

A worldwide taxonomic and distributional synthesis of the genus *Oncopagurus* Lemaitre, 1996 (Crustacea: Decapoda: Anomura: Parapaguridae), with descriptions of nine new species

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Abstract. A worldwide taxonomic and distributional synthesis of the deep-water hermit crab genus *Oncopagurus* Lemaitre, 1996 is presented. This genus, originally defined for 10 species is set apart from other Parapaguridae as well as other Paguroidea, by one synapomorphy: the presence of an upwardly curved epistomial spine. This study is based on a large amount of specimens deposited in major museums and collected during deep-sea sampling across the world oceans since the late 1800s, with the bulk of material coming from French campaigns in the Indo-Pacific, central and south Pacific during the last 40 years. A total of 24 species are recognised in this investigation, nine of which are new and fully described and illustrated. All previously known species are diagnosed or re-described, including figures assembled from recent published accounts or newly illustrated, of the most important morphological features useful for identifications. Information for each species includes a synonymy (full or abbreviated if a synonymy has recently been published), material examined (type and non-types), variations when significant, colouration when available, habitat or type of housing used, distribution, and remarks on taxonomy and morphological affinities. Rare colour photographs are included for five species. Species of *Oncopagurus* range in depth from the Continental Shelf (50 m) to the Continental Rise (2308 m), although they are most commonly found in 50–500 m. Individuals of the majority of species in this genus are minute in size (< 3 mm in shield length), species differ in subtle morphological characters, and often exhibit the same broad morphological variations related to sex and size that has been documented in species of other genera of Parapaguridae. *Oncopagurus mironovi* Zhadan, 1997, a taxon reported from the Nazca and Sala-y-Gómez Ridges, is considered a junior synonym of the widely distributed *O. indicus* (Alcock, 1905). The bathymetric and geographic distributions of *Oncopagurus* species are summarised and briefly discussed, complemented with a summary table, graph, and map with generalised distribution patterns. The scant phylogenetic knowledge of this genus is summarised.

Key words. Deep-water hermit crabs, *Oncopagurus*, Parapaguridae, new species, taxonomy, distribution, world synthesis

INTRODUCTION

The deep-water hermit crab genus *Oncopagurus* Lemaitre, 1996, of the family Parapaguridae Smith, 1882, was originally proposed by Lemaitre (1996) for a group of 10 species that share the presence of an upwardly curved, slender epistomial spine, a unique character not only among parapagurids but also the entire Paguroidea. While the presence of an epistomial spine is one of the primary characters that define the family Parapaguridae Smith, 1882 (see de Saint Laurent, 1972), this spine, when present in species of the other nine genera currently in this family, is straight and short (Lemaitre, 1996, 1998, 1999, 2004a,b, 2013). In contrast, an upwardly curved and often fragile, needle-like epistomial spine is invariably present in all *Oncopagurus* species, and thus its presence can be considered an apomorphic

character with phylogenetic importance. Additional characters that, combined with the curved epistomial spine, serve to define this genus, include the biserial gills, and in males the tendency to have poorly to moderately developed first and second gonopods, or sometimes the lack of first and/or second gonopods.

Species of *Oncopagurus* are found in depths ranging from 50–2308 m, although they occur most commonly between 50 m and 500 m. The species are perhaps the most difficult to study among parapagurids because of the often minute size of specimens (typically < 3 mm in shield length), subtle morphological differences between species, and relatively high species diversity in regions such as the Indo-West Pacific, where several similar and abundant species can co-occur in the same habitat. The appearance of species of this genus is deceptive, and if the morphology of specimens is not examined carefully they can be mistaken to belong to the similarly right-handed members of the Paguridae. The small size of individuals of *Oncopagurus*, and their use of gastropod shells as housing are unlike most other species in the non-monotypic parapagurid genera (i.e., *Parapagurus* Smith, 1879, *Sympagurus* Smith, 1883, *Strobopagurus*

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Lemaitre, 1989, *Paragiopagurus* Lemaitre, 1996), which tend to grow to larger sizes, have much longer ambulatory legs, and frequently live in carcinoecia formed by associated coelenterates.

Since *Oncopagurus* was proposed by Lemaitre (1996), five new species have been described in this genus: *O. glebosus* Lemaitre, 1997, *O. mironovi* Zhadan, 1997, *O. stockmani* Zhadan, 1997, *O. oimos* Lemaitre, 1998, and *O. conicus* Lemaitre, 2006. Other than the material used for descriptions of these new species, relatively few specimens of other *Oncopagurus* species have been reported since Lemaitre's (1996) description of the genus. Exceptions are regional studies of paguroids from Indonesia (Lemaitre, 1997), Japan (Asakura, 2006; Asakura et al., 2006), New Zealand (Lemaitre, 2000), and Taiwan (McLaughlin et al., 2007), which reported a modest number of new specimens of one or more of the following species: *O. indicus* (Alcock, 1905), *O. minutus* (Henderson, 1896), *O. monstrosus* (Alcock, 1894), and/or *O. orientalis* (de Saint Laurent, 1972). Also, a damaged *Oncopagurus* specimen that could not be identified to species level from the Kermadec Islands, New Zealand, was reported as "*Oncopagurus* sp." by Lemaitre (2000) and Forest & McLay (2001); three specimens from the Nazca and Sala-y-Gómez Ridges were reported as "*Oncopagurus* sp. A" by Zhadan (1997); and an undetermined species was reported from Chile as "*Oncopagurus* sp." by Retamal (2007) and Retamal & Moyano (2010). Several regional checklists, keys or distributional summaries published since Lemaitre's (1996) description of the genus, have included a few species based on literature records; these include reports of parapagurids from French Polynesia (Poupin, 1996), the eastern Pacific (Hendrickx & Harvey, 1999; Guzmán Gómez, 1999; Wicksten, 2012), and Hawaii (Castro, 2011). A recent checklist of the anomurans from the world was published by McLaughlin et al. (2010), listing all known species of *Oncopagurus*, and correctly transferred to this genus a species (*Parapagurus curvispina* de Saint Laurent, 1974) that had been generically misplaced by Lemaitre (1996) in *Paragiopagurus*.

Over the last two decades or so, a large number of samples of parapagurids were collected primarily during large-scale explorations of the Indo-Pacific deep water fauna by the Muséum national d'Histoire naturelle, Paris, and the French "Institut de Recherche pour le Développement" (formerly ORSTOM), and in some cases in collaborations with Indonesian institutions, or the National Taiwan Ocean University and Taiwan Fisheries Research Institute. The sorting and study of this invaluable parapagurid material has yielded a considerable number of specimens of species of *Oncopagurus* from a vast region of the tropics in the Indo-Pacific and South Pacific, ranging from the southwestern Indian Ocean to French Polynesia and the Marquesas Islands. The study of this material, together with a significant amount of parapagurid materials accumulated in various major museums from other regions of the oceans such as the Hawaiian Islands, the eastern Pacific, and the Atlantic Ocean, has made possible a worldwide evaluation of the morphology and distribution of all species of *Oncopagurus*

from the world. During the study, nine new species were discovered, and one previously known species, *O. mironovi* Zhadan, 1997, was found to be a junior synonym of *O. indicus* (Alcock, 1905). Including the new species discovered, 24 species of *Oncopagurus* were now recognised, an increase of 140% in the number of species in this genus since it was proposed by Lemaitre (1996). Thus, a much needed worldwide distributional and taxonomic synthesis of all species of this genus is presented herein.

MORPHOLOGICAL COMMENTS

The kind and degree of morphological variations related to size and sex that has been documented in detail in many other species of parapagurids (Lemaitre, 1986, 1989, 1996, 1998, 1999, 2004a, b, 2013; Lemaitre & McLaughlin, 1992), particularly as it affects the right cheliped, is also present in species of *Oncopagurus*. As in many parapagurids, the right cheliped in males has a tendency to become more elongate with size, often markedly so in some species, and the carpus and chela more broader than long in females than in males. There are similarities between species of *Oncopagurus* and *Paragiopagurus* in the morphology of the right cheliped, and also the development of the first and second male gonopods. The morphology of the right chela, in particular the dorsal and ventral armature, and shape of the mesial surface, can often serve to differentiate species of *Oncopagurus*. Several species of *Oncopagurus* have a striking morphology of the ventral surface of the right chela, which in some species consists of a prominent elevation or ridge armed with spines or tubercles (*O. glebosus* Lemaitre, 1997, and two new species: *O. elevatus* and *O. rossanae*).

The evolutionary tendency for reduction or loss of one or both gonopods in males is more pronounced in species of *Oncopagurus* than in *Paragiopagurus*. The first gonopods, when present, are moderately developed, or are altogether lacking in eight species: *O. haigae* (de Saint Laurent, 1972), *O. oimos*, *O. orientalis*, *O. tuamotu* Lemaitre, 1994, and four new species: *O. bifidus*, *O. brevis*, *O. elevatus*, and *O. rossanae*. The second gonopods are asymmetrical in size and degree of development, or absent on one side, in seven species: *O. cidaris* Lemaitre, 1996, *O. haigae*, *O. oimos*, *O. orientalis*, *O. tuamotu*, and two new species: *O. bifidus* and *O. brevis*.

MATERIAL AND METHODS

Many of the specimens used in this study have come from French campaigns and remain deposited in the Muséum national d'Histoire naturelle, Paris (MNHN), with some duplicates, where possible, deposited in the National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM). Of the material deposited in in MNHN, except for types, not all have been assigned numbers or will have the new numbering system recently adopted in that museum. The station data used for most of the French campaigns has been obtained online (<http://www.mnhn.fr/musorstom/>). The details of these campaigns can be found in published or other sources, as follows: BATHUS 1–4 (Richer de Forges & Chevillon,

1996); BERYX 11 (Lehodey et al., 1992; P. Maestrati, pers. comm.); BENTHAUS (B. Richer de Forges, pers. comm.); BENTHEDI (A. Crosnier, pers. comm.); BIOCAL (Richer de Forges, 1990); BIOGEOCAL (Richer de Forges, 1990); BOA 0, 1 (B. Richer de Forges, pers. comm.); BORDAU 1, 2 (A. Crosnier, pers. comm.); CENTOB (A. Crosnier, pers. comm.); CHALCAL 1, 2 (Richer de Forges, 1990); CORINDON (B. Richer de Forges, pers. comm.); EBISCO (P. Maestrati, pers. comm.); French Polynesia, R/V Marara (Poupin et al., 1990, 1996); HALIPRO 1 (Richer de Forges & Chevillon, 1996); LITHIST (P. Maestrati, pers. comm.); MUSORSTOM 1, 2 (Forest, 1981, 1985); MUSORSTOM 3–6 (Richer de Forges, 1990, pers. comm.); MUSORSTOM 7 (Richer de Forges & Menou, 1993); MUSORSTOM 8–10 (B. Richer de Forges, pers. comm.); MUSORSTOM 8 (Richer de Forges et al., 1996); NORFOLK 1, 2 (B. Richer de Forges, pers. comm.); SALOMON 1, 2 (B. Richer de Forges, pers. comm.); SANTO (P. Bouchet, pers. comm.); SMIB 2–4 (Richer de Forges, 1990); SMIB 8 (Richer de Forges & Chevillon, 1996); SMIB 10 (A. Crosnier, pers. comm.); TAIWAN 2000–2006 (A. Crosnier, T.-Y. Chan, pers. comm.); VOLSMAR (Laboute et al., 1989). The original format for reporting latitude and longitude in these official sources or unpublished personal communications, has been retained.

Other materials have come from the following museums or institutions: Australian Museum, Sydney (AM); Bernice P. Bishop Museum, Honolulu, Hawaii, U.S.A. (BPBM); Florida Museum of Natural History, University of Florida, Gainesville (UF); Los Angeles County Museum, California (LACM); National Taiwan Ocean University, Keelung (NTOU); The Natural History Museum, London [formerly British Museum, Natural History, BMNH]; Queensland Museum, Brisbane (QM); South African Museum, Cape Town (SAM); Rosenstiel School of Marine and Atmospheric Science, University of Miami (UMML); Zoologisk Museum, Copenhagen (ZMK); and Zoological Museum, Moscow State University, Russia (ZMMU).

Treatment of each of the previously known species in the taxonomic section includes an abbreviated synonymy, type material, additional material examined and not previously reported, a diagnosis, morphological variations (when significant), colouration (when known), habitat, distribution, and remarks. The availability of new material of *Oncopagurus stockmani* has allowed for a more detailed documentation of the morphology of this species, and thus it was deemed appropriate to include a re-description. Type specimens are listed in full, except for some species where the original paratype materials are extensive. Non-type materials used by the author in previous publications are not repeated here, and instead the particular publications are cited. Only illustrations of the most important diagnostic features are included for these previously known species, assembled from previously published sources and supplemented with new figures when deemed useful. The same arrangement and information is presented for each of the new species, in addition to complete listings of material examined and full descriptions and illustrations.

Morphological terminology used follows that defined or adopted by Lemaitre (1999, 2004a, 2013) in broad reviews of the genera *Parapagurus*, *Sympagurus*, and *Paragiopagurus*. As used in the recent review of *Paragiopagurus* by Lemaitre (2013), herein: an operculate chela is defined as subcircular or ovate in shape, more or less dorsoventrally flattened (more so on the lateral half), with a sharply defined dorsolateral margin; the first and second ambulatory legs refer to the second and third pereopods, respectively; the first and second pleopods in males, when present, and whether paired or unpaired, are called gonopods regardless of degree of development. The numbers or range in millimeters (mm), that follow the number and sex of specimens in the Material Examined sections or text, are measurements of shield length (sl), measured from the tip of the rostrum to the midpoint of the posterior margin of the shield. The list of material examined is arranged by regions from east to west, and within each ocean basin from north to south. Within each region, the expeditions and stations are listed chronologically. The date is reported for each collection in the format: day.month.year. In the Taxonomic Account, the species are discussed in alphabetical order and do not suggest phylogenetic relationships. As an aid, three separate keys are presented for identification of the species from the Indo-Pacific, eastern Pacific, and Atlantic regions. Given the often subtle differences between species, and frequent intra-specific overlap of morphological variations, the user should use the keys with caution and always carefully compare with the descriptive text, figures and photographs, for confirmation of identity.

In the Material Examined sections, the sex of the specimens is abbreviated as: M, male(s); F, female(s); ov F, ovigerous females. Other abbreviations used are: AHF, Allan Hancock Foundation, Los Angeles (now LACM); BURCH, expeditions by Beatrice L. Burch (formerly of BPBM); CH, shrimp trawl; CIDARIS I, expedition sponsored by the Australian Industrial Research Organization; CIMAR, Centro de Instrucción y Capacitación Marítima, Armada de Chile; CP, beam trawl; Institut de Recherche pour le Développement, France, formerly ORSTOM (IRD); DW, Warèn dredge; imm, immature (sex undetermined); HMS, Her Majesty's Ship; IRENav, Institut de Recherche de l'École Navale, Brest; juv, juvenile; sta, station; RIMSS, Royal Indian Marine Survey Ship; SEPPOP, Southeast Pacific Biological Oceanographic Project; SMCB, Service Mixte de Contrôle Biologique des Armées, France; TC, stations for the R/V Townsend Cromwell, United States National Marine Fisheries Service; USFC, United States Fish Commission Steamer; USCGS, United States Coast and Geodetic Survey steamer.

ONCOPAGURUS SPECIES LIST

1. *Oncopagurus africanus* (de Saint Laurent, 1972)
2. *Oncopagurus bicristatus* (A. Milne-Edwards, 1880)
3. *Oncopagurus bifidus*, new species
4. *Oncopagurus brevis*, new species
5. *Oncopagurus cidaris* Lemaitre, 1996
6. *Oncopagurus conicus* Lemaitre, 2006
7. *Oncopagurus cruseoi*, new species
8. *Oncopagurus curvispina* (de Saint Laurent, 1974)

9. *Oncopagurus elevatus*, new species
10. *Oncopagurus elongatus*, new species
11. *Oncopagurus glebosus* Lemaitre, 1997
12. *Oncopagurus gracilis* (Henderson, 1888)
13. *Oncopagurus haigae* (de Saint Laurent, 1972)
14. *Oncopagurus indicus* (Alcock, 1905)
15. *Oncopagurus minutus* (Henderson, 1896)
16. *Oncopagurus monstrosus* (Alcock, 1894)
17. *Oncopagurus oimos* Lemaitre, 1998
18. *Oncopagurus orientalis* (de Saint Laurent, 1972)
19. *Oncopagurus petilus*, new species
20. *Oncopagurus pollicis*, new species
21. *Oncopagurus rossanae*, new species
22. *Oncopagurus spiniartus*, new species
23. *Oncopagurus stockmani* Zhadan, 1997
24. *Oncopagurus tuamotu* (Lemaitre, 1994)

TAXONOMIC ACCOUNT

PARAPAGURIDAE Smith, 1882

Genus *Oncopagurus* Lemaitre, 1996

Sympagurus – Lemaitre, 1989: 36 (in part, see Remarks).
Oncopagurus Lemaitre, 1996: 194; Lemaitre, 2000: 217; Davie, 2002: 88; Poore 2004: 282; De Grave et al., 2009: 26; McLaughlin, 2003: 118 (key); Poore, 2004: 281; Asakura et al., 2006: 215; McLaughlin et al., 2007: 307; McLaughlin et al., 2010: 38.

Type species. *Eupagurus bicristatus* A. Milne-Edwards, 1880, by original designation. Gender: masculine.

Diagnosis. Eleven pairs of biserial or rarely (1 species: *O. elongatus*) quadriserial phyllobranchiate gills. Shield about as broad as long; dorsal surface usually weakly calcified medially. Corneas usually weakly to moderately dilated, or less frequently reduced or subconical. Fourth segment of antennal peduncle armed with dorsodistal spine. Epistomial spine strongly curved upward (e.g., Fig. 16D), rarely bifid (Fig. 2C). Maxillule with internal lobe having long, terminal seta. Right chela operculate, with well delimited dorsolateral margin, or not operculate (1 species: *O. conicus* Lemaitre, 2006) with weakly defined dorsolateral margin. Left cheliped with carpus and palm frequently with weakly calcified areas dorsally. Ambulatory legs with dactyls broadly curved. Fourth pereopod with propodal rasp consisting of 1 row, or rarely 2 rows (1 species: *O. stockmani*), of corneous scales. Second pleonal somite with left pleuron terminating ventrally in small subtriangular lobe. Males with poorly to moderately developed paired first and second gonopods; first gonopods sometimes absent, or if present each with weakly concave distal lobe; second gonopods 1- or 2-segmented, sometimes asymmetric in size and number of segments, or absent on one side. Female usually with vestigial second right pleopod.

Habitat. Typically found in gastropod shells, occasionally with coelenterates (actinian, zoanthid, or hydractinian) living on the shell.

Distribution. Indian Ocean; western, central, south and eastern Pacific Ocean; western and eastern Atlantic Ocean. Depth: 50–2308 m.

Species. Twenty-four species (see list).

Remarks. In his revision of *Parapagurus* sensu lato, Lemaitre (1989) resurrected the genus *Sympagurus* for 30 species (with one species divided into three subspecies) that had been assigned to *Parapagurus* by de Saint Laurent (1972). Ten of those 30 species were subsequently placed by Lemaitre (1996) in his genus *Oncopagurus*. All other taxa assigned by Lemaitre (1989) to *Sympagurus* have now been reassigned to other parapagurid genera (Lemaitre, 1993, 2004a, b, 2013; Osawa, 1995, 1996).

Key to the Indo-West Pacific species of *Oncopagurus**

[**Oncopagurus* sp. A, reported by Zhadan (1997), excluded from key]

1. Cornea subconical or reduced (width no greater than distal width of ocular peduncle) 2
 - Cornea not subconical or reduced (width greater than distal width of ocular peduncle) 5
2. Cornea distally rounded; uropods and telson distinctly asymmetrical; right chela operculate 3
 - Cornea distally acute, usually sharply so (Fig. 10L); uropods and telson symmetrical; right chela not operculate *O. conicus*
3. Antennal acicle short, not exceeding distal margin of corneas or at most exceeding distal margin by 0.2 length of acicle (in *O. elongatus*, new species); right cheliped with chela relatively broad (length/width no more than 1.3) 4
 - Antennal acicle long, exceeding distal margin of cornea by nearly half length of acicle (Fig. 31A); right cheliped with chela relatively slender (length/width distinctly more than 1.3) *O. petilus*, new species
4. Right cheliped sexually dimorphic (in females, palm with mesial face expanded distomesially, and ventromesial margin well delimited by row of spines; in males, palm with mesial face not expanded distally, and ventromesial margin at most weakly delimited by small tubercles; Fig. 22A–D); dactyl of fourth pereopod long and slender, 1.8–2.5 times as long as dorsal margin of propodus, sexually dimorphic, longer and slenderer in females than in males (Fig. 23E, F); gills biserial to weakly quadriserial *O. elongatus*, new species
 - Right cheliped not sexually dimorphic (in both sexes, palm with mesial face not expanded distomesially, and ventromesial margin of palm not well delimited; Fig. 27C, D); dactyl of fourth pereopod short, no more than 1.5 times as long as dorsal margin of propodus, not sexually dimorphic; gills biserial *O. minutus*
5. Antennal acicle not exceeding distal margin of cornea (at most reaching to about mid-portion of cornea) 6
 - Antennal acicle reaching to or slightly exceeding distal margin of cornea 12
6. Ventral surface of right chela with tuberculate ridges or cluster of tubercles on ventral surface of palm, and distinct tuberculate longitudinal ridges on fixed finger and dactyl 7
 - Ventral surface of right chela unarmed, smooth or at most with scattered small tubercles, lacking ridges or tubercles on palm or distinct ridges on fixed finger and dactyl 8
7. Ventral surface of palm of right chela with distinct median cluster of tubercles (Fig. 24D, E); ocular acicles each terminating in submarginal spine (Fig. 24B) *O. glebosus*

- Ventral surface of palm of right chela without median cluster of tubercles, instead with median longitudinal tuberculate or spinose ridges continued on fixed finger and towards mesiodistal angle, forming Y-shape (Fig. 40B); ocular acicles each terminating in simple spine (not submarginal).....
..... *O. rossanae*, new species
- 8. Epistomial spine bifid (Fig. 2C); telson sexually dimorphic (terminal margins of lobes armed with slender, corneous spines stronger and more numerous in females than in males, and extending to midportion of left lateral margin; in females, left lobe armed with 16–20 long and short spines, of which 2 or 3 are strong and curved or bent at nearly right angle; Fig. 5D, E).....
..... *O. bifidus*, new species
- Epistomial spine simple; telson not sexually dimorphic.9
- 9. Palm of right cheliped with distomesial angle mesially not expanded or thumb-like.....10
- Palm of right cheliped with distomesial angle mesially expanded, thumb-like (Fig. 36A, B).....
..... *O. pollicis*, new species
- 10. Carpi and propodi of ambulatory legs armed on dorsal margin with row of small spines (Fig. 45A–C).....
..... *O. spiniartus*, new species
- Carpi and propodi of ambulatory legs unarmed on dorsal margin except for small dorsodistal spine on carpi.....11
- 11. Merus of right cheliped with thick, yellow bristle-like setae on dorsal margin (Fig. 8A, E); male lacking first gonopods, and with poorly developed, asymmetrical second gonopods (Fig. 6F, G).....
..... *O. brevis*, new species
- Merus of right cheliped without thick bristle-like setae on dorsal margin; male with first gonopods, and symmetrical second gonopods.....
..... *O. curvispina*
- 12. Ocular acicles multifid or occasionally bifid (Fig. 30A).....
..... *O. orientalis*
- Ocular acicles simple.....13
- 13. Propodal rasp of fourth pereopod with 1 row of ovate scales.....14
- Propodal rasp of fourth pereopod with 2 rows of ovate scales (Fig. 49E).....
..... *O. stockmani*
- 14. Palm of right cheliped with ventromesial face normally rounded, not elevated as broad, rounded ridge, and ventral face smooth or with scattered tubercles.....15
- Palm of right cheliped with ventromesial face elevated as broad, rounded tuberculate ridge projecting distally near base of dactyl, and ventral face with raised cluster of small blunt spines (Fig. 18C–E).....
..... *O. elevatus*, new species
- 15. Palm of right cheliped with ventromesial margin distinctly delimited by row of spines, more so in females than in males.....16
- Palm of right cheliped with ventromesial margin rounded, not distinctly delimited in either sex.....17
- 16. Antennal flagellum with numerous long setae 1–3 flagellar articles in length; right cheliped not sexually dimorphic (in both sexes, palm with mesial face expanded distomesially (Fig. 50B, C), and ventromesial margin well delimited by row of spines), and row of strong spines on dorsodistal margin of carpus; males lacking first gonopods and with asymmetrical second gonopods.....
..... *O. tuamotu*
- Antennal flagellum with scattered short setae less than 1 flagellar article in length; right cheliped sexually dimorphic (in females, palm with mesial face expanded distomesially, and ventromesial margin well delimited by row of spines; in males, palm with mesial face not expanded distally, and ventromesial margin weakly delimited), and weakly armed dorsodistal margin of carpus; males with first gonopods, and symmetrical second gonopods.....
..... *O. indicus*
- 17. Cornea not dilated; males lacking first gonopods, second gonopods reduced or vestigial; maximum size relatively small (sl < 3 mm).....18

- Cornea dilated (Fig. 28A); males with first and second gonopods (Fig. 28K, L); maximum size relatively large (shield length up to 6 mm or more).....
..... *O. monstrosus*
- 18. Antennal peduncle at most reaching to distal margin of cornea; dactyl of fourth pereopods sexually dimorphic, distinctly slenderer and more strongly curved (hook-like) in females than in males (Fig. 10E, F); second gonopods reduced (1- or 2-segmented, occasionally absent on right side; Fig. 10H, I).....
..... *O. cidaris*
- Antennal peduncle exceeding distal margin of cornea by 0.3 length of fifth segment; dactyl of fourth pereopods not sexually dimorphic (Fig. 29G); second gonopods vestigial (bud-like or very short segment; Fig. 29I, J).....
..... *O. oimos*

Key to the eastern Pacific species of *Oncopagurus*

1. Antennal acicle not exceeding distal margin of cornea, reaching at most to about proximal margin of cornea; right cheliped with dorsal surface of carpus and chela armed with numerous distinct spines or tubercles; left cheliped with carpus armed with irregular row of small sharp spines on dorsal margin; male with paired first gonopods, and with symmetrical second gonopods.....
..... *O. crusoiei*
- Antennal acicle distinctly exceeding distal margin of cornea by 0.3 to 0.5 length of acicle; right cheliped with dorsal surfaces of carpus and chela at most with scattered small spines or tubercles (sometimes arranged medially in irregular rows); left cheliped with carpus lacking spines dorsally except for dorsodistal spine; male lacking first gonopods, and with asymmetrical second gonopods.....
..... *O. haigae*

Key to the Atlantic species of *Oncopagurus*

1. Ocular peduncle about half length of shield, cornea not dilated (Fig. 1A).....
..... *O. africanus*
- Ocular peduncle more than half length of shield, cornea at most weakly dilated.....2
2. Antennal acicle armed mesially with spines set at 90° angle (at least distally) to longitudinal axis of acicle; palm of right cheliped with mesial face concave and often expanded distomesially, ventromesial margin well delimited by row of spines (Fig. 1K, L).....
..... *O. bicristatus*
- Antennal acicle armed mesially with spines set at 45° angle to longitudinal axis of acicle; palm of right cheliped with mesial face not concave, ventromesial face rounded, without spinose margin (Fig. 25A–D).....
..... *O. gracilis*

Oncopagurus africanus (de Saint Laurent, 1972)

Figs. 1A–I, 51

- Parapagurus bicristatus* – Forest, 1961: 231.
Parapagurus africanus de Saint Laurent, 1972: 109, figs 3, 15 (type locality: Angola, western Africa).
Sympagurus africanus – Lemaitre, 1989: 37; 1990: 229, figs 6, 7.
Oncopagurus africanus – Lemaitre, 1996: 194; McLaughlin et al., 2010: 39; Zhadan, 1997: 63 (table).

Type material. Holotype, Angola, western Africa, 1968, coll. A. Crosnier: M 6.0 mm (MNHN-IU-2008-15097, ex MNHN Pg. 2689).

Presumed paratypes (see Remarks), **West Africa:** Congo, off Pointe-Noire, radiale 21, 05°04'S, 11°20'E, 500 m, 12 January 1964: 6 M 3.0–3.5 mm, 2 F 2.9, 3.4 mm (MNHN-IU-2009-3499, ex MNHN Pg. 2690); [Congo], 05°30'S, 11°32'E, 500–505 m, 5 July 1967: 1 M 3.6 mm (MNHN-IU-2009-3500, ex MNHN Pg.

2691); Atlantide Expedition, sta 135, 07°55'S, 12°38'E, 440–360 m, 17 March 1946: 1 M 4.5 mm (MNHN-IU-2009-3501, ex MNHN Pg. 2692); Angola, 09°27'S, 12°38'E, 545–555 m, 18 April 1968, coll. A. Crosnier (2 lots): 1 M 5.2 mm, 1 F 4.4 mm (MNHN-IU-2009-3497, MNHN-IU-2009-3498, both ex MNHN Pg. 2689).

Additional material. Eastern Africa: southwestern Indian Ocean, SE of Durban Bluff, Division of Sea Fisheries, sta K 220, 29°56'S, 31°12.5'E, 366 m, 30 June 1964: 1 M 4.7 mm (SAM A12715).

Diagnosis. Shield (Fig. 1A) about as broad as long, rostrum broadly rounded, with short mid-dorsal ridge; lateral projections subtriangular, usually terminating in small spine. Ocular peduncles about half length of shield, interocular plate rarely with pair of distinct, forwardly directed spines; corneas weakly dilated. Ocular acicles terminating in strong spine (rarely bifid). Antennular peduncle exceeding distal margin of cornea by about 0.2 length of penultimate segment. Antennal peduncle reaching to about same level as distal margin of cornea; fourth segment with dorsolateral distal spine; acicle nearly straight (in dorsal view) at most slightly exceeding distal margin of cornea, mesial margin armed with 8–14 spines; flagellum exceeding extended right cheliped, with few short setae < 1 article in length (placed usually every 2 or 3 articles). Third maxilliped with crista dentata armed with about 15 unequal corneous teeth (4–6 teeth distinctly larger, interspersed with smaller teeth). Right cheliped (Fig. 1B–D) moderately setose, chela operculate; dactyl set at strongly oblique angle to longitudinal axis of palm; palm with dorsolateral and dorsomesial margins well delimited by row of small spines, ventromesial face rounded, ventral face with scattered or numerous small tubercles; carpus with numerous small tubercles or small spines on dorsal surface, lateral margin often well defined by row of strong spines. Left cheliped usually well calcified; palm with dorsomesial row of small spines. Ambulatory legs with ventromesial margins of dactyls (Fig. 1E) lacking corneous spines or at most each with row of 3–5 minute spinules; carpus with small dorsodistal spine. Anterior lobe of sternite XII (between second ambulatory legs) rounded, setose, with 1 or 2 terminal spines. Fourth pereopod propodal rasp (Fig. 1F) with 1 row of rounded scales at least distally. Fifth pereopod propodal rasp extending to midlength of segment. Uropods and telson markedly asymmetrical. Telson (Fig. 1G) lacking or with obsolete, transverse suture; posterior lobes separated by shallow cleft, terminal margin of lobes armed with long, often strongly curved corneous spines. Male with paired first and second gonopods (Fig. 1H, I); first gonopod distal lobe with weakly concave mesial face; second gonopod with distal segment flat and with setae on distal margins. Female with vestigial second right pleopod or occasionally with normal, biramous right second pleopod.

Variations. A marked sexual dimorphism in the right cheliped of this species was observed in the available material. The palm and carpus of the right cheliped in females is typically much shorter than in males of comparable sizes. The length/width ratio of the right palm and carpus in females is at most about 0.7 and 1.2, respectively, whereas in males these ratios can be as high as 1.2 and 2.0 respectively.

Two unusual variations were observed. One female (sl 4.4 mm, MNHN Pg. 2689) has an interocular lobe with two distinct, forwardly directed spines. Another female (shield length 3.0 mm, MNHN-IU-2009-3499, ex MNHN Pg. 2690) has a normal right second pleopod, instead of the typical short bud seen in females of most species of parapagurids.

Colouration. Unknown.

Habitat. Gastropod shells often with anthozoan polyp.

Distribution. Southeastern Atlantic, from Congo to Angola; and southwestern Indian Ocean, from off SE of Durban. Depth: 235–555 m.

Remarks. In the original description of this species, de Saint Laurent (1972) listed only the holotype from Angola, although she cited a distribution from Angola to Congo, and evidently examined specimens other than the holotype. Indeed a number of specimens used by de Saint Laurent are deposited in the MNHN as “paratypes”, and because these were not included in the original description are listed herein as “presumed paratypes”.

Oncopagurus africanus is morphologically closest to *O. gracilis*. The two species exhibit similar morphologies and sex-related variations on the right cheliped, with females having a broader carpus and palm than males. The two species differ most distinctly in that *O. africanus*, has ocular peduncles about half the length of the shield, and the antennal acicles exceed the distal margins of the corneas, whereas the ocular peduncles are more than half the length of the shield, and the antennal acicles do not exceed the distal margins of the corneas in *O. gracilis*.

Based on limited materials, de Saint Laurent (1972) considered *Oncopagurus africanus* (as *Parapagurus africanus*) to be related to the western Atlantic *Parapagurus bicristatus bicristatus*. The latter taxon was elevated to species level by Lemaitre (1989), and subsequently Lemaitre (1996) placed it in *Oncopagurus*. Although *O. africanus* and *O. bicristatus* share the basic overall similarities of *Oncopagurus* species, several important morphological details clearly set them apart. In *O. africanus*, the ocular peduncles are about half the length of the shield, whereas they are more than half the length of the shield in *O. bicristatus*; the palm of the right chela has a rounded mesial face and rounded ventromesial margin, whereas in *O. bicristatus* the mesial face is concave, expanded distomesially (often strongly so in large males sl > 4.0 mm) and with a ventromesial margin well delimited by a row of spines. Additionally, in males of *O. africanus*, the first and second gonopods are more developed than in *O. bicristatus*. In *O. africanus* the first gonopods have a weak but distinct distal lobe, and the second gonopods are 2-segmented and symmetrical; whereas in *O. bicristatus* the first gonopods are represented by short buds, and the second gonopods can be either symmetrical and 2-segmented on both sides, or asymmetrical and 2-segmented in one side, and short, 1-segmented on the other side.

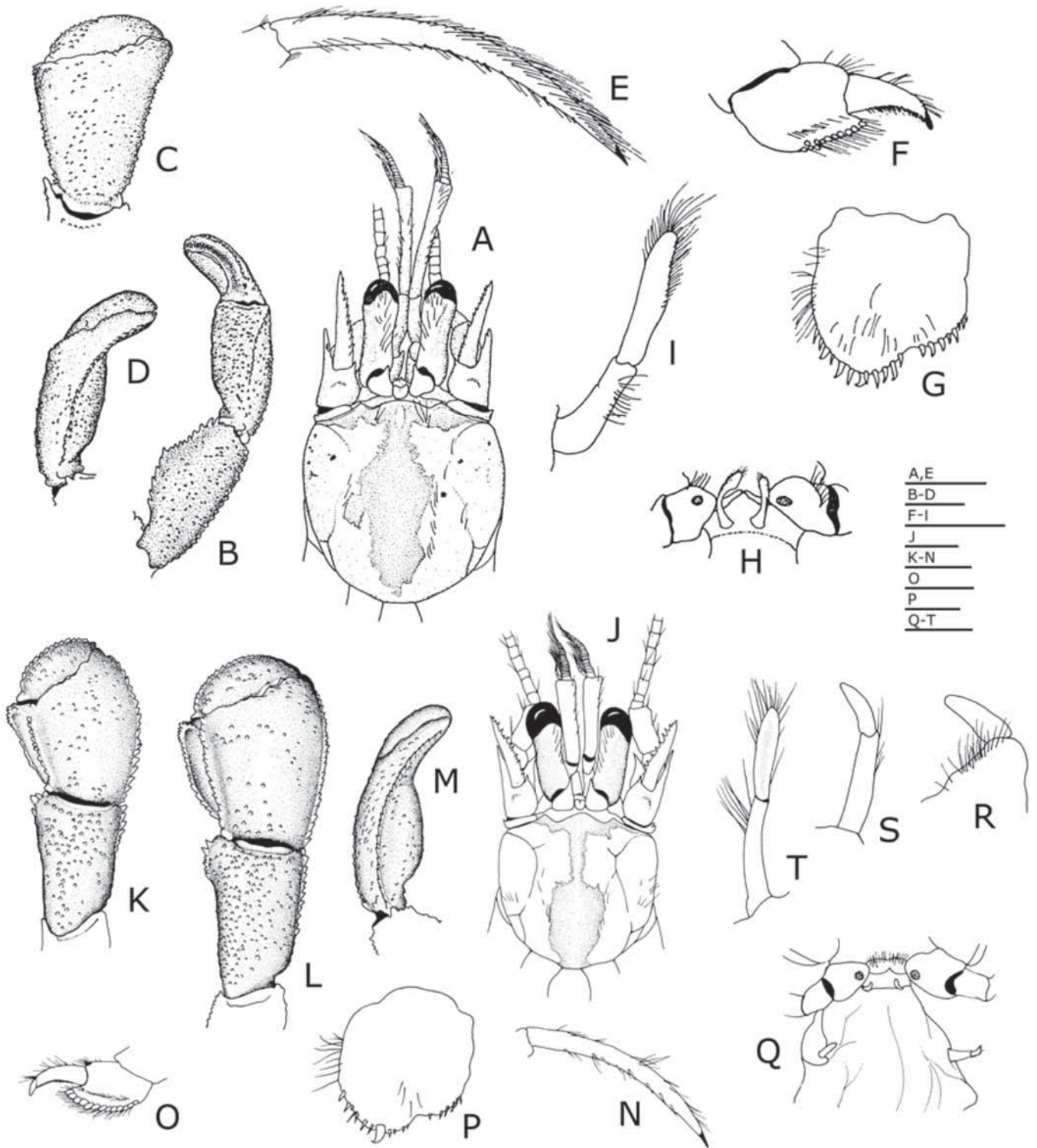


Fig. 1. A–I, *Oncopagurus africanus* (de Saint Laurent, 1972), paratype, male 5.2 mm, Angola (MNHN Pg 2689): A, shield and cephalic appendages, dorsal; B, carpus and chela of right cheliped, mesial; C, D, chela of same, dorsal (C) and lateral (D); E, dactyl of first left ambulatory leg, mesial; F, propodus and dactyl of right fourth pereopod, lateral; G, telson, dorsal; H, male sternite XIV, coxae of fifth pereopods, and first gonopods, ventral; I, male left second pleopod, posteromesial. J–T, *Oncopagurus bicristatus* (A. Milne-Edwards, 1880), J, L, M, P, male 3.1 mm, Straits of Florida (USNM 1100616); K, female 1.9 mm, Straits of Florida (USNM 1100616); N, O, R, S, male 3.0 mm, Caribbean Sea (UMML 32:4607); Q, male 4.4 mm Straits of Florida (UMML 32:4610); T, male 2.6 mm, Straits of Florida (USNM 1100615): J, shield and cephalic appendages, dorsal; K, carpus and chela of right cheliped of female, dorsal; L, carpus and chela of right cheliped of male, dorsal; M, right chela of same, lateral; N, dactyl of first left ambulatory leg, mesial; O, propodus and dactyl of left fourth pereopod, lateral; P, telson, dorsal; Q, male sternite XIV, coxae of fifth pereopods, and anterior portion of pleon with first and second gonopods, ventral. Scale bars = 2 mm (A, E); 3 mm (B–D); 1 mm (F, G, I); 2 mm (H); 1 mm (J, O, P); 2 mm (K–N); 2 mm (Q); 0.5 mm (R–T). [Adapted from Lemaitre (1989, 1990)].

Of the three Atlantic species of *Oncopagurus*, *O. africanus* is the only one to range exclusively on one side of the Atlantic (eastern margin), whereas *O. bicristatus* and *O. gracilis* are ampho-Atlantic in distribution.

Oncopagurus bicristatus (A. Milne-Edwards, 1880)

Figs. 1J–T, 51

Eupagurus bicristatus A. Milne-Edwards, 1880: 43 (in part; type locality: off Frederiksted [sic.], USCGS Blake, sta 136, 17°43.10'N, 64°55.50'S).

Parapagurus bicristatus bicristatus – de Saint Laurent, 1972: 112.

Parapagurus bicristatus – Williams et al., 1989: 32.

Sympagurus bicristatus – Lemaitre, 1989: 58, figs 28–32, 40A, B; Melo, 1999: 152, figs 91, 92.

Oncopagurus bicristatus – Lemaitre, 1996: 194; McLaughlin et al., 2005: 246; Coelho et al., 2007: 10 (Table 1); Felder et al., 2009: 1071; McLaughlin et al., 2010: 38.

(For complete synonymy see Lemaitre, 1989)

Type material. Holotype, off Frederiksted [U.S. Virgin Islands], Caribbean Sea, USCGS Blake, sta 136, 17°43.10'N, 64°55.50'S: M 3.2 mm (MCZ 4039).

Additional material. See Lemaitre (1989).

Diagnosis. Shield (Fig. 1J) about as broad as long; rostrum broadly rounded, weakly produced to obsolete, with short mid-dorsal ridge; lateral projections subtriangular, slightly in advance of rostrum, often terminating in small spine. Ocular peduncles usually more than half length of shield, each with dorsal row of setae; corneas weakly dilated. Ocular acicles subtriangular, terminating in strong spine. Antennular peduncle exceeding distal margin of cornea by entire length of ultimate segment. Antennal peduncle not exceeding distal margin of cornea; fourth segment with dorsodistal spine; second segment terminating in strong, simple or multifid spine, mesial margin with spine on dorsodistal angle; first segment with 1 or 2 small spines on lateral face; acicle nearly straight (in dorsal view), usually not exceeding distal margin of cornea, terminating in strong spine, mesial margin armed with row of 10–14 spines; flagellum exceeding extended right cheliped, articles with numerous setae < 1–3 flagellar articles in length. Third maxilliped with crista dentata of about 10 teeth, proximal teeth only slightly larger than distal. Right cheliped (Fig. 1K–M) with moderately dense, simple or plumose setae, proportions and armature of chela strongly influenced by size and sexual dimorphism [see Variations in Lemaitre (1989), as *Sympagurus bicristatus*], chela operculate; dactyl set at strongly oblique angle to longitudinal axis of palm; palm about as long as broad or slightly broader than long, dorsal face with scattered small tubercles or spines, dorsolateral, dorsomesial and ventromesial margins well delimited by row of blunt to sharp spines, mesial face strongly concave and expanded distomesially (more so in large males (sl > 4.0 mm), ventral surface smooth; carpus with dorsolateral margin rounded or sometimes well delimited distally by row of spines, dorsal face with numerous, well-spaced small spines or tubercles. Left cheliped usually weakly calcified on dorsolateral face of carpus; palm unarmed except for

scattered setae on dorsal face and long setae on dorsomesial margin; carpus with strong dorsodistal spine and long setae dorsally. Ambulatory legs with dactyls (Fig. 1N) each with ventromesial row of about 7–8 slender corneous spines; carpus with small dorsodistal spine. Anterior lobe of sternite XII (between second ambulatory legs) rounded, setose, with subterminal spine. Fourth pereopod propodal rasp (Fig. 1O) with 1 row of rounded scales at least distally. Fifth pereopod propodal rasp extending to or beyond mid-length of segment. Uropods and telson markedly asymmetrical; telson (Fig. 1P) lacking transverse suture, posterior lobes separated by shallow cleft, terminal margin of lobes armed with often strongly curved corneous spines. Male with paired first and second gonopods (Fig. 1Q–T); first gonopods poorly developed, at most consisting of short buds; second gonopods weakly developed, symmetrical (2-segmented) or asymmetrical with left 2-segmented and right 1-segmented. Female with vestigial second right pleopod.

Variations. See Lemaitre (1989, as *Sympagurus bicristatus*)

Colouration. Unknown.

Habitat. Gastropod shells frequently with one or more anthozoan polyps (actinians or zoanthids) attached.

Distribution. Western Atlantic, from Straits of Florida and Gulf of Mexico, to off the coast of Maranhao, Brazil; eastern Atlantic, from Canary Islands and Cape Verde Islands. Depth: 270–1,070 m.

Remarks. (See *Oncopagurus africanus* and *O. gracilis*).

Oncopagurus bifidus, new species

Figs. 2–5, 51

Oncopagurus n. sp. 4 – McLaughlin et al., 2010: 39.

Type material. Holotype, **Philippines**, MUSORSTOM 3, sta CP 96, 14°00'S, 120°17'E, 190–194 m, 1 June 1985: M 3.4 mm (MNHN-IU-2013-5584, ex MNHN Pg. 7569).

Paratypes, Philippines: MUSORSTOM 2: sta CP 2, 14°01'N, 120°17'E, 184–186 m, 20 November 1980: 1 M 2.8 mm (MNHN-IU-2013-5485, ex MNHN Pg. 7571); sta CP 10, 14°00'N, 120°18'E, 188–195 m, 21 November 1980: 2 M 2.4, 2.6 mm, 2 ov F 2.4, 2.5 mm (MNHN-IU-2013-5486, ex MNHN Pg. 7572), 1 M 2.2 mm, 1 F 1.8 mm (MNHN-IU-2013-5487, ex MNHN Pg. 7572), 2 M 2.0, 3.1 mm (MNHN Pg.), 1 M 3.1 mm (MNHN-IU-2013-5488, ex MNHN Pg. 7572); sta CP 11, 14°00'S, 120°20'E, 194–196 m, 21 November 1980: 1 F 2.0 mm (MNHN-IU-2013-5489, ex MNHN Pg. 7573); sta CP 18, 14°00'N, 120°19'E, 188–195 m, 22 November 1980: 3 M 2.3–3.6 mm, 1 ov F 2.4 mm (USNM 1207985, ex MNHN Pg. 7574); sta CP 64, 14°01'N, 120°19'E, 191–195 m, 29 November 1980: 6 M 2.1–2.9 mm, 1 F 2.8 mm (USNM 1207986, ex MNHN Pg. 7575); sta CP 71, 14°00'N, 120°18'E, 189–197 m, 30 November 1980: 1 M 2.9 mm, 1 F 2.4 mm, 1 ov F 2.4 mm (MNHN-IU-2013-5490, ex MNHN Pg. 7576); sta CP 72, 14°01'N, 120°19'E, 182–197 m, 30 November 1980: 1 M 2.4 mm, 1 ov F 1.7 mm (MNHN-IU-2013-5491, ex MNHN Pg. 7577), 1 M 2.3, 1 F 2.2 mm (MNHN-IU-2013-5492, ex MNHN Pg. 7577); sta CP 76, 13°50'N, 120°28'E, 440–485 m, 1 December 1980: 1 F 2.3 mm (MNHN-IU-2013-5493, ex MNHN Pg. 7578).

Table 1: *Oncopagurus* distribution.

| | INDO-WEST PACIFIC | | | | | | | | | | | CENTRAL+SOUTH PACIFIC | | | | | Eastern Pacific | | Western Atlantic | | Eastern Atlantic |
|-----------------------|-------------------|-------|--------|-------------|-----------|---------|-----------------|------|---------|-------|---------------|-----------------------|-------------|---------------|-----------|------------------|--------------------|-----------------|------------------|------------------|------------------|
| | Indian Ocean | Japan | Taiwan | Philippines | Indonesia | Solomon | Wallis & Futuna | Fiji | Vanuatu | Tonga | New Caledonia | Australia | New Zealand | Hawaiian Isl. | Marquesas | French Polynesia | Nazca/Sala-y-Gomez | Eastern Pacific | Western Atlantic | Eastern Atlantic | |
| <i>O. africanus</i> | * | | | | | | | | | | | | | | | | | | | | |
| <i>O. bicristatus</i> | | | | | | | | | | | | | | | | | | | | | |
| <i>O. bifidus</i> | | | | * | | | | | | | | | | | | | | | | | * |
| <i>O. brevis</i> | | | | * | | | | | | | | | | | | | | | | | * |
| <i>O. cidaris</i> | | | | | | | | | | | | | | | | | | | | | * |
| <i>O. conicus</i> | | | | | | | | | | * | | | | | | | | | | | * |
| <i>O. crusoiei</i> | | | | | | | | | | | | | | | | | | | | | * |
| <i>O. curvispina</i> | * | | | | | | | | | | | | | | | | | | | | |
| <i>O. elevatus</i> | | * | | | | | * | | * | * | | | | | | * | | | | | |
| <i>O. elongatus</i> | | | | | | | * | | * | * | | | | | | * | | | | | |
| <i>O. glebosus</i> | | | | * | | | | | * | * | | | | | | | | | | | * |
| <i>O. gracilis</i> | | | | | | | | | | | | | | | | | | | | | * |
| <i>O. haigae</i> | | | | | | | | | | | | | | | | | | | | | * |
| <i>O. indicus</i> | * | | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| <i>O. minutus</i> | * | | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| <i>O. monstrosus</i> | * | | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| <i>O. oimos</i> | | | | | | | | | | | | | | | | | | | | | * |
| <i>O. orientalis</i> | | | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * | * |
| <i>O. petilus</i> | | | | | | | | | | | | | | | | | | | | | * |
| <i>O. pollicis</i> | | | | | | | | | | | | | | | | | | | | | * |
| <i>O. rossanae</i> | | | | | | | | | | | | | | | | | | | | | * |
| <i>O. spiniartus</i> | | | | | | | | | | | | | | | | | | | | | * |
| <i>O. stockmani</i> | | | | | | | | | | | | | | | | | | | | | * |
| <i>O. tuamotu</i> | | | | | | | | | | | | | | | | | | | | | * |
| Total Species | 6 | 1 | 5 | 7 | 5 | 5 | 4 | 4 | 6 | 7 | 8 | 4 | 1 | 2 | 3 | 6 | 2 | 4 | 2 | 3 | |

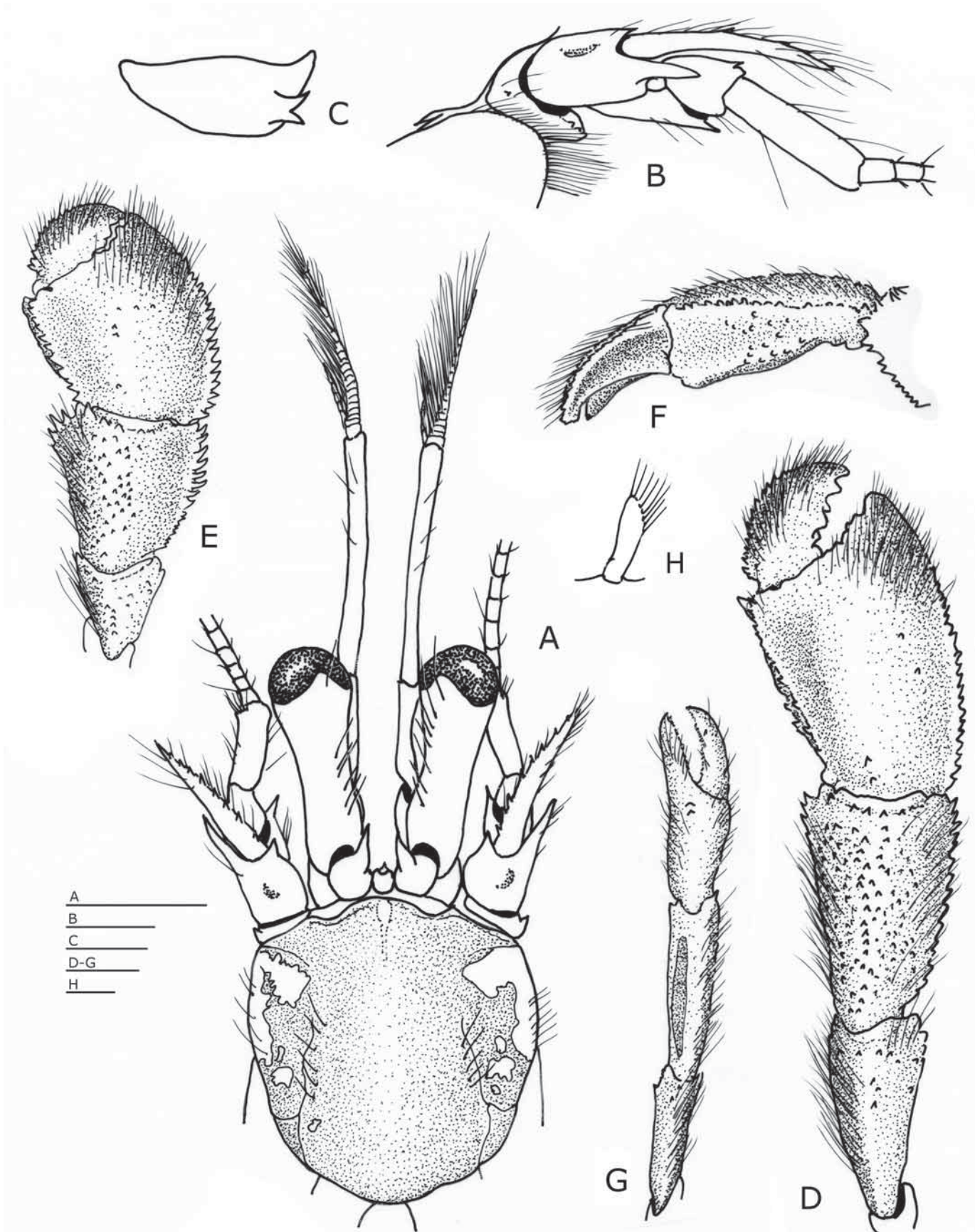


Fig. 2. *Oncopagurus bifidus*, new species, Philippines: A–F, holotype, male 3.4 mm, MUSORSTOM 3, sta CP 96 (MNHN-IU-2013-5584, ex MNHN Pg 7569); G, paratype, ov female 2.8 mm, same sta (MNHN-IU-2013-5583, ex MNHN Pg 7569); H, paratype, male 2.4 mm, sta CP 72 (MNHN-IU-2013-5491, ex MNHN Pg 7577). A, shield and cephalic appendages, dorsal; B, right antennal peduncle, lateral; C, epistome, laterodorsal; D, right cheliped of male, dorsal; E, right cheliped of female, dorsal; F, chela of same, mesial; G, left cheliped, dorsal; H, left second gonopod, lateral. Scale bars = 1 mm (A, D–G); 0.5 mm (B); 0.25 mm (C).

— MUSORSTOM 3: sta CP 96, 14°00'S, 120°17'E, 190–194 m, 1 June 1985: 5 M 2.4–3.0 mm, 1 F 2.7 mm, 4 ov F 1.9–2.9 mm (MNHN-IU-2013-5583, ex MNHN Pg. 7569).

Description. Gills biserial. Shield (Fig. 2A) about as broad as long; dorsal surface weakly calcified on usually most of surface except on small areas on each lateral side, with scattered short setae; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; anterior margins weakly concave; lateral projections bluntly subtriangular, occasionally with small terminal spine; anterolateral margins sloping; posterior margin broadly rounded; ventrolateral margins of shield usually with small slender spine. Anterodistal margin of branchiostegite rounded, unarmed, setose.

Ocular peduncles (Fig. 2A) more than half length of shield, increasing in width distally, weakly calcified on lateral and mesial faces; with longitudinal row of setae dorsally. Cornea moderately dilated. Ocular acicles subtriangular, each terminating in strong spine; separated basally by about half basal width of 1 acicle.

Antennular peduncle (Fig. 2A) exceeding distal margin of cornea by nearly full length of ultimate segment. Ultimate segment about twice as long as penultimate segment, with scattered setae dorsally. Basal segment with strong ventromesial spine; lateral face with distal subrectangular lobe unarmed or with small spine and setae, and strong spine proximally. Ventral flagellum with 5 or 6 articles.

Antennal peduncle (Fig. 2A, B) reaching at most to about middle portion of cornea. Fifth segment unarmed except for scattered setae and distolateral tufts of setae. Fourth segment with small dorsodistal spine. Third segment with strong ventromesial distal spine. Second segment with dorsolateral distal angle produced, terminating in simple spine; mesial margin with spine on dorsodistal angle. First segment with lateral face unarmed or with small spine; ventromesial angle produced, with 2 or 3 small blunt spines laterally. Acicle nearly straight (in dorsal view), reaching at most to about proximal margin of cornea, terminating in strong spine; mesial margin armed with 8–10 spines, setose. Flagellum long, slightly exceeding extended right cheliped, articles with long

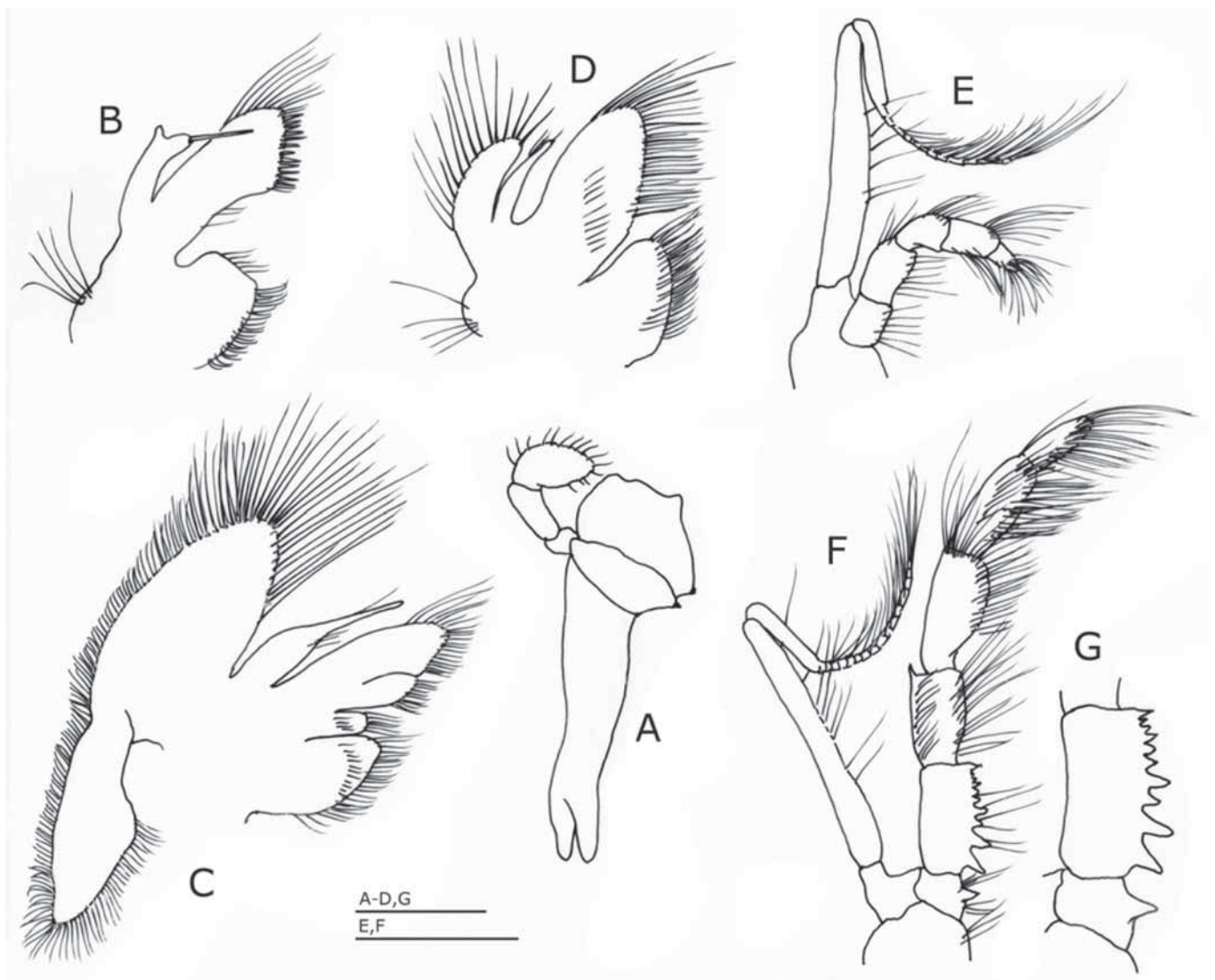


Fig. 3. *Oncopagurus bifidus*, new species, Philippines: paratype, male 2.8 mm, MUSORSTOM 3, sta CP 96 (MNHN-IU-2013-5583, ex MNHN Pg 7569). Left mouthparts, internal: A, mandible; B, maxillule; C, maxilla; D, first maxilliped; E, second maxilliped; F, third maxilliped; G, ischium and crista dentata of same. Scale bars = 0.25 mm (A–D, G); 0.5 mm (E, F).

setae 1–2 flagellar articles in length every 3 or 4 articles, and scattered short setae < 1 article in length.

Mandible (Fig. 3A) with 3-segmented palp; cutting edge calcified, with small corneous tooth medially; molar process with small corneous tooth medially. Maxillule (Fig. 3B) with external lobe of endopod slender, moderately developed, not recurved, internal lobe with long, terminal seta. Maxilla (Fig. 3C) with endopod exceeding distal margin of scaphognathite. First maxilliped (Fig. 3D) with endopod slightly exceeding exopod in distal extension. Second maxilliped (Fig. 3E) without distinguishing characters. Third maxilliped (Fig. 3F, G) with merus to dactyl each distinctly longer than broad, ischium less than twice as long as broad; crista dentata with about 10 often corneous-tipped teeth much stronger proximally than distally, and diminishing in size distally; basis with mesial spine; coxa lacking spine. Sternite of third maxillipeds with small spine on each side of midline. Epistomial spine slender, vertically bifid, with upper spine curved upward (Fig. 2C).

Chelipeds markedly dissimilar. Right cheliped (Fig. 2D–F) with chela operculate, sparsely setose except for dorsal surfaces of fingers and mesial faces of merus and carpus. Fingers curved ventromesially, terminating in small, usually blunt corneous claw; cutting edges each with 5 (dactyl) or 3 (fixed finger) large calcareous teeth, and several additional small calcareous teeth on fixed finger proximally. Dactyl shorter than mesial margin of palm in males, about same length as palm in females, set at oblique angle to longitudinal axis of palm; mesial margin broadly curved, well defined by row of small blunt or sharp spines diminishing in size distally; dorsal face unarmed except for moderately dense setae and sometimes scattered minute tubercles; ventromesial face concave, smooth. Fixed finger broad at base, dorsal and ventral faces unarmed except for moderately dense setae. Palm longer than broad in males, about as broad or slightly broader than long in females, dorsal surface smooth or at most with scattered small spines or tubercles; dorsolateral margin well delimited by row of small spines, dorsomesial margin with row of small spines or tubercles; mesial face flat or slightly concave (Fig. 2F), smooth or with scattered small tubercles, ventromesial margin with row of small spines or tubercles at least on proximal half; ventral surface smooth. Carpus longer than broad; dorsal surface with many small to minute spines or tubercles, dorsodistal margin with row of spines often extending to distomesial margin as larger spines; dorsolateral margin usually well defined by row of spines, often distally flared and upturned (Fig. 2E); dorsomesial margin rounded; ventromesial margin with row of small spines; ventral face with scattered small tubercles. Merus with scattered small spines or tubercles on dorsal surface and moderately dense setae dorsally and mesially; ventromesial and ventrolateral margins each with row of spines. Ischium with dorsal row of setae. Coxa (Fig. 5A) often with ventrolateral row of small tubercles, and ventromesial row of setae.

Left cheliped (Fig. 2G) usually weakly calcified on dorsolateral face of carpus and merus. Fingers terminating

in small corneous claw, often gaping when closed; dorsal and ventral surfaces unarmed except for scattered tufts of setae; cutting edge of dactyl with row of minute, fused corneous teeth; cutting edge of fixed finger with row of well-spaced small calcareous teeth. Dactyl subequal in length to mesial margin of palm. Palm unarmed except for 2 or 3 small dorsomedian spines distally, sparsely setose; ventral face smooth. Carpus with small distal spine on dorsal and dorsolateral margins, dorsal face setose; ventral face smooth. Merus with dorsal face setose and at most with 2 or 3 minute spines; ventromesial margin with row of 2–4 spines distally; ventral face smooth. Ischium and coxa unarmed or with small spine distally on ventrolateral margin; with ventromesial row of setae.

Ambulatory legs (Fig. 4A–D) slender, similar right from left except for longer, spinose meri on right, and lacking spines on left; exceeding extended right cheliped by at most about 0.2 length of dactyls. Dactyl broadly curved, about 1.8 times as long as propodus, and terminating in sharp corneous claw; with dorsal and dorsomesial distal rows of long setae, and ventromesial row of 1–8 minute or inconspicuous, corneous spinules. Propodus with row of long setae on dorsal margin, and scattered setae on ventral margin. Carpus with dorsal margin setose, unarmed or with 1–5 small spines, and small dorsodistal spine; ventral margin with scattered short setae. Merus with long setae on dorsal and ventral margins, lacking spines on dorsal margin (left second and third), or with 1 or 2 (right second) or 3–7 (right third) minute spines on dorsal margin. Ischium unarmed except for setae on dorsal and ventral margins, and small ventrodistal spine. Coxa (Fig. 5A) with row of spines on anteroventral margin proximally (second) or lacking spines (third), and ventromesial row of setae. Anterior lobe of sternite XII (between second ambulatory legs, Fig. 5A) subsemicircular, setose, with distinct spine.

Fourth pereopod (Fig. 4E) semichelate. Dactyl broadly curved, terminating in sharp corneous claw; with ventrolateral row of small corneous spinules. Propodus longer than broad, rasp with 1 row of rounded scales at least distally. Carpus with long setae on dorsal margin. Merus with rows of long setae on dorsal and ventral margins. Coxa with anteroventral row of setae. Anterior lobe of sternite XIII (between fourth pereopods; Fig. 5A) with row of long setae.

Fifth pereopod (Fig. 4F) semichelate. Propodal rasp extending to mid-length of segment. Coxa with dense row of long setae on anteroventral and distoventral margins. Anterior lobe of sternite XIV (between fifth pereopods; Fig. 5A) with row of long setae.

