, 29°43'S, 114°17'E, 274-283 m, 20.III.1972, 1 ♂ (WAM C17380). — Stn 55, 29°15'S, 114°01'E, 146 m, 20.III.1972, 1 ♂ (WAM C17372). — Stn 60, 29°30'S, 114°10'E, 183-194 m, 21.III.1972, 1 ♂ (WAM C17394). — Stn 63, 29°58'S, 114°27'E, 287-300 m, 22.III.1972, 1 juv. ♀ (WAM C17332). — Stn 64, 29°58'S, 114°24'E, 197-219 m, 22.III.1972, 1 ovig. ♀ (WAM C17329). — Stn 68(3), 30°34'S, 114°44'E, 128 m, 22.III.1972, 3 ♂♂, 1 ovig. ♀ (WAM C17345). — Stn 73(1), 31°04'S, 113°50'E, 256 m, 23.III.1972, 2 ♂♂, 10 ovig. ♀♀ (WAM C17365). — Stn 73(2), 31°04'S, 113°50'E, 274 m, 23.III.1972, 2 ♂♂ (WAM C17364). — Stn 79, 31°59'S, 115°14'E, 182 m, 23.III.1972, 6 ♂♂ (WAM C17274).
Southeastern Australia. New South Wales, *Challenger*, stn 163A, off Twofold Bay, 274 m, 1 ovig. ♀ lectotype, 1 ♀ paralectotype. — Off Port Jackson, 55-64 m, 1 ♂ paralectotype, 1 ♀ paralectotype (BMNH 1888.33).
Bass Strait, F.I.S. *Endeavour*, 1909-1914, 1 ♂, 1 ovig. ♀ (USNM 551339).
CSIRO, Cronulla, 75 m, 7.XI.1963, 2 ♂♂, 3 ♀♀, 1 ovig. ♀ (WAM C28958). — Cronulla, 60-100 m, 5.XII.1963, 1 ♂ (WAM C28931).
New Caledonia. MUSORSTOM 5, stn 288, 24°04.8'S, 159°38.8'E, 270 m, 10.X.1986, 3 ♂♂,

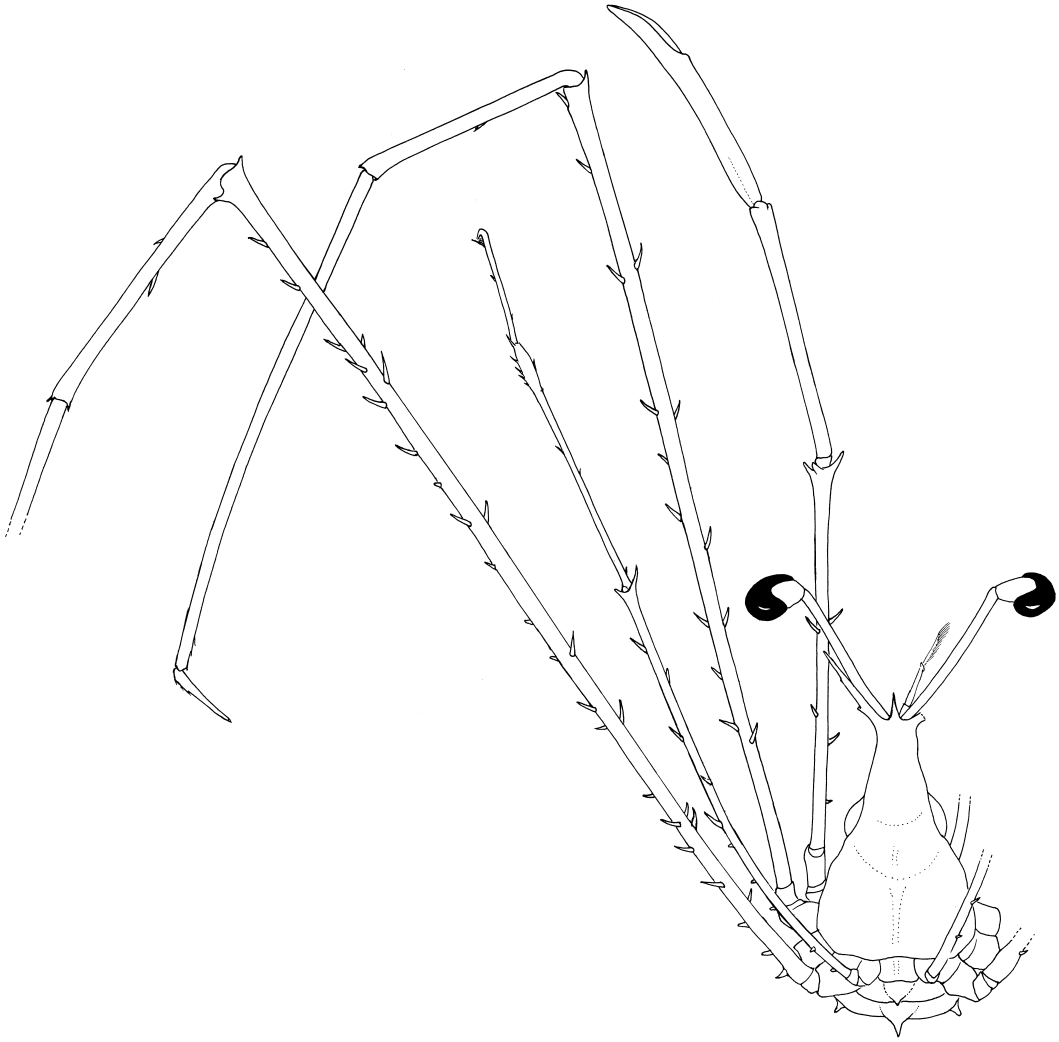

FIG. 2. — *Eplumula australiensis* (Henderson, 1888), New Caledonia, station data unrecorded, ♀, dorsal view, right pereopods omitted.

1 ♀ (MNHN-B 28107). — Stn 289, 24°01.5'S, 159°38.4'E, 273 m, 10.X.1986, 1 ♂ (MNHN-B 28108).
BATHUS 2, stn CP 728, 22°47.11'S, 167°28.11'E, 241-245 m, 12.V.1993, 1 ovig. ♀ (MNHN-B 28109).
BATHUS 3, stn CH 801, 23°39'S, 158°00'E, 270-300 m, 27.XI.1993, 1 ♂ (MNHN-B 28319).

DIAGNOSIS. — Dorsal surface of gastric region of carapace lacking spine (Fig. 2) except in large females. Gastric region slender in appearance, length 0.4 or more of carapace length. Hepatic swellings each topped by tubercle or spine in large females only. Supraocular spines slightly shorter or same length than ocular peduncles. Meri of third maxillipeds without tubercle or tooth on ventral surface (Fig. 3A) except in large females. Abdomen of adult males with middorsal protuberance on somite 1, acute spine on somite 2. Abdomen of adult females with middorsal protuberance on somite 1, slender spine on each somite 2, 3 (Fig. 2); somites 4-6 broad and fused, with proximal spines laterally near articulation with somite 3, sometimes with midlateral pair on fused somite 5 in largest females.

DISTRIBUTION. — Eastern and southeastern Australia as far north as off Moreton Bay, southeastern Queensland (P. Davie pers. comm.) and as far south as Bass Strait between Victoria and Tasmania. Also known from the southwestern coast of Western Australia and the

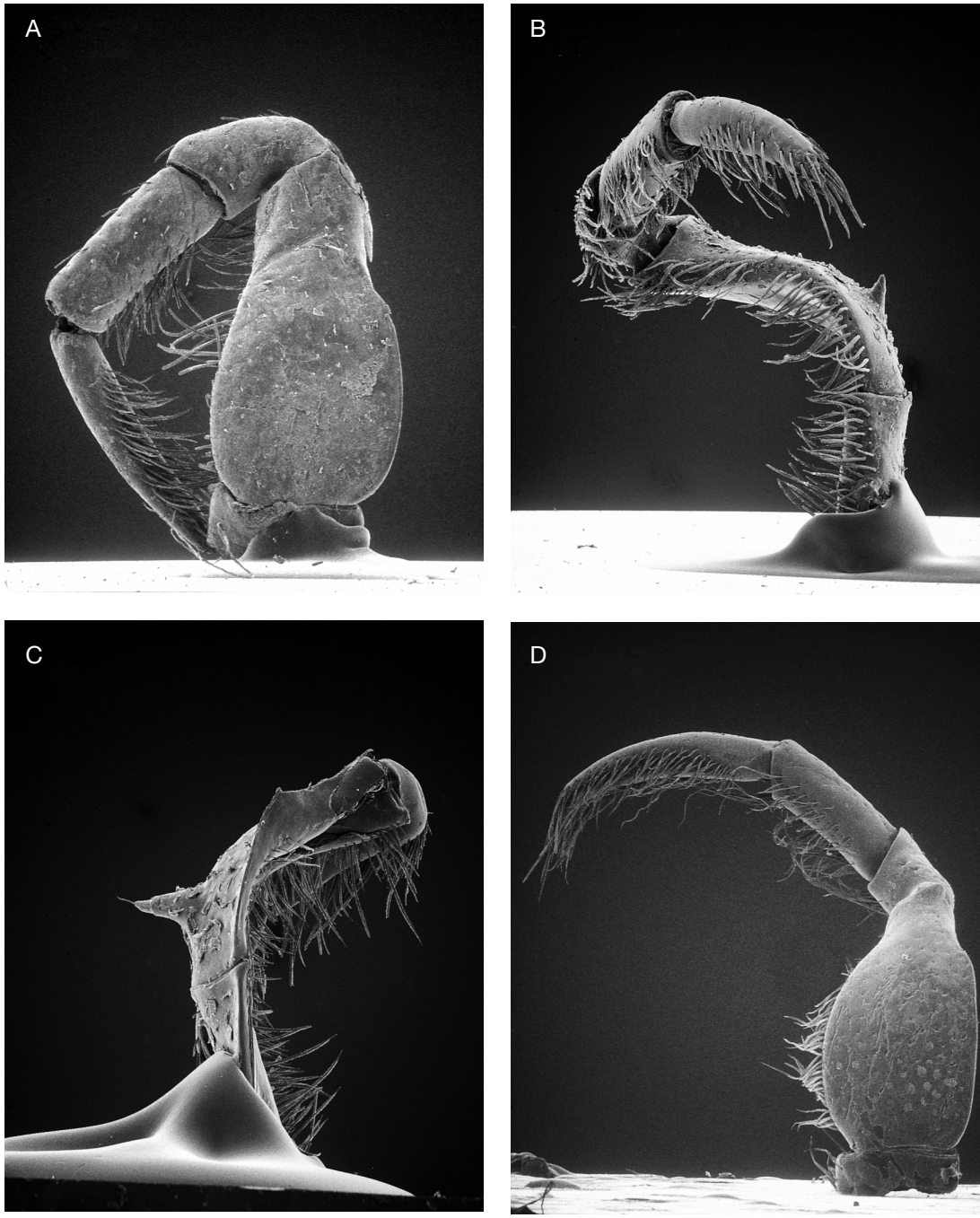

FIG. 3. — Scanning electron micrographs of right third maxillipeds; **A**, *Eplumula australiensis* (Henderson, 1888), station data unrecorded; **B**, *Latreillia elegans* Roux, 1830, Massachusetts, station data unrecorded; **C**, *Latreillia metanesa* Williams, 1982, New Caledonia, CHALCAL 2, stn DW 83, 200 m, juv. ♀ 7.5 × 4.4 mm (MNHN-B 28131); **D**, *Latreillia valida* de Haan, 1839, Philippine Islands, station data unrecorded.

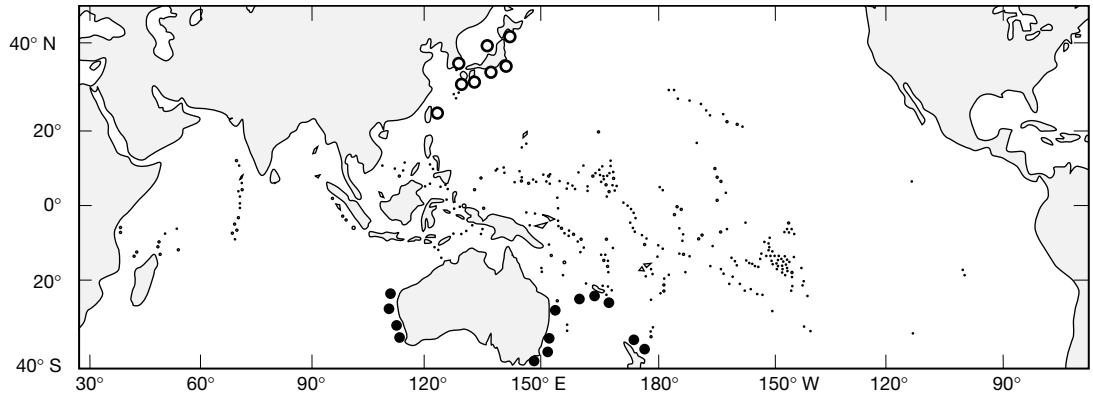

Fig. 4. — Geographical distribution of *Eplumula australiensis* (Henderson, 1888) (●) and *E. phalangium* (de Haan, 1839) (○).

northern coast of North Island, New Zealand (Fig. 4). It is here recorded from Western Australia and New Caledonia for the first time. Depth: 55-300 m.

REMARKS

The size and shape of the teeth and spines of the carapace and abdomen vary according to sex. The dorsal spine and the spine on each hepatic swelling are well developed in the largest females but typically absent in males and in smaller females. Henderson (1888: 25) reported the spines (as "cardiac" and "buccal" spines) as absent in the type material and this absence was used as a difference between his new species and *E. phalangium* (as *L. phalangium*). The presence of spines as well as their relative size varies with overall size in females. Largest females also show a pair of acute midlateral spines on fused abdominal somite 5, as in the case of *L. metanesa* (see Fig. 8). The tooth on each merus of the third maxillipeds is present only in the largest females and in small and juvenile males. The chelae (P1) are thicker in males than in females.

Size

Maximum size: ♂ cl 15.3 mm, ♀ cl 19.0 mm (Dell 1963).

Eplumula phalangium (de Haan, 1839) (Fig. 4)

Latreillia phalangium de Haan, 1839: 108, pl. 30, fig. 2, pl. H. — Utinomi 1956: 68, pl. 34, fig. 6. — Sakai 1956: 6; 1960: 29, pl. 14, fig. 7 (colour). — Takeda 1973a: 11; 1973b: 23; 1977: 74; 1978: 76; 1979: 153; 1982a: 90 (colour); 1982b: 18; 2001: 221, 254, 257. — Kim & Kim 1982: 136, 148. — Kim & Chang 1985: 44. — Guinot 1991: fig. 9.

?*Latreillia phalangium* – Yamaguchi & Holthuis 2001: 73, 75 (figure).

Eplumula phalangia – Miyake *et al.* 1962: 126.

Eplumula phalangium – Williams 1982: 230, figs 1a, 8 (references). — Yamaguchi *et al.* 1987: 7, pl. 1, fig. 7. — Muraoka 1989: 47, figs 1, 2; 1992: fig. 2A, B, E. — Yamaguchi & Baba 1993: 292, fig. 85. — Takeda 1997: 234. — Ikeda 1998: 25, fig. 4. — Minemizu 2000: 186 (unnumbered colour photographs). — Tan *et al.* 2000: 186. — Ng *et al.* 2001: 6. — Chen & Sun 2002: 39, 162, fig. 69.

Eplumura [sic] *phalangium* – Takeda 1995: 138.

Eplumra [sic] *phalangium* – Gosliner *et al.* 1996: 235.

Non *Eplumula phalangium* – Zarenkov 1990: 224, fig. 5 I-II (= *Latreillia metanesa* Williams, 1982).

TYPE MATERIAL. — Lectotype: 1 ♂ 12.0 × 7.2 mm; paralectotypes: 1 ♂ 9.3 × 5.4 mm, 1 ♂ 9.7 × 6.5 mm, 1 ♀ 7.0 × 4.1 mm, 1 ♀ 8.9 × 5.1 mm, H. Bürger leg., 1825-1834 (RMNH D 42205). Lectotype selected by Yamaguchi & Baba (1993: 292, fig. 85). See also Fransen *et al.* (1997: 81).

TYPE LOCALITY. — Japan.

MATERIAL EXAMINED. — **Japan.** Honshu, *Albatross*, stn 3700, Seno-umi, 113 m, 7.V.1900, 2 ♂♂, 2 ovig. ♀♀ (USNM 74566). — Stn 3702, 74-56 m, 1 ♂, 1 ♀, 5 ovig. ♀♀ (USNM 74560). — Stn 3703, 56 m, 1 ♂ (USNM 74574), 1 ♂ (USNM 134139). — Stn 3707, off Ose-zaki Lighthouse, 113-135 m, 8.V.1900, 1 ♂, 2 ovig. ♀♀ (USNM 134140). — Stn 3708, 108-126 m, 8.V.1900, 6 ♂♂, 1 ♀, 1 ovig. ♀ (USNM

74562), 5 ♂♂, 2 ♀♀, 2 ovig. ♀♀ (USNM 74571), 1 ♀ (USNM 134141). — Stn 3713, 81-86 m, 11.V.1900, 1 ovig. ♀ (USNM 134142). — Stn 3715, 117-122 m, 11.V.1900, 1 ♂ (USNM 134143). — Stn 3716, 117-225 m, 11.V.1900, 1 ♂, 1 ♀ (USNM 17231). — Stn 3717, 135-180 m, 11.V.1900, 1 ♂, 1 ovig. ♀ (USNM 134144). — Stn 3718, 117 m, 11.V.1900, 1 ovig. ♀ (USNM 171683). — Stn 3720, 113 m, 1 ♂ (USNM 74564). — Stn 3727, off Omaezaki Lighthouse, 61 m, 16.V.1900, 3 ♂♂, 2 ♀♀, 2 ovig. ♀♀ (USNM 74573), 1 ovig. ♀ (USNM 74565). — Stn 3729, 61 m, 3 ♂♂, 4 ovig. ♀♀ (USNM 74561). — Stn 3730, 61 m, 24 ♂♂, 1 ♀, 11 ovig. ♀♀ (USNM 74587). — Stn 3740, 117 m, 17.V.1900, 1 ♀ (USNM 74572). — Stn 3733, 88 m, 1 ♂, 1 ♀ (USNM 74568). — Stn 3754, off Sunozaki, 86-94 m, 19.V.1900, 1 ♀ (USNM 3754). — Stn 3740, 117 m, 17.V.1900, 1 ♀ (USNM 74572). — Stn 3762, off Suno-zaki, 76 m, 22.V.1900, 1 ovig. ♀ (USNM 74567), stn 3763, 88-94 m, 1 ♂ (USNM 74563). — Stn 3775, off Kinkwasan Lighthouse, 104 m, 5.VI.1900, 3 ♂♂, 4 ovig. ♀♀ (USNM 172322). — Stn 4815, off Niigata, 38°16'N, 138°52'E, 126 m, 18.VII.1906, 12 ♂♂, 8 ♀♀, 6 ovig. ♀♀ (USNM 134148). — Stn 4816, off Niigata, 38°14'N, 138°54'E, 115 m, 18.VII.1906, 3 ♂♂, 1 ovig. ♀ (USNM 134149). — Stn 4817, off Niigata, 38°12'N, 138°52'E, 110 m, 18.VII.1906, 6 ♂♂, 3 ovig. ♀♀ (USNM 134150). — Stn 4877, off Okino-shima I., 34°20'N, 130°11'E, 106 m, 2.VIII.1906, 1 ♂ (USNM 134151). — Stn 5095, Uraga Strait, 35°05.5'N, 139°38.5'E, 104 m, 26.X.1906, 1 ♂ (USNM 171682), 1 ovig. ♀ (USNM 134156).

Odawara, G. Droppers leg., 2 ♂♂, 1 ovig. ♀ (USNM 18868). — Misaki, bought from Kuma-san, 1930, A. S. Pearse leg., 1 ♀ (USNM 63686). — Near Tokyo, 1905, J. Harmand coll., 3 ♂♂, 1 ovig. ♀, 1 undet. sex (MNHN-B 13763).

Kyushu. *Albatross*, stn 4893, off Goto I., 32°32'N, 128°32'E, 171-191 m, 9.VIII.1906, 4 ♂♂, 2 ovig. ♀♀ (USNM 134152), 3 ♂♂, 3 ovig. ♀♀ (USNM 172320). — Stn 4902, off Goto I., 32°30'N, 128°34'E, 250 m, 10.VIII.1906, 1 ♂ (USNM 134154), 1 ♂ (USNM 173108). — Stn 4904, off Goto I., 32°31.3'N, 128°32'E, 193 m, 10.VIII.1906, 1 ovig. ♀ (USNM 134155).

