

Elthusa epinepheli sp. nov. (Crustacea, Isopoda, Cymothoidae) a branchial parasite of the grouper *Epinephelus howlandi* (Serranidae, Epinephelinae) from off New Caledonia

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Abstract

The cymothoid isopod *Elthusa epinepheli* sp. nov., a branchial parasite of the blacksaddle grouper *Epinephelus howlandi* (Serranidae, Epinephelinae) from the coral reef of New Caledonia (Southwestern Pacific), is described and figured. Within the genus, *E. epinepheli* shows some similarity with *E. raynaudii* and *E. myripristae*. The ovigerous female of *E. epinepheli* can be distinguished from *E. raynaudii* by a less ovate body; cephalon deeply immersed in pereonite 1; eyes almost concealed by the amphicephalic processes; pereonites 3–7 distinctly decreasing in size (width and length); pleonites 1–5 distinctly increasing in width; and pleotelson larger. *E. epinepheli* can be distinguished from *E. myripristae* by the anterior margin of the cephalon being rounded in dorsal view and all pleonites being visible. *E. epinepheli* is the first species of *Elthusa* reported from the host genus *Epinephelus*.

Résumé

Elthusa epinepheli sp. nov. (Isopoda, Cymothoidae), parasite branchial du mэрou *Epinephelus howlandi* du récif corallien de Nouvelle-Calédonie, est décrit et représenté. A l'intérieur du genre, *E. epinepheli* est morphologiquement proche des deux espèces *E. raynaudii* et *E. myripristae*. Par rapport à *E. raynaudii*, la femelle ovigère de *E. epinepheli* est caractérisée par un corps moins ovale, un céphalon profondément inclus dans le péréonite 1, des yeux presque entièrement dissimulés par les processus amphicéphaliques, des péréonites dont la taille (largeur et longueur) diminue nettement du troisième au septième, des pléonites dont la largeur augmente nettement du premier au cinquième et un pléotelson plus grand. Le bord antérieur arrondi de son céphalon et le fait que tous les pléonites soient visibles permet de distinguer *E. epinepheli* de *E. myripristae*. *E. epinepheli* est le premier *Elthusa* signalé sur des poissons du genre *Epinephelus*.

Keywords

Isopoda, Cymothoidae, *Elthusa epinepheli* sp. nov., *Epinephelus howlandi*, New Caledonia

Introduction

The genus *Elthusa* Schioedte et Meinert, 1884 was established for the single species *Elthusa emarginata* (Bleeker 1857), type species by monotypy, but the Latin diagnosis given by the Danish authors did not allow an accurate definition of this genus, nor its separation from other related genera. *Elthusa* has most recently been redefined and revised, at least provisionally, by Bruce (1990) and 28 nominal species are recognized (Trilles and Justine 2006). Several species remain incompletely de-

scribed, and the hosts for many species are still unknown (Trilles 1994, Trilles and Justine 2006). Most species are known from the Pacific or from the Indo-Pacific area (Kensley *et al.* 2004, Trilles and Justine 2006), including *E. paraboithi* Trilles et Justine, 2004 and *E. arnoglossi* Trilles et Justine, 2006 from New Caledonia. Only four species have been reported from the Atlantic Ocean, including the recently described *E. alvaradoensis* Rocha-Ramírez, Chávez-López et Bruce, 2005, from the coast of Central Veracruz, Mexico. There are no records from the Mediterranean (Trilles and Justine 2006).

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Cymothoid isopods have rarely been reported from groupers (Teleostei, Serranidae, Epinephelinae). Three species were collected attached to the body walls, *Anilocra dimidiata*

Bleeker, 1857 from *Epinephelus* sp. (Monod 1934), *A. gigantea* (Herklots 1870) from *Epinephelus* sp. (Bruce and Harrison-Nelson 1988) and *A. laticauda* Milne Edwards, 1840 from