Uropods and telson strongly asymmetrical; left uropod (Fig. 5B) with narrow rasp consisting of 2 or 3 rows of corneous scales. Telson (Fig. 5C–E) lacking transverse suture; dorsal surface with scattered setae, lateral margins with long setae; posterior lobes separated by inconspicuous or shallow U-shaped cleft, left lobe considerably longer than right; terminal margins of lobes armed with slender, corneous spines stronger and more numerous in females than in males,

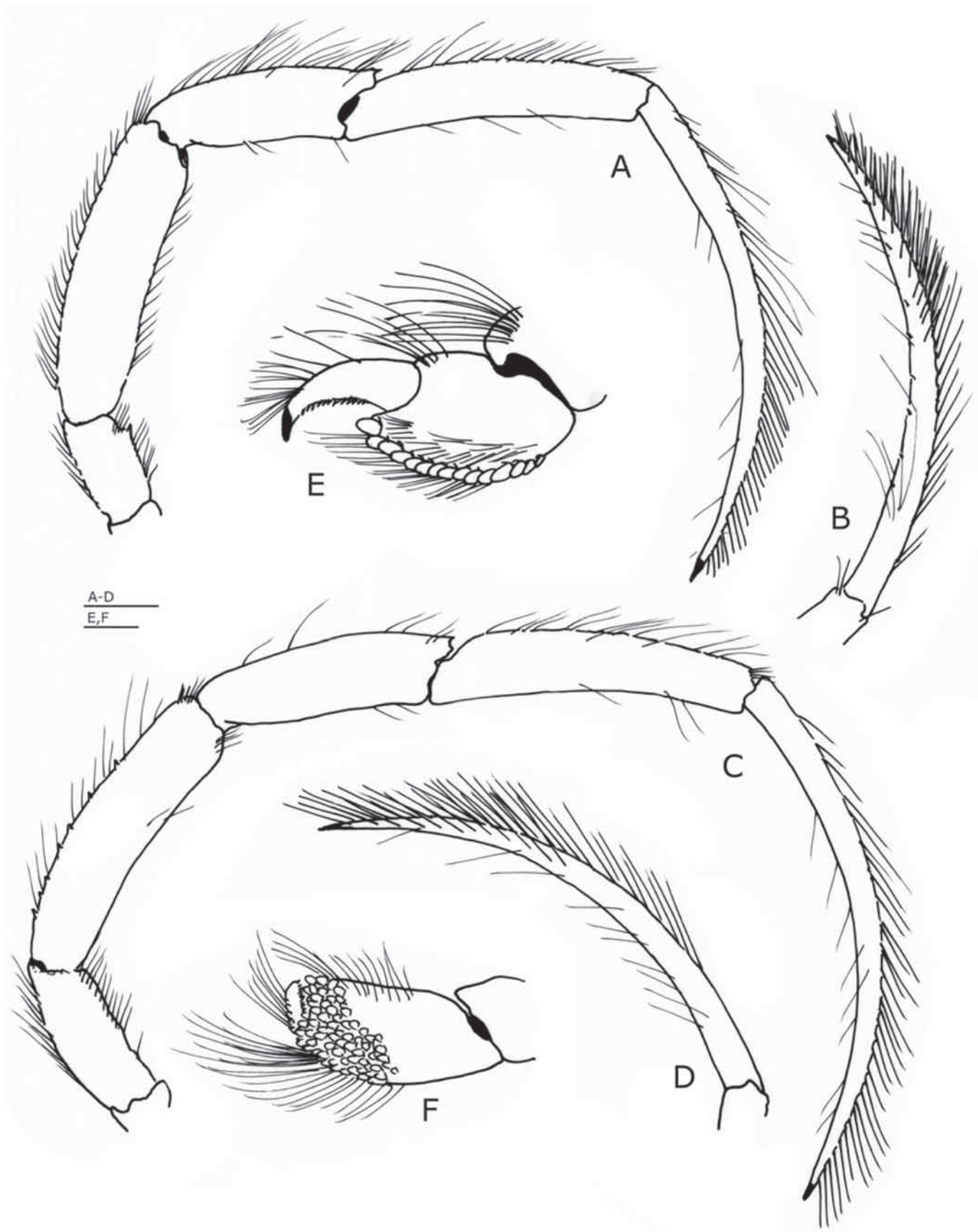


Fig. 4. *Oncopagurus bifidus*, new species, Philippines, holotype, male 3.4 mm, MUSORSTOM 3, sta CP 96 (MNHN-IU-2013-5584, ex MNHN Pg 7569). A, right first ambulatory leg, lateral; B, dactyl of same, mesial; C, right second ambulatory leg, lateral; D, dactyl of same, mesial; E, propodus and dactyl of right fourth pereopod, lateral; F, propodus and dactyl of right fifth pereopod, lateral. Scale bars = 1 mm (A–D); 0.25 mm (E, F).

and extending nearly to midportion of left lateral margin; left lobe with about 16–20 long and short spines, 2 or 3 of which are strongest and strongly curved or bent at nearly right angle; right lobe with about 5 short spines.

Male lacking first gonopods; with paired, asymmetrical second gonopod (Fig. 2H), left short, 1-segmented, right vestigial (occasionally absent). Female without vestigial second right pleopod.

Colouration. Unknown.

Habitat. Gastropod shells.

Distribution. Western tropical Pacific, so far known only from the Philippines. Depth: 182–485 m.

Remarks. This new species is unique in having a vertically bifid epistomial spine, with the upper spine curved upward.

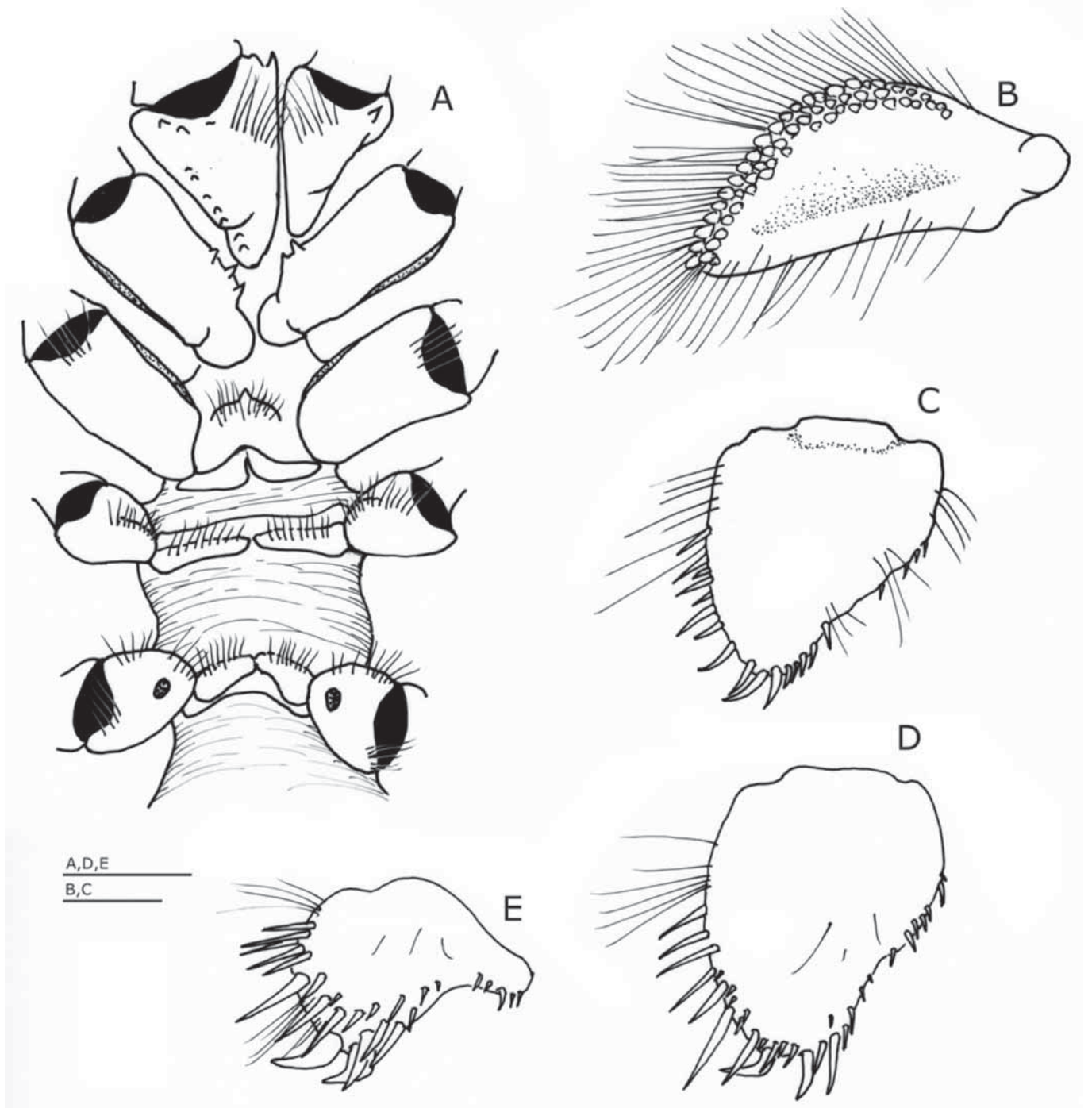


Fig. 5. *Oncopagurus bifidus*, new species, Philippines: A–C, holotype, male 3.4 mm, MUSORSTOM 3, sta CP 96 (MNHN-IU-2013-5584, ex MNHN Pg 7569); D, E, paratype, ov female 2.8 mm, same sta (MNHN-IU-2013-5583, ex MNHN Pg 7569). A, sternum and coxae of first to fifth pereopods, ventral; B, exopod of left uropod, dorsal; C, telson of male, dorsal; D, E, telson of female, dorsal (D) and posterior (E). Scale bars = 1 mm (A); 0.5 mm (D, E); 0.5 mm (B, C).

Other characters that set this new species apart from other congeners are: the ocular peduncles which are slightly constricted medially; the length of the antennal acicles that reach at most to about the proximal margin of the corneas; the noticeably slender ambulatory legs and long dactyls, relative to other congeners; the narrow rasp of the left uropod; the armature of the telson, with a left posterior lobe much longer than the right, and in females the left lobe is armed with often strikingly slender, short to long corneous spines arranged in several uneven rows.

Etymology. The specific name is derived from the Latin, *bi*, two, and *-fid*, divided into many parts, and makes reference to the bifid shape of the epistomial spine, a unique character among species of *Oncopagurus*.

Oncopagurus brevis, new species

Figs. 6–9, 51

Type material. Holotype, Hawaiian Islands, R/V Townsend Cromwell, sta TC 33–38, 20°41.3'N, 156°41.3'W, 289–296 m, 9 November 1967: M 3.2 mm (BPBM S10992).

Paratypes, Central Pacific, Hawaiian Islands: R/V Townsend Cromwell: sta 33–18, 21°03.7'N, 156°43.7'W, 245 m, 1 November 1967: 2 M 2.9, 3.2 mm (BPBM S10957); sta TC 33–38, 20°41.3'N, 156°41.3'W, 289–296 m, 9 November 1967 (4 lots): 3 M 2.4–3.0 mm, 2 ov F 2.4, 2.8 mm (BPBM S10992), 2 M 3.2, 3.7 mm (USNM 1224577, ex BPBM S10992), 1 F 2.7 mm (BPBM S10954), 1 M 3.2 mm, 1 F 2.4 mm (USNM 1224574, ex BPBM S10961); sta TC 40–76, 21°06.8'N, 156°31.9'W, 439 m, 22 November 1968: 1 ov F 2.5 mm (BPBM S10947); sta TC 40–91, 21°03.8'N, 156°32.8'W, 274 m, 25 November 1968: 1 M 2.7 mm (BPBM S10946). West Lanai, sta Mac 3, 20°48'N, 157°01'W, 256–274 m, 11 October 1967: 1 M 1.9 mm (USNM 1224573 ex BPBM). — BURCH: Mamala Bay, Oahu, sta 77050, 21°16.8'N, 157°53.5'W, 174 m, 28 May 1977: 1 F 1.4 mm (BPBM S10980); sta 79036, 21°16.6'N, 157°54.2'W, 265 m, 28 May 1979: 1 M 1.8 mm, 1 ov F 1.6 mm (BPBM S10988); sta 79077, 21°16.3'N, 157°51.7'W, 238–256 m, 1 December 1979 (2 lots): 6 M 1.0–1.8 mm, 3 ov F 1.3–1.9 mm (USNM 1224578, ex BPBM S10978), 2 ov F 1.6, 1.7 mm (USNM 1224576, ex BPBM S10967); sta 80051, 21°16.9'N, 157°55.0'W, 183 m, 30 August 1980 (2 lots): 2 M 2.3, 2.4 mm (USNM 1224575, ex BPBM S10990), 1 M 2.3 mm, 1 F 1.3 mm (BPBM S10975); sta 82034, 21°17.0'N, 158°01.3'W, 183–146 m, 11 June 1982 (3 lots): 1 ov F 1.4 mm (BPBM S10966), 2 ov F 1.3, 1.4 mm (BPBM S10976). — South west Oahu: Makua, [no lat. or long.], 12–107 m, [no date]: 1 M 1.4 mm (BPBM S5560)

Description. Gills biserial. Shield (Fig. 6A) about as long as broad; dorsal surface weakly calcified medially (weak calcification often reaching to anterior margin), with scattered short setae; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; anterior margins weakly concave; lateral projections bluntly subtriangular, sometimes with minute terminal spine; anterolateral margins sloping; posterior margin broadly rounded; ventrolateral margins of shield

usually with slender spine on one or both sides. Anterodistal margin of branchiostegite rounded, unarmed, setose.

Ocular peduncles (Fig. 6A) more than half length of shield, each with longitudinal row of short setae dorsally; lateral and ventral faces usually weakly calcified. Cornea weakly dilated. Ocular acicles subtriangular, each terminating in strong spine; separated basally by about basal width of 1 acicle.

Antennular peduncle (Fig. 6A) exceeding distal margin of cornea by about full length of ultimate segment. Ultimate segment about twice as long as penultimate segment, with scattered setae dorsally. Basal segment with strong ventromesial spine; lateral face with distal subrectangular lobe armed with small spine distally, and strong spine proximally. Ventral flagellum with 6 articles.

Antennal peduncle (Fig. 6A, B) at most slightly exceeding distal margin of cornea. Fifth segment unarmed except for scattered setae and laterodistal tuft of setae. Fourth segment armed with strong dorsodistal spine. Third segment with strong ventromesial distal spine. Second segment with dorsolateral distal angle produced, terminating in strong simple spine; mesial margin with spine on dorsodistal angle. First segment with small blunt or sharp spine on one or both sides; ventromesial angle produced, with 2 or 3 small spines laterally. Acicle short, reaching only to about proximal margin of cornea, nearly straight (in dorsal view), terminating in strong, often bifid spine; mesial margin armed with 5–8 spines, sparsely setose. Flagellum slightly reaching or slightly exceeding extended right cheliped, articles with few setae less than 1 to 2 flagellar articles in length.

Mandible (Fig. 7A) with 3-segmented palp; cutting edge calcified, with small tooth medially; molar process with small tooth medially. Maxillule (Fig. 7B) with external lobe of endopod slender, moderately developed, not recurved, internal lobe with long, terminal seta. Maxilla (Fig. 7C) with endopod slightly exceeding distal margin of scaphognathite. First maxilliped (Fig. 7D) with endopod slightly exceeding exopod in distal extension. Second maxilliped (Fig. 7E) without distinguishing characters. Third maxilliped (Fig. 7F) with merus to dactyl each distinctly longer than broad, ischium about twice as long as broad; crista dentata with about 8 blunt or sharp teeth diminishing in strength distally, proximal 2 or 3 teeth distinctly larger than others; basis with 1 small mesial spine; coxa with spine. Sternite of third maxillipeds with small spine on each side of midline.

Chelipeds markedly dissimilar. Right cheliped (Fig. 8A–E) massive, chela operculate; carpus and chela with sparse setae on dorsal surfaces, setae more numerous on dorsodistal surfaces of fingers and mesial face of carpus. Fingers curved ventromesially, each terminating in small, usually blunt corneous claw; cutting edges with 2 or 3 large calcareous, mostly serrated teeth and, short row of closely set minute corneous teeth distally on dactyl. Dactyl about as long or slightly longer than mesial margin of palm, set at strongly oblique angle to longitudinal axis of palm; mesial margin broadly curved proximally, strongly curved

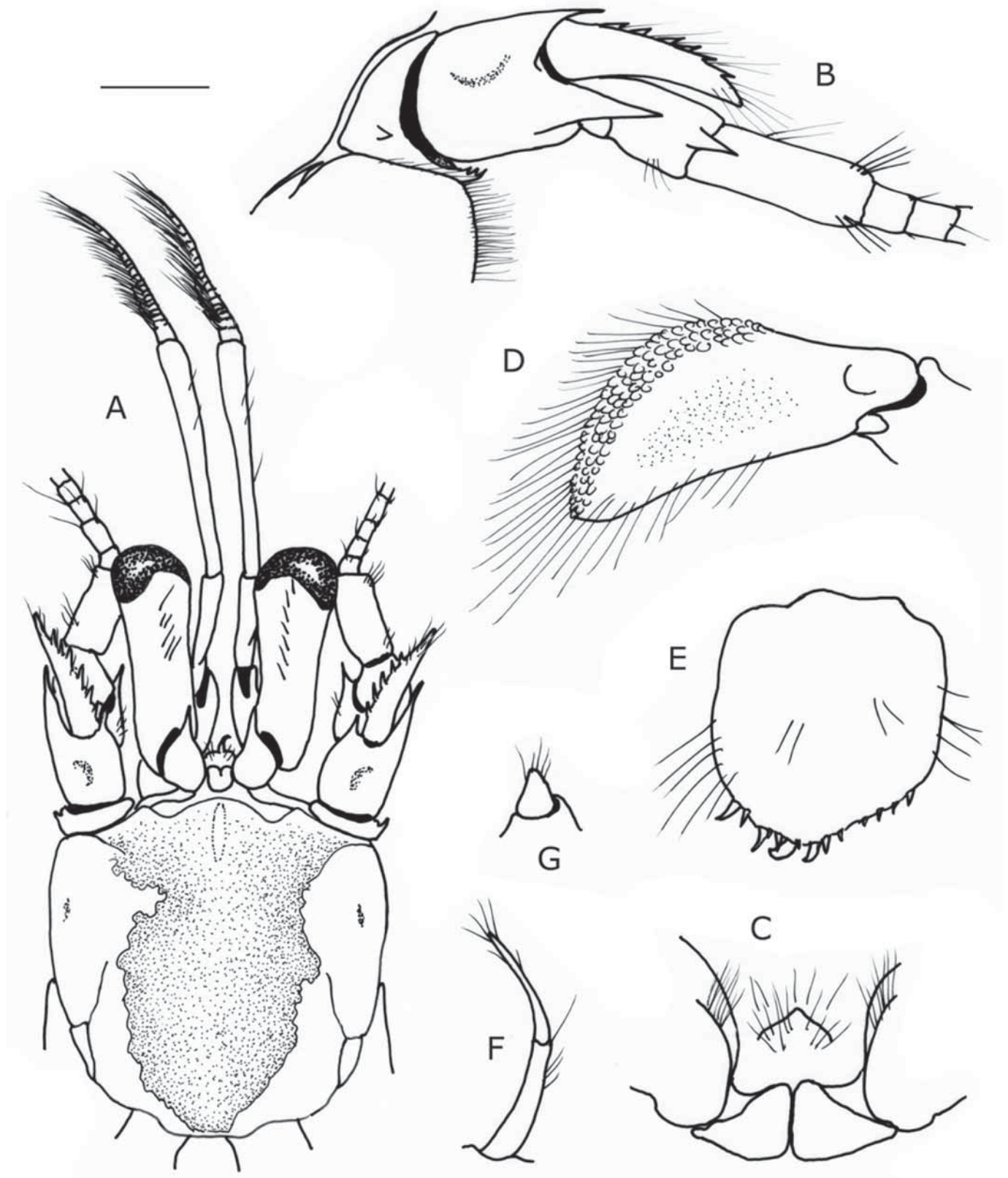


Fig. 6. *Oncopagurus brevis*, new species, A–F, holotype, male 3.2 mm, Hawaiian Islands (BPBM S10992); G, paratype, male 3.0 mm, same station as holotype (BPBM S10992). A, shield and cephalic appendages, dorsal; B, right antennal peduncle, lateral; C, anterior and posterior lobes of thoracic sternite XII (between second ambulatory legs), ventral; D, exopod of left uropod, dorsal; E, telson, dorsal; F, left second gonopod, anteromesial; G, right second gonopod, lateral. Scale bars = 1 mm (A); 0.5 mm (B–G).

distally, delimited by row of small spines diminishing in size distally; dorsal face with scattered setae and small spines or tubercles proximally; ventromesial face concave, elevated longitudinally on midline. Fixed finger broad at base, dorsal face smooth except for setae, lateral margin delimited by row of spines; ventral face moderately concave mesially, elevated longitudinally on midline. Palm about as broad as long; dorsal surface with scattered small spines or tubercles; dorsolateral margin nearly straight or broadly rounded, well delimited by irregular row of calcareous spines, dorsomesial margin delimited by row of small spines or tubercles; dorsomesial face nearly flat, sloping mesially, covered with small, well-spaced tubercles; ventral surface smooth except for scattered short setae. Carpus longer than broad, dorsal surface covered with numerous small spines or tubercles; dorsodistal margin with row of small spines; dorsolateral margin well defined by row of small spines on distal 0.3, rounded proximally; mesial face sloping, weakly expanded distomesially and with row of ventromesial spines

distally; ventral face nearly flat to concave, at most with scattered small tubercles. Merus with irregular row of thick, bristle-like setae on dorsal margin (Fig. 8E), and 1 or less frequently 2, strong blunt or sharp dorsodistal spines; dorsolateral surface with scattered small tubercles and setae; mesial face with long setae; ventromesial margin with row of blunt to sharp spines; ventrolateral margin with row of small tubercles. Ischium with ventromesial row of small, blunt spines. Coxa with row of small spines on ventrodistal margin, and ventromesial row of setae.

Left cheliped (Fig. 8F) usually weakly calcified on nearly entire dorsolateral face of carpus, and often also dorsodistal part of merus. Fingers each terminating in small corneous claw; dorsal and ventral surfaces with scattered tufts of setae; cutting edge of dactyl with row of minute, fused corneous teeth; cutting edge of fixed finger with row of well-spaced small calcareous teeth. Dactyl about as long as length of mesial margin of palm; with small proximal spine or tubercle

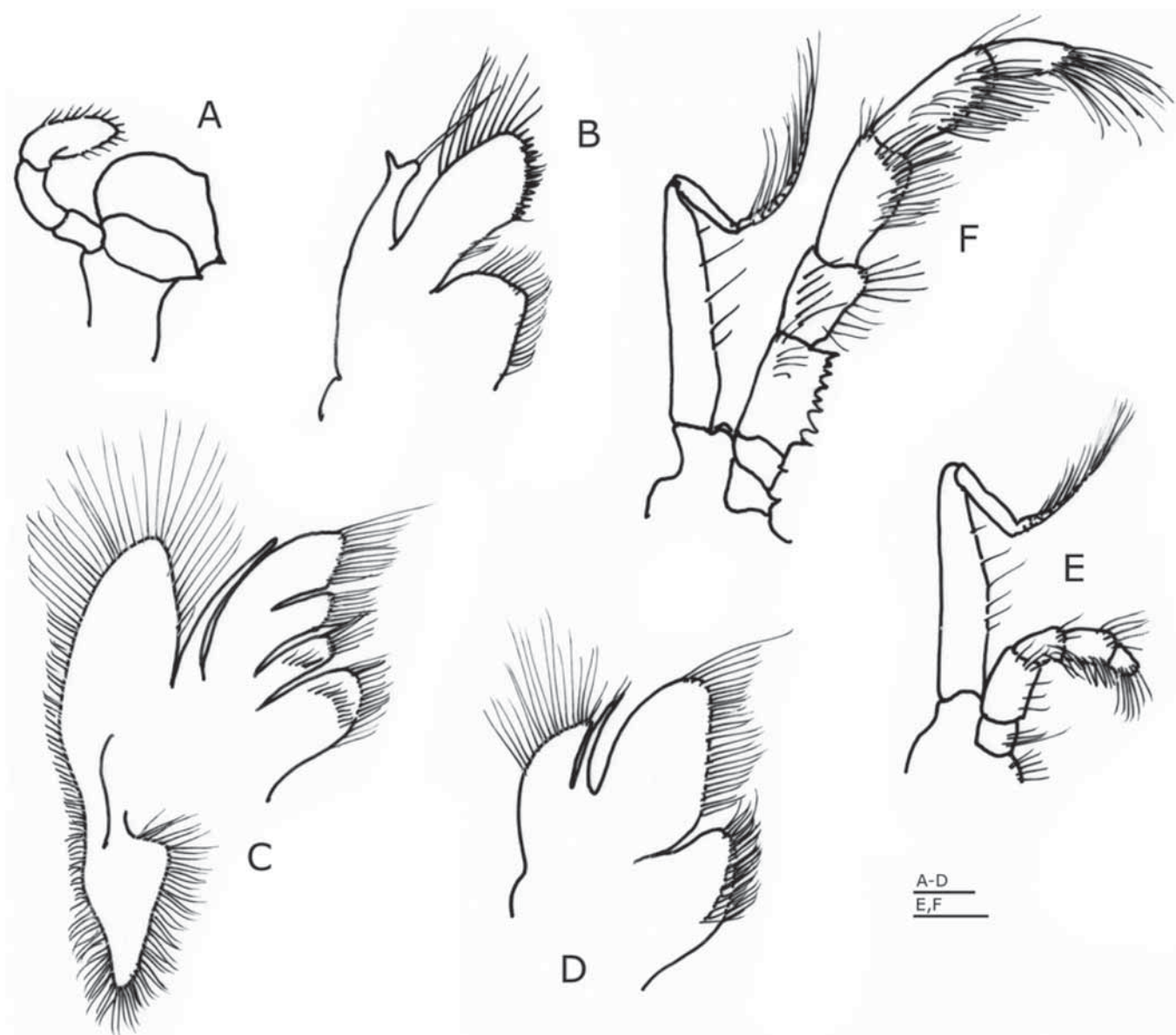


Fig. 7. *Oncopagurus brevis*, new species, paratype, male 3.0 mm, Hawaiian Islands (BPBM S10992). Left mouthparts, internal: A, distal half of mandible; B, maxillule; C, maxilla; D, first maxilliped; E, second maxilliped; F, third maxilliped. Scale bars = 0.25 mm (A–D); 0.5 mm (E, F).

on dorsal face. Fixed finger lacking spines on dorsal face. Palm with scattered setae on dorsal surface; with dorsomesial row of small spines or tubercles; ventral face smooth except for scattered setae. Carpus with irregular row of small spines distally on dorsal margin in addition to small dorsodistal and dorsolateral spine on distal margin; dorsal margin with long setae; ventral face smooth except for scattered setae. Merus with setae on dorsal margin; with ventrolateral row of small spines; ventral face smooth. Ischium and coxa unarmed, but with ventromesial row of setae.

Ambulatory legs (Fig. 9A–D) similar right from left except for longer segments, extending to about tip of dactyls of right cheliped or slightly exceeding them. Dactyls broadly curved, about 1.5 times as long as propodi, terminating in

sharp corneous claws; each with dorsal and dorsomesial distal rows of long setae, and 4–10 small spinules on ventromesial margin. Propodi each with short setae on dorsal margin; ventral margin naked or with few setae. Carpi each with setae on dorsal margin, and small dorsodistal spine. Meri each with setae on dorsal margin, unarmed ventrally or at most with scattered setae. Ischia with setae on dorsal and ventroproximal margin. Coxae with ventromesial row of setae. Anterior lobe of sternite XII (between second ambulatory legs, Fig. 6C), setose, with subdistal spine.

Fourth pereopod (Fig. 9E) semichelate. Dactyl terminating in sharp corneous claw; with ventrolateral row of small corneous spinules. Propodus longer than broad, rasp with 1 row of rounded scales at least distally. Carpus with long

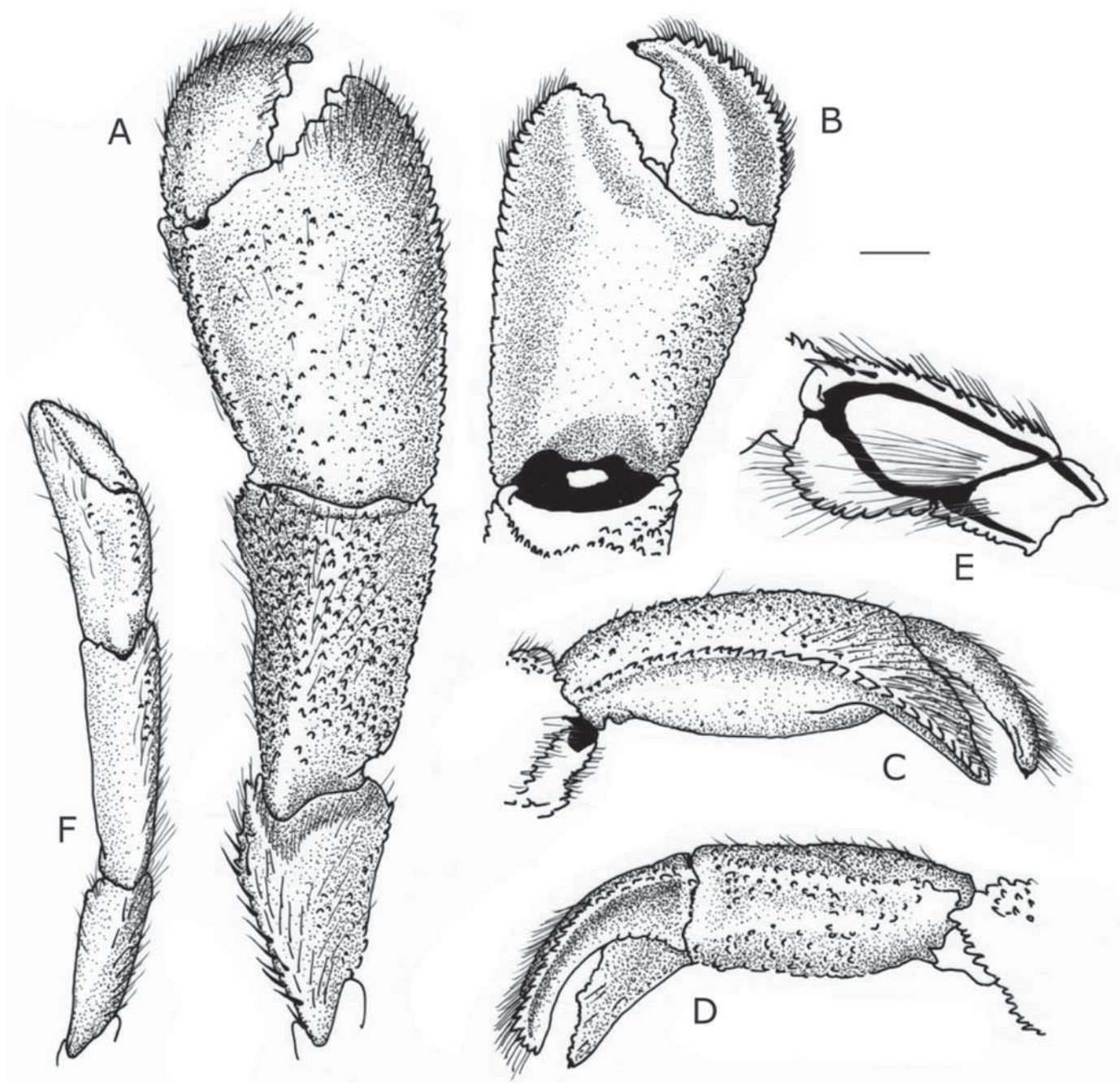


Fig. 8. *Oncopagurus brevis*, new species, holotype, male 3.2 mm, Hawaiian Islands (BPBM S10992). A, right cheliped, dorsal; B–D, chela of same, ventral (B), lateral (C), mesial (D); E, merus of right cheliped, mesial; F, left cheliped, dorsal. Scale bar = 1mm.

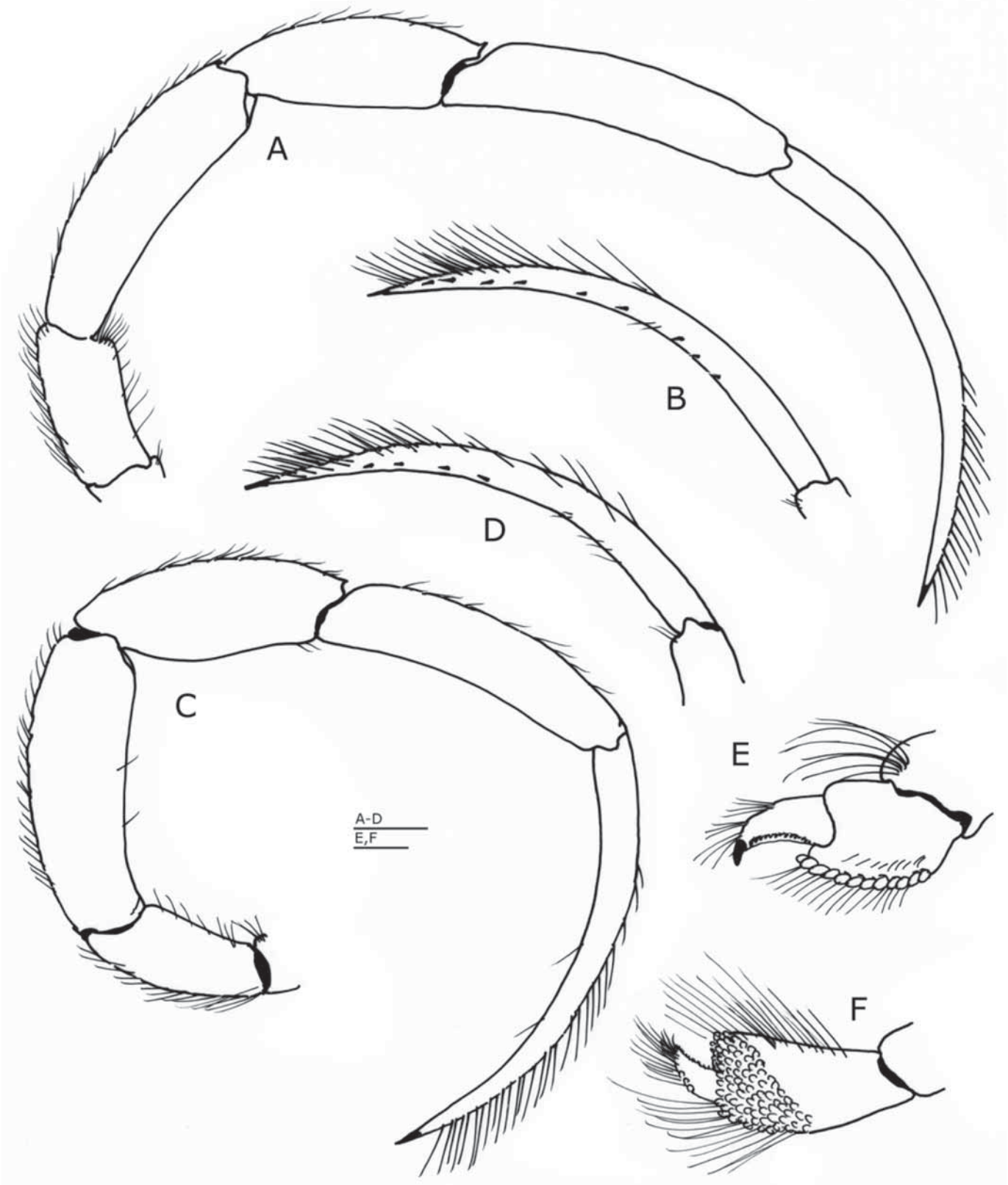


Fig. 9. *Oncopagurus brevis*, new species, holotype, male 3.2 mm, Hawaiian Islands (BPBM S10992). A, right first ambulatory leg, lateral; B, dactyl of same, mesial; C, right second ambulatory leg, lateral; D, dactyl of same, mesial; E, propodus and dactyl of left fourth pereopod, lateral; F, propodus and dactyl of left fifth pereopod, lateral. Scale bar = 1 mm (A–D); 0.25 mm (E, F).

setae on dorsal margin. Merus with rows of long setae on dorsal and ventral margins. Coxa with anteroventral row of setae. Anterior lobe of sternite XIII with row of setae.

Fifth pereopod (Fig. 9F) semichelate. Propodal rasp reaching mid-length of segment. Coxa with row of long setae on anteroventral and ventrodiscal margins. Anterior lobe of sternite XIII with row of setae.

Uropods and telson (Fig. 6D, E) markedly asymmetrical; left exopod about 2.4 times as long as broad, rasp consisting of 2–4 rows of small scales. Telson lacking transverse suture; dorsal surface with scattered setae; lateral margins with long setae medially; posterior lobes separated by shallow, unarmed U-shaped cleft; terminal margin of left lobe armed with about 10 corneous, often curved spines, right lobes armed with about 4 or 5 small, corneous spines.

Male lacking first gonopods; with poorly developed, asymmetrical second gonopods (Fig. 6F, G), left consisting of 2 flat, elongated segments with a few setae, right obsolete, consisting of minute stub. Females lacking second right pleopod.

Colouration. Unknown.

Habitat. Gastropod or scaphopod shells.

Distribution. So far known only from the Hawaiian Islands, in the Central North Pacific. Depth: 146–439 m.

Remarks. This new species is, so far, known only and perhaps endemic to the Hawaiian Islands. The new species is distinguished by having: short antennal acicles; thick bristle-like, and often corneous or yellow-coloured setae on the dorsal margin of the merus of the right cheliped; and the males lacking first gonopods and with poorly developed, asymmetrical second gonopods.

Etymology. The specific epithet is from the Latin, *brevis*, meaning short, and makes reference to the short acicles of this new species.

Oncopagurus cidaris Lemaitre, 1996
Figs. 10A–J, 51

Oncopagurus cidaris Lemaitre, 1996: 204, figs 22, 23 (type locality: off Tully, Queensland, Australia, CIDARIS I, sta 1–3, 18°07.9'S, 147°35.7'E); Zhadan, 1997: 63 (table); Davie, 2002: 88; Poore, 2004: 282, fig. 81a; McLaughlin et al., 2010: 39.

Type material. Holotype, off Tully, Queensland, Australia, CIDARIS I sta 1–3, 18°07.9'S, 147°35.7'E, 956–969 m, 6 May 1986: M 2.6 mm (QM W16596).

Paratypes: see Lemaitre (1996).

Additional material. Philippines: MUSORSTOM 3: sta CP 88, 14°00'S, 120°17'E, 183–187 m, 31 May 1985: 1 M 2.5 mm, 1 ov F 2.3 mm (MNHN Pg.); sta CP 91, 14°00'S, 120°18'E, 190–203 m, 31 May 1985: 1 M 1.9 mm (MNHN Pg.); sta CP 100, 14°00'S, 120°18'E, 189–199 m, 1 June 1985: 1 M 2.3 mm (MNHN Pg.).

Diagnosis. Shield (Fig. 10A) as broad as long; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; lateral projections subtriangular, terminating bluntly. Ocular peduncles more than half length of shield, with dorsal row of long setae; corneas weakly dilated. Ocular acicles subtriangular, terminating in strong spine. Antennular peduncle (Fig. 10A) exceeding distal margin of cornea by entire length of ultimate segment. Antennal peduncle (Fig. 10A) reaching distal margin of cornea; fourth segment with strong dorsodistal spine; second segment with terminating in strong, simple spine, mesial margin with spine on dorsodistal angle; first segment with 1 small spine on lateral face; acicle slightly curved outward (in dorsal view), at most slightly exceeding distal margin of cornea, terminating in strong spine, mesial margin armed with row of 5–9 spines; flagellum exceeding extended right cheliped, articles with numerous setae < 1–3 flagellar articles in length. Third maxilliped with crista dentata of about 8 teeth, proximal 2 or 3 teeth distinctly larger than distal teeth. Right cheliped (Fig. 10B, C) with chela operculate, having moderately dense, plumose setae on distal half of chela; dactyl set at strongly oblique angle to longitudinal axis of palm; palm longer than broad, dorsal surface smooth except for scattered small tubercles, lateral margin well delimited by row of blunt to sharp spines, mesial face rounded, dorsomesial margin delimited by row of small blunt or sharp spines, ventral surface smooth; carpus with dorsolateral margin rounded or sometimes well delimited distally by row of spines, dorsal face with numerous, well-spaced small spines or tubercles. Left cheliped usually weakly calcified on dorsolateral surfaces of merus and carpus; palm unarmed except for scattered setae on dorsal face and long setae on dorsomesial margin; carpus with strong dorsodistal spine and long setae dorsally. Ambulatory legs with dactyl (Fig. 10D) each having ventromesial row of 7–9 slender corneous spines; carpus with small, blunt or sharp dorsodistal spine. Anterior lobe of sternite XII (between second ambulatory legs) rounded, setose, unarmed. Fourth pereopod with dactyl sexually dimorphic, longer, slenderer and more strongly curved in females than in males (Fig. 10E, F); propodal rasp with 1 row of rounded scales at least distally. Fifth pereopod propodal rasp extending to mid-length of segment. Uropods and telson markedly asymmetrical; telson (Fig. 10J) lacking transverse suture, posterior lobes separated by shallow cleft, terminal margin of lobes armed with long, often strongly curved corneous spines. Male lacking first gonopods; second pair of gonopods (Fig. 10G–I) weakly developed, asymmetrical, left usually 1-segmented or occasionally 2-segmented with short distal segment, right 1-segmented, rudimentary or absent. Female with vestigial second right pleopod.

Colouration. Unknown.

Habitat. Gastropod shells.

Distribution. Western Pacific, on the eastern coast of Australia, and the Philippines. Depth: 189–1150 m.

Remarks. *Oncopagurus cidaris* is one of eight species of *Oncopagurus* in which males lack first gonopods; the others

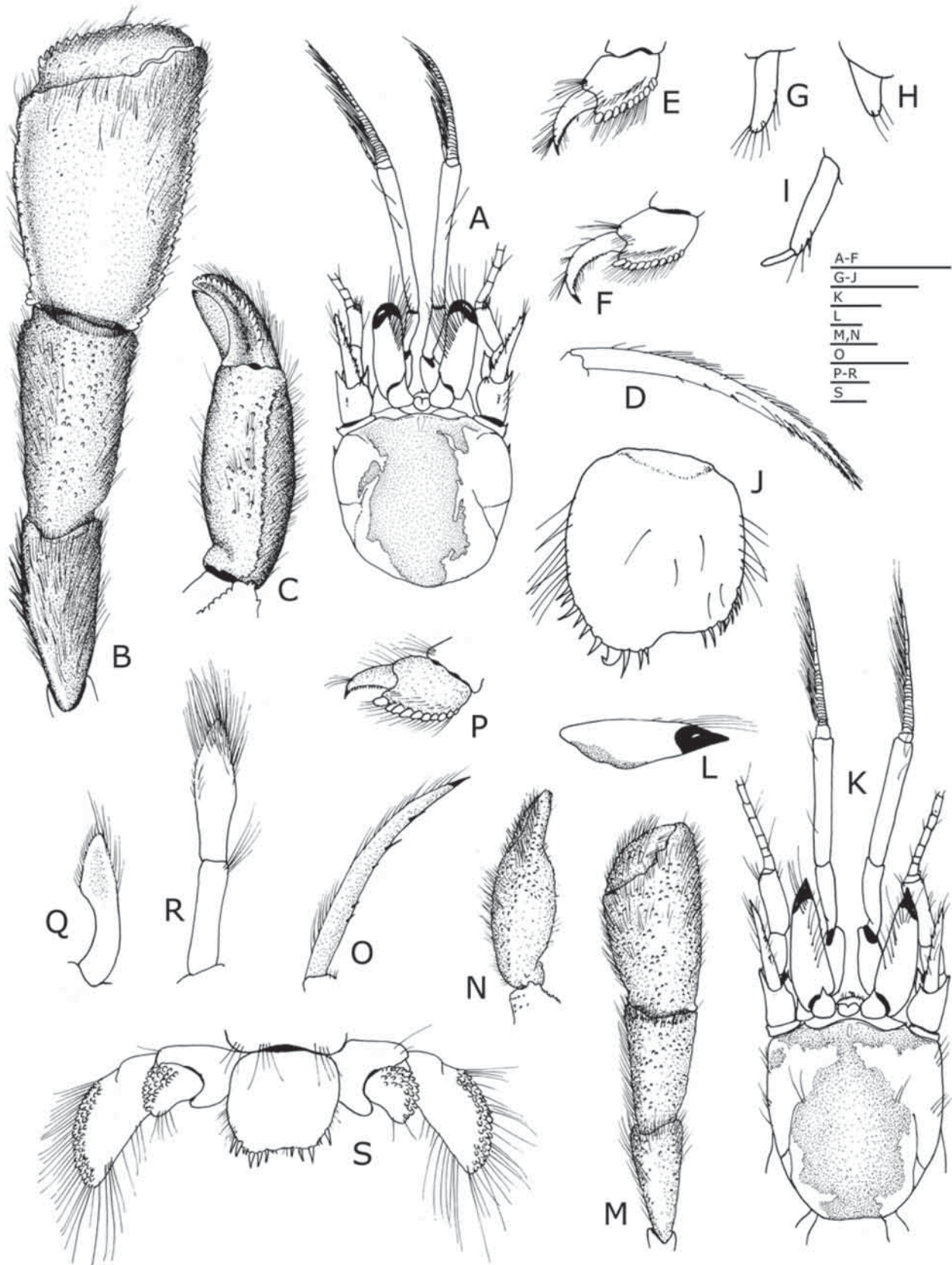


Fig. 10. A–J, *Oncopagurus cidaris* Lemaitre, 1996, Queensland, Australia (QM W16596): A–E, G, H, J, paratype, male 2.9 mm; F, paratype, female 2.6 mm; I, paratype, male 2.7 mm. A, shield and cephalic appendages, dorsal; B, right cheliped, dorsal; C, chela of same, mesial; D, dactyl of left first ambulatory leg, mesial; E, F, propodus and dactyl of left fourth pereopod in male (E) and female (F), lateral; G, I, male left second gonopod, lateral; H, male right second gonopod; J, telson, dorsal. K–S, *Oncopagurus conicus* Lemaitre, 2006, holotype, male 2.0 mm, New Caledonia, (MNHN Pg 7612): K, shield and cephalic appendages, dorsal; L, right ocular peduncle, lateral; M, right cheliped, dorsal; N, chela of same, lateral; O, dactyl of left first ambulatory leg, mesial; P, propodus and dactyl of left fourth pereopod, lateral; Q, left first gonopod, mesial; R, left second gonopod, anterior; S, uropods and telson, dorsal. Scale bars = 2 mm (A–F); 0.5 mm (G–J); 0.5 mm (K, L, S); 1 mm (M, N, O); 0.2 mm (P–R). [Adapted from Lemaitre (1996, 2006)].

are: *O. haigae*, *O. oimos*, *O. orientalis*, *O. tuamotu*, and four of the new species described herein, *O. elevatus*, *O. rossanae*, *O.*, and *O. brevis*. Although these eight species share that condition, they differ markedly in a number of characters, primarily from the epistome, cephalic appendages, right chela, ambulatory legs, and telson. The absence of first gonopods (presumably through loss) is a condition that appears to be the result of evolutionary convergence in the Parapaguridae, as males of eight species of another genus, *Paragiopagurus* Lemaitre, 1996, also lack first gonopods: *P. acutus* (de Saint Laurent, 1972), *P. bicarinatus* (de Saint Laurent, 1972), *P. hirsutus* (de Saint Laurent, 1972), *P. hobbiti* (Macpherson, 1983), *P. ruticheles* A. Milne-Edwards, 1891, *P. ventilatus* Lemaitre, 2004, *P. trilineatus* Lemaitre, 2013, and *P. orthotenes* Lemaitre, 2013.

As documented by Lemaitre (1996), the shape of the dactyl of the fourth pereopod is sexually dimorphic in *Oncopagurus cidaris*, with females having distinctly longer dactyls and more strongly curved (hook-like) than in males.

***Oncopagurus conicus* Lemaitre, 2006**

Figs. 10K–S, 51

Oncopagurus conicus Lemaitre, 2006: 519, figs 1–4 (type locality: New Caledonia, HALIPRO 1, sta C 858, 21°42'S, 166°41'E); McLaughlin et al., 2010: 39.

Type material. Holotype, New Caledonia, HALIPRO 1, sta C 858, 21°42'S, 166°41'E, 1000–1120 m, 20 March 1994: M 2.0 mm (MNHN Pg. 7612).

Paratypes, New Caledonia, same sta as holotype: 2 F 2.0, 2.4 mm (MNHN Pg. 7613); BIOGEOCAL, sta CP 214, 22°43'09"S, 166°27'19"E, 1590–1665 m, 9 April 1987: 1 M 2.1 mm, 1 F 1.8 mm, 1 ov F 2.1 mm (NMNH Pg. 7614).

Additional material. None.

Diagnosis. Shield (Fig. 10K) longer than broad; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; lateral projections subtriangular, terminating in small spine. Ocular peduncles more than half length of shield, diminishing in width distally, somewhat inflated ventroproximally, with longitudinal row of long setae dorsally, corneas reduced, subconical, usually ending sharply (Fig. 10L). Ocular acicles subtriangular, each terminating in strong spine. Antennular peduncle (Fig. 10K) exceeding distal margin of cornea by at least 0.2 length of penultimate segment. Antennal peduncle (Fig. 10K) exceeding distal margin of cornea by about 0.2 length of fifth segment; fourth segment unarmed; second segment with dorsolateral distal angle terminating in strong, simple spine, mesial margin with spine on dorsodistal angle; first segment with lateral face unarmed or with small spine; acicle not reaching tip of acute cornea, mesial margin armed with 2–5 small spines; flagellum slightly exceeding extended right cheliped, with setae < 1–3 flagellar articles in length. Third maxilliped with crista dentata armed with about 9 teeth diminishing in strength distally. Right cheliped (Fig. 10M, N) relatively slender, not operculate, with moderately dense setae on dorsal

surfaces of carpus and chela, fingers nearly straight; dactyl set at weakly oblique angle to longitudinal axis of palm; palm longer than broad, dorsal surface with scattered small spines or tubercles, lateral face rounded or sometimes with dorsolateral margin weakly delimited by row of small spines, mesial face rounded, dorsomesial margin delimited by row of small blunt or sharp spines, ventral surface with scattered small tubercles; carpus with dorsolateral margin rounded, dorsal surface with scattered small spines or tubercles. Left cheliped sometimes weakly calcified dorsomedially on merus and carpus; palm unarmed except for dorsomesial and dorsolateral setae; carpus unarmed except for dorsodistal spine and long setae dorsally. Ambulatory legs with dactyls (Fig. 10O) each having ventromesial row of 4–7 slender, corneous spinules; carpi unarmed except for small dorsodistal spine, and long setae dorsally. Anterior lobe of sternite XII (between second ambulatory legs) subsemicircular, setose, with distinct spine. Fourth pereopod propodal rasp (Fig. 10P) with 1 row of rounded scales at least distally. Fifth pereopod propodal rasp extending to mid-length of segment. Uropods and telson (Fig. 10S) symmetrical or nearly so; telson lacking transverse suture, posterior margin separated by shallow or obsolete U-shaped cleft into rounded projections, each armed with about 4–7 corneous spines, some often ventrally curved. Male with paired first and second gonopods (Fig. 10Q, R); first gonopod with weakly concave distal lobe; second gonopod with distal segment having row of short bristles on lateral margin medially, and long setae on distomesial face. Female with short, uniramous, 1-segmented second right pleopod.

Colouration. Unknown.

Habitat. Scaphopod shells.

Distribution. So far known only from the New Caledonia region. Depth: 1000–1665 m.

Remarks. This species and three other congeners, *Oncopagurus minutus*, and two new species, *O. elongatus* and *O. petilus*, have reduced or subconical corneas. In *O. conicus*, the corneas typically are slender or acute distally and often terminate sharply (Fig. 10K, L), whereas in *O. minutus*, *O. elongatus*, new species, and *O. petilus*, new species, the corneas are rounded distally (Figs. 20B, 27B, 31A). *Oncopagurus conicus* can be readily differentiated from those three species and all others in the genus, by the symmetrical (or nearly so) uropods and telson. Also, in *O. conicus* the right chela is not operculate, with the lateral face rounded or at most with a weakly defined dorsolateral margin; whereas in the other three species the chela is operculate, with a lateral face sharply defined by a row of spines.

***Oncopagurus crusoiei*, new species**

Figs 11–14, 51

Type material. Holotype, eastern Pacific, SEPBOB, R/V Anton Bruun, cruise 12: sta 65–MV–IV–47, off Cumberland Bay, Más a Tierra Island, Juan Fernández Islands, [33°38'29"S 78°50'28"W], 130–160 m, 12 December 1965: M 1.9 mm (USNM 1207981).

Paratypes: eastern Pacific, same stn as holotype: 1 M 1.6 mm, 2 F 1.3, 1.8 mm, 2 ov F 1.5, 1.8 mm (USNM 1207982).

Description. Gills biserial. Shield (Fig. 11A) about as long as broad or slightly longer than broad; dorsal surface weakly calcified medially (weak calcification often reaching to anterior margin), with scattered short setae; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; anterior margins weakly concave; lateral projections subtriangular, terminating in small blunt or sharp spine; anterolateral margins sloping; posterior margin broadly rounded; ventrolateral margins of shield usually with slender spine on one or both sides. Anterodistal margin of branchiostegite rounded, unarmed, setose.

Ocular peduncles (Fig. 11A) stout, more than half length of shield, with longitudinal row of few short setae dorsally; lateral and ventral faces usually weakly calcified. Cornea weakly dilated. Ocular acicles subtriangular, each terminating in strong spine; separated basally by about basal width of 1 acicle.

Antennular peduncle (Fig. 11A) exceeding distal margin of cornea by about 0.75 length of ultimate segment. Ultimate segment about twice as long as penultimate segment, naked or with scattered setae dorsally. Basal segment with strong ventromesial spine; lateral face with distal subrectangular lobe, and strong spine proximally. Ventral flagellum with 5 articles.

Antennal peduncle (Fig. 11A, B) not exceeding distal margin of cornea, reaching to about distal 0.7 of cornea. Fifth segment unarmed except for scattered setae and laterodistal tuft of setae. Fourth segment armed with strong dorsodistal spine. Third segment with strong ventromesial distal spine. Second segment with dorsolateral distal angle produced, terminating in strong simple spine; mesial margin with spine on dorsodistal angle. First segment with lateral face unarmed or with small blunt spine; ventromesial angle produced, with 2 or 3 small spines laterally. Acicle relatively short, reaching to about proximal margin of cornea, nearly straight (in dorsal view), terminating in strong spine; mesial margin armed with 6–8 spines, sparsely setose. Flagellum slightly exceeding extended right cheliped, articles with setae less than 1–2 flagellar articles in length.

Maxillule with external lobe of endopod slender, moderately developed, not recurved, internal lobe with long, terminal seta. Third maxilliped crista dentata with about 10 teeth, proximal 2 or 3 teeth distinctly larger than distal.

Chelipeds markedly dissimilar. Right cheliped (Fig. 13A–E) massive, chela operculate, usually more elongate in males than in females; carpus and chela with sparse to moderately dense setae on dorsal surfaces, setae more dense on dorsal surfaces of fingers and mesial face of carpus. Fingers curved ventromesially, each terminating in small, usually blunt corneous claw; cutting edges with 2 or 3 large calcareous teeth and several irregularly sized smaller calcareous teeth, with short row of closely set minute corneous teeth distally

on dactyl. Dactyl varying 1.0–1.3 times as long as mesial margin of palm, set at moderately (in large males ~ sl 1.9 mm) to strongly oblique angle to longitudinal axis of palm; mesial margin broadly curved, delimited by row of spines diminishing in size distally; dorsal face with moderately dense small spines or tubercles decreasing in density mesially and distally; ventromesial face concave and elevated longitudinally on midline. Fixed finger broad at base, dorsal face covered with moderately dense small spines or tubercles, lateral margin delimited by row of spines; ventrolateral face concave and elevated longitudinally on midline. Palm ranging from slightly broader than long to 1.3 times as long as broad; dorsal surface covered with moderately dense small spines or tubercles; dorsolateral margin nearly straight, delimited by irregular row of small blunt or sharp spines; mesial margin rounded, with well-spaced spines or tubercles; ventral surface covered with well-spaced small spines or tubercles, at most with scattered short setae. Carpus longer than broad, dorsal surface and sometimes also ventral surface, covered with moderately dense small spines or tubercles; dorsolateral face rounded; dorsodistal margin with row of small spines; ventral face nearly flat. Merus with scattered setae dorsally, and moderately dense setae ventrodistally; with scattered small tubercles on dorsal surface; ventromesial margin with row of blunt to sharp spines; ventrolateral margin with row of small tubercles. Ischium with ventromesial row of small, blunt spines. Coxa row of small spines on ventrodistal margin, and ventromesial row of setae.

Left cheliped (Fig. 13F, G) usually weakly calcified on nearly entire dorsolateral face of carpus. Fingers each terminating in small corneous claw; dorsal and ventral surfaces unarmed except for scattered tufts of setae; cutting edge of dactyl with row of minute, fused corneous teeth; cutting edge of fixed finger with row of well-spaced small calcareous teeth. Dactyl about as long as length of mesial margin of palm, with scattered tufts of setae; with 1 or 2 small proximal spines or tubercles on dorsal face. Fixed finger with scattered tufts of setae. Palm with dorsomesial row of small spines or tubercles, and scattered setae; ventral face smooth except for scattered setae. Carpus with dorsal irregular row of small spines in addition to dorsodistal and dorsolateral spine on distal margin; dorsal surface with long setae; ventral face smooth except for scattered setae. Merus with long setae on dorsal margin; with ventrolateral row of small spines; ventral face smooth. Ischium and coxa unarmed, but with ventromesial row of setae.

Ambulatory legs (Fig. 14A–C) similar right from left except for longer segments and stronger spination on right, extending to about tip of dactyls of right cheliped or slightly exceeding them. Dactyls broadly curved, about 1.5 times as long as propodi, and terminating in sharp corneous claws; each with dorsal and dorsomesial distal rows of long setae, and 4–9 small spinules on ventromesial margin. Propodi with setae on dorsal margin; ventral margin with few setae. Carpi each with setae on dorsal margin, and small dorsodistal spine. Meri each with setae on dorsal margin, otherwise unarmed. Ischia with setae on dorsal and ventroproximal margin. Coxae with ventromesial row of setae. Anterior lobe of sternite XII

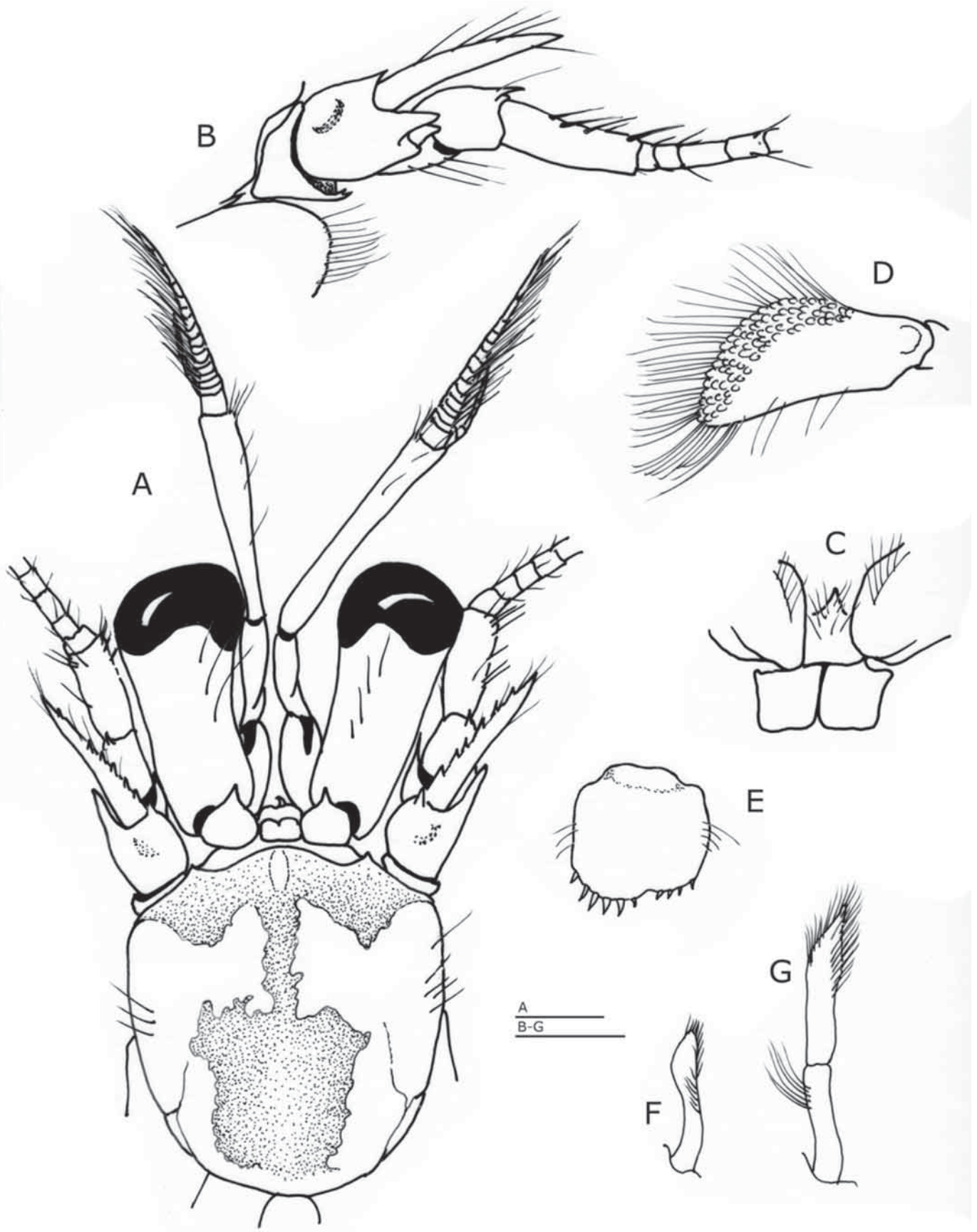


Fig. 11. *Oncopagurus crusoiei*, new species, holotype, male 1.9 mm, Juan Fernández Islands (USNM 1207981). A, shield and cephalic appendages, dorsal; B, right ocular peduncle, lateral; C, anterior and posterior lobes of thoracic sternite XII (between second ambulatory legs), ventral; D, exopod of left uropod, dorsal; E, telson, dorsal; F, left first gonopod, mesial; G, left second gonopod, anterior. Scale bars = 0.5 mm.

(between second ambulatory legs, Fig. 11C), setose, with subdistal spine.

Fourth pereopod (Fig. 14D) semichelate. Dactyl terminating in sharp corneous claw; with ventrolateral row of small corneous spinules. Propodus longer than broad, rasp with 1 row of rounded scales at least distally. Carpus with long setae on dorsal margin. Merus with rows of long setae on dorsal and ventral margins. Coxa with anteroventral row of setae. Anterior lobe of sternite XIII (between fourth pereopods) with row of setae.

Fifth pereopod (Fig. 14E) semichelate. Propodal rasp reaching or exceeding mid-length of segment. Coxa with row of long setae on anteroventral and ventrodiscal margins. Anterior lobe of sternite XIV (between fifth pereopods) with row of setae.

Uropods markedly asymmetrical; left exopod (Fig. 11D) about 2.3 times as long as broad, rasp consisting of 2–4 rows of small scales. Telson (Fig. 11E) moderately asymmetrical, lacking transverse suture; dorsal surface with scattered setae; lateral margins with few setae medially; posterior lobes separated by shallow unarmed, U-shaped cleft; terminal

margin of left lobe armed with about 6–8, often weakly curved corneous spines, terminal margin of right lobe armed with 4 or 5 small spines.

Male with paired first and second gonopods (Fig. 11F, G); first gonopod with distal portion subovate, with setae distally; second gonopod with distal segment flat and with long setae distally, proximal segment with long setae distomesially. Females with vestigial second right pleopod.

Variations. Even in the few known specimens of this new species, variations of the right cheliped due to sex and size are noticeable. As is typical in most congeners and many other parapagurids, the right cheliped is long and slender in large males (Fig. 13A), and broad and short in females (Fig. 13E).

Colouration. Unknown.

Habitat. Gastropod shells.

Distribution. So far known only from the eastern Pacific, in the Juan Fernández Islands, Chile. Depth: 130–160 m.

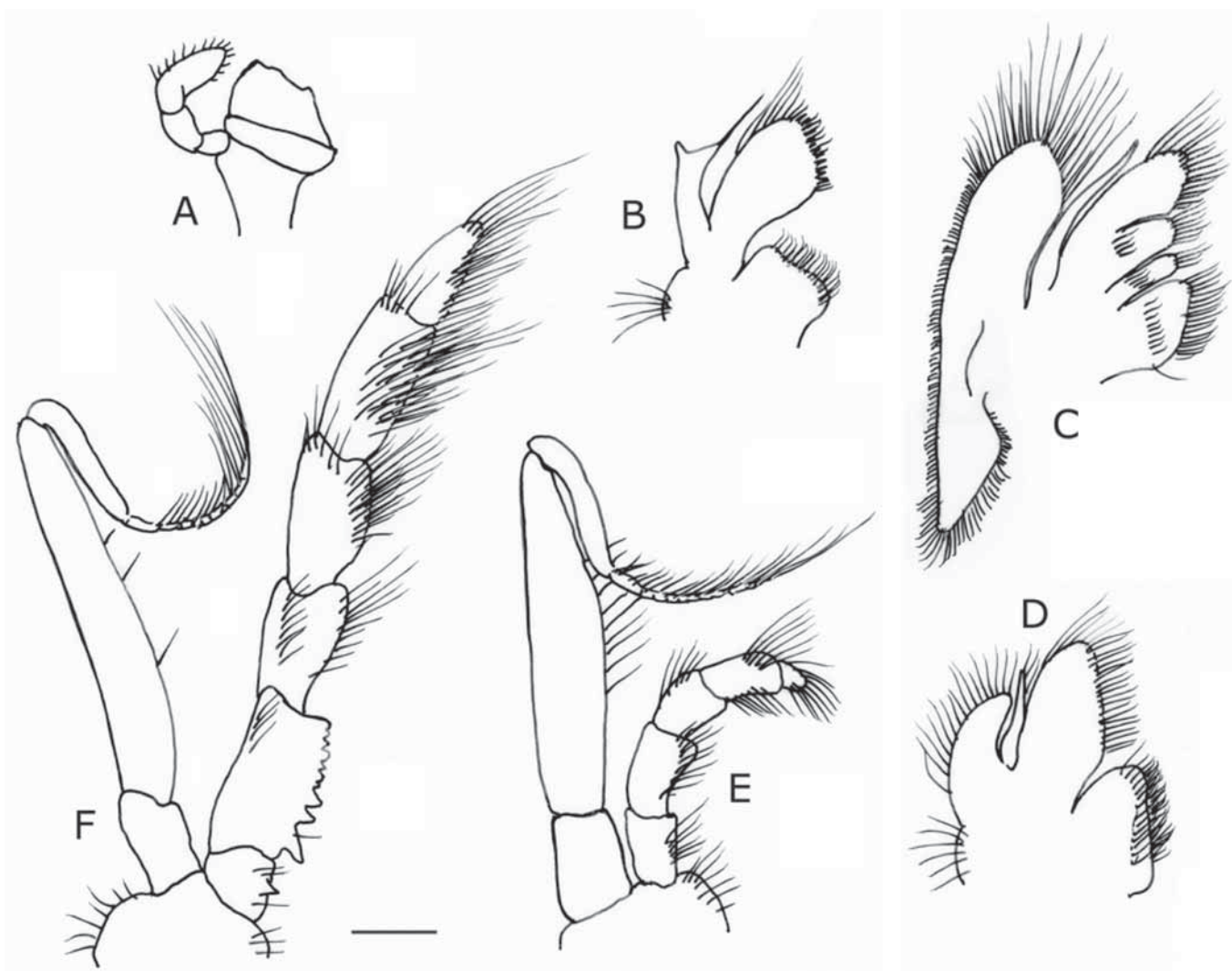


Fig. 12. *Oncopagurus crusoiei*, new species, paratype, ov female 1.8 mm, Juan Fernández Islands (USNM 1207982). Left mouthparts, internal: A, distal half of mandible; B, maxillule; C, maxilla; D, first maxilliped; E, second maxilliped; F, third maxilliped. Scale bar = 0.25 mm.

