

A review of *Strobopagurus* Lemaître, 1989 (Crustacea: Decapoda: Paguroidea: Parapaguridae), with description of a new species*

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SUMMARY: Species of the parapagurid genus *Strobopagurus* Lemaître, 1989 are reviewed based primarily on abundant specimens obtained during French campaigns across the Indo-Pacific region. A new species, *S. breviacus*, is described. The genus contains two other species, *S. gracilipes* (A. Milne-Edwards, 1891), the type of the genus, and *S. sibogae* (de Saint Laurent, 1972). One taxon, *Parapagurus kilburni* Kensley, 1973, originally described from off eastern Africa, has been found to be a junior synonym of *S. sibogae*. An updated diagnosis of the genus, and diagnoses and comparative illustrations of all three species, are presented together with a key to aid in their identification. Information on live coloration is provided for *S. gracilipes* and *S. sibogae*; live coloration of *S. breviacus* is not known.

Key words: Crustacea, Decapoda, Anomura, Paguroidea, Parapaguridae, deep-water hermit crabs, *Strobopagurus*, Indo-Pacific, eastern Atlantic, new species.

RESUMEN: REVISIÓN DE *STROBOPAGURUS* LEMAITRE, 1989 (CRUSTACEA: DECAPODA: PAGUROIDEA: PARAPAGURIDAE), CON LA DESCRIPCIÓN DE UNA ESPECIE NUEVA. – Se revisan las especies del género *Strobopagurus* Lemaître, 1989, principalmente en base a abundantes especímenes obtenidos durante las campañas francesas a través de la región del Indo-Pacífico. Se describe una especie nueva, *S. breviacus*. El género contiene otras dos especies, *S. gracilipes* (A. Milne-Edwards, 1891), la especie tipo del género, y *S. sibogae* (de Saint Laurent, 1972). Se ha determinado que *Parapagurus kilburni* Kensley, 1973, un taxón originalmente descrito de la costa oriental africana, es sinónimo de *S. sibogae*, siendo este último el nombre más antiguo a retener. Se presenta una diagnosis revisada del género, y de cada una de las especies. Se incluyen ilustraciones comparativas, así como una clave para ayudar en la identificación de las especies. Se presenta información sobre los patrones de coloración en vida de *S. gracilipes* y *S. sibogae*; el color en vida de *S. breviacus* se desconoce.

Palabras clave: Crustacea, Decapoda, Anomura, Paguroidea, Parapaguridae, cangrejos ermitaños de aguas profundas, *Strobopagurus*, Indo-Pacífico, Atlántico oriental, especie nueva.

INTRODUCTION

The genus *Strobopagurus* Lemaître, 1989, was established by Lemaître (1989) for a small group of distinctive parapagurids characterized primarily by their short, broad shields with oblique rows of long setae dorsally, stout ocular peduncles with strongly

dilated corneas, slender chelipeds, straight dactyls on the ambulatory legs, and in males, the strongly twisted distal segments of the second pleopods. Lemaître (1989) included three taxa in this genus: *S. gracilipes* (A. Milne-Edwards, 1891), at the time known from the eastern Atlantic and Hawaii; *S. sibogae* (de Saint Laurent, 1972), from the western Pacific; and *S. kilburni* (Kensley, 1973), from off eastern Africa. New specimens of *S. gracilipes* and

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S. sibogae have rarely been reported since their original descriptions, whereas *S. kilburni* has remained exclusively known from the type material.

While continuing the study of the remarkably rich parapagurid collections obtained during the French campaigns of the last three decades to the western Indian Ocean, New Caledonia and other Pacific regions, numerous specimens assignable to *S. gracilipes*, the type species of the genus, and *S. sibogae*, were found. Also, abundant specimens of an undescribed species were discovered. The evaluation of this and all other materials of *Strobopagurus* taxa found in various museums, has provided the opportunity to update the diagnosis of the genus, as well as the morphology and distribution of its species. Furthermore, a comparison of the type materials of *S. kilburni* and *S. sibogae* showed that the former is a junior synonym of the latter.

In this study, the genus *Strobopagurus* is rediagnosed, the newly discovered species is fully described, and the other two species herein recognized as valid are reviewed and diagnosed, including comparative illustrations of diagnostic characters, and color information where available. A key to aid in the identification of species is also presented.

MATERIALS AND METHODS

The morphological terminology employed, and measurements, follows those defined by Lemaitre (1989, 1999, 2004). However, on the fourth pereopod, the length of the propodus is measured in a straight line from the proximal end of the ventral margin to the tip of the distalmost scale of the rasp; the height of the propodus is measured perpendicularly to the dorsal margin, from its midpoint, to the ventral margin. The numbers or range in millimeters (mm) included in the *Material examined* and figure legends, are measurements for shield length (sl), measured from the midpoint of the rostral lobe to the midpoint of the posterior margin of the shield.

The specimens from the French campaigns remain deposited in the Muséum national d'Histoire naturelle, Paris (MNHN), except for some representatives sent to the National Museum of Natural History, Smithsonian Institution, Washington D.C. (USNM). Other specimens used have been returned to the following museums: Bernice P. Bishop Museum, Honolulu, Hawaii, U.S.A. (BPBM); Fisheries Research Station, Hong Kong, China (FRS); Musée Océanographique, Monaco (MO); National Taiwan

Ocean University, Keelung, Taiwan (NTOU); South African Museum, Cape Town, South Africa (SAM); Zoologisch Museum, Universiteit van Amsterdam, The Netherlands (ZMA); Zoologisk Museum, Copenhagen, Denmark (ZMK); Zoological Museum, Moscow State University, Russia (ZMUM).

Other abbreviations used are: M, male(s); F, female(s); ch, "chalutage", shrimp trawl; CP, beam trawl; DW, Waren dredge; FRV, Fishery Research Vessel; juv, juvenile; N.O., Navire Océanographique; ov, ovigerous; stn, station; R/V, Research Vessel.

The station data for the French campaigns from which *Strobopagurus* material was examined, can be found in the following publications or unpublished reports, or through the MNHN website (<http://cimbad.mnhn.fr/musorstom/>):

BATHUS 1-4: Richer de Forges and Chevillon, 1996.
BENTHAUS: MNHN website.
BENTHEDI: unpublished report (A. Crosnier, pers. comm.).
BERYX 11: Lehodey *et al.* (1992).
BIOCAL: Richer de Forges, 1990.
BIOGEOCAL: Richer de Forges, 1990.
BORDAU 1: Richer de Forges *et al.*, 2000a.
BORDAU 2: MNHN website.
CHALCAL 2: Richer de Forges, 1990.
HALIPRO 1: Richer de Forges and Chevillon, 1996.
LIFOU: unpublished report (A. Crosnier, pers. comm.).
Madagascar, N.O. *Vauban*: Crosnier, 1978.
MUSORSTOM 2: MNHN website.
MUSORSTOM 4-6: Richer de Forges, 1990.
MUSORSTOM 8: Richer de Forges *et al.*, 1996.
MUSORSTOM 10: Richer de Forges *et al.*, 2000b.
NORFOLK 1: MNHN website.
SALOMON 1: MNHN website.
SMIB 3, 4: Richer de Forges, 1990.
SMIB 5: Richer de Forges, 1993.
SMIB 8: Richer de Forges and Chevillon, 1996.
SMIB 10: MNHN website.
SURPRISE: Garrige *et al.*, 2000.
TAIWAN 2000-2003: MNHN website, and T.-Y. Chan (pers. obs.).
VOLSMAR: Laboute *et al.*, 1989.

SYSTEMATIC ACCOUNT

Family PARAPAGURIDAE Smith, 1882
Genus *Strobopagurus* Lemaitre, 1989

Parapagurus: de Saint Laurent, 1972: 101 (in part).
Strobopagurus Lemaitre, 1989: 35; 1996: 167.
Type species: By original designation: *Sympagurus gracilipes* A.

Milne-Edwards, 1891: 132. Gender: masculine.
Other species: Strobopagurus breviacus sp. nov., and *S. sibogae* (de Saint Laurent, 1972).

Diagnosis: Eleven pairs of biserial or quadriserial gills weakly divided distally. Shield slightly to distinctly broader than long, evenly calcified; with oblique rows of long setae. Ocular peduncles stout. Corneas strongly dilated. Posterior carapace densely setose, membranous to weakly calcified. Antennal peduncle with or without small dorsodistal spine on fourth segment. Epistomial spine absent. Right cheliped elongate, often more slender in males than in females; palm with rounded mesial face, and weakly to well delimited dorsolateral margin. Left cheliped evenly or sometimes weakly calcified on merus, carpus, and proximal portion of palm. Ambulatory legs with dactyls straight or nearly so. Fourth pereopod with propodal rasp consisting of 1 row of corneous scales at least distally. Fifth pereopod with small, subterminal corneous tooth on prehensile margin of dactyl laterally (Fig. 6). Second abdominal somite with left pleuron terminating ventrally in small subtriangular lobe. Males with well developed paired first and second gonopods; first gonopods each with short, broad subtriangular distal lobe; second gonopods each with strongly twisted distal segment, with rudimentary exopod on both left and right gonopods, or only on left or right.

Distribution: Eastern Atlantic; western Indian Ocean; and western and central Pacific. Depth: 40-1200 m.

Remarks: Lemaitre (1993) and Zhadan (1997) summarized the morphological similarities and differences between *Strobopagurus* and *Bivalvopagurus* Lemaitre, 1993, and suggested the existence of a close phylogenetic relationship between the two. Species of these two genera have broad, short shields typically with dense setae, strongly dilated corneas, short basal antennular segments, densely setose posterior carapaces, slender chelipeds and ambulatory legs, the latter with straight dactyls, and second pleopods with twisted distal segments. *Strobopagurus* does differ from *Bivalvopagurus* in the degree of calcification of the shield and posterior carapace (weak in the former, strong in the latter), and first and second abdominal somites (membranous in the former, calcified in the latter); the rostrum and lateral projections of the shield are weakly produced in the former whereas they are well produced and often spinose in the latter; in both sexes the third to fifth pleopods are unpaired in the former, and paired albeit asymmetrical (reduced on the right

side) in the latter; the telson and uropods are asymmetrical in the former, whereas they are symmetrical or nearly so in the latter.

A small, subterminal corneous tooth laterally on the prehensile margin of the dactyl of the fifth pereopod (Fig. 6) has been found to be present on all *Strobopagurus* species. Its function is unknown. The presence or absence of this tooth has not been reported in other parapagurids, although during this study it was found to occur at least in the monotypic genus *Bivalvopagurus*, and at least one species of *Paragiopagurus*, *P. fasciatus* Lemaitre and Poupin, 2003.

Key to species of *Strobopagurus*

1. Fourth pereopod with propodus short, at most about 1.5 times as long as high, often subcircular (Fig. 5F); meri of ambulatory legs slender, 3.6 (first leg) or 2.7 (second leg) times as long as high; posterior lobes of telson nearly symmetrical *Strobopagurus gracilipes* (A. Milne-Edwards, 1891) (eastern Atlantic; western, central, and South Pacific)
- Fourth pereopod with propodus long, about 1.9 or more times as long as high (Fig. 5A, H); meri of ambulatory legs not slender, at most 2.5 (first leg) or 2.0 (second leg) times as long as high; posterior lobes of telson distinctly asymmetrical 2
2. Right chela with dorsomesial and dorsolateral margins strongly spinose (Fig. 3E, G); carpus of left cheliped armed with spines on dorsal surface (Fig. 3F, H); antennal acicles exceeding distal margin of corneas by 0.2 or more length of acicles *Strobopagurus sibogae* (de Saint Laurent, 1972) (western Indian Ocean; western Pacific)
- Right chela with dorsomesial and dorsolateral margins unarmed or at most with small, blunt spines or tubercles (Fig. 3A); carpus of left cheliped lacking spines on dorsal surface except for small dorsodistal spine; antennal acicles at most reaching to about distal margin of corneas
..... *Strobopagurus breviacus* sp. nov. (western Pacific)

***Strobopagurus breviacus* sp. nov.**
(Figs. 1A-D; 2; 3A, B; 4A-G; 5A-E; 6)

Types: Holotype: M 6.1 mm, New Caledonia. SMIB 5, stn DW 76, 23°41.20'S, 168°00.50'E, 280 m, 07.09.1989 (MNHN Pg 7081).
Paratypes: All other specimens listed below.

Material examined: Solomon Islands. SALOMON 1: stn DW 1772, 8°15.8'S, 160°40.4'E, 570-756 m, 28.09.2001: 1 M 3.5 mm (MNHN Pg 6564); stn CP 1858, 9°37.0'S, 160°41.7'E, 435-461 m, 07.10.2001: 4 M 3.3-5.3 mm, 2 F 3.7, 3.8 mm (MNHN Pg 6565).

Vanuatu. MUSORSTOM 8: stn CP 963, 20°20.10'S, 169°49.08'E, 400-440 m, 21.09.1994: 1 F 3.5 mm, 2 ov F 5.2, 5.9 mm (MNHN Pg 6545); stn CP 964, 20°19.60'S, 169°49.00'E, 360-408 m, 21.09.1994: 1 M 4.0 mm (MNHN Pg 6546).