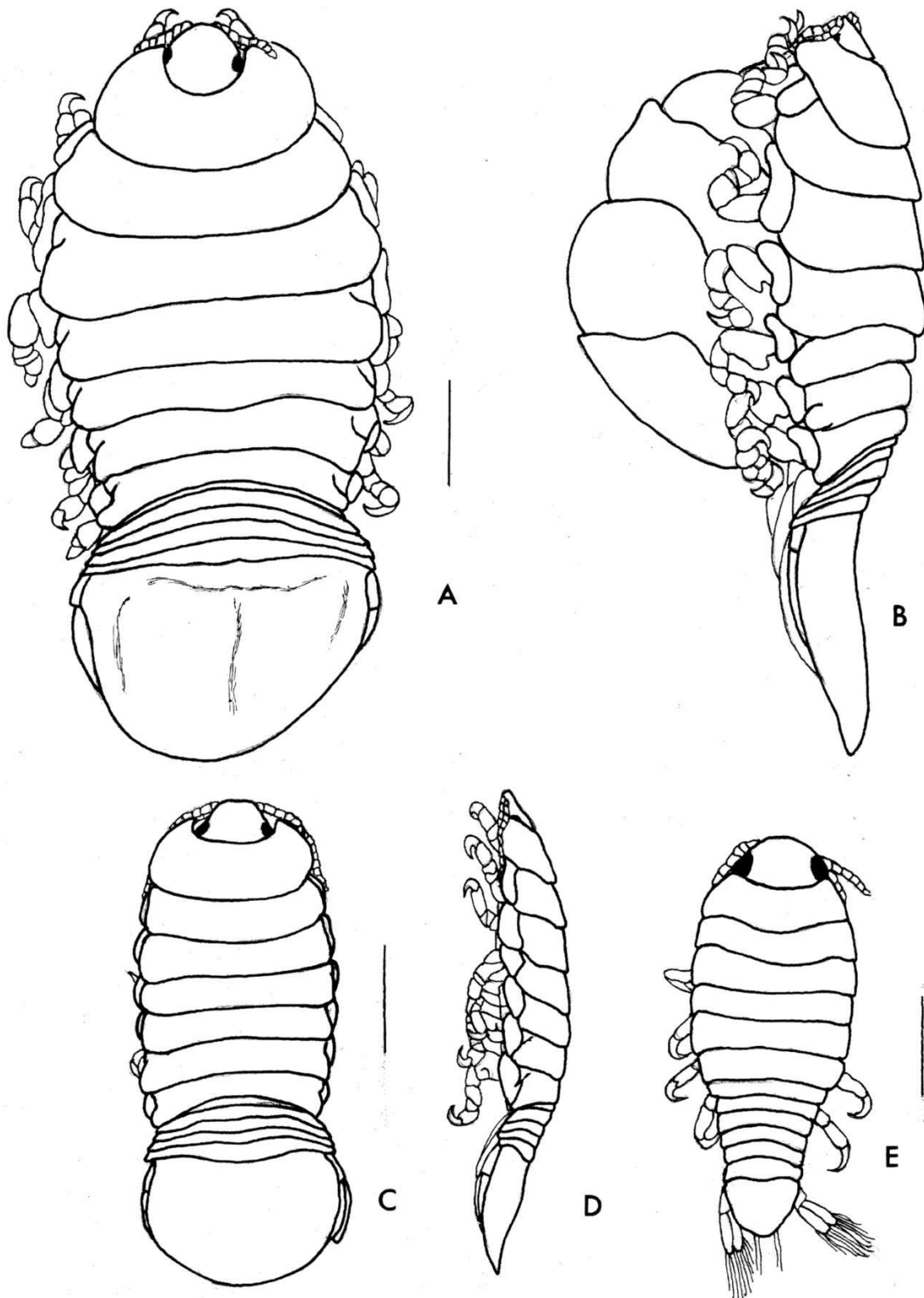


Fig. 1. *Elthusa epinepheli* sp. nov. **A** and **B.** Ovigerous female, holotype. **A** – dorsal view, **B** – lateral view. **C** and **D.** Male. **C** – dorsal view, **D** – lateral view. **E** – manca larva 2, dorsal view. Scale bars = 5 mm (A, B), 4.5 mm (C, D), 0.5 mm (E)

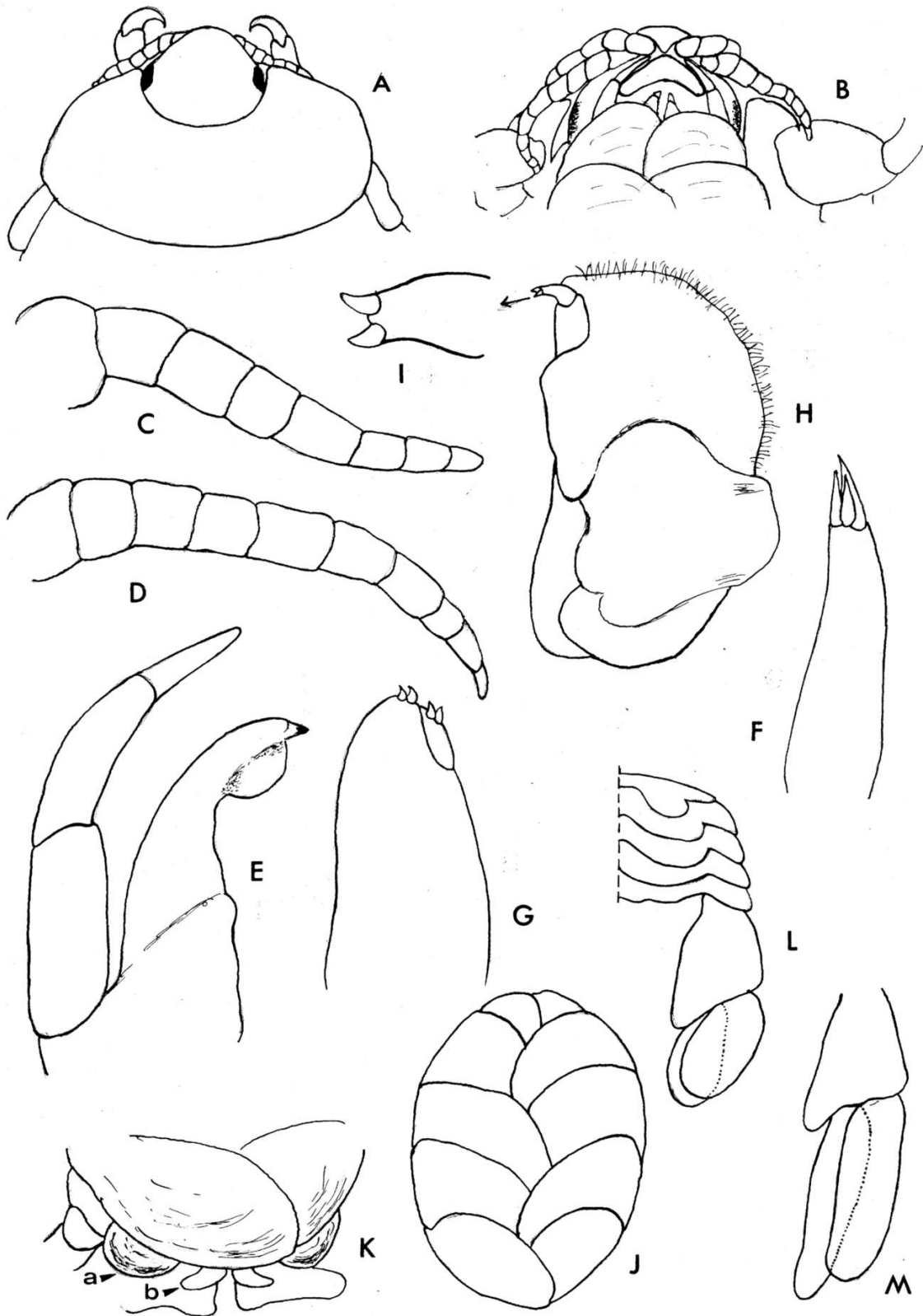


Fig. 2. *Elthusa epinepheli* sp. nov. Ovigerous female. **A** – cephalon and first pereonite; **B** – frons, ventral view; **C** – antennule; **D** – antenna; **E** – mandible; **F** – maxillule; **G** – maxilla; **H** – maxilliped; **I** – maxilliped article 3 apex; **J** – brood pouch; **K** – sternite 7 (**a**, fleshy lobe; **b**, remainder of penes); **M** – uropod