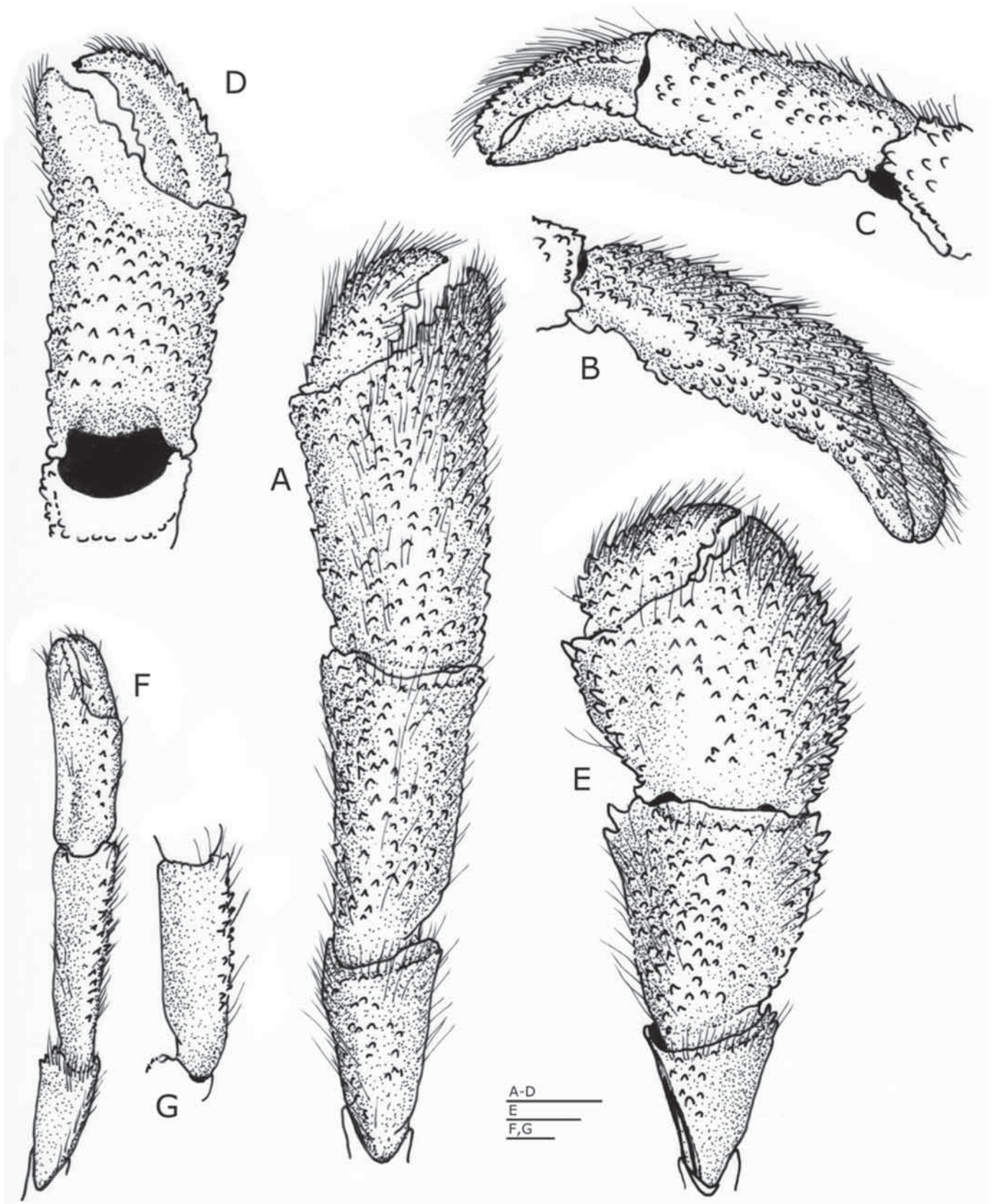


Fig. 13. *Oncopagurus crusoiei*, new species, Juan Fernández Islands: A–D, F, G, holotype, male 1.9 mm (USNM 1207981); E, paratype, ovifemale 1.5 mm (USNM 1207982). A, E, right cheliped, dorsal; B–D, chela of same, lateral (B), mesial (C), ventral (D); F, left cheliped, dorsal; G, carpus of same, dorsolateral. Scale bars = 1 mm (A–D), 0.5 mm (E–G).

Remarks. *Oncopagurus crusoiei*, new species, is only the second species of *Oncopagurus* documented from the entire eastern Pacific, the other being *O. haigae*. This new species distinctly differs from *O. haigae* in various characters. In this new species, the ocular peduncles are stouter than in *O. haigae*; the antennal acicles reach to about the proximal margin of the corneas, whereas in *O. haigae* the acicles exceed the cornea by 0.3–0.5 the length of the acicle. In this new species, the armature of the dorsal and ventral surfaces of the carpus and chela of the right cheliped is generally stronger and with more numerous spines or tubercles, whereas in *O. haigae* the dorsal surface armature is mostly of scattered small

spines (sometimes arranged medially in irregular rows), and the ventral surfaces are unarmed or at most with occasional small tubercles. In this new species, the dorsal margin of the carpus of the left cheliped is armed with an irregular row of mostly sharp spines, whereas in *O. haigae* the carpus is unarmed dorsally except for a dorsodistal spine. The telson (Fig. 11E) in this new species is moderately asymmetrical in both sexes, and at least based on the available material, there is no strong dimorphism in telson shape and armature. In contrast, the telson in females of *O. haigae* have strongly asymmetrical terminal lobes armed with more spines and rows than in males (Fig. 25R). Males of *O. crusoiei*, new

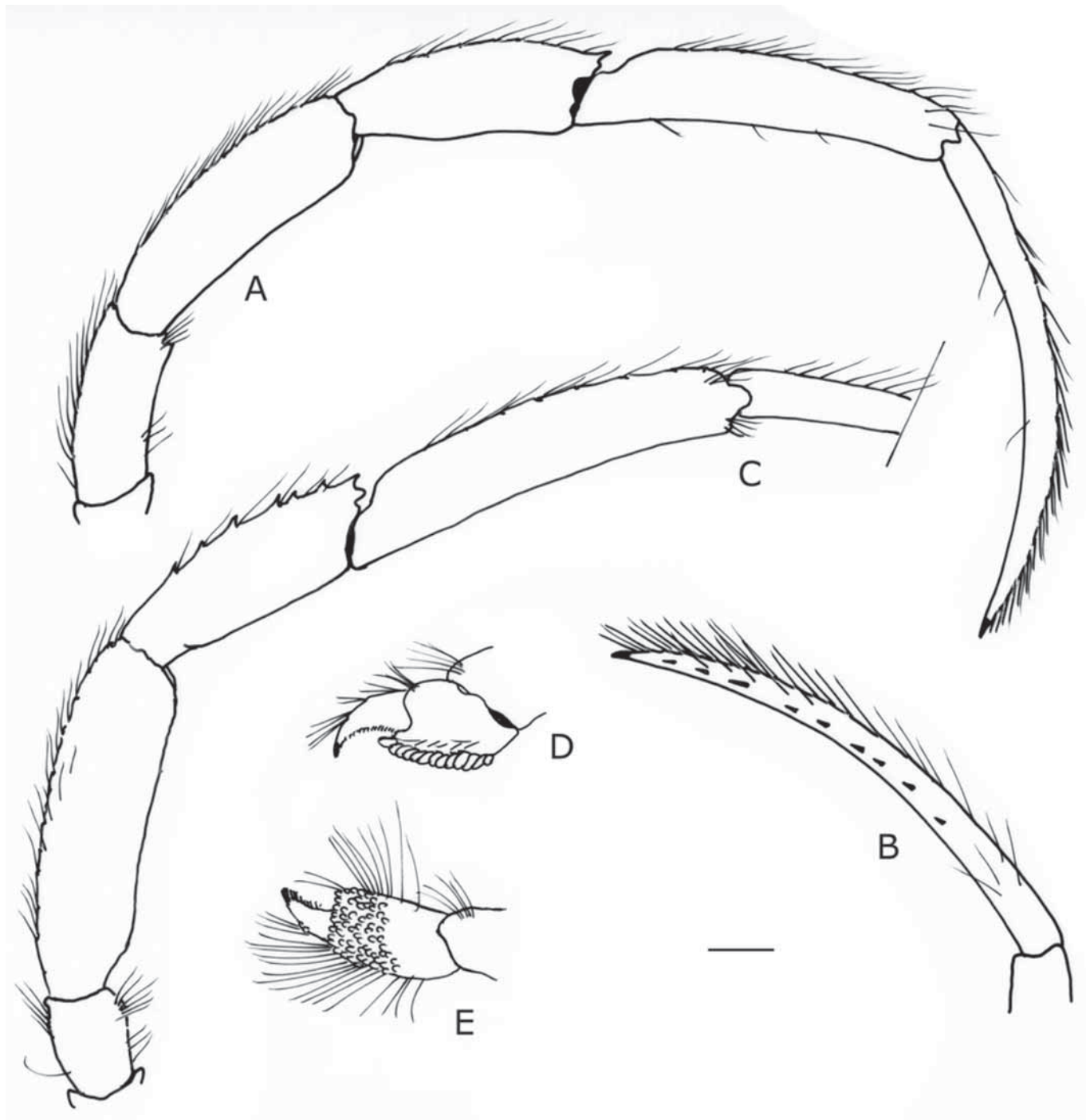


Fig. 14. *Oncopagurus crusoiei*, new species, holotype, male 1.9 mm, Juan Fernández Islands (USNM 1207981). A, right first ambulatory leg, lateral; B, dactyl of same, mesial; C, right second ambulatory leg, lateral (distal portion of dactyl missing); D, propodus and dactyl of left fourth pereopod, lateral; E, propodus and dactyl of left fifth pereopod, lateral. Scale bars = 0.5 mm (A–C), 1 mm (D, E).

species, have paired first and second gonopods (Fig. 11F, G), whereas males of *O. haigae* lack first gonopods and the second gonopods are asymmetrical.

Etymology. The species is named in honor of Robinson Crusoe, the fictional castaway character in the famous novel by Daniel Defoe. The novelist was most likely inspired by the experience of Alexander Selkirk, a Scottish sailor who was marooned in the early 18th century in the island of Más a Tierra, one of the Juan Fernández Islands later renamed Robinson Crusoe Island.

Oncopagurus curvispina (de Saint Laurent, 1974)

Figs. 15, 51

Parapagurus curvispina de Saint Laurent, 1974: 791, figs 1–5 (type locality: Île Amsterdam, southern Indian Ocean).

Sympagurus curvispina – Lemaitre, 1989: 37, table 1.

Paragiopagurus curvispina – Lemaitre, 1996: 207.

Oncopagurus curvispina – McLaughlin et al., 2010: 39; Lemaitre, 2013: 303.

Type material. Holotype, southern Indian Ocean, Île Amsterdam, sta AMS–D9, 50–60 m, 23 January 1972, coll. J. Beurois: M 3.1 mm (MNHN Pg. 3183).

Additional material. None.

Diagnosis. Shield (Fig. 15A) about as broad as long; rostrum broadly rounded, weakly produced, with short mid–dorsal ridge; lateral projections subtriangular, reaching to about same level of distal portion of rostrum, terminating in small spine. Ocular peduncles more than half length of shield, with dorsal row of setae; corneas moderately dilated. Ocular acicles subtriangular, terminating in strong spine. Antennular peduncle (Fig. 15A) exceeding distal margin of corneas by nearly entire length of ultimate segment. Antennal peduncle (Fig. 15A) not exceeding distal margin of cornea; fourth segment with small spine on dorsolateral distal angle; second segment with terminating in strong, simple or multifid spine, mesial margin with spine on dorsodistal angle; first segment with small spine on lateral face; acicle weakly curved (in dorsal view), short, only reaching to about proximal margin of cornea, terminating in strong spine, mesial margin armed with row of 8–10 spines; flagellum missing from holotype. Mouthparts not dissected; third maxilliped with crista dentata, teeth diminishing in strength distally. Right cheliped (Fig. 15B) with scattered setae, chela operculate; dactyl set at strongly oblique angle to longitudinal axis of palm; palm broader than long, dorsal face with double row of tubercles or spines medially, dorsolateral and dorsomesial margins well delimited by row of blunt to sharp spines, mesial face strongly sloping, ventromesial face with small tubercles or spines, ventral surface smooth; carpus dorsal face with numerous small spines or tubercles, dorsolateral margin well defined by row of spines at least distally. Left cheliped (Fig. 15C) weakly calcified on dorsolateral face of carpus; palm with dorsomesial row of small spines; carpus with dorsodistal spine; carpus with small spines or tubercles on dorsal margin. Ambulatory legs with dactyls (Fig. 15E) each having ventromesial row of 11–13 corneous spinules;

propodus with row of small spines on dorsal margin; carpus with small dorsodistal spine and row of small spines on dorsal margin. Anterior lobe of sternite XII (between second ambulatory legs) rounded, setose, with subterminal spine. Fourth pereopod propodal rasp (Fig. 15F) with 1 row of rounded scales at least distally. Fifth pereopod propodal rasp extending to or beyond mid-length of segment. Uropods and telson markedly asymmetrical; telson (Fig. 15G) lacking or with obsolete transverse suture, posterior lobes separated by shallow U-shaped cleft, terminal margin of lobes armed with often curved corneous spines. Male with paired first and second gonopods; first gonopods with ovate distal lobe, marginally setose; second gonopods with distal segment spatulate and with setae distally. Female unknown.

Colouration. Unknown.

Habitat. Presumably a gastropod shell.

Distribution. So far known only from the holotype collected at Île Amsterdam, southern Indian Ocean. Depth: 50–60 m.

Remarks. Based exclusively on de Saint Laurent's (1974) original description, this species was placed in *Sympagurus* Smith, 1883 by Lemaitre (1989), and then in *Paragiopagurus* Lemaitre, 1996 by Lemaitre (1996). However, an examination of the male holotype and only known specimen of this taxon, revealed the presence of a curved epistomial spine, a unique and defining character of *Oncopagurus*. Thus, this taxon was rightfully transferred to *Oncopagurus* by McLaughlin et al. (2010). Although the holotype is in poor shape, with the right cheliped and two ambulatory legs detached, the pleon partially torn, and missing the left first and second gonopods as well as the right antennal flagellum, it is enough to consider this taxon as a valid species, at least until the parapagurid fauna from the southern Indian Ocean is adequately sampled and can be properly evaluated.

Oncopagurus elevatus, new species

Figs. 16–19, 51

Oncopagurus n. sp. – McLaughlin et al., 2007: 310, 311 (in part), not unnumbered colour fig. (= *Paragiopagurus hirsutus* (de Saint Laurent, 1972)], unnumbered fig (See Remarks).

Oncopagurus n. sp. 1 – McLaughlin et al., 2010: 39.

Type material. Holotype, New Caledonia, SMIB 3, sta DW1, 24°55.00 S, 168°21.70 E, 513 m, 20 May 1987: M 3.8 mm (MNHN-IU-2013-5515).

Paratypes, **Taiwan:** TAIWAN 2000: sta DW 44, 22°47.2'N, 121°27.3'E, 439–350 m, 2 August 2000 (2 lots): 1 M 1.9 mm (MNHN-IU-2013-6867), 1 F 2.1 mm (NTOU A00285); sta CP 56, 24°29.8'N, 122°12.6'E, 438–539 m, 4 August 2000 (3 lots): 1 F 2.9 mm (MNHN-IU-2013-6868), 1 F 2.6 mm (NTOU A 00589), 1 F 2.7 mm (NTOU A00286). — TAIWAN 2002: sta DW 151, 22°18.34'N, 121°30.04'E, 301–356 m, 20 May 2002: 1 M 2.0 mm (NTOU). — TAIWAN 2004: sta CP 264, 24°28.07'N, 121°53.55'E, 330–297 m, 1 September 2004: 1 F 2.8 mm (NTOU); sta CP 269, 24°30.55'N, 122°5.78'E, 399–397 m, 2 September 2004: 2 F 2.3, 2.8 mm (MNHN Pg.). **Solomon Islands:** SALOMON 2: sta CP

2193, 08°23.9'S, 159°26.6'E, 362–432 m, 24 October 2004 (2 lots): 1 M 2.7 mm (MNHN Pg.), 7 M 3.0–4.3 mm, 1 ov F 2.3 mm (MNHN Pg.); sta CP 2194, 08°24.8'S, 159°26.7'E, 440–521 m, 24 October 2004: 2 M 3.7, 4.1 mm (MNHN Pg.); sta CP 2199, 07°43.1'S, 158°29.6'E, 296–304 m, 25 October 2004: 1 M 3.1 mm (MNHN Pg.); sta CP 2211, 07°35.9'S, 157°42.4'E, 313–387 m, 26 October 2004: 4 M 2.7–4.1 mm, 1 F 3.1 mm, 2 ov F 3.6, 4.2 mm (MNHN Pg.); sta CP 2212, 07°36.2'S, 157°42.45'E, 400–210 m, 26 October 2004: 2 M 3.3, 4.3 mm, 1 F 3.8 mm (MNHN Pg.);

sta CP 2226, 06°39.0'S, 156°14.3'E, 490–520 m, 28 October 2004: 1 M 3.3 mm (MNHN Pg.); sta CP 2243, 07°42.9'S, 156°27.3'E, 518–527 m, 1 November 2004: 3 M 3.3–3.4 mm (MNHN Pg.); sta CP 2288, 08°36.3'S, 157°26.5'E, 509–520 m, 7 November 2004: 1 M 3.5 mm, 1 F 3.5 mm, 3 ov F 4.0–4.7 mm (MNHN Pg.); sta CP 2289, 08°35.7'S, 157°28.5'E, 623–627 m, 7 November 2004: 1 M 4.3 mm (MNHN Pg.); sta CP 2291, 08°39.2'S, 157°26.6'E, 408–470 m, 7 November 2004: 4 M 3.1–3.3 mm, 2 ov F 2.7, 3.4 mm (MNHN Pg.). **Wallis and Futuna Islands:** MUSORSTOM 7:

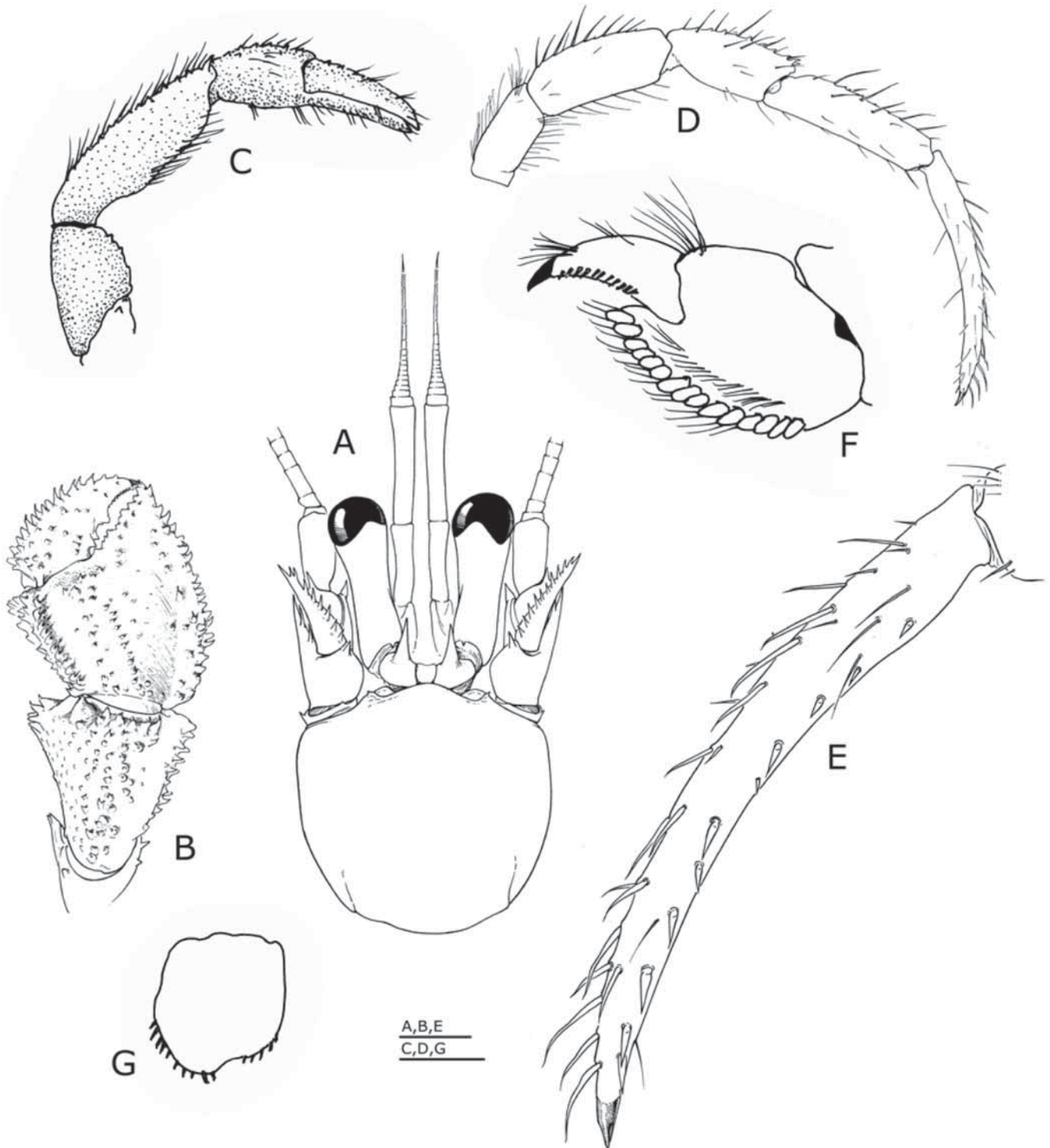


Fig. 15. *Oncopagurus curvispina* (de Saint Laurent, 1974), holotype, male 3.1 mm, Île Amsterdam, southern Indian Ocean (MNHN Pg 3183). A, shield and cephalic appendages, dorsal; B, carpus and chela of right cheliped, dorsal; C, left cheliped, mesial; D, right second ambulatory leg, lateral; E, dactyl of same, mesial; F, propodus and dactyl of left fourth pereopod, lateral; G, telson, dorsal. Scale bars = 2 mm (A); 1 mm (B, E); 2 mm (C, D); 1 mm (G). [Adapted, in part, from de Saint Laurent (1974)].

sta DW 525, 13°10.6'S, 176°14.7'W, 500–600 m, 13 May 1992: 1 M 2.0 mm (MNH-IU-2013-5519); sta DW 535, 12°29.6'S, 176°41.3'W, 330–470 m, 16 May 1992: 1 M 2.7 mm (MNHN Pg.), sta DW 556, 11°48.7'S, 178°18.0'W, 440 m, 19 May 1992: 1 F 1.7 mm (MNHN-IU-5517); sta DW 576, 12°31.0'S, 176°52.9'W, 680–685 m, 21 May 1992: 1 M 2.6 (MNHN-IU-2013-5518); sta DW 589, 12°16.2'S, 174°41.4'W, 400 m, 23 May 1992: 1 M 1.7 mm (MNHN-IU-2013-5520); sta DW 597, 12°31.4'S, 174°18.6'W, 469–475 m,

24 May 92: 1 M 2.4 mm, 1 F 2.7 mm (USNM 1207987). **Fiji:** MUSORSTOM 10: sta CP 1389, 18°18.58'S, 178°04.73'E, 241–417 m, 19 August 1998: 1 F 2.6 mm, 1 ov F 2.0 mm (MNHN Pg. 6878). **Vanuatu:** VOLSMAR, sta DW 51, 20°58.5'S, 170°03.4'E, 450 m, 4 July 1989: 2 M 2.7, 2.9 mm, 2 F 2.0, 2.1 mm (MNHN-IU-2013-5524). **Tonga Islands:** BORDAU 2: sta CP 1510, 21°05'S, 175°23'W, 461–497 m, 31 May 2000: 4 M 2.4–2.6 mm (MNHN Pg. 6708); sta DW 1606, 22°16'S, 175°20'W, 313–316 m, 16 June

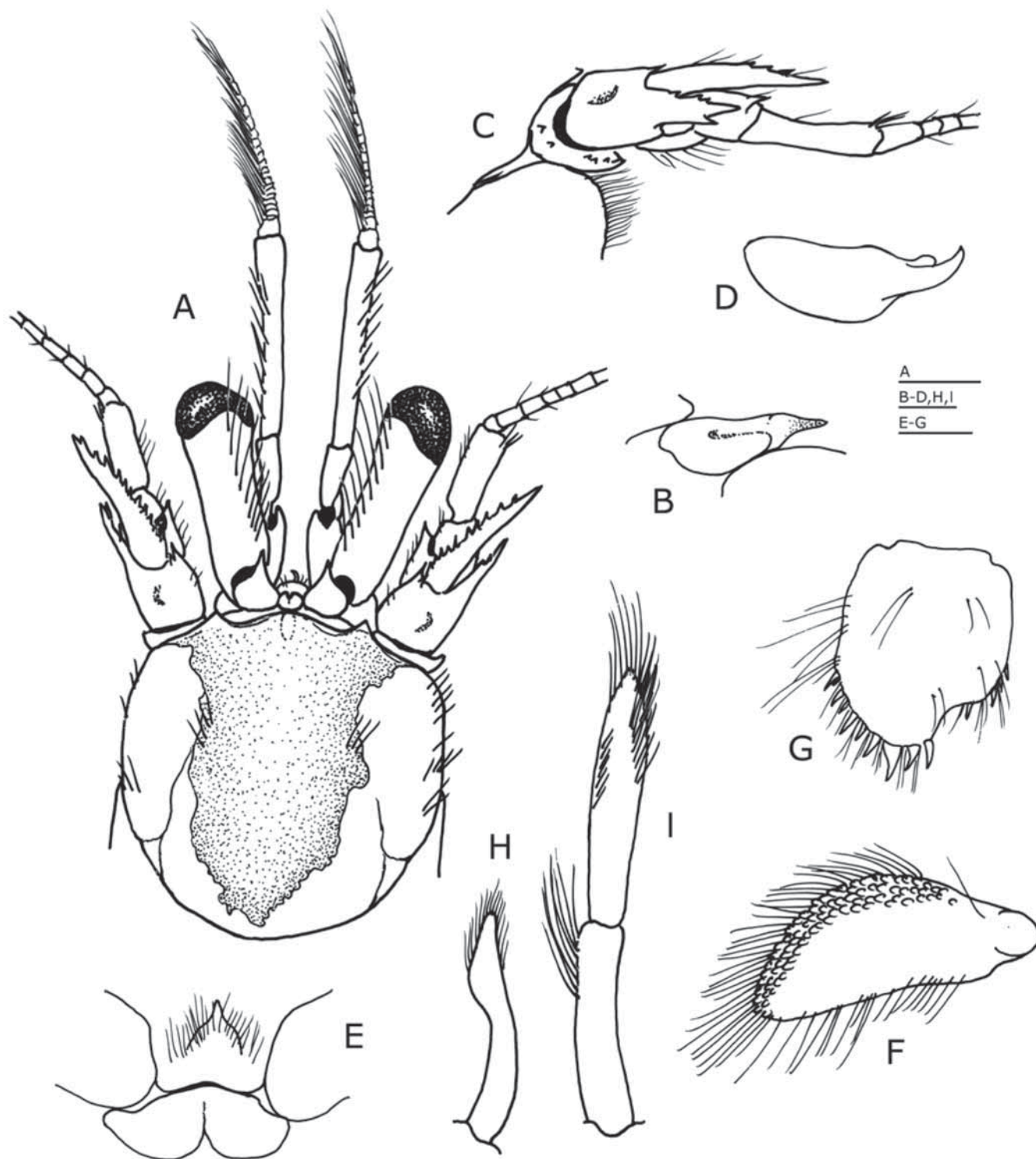


Fig. 16. *Oncopagurus elevatus*, new species, New Caledonia: A–I, holotype, male 3.8 mm, SMIB 3, sta DW 1 (MNHN-IU-2013-5515); H, paratype, male 3.2 mm, CHALCAL 2, sta DW 72 (MNHN-IU-2013-5516). A, shield and cephalic appendages, dorsal; B, right ocular acicle, lateral; C, right antennal peduncle, lateral; D, epistome, laterodorsal; E, anterior and posterior lobes of thoracic sternite XII (between second ambulatory legs), ventral; F, exopod of left uropod, dorsal; G, telson, dorsal; H, left first gonopod, mesial; I, left second gonopod, anterior. Scale bars = 1 mm (A); 0.25 mm (B, D, H, I); 0.5 mm (C, E–G).

2000: 1 M 2.2 mm (MNHN Pg. 6709). **New Caledonia:** BIOCAL: sta DW 66, 24°55.43 S, 168°21.67 E, 505–515 m, 3 September 1985: 1 M 2.2 mm (MNHN-IU-2013-5523). — MUSORSTOM 5: sta DW 301, 22°06.90'S, 159°24.60'E, 487–610 m, 12 October 1986: 1 ov. F 1.6 mm (MNHN-IU-2013-5525). — CHALCAL 2: sta CC1, 24°54.96'S, 168°21.91'E, 500–580 m, 28 October 1986: 1 M 2.8 mm (MNHN-IU-2013-5521); sta CC2, 24°55.48'S, 168°21.29'E, 500–610 m, 28 October 1986: 1 M 2.4 mm, 1 F 3.1 mm (USNM 1207988); sta DW 72, 24°54.50'S, 168°22.30'E, 527 m, 28 October 1986 (2 lots): 4 M 2.2–2.7 mm, 2 F 2.0, 2.4 mm (USNM 1207989), 5 M 2.7–3.2 mm, 4 F 3.0–3.2 mm (MNHN-IU-2013-5516); sta DW 75, 24°39.31'S, 168°39.67'E, 600 m, 29 October 1986: 1 M 2.8 mm (MNHN-IU-2013-5522). — SMIB 3: sta DW 1, 24°55.70'S, 168°21.80'E, 520 m, 20 May 1987: 2 M 2.7, 3.7 mm, 2 F 2.2, 2.3 mm, 2 ov F 3.0, 3.1 mm (MNHN-IU-2013-5514); sta DW 2, 24°53.40'S, 168°21.70'E, 530 m, 20 May 1987: 2 M 2.9, 3.3 mm, 1 ov F 2.8 mm (MNHN-IU-2013-5527); sta DW 3, 24°55.00'S, 168°21.70'E, 513 m, 20 May 1987: 1 M 2.7 mm, 1 ov F 2.6 mm (USNM 1207990); sta DW 5, 24°54.90'S, 168°21.60'E, 502 m, 21 May 1987 (2 lots): 2 ov F 1.5, 2.6 mm (MNHN-IU-2013-5526), 1 ov. F 2.8 mm (USNM 1207991); sta DW 6, 24°56.40'S, 168°21.20'E, 505 m, 21 May 1987: 2 M 3.1, 3.2 mm, 1 ov F 2.5 mm (USNM 1207992). — SMIB 4: sta DW 36, 24°55.60'S, 168°21.70'E, 530 m, 7 March 1989: 1 F 2.7 mm (MNHN-IU-2013-5529); sta DW 38, 24°54.50'S, 168°22.00'E, 510 m, 7 March 1989: 1 F 2.4 mm (USNM 1207993); sta DW 55, 23°21.40'S, 168°04.50'E, 260 m, 9 March 1989: 1 M 2.5 mm (MNHN-IU-2013-5528). — BERYX 11: sta DW 10, 24°53.15'S, 168°21.60'E, 560–600 m, 1992: 1 ov F 3.0 mm (MNHN Pg. 6700); sta DW 11, 24°44.75'S, 168°09.90'E, 350–615 m, 1992: 1 M 3.6 mm (MNHN Pg. 6701). — SMIB 8: sta DW 147, 168°21.85'S, 24°54.90'E, 508–532 m, 27 January 1993: 2 M 2.7, 3.0 mm, 1 F 2.2 mm (MNHN Pg.); sta DW 149, 24°54.94'S, 168°21.82'E, 508–510 m, 27 January 1993: 1 F 2.0 mm (MNHN Pg.); sta DW 152, 24°54.35'S, 168°22.23'E, 514–530 m, 27 January 1993 (3 lots): 2 M 2.8, 2.9 mm, 3 F 2.2–2.8 (MNHN Pg. 6702), 2 F 2.7, 2.8 mm (MNHN Pg. 6703), 1 F 2.4 mm (MNHN Pg. 6704); sta DW 153, 24°53.55'S, 168°21.33'E, 547–560 m, 27 January 1993: 2 F 2.5, 3.2 mm (MNHN Pg. 6705). — SMIB 10: sta DW 203, 24°56'S, 168°22'E, 508–502 m, 10 January 1995: 2 M 2.3, 2.7 mm, 1 F 2.8 mm (MNHN Pg. 6706); sta DW 204, 24°57'S, 168°21'E, 513–553 m, 10 January 1995: 1 F 2.4 mm (MNHN Pg. 6707). — LITHIST: sta CP 8, 24°54.24'S, 168°21.35'W, 540 m, 11 August 1999: 7 M 2.6–2.9 mm (MNHN Pg. 6710). — NORFOLK 1: sta DW 1688, 24°55.621'S, 168°22.038 E, 533–545 m, 23 June 2001: 2 ov F 2.4, 3.1 mm (MNHN Pg. 6712); sta DW 1692, sta DW 1692, 24°56'S, 168°21'E, 507–967 m, 23 June 2001: 1 M 2.8 mm (MNHN Pg. 6713); sta DW 1698, 24°40.186'S, 168°39.545'E, 562–576 m, 23 June 2001: 1 ov F 3.4 mm (MNHN Pg. 6711). — NORFOLK 2: sta DW 2081, 25°54.40'S, 168°21.64'E, 500–505 m, 28 October 2003: 1 F 1.8 mm, 1 ov F 2.2 mm (MNHN Pg.). — EBISCO: sta CP 2540, 22°16'S, 159°26'E, 323–331 m, 10 October 2005: 1 ov F 2.2 mm (MNHN Pg.); sta DW 2629, 21°06'S, 160°46'E, 569–583 m, 21 October 2005: 1 F 1.6 mm (MNHN Pg.). **French Polynesia:** BENTHAUS: sta DW 1897, 27°34.27'S, 144°26.68'W, 480–700 m, 8 November 2002: 1 ov F 3.2 mm (MNHN Pg. 6714).

Description. Gills biserial. Shield (Fig. 16A) about as long as broad; dorsal surface weakly calcified medially (weak calcification often reaching to anterior margin), with scattered short setae; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; anterior margins weakly concave; lateral projections subtriangular, terminating in small spine; anterolateral margins sloping; posterior margin broadly rounded; ventrolateral margins of shield usually with

slender spine on one or both sides. Anterodistal margin of branchiostegite rounded, unarmed, setose.

Ocular peduncles (Fig. 16A) more than half length of shield; with longitudinal row of long setae dorsally; lateral and ventral faces usually weakly calcified. Cornea weakly dilated. Ocular acicles (Fig. 16B) subtriangular, each terminating in strong spine; separated basally by about basal width of 1 acicle.

Antennular peduncle (Fig. 16A) long, slender, exceeding distal margin of cornea by nearly full length or ultimate segment. Ultimate segment nearly twice as long as penultimate segment, with row of setae dorsally. Basal segment with strong ventromesial spine; lateral face with distal subrectangular lobe armed with small spine, and strong spine proximally. Ventral flagellum with 5 or 6 articles.

Antennal peduncle (Fig. 16A, C) at most reaching distal margin of cornea. Fifth segment unarmed except for scattered setae and laterodistal tuft of setae. Fourth segment armed with strong dorsodistal spine. Third segment with strong ventromesial distal spine. Second segment with dorsolateral distal angle produced, terminating in strong, simple spine and additional 1–3 small spines dorsally and ventrally; mesial margin with 1 or 2 spines on dorsodistal angle. First segment with lateral face armed with 1–3 small spines; ventromesial angle produced, with 2 or 3 small blunt spines laterally. Antennal acicle nearly straight (in dorsal view), not reaching distal margin of cornea, terminating in strong spine; mesial margin armed with 8–13 small spines, sparsely setose. Flagellum long, slightly exceeding extended right cheliped, articles with setae < 1–3 flagellar articles in length.

Mandible (Fig. 17A) with 3-segmented palp; cutting edge calcified, with small tooth medially; molar process with small corneous tooth medially. Maxillule (Fig. 17B) with external lobe of endopod slender, moderately developed, not recurved, internal lobe with long, terminal seta. Maxilla (Fig. 17C) with endopod exceeding distal margin of scaphognathite. First maxilliped (Fig. 17D) with endopod slightly exceeding exopod in distal extension. Second maxilliped (Fig. 17E) without distinguishing characters. Third maxilliped (Fig. 17F, G) with merus to dactyl each distinctly longer than broad, ischium about twice as long as broad; crista dentata with about 6 sharp teeth diminishing in strength distally and row of minute teeth distally; basis with mesial spine; coxa lacking spine. Sternite of third maxillipeds unarmed or with small spine on each side of midline.

Chelipeds markedly dissimilar; dorsal surfaces of meri, carpi and propodi with some iridescence. Right cheliped (Fig. 18A–E) massive; carpus and chela with moderately dense setae on all surfaces except for dense plumose setae on dorsal surfaces of fingers. Fingers curved ventromesially, terminating in small, usually blunt corneous claw; cutting edges with 2 or 3 large and several small calcareous teeth. Dactyl in males longer than mesial margin of palm or in females about as long as mesial margin of palm, set at strongly oblique angle to longitudinal axis of palm; mesial

margin broadly curved, well delimited by row of strong spines diminishing in size distally; dorsal face with scattered small spines or tubercles proximally; ventral face with distinct median longitudinal ridge with or without small blunt spines or tubercles; ventromesial face concave. Fixed finger broad at base, dorsal face at most with scattered small tubercles, lateral margin well delimited by row of spines; ventral face with distinct median longitudinal ridge having scattered

minute tubercles, ventrolateral face concave. Palm varying in shape with size and sex, longer than broad in males (Fig. 18A, D) or broader than long in females (Fig. 18E); dorsal surface with well-spaced, small tubercles medially; dorsolateral margin sharply delimited by row of strong, distally upturned spines, dorsomesial margin delimited by row of small spines or tubercles; dorsomesial face sloping inwardly; ventromesial face elevated as broad, rounded ridge

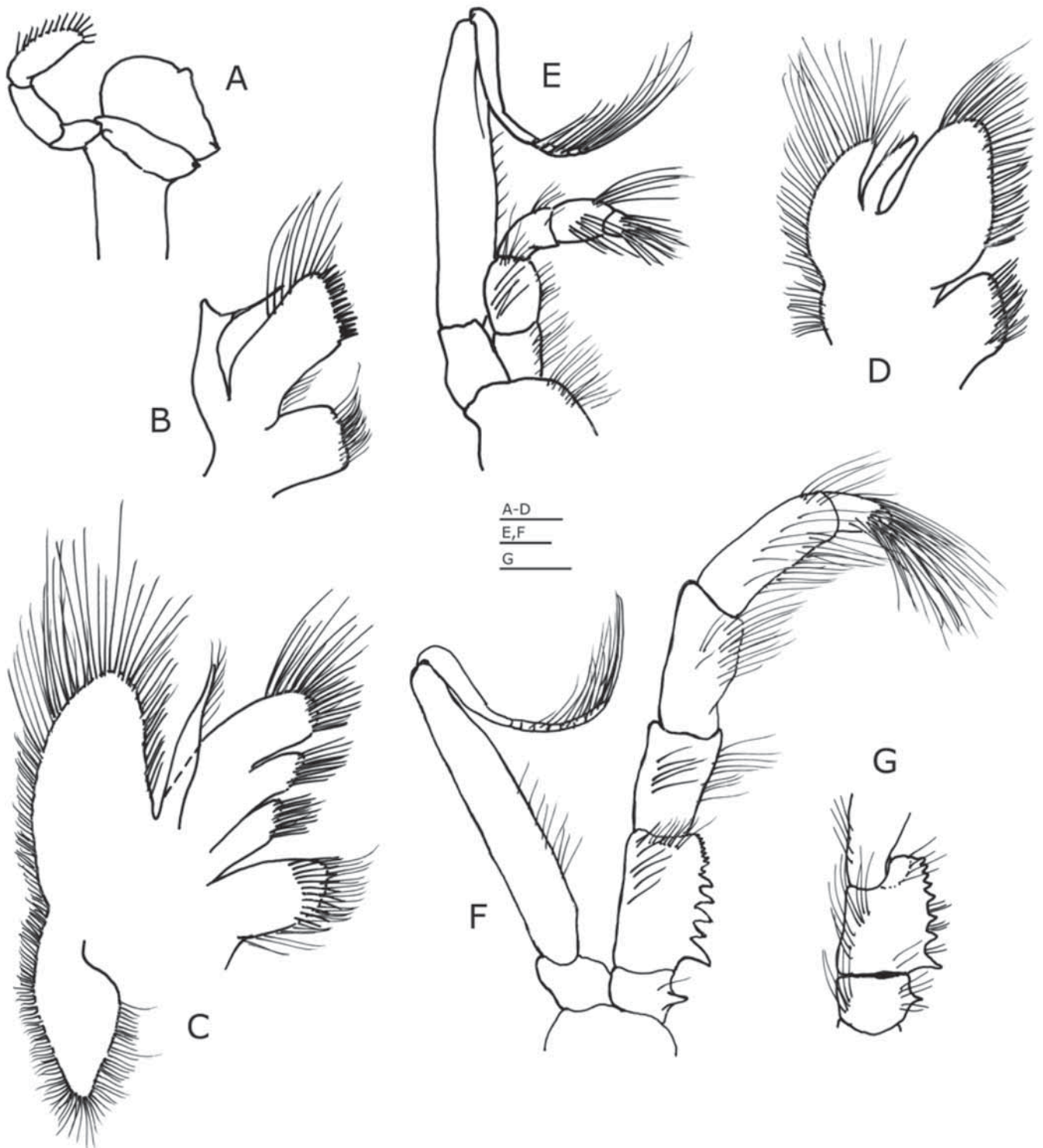


Fig. 17. *Oncopagurus elevatus*, new species, paratype, ov female 3.1 mm, New Caledonia, SMIB 3, sta DW 1 (MNHN-IU-2013-5514). Left mouthparts, internal: A, distal half of mandible; B, maxillule; C, maxilla; D, first maxilliped; E, second maxilliped; F, third maxilliped; G, ischium and crista dentata of same. Scale bars = 0.25 mm (A-F), 0.5 mm (G).

with few small tubercles, and projecting distally near base of dactyl; ventral surface (Fig. 18D, E) naked and smooth except for prominent median elevation armed with cluster of small blunt spines or small tubercles; ventrolateral surface concave. Carpus with dorsolateral margin usually well delimited by row of small spines; dorsodistal margin with row of small spines; dorsal face with numerous small spines or tubercles; ventromesial and ventrolateral margins prominently elevated, each with row of spines; ventral face between ventromesial and ventrolateral margins concave, with scattered small tubercles or spines. Merus with moderately dense setae;

with scattered small tubercles on dorsal face; ventromesial margin with row of spines; ventrolateral margin with row of small spines or tubercles. Ischium with ventromesial row of small, blunt spines. Coxa with ventromesial row of setae; ventral face with few small tubercles and ventrodiscal row of small spines.

Left cheliped (Fig. 18F) usually weakly calcified on dorsolateral face of carpus. Fingers each terminating in small corneous claw; dorsal and ventral surfaces unarmed except for scattered tufts of setae; cutting edge of dactyl

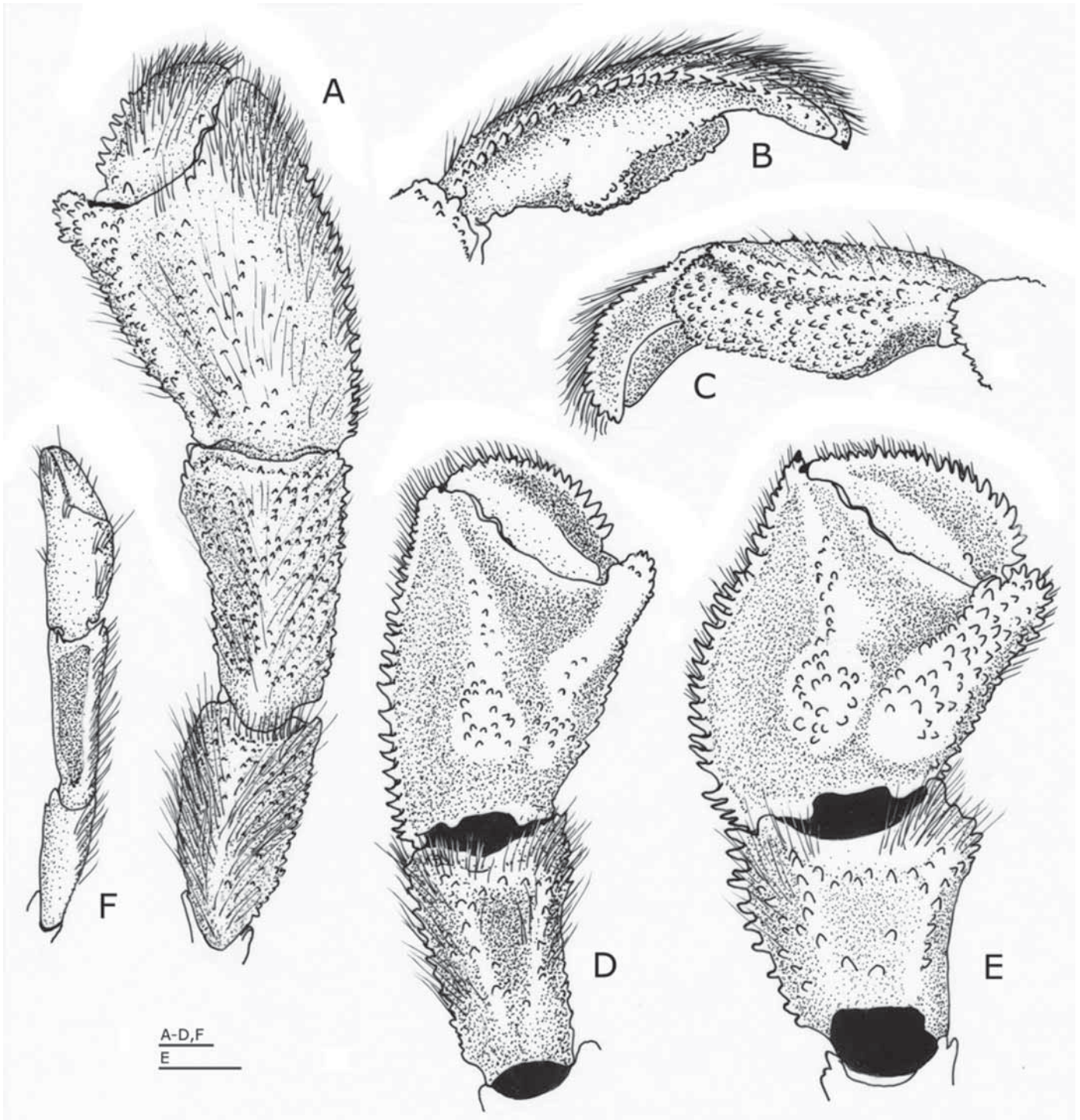


Fig. 18. *Oncopagurus elevatus*, new species, A–D, F, holotype, male 3.8 mm, SMIB 3, sta DW 1 (MNHN-IU-2013-5515); E, paratype, female 3.0 mm, CHALCAL 2, sta DW 72 (MNHN-IU-2013-5516). A, right cheliped, dorsal; B, C, chela of same, lateral (B), mesial (C); D, E, carpus and chela, ventral; E, carpus and chela. Scale bars = 1 mm.

with row of minute, fused corneous teeth; cutting edge of fixed finger with row of well-spaced small calcareous teeth. Dactyl about same length of mesial margin of palm. Palm unarmed except for dorsomesial and dorsolateral setae and row of 2 or 3 dorsomesial tubercles; ventral face smooth. Carpus with dorsodistal and small ventrodistal spines; dorsal margin with long setae; ventral face smooth. Merus with long setae on dorsal margin; with ventrolateral row of small spines; ventral face smooth. Ischium and coxa unarmed, but with ventromesial row of setae.

Ambulatory legs (Fig. 19A–D), similar right from left except for longer meri on right, extending to about tip of dactyls of right cheliped or slightly exceeding them. Dactyls broadly curved, about 1.6 times as long as propodi, and terminating in sharp corneous claws; each with dorsal and dorsomesial distal rows of long setae, and 8–11 minute spinules on ventromesial margin. Propodi each with row of setae on dorsal margin; ventral margin with few setae and 0–3 minute distal spinules. Carpi each with small dorsodistal spine, and few setae dorsally and ventrally. Meri with dorsal margins unarmed (left side) or with 1 or 2 small spines on proximal half (right side); with 1 or 2 small ventrodistal spines on second pereopod. Ischia with small dorsodistal spine, and ventrodistal tufts of setae. Coxae with 1 or 2 small spines ventrodistally, and ventromesial row of setae. Anterior lobe of sternite XII (between second ambulatory legs, Fig. 16E), setose, with subdistal distinct spine.

Fourth pereopod (Fig. 19E) semichelate. Dactyl terminating in sharp corneous claw; with ventrolateral row of small corneous spinules. Propodus longer than broad, rasp with 1 row of rounded scales at least distally. Carpus with long setae on dorsal margin. Merus with rows of long setae on dorsal and ventral margins. Coxa with anteroventral row of setae. Anterior lobe of sternite XIII (between fourth pereopods) with row of setae.

Fifth pereopod (Fig. 19F) semichelate. Propodal rasp extending to mid-length of segment. Coxa with row of long setae on anteroventral and ventrodistal margins.

Uropods and telson (Fig. 16F, G) markedly asymmetrical. Telson lacking transverse suture; dorsal surface with scattered setae; left lateral margin with long setae; posterior lobes separated by shallow unarmed, U-shaped cleft; terminal margin of left lobe armed with about 10 mostly long, often strongly curved corneous spines, terminal margin of right lobe armed with small spines.

Males usually without paired first gonopods, and with paired second gonopods. First gonopod (Fig. 16H), when present, with distal portion subtriangular and with row of short bristles on distal margin. Second gonopod (Fig. 16I) with distal segment more or less flat and distally subtriangular, with short setae medially on lateral margin, and long setae distally and distomesially; proximal segment with long setae distomesially. Females with vestigial second right pleopod.

Variations. The presence of second gonopods in males is variable, and their presence seems unrelated to size or maturity of the individuals. Approximately 25% of the specimens examined lack second gonopods.

Colouration. Unknown in life. Many of the preserved specimens examined still had colour patterns visible on the chelipeds and ambulatory legs. On the right cheliped, the merus with a pair of orange patches distally on the dorsal surface; the carpus with the dorsal surface having a pair of similarly coloured patches proximally, and a similar colouration on the distal half. On the left cheliped, the carpus and palm with an orange colouration proximally on the dorsal surface. On the ambulatory legs, the meri, carpi and propodi also have an orange colouration proximally.

Habitat. Gastropod shells.

Distribution. Known from the western and south Pacific, in Taiwan, and from the Solomon to the Tonga Islands, including French Polynesia. Depth: 210–967 m.

Remarks. In their catalog of the hermit crabs from Taiwan, McLaughlin et al. (2007) included under “*Oncopagurus* n. sp.” two specimens from stations CP 56 and DW 151. The specimen on the colour photograph (unnumbered figure, p. 310) and the one illustrated (unnumbered figure, p. 311) are not the same or from the same station. The specimen shown in the colour photograph on p. 310 is actually *Paragiopagurus hirsutus* (de Saint Laurent, 1972), from station CP56 as indicated therein. The specimen illustrated in the unnumbered figure on page 311 does represent *O. elevatus*, new species, and is actually from station DW 151.

As pointed out by McLaughlin et al. (2007) who reported this new species as “*Oncopagurus* n. sp.”, it is most similar to *O. glebosus*. The two species can be separated primarily using characters derived from the ocular acicles, right chela, and ambulatory legs. The spine on the ocular acicle in *O. elevatus*, new species, is marginal (Fig. 16B), although McLaughlin et al. (2007: 311) considered the spine to be “indistinctly submarginal”. In *O. glebosus* the acicular spine is clearly submarginal (Fig. 24B), although in some small specimens it appears that the acicle is not fully developed and thus the spine can be considered indistinctly submarginal. The morphology of the ventral faces of the fingers and palm of the right cheliped in these two species is similar in having a distinct longitudinal ridge on each finger, and a prominent median elevation on the palm. In the new species, the ridges on the fingers are unarmed, whereas in *O. glebosus* the ridges are armed with low tubercles; in this new species, the median elevation of the palm (Fig. 18E, F) is armed with small spines or tubercles, whereas in *O. glebosus* it is armed with low, larger tubercles (Fig. 24D). Although the degree of development of the distal angle of the ventromesial face of the right palm is variable in this new species, the angle is usually prominent and projects distally over the base of the dactyl, whereas in *O. glebosus* the distal angle does not project distally. In *O. elevatus*, new species, the armature of the ventral margin of the dactyl of

the ambulatory legs consists of 8–11 spinules, whereas in *O. glebosus* the margin has 1–5 spinules. Also, in *O. elevatus*, new species, the anterior lobe of sternite XII (Fig. 16E) has a strong subdistal spine, whereas in *O. glebosus* the lobe is unarmed or at most has a weak spine.

Etymology. The specific name is derived from the Latin *elevatus*, meaning elevation, and makes reference to the tuberculate elevations on the ventral surface of the right palm in this new species.

Oncopagurus elongatus, new species

Figs. 20–23, 51

Oncopagurus n. sp. 3 – McLaughlin et al., 2010: 39.

Type material. Holotype, Vanuatu, MUSORSTOM 8, sta CP 1080, 15°57.30'S, 167°27.73'E, 799–850 m, 5 October 1994: F 4.0 mm (MNHN-IU-2013-5497).

Paratypes, **Fiji**: MUSORSTOM 10, sta CP 1361, 18°00.00'S, 178°53.71'E, 1058–1091 m, 13 August 1998: 1 M 3.0 mm

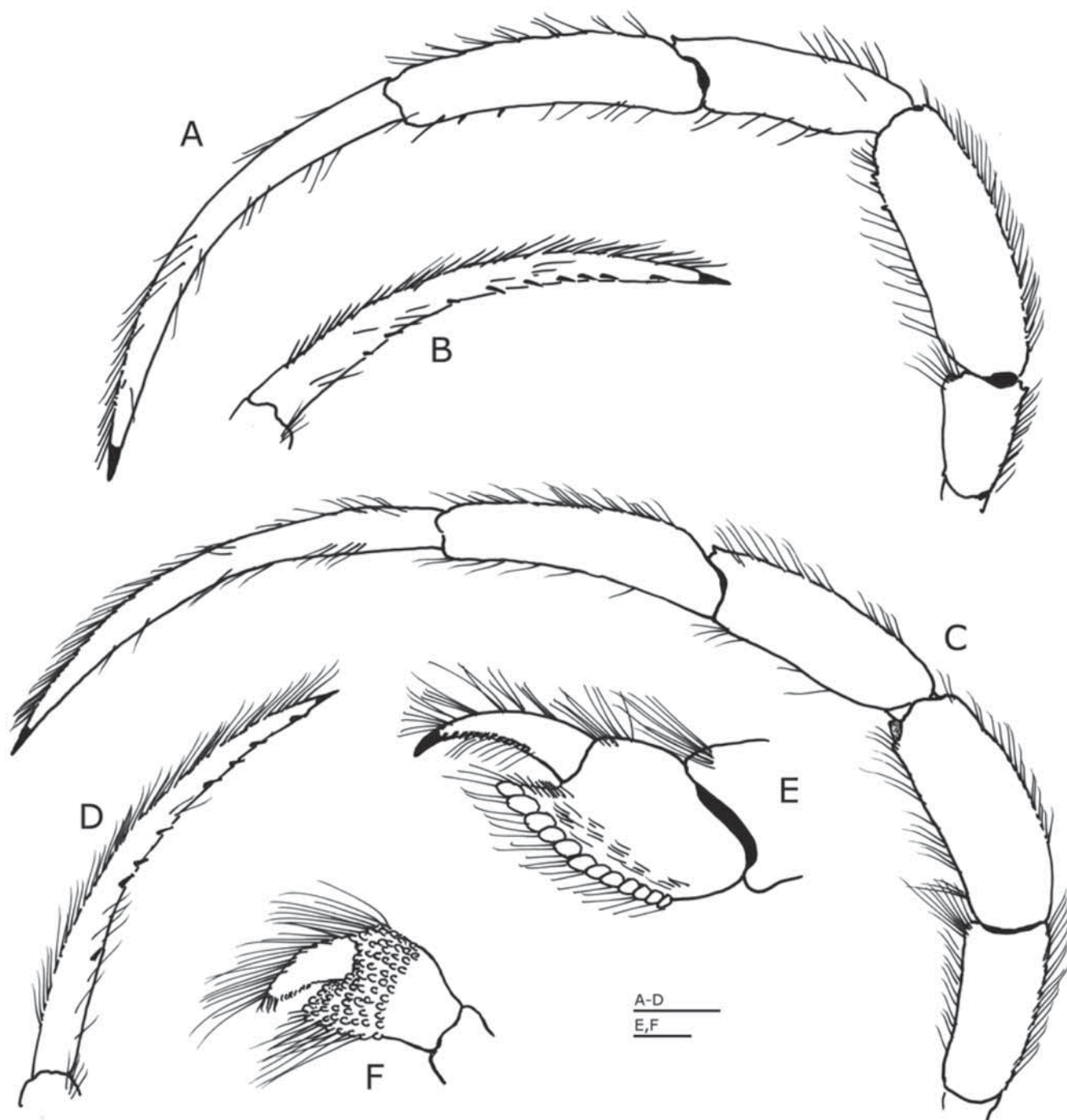


Fig. 19. *Oncopagurus elevatus*, new species, holotype, male 3.8 mm, SMIB 3, sta DW 1 (MNHN-IU-2013-5515. A, left first ambulatory leg, lateral; B, dactyl of same, mesial; C, left second ambulatory leg, lateral, D, dactyl of same, mesial; E, propodus and dactyl of left fourth pereopod, lateral; F, propodus and dactyl of left fifth pereopod, lateral. Scales bar = 1 mm (A–D); 0.25 mm (E, F).

(MNHN-IU-2013-5510, ex MNHN Pg. 6722). — BORDAU 1, sta CP 1490, 18°50.60'S, 178°32.13'W, 785–820 m, 11 March 1999: 1 M 3.6 mm (USNM 1207994, ex MNHN Pg. 6720). **Vanuatu:** MUSORSTOM 8, sta CP 1080, 15°57.30'S, 167°27.73'E, 799–850 m, 5 October 1994: 2 F 3.7, 3.9 mm (MNHN-IU-5498). **Tonga Islands:** BORDAU 2, sta CP 1565, 20°58'S, 175°16'W, 869–880 m, 9 June 2000: 2 M 3.0, 3.4 mm, 2 F 2.6, 2.8 mm, 4 ov F 3.1–3.3 mm (MNHN-IU-2013-5509, ex MNHN Pg. 6721). **French Polynesia, Austral Islands:** BENTHAUS: sta DW 1933, Thiers Bank, 24°40.72'S, 146°01.31'W, 500–850 m, 14 November 2002: 1 M 2.8 mm (USNM 1207995, ex MNHN Pg. 6723); sta DW 2020, Rimatara, 22°36.96'S, 152°49.13'W, 920–930 m, 25 November 2002: 1 M 3.0 mm, 2 F 2.3, 2.9 mm (MNHN-IU-2013-5508, ex MNHN Pg. 6724).

Description. Gills biserial to weakly quadriserial. Shield (Fig. 20A) about as broad as long; dorsal surface weakly calcified medially and sometimes also near anterior margin, with scattered short setae; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; anterior margins weakly concave; lateral projections bluntly subtriangular; anterolateral margins sloping; posterior margin broadly rounded; ventrolateral margins of shield usually without spine. Anterodistal margin of branchiostegite rounded, unarmed, setose.

Ocular peduncles (Fig. 20A, B) about half length of shield, diminishing in width distally, somewhat inflated and weakly calcified ventroproximally; with longitudinal row of long setae dorsally extending to edge of cornea and forming “eye-brow”; ventroproximal surface weakly calcified. Cornea reduced, not dilated, about as wide as distal width of peduncle. Ocular acicles subtriangular, each terminating in strong spine; separated basally by about half basal width of 1 acicle.

Antennular peduncle (Fig. 20A, C) long, slender, exceeding distal margin of cornea by 0.7 length of penultimate segment. Ultimate segment about twice as long as penultimate segment, with scattered setae dorsally. Basal segment with strong ventromesial spine; lateral face with distal subrectangular lobe unarmed or with small spine and setae, and strong spine proximally. Ventral flagellum with 5 or 6 articles.

Antennal peduncle (Fig. 20A, C) exceeding distal margin of cornea by about 0.3–0.5 length of fifth segment. Fifth segment unarmed except for scattered setae and distolateral tufts of setae. Fourth segment with dorsodistal spine. Third segment with strong ventromesial distal spine. Second segment with dorsolateral distal angle produced, terminating in simple spine; mesial margin with spine on dorsodistal angle. First segment with lateral face unarmed or with small spine; ventromesial angle produced, with 2 or 3 small blunt spines laterally. Acicle nearly straight (in dorsal view), exceeding distal margin of cornea by about 0.1–0.2 length of acicle, terminating in strong spine; mesial margin armed with 8–13 spines, setose. Flagellum long, slightly exceeding extended right cheliped, articles with long setae 3 or 4 flagellar articles

in length every 3 or 4 articles, and scattered short setae < 1 article in length.

Mandible (Fig. 21A) with 3-segmented palp; cutting edge calcified, with small corneous tooth medially; molar process with small corneous tooth medially. Maxillule (Fig. 21B) with external lobe of endopod obsolete, internal lobe with long, terminal seta. Maxilla (Fig. 21C) with endopod exceeding distal margin of scaphognathite. First maxilliped (Fig. 21D) with endopod exceeding exopod in distal extension. Second maxilliped (Fig. 21E) without distinguishing characters. Third maxilliped (Fig. 21F, G) with merus to dactyl each distinctly longer than broad, ischium less than twice as long as broad; crista dentata with about 13–15 often corneous-tipped teeth diminishing in size distally; basis with mesial spine; coxa lacking spine. Sternite of third maxillipeds with small spine on each side of midline.

Chelipeds markedly dissimilar. Right cheliped (Fig. 22A–D) with chela operculate, having moderately dense setae on dorsal surfaces of carpus and chela. Fingers curved ventromesially, terminating in small, usually blunt corneous claw; cutting edges each with 3 (dactyl) or 2 (fixed finger) large calcareous teeth. Dactyl about as long as mesial margin of palm, set at oblique angle to longitudinal axis of palm; mesial margin broadly curved, well defined by row of blunt or sharp spines diminishing in size distally; dorsal face with scattered small tubercles and small spines proximally; ventromesial face moderately concave, smooth. Fixed finger broad at base, dorsal and ventral faces smooth. Palm broader than long, dorsal surface with scattered small spines or tubercles medially; dorsolateral margin sharply delimited by row of spines, dorsomesial margin with row of spines; mesial face rounded (Fig. 22B), or in females often concave and expanded distomesially and with well delimited ventromesial margin (Fig. 22D), with scattered small tubercles; ventral surface nearly smooth or at most with scattered small tubercles. Carpus distinctly longer than broad; dorsal surface with numerous small spines or tubercles; dorsolateral and dorsomesial margins rounded; ventromesial margin well defined by row of spines; ventral face with scattered small tubercles. Merus with numerous small spines on dorsal surface; ventromesial margin with row of spines. Ischium with dorsal row of setae. Coxa unarmed, but with ventromesial row of setae.

Left cheliped (Fig. 22E) usually weakly calcified on dorsolateral face of carpus and lateral face of merus. Fingers terminating in small corneous claw; dorsal and ventral surfaces unarmed except for scattered tufts of setae; cutting edge of dactyl with row of minute, fused corneous teeth; cutting edge of fixed finger with row of well-spaced small calcareous teeth. Dactyl slightly shorter or subequal in length to mesial margin of palm. Palm unarmed except for dorsomedian row of 2 or 3 small spines or tubercles, and sparse setae; ventral face smooth. Carpus with small dorsodistal spine; dorsal margin with long setae; ventral face smooth. Merus with long setae on dorsal margin; ventral face smooth. Ischium and coxa unarmed, but with ventromesial row of setae.

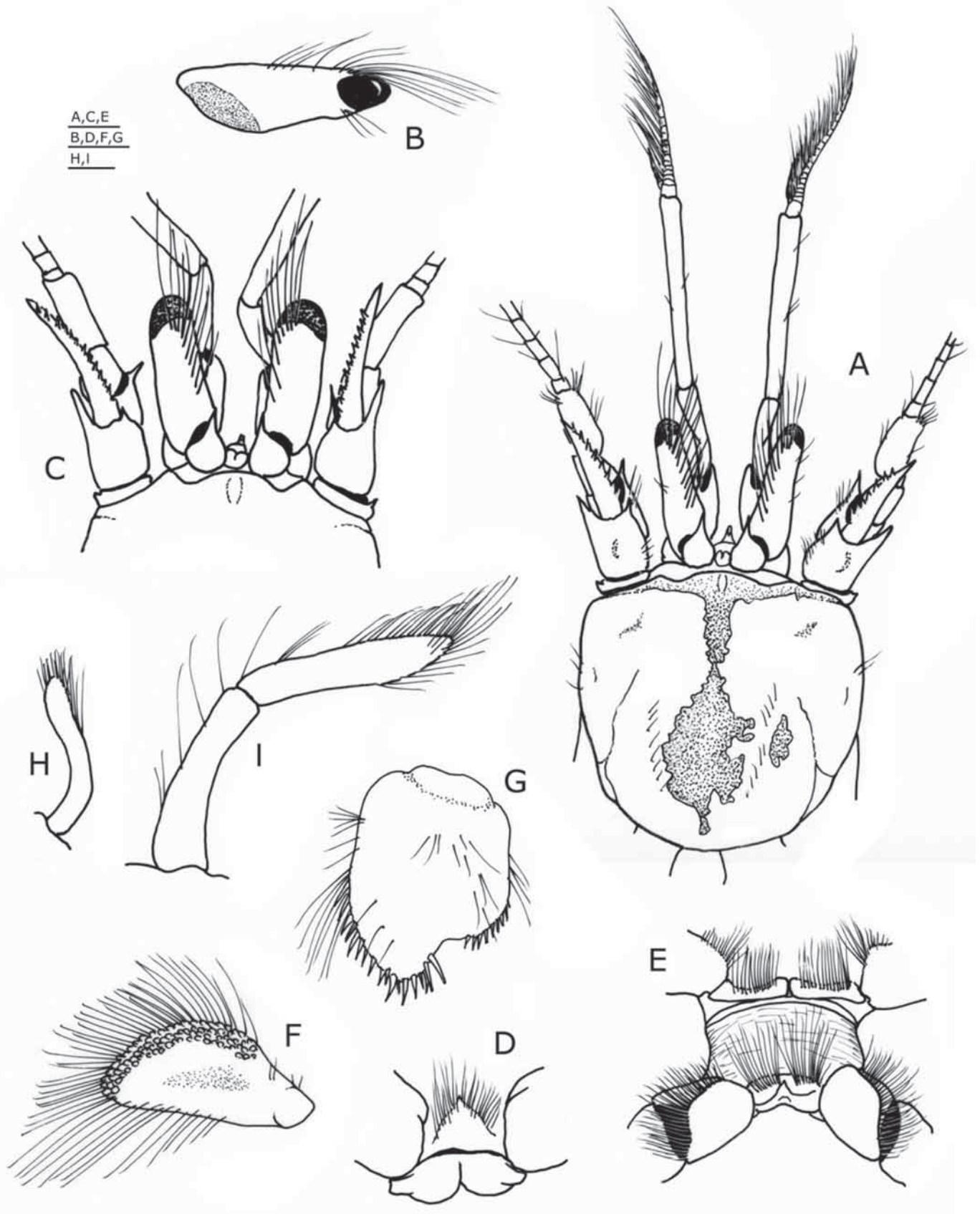


Fig. 20. *Oncopagurus elongatus*, new species: A, B, D–G, holotype, female 4.0 mm, Vanuatu, MUSORSTOM 8, sta CP 1080 (MNHN-IU-2013-5497); C, H, I, paratype, male 3.0 mm, French Polynesia, BENTHAUS, sta DW 2020 (MNHN-IU-2013-5508, ex MNHN Pg 6724). A, shield and cephalic appendages, dorsal; B, right ocular peduncle, lateral; C, anterior portion of shield and cephalic appendages, dorsal; D, anterior and posterior lobes of sternite XII (between second ambulatory legs); E, sternites XIII and XIV, and coxae of fourth and fifth pereopods, ventral; F, exopod of left uropod, dorsal; G, telson, dorsal; H, left first gonopod, mesial; I, left second gonopod, anterior. Scale bars = 1 mm (A, C); 0.5 mm (D, B, E–G); 0.25 mm (H, I).