New Caledonia. (No expedition name), Dr 3, (no depth), 23.05.1978: 1 M 6.4 mm (MNHN Pg 7082). Drage 3, N.O. *Vauban*, 22°17'S, 167°12'E, 390 m, 23-28.05.1978: 1 M 5.7 mm (MNHN Pg 7083). CHALCAL 1: stn DC 64, 22°11.50'S, 159°15.40'E, 305 m, 27.07.1984: 1 F 3.9 mm (MNHN Pg 6531). MUSORSTOM 4: stn CP 172, 19°01.20'S, 163°16.00'E, 275-330 m, 17.09.1985: 1 M 5.2 mm (MNHN Pg 7084); stn DW 226, 22°47.20'S, 167°21.60'E, 390 m, 30.09.1985: 1 M 6.4 mm, 2 ov F 5.2, 6.4 mm (MNHN Pg 7085); stn DW 227, 22°46.00'S, 167°20.00'E, 300 m, 30.09.1985: 2 F 4.7 mm (MNHN Pg 7086). MUSORSTOM 5: (no stn number), Chesterfield Islands, (no depth), (no month or day) 1986: 3 M 5.2-6.9 mm, 2 ov F 4.9-7.0 mm (USNM 1016949); stn 258, 25°32.8'S, 159°46.10'E, 300 m, 08.10.1986: 2 F 3.6, 4.8 mm (MNHN Pg 7087); stn 263, 25°21.30'S, 159°46.44'E, 225-150 m, 08.10.1986: 1 M 4.8 mm, 2 F 3.6, 4.3 mm, 1 ov F 4.9 mm (MNHN Pg 7088); stn 265, 25°21.10'S, 159°45.20'E, 190-260 m, 08.10.1986: 2 M 3.6, 3.7 mm (MNHN Pg 7089); stn 266, 25°20.20'S, 159°45.70'E, 240 m, 08.10.1986: 2 M 5.2, 6.7 mm, 1 ov F 5.7 mm (MNHN Pg 7090); stn 267, 25°23.60'S, 159°47.20'E, 285 m, 08.10.1986: 1 M 3.9 mm (MNHN Pg 7091); stn 268, 24°44.70'S, 159°39.20'E, 280 m, 09.10.1986: 3 ov F 4.6-4.7 mm (MNHN Pg 7092); stn 273, 24°43.02'S, 159°43.26'E, 290 m, 09.10.1986: 1 M 4.6 mm, 1 F 2.5 mm (MNHN Pg 7093); stn 274, 24°44.83'S, 159°41.00'E, 285 m, 09.10.1986: 1 M 4.7 mm (MNHN Pg 7094); stn 275, 24°46.60'S, 159°40.30'E, 285 m, 09.10.1986: 1 M 6.3 mm, 1 F 3.4 mm (MNHN Pg 7095); stn 276, 24°48.90'S, 159°40.90'E, 269-258 m, 09.10.1986: 1 M 3.8 mm (MNHN Pg 7096); stn 279, 24°08.72'S, 159°37.76'E, 260-270 m, 10.10.1986: 1 F 3.6 mm (MNHN Pg 7097); stn 280, 24°09.99'S, 159°35.75'E, 270 m, 10.10.1986: 1 juv M 2.7 mm, 1 F 3.0 mm (MNHN Pg 7098); stn 288, 24°04.80'S, 159°36.80'E, 270 m, 10.10.1986: 2 M 3.1, 4.2 mm (MNHN Pg 7099); stn 289, 24°01.50'S, 159°38.40'E, 273 m, 10.10.1986: 2 M 4.8, 4.9 mm, 1 ov F 4.8 mm (MNHN Pg 7100); stn 291, 23°07.70'S, 159°28.40'E, 300 m, 11.10.1986: 1 M 3.9 mm (MNHN Pg 7101); stn 293, 23°09.35'S, 159°30.80'E, 280 m, 11.10.1986: 2 M 3.3, 4.3 mm, 1 F 3.3 mm, 1 ov F 4.9 mm (MNHN Pg 7102); stn 299, 22°47.70'S, 159°23.70'E, 360-370 m, 11.10.1986: 1 M 7.2 mm (MNHN Pg 7103); stn 307, 22°11.07'S, 159°24.07'E, 350-345 m, 12.10.1986: 2 juv F 2.9, 3.4 mm (MNHN Pg 7104); stn 312, 22°17.20'S, 159°24.80'E, 315-320 m, 12.10.1986: 2 5.5, 6.7 mm, 3 ov F 4.8-5.1 mm (MNHN Pg 7105); stn 318, 22°26.51'S, 159°21.36'E, 330 m, 13.10.1986: 1 ov F 4.6 mm (MNHN Pg 7106). CHALCAL 2: stn DW 71, 24°42.26'S, 168°09.52'E, 230 m, 27.10.1986: 1 M 3.9 mm (MNHN Pg 7107); stn DW 74, 24°40.36'S, 168°38.38'E, 650 m, 29.10.1986: 1 M 2.9 mm (MNHN Pg 7108). SMIB 3: stn DW 18, 23°41.50'S, 167°59.40'E, 338 m, 23.05.1987: 1 M 8.4 mm (MNHN Pg 7109), 1 F 5.2 mm (MNHN Pg 7110); stn DW 29, 22°46.70'S, 167°11.70'E, 405 m, 25.05.1987: 1 M 5.8 mm (MNHN Pg 7111). MUSORSTOM 6: (no stn number), Loyalty Islands, (no depth): 1 F 2.5 mm, 1 ov F 4.5 mm (MNHN Pg 7112); stn DW 391, 20°47.35'S, 167°05.70'E, 390 m, 13.02.1989: 3 M 3.4-6.4 mm, 1 F 5.2 mm (USNM 1016951); stn DW 406, 20°40.65'S, 167°06.80'E, 373 m, 15.02.1989: 1 M 6.1 mm (USNM 1016953); stn DW 407, 20°40.70'S, 167°06.60'E, 360 m, 15.02.1989: 1 ov F 5.1 mm (MNHN Pg 7113); stn DW 428, 20°23.54'S, 166°12.57'E, 420 m, 17.02.1989: 2 M 2.5, 4.3 mm (MNHN Pg 7114); stn DW 452, 21°00.30'S, 167°25.50'E, 300 m, 20.02.1989: 1 M 6.4 mm (USNM 1016950); stn DW 457, 21°00.42'S, 167°28.71'E, 353 m, 20.02.1989: 1 M 5.7 mm, 1 F 4.6 mm (USNM 1016952); stn DW 480, 21°08.50'S, 167°55.98'E, 380 m, 22.02.1989: 1 F 5.2 mm (MNHN Pg 7115). SMIB 4: stn DW 46, 24°46.70'S, 168°08.50'E, 260 m, 08.03.1989: 1 M 6.3 mm (USNM 1016954). SMIB 5: stn DW 73, 23°41.40'S, 168°00.60'E, 240 m, 07.09.1989: 1 ov F 6.6 mm (USNM 1016955); stn DW 76, 23°41.20'S, 168°00.50'E, 280 m, 07.09.1989: 1 M 6.1 mm (MNHN Pg 7116); stn DW 105, 23°14.30'S, 168°04.50'E, 310 m, 14.09.1989: 1 ov F 5.4 mm (MNHN Pg 7117). BERYX 11: stn DW 10, 24°53'S, 168°21'E, 565-600 m, 15.10.1992: 1 M 2.7 mm (MNHN Pg 7118). SMIB 8: stn DW 157, 24°45.64'S, 168°08.23'E, 251-255 m, 28.01.1993: 1 M 6.7 mm (MNHN Pg 6532); stn DW

165, 24°47.64'S, 168°09.61', 372-600 m, 28.01.1993: 1 F 2.9 mm, 1 ov F 4.9 mm (MNHN Pg 6533); stn DW 175, 23°41.13', 168°00.38', 235-240 m, 29.01.1993: 1 M 5.9 mm (MNHN Pg 6534); stn DW 177, 23°39.06', 168°00.05', 320-370 m, 29.01.1993: 1 M 7.9 mm, 3 F 3.4-7.1 mm (MNHN Pg 6535); stn DW 178, 23°45.12'S, 168°17.01'E, 400 m, 30.01.1993: 1 ov F 5.0 mm (MNHN Pg 6536). BATHUS 1: stn DW 690, 20°32.94'S, 165°00.83'E, 352 m, 16.01.1993 (MNHN Pg 6537). BATHUS 2: stn CP 724, 22°47.85'S, 167°25.77'E, 344-358 m, 11.05.1993: 4 M 2.0-6.2 mm (MNHN Pg 6538); stn CP 730, 23°02.56'S, 166°58.30'E, 350-400 m, 12.05.1993: 1 M 5.5 mm (MNHN Pg 6539); stn CP 737, 23°03.42'S, 166°59.97'E, 350-400 m, 13.05.1993: 1 ov F 4.7 mm (MNHN Pg 6540). BATHUS 3: stn DW 838, 23°00.81'S, 166°55.87'E, 400-402 m, 30.11.1993: 1 M 2.5 mm, 2 ov F 4.4, 5.0 mm (MNHN Pg 6541). BATHUS 4: stn DW 904, 18°59.85'S, 163°11.76'E, 461 m, 04.08.1994: 2 M 4.9, 5.0 mm, 1 ov F 4.1 mm (MNHN Pg 6542). SMIB 10: stn DW 208, 24°49'S, 168°09'E, 270 m, 10.01.1995: 1 M 7.2 mm (MNHN Pg 6543); stn DW 209, 24°49'S, 168°09'E, 329-560 m, 10.01.1995: 1 F 5.0 mm (MNHN Pg 6544). SURPRISE: stn CP DW 1391, 18 29.8'S, 16302.8'E, 365 m, 12.05.1999: 1 M 8.3 mm (MNHN Pg 6552); stn CP 1392, 18°29.8'S, 163°02.7'E, 365 m, 12.05.1999: 2 M 3.5, 7.0 mm (MNHN Pg 6553). LIFOU 2000: stn CP 1 (no coordinates), near Récif Shelter, (no depth), 20.11.2000: 1 M 3.7 mm (MNHN Pg 6554). NORFOLK 1: stn CP 1672, 23°43'S, 168°01'E, 267-324 m, 21.06.2001: 1 M 6.0 mm (MNHN Pg 6547); stn CP 1676, 24°43'S, 168°09'E, 227-232 m, 22.06.2001: 1 M 3.6 mm (MNHN Pg 6548); stn DW 1679, 24°43'S, 168°10'E, 298-324 m, 22.06.2001: 1 F 6.4 mm (MNHN Pg 6549); stn CP 1716, 23°22'S, 168°03'E, 266-276 m, 26.06.2001: 1 M 5.7 mm, 1 ov F 6.7 mm (MNHN Pg 6550); stn CP 1718, 23°24'S, 168°01'E, 260-373 m, 26.06.2001: 1 M 5.5 mm (MNHN Pg 6551).

Fiji. MUSORSTOM 10: stn CP 1387, 18°18.5'S, 178°04.7'E, 229-370 m, 19.08.1998: 1 F 6.8 mm (MNHN Pg 6566). BORDAU 1: stn CP 1470, 19°40'S, 178°10'W, 316-323 m, 08.03.1999: 1 M 4.4 mm, 1 F 3.7 mm, 1 ov F 6.8 mm (MNHN Pg 6446); stn 1475, 19°41'S, 178°11'W, 321-424 m, 08.03.1999: 3 M 3.8-4.8 mm, 3 F 3.8-4.8 mm (MNHN Pg 6555); stn CP 1476, 19°41'S, 178°11'W, 310-420 m, 08.03.1999: 1 M 3.7 mm (MNHN Pg 6556), 4 M 4.7-7.8 mm, 3 F 4.2-4.3 mm (MNHN Pg 6557); stn DW 1477, 20°58'S, 178°45'W, 390-405 m, 09.03.1999: 1 M 6.3 mm (MNHN Pg 6558); stn CP 1478, 20°59'S, 178°44'W, 386-396 m, 09.03.1999: 1 M 4.9 mm, 1 ov F 6.2 mm (MNHN Pg 7013); stn DW 1497, 18°44'S, 178°25'W, 335-350 m, 12.03.1999: 2 M 2.0, 2.8 mm, 1 F 4.7 mm (MNHN Pg 6559).

Tonga. BORDAU 2: stn CP 1533, 21°44'S, 175°20'W, 322-329 m, 04.06.2000: 1 M 5.1 mm (MNHN Pg 6568); stn CP 1541, 21°15'S, 175°14'W, 319-333 m, 05.06.2000: 2 F 2.6, 4.9 mm, 1 F 5.3 mm (MNHN Pg 6560); stn DW 1587, 18°37'S, 173°54'W, 309-400 m, 13.06.2000: 1 M 2.0 mm (MNHN Pg 6561); stn CP 1592, 19°08'S, 174°17'W, 391-426 m, 14.06.2000: 1 F 4.2 mm (MNHN Pg 6562); stn CH 1596, 19°06'S, 174°18'W, 371-437 m, 14.06.2000: 1 ov F 7.1 mm (MNHN Pg 6569); stn DW 1636, 21°44'S, 175°20'W, 321-331 m, 20.06.2000: 1 F 6.5 mm, (MNHN Pg 6553); stn CP 1643, 21°05'S, 175°22'W, 371-437 m, 22.06.2000: 1 M 9.1 mm (MNHN Pg 6570).

Etymology: The specific name is a compound noun used as an adjective, from the Latin *brevis*, short, and *acus*, needle. The latter is also the stem of the word “acicle”. The name makes reference to the short antennal acicle, one of the characters that distinguishes this new species from its congeners.

Description: Shield (Fig. 1A) weakly convex in lateral view; dorsal surface moderately calcified; with rows of long setae on each side, usually as follows: 1 oblique row from level of rostrum to level of lateral projection, 1 oblique row from midpoint between base of antennal peduncle and posterior midline of shield, and 1 longitudinal row parallel to lateral margin of shield. Rostrum broadly rounded, with short longitudinal dorsal ridge; in juveniles (sl <3.0 mm) occasion-

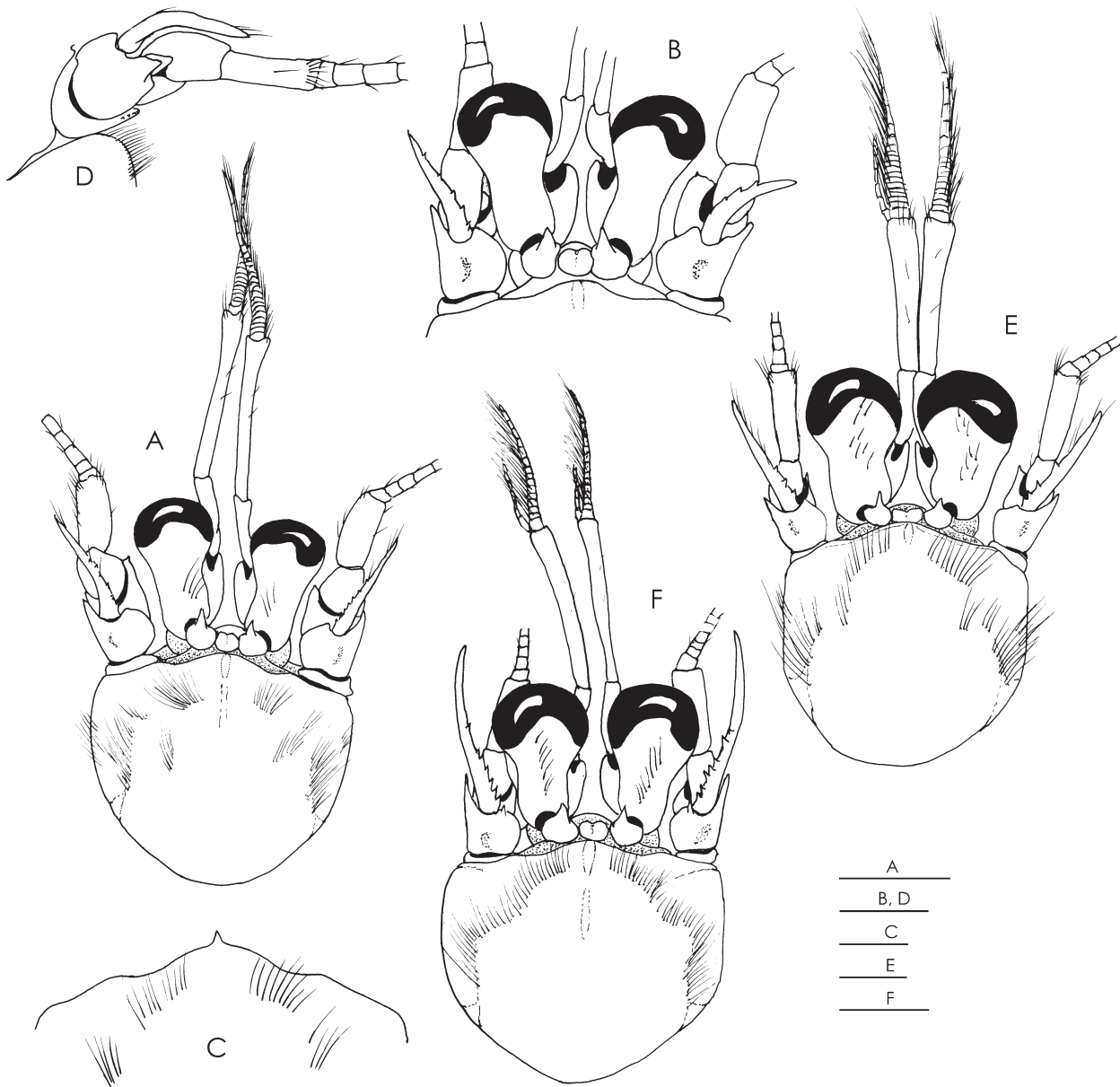


FIG. 1. – *Strobopagurus breviacus* sp. nov., New Caledonia: A, D, SMIB 5, stn DW 76, holotype M 6.1 mm (MNHN Pg 7116); B, SMIB 3, stn DW 18, paratype M 8.4 mm (MNHN Pg 7109); C, MUSORSTOM 5, stn 307, paratype juv F 2.9 mm (MNHN Pg 7104). A, shield and cephalic appendages; B, anterior portion of shield and cephalic appendages; C, anterior portion of shield; D, right antennal peduncle and anterolateral margin of branchiostegite, lateral view. *Strobopagurus gracilipes* (A. Milne-Edwards, 1891), New Caledonia, BIOCAL, stn DW 33, M 3.7 mm (MNHN Pg 7119); E, shield and cephalic appendages. *Strobopagurus sibogae* (de Saint Laurent, 1972), Indonesia, “*Siboga*” Expedition, stn 12, holotype ov F 7.4 mm (ZMA De103.109); F, shield and cephalic appendages. Scales equal 3 mm (A, F), 2 mm (B, D), 0.5 mm (C), and 1 mm (E).