Ibusuki, T. Urita coll., 1 ovig. ♀ (USNM 48459).

Unknown Japanese locations. Palos, stn? 2325, 1881, F. C. Dale & P. L. Jouy coll., 1 ♀ (USNM 23325). — G. A. Frank coll., 1 ♂ (MNHN-B 12354).

Taiwan. TAIWAN 2000, stn CP 58, 24°35.1'N, 122°05.8'E, 221 m, 4.VIII.2000, 2 ♂♂, 2 ♀♀ (MNHN-B 28475).

TAIWAN 2001, stn CP 83, 24°51.4'N, 121°57.4'E, 75-110 m, 8.V.2001, 15 ♂♂, 2 ♀♀, 10 ovig. ♀♀ (MNHN-B 28467). — Stn CP 93, 24°50.1'N, 121°55.7'E, 66-110 m, 10.V.2001, 1 ovig. ♀ (MNHN-B 28468). — Stn CP 116, 24°55.4'N, 122°00.4'E, 100 m, 21.V.2001, 1 ovig. ♀ (MNHN-B 28469). — Stn CP 119, 24°56.6'N, 122°01.7'E, 123-140 m, 31.VII.2001, 2 ♂♂, 1 ♀ (MNHN-B 28470).

DISTRIBUTION. — Japan and southern Korea to Taiwan (Fig. 4). It is also known from the Philippine Islands (Gosliner *et al.* 1996: 235, as *Eplumra* [sic] *phalangium*). Depth: 30-307 m (Takeda 2001).

DIAGNOSIS. — Dorsal surface of gastric region of carapace topped by spine, more prominent and acute in females (see Sakai 1965: fig. 1a, b). Gastric region relatively short, not slender in appearance (0.5 or less carapace length), especially in females. Supraocular spines typically longer than ocular peduncles. Hepatic swellings each topped by spine, more prominent and acute in females. Branchial regions of adult females usually with spine on each side (see Sakai 1965: fig. 1a, b). Merus of each third maxilliped typically with obtuse tubercle or acute tooth on ventral surface, particularly in females. Abdomen of adult males with middorsal protuberance on somite 1, acute spine on somite 2. Abdomen of adult females with middorsal protuberance on somite 1, acute spine on each somite 2, 3; somites 4-6 broad and fused, with proximal spines laterally near articulation with somite 3 and sometimes with midlateral pair on fused somite 5 in largest females.

REMARKS

Specimens of this species that have lost the last pair of pereopods (P5) can be easily confused with *L. valida*, because both have a relatively short gastric region that is topped by a dorsal spine, and both are sympatric in distribution. *Eplumula phalangium* can be differentiated from *L. valida* by having supraocular spines that are longer or as long as the ocular peduncles, an acute spine on each hepatic swelling, an acute spine or tubercle on the third maxillipeds of females and small males (see Sakai 1965: fig. 1), and a slightly longer gastric region, typically more than 0.5 total length (0.5 or less total length in *E. phalangium*). The supraocular spines are markedly shorter in *L. valida* (Fig. 12) and there are no spines on the hepatic swellings or on the merus of the third maxillipeds (Fig. 3D).

As in *E. australiensis*, there is a marked sexual dimorphism in the size and shape of the teeth and spines of the carapace. The dorsal spine and the spine on each hepatic swelling are longer, thicker, and more acute in females than in males, and lateral teeth (also long and acute) are present only in females (see Sakai 1965: fig. 1a, b). The

tooth on each merus of the third maxillipeds is also longer and more acute in females. As in other members of the family, the chelae (P1) of males are thicker than those of females. The carapace is proportionally wider in males than in females, and the gastric region is noticeably bowed dorsally in females (see Williams 1982: 231).

Size

Maximum size: ♂ 12.4 × 7.9 mm, ♀ 14.0 × 9.5 mm (Williams 1982).

Genus *Latreillia* Roux, 1830

Latreillia Roux, 1830: unnumbered page, pl. 22. — Guinot & Richer de Forges 1981: 559. — Williams 1982: 232 (synonymy and references).

Proctor Gistel, 1848: ix (erroneously substituted for *Latreillia* [see Rathbun 1937: 73]).

Latreilla [sic] – Gosliner *et al.* 1996: 235.

TYPE SPECIES. — *Latreillia elegans* Roux, 1830 by monotypy. Gender: feminine.

DIAGNOSIS. — Total length of each last pair of pereopods (P5) greater than merus of fourth pair (P4) (Figs 6; 10; 12); propodus of each P5 shorter or longer than carpus; conspicuous, feather-like setae on both lateral margins, distal end not conspicuously broadened; dactyli forming subchelae or trailing without forming subchela.

REMARKS

Williams (1982), in separating *Latreillia* from *Eplumula*, placed more importance on the morphology of the last pair of pereopods (P5) than on the nature of the dactyli of the same. Although in the two species of *Eplumula* the dactylus forms a subchela, the same situation is present in three of the five known species of *Latreillia* (*L. elegans*, *L. metanesa* and *L. williamsi*), while a trailing, non-subchelate dactylus is present in the remaining two (*L. pennifera* and *L. valida*). Although the presence of a unique, non-subchelate arrangement is of generic importance, similarities in other characters (i.e. total length, shape, and setation of P5) among the seven species are significant enough that they do not merit the separation of *Latreillia* into two genera.

Latreillia elegans Roux, 1830
(Figs 3B; 5)

Latreillia elegans Roux, 1830: pl. 22, unnumbered page. — Monod 1956: 78 (references). — Manning & Holthuis 1981: 25. — Rice 1982: 205. — Williams 1982: 238, figs 3b, 8 (synonymy and references). — Debelius 2001: 95 (unnumbered colour photograph).

Latreillia manningi Williams, 1982: 233, figs 1b, c, 2a-e, 3a, 8 (synonymy and references). — Williams 1984: 262, fig. 194a-d. — Manning & Chace 1990: 44. — Guinot 1991: figs 6-8.

Latreillia elegans elegans – d'Udekem d'Acoz 1999: 34, 41, 187 (references). — Türkay 2001: 290.

Latreillia elegans manningi – d'Udekem d'Acoz 1999: 41.

TYPE MATERIAL. — Holotype of *L. elegans*: 1 ♀ 13.9 × 6.9 mm, Sicily, Cabinet P. Roux (RMNH D 42204; see Fransen *et al.* 1997: 81).
Holotype of *L. manningi*: 1 ♂ 9.8 × 5.0 mm, State University of Iowa Bahama Expedition, stn 52, American Shoal Light, Florida, 192-201 m (USNM 5707).
Paratypes of *L. manningi*: 1 ♂ 6.5 × 3.5 mm, off La Habana, Cuba, 234 m (USNM 21697); 1 ♂ 6.7 × 3.5 mm, 3 ♂♂, 4 ♀♀, Nantucket Shoals, 39°54'N, 69°51'W, 241 m (USNM 19296), plus 3 other specimens, 1 ♂, south of Cape Lookout, 34°39'N, 75°33'W, 193 m (USNM 21698), 2 ovig. ♀♀, off Key West, 24°19'N, 81°39'W, 216 m (USNM 55989), 1 ♀, same as holotype, (USNM 172323). Contrary to Williams' (1982: 237) indication, no paratypes are deposited at RMNH.

TYPE LOCALITY. — Italy, Sicily.

MATERIAL EXAMINED. — **Adriatic Sea.** Off southern Italy, 42°32'N, 17°10'E, 2 ♂♂, 1 ovig. ♀ (USNM 15218).
Sicily. 1 ovig. ♀ (USNM 152219).
Algeria. 1 ♂ (MNHN-B 16554).
Western Sahara. *Talisman*, stn 66, 26°13'N, 17°10'W, 175 m, 8.VII.1883, 1 juv. ♀ (MNHN-B 16555).
Cape Verde Islands. *Talisman*, off La Praya, 229 m, 23.VII.1883, 1 juv. ♂, 1 juv. ♀ (MNHN-B 16556).
St Helena. Dredging 6, 1 ♂ (MNHN-B 17838).
Eastern United States. Fish Hawk, Nantucket Shoals, 39°54'N, 59°51'W, 241 m, 8.IV.1885, 1 ♂ (USNM 19296). — South of Cape Lookout, 180-260 m, 1 ♂ (USNM 51060). — Off Key West, 24°17'N, 81°58'W, 238 m, 14.II.1902, 1 ♂ (USNM 67740). Straits of Florida, 25°15'N, 79°15'W, 236 m, 30.I.1964, 1 juv. ♂ (USNM 136827).
Cuba. *Albatross*, stn 2320, off La Habana, 23°10'N, 82°18'W, 234 m, 17.I.1885, 1 ♂ paratype (USNM 21697), 1 ♂ paratype of *L. manningi* (USNM 19296).

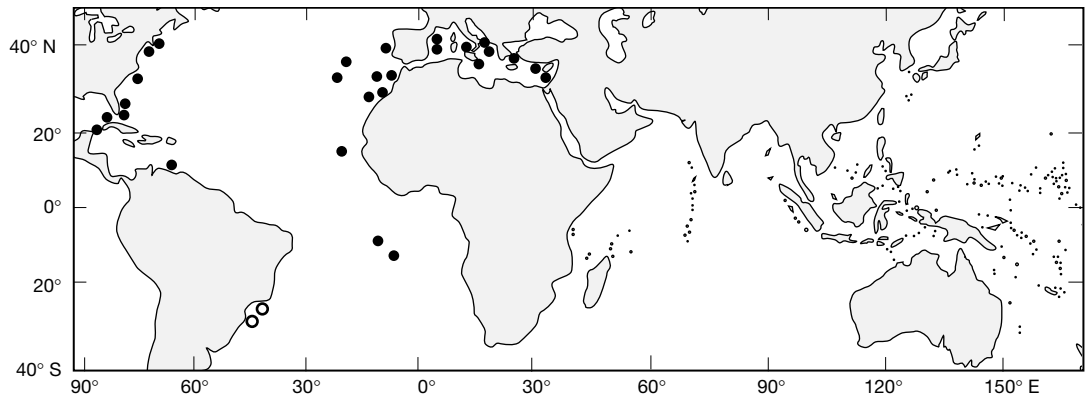

FIG. 5. — Geographical distribution of *Latreillia elegans* Roux, 1830 (●) and *L. williamsi* Melo, 1990 (○).

DIAGNOSIS. — Dorsal surface of gastric region of carapace without spine (see Rathbun 1937: fig. 18) except in some juveniles and small individuals. Gastric region slender, length 0.4 or more of carapace length. Supraocular spines shorter or slightly longer than ocular peduncles. Hepatic swellings rarely topped by spine. Merus of each third maxilliped sometimes with obtuse tubercle or acute spine on ventral surface (Fig. 3B). Abdomen of adult males with all somites distinct; middorsal protuberance on somite 1, acute spine on somite 2 (see Williams 1982: fig. 1c, as *L. manningi*). Abdomen of adult females with middorsal protuberance on somite 1, acute spine on each somite 2, 3; somites 4-6 broad, fused with proximal spines laterally near articulation with somite 3 (see Williams 1982: fig. 2e, as *L. manningi*), sometimes with midlateral pair on fused somite 5 in largest females. Propodus of each last pair of walking appendage (P5) shorter than carpus; dactylus forming subchela when flexed on distal portion of propodus; propodus with five or six movable spinules (see Williams 1982: fig. 2c, as *L. manningi*).

DISTRIBUTION. — Mediterranean Sea, eastern Atlantic Ocean (from the Azores and Portugal to Cape Verde Islands), western Atlantic Ocean (from New England to Venezuela), and from Ascension and St Helena islands in the South Atlantic (Fig. 5). Depth: 35-474 m (Williams 1982).

Colour: Longitudinal red-brown bands on carapace; red-brown and yellow rings on pereopods and ocular peduncles (Zariquiey Álvarez 1968: 307). Williams (1982: 239) summarized descriptions of similar colour patterns. Debelius (2001: 95) gave a colour photograph.

REMARKS

Williams (1982) separated the western Atlantic populations previously considered *L. elegans* as a distinct species, *L. manningi* Williams, 1982. Both species were found to be morphologically identical and several potential differences were ultimately shown to overlap among the populations. The only exception was the relative length of the pereopods, which was shown to be significantly longer in relation to carapace length in the eastern Atlantic than in the western Atlantic populations (Williams 1982: 238). Specimens from Ascension Island, nearly halfway between the two populations, were considered as intermediate between the two species. As in the other species of *Latreillia*, the ratio between the somites of the pereopods is a highly variable character, and thus not a very reliable character. D'Udekem d'Acoz (1999) ultimately treated the two geographical variants of *L. elegans* as different subspecies. The differences between the two populations are thus seen as minor and overlapping and do not warrant the separation of *L. elegans* into two separate species.

Besides their geographical distribution, the only clear difference between *L. elegans* and *L. metanesa* of the Indo-west Pacific, is the rare presence of a dorsal spine in *L. elegans*. A dorsal spine was observed only once, in a juvenile male (4.5 × 2.4 mm, MNHN-B 16556) from the eastern Atlantic. The specimen also had a branchial spine on each branchial region of the carapace, a characteristic of juveniles in other species of

Latreillia. None of the five smallest specimens in the material identified as *L. manningi* (= *L. elegans*) by Williams (1982: 237) had a spine. Three small males (6.4 × 3.2 mm, USNM 67740; 6.5 × 3.5 mm, USNM 21697; 6.7 × 3.5 mm, USNM 19296) had a smooth carapace. One male (5.2 × 2.6 mm, USNM 51060) had a dorsal prominence but no spine, and a juvenile male, the smallest individual (3.5 × 1.7 mm, USNM 136827), branchial spines and a dorsal prominence but no dorsal spine. In *L. metanesa* specimens within this size range, and, most importantly, specimens having branchial spines, do have a dorsal spine.

The analysis of DNA from different populations of *L. elegans* and *L. metanesa* may prove to be a more reliable way to show if the two species are genetically distinct. It should also determine the genetic distance between the populations of *L. elegans* on both sides of the Atlantic.

Size

Maximum size: ♂ 14.3 × 8.8 mm, ♀ 12.9 × 7.5 mm (Williams 1982).

Latreillia metanesa Williams, 1982
(Figs 3C; 6-9; 14A-C)

Latreillia metanesa Williams, 1982: 240, figs 3d, 4, 5a-d, 8.

Latreillia sp. near *L. manningi* – Williams 1982: 243, figs 3c, 8.

Eplumula phalangium – Zarenkov 1990: 224, fig. 5 I-II (non *Eplumula phalangium* (de Haan, 1839)).

Latreillia sp. B – Guinot & Richer de Forges 1981: 560, figs 4D, D1, 7C, C1, C2.

Latreillia sp. C – Guinot & Richer de Forges 1981: 560, figs 4E, E4, 7B, B1, B2.

TYPE MATERIAL. — Holotype: 1 ♂ 8.6 × 5.1 mm, *Albatross*, stn 4098, off Puniawa Point, Maui, Hawaiian Islands, 174-278 m (USNM 74570); paratypes: 1 ♂, 3 ovig. ♀♀, *Albatross*, same location as holotype (USNM 172325); 1 ♂, 1 ♀, *Albatross*, stn 3965, Laysan I., Hawaiian Islands, 25°52'N, 171°47'W, 265-209 m (USNM 134157). Contrary to Williams' (1982: 242) indication, no paratypes are deposited at RMNH.

TYPE LOCALITY. — Hawaiian Islands, Maui, off north coast, 21°00'N, 156°24'W, 174-278 m.

MATERIAL EXAMINED. — **Somalia.** *Anton Brunn*, stn 445, 09°41'N, 51°03'E, 60-70 m, 16.XII.1964, 1 ovig. ♀ (USNM 172330).
Kenya. *Anton Brunn*, stn 420-A, 02°42'S, 40°53'E, 140 m, 6.XI.1964, 1 ovig. ♀ (USNM 172329).
Mozambique. *Algoa*, stn C00815-014-012-2144, 23°8.0'S, 35°42.0'E, 180 m, 12.VI.1994, 1 ♂ (SAM-A 41480).
Madagascar. Stn CH 8, 12°43.5'S, 48°14.3'E, 370 m, 14.IV.1971, A. Crosnier coll., 1 ovig. ♀ (MNHN-B 9787). — Stn CH 44, 15°25.7'S, 46°01.0'E, 200-210 m, 7.XI.1972, A. Crosnier coll., 1 ♂, 2 ovig. ♀♀ (MNHN-B 9791). — Stn CH 56, 23°36.0'S, 43°31.6'E, 395-410 m, 26.II.1973, A. Crosnier coll., 1 juv. ♀, 1 ovig. ♀ (MNHN-B 9789). — Stn CH 68, 25°08.9'S, 47°21.5'E, 255 m, 3.III.1973, A. Crosnier coll., 1 ♂ (MNHN-B 9786). — Stn CH 71, 25°13.1'S, 47°17.8'E, 105-115 m, 3.III.1973, A. Crosnier coll., 1 ♂ (MNHN-B 9785).
Taiwan. TAIWAN 2000, stn CP 58, 24°35.1'N, 122°05.8'E, 221 m, 4.VIII.2000, 2 ♂♂, 2 ♀♀ (MNHN-B 28476).
South China Sea. *Albatross*, stn 5310, 21°33'S, 116°13'E, 180 m, 4.XI.1908, 1 ♂, 2 ovig. ♀♀ (USNM 134161).
Philippine Islands. South China Sea. MUSORSTOM 2, stn CP 2, 14°01'N, 120°17'E, 184-186 m, 20.XI.1980, 1 ♂ (MNHN-B 28144). — Stn CP 51, 14°00'N, 120°17'E, 170-187 m, 27.XI.1980, 1 ovig. ♀ (MNHN-B 28142). — Stn CP 53, 14°01'N, 120°17'E, 215-216 m, 27.XI.1980, 1 ovig. ♀ (MNHN-B 28205). — Stn CP 57, 13°52'N, 120°04'E, 156-182 m, 28.XI.1980, 1 ♂ parasitized by *Sacculina* sp. (MNHN-B 28471).
MUSORSTOM 3, stn CP 112, 14°00'N, 120°18'E, 187-199 m, 2.VI.1985, 1 ♂ (MNHN-B 28218). — Stn CP 133, 11°58'N, 121°52'E, 334-390 m, 5.VI.1985, 1 ♂ (MNHN-B 28219).
Sulu Archipelago, *Albatross*, stn 5166, Simunul I., 04°56'N, 119°46'E, 177 m, 24.II.1908, 1 ♂ (USNM 172328).
Indonesia. Kai Islands, KARUBAR, stn CP 16, 05°17'S, 132°50'E, 315-249 m, 24.X.1991, 1 ovig. ♀ (MNHN-B 28132). — Stn CP 36, 06°05'S, 132°44'E, 268-210 m, 27.X.1991, 1 ♀ (MNHN-B 28178).
Vanuatu. MUSORSTOM 8, stn CP 970, 20°18.56'S, 169°53.19'E, 252-310 m, 21.IX.1994, 1 juv. ♀ (MNHN-B 28117). — Stn DW 959, 20°20.52'S, 169°48.24'E, 436-475 m, 20.IX.1994, 1 ♂ (MNHN-B 28228). — Stn CP 963, 20°20.10'S, 169°49.08'E, 400-504 m, 21.IX.1994, 1 ♂ (MNHN-B 28231). — Stn CP 1017, 17°48.21'S, 168°39.33'E, 294-295 m, 27.IX.1994, 1 juv. ♂ (MNHN-B 28225). — Stn CP 1018, 17°52.88'S, 168°25.08'E, 300-301 m, 27.IX.1994, 3 ♂♂, 1 juv. ♀, 1 ♀ (MNHN-B

28222). — Stn CP 1024, 17°48.21'S, 168°38.77'E, 335-370 m, 28.IX.1994, 1 juv. ♀, 1 ovig. ♀ (MNHN-B 28230). — Stn CP 1026, 17°50.35'S, 168°39.33'E, 437-440 m, 28.IX.1994, 1 ♀ (MNHN-B 28229). — Stn CP 1083, 15°51.91'S, 167°19.42'E, 397-439 m, 5.X.1994, 2 ♂♂, 1 ovig. ♀ (MNHN-B 28226). — Stn CP 1084, 15°50.29'S, 167°17.48'E, 207-280 m, 5.X.1994, 1 ovig. ♀ (MNHN-B 28224). — Stn CP 1132, 15°38.43'S, 167°02.80'E, 161-182 m, 11.X.1994, 1 ovig. ♀ (MNHN-B 28223). — Stn CP 1135, 15°40.50'S, 167°02.43'E, 282-375 m, 11.X.1994, 1 ♂ (MNHN-B 28227). — Stn CP 1136, 15°40.62'S, 167°01.60'E, 398-400 m, 11.X.1994, 1 juv. ♀ (MNHN-B 28270).