Ambulatory legs (Fig. 23A–D) similar right from left except for longer meri on right; exceeding extended right cheliped by about 0.2 length of dactyls. Dactyl broadly curved, about 1.6 times as long as propodus, and terminating in sharp corneous claw; with dorsal and dorsomesial distal rows of long setae, and ventromesial row of about 4–7 slender, corneous spinules. Propodus with row of setae on dorsal margin, and naked or with scattered setae elsewhere. Carpus with long setae dorsally, small dorsodistal spine, and often 1 or 2 small well-spaced spines on dorsal margin. Merus with long setae dorsally, often with row of 3 or 4 small, well-spaced spines on dorsal margin. Ischium unarmed except for setae on dorsal and ventral margins. Coxa with ventromesial row of setae. Anterior lobe of sternite XII (between second ambulatory legs, Fig. 20D) subsemicircular, setose, with distinct spine.

Fourth pereopod (Fig. 23E, F) semichelate. Dactyl slender, 2.0–2.5 times as long as dorsal margin of propodus, distinctly longer and slenderer in females than in males, broadly curved and terminating in sharp corneous claw; with ventrolateral row of small corneous spinules. Propodus longer than broad, rasp with 1 row of rounded scales at least distally. Carpus with long setae on dorsal margin. Merus with rows of long setae on dorsal and ventral margins. Coxa with anteroventral row of setae. Anterior lobe of sternite XIII (between fourth pereopods, Fig. 20E) with dense row of long setae.

Fifth pereopod (Fig. 23G) semichelate. Propodal rasp extending to mid-length of segment. Coxa with dense row of long setae on anteroventral and distoventral margins. Anterior lobe of sternite XIV (fifth pereopods, Fig. 20E) with dense row of long setae.

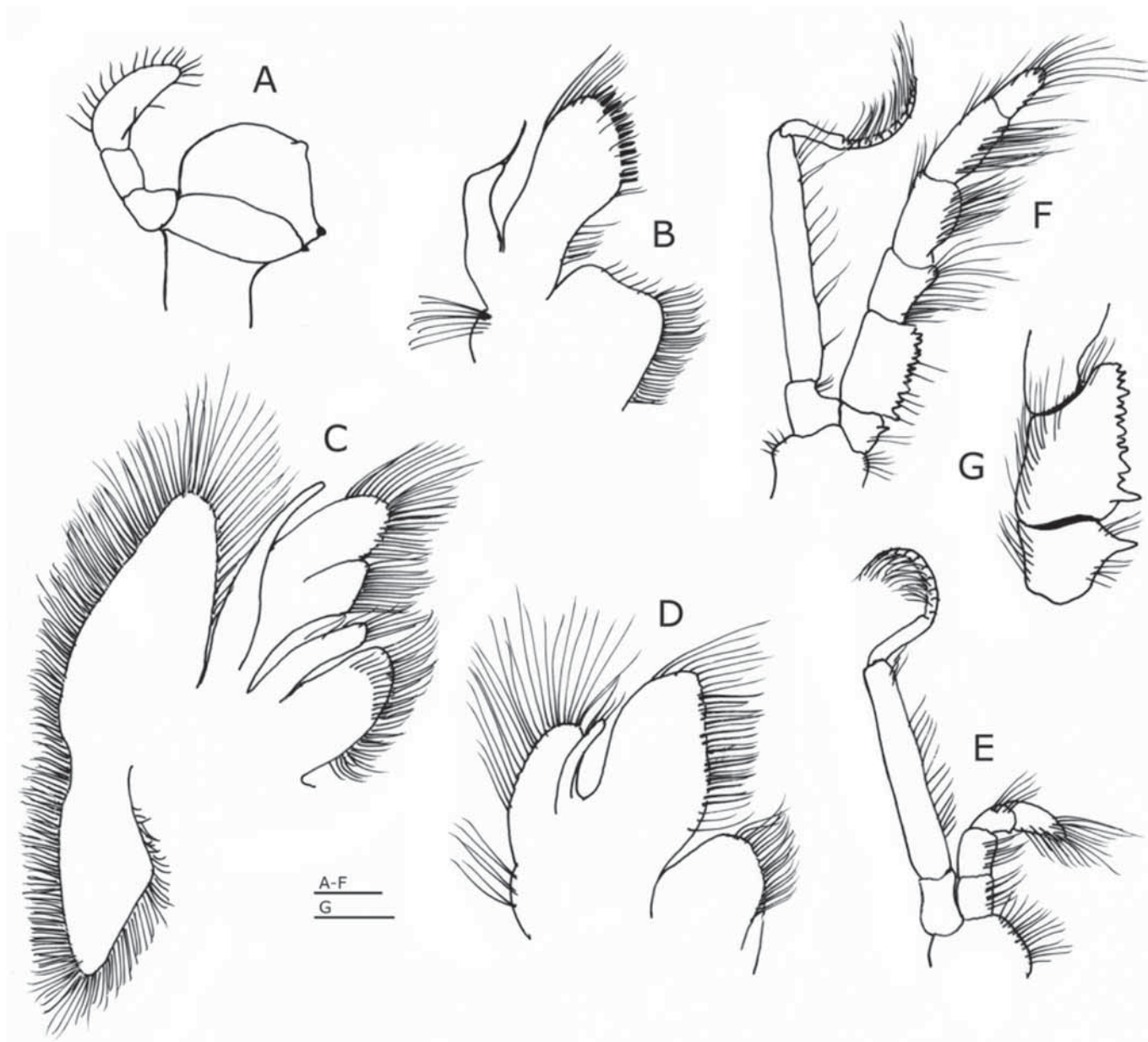


Fig. 21. *Oncopagurus elongatus*, new species, paratype, male 3.0 mm, French Polynesia, BENTHAUS, sta DW 2020 (MNHN-IU-2013-5508, ex MNHN Pg 6724). Left mouthparts, internal: A, distal half of mandible; B, maxillule; C, maxilla; D, first maxilliped; E, second maxilliped; F, third maxilliped; G, ischium and crista dentata of same. Scale bars = 0.25 mm (A–D); 0.5 mm (E–G).

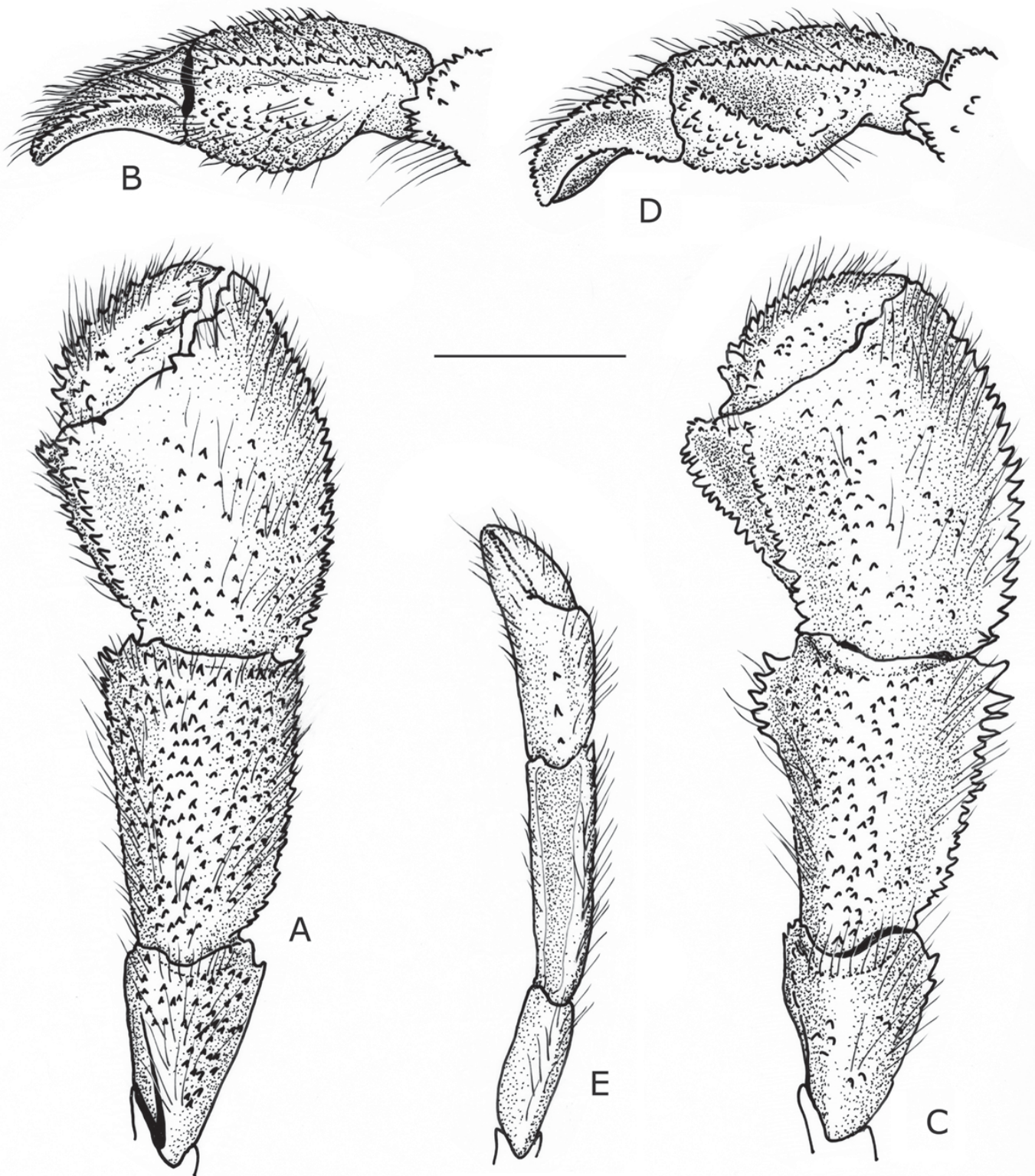


Fig. 22. *Oncopagurus elongatus*, new species: A, B, E, holotype, female 4.0 mm, Vanuatu, MUSORSTOM 8, sta CP 1080 (MNHN-IU-2013-5497); C, D, paratype, male 3.0 mm, French Polynesia, BENTHAUS, sta DW 2020 (MNHN-IU-2013-5508, ex MNHN Pg 6724). A, right cheliped, dorsal; B, chela of same, mesial; C, right cheliped, dorsal; D, chela of same, mesial; E, left cheliped, dorsal. Scale bar = 1 mm.

Uropods and telson strongly asymmetrical (Fig. 20F, G). Telson lacking transverse suture; dorsal surface with scattered setae, lateral margins with long setae; posterior lobes separated by shallow U-shaped cleft; terminal margins of lobes armed with slender, long corneous spines (about 18 on left lobe, 10 on right lobe) weakly curved ventrally, spines on terminal margin of left lobe often extending nearly to midportion of lateral margin. Male with paired first and second gonopods; first gonopod (Fig. 20H, I) with distal portion subovate, with setae distally; second gonopod with distal segment setose distally and on lateral margin medially. Female with or without vestigial second right pleopod.

Colouration. Unknown.

Habitat. Gastropod shells with or without zoanths incompletely covering the shells.

Distribution. Western and Central Pacific, from Vanuatu, Fiji and the Tonga Islands, and the Austral Islands, French Polynesia. Depth: 500–1091 m.

Remarks. This new species is the fourth in *Oncopagurus* to have reduced or subconical corneas, the others being *O. conicus*, *O. minutus*, and *O. petilus*, new species. However, *O. elongatus*, new species, is unusual in several other respects. In the shape and relative length of the ocular peduncles, *O. elongatus*, new species, superficially resembles species of *Parapagurus*. In *O. elongatus*, new species, the ocular

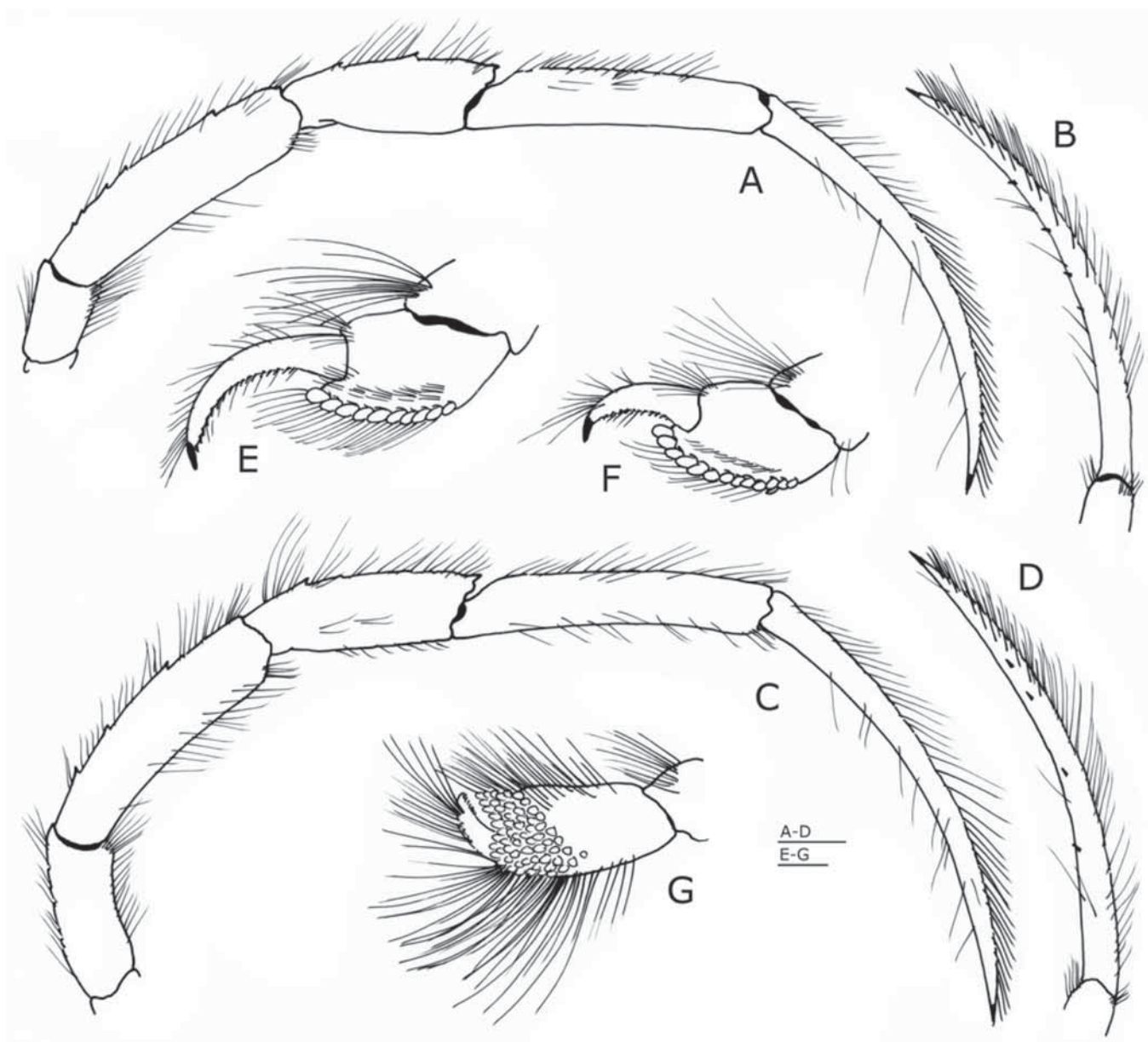


Fig. 23. *Oncopagurus elongatus*, new species: A–E, G, holotype, female 4.0 mm, Vanuatu, MUSORSTOM 8, sta CP 1080 (MNHN-IU-2013-5497); F, paratype, male 3.0 mm, French Polynesia, BENTHAUS, sta DW 2020 (MNHN-IU-2013-5508, ex MNHN Pg 6724). A, right first ambulatory leg, lateral; B, dactyl of same, mesial; C, right second ambulatory leg, lateral; D, dactyl of same, mesial; E, F, propodus and dactyl of left fourth pereopod, lateral. Scale bars = 1 mm (A–D); 0.25 mm (E–G).

peduncles are at most about half the length of the shield, decreasing in width distally, whereas the peduncles in all other species of *Oncopagurus* are more than half the length of the shield and are more or less equal in width throughout (except for *O. conicus*). The ocular peduncles in *O. elongatus*, new species have a row of long and often dense setae dorsally that extends to the proximal margin of the corneas, forming a sort of “eyebrow”. The gills in *O. elongatus*, new species, are atypical for a species of *Oncopagurus* as they vary in this new species from biserial to weakly quadriserial, instead of strictly biserial as in other congeners. The anterior lobes of sternites XIII and XIV, and the coxae of the fourth and fifth pereopods, have longer, denser setae (Fig. 20E) than in other congeners.

In *Oncopagurus elongatus*, new species, there is a distinct sexual dimorphism on the right cheliped and fourth pereopod. The right palm in females (especially larger ones) have the mesial face expanded distomesially, and a distinctly delimited ventromesial margin (Fig. 22D). The dactyl of the fourth pereopod in females is distinctly longer and more strongly curved than in males. A similar dimorphism of this dactyl is present in *O. cidaris*, although the length of the dactyl in *O. elongatus*, new species is even strikingly longer relative to the dactyl of the male.

Etymology. The specific name is from the Latin, *elongatus*, in reference to the strikingly long dactyl of the fourth pereopod usually seen in females of this new species.

Oncopagurus glebosus Lemaitre, 1997

Figs. 24, 51

Oncopagurus glebosus Lemaitre, 1997: 580, figs 3–6 (type locality: Indonesia, Tanimbar Island, R/V Baruna Jaya 1, sta CP 86, 09°26'S, 131°13'E); McLaughlin et al., 2007: 311; 2010: 39.

Type material. Holotype, Indonesia, Tanimbar Island, R/V Baruna Jaya 1, sta CP 86, 09°26'S, 131°13'E, 225–223 m, 4 November 1991: M 1.8 mm (MNHN Pg. 5342).

Paratypes, **Indonesia, Tanimbar Island:** R/V Baruna Jaya 1, sta DW 49, 08°00'S, 132°59'E, 210–206 m, 29 October 1991: 15 M 1.4–2.6 mm, 2 ov F (2.2, 2.3 mm), 1 juv 1.2 mm (MNHN Pg. 5344); sta DW 80, 09°37'S, 131°02'E, 199–201 m, 4 November 1991: 5 M 1.2–2.7 mm, 2 F 1.2, 1.5 mm, 1 ov F 1.8 mm (USNM 276035); sta CP 86, 09°26'S, 131°13'E, 225–223, 4 November 1991: 2 M 1.3, 1.7 mm (MNHN Pg. 5343), 1 M 2.3 mm, 2 F 1.3, 2.7 mm, 1 ov F 2.5 mm (USNM 276036).

Additional material. Philippines: MUSORSTOM 3: sta CP 27, 14°00'S, 120°19'E, 188–192 m, 22 March 1976: 1 M 2.3 mm (MNHN Pg.). **Vanuatu:** MUSORSTOM 8: sta DW 978, 19°22.62'S, 169°27.11'E, 413–408 m, 22 September 1994: 1 M 1.4 mm (MNHN Pg.); sta DW 1014, 17°54.53'S, 168°19.08'E, 495–498 m, 27 September 1994: 1 M 2.5 mm (MNHN Pg.) — BOA 1: sta DW 2459, 16°10.16'S, 167°19.57'E, 336–353 m, 12 September 2005: 1 M 2.2 mm (MNHN Pg.). **Tonga Islands:** BORDAU 2: sta DW 1537, 21°41'S, 175°19'W, 391–421 m, 4 June 2000: 1 ov F 2.2 mm (MNHN Pg.); sta DW 1567, 21°02'S, 175°19'W, 351–356 m, 10 June 2000: 1 M 2.3 mm, 1 F 1.4 mm, 5 ov F 1.2–2.6 mm (MNHN Pg.). **New Caledonia:** MUSORSTOM 4: sta CC 174, 19°00.30'S, 163°18.50'E, 385 m, 17 September 1985: 1 M 1.7 mm

(MNHN-IU-2013-5541); sta DW 181, 18°57.20'S, 163°22.40'E, 355 m, 18 September 1985: 1 M 2.0 mm (MNHN-IU-2013-5542) — MUSORSTOM 5: sta CP 309, 22°10.20'S, 159°22.80'E, 340 m, 12 October 1986: 1 M 1.9 mm (MNHN-IU-2013-5539) — SMIB 3: sta DW 1, 24°55.70'S, 168°21.80'E, 520 m, 20 May 1987: 1 M 3.5 mm, 1 ov F 3.1 mm (USNM 1211196) — MUSORSTOM 6: sta DW 391, 20°47.35'S, 167°05.70'E, 390 m, 13 February 1989: 1 M 1.8 mm (MNHN-IU-2013-5544); sta DW 417, 20°41.80'S, 167°03.65'E, 283 m, 16 February 1989: 2 M 1.6, 1.7 mm, 2 F 1.7, 2.1 mm (USNM 1211197); sta DW 418, 20°41.75'S, 167°03.35'E, 283 m, 16 February 1989: 1 M 2.4 mm (USNM 1211200); sta DW 428, 20°23.54'S, 166°12.57'E, 420 m, 17 February 1989: 1 M 2.1 mm (MNHN-IU-2013-5538); sta DW 451, 20°59.00'S, 167°24.50'E, 330 m, 20 February 1989: 1 M 2.1 mm (MNHN-IU-2013-5543); sta DW 452, 21°00.30'S, 167°25.50'E, 300 m, 20 February 1989: 2 M 1.8, 2.1 mm (MNHN-IU-2013-5540); sta DW 453, 21°00.50'S, 167°26.90'E, 250 m, 20 February 1989: 1 F 1.3 mm (USNM 1211201); sta DW 456, 21°00.71'S, 167°26.35'E, 240 m, 20 February 1989: 1 M 1.5 mm, 1 F 1.7 mm (USNM 1211198); sta CB 481, 21°21.85'S, 167°50.30'E, 300 m, 23 February 1989 (2 lots): 1 F 1.8 mm (MNHN-IU-2013-5537), 1 F 1.7 mm (USNM 1211199) — BATHUS 2: sta DW 730, 23°02.56'S, 166°58.30'E, 350–400 m, 12 May 1993: 1 M 2.3 mm, 3 F 1.8–1.9 mm (MNHN Pg.); sta DW 749, 22°33.39'S, 166°26.02'E, 369–258 m, 13 May 93: 1 F 1.7 mm (MNHN Pg.) — Passe Boulari, 12°33.62'S, 166°25.97'E, [no depth], 12 September 1994, coll. B. Richer de Forges: 4 M 1.3–2.6 mm, 1 F 1.7 mm (ZMMU) — EBISCO: sta DW 2538, 22°20'S, 159°25'E, 318–323 m, 10 October 2005: 1 M 2.6 mm (MNHN Pg.).

Diagnosis. Shield (Fig. 24A) as broad as long; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; lateral projections subtriangular, terminating in small spine. Ocular peduncle more than half length of shield, with dorsal row of long setae; cornea moderately dilated. Ocular acicles (Fig. 24A, B) subtriangular, terminating bluntly or subacutely, with strong, distinctly or rarely indistinctly submarginal spine. Antennular peduncle (Fig. 24A) exceeding distal margin of cornea by entire length of ultimate segment. Antennal peduncle (Fig. 24A) reaching distal margin of cornea; fourth segment with strong dorsodistal spine; second segment with dorsolateral distal angle terminating in strong, simple spine, mesial margin with spine on dorsodistal angle; first segment with small spine on lateral face; antennal acicle slightly curved outward (in dorsal view), short, not reaching distal margin of cornea, terminating in strong spine (rarely bifid), mesial margin armed with row of 8–11 spines; flagellum exceeding extended right cheliped, with serial arrangement of short (< 1 article in length) and long (3–5 articles in length) setae every 2–4 articles. Third maxilliped with crista dentata consisting of about 8 calcareous or corneous-tipped teeth, proximal 2 or 3 teeth distinctly larger than distal teeth. Right cheliped (Fig. 24C–E) massive, chela operculate; dorsal surfaces of merus, carpus and chela each with moderately dense setae; chela with dense fringe of long setae on lateral and mesial margins; dactyl set at strongly oblique angle to longitudinal axis of palm, mesial margin well delimited by row of strong spines, dorsal face with scattered small tubercles; palm longer than broad, dorsolateral margin well delimited by row of strong spines, dorsomesial margin delimited by row of spines, mesial face rounded and with scattered tubercles, dorsal surface with irregular rows of spines medially, ventral face with irregularly arranged

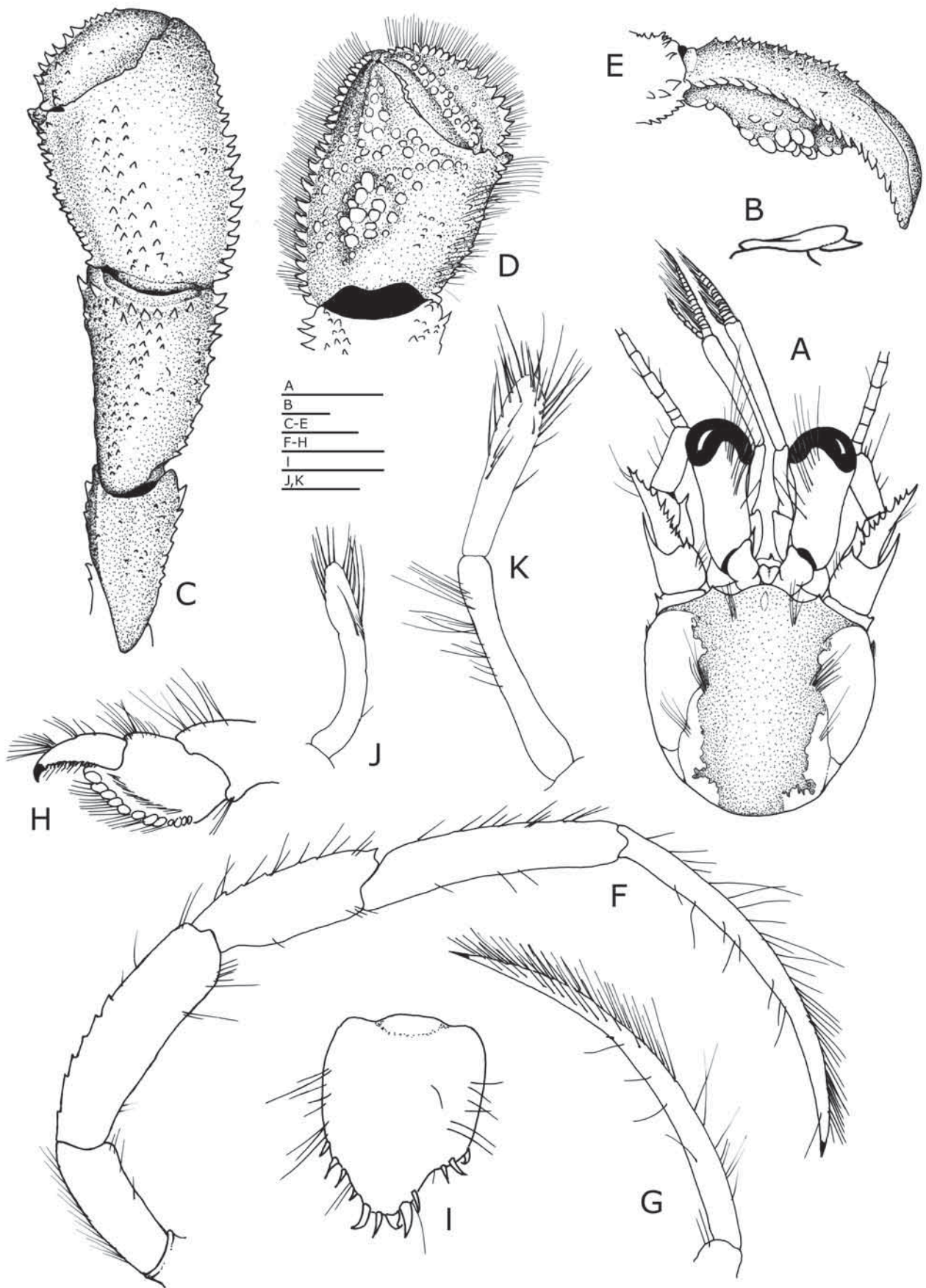


Fig. 24. *Oncopagurus glebosus* Lemaitre, 1997, paratype, male 2.3 mm, Indonesia, KARUBAR, sta CP 86 (USNM 276036). A, shield and cephalic appendages, dorsal; B, right ocular acicle, lateral; C, right cheliped, dorsal; D, E, chela of same, ventral (D), and lateral (E); F, right second ambulatory leg, lateral; G, dactyl of same, mesial; H, propodus and dactyl of left fourth pereopod, lateral; I, telson, dorsal; J, left first gonopod, mesial; K, left second gonopod, anterior. Scale bars = 1 mm (A, C–E, F, G), 0.25 mm (B, J, K), 0.5 mm (H, I). [Adapted from Lemaitre (1997)].

tubercles or blunt spines, and raised frequently very prominent cluster of tubercles medially (Fig. 24D, E); carpus with dorsolateral margin usually well delimited by row of spines distally, dorsal face with numerous small spines. Left cheliped usually weakly calcified on dorsolateral face of carpus and lateral face of merus, palm unarmed except for scattered setae and proximomedial row of blunt spines on dorsal face. Ambulatory legs (Fig. 24F, G) with dactyls each with row of 1–5 minute spinules on ventromesial margin, carpi each with small dorsodistal spine. Anterior lobe of sternite XII (between second ambulatory legs) rounded, setose, unarmed or with small subdistal spine. Fourth pereopod propodal rasp (Fig. 24H) with 1 row of rounded scales at least distally. Fifth pereopod propodal rasp extending to mid-length of segment. Uropods and telson markedly asymmetrical; telson (Fig. 24I) lacking transverse suture, posterior lobes separated by shallow unarmed cleft, terminal margin of lobes armed with long, often strongly curved corneous spines. Male with paired first and second gonopods; first gonopod in juveniles (sl < 1.5 mm) not present or not fully developed, in adults with nearly flat distal lobe and long marginal setae (Fig. 24J); second gonopod (Fig. 24K) with distal segment flat, with long setae marginally and on anterior face. Female with vestigial second right pleopod.

Variations. The terminal spine on the ocular is clearly submarginal (Fig. 24B), although in some small specimens it appears that the acicle is not fully developed and the terminal spine can be interpreted as indistinctly submarginal. (See also *Oncopagurus elevatus*, new species).

Colouration. Unknown.

Habitat. Gastropod shells.

Distribution. Previously known only from the original description (Lemaitre, 1997) based on specimens from Tanimbar Island, Indonesia, this species has been found during this study in a wide area of the Western Pacific, including the Philippines, Vanuatu, Tonga Islands, and New Caledonia. Depth: 188–520 m.

Remarks. (See also *Oncopagurus elevatus*, new species). When this species was described (Lemaitre, 1997), the peculiar armature of the ventral surface of the right palm was considered unique among species of *Oncopagurus*. During this study, however, three of the new species discovered (*O. elevatus*, new species, *O. crusoiei*, new species, and *O. rossanae*, new species) were found to also have a distinct armature on the ventral face of the palm and fingers of the right chela, although the armature differs in development in each of the species (see Remarks under those new species for comparisons). In *O. glebosus* the ventral surface of the right palm has numerous irregularly arranged tubercles which typically form a prominent, raised cluster medially (Fig. 24D, E). In small individuals (sl < 1.5 mm) the cluster is not as prominent, with smaller and more separated tubercles than in large individuals.

Oncopagurus glebosus is also distinguished from other congeners and even all other parapagurids, by the unique condition of the ocular acicles. This is the only species in the family known to have ocular acicles terminating in a submarginal (or rarely indistinctly submarginal) spine (Fig. 24B), whereas the ocular acicles in all other parapagurids terminate in a simple to multifid marginal spine.

Oncopagurus gracilis (Henderson, 1888)

Figs. 25A–J, 51

Eupagurus bicristatus A. Milne-Edwards, 1880: 43 (in part, see Remarks).

Parapagurus gracilis Henderson, 1888: 92, pl. 10, fig. 3 (type locality: off Pernambuco, Brazil, HMS Challenger, sta 122, 09°05'S, 34°50'W); Rieger, 1998: 413.

Sympagurus arcuatus A. Milne-Edwards & Bouvier, 1893: 67, pl. 5, figs 21–28 (type locality: St. Lucia, Caribbean Sea, USCGS Blake, sta 218, 13°49.12'N, 61°04.40'S).

Pylopagurus exquisitus Boone, 1927: 71, fig. 14 (type locality: Pawnee I, N of Glover Reef, off the coast of British Honduras [=Belize])

Parapagurus bicristatus gracilis – de Saint Laurent, 1972: 112; Coelho & Ramos-Porto, 1987: 38.

Sympagurus gracilis – Lemaitre, 1989: 64, figs 32–35, 40C; Melo, 1999: 156, figs 95, 96.

Parapagurus arcuatus – Williams et al., 1989: 32.

Oncopagurus gracilis – Lemaitre, 1996: 194; McLaughlin et al., 2005: 246; Coelho et al., 2007: 10 (Table 1); Felder et al., 2009: 1071; McLaughlin et al., 2010: 39; Campos et al., 2005: 139, figs. 99, 100; Martínez Campos et al., 2012: 240.

(For complete synonymy see Lemaitre, 1989)

Type material. Lectotype designated by Lemaitre (1989): M 2.8 mm, off Pernambuco, Brazil, HMS Challenger, sta 122, 09°05'S, 34°50'W, 630 m, 10 September 1883 (BMNH 1888: 33).

Holotype of *Sympagurus arcuatus* A. Milne-Edwards & Bouvier, 1893: ov F 2.6 mm, off St. Lucia, Caribbean Sea, USCGS Blake, sta 218, 13°49.12'N, 61°04.40'S, 295 m, 15 February 1879 (MCZ 6330).

Additional material. est Africa: Atlantide Expedition, sta 135, 07°55'S, 12°33'E, off Angola, 235–460 m, 17 March 1946: 1 M 4.5 mm (ZMK).

For additional material see Lemaitre (1989, as *Sympagurus gracilis*).

Diagnosis. Shield (Fig. 25A) about as broad as long; rostrum broadly rounded, weakly produced to obsolete, with short mid-dorsal ridge; lateral projections subtriangular, slightly in advance of rostrum, often terminating in small spine. Ocular peduncles usually more than half length of shield, with dorsal row of setae; corneas weakly dilated. Ocular acicles subtriangular, terminating in strong spine. Antennular peduncle (Fig. 25A) exceeding distal margin of cornea by nearly entire length of ultimate segment. Antennal peduncle (Fig. 25A) not exceeding distal margin of cornea; fourth segment with small spine on dorsolateral distal angle; second segment with dorsolateral distal angle terminating in strong, simple or multifid spine, mesial margin with spine on dorsodistal angle; first segment with small spine on lateral

face; acicles weakly curved (in dorsal view), usually not exceeding distal margin of corneas, terminating in strong spine, mesial margin armed with row of 7–11 spines each set at about 45° angle to longitudinal axis of acicle; flagellum exceeding extended right cheliped, with series of 2 or 3 long setae 4–8 articles in length every 10–20 articles. Third maxilliped with crista dentata of about 10 teeth, proximal 2 or 3 teeth usually larger than distal. Right cheliped (Fig. 25B–E) with moderately dense, simple and plumose setae, chela operculate, proportions and armature of chela, and carpus strongly influenced by size and sexual dimorphism; dactyl set at strongly oblique angle to longitudinal axis of palm; palm varying from broader than long to longer than broad, dorsal face with irregular rows of scattered small tubercles or spines medially, dorsolateral and dorsomesial margins well delimited by row of blunt to sharp spines, mesial face strongly sloping, ventromesial face rounded, ventral face smooth; carpus 1.3–1.8 times as long as broad, dorsolateral margin usually well delimited by row of spines at least distally, dorsal face with numerous, well-spaced small spines or tubercles. Left cheliped usually weakly well calcified on dorsolateral face of carpus; palm unarmed except for dorsomesial row of small spines and long setae on dorsomesial margin; carpus with strong dorsodistal spine and long setae dorsally. Ambulatory legs with dactyls (Fig. 25F) each having ventromesial row of about 3–9 corneous spinules; carpus with small dorsodistal spine. Anterior lobe of sternite XII (between second ambulatory legs) rounded, setose, with 1 or 2 subterminal spines. Fourth pereopod propodal rasp (Fig. 25G) with 1 row of rounded scales at least distally. Fifth pereopod propodal rasp extending to or beyond mid-length of segment. Uropods and telson markedly asymmetrical; telson (Fig. 25H) lacking or with obsolete transverse suture, posterior lobes separated by shallow V-shaped cleft, terminal margin of lobes armed with often strongly curved corneous spines. Male with paired first and second gonopods (Fig. 25I, J), small individuals (sl < 1.6 mm) often lacking first gonopods; first gonopods with ovate distal lobe, marginally setose; second gonopods with distal segment spatulate and with setae distally. Female with vestigial second right pleopod.

Variations. See Lemaitre (1989, as *Sympagurus gracilis*)

Colouration. Unknown.

Habitat. Gastropod shells frequently with one or more anthozoan polyps (actinians or zoanthids) attached.

Distribution. Western Atlantic, from the Straits of Florida and Gulf of Mexico to off Pernambuco, Brazil. Eastern Atlantic, from Gulf of Guinea and off Angola. Depth 146–634 m.

Remarks. (See also *Oncopagurus africanus* and *O. bicristatus*). As discussed by Lemaitre (1989), one of the two type specimens used to describe *Eupagurus bicristatus* A. Milne Edwards, 1880 (= *Oncopagurus bicristatus*) was also used by A. Milne-Edwards & Bouvier (1893) to

describe *Sympagurus arcuatus*. That taxon and *Pylopagurus exquisitus* Boone, 1927, were shown by Lemaitre (1989) to be junior synonyms of *Parapagurus gracilis* Henderson, 1888 (= *O. gracilis*).

Oncopagurus gracilis and *O. bicristatus* are the only two species of *Oncopagurus* that occur in the western Atlantic, where they occur sympatrically. Both also range to the eastern Atlantic. In the eastern Atlantic, *O. gracilis* has been found in the Gulf of Guinea and off Angola. *Oncopagurus gracilis* differs from *O. bicristatus* in the shape of the right palm, armature of antennal acicles, and in males, degree of development of the first and second gonopods. In *O. gracilis*, the ventromesial face of the right palm is rounded, whereas in *O. bicristatus* there is a distinct, spinose ventromesial margin. In *O. gracilis*, the spines on the mesial margin of the antennal acicle are set at about a 45° angle with the longitudinal axis of the acicle, whereas in *O. bicristatus* the spines are set at nearly 90° angle. The first and second gonopods in *O. gracilis* are fairly well developed for a species of *Oncopagurus*, whereas in *O. bicristatus* the first gonopods are reduced to short buds and the second gonopods are either poorly developed or asymmetrical.

Oncopagurus haigae (de Saint Laurent, 1972)

Figs. 25K–R, 51

Parapagurus haigae de Saint Laurent, 1972: 115, figs 9, 17 (type locality: eastern Pacific, AHF, sta 993–39, off Santa Rosa Island, California); Retamal, 1981: 58, fig. 68; Williams et al., 1989: 32; Wicksten, 1980: 362; 1987: 55; 1989: 314.

Sympagurus haigae – Lemaitre, 1989: 37; Lemaitre & McLaughlin, 1992: 760, fig 8; Guzmán Gómez, 1999: 31, unnumbered fig.; Quiroga et al., 2009: 1116, tbl. 2.

Oncopagurus haigae – Lemaitre, 1996: 194; Hendrickx & Harvey, 1999: 373; Guzmán, 2004: 132 (key); McLaughlin et al., 2005: 246; McLaughlin et al., 2010: 39; Retamal & Moyano, 2010: 313; Wicksten, 2012: 199, fig. 46O, P.

?*Oncopagurus cf. haigae* – Zhadan, 1997: 59; Retamal & Moyano, 2010: 312 (see Remarks).

Oncopagurus haigae – Zhadan, 1997: 63 (table).

Type material. Holotype, off Santa Rosa Island, California, AHF sta 993–39, 229–238 m, 10 August 1939: M 3.1 mm (LACM 3929).

Paratypes: see Lemaitre & McLaughlin (1992).

Additional material. Eastern Pacific: Baja California, Mexico, R/V Zaca, sta 136 D-30, [no other data]: 1 ov F 2.7 mm (USNM 1095944). — Islas Desventuradas, Isla San Felix, Chile, [approx. 26°17'30"S 80°05'42"W], 204 m, 23 October 2000, coll. M. Retamal (2 lots): 1 M (missing both chelipeds) (USNM 1211202), 1 M 2.4 mm (USNM 1211203) — SEPBOB, Anton Bruun: Juan Fernández Islands, Chile, cruise 12, sta MV65IV68, 15 December 1965: 1 F 1.5 mm (USNM 1095957); cruise 18A, sta 697, 35°27'S, 73°01'W, 290–450 m, 9 Aug 1966: 11 M 4.5–6.4 mm, 2 ov F 3.9, 4.2 mm (USNM 1095942). — Boca del Guafo, Chile, CIMAR 8, sta 4, 43°39'36"S, 73°51'11"W, 189 m, Jul 2002, coll. M. Retamal: 1 M 3.8 mm (USNM 1008981).

For additional material examined see Lemaitre & McLaughlin (1992).

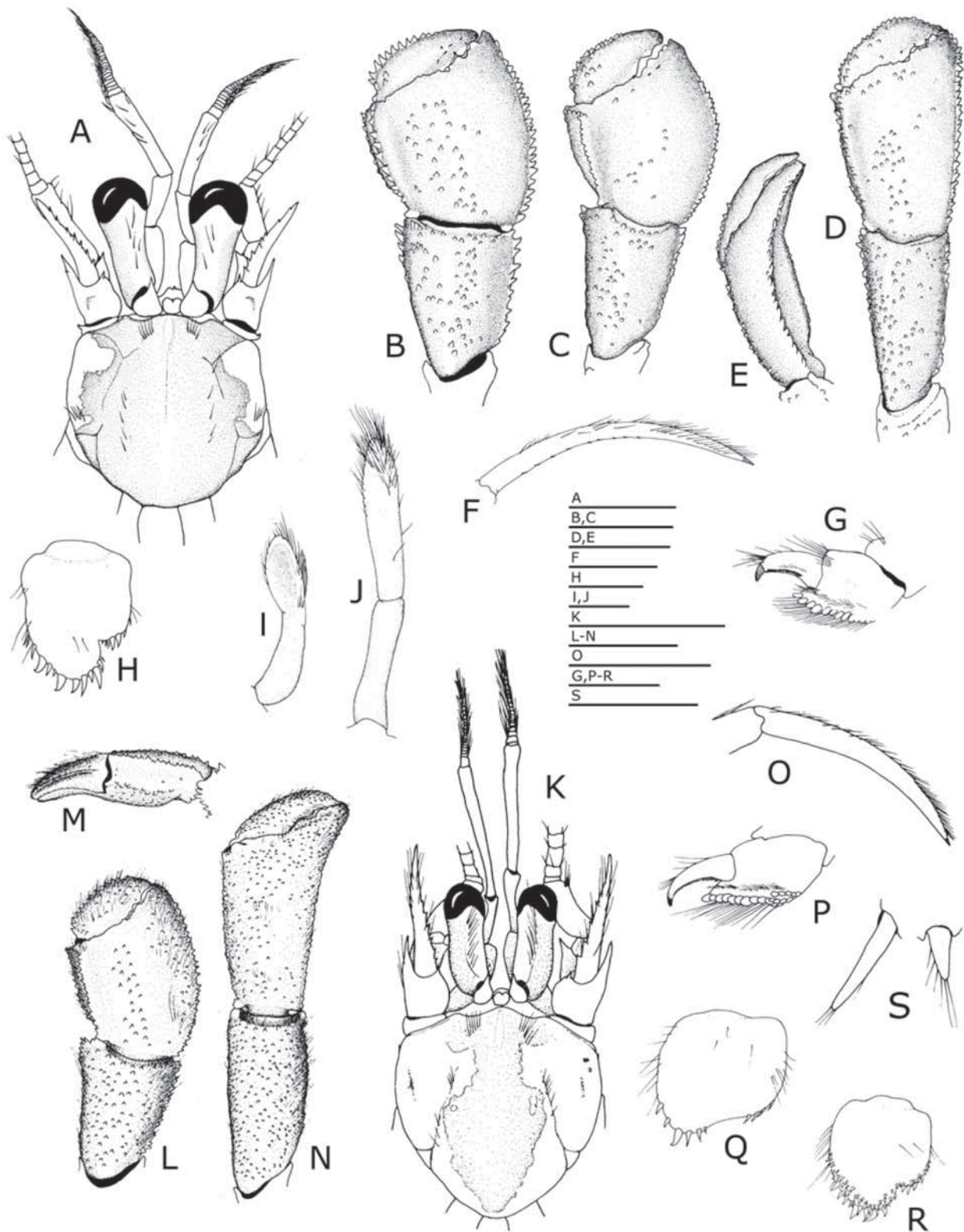


Fig. 25. A–J, *Oncopagurus gracilis* (Henderson, 1888): A, male 5.5 mm, Straits of Florida, Bellows sta 78-8 (USNM 1100625); B, female 2.7 mm Caribbean Sea, Pillsbury, sta 610 (UMML 32: 4600); C, male 2.2 mm, SW Atlantic, Oregon sta 4226 (UMML 32: 4538); G–H, male 4.6 mm, Caribbean Sea, Oregon sta 4423 (UMML 32:4591); I, J, male 5.5 mm, SW Atlantic, Oregon sta 4226 (UMML 32: 4538): A, shield and cephalic appendages, dorsal; B–D, carpus and chela of right cheliped; E, right chela, lateral; F, dactyl of left first ambulatory leg, mesial; G, propodus and dactyl of left fourth pereopod, lateral; H, telson, dorsal; I, left first gonopod, mesial; J, left second gonopod, anterior. K–R, *Oncopagurus haigae* (de Saint Laurent, 1972): K–M, O–Q, male 4.2 mm, off Chile, USNS Eltanin, sta 71 (USNM 216289); N, male 3.9 mm, R, female 3.0 mm, off southern California, Albatross, sta 2935 (USNM 216289): K, shield and cephalic appendages, dorsal; L, N, carpus and chela of right cheliped, dorsal; M, chela, mesial; O, dactyl of right first ambulatory leg, lateral; P, propodus and dactyl of left fourth pereopod, lateral; Q, R, telson, dorsal; S, second pair of gonopods, lateral (right on right, left on left). Scale bars = 3 mm (A, F, K); 2 mm (B, C); 4 mm (D, E); 1 mm (H, G, P–R); 0.5 mm (I, J); 5 mm (L, N, O); 1 mm (S). [Adapted from Lemaitre (1989), and Lemaitre & McLaughlin (1992)].

Diagnosis. Shield (Fig. 25K) about as broad as long; rostrum broadly rounded, slightly overreaching lateral projections, with short mid-dorsal ridge; lateral projections broadly subtriangular, usually ending bluntly. Ocular peduncles more than half length of shield, with dorsal row of setae; corneas weakly dilated; ocular acicles subtriangular, terminating in strong spine. Antennular peduncle (Fig. 25K) exceeding distal margin of cornea by entire length of ultimate segment. Antennal peduncle (Fig. 25K) exceeding distal margin of cornea; fourth segment with small spine on dorsolateral distal angle; second segment with dorsolateral distal angle terminating in strong, simple spine, mesial margin with spine on dorsodistal angle; first segment usually unarmed on lateral face; acicle exceeding distal margin of cornea by about 0.2–0.5 length of acicle, mesial margin armed with 5–7 small spines; flagellum reaching to distal end of right cheliped, with numerous setae < 1 to 3 flagellar articles in length. Third maxilliped with crista dentata of about 10–12 teeth, 2 or 3 proximal teeth larger than distal. Right cheliped (Fig. 25L–N) moderately setose, chela operculate; carpus and chela proportions affected by size, large specimens with carpus and chela distinctly longer than broad; dactyl set at strongly oblique angle to longitudinal axis of palm; palm broader than long to longer than broad, lateral and dorsomesial margins well delimited by row of small blunt to sharp spines, mesial face strongly sloping, dorsal surface with irregular rows of small spines medially and scattered small tubercles or spines elsewhere, ventral surface smooth; carpus with dorsolateral margin rounded or sometimes well delimited distally by row of spines, dorsal face with numerous small spines or tubercles. Left cheliped usually with lateral face of carpus weakly calcified; palm with dorsomesial row of small spines; carpus with strong dorsodistal spine and long setae dorsally. Ambulatory legs with dactyls (Fig. 25O) each lacking spinules on ventromesial margin or with row of few (up to 9) inconspicuous corneous spinules; carpus with small, blunt or sharp dorsodistal spine. Anterior lobe of sternite XII (between second ambulatory legs) rounded, setose, with subterminal spine. Fourth pereopod propodal rasp (Fig. 25P) with 1 row of rounded scales at least distally. Fifth pereopod propodal rasp extending to mid-length of segment. Uropods and telson markedly asymmetrical; telson (Fig. 25Q, R) lacking transverse suture, posterior lobes separated by shallow cleft, terminal margin of lobes armed with long, often strongly curved corneous spines (females with more spines, usually arranged in several rows, than males). Male lacking first gonopods; second pair of gonopods (Fig. 25S) weakly developed, asymmetrical (right smallest or obsolete), 1-segmented. Female with vestigial second right pleopod.

Colouration. Unknown.

Habitat. Gastropod shells, frequently with an actinian attached.

Distribution. Eastern Pacific, from off southern California and the Gulf of California, the Gulf of Panamá, to off Boca del Guafo and the Juan Fernández Islands, Chile. In the South Pacific, questionably from the Nazca & Sala-y-Gómez Ridge (Zhadan, 1997). Depth: 55–993 m.

Remarks. (See also *Oncopagurus crusoei*, new species). There is some confusion as to the type locality of *O. haigae*. The type locality given by de Saint Laurent (1972) in her original description as “Golfe de Californie”, is incorrect. Wicksten (2012) pointed out de Saint Laurent’s mistake and indicated that the type locality was “off Santa Cruz I., California”. However, the specimen label and AHF records of the type deposited in the LACM indicate that the locality is actually Santa Rosa Island, off Los Angeles.

Oncopagurus haigae is broadly distributed in the eastern Pacific over an immense expanse of coastline, from off southern California to nearly 44°S, off Chile. Previous to this study, the southern distribution limit of this species was near 31°S, off Valaparaiso, Chile (Lemaitre & McLaughlin, 1992). It’s wide range is therefore extended herein even more, nearly 1300 km to the south.

Zhadan (1997) reported and briefly discussed, without figures, a damaged male specimen from Nazca & Sala-y-Gómez Ridge as *Oncopagurus* cf. *haigae*, considering only tentatively that the specimen might represent *O. haigae*. In their summary of Chilean decapod zoogeography, Retamal & Moyano (2010) repeated Zhadan’s report. The specimen has not been available for examination, and thus the presence of this species in Nazca & Sala-y-Gómez ridge remains to be confirmed.

Oncopagurus indicus (Alcock, 1905)

Figs. 26, 51, 53A

Sympagurus bicristatus var. *indicus* Alcock, 1905: 105, pl.10, fig. 4 (type locality: Andaman Sea); Gordan, 1956: 341.

Parapagurus bicristatus indicus –de Saint Laurent, 1972: 112.

Sympagurus indicus – Lemaitre, 1989: 37; 1994: 412.

Oncopagurus indicus – Lemaitre, 1996: 195, figs. 17, 18; 1997: 594; Zhadan, 1997: 63 (table); Davie, 2002: 88; Poore, 2004: 282, fig. 81b,c; McLaughlin et al., 2005: 246; McLaughlin et al., 2007: 312, unnumbered figs. p. 312, not unnumbered fig. (DW56) p. 313 [= *Oncopagurus monstrosus* (Alcock, 1894), see Remarks]; 2010: 39; Castro, 2011: 29.

Oncopagurus mironovi Zhadan, 1997: 59, figs. 2–5 (type locality: Nazca and Sala-y-Gómez Ridges, R/V Professor Stockman, 18th cruise, sta 1957, 24°31'5"S, 88°31'6"W); Zhadan, 1999: 735, fig. 1A. (See Remarks).

(For complete synonymy see Lemaitre, 1996)

Type material. Syntypes from Andaman Sea, Indian Ocean, probably in Indian Museum, Calcutta (not examined).

Types of *Oncopagurus mironovi* Zhadan, 1997: holotype (not examined), R/V Professor Stockman, 18th cruise, sta 1957, 24°31'5"S, 88°31'6"W, 570–575 m, 29 April 1987, coll. A. N. Mironov: M 3.8 mm (ZMUM Ma-4830); paratypes: same sta as holotype, M 3.5 mm, ov F 3.3 mm (MNHN Pg. 5526); additional paratypes (not examined): see Zhadan (1997).

Additional material. Madagascar, NE Mozambique Channel: BENTHEDI: sta DR 37, 12°53'8S, 45°16'2E, 830–520 m, 26 March 1977: 1 F 1.9 mm (MNHN Pg.); sta DR 38, 12°54'8S, 45°15'6E, 200–500 m, 26 March 1977: 2 M 2.0–2.2 mm (MNHN Pg.); sta DS 122, 11°32'S, 47°23'E, 615–625 m, 12 April 1977: 4 M 1.5–2.8 mm, 4 F 1.5–2.7 mm [dismembered] (MNHN Pg.). **Taiwan:**

TAIWAN 2000: sta CP 56, 24°29.8'N, 122°12.6'E, 438 m, 4 August 2000 (2 lots): 1 F 2.8 mm (NTOU), 1 M 2.8 mm (NTOU A00370); sta CP 60, 24°41.2'N, 122°11.8'E, 532 m, 4 August 2000: 1 M 4.4 mm (NTOU 00287) — TAIWAN 2003: sta CP 212, 24°34.60'N, 122°5.84'E, 223–260 m, 26 August 2003 (2 lots): 1 M 4.5 mm (NTOU), 1 M 3.9 mm (NTOU A00587); sta CP 214, 24°28.59'N, 122°01.76'N, 122°01.76'E, 490–1027 m, 27 August 2003: 1 M 3.4 mm (NTOU A00288), 1 F 4.6 mm — TAIWAN 2004: sta CP 264, 24°28.07'N, 121°53.55'E, 330–297 m, 1 September 2004: 2 M 2.8, 3.1 mm (NTOU A00572) — TAIWAN 2005: sta CP 316, 21°40.349'N, 117°43.274'E, 514 m, 17 August 2005: 1 M 3.9 mm (NTOU) — TAIWAN 2005: sta CP 314, 21°40.072'N, 117°43.123'E, 506 m, 17 August 2005: 1 F 3.3 mm (NTOU) — TAIWAN 2006: sta CP 371, 24°28.521'N, 122°12.821'E, 582–613 m, 26 August 2006: 1 M 2.9 mm (NTOU). **Solomon Islands:** SALOMON 1: sta CP 1783, 8°32.8'S, 160°41.7'E, 399–700 m, 29 September 2000: 1 F 1.9 mm (MNHN Pg.); sta DW 1830, 10°11.3'S, 161°18.8'E, 500–563 m, 4 October 2000: 1 M 3.2 mm (MNHN Pg. 7020); sta CP 1837, 10°12.8'S, 161°28.6'E, 381–383 m, 5 October 2000: 5 M 2.0–4.1 mm, 3 F 1.6–2.4 mm, 1 ov F 2.4 mm (MNHN Pg.) — SALOMON 2: sta CP 2194, 8°24.05'S, 159°26.27'E, 440–521 m, 24 October 2004: 10 M 2.2–4.0 mm, 1 ov F 2.8 mm (MNHN Pg.); sta CP 2195, 8°24.57'S, 159°26.06'E, 543–593 m, 24 October 2004: 1 M 2.7 mm (MNHN Pg.); sta CP 2227, 6°38.27'S, 156°13.52'E, 508–522 m, 24 October 2004: 3 M 2.2–3.5 mm, 1 ov F 2.5 mm (MNHN Pg.); sta CP 2262, 7°57.5'S, 156°51.346'E, 460–487 m, 11 March 2004: 3 M 1.1–3.5 mm, 3 F 2.7–3.4 mm, 4 ov F 2.4–3.3 mm (MNHN Pg.); sta CP 2263, 7°56.27'S, 156°50.885'E, 485–520 m, 11 March 2004 (2 lots): 1 M 4.3 mm (MNHN Pg.), 12 M 2.3–4.4 mm, 4 F 3.1–3.3 mm, 11 ov F 2.8–4.6 mm (MNHN Pg.); sta CP 2266, 7°52.94'S, 156°52.4'E, 560 m, 11 April 2004: 1 ov F 3.1 mm (MNHN Pg.); sta CP 2272, 8°32.12'S, 157°44.38'E, 380–537 m, 11 May 2004: 1 M 3.9 mm (MNHN Pg.); sta CP 2290: 1 M 2.4 mm (MNHN Pg.). **Wallis and Futuna Islands:** MUSORSTOM 7: sta DW 556, 11°48.7'S, 178°18.0'W, 440 m, 19 May 1992: 1 F 2.4 mm (MNHN-IU-2013-5550); sta DW 587, 12°17.5'S, 174°44.8'W, 715–720 m, 23 May 1992: 1 M 3.1 mm, 1 ov F 3.4 mm (MNHN-IU-2013-5512); sta DW 598, 12°30.5'S, 174°18.4'W, 702–708 m, 24 May 1992: 1 M 2.7 mm (USNM 1211218). **Fiji:** BORDAU 1: sta CP 1460, 18°47.06'S, 178°47.29'W, 750–767 m, 6 March 1999: 1 M 2.6 mm (MNHN Pg. 6434); sta DW 1479, 20°58.05'S, 178°44.94'W, 450–460 m, 9 March 1999: 2 M 1.6, 2.1 mm (MNHN Pg. 6489). **Vanuatu:** VOLSMAR: sta CAS 3, 22°24.00'S, 171°49.30'E, 800 m, 31 May 1989: 2 ov F 2.0, 3.1 mm (USNM 1211205) — MUSORSTOM 8: sta DW 1063, 16°15.67'S, 167°18.25'E, 650–719 m, 2 October 1994: 1 M 2.7 mm (MNHN-IU-2013-5504); sta DW 1064, 16°16.02'S, 167°20.55'E, 459 m, 2 October 1994: 1 ov F 2.3 mm (MNHN Pg.); sta CP 1136, 15°40.62'S, 167°01.60'E, 398–400 m, 11 October 1994: 1 M 1.5 mm (MNHN Pg.) — BOA 1: sta CP 2412, 15°42.33'S, 167°03.57'E, 373–800 m, 5 September 2005: 2 M 2.8, 3.1 mm (MNHN Pg.); sta CP 2457, 16°14.18'S, 167°18.49'E, 630–690 m, 12 September 2005: 8 M 3.4–3.3 mm (MNHN Pg.) — BOA 0: CP 2310, 14°46'S, 167°07'E, 864–927 m, 15 November 2004: 5 M 4.6–5.1 mm (MNHN Pg.). **Tonga Islands:** BORDAU 2: sta DW 1508, 21°02'S, 175°19'W, 555–581 m, 31 May 2000: 2 ov F 2.2, 2.9 mm (MNHN Pg.); sta DW 1553, 20°42'S, 174°54'W, 650–676 m, 6 June 2000: 1 M 2.1 mm (MNHN Pg.); sta CP 1565, 20°58'S, 175°16'W, 869–880 m, 9 June 2000: 3 M 3.6–3.9 mm (MNHN Pg. 6485); sta DW 1618, 24°13'S, 176°18'W, 627–656 m, 18 June 2000: 1 ov F 2.2 mm (MNHN Pg.); sta DW 1637, 21°05'S, 175°23'W, 464–507 m, 21 June 2000: 2 M 2.6, 2.7 mm (MNHN Pg.); sta CP 1638, 21°05'S, 175°23'W, 469–520 m, 21 June 2000: 1 M 2.6 mm (MNHN Pg. 6481); sta CP 1640, 21°09'S, 175°24'W, 564–569 m, 21 June 2000: 2 M 1.9, 2.0 mm (MNHN Pg. 6482); sta CP 1642, 21°05'S, 175°23'W, 532 m, 21 June 2000 (3 lots): 4 M 1.8–3.0 mm (MNHN Pg. 6486), 1 M 2.6 mm (MNHN

Pg. 6484), 2 M 1.9, 2.2 mm, 1 ov F 2.0 mm (MNHN Pg.); sta CP 1643, 21°05'S, 175°22'W, 487 m, 22 June 2000: 2 M 2.3 mm, 1 ov F 2.3 mm (MNHN Pg. 6487). **New Caledonia:** BIOCAL: sta DW 33, 23°09.71'S, 167°10.27'E, 675 m, 29 August 1985 (2 lots): 4 M 1.9–2.6 mm (USNM 1211206), 5 M 2.3–3.2 mm (MNHN-IU-2013-5547); sta DW 36, 23°08.64'S, 167°10.99'E, 650 m, 29 August 1985: 1 ov F 2.0 mm (USNM 1211207); sta DW 46, 22°53.05'S, 167°17.08'E, 570–610 m, 30 August 1985: 2 M 1.7, 3.0 mm, 1 F 3.0 mm (USNM 1211208); sta DW 51, 23°05.27'S, 167°44.95'E, 680–700 m, 31 August 1985 (3 lots): 1 M 3.7 mm (MNHN-IU-2013-5551), 3 M 1.7–2.2 mm, 2 F 1.7, 2.3 mm (USNM 1211210), 11 M 1.4–3.7 mm, 3 F 1.9–3.0 mm (MNHN-IU-2013-5553); sta CP 61, 24°11.70'S, 167°31.80'E, 1070 m, 2 September 1985: 1 M 3.3 mm, 1 ov F 2.3 mm (USNM 1211211); sta DW 66, 24°55.43'S, 168°21.67'E, 505–515 m, 3 September 1985 (2 lots): 1 M 3.1 mm, 1 F 2.7 mm (MNHN-IU-2013-5545 Pg.), 5 M 1.3–1.4 mm, 2 F 1.2, 1.4 mm, 5 imm 1.1–1.2 mm (MNHN-IU-2013-5546) — CHALCAL 2: sta DW 72, 24°54.50'S, 168°22.30'E, 527 m, 28 October 1986 (2 lots): 3 M 1.9–3.1 mm, 1 F 2.6 mm (MNHN-IU-2013-5548), 1 M 2.1 mm, 1 F 2.5 mm (USNM 1211212); sta DW 74, 24°40.36'S, 168°38.38'E, 650 m, 29 October 1986: 10 M 2.0–3.7 mm, 2 F 2.2, 2.6 mm, 1 ov F 2.4 mm (MNHN-IU-2013-5552); sta DW 75, 24°39.31'S, 168°39.67'E, 600 m, 29 October 1986: 14 M 2.2–3.6 mm, 8 F 2.1–4.0 mm, 3 ov F 2.5–3.6 mm (USNM 1211213) — SMIB 3: sta DW 2, 24°53.40'S, 168°21.70'E, 530 m, 20. 5.1987: 2 M 2.2, 3.0 mm (MNHN-IU-2013-5549); sta DW 3, 24°55.00'S, 168°21.70'E, 513 m, 20 May 1987 (2 lots): 1 F 2.2 mm, 1 ov F 2.6 mm (MNHN-IU-2013-5555), 1 M 3.1 mm (USNM 1211204) — MUSORSTOM 5: sta DW 301, 22°06.90'S, 159°24.60'E, 487–610 m, 12 October 1986: 1 M 1.5 mm (USNM 1211215) — MUSORSTOM 6: sta DW 453, 21°00.50'S, 167°26.90'E, 250 m, 20 February 1989: 2 M 1.6, 1.8 mm (USNM 1211216); sta DW 457, 21°00.42'S, 167°28.71'E, 353 m, 20 February 1989: 1 F 1.6 mm (MNHN-IU-2013-5554); sta DW 480, 21°08.50'S, 167°55.98'E, 380 m, 22 February 1989: 1 F 1.7 mm (USNM 1211217); sta DW 488, 20°49.20'S, 167°06.44'E, 800 m, 24 February 1989: 1 M 2.4 mm (USNM 1211214) — BERYX 11: sta DW 10, 24°44.75'S, 168°09.90'E, 560–600 m, 15 October 1992: 1 F 2.4 mm (MNHN Pg.); sta C 28, 23°38.80'S, 167°43.00'E, 430–490 m, 18 October 1992: 1 M 2.5 mm (MNHN Pg.) — SMIB 8: sta DW 152, 24°54.35'S, 168°22.23'E, 514–530 m, 27 January 1993: 1 M 3.1 mm (MNHN Pg.); sta DW 153, 24°53.55'S, 168°21.33'E, 547–560 m, 27 January 1993: 2 M 3.1, 3.2 mm, 1 ov F 3.2 mm (ZMMU); sta DW 177, 23°39.06'S, 168°00.05'E, 320–370 m, 29 January 1993: 1 M 2.2 mm (MNHN Pg.) — BATHUS 1, 20°57.28'S, 165°35.30'E, 255–280 m, 14 March 1993: 2 M 1.9, 2.0 mm (MNHN Pg.) — BATHUS 2: sta CP 738, 23°02.09'S, 166°56.61'E, 358–647 m, 13 May 1993: 1 M 2.4 mm (MNHN Pg.) — BATHUS 3: DW 776, 24°44.24'S, 170°08.0'E, 770–830 m, 24 November 1993 (2 lots): 1 M 3.1 mm (MNHN-IU-2013-5506), 4 M 2.2–3.3 mm, 4 F 2.2–2.7 mm, 1 ov F 2.4 mm (MNHN-IU-2013-5501); sta DW 778, 24°43.49'S, 170°07.07'E, 750–760 m, 24 November 1993 (2 lots): 1 ov F 2.1 (MNHN Pg. 6505), 1 ov F 1.8 mm (MNHN-IU-2013-5505); sta DW 785, 23°56.10'S, 169°45.70'E, 607–608 m, 25 November 1993: 2 M 3.4, 4.0 mm (MNHN Pg. 7014); sta DW 794, 23°48.35'S, 169°49.10'E, 751–755 m, 26 November 1993: 1 M 3.2 mm (MNHN-IU-2013-5503); sta DW 800, 23°35.12'S, 169°36.73'E, 655 m, 26 November 1993: 2 M 2.5, 2.9 mm (MNHN Pg.); sta CP 822, 23°19.92'S, 167°57.45'E, 950–980 m, 29 November 1993: 1 F 3.5 mm (MNHN Pg.) — HALIPRO 1: sta CP 858, 21°42.81'S, 166°41.95'E, 1000–1120 m, 20 March 1994: 1 M 2.8 mm, 2 F 1.7, 1.9 mm (MNHN-IU-2013-5502); sta CP 869, 21°14.84'S, 165°55.49'E, 450–490 m, 23 March 1994: 1 juv sex indet. 1.5 mm (MNHN Pg.) — BATHUS 4: sta DW 890, 21°01.20'S, 164°27.34'E, 500–520 m, 2 August 1994: 1 M 2.0 mm (MNHN Pg.); sta CP 913, 18°56.23'S, 163°04.86'E, 777–820 m, 5 August

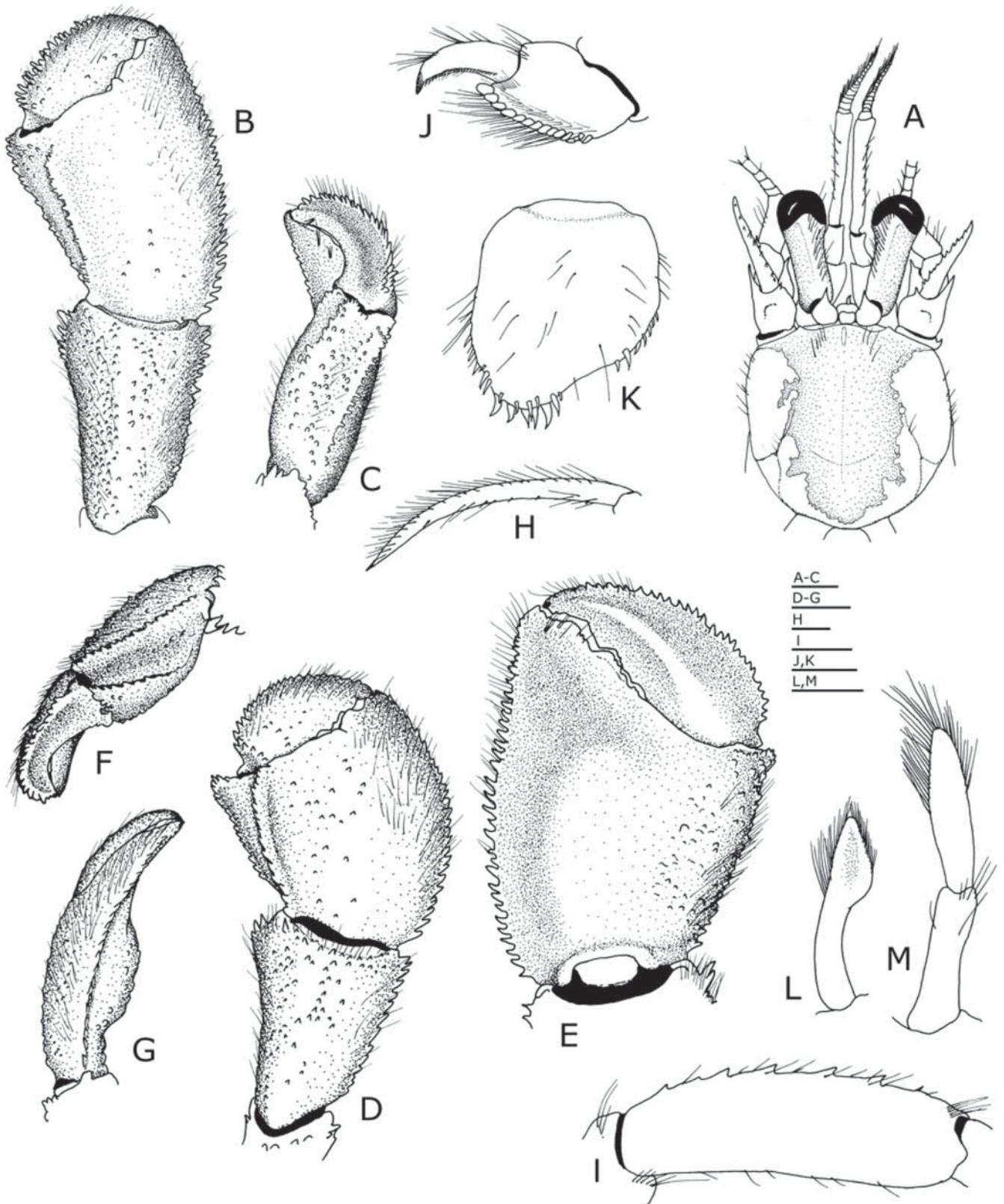


Fig. 26. *Oncopagurus indicus* (Alcock, 1905): A-C, H-M, male 4.0 mm, Queensland, Australia (QM W16600); D-G, female 3.3 mm Queensland (QM W16599). A, shield and cephalic appendages, dorsal; B, carpus and chela of male right cheliped, dorsal; C, chela of same, mesial; D, carpus and chela of female right cheliped, dorsal; E, F, G, chela of same, ventral (E), mesial (F), lateral (G); H, dactyl of right first ambulatory leg, mesial; I, merus of right second ambulatory leg, lateral; L, left first gonopod, mesial; M, left second gonopod, anterior. Scale bars = 1 mm (A, C-H, L, M); 0.5 mm (I-K). [Adapted from Lemaitre (1996)].