ally with small terminal spine (Fig. 1C). Anterior margins weakly concave; lateral projections broadly subtriangular, unarmed; anterolateral margins sloping; posterior margin broadly rounded. Anterodistal margin of branchiostegite rounded, setose.

Ocular peduncles slightly more than 0.5 length of shield, constricted at about midpoint; with short row of setae dorsally. Ocular acicles subtriangular, each terminating in prominent simple spine (rarely bifid), separated by about basal width of 1 acicle.

Antennular peduncles long, exceeding distal margins of corneas by about half length of penultimate segments; with scattered setae. Basal segment with strong ventromesial spine distally; lateral face with distal subrectangular lobe usually unarmed, and strong spine proximally. Ventral flagellum with about 10 articles.

Antennal peduncles (Fig. 1D) exceeding distal margins of corneas by 0.3 or more length of fifth segments. Fifth segment with scattered setae. Fourth

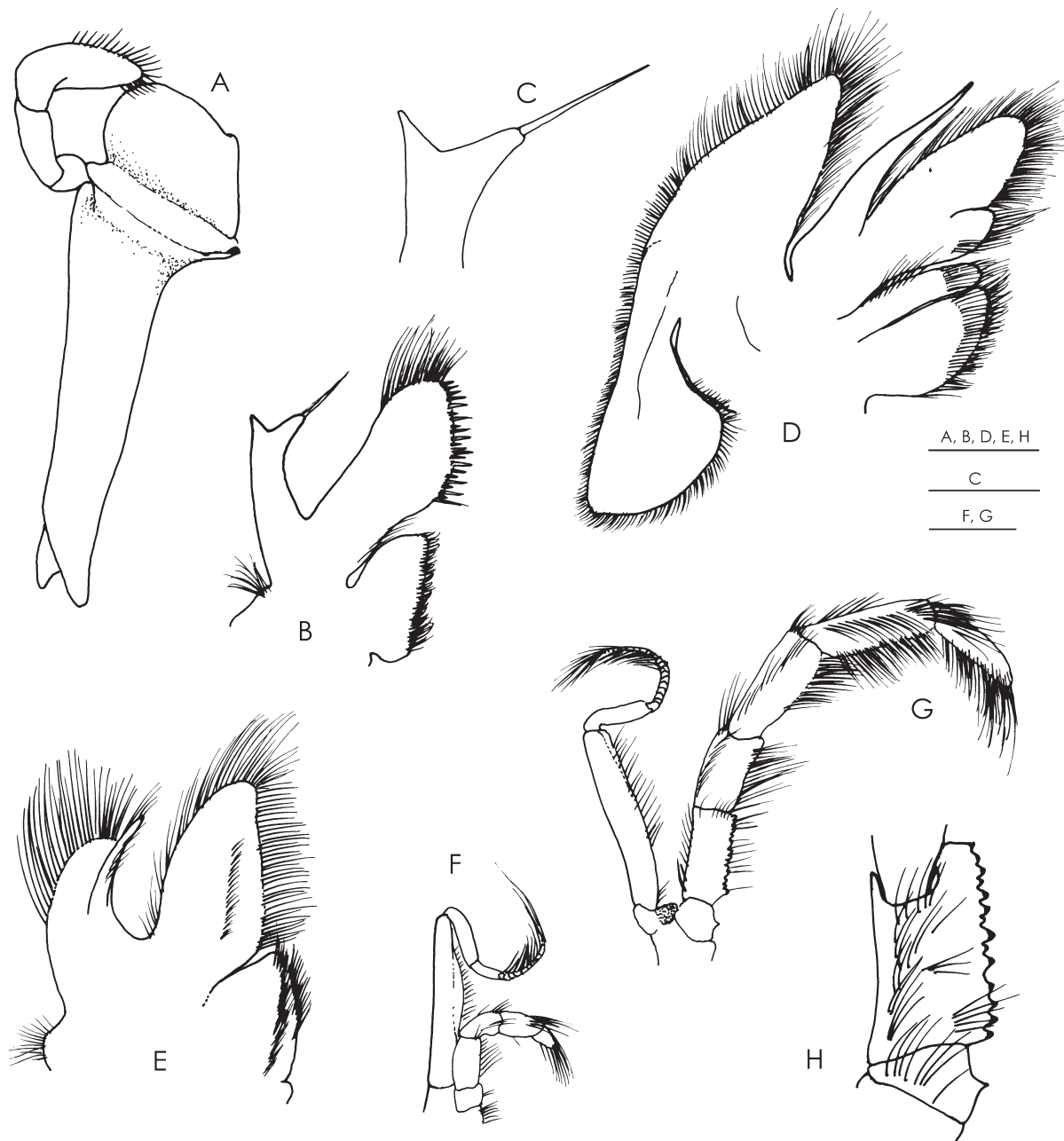


FIG. 2. – *Strobopagurus breviacus* sp. nov., New Caledonia: SMIB 3, stn DW 18, paratype M 8.4 mm (MNHN Pg 7109). Left mouthparts, internal view: A, mandible; B, maxillule; C, distal end of endopod of same; D, maxilla; E, first maxilliped; F, second maxilliped; G, third maxilliped; H, same, basis and ischium with crista dentata. Scales equal 1 mm (A, B, D, E, H), 0.5 mm (C), and 2 mm (F, G).

segment unarmed or with minute dorsodistal spine, with scattered setae. Third segment with small, blunt or sharp ventromesial distal spine. Second segment with dorsolateral distal angle produced, terminating in strong spine; mesial margin rounded distally, with or without small spine. First segment with unarmed lateral face. Flagellum long, nearly twice as long as ambulatory legs, naked or at most with scattered short setae less than 1 flagellar article in length. Acicula (Fig. 1A,B) not reaching or slightly exceeding

distal margin of cornea, sparsely setose, frequently strongly curved outward, and terminating in strong spine; with 4-9 small spines on mesial margin.

Mandible (Fig. 2A) as figured. Maxillule (Fig. 2B, C) with external lobe of endopod weakly developed, internal lobe with long seta distally. Maxilla (Fig. 2D) with endopod exceeding distal margin of scaphognathite. First maxilliped (Fig. 2E) with endopod exceeding exopod in distal extension. Second maxilliped (Fig. 2F) without distinguishing

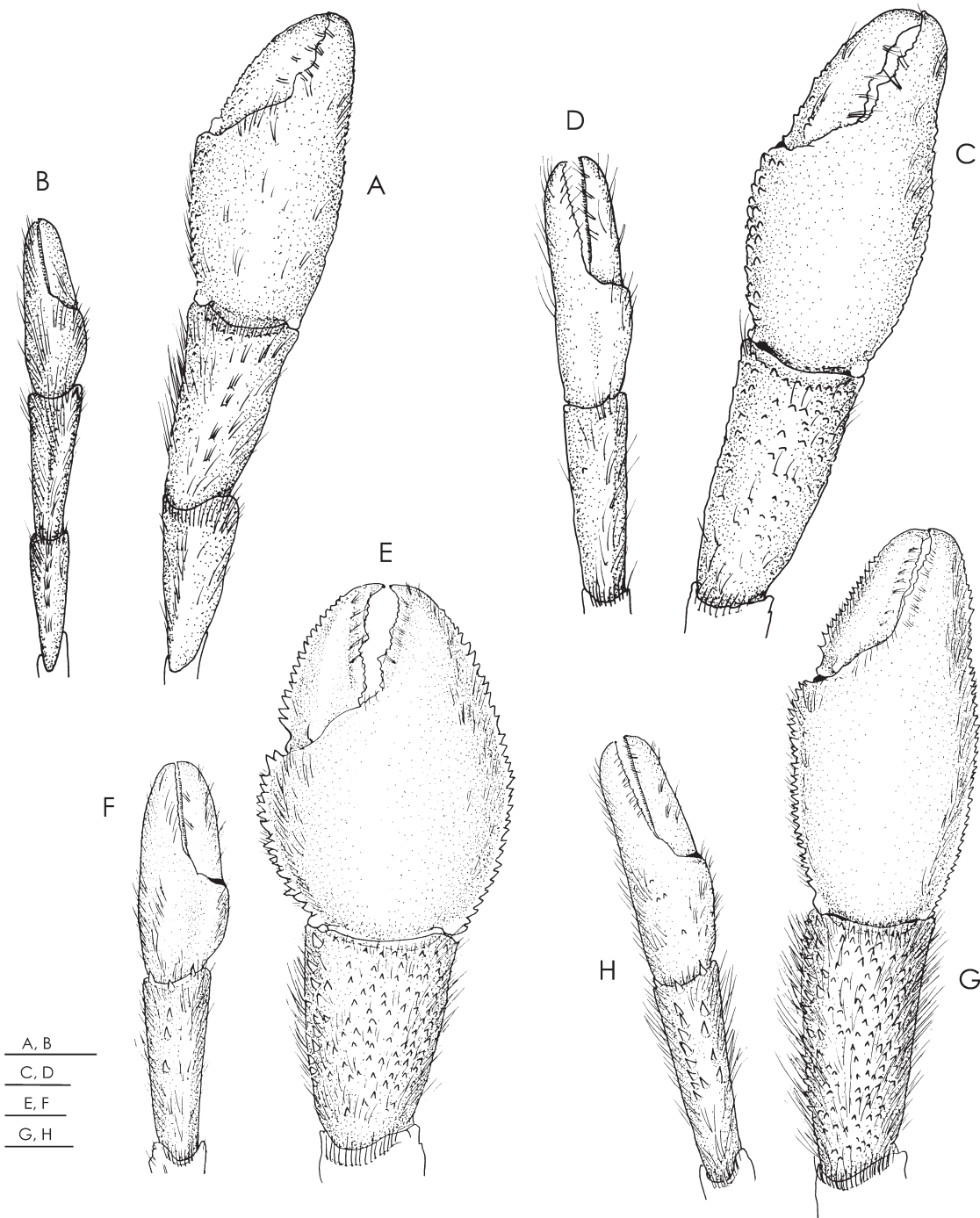


FIG. 3. – Right (A, C, E, G) and left (B, D, F, H) chelipeds. A, B, *Strobopagurus breviacus* sp. nov., New Caledonia, SMIB 5, stn DW 76, holotype M 6.1 mm (MNHN Pg 7116). C, D, *Strobopagurus gracilipes* (A. Milne-Edwards, 1891), New Caledonia, BIOCAL, stn DW 33, M 3.7 mm (MNHN Pg 7119). E-H, *Strobopagurus sibogae* (de Saint Laurent, 1972), Madagascar, ch 61 (MNHN Pg 5707): E, F, M 4.7 mm; G, H, M 8.2 mm. Scales equal 4 mm (A, B), 1 mm (C, D), 2 mm (E, F), and 3 mm (G, H).

characters. Third maxilliped (Fig. 2G,H) with crista dentata consisting of about 14 small corneous-tipped teeth; basis with 1 small tooth mesially. Sternite of third maxillipeds with spine on each side of midline.

