

## A review of eastern Atlantic species of the family Parapaguridae (Decapoda, Anomura, Paguroidea)

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*(Accepted 21 August 1989)*

Fifteen hermit crab species of *Parapagurus* Smith, 1879, *Sympagurus* Smith, 1883, or *Strobopagurus* Lemaitre, 1989, have been found to occur in the eastern Atlantic. Of these, eight are also found in the western Atlantic and have been sufficiently described previously. The remaining seven species are reviewed and for each, a complete synonymy, a diagnosis or amended description, and illustrations, are presented. Keys to aid in the identification of all eastern Atlantic species are included.

**KEYWORDS:** Hermit crabs, Parapaguridae, *Parapagurus*, *Sympagurus*, *Strobopagurus*, review, keys, eastern Atlantic.

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### Introduction

The genus *Parapagurus* Smith, 1879, was divided by Lemaitre (1989) into three genera: *Parapagurus* (redefined), *Sympagurus* Smith, 1883 (reinstated), and *Strobopagurus* Lemaitre, 1989, and all known species were reassigned to one of these three. A review of eastern Atlantic parapagurid species has shown that 15 species of *Parapagurus*, *Sympagurus*, or *Strobopagurus*, occur in the region. Of these, eight are also found in the western Atlantic, and have been re-examined by Lemaitre (1989). The remaining seven species are reviewed herein. *Sympagurus acinops* Lemaitre, previously known from a small area in the western Atlantic, has also been found in the eastern Atlantic and the ranges of three species, *Parapagurus bouvieri* Stebbing, *P. andreui* Macpherson, and *Sympagurus africanus* (De Saint Laurent), have been extended to include the southwestern Indian Ocean.

### Materials and methods

Type specimens and additional material used for this review have come primarily from the collections of the Instituto de Investigaciones Pesqueras de Barcelona (IIPB), Musée Océanographique, Monaco (MO), Muséum National d'Histoire Naturelle, Paris (MNHN), Rijksmuseum van Natuurlijke Historie, Leiden (RMNH), South African Museum, Capetown (SAM), and National Museum of Natural History, Washington, D.C. (USNM). The abbreviation SL indicates shield length (to the nearest 0.1 mm), measured from the tip of the rostrum to the midpoint of the posterior margin of the shield. Other abbreviations used are: Benguela and Valdivia: Expeditions of the Instituto de Investigaciones Pesqueras de Barcelona; Canap: Canarian-Cape Verdean Expeditions of the Rijksmuseum van Natuurlijke Historie, Leiden.

## Family PARAPAGURIDAE Smith, 1882

*Parapagurus* Smith, 1879

*Parapagurus* Smith, 1879: 50. Type species: *Parapagurus pilosimanus* Smith, 1879: 51. Lemaitre, 1989: 11.

Key to the eastern Atlantic species of *Parapagurus*

- 1a Mesial and lateral faces of meri, carpi, and propodi of ambulatory legs armed with small spines . . . . . *P. abyssorum* (Filhol)
- 1b Mesial and lateral faces of meri, carpi, and propodi of ambulatory legs unarmed. . . . . 2
- 2a Scales of propodal rasp of 4th pereopod conical . . . . . 3
- 2b Scales of propodal rasp of 4th pereopod ovate . . . . . 5
- 3a Mesial and lateral faces of meri of ambulatory legs weakly calcified, at least proximally (figs 2H–J); ocular peduncles more than half length of shield; antennal peduncle exceeds distal margin of cornea by less than half the length of last segment  
*Parapagurus bouvieri* Stebbing
- 3b Mesial and lateral faces of meri of ambulatory legs well calcified; ocular peduncles less than half length of shield; antennal peduncle exceeds distal margin of cornea by more than half the length of last segment . . . . . 4
- 4a Telson with symmetrical lobes; antennal acicles armed with 1–6 small tubercles or spines . . . . . *Parapagurus pilosimanus* Smith
- 4b Telson with asymmetrical lobes; antennal acicles unarmed  
*Parapagurus andreui* Macpherson
- 5a Carpus of left cheliped armed with numerous small spines or tubercles dorsally (more numerous in males than in females); terminal margin of telson armed with long spines  
*Parapagurus alaminos* Lemaitre
- 5b Carpus of left cheliped unarmed or at most with few small tubercles (males and females); terminal margin of telson armed with short spines  
*Parapagurus nudus* (A. Milne Edwards)

*Parapagurus pilosimanus* Smith, 1879

*Description.* See Lemaitre (1986, 1989).

*Distribution.* Eastern Atlantic: from the Bay of Biscay to the Gulf of Guinea. South Atlantic: Tristan da Cunha (Henderson, 1888). North Atlantic: from southwest of Iceland and the Faeroe Islands (Hansen, 1908) to west of Ireland. Western Atlantic: from off Nova Scotia to Guyana.

*Depth range:* 102 m to 3864 m.

*Parapagurus abyssorum* (Filhol, 1885)

*Description.* See Lemaitre [1986 (as *Parapagurus scaber* Henderson), 1989].

*Distribution.* Eastern Atlantic: from the Azores to Cape Verde Islands. North Atlantic, including the northeastern coast of the United States.

*Depth range:* 2500 m to 4360 m.

*Parapagurus alaminos* Lemaitre, 1986

*Description.* See Lemaitre (1986, 1989).

*Distribution.* Eastern Atlantic: from the Azores and Canary Islands to the Gulf of Guinea. Western Atlantic: from off the coast of North Carolina to the southern Caribbean.

*Depth range:* 850 m to 3360 m.

*Parapagurus nudus* (A. Milne Edwards, 1891)

*Description.* See Lemaitre (1986, 1989).

*Distribution.* Eastern Atlantic: from the Azores and Canary Islands to the Gulf of Guinea. Western Atlantic: from off Nantucket Island to Guyana.

*Depth range:* 630 m to 3864 m.

*Parapagurus andreui* Macpherson, 1984

(Fig. 1)

*Parapagurus andreui* Macpherson, 1984: 81, figs 24–27 (type locality: Valdivia Bank); Lemaitre, 1986: 526; 1989: 11.

*Material.* PARATYPES: 1♂, 1♀ ov. (SL = 14.4–14.8 mm), Valdivia I, P-5, 25°34.5'S, 06°04'E, 933 m, 17 May 1983, USNM. Southeastern Atlantic: 1♂ (SL = 10.7 mm), Benguela IV, P-77, 17°41'S, 11°17'E, 809 m, 16 April 1981, USNM. 1♀ ov. (SL = 13.0 mm), Benguela II, P-40, 20°29'S, 12°04'E, 406 m, 22 August 1980, IIPB. Southwestern Indian Ocean: 1♂, (SL = 14.2 mm), Vityaz, station 2670, 33°01.6'S, 44°92.2'E, 1100 m, 8–9 December 1988, USNM.

*Description* (amending Macpherson, 1984). Dorsal surface of shield often with weakly calcified areas irregular in shape. Anterolateral margin of branchiostegite unarmed. Antennular peduncles exceeding distal margin of corneae by entire length of penultimate segment. Antennal peduncles exceeding distal margin of corneae by entire length last segment; second segment with mesial margin usually unarmed; first segment unarmed. Antennal acicles nearly straight in dorsal view, exceeding corneae by at least half length of acicle. Sternite of 3rd maxillipeds with spine on each side of midline. Epistomial spine absent. Chelipeds usually with chela and carpus covered with dense setae. Dactyls of ambulatory legs each with a dorsolateral and a distal dorsomesial row of long setae, and a ventromesial row of corneous spinules. Anterior lobe of sternite of 3rd pereopods unarmed. Fourth pereopod with dactyl shorter than length of propodal rasp, subtriangular; propodal rasp with two–three rows of conical scales. Fifth pereopod with propodal rasp forming subtriangular area less than half length of propodus. Terminal margin of telson divided by V-shaped sinus into asymmetrical lobes armed with numerous corneous spines. Female with vestigial 2nd right pleopod.

*Symbiotic associations.* Usually found living in shelters formed by species of *Epizoanthus*.

*Distribution.* Southeastern Atlantic: from off the southern coast of Angola to Namibia, including the Valdivia Bank. Southwestern Indian Ocean: south of Madagascar.

*Depth range:* 406 m to 1100 m.

*Remarks.* This species is very similar to *P. pilosimanus*. The two species differ primarily in the armature of the antennal acicles and in the shape of the telson. In *P. andreui*, the antennal acicles are unarmed, whereas in *P. pilosimanus* they have small tubercles or spines on the proximal half. In *P. andreui* the terminal margin of the telson is divided by a broad, V-shaped sinus into asymmetrical lobes. In *P. pilosimanus*, the terminal margin of the telson is evenly curved or at most divided by a narrow, V-shaped sinus into symmetrical lobes. Both species live associated with species of *Epizoanthus*.

The spine reported by Macpherson (1984: 81) on the epistome of *P. andreui* is actually the labral spine as defined by Lemaitre (1989). This species lacks an epistomial spine.