1994: 1 M 2.1 mm, 1 F 2.4 mm (MNH-IU-2013-5507); sta CP 946, 20°33.81'S, 164°58.35'E, 386–430 m, 10 August 1994: 1 F 1.5 mm (MNHN-IU-2013-5500) — SMIB 10: sta DW 204, 24°57'S, 168°21'E, 513–553 m, 10 January 1995: 1 M 2.6 mm (MNHN Pg.) — LITHIST: sta CP 8, 24°54.24'S, 168°21.35'W, 540 m, 11 August 1999: 1 M 1.9 mm (MNHN Pg. 6875) — NORFOLK 1: sta DW 1698, 24°40'186S, 168°39'545E, 562–576 m, 24 June 2001: 2 M 2.8, 3.5 mm, 1 ov F 2.4 mm (MNHN Pg. 6501); sta CP 1716, 23°21'525S, 168°02'598 E, 276–266 m, 26 June 2001: 1 ov F 1.7 mm (MNHN Pg. 6506) — NORFOLK 2: sta DW 2060, 24°39.84 S, 168°38.50 E, 582–600 m, 25 October 2003: 1 F 1.8 mm (MNHN Pg.); sta DW 2064, 25°16.59'S, 168°55.64'E, 609–691 m, 26 October 2003: 1 M 2.5 mm (MNHN Pg.); sta DW 2070, 25°22.97'S, 168°57.12'E, 630–1150 m, 26 October 2003: 1 M 2.1 mm (MNHN Pg.); sta DW 2073, 25°24.21'S, 168°19.46'E, 609 m, 27 October 2003: 1 M 2.5 mm (MNHN Pg.); sta DW 2077, 25°20.63'S, 168°18.53'E, 666–1000 m, 27 October 2003: 1 M 3.4 mm (MNHN Pg.); sta DW 2084, 24°52.00'S, 168°22'00E, 586–730 m, 27 October 2003: 1 M 3.5 mm, 2 F 2.8, 3.4 mm (MNHN Pg.) — EBISCO: sta DW 2536, 22°18.051'S, 159°28.661'E, 650–713 m, 10 October 2005: 1 M 2.8 mm (MNHN Pg.); sta DW 2574, 20°20.964'S, 158°45.149'E, 358–374 m, 14 October 2005: 1 M 2.0 mm (MNHN Pg.); sta DW 2603, 19°37.761'S, 158°43.898'E, 570–568 m, 18 October 2005: 2 M 1.9, 2.0 mm (MNHN Pg.); sta DW 2625, 20°04.872'S, 160°20.039'E, 627–741 m, 20 October 2005: 1 M 2.5 mm (MNHN Pg.). **Hawaiian Islands:** USFCS Albatross: sta 3919, Oahu, SW Diamond Head light, 21°15'00"N, 157°48'00"W, 402–470 m, 6 May 1902: 1 F 2.7 mm (USNM 1154274); R/V Townsend Cromwell, sta TC 40–76, 21°06.8'N, 156°31.9'W, 438.9 m, 22 November 1968: 1 M 2.8 mm, 1 ov F 3.3 mm (BPBM). **Marquesas Islands:** MUSORSTOM 9: sta CP 1169, 8°58.6'S, 140°04.6'W, 391–408 m, 24 August 1997: 1 M 3.4 mm (MNHN Pg. 6502); sta DW 1206, 9°51.4'S, 139°09.1'W, 352–358 m, 28 August 1997: 1 M 2.6 mm (MNHN Pg. 6498); sta DW 1207, 9°50.8'S, 139°09.8'W, 500–525 m, 28 August 1997: 1 M 2.7 mm, 1 F 2.0 mm (MNHN Pg.); sta DR 1255, 9°38.5'S, 139°48.4'W, 416–440 m, 2 September 1997: 1 M 2.2 mm (MNHN Pg. 6500); sta CP 1269, 7°56.3'S, 140°43.3'W, 420–430 m, 4 September 1997: 1 ov F 3.0 mm (MNHN Pg. 6503); sta CP 1270, 7°56.0'S, 140°43.2'W, 497–508 m, 4 September 1997: 4 M 2.6–3.1 mm (MNHN Pg. 6492); sta CP 1272, 7°55.5'S, 140°43.6'W, 660–680 m, 4 September 1997(2 lots): 2 M 3.0, 3.6 mm (MNHN Pg. 6497), 1 M 3.5 mm (MNHN Pg.); sta CP 1276, 7°51.9'S, 140°37.3'W, 800–805 m, 5 September 1997 (2 lots): 7 M 3.7–4.5 mm, 1 F 3.4 mm (MNHN Pg. 6490), 1 M 3.6 mm (MNHN Pg.); sta CP1278, 7°58.9'S, 140°43.3'W, 87–98 m, 6 September 1997: 1 M 3.3 mm (MNHN Pg. 6499); sta DW 1281, 7°47.8'S, 140°20.8'W, 450–455 m, 7 September 1997: 5 M 1.9–3.7 mm, 2 F 2.3, 3.4 mm, 4 ov F 2.7–2.8 mm (MNHN Pg. 6493); sta DW 1286, 7°53.1'S, 140°39.2'W, 760 m, 7 September 1997: 1 M 4.8 mm (MNHN Pg. 6495); sta CP 1307, 8°57.9'S, 140°15.8'W, 708–738 m, 10 September 1997: 2 M 2.8, 4.3 mm, 3 F 2.5–3.3 mm (MNHN Pg. 6496). **French Polynesia:** Society Islands, Moorea Island, DW 3463, 17.5667°N, 149.9°S, 460–505 m, 20 October 2009: 1 M 1.5 mm (UF23838). — Austral Islands: BENTHAUS: sta DW 1884, 27°53.75'S, 143°32.9'W, 570–620 m, 6 November 2002: 8 M 2.3–3.6 mm (MNHN Pg.); sta DW 1887, 27°51.59'S, 143°32.68'W, 750–1000 m, 6 November 2002: 1 M 3.6 mm (MNHN Pg.); sta DW 1898, 27°34.29'S, 144°26.65'W, 580–820 m, 8 November 2002: 2 M 2.6, 2.7 mm (MNHN Pg.); sta DW 1955, 23°18.52'S, 149°25.71'W, 750–850 m, 18 November 2002: 2 M 3.0, 4.1 mm (MNHN Pg. 7015); sta DW 1957, 23°18.8'S, 149°29.34'W, 558–1000 m, 18 November 2002: 2 M 3.2, 3.6 mm, 6 F 1.9–2.8 mm (MNHN Pg. 7016); sta DW 1961, 23°20.89'S, 149°33.51'W, 470–800 m, 19 November 2002: 1 M 2.8 mm (MNHN Pg. 7017); sta CP 1965, 23°21.35'S, 149°33.92'W, 500–1200 m, 19 November 2002: 4 M

2.6–4.3 mm, 1 F 3.1 mm (MNHN Pg.); sta CP 1967, 23°21.44'S, 149°34.25'W, 600–1200 m, 19 November 2002: 4 m 3.5–4.3 (MNHN Pg.); sta DW 1975, 23°24.09'W, 150°44.35'S, 600–691 m, 20 November 2002: 1 ov F 2.6 mm (MNHN Pg. 7018); sta DW 2005, 22°28.09'W, 151°18.30'W, 680–1800 m, 24 November 2002: 1 F 2.6 mm (MNHN Pg. 7019); sta DW 2018, 22°37.15'S, 152°49.06'W, 770–771 m, 25 November 2002: 3 M 2.2–3.5 mm (MNHN Pg.).

For additional material examined see Lemaitre (1996).

Diagnosis. Shield (Fig. 26A) as long as broad, rostrum broadly rounded, with low mid-dorsal ridge; lateral projections subtriangular, usually terminating in small spine. Ocular peduncles more than half length of shield; ocular acicles subtriangular, terminating in strong spine; corneas slightly dilated. Antennular peduncle (Fig. 26A) exceeding distal margin of cornea by full length of ultimate segment. Antennal peduncle (Fig. 26A) at most reaching distal margin of cornea; fourth segment with small spine on dorsolateral distal angle; second segment with dorsolateral distal angle terminating in strong simple or multifid spine; acicle reaching distal margin of cornea, mesial margin with 8–11 spines; flagellum with few setae about 1 flagellar article in length. Third maxilliped with crista dentata of about 10 teeth, proximal teeth slightly larger than distal. Right cheliped (Fig. 26B–G) with moderately dense setae, chela operculate, proportions and armature exhibiting sexual dimorphism; males with palm varying from as long as broad to slightly longer than broad, dorsomesial margin always well delimited by row of spines, ventromesial margin varying from weakly to well delimited by row of tubercles or spines, mesial face occasionally weakly expanded distomesially; females with palm broader than long, mesial face concave and expanded distomesially (more so in large females $sl > 3.0$ mm); in both sexes, dorsal face of palm with scattered small spines or tubercles often arranged in irregular rows medially, ventral face of palm mostly smooth; carpus with numerous small tubercles or spines mostly on dorsal and dorsolateral surfaces. Left cheliped usually weakly calcified on lateral face of carpus; palm unarmed or with dorsomesial row of few small spines; dorsal margin of carpus with irregular row of small spines, or few small tubercles, or unarmed except for dorsodistal spine. Ambulatory legs with dactyls (Fig. 26H) each having row of about 4–8 small corneous spinules on ventromesial margin; carpus with small dorsodistal spine; merus of third pereopods unarmed dorsally except for setae, or with row of 2–8 small spines (occasionally with 1 spine; Fig. 26I). Anterior lobe of sternite XII (between second ambulatory legs) rounded, setose, with or without subterminal spine. Fourth pereopod propodal rasp (Fig. 26J) with 1 row of ovate scales at least distally. Uropods and telson markedly asymmetrical; telson (Fig. 26K) lacking or with obsolete transverse suture, posterior lobes separated by shallow U-shaped median cleft, terminal margins armed with often strongly curved corneous spines. Male with paired first and second gonopods (Fig. 26L, M); first gonopod with weakly concave distal lobe; second gonopod with distal segment nearly flat, setose distally. Females with vestigial right second pleopod.

Variations. See Lemaitre (1996).

Colouration (Fig. 53A). Shield generally whitish or cream coloured, with faint undefined orange areas on anteromedian and lateral surfaces. Ocular peduncles with dorsolateral faces faint orange. Antennular peduncles with segments light orange. Antennal peduncles mostly whitish except for faint orange areas dorsolaterally, and light to transparent orange flagella. Chelipeds with proximal two-thirds of dorsal faces of meri and carpi orange and white distally; dorsal surface of chelae light orange proximally, otherwise white. Ambulatory legs generally whitish; dactyls entirely white; carpi and propodi orange on half to proximal two-thirds; meri white, with orange proximally and on dorsal margin; ischia light orange. Fourth and fifth pereopods mostly whitish, with at most small, faint orange area on lateral faces of propodi. Uropods and telson white or cream.

Habitat. Gastropod shells occasionally with one or more anthozoan polyps attached to the shell.

Distribution. Indian Ocean: Zanzibar; Mozambique Channel, Madagascar; Maldives. Western Pacific: Indonesia; Taiwan; Solomon Islands; Wallis and Futuna; Fiji; Vanuatu, Tonga Islands; New Caledonia; Australia; Philippines. Central and South Pacific: Hawaiian Islands; Marquesas Islands; French Polynesia; Nazca and Sala-y-Gómez Ridge. Depth: 87–1800 m.

Remarks. *Oncopagurus indicus* is widely distributed and often found abundantly, from the western Indian Ocean, and across the western and central Pacific, to the Nazca and Sala-y-Gómez Ridges in the south Pacific. Previous to this study, *O. indicus* had been reported westward in the Indo-Pacific only from the Philippines and Hawaiian Islands (Lemaitre, 1996). Its presence herein documented from French Polynesia and the Nazca and Sala-y-Gómez Ridges, considerably expands the distribution of this species.

A detailed evaluation of the morphological variations and its effect on the taxonomy of this species, and its close affinities and differences with *Oncopagurus monstrosus*, was discussed by Lemaitre (1996). Since then, the study of considerable additional material of *O. indicus* obtained during French campaigns and reported herein, has amplified even more its known distribution, and reinforced the concept of *O. indicus* as a morphologically variable and sexually dimorphic species. As discussed by Lemaitre (1996) and illustrated herein, that dimorphism is more strongly manifested in the shape and armature of the right chela.

Males of *Oncopagurus indicus* can often be difficult to separate from males of *O. monstrosus*, although there are some clear distinctions. In males of *O. indicus*, the mesial face of the right palm is at most weakly expanded distomesially, and the palm has a distinct, spinose ventromesial margin (Fig. 26B, C); in males of *O. monstrosus* the mesial face is similar to that of females (Fig. 28B, D–G). Females of these two species can be separated by the shape and armature of the mesial face of the palm of the right cheliped, which in

O. indicus is expanded distomesially, and the palm has a well delimited ventromesial, spinose margin (Fig. 26D–F); in *O. monstrosus* the mesial face of the palm is not expanded distally, and the ventromesial face is rounded, without any distinct ventromesial margin (Fig. 28E, F). In both sexes of *O. indicus* the ocular peduncles are nearly subequal in width throughout the peduncle, and the width of the corneas is subequal to the distal width of the peduncles (Fig. 26A); in both sexes of *O. monstrosus* the peduncles increase in width distally, are slightly constricted medially, and the width of the corneas is distinctly greater than that of the peduncles (Fig. 28A).

Observations and photographs of fresh specimens obtained during this study have also revealed subtle but distinct colouration differences between *Oncopagurus indicus* and *O. monstrosus*. The orange colouration is overall stronger in *O. indicus* than in *O. monstrosus*. The most visible difference in colouration is on the orange pattern of carpi and propodi of the ambulatory legs. In *O. indicus* the meri, carpi and propodi have uninterrupted orange bands (Fig. 53A), whereas in *O. monstrosus* the meri, carpi and propodi are orange interrupted medially by a white area (Figs. 53B, C).

In their catalogue of hermit crabs from Taiwan, McLaughlin et al. [2007: 313, unnumbered fig. (DW56)] included under *Oncopagurus indicus* a colour photograph of a female specimen from station DW 56 (shield length 2.8 mm). The specimen used for that photograph has not been found, but it is clear that based on differences in colour pattern alone with the other photographs published therein (p. 312) for *O. indicus* and comparisons with confirmed specimens of *O. monstrosus* photographed alive (see Fig. 53B, C), that it is not *O. indicus*, and instead represents *O. monstrosus*.

A sexual dimorphism of the right palm similar to that of *Oncopagurus indicus* has been documented in the Atlantic congener, *O. bicristatus* (A. Milne-Edwards, 1880). However, in *O. bicristatus*, the dimorphic features are reversed, with the distal expansion of the mesial face of the palm distinctly developed in males instead of females (see Lemaitre, 1989 as *Sympagurus bicristatus*).

The morphology of the right cheliped and colour pattern of *Oncopagurus indicus* is also similar to that of *O. tuamotu* (see Remarks under *O. tuamotu*).

Oncopagurus minutus (Henderson, 1896)

Figs. 27, 51

Parapagurus minutus Henderson, 1896: 531 (type locality: off the north Maldive Atoll, RIMSS Investigator, sta 150); Alcock & Anderson, 1897, pl. 32, fig. 3, 3a; Alcock, 1901: 222; 1905: 101, pl. 10, fig. 3; de Saint Laurent, 1972: 108; Miyake 1982: 196 (list).

Sympagurus minutus – Lemaitre, 1989: 37; 1994: 412.

Oncopagurus minutus – Lemaitre, 1996: 201, fig. 21; 1997: 594; Zhadan, 1999: 735, figs. 2a, b; Davie, 2002: 89; Poore, 2004: 282, fig. 81d; Asakura et al., 2006: 211; Asakura, 2006: 309; McLaughlin et al., 2010: 39.

(For complete synonymy see Lemaitre, 1996)

Type material. Syntype: F 2.3 mm, Indian Ocean, off north Maldive Atoll, RIMSS Investigator, sta 150, 1308.6 m (BMNH 1896:9.8.24).

Additional material. Taiwan: TAIWAN 2006: sta CP 372, 24°23.619'N, 122°14.138'E, 1220–1280 m, 26 August 2006: 3 M 3.0–4.1 mm, 1 ov F 2.8 mm (NTOU). **Philippines:** MUSORSTOM 2: sta CP 55, 13°54'N, 119°58'E, 865–866 m, 27 November 1980 (2 lots): 1 M 2.8 mm, 1 ov F 3.6 mm (MNHN Pg.), 1 F 2.8 mm, 1 ov F 3.0 mm (MNHN Pg.). **Indonesia:** CORINDON: sta CH 276, 01°55'S, 119°14'E, 395–450 m, 8 November 1980: 1 F 2.7 mm (MNHN Pg.); [unknown sta]: 1 ov F 3.6 mm (MNHN Pg.). **Solomon Islands:** SALOMON 1: sta CP 1808, 9°45.5'S, 160°52.5'E, 611–636 m, 2 October 2000: 1 M 3.2 mm (MNHN Pg.) — SALOMON 2: sta CP 2176, 9°10.6'S, 159°01.14'E, 600 m, 21 October 2004: 2 ov F 2.1, 2.5 mm (MNHN Pg.); sta CP 2231, 6°26.6'S, 156°24.4'E, 1083–1100 m, 29 October 2004: 1 M 2.6 mm (MNHN Pg.). **Wallis and Futuna Islands:** MUSORSTOM 7: sta CP 567, 11°47.0'S, 178°27.3'W, 1010–1020 m, 20 May 1992: 1 M 3.5 mm (USNM 1211220). **Vanuatu:** MUSORSTOM 8: sta CC 996, 18°52.41'S, 168°55.73'E, 764–786 m, 24 September 1994: 1 M 2.7 mm (MNHN Pg.); sta CP 1008, 18°53.29'S, 168°52.65'E, 919–1000 m, 25 September 1994: 1 M 3.3 mm (MNHN-IU-2013-5499) — BOA 0: sta CP 2311, 14°44'S, 167°06'E, 932–986 m, 15 November 2004: 1 M 3.8 mm (MNHN Pg.). **Tonga Islands:** BORDAU 2: sta DW 1508, 21°02'S, 175°19'W, 555–581 m, 31 May 2000: 1 F 1.9 mm (USNM 1211219, ex MNHN Pg. 6719). **New Caledonia:** BIOCAL: sta CP 55, 23°19.80'S, 167°30.70'E, 1160–1175 m, 1

September 1985: 1 ov F 2.8 mm (MNHN-IU-2013-5536); sta CP 57, 23°43.30'S, 166°58.10'E, 1490–1620 m, 1 September 1985: 1 M 2.5 mm (USNM 1211225) — MUSORSTOM 5: sta DW 322, 21°19.00'S, 158°00.40'E, 975 m, 14 October 1986: 1 M 1.6 mm [parasitised] (USNM 1211224); sta CP 323, 21°18.52'S, 157°57.62'E, 970 m, 14 October 1986: 1 M 2.7 mm (USNM 1211223); sta CP 324, 21°15.01'S, 157°51.33'E, 970 m, 14 October 1986: 1 M 3.7 mm (USNM 1211222) — BIOGEOCAL: sta CP 238, 21°27.64'S, 166°23.41'E, 1260–1300 m, 13 April 1987: 1 ov F 3.2 mm (MNHN-IU-2013-5513); sta DW 313, 20°58.95'S, 166°59.04'E, 1600–1640 m, 2 May 1987: 1 M 2.3 mm (USNM 1211221) — BENTHAUS: sta CP 1911, 27°37.94'S, 144°15.23'E, 900–1300 m, 10 November 2002: 1 ov F 2.2 mm (USNM 1211226, ex MNHN Pg. 6718); sta DW 1956, 23°18.42'S, 149°26.96'E, 600–990 m, 18 November 2002: 1 M 1.7 mm (MNHN Pg.); sta DW 2001, 22°26.59'S, 151°20.12'E, 200–550 m, 23 November 2002: 1 F 2.4 mm (MNHN Pg.); sta DW 2005, 22°28.09'S, 151°18.30'E, 680–1800 m, 24 November 2002: 1 F 1.7 mm (MNHN Pg.) — EBISCO: sta CP 2556, 21°06'S, 158°32'E, 741–791 m, 12 October 2005 (2 lots): 1 M 3.3 mm (MNHN Pg.), 1 M 3.9 mm (MNHN Pg.); sta CP 2557, 21°07'S, 158°30'E, 800–923 m, 12 October 2005: 2 M 2.4, 3.3 mm (MNHN Pg.); sta CP 2615, 19°35'S, 158°48'E, 680–722 m, 19 October 2005: 1 ov F 2.1 mm (MNHN Pg.); sta CP 2647, 21°32'S, 162°27'E, 747 m, 23 October 2005: 1 F 1.2 mm (MNHN Pg.); sta CP 2648, 21°32'S, 162°30'E, 458–750 m, 23 October 2005: 4 M 1.7–2.7 mm (MNHN Pg.); sta CP 2650, 21°27'S, 162°33'E, 825–894 m, 23 October 2005: 1 M 2.5 mm (MNHN Pg.). **Marquesas:** MUSORSTOM 9: sta DW 1286, 7°53.1'S, 140°39.2'W, 760 m, 7 September 1997: 1 M 2.4 mm (MNHN-IU-2013-5511, ex MNHN Pg. 6420).

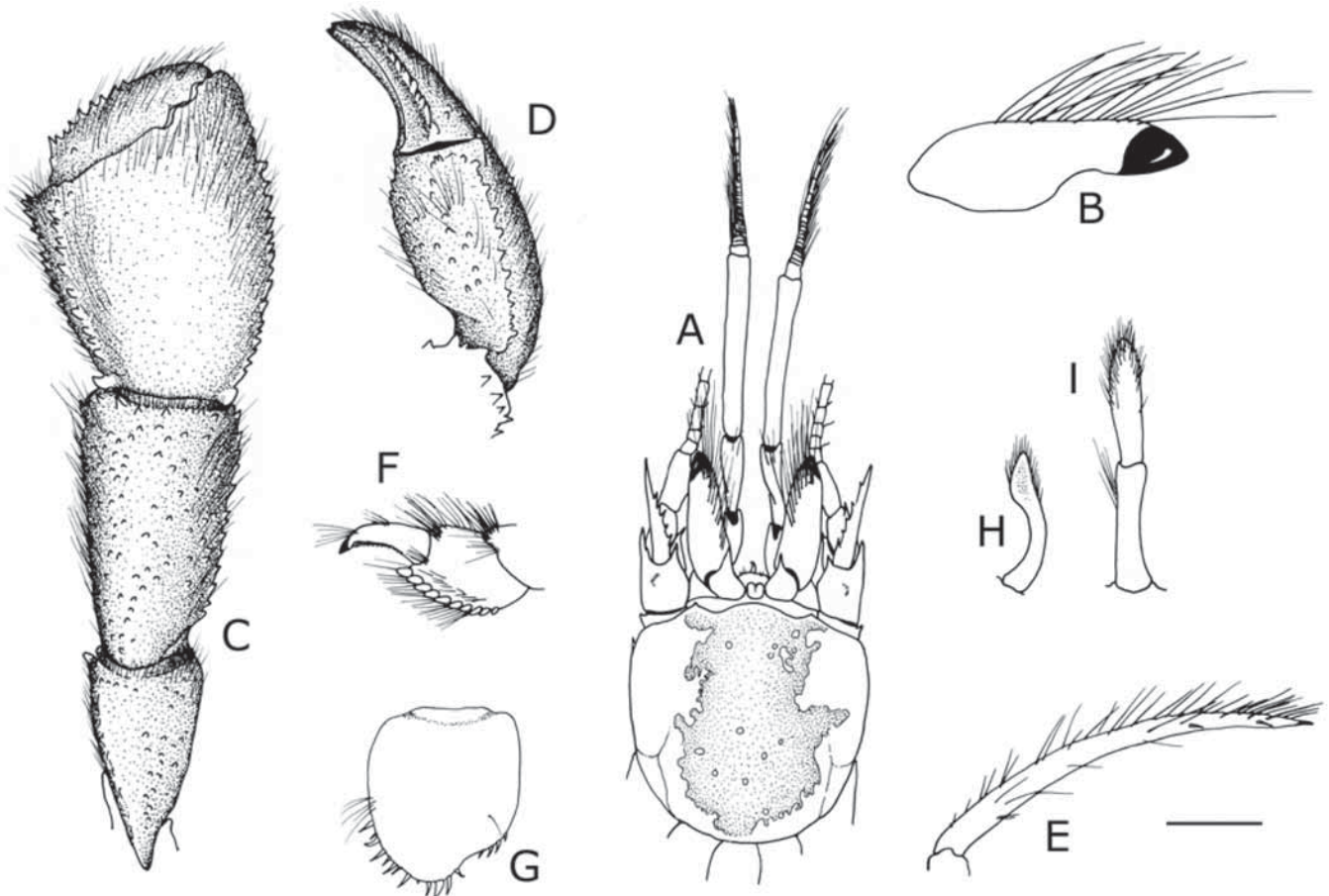


Fig. 27. *Oncopagurus minutus* (Henderson, 1896): male 2.5 mm, New South Wales, Australia (AM P40409). A, shield and cephalic appendages, dorsal; B, right ocular peduncle, lateral; C, right cheliped, dorsal; D, chela of same mesial; E, dactyl of first ambulatory leg, mesial; F, propodus and dactyl of left fourth pereopod, lateral; G, telson, dorsal; H, left first gonopod, mesial; I, left second gonopod, anterior. Scale bars = 1 mm (A, C–E), 0.5 mm (B, F–I). [Adapted from Lemaitre (1996)].

For additional material examined see Lemaitre (1996).

Diagnosis. Shield (Fig. 27A) about as long as broad; rostrum broadly rounded, with short, low mid-dorsal ridge; lateral projections subtriangular, terminating in small spine. Ocular peduncles more than half length of shield, diminishing in width distally, with long setae dorsally; ocular acicles subtriangular, terminating in strong spine; corneas subconical, distally rounded, maximum width of each subequal to distal width of peduncle at base of cornea (Fig. 27A, B). Antennular peduncle (Fig. 27A) exceeding distal margin of cornea by half or more length of penultimate segment. Antennal peduncle (Fig. 27A) slightly exceeding distal margin of cornea; fourth segment with small spine on dorsolateral distal angle; second segment with dorsolateral distal angle terminating in strong spine, mesial margin with small spine on dorsodistal angle; acicle at most slightly exceeding distal margin of cornea, mesial margin armed with 5–7 spines; flagellum with setae 1 to 2 flagellar articles in length. Third maxilliped with crista dentata of about 10–13 teeth gradually diminishing in strength distally. Chelipeds markedly dissimilar, with moderately dense setae. Right cheliped (Fig. 27C, D) with moderately dense setae, chela operculate; dactyl set at strongly oblique angle to longitudinal axis of palm; palm with dorsal surface unarmed or at most with scattered small tubercles, dorsolateral and dorsomesial margins well defined by row of small spines or tubercles, mesial face rounded and with few tubercles; carpus with numerous and generally well-spaced small tubercles or spines on dorsal surface. Left cheliped with carpus weakly calcified dorsolateral face; palm unarmed except for few setae; carpus with dorsodistal spine. Ambulatory legs with dactyls (Fig. 27E) having ventromesial row of about 2–5 small corneous spinules; carpus with small dorsodistal spine. Anterior lobe of sternite XII (between second ambulatory legs) unarmed or with small subterminal spine, setose. Fourth pereopod propodal rasp (Fig. 27F) with 1 row of ovate scales at least distally. Uropods and telson markedly asymmetrical; telson (Fig. 27G) lacking transverse suture, posterior lobes separated by shallow, U-shaped median cleft, terminal margins armed with often curved corneous spines. Male with paired first and second gonopods (Fig. 27H, I); first gonopod with weakly concave distal lobe; second gonopod with distal segment nearly flat, setose distally. Females with vestigial right second pleopod.

Colouration. Unknown

Habitat. Gastropod shells.

Distribution. Indo-Pacific: from the Maldives in the Indian Ocean; and from Indonesia to the Marquesas in the Western to Central Pacific. Depth: 200–2308 m.

Remarks. (See also *Oncopagurus conicus*, *O. elongatus*, new species, and *O. petilus*, new species). As previously mentioned, *O. minutus* and three other congeners, *O. conicus*, *O. elongatus*, new species, and *O. petilus*, new species, are set apart from other *Oncopagurus* species in having reduced, subconical corneas. *Oncopagurus minutus* differs from those species as follows: from *O. conicus* in having an operculate

right chela (not operculate in *O. conicus*), and the uropods and telson are asymmetrical in *O. minutus* (symmetrical in *O. conicus*); from *O. elongatus*, new species in the shape and armature of the mesial face of the right chela, which is rounded in *O. minutus*, whereas in *O. elongatus*, new species the mesial face can be rounded (males) or concave and expanded distomesially with a well delimited ventromesial margin, and the dactyl of the fourth pereopod, which in *O. minutus* is similarly shaped in both sexes (Fig. 27F), whereas in *O. elongatus*, new species, the dactyl is distinctly longer and slenderer in females than in males; from *O. petilus*, new species, in the length of the antennal acicles relative to the ocular peduncles, not exceeding the corneas in *O. minutus* (acicles distinctly exceeding the corneas in *O. petilus*, new species, and the ventromesial face of the right chela rounded (with ventromesial row of spines in *O. petilus*, new species).

Oncopagurus minutus is broadly distributed. It has been found from the Maldives, in the central Indian Ocean, throughout the tropical western Pacific, and the Marquesas in the Central Pacific. Bathymetrically it reaches to 2308 m in depth (Fig. 51), the deepest among species of *Oncopagurus*.

***Oncopagurus monstrosus* (Alcock, 1894)**

Figs. 28, 51, 53B, C

“*Parapagurus monstrosus*” Alcock, 1894: 243 (type locality, by lectotype designation: Bay of Bengal).

Sympagurus monstrosus – Henderson, 1896: 533; Alcock & Anderson, 1897, pl. 32, fig. 4; Alcock, 1901: 223; Lemaitre, 1989: 37; 1994: 412.

Sympagurus arcuatus var. *monstrosus* – Alcock, 1905: 104, pl. 10, fig. 5; Gordan, 1956: 341; Kemp & Sewell, 1912: 26.

Parapagurus monstrosus – de Saint Laurent, 1972: 108; Miyake, 1978: 72 (key); 1982: 119, pl. 40, fig. 1; Baba et al., 1986: 302, fig. 146; Imafuku, 1992: 234, unnumbered fig.

Oncopagurus monstrosus – Lemaitre, 1996: 199, figs. 19, 20; 1997: 594; Spiridonov & Zhadan, 1999: 625, fig. 1; Zhadan, 1997: 63 (table); Zhadan, 1999: 737; Rahayu, 2000: 396; McLaughlin, 2002: 450; Davie, 2002: 89; Asakura et al., 2006: 211, fig. 2; McLaughlin et al., 2007: 315, unnumbered figs. a–d; McLaughlin et al., 2010: 2010: 39, fig. 19A.

Oncopagurus indicus – McLaughlin et al., 2007: 313, unnumbered colour photo (sta DW 56) (See Remarks).

(For complete synonymy see Lemaitre, 1996)

Type material. Lectotype, Indian Ocean, Bay of Bengal [probably from RIMSS Investigator, sta 120, 15°56'50"N, 81°30'30"E, 439 m, 24 December 1890]: M 4.2 mm (USNM 156566)

Paralectotypes: 2 M 3.4, 3.7 mm, same sta data as lectotype (USNM 156566).

Additional material. Japan: Tosa Bay, 275 m, 9 April 1985, coll. M. Toriyama: 4 M 4.3–6.1 mm, 1 ov F 4.5 mm (USNM 1211227); Shionomisaki, Kii Peninsula, 200 m, 4 March 1991, coll. S. Nagai: 1 M 5.2 mm (USNM 276119). **Taiwan:** TAIWAN 2004: sta CP 269, 24°30.55'N, 122°5.78'E, 399–397 m, 9 February 2004: 3 M 2.4–3.6 mm (MNHN Pg.). **Philippines:** Siboga Expedite, sta 212, 05°54.5'S, 120°19.2'E, 462 m, 19 September 1899: 1 M 2.0 mm (MNHN Pg. 3203). — Th. Mortensen's Pacific Expedition 1913–1916: 3 miles SW of Tucuran, 550 m, 10 March 1914: 1 M 1.5 mm, 1 F 2.2 mm (ZMK); 25 miles E of S. Zamboanga, 665–290 m, 3

March 1914: 1 M 3.9 mm (ZMK) — MUSORSTOM 2: sta CP 40, 13°08'N, 122°39'E, 280–340 m, 25 November 1980 (2 lots): 9 M 3.2–4.8 mm (MNHN Pg.), 1 M 3.8 mm (MNHN Pg.); sta CP 49, 13°38'N, 121°44'E, 416–425 m, 26 November 1980: 3 M 3.5–5.5 mm (MNHN Pg.); sta CP 64, 14°01'N, 120°19'E, 191–195 m, 29 November 1980: 1 F 2.4 mm (MNHN Pg.) — MUSORSTOM 3: sta CP 108, 14°01'S, 120°18'E, 188–195 m, 2 June 1985: 1 F 3.0 mm (MNHN Pg.); sta CP 138, 11°54'S, 122°15'E, 252–370 m, 6 June 1985: 1 M 3.7 mm, 1 F 2.2 mm (MNHN Pg.). **Indonesia:** Den danske Kei Eksped. 1922: sta 50, 05°34'S, 132°25'40"E, 233 m, 4 May 1922: 1 M 2.1 mm (ZMK); sta 63, 05°32'S, 132°36'25"E, 250 m, 16 May 1922: 1 F 2.2 mm (ZMK) — Th. Mortensen's Pacific Expedition 1913–1916: sta 7, 08°29'S, 114°40'E, 200 m, 5 April 1929: 1 M 3.9 mm (ZMK); sta 15, 07°29'S, 114°49'E, [no depth], 10 April 1929: 1 F 2.0 mm (ZMK). **Solomon Islands:** SALOMON 1: sta CP 1747, 9°21.8'S, 159°58.7'E, 364–402 m, 25 September 2000 (2 lots): 3 M 4.2–4.8 mm, 1 F 4.1 mm (MNHN Pg.), 6 M 3.2–4.4 mm, 5 F 2.7–4.7 mm, 1 ov F 3.1 mm (MNHN Pg.); sta CP 1786, 9°21.3'S, 160°24.6'E, 387 m, 30 September 2000: 2 M 4.2, 4.7 mm, 2 F 3.0, 3.8 mm, 1 ov F 3.7 mm (MNHN Pg.); sta CP 1800, 9°21.4'S, 160°23.9'E, 357–359 m, 1 October 2000 (3 lots): 1 M 4.7 mm (MNHN Pg.), 1 M 5.2 mm (MNHN Pg.), 8 M 2.4–4.3 mm, 3 F 1.8–2.9 mm (MNHN Pg.); sta CP 1804, 9°32.0'S, 160°37.4'E, 309–328 m, 2 October 2000: 3 M 3.6–4.8 mm, 2 ov F 3.6, 4.0 mm (MNHN Pg.) — SALOMON 2: sta CP 2262, 7°57.5'S, 156°51.346'E, 460–487 m, 11 March 2004: 1 M 5.5 mm (MNHN Pg.). **Tonga Islands:** BORDAU 2: sta CP 1593, 19°06'S, 174°18'W, 436–442 m, 14 June 2000: 1 M 3.1 mm (MNHN Pg. 6504). **New Caledonia:** BIOCAL: sta DW 33, 23°09.71'S, 167°10.27'E, 675 m, 29 August 1985: 1 M 2.1 mm, 2 F 2.0, 3.2 mm (USNM 1211228) — MUSORSTOM 4: sta CC 175, 18°59.30'S, 163°17.50'E, 370 m, 17 September 1985: 1 M 2.7 mm, 1 ov F 2.1 mm (USNM 1211229) — CHALCAL 2: sta DW 73, 24°39.90'S, 168°38.10'E, 573 m, 29 October 1986: 5 M 3.0–3.3 mm, 2 F 2.0, 2.4 mm, 1 ov F 1.9 mm (USNM 1202681) — BATHUS 1: sta CP 695, 20°34.59'S, 164°57.88'E, 410–430 m, 17 March 1993: 1 M 1.5 mm, 2 F 1.7, 1.9 mm, 1 ov F 1.5 mm (MNHN Pg.) — BATHUS 3: sta DW 838, 23°00.81'S, 166°55.87'E, 400–402 m, 30 November 1993: 2 F 1.8, 2.3 mm (MNHN Pg.) — BATHUS 4: sta CP 950, 20°31.93'S, 164°56.11'E, 705–750 m, 10 August 1994: 1 M 3.1 mm (MNHN Pg.) — NORFOLK 2: sta DW 2074, 25°24.01'S, 168°19.96'E, 623–691 m, 27 October 2003: 4 M 2.4–2.8 mm (MNHN Pg.); sta DW 2080, 25°20.40 S, 168°18.74 E, 764–816 m, 27 October 2003: 1 M 4.0 mm (MNHN Pg.).

Diagnosis. Shield (Fig. 28A) about as long as broad; rostrum broadly rounded, with low mid-dorsal ridge; lateral projections broadly subtriangular, usually terminating in small spine. Ocular peduncles more than half length of shield; ocular acicles subtriangular, terminating in strong spine; corneas dilated. Antennular peduncle (Fig. 28A) exceeding distal margin of corneas by full length of ultimate segment. Antennal peduncle (Fig. 28A) exceeding distal margin of cornea by at most 0.3 length of fifth segment; fourth segment with small spine on dorsolateral distal angle; second segment with dorsolateral distal angle terminating in strong spine; acicles at most slightly exceeding distal margin of corneas, mesial margin armed with 8–15 spines; flagellum with series of short (< 1 article in length) and long (> 3 articles in length) setae every 8–20 articles. Third maxilliped with crista dentata of about 10–13 teeth, proximal teeth larger than distal. Right cheliped (Fig. 28B–G) with moderately dense setae, chela operculate, chela proportions influenced by sex, less than twice as long as broad in males, or about

as long as broad in females; palm with irregular rows of small spines medially on dorsal face, dorsolateral and dorsomesial margins well delimited by row of small spines; mesial face of palm rounded, with small spines or tubercles. Left cheliped with dorsolateral face of carpus often weakly calcified; palm unarmed except for few setae; carpus with dorsodistal spine. Ambulatory legs with dactyls (Fig. 28H) each having ventromesial row of about 5–15 small corneous spinules; carpus with small dorsodistal spine. Anterior lobe of sternite XII (between second ambulatory legs) with small subterminal spine, setose. Fourth pereopod propodal rasp (Fig. 28I) with 1 row of ovate scales at least distally. Uropods and telson markedly asymmetrical; telson (Fig. 28J) lacking transverse suture, posterior lobes separated by U-shaped median cleft, terminal margins armed with often strongly curved corneous spines. Males with paired first and second gonopods (Fig. 28K, L); first gonopod with weakly concave distal lobe; second gonopod with distal segment nearly flat, setose distally. Females with vestigial right second pleopod.

Colouration (Fig. 53B, C). Carapace light orange. Right cheliped with chela and distal 0.6 of carpus creamy-white; carpus with orange-red portion on proximal third of dorsal surface; merus dorsal surface orange-red on proximal 0.6 of dorsal surface, creamy-white distally. Left cheliped creamy-white with reddish-orange patches on lateral faces of merus, carpus and propodus. Ambulatory legs with carpi and propodi each with two orange-reddish patches on mesial and lateral faces; meri with orange-reddish patches on dorsal surface that are often partially fused and extended to lateral and mesial surfaces. [See also Miyake (1982: 118, pl. 40, fig. 1), Baba et al. (1986: 146, pl. 302), Imafuku (1992: 234), and McLaughlin et al. (2007: 313, as *O. indicus*)].

Habitat. Gastropod shells usually with actinian attached to shell.

Distribution. Indo-Pacific: Gulf of Aden; Bay of Bengal; Japan; Taiwan; Philippines; Indonesia; Solomon Islands; Tonga Islands; New Caledonia; and Australia. Depth: 188–1000 m.

Remarks. As previously mentioned, *Oncopagurus monstrosus* is similar to *O. indicus*, and often the two are difficult to separate (see Remarks under *O. indicus*). Individuals of *O. monstrosus* grow to a larger size, reaching 6 mm or more in sl, whereas specimens of *O. indicus* rarely exceed 3 or 4 mm in sl. Aside from characters of the right cheliped as discussed under *O. indicus*, the greater development of ocular peduncles and corneas in *O. monstrosus* can also serve to distinguish the two species. To a lesser degree, because of some variability, the armature of the merus of the right second ambulatory leg, can also serve to distinguish the two species. In *O. monstrosus* the merus lacks spines dorsally, whereas a row of several small spines is usually present on the merus in *O. indicus*.

Colour differences between *Oncopagurus monstrosus* and *O. indicus* are discussed under the latter species.

Oncopagurus oimos Lemaitre, 1998

Figs. 29, 51

Oncopagurus oimos Lemaitre, 1998: 102, figs 1–3 (type locality: Tuamotu Archipelago, Moruroa atoll, French Polynesia, FRV Marara, sta 499, 21°47.6'S, 138°55.7'W); McLaughlin et al., 2010: 2010: 39.

Type material. Holotype, French Polynesia, Tuamotu Archipelago, Moruroa atoll, R/V Marara, sta 499, 21°47.6'S, 138°55.7'W, 200 m, 5 May 1996: M 2.8 mm (MNHN Pg. 5505).

Paratypes, same locality as holotype: 1 M 2.4 mm, 1 F 2.7 mm (MNHN Pg. 5506); 1 M 2.9 mm (USNM 276085).

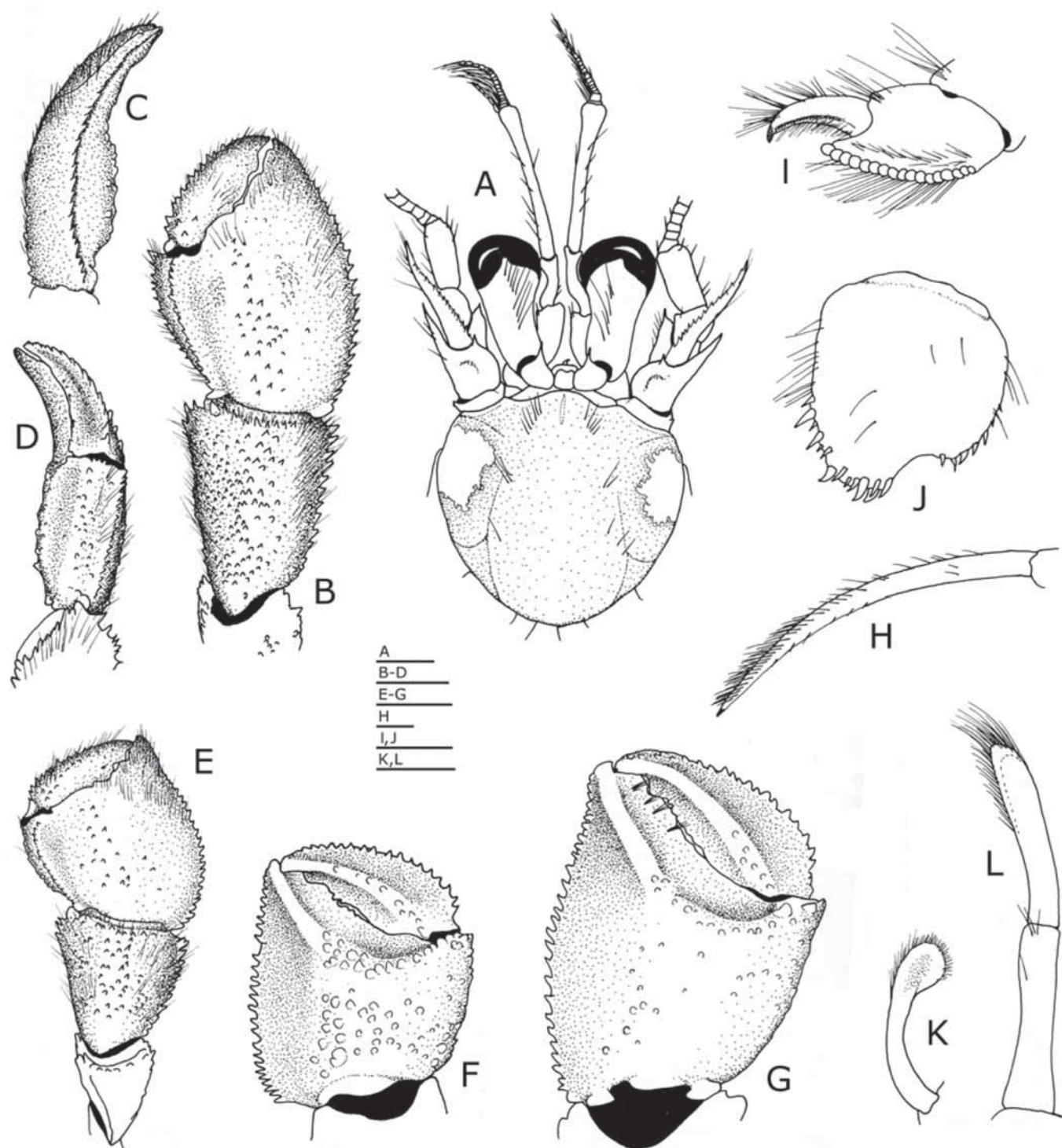


Fig. 28. *Oncopagurus monstrosus* (Alcock, 1894): A–D, H–L, lectotype, male 4.2 mm, Bay of Bengal (USNM 156566); E, female 3.4 mm, Indonesia (USNM 168939); F, male 4.2 mm, Indonesia (USNM 168940); G, male 5.1 mm, Philippines (USNM 168931). A, shield and cephalic appendages, dorsal; B, carpus and chela of right cheliped, dorsal; C, D, chela of same, lateral (C), mesial (D); E, right cheliped of female, dorsal; F, G, chela of male, ventral; H, dactyl of right first ambulatory leg, mesial; I, propodus and dactyl of left fourth pereopod, lateral; J, telson, dorsal; K, left first gonopod, mesial; L, left second gonopod, anterior. Scale bars = 1 mm (A, H); 2 mm (B–G); 0.5 mm (I–L). [Adapted from Lemaitre (1996)].

Additional material. None found since original description.

Diagnosis. Shield (Fig. 29A) as broad as long; lateral projections subtriangular, terminating in small spine. Rostrum broadly rounded, weakly produced, with short mid-dorsal ridge. Ocular peduncles more than half length of shield, with dorsal row of short setae; cornea weakly dilated. Ocular acicles subtriangular, terminating in short spine. Antennular peduncle (Fig. 29A) exceeding distal margin of cornea by entire length of ultimate segment. Antennal peduncle (Fig. 29A) exceeding distal margin of cornea by about 0.3 length of fifth segment; fourth segment with strong spine on dorsolateral distal angle; second segment with dorsolateral distal angle terminating in strong, simple spine, mesial margin with spine on dorsodistal angle; first segment with unarmed lateral face; acicle at most slightly exceeding distal margin of cornea, mesial margin with 8–13 spines. Third maxilliped with crista dentata armed with about 12 teeth, proximal teeth larger than distal. Right cheliped (Fig. 29B, C) massive, chela operculate; dactyl set at strongly oblique angle to longitudinal axis of palm, with ventromesial face concave; palm broader than long, dorsal surface smooth except for scattered small spines or tubercles, lateral margin well delimited by row of blunt to sharp small spines, dorsomesial margin with row of small spines or tubercles, mesial face rounded, ventral surface smooth; carpus with lateral margin well delimited by row

of small spines, dorsal surface with numerous small spines or tubercles. Left cheliped usually well calcified, carpus long (up to 4 times as long as broad), unarmed dorsally except for strong dorsodistal spine. Ambulatory legs (Fig. 29D, E) with dactyls (Fig. 29F) each armed with 10–14 small corneous spinules, carpi unarmed dorsally except for small dorsodistal spine. Anterior lobe of sternite XII (between second ambulatory legs) subsemicircular, setose, with distinct spine. Fourth pereopod propodal rasp (Fig. 29G) with 1 row (at least distally) of rounded scales. Fifth pereopod propodal rasp extending to midlength of segment. Uropods and telson markedly asymmetrical; telson (Fig. 29H) lacking transverse suture, posterior lobes separated by shallow unarmed, U-shaped cleft, terminal margins of lobes with about 13 corneous spines (left lobe) and 4 small corneous spines (right lobe). Male lacking first gonopods, with unpaired reduced second gonopod (Fig. 29I, J) consisting of minute bud or short segment. Female lacking vestigial second right pleopod.

Colouration. After approximately one year in alcohol, shield with two small reddish spots on anterior half, one just behind each lateral projection. On both chelipeds, dorsodistal portions of the meri reddish. Carpus of right cheliped with reddish area on proximal portion of lateral and mesial faces. Carpus of left cheliped with distinctive broad reddish stripe

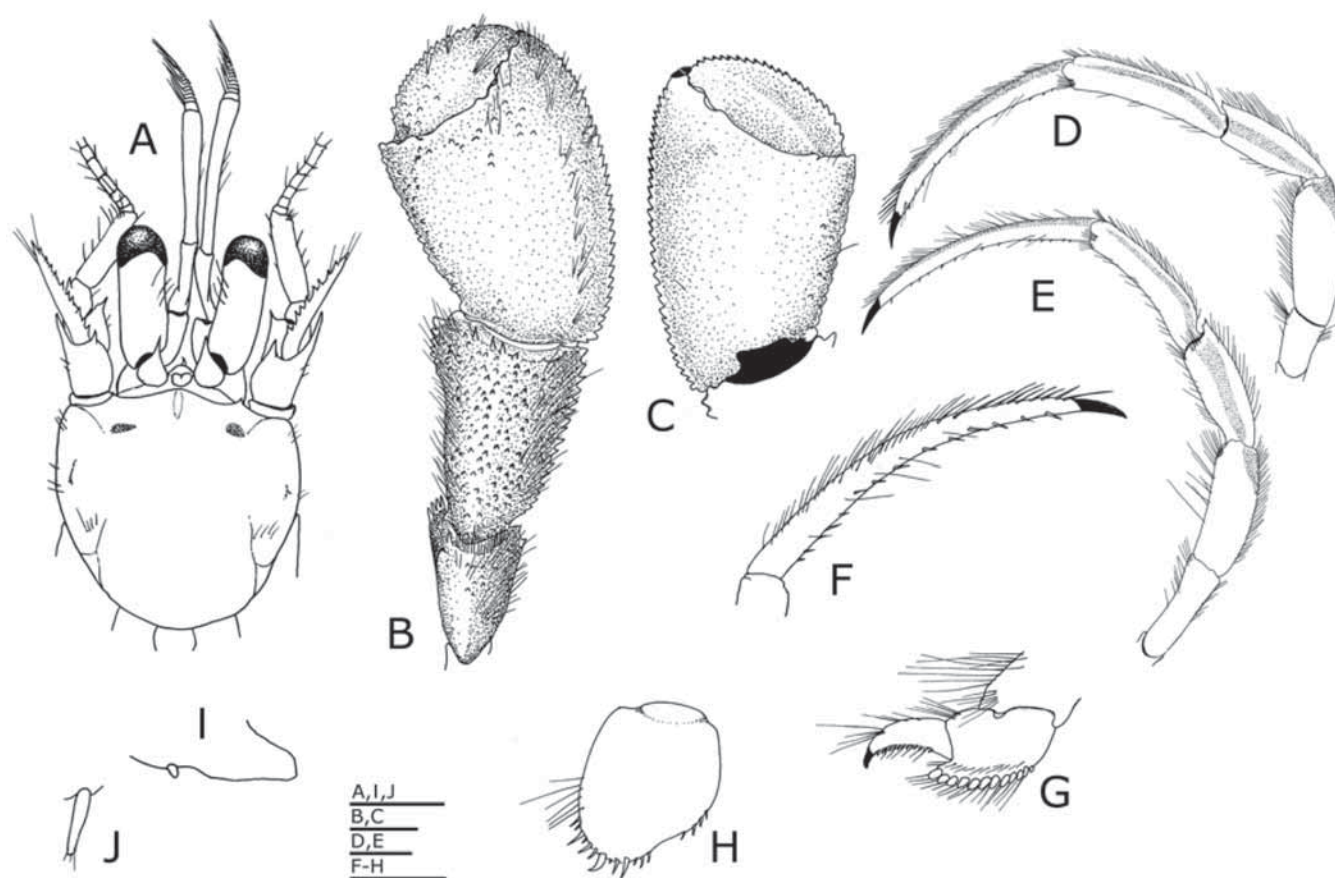


Fig. 29. *Oncopagurus oimos* Lemaitre, 1998, holotype, male 2.8 mm, French Polynesia, Moruroa atoll (MNHN Pg 5505). A, shield and cephalic appendages, dorsal; B, right cheliped, dorsal; C, chela of same, ventral; D, first left ambulatory leg, lateral; E, second left ambulatory leg, lateral; F, dactyl of same, mesial; G, propodus and dactyl of left fourth pereopod, lateral; H, telson, dorsal; I, left second gonopod, lateral; J, left second pleopod, lateral. Scale bars = 1 mm (A–E), 0.5 mm (F–H, I, J). [Adapted from Lemaitre (1998)].

on dorsolateral and mesial faces; dorsomesial margin of palm light reddish; dactyl reddish. Ambulatory legs (Fig.) with reddish colour dorsodistally on meri; carpi each with reddish stripe on lateral and mesial faces, stripes of carpi continue on meri but only on lateral faces; dactyls with reddish dorsal faces (from Lemaitre, 1998).

Habitat. Gastropod shells.

Distribution. So far known exclusively from the type locality in Moruroa atoll, on the Tuamotu Archipelago, French Polynesia. Depth: 200 m.

Remarks. As previously mentioned, *Oncopagurus oimos*, is one of eight species of *Oncopagurus* in which males lack first gonopods (see Remarks under *O. cidaris*). The degree of development of the second gonopods, however, differs in these eight species. The second gonopods can be symmetrical (*O. elevatus*, new species, *O. rossanae*, new species), or asymmetrical and 1-segmented or 2-segmented (*O. cidaris*, *O. haigae*, *O. orientalis*, *O. bifidus*, new species, *O. brevis*, new species). The right second gonopod varies, and can be vestigial or altogether absent (*O. oimos*, *O. cidaris*, *O. orientalis*, *O. bifidus*, new species).

Among *Oncopagurus* species that occur in the French Polynesia region, *O. oimos* is closest morphologically to *O. tuamotu*. The two species can be separated based on the armature of the mesial face of the right palm, which is rounded in *O. oimos* or at most with a weak dorsomesial row of small spines, whereas the mesial face is expanded distally and there is a distinct dorsomesial and ventromesial rows of spines in *O. tuamotu*. Males of *O. oimos* have reduced, unpaired second gonopod (left gonopod only), whereas the second gonopods are paired and 2-segmented in *O. tuamotu*. The left chela in *O. oimos* is noticeably more slender, as long as the carpus, and the fingers are set nearly parallel to the longitudinal axis of the palm, whereas the chela is shorter than the carpus, and the fingers are set obliquely (pointing ventrolaterally) to the longitudinal axis of the palm in *O. tuamotu*. The colour pattern (at least in preserved specimens) of *O. oimos* is distinctive in having a broad orangish stripe that extends from the distal part of the merus to near the dactyl claw of each of the ambulatory legs (Fig. 29D, E).

Oncopagurus orientalis (de Saint Laurent, 1972)

Figs. 30, 51, 53D

Parapagurus orientalis de Saint Laurent, 1972: 114, figs. 8, 16 (type locality: Philippines, southern Luzon, USFC Albatross, sta 5289, 13°41'50"N, 120°58'30"E).

Sympagurus orientalis – Lemaitre, 1989: 37; 1994: 412.

Oncopagurus orientalis – Lemaitre, 1996: 194; 1997: 577, figs 1, 2; Rahayu, 2000: 396; McLaughlin et al., 2007: 308, 2 unnumbered figs.; McLaughlin et al., 2010: 39; Tsang et al., 2011: 620.

Type material. Holotype, Philippines Islands, southern Luzon, USFC Albatross, sta 5289, 13°41'50"N, 120°58'30"E, 314 m, 22 July 1908: M 2.9 mm (USNM 168311).

Paratypes, **Philippines Islands:** USFC Albatross, sta 5268, Batangas Bay, 13°42'N, 120°57'15"E, 311 m, 8 June 1908: 3 M 2.0–2.4 mm (USNM 168320).— Th. Mortensen's Pacific Expedition 1914–16, 3 mi SW of Tukuran, 550 m, 10 March 1914: 1 F 1.7 mm (ZMK). **Indonesia:** Siboga Expedition, sta 137, 00°23.8'N, 127°29'E, 472 m, 3 August 1899, coll. M. Weber: 2 M 1.7, 1.9 mm (ZMA De 103.108).— Galathea Expedition. 1950–52, sta 490, Bali Sea, 05°25'S, 117°03'E, 545–570 m, 14 September 1951: 1 ov F 1.8 mm (ZMK).

Additional material. Taiwan. TAIWAN 2000: sta CP 19, 22°24.2'N, 120°10.2'E, 468 m, 29 July 2000 (2 lots): 2 M 2.9, 3.2 mm (MNHN Pg.), 5 M 2.3–3.3 mm, 1 F 3.0 mm (MNHN Pg.); sta CP 56, 24°29.8'N, 122°12.6'E, 438 m, 4 August 2000 (2 lots): 1 M 3.2 mm (NTOU), 1 M 2.8 mm (NTOU A370) — TAIWAN 2001: sta CP 98, 24°54.2'N, 122°02.9'E, 362–400 m, 18 May 2001: 1 ov F 2.6 mm (MNHN Pg.) — TAIWAN 2004: sta CP 248, 24°51.74'N, 122°2.43'E, 516–557 m, 28 August 2004: 1 M 3.1 mm (NTOU A00571); sta CP 264, 24°28.07'N, 121°53.55'E, 330–297 m, 1 September 2004 (2 lots): 4 M 3.0–3.7 mm (NTOU), 1 M 2.4 mm (NTOU); sta CP 269, 24°30.55'N, 122°5.78'E, 399–397 m, 2 September 2004: 2 M 2.9, 3.6 mm (MNHN Pg.) — TAIWAN 2006: sta CP 371, 24°28.521'N, 122°12.821'E, 582–613 m, 26 August 2006: 1 M 2.5 mm, 5 F 2.4–2.8 mm (NTOU A00590). **Philippines:** MUSORSTOM 1: sta CP 44, 13°47'S, 120°29'E, 592–610 m, 24 March 1976: 4 M 2.0–2.6 mm (MNHN Pg.) — MUSORSTOM 3: sta CP 86, 14°00'S, 120°18'E, 187–192 m, 31 May 1985: 1 M 2.6 mm (MNHN Pg.); sta CP 106, 13°47'S, 120°30'E, 640–668 m, 2 June 1985: 2 M 1.9, 2.1 mm, 1 F 1.5 mm (MNHN Pg.). **Solomon Islands:** SALOMON 1: sta CP 1749, 9°20.9'S, 159°56.2'E, 582–594 m, 25 September 2000: 1 F 2.2 mm (MNHN Pg.); sta CP 1783, 8°32.8'S, 160°41.7'E, 399–700 m, 29 September 2000 (3 lots): 2 M 2.3, 2.9 mm, 1 F 2.3 mm (MNHN Pg.); 36 M 1.7–2.8 mm (MNHN Pg.), 1 M 1.9 mm (MNHN Pg.); sta CP 1786, 9°21.3'S, 160°24'E, 387 m, 30 September 2000: 3 M 2.7–3.3 mm, 2 ov F 2.6, 2.8 mm (MNHN Pg.); sta CP 1795, 9°18.8'S, 160°22.9'E, 442–451 m, 1 October 2000 (2 lots): 1 ov F 1.9 mm (MNHN Pg.), 19 M 2.2–3.1 mm, 2 F 1.8, 2.6 mm, 10 ov F 2.1–2.6 mm (MNHN Pg.); sta CP 1796, 9°19.2'S, 160°25.4'E, 469–481 m, 1 October 2000: 2 M 2.9, 3.1 mm (MNHN Pg.); sta CP 1798, 9°21.0'S, 160°29.2'E, 513–564 m, 1 October 2000: 1 M 2.6 mm (MNHN Pg.); sta CP 1800, 9°21.4'S, 160°23.9'E, 357–359 m, 1 October 2000: 2 M 2.2, 2.3 mm, 1 F 2.2 mm 1 ov F 2.5 mm (MNHN Pg.); sta CP 1837, 10°12.8'S, 161°28.6'E, 381–383 m, 5 October 2000: 2 M 2.1, 2.2 mm (MNHN Pg.); sta CP 1851, 10°27.6'S, 162°00'E, 297–350 m, 6 October 2000: 1 M 2.2 mm (MNHN Pg.); sta CP 1859, 9°32.6'S, 160°37.3'E, 283–305 m, 7 October 2000: 2 M 2.0, 2.3 mm (MNHN Pg.) — SALOMON 2: sta CP 2187, 6°38.27'S, 156°13.52'E, 508–522 m, 28 October 2004: 2 M 2.7, 3.1 mm (MNHN Pg.); sta CP 2211, 7°34.4'S, 157°41.8'E, 313–387 m, 26 October 2004: 1 M 2.0 mm, 1 ov F 2.3 mm (MNHN Pg.); sta CP 2226, 6°37.6'S, 156°13.15'E, 520–490 m, 28 October 2004: 10 M 2.3–2.9 mm, 1 F 1.7 mm, 3 ov F 2.1–2.7 mm (MNHN Pg.); sta CP 2227, 6°38.27'S, 156°13.52'E, 508–522 m, 28 October 2004: 5 M 2.3–3.4 mm, 1 ov F 2.3 mm (MNHN Pg.); sta CP 2264, 7°54.35'S, 156°50.86'E, 515–520 m, 11 March 2004: 1 F 2.8 mm (MNHN Pg.). **Wallis and Futuna Islands:** MUSORSTOM 7: sta DW 523, 13°12.0'S, 176°15.6'W, 455–515 m, 13 May 1992: 1 F 1.6 mm (MNHN-IU-2013-5533); sta DW 534, 12°23.3'S, 176°42.0'W, 440–500 m, 16 May 1992: 1 M 2.6 mm (MNHN-IU-2013-5534); sta DW 535, 12°29.6'S, 176°41.3'W, 340–470 m, 16 May 1992: 2 M 2.6, 2.7 mm (USNM 1211230); sta DW 556, 11°48.7'S, 178°18.0'W, 440 m, 19 May 1992: 1 M 2.5 mm (USNM 1211231); sta DW 557, 11°48.1'S, 178°18.2'W, 600–608 m, 19 May 1992: 1 M 2.5 mm (MNHN-IU-2013-5535).