New Caledonia. Île des Pins, dredging, 400 m, 10.IV.1978, 1 ♂, 1 ♀ parasitized by *Sacculina* sp. (MNHN-B 7036), 22°49'S, 167°12'E, 400 m, 10.VI.1978, 1 ♂ (MNHN-B 7101).

Récif Tombo, Wreck side of reef, in trap, 200 m, 6.VI.1979, 1 ovig. ♀ (MNHN-B 7037).

BIOCAL, stn CP 42, 23°46'S, 167°13'E, 380 m, 30.VIII.1985, 1 ♂ parasitized by *Sacculina* sp. (MNHN-B 28237). — Stn CP 45, 22°47'S, 167°15'E, 430-465 m, 30.VIII.1985, 1 ovig. ♀ (MNHN-B 28238). — Stn CP 67, 24°55'S, 168°22'E, 500-510 m, 3.IX.1985, 1 ♂ (MNHN-B 28169). — Stn DW 77, 22°15'S, 167°15'E, 440 m, 5.IX.1985, 1 ♂ (MNHN-B 28258). — Stn DW 83, 20°35'S, 166°54'E, 460 m, 6.IX.1985, 1 ovig. ♀ (MNHN-B 28126). — Stn CP 105, 21°31'S, 166°22'E, 330-335 m, 8.IX.1985, 1 ♂, 1 ovig. ♀ (MNHN-B 28236). — Stn CP 108, 22°03'S, 167°06'E, 335 m, 9.IX.1985, 3 ovig. ♀♀ (MNHN-B 28325), 1 ovig. ♀ (MNHN-B 28125), 2 juv. ♀♀ (MNHN-B 28185).

MUSORSTOM 4, stn DW 156, 18°54.0'S, 163°18.8'E, 525 m, 15.IX.1985, 1 juv. ♀ (MNHN-B 28267), 1 ovig. ♀ (MNHN-B 28173). — Stn CP 171, 18°57.8'S, 163°14.0'E, 425 m, 17.IX.1985, 4 ♂♂, 4 ovig. ♀♀, 2 ♀♀ (MNHN-B 28239), 1 juv. ♂ (MNHN-B 28140), 1 juv. ♀ (MNHN-B 28145), 1 ovig. ♀ (MNHN-B 28162). — Stn CP 172, 19°01.2'S, 163°16.0'E, 275-330 m, 17.IX.1985, 1 juv. ♀, 2 ovig. ♀♀ (MNHN-B 28197), 1 ♂ (MNHN-B 28141). — Stn CP 173, 19°02.5'S, 163°18.8'E, 250-290 m, 17.IX.1985, 2 ♂♂ (MNHN-B 28198). — Stn CP 174, 19°00.3'S, 163°18.5'E, 365 m, 17.IX.1985, 1 ♂ (MNHN-B 28187). — Stn CP 180, 18°56.8'S, 163°17.7'E, 440 m, 18.IX.1985, 1 ovig. ♀ (MNHN-B 28199). — Stn DW 182, 18°59.3'S, 163°24.0'E, 305 m, 18.IX.1985, 1 ♂ (MNHN-B 28186). — Stn CP 193, 18°56.3'S, 163°23.2'E, 415 m, 19.IX.1985, 2 ovig. ♀♀, 1 ♀ (MNHN-B 28201). — Stn CP 194, 18°52.8'S, 163°21.7'E, 545 m, 18.IX.1985, 1 ♂ (MNHN-B 28153). — Stn CC 201, 18°55.8'S, 163°13.8'E, 490 m, 20.IX.1985, 1 ♂ (MNHN-B 28200). — Stn CP 215, 22°55.7'S, 167°17.0'E, 485-520 m, 28.IX.1985, 1 ♀ (MNHN-B 28168). — Stn DW 221, 22°58.6'S, 167°36.8'E, 535-560 m, 29.IX.1985, 1 ♂ (MNHN-B 28175), 1 juv. ♀ (MNHN-B 28141). — Stn DW 222, 22°57.6'S, 167°33.0'E, 410-440 m, 30.IX.1985, 1 ovig. ♀ (MNHN-B 28272), 1 juv. ♀ (MNHN-B 28141). — Stn DW 223, 22°57.0'S, 167°30.0'E, 545-560 m, 30.IX.1985, 1 unknown sex (MNHN-B 28164). — Stn CC 246, 22°08.5'S, 167°11.5'E, 410-420 m, 3.X.1985, 1 juv. ♀, 1 ovig. ♀ (MNHN-B 28188). — Stn CC 247, 22°09.0'S, 167°13.3'E, 435-460 m, 4.X.1985, 1 ♂ (MNHN-B 28202).

MUSORSTOM 5, stn CP 287, 24°05.40'S, 159°36.30'E, 270 m, 10.X.1986, 1 ♀ (MNHN-B 28179). — Stn DW 299, 22°47.70'S, 159°23.70'E, 360-390 m, 11.X.1986, 1 ovig. ♀ (MNHN-B 28156). — Stn DW 300, 22°44.27'S, 159°23.94'E, 450 m, 11.X.1986, 1 juv. ♀ (MNHN-B 28139).

CHALCAL 2, stn CC 1, 24°54.96'S, 168°21.9'E, 500 m, 28.X.1986, 1 ♂ (MNHN-B 28165). — Stn CH 4, 24°44.31'S, 168°09.32'E, 253 m, 27.X.1986, 1 ovig. ♀ (MNHN-B 28257). — Stn CP 18, 24°47.00'S, 168°09.43'E, 274 m, 27.X.1986, 1 ♀ (MNHN-B 28250). — Stn CP 19, 24°42.85'S, 168°09.73'E, 271 m, 27.X.1986, 1 ♂ (MNHN-B 28251), 1 ♂ (MNHN-B 28252). — Stn CH 8, 23°13.36'S, 168°02.73'E, 300 m, 31.X.1986, 1 ovig. ♀ (MNHN-B 28255). — Stn CP 27, 23°15.29'S, 168°04.55'E, 289 m, 31.X.1986, 2 ovig. ♀♀ (MNHN-B 28260). — Stn DW 73, 24°39.9'S, 168°38.1'E, 573 m, 29.X.1986, 2 ♂♂ (MNHN-B 28124). — Stn DW 74, 24°40.36'S, 168°38.38'E, 650 m, 29.X.1986, 1 juv. ♀ (MNHN-B 28129). — Stn DW 76, 23°40.5'S, 167°45.2'E, 470 m, 30.X.1986, 1 ♂, 1 ovig. ♀ (MNHN-B 28157). — Stn DW 81, 23°19.6'S, 168°03.4'E, 311 m, 31.X.1986, 1 juv. ♂ (MNHN-B 28128). — Stn DW 83, 23°20.3'S, 168°05.5'E, 200 m, 31.X.1986, 1 juv. ♀ (MNHN-B 28131). — Stn DW 84, 23°23.8'S, 168°07.1'E, 170 m, 31.X.1986, 1 juv. ♀ (MNHN-B 28130).

SMIB 3, stn DW 3, 24°55.00'S, 168°21.70'E, 513 m, 20.V.1987, 1 ♂, 1 ovig. ♀ (MNHN-B 20135).

SMIB 4, stn DW 36, 24°55.6'S, 168°21.7'E, 530 m, 7.III.1989, 1 ♂ (MNHN-B 28158). — Stn DW 37, 24°55.6'S, 168°21.7'E, 530 m, 7.III.1989, 1 ovig. ♀ (MNHN-B 28174).

VOLSMAR, stn DW 39, 22°20.5'S, 168°43.5'E, 305 m, 6.VIII.1989, 1 ♂ (MNHN-B 28148).

SMIB 5, stn DW 76, 23°41.2'S, 168°00.5'E, 280 m, 7.IX.1989, 1 ovig. ♀ (MNHN-B 28166). — Stn DW 85, 22°20.0'S, 168°42.9'E, 260 m, 13.IX.1989, 1 ♂ (MNHN-B 28203). — Stn DW 87, 22°18.7'S, 168°41.3'E, 370 m, 13.IX.1989, 1 juv. ♂ (MNHN-B 28138). — Stn DW 94, 22°19.6'S, 168°42.8'E, 275 m, 13.IX.1989, 1 ♂ (MNHN-B 28182).

BERYX 11, stn CP 16, 24°47'S, 168°09'E, 240-450 m, 16.X.1992, 1 ♂ (MNHN-B 28217). — Stn CP 23, 24°43'S, 168°08'E, 270-290 m, 17.X.1992, 2 juv. ♀♀ (MNHN-B 28216). — Stn DW 40, 23°41'S, 168°01'E, 240-300 m, 20.X.1992, 1 juv. ♀ (MNHN-B 28215). — Stn CP 44, 23°41'S, 168°01'E, 230-

250 m, 20.X.1992, 1 juv. ♀ (MNHN-B 28137). — Stn CP 51, 23°44'S, 168°17'E, 390-400 m, 21.X.1992, 1 ♂ (MNHN-B 28206). — Stn CP 52, 23°47'S, 168°17'E, 430-530 m, 21.X.1992, 1 ovig. ♀ (MNHN-B 28170).

SMIB 8, stn CP 161, 24°46.69'S, 168°09.01'E, 232-251 m, 28.I.1993, 2 ovig. ♀♀ (MNHN-B 28171), 1 ovig. ♀ (MNHN-B 28249). — Stn DW 166, 23°37.83'S, 167°42.69'E, 433-450 m, 29.I.1993, 2 ovig. ♀♀ (MNHN-B 28146). — Stn DW 167, 22°38.13'S, 168°43.16'E, 430-452 m, 29.I.1993, 1 ♀ parasitized by *Sacculina* sp. (MNHN-B 28274). — Stn DW 170, 23°41.23'S, 168°00.56'E, 241-244 m, 29.I.1993, 1 ♀ (MNHN-B 28268). — Stn DW 178, 23°45.12'S, 168°17.01'E, 400-440 m, 30.I.1993, 1 ovig. ♀ (MNHN-B 28233). — Stn DW 179, 23°45.87'S, 168°16.95'E, 400-405 m, 30.I.1993, 1 ovig. ♀ (MNHN-B 22901). — Stn DW 180, 23°47.72'S, 168°18.09'E, 460-525 m, 30.I.1993, 1 ovig. ♀ (MNHN-B 28143). — Stn DW 181, 23°17.74'S, 168°04.82'E, 311-330 m, 31.I.1993, 1 ♀ (MNHN-B 28273).

BATHUS 1, stn CP 656, 21°13.17'S, 165°53.98'E, 452-460 m, 12.III.1993, 1 ♂, 1 ♀ (MNHN-B 28212), 1 juv. ♀ (MNHN-B 28127). — Stn CP 670, 20°54.05'S, 165°53.38'E, 394-397 m, 14.III.1993, 1 ♂, 2 ovig. ♀♀ (MNHN-B 28207). — Stn CP 688, 20°33.17'S, 165°00.37'E, 270-282 m, 16.III.1993, 1 ovig. ♀ (MNHN-B 28271). — Stn CP 695, 20°34.59'S, 164°57.88'E, 410-430 m, 17.III.1993, 1 juv. ♂, 1 juv. ♀, 1 ♀ (MNHN-B 28133). — Stn CP 701, 20°57.54'S, 165°35.86'E, 302-335 m, 18.III.1993, 2 ♂♂ (MNHN-B 28209). — Stn CP 707, 21°42.72'S, 166°35.75'E, 347-375 m, 18.III.1993, 1 juv. ♀ (MNHN-B 28210). — Stn CP 710, 21°43.16'S, 166°36.35'E, 320-386 m, 19.III.1993, 1 ovig. ♀ (MNHN-B 28204). — Stn CP 711, 21°43.00'S, 166°35.71'E, 315-327 m, 19.III.1993, 1 ♂, 3 ♀♀, 1 ovig. ♀ (MNHN-B 28208), 1 juv. ♂, 1 ovig. ♀ (MNHN-B 28134).

BATHUS 2, stn DW 718, 22°46.70'S, 167°14.45'E, 430-436 m, 11.V.1993, 1 ovig. ♀ (MNHN-B 28213). — Stn CP 728, 22°47.11'S, 167°28.11'E, 241-245 m, 12.V.1993, 1 ♂ (MNHN-B 28147), 1 ♂ (MNHN-B 28234), 2 juv. ♀♀ (MNHN-B 28135). — Stn CP 735, 23°01.77'S, 166°56.10'E, 530-570 m, 13.V.1993, 1 ovig. ♀ (MNHN-B 28172). — Stn CP 736, 23°03.38'S, 166°58.96'E, 452-464 m, 13.V.1993, 1 ♂, 1 ovig. ♀ (MNHN-B 28211), 1 juv. ♀, 1 ovig. ♀ (MNHN-B 28167). — Stn CP 738, 23°02.09'S, 166°56.61'E, 558-647 m, 13.V.1993, 1 juv. ♀ (MNHN-B 28118). — Stn CP 742, 22°33.45'S, 166°25.86'E, 340-470 m, 14.V.1993, 1 juv. ♂ (MNHN-B 28116), 1 ovig. ♀ (MNHN-B 28176). — Stn CP 759, 22°18.29'S, 166°10.35'E, 370-420 m, 16.V.1993, 1 ovig. ♀ (MNHN-B 28275). — Stn CP 760, 22°18.87'S, 166°10.55'E, 455 m, 16.V.1993, 2 juv. ♀♀ (MNHN-B 28119).

BATHUS 3, stn CH 801, 23°39'S, 158°00'E, 270-300 m, 27.XI.1993, 1 ♂, 1 ovig. ♀ (MNHN-B 28263). — Stn CP 804, 23°41'S, 168°00'E, 244-278 m, 27.XI.1993, 3 ♂♂, 5 juv. ♀♀, 2 ovig. ♀♀ (MNHN-B 28262), 2 ovig. ♀♀ (MNHN-B 28159). — Stn CP 813, 23°45'S, 168°17'E, 410-415 m, 28.XI.1993, 2 ♂♂ (MNHN-B 28261). — Stn CP 814, 23°48'S, 168°17'E, 444-530 m, 28.XI.1993, 1 ♂, 2 ovig. ♀♀ (MNHN-B 28244), 1 juv. ♂ (MNHN-B 28245). — Stn DW 817, 23°42'S, 168°16'E, 405-410 m, 28.XI.1993, 1 ♂ (MNHN-B 28256). — Stn DW 829, 23°21'S, 168°02'E, 386-390 m, 29.XI.1993, 1 ♂, 1 juv. ♀, 3 ovig. ♀♀ (MNHN-B 28243). — Stn CP 833, 23°03'S, 166°58'E, 441-444 m, 30.XI.1993, 2 ♂♂, 2 unknown sex (MNHN-B 28247), 1 juv. ♂ (MNHN-B 28122). — Stn CP 835, 23°02'S, 166°58'E, 350 m, 30.XI.1993, 1 ovig. ♀ (MNHN-B 28242). — Stn DW 838, 23°01'S, 166°56'E, 400-402 m, 30.XI.1993, 1 ♂ (MNHN-B 28241). — Stn CP 846, 23°03'S, 166°58'E, 500-514 m, 1.XII.1993, 3 ovig. ♀♀ (MNHN-B 28161), 1 juv. ♂ (MNHN-B 28120). — Stn CP 847, 23°03'S, 166°58'E, 405-411 m, 1.XII.1993, 3 juv. ♂♂, 19 ♂♂, 1 ♂ feminized by *Sacculina* sp., 12 juv. ♀♀, 1 ♀, 3 ovig. ♀♀ (MNHN-B 28264), 1 ♂, 1 juv. ♀, 2 ovig. ♀♀ (MNHN-B 28155). — Stn CC 856, 21°44'S, 166°37'E, 311-365 m, 20.III.1994, 1 ovig. ♀, 1 undet. sex (MNHN-B 28320). — Stn CP 851, 21°43.960'S, 166°37.429'E, 314-364 m, 19.III.1994, 2 juv. ♀♀, 2 ovig. ♀♀ (MNHN-B 28253). — Stn CH 877, 23°03'S, 166°59'E, 464-480 m, 31.III.1994, 1 ♂, 1 juv. ♀, 1 ♀, 2 ovig. ♀♀ (MNHN-B 28160), 1 juv. ♂ (MNHN-B 28136). — Stn CH 878, 23°04'S, 167°01'E, 420-430 m, 31.III.1994, 1 ♂ (MNHN-B 28254).

BATHUS 4, stn CP 889, 21°00.83'S, 164°27.34'E, 416-433 m, 2.VIII.1994, 3 ♂♂, 1 juv. ♀, 1 ovig. ♀ (MNHN-B 28248). — Stn CP 899, 20°16.68'S, 163°50.26'E, 500-600 m, 3.VIII.1994, 2 ♂♂, 1 ovig. ♀ (MNHN-B 28246). — Stn CP 905, 19°02.45'S, 163°15.65'E, 294-296 m, 4.VIII.1994, 1 ♂, 1 ovig. ♀ (MNHN-B 28123). — Stn CP 906, 19°01.07'S, 163°14.51'E, 339-350 m, 4.VIII.1994, 4 ♂♂, 2 juv. ♀♀ (MNHN-B 28232), 1 ♂ (MNHN-B 28265). — Stn DW 927, 18°55.48'S, 163°22.11'E, 452-444 m, 7.VIII.1994, 2 ♂♂ (MNHN-B 28240).

SURPRISES, stn CP 1392, 18°29.8'S, 163°02.7'E, 370 m, 12.V.1999, 1 ♀, 1 ovig. ♀ (MNHN-B 28259).

LITHIST, stn CP 02, 23°37.1'S, 167°41.1'E, 442 m, 10.VIII.1999, 1 ovig. ♀, 1 undet. sex (MNHN-B 28488). — Stn CP 10, 24°48.4'S, 168°09.0'E, 245-261 m, 11.VIII.1999, 3 ♂♂, 1 juv. ♀ (MHNH-B 28489). — Stn DW 13, 24°45.0'S, 168°16.7'E, 400 m, 12.VIII.1999, 1 ♂, 1 ♀ (MNHN-B 28490).

NORFOLK 1, stn DW 1653, 23°28'S, 167°51'E, 328-340 m, 19.VI.2001, 1 ♂ parasitized by *Sacculina* sp. (MNHN-B 28477). — Stn CP 1660, 23°37'S, 167°41'E, 463-470 m, 20.VI.2001, 1 ♂ (MNHN-B

28478). — Stn CP 1667, 23°40'S, 168°01'E, 237-250 m, 21.VI.2001, 1 ♀ (MNHN-B 28479). — Stn CP 1671, 23°41'S, 168°00'E, 320-397 m, 21.VI.2001, 2 ovig. ♀♀ (USNM 1003709). — Stn CP 1676, 24°43'S, 168°09'E, 227-232 m, 22.VI.2001, 1 ♂, 1 ovig. ♀ (USNM 1003711). — Stn CP 1677, 24°44'S, 168°09'E, 233-259 m, 24.VI.2001, 1 ♀ (MNHN-B 28480). — Stn CP 1681, 24°44'S, 168°10'E, 228-240 m, 22.VI.2001, 1 ♀ (MNHN-B 28481). — Stn DW 1694, 24°40'S, 168°39'E, 578-589 m, 26.VI.2001, 1 ♂, 1 ♀ (MNHN-B 28482). — Stn DW 1712, 23°23'S, 168°02'E, 180-250 m, 26.VI.2001, 1 juv. ♂ (USNM 1003712). — Stn CP 1713, 23°22'S, 168°02'E, 204-216 m, 26.VI.2001, 3 ♂♂ (USNM 1003710). — Stn CP 1714, 23°22'S, 168°03'E, 257-269 m, 26.VI.2001, 1 ♂ (MNHN-B 28483). — Stn CP 1715, 23°22'S, 168°02'E, 270-312 m, 26.VI.2001, 2 ♂♂, 1 ♀, 3 ovig. ♀♀ (USNM 1003713). — Stn CP 1716, 23°22'S, 168°03'E, 266-276 m, 26.VI.2001, 1 ♂, 2 ovig. ♀♀ (MNHN-B 28484). — Stn CP 1724, 23°17'S, 168°14'E, 200-291 m, 27.VI.2001, 1 ovig. ♀ (MNHN-B 28485). — Stn CP 1727, 23°17'S, 168°14'E, 190-212 m, 27.VI.2001, 1 ♂, 2 ovig. ♀♀ (MNHN-B 28486). — Stn CP 1731, 23°20'S, 168°16'E, 310-788 m, 27.VI.2001, 1 ovig. ♀ (MNHN-B 28487).