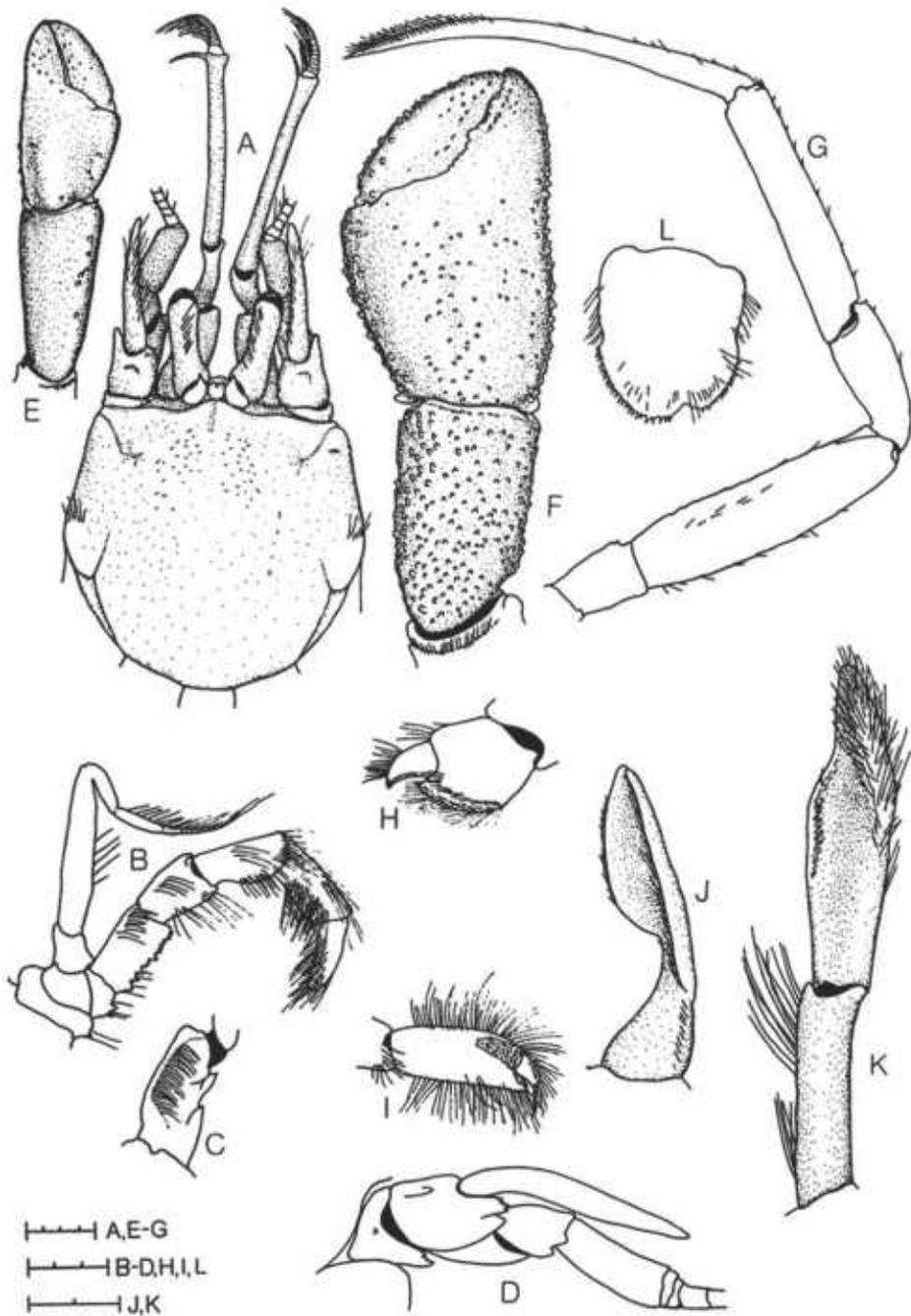


FIG. 1. *Parapagurus andrei* Macpherson. A, shield and cephalic appendages; B, left 3rd maxilliped (internal view); C, right basal antennular segment (dorsal view); D, right antennal peduncle (lateral view); E, left chela and carpus; F, right chela and carpus; G, left 2nd pereopod (lateral view); H, dactyl and propodus of left 4th pereopod; I, dactyl and propodus of left 5th pereopod; J, male left 1st pleopod (mesial view); K, male left 2nd pleopod (anterior view); L, telson. Scales equal 4 mm (A, E-G), 3 mm (B-D, H, I, L), and 2 mm (J, K).

*Parapagurus bouvieri* Stebbing, 1910

(Fig. 2)

*Parapagurus bouvieri* Stebbing, 1910: 357, pl. 17 (Crustacea pl. 43) (type locality: Buffalo River, NW 1/2 W 19 miles, South Africa); Balss, 1924: 768; Gordan, 1956: 338; Füller, 1958: 164; Kensley, 1974: 65; Lemaitre, 1986: 526; 1989: 11.

*Parapagurus pilosimanus*: Barnard, 1950: 450, fig 83 a,b; Kensley, 1974: 65.

*Parapagurus pilosimanus bouvieri*: De Saint Laurent, 1972: 103, pl. 1, fig. 4; Kensley, 1981: 34; Macpherson, 1983 a: 12; 1983 b: 472.

*Lectotype* (here selected). ♀ ov. (SL = 6.3 mm), S.S. Pieter Faure, station 153, Buffalo River, NW 1/2 W, 19 miles, South Africa, 549 m SAM A1524.

*Additional material*. Southeastern Atlantic: 2♂ (SL = 9.6–10.8 mm), Benguela IV, P-107, 22°50'S, 12°52'E, 607 m, 21 April 1981, USNM. 1♀ (SL = 10.0 mm), Benguela IV, P-110, 23°03'S, 12°55'E, 607–615 m, 21 April 1981, USNM. 1♀ (SL = 11.0 mm), Benguela IV, P-113, 23°34'S, 13°05'E, 607–615 m, 22 April 1981, USNM. 1♂ (SL = 8.2 mm), Benguela IV, P-120, 24°47'S, 13°31'E, 531–534 m, 23 April 1981, USNM. 2♀ ov. (SL = 10.0–10.8 mm), Benguela IV, P-122, 24°59'S, 13°33'E, 600 m, 23 April 1981, IIPB. 1♀, 1♀ ov. (SL = 10.0–10.1 mm), Benguela IV, P-126, 25°38'S, 13°36'E, 527–531 m, 24 April 1981, USNM. 8♂, 1♀ ov. (SL = 11.7–14.5 mm), 27°12'S, 14°42.7'E, 283 m 19 January 1984, USNM. 5♂ (SL = 10.8–11.2 mm), Benguela IV, P-140, 28°14'S, 14°26'E, 534–542 m, 26 April 1981, IIPB. 2♂ (SL = 13.5–14.0 mm), Benguela IV, P-144, 28°34'S, 14°23'E, 432–437 m, 27 April 1981, USNM. 1♀ ov. (SL = 11.0 mm), 29°00'S, 14°30'E, 306 m, 29 August 1981, USNM. 4♂ (SL = 11.5–14.0 mm), Benguela VIII, P-34, 29°17.5'S, 14°31'E, 249 m, 14 July 1981, USNM. Southwestern Indian Ocean: 4♀ ov. (SL = 10.7–12.2 mm), R. V. Meiring Naude, SM 22, 27°45'S, 32°44'E, 492–700 m, 26 May 1976, SAM A15338. 2♀ (SL = 6.0–6.2 mm), R.V. Meiring Naude, SM 83, 28°00'S, 32°46'E, 600–810 m, 22 May 1976, SAM A15337. 18♂, 7♀, 17♀ ov. (SL = 4.0–14.2 mm), off southern coast of South Africa between East London and Cape Agulhas, 277–720 m, SAM A1526, A1530, A1532, A1535, A1536.

*Diagnosis*. Shield usually as broad as long. Rostrum broadly subtriangular, with short dorsal ridge. Lateral projections broadly rounded. Dorsal surface often with weakly calcified areas irregular in shape. Anterodistal margin of branchiostegite unarmed. Corneae reduced or at most slightly dilated (see *Remarks*). Ocular peduncles more than half length of shield. Ocular acicles terminating in strong spine (rarely bifid). Antennular peduncles exceeding distal margin of corneae by half length of penultimate segment. Antennal peduncles exceeding distal margin of corneae by at most half length of last segment. Antennal acicles exceeding corneae by at most half length of acicle; mesial margin armed with 5–10 small spines. Epistomial spine usually present. Carpus and chela of chelipeds usually covered with dense setae. Ambulatory legs with dactyls having a dorsodistal and a distal dorsomesial row of short setae, and a ventromesial row of small corneous spinules; meri, carpi and propodi of specimens with SL > 13.0 mm have the lateral and mesial faces weakly calcified (Figs 2 H–J). Fourth pereopod with dactyl shorter than length of propodal rasp, subtriangular; propodal rasp with 3–4 rows of conical scales. Fifth pereopod with propodal rasp forming subtriangular area less than half length of propodus. Terminal margin of telson divided into asymmetrical lobes armed (usually) with alternating short and long corneous spines. Female with vestigial 2nd right pleopod.

*Symbiotic associations*. Usually found living in shelters formed by species of *Epizoanthus*.