Fiji: MUSORSTOM 10: sta CP 1331, 17°02.45'S, 178°01.84'E, 694–703 m, 8 August 1998: 2 M 3.4, 3.7 mm (MNHN Pg. 6488); sta CP 1332, 16°56.17'S, 178°07.86'E, 640 m, 8 August 1998: 2 M 3.2, 3.3 mm (MNHN Pg. 6944); sta CP 1346, 17°19.63'S, 178°32.39'E, 673–683 m, 11 August 1998: 1 M 3.4 mm (MNHN Pg. 6941) — BORDAU 1: sta CP 1396, 16°38.98'S, 179°57.16'W, 591–596 m, 24 February 1999: 9 M 1.9–3.2 mm, 1 F 2.1 mm, 1 ov F 2.4 mm (MNHN Pg. 6433). **Vanuatu:** MUSORSTOM 8: sta CP 1028, 17°54.01'S, 168°40.42'E, 624–668 m, 28 September 1994: 1 ov F 1.6 mm (MNHN Pg.) — BOA 0: sta CP 2307, 16°38 S, 167°58'E, 586–646 m, 14 November 2004: 1 M 3.4 mm (MNHN Pg.); sta CP 2327, 15°42'S, 167°02'E, 287–440 m, 18 November 2004: 2 M 2.8, 3.1 mm (MNHN Pg.); sta CP 2329, 15°43'S, 167°04'E, 514–609 m, 18 November 2004: 1 M 2.7 mm (MNHN Pg.) — BOA 1: sta CP 2448, 15°08.031'S, 166°50.853'E, 297–387

m, October 2005: 1 ov F 1.4 mm (MNHN Pg.) ; sta DW 2459, 16°15.88'S, 167°16.75'E, 850–1027 m, 12 September 2005: 1 M 2.1 mm (MNHN Pg.); sta CP 2461, 16°35.11'S, 167°59.68'E, 582–614 m, 13 September 2005: 1 M 2.5 mm (MNHN Pg.); sta CP 2462, 16°35.78'S, 167°57.57'E, 618–641 m, 13 September 2005: 1 M 2.7 mm (MNHN Pg.); sta CP 2469, 16°30.12'S, 137°55.27'E, 568 m, 14 September 2005: 1 M 3.1 mm (MNHN Pg.); sta CP 2472, 16°22.46'S, 167°49.90'E, 638–658 m, 14 September 2005: 1 M 2.9 mm (MNHN Pg.) — SANTO: sta AT 19, 15°40.8'S, 167°00.5'E, 503–600 m, 21 September 2006 (2 lots): 1 M 2.1 mm (MNHN Pg.), 1 M 2.8 (MNHN Pg.). **Tonga Islands:** BORDAU 2: sta DW 1508, 21°02'S, 175°19'W, 555–581 m, 31 May 2000: 2 M 2.3, 2.4 mm, 1 F 1.9 mm (MNHN Pg.); sta CP 1556, 20°11'S, 174°45'W, 589–591 m, 7 June 2000: 1 M 2.6 mm (MNHN Pg.); sta CP 1558, 20°10'S, 174°43'W, 580–593 m, 7 June 2000: 1 M 2.8 mm

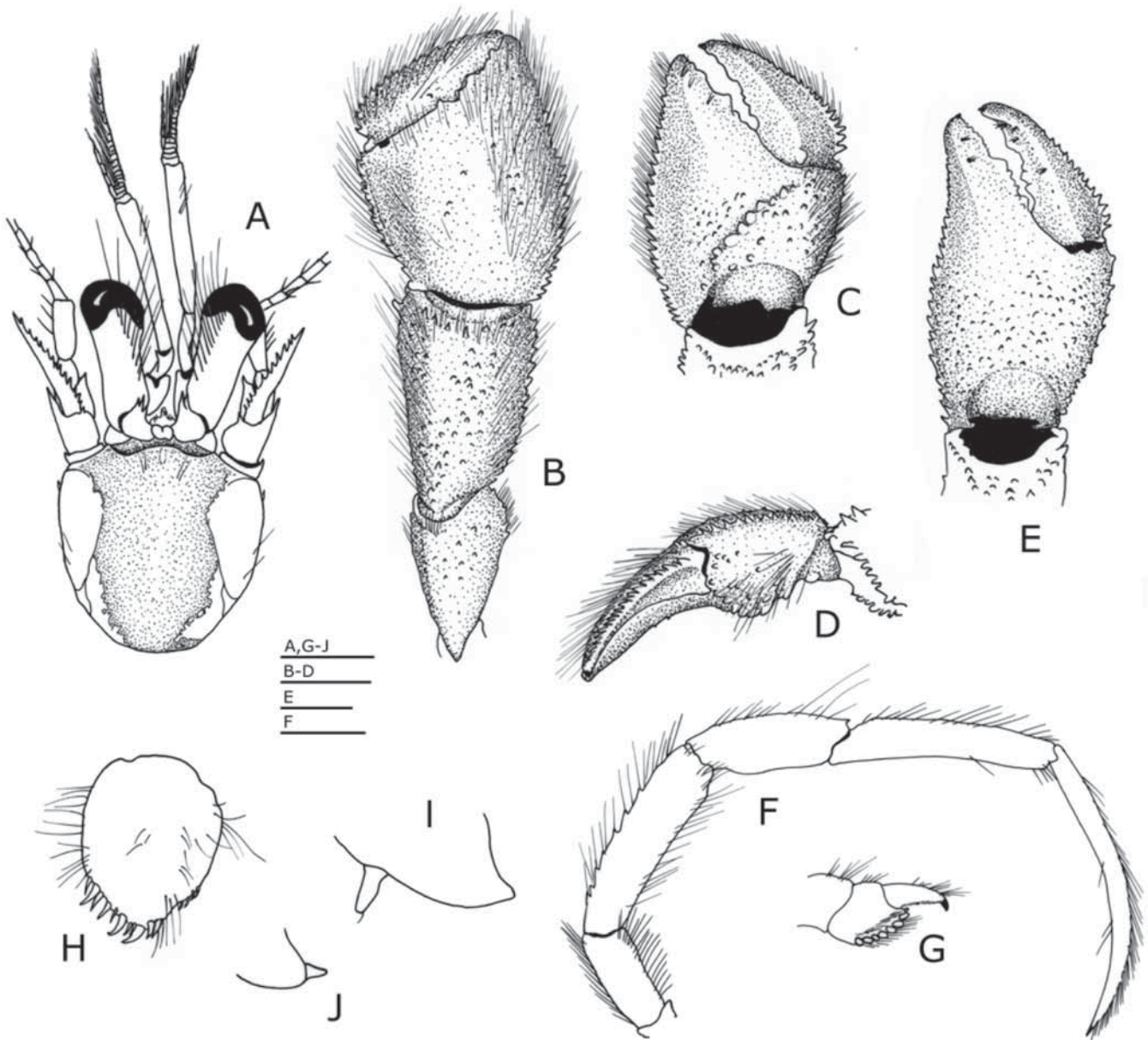


Fig. 30. *Oncopagurus orientalis* (de Saint Laurent, 1972), Indonesia, KARUBAR, sta CP 35 (MNHN Pg 5353): A–D, F–H, female 2.2 mm; I, J, male 2.5 mm. A, shield and cephalic appendages, dorsal; B, right cheliped, dorsal; C, D, chela of same, ventral (C), mesial (D); E, chela of holotype, ventral; F, left second ambulatory leg, lateral; G, propodus and dactyl of right fourth pereopod, lateral; H, telson, dorsal; I, J, male second right (I) and left (J) gonopods, lateral. Scale bars = 1 mm (A, B–F), 0.5 mm (G–J). [Adapted from de Saint Laurent (1972) and Lemaitre (1997)].

(MNHN Pg.); sta CP 1562, 19°52'S, 174°42'W, 417–424 m, 8 June 2000: 1 M 3.6 mm (MNHN Pg. 6480); sta DW 1637, 21°05'S, 175°23'W, 464–507 m, 21 June 2000: 1 ov F 1.9 mm (MNHN Pg.); sta CP 1642, 21°05'S, 175°23'W, 532 m, 21 June 2000 (2 lots): 1 M 3.1 mm (MNHN Pg. 6483), 2 M 1.6, 2.8 mm (MNHN Pg.). **New Caledonia:** MUSORSTOM 5: sta DW 341, 19°45.90'S, 158°43.37'E, 620–630 m, 16 October 1986: 2 M 2.4, 2.6 mm, 1 F 2.8 mm [parasitised] (USNM 1211232) — MUSORSTOM 6: sta DW 483, 21°19.80'S, 167°47.80'E, 600 m, 23 February 1989: 1 M 1.5 mm (MNHN-IU-2013-5532) — BATHUS 1: sta DE 694, 20°35.88'S, 164°58.28'E, 400–500 m, 17 March 1993: 2 M 1.7, 1.9 mm, 1 F 1.5 mm, 2 ov F 1.2, 1.3 mm (MNHN Pg.) — BATHUS 4: sta CP 949, 20°32.01'S, 164°56.85'E, 616–690 m, 10 August 1994: 6 M 2.4–2.5 mm, 1 ov F 1.7 mm (MNHN Pg.) — NORFOLK 2: sta DW 2066, 25°16.90'S, 168°55.11'E, 834–870 m, 26 October 2003: 1 F 3.3 mm (MNHN Pg.); sta DW 2137, 23°01.18'S, 168°22.70'E, 547–560 m, 3 November 2003: 1 F 3.1 mm (MNHN Pg.) — EBISCO: sta CP 2600, 19°38'S, 158°46'E, 603 m, 18 October 2005: 1 M 2.4 mm (MNHN Pg.); sta DW 2607, 19°33'S, 158°40'E, 400–413 m, 18 October 2005: 1 M 3.6 mm (MNHN Pg.).

For additional material see Lemaitre (1994, 1997).

Diagnosis. Shield (Fig. 30A) as long as broad, dorsal surface weakly calcified medially; rostrum broadly rounded, with short, low dorsal ridge; lateral projections broadly subtriangular, usually terminating in small spine. Ocular peduncles more than half length of shield; ocular acicles subtriangular, terminating in strong bifid or occasionally multifid spine; corneas weakly dilated. Antennular peduncle (Fig. 30A), exceeding distal margin of cornea by full length of ultimate segment. Antennal peduncle (Fig. 30A) not exceeding distal margin of cornea; fourth segment with strong spine on dorsolateral distal angle; second segment with dorsolateral distal angle terminating in strong spine; first segment with small lateral spine; acicle not exceeding distal margin of cornea, mesial margin armed with 8–12 spines; flagellum with series of short setae (< 1 article in length) and long setae (> 3 articles in length) every 4–8 articles. Third maxilliped with crista dentata armed with about 10 teeth, proximal teeth larger than distal. Chelipeds with some iridescence and moderately dense setae. Right cheliped (Fig. 30B–E) with chela longer than broad, chela operculate; palm with scattered small spines on dorsal face, dorsolateral and dorsomesial margins each well delimited by row of spines; mesial face of palm rounded, with small spines or tubercles. Left cheliped with carpus weakly calcified on dorsal surface; palm unarmed except for few setae; carpus with dorsodistal spine. Ambulatory legs with dactyls (Fig. 30F) each with ventromesial row of 1–4 minute spinules; carpi each with small dorsodistal spine; merus of right third pereopod with row of small spines on dorsal margin; meri of left second and third pereopods with dorsal margins unarmed. Anterior lobe of sternite XII (between second ambulatory legs) subsemicircular, setose, with small terminal spine. Fourth pereopod propodal rasp (Fig. 30G) with 1 row of ovate scales at least distally. Uropods and telson markedly asymmetrical, telson (Fig. 30H) lacking transverse suture; posterior lobes separated by shallow U-shaped median cleft, right lobe weakly developed (frequently obsolete), terminal margins armed with often strongly curved corneous spines.

Male lacking first gonopods; second gonopods (Fig. 30I, J) vestigial or rudimentary, 1-unsegmented, usually paired, asymmetrical, or sometimes with unpaired left. Female with vestigial right second pleopod.

Colouration (Fig. 53D). Overall creamy-white. Shield with light orange hue medially. Ocular peduncles light orange basally. Antennular peduncles transparent or light orange. Antennal peduncles with acicles, third to fifth segments, and flagella, somewhat transparent or light orange. Chelipeds with meri and carpi light orange on dorsal surface proximally; left chela light orange on dorsal surface proximally. Ambulatory legs with carpi and propodi light orange on proximal third (orange hue more intense on dorsal and ventral portion); meri with proximal two-thirds of dorsal and upper half of mesial and lateral surfaces, light orange; ischia light orange dorsally.

Habitat. Found living in coarse-textured zoanths or in gastropod shells.

Distribution. Indo-West Pacific: Taiwan, Philippines; Indonesia, including the Moluccas; Solomon Islands; Wallis and Futuna Islands; Fiji; Vanuatu; Tonga Islands; and New Caledonia. Depth: 187–1027 m.

Remarks. The bifid or multifid condition of the ocular acicles in *O. orientalis* immediately distinguishes this species from all other species of *Oncopagurus*. As noted by Lemaitre (1997), the right palm of *O. orientalis* can vary in length and armature of the ventral face depending on size and sex. The palm can be longer than broad, or broader than long. The ventral face has only scattered small tubercles, or moderately large tubercles arranged in an oblique row (Fig. 30C, E). Males of *O. orientalis* lack first gonopods, as in eight other congeners (see Remarks under *O. cidaris*), and the second gonopods are vestigial or rudimentary.

Previously, *Oncopagurus orientalis* was known from the Philippines and Indonesia regions. This study has revealed this species to have a much broader distribution in the western tropical Pacific from Taiwan to the Tonga Islands, where it is often found in abundant numbers. The bathymetric distribution of *O. orientalis* has been found to be much broader also, previously reported from a depth range of 300–575 m (Lemaitre, 1997), whereas the present study has found specimens from a depth range of 187–1027 m.

Oncopagurus petilus, new species

Figs. 31–34, 51

Type material. Holotype, eastern Pacific, SEPBOB, R/V Anton Bruun, cruise 18B, sta 770, [off Ecuador], 03°15'S, 80°55'W, 945–960 m, trawl, 10 September 1966: M 4.6 mm (USNM 1207983).

Paratype, same sta as holotype: M 5.2 mm (USNM 1207984).

Description. Gills biserial. Shield (Fig. 31A) about as long as broad; dorsal surface weakly calcified medially, with scattered short setae; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; anterior margins

weakly concave; lateral projections bluntly subtriangular; anterolateral margins sloping; posterior margin broadly rounded; ventrolateral margins of shield usually with small slender spine on one or both sides. Anterodistal margin of branchiostegite rounded, unarmed, setose.

Ocular peduncles (Fig. 31A) more than half length of shield, decreasing in width distally; with longitudinal row of long setae dorsally. Cornea not dilated, about as wide as distal width of peduncle. Ocular acicles subtriangular, each terminating in strong spine; separated basally by about basal width of 1 acicle.

Antennular peduncle (Fig. 31A) exceeding distal margin of cornea by 0.7 to nearly full length or ultimate segment when fully extended. Ultimate segment slightly less than twice as long as penultimate segment, with setae dorsally. Basal segment with strong ventromesial simple or bifid spine; lateral face with distal subrectangular lobe armed with small spine, and strong spine proximally. Ventral flagellum with 6 articles.

Antennal peduncle (Fig. 31A, B) exceeding distal margin of cornea by about half length of fifth segment when fully extended. Fifth segment unarmed except for scattered setae and laterodistal tuft of setae. Fourth segment armed with dorsodistal spine. Third segment with strong ventromesial distal spine. Second segment with dorsolateral distal angle produced, terminating in strong, simple spine; mesial margin with spine on dorsodistal angle. First segment with lateral face armed with small spine; ventromesial angle produced, with 2 small blunt spines laterally. Acicle long, exceeding distal margin of cornea by nearly half length of acicle, weakly curved outwardly (in dorsal view), terminating in strong spine; mesial margin armed with 6–9 spines, setose. Flagellum well exceeding extended right cheliped, articles with numerous setae 1 or 2 flagellar articles in length.

Mandible (Fig. 32A) with 3-segmented palp; cutting edge calcified, with small calcareous tooth medially; molar process with small calcareous or corneous tooth medially. Maxillule (Fig. 32B) with external lobe of endopod obsolete, internal lobe with long, terminal seta. Maxilla (Fig. 32C) with endopod not exceeding distal margin of scaphognathite. First (Fig. 32D) maxilliped with endopod not exceeding exopod in distal extension. Second maxilliped (Fig. 32E) without distinguishing characters. Third maxilliped (Fig. 32F) with merus to dactyl each distinctly longer than broad; crista dentata with about 12 sharp, unequal teeth diminishing in strength distally; basis with 1 small mesial spine; coxa with spine. Sternite of third maxillipeds with small spine on each side of midline.

Chelipeds markedly dissimilar. Right cheliped (Fig. 33A–C) massive, chela operculate; dorsal surfaces of merus, carpus and chela, with moderate setation, setae more dense on fingers. Fingers curved ventromesially, each terminating in small, usually blunt corneous claw; cutting edges with 2 or 3 large calcareous teeth and several irregularly sized smaller sharp or blunt calcareous teeth, with closely set

minute corneous teeth distally (corneous teeth interspersed with small calcareous teeth on fixed finger). Dactyl about as long as mesial margin of palm, set at oblique angle to longitudinal axis of palm; mesial margin broadly curved, well delimited by row of spines diminishing in size distally; dorsal face smooth except for setae; ventromesial face concave proximally. Fixed finger broad at base, dorsal face smooth except for setae, lateral margin well delimited by row of spines; ventral face elevated longitudinally on midline. Palm about as broad as long; dorsal surface smooth except for short setae; dorsolateral margin nearly straight, well delimited by row of calcareous spines, dorsomesial margin delimited by row of small spines or tubercles; dorsomesial face nearly flat, slightly sloping mesially, with few, scattered small tubercles; ventral surface smooth except for scattered short setae. Carpus about 1.7 times as long as broad, dorsal surfaces covered with moderately dense small spines or tubercles, dorsodistal margin with row of small spines; dorsolateral and dorsomesial faces rounded, with scattered small tubercles; ventral face slightly concave, with scattered small tubercles or spines. Merus with small spines or tubercles on dorsal surfaces, dorsodistal margin with row of small spines; ventromesial margin with row of blunt to sharp spines. Ischium with ventromesial row of small, blunt spines. Coxa with ventromesial row of setae and 2 small spines on lateral angle of ventrodistal margin.

Left cheliped (Fig. 33D) with moderately dense, long setae on dorsal margins of merus and carpus. Fingers each terminating in small corneous claw; dorsal and ventral surfaces unarmed except for scattered tufts of setae; cutting edge of dactyl with row of minute, fused corneous teeth; cutting edge of fixed finger with row of well-spaced small calcareous teeth. Dactyl about as long as length of mesial margin of palm; with setae dorsally. Palm unarmed dorsally except for dorsomesial setae; ventral face smooth. Carpus with dorsodistal spine; ventral face smooth. Merus unarmed dorsally except for setae; ventral face unarmed. Ischium and coxa unarmed except for ventromesial row of setae.

Ambulatory legs (Fig. 34A–D) similar right from left except for longer segments on right, extending to about tip of dactyls of right cheliped or slightly exceeding them; meri, carpi and propodi with setae on dorsal margins. Dactyls (Fig. 34B, D) broadly curved, about 1.5 times as long as propodi, terminating in sharp corneous claws; with dorsal and distal ventromesial row of setae, and 5–8 minute spinules on ventromesial margin. Propodi unarmed except for setae. Carpi unarmed except for setae and small dorsodistal spine. Meri unarmed except for setae and 2 or 3 small ventrodistal spines. Ischia with setae dorsally and ventrally, and small ventrodistal spine. Coxae with ventromesial row of setae. Anterior lobe of sternite XII (between second ambulatory legs, Fig. 31C), setose, with subdistal spine.

Fourth pereopod (Fig. 34E) semichelate. Dactyl terminating in sharp corneous claw; with ventrolateral row of small corneous spinules. Propodus longer than broad, rasp with 1 row of rounded scales at least distally. Carpus with long setae on dorsal margin. Merus with rows of long setae on dorsal

and ventral margins. Coxa with anteroventral row of setae. Anterior lobe of sternite XIII (between fourth pereopods, Fig.31C) with row of setae.

Fifth pereopod (Fig. 34F) semichelate. Propodal rasp reaching to about mid-length of segment. Coxa with row of long

setae on anteroventral and ventrodistal margins. Anterior lobe of sternite XIII (between fourth pereopods, Fig. 31C) with row of setae.

Uropods markedly asymmetrical; left exopod (Fig. 31D) about 2.5 times as long as broad, rasp consisting of 3

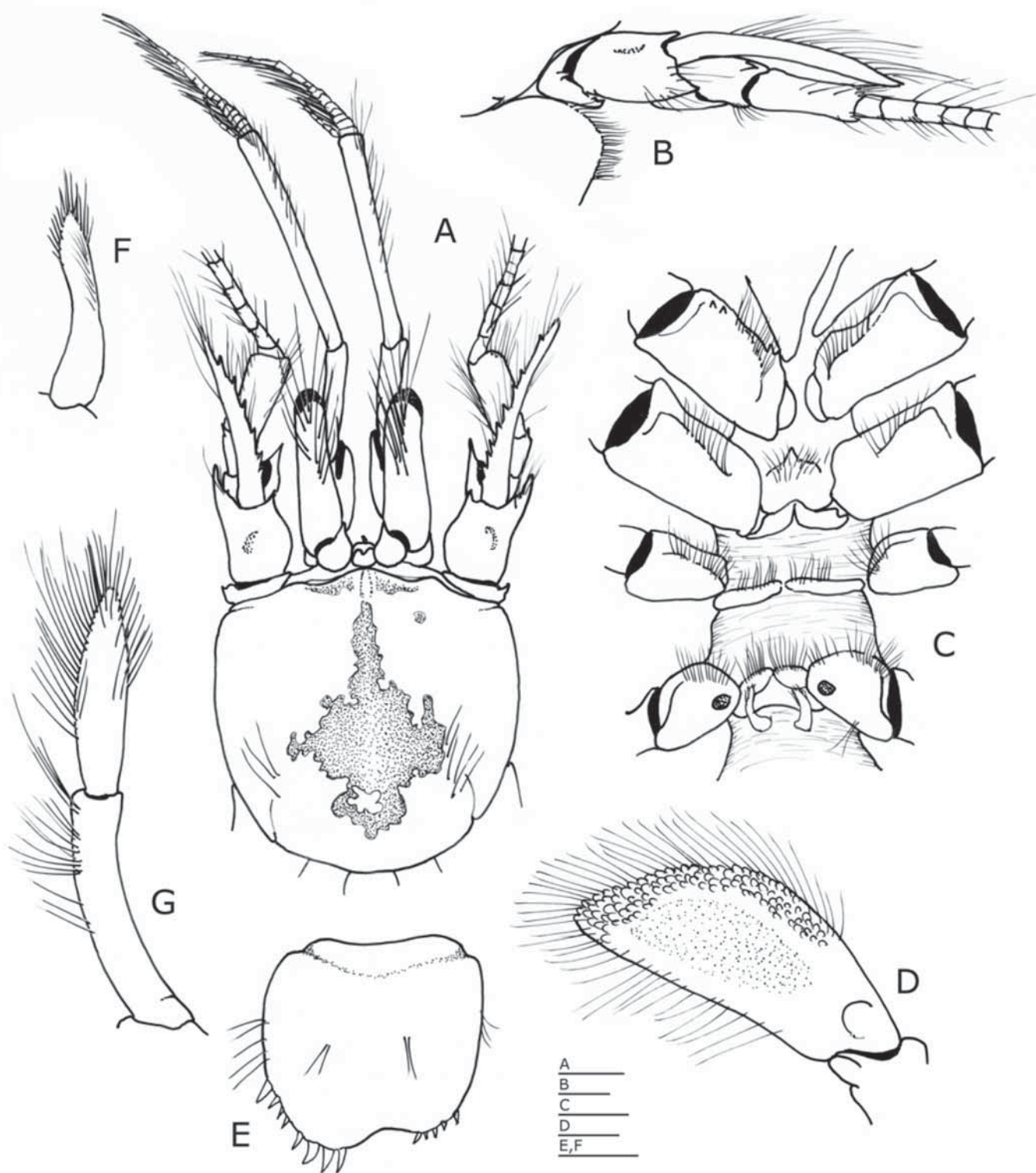


Fig. 31. *Oncopagurus petilus*, new species: holotype, male 4.6 mm, eastern Pacific, off Ecuador SEBPBP, R/V Anton Bruun: cruise 18B, sta 770 (USNM 1207983). A, shield and cephalic appendages, dorsal; B, right antennal peduncle, lateral; C, sternum and coxae of first to fifth pereopods, and anterior portion of pleon with first gonopods, ventral; D, exopod of left uropod, dorsal; E, telson, dorsal; F, left first gonopod, mesial; G, left second gonopod, anterior. Scale bars = 1 mm (A, C); 0.5 mm (B, E, F); 0.25 mm (D).

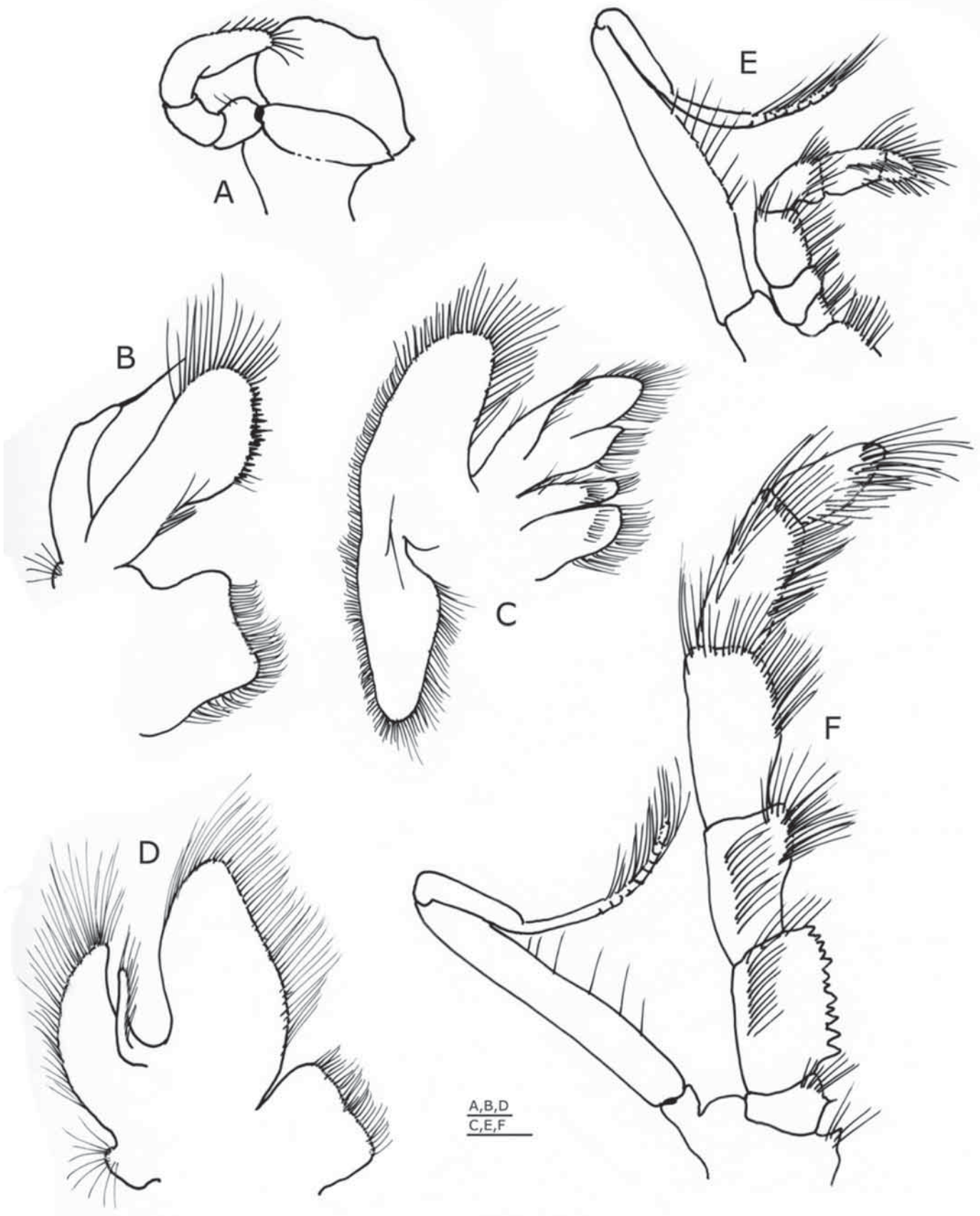


Fig. 32. *Oncopagurus petilus*, new species: paratype, male 5.2 mm, eastern Pacific, off Ecuador SEPBOB, R/V Anton Bruun: cruise 18B, sta 770 (USNM 1207984). Left mouthparts, internal: A, distal half of mandible; B, maxillule; C, maxilla; D, first maxilliped; E, second maxilliped; F, third maxilliped. Scale bars = 0.25 mm (A, B, D); 0.5 mm (C, E, F).

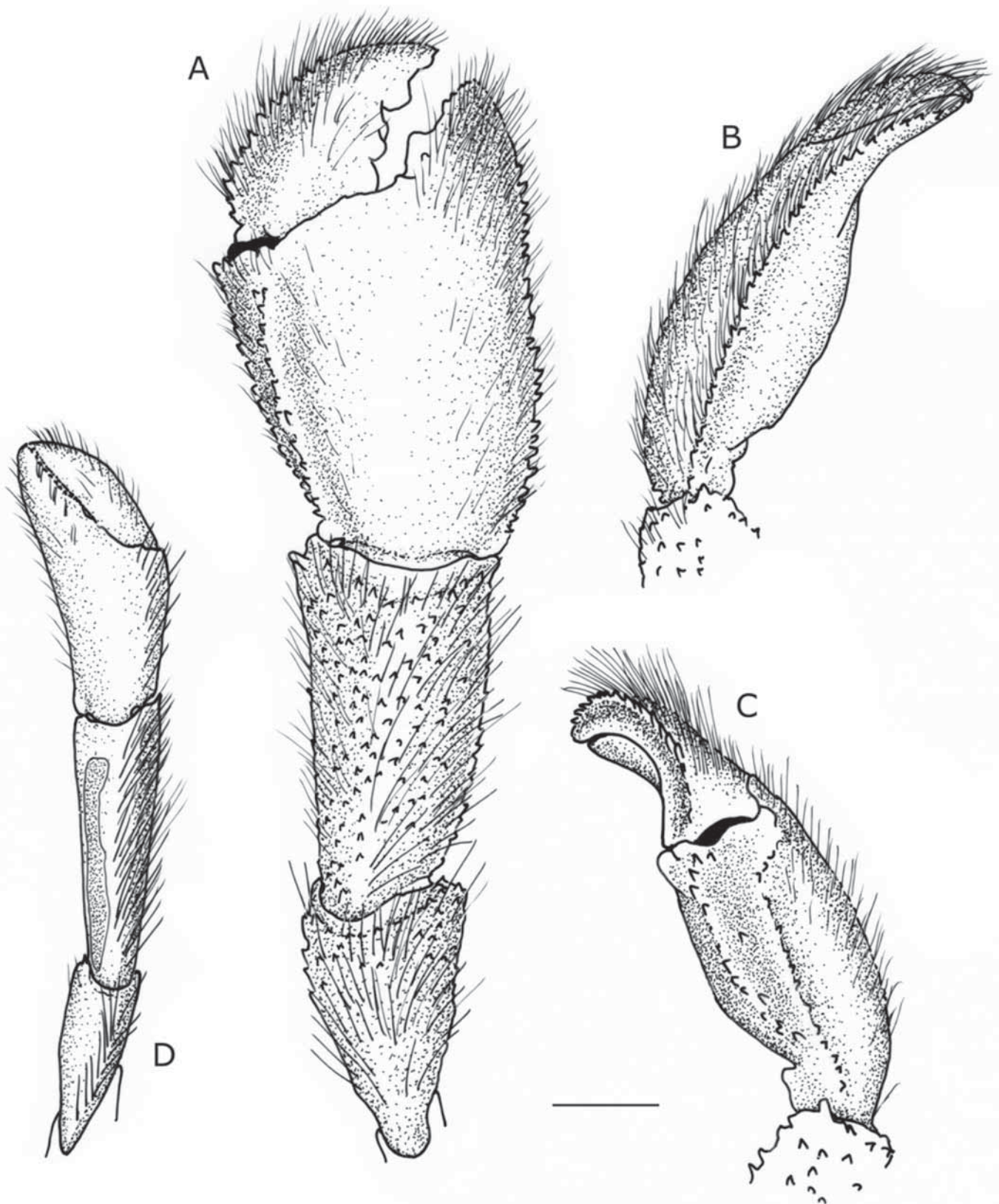


Fig. 33. *Oncopagurus petilus*, new species: holotype, male 4.6 mm, eastern Pacific, off Ecuador SEPBOF, R/V Anton Bruun: cruise 18B, sta 770 (USNM 1207983). A, right cheliped, dorsal; B, C, chela of same, lateral (B), mesial (C); D, left cheliped, dorsal. Scale bar = 2 mm.

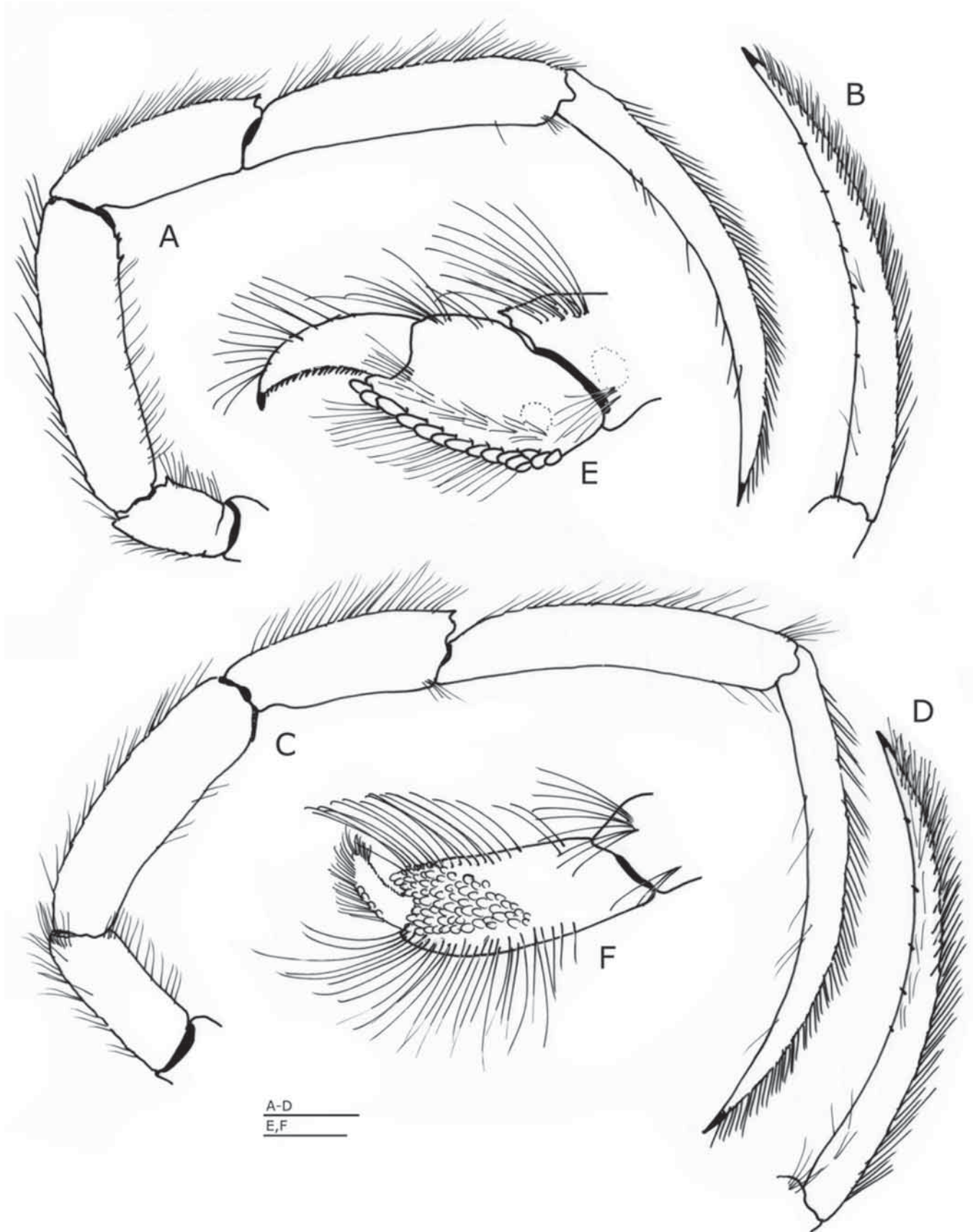


Fig. 34. *Oncopagurus petilus*, new species: holotype, male 4.6 mm, eastern Pacific, off Ecuador SEPBOB, R/V Anton Bruun: cruise 18B, sta 770 (USNM 1207983). A, right first ambulatory leg, lateral; B, dactyl of same, mesial; C, right second ambulatory leg, lateral; D, dactyl of same, mesial; E, propodus and dactyl of left fourth pereopod, lateral; F, propodus and dactyl of left fifth pereopod, lateral. Scale bars = 2 mm (A–D); 0.5 mm (E, F).

or 5 rows of small scales. Telson (Fig. 31E) moderately asymmetrical, without transverse suture; dorsal surface with scattered setae; lateral margins with long setae medially; posterior lobes separated by shallow unarmed, U-shaped cleft; terminal margin of left lobe armed with 8 corneous spines, some slightly curved, terminal margin of right lobe with 5 small corneous spines.

Male with paired first and second gonopods; first gonopod (Fig. 31F) with distal portion subovate, and setose distal margins; second gonopod (Fig. 31G) with distal segment flat and with long setae distally, proximal segment with long setae distomesially. Females unknown.

Colouration. Unknown.

Habitat. Presumably gastropod shells.

Distribution. So far known only from the eastern Pacific, off Ecuador. Depth: 945–960 m.

Remarks. The shape and relative length of the ocular peduncles, reduced corneas and long acicles exceeding the distal margins of the corneas of this new species, are reminiscent of *Parapagurus* species. In those features it is unique among *Oncopagurus* species. Although three other species (*O. minutus*, *O. conicus*, and *O. elongatus*, new species) also have reduced or subconical corneas, none have as long antennal acicles as *O. petilus*, new species, a character that makes this new species distinct from other congeners distributed in the eastern Pacific.

Etymology. The specific name, from the Latin, *petilus*, thin, makes reference to the relatively thin or slender right cheliped.

Oncopagurus pollicis, new species

Figs. 35–37, 51

Type material. Holotype, New Caledonia, CHALCAL 2, sta DW 72, 24°54.50'S, 168°22.30'E, 527 m, 28 October 1986: 1 M 3.2 mm (MNHN-IU-5496).

Description of holotype. Gills biserial. Shield (Fig. 35A) slightly longer than broad; dorsal surface weakly calcified medially, with scattered short setae; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; anterior margins weakly concave; lateral projections bluntly subtriangular; anterolateral margins sloping; posterior margin broadly rounded; ventrolateral margins of shield with slender spine on left side. Anterodistal margin of branchiostegite rounded, unarmed, setose.

Ocular peduncles (Fig. 35A) more than half length of shield; with longitudinal row of long setae dorsally; lateral and ventral faces weakly calcified. Cornea weakly dilated. Ocular acicles subtriangular, each terminating in strong spine; separated basally by about basal width of 1 acicle.

Antennular peduncle (Fig. 35A) exceeding distal margin of cornea by 0.7 to nearly full length or ultimate segment.

Ultimate segment slightly less than twice as long as penultimate segment, naked or with scattered setae dorsally. Basal segment with strong ventromesial spine; lateral face with distal subrectangular lobe armed with small spine, and strong spine proximally. Ventral flagellum with 6 articles.

Antennal peduncle (Fig. 35A, B) not exceeding distal margin of cornea, reaching at most to about distal 0.7 length of cornea. Fifth segment unarmed except for scattered setae and laterodistal tuft of setae. Fourth segment armed with strong dorsodistal spine. Third segment with strong ventromesial distal spine. Second segment with dorsolateral distal angle produced, terminating in strong, simple spine often with 1 or 2 small dorsal subterminal spines; mesial margin with spine on dorsodistal angle. First segment with lateral face usually armed with small spine; ventromesial angle produced, with 2 or 3 small spines laterally. Acicle relatively short, reaching to about midportion of cornea, nearly straight (in dorsal view), terminating in strong spine; mesial margin armed with 9 spines, sparsely setose. Flagellum slightly exceeding extended right cheliped, articles with setae 1 or 2 flagellar articles in length.

Mouthparts not dissected. Mandible with 3-segmented palp; cutting edge calcified, with small calcareous tooth medially; molar process with small calcareous tooth medially. Maxillule with external lobe of endopod obsolete, internal lobe with long, terminal seta. Maxilla with endopod not exceeding distal margin of scaphognathite. First maxilliped with endopod not exceeding exopod in distal extension. Second maxilliped without distinguishing characters. Third maxilliped with merus to dactyl each distinctly longer than broad, ischium about twice as long as broad; crista dentata with about 12 sharp teeth diminishing in strength distally, proximal 3 teeth distinctly larger than others; basis with 1 small mesial spine; coxa lacking spine. Sternite of third maxillipeds with small spine on each side of midline.

Chelipeds markedly dissimilar. Right cheliped (Fig. 36A–C) massive, chela operculate; dorsal surfaces of merus, carpus and chela with dense, finely plumose setae, setae more dense on fingers. Fingers curved ventromesially, each terminating in small, usually blunt corneous claw; cutting edges with 2 or 3 large calcareous teeth and several irregularly sized smaller sharp or blunt calcareous teeth, with closely set minute corneous teeth distally (corneous teeth interspersed with small calcareous teeth on fixed finger). Dactyl about as long as mesial margin of palm, set at strongly oblique angle to longitudinal axis of palm; mesial margin broadly curved, well delimited by row of strong, corneous-tipped spines diminishing in size distally; dorsal face with moderately dense small spines or tubercles decreasing in density distally; ventromesial face concave proximally. Fixed finger broad at base, dorsal face smooth and without spines or tubercles, lateral margin well delimited by row of corneous-tipped spines; ventrolateral face elevated along midline. Palm with distomesial angle mesially expanded, thumb-like (Fig. 36A–C), about as broad as long (if including expanded distomesial angle) or longer than broad (if excluding expanded distomesial angle); dorsal surface with scattered

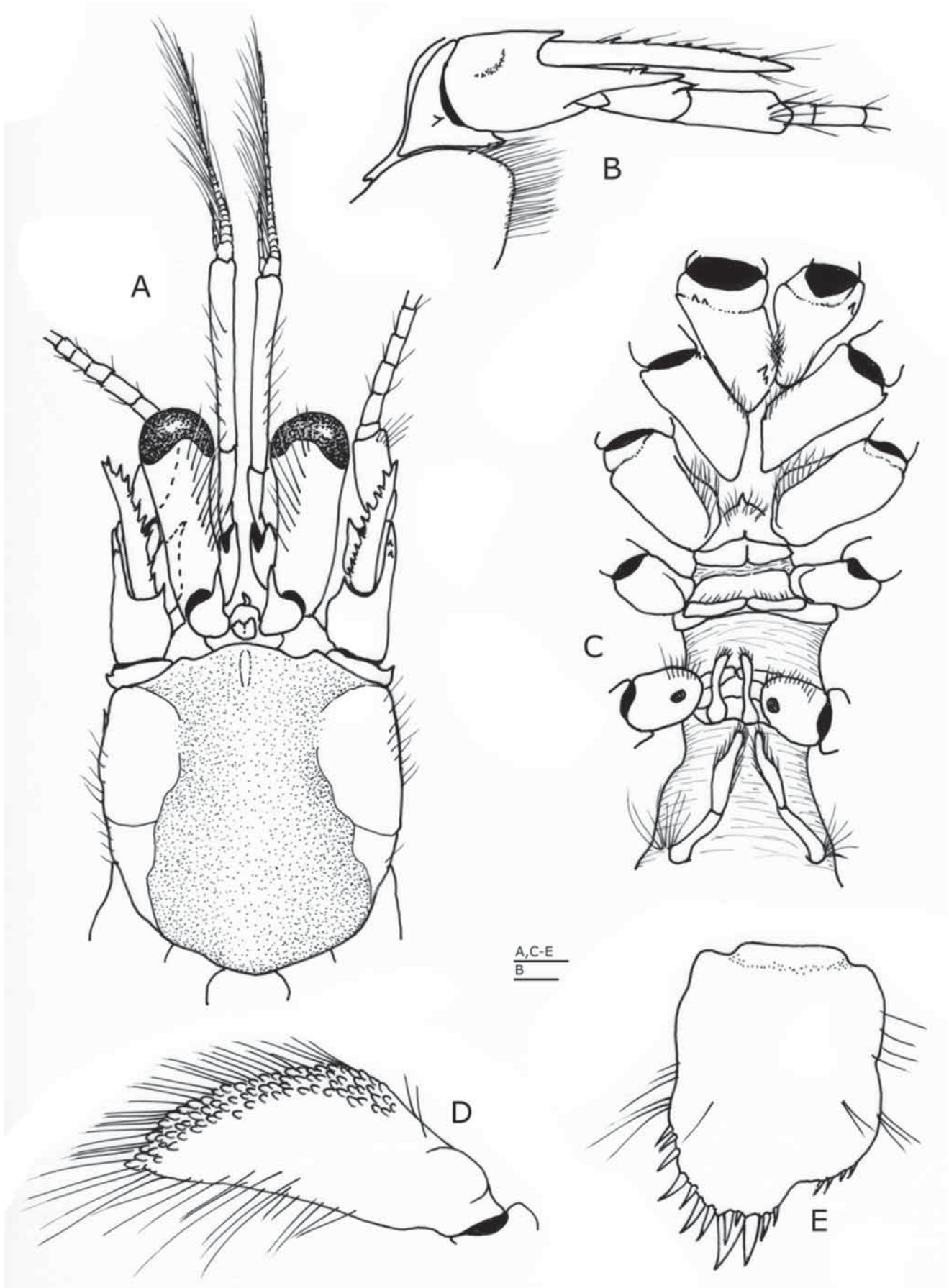


Fig. 35. *Oncopagurus pollicis*, new species, holotype, male 3.2 mm, New Caledonia, CHALCAL 2, sta DW 72 (MNHN-IU-5496): A, shield and cephalic appendages, dorsal; B, right antennal peduncle, lateral; C, sternum and coxae of first to fifth pereopods, and anterior portion of pleon with first and second gonopods, ventral; D, exopod of left uropod, dorsal; E, telson, dorsal. Scale bars = 0.5 mm (A, C), 0.25 mm (B), 1 mm (D, E).

small spines or tubercles; dorsolateral margin nearly straight, well delimited by row of strong, mostly corneous-tipped calcareous spines, dorsomesial margin weakly delimited by row of small spines or tubercles; mesial face rounded, with numerous small spines or tubercles; ventral surface smooth or with scattered small tubercles. Carpus 1.7 times as long as

broad, dorsal surfaces covered with small spines or tubercles, dorsodistal margin with row of small spines; dorsolateral face rounded and with 3 calcareous spines distally, dorsomesial face rounded; ventral face slightly concave, with scattered small tubercles or spines. Merus with small spines or tubercles on dorsal surfaces; scattered setae dorsally, and moderately

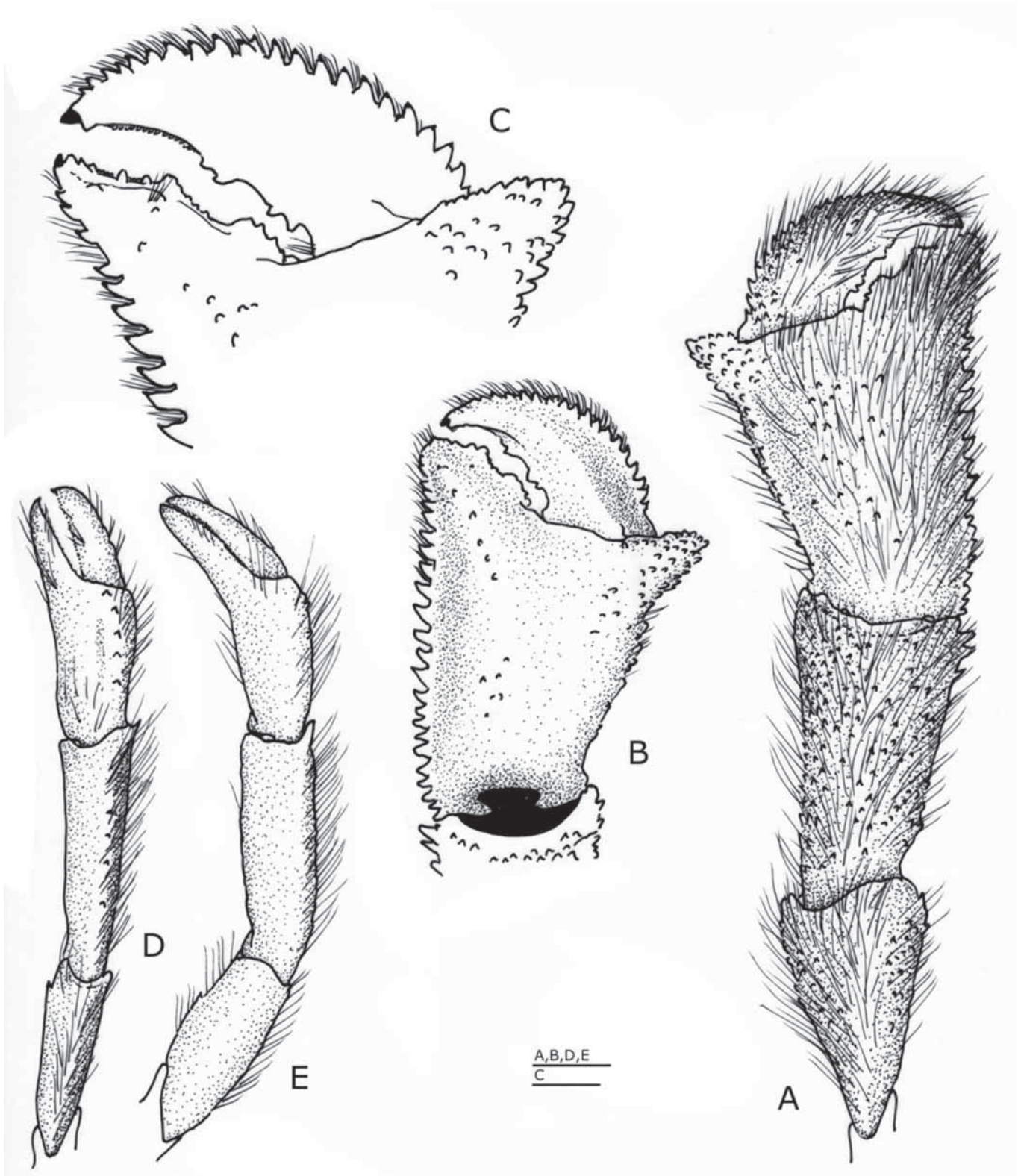


Fig. 36. *Oncopagurus pollicis*, new species, holotype, male 3.2 mm, New Caledonia, CHALCAL 2, sta DW 72 (MNHN-IU-5496): A, right cheliped, dorsal; B, chela of same, ventral; C, dactyl, fixed finger, and distal portion of palm of right cheliped, ventral; D, left cheliped, dorsal; E, same lateral. Scale bars = 1 mm (A, B, D, E); 0.5 mm (C).

dense setae ventrodistally; ventromesial margin with row of blunt to sharp spines. Ischium with ventromesial row of small, blunt spines. Coxa with ventromesial row of setae and 2 small spines on lateral angle of ventrodistal margin.

Left cheliped (Fig. 36D, E) evenly calcified, with moderately dense, long setae on merus, carpus and chela. Fingers each

terminating in small corneous claw; dorsal and ventral surfaces unarmed except for scattered tufts of setae; cutting edge of dactyl with row of minute, fused corneous teeth; cutting edge of fixed finger with row of well-spaced small calcareous teeth. Dactyl about as long as length of mesial margin of palm. Palm unarmed except for dorsomesial row of small sharp or blunt spines; ventral face smooth. Carpus

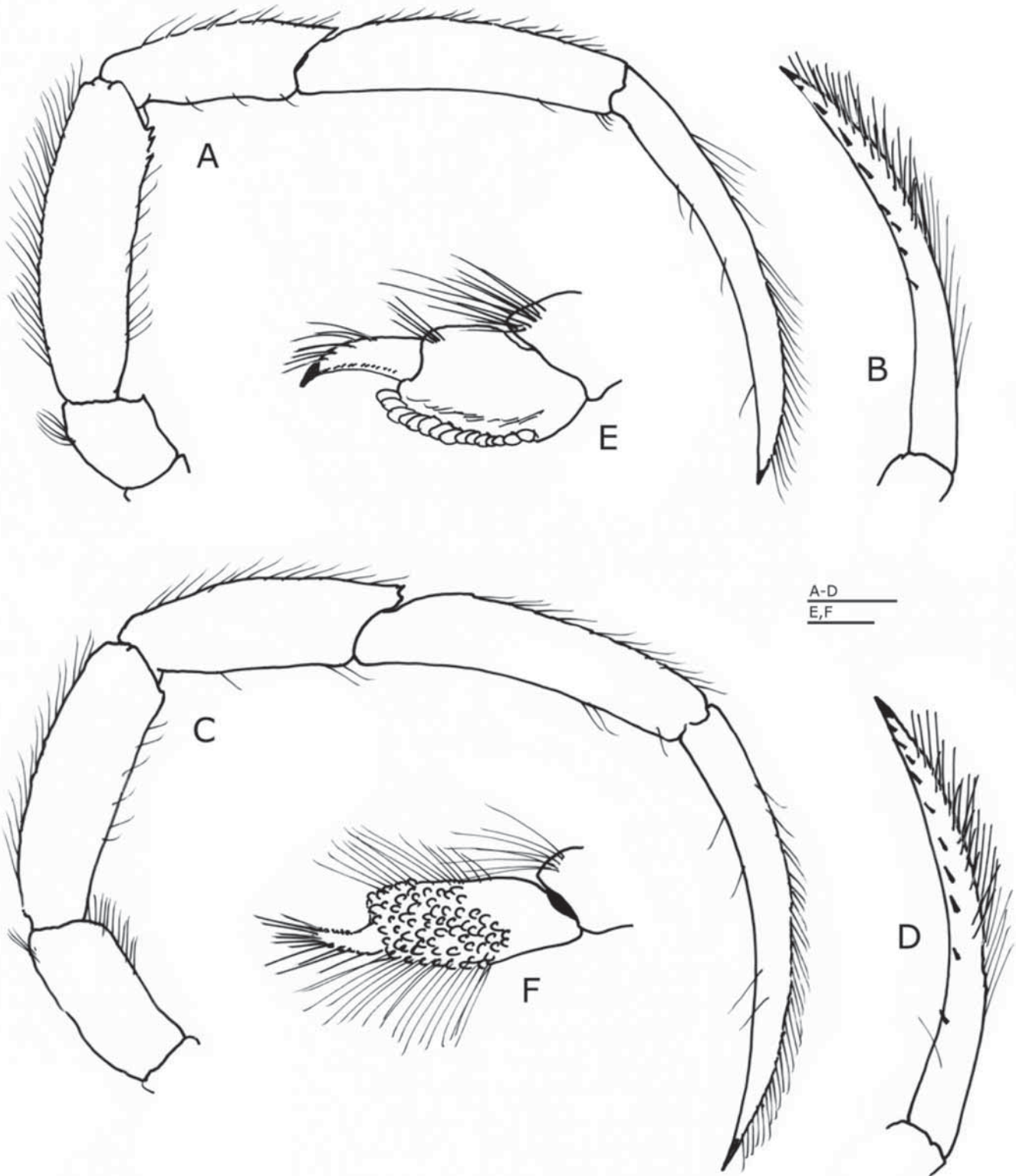


Fig. 37. *Oncopagurus pollicis*, new species, holotype, male 3.2 mm, New Caledonia, CHALCAL 2, sta DW 72 (MNHN-IU-5496): A, right first ambulatory leg, lateral; B, dactyl of same, mesial; C, right second ambulatory leg, lateral; D, dactyl of same, mesial; E, propodus and dactyl of left fourth pereopod, lateral; F, propodus and dactyl of left fifth pereopod, lateral. Scale bars = 1 mm (A–D); 0.25 mm (E, F).

with strong dorsodistal spine; ventral face smooth. Merus unarmed dorsally except for setae; ventral face with 3 small spines distally. Ischium and coxa unarmed, but with ventromesial row of setae.

Ambulatory legs (Fig. 37A–D) similar right from left except for longer segments on right, extending to about tip of dactyls of right cheliped or slightly exceeding them; meri, carpi and propodi with setae on dorsal and ventral margins, dactyl also with distal row of dorsomesial setae. Dactyls (Fig. 37B, D) broadly curved, about 1.5 times as long as propodi, and terminating in sharp corneous claws; with 7–10 small spinules on ventromesial margin. Propodi unarmed except for setae. Carpi unarmed except for setae and small dorsodistal spine. Meri unarmed except for setae. Ischia with setae dorsally and ventrally, and small distal spine on ventral margin. Coxae with ventromesial row of setae. Anterior lobe of sternite XII (between second ambulatory legs, Fig. 35C), setose, with subdistal spine.

Fourth pereopod (Fig. 37E) semichelate. Dactyl terminating in sharp corneous claw; with ventrolateral row of small corneous spinules. Propodus longer than broad, rasp with 1 row of rounded scales at least distally. Carpus with long setae on dorsal margin. Merus with rows of long setae on dorsal and ventral margins. Coxa with anteroventral row of setae. Anterior lobe of sternite XIII (between fourth pereopods, Fig. 35C) with row of setae.

Fifth pereopod (Fig. 37F) semichelate. Propodal rasp extending beyond mid-length of segment. Coxa with row of long setae on anteroventral and ventrodorsal margins. Anterior lobe of sternite XIII (between fourth pereopods, Fig. 35C) with row of setae.

Telson and uropods markedly asymmetrical; left exopod (Fig. 35D) about 2.6 times as long as broad, rasp consisting of 3 or 4 rows of small scales. Telson (Fig. 35E) without or at most obsolete transverse suture; dorsal surface with scattered setae; lateral margins with long setae medially; posterior lobes separated by shallow unarmed, U-shaped cleft; terminal margin of left lobe armed with 13 corneous spines, some slightly curved and distal 2 or 3 strong, terminal margin of right lobe armed with 4 small spines.

Male with paired first and second gonopods (Fig. 35C); first gonopod with distal portion subovate, with setae distally; second with distal segment flat and with long setae distally, proximal segment with long setae distomesially. Female unknown.

Colouration. Unknown.

Habitat. The only specimen known was found in a gastropod shell.

Distribution. So far known only from the Norfolk Ridge, in the New Caledonia region. Depth: 527 m.

Remarks. Despite the existence of only one specimen, the

distinctive morphology of the right cheliped, especially the chela, is sufficient to propose a new species. The dorsolateral margin of the palm and fixed finger are nearly straight, and the distal angle of the mesial face is strongly produced mesially, appearing thumb-like and covered with small spines or tubercles. The cutting edges of the fingers are also different from other *Oncopagurus* species, in that the large teeth are sharp and serrated, whereas in other species the large teeth are blunt and rounded.

Etymology. The specific name is derived from the Latin, *pollex*, thumb, and is given in reference to the thumb-like projection on the distomesial angle of the right chela.

Oncopagurus rossanae, new species

Figs. 38–41, 51, 53E, F

Oncopagurus n. sp. 2 – McLaughlin et al., 2010: 39.

Type material. Holotype, French Polynesia, Austral Islands, BENTHAUS, sta DW 1973, Arago Bank, 23°23.49'S, 150°43.87'W, 200–350 m, 20 November 2002: M 2.9 mm (MNHN-IU-2013-6869).

Paratypes, **Marquesas Islands:** MUSORSTOM 9: sta DW 1145, 9°19.0'S, 140°06.3'W, 150–180 m, 22 August 1997: 1 ov F 1.2 mm (MNHN Pg. 6424); sta DW 1146, 9°18.8'S, 140°06.2'W, 200 m, 22 August 1997: 2 M 2.4, 2.7 mm, 6 ov F 1.4–2.1 mm (USNM 1207996, ex MNHN Pg. 6422); sta DW 1148, 9°18.9'S, 140°06.3'W, 300 m, 22 August 1997: 3 M 2.0–2.6 mm, 1 F 1.6 mm, 4 ov F 1.8–2.0 mm (MNHN Pg. 6416); sta DW 1172, 8°44.8'S, 140°15.3'W, 300–302 m, 25 August 1997: 1 F 1.3 mm, 1 ov F 1.7 mm (MNHN Pg. 6423); sta DR 1197, 8°57.4'S, 140°01.9'W, 277–372 m, 27 August 1997: 3 M 1.6–2.4 mm (MNHN Pg. 6425); sta DR 1198, 9°50.0'S, 139°09.4'W, 290–320 m, 28 August 1997: 1 M 1.5 mm (MNHN Pg. 6429); sta DR 1199, 9°49.2'S, 139°09.6'W, 210–258 m, 28 August 1997: 3 M 1.5–1.9 mm, 1 ov F 1.6 mm (MNHN Pg. 6430); sta DW 1201, 9°50.6'S, 139°09.2'W, 275–300 m, 28 August 1997 (2 lots): 5 M 1.2–2.4 mm, 3 ov F 1.9–2.0 mm (USNM 1207997, ex MNHN Pg. 6419), 1 M 2.3 mm (MNHN Pg. 6426); sta DR 1231, 9°42.5'S, 139°05.1'W, 270–285 m, 31 August 1997: 2 M 1.6, 1.9 mm (MNHN Pg. 6427); sta DR 1253, 9°47.9'S, 139°38.1'W, 360–405 m, 2 September 1997: 1 M 1.3 mm (MNHN Pg. 6431); sta CP 1268, 7°55.8'S, 140°42.6'W, 285–320 m, 4 September 1997: 1 ov F 2.5 mm (MNHN Pg. 6421); sta DW 1287, 7°54.5'S, 140°40.2'W, 163–245 m, 7 September 1997 (2 lots): 13 M 1.5–3.0 mm, 4 ov F 1.8–2.4 mm (MNHN Pg. 6418), 1 F 1.6 mm (MNHN Pg. 6417); sta DW 1288, 8°53.9'S, 139°38.0'W, 200–220 m, 8 September 1997: 6 M 1.4–2.5 mm, 3 ov F 1.3–1.8 mm (MNHN Pg. 6428). **French Polynesia, Austral Islands:** BENTHAUS: sta DW 1869, Mac Donald Bank, 28°58.4'S, 140°15.4'W, 240–440 m, 4 November 2002: 2 M 1.4, 1.5 mm, 1 F 1.3 mm, 1 ov F 1.4 mm (MNHN Pg. 6688); sta DW 1880, Marotiri, 27°54.8'S, 143°29.45'W, 90–94 m, 6 November 2002: 1 F 1.2 mm 1 ov F 1.4 mm (MNHN Pg. 6876); sta DW 1881, Marotiri, 27°54.6'S, 143°28.5'W, 112–121 m, 6 November 2002: 5 M 1.2–2.1 mm, 2 F 1.1, 2.3 mm, 3 ov F 1.1–1.6 mm (MNHN Pg. 6689); sta DW 1885, Marotiri, 27°51.87'S, 143°32.59'W, 700–800 m, 6 November 2002: 1 F

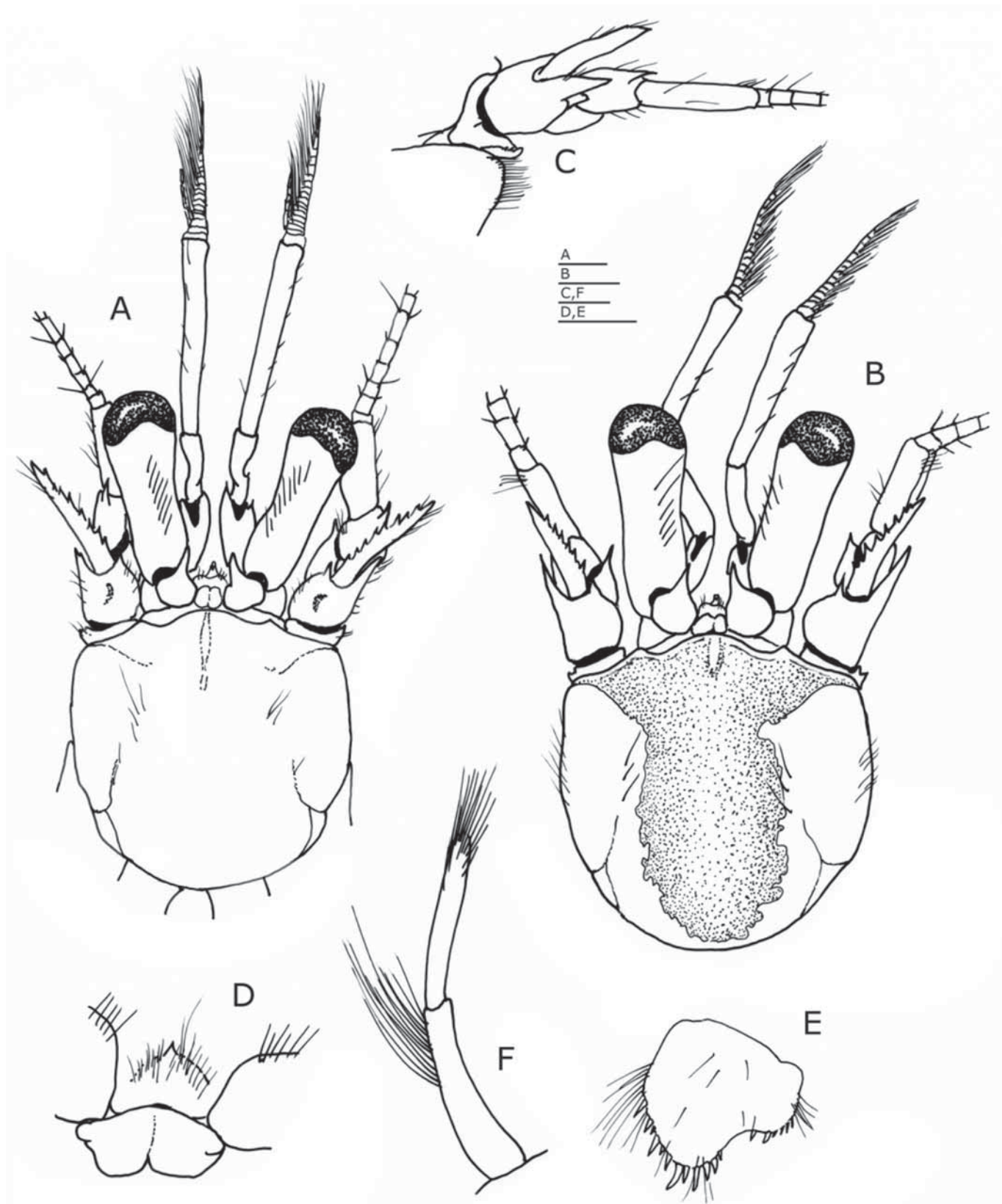


Fig. 38. *Oncopagurus rossanae*, new species, A, C–D, holotype, male 2.9 mm, French Polynesia, Austral Islands, BENTHAUS, sta DW 1973 (MNHN-IU-2013-6869); B, paratype, male 2.4 mm, Marquesas Islands, MUSORSTOM 9, sta DW 1146 (USNM 1207996, ex MNHN Pg 6422); F, paratype, male 3.0 mm, same station as holotype (MNHN Pg 7032): A, B, shield and cephalic appendages; C, right antennal peduncle, lateral; D, anterior and posterior lobes of sternite XII (between second ambulatory legs), ventral; E, telson, dorsal; F, left second gonopod, anterior. Scale bars = 0.5 mm.