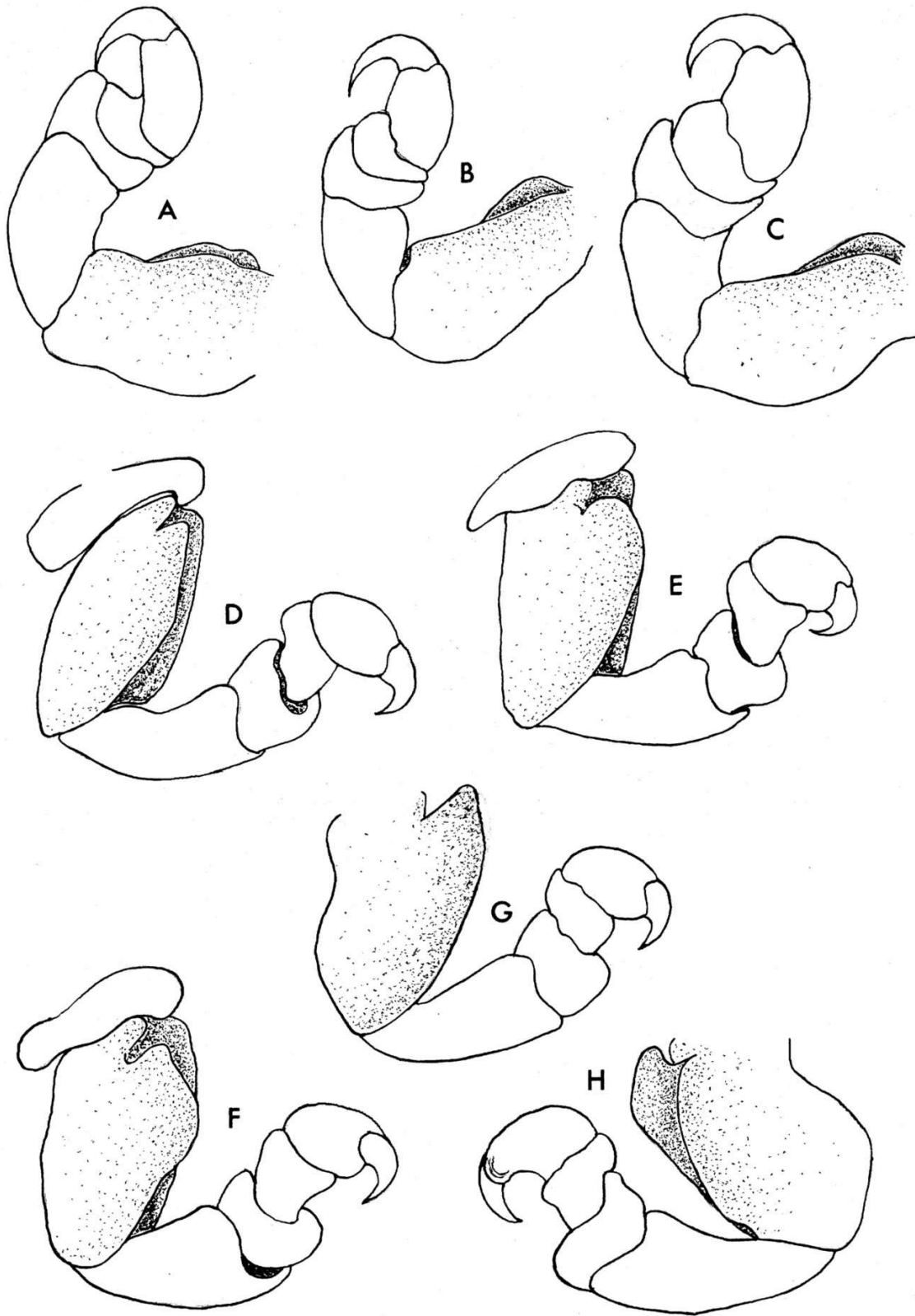


Fig. 3. *Elthusa epinepheli* sp. nov. Ovigerous female. **A-F** – left pereopods 1–6 respectively, lateral view; **G-H** – left pereopod 7 (**G**, lateral view; **H**, medial view)

Upeneus martinicus (Richardson 1905), *Epinephelus guttatus* (Hochberg and Ellis 1972) and *Cephalopholis fulva* (Trilles and Vala 1975). *Nerocila arres* Bowman et Tareen, 1983 was reported from the caudal fin of *Epinephelus tauvina* (Bowman and Tareen 1983) and *Cymothoa borbonica* Schioedte et Meinert, 1884 from the mouth of the same fish species. This record of *Elthusa epinepheli* is the first record of a gill-attaching cymothoid from groupers.

While examining groupers from New Caledonia (South-western Pacific) for metazoan parasites during 2003–2008, we collected a new species of *Elthusa* from a grouper of the genus *Epinephelus*, *E. howlandi* (Günther). In this article, we describe all stages (ovigerous female, male and manca larva 2) of the new species.