Chelipeds markedly dissimilar. Right cheliped (Fig. 3A) elongate, usually not exceeding tip of

dactyls of ambulatory legs when cheliped and legs fully extended; chela nearly naked or with setae on lateral and mesial margins, and scattered setae dorsally. Fingers straight, tips curving inward and terminating in corneous claws; cutting edges each with 2 or 3 large calcareous teeth separated by smaller similar teeth. Palm smooth dorsally, or at

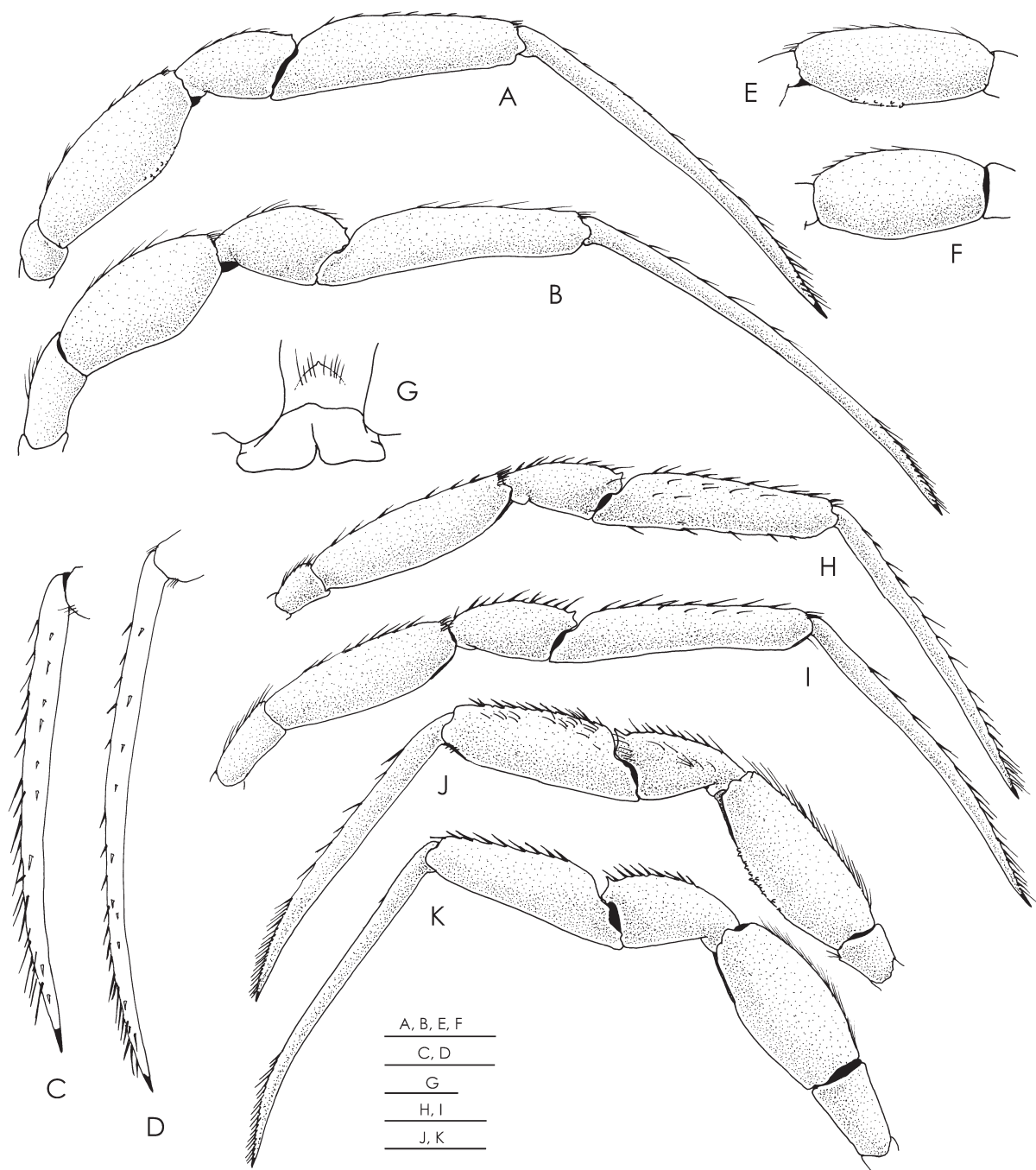


FIG. 4. – *Strobopagurus breviacus* sp. nov., New Caledonia, SMIB 5, stn DW 76, holotype M 6.1 mm (MNHN Pg 7116): A, B, right first (A) and second (B) ambulatory legs, lateral view; C, D, dactyls of same, mesial view (C, first; D, second); E, F, meri of left first (E) and second (F) ambulatory legs, lateral view; G, sternite of sixth thoracic sternite (second ambulatory legs), ventral view. *Strobopagurus gracilipes* (A. Milne-Edwards, 1891), New Caledonia, BIOCAL, stn DW 33, M 3.7 mm (MNHN Pg 7119): H, left first ambulatory leg, lateral view; I, left second ambulatory leg, lateral view. *Strobopagurus sibogae* (de Saint Laurent, 1972), Indonesia, “Siboga” Expedition, stn 12, holotype ov F 7.4 mm (ZMA De103.109): J, left first ambulatory leg, lateral view; K, left second ambulatory leg, lateral view. Scales equal 5 mm (A, B, J, K), 4 mm (C, D), 1 mm (G), and 2 mm (H, I).

most with scattered minute tubercles; dorsomesial margin straight, with irregular rows of small spines or tubercles; dorsolateral margin nearly straight or weakly curved in outline (dorsal view), with irregular row of small blunt spines; ventral surface smooth or with scattered small tubercles. Carpus

with longitudinal rows of small setose tubercles on dorsal surface, and row of small spines or tubercles on dorsodistal margin; mesial and lateral surfaces with moderately dense setae, ventral surface often with dense setae. Merus unarmed but with setae on dorsal surface, and often dense setae on ventral

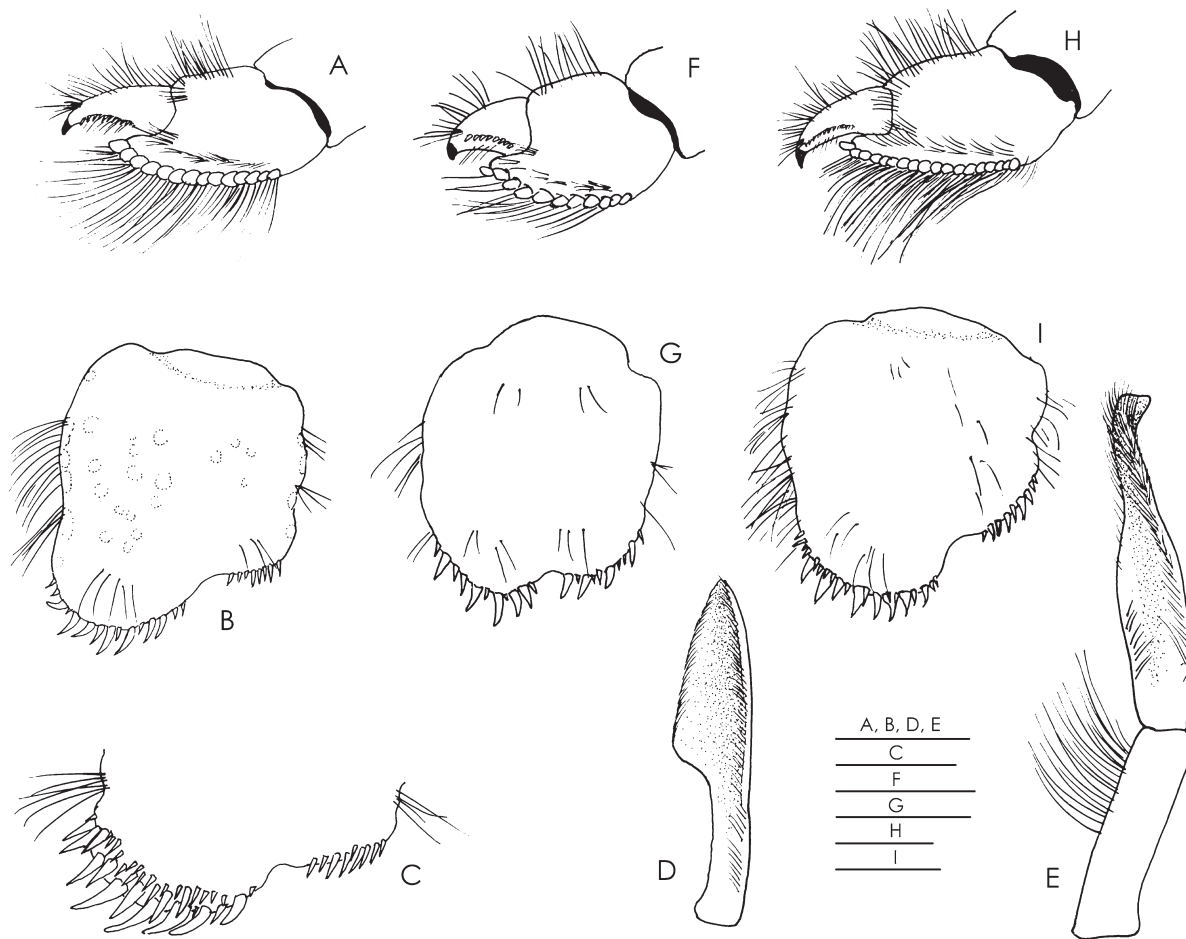


FIG. 5. — *Strobopagurus breviacus* sp. nov., New Caledonia: A-C, D, E, SMIB 5, stn DW 76, holotype M 6.1 mm (MNHN Pg 7116); C, MUSORSTOM 5, stn DW 258, paratype F 4.8 mm (MNHN Pg 7087). *Strobopagurus gracilipes* (A. Milne-Edwards, 1891), New Caledonia: F, G, BIOCAL, stn DW 33, M 3.7 mm (MNHN Pg 7119). *Strobopagurus sibogae* (de Saint Laurent, 1972), Indonesia: H, I, "Siboga" Expedition, stn 12, holotype ov F 7.4 mm (ZMA De103.109). A, F, H, propodus and dactyl of left fourth pereopod, lateral view; B, G, I, telson, dorsal view; C, posterior margin of telson, dorsal view; D, left male first pleopod, mesial view; E, left male second pleopod, anterior view. Scales equal 1 mm (A, B, D, E, F, H, I), and 0.5 mm (C, G).

surface. Ischium and coxa each with ventromesial margin setose.

Left cheliped (Fig. 3B) with dense setae on dorsal surfaces of chela and carpus, and ventral surfaces of carpus and merus; frequently iridescent (preserved) on dorsal surface of palm and carpus. Fingers straight, tips curving inwards and terminating in corneous claws; cutting edge of dactyl with comb-like row of small corneous spinules, cutting edge of fixed finger with small blunt to sharp calcareous teeth. Palm unarmed but with setae. Carpus with small dorsodistal spine. Merus unarmed except for dorsal row of short tufts of setae. Ischium and coxa each with ventromesial margin setose.

Ambulatory legs (Fig. 4A-F) similar from right to left except for slightly shorter meri on left. Dactyl about 1.9-2.2 times as long as propodus, terminating in sharp corneous claw; with dorsodistal row of bris-

tle-like setae; mesial face with median longitudinal row of about 9 minute corneous spinules. Propodus with dorsal row of short setae. Carpus with small dorsodistal spine, and dorsal row of short setae. Merus about 2.4 times (first leg) or 1.9 (second leg) as long as high; with dorsal row of short setae; ventrodistal margin armed with irregular rows of small spines (first leg), or unarmed (second leg). Ischium unarmed. Coxa with ventromesial row of setae. Anterior lobe of sixth thoracic sternite (Fig. 4G), with or without small subterminal spine.

Fourth pereopod (Fig. 5A) semichelate. Dactyl subtriangular, longer than dorsal margin of propodus, terminating in corneous claw; with ventrolateral row of corneous spinules. Propodus ovate (lateral view), about 1.9 times or more as long as high; rasp consisting of 1 row of ovate scales; ventral margin with long setae.

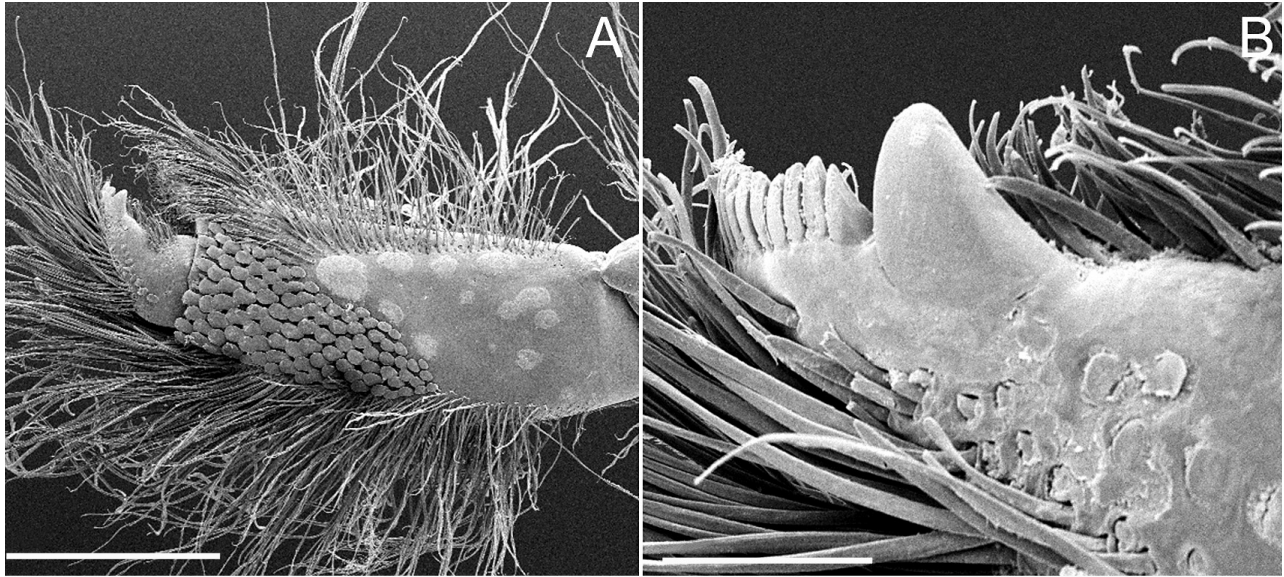


FIG. 6. – *Strobopagurus breviacus* sp. nov., New Caledonia, MUSORSTOM 4, stn DW 226, F 6.4 mm (MNHN Pg 7085), SEM micrographs: A, distal portion of propodus and dactyl of left fifth pereopod, lateral view; B, distal portion of dactyl of same, lateral view. Scales equal 1 mm (A), and 100 μ m (B).

Fifth pereopod (Fig. 6) semichelate. Dactyl with small subterminal corneous tooth laterally. Propodal rasp extending to midpoint or more of lateral face of propodus.

Uropods and telson asymmetrical. Telson (Fig. 5B, C) with weak lateral indentations; dorsal surface frequently with scattered, low blister-like tubercles; terminal half divided into 2 distinctly asymmetrical posterior lobes separated by shallow, unarmed U-shaped cleft; terminal margins of posterior lobes armed with row of corneous spines stronger, and curved, on left side; females frequently with several submarginal rows of spines on terminal margin of left posterior lobe (Fig. 5C).

Males first and second gonopods (Fig. 5D, E) as diagnosed for genus; second gonopods sometimes missing rudimentary exopod on left or right gonopod (Fig. 5E).

Coloration in life: Unknown.

Distribution: Western Pacific: New Caledonia region; Fiji; Tonga; Vanuatu; and Solomon Islands. Depth: 150 to 756 m.

Similarities: This new species is most similar to *S. sibogae*. The two can be separated by differences in shape and armature of the right cheliped (chela and carpus), and relative length of the antennal acicles. The mesial and lateral margins of the right chela in *S. breviacus* are nearly straight in outline (viewed dorsally), whereas they are arched in all but the largest sized specimens (sl > 8.0 mm) of *S. sibogae*. The dorsomesial and dorsolateral margins of the chela, and the dorsal surface of the carpus are

unarmed or have small blunt spines in *S. breviacus*, whereas the margins of the chela are strongly spinose, and the carpus has many spines on the dorsal surface in *S. sibogae*. The antennal acicles at most reach to about the distal margins of the corneas in *S. breviacus*, whereas the acicles exceed the corneas by 0.2 or more the length of each acicle in *S. sibogae*. Unfortunately the coloration of *S. breviacus* is not known, and thus cannot be compared to the distinct color pattern of *S. sibogae*.

Strobopagurus gracilipes

(A. Milne-Edwards, 1891)

(Figs. 1E; 3C,D; 4H,I; 5F,G; 7, 8 A-D)

Sympagurus gracilipes A. Milne-Edwards, 1891: 132; A. Milne-Edwards and Bouvier, 1892: 205; 1894: 68, pl. 9, figs. 18-34; 1897: 133; 1899: 58; 1900: 194, pl. 24, figs. 7, 8; Alcock, 1905: 173; Pzibram, 1905: 197; Bouvier, 1922: 21; Forest, 1954: 167, figs. 3, 7; Gordan, 1956: 341.