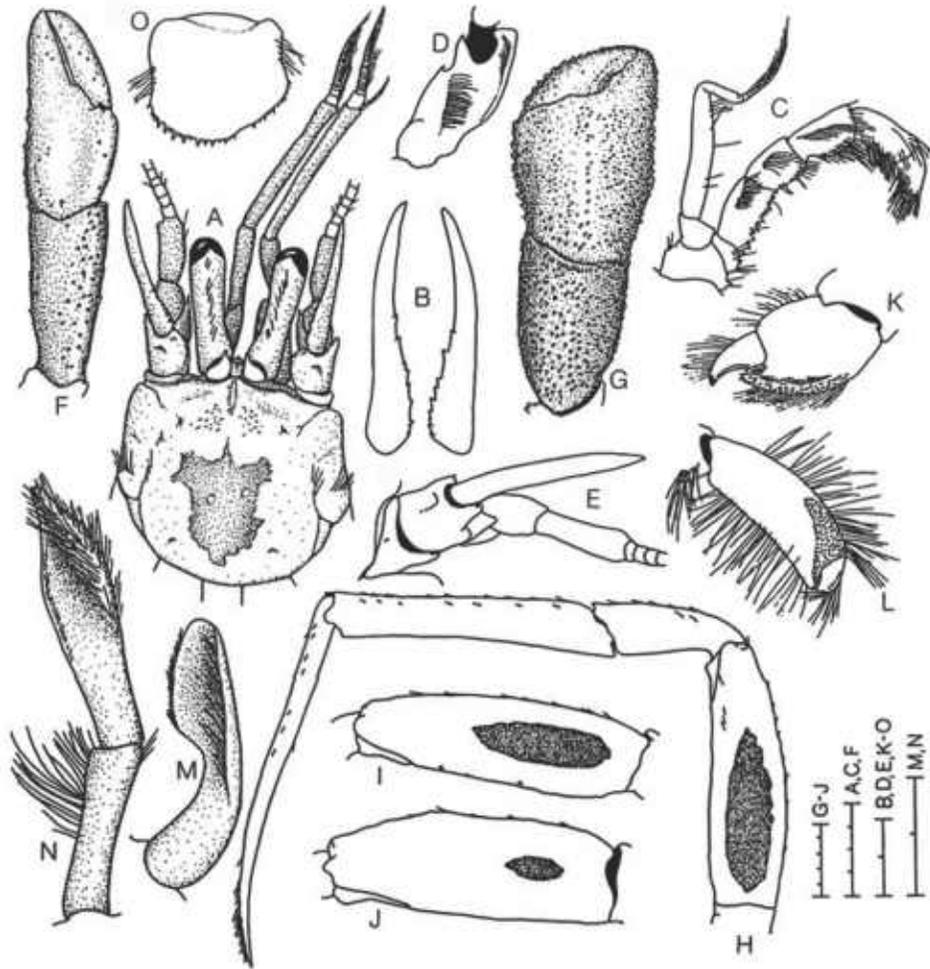


FIG. 2. *Parapagurus bouvieri* Stebbing. A, shield and cephalic appendages; B, antennal acicles (dorsal view); C, left 3rd maxilliped (internal view); D, left basal antennular peduncle (dorsal view); E, right antennular peduncle (lateral view); F, left chela and carpus; G, right chela and carpus; H, left 2nd pereopod (lateral view); J, merus of left 3rd pereopod (lateral view); K, dactyl and propodus of left 4th pereopod; L, dactyl and propodus of left 5th pereopod; M, male left 1st pleopod (mesial view); N, male left 2nd pleopod (anterior view); O, telson. Scales equal 4 mm (A, C, F), 2 mm (B, D, E, K-O), and 5 mm (G-J).

**Distribution.** Southeastern Atlantic: from Namibia to South Africa. Southwestern Indian Ocean: from off Natal to South Africa.

**Depth range:** 249 m to 810 m.

**Remarks.** Of the two specimens used by Stebbing (1910) in his description of this species, only one has been found. In the past, Stebbing's species has been confounded with other similar ones. Because of the potential for confusion, I have selected the only available syntype as the lectotype for this species.

This species can be distinguished from all other species of *Parapagurus* by the greater development of the ocular peduncles, and by the presence of weakly calcified areas on the lateral and mesial faces of the meri of the 2nd and 3rd pereopods. In *P.*

*bouvieri* the length of the peduncles is distinctly more than half the length of the shield whereas in all other species in the genus, the peduncles are half or less than half the length of the shield. In *P. bouvieri*, the corneae are often slightly dilated. The development of the corneae, however, has been observed to vary in this species. The dilation of the corneae generally decreases with increasing size of the animal. The weakly calcified areas on the 2nd and 3rd pereopods are often present also on the carpus and propodus of large specimens (SL > 13.0 mm), and at least in preserved specimens, the areas usually have a dark, brownish colour. The coloration of this species was briefly described by Barnard (1950: 451, as *P. pilosimanus*), as having a pinkish body, with reddish patches on the basal joints of the chelipeds; 2nd and 3rd legs red, with a conspicuous white band along the upper and lower margins; cornea dark crimson; antennule pink with a white band along the upper margin of the last segment; antenna pink. Coloration may be of diagnostic importance in living specimens.

### *Strobopagurus* Lemaitre, 1989

*Strobopagurus* Lemaitre, 1989: 35. Type species: *Sympagurus gracilipes* A. Milne Edwards, 1891: 132.

### *Strobopagurus gracilipes* (A. Milne Edwards, 1891)

(Figs 3, 4, 5)

*Sympagurus gracilipes* A. Milne Edwards, 1891: 132 (type locality: Azores, L'Hirondelle station 198, 38°26'25"N, 30°59'10"W, 800 m); A. Milne Edwards and Bouvier, 1892: 205; 1894: 68, pl. 9, figs 18–34; 1897: 133; 1899: 58; 1900: 194, pl. 24, figs 7, 8; Alcock, 1905: 173; Przibram, 1905: 197; Bouvier, 1922: 21; Forest, 1954: 167, figs 3, 7; Gordan, 1956: 341.

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

**Material.** SYNTYPES: 1♂ (SL = 4.1 mm), 1♀ (SL = 3.6 mm), 1♀ ov. (SL = 3.4 mm), L'Hirondelle station 198, 38°26'25"N, 30°59'10"W, 800 m, 25 July 1888, MO. Northeastern Atlantic: 1♀, 2♀ ov. (SL = 4.3–4.9 mm), Cancap-IV, station 4.061, 28°48'N, 13°45'W, 620–650 m, 19 May 1980, RMNH. 4♂, 3♀ ov. (SL = 3.4–5.9 mm), Cancap-II, station 37, 28°00'N, 13°22'W, 570 m, 26 August 1977, RMNH. 17♂, 10♀ ov. (SL = 3.7–5.7 mm), Cancap-II, station 58, 27°58'N, 13°24'W, 500 m, 28 August 1977, RMNH. 2♂, 2♀ ov. (SL = 3.6–5.4 mm), Talisman, station 86, 22°49'N, 19°41'W, 800 m, 12 July 1883, USNM 22916. 1♂, 1♀ ov. (SL = 3.8–3.9 mm), Talisman, station 110, 16°53'N, 27°30'W, 410–450 m, 29 July 1883, USNM.

**Diagnosis.** Shield convex in lateral view. Rostrum broadly rounded, with short dorsal ridge. Ocular peduncles more than half length of shield. Ocular acicles terminating in a strong spine. Antennular peduncles exceeding distal margin of corneae by slightly more than length of last segment; basal segment short, about as broad as long (Fig. 4H). Antennal peduncles exceeding distal margin of corneae by about one-third length of last segment; second segment with dorsolateral distal angle produced, terminating in a strong simple or bifid spine; mesial margin with small spine at dorsodistal angle. Antennal acicles exceeding distal margin of corneae by at most one-fifth length of acicle; mesial margin armed with 3–7 small spines. Mouthparts as figured (Figs 4A–G). Sternite of 3rd maxillipeds unarmed. Chelipeds slender, usually iridescent (preserved specimens). Right cheliped usually broader in females than in males (Figs 3C–E); chela unarmed dorsally, with mesial and lateral faces armed with small blunt or