2.2 mm (MNHN Pg. 7027); sta DW 1889, Rapa, 27°36.87'S, 144°15.75'W, 600–620 m, 7 November 2002: 10 M 1.7–2.6 mm, 3 F 1.2–2.3 mm (MNHN Pg. 6690); sta DW 1901, Rapa NE Bank, 17°24.8'S, 144°01.67'W, 115–120 m, 9 November 2002: 36 M 2.0–2.6 m, 9 F 1.6–2.8 mm, 15 ov F 2.2–2.4 mm (MNHN Pg. 6691); sta DW 1905, Rapa NE Bank, 27°25.36'S, 144°02.62'W, 120–140 m, 9 November 2002: 3 M 2.0–2.7 mm, 2 F 1.8, 2.2 mm, 1 ov F 2.3 mm (USNM 1207998, ex MNHN Pg. 6692); sta CP 1906, Rapa NE Bank, 27°24.78'S, 144°01.75'W, 110–127 m, 9 November 2002: 3 M 1.9–2.2 mm, 2 ov F 2.1, 2.4 mm (USNM 1207999, ex MNHN Pg. 6693); sta DW 1913, Neilson Reef, 27°01.55'S,

146°00.3'W, 120 m, 11 November 2002: 1 M 1.5 mm, 3 F 1.2–1.5 mm, 4 ov F 1.3–2.6 mm (USNM 1208000, ex MNHN Pg. 6694); sta CP 1918, Neilson Reef, 27°03.45'S, 146°03.96'W, 130–140 m, 12 November 2002: 1 ov F 1.1 mm (MNHN-IU-2013-6870); sta CP 1920, Neilson Reef, 27°03.58'S, 146°03.84'W, 120–203 m, 12 November 2002: 4 M 2.3–2.4 mm, 1 F 1.1 mm (USNM 1208001, ex MNHN Pg. 6695); sta DW 1929, Thiers Bank, 24°38.61'S, 146°01.61'W, 350–370 m, 13 November 2002: 1 M 1.6 mm (MNHN Pg. 7028); sta DW 1941, Raevavae, 23°49.05'S, 147°41.6'W, 290–620 m, 15 November 2002: 1 M 2.7 mm (MNHN Pg. 6696); sta DW 1951, Lotus Bank Raevavae,

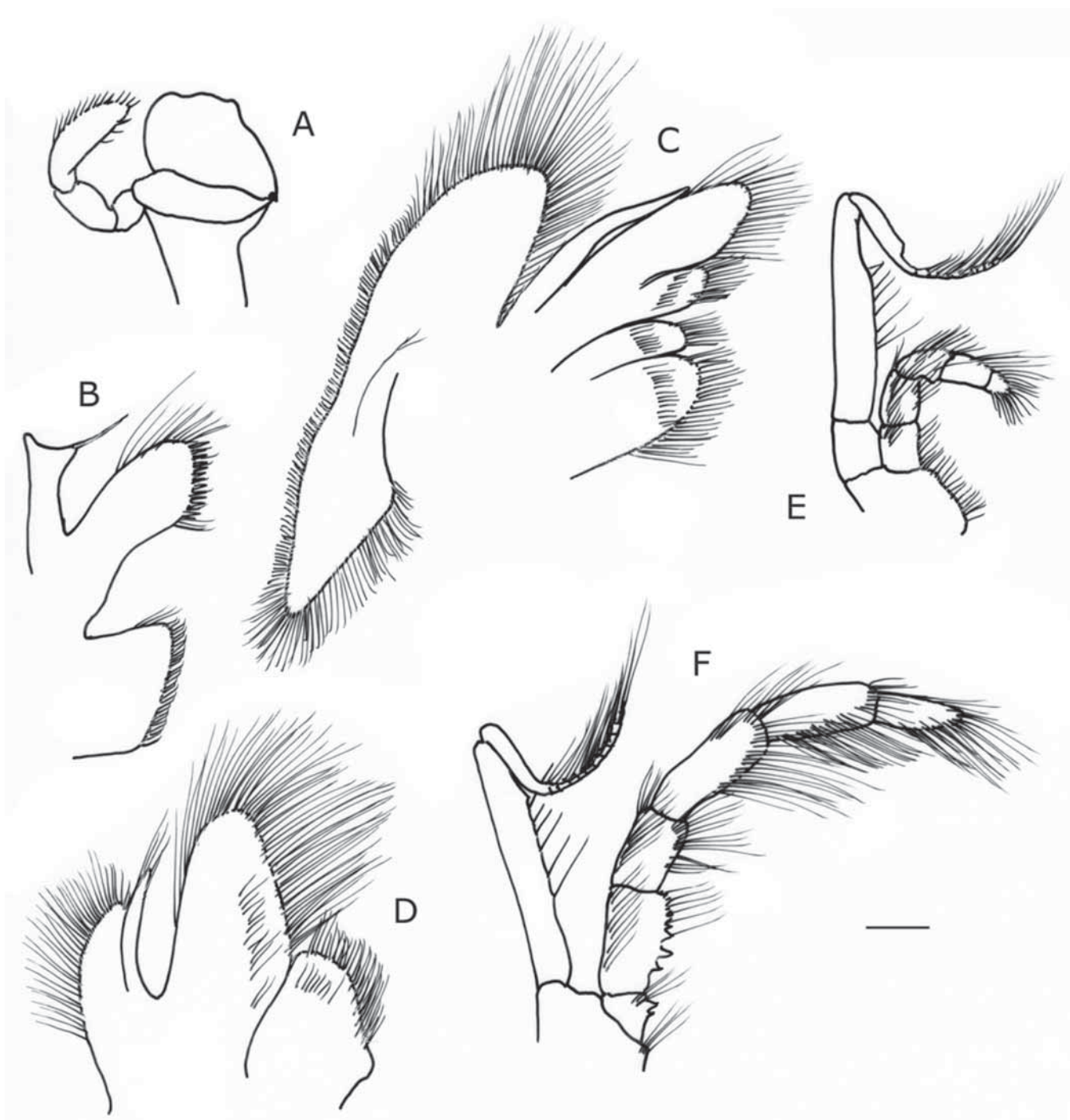


Fig. 39. *Oncopagurus rossanae*, new species, paratype, male 3.0 mm, French Polynesia, Austral Islands, BENTHAUS, sta DW 1973 (MNHN Pg 7032). Left mouthparts, internal: A, distal half of mandible; B, maxillule; C, maxilla; D, first maxilliped; E, second maxilliped; F, third maxilliped. Scale bars = 0.25 mm (A–D), 0.5 mm (E, F).

23°49.08'S, 147°53.38'W, 206–450 m, 17 November 2002 (2 lots): 1 M 1.3 mm, 1 F 1.6 mm (MNHN Pg. 7029), 1 M 2.8 mm (MNHN Pg. 6697); sta DW 1961, Tubuai, 23°20.89'S, 149°33.51'W, 470–800 m, 19 November 2002: 3 M 1.3–1.8 mm (MNHN Pg. 7030); sta DW 1972, Arago Bank, 23°21.96'S, 150°42.87'W, 500–1000 m, 20.22.2001: 1 M 1.7 mm (MNHN Pg. 7031); sta DW 1973, Arago Bank, 23°23.49'S, 150°43.87'W, 200–350 m, 20 November 2002: 8 M 1.7–3.2 mm, 3 F 1.5–1.7 mm, 4 ov F 1.1.6–2.3 mm (MNHN Pg. 7032); sta DW 1974, Arago Bank, 23°23.93'S, 150°43.93'W, 450–618 m, 20 November 2002: 1 ov F 1.5 mm (MNHN Pg. 7033); sta DW 1998, Rurutu, 22°24.81'S, 151°22.17'W, 250–302 m, 23 November 2002: 1 M 1.9 mm (MNHN Pg. 6698); sta DW 2015, Rimataru, 22°38.16'S, 152°49.55'W, 250–280 m, 25 November 2002: 1 M 2.0 mm (USNM 1208002, ex MNHN Pg. 6699).

Description. Gills biserial. Shield (Fig. 38A, B) about as long as broad; dorsal surface moderately to weakly calcified medially (weak calcification often reaching to anterior margin), with scattered short setae; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; anterior margins weakly concave; lateral projections subtriangular, terminating in small blunt or sharp spine; anterolateral margins sloping; posterior margin broadly rounded; ventrolateral margins of shield usually with slender spine on one or both sides. Anterodistal margin of branchiostegite rounded, unarmed, setose.

Ocular peduncles (Fig. 38A, B) more than half length of shield; with longitudinal row of moderately long setae dorsally; lateral and ventral faces usually weakly calcified. Cornea weakly dilated. Ocular acicles subtriangular, each

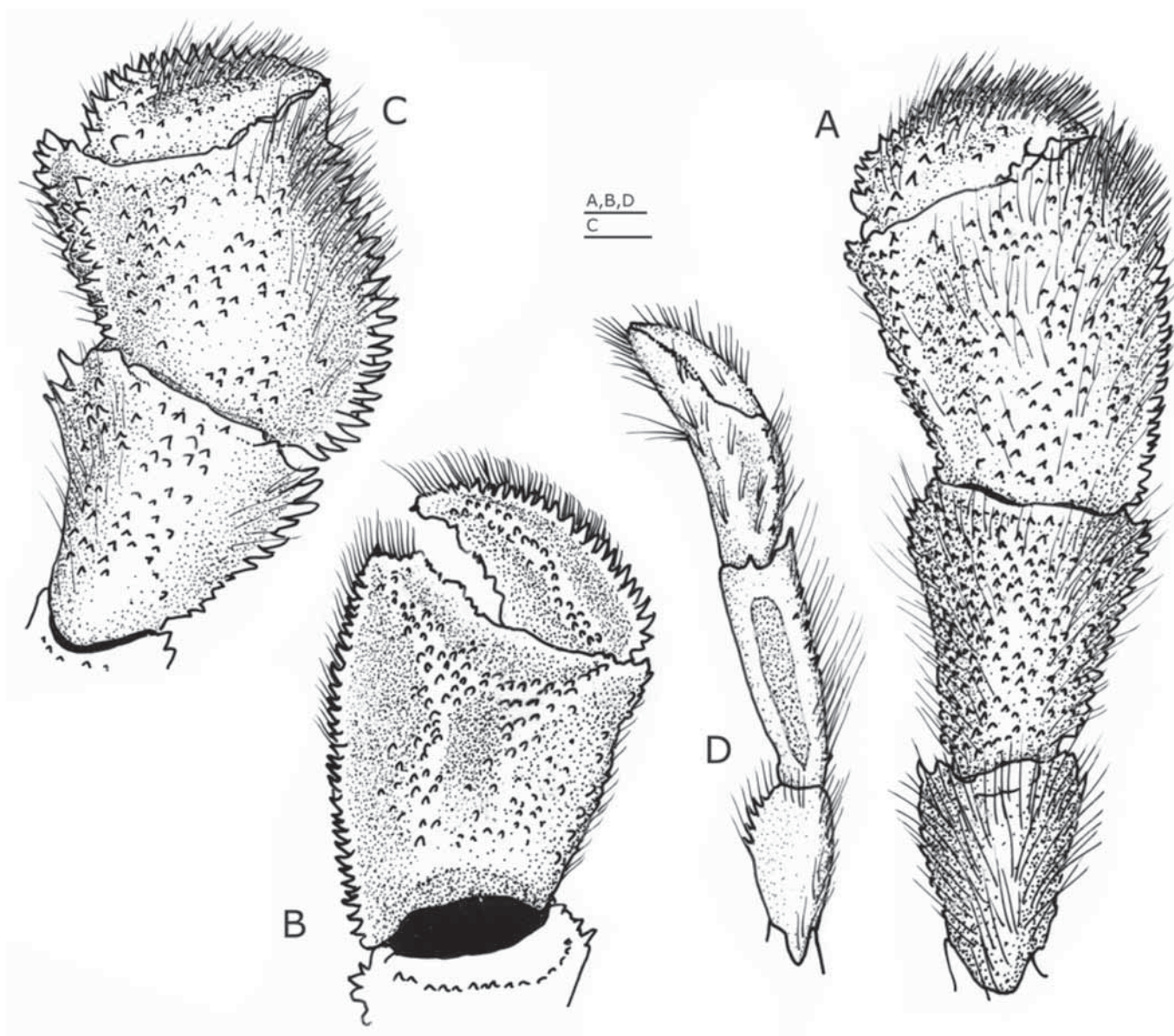


Fig. 40. *Oncopagurus rossanae*, new species, A, B, D, holotype, male 2.9 mm, French Polynesia, Austral Islands, BENTHAUS, sta DW 1973 (MNHN-IU-2013-6869); C, paratype female 2.0 mm, French Polynesia, Austral Islands, BENTHAUS, sta DW 1905 (USNM 1207998, ex MNHN Pg 6692): A, right cheliped, dorsal; B, chela of same, ventral; C, carpus and chela of right cheliped, dorsal; D, left cheliped, dorsal. Scale bars = 1 mm (A, B, D); 0.5 mm (C).

terminating in strong spine; separated basally by about basal width of 1 acicle.

Antennular peduncle (Fig. 38A, B) exceeding distal margin of cornea by 0.7 to nearly full length or ultimate segment. Ultimate segment not quite twice as long as penultimate segment, with scattered setae dorsally. Basal segment with strong ventromesial spine; lateral face with distal subrectangular lobe armed with small spine, and strong spine proximally. Ventral flagellum with 5 or 6 articles.

Antennal peduncle (Fig. 38A, B) not reaching distal margin of cornea (usually reaching to about midportion of cornea). Fifth segment unarmed except for scattered setae and laterodistal tuft of setae. Fourth segment armed with strong dorsodistal spine. Third segment with strong ventromesial distal spine. Second segment with dorsolateral distal angle produced, terminating in strong, usually simple spine; mesial margin with spine on dorsodistal angle. First segment with lateral face armed with small spine; ventromesial angle produced, with 2 or 3 small blunt spines laterally. Acicle relatively short, reaching to about proximal margin of cornea, nearly straight (in dorsal view), terminating in strong spine; mesial margin armed with 4–8 spines, sparsely setose. Flagellum long, slightly exceeding extended right cheliped, articles with long setae 1 or 2 flagellar articles in length every 3 or 4 articles, and scattered short setae < 1 article in length.

Mandible (Fig. 39A) with 3-segmented palp; cutting edge calcified, with small tooth medially; molar process with small corneous tooth medially. Maxillule (Fig. 39B) with external lobe of endopod slender, moderately developed, not recurved, internal lobe with long, terminal seta. Maxilla (Fig. 39C) with endopod exceeding distal margin of scaphognathite. First maxilliped (Fig. 39D) with endopod distinctly exceeding exopod in distal extension. Second maxilliped (Fig. 39E) without distinguishing characters. Third maxilliped (Fig. 39F) with merus to dactyl each distinctly longer than broad, ischium about twice as long as broad; crista dentata with about 9 sharp teeth diminishing in strength distally; basis with 1 or 2 small mesial spines; coxa lacking spine. Sternite of third maxillipeds unarmed or with small spine on each side of midline

Chelipeds markedly dissimilar; dorsal surfaces of meri, carpi and propodi with some iridescence. Right cheliped (Fig. 40A–C) massive, chela operculate; chela varying considerably in shape and strength or armature with sex or size (see Variations); carpus and chela with sparse to moderately dense, mostly plumose setae on dorsal surfaces, setae more dense on dorsal surfaces of fingers and distally on dorsal and ventral faces of carpus. Fingers curved ventromesially, each terminating in small, usually blunt corneous claw; cutting edges with 3 or 4 large and several small calcareous teeth. Dactyl in males about as long as mesial margin of palm or in females longer than mesial margin of palm, set at strongly oblique angle to longitudinal axis of palm; mesial margin broadly curved, well delimited by row of strong spines diminishing in size distally; dorsal face with scattered small spines or tubercles; ventral face with short, usually tuberculate

median longitudinal ridge proximally; ventromesial face concave. Fixed finger broad at base, dorsal face with scattered small spines or tubercles, lateral margin well delimited by row of spines; ventrolateral face concave. Palm about 1.2 times as broad as long in males (Fig. 40A), about 1.5 times as broad as long in females (Fig. 40C); dorsal surface with numerous well-spaced small spines or tubercles; dorsolateral margin broadly rounded or sometimes arching (Fig. 40A, C), sharply delimited by row of distally upturned spines which can be strong, dorsomesial margin delimited by row of small spines or tubercles; dorsomesial face rounded; ventral surface (Fig. 40B) naked or with scattered short setae, usually with a submedian longitudinal tuberculate ridge branching towards fixed finger and ventromesial distal angle of palm (ridges often forming a Y-shape), with small, moderately concave area medially; ventrolateral surface concave. Carpus longer than broad in males and about as long as broad or broader than long in females, much broader distally than proximally (distal width 2.0–2.5 times as large as proximal width); dorsolateral margin usually well delimited by row of small to strong spines; dorsodistal margin with row of small spines; dorsal face with numerous small spines or tubercles; ventral face weakly to strongly concave medially, with scattered small tubercles or spines. Merus with moderately dense and usually plumose setae; with scattered small tubercles on dorsal face; ventromesial margin with row of blunt to sharp spines; ventrolateral margin with row of small spines or tubercles. Ischium with ventromesial row of small, blunt spines. Coxa with ventromesial row of setae; ventral face with few small tubercles and ventrodistal row of small spines.

Left cheliped (Fig. 40D) usually weakly calcified on dorsolateral face of carpus. Fingers each terminating in small corneous claw; dorsal and ventral surfaces unarmed except for scattered tufts of setae; cutting edge of dactyl with row of minute, fused corneous teeth; cutting edge of fixed finger with row of well-spaced small calcareous teeth. Dactyl slightly longer than length of mesial margin of palm. Palm unarmed except for dorsomesial row of small spines and scattered tufts of setae; ventral face smooth. Carpus with dorsodistal and dorsolateral spines; dorsal margin with long setae and row of small spines; ventral face smooth. Merus with long setae on dorsal margin; with ventrolateral row of small spines; ventral face smooth. Ischium and coxa unarmed, but with ventromesial row of setae.

Ambulatory legs (Fig. 41A–D) similar right from left except for longer meri on right, extending to about tip of dactyls of right cheliped or slightly exceeding them. Dactyls (Fig. 41B, D) broadly curved, about 1.5 times as long as propodi, and terminating in sharp corneous claws; each with dorsal and dorsomesial distal rows of long setae, and about 4–6 minute spinules on ventromesial margin. Propodi each with sparse setae on dorsal margin; ventral margin with few setae. Carpi with few setae, each with small dorsodistal spine; dorsal margin unarmed or occasionally with 1 or 2 minute spines proximally. Meri unarmed or occasionally in larger specimens (sl > 2.5 mm) with row 2 or 3 small, well-spaced spines on dorsal margin (Fig. 41C). Ischia with small dorsodistal tufts of setae, and ventrodistal row of setae. Coxae with 1 or 2

small spines ventrodistally, and ventromesial row of setae. Anterior lobe of sternite XII (between second ambulatory legs, Fig. 38D), setose, with subdistal blunt or sharp spine.

Fourth pereopod (Fig. 41E) semichelate. Dactyl terminating in sharp corneous claw; with ventrolateral row of small corneous spinules. Propodus longer than broad, rasp with 1 row of rounded scales at least distally. Carpus with long setae on dorsal margin. Merus with rows of long setae on dorsal and ventral margins. Coxa with anteroventral row of setae. Anterior lobe of sternite XIII (between fourth pereopods) with row of setae.

Fifth pereopod (Fig. 41F) semichelate. Propodal rasp extending to mid-length of segment. Coxa with row of long setae on anteroventral and ventrodistal margins. Anterior lobe of sternite XIV (between fifth pereopods) with row of setae. Uropods and telson markedly asymmetrical. Telson (Fig. 38E) lacking transverse suture; dorsal surface with scattered setae; lateral margins with long setae distally; posterior lobes separated by shallow unarmed, U-shaped cleft; terminal margin of left lobe armed with about 12 mostly long and

often strongly curved corneous spines, terminal margin of right lobe armed with about 6 small spines.

Male lacking first gonopods, with paired second gonopods. Second gonopod (Fig. 38F) flat, distal segment with long setae distally, proximal segment with long setae distomesially. Females with vestigial second right pleopod.

Variations. There is considerable variation in the shape and strength of armature of the carpus and chela of the right cheliped. The carpus varies from broader than long (about 1.1 as broad as long, Fig. 40C) to distinctly longer than broad (about 1.2 times as long as broad, Fig. 40A). The spines on the dorsolateral margin of the carpus and palm vary in strength; the dorsolateral margin of the palm is often sharply delimited by row of strong, distally upturned spines (Fig. 40C). The ventral surface of the right chela is somewhat variable, but generally the palm has a Y-shaped, median tuberculate ridge which branches towards the dactyl and the ventromesial angle of the palm; the median ridge can have a moderate to strong concave area.

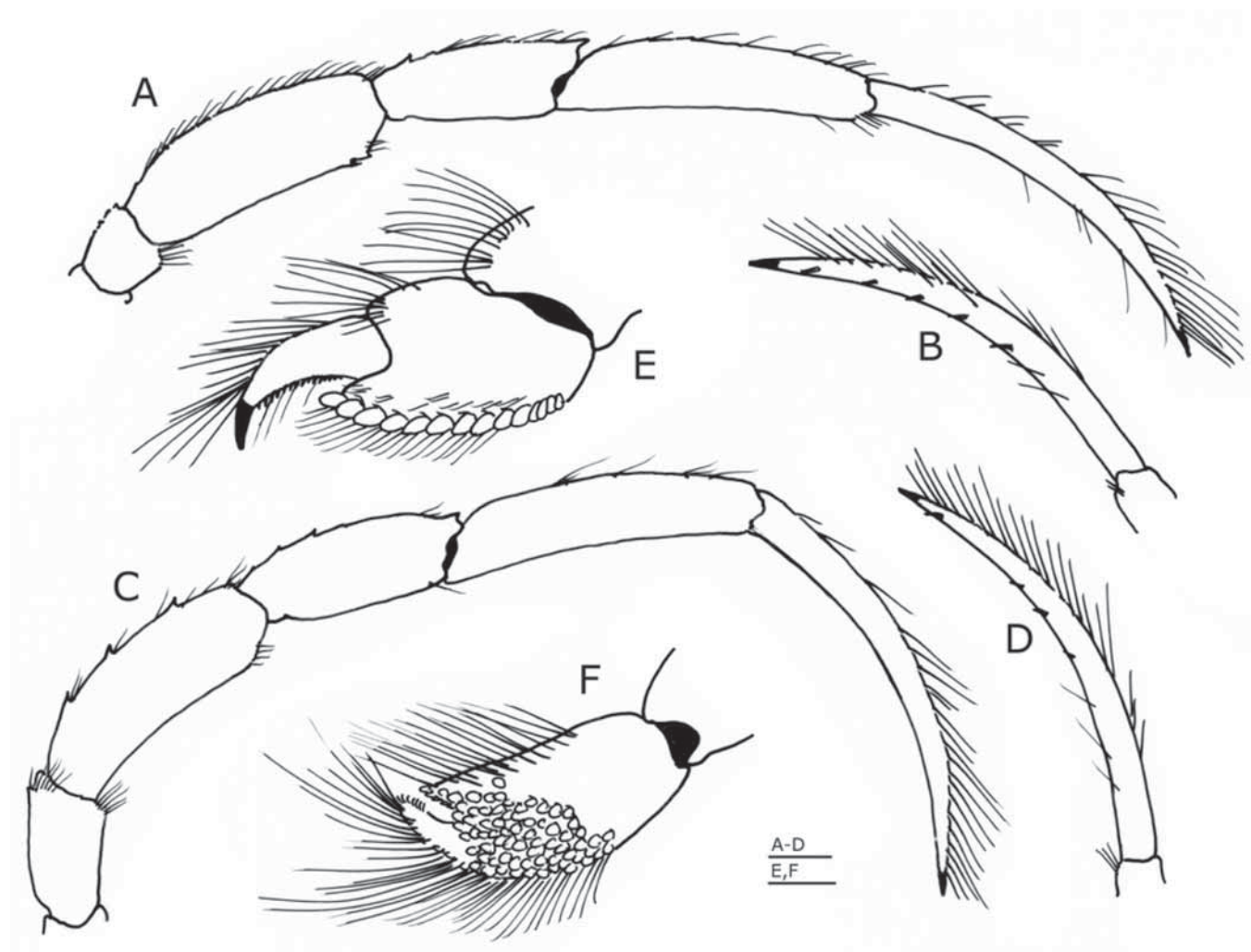


Fig. 41. *Oncopagurus rossanae*, new species, holotype, male 2.9 mm, French Polynesia, Austral Islands, BENTHAUS, sta DW 1973 (MNHN-IU-2013-6869): A, right first ambulatory leg, lateral; B, dactyl of same, mesial; C, right second ambulatory leg, lateral; D, dactyl of same, mesial; E, propodus and dactyl of left fourth pereopod, lateral; F, propodus and dactyl of left fifth pereopod, lateral. Scale bars = 1 mm, (A–D); 0.25 mm (E, F).

Colouration (Fig. 53E, F). In life, light orange overall, with darker orange tone on dorsal surfaces of carpi of chelipeds and on dorsal surfaces of segments of ambulatory legs. Preserved specimens (at least about 5 years after fixation), although pale orange overall, stand out by the presence of a darker orange tone on the dorsal surfaces of the carpi of the right and left chelipeds, and on the dorsal faces of meri, carpi and propodi of the ambulatory legs.

Habitat. Gastropod shells.

Distribution. Known only from the south Pacific, in the Marquesas and the Austral Islands, French Polynesia. Depth: 90–1000 m.

Remarks. This new species is one of eight in *Oncopagurus* in which the antennal acicles are short, not exceeding the distal margin of the corneas; the others are: *O. curvispina*, *O. bifidus*, new species, *O. glebosus*, *O. minutus*, and four new species described herein, *O. brevis*, new species, *O. elongatus*, new species, and *O. spiniartus*, new species. *Oncopagurus rossanae*, new species can be separated most readily from those other congeners with short antennal acicles, by the Y-shaped tuberculate ridge on the ventral face of the palm of the right cheliped.

Oncopagurus rossanae, new species is one of eight *Oncopagurus* species in which males lack first gonopods (see Remarks under *O. cidaris*). Of those eight, *O. rossanae*, new species, and two other new species described herein, *O. bifidus* and *O. brevis*, have short antennal acicles.

The size of adult specimens of this new species is quite small, varying in shield length from 1.1–3.3 mm, although the majority of the specimens are less than 2.0 mm.

Etymology. The name of this species is dedicated to my wife, Rossana, who for nearly four decades has encouraged my discoveries as well as accompanied me in every facet of my life.

Oncopagurus spiniartus, new species
Figs. 42–45, 51

Type material. Holotype, Southern Indian Ocean, Île Amsterdam and Île St.-Paul, CENTOB, MD 50, DC 82, sta 19, 38°42'S, 77°283'E, 165 m, 17 July 1986: M 2.3 mm [dismembered] (MNHN-IU-5494, ex MNHN Pg. 7610).

Paratypes, Southern Indian Ocean, Île Amsterdam and Île St.-Paul: CENTOB, MD 50, DC 114, sta 24, 39°00'S, 77°464'E, 160 m, 19 July 1986: 2 M 2.8, 2.9 mm, 1 F 2.1 mm (MNHN-IU-5495, ex MNHN Pg. 7609).

Description. Gills biserial. Shield (Fig. 42A) about as long as broad; dorsal surface weakly calcified medially (weak calcification often reaching to anterior margin), with scattered short setae; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; anterior margins weakly concave; lateral projections subtriangular, terminating in small blunt or

sharp spine; anterolateral margins sloping; posterior margin broadly rounded; ventrolateral margins of shield usually with slender spine on one or both sides. Anterodistal margin of branchiostegite rounded, unarmed, setose.

Ocular peduncles (Fig. 42A) more than half length of shield; with longitudinal row of long setae dorsally; lateral and ventral faces usually weakly calcified. Cornea weakly dilated. Ocular acicles subtriangular, each terminating in strong spine; separated basally by about basal width of 1 acicle.

Antennular peduncle (Fig. 42A) exceeding distal margin of cornea by 0.7 to nearly full length or ultimate segment. Ultimate segment slightly less than twice as long as penultimate segment, naked or with scattered setae dorsally. Basal segment with strong ventromesial spine; lateral face with distal subrectangular lobe armed with small spine, and strong spine proximally. Ventral flagellum with 5 or 6 articles.

Antennal peduncle (Fig. 42A, B) not exceeding distal margin of cornea, reaching at most to about midportion of cornea. Fifth segment unarmed except for scattered setae and laterodistal tuft of setae. Fourth segment armed with strong dorsodistal spine. Third segment with strong ventromesial distal spine. Second segment with dorsolateral distal angle produced, terminating in strong, simple spine often with smaller dorsal subterminal spine; mesial margin with spine on dorsodistal angle. First segment with lateral face usually armed with small spine; ventromesial angle produced, with 2 or 3 small spines laterally. Acicle relatively short, reaching to about proximal margin of cornea, nearly straight (in dorsal view), terminating in strong spine; mesial margin armed with 6–10 spines, sparsely setose. Flagellum slightly exceeding extended right cheliped, articles with setae 1 or 2 flagellar articles in length.

Mandible (Fig. 43A) with 3-segmented palp; cutting edge calcified, with small tooth medially; molar process with small tooth medially. Maxillule (Fig. 43B) with external lobe of endopod slender, moderately developed, not recurved, internal lobe with long, terminal seta. Maxilla (Fig. 43C) with endopod not exceeding distal margin of scaphognathite. First maxilliped (Fig. 43D) with endopod not exceeding exopod in distal extension. Second maxilliped (Fig. 43E) without distinguishing characters. Third maxilliped (Fig. 43F) with merus to dactyl each distinctly longer than broad, ischium about twice as long as broad; crista dentata with about 7 sharp teeth diminishing in strength distally, proximal tooth distinctly larger than others; basis with 1 small mesial spine; coxa lacking spine. Sternite of third maxillipeds unarmed or with small spine on each side of midline.

Chelipeds markedly dissimilar. Right cheliped (Fig. 44A, B) massive, chela operculate; carpus and chela with sparse to moderately dense setae on dorsal surfaces, setae more dense on dorsal surfaces of fingers and mesial face of carpus. Fingers curved ventromesially, each terminating in small, usually blunt corneous claw; cutting edges with 1 or 2 large calcareous teeth and several irregularly sized smaller calcareous teeth, with short row closely set minute

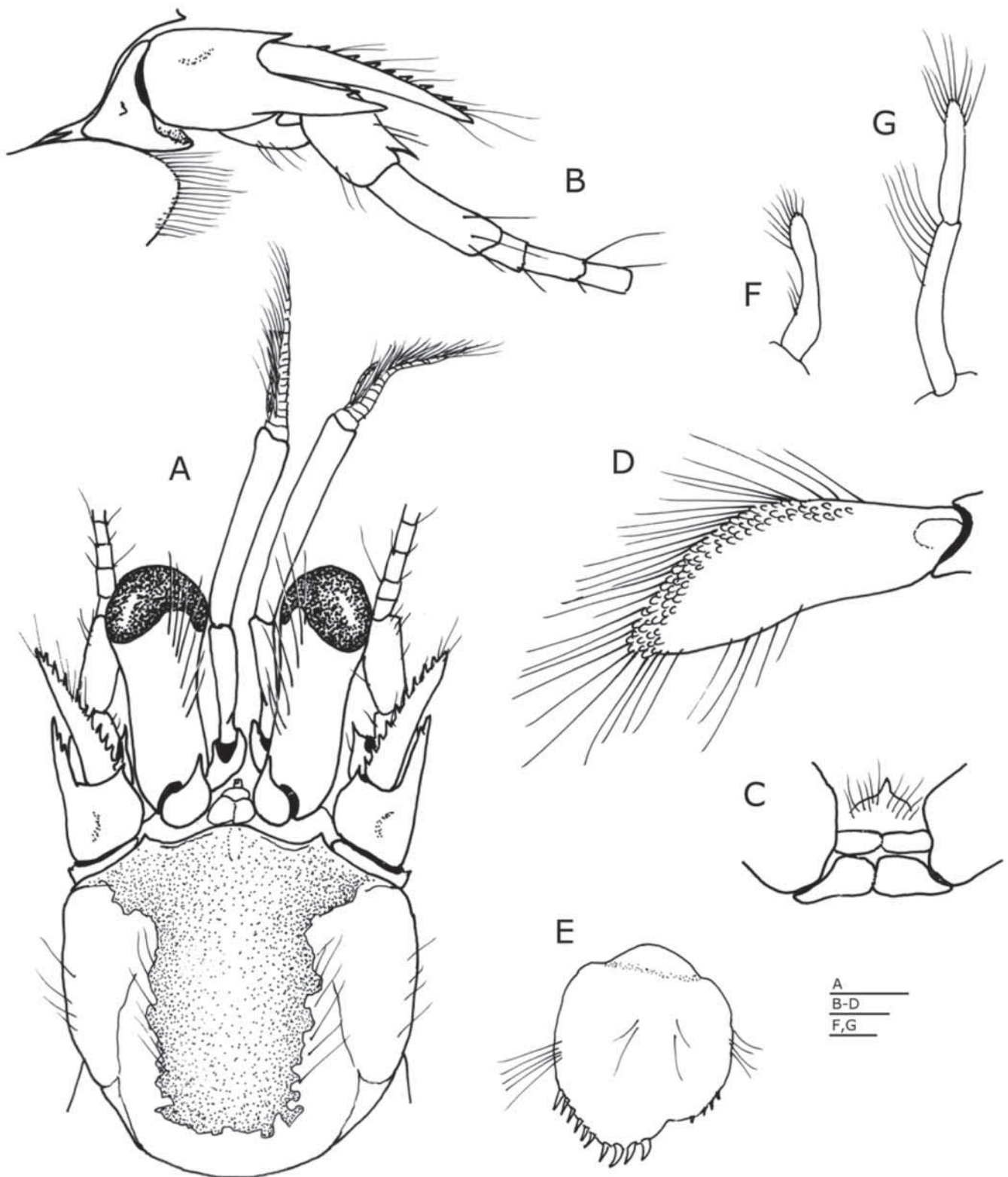


Fig. 42. *Oncopagurus spiniartus*, new species, southern Indian Ocean, Île Amsterdam and Île St.-Paul: A–E, holotype, male 2.3 mm, CENTOB, MD 50, DC 82, sta 19 (MNHN-IU-5494, ex MNHN Pg 7610); F, G, paratype, male 2.8 mm, CENTOB, MD 50, DC 114, sta 24, (MNHN-IU-5495, ex MNHN Pg 7609): A, shield and cephalic appendages; B, right antennal peduncle, lateral; C, anterior and posterior lobes of sternite XII (between second ambulatory legs), ventral; D, exopod of left uropod, dorsal; E, telson, dorsal; F, left first gonopod, mesial; G, left second gonopod, anterior. Scale bars = 0.5 mm (A), 0.25 mm (B–D), 0.2 mm (F, G).

corneous teeth distally. Dactyl about 1.3 times as long as mesial margin of palm, set at strongly oblique angle to longitudinal axis of palm; mesial margin broadly curved, well delimited by row of spines diminishing in size distally; dorsal face with moderately dense small spines or tubercles decreasing in density distally; ventromesial face concave. Fixed finger broad at base, dorsal face with scattered small spines or tubercles, lateral margin well delimited by row of spines; ventrolateral face concave. Palm about 1.5–1.7 times as broad as long; dorsal surface with numerous small spines or tubercles; dorsolateral margin broadly rounded, well delimited by row of spines, dorsomesial margin delimited by row of spines or tubercles; dorsomesial face rounded, with small spines or tubercles and usually well delimited, blunt ventromesial margin; ventral surface smooth, at most with scattered short setae. Carpus longer than broad; dorsolateral margin usually well delimited by row of spines; dorsodistal margin with row of small spines; dorsal face with numerous small spines or tubercles; ventral face nearly flat, with scattered small tubercles or spines. Merus with scattered setae dorsally, and moderately dense setae ventrodistally;

with scattered small tubercles on dorsal face and small dorsodistal spine; ventromesial margin with row of blunt to sharp spines; ventrolateral margin with row of small tubercles. Ischium with ventromesial row of small, blunt spines. Coxa with ventromesial row of setae.

Left cheliped (Fig. 44C, D) usually weakly calcified on dorsolateral face of carpus. Fingers each terminating in small corneous claw; dorsal and ventral surfaces unarmed except for scattered tufts of setae; cutting edge of dactyl with row of minute, fused corneous teeth; cutting edge of fixed finger with row of well-spaced small calcareous teeth. Dactyl longer than length of mesial margin of palm. Palm unarmed except for dorsomesial row of small sharp or blunt spines and scattered tufts of setae; ventral face smooth. Carpus with irregular dorsal row of about 9 small spines in addition to 1 dorsodistal and 1 dorsolateral spine on distal margin; dorsal surface with long setae; ventral face smooth. Merus with long setae on dorsal margin; with ventrolateral row of small spines; ventral face smooth. Ischium and coxa unarmed, but with ventromesial row of setae.

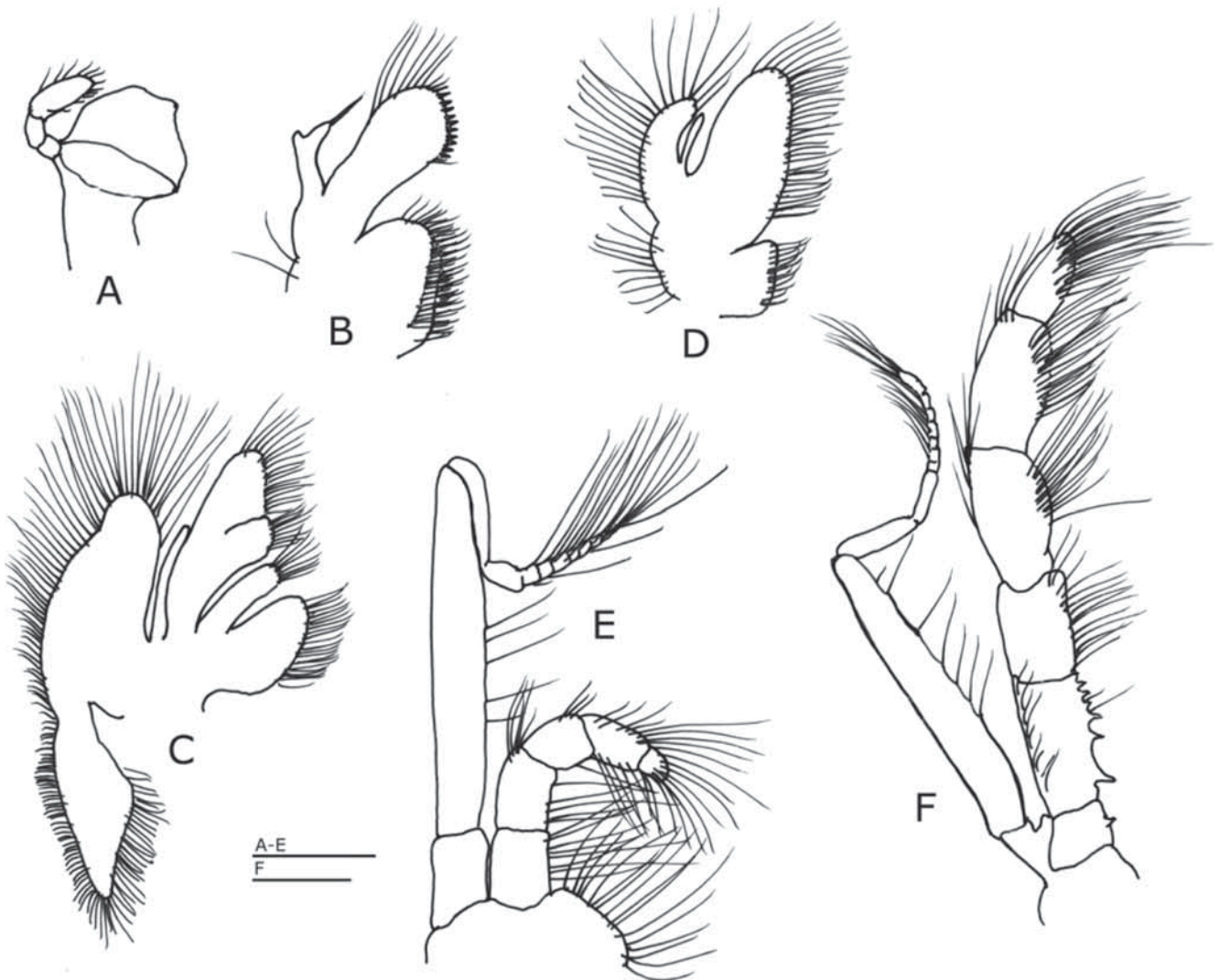


Fig. 43. *Oncopagurus spiniartus*, new species, paratype, male 2.8 mm, southern Indian Ocean, Île Amsterdam and Île St.-Paul, CENTOB, MD 50, DC 114, sta 24 (MNHN-IU-5495, ex MNHN Pg 7609). Left mouthparts, internal: A, distal half of mandible; B, maxillule; C, maxilla; D, first maxilliped; E, second maxilliped; F, third maxilliped. Scale bars = 0.2 mm (A–E); 0.5 mm (F).

Ambulatory legs (Fig. 45A–D) similar right from left except for longer segments and stronger spination on right, extending to about tip of dactyls of right cheliped or slightly exceeding them. Dactyls broadly curved, about 1.5 times as long as propodi, and terminating in sharp corneous claws; each with dorsal and dorsomesial distal rows of long setae, and 10–13 small spinules on ventromesial margin. Propodi each with row of about 8 small spines (reduced or obscure on right side) and sparse setae on dorsal margin; ventral margin with few setae. Carpi each with row of 9 or 10 small spines and few setae on dorsal margin, and small dorsodistal spine.

Meri each with row of 9 or 10 small spines and long setae on dorsal margin. Ischia with setae dorsally and ventrally. Coxae with ventromesial row of setae. Anterior lobe of sternite XII (between third pereopods, Fig. 42C), setose, with subdistal spine.

Fourth pereopod (Fig. 45E) semichelate. Dactyl terminating in sharp corneous claw; with ventrolateral row of small corneous spinules. Propodus longer than broad, rasp with 1 row of rounded scales at least distally. Carpus with long setae on dorsal margin. Merus with rows of long setae on dorsal

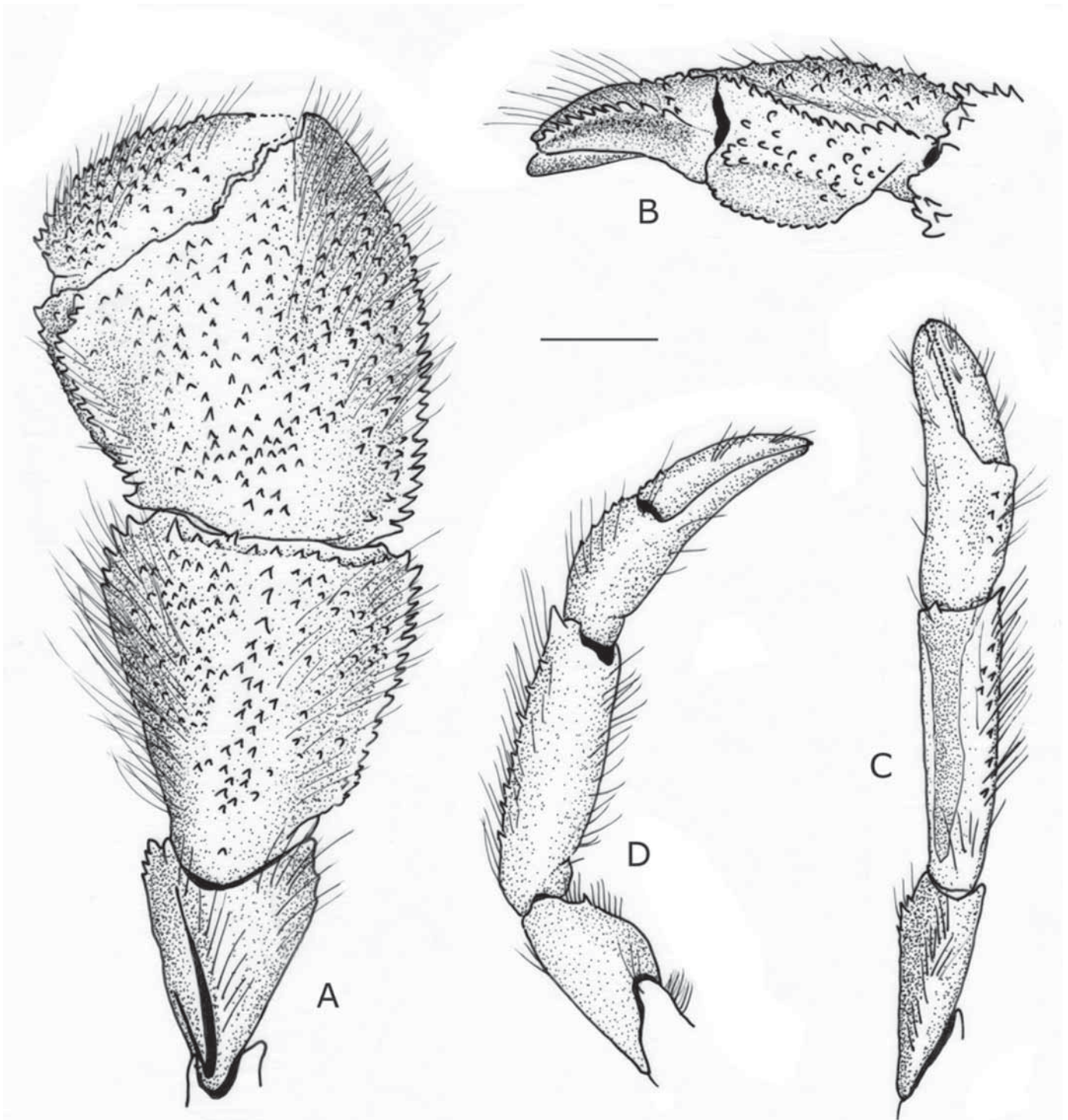


Fig. 44. *Oncopagurus spiniartus*, new species, holotype, male 2.3 mm, southern Indian Ocean, Île Amsterdam and Île St.-Paul, CENTOB, MD 50, DC 82, sta 19 (MNHN-IU-5494, ex MNHN Pg 7610): A, right cheliped, dorsal; B, chela of same, mesial; C, left cheliped, dorsal; D, same, mesial. Scale bar = 1 mm.

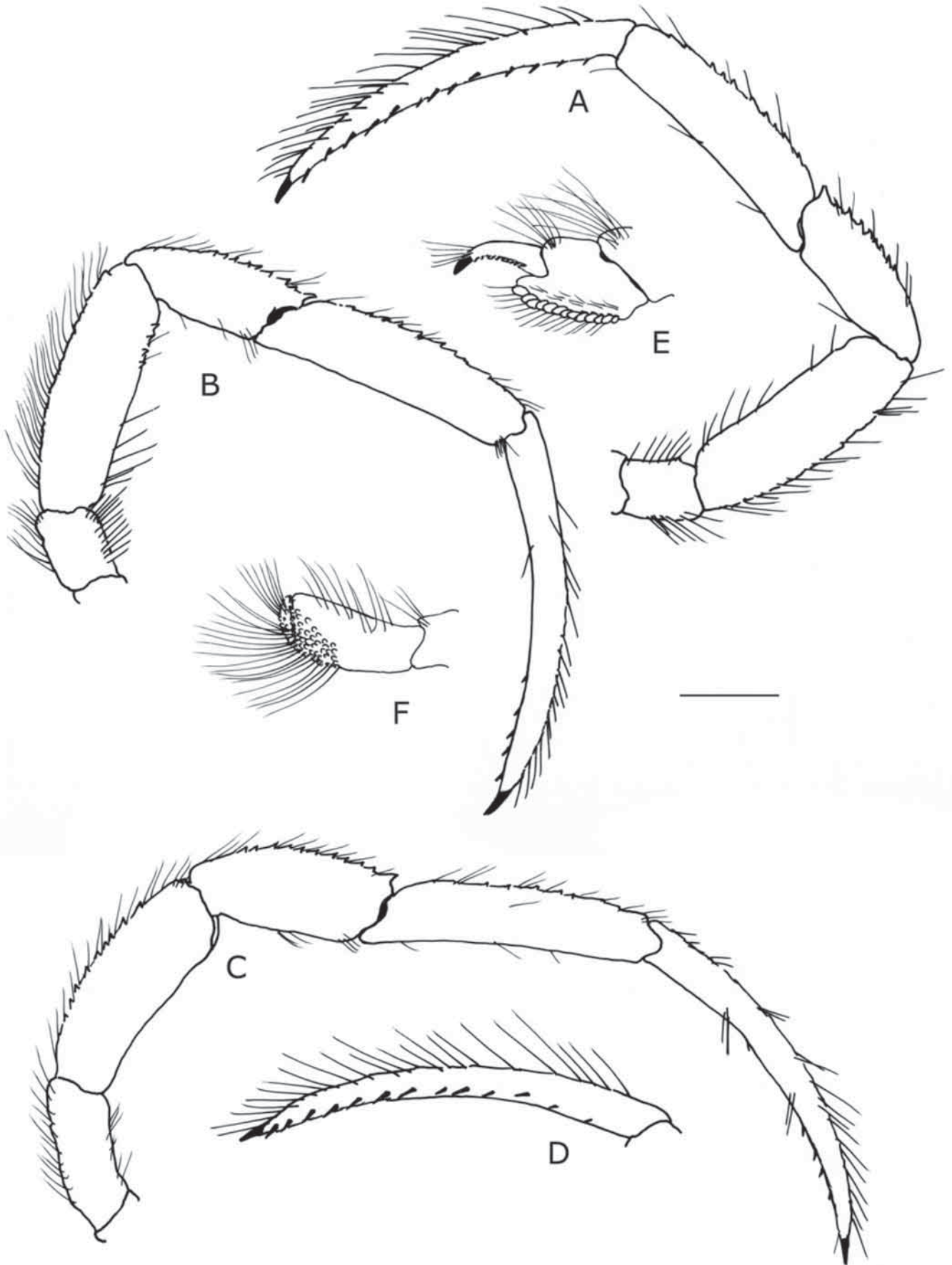


Fig. 45. *Oncopagurus spiniartus*, new species, holotype, male 2.3 mm, southern Indian Ocean, Île Amsterdam and Île St.-Paul, CENTOB, MD 50, DC 82, sta 19 (MNHN-IU-5494, ex MNHN Pg 7610): A, right first ambulatory leg, mesial; B, same, lateral; C, right second ambulatory leg, lateral, D, dactyl of same, mesial. Scale bars = 1 mm (A–D); 0.5 mm (E, F).

and ventral margins. Coxa with anteroventral row of setae. Anterior lobe of sternite XIII (between fourth pereopods) with row of setae.

Fifth pereopod (Fig. 45F) semichelate. Propodal rasp not reaching mid-length of segment. Coxa with row of long setae on anteroventral and ventrodiscal margins. Anterior lobe of sternite XIII (between fifth pereopods) with row of setae.

Uropods markedly asymmetrical; left exopod (Fig. 42D) slender, slightly more than 3 times as long as broad, rasp narrow, consisting of 1–4 rows of small scales. Telson (Fig. 42E) moderately asymmetrical, lacking transverse suture; dorsal surface with scattered setae; lateral margins with long setae medially; posterior lobes separated by shallow unarmed, U-shaped cleft; terminal margin of left lobe armed with about 10, often curved corneous spines, terminal margin of right lobe armed with 4 or 5 small spines.

Male with paired first and second gonopods (Fig. 42F, G) occasionally with first pair missing and poorly developed second pair; first gonopod with distal portion subovate, with setae distally; second gonopod with distal segment flat and with long setae distally, proximal segment with long setae distomesially. Females with vestigial second right pleopod.

Variations. With only four known specimens, variations cannot be properly ascertained. However, it appears that in males, gonopods can vary in development irrespective of whether the individuals are mature or not. One of the males (holotype), despite being an adult, lacks first gonopods, and the second gonopods are incompletely and asymmetrically developed.

Colouration. Unknown.

Habitat. Presumably gastropod shells.

Distribution. So far known only from Île Amsterdam and Île St.-Paul, in the southern Indian Ocean. Depth: 165 m.

Remarks. This new species is characterised by the spinose condition of the left cheliped and ambulatory legs. The carpus of the left cheliped has a row of nine small spines on the dorsal margin; the meri, carpi and propodi of the ambulatory legs (both sides), each have a row of nine small spines on the dorsal margin. Also, the ambulatory legs are not as slender as in other *Oncopagurus* species; this is particularly visible in the meri and carpi.

Not many samples of parapagurids are known from the isolated islands at higher latitudes of the southern Indian Ocean. The discovery of this new species in the only known samples from Île Amsterdam and Île St.-Paul, suggests that additional sampling could yield even more species from this region.

Etymology. The specific name is derived from the Latin, *spina*, spine, and *artus*, limb, and is in reference to the

spinose condition of the carpi and meri of the ambulatory legs in this new species.

***Oncopagurus stockmani* Zhadan, 1997**

Figs. 46–49, 51

Parapagurus dimorphus – Zarenkov, 1990: 238.

Sympagurus africanus subsp. nov. – Parin et al., 1997: 163

Oncopagurus stockmani Zhadan, 1997: 65, figs 6–8 (type locality: Nazca and Sala-y-Gómez ridges, southeastern Pacific, R/V Professor Stockman, sta 1873, 22°07'S, 81°18'W); McLaughlin et al., 2010: 39; Retamal & Moyano, 2010: 313.

Type material. Holotype (not seen), southeastern Pacific, Nazca and Sala-y-Gómez Ridges, R/V Professor Stockman, 18th cruise, sta 1873, 22°07'S, 81°18'W, 235 m, 22 April 1987, coll. A. N. Mironov: M 6.1 mm (ZMUM Ma-4758).

Paratypes: 2 M 4.5, 6.4 mm, same station data as holotype (MNHN-IU-2013-6871).

Additional material. Eastern Pacific: SEPBOP, R/V Anton Bruun, cruise 12: sta 65–MV–IV–54, off Más a Tierra Island, Juan Fernández Islands, [approx. 33°38'29"S 78°50'28"W], 150 m, 13 December 1965: ov F 7.0 mm (USNM 1211233); CIMAR 6, stan 38, Robinsoe Crusoe Island, Juan Fernández Islands, 146 m, 23 October 2000: 1 F 4.9 mm, 1 ov F 4.0 mm (USNM 1211234).

Re-description. Gills biserial. Shield (Fig. 46A) about as long as broad; dorsal surface weakly calcified medially, with scattered short setae; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; anterior margins weakly concave; lateral projections subtriangular, terminating in small blunt or sharp spine; anterolateral margins sloping; posterior margin broadly rounded; ventrolateral margins of shield usually with slender spine on one or both sides. Anterodistal margin of branchiostegite rounded, unarmed, setose.

Ocular peduncles (Fig. 46A) about half length of shield, with longitudinal row of short setae dorsally; lateral and ventral faces usually weakly calcified. Cornea weakly dilated. Ocular acicles subtriangular, each terminating in strong spine; separated basally by about basal width of 1 acicle.

Antennular peduncle (Fig. 46A) exceeding distal margin of cornea by about full length or slightly more, of ultimate segment. Ultimate segment about twice as long as penultimate segment, naked or with scattered setae dorsally. Basal segment with strong ventromesial spine; lateral face with distal subrectangular lobe armed with small spine distally, and strong spine proximally. Ventral flagellum with 8 articles.

Antennal peduncle (Fig. 46A) at most slightly exceeding distal margin of cornea. Fifth segment unarmed except for scattered setae and laterodistal tuft of setae. Fourth segment armed with strong dorsodistal spine. Third segment with strong ventromesial distal spine. Second segment with dorsolateral distal angle produced, terminating in strong simple spine (often with small spine dorsally); mesial margin with spine on dorsodistal angle. First segment with lateral

face unarmed or with small blunt spine; ventromesial angle produced, with 2 or 3 small spines laterally. Acicle reaching or slightly exceeding distal margin of cornea, weakly curved outward (in dorsal view), terminating in strong spine; mesial margin armed with 6–9 spines, sparsely setose. Flagellum slightly exceeding extended right cheliped, articles with few setae less than 1 to 2 flagellar articles in length.

Mandible (Fig. 47A) with 3-segmented palp; cutting edge calcified, with small tooth medially; molar process with small tooth medially. Maxillule (Fig. 47B) with external lobe of endopod slender, moderately developed, not recurved, internal lobe with long, terminal seta. Maxilla (Fig. 47C) with endopod not exceeding distal margin of scaphognathite.

First maxilliped (Fig. 47D) with endopod slightly exceeding exopod in distal extension. Second maxilliped (Fig. 47E) without distinguishing characters. Third maxilliped (Fig. 47F) with merus to dactyl each distinctly longer than broad, ischium about twice as long as broad; crista dentata with about 12–18 blunt or sharp teeth gradually diminishing in strength distally, proximal tooth distinctly larger than others; basis with 1 small mesial spine; coxa with spine. Sternite of third maxillipeds with small spine on each side of midline.

Chelipeds markedly dissimilar. Right cheliped (Fig. 48A–D) massive, chela operculate; carpus and chela with sparse to moderately dense setae on dorsal surfaces, setae more dense on dorsaldistal surfaces of fingers and mesial face

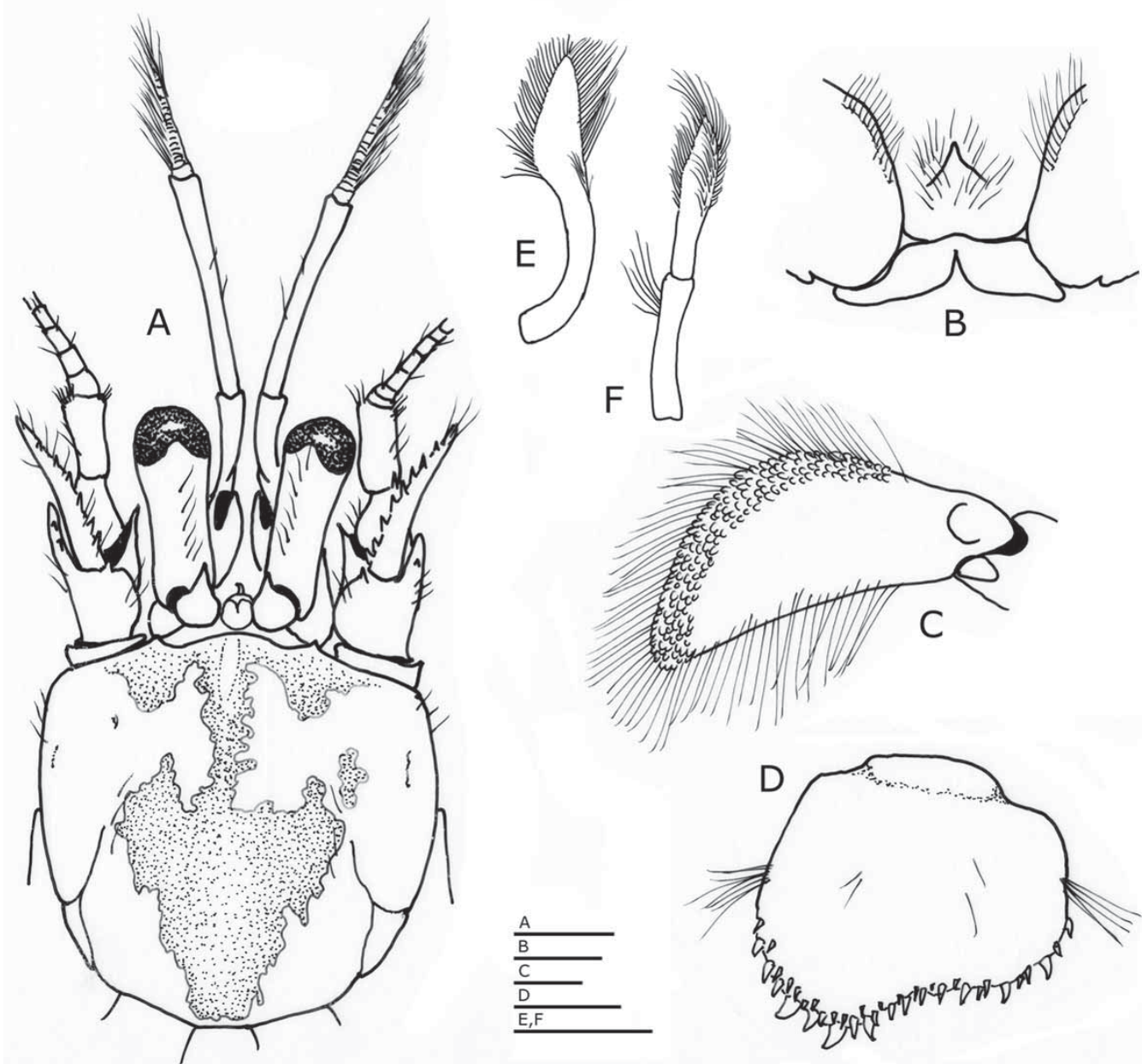


Fig. 46. *Oncopagurus stockmani* Zhadan, 1997: A–D, ov female 7.0 mm, eastern Pacific, off Más a Tierra Island, Juan Fernández Islands, SEPBP, R/V Anton Bruun, cruise 12: sta 65–MV–IV–54 (USNM 1211233); E, F, holotype, male 6.1 mm, southeastern Pacific, Nazca and Sala-y-Gómez ridges, “Professor Stockman”, 18th cruise, sta 1873 (ZMUM Ma 4758). A, shield and cephalic appendages, dorsal; B, anterior and posterior lobes of sternite XII (between second ambulatory legs), ventral; C, exopod of left uropod, dorsal; D, telson, dorsal; E, left first gonopod, mesial; F, left second gonopod, anterior. Scale bars = 2 mm (A); 1 mm (B–E); 2 mm (F).

of carpus. Fingers curved ventromesially, each terminating in small, usually blunt corneous claw; cutting edges with 1 or 2 large calcareous, mostly serrated teeth and, with short row of closely set minute corneous teeth distally on dactyl. Dactyl about as long as mesial margin of palm, set at strongly oblique angle to longitudinal axis of palm; mesial margin broadly curved, delimited by row of spines diminishing in size distally; dorsal face with numerous small spines or tubercles; ventromesial face concave and elevated longitudinally on midline. Fixed finger broad at base, dorsal face covered with numerous small spines or tubercles, lateral

margin delimited by row of spines; ventral face concave mesially, elevated longitudinally on midline. Palm about 1.3 times broader than long; dorsal surface covered with numerous well-spaced small spines or tubercles; dorsolateral margin broadly rounded, or well delimited by irregular row of calcareous spines, dorsomesial margin delimited by row of small spines or tubercles; dorsomesial face nearly flat, sloping mesially, with many small tubercles; ventral surface with numerous small spines or tubercles, and scattered short setae. Carpus longer than broad, dorsal surface covered with numerous small spines or tubercles; dorsodistal margin with

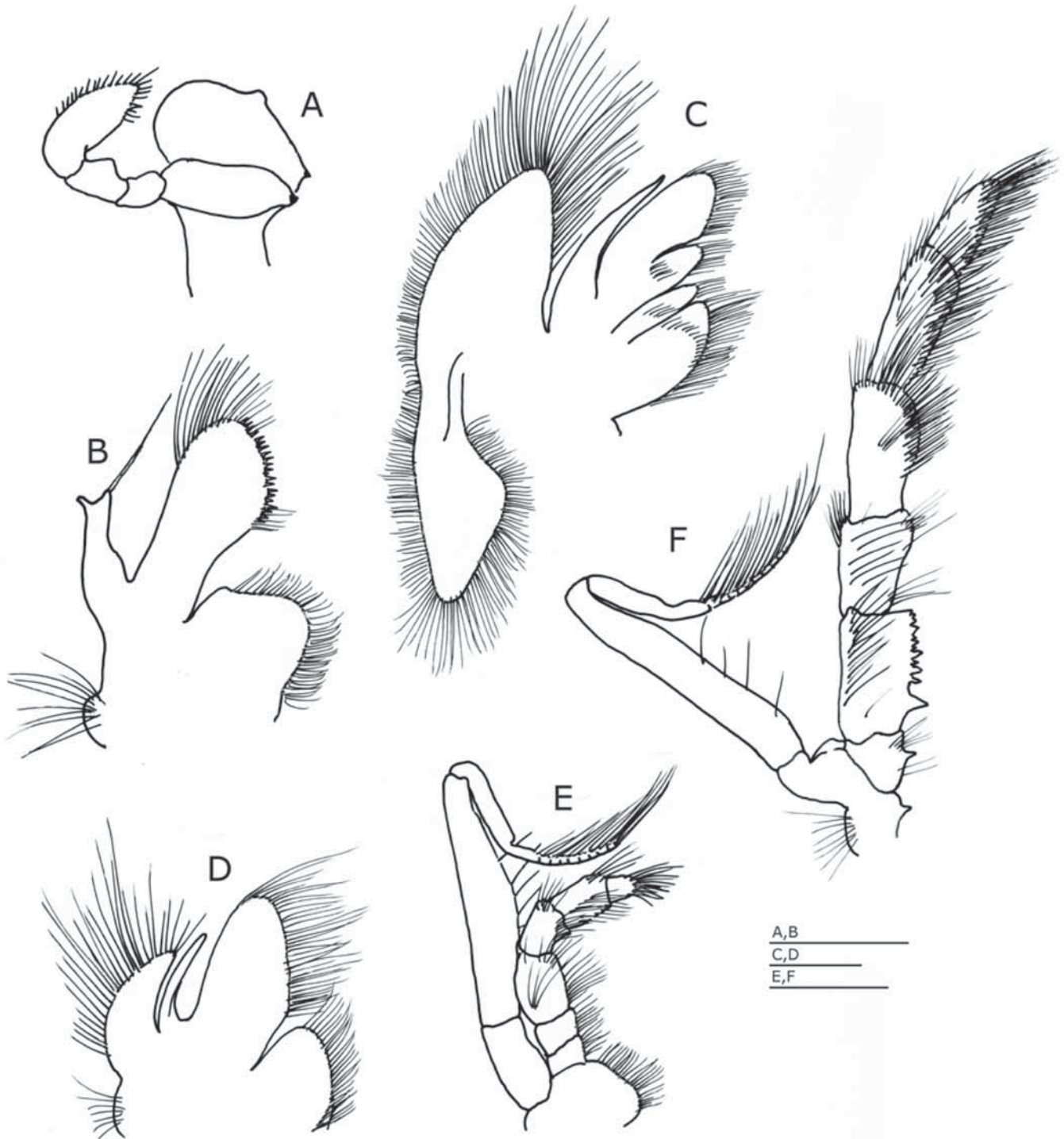


Fig. 47. *Oncopagurus stockmani* Zhadan, 1997: ov female 4.0 mm, eastern Pacific, Robinsoe Crusoe Island, Juan Fernández Islands, CIMAR 6, sta 38 (USNM 1211234). Left mouthparts, internal: A, distal half of mandible; B, maxillule; C, maxilla; D, first maxilliped; E, second maxilliped; F, third maxilliped. Scale bars = 0.5 mm.

row of small spines; dorsolateral face rounded; mesial face strongly sloping, expanded distomesially and with row of strong ventromesial spines distally; ventral face nearly flat, with well spaced small tubercles. Merus with scattered setae dorsally, and moderately dense setae ventrodistally; dorsal surface with scattered small tubercles and transverse, distal row of setae near dorsodistal margin; ventromesial margin with row of blunt to sharp spines; ventrolateral margin with row of small tubercles. Ischium with ventromesial row of small, blunt spines. Coxa row of small spines on ventrodistal margin, and ventromesial row of setae.