Parapagurus gracilipes: Forest, 1955: 103, pl. 3, figs. 8-11; de Saint Laurent-Dechancé, 1964: 21; Zariquiey-Alvarez, 1968: 252; de Saint Laurent, 1972: 115; Kensley, 1973: 287; Türkay, 1976: 31; Ingle, 1985: 764; Lemaitre, 1989: 36.

Strobopagurus gracilipes: Lemaitre, 1989: 36; 1990: 225, figs. 3-5; 1996: 167; García Raso, 1996: 739; Udekem d'Acoz, 1999: 176.

Strobopagurus cf. *sibogae*: Poupin, 1993: 51 (abstract). [Not *Strobopagurus sibogae* (de Saint Laurent, 1972)]. (See *Remarks*).

Strobopagurus cf. *gracilipes*: Lemaitre, 1994: 377, figs. 1, 2; Poupin 1996: 96. (See *Remarks*).

Not *Strobopagurus* aff. *gracilipes*: Zhadan, 1997: 77, figs. 15, 16. (= ?*Bivalvopagurus* sp.; see *Remarks*).

Types: Syntypes: 1 M 4.1 mm, 1 F 3.6 mm, 1 ov F 3.4 mm, *L'Hirondelle* stn 198, Azores, 38°26'25''N, 30°59'10''W, 800 m, 25.07.1888 (MO).

Material examined (see also Lemaitre, 1990, 1994): **Taiwan**. TAIWAN 2000: stn CP 20, 22°21.0'N, 120°41.2'E, 720 m, 28.07.2000: 1 ov F 4.7 mm (NTOU A00011); stn CP 55, 24°26.9'S, 122°18.1'E,

638 m, 04.08.2000: 1 M damaged (NTOU A00005). TAIWAN 2001: stn CP 139, 22°10.7'N, 120°14.1'E, 718 m, 23.11.2001: 1 ov F 4.2 mm (NTOU A00003). TAIWAN 2003: stn CP 214, 24°28.6'N, 122°12.7'E, 490-1027 m, 27.08.2003: 1 M 4.6 mm, 2 F 4.7, 5.1 mm, 9 ov F 3.5-5.1 mm (NTOU A00001), 4 M 4.5-6.1 mm (NTOU A00009), 1 M 6.0 mm (with abnormal right cheliped) (NTOU A00002).

Solomon Islands. SALOMON 1: stn DW 1830, 10°11.3'S, 161°18.8'E, 500-563 m: 1 M 3.4 mm (MNHN Pg 6598); stn CP 1833, 10°11.8'S, 161°18.7'E, 367-533 m: 1 M 4.8 mm (MNHN Pg 6599).

Vanuatu. MUSORSTOM 8: stn CP 963, 20°20'S, 169°49'E, 400-440 m, 21.09.1994: 1 M 3.0 mm (MNHN Pg 6586); stn CP 993, 18°48.3'S, 168°54'E, 780-783 m, 24.09.1994: 1 M 5.0 mm (MNHN Pg 6587); stn CP 1035, 17°56'S, 168°44'E, 765-780 m, 29.09.1994: 2 M 4.9, 5.5 mm, 1 ov F 4.5 mm (MNHN Pg 6558); stn CP 1114, 14°52'S, 167°03'E, 647 m, 08.10.1994: 2 M 4.5, 4.7 mm (MNHN Pg 6589).

New Caledonia. BIOCAL: stn DW 33, 23°10'S, 167°10'E, 675-680 m, 29.08.1985: 14 M 2.0-4.0 mm, 11 F 2.6-3.8 mm, 4 ov F 2.7-4.3 mm, 1 imm 2.2 mm, 2 megalopa 1.6, 1.7 mm (MNHN Pg 7119); stn DW 36, 23°09'S, 167°11'E, 650-680 m, 29.08.1985: 1 M 3.3 mm (MNHN Pg 7120); stn DW 51, 23°05'S, 167°45'E, 680-700 m, 31.08.1985: 1 M 3.2 mm (MNHN Pg 7121). MUSORSTOM 4: stn CP 158, 18°49.3'S, 163°15'E, 625 m, 15.09.1985: 2 M 4.6, 5.1 mm (MNHN Pg 7122); stn DW 161, 18°38.8'S, 163°10.6'E, 550 m, 15.09.1985: 1 M 3.0 mm, 1 F 2.5 mm (MNHN Pg 7123); stn CP 169, 18°54.3'S, 163°11.2'E, 590 m, 17.09.1985: 8 M 3.3-4.9 mm, 1 F 4.2 mm, 7 ov F 3.3-4.6 mm (MNHN Pg 7124); stn CP 199, 18°50'S, 163°14.5'E, 595 m, 20.09.1985: 1 M 5.2 mm, 1 ov F 4.0 mm (MNHN Pg 7125). CHALCAL 2: stn DW 73, 24°39.9'S, 168°38.1'E, 573 m, 29.10.1986: 2 F 4.5, 5.1 mm, 1 ov F 7.5 mm (MNHN Pg 7126); stn DW 74, 24°40.36'S, 168°38.38'E, 650 m, 29.10.1986: 1 M 3.1 mm, 4 F 2.3-4.2 mm, 1 ov F 4.3 mm (MNHN Pg 7127); stn DW 75, 24°39.31'S, 168°39.67'E, 600 m, 29.10.1986: 1 M 3.1 mm, 2 F 2.2, 3.4 mm, 1 ov F 3.6 mm (MNHN Pg 7128). BIOGEOCAL: stn CP 290, 20°36.91'S, 167°03.3'E, 920-760 m, 27.04.1987: 1 M 4.5 mm (MNHN Pg 7129). SMIB 3: stn DW 2, 24°53.40'S, 168°21.70'E, 530 m, 20.05.1987: 1 F 2.7 mm (MNHN Pg 7130). MUSORSTOM 6: stn CP 438, 20°23'S, 166°20'E, 780 m, 18.02.1989: 1 ov F 5.4 mm (MNHN Pg 7131). BERYX 11: Stn DW 10, 24°53'S, 168°21'E, 565-600 m, 15.10.1992: 1 M 2.7 mm (MNHN Pg 7006). BATHUS 3: stn DW 776, 24°44'S, 170°08'E, 770-830 m, 24.11.1993: 3 M 2.5-3.0 mm, 1 ov F 3.5, 4.0 mm (MNHN Pg 6571); stn DW 781, 23°53'S, 169°46'E, 625-640 m, 25.11.1993: 1 ov F 5.0 mm (MNHN Pg 6572); stn DW 784, 23°56'S, 169°46'E, 611-615 m, 25.11.1993: 1 M 5.0 mm (MNHN Pg 6573); stn DW 787, 23°53'S, 169°48'E, 695-702 m, 25.11.1993: 1 ov F 5.1 mm (MNHN Pg 6574); stn DW 790, 23°48.94'S, 169°49.60'E, 685-715 m, 25.11.1993: 2 M 3.4, 5.1 mm (MNHN Pg 7000); stn DW 793, 23°47'S, 169°48'E, 731-751 m, 26.11.1993: 1 ov F 4.4 mm (MNHN Pg 6575); stn DW 794, 23°48'S, 169°49'E, 751-755 m, 26.11.1993: 2 M 4.3, 4.8 mm, 1 F 3.0 mm, 1 ov F 5.0 mm (MNHN Pg 6576); stn DW 800, 23°35'S, 169°36'E, 655 m, 26.11.1993: 1 M 2.3 mm (MNHN Pg 6577); stn DW 809, 23°41'S, 167°59'E, 510-530 m, 27.11.1993: 1 M 3.3 mm, 2 ov F 3.1, 3.6 mm (MNHN Pg 6578); stn DW 827, 23°22'S, 168°01'E, 381-469 m, 29.11.1993: 1 ov F 4.6 mm (MNHN Pg 6579); stn CP 831, 23°04'S, 166°55'E, 650-658 m, 30.11.1993: 1 F 4.7 mm (MNHN Pg 6580); stn CP 832, 23°03'S, 166°53'E, 650-659 m, 30.11.1993: 1 M 5.0 mm (MNHN Pg 6581); stn CP 842, 23°05'S, 166°47'E, 830 m, 01.12.1993: 1 M 3.4 mm, 1 ov F 4.0 mm (MNHN Pg 6582); stn CP 844, 23°06'S, 166°45'E, 908 m, 01.12.1993: 28 M 3.1-4.1 mm, 10 F 2.5-3.5 mm, 17 ov F 2.9-3.5 mm (MNHN Pg 6583). HALIPRO 1: stn CP 854, 21°40'S, 166°38'E, 650-780 m, 31.03.1994: 1 M 4.8 mm (MNHN Pg 7007); stn CP 867, 21°26.15'S, 166°18.17'E, 720-950 m, 22.03.1994: 1 M 5.1 mm, 1 F 2.7 mm (MNHN Pg 7008); stn CH 876, 23°10'S, 166°49'E, 870-1000 m, 31.03.1994: 7 M 2.8-5.4 mm, 2 ov F 3.5, 3.9 mm (MNHN Pg 6584). BATHUS 4: stn CP 913, 18°56'S, 163°04'E, 777-820 m, 05.08.1994: 1 M 4.5 mm, 2 F 3.5, 3.7 mm (MNHN Pg 6585); stn CP 921, 18°46.72'S, 163°17.01'E, 613-610 m, 06.08.1994: M 5.2 mm (MNHN Pg 7001); stn CP 922, 18°48'S, 163°18'E, 600 m, 06.08.1994: 2 M 3.5-4.7 mm, 3 F 2.9-3.9 mm, 6 ov F 3.4-4.2 mm (ZMUM). NORFOLK 1: stn DW 1694, 2440'S, 16839'E, 575-589 m, 24.06.2001: 3 F 2.7-3.7 mm (MNHN Pg 6448); stn DW 1695, 24°40'S, 168°39'E, 562-587 m, 24.06.2001: 3 M 5.0-5.5 mm, 1 ov F 2.8 mm (MNHN Pg 6445); stn DW 1697, 24°39'S, 168°38'E, 569-616 m, 24.06.2001: 1 M 2.7 mm

(MNHN Pg 6449); stn DW 1700, 24°40'S, 168°40'E, 572-605 m, 24.06.2001: 1 M 4.1 mm (MNHN Pg 6447).

French Polynesia, Austral Islands. BENTHAUS: stn DW 1863, 27°39.1'S, 144°15.8'W, 650-684 m, 02.11.2002: 1 M 3.6 mm, 1 ov F 3.8 mm (MNHN Pg 7003); stn 1889, 27°36.8'S, 144°15.7'W, 600-620 m, 07.11.2002: ov F 4.3 mm (MNHN Pg 6590); stn 1891, 27°37.1'S, 144°15.4'W, 800-850 m, 07.11.2002: 2 M 3.6, 5.2 mm, 1 F 3.1 mm (MNHN Pg 6591); stn 1892, 27°38.8'S, 144°15.6'W, 742-1000 m, 02.11.2002: 1 M 2.3 mm, 3 F 3.0-4.0 mm (MNHN Pg 6592); stn 1906, 27°24.8'S, 144°01.7'W, 110-127 m, 09.11.2002: 1 M 3.2 mm, 3 F 2.9, 4.3 mm, 2 ov F 4.0, 4.4 mm (MNHN Pg 6593); stn DW 1961, 23°20.9'S, 149°33.5'W, 470-800 m, 19.11.2002: 1 F 4.8 mm (MNHN Pg 7002); stn CP 1965, 23°21.35'S, 149°33.92'W, 500-1200 m, 19.11.2002: 2 M 5.5, 6.1 mm, 3 F 4.4, 4.7 mm, 2 ov F 4.2, 4.8 mm, 1 megalopa 3.2 mm (MNHN Pg 6594); stn CP 1967, 23°21.4'S, 149°34.2'W, 600-1200 m, 19.11.2002: 1 M 5.8 mm (MNHN Pg 6595); stn DW 1972, 23°22'S, 150°42.9'W, 500-1020 m, 02.11.2002: 1 F 3.1 mm (MNHN Pg 7004); stn DW 2004, 22°27.72, 151°18.7'W, 430-850 m, 24.11.2002: 1 M 5.7 mm (MNHN Pg 6596); stn DW 2010, 22°32.4'S, 151°20.8'W, 520-950 m, 24.11.2002: 2 M 2.8, 5.9 mm, 1 F 2.1 mm (MNHN Pg 7005); stn DW 2018, 22°37.1'S, 152°49.1'W, 770-771 m, 02.11.2002: 1 M 7.0 mm (MNHN Pg 6597).

Hawaiian Islands. U.S. Fisheries Steamer *Albatross*: stn 3471, Oahu, SE of Honolulu, 21°10.50'N, 157°48.50'W, 616 m, 04.12.1891: 1 M 3.5 mm (USNM 168990); stn 3472, Oahu, SE of Honolulu, 21°12.00'N, 157°49.00'W, 540 m, 04.12.1891: 2 ov F 3.6, 4.3 mm (USNM 168991); stn 3476, 21°09.00'N, 157°53.00'W, 545 m, 06.12.1891: 1 M 4.8 mm (USNM 216792), 2 M 4.9-6.3 mm (USNM 168992); stn 3815, Oahu, off Diamond Head light, 571-417 m, 28.03.1902: 1 ov F 4.5 mm (USNM 168993); stn 3835, Molokai, off Laeoka Laau light, 21°00.17'N, 157°05.83'W, 309-333 m, 03.04.1902: 1 M 5.2 mm (USNM 168994); stn 3836, Molokai, off Laeoka Laau light, 21°00.08'N, 157°08.33'W, 435-466 m, 03.04.1902: 2 F 3.3, 4.2 mm (USNM 168995); stn 4084, Maui, off Puniana Point, 21°06.66'N, 155°20.25'W, 463-488 m, 21.07.1902: 2 M 5.0, 5.9 mm (USNM 169005); stn 3865, Pailolo Channel, off Mikuhooniki islet, 468-518 m, 10.04.1902: 5 M 2.8-6.2 mm, 1 F 3.9 mm (USNM 168996); stn 3867, Pailolo Channel, off Mikuhooniki islet, 21°11.91'N, 156°33.66'W, 519-530 m, 10.04.1902: 4 F 4.2-4.5 mm (USNM 168997); stn 3883, Pailolo Channel, off Mikuhooniki islet, 21°09.25'N, 156°34.25'W, 507-519 m, 16.04.1902: 4 M 2.8-6.4 mm (USNM 168998); stn 3910, Oahu, off Diamond Head, 569-616 m, 05.05.1902: 1 M 6.0 mm (USNM 168999); stn 3916, Oahu, off Diamond Head, 547-604 m, 06.05.1902: 1 M 6.2 mm, 1 ov F 4.7 mm (USNM 169000); stn 3917, Oahu, off Diamond Head light, 604-538 m, 06.05.1902: 1 M 6.4 mm, 1 ov F 5.1 mm (USNM 169001); stn 3918, Oahu, off Diamond Head light, 538-470 m, 06.05.1902: 1 juv sex indet. 2.2 mm (USNM 169002); stn 3939, vicinity of Laysan Island light, 25°52.58'N, 171°42.48'W, 298-108 m, 16.05.1902: 1 left cheliped (USNM 169003); stn 4083, Maui, off Puniana Point, 21°05.42'N, 156°20.33'W, 435-463 m, 21.07.1902: 1 ov F 5.0 mm (USNM 169004); stn 4089, Pailolo Channel, off Mokuhooniki islet, 543-556 m, 22.07.1902: 1 M 6.0 mm (USNM 169006); stn 4116, 21°43.50'N, 158°09.00'W, Oahu, off Kahuku Point, 440-516 m, 25.07.1902: 1 M 8.9 mm (USNM 169007); stn 4132, Kauai, off Hanamaulu warehouse, 22°01.50'N, 159°21.16'W, 470-570 m, 01.08.1902: 1 ov F 4.6 mm (USNM 169008); stn 4133, Kauai, off Hanamaulu warehouse, 22°02.66'N, 159°19.92'N, 302-75 m, 01.08.1902: 1 ov F 3.8 mm (USNM 169009). Stn Mac 3, W of Lanai, 20°48'N, 157°01'W, 256-274 m, 11.10.1967, coll. L.G. Eldredge: 1 M 4.0 mm (BPBM). R/V *Townsend Cromwell*, United States National Marine Fisheries Service: stn 33-2, 20°36.9'N, 156°53.8'W, 417-420 m, 26.10.1967: 1 M 3.7 mm, 1 F 3.7 mm (dry, BPBM S10962); stn 35-15, 21°05'N, 156°32'W, 360 m, 01.04.1968: 2 M 5.1, 5.7 mm (BPBM S10953). R/V *Proteus*: stn 103, 8 mi (14.8 km) NE of Kauhola Point, 20°20.7'N, 155°47.5'W, 457 m, 05.09.1971: 4 M 4.0-4.9 mm, 1 F 3.4 mm (BPBM S8597).