Loyalty Islands. MUSORSTOM 6, stn DW 391, 20°47.35'S, 167°05.70'E, 390 m, 13.II.1989, 1 juv. ♀ (MNHN-B 28195). — Stn DW 399, 20°41.80'S, 167°00.20'E, 282 m, 14.II.1989, 1 ♂ (MNHN-B 28189). — Stn DW 400, 20°42.18'S, 167°00.40'E, 270 m, 14.II.1989, 1 ♂ (MNHN-B 28191). — Stn CP 401, 20°42.15'S, 167°00.35'E, 270 m, 14.II.1989, 2 ♂♂ (MNHN-B 28181). — Stn DW 406, 20°40.65'S, 167°06.80'E, 373 m, 15.II.1989, 1 juv. ♀ (MNHN-B 28190). — Stn DW 453, 21°00.50'S, 167°26.90'E, 250 m, 20.II.1989, 1 ♂ (MNHN-B 28196). — Stn CP 455, 21°00.65'S, 167°26.08'E, 260 m, 20.II.1989, 1 ovig. ♀ (MNHN-B 28121). — Stn DW 459, 21°01.39'S, 167°31.47'E, 425 m, 21.II.1989, 1 ♂ (MNHN-B 28184). — Stn CP 464, 21°02.30'S, 167°31.60'E, 430 m, 21.II.1989, 1 ♂ (MNHN-B 28194), 1 ovig. ♀ (MNHN-B 28154), 2 ovig. ♀♀ (MNHN-B 28193). — Stn DW 474, 21°08.80'S, 167°55.50'E, 260 m, 22.II.1989, 1 ♂ (MNHN-B 28192). — Stn DW 480, 21°08.5'S, 167°55.98'E, 380 m, 22.II.1989, 1 ♂, 1 ovig. ♀ (MNHN-B 28276).

LIFOU 2000, stn CP 1646, 21°02.06'S, 167°31.6'E, 420-480 m, 24.XI.2000, 1 ♂, 1 ♀, 2 ovig. ♀♀ (MNHN-B 28267).

Fiji. MUSORSTOM 10, stn CP 1389, 18°18.6'S, 178°04.7'E, 241-417 m, 19.VIII.1998, 1 ovig. ♀ (MNHN-B 28177).

BORDAU 1, stn CP 1446, 17°11'S, 178°42'E, 350-367 m, 3.III.1999, 1 ♂ (MNHN-B 28220). — Stn CP 1478, 20°59'S, 178°44'E, 386-396 m, 9.III.1999, 1 ♂ (MNHN-B 28221).

Tonga. BORDAU 2, stn DW 1546, 21°18'S, 175°18'E, 430-441 m, 5.VI.2000, 2 ovig. ♀♀ (MNHN-B 28163). — Stn DW 1595, 19°03'S, 174°19'E, 532-806 m, 14.VI.2000, 1 ovig. ♀ (MNHN-B 28180).

Hawaiian Islands. Laysan I., *Albatross*, stn 3958, 25°49'N, 171°43'W, 79 m, 22.V.1902, 1 ♂, 1 ovig. ♀ (USNM 74579). — Stn 3965, 25°52'N, 171°43'W, 265-209 m, 23.V.1902, 1 ♂, 1 ♀ paratypes (USNM 134157).

Kauai, *Albatross*, stn 4002, NW Kaupai Pt., 22°04'N, 159°52'W, 414-95 m, 16.VI.1902, 1 ♂, 1 ovig. ♀ (USNM 74569).

Maui, *Albatross*, stn 4077, off Puniawa Pt., 181-194 m, 21.VII.1902, 1 juv. ♂, 2 ♂♂, 1 ovig. ♀ (USNM 74577). — Stn 4098, 21°00'N, 156°24'W, 174-278 m, 23.VII.1902, 1 ♂ holotype (USNM 74570), 1 ♂, 3 ovig. ♀♀ paratypes (USNM 172325), 1 ovig. ♀ (USNM 74578).

Molokai, *Albatross*, stn 3859, Pailolo Channel, off Mokuhooniki I., 21°02.7'N, 156°44.3'W, 252-256 m, 9.IV.1902, 1 juv. ♂ (USNM 134146). — Stn 4100, 21°02.3'N, 156°46.3'W, 238-276 m, 23.VII.1902, 1 ♂ (USNM 172327). — Stn 4101, 21°03.2'N, 156°43.3'W, 223-260 m, 23.VII.1902, 1 juv. ♂, 1 ♀ (USNM 134147), 2 ♂♂ (USNM 134158).

Hawaii, *Albatross*, stn 4061, NW Kauhola Pt., 20°16'N, 155°53.3'W, 44-152 m, 18.VII.1902, 1 ♂ (USNM 172326).

French Polynesia. Tuamotu Archipelago, *Albatross*, stn 3846, 16°03'S, 147°11'W, 238 m, 7.X.1899, 1 ♂ (USNM 74586).

Stn 314, 21°52.6'S, 139°02.9'W, in trap, 470 m, 17.X.1990, J. Poupin coll., 1 ovig. ♀ (MNHN-B 28152).

Marquesas Islands, MUSORSTOM 9, stn DW 1145, Ua Pou Island, 9°19'S, 140°06'W, 150-180 m, 22.VIII.1997, 1 ♂ (MNHN-B 28214).

Sala y Gómez submarine ridge. *Professor Shtokman*, stn 1924, Great Mountain, 25°34'S-25°35'S, 85°27'W-85°30'W, 24-245 m, 26.IV.1987, 1 ovig. ♀ (ZMMU).

Nazca Ridge. Shoal Guyot, stn DW HO 73, 25°44'S, 88°25'W, 26.I.1958, 1 ♂ (USNM).

DISTRIBUTION. — Indo-west Pacific region from East Africa to French Polynesia and the Hawaiian Islands (Fig. 9). Also present in the Sala y Gómez and Nazca submarine ridges technically in the eastern Pacific region. Depth: 22-806 m.

DIAGNOSIS. — Dorsal surface of gastric region of carapace topped by spine in juveniles, small males and females, sometimes large adults (see Williams 1982: fig. 4). Gastric region slender, length 0.4 or more of carapace length (Fig. 6). Supraocular spines equal or slightly longer than ocular peduncles. Hepatic swellings each often topped by tubercle or spine, more prominent in females. Branchial regions of juveniles with spine on each side (Fig. 7A). Merus of each third

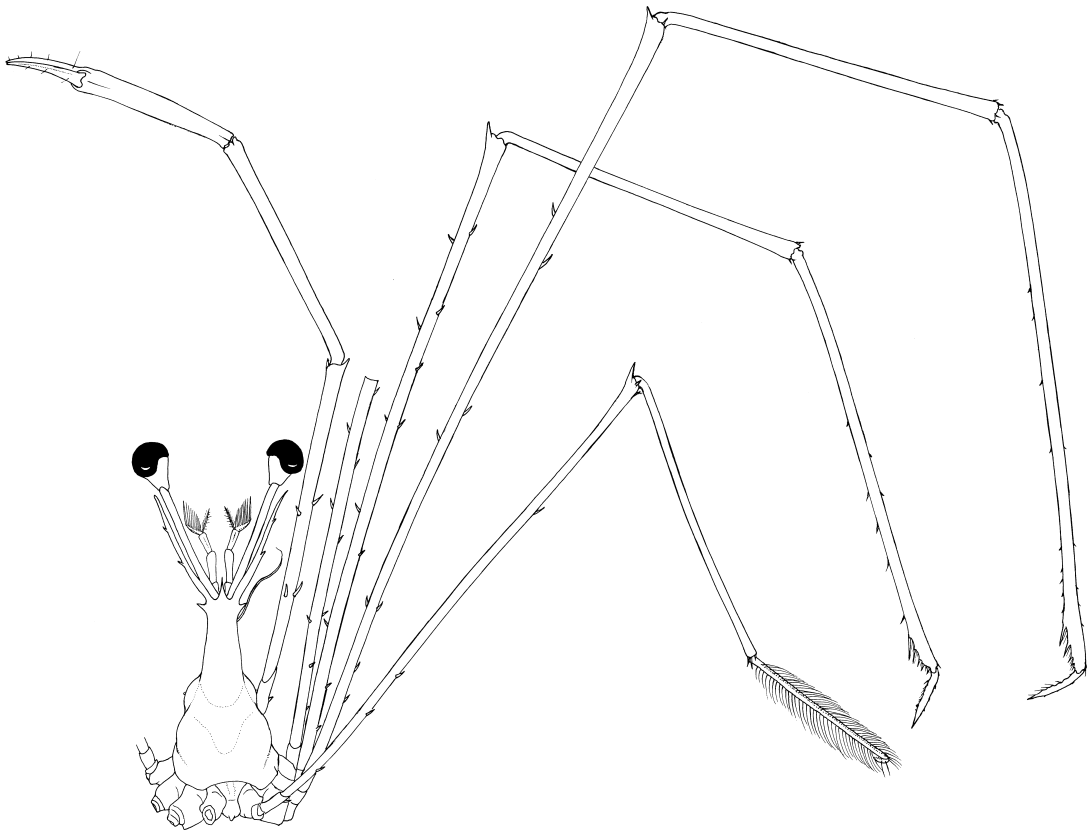

FIG. 6. — *Latreillia metanesa* Williams, 1982, station data unrecorded, ♂, dorsal view, left pereopods omitted.

maxilliped typically with obtuse tubercle or acute spine on ventral surface, particularly in females (Fig. 3C). Abdomen of adult males with all somites distinct; middorsal protuberance on somite 1, acute spine on somite 2 (Fig. 6). Abdomen of adult females (Fig. 8) with middorsal protuberance on somite 1, acute spine on each somite 2, 3; somites 4-6 broad and fused with proximal spines laterally near articulation with somite 3, sometimes with midlateral pair on fused somite 5 in largest females. Propodus of each last pair of walking appendage (P5) shorter than carpus; dactylus forms subchela when flexed on distal portion of propodus; propodus with five or six movable spinules (see Williams 1982: fig. 5b).

Colour: Live or freshly fixed specimens with transparent to yellowish carapace with thin, red and white vertical lines (Fig. 14A-C). Vertical red and white lines along supraocular spines and ocular peduncles. Red line outlined by white line along posterior border of carapace. Red line along each abdominal somite in both sexes. Cornea of eyes bright yellow. Chelipeds and pereopods white with narrow to wide red bands.

REMARKS

Williams (1982) described *L. metanesa* as very close to *L. manningi* Williams, 1982 (= *L. elegans*) of the western Atlantic except for being "less robust" and having a dorsal spine (Williams 1982: 240). It was described from specimens collected in the Hawaiian Islands and French Polynesia along the northeastern and southeastern limits of the Indo-west Pacific region. The specimens examined by Williams consisted of the type material (seven specimens, all from the Hawaiian Islands), 16 additional specimens from the Hawaiian Islands (USNM 74569, 74577-74579, 134146, 134147, 134158, 172326, 172327), and one from French Polynesia (USNM 74586). Specimens listed from the Caroline (USNM 74569) and Gilbert (= Kiribati) islands (USNM 74579) (Williams 1982:

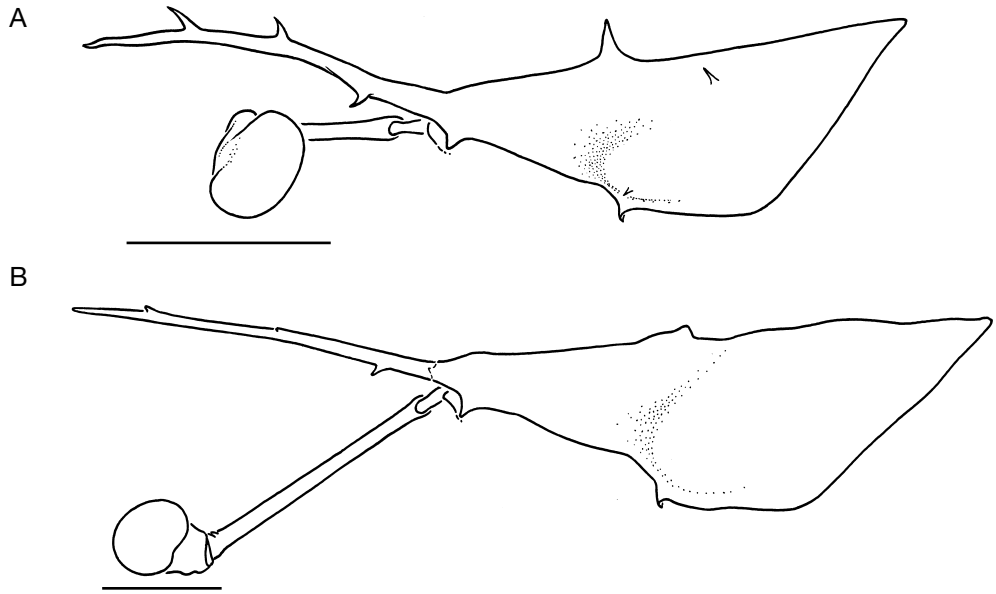

FIG. 7. — *Latreillia metanesa* Williams, 1982, lateral view of carapace; **A**, New Caledonia, BATHUS 2, stn CP 742, 340-470 m, juv. ♂ 4.6 × 2.3 mm (MNHN-B 28116); **B**, Indonesia, Kai Islands, KARUBAR, stn CP 16, 315-249 m, ovigerous ♀ 9.2 × 4.7 mm (MNHN-B 28132). Scale bars: 2.0 mm.

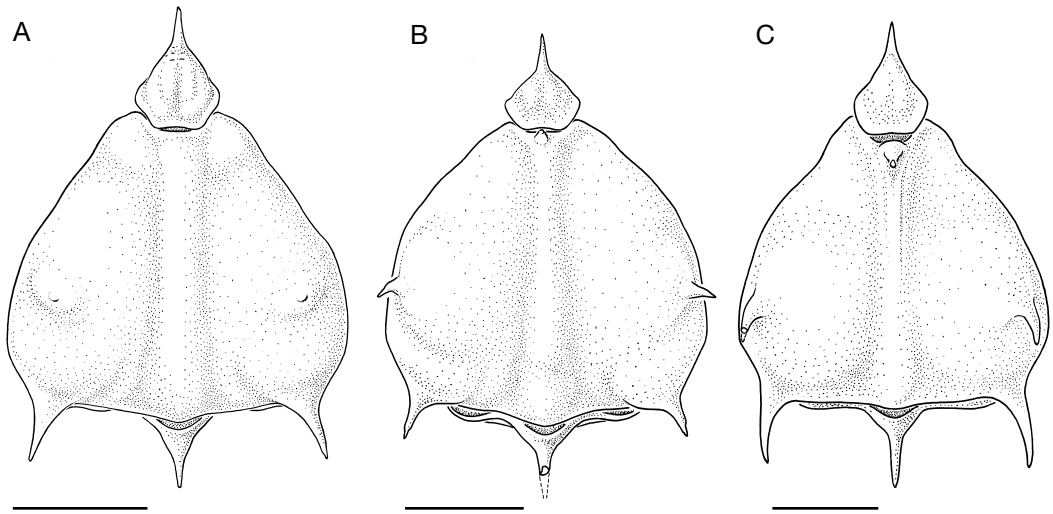

FIG. 8. — *Latreillia metanesa* Williams, 1982, ventral view of abdomen; **A**, New Caledonia, CHALCAL 2, stn CH 4, 253 m, ovigerous ♀ 9.2 × 4.5 mm (MNHN-B 28257); **B**, New Caledonia, MUSORSTOM 4, stn DW 156, 525 m, ovigerous ♀ 11.3 × 5.1 mm (MNHN-B 28173); **C**, Tuamotu Archipelago, French Polynesia, stn 314, J. Poupin coll., 470 m, ovigerous ♀ 11.9 × 6.4 mm (MNHN-B 28152). Scale bars: 2.0 mm.

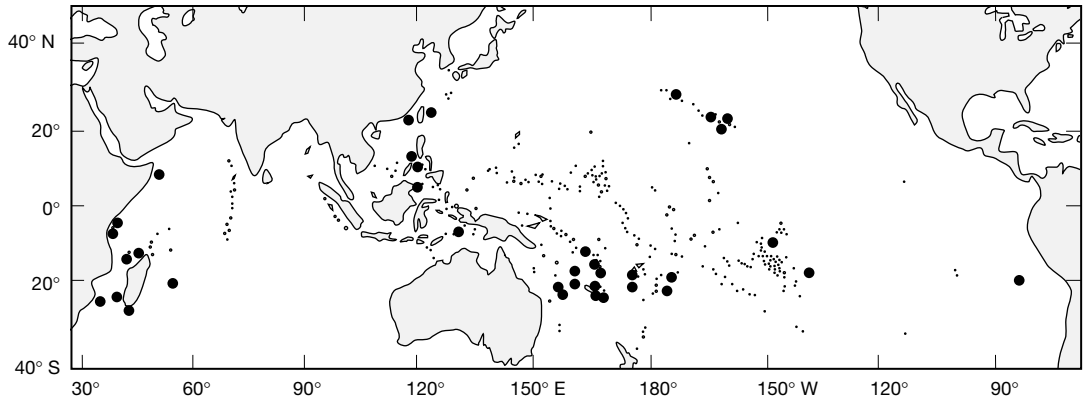

FIG. 9. — Geographical distribution of *Latreillia metanesa* Williams, 1982.

243) were actually collected in the Hawaiian Islands (see Material examined).

The examination of the type material and the other specimens studied by Williams revealed that although most of the type material had a dorsal spine, one of the paratypes (♂ 9.6 × 5.1 mm, USNM 134157) lacked the spine and another paratype (♂ cw 4.8 mm, USNM 172325) had only a dorsal prominence instead of a spine. Most other Hawaiian specimens, however, lacked a dorsal spine or had a dorsal prominence instead of a spine.

Except for some of the specimens from the Hawaiian Islands and the southeastern Pacific, the presence of a dorsal spine is only a characteristic of juveniles and many (but not all) small individuals. A clear dorsal spine was found in 47 specimens from outside the Hawaiian Islands and the southeastern Pacific, of which 24 were males (14 juveniles, 10 with fully developed first pleopods) and 23 females (16 juveniles, one adult non-ovigerous but with fully developed pleopods, six ovigerous). Their sizes varied from 4.0 × 2.2 to 7.8 × 3.8 mm in males and 4.3 × 2.5 to 10.2 × 5.2 mm in females. In addition, all three juvenile specimens from the Hawaiian Islands, all of which were males (4.4 × 2.3 to 4.8 × 2.5 mm), had a clear dorsal spine. The absence of a dorsal spine is a diagnostic but variable character in *L. elegans* and *L. williamsi* (see discussion of *L. elegans* above). Nevertheless, some specimens (particularly juveniles, as it seems to be the case in *L. elegans*) do show a spine. Williams (1982) described *L. metanesa* from mostly juvenile and small specimens and therefore gave the presence of a dorsal spine as a diagnostic character for the species.

Some of the other diagnostic features of *L. metanesa* (the presence of a spine at the tip of each hepatic swelling and a tooth or tubercle on the meri of the third maxillipeds) also showed unusual variations among the Hawaiian specimens. A large male (12.1 × 6.4 mm, USNM 74579) and the male holotype (8.6 × 5.1 mm, USNM 74570) had a dorsal spine and an acute spine on each hepatic swelling. The holotype has a short tubercle on the meri of the third maxillipeds but the meri is smooth in the first specimen (USNM 75479). A large female from the same station (9.6 × 5.5 mm, USNM 74579), however, lacked a dorsal spine but showed no spines on the hepatic swellings or teeth or tubercles on the third maxillipeds. An unusually large female from a different station in the Hawaiian Islands (14.4 × 7.7 mm, USNM 74578) had a very conspicuous and acute dorsal spine and an acute spine on each hepatic swelling. Another large female (13.1 × 6.7 mm, USNM 74569), however, had a small acute dorsal spine but no spine on each hepatic swelling. Two relatively small males (7.4 × 4.1 mm, the second too soft to measure, USNM 134158) also had a dorsal spine. All other

Hawaiian specimens, however, conformed to the characters now used to define the species, that is, a subchela at the end of the last pair of pereopods (P5), a slender gastric region, the absence of a dorsal spine (or the presence instead of a dorsal prominence) in most adult specimens, and a tooth or tubercle on the merus of the third maxilliped.