Materials and methods

More than 400 groupers belonging to 28 species, including 23 specimens of *Epinephelus howlandi*, have been examined for gill parasites over a 7-year period in New Caledonia (Justine *et al.*, submitted). The parasitized fish (308 mm in fork length, 496 g in weight) was collected by line on 27 June 2006 (off Nouméa, in the centre of Récif Toombo, 22°26'10"S, 166°33'00"E). Isopods were removed alive from the right gill chamber of the fish and measured for total length (TL) and maximum width (W). All measurements are in millimetres. Parasites were preserved in 70% ethanol. Mouthparts and appendages were carefully dissected and figures were drawn using a camera lucida. Specimens are deposited in the collections of the Muséum National d'Histoire Naturelle, Paris (MNHN). Fish taxonomy is according to Froese and Pauly (2009).

Results

Family Cymothoidae Leach, 1814

Genus *Elthusa* Schioedte et Meinert, 1884

Elthusa Schioedte et Meinert, 1884: 337; Nierstrasz, 1915: 96; Nierstrasz, 1931: 128; Bruce, 1990: 254; Trilles, 1994: 164.

Livoneca Bleeker, 1857: 21.

Lironeca Miers, 1880: 465.

Type species: The type species is *Livoneca emarginata* Bleeker, 1857, by monotypy (Schioedte and Meinert 1884). One of Bleeker's type specimens, reported and figured by Schioedte and Meinert, held in the collections of the Rijksmuseum van Natuurlijke Historie, Leiden, is now apparently lost and not available (Trilles 1979). One female syntype extant in this museum is too fragile for dissection (Bruce 1990). Another is held in the collection of the MNHN, Paris, under registration No. 241 (Trilles 1976). Several additional specimens were recently collected by Trilles and Randall from two species of *Parupeneus* (Teleostei, Mullidae) and the species is being redescribed.

Elthusa epinepheli sp. nov. (Figs 1–7)

Description

Ovigerous female. Body about 2 times as long as wide, widest at pereonite 3, very weakly twisted to the right side. Dorsum weakly vaulted at the level of pereon and pleon (Fig. 1A, B).

Cephalon about 1.3 times as wide as long, sub-triangular, deeply immersed in pereonite 1, anterior margin rounded in dorsal view and ventrally flexed, forming lobe between bases of antennae, posterior margin rounded. Eyes small, about 0.2 times width of cephalon, black, set close to the margin of cephalon (Fig. 2A, B).

Pereon broad, about 0.9 as wide as long. Pereonite 1 longest, 2–7 progressively decreasing in length. Posterior margin of pereonite 7 slightly rounded. Coxal plates of pereonites 2–7 conspicuous in dorsal view.

Pleon about 3.5 times as wide as long; all pleonites visible but pleonite 1 narrower than others and partially concealed by pereonite 7, pleonites 1–5 progressively widest towards posterior, 2–4 entirely conspicuous in dorsal view and subequal in length, 5 slightly longest with posterior margin very broadly rounded, nearly straight. Pleotelson hemispherical, slightly asymmetrical, about 1.35 times as wide as long, 2.3 times longer than pleon, posterior margin rounded.

Brood pouch very prominent in lateral view, made up of five pairs of alternatively overlapping oostegites arising from sternites 1 to 4 and 6 (Fig. 2J); anterior pair partly overlapping mouth parts (Fig. 2B); sternite 7 with 2 distal submedian fleshy lobes and remainder of penes (Fig. 2K).

Antennule with 8 articles, not extending to posterior of cephalon but extending to posterior of eyes, basal article not contiguous. Antenna, slightly longer than antennule, composed of 10 articles, nearly reaching posterior margin of cephalon, with bases wide apart (Fig. 2C, D).

Mandible without setae and spines, prominent molar, incisor acute but reduced, palpal article 1 slender and longest, palpal article 3 longer than 2. Maxillule with 3 terminal spines. Maxilla medial and lateral lobes each with 2 spines. Maxilliped article 3 with 2 blunted spines and oostegial lobe bearing some plumose setae (Fig. 2E–I).

Pereopods almost similar with anterolateral carina on basis increasing in size from pereopod 1 to 7, distinctly dilated merus, propodus short and dactyli short extending to middle of carpus (Fig. 3A–H).

Pleopods with all rami lamellar, decreasing progressively in size, exopod larger than endopod; all pleopods without coupling hooks on medial margin of peduncle; pleopod 2 without appendix masculina; endopods 2–5 with small, simple proximomedial lobe, increasing in size from pleopod 2 to 5 (Fig. 4A–F).

Uropods short, right and left uropods differing in size, rami unequal, exopod shorter than endopod, apices blunted pointed (Fig. 2M).