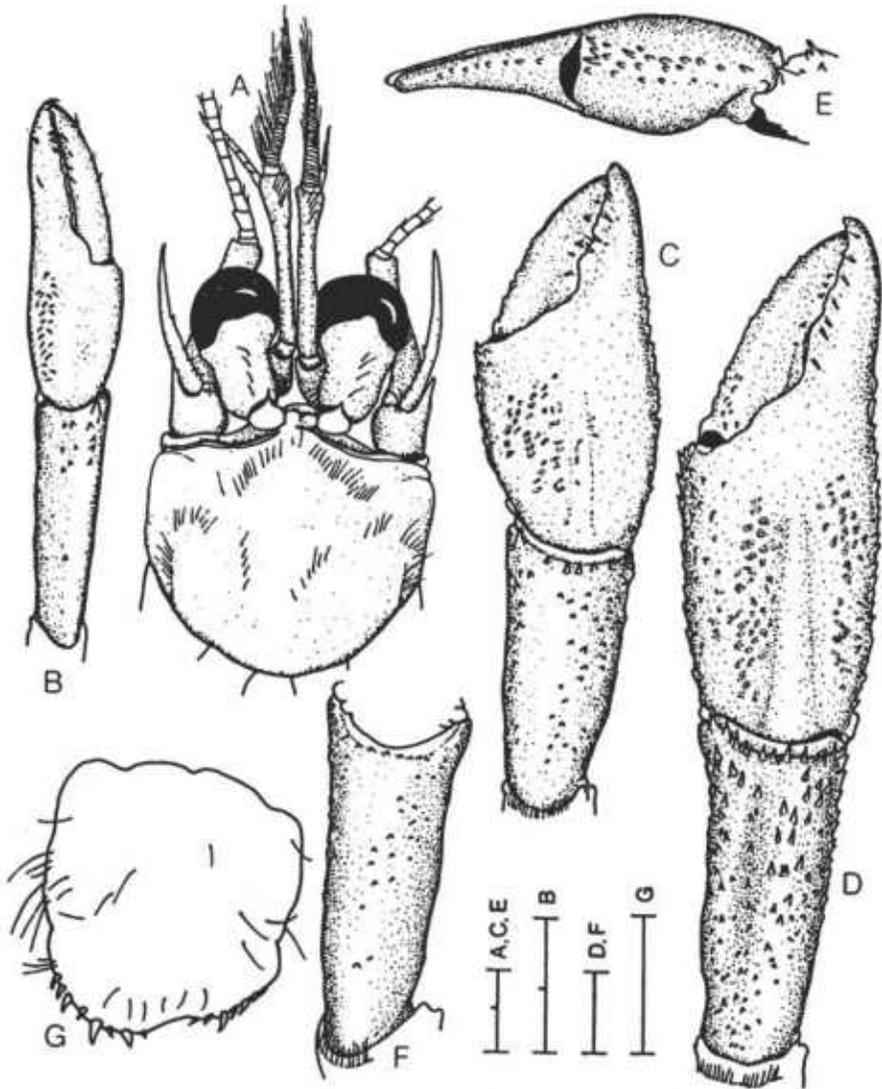


FIG. 3. *Strobopagurus gracilipes* (A. Milne Edwards). A, shield and cephalic appendages; B, left chela and carpus; C, right chela and carpus of male; E, right chela of female (mesial view); F, carpus of right cheliped of male; G, telson. Scales equal 2 mm (A–C, E) and 1 mm (D, F, G).

sharp spines. Ambulatory legs slender, laterally compressed; dactyl straight or at most weakly curved distally; meri, carpi and propodi each with row of long spinules on dorsal margin. Fourth pereopod with dactyl shorter than length of propodal rasp, subtriangular; propodal rasp with one row of ovate scales. Fifth pereopod with propodal rasp extending to about one-third length of propodus. Gills phyllobranchiate (Fig. 5 E), or of the intermediate type (Fig. 5 F). Anterior lobe of sternite of 3rd pereopods, unarmed. Terminal margin of telson divided into asymmetrical lobes armed with curved corneous spines. Females with a vestigial right 2nd pleopod.

*Symbiotic associations.* Frequently found living in a gastropod shell covered by an unidentified actinian.

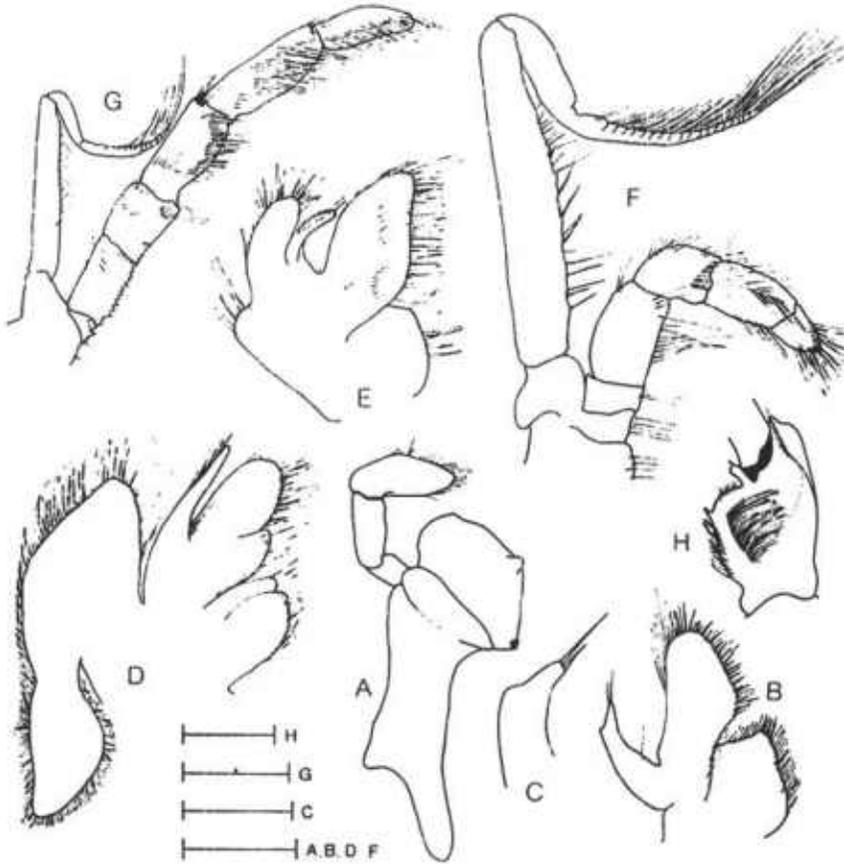


FIG. 4. *Strobopagurus gracilipes* (A. Milne Edwards). A-G, mouthparts (left, internal view): A, mandible; B, maxillule; C, endopod of same; D, maxilla; E, 1st maxilliped; F, 2nd maxilliped; G, 3rd maxilliped. H, left basal antennular segment (dorsal view). Scales equal 1 mm (A, B, D-F, H), 0.5 mm (C) and 2 mm (G).

**Distribution.** Eastern Atlantic: from Portugal to Morocco, including the Azores, Canary and Cape Verde Islands. Pacific: Hawaiian Islands (De Saint Laurent, 1972).  
**Depth range:** 410 m to 1113 m.

***Sympagurus* Smith, 1883**

*Sympagurus* Smith, 1883: 37. Type species: *Sympagurus pictus* Smith, 1883: 37. Lemaitre, 1989: 36.

**Key to the eastern Atlantic species of *Sympagurus***

- 1a Corneae reduced, subconical . . . . . *Sympagurus acinops* Lemaitre
- 1b Corneae dilated, globular . . . . . 2
- 2a Right chela and carpus with transverse furrows (Figs 11 C, D, F)  
*Sympagurus ruticheles* (A. Milne Edwards)
- 2b Right chela and carpus lacking transverse furrows . . . . . 3

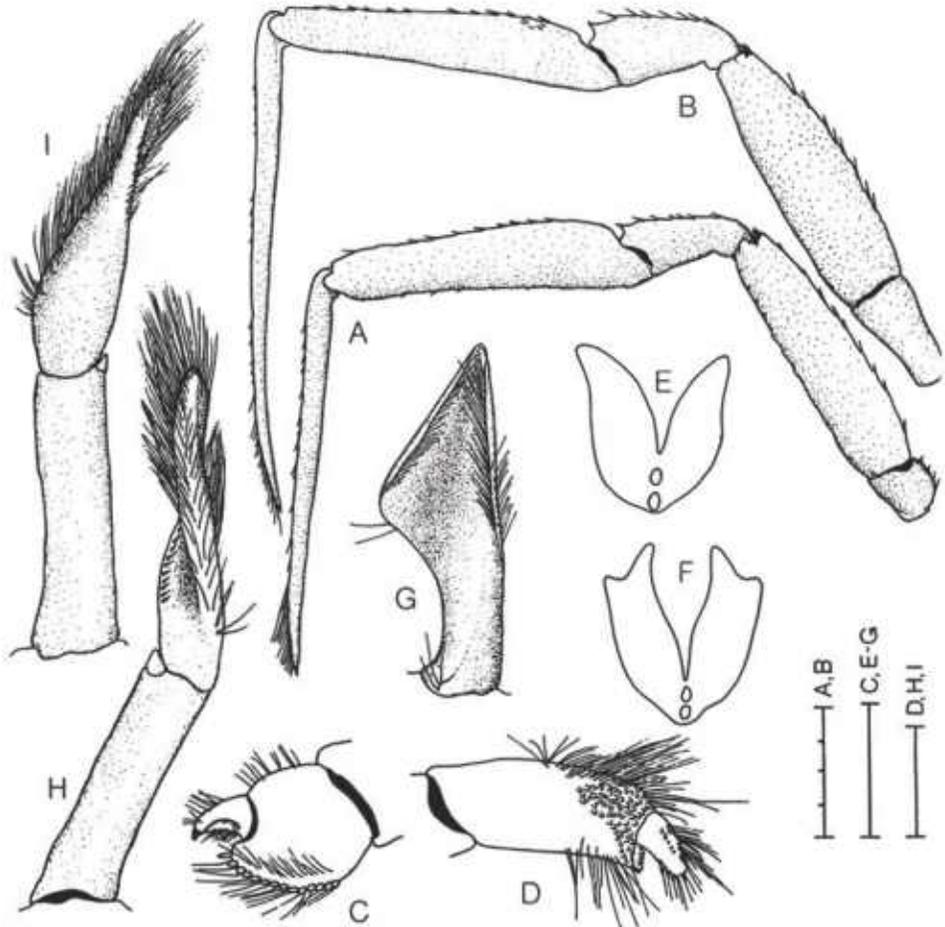


FIG. 5. *Strobopagurus gracilipes* (A. Milne Edwards). A, left 2nd pereopod (lateral view); B, left 3rd pereopod (lateral view); C, dactyl and propodus of left 4th pereopod; D, dactyl and propodus of left 5th pereopod; E, F, branchiae (transverse section); G, male left 1st pleopod (mesial view); H, male left 2nd pleopod (posterior view); I, same (anterior view). Scales equal 4 mm (A, B), 1 mm (C, E-G), and 0.5 mm (D, H, I).