Part of the morphological variation was found to be a function of sexual dimorphism. Females (particularly the largest ones) rather than the largest males tended to show more prominent teeth or tubercles on the third maxillipeds and more acute spines on the hepatic swellings, a condition similar to that observed in *E. phalangium* (see above).

Two large females from the southeastern Pacific, one from the Tuamotu Archipelago, French Polynesia (11.7 × 5.6 mm, MNHN-B 28152) and a second from the Sala y Gómez submarine ridge (11.8 × 5.8 mm, ZMMU), showed unusually prominent spines throughout the carapace, abdomen (Fig. 8C), and pereopods (Fig. 14B, C). The Tuamotu specimen, even after preservation, showed a colour pattern (Fig. 14B, C) similar to that of live *L. metanesa* (Fig. 14A). One of the females (ZMMU), erroneously identified as *E. phalangium* by Zarenkov (1990: 224), showed a small, acute dorsal spine, as in one of the Hawaiian specimens (USNM 74569). Three smaller males from similar southeastern (USNM 74586, MNHN-B 28214) and eastern Pacific submarine ridges (USNM) locations, however, showed the more characteristic features of *L. metanesa*.

Six specimens from the south China Sea (USNM 134161), Philippine Islands (USNM 172328), and the western Indian Ocean (USNM 172329, 172330) that were identified by Williams (1982: 243) as "*Latreillia* sp. near *L. manningi*" were found to be identical to *L. metanesa*. They all lacked a dorsal spine but were of a relatively large size. All other characters given by Williams as separating these specimens from *L. manningi* (= *L. elegans*) ("somewhat longer" neck, less robust and longer but "variable" supraocular spines and ocular peduncles, "slightly shorter" fingers of chelae, and the absence of spines on the proximal edge of the fused fifth abdominal segments of females) were found to be variable characters in *L. metanesa*.

A few other specimens departed from the more typical form of the species. A female (7.41 × 4.16 mm, MNHN-B 28121), the only specimen of the species collected from the Loyalty Islands, had a dorsal spine but slight spines on the hepatic swellings, a less spiny appearance, and propodus/P5 carpus (0.61) and cl/merus (0.31) ratios lower than the average for the species (0.66, N = 13 and 0.46, N = 12 respectively). An ovigerous female from New Caledonia (7.15 × 4.03 mm, MNHN-B 28125) had a short prominence on the gastric region, unusually thin, spiny pereopods, and a cl/merus ratio (0.33) similar to the preceding specimen. Its propodus/P5 ratio, however, was similar to the average for the species (0.67). Similar characteristics were observed in two males from New Caledonia (both cl 8.19 mm, MNHN-B 28124). Two juvenile females (5.5 × 3.4 and 5.7 × 3.4 mm, MNHN-B 28185) from New Caledonia had unusually thin pereopods and higher cl/merus ratio (0.37 in both) than average for the specimens of *L. metanesa* that were measured (0.31, N = 83). In all of these specimens, however, all other characters agree with those diagnostic for *L. metanesa*, as in the case of the more atypical specimens from the Hawaiian Islands and the southeastern Pacific previously mentioned.

All of the diagnostic characters of *L. metanesa* (subchelate P5, slender gastric region, absence of dorsal spine in adults, and the presence of a tooth or tubercle on the merus of the third maxillipeds) were present among practically all specimens of the species collected throughout its distribution. *Latreillia metanesa*, however, shows a wide degree of morphological variation. These variations did not show any particular geographical patterns to suggest the existence of different species or even the existence of a cline. The presence of unusual variants among some of the specimens collected along the easternmost range of the species is perhaps a result of geographical isolation but one that does not support the description of new spe-

cies. As in the case of the question of the genetic makeup of the Atlantic populations of *L. elegans* (see above), the analysis of the DNA of different populations of *L. metanesa* should provide information on the genetic distance of these populations, particularly those from the easternmost limit of its distribution.

Size

Maximum size: ♂ 12.1 × 6.4 mm (USNM 74579), ♀ 14.4 × 7.7 mm (USNM 74578).

Latreillia pennifera Alcock, 1900
(Figs 10; 11)

Latreillia pennifera Alcock, 1900a: 118. — Alcock 1901: 71, pl. 7, fig. 27, 27a, 27b. — Kensley 1981: 37. — Williams 1982: 244, figs 3e, 6b, c, 7b, c, 8 (synonymy and references). — Guinot 1991: fig. 11.

TYPE MATERIAL. — No holotype designated; deposit of type material unknown (probably Zoological Survey of India, Calcutta).

TYPE LOCALITY. — Myanmar (= Burma), Andaman Sea, Gulf of Martaban, 14°26'S, 96°23'E, 122 m.

MATERIAL EXAMINED. — **Somalia.** *Anton Brunn*, stn 444, 09°36'N-09°40'N, 51°01'E-51°03'E, 16.XII.1964, 80 m, 1 ♂ (USNM 172333). — Stn 445, 09°41'N, 51°03'E, 16.XII.1964, 1 ♂ (USNM 172331).
Seychelles. Percy Sladen Trust Expedition, stn F8, 62 m, 20.X.1905, 1 ♂ (USNM 41049). — Stn F3, 71 m, 20.X.1905, 1 ovig. ♀ (USNM 41050).
?Mozambique. *Anton Brunn*, stn 372-L, 25°07'N, 34°34'E, 112 m, 19.VIII.1964, 1 juv. ♂ (MNHN 172332).
South Africa. Dry specimens from mixed lot examined by Williams (1982), mostly collected in South Africa and Mozambique, 4 ovig. ♀♀ (SAM-A1352, 1453, 6792, 8214).
Madagascar. Mitsio I., 60 m, A. Crosnier coll., II.1960, 1 ♂, 1 ♀ (MNHN-B 28472). — Fort-Dauphin (= Tôlañaro), 90 m, A. Crosnier coll., 25.X.1958, 1 ♂, 1 ♀ (MNHN-B 28473).
Thailand. Andaman Sea, Te Vega, stn 80, off Similan Is., 08°46'S, 97°46'E, 122-127 m, 4.XI.1963, 1 ♂, 1 ♀ (USNM).
Philippine Islands. South China Sea, MUSORSTOM 3, stn CP 121, 12°08'N, 121°18'E, 74-84 m, 3.VI.1985, 1 ♂, 2 ovig. ♀♀ (MNHN-B 28110).
Indonesia. Strait of Makassar, CORINDON, stn CH 206, 01°06'S, 117°45'E, 85 m, 30.X.1980, 1 ♂ (MNHN-B 28111).
New Caledonia. LAGON, stn 696, 21°28.9'S, 166°11.9'E, 57-41 m, 10.VIII.1986, 1 ♀ (MNHN-B 28112). — Stn 933, 20°44.9'S, 164°14.9'E, 90-100 m, 27.IV.1988, 1 ♂ (MNHN-B 28113).
Kandjar dredgings, 22°40'-22°50'S, 167°10'-167°30'E, 200-350 m, P. Tirard coll., 7-10.X.1986, 1 ovig. ♀ (MNHN-B 28183).
SMIB 5, stn DW 88, 22°18.6'N, 168°40.2'E, 350 m, 13.IX.1989, 1 ♂ (MNHN-B 28114).
Passe de Koumac, 20°40.70'S, 164°14.70'E, 65-70 m, 24.X.1993, 1 ♂ (MNHN-B 28115).
BATHUS 3, stn CP 847, 23°03'S, 166°58'E, 405-411 m, 1.XII.1993, 2 ♂♂, 1 unknown sex (MNHN-B 28318).

DISTRIBUTION. — Indian Ocean (South Africa to the Andaman Sea) and the western Pacific Ocean (Philippine Islands to New Caledonia) (Fig. 11). Depth: 37-411 m.

DIAGNOSIS. — Dorsal surface of gastric region of carapace lacking spine (Fig. 10). Gastric region slender, length 0.35-0.45 of carapace length. Supraocular spines slightly shorter or nearly equal than ocular peduncles. Hepatic swellings not topped by tubercle or spine. Merus of each third maxilliped without tubercle or spine on ventral surface. Abdomen of adult males with all somites distinct; middorsal protuberance on somite 1, acute spine on somite 2. Abdomen of adult females with middorsal protuberance on somite 1, acute spine on each somite 2, 3 (Fig. 10); somites 4-6 broad and fused with proximal spines laterally near articulation with somite 3. Propodus of each last pair of walking appendage (P5) equal or longer than carpus; dactylus of P5 trailing, not forming subchela; distal portion of propodus without spinules (see Williams 1982: fig. 7b, c).
Colour: Carapace "reddish with longitudinal stripes of dark red, the ocular peduncles, chelipeds and legs are closely cross-banded with red, and the retina of the eyes is purplish black" (Alcock 1901: 72).

REMARKS

Latreillia pennifera is close to *L. metanesa* in its general morphology but easily distinguished by its last pair of pereopods (P5), each having a non-toothed, slender, and trailing dactylus that does not form a subchela (see Williams 1982: fig. 7b, c). In contrast, *L. metanesa* has a toothed dactylus that forms a subchela against a spined propodus (Fig. 6). Specimens of *L. pennifera* that lack the P5 are best separated by the absence of a tubercle, tooth, or acute spine on the meri of the third maxillipeds. In *L. metanesa* there is a tubercle (which varies from a slightly raised area to a high, obtuse tubercle) on the meri.

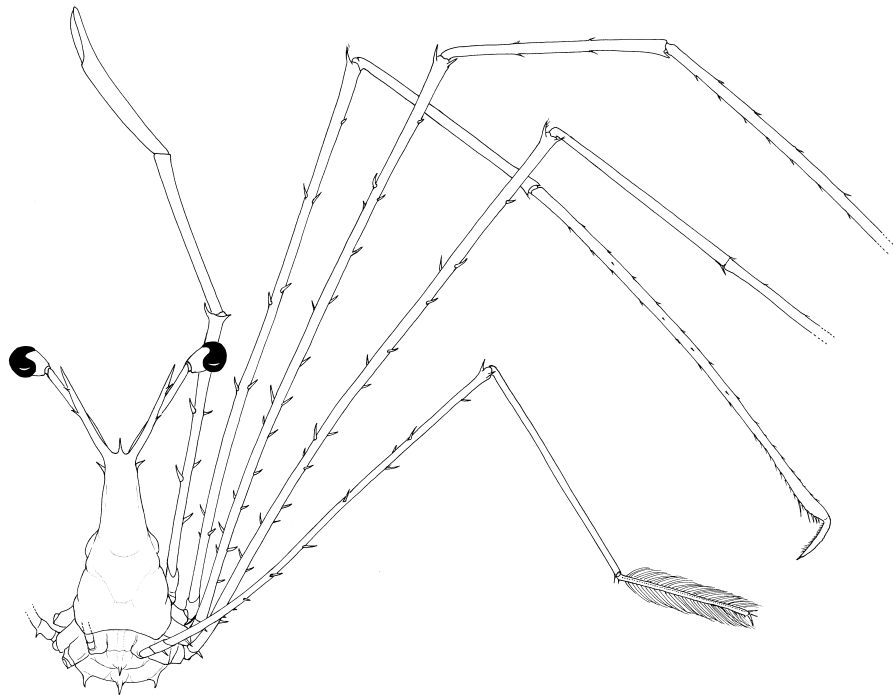

FIG. 10. — *Latreillia pennifera* Alcock, 1900, New Caledonia, station data unrecorded, ♀, dorsal view, left pereopods omitted.

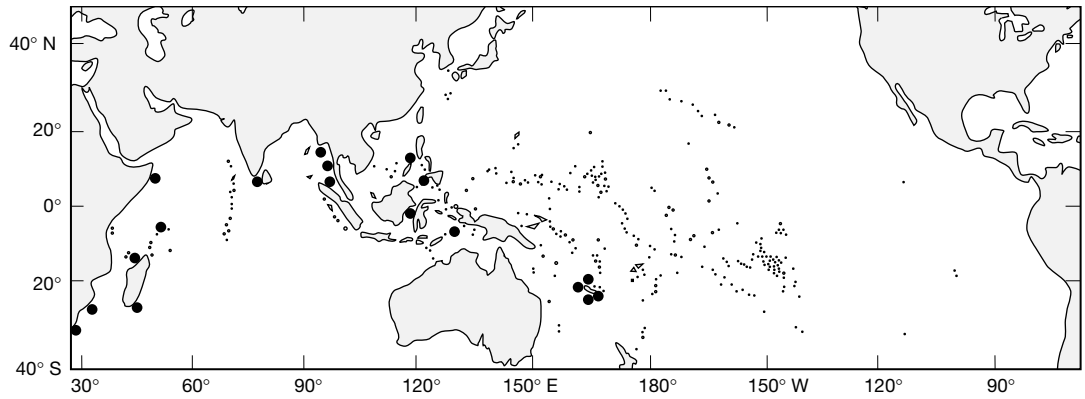

FIG. 11. — Geographical distribution of *Latreillia pennifera* Alcock, 1900.

Other characters that are not always reliable are supraocular spines shorter than the ocular peduncles, absence of a dorsal spine in juveniles and small adults, and a spine or small tubercle on each hepatic swelling. The structure of the male first pleopods is not a reliable character. Although shown as short and with straight borders by Williams (1982: fig. 3e), it can be identical to that of *L. metanesa*: more slender and slightly curved (Williams 1982: fig. 3d), or long and

curved (Williams 1982: fig. 3c, as "near *L. manningi*"). No juvenile specimens of *L. pennifera* were identified during this investigation so it can be speculated that, if a dorsal spine is present, juveniles may be undistinguishable from those of *L. metanesa*.

L. pennifera has been recorded from slightly shallower depths (37-411 m) than in the other Indo-west Pacific species of *Latreillia* with which it may occur sympatrically: *L. metanesa* (60-650 m) and *L. valida* (30-731 m).

Size

Maximum size: ♂ cl 10.4 mm, ♀ cl 12.3 mm (Williams 1982).

Latreillia valida de Haan, 1839
(Figs 3D; 12; 13; 14D-F)

Latreillia valida de Haan, 1839: 107, pl. 30, fig. 1. — Sakai 1956: 6; 1960: 29, pl. 14, fig. 6 (colour). — Miyake *et al.* 1962: 126. — Takeda 1975: 142; 1982a: 90, fig. 264 (colour). — Serène & Vadon 1981: 121. — Kim & Kim 1982: 136, 148. — Williams 1982: 246, figs 3f, 6a, 7a, 8. — Miyake 1983: 11, 197, pl. 4, fig. 4 (colour). — Kim & Chang 1985: 44. — Yamaguchi *et al.* 1987: 7. — Tung *et al.* 1988: 77, 107, 110, 112, 113, fig. 72. — Dai & Yang 1991: 40, fig. 16(1), pl. 4, fig. 1. — Guinot 1991: fig. 10. — Yamaguchi & Baba 1993: 293, fig. 86. — Zarenkov 1994: 99. — Guinot & Bouchard 1998: fig. 10B. — Takeda & Kubodera 1998: 211. — Minemizu 2000: 186 (unnumbered colour photograph). — Tan *et al.* 2000: 187. — Ng *et al.* 2001: 6. — Debelius 2001: 258 (unnumbered colour photograph). — Takeda 2001: 221, 254, 257. — Yamaguchi & Holthuis 2001: 73, 74 (figure), 75. — Chen & Sun 2002: 39, 164, fig. 70, pl. 7, fig. 2.

Latreillia valide [sic] – Dai *et al.* 1986: 35, fig. 16(1), pl. 4, fig. 1 (as *L. valida*). — Chen & Xu 1991: 48, 96 (as *L. valida*), 102 (as *L. valida*).

Latreilla [sic] *valida* – Gosliner *et al.* 1996: 235 (unnumbered colour photograph).

Latreillia aff. *valida* – Guinot & Bouchard 1998: fig. 9D.

Latreillia sp. A – Guinot & Richer de Forges 1981: 559.

TYPE MATERIAL. — Lectotype: 1 ♂ 9.9 mm × 6.6 mm; paralectotype: 1 ♂ 7.1 mm × 5.4 mm, P. F. von Siebold & H. Bürger leg., 1823-1834 (lectotype RMNH D 42206, mouthparts in RMNH D 42207; paralectotype RMNH D 42207). Lectotype selected by Yamaguchi & Baba (1993: 293, fig. 86). See also Fransen *et al.* (1997: 81).

TYPE LOCALITY. — Japan.

MATERIAL EXAMINED. — **South Africa.** Dry specimen from mixed lot examined by Williams (1982: 248), most of which collected in South Africa and Mozambique, 1 ♀ (SAM).

Madagascar. Stn CH 63, 23°36.3'S, 43°32.5'E, 250 m, 28.II.1973, A. Crosnier coll., 1 ♂ (MNHN-B 9790). — FAO 26, 21°53'S, 43°10'E, 150-180 m, 26.X.1973, A. Crosnier coll., 1 ♂, 1 ovig. ♀ (MNHN-B 7040).

Western Australia. Rawley Shoals, S Bedwell I., 17°53.2'S, 119°20.1'E-17°50.9'S, 119°22.3'E, 200 m, 18.VIII.1995, L. M. Marsh *et al.* coll., 1 ♂ (WAM C28963).

CSIRO, stn 192, W of North West Cape, 21°48'S, 113°56'E, 122-128 m, 1.II.1964, 2 ovig. ♀ (WAM C28955).

Japan. Honshu, *Albatross*, stn 3775, off Kinkwasan Lighthouse, 104 m., 5.VI.1900, 2 ♂♂, 1 ovig. ♀ (USNM 172334).

Kyushu, *Albatross*, stn 4906, off SW Koshika Is., 31°39'N, 129°20.5'E, 664-731 m, 11.VIII.1906, 1 ♂ (USNM 173106).

Near Tokyo, J. Harmand, coll., 2 ♂♂ (MNHN-B 28321). — Kii Peninsula, Jordan & Snyder, 1900, 1 ovig. ♂ (USNM 26285).

Philippine Islands. South China Sea, *Albatross*, stn 5117, off Sombrero I., 13°52'N, 120°46'E, 212 m, 21.I.1908, 1 ♂, 1 ovig. ♀ (USNM 134160). — Stn 5279, off Malavatuan I., 13°56'N, 120°13'E, 240 m, 17.VII.1908, 1 ♂ (USNM 172335).

MUSORSTOM 1, stn 11, 13°59.8'N, 120°23.7'E, 230-217 m, 20.III.1976, 1 ♀ ovig (MNHN-B 28044). — Stn 12, 14°00.8'N, 120°20.5'E, 210-187 m, 20.III.1976, 1 ♀ ovig (MNHN-B 28049). — Stn 20, 13°59.2'N, 120°20.3'E, 208-222 m, 21.III.1976, 1 ovig. ♀ (MNHN-B 28050). — Stn 25, 14°02.7'N, 120°20.3'E, 200-191 m, 22.III.1976, 1 ovig. ♀ (MNHN-B 28047). — Stn 30, 14°01.3'N, 120°18.7'E, 186-177 m, 22.III.1976, 1 ♀ (MNHN-B 28053). — Stn 36, 14°01.2'N, 120°20.2'E, 210-187 m, 23.III.1976, 1 ovig. ♀ (MNHN-B 28051). — Stn 51, 13°49.4'N, 120°04.2'E, 200-170 m, 25.III.1976, 1 ovig. ♀ (MNHN-B 28052). — Stn 56, 13°53.1'N, 120°08.9'E, 134-129 m, 26.III.1976, 1 juv. ♀ (MNHN-B 28045). — Stn 64, 14°00.5'N, 120°16.3'E, 194-195 m, 27.III.1976, 1 juv. ♀ (MNHN-B 28054).

MUSORSTOM 2, stn CP 8, 13°55'N, 120°20'E, 85-90 m, 21.XI.1980, 1 juv. ♀ (MNHN-B 28055). — Stn CP 66, 14°00'N, 120°20'E, 192-209 m, 29.XI.1980, 1 ovig. ♀ (MNHN-B 28048).