Diagnosis: Shield (Fig. 1E) convex in lateral view, slightly broader than long. Rostrum broadly rounded, with short longitudinal dorsal ridge. Ocular peduncles more than half length of shield. Ocular acicles each terminating in strong spine (rarely

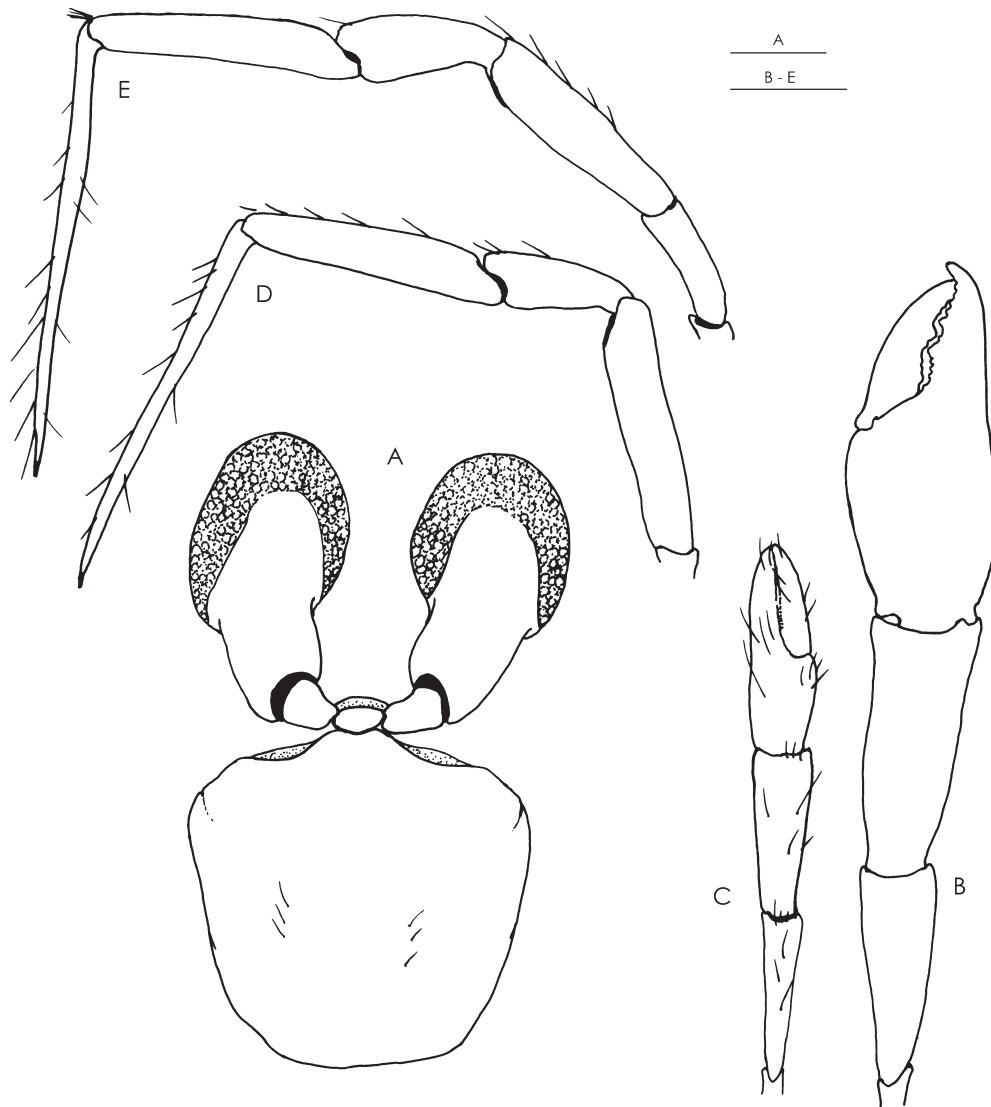


FIG. 7. – *Strobopagurus gracilipes* (A. Milne-Edwards, 1891), New Caledonia, BIOCAL, stn DW 33, megalopa 1.7 mm (MNHN Pg 7119): A, shield and ocular peduncles; B, right cheliped; C, left cheliped; D, left first ambulatory leg; E, left second ambulatory leg. Scales equal 0.5 mm (A), and 1 mm (B-E).

bifid). Antennular peduncles exceeding distal margin of corneas by slightly more than length of ultimate segments. Antennal peduncles at most exceeding distal margin of corneas by about 0.2 length of ultimate segments; fourth segment usually lacking or occasionally with dorsodistal spine; second segment with dorsolateral distal angle produced, terminating in strong spine, mesial margin with or without small spine at dorsodistal angle; first segment with row of short spines on ventrodistal margin. Antennal acicle exceeding distal margin of corneas by at most 0.2 length of acicle; mesial margin armed with 3-7 small spines on proximal half. Sternite of third maxillipeds usually lacking spines on each side of midline. Right cheliped (Fig. 3C) usually broader and shorter in females than in males; in large males

(sl > 4.0 mm) carpus and chela frequently very elongated, each 2.0-2.5 times as long as broad; dactyl with row of small blunt spines on mesial margin proximally; palm unarmed dorsally but with scattered setae, dorsomesial and dorsolateral margins with small blunt or sharp spines; carpus with scattered or numerous small spines or tubercles dorsally. Left cheliped (Fig. 3D) with setae or bristles on dorsal surface of chela, carpus, and merus; dorsal surface of carpus with or without small spines, and small dorsodistal spine. Ambulatory legs (Fig. 4H, I) with meri shorter on left legs than on right legs; merus about 3.6 (first leg) or 2.7 (second leg) times as long high. Fourth pereopod (Fig. 5F) semichelate; dactyl stout, about as long as dorsal margin of propodus; propodus short, about 1.4 times as long as

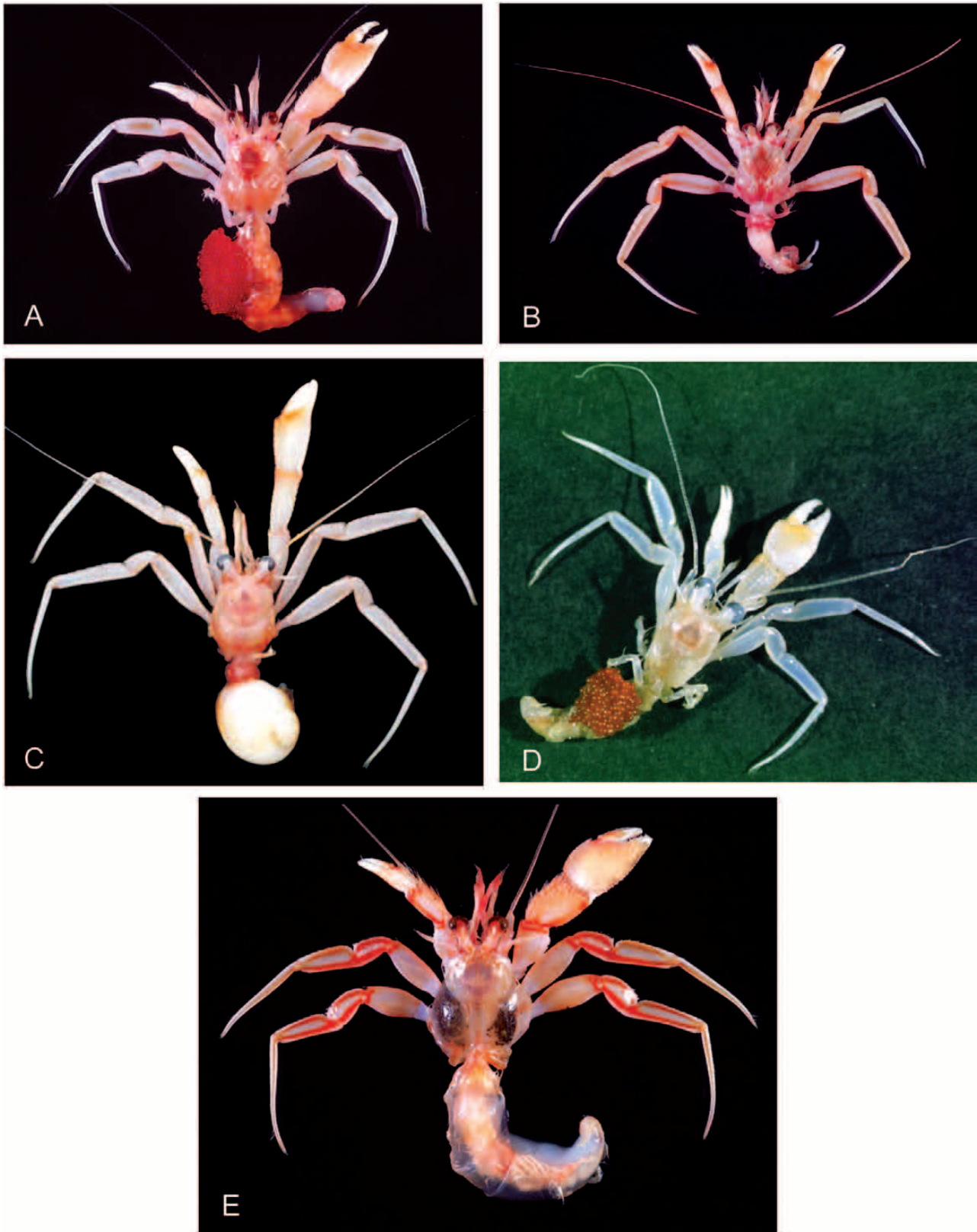


Fig. 8.— Live coloration. A-D, *Strobopagurus gracilipes* (A. Milne-Edwards, 1891): A, ov F 5.1 mm, TAIWAN 2003, stn CP 214 (NTOU A00001); B, M 6.0 mm (with abnormal right cheliped), same station (NTOU A00001); C, M 6.1 mm, French Polynesia, BENTHAUS, stn CP 1965 (MNHN Pg 6594); D, ov F 3.8 mm, French Polynesia, BENTHAUS, stn DW 1863 (MNHN Pg 7003). E, *Strobopagurus sibogae* (de Saint Laurent, 1972): F 6.2 mm, TAIWAN 2003, stn CP 216 (NTOU A00007). Photographs by T.-Y. Chan (A, B, E), and J. Poupin (C, D).

high, often subcircular in outline (lateral view); propodal rasp with 1 row of rounded scales. Anterior lobe of sternite of sixth thoracic sternite (second ambulatory leg) usually unarmed, setose. Uropods strongly asymmetrical, telson (Fig. 5G) weakly so. Terminal half of telson divided into 2 nearly symmetrical, rounded posterior lobes separated by wide U-shaped cleft, and armed with often curved corneous spines.

Coloration in life (Fig. 8A-D): Somewhat variable. Shield and cephalic appendages white or light orange, antennular and antennal peduncles sometimes light red. Chelipeds white or light orange becoming darker distally on carpi and near base of fingers on palm. Ambulatory legs white, most frequently with lateral faces of meri, carpi, and propodi partially light orange or with light orange stripe; dactyls light orange proximally near propodi, white distally.

Distribution: Eastern Atlantic: from Portugal to Morocco, including the Azores, Canary and Cape Verde Islands. Western, central, and South Pacific: New Caledonia region; Vanuatu; Solomon Islands; Taiwan; Hawaiian Islands; and French Polynesia. Depth: 75 to 1200 m.

Variations: As stated in the diagnosis, the right cheliped in large males of this species can be quite long, and slender. One male examined (Taiwan 2003, stn CP 214, sl 6.0 mm, NTOU A00001) has what appears to be an abnormal right cheliped, similar in size to the left cheliped (Fig. 8B). Small specimens (sl < 2.0 mm), and immature individuals usually have paired, asymmetrical pleopods.

Similarities: This species can be distinguished from the other two congeners, *S. sibogae* and *S. breviacus* sp. nov., primarily by the shape of the propodus and dactyl of the fourth pereopod, the more slender segments (the meri in particular) of the ambulatory legs, and shape of telson. On the fourth pereopod, the propodus is short and subcircular (in lateral view) in *S. gracilipes*, whereas it is long and ovate in the other two species; the dactyl is stout and short, about as long as the dorsal margin of the propodus in *S. gracilipes*, whereas the dactyl is elongate, and longer than the dorsal margin of the propodus in the other two congeners. The length/height ratio of the meri of the ambulatory legs varies from 2.7 to 3.6 in *S. gracilipes*; from 1.9 to 2.4 in *S. breviacus* sp. nov.; and from 2.0 to 2.5 in *S. sibogae*. The terminal half of the telson is divided into nearly symmetrical posterior lobes in *S. gracilipes*, whereas the lobes are distinctly asymmetrical in the other

two congeners. Also, the two species differ in coloration (Fig. 8) of chelipeds and ambulatory legs.