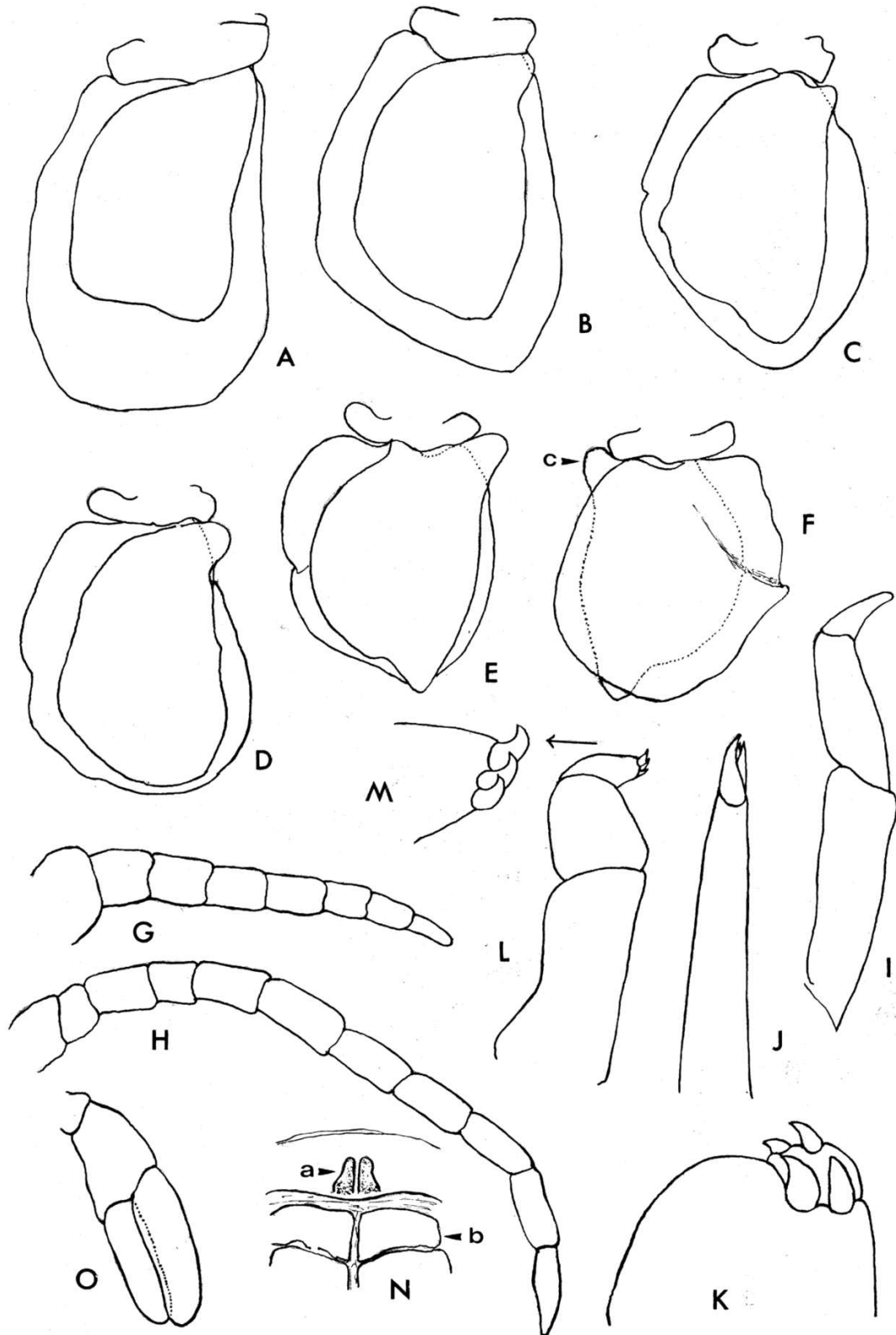


Fig. 4. *Elthusa epinepheli* sp. nov. Ovigerous female. **A-D** – left pleopods 1–4 respectively, posterior view; **E-F** – left pleopod 5 (**E**, posterior view; **F**, anterior view; **c**, proximomedial lobe). Male. **G** – antennule, **H** – antenna, **I** – mandible palp, **J** – maxillule, **K** – maxilla apex, **L** – maxilliped, **M** – maxilliped article 3 apex, **N** – sternite 7 (**a**, penes; **b**, pleopod 1), **O** – uropod

Male. Smaller than female; body bilaterally symmetrical, about 2.5 times as long as wide, lateral margins straight; dorsum weakly vaulted (Fig. 1C, D).

Cephalon about 1.8 times as wide as long, distinctly immersed in pereonite 1, anterior margin forming broad subtruncate rostrum, posterior margin rounded.

Pereon 0.4 times as wide as long. Pereonite, 3–7 subequal in length; posterior margin of pereonite 7 slightly rounded. Coxal plates 2–7 conspicuous in dorsal view.

Pleon about 3.2 times as wide as long, posterior margin of pleonite 5 weakly bisinuate. Pleotelson about 0.6 times as long as wide, posteriorly broadly rounded. Elongate paired penes on posterior margin of sternite 7 (Fig. 4N).

Antennule and antenna similar to female, without setae, but antenna proportionally longer than in female and composed of 11 articles (Fig. 4G, H).

Mandible palp, articles decreasing in size from 1 to 3, article 3 slender and shortest. Maxilla with 2 large curved spines each on medial and lateral lobe. Maxilliped article 3 with 2 or 3 (according to the right or left body side) recurved spines (Fig. 4I–M).

All pereopods similar to those of female with anterolateral carina on basis increasing in size from 1 to 7 but merus proportionally less dilated than in female (Fig. 5A–H).

Pleopod rami lamellar, exopod larger than endopod, without coupling hooks on peduncle. Pleopod 2 with appendix masculina about 0.6 times as long as endopod. Simple