- 3a Last thoracic somite with pair of vestigial pleurobranchiae; gills trichobranchiate; propodal rasp of 4th pereopod with 3 or more rows of scales  
*Sympagurus dimorphus* (Studer)
- 3b Last thoracic somite lacking vestigial pleurobranchiae; gills phyllobranchiate; propodal rasp of 4th pereopod with one row of scales . . . . . 4
- 4a Epistomial spine strongly curved upward, always present . . . . . 5
- 4b Epistomial spine when present, short and straight . . . . . 7
- 5a Sternite of 3rd maxillipeds unarmed . . . . . *Sympagurus africanus* (De Saint Laurent)
- 5b Sternite of 3rd maxillipeds armed with 2 spines . . . . . 6
- 6a Antennal acicles with mesial spines set at a 45° angle to longitudinal axis of acicle; ventromesial face of right chela rounded . . . . . *Sympagurus gracilis* (Henderson)
- 6b Antennal acicles with mesial spines set at a 90° angle to longitudinal axis of acicle, at least distally; ventromesial face of right chela with well-delimited margin  
*Sympagurus bicristatus* (A. Milne Edwards)



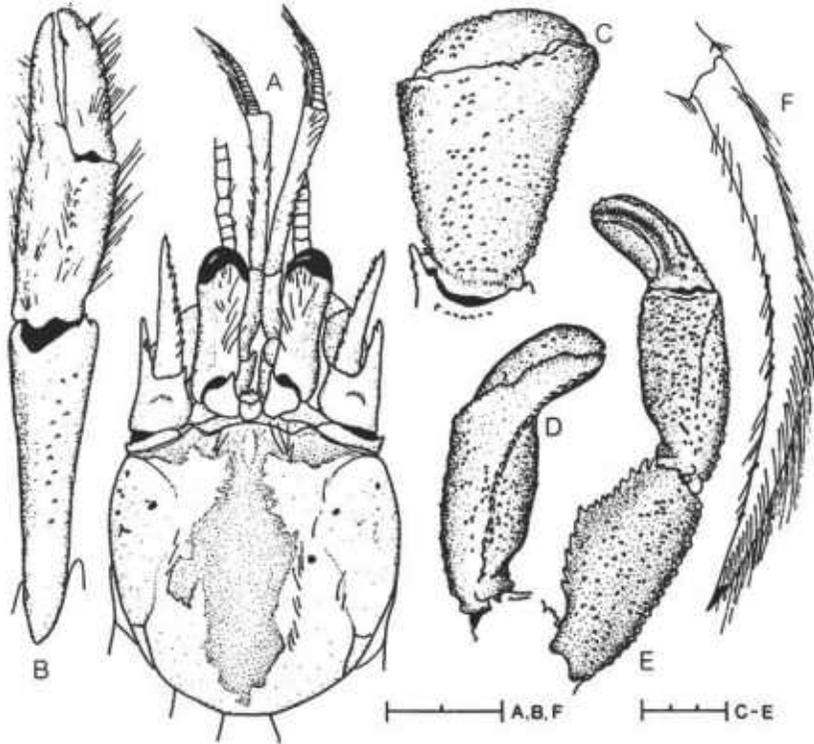


FIG. 6. *Sympagurus africanus* (De Saint Laurent). A, shield and cephalic appendages; B, left chela and carpus; C, right chela; D, same (lateral view); E, right carpus and chela (mesial view); F, dactyl of 2nd left pereopod (mesial view). Scales equal 2 mm (A, B, F), and 3 mm (C-E).

margins with small spine (often lacking on one side). Ocular peduncles about half length of shield. Corneae dilated. Ocular acicles terminating in strong spine (occasionally bifid). Antennular peduncles exceeding distal margin of corneae by about one-fifth length of penultimate segment. Antennal peduncles reaching to about same level as distal margin of corneae; fourth segment with dorsolateral distal spine. Antennal acicles at most slightly exceed distal margin of corneae; mesial margin armed with 8–14 spines. Third maxilliped with two strong teeth proximally on crista dentata. Sternite of 3rd maxillipeds unarmed. Epistomial spine strongly curved upward. Labral spine present. Palm of right cheliped with rounded ventromesial face and well delimited dorsomesial and dorsolateral margins. Left cheliped well calcified. Dactyls of ambulatory legs evenly curved throughout, each with a dorsal and a distal dorsomesial row of long setae, and a ventromesial row of corneous spinules. Anterior lobe of sternite of 3rd pereopods armed with one to two spines. Fourth pereopod with dactyl subequal in length to propodal rasp, terminating in short corneous claw; propodal rasp with one row of ovate scales distally, and often with one to two rows proximally. Fifth pereopod with propodal rasp extending to about midlength of propodus. Gills phyllobranchiate. Second left pleuron terminating ventrally in subtriangular lobe. Terminal margin of telson divided into strongly asymmetrical lobes armed with strong, often curved, corneous spines. Male with moderately developed paired 1st and 2nd

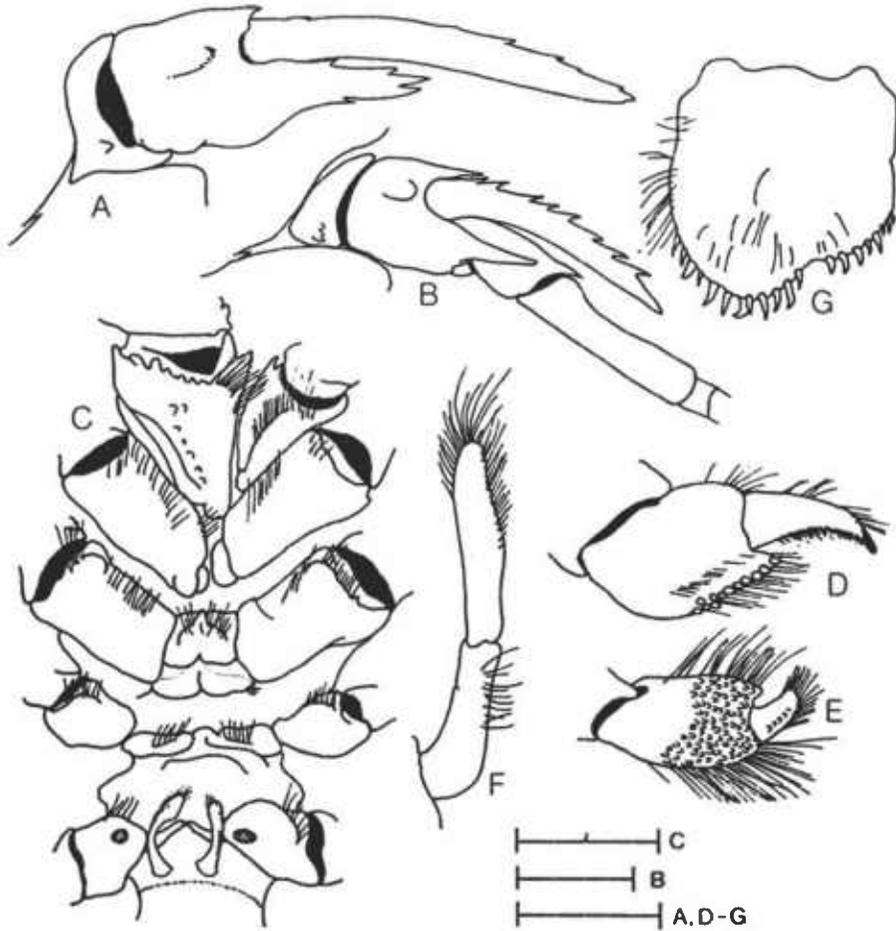


FIG. 7. *Sympagurus africanus* (De Saint Laurent). A, B, right antennal peduncles (lateral view); C, male thorax (ventral view), and 1st pleopods; D, dactyl and propodus of right 4th pereopod; E, dactyl and propodus of right 5th pereopod; F, male left 2nd pleopod (posteromesial view). Scales equal 1 mm (A, B, D-G), and 2 mm (C).

pleopods; mesial face of distal lobe of 1st pleopod weakly concave; distal segment of 2nd pleopod spatulate. (Females not seen.)

*Symbiotic associations.* The specimens examined inhabited gastropod shells without any anthozoan symbionts.

*Distribution.* Southeastern Atlantic: from Angola to Congo. Southwestern Indian Ocean: SE of Durban.

*Depth range:* 235 m to 555 m.

***Sympagurus hobbiti* (Macpherson, 1983 b)**

(Fig. 8)

*Parapagurus hobbiti* Macpherson, 1983 b: 472, figs 1-3 (type locality: Valdivia Bank).

*Sympagurus hobbiti*: Lemaitre, 1989: 37.

*Material.* PARATYPES: 1♂, 1♀ ov. (SL=2.2-2.5 mm), Valdivia I, P-7, 26°11'S, 06°12'E, 234-242 m, 21 May 1982, USNM.