MUSORSTOM 3, stn CP 87, 14°00'N, 120°19'E, 191-197 m, 31.V.1985, 1 ♂, 2 ♀♀ (MNHN-B 28046). — Stn CP 90, 14°00'N, 120°19'E, 195 m,

1 ♂ (MNHN-B 28057). — Stn CP 92, 14°03'N, 120°12'E, 224 m, 31.V.1985, 1 ♂, 3 ♀♀ (MNHN-B 28029). — Stn CP 99, 14°01'N, 120°19'E, 196-204 m, 1.VI.1985, 1 ♂ (MNHN-B 28056). — Stn CP 103, 14°00'N, 120°18'E, 193-200 m, 1.VI.1985, 3 ♀♀ (MNHN-B 28027).

Mindoro, *Albatross*, stn 5121, east coast, 13°27'N, 121°17'E, 194 m, 2.II.1908, 1 ♂ (USNM 74575).

MUSORSTOM 3, stn CP 120, 12°06'N, 121°15'E, 219-220 m, 3.VI.1985, 2 ♂♂, 2 ovig. ♀♀, 1 ♀ (MNHN-B 28030).

Visayan Sea, *Albatross*, stn 5213, Destacado I., 12°15'N, 123°57.5'E, 144 m, 20.IV.1908, 1 ♀ (USNM 74576).

Camotes Sea, *Albatross*, stn 5408, off Capitancillo Lighthouse, 10°40.2'N, 124°15'E, 286 m, 18.III.1909, 2 ♂♂, 2 ovig. ♀♀ (USNM 173107).

Indonesia. Strait of Makassar, CORINDON, stn CH 267, 01°56'S, 119°17'E, 134-186 m, 7.XI.1980, 1 ♂, 3 juv. ♀♀ (MNHN-B 28040), 1 ♂, 1 juv. ♀, 1 ♀ (MNHN-B 28039), 2 ♀♀ (MNHN-B 28043). — Stn CH 273, 01°57'S, 119°15'E, 220 m, 7.XI.1980, 1 ♂, 1 juv ♀, 1 ♀ (MNHN-B 28039).

Kai Islands, KARUBAR, stn CP 65, 09°14'S, 132°27'E, 176-174 m, 1.XI.1991, 1 ♂, 1 ovig. ♀ (MNHN-B 28026). — Stn CP 67, 08°58'S, 132°06'E, 233-146 m, 1.XI.1991, 1 ♀ (MNHN-B 28037). — Stn CP 82, 09°32'S, 131°02'E, 219-215 m, 4.XI.1991, 1 ♂ (MNHN-B 28042). — Stn CP 86, 09°26'S, 131°13'E, 223-225 m, 4.XI.1991, 1 ♂ (MNHN-B 28020), 2 ♀♀ (MNHN-B 28038).

Vanuatu. MUSORSTOM 8, stn CP 1001, 18°48.97'S, 168°59.83'E, 150-250 m, 25.IX.1994, 1 ♂ (MNHN-B 28070). — Stn CP 1017, 17°52.80'S, 168°26.20'E, 294-295 m, 27.IX.1994, 3 juv. ♀♀, 1 ovig. ♀ (MNHN-B 28066). — Stn CP 1018, 17°52.88'S, 168°25.08'E, 300-301 m, 27.IX.1994, 1 juv. ♂, 2 ♂♂, 1 juv. ♀ (MNHN-B 28083). — Stn CP 1031, 17°52.95'S, 168°33.11'E, 310 m, 29.IX.1994, 1 ♂ (MNHN-B 28067). — Stn CP 1077, 16°04.00'S, 167°06.09'E, 180-210 m, 5.X.1994, 1 ♂ (MNHN-B 28474). — Stn CP 1135, 15°40.50'S, 167°02.43'E, 282-375 m, 11.X.1994, 2 ♂♂, 2 ovig. ♀♀ (MNHN-B 28065).

New Caledonia. *Vauban* dredgings, stn 04, 22°17.5'S, 167°13.0'E, 400 m, 23.V.1978, 1 ♂ (MNHN-B 28072).

BIOCAL, stn CP 108, 22°03'S, 167°06'E, 335 m, 9.IX.1985, 2 ♂♂, 2 ovig. ♀♀ (MNHN-B 28021). — Stn CP 109, 22°11'S, 167°16'E, 495-515 m, 9.IX.1985, 1 ♂ (MNHN-B 28082). — Stn CP 110, 22°13'S, 167°08'E, 275-320 m, 9.IX.1985, 2 ♂♂ (MNHN-B 28098).

MUSORSTOM 4, stn CP 172, 19°01.2'S, 163°16.0'E, 275-300 m, 17.IX.1985, 2 ♂♂, 1 ovig. ♀ (MNHN-B 28105). — Stn CP 243, 22°02.8'S, 167°07.7'E, 435-450 m, 3.X.1985, 1 ♀ (MNHN-B 28022). — Stn CC 245, 22°07.0'S, 167°11.0'E, 415-435 m, 3.X.1985, 2 ♂♂ (MNHN-B 28024). — Stn CC 248, 22°09.5'S, 167°10.0'E, 385 m, 4.X.1985, 3 ovig. ♀♀ (MNHN-B 28023), 1 ♂ (MNHN-B 28075).

SMIB 5, stn DW 94, 22°19.6'S, 168°42.8'E, 275 m, 13.IX.1989, 1 ♀ (MNHN-B 28058).

BATHUS 1, stn CP 654, 21°17.11'S, 165°56.77'E, 237-298 m, 12.III.1993, 1 ♀ (MNHN-B 28087). — Stn CP 656, 21°13.17'S, 165°53.98'E, 452-460 m, 12.III.1993, 1 ♀ (MNHN-B 28081). — Stn CP 668, 20°57.21'S, 165°34.57'E, 205-219 m, 14.III.1993, 2 ♀♀ (MNHN-B 28078). — Stn CP 669, 20°57.28'S, 165°35.30'E, 225-280 m, 14.III.1993, 1 ♂, 1 ♀ (MNHN-B 28088), 1 ♂, 6 ♀♀ (MNHN-B 28036). — Stn CP 670, 20°54.05'S, 165°53.38'E, 394-397 m, 14.III.1993, 2 ♂♂, 1 ovig. ♀ (MNHN-B 28079). — Stn DW 674, 20°48.79'S, 165°19.41'E, 105-110 m, 14.III.1993, 1 ♀ (MNHN-B 28077). — Stn DW 688, 20°33.17'S, 165°00.37'E, 270-282 m, 16.III.1993, 2 ♀♀ (MNHN-B 28089). — Stn CP 695, 20°34.59'S, 164°57.88'E, 410-430 m, 17.III.1993, 1 ♂ (MNHN-B 28090). — Stn CP 701, 20°57.54'S, 165°35.86'E, 302-335 m, 18.III.1993, 1 ♀ (MNHN-B 28091). — Stn CP 702, 20°55.975'S, 165°34.67'E, 591-660 m, 18.III.1993, 1 ovig. ♀ (MNHN-B 28092). — Stn CP 707, 21°42.72'S, 166°35.75'E, 347-375 m, 19.III.1993, 12 ♂♂, 11 ♀♀ (MNHN-B 28028). — Stn CP 708, 21°43.05'S, 166°38.57'E, 550-580 m, 19.III.1993, 1 ♂, 2 ♀♀ (MNHN-B 28093). — Stn CP 710, 21°43.16'S, 166°36.35'E, 320-386 m, 19.III.1993, 7 ♂♂, 16 ♀♀ (MNHN-B 28031). — Stn CP 711, 21°43.00'S, 166°35.71'E, 215-327 m, 19.III.1993, 10 ♂♂, 7 ♀♀ (MNHN-B 28025). — Stn CP 712, 21°44.26'S, 166°35.34'E, 210 m, 19.III.1993, 1 ♂, 2 ovig. ♀♀, 1 ♀ (MNHN-B 28094). — Stn CP 713, 21°45.18'S, 166°36.83'E, 250 m, 19.III.1993, 1 ♂ (MNHN-B 28080).

BATHUS 2, stn DW 730, 23°02.56'S, 166°58.30'E, 397-400 m, 12.V.1993, 2 ♂♂, 1 ♀ (MNHN-B 28095), undetermined sex (MNHN-B 22900). — Stn CP 737, 23°03.42'S, 166°59.97'E, 350-400 m, 13.V.1993, 1 ovig. ♀ (MNHN-B 28096). — Stn CP 742, 22°33.45'S, 166°25.86'E, 340-470 m, 14.V.1993, 2 ♂♂ (MNHN-B 28086).

BATHUS 3, stn CP 835, 23°02'S, 166°58'E, 350 m, 3.XI.1993, 1 juv. ♂, 2 ♂♂, 1 juv. ♀, 1 ovig. ♀ (MNHN-B 28101). — Stn CP 847, 23°02.53'S, 166°58.18'E, 405-411 m, 1.XII.1993, 1 ♂, 1 ovig. ♀ (MNHN-B 28062).

HALIPRO 1, stn CP 851, 21°43.960'S, 166°37.429'E, 314-364 m, 19.III.1994, 7 ♂♂, 4 juv. ♀♀, 7 ovig. ♀♀ (MNHN-B 28106). — Stn CC 856, 21°44'S, 166°37'E, 311-365 m, 20.III.1994, 15 ♂♂, 4 juv. ♀♀, 9 ovig. ♀♀, 1 undetermined sex (MNHN-B 25801). — Stn CH 879, 23°03'S, 167°02'E, 350 m, 31.III.1994, 2 ♂♂ (MNHN-B 28100).

BATHUS 4, stn CP 905, 19°02.45'S, 163°15.65'E, 294-296 m, 4.VIII.1994, 1 ovig. ♀ (MNHN-B 28099). — Stn CP 906, 19°01.07'S, 163°14.51'E,

339-350 m, 4.VIII.1994, 1 ♂ (MNHN-B 28071). — Stn CP 952, 20°34.70'S, 164°58.76'E, 316-270 m, 10.VIII.1994, 2 juv. ♂♂, 4 ♂♂, 2 juv. ♀♀ (MNHN-B 28102). — Stn CP 954, 21°44.13'S, 166°35.71'E, 255-250 m, 11.VIII.1994, 1 ovig. ♀ (MNHN-B 28103). — Stn CP 955, 21°45.71'S, 166°35.47'E, 242-250 m, 11.VIII.1994, 2 ♂♂, 2 ovig. ♀♀ (MNHN-B 28104).

Loyalty Islands. MUSORSTOM 6, stn CP 419, 20°41.65'S, 167°03.70'E, 283 m, 16.II.1989, 6 ♂♂, 1 juv. ♀, 1 ♀ (MNHN-B 28041), 1 ♂ (MNHN-B 28076), 1 ♂ (MNHN-B 28097). — Stn DW 457, 21°00.42'S, 167°28.71'E, 353 m, 20.II.1989, 1 ♀ (MNHN-B 28073). — Stn DW 482, 21°21.50'S, 167°46.80'E, 375 m, 23.II.1989, 1 ♂ (MNHN-B 28074).

Fiji. MUSORSTOM 10, stn CP 1351, 17°31.1'S, 178°40.0'E, 292-311 m, 11.VIII.1998, 1 ♂ (MNHN-B 28084). — Stn CP 1366, 18°12.4'S, 178°33.1'E, 149-168 m, 15.VIII.1998, 1 ♂ (MNHN-B 28061).

BORDAU 1, stn CP 1446, 17°11'S, 178°42'E, 350-367 m, 3.III.1999, 2 ♂♂ (MNHN-B 28064). — Stn CP 1475, 19°41'S, 178°11'E, 321-424 m, 8.III.1999, 2 juv. ♀♀ (MNHN-B 28085). — Stn CP 1501, 18°40'S, 178°30'E, 350-357 m, 12.III.1999, 1 juv. ♀ (MNHN-B 28063).

Tonga. BORDAU 2, stn CP 1562, 19°52'S, 174°42'W, 417-424 m, 8.VI.2000, 1 ovig. ♀ (MNHN-B 28068). — Stn CP 1563, 19°52'S, 174°39'W, 362-388 m, 8.VI.2000, 2 ♂♂, 3 ovig. ♀♀ (MNHN-B 28034). — Stn CH 1564, 19°52'S, 174°39'W, 371-387 m, 8.VI.2000, 2 ♂♂ (MNHN-B 28032). — Stn CP 1573, 19°42'S, 174°26'W, 331-345 m, 11.VI.2000, 1 ovig. ♀ (MNHN-B 28059). — Stn CP 1575, 19°42'S, 174°21'W, 232-295 m, 11.VI.2000, 1 ♂, 1 juv. ♀, 1 ovig. ♀ (MNHN-B 28033). — Stn CP 1578, 19°42'S, 174°25'W, 329-331 m, 11.VI.2000, 1 ♂, 1 undetermined sex (MNHN-B 28060). — Stn CH 1579, 19°42'S, 174°26'W, 332 m, 11.VI.2000, 1 ♂, 1 ♀, 3 ovig. ♀♀ (MNHN-B 28035). — Stn DW 1602, 20°49'S, 174°57'W, 263-320 m, 15.VI.2000, 1 ovig. ♀ (MNHN-B 28069).

DISTRIBUTION. — Indian Ocean from South Africa and Madagascar to Western Australia and western Pacific Ocean from Japan to as far east as Tonga (Fig. 13). It is here recorded from Madagascar, Western Australia, Vanuatu, New Caledonia, Loyalty Islands, Fiji, and Tonga for the first time. Depth: 30-731 m.

DIAGNOSIS. — Dorsal surface of gastric region of carapace topped by spine (Fig. 12). Gastric region short, length less than 0.35 carapace length. Supraocular spines shorter than ocular peduncles. Hepatic swellings not topped by tubercle or spine. Merus of each third maxilliped without tubercle or spine on ventral surface (Fig. 3D). Abdomen of adult males with all somites distinct; middorsal protuberance on somite 1, acute spine on somite 2 (Fig. 12). Abdomen of adult females with middorsal protuberance on somite 1, acute spine on each somite 2, 4; somites 4-6 broad and fused with proximal spines laterally near articulation with somite 3. Propodus of each last pair of walking appendage (P5) shorter than carpus; dactylus trailing, not forming subchela (Fig. 12); distal portion of propodus without spinules.

Colour: Live or freshly fixed specimens with transparent to yellowish carapace that is covered with irregular red spots and lines (Fig. 14D-F) (Sakai 1976: pl. 16; Gosliner *et al.* 1996: 235; Minemizu 2000: 186; Debelius 2001: 258). A wider and complete red line along the posterior border of carapace and along each abdominal somite in both sexes. Cornea of eyes dark brown. Chelipeds and pereopods transparent with narrow, vertical red bands.

REMARKS

Specimens of *L. valida* showed a relatively small morphological variation throughout its wide geographical range. An exception was a male from Madagascar (MNHN-B 9790), at the southwestern limit of its distribution, which had a reduced dorsal spine and relatively long pereopods.

Size

Maximum size: ♂ 16.0 × 11.5 mm (Sakai 1976), ♀ cl 17.9 mm (Williams 1982).

Latreillia williamsi Melo, 1990
(Fig. 5)

Latreillia williamsi Melo, 1990: 27, figs 1, 2a, b (synonymy and references). — Melo 1996: 77, unnumbered fig.

TYPE MATERIAL. — Holotype: ♂, GEDIP Project, stn 396, Rio Grande do Sul, Brazil, 155 m (Museu de Zoologia, Universidade de São Paulo, Brazil, MZUSP-3295). Paratypes: 1 ♂, 2 ♀♀, same as holotype (MZUSP-5492-5494).

TYPE LOCALITY. — Brazil, Rio Grande do Sul, 34°26'S, 51°47'W, 155 m.

MATERIAL EXAMINED. — **Brazil.** Rio Grande do Sul, 1 ovig. ♀ (USNM 234433), 1 ♂ (USNM 234434). — Rio Grande do Sul, GEDIP, stn 1648, 18.I.1972, 1 ovig. ♀ (MNHN-B 24562).

DISTRIBUTION. — Off the coast of southern Brazil from Rio de Janeiro to the Uruguay border (Melo 1996: 77). Depth: 130-290 m (Melo 1996).

DIAGNOSIS. — Dorsal surface of gastric region of carapace usually smooth, rarely topped by spine (see Melo

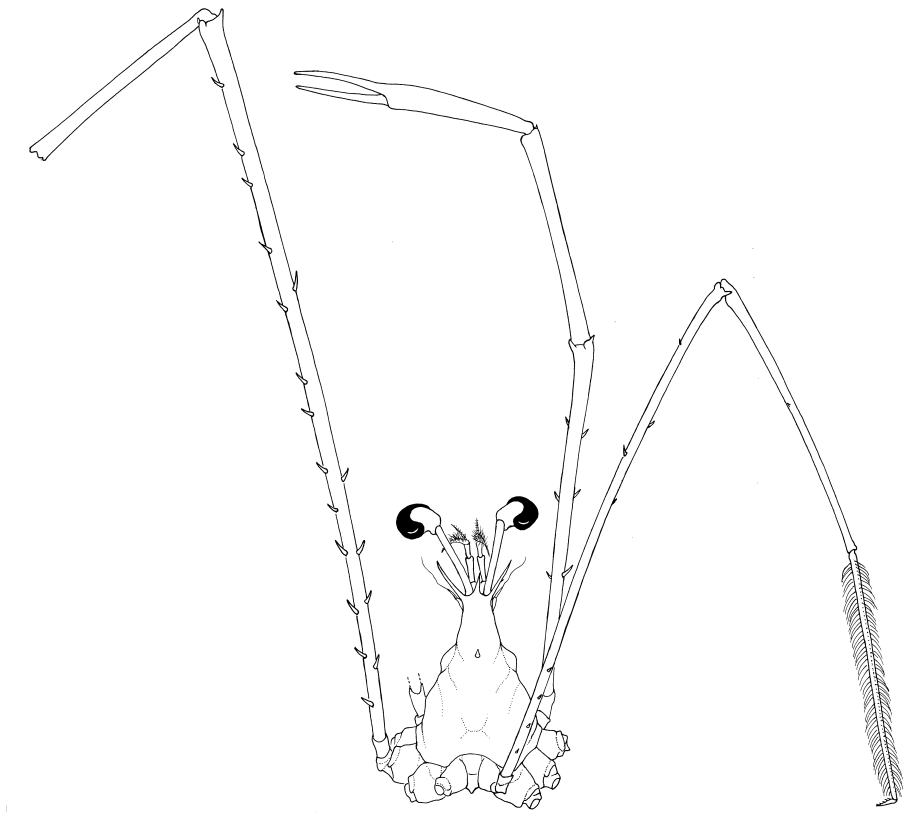

FIG. 12. — *Latreillia valida* de Haan, 1839, New Caledonia, *Vauban* trawlings, stn 04, 400 m, ♂ 10.4 × 6.2 mm (MNHN-B 28072), dorsal view, left cheliped omitted, most other pereopods missing from specimen.

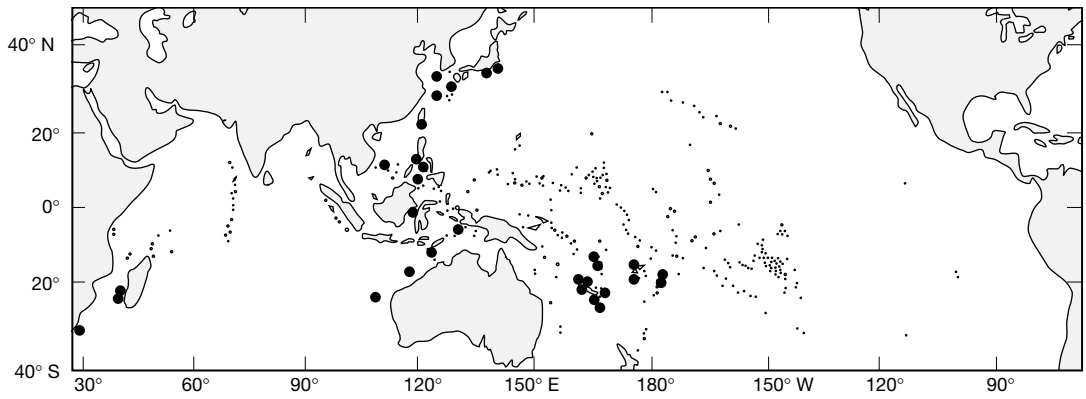

FIG. 13. — Geographical distribution of *Latreillia valida* de Haan, 1839.