Left cheliped (Fig. 48E, F) usually weakly calcified on nearly entire dorsolateral face of carpus. Fingers each terminating in small corneous claw; dorsal and ventral surfaces with scattered tufts of setae; cutting edge of dactyl with row of minute, fused corneous teeth; cutting edge of fixed finger with row of well-spaced small calcareous teeth. Dactyl about as long as length of mesial margin of palm; with small proximal spine on dorsal face. Fixed finger with 1 or 2 small spines or tubercles proximally on dorsal face. Palm with scattered setae on dorsal surface; with dorsomesial row

of small spines or tubercles and scattered small tubercles or spines on rest of dorsal face; ventral face smooth except for scattered setae. Carpus with dorsal irregular row of small spines in addition to dorsodistal and dorsolateral spine on distal margin; dorsal margin with long setae; ventral face smooth except for scattered setae. Merus with setae on dorsal margin; with ventrolateral row of small spines; ventral face smooth. Ischium and coxa unarmed, but with ventromesial row of setae.

Ambulatory legs (Fig. 49A–D) similar right from left except for longer segments and stronger spination on right, extending to about tip of dactyls of right cheliped or slightly exceeding them. Dactyls (Fig. 49B, D) broadly curved, about 1.5 times as long as propodi, terminating in sharp corneous claws; each with dorsal and dorsomesial distal rows of long setae, and 15–35 small spinules on ventromesial margin (in large specimens such as holotype, sl 7.0 mm, spinules arranged irregularly on proximal 0.6 of ventromesial margin and in regular row distally). Propodi with setae on dorsal margin; ventral margin with few setae. Carpi each with setae on dorsal margin, and small dorsodistal spine; carpi of right with row

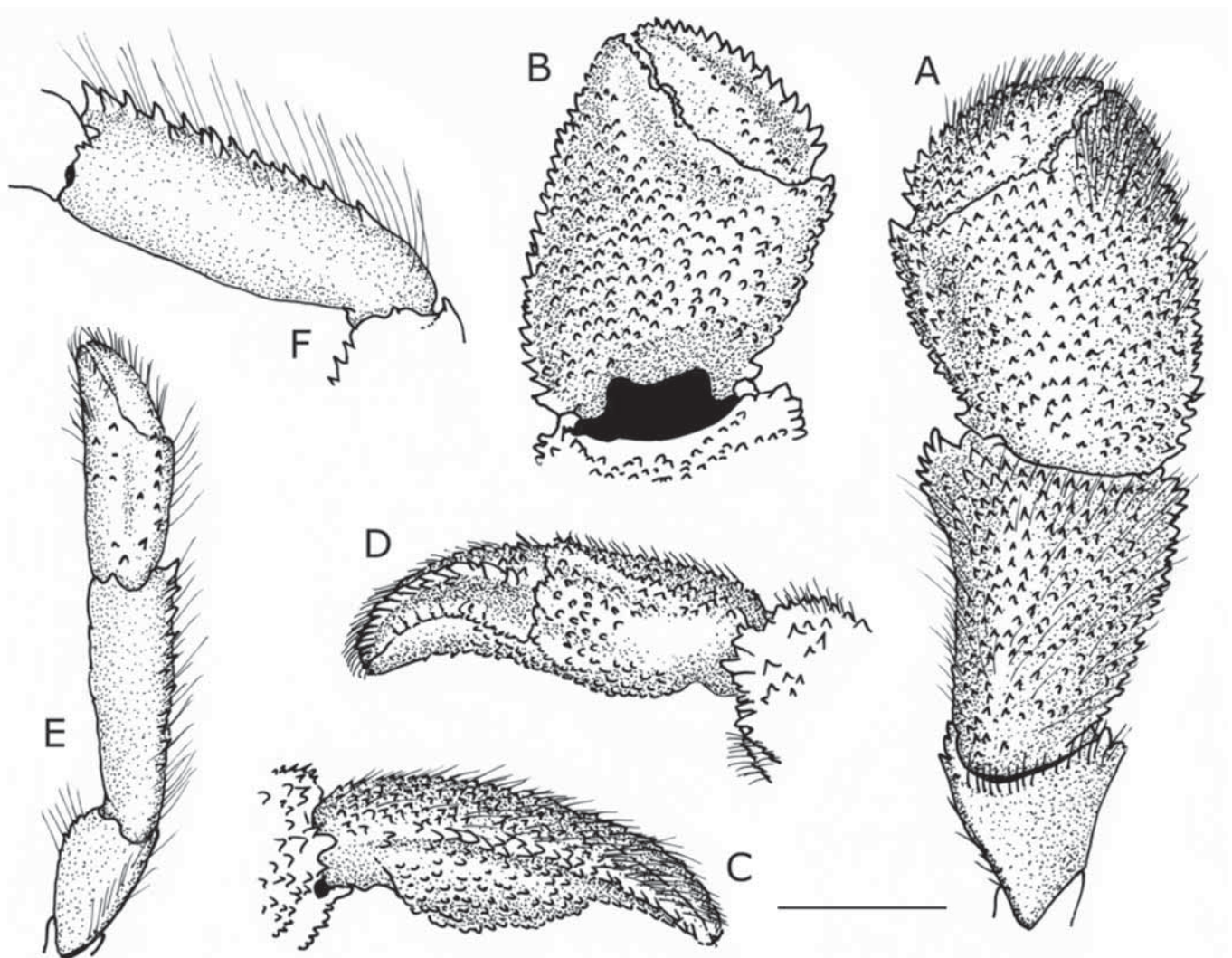


Fig. 48. *Oncopagurus stockmani* Zhadan, 1997, ov female 7.0 mm, eastern Pacific, off Más a Tierra Island, Juan Fernández Islands, SEPBOB, R/V Anton Bruun, cruise 12: sta 65–MV–IV–54 (USNM 1211233): A, right cheliped, dorsal; B–D, chela of same, ventral (B), lateral (C), mesial (D); E, left cheliped, dorsal; F, carpus of same, dorsolateral. Scale bars = 5 mm.

of small spines on dorsal margins. Meri each with setae on dorsal margin, and 2 or 3 small spines distally on ventrolateral margin. Ischia with setae on dorsal and ventroproximal margins. Coxae with ventromesial row of setae. Anterior lobe of sternite XII (between second ambulatory legs, Fig. 46B), setose, with subdistal spine.

Fourth pereopod (Fig. 49E) semichelate. Dactyl terminating in sharp corneous claw; with ventrolateral row of small corneous spinules. Propodus longer than broad, rasp with 2 or 3 rows of ovate scales at least distally. Carpus with long setae on dorsal margin. Merus with rows of long setae on dorsal and ventral margins. Coxa with anteroventral row of setae. Anterior lobe of sternite XIII (between fourth pereopods) with row of setae.

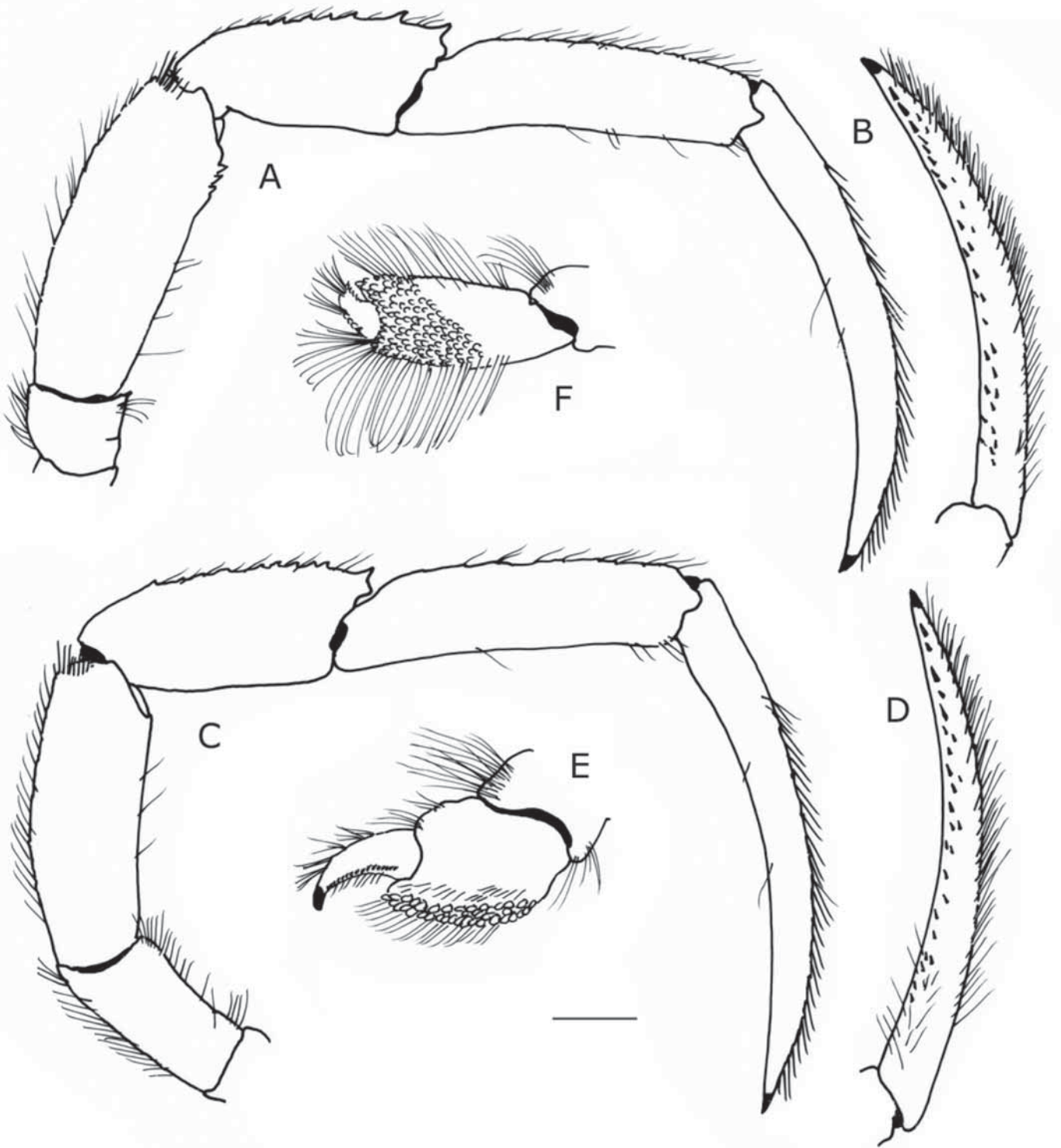


Fig. 49. *Oncopagurus stockmani* Zhadan, 1997, ov female 7.0 mm, eastern Pacific, off Más a Tierra Island, Juan Fernández Islands, SEPBP, R/V Anton Bruun, cruise 12: sta 65–MV–IV–54 (USNM 1211233): A, right first ambulatory leg, lateral; B, dactyl of same, mesial; C, right second ambulatory leg, lateral; D, dactyl of same, mesial; E, propodus and dactyl of left fourth pereopod, lateral; F, propodus and dactyl of left fifth pereopod, lateral. Scale bars = 2 mm.

Fifth pereopod (Fig. 49F) semichelate. Propodal rasp reaching to or slightly exceeding mid-length of segment. Coxa with row of long setae on anteroventral and ventrodiscal margins. Anterior lobe of sternite XIII (between fifth pereopods) with row of setae.

Uropods markedly asymmetrical; left exopod (Fig. 46C) about 2.7 times as long as broad, rasp consisting of 2–5 rows of small scales. Telson (Fig. 46D) moderately asymmetrical, lacking transverse suture; dorsal surface with scattered setae; lateral margins with long setae medially; posterior lobes separated by shallow, armed, U-shaped cleft; terminal margin of left and right lobes armed with about 2 or 3 irregular rows of often weakly curved corneous, unequal spines.

Male with paired first and second gonopods well developed; first gonopod (Fig. 46E) with ovate or subtriangular distal lobe; second gonopods (Fig. 46F) with spatulate distal segment, densely setose distally. Female with vestigial second right pleopod.

Colouration. Unknown.

Habitat. Gastropod shells with or without zoanthid or *Hydractinia* colonies.

Distribution. So far known only from the type locality, Nazca and Sala-y-Gómez Ridges, in the southeastern Pacific. Depth: 146–330 m.

Remarks. *Oncopagurus stockmani* is unique among species of *Oncopagurus* in having two rows of scales throughout the propodal rasp of the fourth pereopods. Individuals of this species are among the largest known in species of *Oncopagurus*, reaching up to 8.0 mm (a paratype reported by Zhadan, 1997: 65) in shield length.

As noted by Zhadan (1997), the presence of several rows of scales on the propodal rasp of the fourth pereopod, misled Zarenkov (1990) to report earlier specimens of *Oncopagurus stockmani* collected at R/V Professor Stockman, sta 1873, as *Parapagurus dimorphus* [= *Sympagurus dimorphus* (Studer, 1883)], a species which has two or more rows of scales on the propodal rasp. The resemblance of these two species is only superficial as they differ in fundamental generic characters such as type and number of gills, and presence or shape of the epistomial spine. Zhadan (1997) compared his *Oncopagurus stockmani* with other congeners, and stated that two other species, *O. africanus* and *O. haigae*, also had more than one row of scales on the propodal rasp of the fourth pereopod. However, in actuality the propodal rasp in *O. africanus* and *O. haigae* may have more than one row of scales only on the proximal portion of the segment where the scales can often be arranged in a small cluster. Except for *O. stockmani*, all species of *Oncopagurus* invariably have only one row of scales on the propodal rasp, at least distally.

Previous to this study, *Oncopagurus stockmani* was known exclusively based on the type material from the Nazca and Sala-y-Gómez ridges, in the southeastern Pacific. The range

of this species is herein extended about 2000 km to the southeast, where it has been found in the Juan Fernández Islands, Chile.

Oncopagurus tuamotu (Lemaitre, 1994)

Figs. 50, 51, 53G

Sympagurus tuamotu Lemaitre, 1994: 407, figs 24–26, 28i (type locality: Tuamotu, Tureia, French Polynesia, SMCB sta 336, 20° 46.2'S, 138° 34.6'W); Lemaitre, 1996: 194; Poupin, 1996: 20, pl. 9f; Zhadan, 1997: 63 (table); McLaughlin et al., 2010: 39.

Type material. Holotype, French Polynesia, Tuamotu, Tureia, SMCB sta 336, 20°46.2'S, 138°34.6'W, trapped, 760 m, 29 October 1990: F 3.7 mm (MNHN Pg. 5153).

Paratypes, French Polynesia, Austral Islands, Raivavae, sta D 66, 23°50.54'S, 147°42.73'W, trapped, 400 m, 3 December 1990: 1 M 3.4 mm (MNHN Pg. 5154); 1 F 2.1 mm (USNM 265396).

Additional material. French Polynesia, Society Islands, Moorea Island: sta DW 3463, 17.5667°N, 149.9°S, 460–505 m, 20 October 2009: 1 F 3.4 mm (UF 23839); sta DW 3478, 17.5667°N, 149.75°S, 678–810 m, 22 October 2009: 1 M 3.9 mm (UF 24544); sta DW 3478, 17.5667°N, 149.75°S, 678–810 m, 22 October 2009: 1 ov F 3.6 mm (UF 24546).

Diagnosis. Shield (Fig. 50A) about as broad as long; rostrum broadly rounded, weakly produced, with short mid-dorsal ridge; lateral projections subtriangular, terminating bluntly or in small spine. Ocular peduncles more than half length of shield, with dorsal row of setae, cornea weakly dilated; ocular acicles subtriangular, each terminating in strong spine. Antennular peduncle (Fig. 50A) exceeding distal margin of cornea by entire length of ultimate segment. Antennal peduncle (Fig. 50A) reaching or slightly exceeding distal margin of cornea; fourth segment with strong spine on dorsolateral distal angle; second segment with dorsolateral distal angle terminating in strong, simple or trifid spine occasionally with 1–3 small spines dorsally, mesial margin with spine on dorsolateral distal angle; first segment with 1 or 2 small spines on lateral face; acicle slightly curved outward (in dorsal view), at most slightly exceeding distal margin of cornea, terminating in strong spine, mesial margin armed with 11 or 12 spines or 6–8 spines in small specimens (sl < 2.1 mm); flagellum with numerous setae < 1 or 2 flagellar articles in length. Maxillule with external lobe of endopod weakly developed, internal lobe broad and with 3 long setae. Third maxilliped crista dentata with 7 teeth, proximal 2 or 3 teeth distinctly larger than distal teeth. Right cheliped (Fig. 50B, C) with chela operculate, having dense, plumose setae on distal half of chela; dactyl set at strongly oblique angle to longitudinal axis of palm; palm broader than long, dorsolateral, dorsomesial and ventromesial margins well delimited by row of blunt to sharp spines, mesial face strongly concave, expanded distally, dorsal surface smooth except for few small tubercles proximally, ventral surface smooth except for few small tubercles distolaterally; carpus with lateral margin well delimited by row of spines, dorsal face with irregular rows of small spines, dorsodistal margin with row of strong spines, ventromesial distal margin mesially expanded, with row of spines. Left cheliped usually well

calcified; palm dorsal surface unarmed or with small, setose tubercle on dorsomesial angle, and scattered setae; carpus with strong dorsodistal spine, and often small spine on mid-dorsal margin. Ambulatory legs with dactyls (Fig. 50D) each having ventromesial row of about 10 small corneous spinules; carpus with small dorsodistal spine. Anterior lobe of sternite XII (between second ambulatory legs) setose, armed with simple or bifid spine. Fourth pereopod propodal rasp (Fig. 50E) with 1 row of ovate scales at least distally. Fifth pereopod propodal rasp extending to mid-length of segment. Uropods and telson markedly asymmetrical; telson (Fig. 50F) lacking transverse suture, posterior lobes separated by shallow cleft, terminal margin of lobes armed with long, corneous and often curved spines. Male lacking first gonopods; second pair of gonopods (Fig. 50G, H) weakly developed, usually asymmetrical (right slightly larger and more setose than left),

2-segmented, distal segment flat or spatulate, setose distally. Female with vestigial second right pleopod.

Colouration (Fig. 53G). Shield whitish to cream overall, with light orange portion medially on each side; anterior portion light pink. Ocular peduncles whitish or light pink. Antennules solid red. Antennal peduncles whitish or light orange. Right cheliped with white chela; carpus and merus orange on proximal half, white distally. Left cheliped with chela orange proximally, white distally; carpus and merus orange on proximal half. Ambulatory legs with orange band on proximal third to one-half of ischia, meri, carpi, propodi and dactyls, and white distally.

Habitat. Gastropod shells, usually with anthozoan polyps growing on shell.

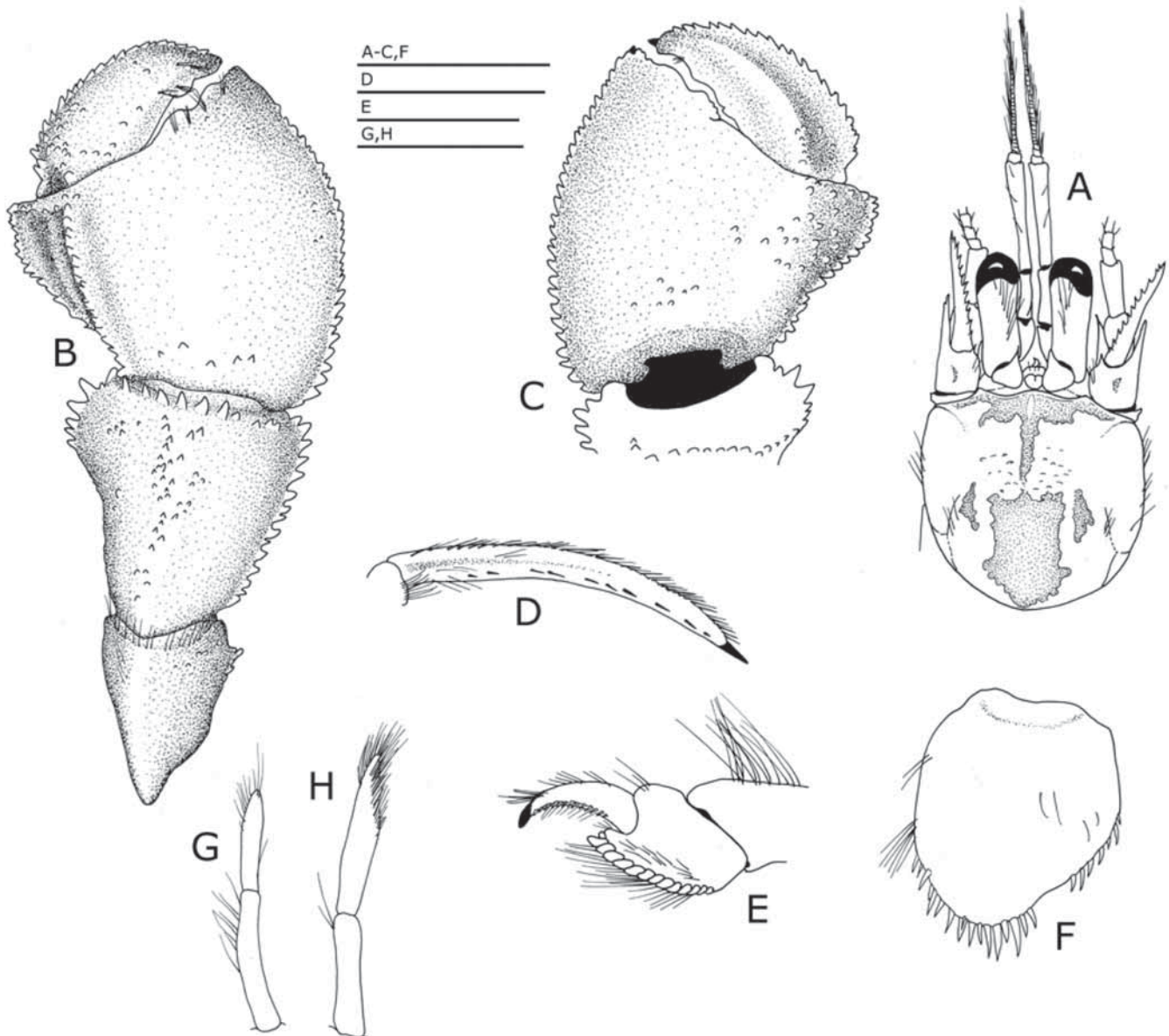


Fig. 50. *Oncopagurus tuamotu* (Lemaitre, 1994), French Polynesia: A–F, holotype female 3.7 mm, Tuamotu, Tureia (MNHN Pg 5153); G, H, paratype male 3.4 mm, Austral Islands (MNHN Pg 5154). A, shield and cephalic appendages, dorsal; B, right cheliped, dorsal; C, chela of same, ventral; D, dactyl of left second ambulatory leg, mesial; E, propodus and dactyl of left fourth pereopod, lateral; F, telson, dorsal; G, male left second gonopod, anterior; H, male right second gonopod, anterior. Scale bars = 3 mm (A–D); 1 mm (E–H). [Adapted from Lemaitre (1994)].

Distribution. So far has been found only in French Polynesia. Depth: 400–810 m.

Remarks. (See also *Oncopagurus cidaris*). The shape of the right cheliped of this species resembles that in females of *O. indicus*. In males and females of *O. tuamotu*, and females of *O. indicus*, the dorsomesial and ventromesial margins of the right palm are each well delimited by a row of blunt to sharp spines, and the mesial face is strongly concave and expanded distally. In other characters, the two species differ, such as in the longer and denser setation of the antennal flagella in *O. tuamotu* than in *O. indicus* (with numerous setae one to two flagellar articles in the former vs. few setae less than one flagellar article in length in the latter); the stouter and more strongly armed right cheliped (the carpus in particular) in *O. tuamotu* than in *O. indicus* (compare Figs. 26B, D and 50B); and in males, the absence of first gonopods and presence of asymmetrical second gonopods in of *O. tuamotu*, whereas there are paired, symmetrical first and second gonopods in males of *O. indicus*.

The colour pattern of this species differs only slightly from that of *O. indicus*. The main difference is in the colour of

the dactyls of the ambulatory legs (compare Fig. 53A, G), which is orange or reddish basally in *O. tuamotu*, whereas it is entirely white in *O. indicus*.

Oncopagurus sp. A

Oncopagurus sp. A: Zhadan, 1997: 67, fig. 9.

Remarks. Zhadan (1997: 69) stated that differences observed in the few specimens he reported as *Oncopagurus* sp., did “not allow to describe this form as a new species”. Although Zhadan indicated that his specimens were intermediate between *O. tuamotu* and *O. cidaris*, it is not possible to ascertain which taxon the specimens could represent based on his description and figures. Regrettably, Zhadan’s material has not been available for examination, and he did not illustrate several important features, such as shield and cephalic appendages, left cheliped, ambulatory legs, uropods, and telson. Furthermore, a number of *Oncopagurus* species have been described since Zhadan’s study that could possibly be conspecific with his specimens, in addition to the new species described in the present study.

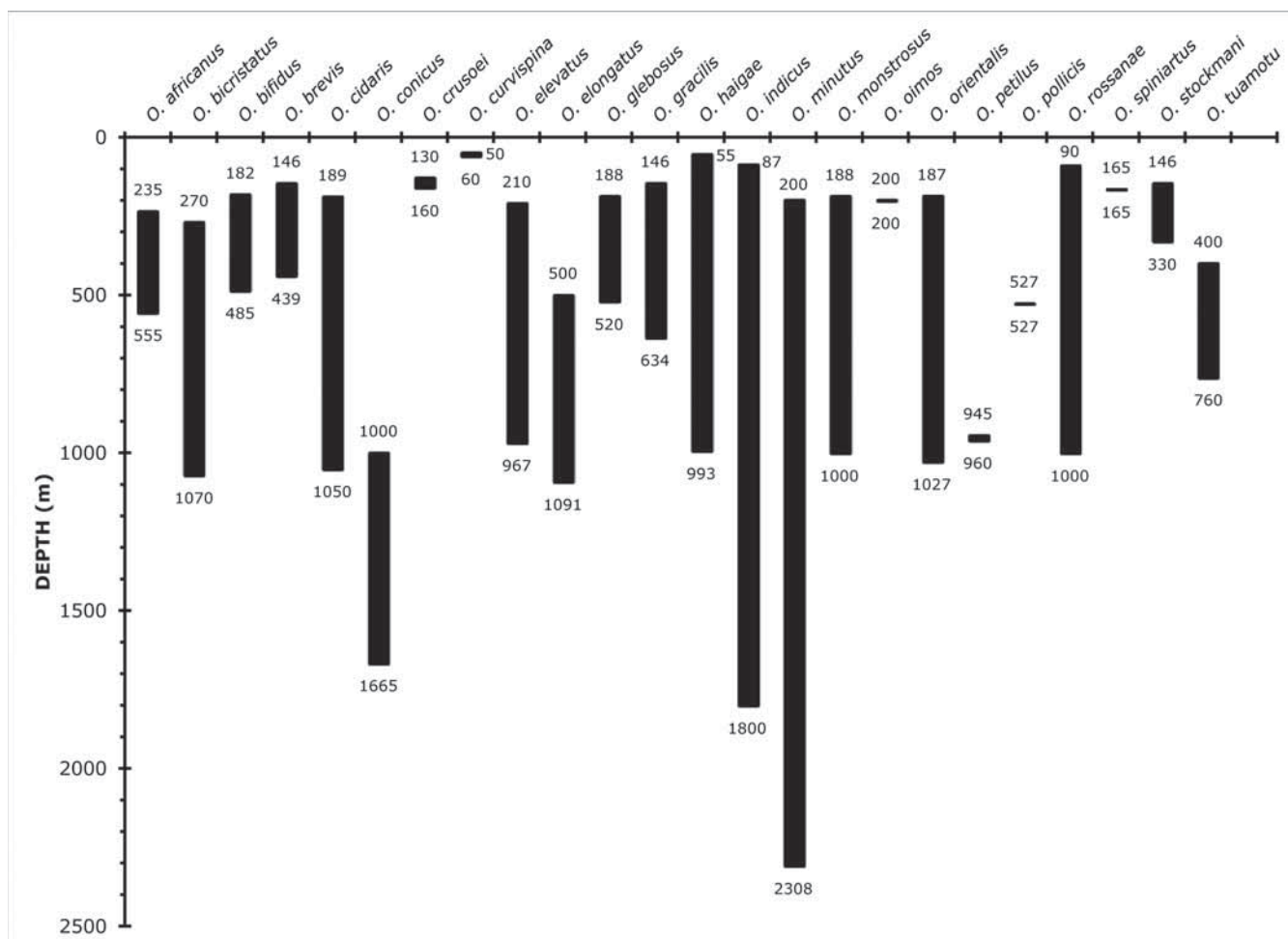


Fig. 51. Bathymetric distribution of *Oncopagurus* species from the world, with maximum and minimum depths (meters) indicated for each.

DISTRIBUTION SUMMARY AND EVOLUTIONARY KNOWLEDGE

The study of abundant samples of *Oncopagurus* has made possible to obtain a better, albeit still limited, worldwide view of the horizontal and vertical distribution of this genus and its species. Despite the richness and diversity of the samples studied, such view must be considered incomplete given that many oceanic regions, in particularly deep waters of many continental shelves and slopes, remain incompletely sampled or not sampled at all. Furthermore, studies of *Oncopagurus* species are hampered by the small size and fragility of specimens (usually ranging 1–3 mm in shield length), as well their apparent preference to live in habitats that are more difficult to survey using conventional ship gear.

As previously mentioned, species of *Oncopagurus* range from 50–2308 m (Fig. 51). However, they most frequently live on the lower continental shelf, where a total of 15 (62.5%) species have been found between 50–200 m. Most species are encountered on the continental slope between 200–1000 m, where 21 (87.5%) species have been found. Seven (29.2%) species range below 1000 m, of which only one (*O. minutus*) ranges below 2000 m (to 2308 m).

As has been documented for other parapagurid genera (Lemaitre, 1993, 1998, 1999, 2004a, b, 2013; Osawa, 1995), most species of *Oncopagurus* occur in the geologically old zone of the Indo-West Pacific, where 19 (79.2%) of the species are distributed (Table 1, Fig. 52). Of those species, six (25%) are found in the Indian Ocean, although many deep areas of this Ocean remain to be sampled; 16 (66.7%) in the western, central, and south Pacific Ocean; two (8.3%) in the Hawaiian Islands, of which one (*O. indicus*) is the

most widely distributed in genus, encompassing the entire Indo-Pacific, and another (*O. brevis*, new species) has not been found elsewhere and conceivably could be endemic; seven (29.2%) are found in French Polynesia and Marquesas Islands; and two (8.3%) in the Nazca and Sala-y-Gómez Ridges. In contrast, only three (1.2%) species are distributed in the Atlantic Ocean, of which two are amphi-Atlantic (*O. bicristatus* and *O. gracilis*), and one (*O. africanus*) ranges around South Africa to off Durban in the southwestern Indian Ocean. In the eastern Pacific, four species are exclusively found off the large North-to-South coastline of the Americas, although one (*O. stockmani*) ranges westward to the relatively proximal Nazca y Sala-y-Gómez Ridges.

No species of *Oncopagurus* is known from the Mediterranean Sea. The only known parapagurid from this sea is the recent report by Spanò et al. (2013) of *Parapagurus pilosimanus* Smith, 1879, from the Straits of Sicily.

The evolution of the Parapaguridae has been discussed in studies that have used larval information (de Saint-Laurent-Dechancé, 1964; Williamson & von Levetzow, 1967), or comparative adult morphological observations (de Saint Laurent, 1972). Those studies noted the similarity of adult morphology (e.g., right-handness) between Parapaguridae and Paguridae. However, a closer evolutionary relationship of the Parapaguridae was proposed instead in those studies with the Diogenidae, based on the close affinities in larval characters as well as similar larval development of various species in these two families. Regrettably, the parapagurid larval data use by those studies was based on a few stages obtained from plankton samples, at most identified to genus level (*Parapagurus sensu lato*). The full larval development of any species of Parapaguridae remains unknown even to date.

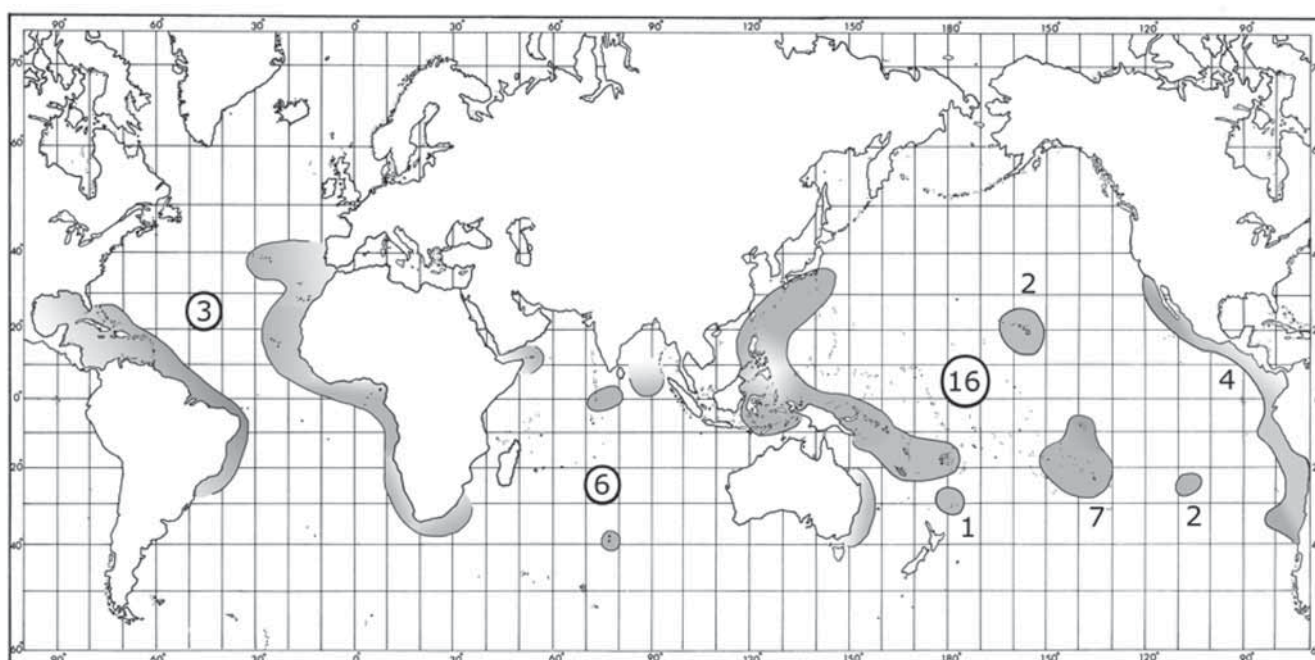


Fig. 52. Generalised distributions of *Oncopagurus* species from the world, with total number of species shown for major ocean regions. Circled numbers are species totals for Atlantic Ocean, Indian Ocean, and western + central + south Pacific (excluding eastern Pacific).

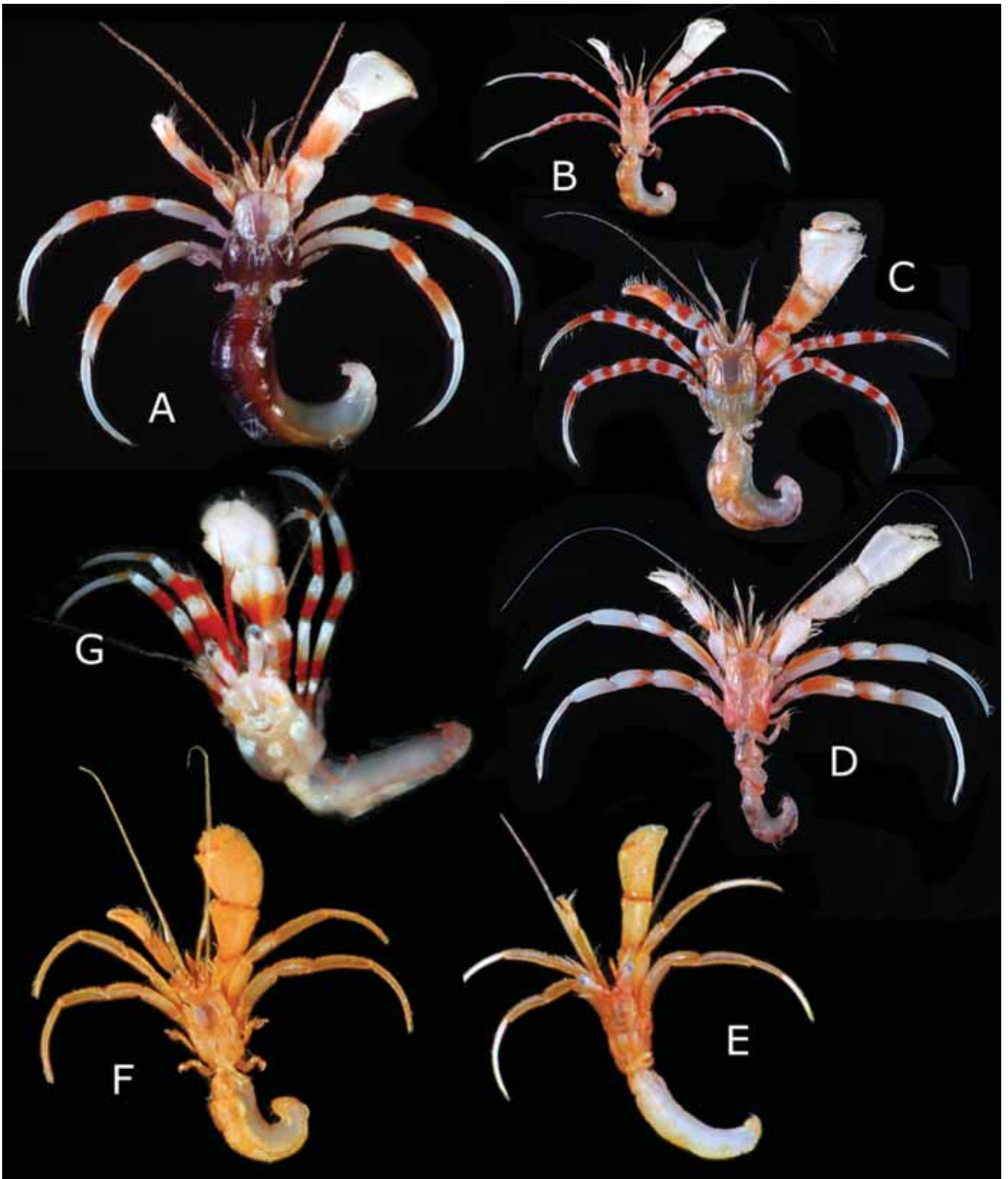


Fig. 53. Colouration in species of *Oncopagurus* (in life or fresh, except where noted). A, *O. indicus* (Alcock, 1905): Taiwan, TAIWAN 2003, sta CP 214: female 4.6 mm (NTOU). B, C, *O. monstrosus* (Alcock, 1894): B, [not sexed or measured], Taiwan (NTOU); C, male 3.6 mm, TAIWAN 2004, sta CP 269 (NTOU). D, *O. orientalis* (de Saint Laurent, 1972): male 3.6 mm, Taiwan, TAIWAN 2004 (MNHN Pg). E, F, *O. rossanae*, new species, French Polynesia, BENTHAUS: E, paratype male 2.5 mm, sta DW 1905 (MNHN Pg 6692); F, holotype M 2.9 mm, sta DW 1973 (MNHN-IU-2013-6869). G, *O. tuamotu* (Lemaitre, 1994): [not sexed or measured], French Polynesia, Moorea (UF). (Photographs by: Tin-Y. Chan [A–D]; Joseph Poupin [E, F]; Gustav Paulay [G]).

A few modern studies using cladistic and/or molecular methods have included a limited number of taxa of Parapaguridae, although they have focused on high level (family and above) decapod or anomuran classification. Of the studies that have used morphological data, some have allied the Parapaguridae more closely with the Paguridae (McLaughlin, 1983; Martin & Abele, 1986; McLaughlin, Lemaitre & Sorhannus, 2007), whereas others with the Diogenidae (Richter & Scholtz, 1994; McLaughlin & Lemaitre, 1997). The parapagurid relationships proposed based on molecular data are equally ambiguous. Tsang et al. (2011) concluded that the Parapaguridae were not closely related to the Paguridae but instead with a clade composed of some squat lobsters (Chirostylidae + Kiwaidae + Aeglidae) and the monotypic Lomisoidea (Lomisidae). Yet, Bracken-Grissom et al. (2013), using the largest anomuran molecular dataset so far, showed a closer affinity of Parapaguridae (*Parapagurus* + *Sympagurus*) with the Diogenidae (*Areopaguristes* + *Paguristes*). At the generic level, relationships remain in essence unknown, as no study so far has focused or included all 10 genera currently in this family. According to Tsang et al.'s (2011) at least, it would appear that *Oncopagurus* is allied more closely with *Paragiopagurus*, a conclusion that is expected given the significant overlap in a number of diagnostically important morphological characters. Nevertheless, it is clear that only sketchy conclusions can be drawn of relationships at the generic level within the Parapaguridae, and that family level relationships with other hermit crab and anomuran families remain to be studied in detail.

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LITERATURE CITED

- Alcock A (1894) On the results of deep-sea dredging during the season 1890–91 (continued). Natural history notes from H.M. Indian Survey Steamer 'Investigator', Commander R.F. Hoskyn, R.N., commanding. Ser. 2, No. 1. Annals and Magazine of Natural History, 13(6): 225–245.
- Alcock A (1901) A Descriptive Catalogue of the Indian deep-sea Crustacea Decapoda Macrura and Anomala in the Indian Museum, being a Revised Account of the Decapod Species Collected by the Royal Indian Marine Survey Ship Investigator. Calcutta, India, 286 pp.
- Alcock A (1905) Catalogue of the Indian Decapod Crustacea in the Collection of the Indian Museum. Part II. Anomura. Fascicle I, Pagurides. Indian Museum, Calcutta, India, xi + 197 pp., pls 1–15.
- Alcock A & Anderson ARS (1897) Crustacea Part V. In: Alcock A (ed.) Illustrations of the Zoology of the Royal Marine Surveying Steamer "Investigator" Calcutta, India, pls. 28–32.
- Asakura A (2006) Recent topics on taxonomy of hermit crabs from Japanese waters – Family Parapaguridae Part III. Aquabiology, 28(3): 309–316.
- Asakura A, Watabe H & Hashimoto J (2006) Recent topics on taxonomy of hermit crabs from Japanese waters – Family Parapaguridae Part II. Aquabiology, 28(2): 211–226.
- Baba K, Hayashi K-I & Toriyama M (1986) Decapod Crustaceans from Continental Shelf and Slope around Japan. Japan Fisheries Resource Conservation Association, Tosho Printing Co. Ltd, Tokyo, 336 pp.
- Boone L (1927) Scientific results of the first oceanographic expedition of the "Pawnee" 1925. Bingham Oceanographic Collection, 1(2): 1–147.
- Bracken-Grissom HD, Cannon ME, Cabezas P, Feldmann RM, Schweitzer CE, Ah Yong ST, Felder DL, Lemaitre R & Crandall KA (2013) A comprehensive and integrative reconstruction of evolutionary history for Anomura (Crustacea: Decapoda). BMC Evolutionary Biology, 13: 128 [28 pp.].
- Campos CNH, Navas SGR, Bermúdez TA & Cruz CN (2005) Monografías de Fauna de Colombia. 2. Los Crustáceos Decápodos de la Franja Superior del Talud Continental (300–500 m) del mar Caribe Colombiano. Universidad Nacional de Colombia, Facultad de Ciencias, Instituto de Ciencias Naturales, 272 pp.
- Castro P (2011) Catalog of the anomuran and brachyuran crabs (Crustacea: Decapoda: Anomura, Brachyura) of the Hawaiian Islands. Zootaxa, 2947: 1–154.
- Coelho PA & Ramos-Porto M (1987) Sinopse dos crustáceos decápodos brasileiros (Famílias Callianassidae, Callianideidae, Upogebiidae, Parapaguridae, Paguridae, Diogenidae). Trabalhos Oceanográficos da Universidade Federal de Pernambuco, Recife, 19: 27–53. [1985].
- Coelho PA, Oliveira de Almeida A, Arruda Bezerra LE & Fidelis de Souza-Filho J (2007) An updated checklist of decapod crustaceans (infraorders Astacidea, Thalassinidea, Polychelida, Palinura, and Anomura) from the northern and northeastern Brazilian coast. Zootaxa, 1519: 1–16.
- Davie PJF (2002) Crustacea: Malacostraca Eucarida (part 2) Decapoda-Anomura, Brachyura. Zoological Catalogue of Australia, 19.3B: i–xiv, 1–641.
- De Grave S, Pentcheff ND, Ah Yong ST, Chan T-Y, Crandall KA, Dworschak PC, Felder DL, Feldmann RM, Fransen CHJM,

- Goulding LYD, Lemaitre R, Low MEY, Martin JW, Ng PKL, Schweitzer CE, Tan SH, Tshudy D & Wetzer R (2009) A classification of living and fossil genera of decapods crustaceans. The Raffles Bulletin of Zoology, Supplement 21: 1–109.
- Felder DL, Álvarez F, Goy JW & Lemaitre R (2009) Decapoda (Crustacea) of the Gulf of Mexico, with comments on the Amphionidacea. In: Felder DL & Camp DK (eds.), Gulf of Mexico Origin, Waters, and Biota. Volume 1, Biodiversity. A&M University Press, College Station, Texas. Pp. 1019–1104.
- Forest J (1961) Pagurides de l’Afrique occidentale. Scientific Results of the Danish Expedition to the Coasts of Tropical West Africa. Atlantide Report, 6: 203–250.
- Forest J (1981) Résultats des campagnes MUSORSTOM. I. Philippines (18–28 mars 1976), tome I. Mémoires ORSTOM, 91: 9–50.
- Forest J (1985) La campagne MUSORSTOM II (1980) – Comptendu et liste des stations. Mémoires du Muséum national d’Histoire naturelle, Série A, 133: 7–30.
- Forest J & McLay CL (2001) The biogeography and bathymetric distribution of New Zealand hermit crabs (Crustacea: Anomura: Paguroidea). Journal of the Royal Society of New Zealand, 31(4): 687–720.
- Gordan J (1956) A bibliography of pagurid crabs, exclusive of Alcock, 1905. Bulletin of the American Museum of Natural History, 108: 253–352.
- Guzmán G (2004) *Isocheles aequimanus* (Dana, 1852) (Decapoda, Anomura, Paguroidea): revalidación para la carcinofauna chilena. Investigaciones Marinas, Valparaíso, 32(2): 129–132.
- Guzmán G (1999) Claves para los crustáceos decápodos anomuros marinos de Chile. Universidad Arturo Prat, Dirección de Extensión Académica y Cultural Departamento Ciencias del Mar, Chile, 53 pp.
- Henderson JR (1888) Report on 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 (Zoology), 27: i–xi, 1–221, pls 1–21.
- Henderson JR (1896) Natural history notes from H. M. Indian Marine Survey Steamer “Investigator”, Commander C.F. Oldham, R.N., commanding, Ser. 2, No. 24. Report on the Paguridae collected during the season 1893–94. Journal Asiatic Society of Bengal, 65(3): 516–536.
- Hendrickx ME & Harvey AW (1999) Checklist of anomuran crabs (Crustacea: Decapoda) from the eastern tropical Pacific. Belgian Journal of Zoology, 129(2): 363–389.
- Imafuku M (1992) Anomuran members. In: Takeda, M. (ed.), Invertebrates, 8, Macrura, Anomura, and Others. The Earth for Animals. Asahi Shimbun Press, Tokyo. Pp. 234–235 [In Japanese]
- Kemp S & Sewell RBS (1912) II. Notes on Decapoda in the Indian Museum. III. The species obtained by R.I.M.S.S. “Investigator” during the survey season 1910–11. Records of the Indian Museum, 7(1): 15–32, pl. 1.
- 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). Rapport 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) 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 (1986) Western Atlantic species of the *Parapagurus pilosimanus* complex (Anomura: Paguroidea: Parapaguridae): description of a new species and morphological variations. Journal of Crustacean Biology, 6(3): 525–542.
- Lemaitre R (1989). Revision of the genus *Parapagurus* (Anomura, Paguroidea, Parapaguridae), including redescriptions of the western Atlantic species. Zoologische Verhandlungen, 253: 1–106.
- Lemaitre R (1990) A review of eastern Atlantic species of the family Parapaguridae (Decapoda, Anomura, Paguroidea). Journal of Natural History, 24: 219–240.
- Lemaitre R (1993) A new genus of Parapaguridae (Decapoda: Anomura). 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: Crosnier A (ed.) Résultats des Campagnes MUSORSTOM, vol. 12. Mémoires du Muséum national d’Histoire naturelle, 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. Records of the Australian Museum, 48(2): 163–221.
- Lemaitre R (1997) Crustacea Decapoda: Parapaguridae from the KARUBAR Cruise in Indonesia, with descriptions of two new species. In: Crosnier A & Bouchet P (eds.) Résultats des Campagnes MUSORSTOM, vol. 16. Mémoires du Muséum national d’Histoire naturelle, 172: 573–596.
- Lemaitre R (1998) Revisiting *Tylaspis anomala* Henderson, 1885 (Parapaguridae), with comments on its relationships and evolution. Zoosystema, 20(2): 289–305.
- Lemaitre R (1999) Crustacea Decapoda: A review of the species of the genus *Parapagurus* Smith, 1879 (Parapaguridae) from the Pacific and Indian Oceans. In: Crosnier A (ed.) Résultats des Campagnes MUSORSTOM, vol. 20. Mémoires du Muséum national d’Histoire naturelle, 180: 303–378.
- Lemaitre R (2000) The marine fauna of New Zealand: Paguroidea (Decapoda: Anomura) exclusive of the Lithodidae. Part 3. Superfamily Paguroidea, family Parapaguridae. New Zealand Oceanographic Institute Memoir, 114: 1–250.
- Lemaitre R (2004a) A worldwide review of hermit crab species of the genus *Sympagurus* Smith, 1883 (Crustacea: Decapoda: Parapaguridae). In: Marshall B & Richer de Forges B (eds.) Tropical Deep-Sea Benthos, vol. 23. Mémoires du Muséum national d’Histoire naturelle, 191: 85–149.
- Lemaitre R (2004b) A review of *Strobopagurus* Lemaitre, 1989 (Crustacea: Decapoda: Paguroidea: Parapaguridae), with description of a new species. Scientia Marina, 68(3): 355–372.
- Lemaitre R (2004) Discovery of the first hermit crab (Crustacea: Decapoda: Parapaguridae) associated with hydrothermal vents. Cahiers de Biologie Marine, 45: 325–334.
- Lemaitre R (2006) Two new species of Parapaguridae (Crustacea, Decapoda, Anomura, Paguroidea) with subconical corneas, and new data on biology of some rare species. Zoosystema, 28(2): 517–532.
- Lemaitre R (2013) The genus *Paragiopagurus* Lemaitre, 1996 (Decapoda: Anomura: Paguroidea: Parapaguridae): A worldwide review and summary, with descriptions of five new species. In: Ahyong ST, Chan T-Y, Corbari L & Ng PKL (eds.) Tropical Deep-Sea Benthos, vol. 27. Mémoires du Muséum national d’Histoire naturelle, 204: 311–422.
- Lemaitre R & McLaughlin PA (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. Journal of Natural History, 26: 745–768.
- Macpherson E (1983) *Parapagurus hobbiti*, new species (Decapoda, Anomura, Parapaguridae), hermit crab from the Valdivia Bank, southeast Atlantic. Journal of Crustacean Biology, 3(3): 472–476.

- Martin JW & Abele LG (1986) Phylogenetic relationships of the genus *Aegla* (Decapoda: Anomura: Aegliidae), with comments on anomuran phylogeny. *Journal of Crustacean Biology*, 6(3): 576–616.
- Martínez Campos B, Campos NH & Bermúdez Tobón A (2012) Distribución de cangrejos ermitaños (Anomura: Paguroidea) en el mar Caribe colombiano. *Revista de Biología Tropical*, 60(1): 233–252.
- McLaughlin PA (1983) Hermit crabs — are they really polyphyletic? *Journal of Crustacean Biology*, 3(4): 608–621.
- McLaughlin PA (2002) A review of the hermit-crab (Decapoda: Anomura: Paguridea) fauna of southern Thailand, with particular emphasis on the Andaman Sea, and descriptions of three new species. *Phuket Marine Biological Center Special Publication*, 23(2): 385–460.
- McLaughlin PA (2003) Illustrated keys to the families and genera of the superfamily Paguroidea (Crustacea: Decapoda; Anomura), with diagnoses of the genera of Paguridae. In: Lemaitre R & Tudge CC (eds.) *Biology of the Anomura*. Proceedings of a Symposium at the Fifth International Crustacean Congress, Melbourne, Australia, 9–13 July 2001. *Memoirs of Museum Victoria*, 60: 111–144.
- McLaughlin PA & Lemaitre R (1997) Carcinization in the Anomura-fact or fiction? I. Evidence from adult morphology. *Contributions to Zoology*, 67(2):79–123.
- McLaughlin PA, Lemaitre R & Sorhannus U (2007) Hermit crab phylogeny: reappraisal, and “fall out”. *Journal of Crustacean Biology*, 27(1): 97–115.
- McLaughlin PA, Rahayu DL, Komai T & Chan T-Y (2007) A Catalog of the Hermit Crabs (Paguroidea) of Taiwan. *National Taiwan Ocean University, Keelung*, 365 pp.
- McLaughlin PA, Komai T, Lemaitre R & Rahayu DL (2010) Annotated checklist of anomuran decapod crustaceans of the world (exclusive of the Kiwaoidea and families Chirostylidae and Galatheidae of the Galatheoidea). Part I – Lithodoidea, Lomisoidea and Paguroidea. *The Raffles Bulletin of Zoology, Supplement 23*: 5–107.
- McLaughlin PA, Camp DK, Eldredge LG, Goy JW, Felder DL, Hobbs III HH, Kensley B, Lemaitre R & Martin JW (2005) Order Decapoda. In: McLaughlin PA et al. (eds.) *Common and Scientific Names of Aquatic Invertebrates from the United States and Canada: Crustaceans*. American Fisheries Society Special Publication, Pp. i–xiii, 1–545.
- Melo GAS (1999) Cap. 25, Infraordem BRACHYURA (siris e caranguejos: espécies marinhas e estuarinas). In: Buckup L & Bond-Buckup G (eds.) *Os crustáceos do Rio Grande do Sul*. Porto Alegre, ed. Universidade/UFRGS. Pp. 415–485.
- Milne-Edwards A (1880) Reports on the results of dredging, under the supervision of Alexander Agassiz, in the Gulf of Mexico, and in the Caribbean Sea, 1877, 78, 79, by the United States Coast Survey steamer “Blake”, Lieut.-Commander C.D. Sigsbee, U.S.N., and Commander J. R. Bartlett, U.S.N., commanding. 8. Études préliminaires sur les Crustacés. *Bulletin of the Museum of Comparative Zoology, Harvard College*, 8(1): 1–68, pls 1, 2.
- Milne-Edwards A (1891) Pagurides nouveaux des Açores. *Campagnes Scientifiques de S. A. Le prince de Monaco sur le yacht l’Hirondelle*. *Bulletin de la Société de Zoologie de France*, 16: 131–134.
- Milne-Edwards A & Bouvier E-L (1893) Reports on the results of dredging under the supervision of Alexander Agassiz, in the Gulf of Mexico (1877–78), in the Caribbean Sea (1878–79), and along the Atlantic coast of the United States (1880), by the U.S. Coast Survey Steamer “Blake”, Lieut.-Com. S.D. Sigsbee, U.S.N., and Commander J.R. Bartlett, U.S.N., commanding. 33. Description des Crustacés de la famille des Paguriens recueillis pendant l’Expédition. *Memoirs of the Museum of Comparative Zoology, Harvard College*, 14(3): 1–172, pls 1–12.
- Miyake S (1978) The Crustacean Anomura of Sagami Bay. *Biological Laboratory, Imperial Household*. Tokyo, Hoikusha, 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, Japan, 261 pp. [In Japanese].
- Osawa M (1995) A new parapagurid genus, *Tsunogaipagurus*, for *Sympagurus chuni* (Balss, 1911) (Crustacea: Decapoda: Anomura). *Proceedings of the Japanese Society of Systematic Zoology*, (53): 62–70.
- Osawa M (1996) Additional note on *Tsunogaipagurus chuni* (Balss, 1911) (Decapoda, Anomura, Parapaguridae). *Crustaceana*, 69(7): 878–881.
- Parin NV, Mironov AN & Nesis KN (1997) Biology of the Nazca and Sala y Gómez submarine ridges, and outpost of the Indo-West Pacific fauna in the eastern Pacific Ocean: composition and distribution of the fauna, its communities and history. *Advances in Marine Biology*, 32: 145–242.
- Poore GCB (2004) *Marine Decapod Crustacea of Southern Australia, a Guide to Identification*. CSIRO Publishing, Collingwood, Australia, 574 pp.
- Poupin J (1996) Atlas des Crustacés marins profonds de Polynésie Française. Récoltes du navire MARARA (1986/1996). Service mixte de Surveillance radiologique et biologique (SMSRB), Monthéry, 59 pp.
- Poupin J, Tamarii T & Vandenboomgaerde A (1990) Pêches profondes aux casiers sur les pentes océaniques des îles de Polynésie Française. (N/O MARARA – 1986/1989). Notes et Documents ORSTOM Papeete, sér. Océanographie (42): 1–97, pls 1–3.
- Quiroga E, Sellanes J, Arntz WE, Gerdes D, Gallardo VA & Hebbeln D (2009) Benthic megafaunal and demersal fish assemblages on the Chilean continental margin: the influence of the oxygen minimum zone on bathymetric distribution. *Deep Sea Research II*, 56: 1112–1123.
- Rahayu DL (2000) Hermit crabs from the South China Sea (Crustacea: Decapoda: Anomura: Diogenidae, Paguridae, Parapaguridae). *The Raffles Bulletin of Zoology, Supplement 8*: 377–404.
- Retamal MA (1981) Catálogo ilustrado de los crustáceos decápodos de Chile. *Gayana, Zoología*, 44: 1–110.
- Retamal MA (2007) Nota sobre la biodiversidad carcinológica (stomatopoda y decapoda) en los fiordos occidentales entre el guafo y estero elefantes. *Ciencia y Tecnología del Mar, Comité Oceanográfico Nacional Chile*, 30(1): 8.
- Retamal M & Moyano HI (2010). Zoogeografía de los crustáceos decápodos chilenos marinos y dulceacuicolas. *Latin American Journal of Aquatic Research*, 38(3): 302–328.
- Richer de Forges B (1990) Les campagnes d’exploration de la faune bathyale dans la zone économique de la Nouvelle-Calédonie. Explorations pour 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 (A)*, 145: 9–54.
- Richer de Forges B & Chevillon C (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: Crosnier A (ed.) *Résultats des Campagnes MUSORSTOM*, vol. 15. *Mémoires du Muséum national d’Histoire naturelle*, 168: 33–53.
- Richer de Forges B & Menou J-L (1993) La campagne MUSORSTOM 7 dans la zone économique de îles Wallis et Futuna. *Compte rendu et liste des stations*. In: Crosnier A (ed.) *Résultats des Campagnes MUSORSTOM*, vol. 10. *Mémoires du Muséum national d’Histoire naturelle*, 156: 9–25.

- Richer de Forges B, Faliex E & MenouJ-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.
- Richter S & Scholtz G (1994) Morphological evidence for a hermit crab ancestry of lithodids (Crustacea, Decapoda, Anomala, Paguroidea). *Zoologischer Anzeiger*, 233(5–6): 187–210.
- Rieger PJ (1998) Malacostraca – Eucarida. Paguroidea. In: Young PS (ed.) Catalogue of Crustacea of Brazil. Museu Nacional. (Série Livros n. 6), Rio de Janeiro, Brazil. Pp. 413–429
- de Saint Laurent M (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). *Bijdragen tot de Dierkunde*, 42(2): 97–123.
- de Saint Laurent M (1974) *Parapagurus curvispina* sp. nov. de l'île d'Amsterdam, Océan Indien (Crustacea Decapoda Parapaguridae). *Tethys*, 5(4): 791–794.
- de Saint Laurent-Dechancé M (1964) Développement et position systématique du genre *Parapagurus* Smith (Crustacea Decapoda Paguridea). I. Description des stades larvaires. *Bulletin de l'Institut Océanographique Fondation Albert I^{er} de Monaco*, 64(1321): 1–26.
- Smith SI (1879) The stalked-eyed crustaceans of the Atlantic coast of North America north of Cape Cod. *Transactions of the Connecticut Academy of Arts and Sciences*, 5(1): 27–136.
- Smith SI (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. *Bulletin of the Museum of Comparative Zoology, Harvard College*, 10(1): 1–108, pls 1–16.
- Smith SI (1883) Preliminary report on the Brachyura and Anomura dredged in deep water off the south coast of New England by the United States Fish Commission in 1880, 1881, and 1882. *Proceedings of the United States National Museum*, 6(1): 1–57.
- Spanò N, Porporato EMD & Ragonese S (2013) Spatial distribution of Decapoda in the Strait of Sicily (central Mediterranean Sea) based on a trawl survey. *Crustaceana*, 86(2): 139–157.
- Spiridonov VA & Zhadan DG (1999) Comparing distribution patterns of shallow water and deep water decapod species in the Indo-Pacific (Crustacea, Decapoda). In: Schram FR & von Vaupel Klein JC (eds.) *Crustaceans and the Biodiversity Crisis*, Amsterdam, The Netherlands, July 20–24, 1998. Pp. 623–636.
- Studer T (1883) Verzeichniss der Crustaceen, Welche Während der Reise S.M.S. Gazelle an der Westküste von Africa, Ascension und dem Cap der guten Hoffnung gesammelt wurden. *Abhandlungen der Preussischen Akademie der Wissenschaften*, 2(1882-1883): 1–32.
- Tsang LM, Chan T-Y, Ahyong ST & Chu KH (2011) Hermit to king, or hermit to all: multiple transitions to crab-like forms from hermit crab ancestors. *Systematic Biology*, 60(5): 616–629.
- Wicksten MK (1980) Mainland and insular assemblages of benthic decapod crustaceans of southern California. In: Power D (ed.) *The California Islands: Proceedings of a Multidisciplinary Symposium*. Santa Barbara Museum of Natural History, Santa Barbara, California, pp. 357–367.
- Wicksten MK (1987) Range extensions of offshore decapod crustaceans from California and western Mexico. *California Fish and Game*, 73, 49–61.
- Wicksten MK (1989) Ranges of offshore decapod crustaceans in the eastern Pacific Ocean. *Transactions of the San Diego Society of Natural History*, 21(19): 291–316.
- Wicksten MK (2012) Decapod Crustacea of the Californian and Oregonian Zoogeographic Provinces. *Zootaxa*, 3371: 1–307.
- Williams AB, Abele LG, Felder DL, Hobbs Jr H, Manning RB, McLaughlin PA & Pérez-Farfante I (1989). Common and scientific names of aquatic invertebrates from the United States and Canada: Decapod crustaceans. *American Fisheries Society Special Publication* 17: i–vii, 1–77, pls 1–4.
- Williamson DI & von Levetzow KG (1967) Larvae of *Parapagurus diogenes* (Whitelegge) and some related species (Decapoda, Anomura). *Crustaceana*, 12(2): 179–192.
- Zarenkov NA (1990) Decapods (Stenopodidea, Brachyura, Anomura) of the Naska and Sala-I-Comes underwater Ridges. *Trudy Institute of Oceanology*, 124: 218–244. [In Russian, with English summary].
- Zhadan DG (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 DG (1999) The use of straight microhabitats among deep-sea hermit crabs (Decapoda, Anomura, Parapaguridae). In: Schram FR & von Vaupel Klein JC (eds.) *Crustaceans and the Biodiversity Crisis*, Proceedings of the Fourth International Crustacean Congress, Amsterdam, The Netherlands, July 20–24, 1998, 1: 733–743.