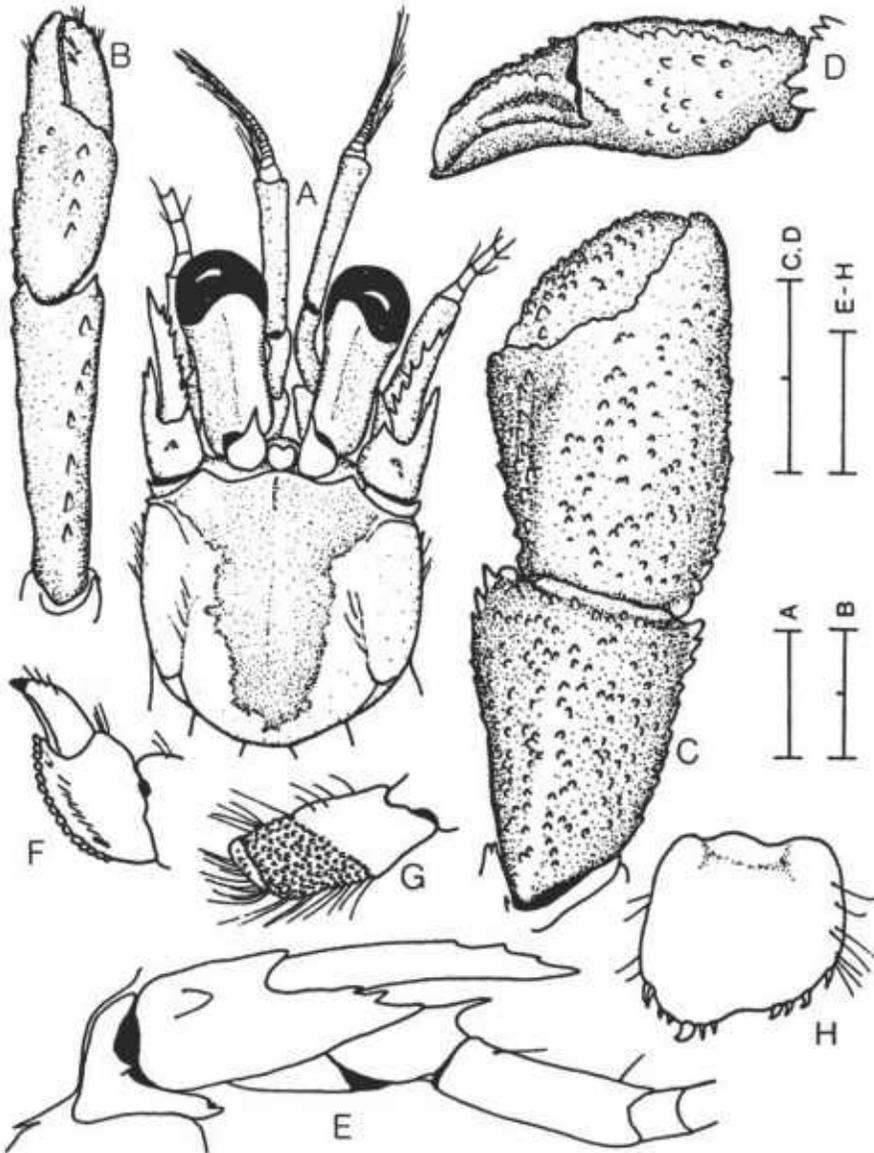


FIG. 8. *Sympagurus hobbiti* (Macpherson). A, shield and cephalic appendages; B, left chela and carpus; C, right chela and carpus; D, right chela (mesial view); E, right antennal peduncle (lateral view); F, dactyl and propodua of left 4th pereopod; G, dactyl and propodus of left 5th pereopod; H, telson. Scales equal 1 mm (A), 2 mm (B-D), and 0.5 mm (E-H).

*Description* (amending Macpherson, 1983 b). Shield with subtriangular lateral projections often terminating in a small spine; dorsal surface usually weakly calcified on medial and anterior regions; ventrolateral margins with small spine. Ocular peduncles about three-quarters length of shield. Antennular peduncles exceeding distal margin of corneae by about three-quarters length of last segment. Antennal peduncles usually not exceeding distal margin of corneae; fourth segment armed with strong spine on dorsolateral distal angle; first segment with small spine on lateral face distally. Third

maxilliped with crista dentata as series of irregular-sized teeth. Sternite of 3rd maxillipeds unarmed. Epistomial spine short, straight. Labral spine present. Right cheliped with fingers weakly curved ventromesially. Palm with mesial face strongly sloping, covered with tubercles; dorsomesial margin with a row of tubercles or spines; ventromesial face rounded; dorsolateral margin more or less well delimited, with a row of spines. Left cheliped usually well calcified. Ambulatory legs with dactyls more strongly curved distally than proximally; dactyls each with a dorsal and a distal dorsomesial row of setae, and a ventromesial row of weak spinules. Anterior lobe of sternite of 3rd pereopods armed with a spine. Fourth pereopod with dactyl shorter than length of propodal rasp, terminating in short corneous claw; propodal rasp with one row of ovate scales. Fifth pereopod with propodal rasp extending to about midlength or more of propodus. Gills phyllobranchiate. Second left abdominal pleuron terminating ventrally in a small subtriangular lobe. Telson with terminal margin divided into unequal lobes armed with a few corneous spines. Male lacks 1st pleopods and with an unpaired vestigial 2nd left pleopod. Female lacks 2nd right pleopod.

*Symbiotic associations.* Found living in gastropod shells inside cavities formed by the siliceous sponge *Pachastrella monolifera* Schmidt (Macpherson, 1983 b).

*Distribution and depth range.* Southeastern Atlantic: known only from the Valdivia Bank, off the coast of Namibia, at a depth of 250 m

### *Sympagurus macrocerus* (Forest, 1955)

(Figs 9, 10)

*Parapagurus macrocerus* Forest, 1955: 101, text fig. 22, pl. 3, figs 1–7 (type locality: off Banana, Angola); De Saint Laurent, 1972: 116; Macpherson, 1983 b: 472.

*Sympagurus macrocerus*: Lemaitre, 1989: 37.

*Material.* Eastern Atlantic: 4♂, 2♀ ov. (SL = 4.2–5.3 mm), John Elliott Pillsbury, station 50, 04°58'N, 05°00'W, 128–192 m, 31 May 1964, UMML. 2♂ (SL = 5.2–5.5 mm), 11°50'S, 13°29.5'E, 190–200 m, 17 April 1968, coll.: A. Crosnier, MNHN 2688. 1♂ (SL = 7.7 mm), Benguela I., P-5, 22°18'S, 13°07'E, 240 m, 10 November 1979, USNM.

*Diagnosis.* Shield broader than long. Rostrum broadly rounded, with dorsal ridge often extending posteriorly to about mid-length of shield. Lateral projections broadly rounded, unarmed. Dorsal surface evenly calcified, often with low blister-like tubercles. Ventrolateral margins unarmed. Ocular peduncles more than half length of shield. Corneae dilated. Ocular acicles terminating in a strong spine (rarely bifid). Antennular peduncles exceeding distal margin of corneae by slightly more than length of last segment. Antennal peduncles exceeding distal margin of corneae by about one-third length of last segment; fourth segment with small dorsolateral distal spine. Antennal acicles exceeding distal margin of corneae by about half length of acicles; mesial margin armed with 7–10 spines on proximal two-thirds. Ischium of third maxilliped with one or two strong teeth proximally on crista dentata. Sternite of 3rd maxillipeds unarmed. Epistomial spine small, blunt. Labral spine present. Right cheliped elongate, proportions and armature depending on size and sex; carpus and chela usually broader in females than in males (Figs 9 C, D); fingers weakly curved ventrally; palm with well delimited dorsolateral margin, usually smooth on dorsal surface except for medial, irregular rows of small spines, proximally; carpus with strong spines or tubercles dorsally. Left cheliped weakly calcified on merus and carpus. Ambulatory legs with dactyls evenly curved throughout, with a dorsal and a distal dorsomesial row of long setae, and a ventromesial row of minute spinules; meri, carpi and propodi each with

rows of setae and spinules dorsally. Anterior lobe of sternite of 3rd pereiopods unarmed. Fourth pereiopod with dactyl shorter than length of propodal rasp, subtriangular; propodal rasp with one row of ovate scales. Fifth pereiopod with propodal rasp forming subtriangular area reaching beyond midlength of propodus. Gills phyllobranchiate. Terminal margin of telson divided into strongly asymmetrical lobes armed with strong curved corneous (often more numerous in females than in males). Males with moderately developed paired 1st and 2nd pleopods (Figs 10 H, I). Females with vestigial 2nd right pleopod.

*Symbiotic associations.* Commonly found in gastropod shells covered with an unidentified actinian.

*Distribution.* Eastern Atlantic: from Ivory coast in the Gulf of Guinea to Namibia.

*Depth range:* 128 m to 280 m.

*Remarks.* This species is superficially similar to *Strobopagurus gracilipes* (A. Milne Edwards). In addition to the characters that differentiate *Sympagurus* from *Strobopagurus*, the two species differ in the length of the antennal acicles relative to that of the ocular peduncles, the shape of the basal antennular segment, and the armature of the telson.