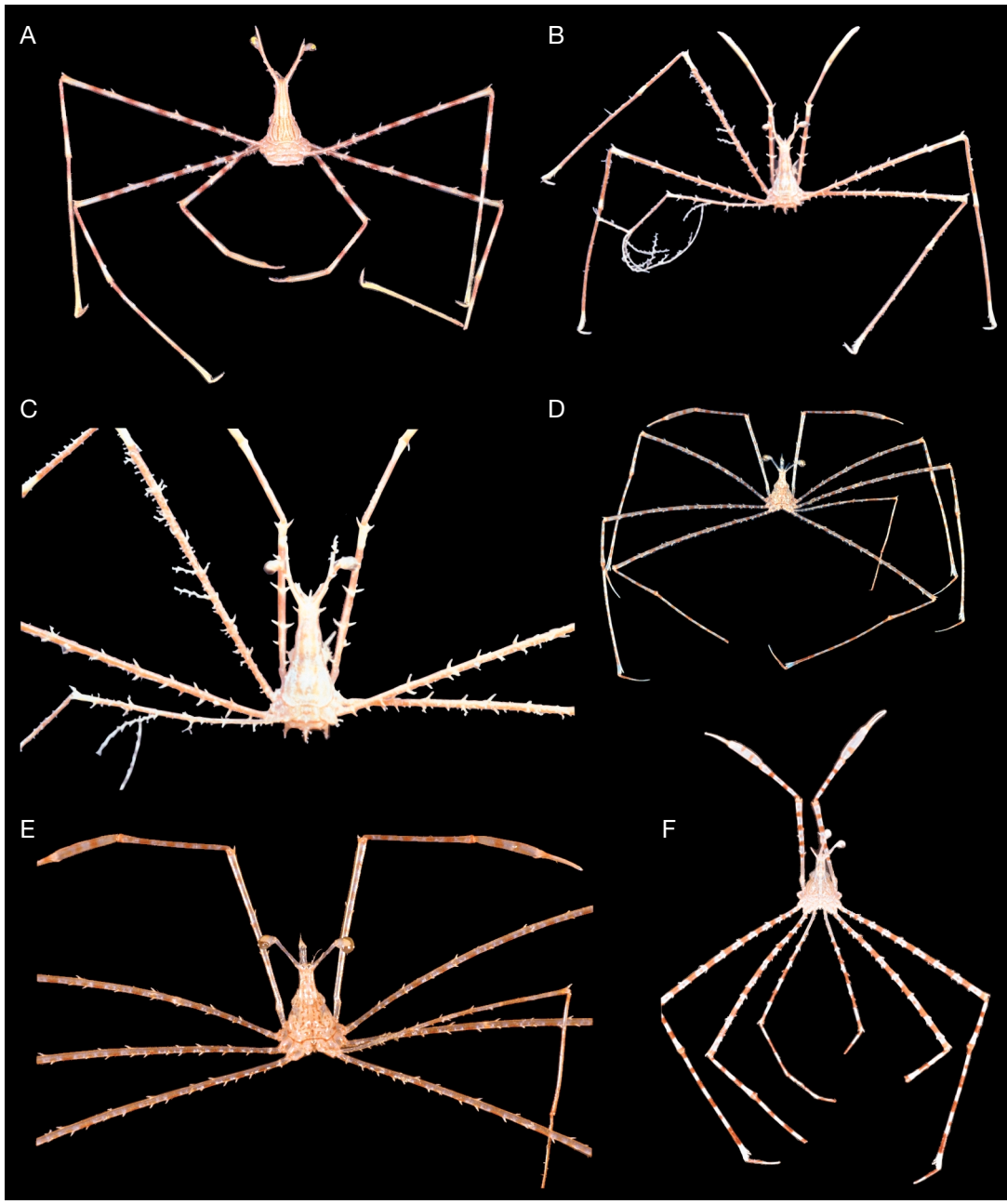

FIG. 14. — **A**, *Latreillia metanesa* Williams, 1982, New Caledonia, SMIB 8, stn CP 161, 232-251 m, ovigerous ♀ 10.9 × 5.3 mm (MNHN-B 28171), photo J.-L. Menou; **B**, **C**, *Latreillia metanesa* Williams, 1982, Tuamotu Archipelago, French Polynesia, stn 314, 470 m, J. Poupin coll., ovigerous ♀ 11.9 × 6.4 mm (MNHN-B 28152), with colonial bryozoans on P2 and P4, photos J. Poupin; **D**, **E**, *Latreillia valida* de Haan, 1839, Vanuatu, MUSORTOM 8, stn CP 1077, 180-210 m, ♂ 8.7 × 5.3 mm (MNHN-B 28474), photos J.-L. Menou; **F**, *Latreillia valida* de Haan, 1839, Loyalty Islands, MUSORTOM 6, stn DW 482, 375 m, ♂ 15.0 × 10.1 mm (MNHN-B 28074), photo P. Laboute.

1990: fig. 1). Gastric region slender, length more than 0.35 carapace length. Hepatic swellings not topped by tubercle or spine. Supraocular spines shorter or longer than ocular peduncles. Meri of third maxillipeds with short tubercle on ventral surface. Abdomen of adult males with somites 4-5 fused (see Melo 1990: fig. 2b); middorsal protuberance on somite 1, acute spine on somite 2. Abdomen of adult females with middorsal protuberance on somite 1, acute spine on each somite 2, 3; somites 4-6 broad and fused with proximal spines laterally near articulation with somite 3. Propodus of each last pair of pereopods (P5) shorter than carpus; dactylus forming subchela when flexed on distal portion of propodus.
Colour: Carapace pale-yellow (Melo 1990: 30). Pereopods P2-P4 yellow with red rings; P5 yellow without rings, darker in males than in females. Cornea of eyes "wine color".

REMARKS
Latreillia williamsi is very close to *L. metanesa* and *L. elegans*. It is unique among members of the family in that the abdominal somites 4, 5 of males are fused (Melo 1990: fig. 2b). Only around 9% of the specimens studied by Melo (1990: 30) had a spine on the dorsal surface of the gastric region.

Size
Maximum size: unknown.

PHYLOGENY OF LATREILLIIDAE

The family Latreilliidae was placed by Guinot (1978) in the superfamily Homoloidea de Haan, 1839, subsection Archaeobrachyura Guinot, 1977 of the section Podotremata Guinot, 1977, based primarily on the coxal location of both male and female genital openings. The Homoloidea (which also contains the families Homolidae de Haan, 1839 and Poupiniidae Guinot, 1991) was subsequently removed from the subsection Archaeobrachyura and considered a distinct clade (subsection Homolidea) different from both the basal Podotremata (Dromiacea de Haan, 1839), and the redefined Archaeobrachyura (see Guinot & Tavares 2001). Martin & Davis (2001) did not recognize the group Podotremata and included the Latreilliidae in the superfamily Homoloidea de Haan, 1839 of the section Dromiacea, which they suggested as one of the two clades that comprise Brachyura. There is ample evidence, however, that the subsection Homolidea (which consists of the superfamily Homoloidea) is a monophyletic group distinct from the two other clades (Dromiacea and Archaeobrachyura) that are included in the Podotremata (see Guinot & Tavares 2001: fig. 16; Guinot & Tavares 2003).
Larval development among members of the Latreilliidae shows clear affinities to the Homoloidea (see Williamson 1965, 1967). The ultrastructure of their sperm, however, has failed to show any clear, unambiguous relationships with particular groups within the Brachyura (see Jamieson 1994: 385; Jamieson *et al.* 1995: 277).

BIOGEOGRAPHY OF LATREILLIIDAE

Three of the seven species of latreilliids (*L. metanesa*, *L. pennifera* and *L. valida*) are found throughout the Indo-west Pacific region. *Latreillia metanesa*, however, is now recorded for the first time from seamounts in the eastern Pacific region. Two species are found mostly in the Indo-west Pacific but extend into adjacent non-tropical regions: *E. australiensis*, also found in subtemperate and temperate eastern Australia as far south as Bass Strait and off the North Island of New Zealand (Fig. 3), and *E. phalangium*, which extends into temperate northern Japan (Fig. 3). Only two species are found outside the Indo-west Pacific: *L. elegans* from the Mediterranean and the subtemperate and temperate Atlantic Ocean as far north as Portugal and New England and as far south as Ascension and St Helena islands in the South Atlantic (Fig. 4), and *L. williamsi*, so far known from the subtemperate South Atlantic along the eastern coast of South America (Fig. 4).
Springer (1982: 110) gave the distribution of the species of *Latreillia* as an example of plate endemism. The extensions in the distribution of species that have resulted from this investigation, however, reject this hypothesis. The eastern and western Atlantic plates are no longer considered to be inhabited by separate endemic species but

by populations of the same species (*L. elegans*), *L. valida* is no longer absent from the Pacific Plate, and *L. metanesa*, which extends into the Indian Ocean and the Nazca Plate on the eastern Pacific region, is no longer an endemic of the Pacific Plate. *Latreillia pennifera* remains the only Indo-west Pacific species of *Latreillia* not yet recorded from the Pacific Plate.

CARRYING BEHAVIOUR IN THE LATREILLIIDAE

Very little is known about the biology and habits of latreilliids. Of special interest is the role of the last pair of pereopods (P5) in carrying objects for camouflaging (see Wiksten 1986; Guinot *et al.* 1995) and in agonistic behaviour. Scant information is known only from two species that live in relatively shallow water, and thus can be observed and photographed by divers.

E. phalangium from Japan is known to carry seaweeds and hydroids with their P5 (Muraoka 1982: 30) and wave the appendages "when in danger" (Minemizu 2000: 186, 187 [unnumbered photographs]). This species often lives on the branches of gorgonians (Gosliner *et al.* 1996: 235 [unnumbered photograph], as *Eplumra* [sic] *phalangium*; Minemizu 2000: 187 [unnumbered photograph]). In Japan *E. phalangium* has been found on gorgonians together with the galatheoid *Chirostylus* spp., both of which have a reduced body and greatly elongated pereopods. *E. phalangium* moves into shallow water during winter, where it becomes associated with the base of sea anemones (Minemizu 2000).

Live individuals of *L. valida* carry their P5 erect over the body (see Takeda 1992: 13 [figure]; Gosliner *et al.* 1996: 235 [unnumbered photograph]; Minemizu 2000: 186 [unnumbered photograph]; Debelius 2001: 258 [unnumbered photograph]). Observations in Japan have shown that, unlike *E. phalangium*, individuals appear not to be associated with gorgonians or sea anemones or to carry seaweed, hydroids, or other organisms with their simple, non-subchelate P5 (Minemizu 2000).

None of the specimens of latreilliids that were examined during this investigation were found with organisms attached to their P5. These included those species with a subchelate P5 morphologically capable of carrying an object. One specimen of *L. metanesa* (MNHN-B 28152) had an encrusting bryozoan on a P2 and P4 (Fig. 14B, C).

ADDENDUM

Two records of *Latreillia* came to the attention of the authors after the submission of the manuscript:

Latreillia aff. *phalangium* – Poupin 1996: pl. 13, fig. f (= *L. metanesa* Williams, 1982).

Latreillidae sp. – DiSalvo *et al.* 1988: 458 (possibly *L. metanesa*; first known record of family from Easter I.).

Acknowledgements

We are much indebted to A. Crosnier (MNHN), who first proposed to the first author examining the French material that remained at USNM after the death of A. Williams. D. Guinot (MNHN) generously shared her knowledge with the first author. Our gratitude also to B. Richer de Forges (IRD, Nouméa), responsible for collecting most of the material, M. Nizinski (National Marine Fisheries Service Systematics Laboratory, Smithsonian Institution, Washington DC), who sent documents and photographs pertaining to Williams' work, and M. Hewitt (WAM), L. Hoenson and M. Van Der Merwe (SAM) for loans of material. K. H. Moore (Systematics Laboratory, National Marine Fisheries Service) and J.-F. Dejouannet (IRD, Paris) expertly prepared the illustrations; M. Tortelier (IRD, Nouméa) the maps. The manuscript was greatly improved by comments and suggestions from D. Guinot and R. Lemaitre (USNM). Grants from the MNHN and the Office of Fellowships & Grants of the Smithsonian Institution allowed the first author to travel to Paris and Washington DC. For these, and their hospitality, the first author is much indebted to A. Crosnier and R. Lemaitre.

REFERENCES

ALCOCK A. 1900a. — On some notable new and rare species of Crustacea. Natural history notes from the Royal Indian Marine Survey Ship *Investigator*, Commander T. H. Heming, R. N., commanding, Series III, No. 3. *Journal of the Asiatic Society of Bengal* 68 (pt. 2, No. 2): 111-119, pl. 1 (dated 1899, published 1900).

ALCOCK A. 1900b. — The Brachyura Primigenia, or Dromiacea. Materials for a carcinological fauna of India, No. 5. *Journal of the Asiatic Society of Bengal* 68 (pt. 2, No. 3): 123-169 (dated 1899, published 1900).

ALCOCK A. 1901. — *Catalogue of the Indian Decapod Crustacea in the Collection of the Indian Museum*, Part I. *Brachyura*, Fasciculus 1. *Introduction and Dromides or Dromiacea (Brachyura Primigenia)*. Indian Museum, Calcutta, viii + 80 p., pls 1-7.

BALSS H. 1957. — Decapoda, VIII. Systematik, *in* BRONNS H. G. (ed.), *Klassen und Ordnungen des Tierreichs*, Band 5, Abteilung 1, Buch 7. Akademische Verlagsgesellschaft, Geest & Portig K.-G., Leipzig: 1505-1672.

BARNARD K. H. 1950. — Descriptive catalogue of South African decapod Crustacea (crabs and shrimps). *Annals of the South African Museum* 38: 1-837.

BORRADAILE L. A. 1903. — The sponge-crabs (Dromiacea), Marine Crustaceans, part 9. *Fauna and Geography of the Maldive and Laccadive Archipelagoes* 2 (1): 574-578, pl. 33.

BOUCHARD J.-M. 2000. — *Morphologie fonctionelle des systèmes de rétention de l'abdomen chez les Brachyoures (Crustacea Decapoda). Microstructure ; implications phylogénétiques et systématiques*. Thèse, Muséum national d'Histoire naturelle, Paris, France, 299 p.

CAMPBELL B. M. 1971. — New records and new species of crabs (Crustacea: Brachyura) trawled off Southern Queensland: Dromiacea, Homolidea, Gymnopleura, Corystoidea, and Oxystomata. *Memoirs of the Queensland Museum* 16 (1): 27-48, pls 2, 3.

CHEN H. & SUN H. 2002. — [Marine primitive crabs, Brachyura, Arthropoda, Crustacea]. *Fauna Sinica*, Invertebrata 30: xiii + 597 p., pls 1-16 (in Chinese with English summary).

CHEN H. & XU Z. 1991. — [A preliminary study on the crabs of the Nansha Islands, China]. [*Study of the Marine Organisms in the Nansha Islands and the Nearby Seas*] 3: 1-47 (in Chinese with English summary).

CROSNIER A., RICHER DE FORGES B. & BOUCHET P. 1997. — La campagne KARUBAR en Indonésie, au large des îles Kai et Tanimbar, *in* CROSNIER A. & BOUCHET P. (eds), Résultats des campagnes MUSORSTOM, vol. 16. *Mémoires du Muséum national d'Histoire naturelle* 172: 9-26.

DAI A. & YANG S. 1991. — *Crabs of the China Seas*. China Ocean Press, Beijing; Springer-Verlag, Berlin, 21 + 608 p.

DAI A.-Y., YANG S., SONG Y. & CHEN G. 1986. — [*Crabs of Chinese Seas*]. China Ocean Press, Beijing, 17 + 642 p. (in Chinese).

DAVIE P. J. F. 2002. — Crustacea: Malacostrata: Eucarida (Part 2): Decapoda – Anomura, Brachyura, *in* WELLS A. & HOUSTON W. W. K. (eds), *Zoological Catalogue of Australia* 19.3B, xiv + 641 p.

DEBELIUS H. 2001. — *Crustacea. Guide of the World. Atlantic Ocean, Indian Ocean, Pacific Ocean*. Ikan, Frankfurt, 321 p.

DELL R. K. 1963. — Some deep-water crabs (Crustacea, Brachyura) from New Zealand. *Records of the Dominion Museum*, Wellington 4 (18): 243-253.

DELL R. K. 1968. — Notes on New Zealand crabs. *Records of the Dominion Museum*, Wellington 6 (3): 13-28.

DISALVO L. H., RANDALL J. A. & CEA A. 1988. — Ecological reconnaissance of the Easter Island sublittoral marine environment. *National Geographic Research* 4 (4): 451-473.

FOREST J. 1981. — Compte rendu et remarques générales. Report and general comments, *in* Résultats des campagnes MUSORSTOM I – Philippines (18-28 mars 1976). *Mémoires ORSTOM* 91: 9-50.

FOREST J. 1985. — La campagne MUSORSTOM II (1980). Compte rendu et liste des stations. The MUSORSTOM II Expedition (1980). Report and list of stations, *in* FOREST J. (ed.), Résultats des campagnes MUSORSTOM I & II, Tome 2. *Mémoires du Muséum national d'Histoire naturelle*, sér. A (Zoologie) 133: 7-30.

FOREST J. 1989. — Compte rendu de la campagne MUSORSTOM 3 aux Philippines (31 mai-7 juin 1985). Report on the MUSORSTOM 3 Expedition to the Philippines (May 31st-June 7th 1985), *in* FOREST J. (ed.), Résultats des campagnes MUSORSTOM, vol. 4. *Mémoires du Muséum national d'Histoire naturelle*, sér. A (Zoologie) 143: 9-23.

FRANSEN C. H. J. M., HOLTHUIS L. B. & ADEMA J. P. H. M. 1997. — Type-catalogue of the Decapod Crustacea in the collections of the Nationaal Natuurhistorisch Museum, with appendices of pre-1900 collectors and material. *Zoologische Verhandelingen* 311: xvi + 1-344.

GISTEL J. 1848. — *Naturgeschichte des Thierreichs für höhere Schulen*. Hoffmann'sche Verlag-Buchandlung, Sttutgart, xvi + 216 p, 32 pls.

GORDON I. 1950. — Crustacea: Dromiacea, Part I: Systematic account of the Dromiacea collected by the "John Murray" Expedition. Part II: The morphology of the spermatheca in certain Dromiacea. *Scientific Reports, John Murray Expedition, 1933-34* 9 (3): 201-253, pl. 1.

GOSLINER T. M., BEHRENS D. W. & WILLIAMS G. C. 1996. — *Coral Reef Animals of the Indo-Pacific, Animal Life from Africa to Hawai'i Exclusive of the Vertebrates*. Sea Challengers, Monterey, California, 314 p.

GUINOT D. 1978. — Principes d'une classification évolutive des crustacés décapodes brachyoures. *Bulletin biologique de la France et de la Belgique* 112 (3): 211-292.

GUINOT D. 1991. — Établissement de la famille des Poupiniidae pour *Poupinia hirsuta* gen. nov., sp. nov. de Polynésie (Crustacea Decapoda Brachyura Homoloidea). *Bulletin du Muséum national d'Histoire naturelle* 4e sér., A 12 (3/4): 577-605.

GUINOT D. & BOUCHARD J.-M. 1998. — Evolution of the abdominal holding systems of brachyuran crabs (Crustacea, Decapoda, Brachyura). *Zoosystema* 20 (4): 613-694.

GUINOT D. & RICHER DE FORGES B. 1981. — Homolidae, rares ou nouveaux, de l'Indo-Pacifique (Crustacea, Decapoda, Brachyura. *Bulletin du Muséum national d'Histoire naturelle* 4e sér., A 3: 523-581.

GUINOT D. & RICHER DE FORGES B. 1995. — Crustacea Decapoda Brachyura : révision de la famille des Homolidae de Haan, 1839, *in* CROSNIER A. (ed.), Résultats des campagnes MUSORSTOM, vol. 13. *Mémoires du Muséum national d'Histoire naturelle* 163: 283-517.

GUINOT D. & TAVARES M. 2001. — Une nouvelle famille de crabes du Crétacé, et la notion de Podotremata Guinot, 1977 (Crustacea, Decapoda, Brachyura). *Zoosystema* 23 (3): 507-546.

GUINOT D. & TAVARES M. 2003. — A new subfamilial arrangement for the Dromiidae de Haan, 1833, with diagnoses and descriptions of new genera and species (Crustacea, Decapoda, Brachyura). *Zoosystema* 25 (1): 43-129.

GUINOT D., DOUMENC D. & CHINTIROGLOU C. C. 1995. — A review of the carrying behaviour in brachyuran crabs, with additional information on the symbioses with sea anemones. *Raffles Bulletin of Zoology* 43 (2): 377-416.