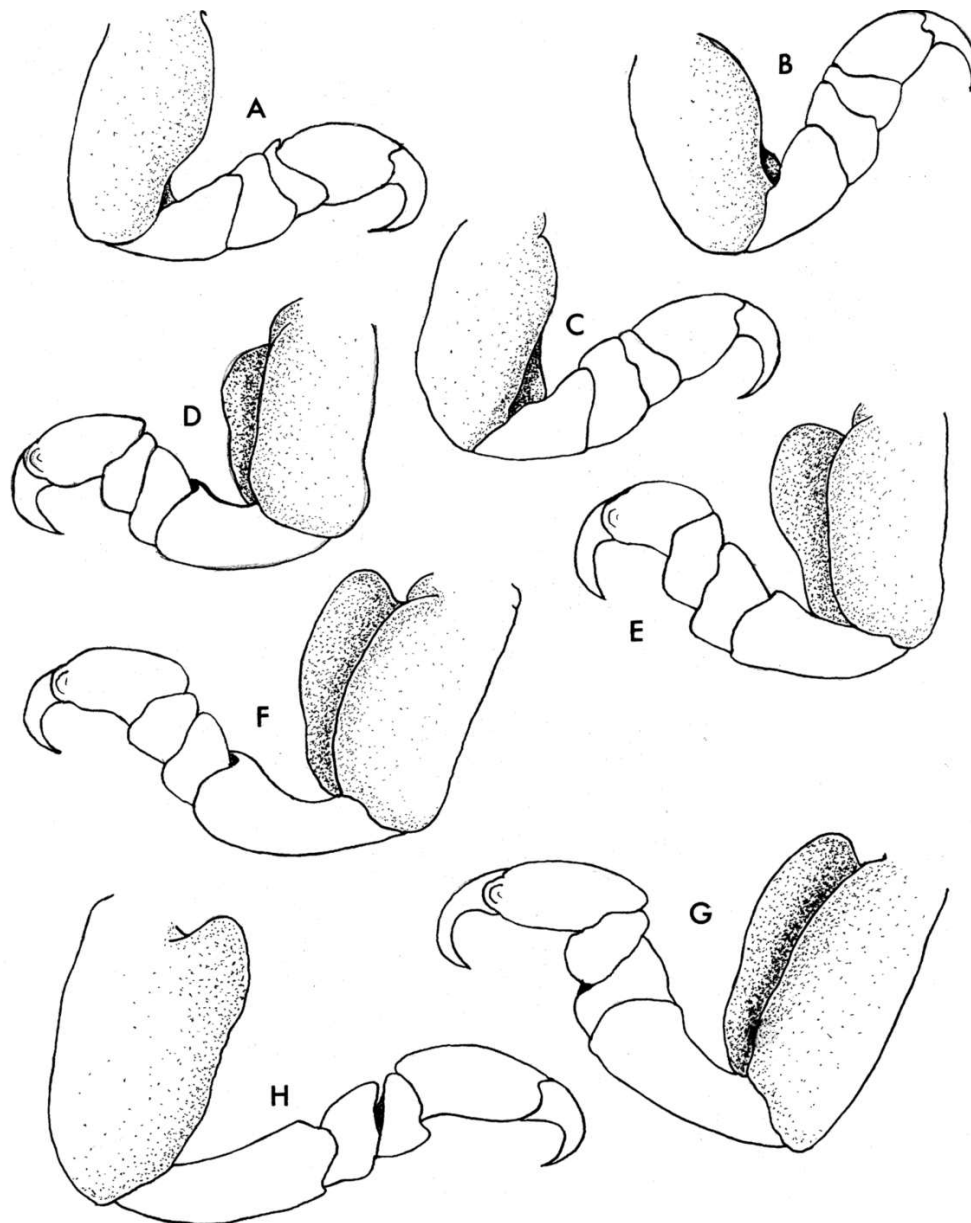


Fig. 5. *Elthusa epinepheli* sp. nov. Male. A–F – right pereopods 1–6, respectively (A–C, lateral view; D–F, medial view); G–H – right pereopod 7 medial and lateral view, respectively