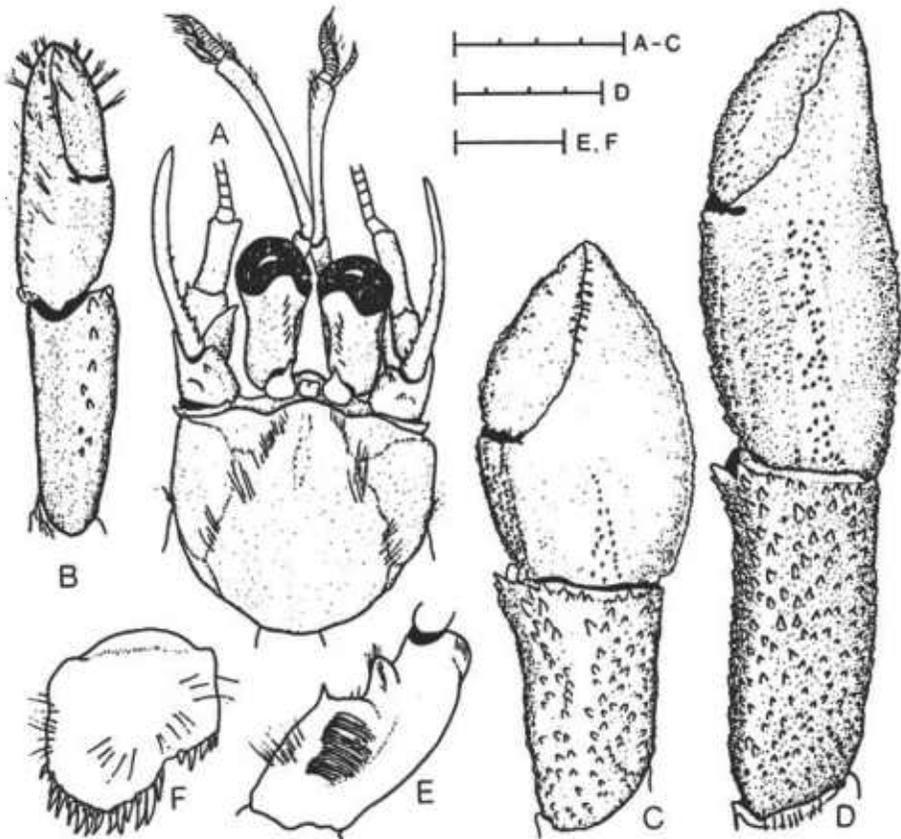


FIG. 9. *Sympagurus macrocerus* (Forest). A, shield and cephalic appendages; B, left chela and carpus; C, right chela and carpus of female; D, right chela and carpus of male; E, left basal antennular segment (dorsal view); F, telson. Scales equal 4 mm (A-D), and 1 mm (E, F).

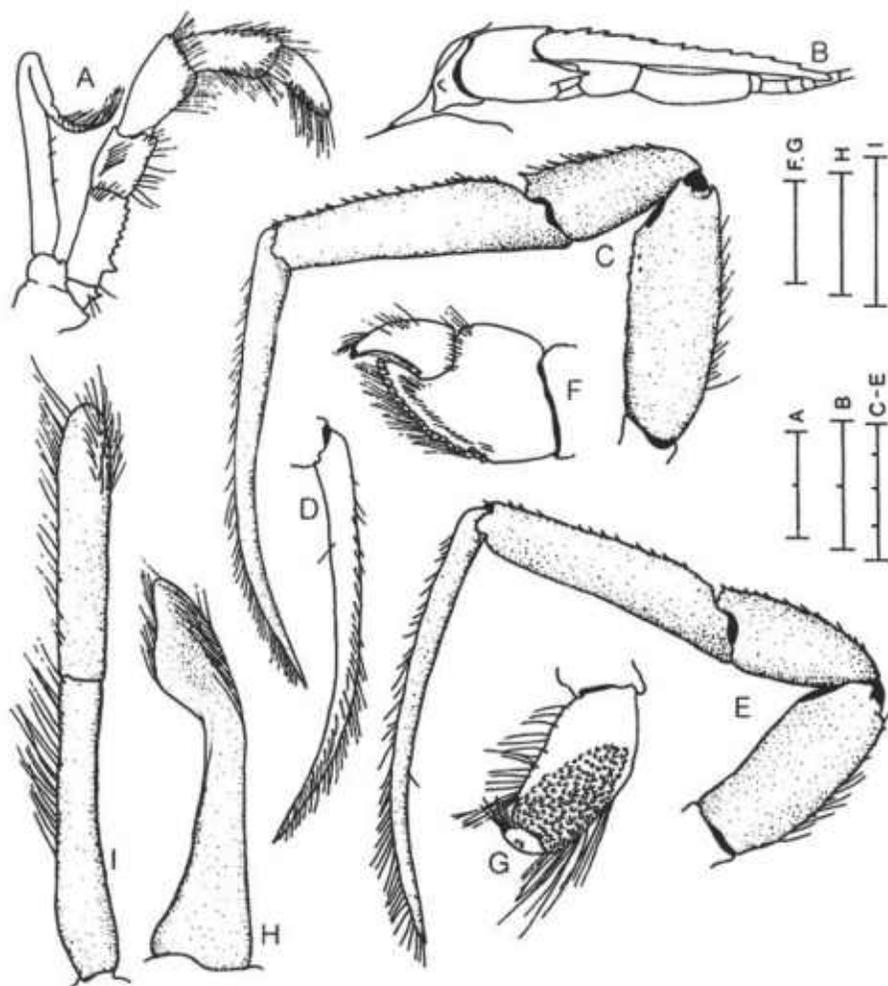


FIG. 10. *Sympagurus macrocerus* (Forest). A, left 3rd maxilliped (internal view); B, right antennal peduncle (lateral view); C, left 2nd pereopod (lateral view); D, dactyl of same (mesial view); E, left 3rd pereopod (lateral view); F, dactyl and propodus of left 4th pereopod; G, dactyl and propodus of left 5th pereopod; H, male left 1st pleopod (mesial view); I, male left 2nd pleopod (anterior view). Scales equal 2 mm (A,B), 4 mm (C-E), 1 mm (F, G, I), and 0.5 mm (H).

***Sympagurus ruticheles* (A. Milne Edwards, 1891)**

(Figs 11, 12)

*Eupagurus ruticheles* A. Milne Edwards, 1891: 133 (type locality: near Graciosa, Azores, L'Hirondelle station 234); A. Milne Edwards and Bouvier, 1894: 70, pl. 10, legends for figs 1-14 (see *Remarks*); Alcock, 1905: 173.

*Sympagurus ruticheles*: A. Milne Edwards and Bouvier, 1892: 206; 1894: 70, pl. 10, figs 1-14; 1897: 133; 1899: 59; Alcock, 1905: 173; Bouvier, 1922: 22; Gordan, 1956: 342.

*Parapagurus ruticheles*: De Saint Laurent, 1972: 112; Macpherson, 1983 b: 476; Ingle, 1985: 764; Lemaitre, 1989: 37.

*Material*. SYNTYPES: 2♂ (SL=3.6-5.9 mm), 1♀ ov. (SL=3.2 mm), L'Hirondelle, station 234, 39°01'40"N, 30°15'40"W, 454 m, 19 August 1888, MO. Northeastern

Atlantic: 1♂ (SL=3.4 mm), Cancap-IV, station 4-029, 28°48'N, 13°45'W, 420–475 m, 19 May 1980, RMNH. 1♀ ov. (SL=3.9 mm), Cancap-IV, station 4.VO5, 28°48'N, 13°46'W, 225 m, 16–17 May, 1980, RMNH.

**Diagnosis.** Shield usually as broad as long. Rostrum broadly rounded, with short dorsal ridge. Lateral projections subtriangular, armed with a small spine. Dorsal surface usually weakly calcified medially. Ventrolateral margin with small spine (often lacking on one side). Ocular peduncles more than half length of shield. Corneae dilated. Ocular acicles terminating in a strong spine. Antennular peduncles exceeding distal margin of corneae by slightly less than length of last segment. Antennal peduncles not exceeding distal margin of corneae; fourth segment with spine on dorsolateral distal angle. Antennal acicles not exceeding distal margin of corneae; mesial margin armed with 7–14 spines. Ischium of 3rd maxilliped with two strong teeth proximally on crista dentata. Sternite of 3rd maxillipeds armed with two spines. Epistomial spine straight (occasionally bifid). Labral spine present. Right cheliped elongate, with transverse furrows on ventral surfaces of chela and ventrolateral face of carpus (Figs 11 C, D, F); palm with well delimited dorsomesial, ventromesial and dorsolateral margins armed with spines (usually bearing corneous tips), and concave mesial face often expanded distally; carpus with well delimited dorsolateral margin armed with spines bearing corneous tips. Left cheliped weakly calcified on merus and carpus. Ambulatory legs with dactyls evenly curved throughout; dactyls each with a dorsal and a distal dorsomesial row of setae, and a ventromesial row of spinules; merus of right 3rd pereopod usually with a dorsal row of small spines. Anterior lobe of sternite of 3rd pereopods unarmed. Fourth pereopod with a strongly curved dactyl shorter than length of propodal rasp and terminating in a short corneous claw; propodal rasp with one row of ovate scales. Fifth pereopod with propodal rasp forming subtriangular area extending to mid-length of propodus. Gills phyllobranchiate. Second left pleuron terminating ventrally in subtriangular lobe. Terminal margin of telson divided into strongly asymmetrical lobes armed with strong corneous spines. Males lack 1st pleopods, with unpaired, uniramous 2nd left pleopod (Fig. 12I). Females lack 2nd right pleopod.

**Symbiotic associations.** Found living in gastropod shells without anthozoan symbionts.

**Distribution.** Eastern Atlantic: from the southern coast of Portugal to Senegal, including the Azores, Madeira and the Canary Islands. Pacific: Hawaiian Islands (De Saint Laurent, 1972).