HAAN W. DE 1833-1849. — Crustacea, *in P. F. von Siebold, Fauna Japonica sive Descriptio Animalium, quae in Itinere per Japoniam, Jussu et Auspiciis Superiorum, Qui Summum in India Batavia Imperium Tenent, Suscepto Annis 1823-1830 Collegit, Notis, Observationibus et Adumbrationibus Illustravit.* Leiden, i-xvii + i-xxxi + ix-xvi + 243 p., pls A-J, L-Q, 1-55, circ. tab. 2.

HENDERSON J. R. 1888. — Report of the Anomura collected by H.M.S. *Challenger* during the years 1873-76. *Report on the Scientific Results of the Voyage of H.M.S.* Challenger *during the Years 1873-76 under the Command of Captain George S. Nares, R.N., F.R.S. and the late Captain Frank Tourle Thompson, R.N.*, Zoology 27 (69), xi + 221 p., 21 pls.

HOLTHUIS L. B. 1962. — Forty-seven genera of Decapoda (Crustacea); proposed addition to the official list. *Bulletin of Zoological Nomenclature* 19 (4): 232-253.

IHLE J. E. W. 1913. — Dromiacea. Die Decapoda Brachyura der Siboga-Expedition, I. *Siboga Expeditie* 39 (b): 1-96, pls 1-4.

IKEDA H. 1998. — *The Deep-Sea Crabs of Sagami Bay*. Hayama Shiosai Museum, Kanagawa, Japan, 180 p.

JAMIESON B. G. M. 1994. — Phylogeny of the Brachyura with particular reference to the Podotremata: evidence from a review of spermatozoal ultrastructure (Crustacea, Decapoda). *Philosophical Transactions of the Royal Society* ser. B 345: 373-393.

JAMIESON B. G. M., GUINOT D. & RICHER DE FORGES B. 1995. — Phylogeny of the Brachyura (Crustacea, Decapoda): evidence from spermatozoal ultrastructure, *in* JAMIESON B. G. M., AUSIO J. & JUSTINE J.-L. (eds), Advances in spermatozoal phylogeny and taxonomy. *Mémoires du Muséum national d'Histoire naturelle* 166: 265-283.

KENSLEY B. 1981. — On the zoogeography of Southern African decapod Crustacea, with a distributional checklist of the species. *Smithsonian Contributions to Zoology* 338: 1-64.

KIM H. S. & CHANG C. Y. 1985. — The brachyuran crabs of Cheju Island, Korea (Crustacea: Decapoda). *Korean Journal of Systematic Zoology* 1 (1-2): 41-60.

KIM W. & KIM H. S. 1982. — Classification and geographical distribution of Korean crabs (Crustacea, Decapoda, Brachyura). *Proceedings of the College of Natural Sciences, Seoul National University* 7 (1): 133-159.

KONISHI K., TAKEOKA H. & TAISHAKU H. 1995. — Description of the first zoea of *Paramola macrochira* Sakai (Brachyura: Homolidae) with notes on larval characters of archaeobrachyuran families. *Crustacean Research* 24: 69-77.

LABOUTE P., LARDY M., MENOU J.-L., MONZIER M. & RICHER DE FORGES B. 1989. — La campagne VOLSMAR sur les volcans sous-marins du sud de l'arc des Nouvelles-Hébrides (N.O. *Alis*, 29 mai au 9 juin 1989). *Rapports de Missions, Sciences de la Terre, Géologie-Géophysique, ORSTOM*, Nouméa 11: 1-22.

LEHODEY P., RICHER DE FORGES B., NAUGES C., GRANDPERRIN R. & RIVATON J. 1992. — Campagne BERYX 11 de pêche au chalut sur six monts sous-marins du Sud-Est de la Zone Économique de Nouvelle-Calédonie (N.O. *Alis*, 13 au 23 octobre 1992). *Rapports de Missions, Sciences de la Mer, Biologie marine, ORSTOM*, Nouméa 22: 1-93.

LEMAITRE R. & COLLETTE B. B. 2000. — Austin Beatty Williams (17 October 1919-27 October 1999). Biographical summary. *Proceedings of the Biological Society of Washington* 113 (1): 2-13.

MANNING R. B. & HOLTHUIS L. B. 1981. — West African Brachyuran crabs (Crustacea: Decapoda). *Smithsonian Contributions to Zoology* 306: xii + 1-379.

MANNING R. B. & CHACE F. A. 1990. — Decapod and stomatopod Crustacea from Ascension Island, South Atlantic Ocean. *Smithsonian Contributions to Zoology* 503: v + 1-91.

MARTIN J. W. & DAVIES G. E. 2001. — An updated classification of the recent Crustacea. *Science Series, Natural History Museum of Los Angeles County* 39: 1-124.

MCLAY C. L. 1988. — Brachyura and crab-like Anomura of New Zealand. *Leigh Laboratory Bulletin* 22: i-iv + 1-463.

MELO G. A. S. 1990. — Descrição de *Latreillia williamsi* sp. n. (Crustacea: Brachyura: Homoloidea), e a ocorrência da Família Latreilliidae no litoral brasileiro. *Atlântica*, Rio Grande 12 (1): 27-34.

MELO G. A. S. 1996. — *Manual de identificação dos Brachyura (caranguejos e siris) do litoral brasileiro*. Plêiade, São Paulo, 603 p.

MINEMIZU R. 2000. — [*Marine Decapod and Stomatopod Crustaceans mainly from Japan*]. Bun-Ichi Sogo Shuppan, Tokyo, 344 p. (in Japanese).

MIYAKE S. 1983. — *Japanese Crustacean Decapods and Stomatopods in Color*. Vol. 2, *Brachyura (Crabs)*. Hoikusha, Osaka, 277 p.

MIYAKE S., SAKAI K. & NISHIKAWA S. 1962. — A fauna-list of the decapod Crustacea from the coasts washed by the Tsushima warm current. *Records of Oceanographic Works in Japan* special No. 6: 121-131.

MONOD T. 1956. — Hippidea et Brachyura ouest-africains. *Mémoires de l'Institut français d'Afrique noire* 45: 1-674.

MOOSA M. K. 1984. — Report on the CORINDON cruises. *Marine Research in Indonesia* 24: 1-6.

MURAOKA K. 1982. — [*Crabs*]. Hoikusha, Osaka, 89 p. (in Japanese).

MURAOKA K. 1989. — The megalopa stage of *Eplumula phalangium* (De Haan) (Crustacea, Brachyura, Latreilliidae). *Bulletin of the Kanagawa Prefectural Museum* 18: 47-52.

MURAOKA K. 1992. — [Taxonomical characters of the megalopae of the genera *Eplumula* and *Latreillia* (Crustacea, Latreillidae)]. *Aquabiology* 14 (5): 356-359 (in Japanese).

NG P. K. L., WANG C.-H., HO P.-H. & SHIH H.-T. 2001. — An annotated checklist of brachyuran crabs from Taiwan (Crustacea: Decapoda). *National Taiwan Museum Special Publication Series* 11: 1-86.

POUPIN J. 1996. — *Atlas des crustacés marins profonds de Polynésie française. Récoltes du navire* Marara *(1986/1996)*. Service mixte de Surveillance radiologique et biologique de l'Homme et de l'Environment, Montlhéry, France, 59 p.

RATHBUN M. J. 1937. — The oxystomatous and allied crabs of America. *Bulletin of the United States National Museum* 166: vi + 1-272, pls 1-86.

RICE A. L. 1981. — The megalopa stage in brachyuran crabs. The Podotremata Guinot. *Journal of Natural History* 15: 1003-1011.

RICE A. L. 1982. — The megalopa stage of *Latreillia elegans* Roux (Decapoda, Brachyura, Homoloidea). *Crustaceana* 43 (2): 205-210.

RICHER DE FORGES B. 1990. — Les campagnes d'exploration de la faune bathyale dans la zone économique de la Nouvelle-Calédonie. Explorations for bathyal fauna in the New Caledonia economic zone, *in* CROSNIER A. (ed.), Résultats des campagnes MUSORSTOM, vol. 6. *Mémoires du Muséum national d'Histoire naturelle* sér. A 145: 9-54.

RICHER DE FORGES B. 1991. — Les fonds meubles des lagons de Nouvelle-Calédonie : généralités et échantillonnages par dragages, *in* RICHER DE FORGES B. (ed.), Le benthos des fonds meubles des lagons de Nouvelle-Calédonie. *Études et Thèses, ORSTOM*, Paris 1: 7-148.

RICHER DE FORGES B., LABOUTE P. & MENOU J.-L. 1986. — La campagne MUSORSTOM V aux îles Chesterfield ; N.O. *Coriolis* 5-24 octobre 1986. *Rapports scientifiques et techniques, ORSTOM* 41: 1-31.

RICHER DE FORGES B. & CHEVILLON C. 1996. — Les campagnes d'échantillonnage du benthos bathyal en Nouvelle-Calédonie, en 1993 et 1994 (BATHUS 1 à 4, SMIB 8 et HALIPRO 1), *in* CROSNIER A. (ed.), Résultats des campagnes MUSORSTOM, vol. 15. *Mémoires du Muséum national d'Histoire naturelle* 168: 33-53.

RICHER DE FORGES B., FALIEX E. & MENOU J.-L. 1996. — La campagne MUSORSTOM 8 dans l'archipel de Vanuatu. Compte rendu et liste des stations, *in* CROSNIER A. (ed.), Résultats des campagnes MUSORSTOM, vol. 15. *Mémoires du Muséum national d'Histoire naturelle* 168: 9-32.

RICHER DE FORGES B., NEWELL P., SCHLACHER-HOENLINGER M., SCHLACHER T., NATING D., CÉSA F. & BOUCHET P. 2000a. — La campagne MUSORSTOM 10 dans l'archipel des îles Fidji. Compte rendu et liste des stations, *in* CROSNIER A. (ed.), Résultats des campagnes MUSORSTOM, vol. 21. *Mémoires du Muséum national d'Histoire naturelle* 184: 9-23.

RICHER DE FORGES B., BOUCHET P., DAYRAT B., WARÉN A. & PHILIPPE J.-S. 2000b. — La campagne BORDAU 1 sur la ride de Lau (îles Fidji). Compte rendu et liste des stations, *in* CROSNIER A. (ed.), Résultats des campagnes MUSORSTOM, vol. 21. *Mémoires du Muséum national d'Histoire naturelle* 184: 25-38.

ROUX P. 1828-1830. — *Crustacés de la Méditerranée et de son littoral*. Levrault, Paris, 176 unnumbered p.,

pls 1-45 (pls 1-10 [1828], 11-15 [1829], pls 16-45 [1830]).

SAKAI T. 1956. — [*Crabs*]. Saito Press, Tokyo, 224 + 60 p. (in Japanese).

SAKAI T. 1960. — [Order Decapoda, suborder Brachyura], *in* OKADA K. & UCHIDA T. (eds), *Encyclopaedia Zoologica Illustrated in Colours*, vol. 4. Hokuryukan, Tokyo: 28-87 (in Japanese).

SAKAI T. 1965. — *The Crabs of Sagami Bay collected by His Majesty the Emperor of Japan*. Maruzen, Tokyo, xvi + 206 p. (English text) + 92 p. (Japanese text) + 32 p. (bibliography & indices), pls 1-100, 1 map.

SAKAI T. 1976. — *Crabs of Japan and the Adjacent Seas*. Kodansha, Tokyo, vol. 1, xxxix + 773 p.; vol. 2, 461 p.; vol. 3, 16 p., pls 1-251.

SERÈNE R. 1968. — The Brachyura of the Indo-West Pacific region, *in Prodromus for a Check List of the Non-Planctonic Marine Fauna of South East Asia*. UNESCO, Singapore National Academy of Science, Special Publication 1, Fauna III Cc3: 33-118.

SERÈNE R. & LOHAVANIJAYA P. 1973. — The Brachyura (Crustacea: Decapoda) collected by the Naga Expedition, including a review of the Homolidae. Scientific results of marine investigations of the South China Sea and the Gulf of Thailand, 1959-1961. *Naga Report* 4 (4): 1-187.

SERÈNE R. & VADON C. 1981. — Crustacés décapodes : brachyoures. Liste préliminaire, description de formes nouvelles et remarques taxonomiques, *in* Résultats des campagnes MUSORSTOM. I. Philippines (18-28 mars 1976), vol. 1. *Mémoires ORSTOM* 91: 117-140.

SPRINGER V. G. 1982. — Pacific plate biogeography, with special reference to shorefishes. *Smithsonian Contributions to Zoology* 367: iv + 1-182.

STEBBING T. R. R. 1902. — South African Crustacea, Part. II. *Marine Investigations in South Africa* 12: 1-92.

STEBBING T. R. R. 1910. — General catalogue of South African Crustacea (Part V of S. A. Crustacea for the Marine Investigations in South Africa). *Annals of the South African Museum* 6 (4): 281-593.

STIMPSON W. 1858. — Crustacea Anomura, Pars VII. Prodromus descriptionis animalium evertebratorum, quae in Expeditione ad Oceanum Pacificum Septentrionalem, a Republica Federata missa, Cadwaladaro Ringgold et Johanne Rodgers Ducibus, observavit et descripsit W. Stimpson, Pars VII. *Proceedings of the Academy of Natural Sciences of Philadelphia* 10: 225-252.

TAKEDA M. 1973a. — [Crabs from the sea around the Tsushima Islands]. *Bulletin of the Biogeographical Society of Japan* 29 (3): 9-16 (in Japanese).

TAKEDA M. 1973b. — Report on the crabs from the sea around the Tsushima Islands collected by the Research Vessel *Genkai* for the Trustees of the National Science Museum, Tokyo. *Bulletin of the Liberal Arts & Sciences Course, Nihon University School of Medicine*, Tokyo 1: 17-68.

TAKEDA M. 1975. — A collection from off the Danjo Islands made by the R/V *Hakuhô Maru* cruise KH-74-3. Crabs from the East China Sea, VI. *Bulletin of the National Science Museum*, Tokyo, ser. A (Zoology) 1 (3): 137-156.

TAKEDA M. 1977. — Crabs from shallow waters off Mage-jima Island, southwest Japan. *Bulletin of the National Science Museum*, Tokyo, ser. A (Zoology) 3 (2): 73-89.

TAKEDA M. 1978. — [Biogeographical notes on the crabs obtained by dredging at the sea around Nii-jima and O-shima, Izu Islands]. *Memoirs of the National Science Museum*, Tokyo 11: 73-80 (in Japanese).

TAKEDA M. 1979. — [Systematic and biogeographic notes on the crabs obtained by dredging at the sea around Cape Shimonoseki, Kii Peninsula]. *Memoirs of the National Science Museum*, Tokyo 12: 151-157 (in Japanese).

TAKEDA M. 1982a. — *Key to the Japanese and Foreign Crustaceans Fully Illustrated in Colors*. Hokuryukan, Tokyo, vi + 284 + 54 p. (keys).

TAKEDA M. 1982b. — [Biogeographical notes on the crabs obtained by dredging off the southeast coast of the Izu Peninsula, Central Japan]. *Bulletin of the Biogeographical Society of Japan* 37 (4): 15-21 (in Japanese).

TAKEDA M. 1992. — [*Not all Crabs Crawl only Sideways*]. PHP Laboratory, Tokyo, 236 p. (in Japanese).

TAKEDA M. 1995. — [Geographical notes on the crabs from Onagawa Bay and its adjacent waters, Northeastern Honshu, Japan]. *Memoirs of the National Science Museum*, Tokyo 28: 135-145 (in Japanese).

TAKEDA M. 1997. — Deep-sea decapod crustacean fauna of Suruga Bay, Central Japan. *National Science Museum Monographs*, Tokyo 12: 229-255.

TAKEDA M. 2001. — Annotated list of crabs from Tosa Bay, Southwest Japan, collected by the R/V *Kotaka Maru* during the years 1997-2000, *in* FUJITA F., SAITO H. & TAKEDA M. (eds), Deep-sea fauna and pollutants in Tosa Bay. *National Museum Monographs*, Tokyo 20: 217-262.

TAKEDA M. & KUBODERA T. 1998. — A small collection of crabs from the East China Sea. *Memoirs of the National Science Museum*, Tokyo 31: 211-222.

TAN S. H., HUANG J.-F. & NG P. K. L. 2000. — The deep-water crabs of the families Homolidae and Latreilliidae (Crustacea: Decapoda: Brachyura) from Taiwan. Proceedings of the international symposium on marine biology in Taiwan – Crustacean and zooplankton taxonomy, ecology and living resources, 26-27 May, 1998, Taiwan. *National Taiwan Museum Special Publication Series* 10: 181-189.

TUNG Y.-M., CHEN Y.-S., WANG F.-Z. WANG B.-Y. & LI Z.-C. 1988. — [*Report on Crustaceans of the*

Deep East China Sea]. Zhejiang Science and Technology Publishing House, Hangzhou, China, 132 p. (in Chinese).

TÜRKAY M. 2001. — Decapoda, *in* COSTELLO M. J., EMLOW C. S. & WHITE R. (eds), European register of marine species. A check-list of the marine species in Europe and a bibliography of guides to their identification. *Patrimoines naturels* Muséum national d'Histoire naturelle, Paris 50: 284-294.

UDEKEM D'ACOZ C. D' 1999. — Inventaire et distribution des crustacés décapodes de l'Atlantique nord-oriental, de la Méditerranée et des eaux continentales adjacentes au nord de 25°N. *Patrimoines naturels* Muséum national d'Histoire naturelle, Paris 40, x + 383 p.

UTINOMI H. 1956. — [*Coloured Illustrations of the Sea Shore Animals of Japan*]. 1st ed., Hoikusha, Osaka, xvii + 167 + xii p. (in Japanese).

WEAR R. G. & FIELDER D. R. 1985. — The marine fauna of New Zealand: larvae of the Brachyura (Crustacea, Decapoda). *New Zealand Oceanographic Institute Memoir* 92: 1-90.

WIKSTEN M. K. 1986. — Carrying behavior in brachyuran crabs. *Journal of Crustacean Biology* 6 (3): 364-369.

WILLIAMS A. B. 1982. — Revision of the genus *Latreillia* Roux. *Quadereni del Laboratorio di Tecnologia della Pesca*, Ancona 3 (2/5): 227-255.

WILLIAMS A. B. 1984. — *Shrimps, Lobsters, and Crabs of the Atlantic Coast of the Eastern United States, Maine to Florida*. Smithsonian Institution Press, Washington DC, xviii + 550 p.

WILLIAMSON D. I. 1965. — Some larval stages of three Australian crabs belonging to the families Homolidae and Raninidae, and observations on the affinities of these families (Crustacea: Decapoda). *Australian Journal of Marine and Freshwater Research* 16 (3): 369-398.

WILLIAMSON D. I. 1967. — The megalopa stage of the homolid crab *Latreillia australiensis* Henderson and comments on other homolid megalopas. *Australian Zoologist* 14 (2): 206-211.

WRIGHT C. W. & COLLINS J. S. H. 1972. — British cretaceous crabs. *Palaeontological Society Monographs* 126: 1-114.

YAMAGUCHI T. & BABA K. 1993. — Crustacean specimens collected in Japan by Ph. F. von Siebold and H. Bürger and held by the Nationaal Natuurhistorisch Museum in Leiden and other museums, *in* YAMAGUCHI T. (ed.), *Ph. F. von Siebold and Natural History of Japan Crustacea*. Carcinological Society of Japan, Tokyo: 145-570.

YAMAGUCHI T. & HOLTHUIS L. B. 2001. — Kia-ka Rui Siya-sin, a collection of pictures of crabs and shrimps, donated by Kurimoto Suiken to Ph. F. von Siebold. *Calanus* spec. No. 3: 1-156.

YAMAGUCHI T., BABA K., TAKEDA M. & KIKUCHI K. 1987. — Crab fauna of the Amakusa Islands. *Calanus* 10: 1-71.

ZARENKOV N. A. 1990. — [Decapods (Stenopodidea, Brachyura, Anomura) of the Naska and Sala-I-Comes [sic] underwater ridges]. *Trudy Instituta Okeanologii* 124: 218-244 (in Russian).

ZARENKOV N. A. 1994. — Crabs from seamounts of the western part of the Indian Ocean. *Transactions of the P.P. Shirshov Institute of Oceanology* 129: 97-124.

ZARIQUIEY ÁLVAREZ R. 1968. — Crustáceos decápodos ibéricos. *Investigación Pesquera*, Barcelona 32: xv + 1-510.

Submitted on 29 April 2002;
accepted on 23 August 2002.