Remarks: Lemaitre (1994) tentatively reported a female specimen from French Polynesia as *S. cf. gracilipes*. This same specimen had been reported by Poupin (1993) as *Strobopagurus cf. sibogae*. Reexamination of the specimen has removed any doubts on its identity, and represents *S. gracilipes*. So far, *S. sibogae* is not known to occur in French Polynesia.

Zhadan (1997) reported a number of specimens from the ridges of Sala y Gómez, in the southeastern Pacific, as *Strobopagurus aff. gracilipes*. He found the specimens to be intermediate between *S. gracilipes* and *Bivalvopagurus sinensis*. To explain their morphology Zhadan invoked a process of “progressive carcinization” similar to that presumed by Blackstone (1989) for southern and northern populations of *Pagurus hirsutiusculus* (Dana, 1851) in the eastern Pacific. Zhadan chose to assign his specimens tentatively to *S. gracilipes* based on the presence of unpaired left third to fifth pleopods. However, the degree of development of right third to fifth pleopods in *B. sinensis* can vary substantially (pers. obs.), and they can often be small or obscured by tufts of setae. The description and characters depicted by Zhadan (1997) suggest instead that his specimens represent either *B. sinensis* or perhaps an undescribed species of that currently monotypic genus. It should be pointed out that the concept of carcinization, as traditionally applied to the Paguridae, and Blackstone’s (1989) assumption, have both been shown to be erroneous (Crain and McLaughlin, 1993; McLaughlin and Lemaitre, 1997; McLaughlin et al., 2004).

Strobopagurus gracilipes has a broad, disjunct distribution that includes the eastern Atlantic, and western, central and South Pacific. At least two other parpagurids, *Paragiopagurus ruticheles* (A. Milne-Edwards, 1891) and *Sympagurus acinops* Lemaitre, 1989, have similar, disjunct distributions (Lemaitre, 1990, unpub. obs.). It is conceivable that such distributions may reflect the existence of cryptic species. However, so far no adult morphological characters have been found that allow separation of Atlantic and Pacific populations of any of these three species.

Two megalopas inhabiting gastropod shells, believed to be of *S. gracilipes*, were found at BIOCAL station DW 33 (MNHN Pg 7119) along with adults of this species. These megalopas differ from other parpagurid megalopas previously reported

(see de Saint Laurent-Dechancé, 1964; Lemaitre and McLaughlin, 1992; Lemaitre, 1997) by the short, broadly subtriangular rostrum (Fig. 7A) with a shallow, median indentation, and the straight dactyls (Fig. 7D, E) of the first and second ambulatory legs, which lack ventromesial spines. In other parapagurid megalopas, the dactyls of the pereopods have a row of ventromesial spines, and are evenly curved; the rostrum is obtusely subtriangular, rounded, more produced anteriorly than in *S. gracilipes*, and lacks a median indentation. The chelipeds (Fig. 7B, C) of the megalopas of *S. gracilipes* are smooth, unarmed, similar to those of the megalopa of *Sympagurus dimorphus* (see Lemaitre and McLaughlin, 1992). In other characters so far studied, all parapagurid megalopas are nearly identical.

Strobopagurus sibogae (de Saint Laurent, 1972)
(Figs. 1F; 3E-H; 4J, K; 5H, I, 8E)

Parapagurus sibogae de Saint Laurent, 1972: 116, figs. 10, 23; Miyake, 1978: 71; 1982: 197.

Parapagurus kilburni Kensley, 1973: 285, figs. 1, 2; 1974: 66; 1981: 33. (See Remarks)

Strobopagurus sibogae: Lemaitre, 1989: 36; 1996: 167, fig. 1; 1997: 575; Miyake, 1991: 197; Davie, 2002: 91.

Strobopagurus kilburni: Lemaitre, 1989: 36; 1996: 167; Zhadan, in press: figs. 45-47, 53.

Types: Holotype: ov F 7.4 mm, Indonesia, "Siboga" Expedition, stn 12, 07°15'S, 115°15.6'E, 289 m, 14.03.1899, coll. M. Weber (ZMA De103.109). Presumed paratypes (see Remarks): China Seas, Fisheries Research Station, Hong Kong, coll. O. T. Chan: 1 M 5.9 mm, Cr. 4/64, stn 146, trawl 227, 285 m, 24.08.1964, (MNHN Pg 2204); 1 M 4.3 mm, Cr. 4/64, T 227, 285 m (MNHN Pg 2206); 1 F 3.6 mm, Cr. 4/14, stn 114, trawl 216, 251-256 m, 22.08.1964 (MNHN Pg 2207); 1 M 8.2 mm, Cr. 12/65, stn 65, T/380 (MNHN Pg 2205). 1 F 4.3 mm, Indonesia, Borneo, Sibuko Bay, off Mabul Island, *Albatross* stn 5589, 04°12.10'N, 118°38.08'E, 260 m, 29.09.1909 (USNM 169010). 1 F 6.5 mm, (exact locality unknown), Gier no. 24, 06.09.1909 (ZMA De.103.114). Types of *Parapagurus kilburni* Kensley, 1973: all from off Durban, South Africa, 270 m, (unknown date), coll. R. N. Kilburn: holotype: M 7.5 mm (SAM A13185); paratypes: 4 M 6.0-7.5 mm (SAM A13186).

Material examined (see also Lemaitre, 1996, 1997): **Western Indian Ocean.** BENTHEDI: NE Mozambique Channel, (Eles Glorieuses, stn 98F, 11°35.5'S, 47°16.5'E, 260-460 m, 07.04.1977: 1 F 6.7 mm (MNHN Pg 7132). Madagascar: P1 ch 4, 12°52.4'S, 48°10.4'E, 400-410 m, 04.03.1971, coll. A. Crosnier: 1 M 4.0 mm, 1 F 3.5 mm, 1 ov F 4.6 mm (USNM 1016851, ex MNHN Pg 5699 in part); P1 ch 6, 12°52.42.7'S, 48°12.8'E, 444-435 m, 05.03.1971, coll. A. Crosnier: 2 ov F 4.3-4.4 mm (MNHN Pg 5700); ch 12, 12°42.2'S, 48°14.2'E, 395-405 m, 14.04.1971, coll. A. Crosnier: 3 M 5.1-5.2 mm (MNHN Pg 5706); ch 61, 23°36.1'S, 43°31.0'E, 445-455 m, 27.02.1973, coll. A. Crosnier: 3 M 4.7-8.2 mm, 1 F 3.8 mm (MNHN Pg 5707); ch 105, 22°17.9'S, 43°04.0'E, 450 m, 29.11.1973, coll. A. Crosnier: 1 F 4.8 mm (MNHN Pg 5711). Walters Bank: *Marion Dufresne*, stn CP 47, 33°11.4'S, 44°00.4'E, 620-635 m, 16.03.1976: 1 M 5.1 mm (MNHN Pg 6604).

Indonesia. *Java-South Africa Expedition 1929-30*: stn 7, 8°29'S, 114°40'E, 200 m, 05.04.1929: 5 M 3.9-7.6 mm, 3 F 3.9-6.1 mm, 3 ov F 5.5-7.0 mm (ZMK); stn 10, 8°36'S, 114°34'E, 300 m, 07.04.1929: 1 M 6.4 mm (ZMK); stn 15, 7°29'S, 114°49'E, 240 m, 10.04.1929: 1 ov F 6.7 mm (ZMK); stn 16, 7°35'S, 114°42'E, 200 m, 10.04.1929: 1 F 3.3 mm (ZMK).

Taiwan. TAIWAN 2000: stn DW 7, 22°20.2'S, 119°13.2'E, 260 m, -07.2000: 1 M 4.6 mm, 1 F 4.2 mm (MNHN Pg 7136), 1 F 4.0 mm (MNHN Pg 7011); stn CP 11, 22°18.6'S, 119°14.8'E, 262 m,

28.07.2000: 1 F 4.3 mm (MNHN Pg 7012). TAIWAN 2001: stn CP 74, 24°50.8'N, 121°59.3'E, 220 m, 07.05.2001: 1 M 7.8 mm (NTOU A00010). TAIWAN 2002: stn CP 162, 22°09.6'S, 120°37.9'E, 190-200 m, 25.05.2002: 1 M 7.4 mm (MNHN Pg 6734). TAIWAN 2003: stn CP 216, 24°34.71'N, 122°4.02'E, 209-280 m, 27.08.2003: 1 F 6.2 mm (NTOU A00007). Su-Aou fishing port, I-Lan County, NE Taiwan, 23 Mar 1999, coll. commercial trawler: 1 M 7.9 mm + loose cheliped (NTOU A00008). TaiShi fishing port, I-Lan County, NE Taiwan, 25 May 1998, coll. P.K.L. Ng, from commercial trawler: 1 M 9.0 mm (NTOU A00004).

Philippines. *Th. Mortensen's Pacific Expedition 1913-1916*: 25 mi (45.7 km) E by S of Zamboanga, 370-290 m, 03.03.1914: 1 F 4.8 mm (ZMK).

Solomon Islands. SALOMON 1: stn CP 1851, 10°27.6'S, 162°00'E, 297-350 m, 07.10.2001: 2 M 5.1, 5.6 mm, 4 F 5.1-5.6 mm (MNHN Pg 7010); stn 1860, 9°22'S, 160°31'E, 620 m, 07.10.2001: 1 M 7.9 mm (MNHN Pg 6605).

New Caledonia. MUSORSTOM 2: stn CP 63, 14°07'S, 120°15'W, 215-230 m, 29.11.1980: 1 ov F (MNHN Pg 6412). VOLSMAR: Stn DW 7, 22°26'S, 171°44.10'E, 400 m, 01.06.1989: 1 M 7.5 mm (MNHN Pg 7133). SMIB 5: stn DW 75, 23°40.90'S, 168°00.80'E, 270 m, 07.09.1989: 1 M 6.9 mm (MNHN Pg 7134). BATHUS 2: stn CP 737, 23°03'S, 166°59'E, 350-400 m, 13.05.1993: 1 M 7.9 mm, 1 F 5.4 mm (MNHN Pg 6600); stn CP 743, 22°35'S, 166°26'E, 713-950 m, 14.05.1993: 1 M 4.5 mm (MNHN Pg 6601). BATHUS 3: stn CP 822, 23°19'S, 167°57'E, 950-980 m, 29.11.1993: 1 M 7.9 mm, 1 F 5.4 mm (MNHN Pg 6602); stn DW 827, 23°22'S, 168°01'E, 381-469 m, 29.11.1993: 1 M 4.6 mm (MNHN Pg 7009). HALIPRO 1: stn CP 854, 21°40'S, 166°38'E, 650-780 m, 19.03.1994: 1 M 4.8 mm (MNHN Pg 6603). BATHUS 4: stn CP 921, 18°46'S, 163°17'E, 613-610 m, 06.08.1994: 1 M 5.2 mm (MNHN Pg 7135).

Diagnosis: Shield (Fig. 1F) convex in lateral view. Rostrum broadly rounded, with short longitudinal dorsal ridge. Ocular peduncles more than half length of shield. Ocular acicles each terminating in strong spine (occasionally bifid). Antennular peduncles exceeding distal margin of corneas by slightly more than length of ultimate segments. Antennal peduncles exceeding distal margin of corneas by about 0.3 or less length of fifth segments; fourth segment with small dorsodistal spine; second segment with dorsolateral distal angle produced, terminating in strong spine (occasionally bifid), mesial margin with small spine at dorsodistal angle; first segment with row of short spines on ventrodistal margin. Antennal acicles exceeding distal margin of corneas by as much as 0.3 length of acicles; mesial margin armed with 5-7 spines on proximal half. Sternite of third maxillipeds with small spine on each side of midline. Right cheliped (Fig. 3E, G) with chela usually ovate, or oblong in large specimens (sl > 8.0 mm); dactyl with row of spines on mesial margin; palm with dorsal surface covered with short, fine setae not hiding surface beneath, dorsal surface lacking spines or tubercles, and with dorsomesial and dorsolateral margins well delimited by row of often strong spines (usually double row on mesial margin); carpus armed with often numerous small spines on dorsal surface. Left cheliped densely setose; carpus with dorsolateral, and often also dorsomesial rows of spines. Ambulatory legs with

meri shorter on left side than on right; merus about 2.5 (first leg) or 2.0 (second leg) times as long as dorsoventral height. Fourth pereopod (Fig. 5H) semichelate; dactyl elongate, as long or longer than dorsal margin of propodus; propodus ovate (lateral view), about 1.8 times as long as greatest height; propodal rasp with 1 row of ovate scales. Anterior lobe of sixth thoracic sternite (second ambulatory legs) usually unarmed, setose. Uropods and telson (Fig. 5I) strongly asymmetrical; terminal half of telson divided into 2 rounded, distinctly asymmetrical posterior lobes by broad, U-shaped cleft, and armed with strong, often curved corneous spines.

Coloration in life (Fig. 8E): Shield and cephalic appendages mostly white except for light orange antennules. Chelipeds mostly light orange, with white fingertips, dark orange ventrolateral margins of carpi, and dark orange band near dorsodistal margin of meri; chelae sometimes mostly white with light orange dorsomesial face. Ambulatory legs white; dactyl light orange proximally; carpi and propodi with dorsolateral and dorsoventral stripes; meri with dark orange band near dorsodistal margin, and light orange proximally fading to white distally.

Distribution: Western Indian Ocean: Mozambique Channel; Madagascar. Western Pacific: Indonesia; Philippines; New Caledonia region; Solomon Islands; Taiwan; China Sea; and Japan. Depth: 40 to 980 m.

Variations: Variations in shape of the right cheliped of *S. sibogae* are related to size, particularly in males. Most specimens of both sexes have the lateral margins of palm and fixed finger, and the mesial margin of the palm, distinctly arched (Fig. 3E), with chela and carpus each about 1.4 times as long as broad. In contrast, large males (sl > 8.0 mm) have the lateral margins of palm and fixed finger, and mesial margin of palm, nearly straight, with chela and carpus each about 2.1 times longer than broad (Fig. 3G).

Similarities: (See *S. breviacus*).

Remarks: In the original description of this species by de Saint Laurent (1972: 116) the paratypes were not listed in detail, although it was mentioned that they came from "Indonesia ("*Siboga*", and coll. Mortensen), China Sea (F.R.S. Hong Kong), and Japan (coll. K. Sakai)". Thus, it is unclear which were to be considered paratypes. Of the specimens used and labeled by de Saint Laurent, only those listed above under "presumed paratypes" have been located and examined.

Kensley (1973), in his description of *Parapagurus kilburni*, contrasted his species with *Parapagurus gra-*

cilipes (A. Milne-Edwards, 1891) (= *Strobopagurus gracilipes*), and *Parapagurus macrocerus* Forest, 1955 (= *Paragiopagurus macrocerus*). Kensley justified his new species on the basis of differences in the antennal acicles, cheliped armature, and telson. It appears that Kensley was unaware of de Saint Laurent's (1972) description of *Parapagurus sibogae* (= *Strobopagurus sibogae*) as he did not mention her taxon or 1972 publication. A comparison of Kensley's (1973) description and type material of *Parapagurus kilburni* with *Strobopagurus sibogae*, has shown that the two are indistinguishable morphologically, and therefore the former must be considered a junior synonym of the latter.