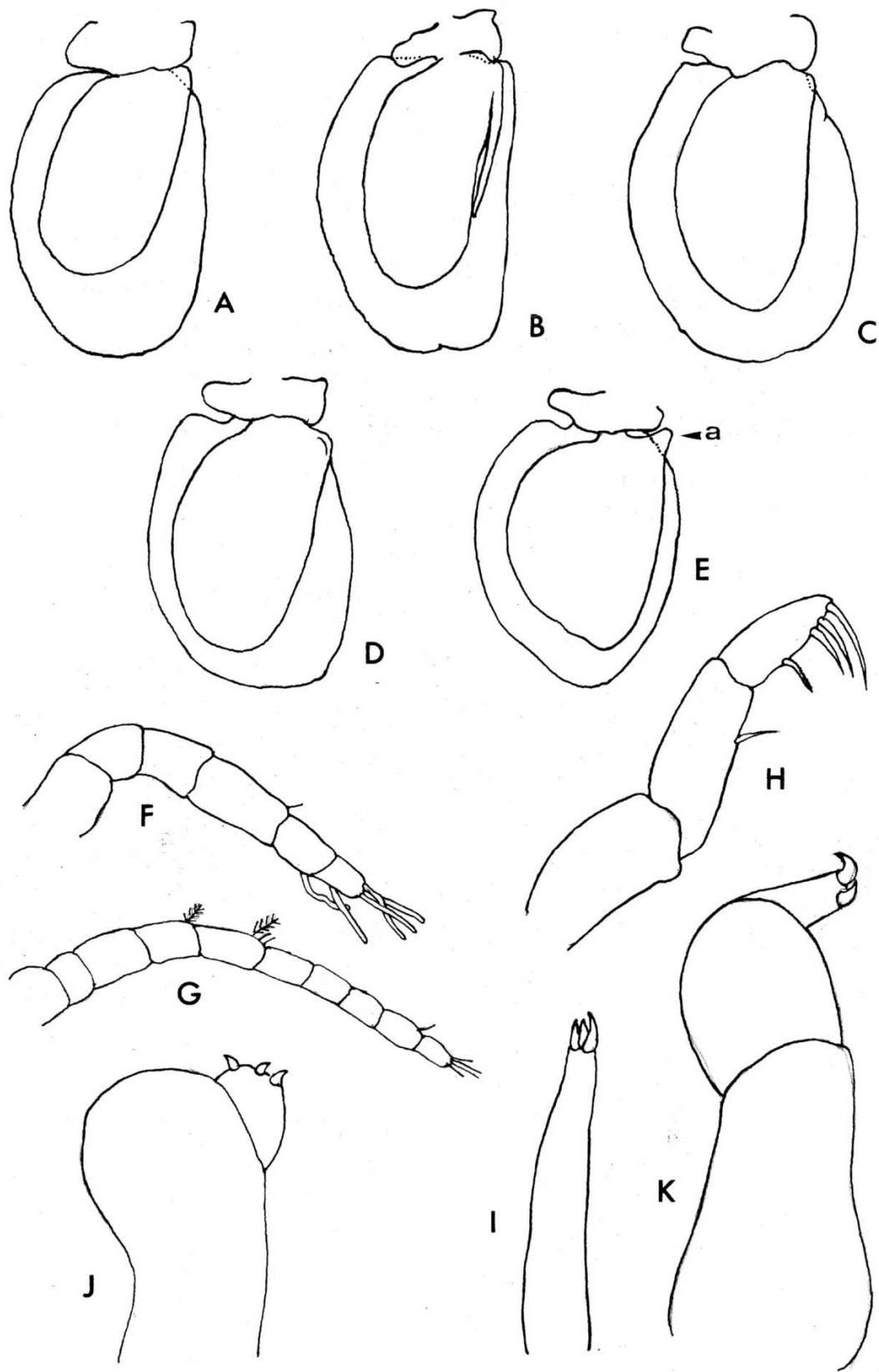


Fig. 6. *Elthusia epinepheli* sp. nov. Male. **A-E** – left pleopods 1–5 respectively, posterior view (**a**, proximomedial lobe). Manca larva 2. **F** – antennule, **G** – antenna, **H** – mandible palp, **I** – maxillule, **J** – maxilla, **K** – maxilliped

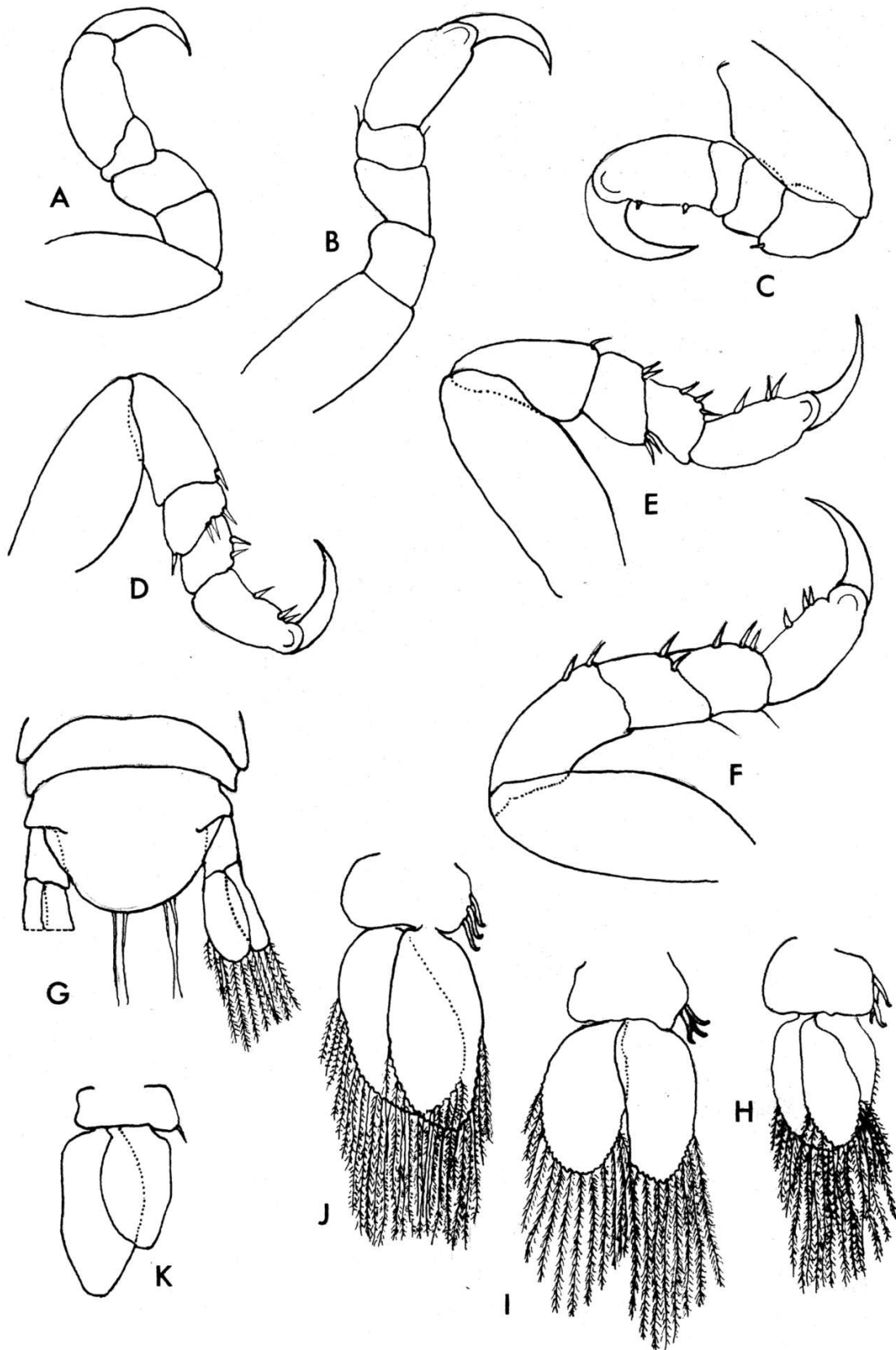


Fig. 7. *Elthusa epinepheli* sp. nov. Manca larva 2. A-F – pereopods 1–6 respectively, lateral view; G – pleonites 4–5, pleotelson, uropods; H-K – left pleopods 1, 2, 4, 5 respectively, posterior view

proximomedial lobe particularly conspicuous in pleopods 4–5 (Fig. 6A–E).

Uropods about 0.6 times as long as pleotelson, rami weakly unequal, bluntly rounded, exopod slightly longer than endopod (Fig. 4O).