**Depth range:** 200 m to 1440 m.

**Remarks.** This species was originally assigned to the genus *Eupagurus* by A. Milne Edwards (1891), and subsequently transferred to *Sympagurus* by A. Milne Edwards and Bouvier (1892). However, in A. Milne Edwards and Bouvier's (1894) report of this species, the name *Eupagurus ruticheles* was inadvertently retained in the legend for plate 10, figs 1–14.

#### Acknowledgements

I am indebted to C. Carpine, J. Forest, L. B. Holthuis, E. Louw, R. B. Manning, E. Macpherson, and P. A. McLaughlin, for placing their personal collections, or those deposited in their institutions, at my disposal. The help of the late G. L. Voss in providing me with technical assistance is gratefully acknowledged.

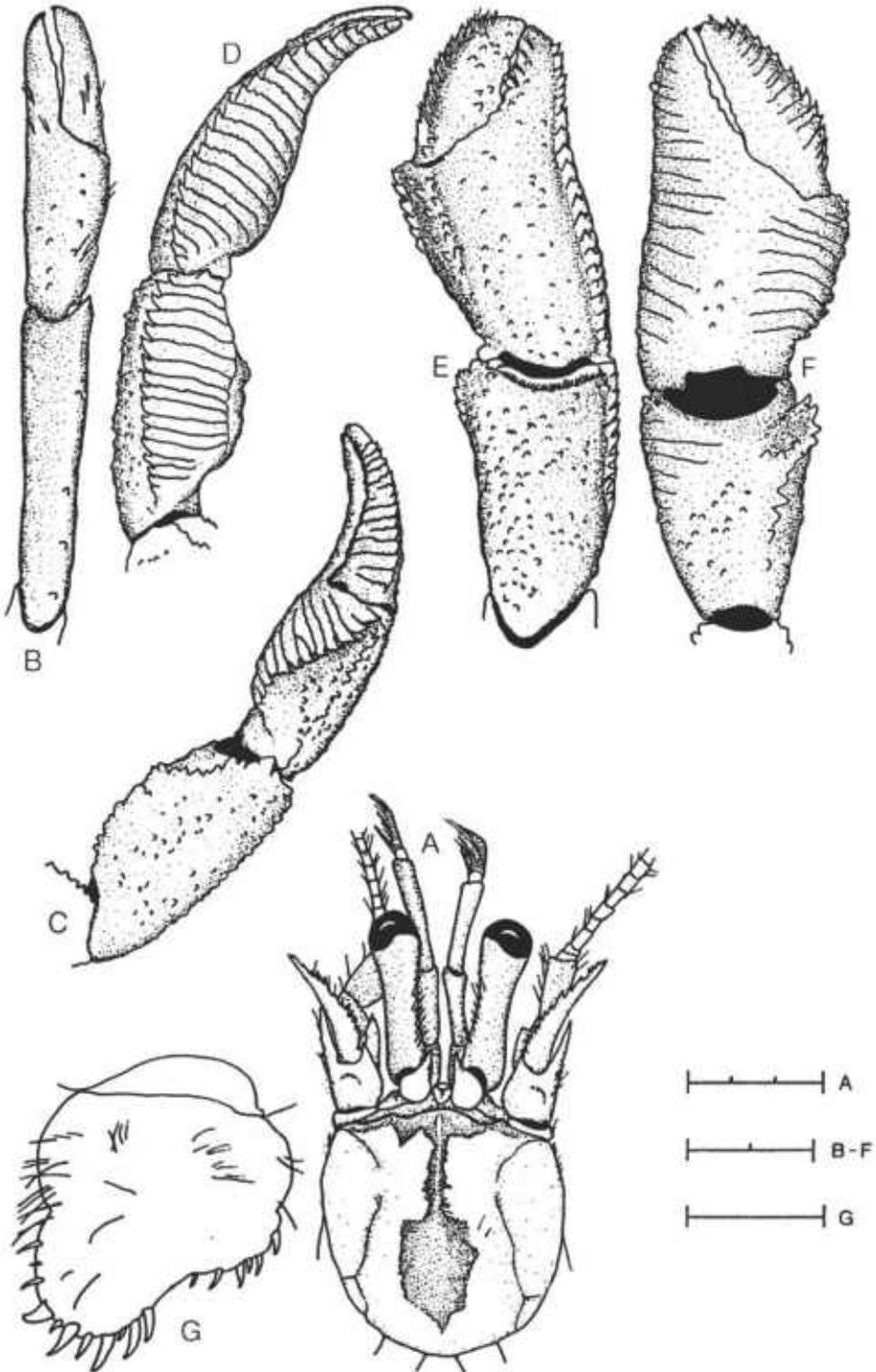


FIG. 11. *Sympagurus ruticheles* (A. Milne Edwards). A, shield and cephalic appendages; B, left chela and carpus; C, right chela and carpus (mesial view); D, same (lateral view); E, same (dorsal view); F, same (ventral view); G, telson. Scales equal 3 mm (A), 2 mm (B-F), and 1 mm (G).

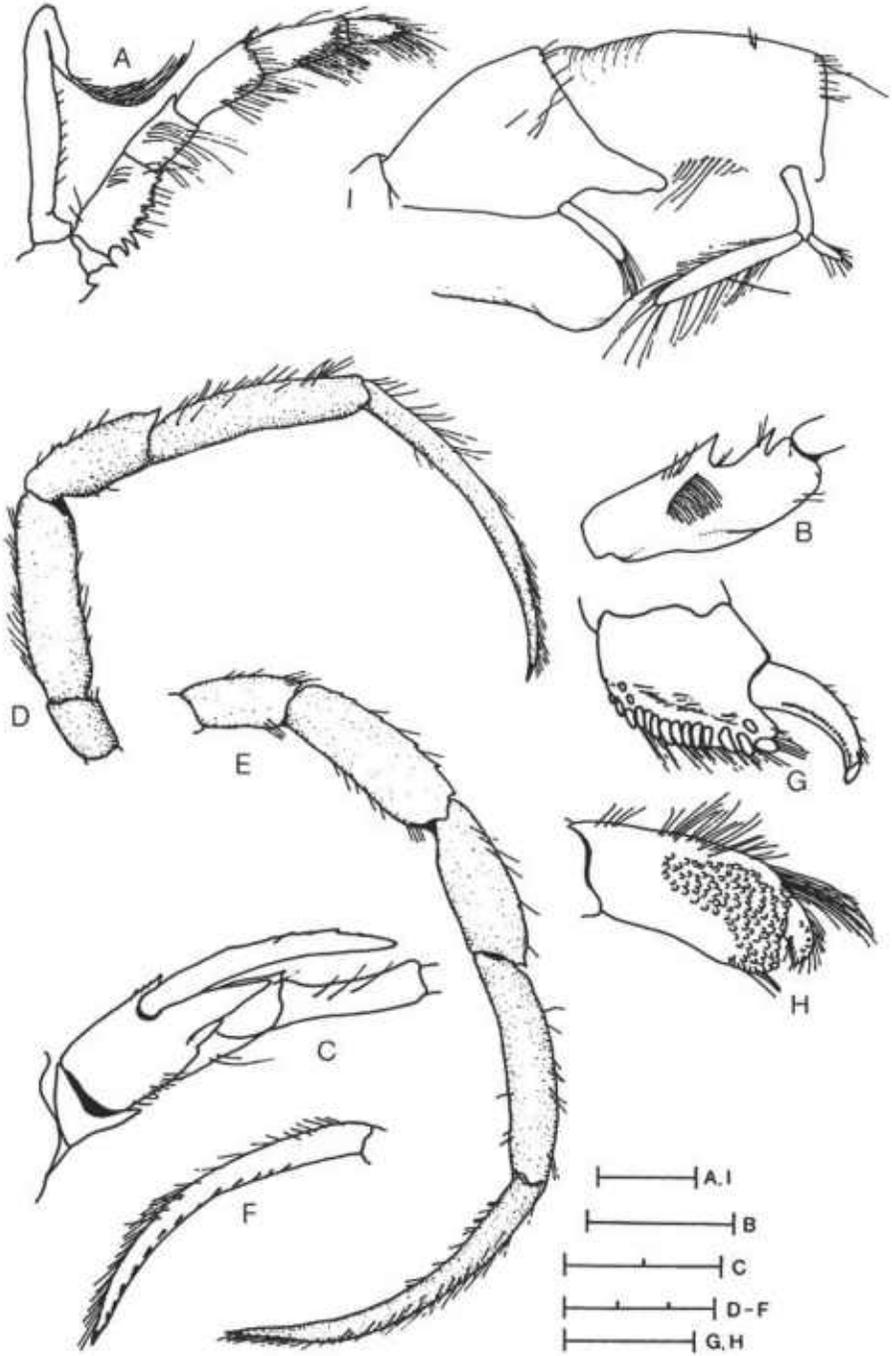


FIG. 12. *Sympagurus ruticheles* (A. Milne Edwards). A, left 3rd maxilliped (internal view); B, left basal antennular segment (dorsal view); C, right antennal peduncle (lateral view); D, right 2nd pereopod (lateral view); E, right 3rd pereopod (lateral view); F, dactyl of same (mesial view); G, dactyl and propodus of right 4th pereopod; H, dactyl and propodus of left 5th pereopod; I, left side of male 2nd and 3rd abdominal somites with 2nd and 3rd pleopods (lateral view). Scales equal 1 mm (A, B, G, H, I), 2 mm (C), and 3 mm (D-F).

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