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REFERENCES

- Alcock, A. – 1905. *Catalogue of the Indian Decapod Crustacea in the Collection of the Indian Museum. Part II. Anomura. Fasc. I, Pagurides*. Indian Museum, Calcutta, xi + 197 pp., 16 pls.
- Blackstone, N.W. – 1989. Size, shell-living and carcinization in geographic populations of a hermit crab, *Pagurus hirsutiusculus*. *J. Zool.*, 217: 477-490.
- Bouvier, E.-L. – 1922. Observations complémentaires sur les Crustacés Décapodes (Abstraction faite des Carides) provenant des Campagnes de S. A. S. Le Prince de Monaco. *Résult. Camp. sci. Monaco*, 62: 1-106, pls 1-6.
- Crain, J.A. and McLaughlin, P.A. – 1993. Larval, postlarval, and early juvenile development in *Pagurus venturus* Coffin, 1957 (Decapoda: Anomura: Paguridae) reared in the laboratory, with a redescription of the adult. *Bull. Mar. Sci.*, 53(3): 985-1012.
- Crosnier, A. – 1978. Crustacés Décapodes Pénéides Aristeidae (Benthescyminae, Aristeinae, Solenocerinae). *Faune de Madagascar*, 46: 1-197.
- Dana, J.D. – 1851. Conspectus crustaceorum quae in orbis terrarum circumnavigatione, Carolus Wilkes e class reipublicae foederatae duce, lexit et descripsit. (Preprint from) *Proc. Acad. Nat. Sci. Philadelphia*, 5: 267-272.
- Davie, P.J.F. – 2002. Crustacea: Malacostraca: Eucarida (Part 2): Decapoda — Anomura, Brachyura. In: A. Wells and W.W.K. Houston (eds), *Zoological Catalogue of Australia*. Volume 19.3B. Melbourne: CSIRO Publishing, Australia, xiv + 641 pp.
- Forest, J. – 1954. Les Paguristes des côtes occidentales et méridionales d'Afrique. *Ann. S. Afr. Mus.*, 41(4): 159-213.
- Forest, J. – 1955. Crustacés décapodes, Pagurides. *Expéd. Océanogr. belge eaux côtières afr. Atl. Sud (1948-1949). Résult. Scient.*, 3(4): 21-147.
- García Raso, J.E. – 1996. Crustacea Decapoda (excl. Sergestidae) from Ibero-Moroccan waters. Results of BALGIM-84 Expedition. *Bull. Mar. Sci.*, 58(3): 730-752.
- Garrigue, C., B. Richer de Forges, P. Laboute, J.-S. Philippe, J.-S., V. Chazottes, G. Cabioch, T. Corregge and J. Récy. – 2000. Paléo-Surprise: paléoenvironnements et bioécologie de l'atoll de Surprise, Nouvelle-Calédonie. *Rapports de missions - Sciences de la mer - Biologie marine. Nouméa, IRD*. 25: 53pp.
- Gordan, J. – 1956. A bibliography of pagurid crabs, exclusive of Alcock, 1905. *Bull. Amer. Mus. Nat. Hist.*, 108(3): 253-352.
- Ingle, R. – 1985. Northeastern Atlantic Ocean and Mediterranean hermit crabs (Crustacea: Anomura: Paguroidea: Paguridae). I. The genus *Pagurus* Fabricius, 1775. *J. Nat. Hist.*, 19: 745-769.
- Kensley, B. – 1973. A new species of hermit crab from Natal, South Africa (Decapoda, Anomura, Paguridae). *Durban Mus. Nov.*, 9(19): 285-290.
- Kensley, B. – 1974. Type specimens of Decapoda (Crustacea) in the collections of the South African Museum. *Ann. S. Afr. Mus.*, 66(4): 55-80.
- Kensley, B. – 1981. On the zoogeography of Southern African decapod Crustacea, with a distributional checklist of species. *Smithsonian Contrib. Zool.*, 338: 1-64.
- Laboute, P., M. Lardy, J.-L. Menou, M. Monzier and B. Richer de Forges. – 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). *Rapport de Missions, Sciences de la Terre, Géologie-Géophysique*, ORSTOM Nouméa, (11): 1-22.
- Lehodey, P., B. Richer de Forges, C. Nauges, R. Grandperrin, and J. Rivaton, 1992. — Campagnes 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. – 1989. Revision of the genus *Parapagurus* (Anomura: Paguroidea: Parapaguridae), including redescriptions of the western Atlantic species. *Zool. Verh.*, Leiden, (253): 1-106.
- Lemaitre, R. – 1990. A review of eastern Atlantic species of the family Parapaguridae (Decapoda, Anomura, Paguroidea). *J. Nat. Hist.*, 24: 219-240.
- Lemaitre, R. 1993. A new genus of Parapaguridae. *Crustacean Research*, 22: 11-20.
- Lemaitre, R. – 1994. Crustacea Decapoda: deep-water hermit crabs (Parapaguridae) from French Polynesia with descriptions of four new species. In: A. Crosnier (ed.), *Résult. Camp. MUSORSTOM*, Vol. 12. *Mém. Mus. nat. Hist. nat.*, Paris, 161: 375-419.
- Lemaitre, R. – 1996. Hermit crabs of the family Parapaguridae (Crustacea: Decapoda: Anomura) from Australia: species of *Strobopagurus* Lemaitre, 1989, *Sympagurus* Smith, 1883, and two new genera. *Rec. Aust. Mus.*, 48(2): 163-221.
- Lemaitre, R. – 1997. Crustacea Decapoda: Parapaguridae from the KARUBAR Cruise in Indonesia, with descriptions of two new species. In: A. Crosnier and P. Bouchet (eds), *Résult. Camp. MUSORSTOM*, Vol. 16. *Mém. Mus. nat. Hist. nat.*, Paris, 172: 573-596.
- Lemaitre, R. – 1999. Crustacea Decapoda: A review of the species of the genus *Parapagurus* Smith, 1879 (Parapaguridae) from the Pacific and Indian Oceans. In: A. Crosnier (ed.), *Résult. Camp. MUSORSTOM*, Vol. 20. *Mém. Mus. nat. Hist. nat.*, Paris, 180: 303-378.
- Lemaitre, R. – 2004. Crustacea Decapoda: A worldwide review of hermit crab species of the genus *Sympagurus* Smith, 1883 (Parapaguridae). In: B. Marshall and B. Richer de Forges, (eds), *Tropical Deep-Sea Benthos*, Vol. 23. *Mém. Mus. nat. Hist. nat.*, Paris, 191: 000-000.
- Lemaitre, R. and P.A. McLaughlin. – 1992. Descriptions of megalopa and juveniles of *Sympagurus dimorphus* (Studer, 1883), with an account of the Parapaguridae (Crustacea: Anomura: Paguroidea) from Antarctic and Subantarctic waters. *J. Nat. Hist.*, 26: 745-768.
- Lemaitre, R. and J. Poupin. – 2003. A strikingly coloured new species of *Paragiopagurus* Lemaitre, 1996 (Crustacea: Decapoda: Anomura: Parapaguridae) from French Polynesia. *Zootaxa*, 386: 1-11.
- McLaughlin, P.A. and R. Lemaitre. – 1997. Carcinization in the Anomura – Fact or fiction? I. Evidence from adult morphology. *Cont. Zool.*, 67(2): 79-123.
- McLaughlin, P.A., R. Lemaitre and C.C. Tudge. – 2004. Carcinization in the Anomura – Fact or fiction? II. Evidence from larval, megalopal and early juvenile morphology. *Cont. Zool.*, 73(4): 1-41.
- Milne-Edwards, A. – 1891. Pagurides nouveaux des Açores. Campagnes Scientifiques de S.A. Le Prince de Monaco sur le yacht *L'Hirondelle*. *Bull. Soc. Zool. France*, 16: 131-134.
- Milne-Edwards, A. and E.-L. Bouvier. – 1892. Observations préliminaires sur les paguriens recueillis par les expéditions françaises du *Travailleur* et *Talisman*. *Ann. Sci. Nat. (Zool.)*, 7(13): 185-226.
- Milne-Edwards, A. and E.-L. Bouvier. – 1894. Crustacés décapodes provenant des campagnes du yacht *L'Hirondelle* (1886, 1887, 1888). I. Brachyures et anomoures. *Résult.s Camp. sci. Monaco*, 7: 1-112.
- Milne-Edwards, A. and E.-L. Bouvier. – 1897. Observations sur le genre *Sympagurus*. Campagnes Scientifiques de S. A. Le Prince Albert 1^{er} de Monaco, a bord de *L'Hirondelle* et de la *Princesse-Alice*. *Bull. Soc. Zool. France*, 22: 131-136.
- Milne-Edwards, A. and E.-L. Bouvier. – 1899. Crustacés décapodes provenant des campagnes de *L'Hirondelle* (Supplément) et de la *Princesse-Alice* (1891-1897). Brachyures et Anomoures. *Résult. Camp. sci. Monaco*, 13: 1-106, pls 1-4.
- Milne-Edwards, A. and E.-L. Bouvier. – 1900. Crustacés Décapodes. I. Brachyures et Anomoures. *Expéditions scientifiques du "Travailleur" et du "Talisman" pendant les années 1880, 1881, 1882, 1883*. Masson, Paris, 396 pp., 32 pls.
- Miyake, S. – 1978. *The crustacean Anomura of Sagami Bay*. Biological Laboratory, Imperial Household. Hoikusha, Tokyo. 200 [English] + 161 [Japanese] pp., pls 1-4.
- Miyake, S. – 1982. *Japanese crustacean decapods and stomatopods in color*. Volume 1, Macrura, Anomura, and Stomatopoda. Hoikusha Publishing Co., Ltd., Osaka, 261 pp. [in Japanese].
- Miyake, S. – 1991. *Japanese crustacean decapods and stomatopods*

- in color*. Volume 1, Macrura, Anomura, and Stomatopoda. Hoikusha Publishing Co., Ltd., Osaka, 261 pp., second printing, [in Japanese].
- Poupin, J. – 1993. Recent contributions to the deep sea decapod Crustacea of French Polynesia. *International Senckenberg Symposium Crustacea Decapoda, Frankfurt a.M., October 18-22, 1993*, 84 pp. [abstract].
- Poupin, J. – 1996. Crustacea Decapoda of French Polynesia (Astacidea, Palinuridea, Anomura, Brachyura). *Atoll Res. Bull.*, 442: i-iv, 1-114.
- Przibram, H. – 1905. Die "Heterochelie" bei decapoden Crustaceen (zugleich: Experimentelle Studien über Regeneration. Dritte Mitteilung). *Arch. Entw. Mech. Org.*, 19: 181-247, pls 8-13.
- 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: A. Crosnier (ed.), *Résult. Camp. MUSORSTOM*, Vol. 6. *Mém. Mus. nat. Hist. nat.*, sér. A, Paris, 145: 9-54.
- Richer de Forges, B. – 1993. Campagnes d'exploration de la faune bathyale faites depuis mai 1989 dans la zone économique de la Nouvelle-Calédonie. Liste des stations. In: A. Crosnier (ed.), *Résult. Camp. MUSORSTOM*, Vol. 10. *Mém. Mus. nat. Hist. nat.*, Paris, 156: 27-32.
- Richer de Forges, B. and C. Chevillon. – 1996. Les campagnes d'échantillonnages du benthos bathyal en Nouvelle-Calédonie, en 1993 et 1994 (BATHUS 1 à 4, SMIB 8 et HALIPRO 1). In: A. Crosnier (ed.), *Résult. Camp. MUSORSTOM*, Vol. 15. *Mém. Mus. nat. Hist. nat.*, Paris, 168: 33-53.
- Richer de Forges, B., E. Faliex and J.-L. Menou. – 1996. La campagne MUSORSTOM 8 dans l'archipel de Vanuatu. Compte rendu et liste des stations. In: A. Crosnier (ed.), *Résult. Camp. MUSORSTOM*, Vol. 15. *Mém. Mus. nat. Hist. nat.*, Paris, 168: 9-32.
- Richer de Forges, B., P. Bouchet, B. Dayrat, A. Warén and J.-S. Philippe. – 2000a. La campagne BORDAU 1 sur la ride de Lau (Îles Fidji). Compte rendu et liste des stations. In: A. Crosnier (ed.), *Résult. Camp. MUSORSTOM*, Vol. 21. *Mém. Mus. nat. Hist. nat.*, Paris, 184: 25-38.
- Richer de Forges, B., P. Newell, M. Schlacher, T. Hoelinger, D. Nating, F. Césari and P. Bouchet. – 2000b. La campagne MUSORSTOM 10 dans l'archipel des îles Fidji. Compte rendu et liste des stations. In: A. Crosnier (ed.), *Résult. Camp. MUSORSTOM*, Vol. 21. *Mém. Mus. nat. Hist. nat.*, Paris, 184: 9-23.
- Saint Laurent, M. de. – 1972. Sur la famille des Parapaguridae Smith, 1882. Description de *Typhlopagurus foresti* gen. nov., et de quinze espèces ou sous-espèces nouvelles de *Parapagurus* Smith (Crustacea, Decapoda). *Bijdr. Dierk.*, 42 (2): 97-123.
- Saint Laurent-Dechancé, M. de. – 1964. Développement et position systématique du genre *Parapagurus* Smith (Crustacea Decapoda Paguridea). I. Description des stades larvaires. *Bull. Inst. Océanogr., Monaco*, 64(1321): 2-26.
- Smith, S.I. 1882. – 17. Report on the Crustacea. Part I. Decapoda. Reports on the dredging, under the supervision of Alexander Agassiz, on the east coast of the United States, during the summer of 1880, by the U.S. Coast Survey Steamer "Blake", commander J. R. Bartlett U.S.N., commanding. *Bull. Mus. Comp. Zool., Harvard*, 10(1): 1-108, pls 1-16.
- Türkay, M. – 1976. Decapoda Reptantia von der Portugiesischen und Marokkanischen küste Auswertung der Fahrten 8, 9c (1967), 19 (1970), 23 (1971) und 36 (1975) von F.S. 'Meteor'. *'Meteor' Forsch.-Ergebnisse, Reihe D*, 23: 23-44.
- 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*. Muséum national d'Histoire Naturelle, Institut d'Écologie et de Gestion de la Biodiversité Service du Patrimoine Naturel, 40: i-x + 383 pp.
- Zariquiey-Álvarez, R. – 1968. Crustáceos decápodos ibéricos. *Inv. Pesq.*, 32: 1-510.
- Zhadan, D.G. – 1997. Deep-sea hermit crabs from the submerged ridges Nazka and Sala-y-Gomez, southeastern Pacific (Decapoda Anomura Parapaguridae). *Arthropoda Selecta*, 6 (1/2): 55-79.
- Zhadan, D.G. – in press. Hermit crabs of the family Parapaguridae (excl. *Parapagurus*) from the western Indian Ocean (Decapoda, Anomura, Paguroidea). *Senck. mar.*
- Scient. ed.: E. Macpherson