Manca larva 2 (pullus 2). The specimen illustrated in Figure 1E is at the intramarsupial stage 2 (manca larva 2 or pullus 2), just before spawning. It shows 7 pereonites but only 6 pereopods, an enlarged semi-circular cephalon, ovate pereon and narrowed pleon with pleonites 1–5 decreasing progressively in width towards posterior. Posterior margin of pleotelson rounded, with sparse plumose setae (Fig. 7G).

Antennule composed of 6 articles extending to the middle of pereonite 1, with simple spiny short seta on antero-distal margin of article 4, large seta on the postero-distal margin of article 5 and four similar setae on article 6. Antenna slightly longer than antennule, composed of 10 articles, with plumose seta on antero-distal margin of articles 4–5, two spiny setae on the antero-distal margin of article 5, spiny seta on the antero-distal margin of article 9 and tuft of four fine setae on distal margin of article 10 (Fig. 6F, G).

Mandible palp with small seta on lateral margin of article 2 and palpal article 3 with 4 setae increasing gradually in length along disto-lateral margin. Maxillule with 3 terminal spines and maxilla with 3 spines on medial lobe. Maxilliped article 3 with 2 recurved spines (Fig. 6H–K).

All pereopods similar with acute dactyli, increase slightly in length from pereopod 1 to 6, with spines or setae on pereopods 2–6: pereopod 2, 2 small setae on posterior margin of propodus; pereopod 3, 1 spine on ischium and 2 on propodus; pereopod 4, 1 spine on ischium, 4 on merus, 2 on carpus and 3 on propodus; pereopod 5, 1 spine on ischium, 4 on merus, 3 on carpus and 3 on propodus; pereopod 6, 2 spines on ischium, 2 spines and 1 seta on merus, 3 spines and 1 seta on carpus and 3 spines on propodus (Fig. 7A–F).

Pleopods 1–4 have peduncles with coupling hooks and lamellar rami with long plumose setae. Pleopod 5 with only 1 short seta on peduncle and rami without setae (Fig. 7H–K).

Uropod rami extending beyond posterior of pleotelson; both rami subequal in length; apices of both rami rounded, with plumose setae on posterior margin (Fig. 7G).

Type-host: *Epinephelus howlandi* (Günther) (Serranidae).

Type-locality: Off Nouméa, New Caledonia.

Site: Branchial cavity.

Type-material: Female holotype (ovigerous with many manca larvae 2 in the brood pouch; TL = 37 mm), Muséum National d'Histoire Naturelle, Paris, MNHN-IS 6257, male (TL = 20 mm), MNHN-IS 6258, off Nouméa, in the centre of Récif Toombo, 22°26'10"S, 166°33'00"E, New Caledonia, 27 June 2006. Parasitological number MNHN JNC 1886.

Etymology: Epithet taken from the host genus.

Remarks

Bruce (1990) recognised 25 species of *Elthusa* Schioedte et Meinert, 1884, most of which had been previously accommo-

dated in *Livoneca* Leach, 1818. With the description of *Elthusa epinepheli* sp. nov., 29 species are now recognised. Most (25) are known from the Pacific or Indo-Pacific area and only four species are reported from the Atlantic Ocean (Trilles and Justine 2006).

Elthusa epinepheli is the third species of *Elthusa* reported from New Caledonia (the others are *E. parabothi* Trilles et Justine, 2004 and *E. arnoglossi* Trilles et Justine, 2006) and the first collected from gills of groupers of the genus *Epinephelus* (Serranidae, Epinephelinae).

Elthusa epinepheli can be considered uncommon. *Epinephelus howlandi* in New Caledonia had a surprisingly low diversity of gill parasites, with only two species of monogeneans and apparently – an exceptional fact – no copepod (Hinsinger and Justine 2006a, b). Absence of copepods and presence of this isopod suggests that some unknown biogeographical or biological feature differentiates *E. howlandi* from the other groupers in this locality.

The new species can be easily distinguished from the following five species, *Elthusa arnoglossi* Trilles et Justine, 2006, *E. nanoides* (Stebbing, 1905), *E. propinqua* (Richardson, 1904), *E. samariscii* (Shiino, 1951) and *E. sigani* Bruce, 1990, all of which are distinctly asymmetrical. The remaining species have a bilaterally symmetrical body or are only weakly asymmetrical. Of these, only two species, *Elthusa myripristae* Bruce, 1990 and *E. raynaudii* (Milne Edwards, 1840) show some similarity to *E. epinepheli*. *E. myripristae* can be easily separated by the cephalon, which has a distinct medial rostral point and pleonite 1, which is totally concealed by pereonite 7, and therefore is not visible in dorsal view. *E. epinepheli* can be separated from *E. raynaudii* by a number of characters, including: female body slightly more twisted to one side, more elongated and less ovate, pereonites 3 to 7 decreasing distinctly in width and length, pleonites increasing distinctly in width from 1 to 5, pleotelson bigger (width and length) and slightly asymmetrical, cephalon more deeply immersed in pereonite 1 and eyes almost concealed by the amphicephalic processes, antenna composed of 10 articles (11 in *E. raynaudii*), mandible palp without setae (5 and 2 setae on disto-lateral margin of articles 2 and 3 respectively in *E. raynaudii*), maxillule with 3 spines (4 in *E. raynaudii*), pereopods 5–7 with carina most pronounced forming a more prominent boss, dactyli smaller, all pleopods without coupling hooks on medial peduncle margin and endopods 3–5 with proximomedial lobe (with coupling hooks and without proximomedial lobe in *E. raynaudii*); male body with cephalon more deeply embedded in pereonite 1, pleon proportionally shorter and wider than in *E. raynaudii*, pleonite 1 more concealed by pereonite 7 and pleotelson larger and distinctly dissimilar in shape, antenna with 11 articles instead of 13, mandible palp without setae and maxillule with only 3 spines instead of 6.

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