

A new genus of leucosiid crabs (Crustacea, Decapoda, Brachyura) from the Red Sea

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ABSTRACT

A new leucosiid crab genus, *Nobiliella* n. gen., is proposed for *Nursia jousseaumei* Nobili, 1905 (type species) and *N. jousseaumei* var. *cornigera* Nobili, 1905, the latter of which should be raised to the specific rank as *Nobiliella cornigera* n. comb. *Nobiliella* n. gen. is readily distinguished from *Nursia* Leach, 1817 by the form of the carapace, the reduced mouth parts and the formula of the male abdomen. *Nobiliella* n. gen. is similar to *Philyra* Leach, 1817 in the form of the carapace, the mouth parts and the male abdomen, but is distinguished by the dorsal ridges of the carapace, the triangular tooth of the metabranchial margin and the medially concealed first segment of the female abdomen.

KEY WORDS

Crustacea,
Decapoda,
Brachyura,
Leucosiidae,
Nobiliella n. gen.,
Red Sea,
new genus.

RÉSUMÉ

Un nouveau genre de crabes Leucosiidae (Crustacea, Decapoda, Brachyura) de la mer Rouge.

Un nouveau genre de crabes Leucosiidae, *Nobiliella* n. gen., est proposé pour *Nursia jousseaumei* Nobili, 1905 (espèce type) et *N. jousseaumei* var. *cornigera* Nobili, 1905, ce dernier devant être élevé au rang spécifique : *Nobiliella cornigera* n. comb. *Nobiliella* n. gen. est aisément distingué du genre *Nursia* Leach, 1817 par la forme de la carapace, les pièces buccales réduites et la formule de l'abdomen mâle. D'autre part, *Nobiliella* n. gen. ressemble au genre *Philyra* Leach, 1817 par la forme de la carapace, les parties buccales et l'abdomen mâle, mais s'en distingue par les arêtes dorsales de la carapace, la dent triangulaire de la marge métabranchiale et le premier segment partiellement caché de l'abdomen femelle.

MOTS CLÉS

Crustacea,
Decapoda,
Brachyura,
Leucosiidae,
Nobiliella n. gen.,
mer Rouge,
nouveau genre.

INTRODUCTION

The leucosiid crab genus *Nursia* Leach, 1817 is currently composed of 17 species and four subspecies from the Indo-West Pacific waters, being mainly characterized by their distinct dorsal ridges of the carapace. However, according to Serène & Soh (1976) who established a new genus, *Paranursia*, to accommodate *N. abbreviata* Bell, 1855, *Nursia* is still heterogeneous and will have to be limited to the species of the group "A" of Ihle (1918). In this paper, as part of our revisional study of *Nursia*, we redescribe *Nursia jousseaumei* Nobili, 1905 and *N. jousseaumei* var. *cornigera* Nobili, 1905, unknown since the original descriptions (Nobili 1905, 1906) from the Red Sea and the Gulf of Aden, raise the latter to the specific rank and establish a new genus for both of these rare leucosiid crabs.

ABBREVIATIONS

Measurements, given in millimeters (mm), are of the greatest carapace length (including the posterior lobe) and breadth, respectively. The descriptive terminology generally follows Ihle (1918), with use of the abbreviations T and R for the abdominal formulae, which denote the telson and rest of the fused abdominal segments, respectively. All the specimens examined are deposited in the Muséum national d'Histoire naturelle, Paris (MNHN).

SYSTEMATICS

Family LEUCOSIIDAE Samouelle, 1819

Genus *Nobiliella* n. gen.

TYPE SPECIES. — *Nursia jousseaumei* Nobili, 1905, by present designation.

ETYMOLOGY. — The generic name is dedicated to Dr G. Nobili, who is one of the great carcinologists of Italy. Gender feminine.

OTHER SPECIES INCLUDED. — *Nursia jousseaumei* var. *cornigera* Nobili, 1905, which is raised to the specific rank in this paper.

DIAGNOSIS. — Carapace subcircular in general outline, convex dorsally, with intestinal and epibranchial ridges; margins and ridges furnished with pearly granules; frontal region moderately produced; orbit with only one fissure on dorsal roof; mesogastric region weakly convex longitudinally; gastro-cardiac region prominently raised, marked with pearly granules on pair of gastric tubercles, with prominent cardiac tubercle; intestinal region prominently raised, with median ridge; hepatic region weakly demarcated, hepatic facet developed; epibranchial margin rounded; epibranchial ridge obliquely running from near gastric tubercle to triangular tooth of metabranchial margin. Basal segment of antennule concealed. Second segment of antenna triangular, subsquamate. Endopod of maxillule reduced. Exopod of first maxilliped reduced. Exopodal flagellum of second maxilliped absent. Internal exopodal ridge of third maxilliped short. Afferent channel with weak oblique ridge; lateral margin with V-shaped notch near anterior end. Cheliped moderate; coxal condyle concealed beneath sternite in both sexes. Ambulatory legs slender; coxal condyles concealed beneath sternites in both sexes. Male abdomen with formula of 1+R+T. Female abdomen with formula of (1)+2+3+R+T; median part of first segment concealed beneath carapace. First male pleopod twisted. Second male pleopod short. Male genital pore with coxal-sternal opening.

REMARKS

Nobiliella n. gen. contains *Nursia jousseaumei* and *N. jousseaumei* var. *cornigera*, the latter of which is raised to the specific rank in this paper. *Nobiliella* n. gen. is readily distinguished from *Nursia* s.s. (type species: *N. hardwickii* Leach, 1817, which is junior synonym of *Cancer lar* Fabricius, 1798) by the absence of mesial fissure on orbital region, the concealed basal segment of antennule, the reduced endopod of maxillule, the reduced exopods of first and second maxillipeds, the fused second segment of male abdomen and the coxal-sternal opening male genital pore. *Nobiliella* n. gen. is also distinguished from the other species of *Nursia* by the abdominal formula of male being 1+R+T and the medially concealed first segment of female abdomen.

On the other hand, *Nobiliella* n. gen. is similar to *Philyra* Leach, 1817 s.s. (type species: *Leucosia globus* Fabricius, 1775) in the form of carapace, mouth parts and male abdomen and the coxal-sternal opening male genital pore, but can be distinguished from *Philyra* s.s. by the dorsal ridges on the carapace, a lateral triangular tooth on the

metabranial margin, and the medially concealed first segment of female abdomen. Among the species of *Philyra*, *P. malefactorix* (Kemp, 1915) and some species close to it are at first glance closely similar to *Nobiliella* n. gen. in the trilobate posterior margin of carapace, the fused sixth segment of male abdomen and a distal tooth of main fused section of male abdomen. However, *Nobiliella* n. gen. is distinguished by the distinct dorsal ridges on the carapace, the gastric tubercles covered with pearly granules, the absence of vertical row of setae on the ischium-merus of third maxilliped and the medially concealed first segment of female abdomen.

Nobiliella n. gen. is also similar to *Praosia* Tan & Ng, 1993, however, it is distinguished by the following features: 1) the carapace has one median longitudinal ridge, whilst that of *Praosia* has four longitudinal ridges; 2) the second and sixth segments of male abdomen are fused, whilst those of *Praosia* are divided; and 3) the first segment of female abdomen is medially concealed, whilst that of *Praosia* is exposed.

Nobiliella jousseumei (Nobili, 1905) n. comb.
(Figs 1; 2; 4A-D)

Nursia jousseumei Nobili, 1905: 398 (type locality: Red Sea and Perim); 1906: 151, pl. 9(4).

TYPE MATERIAL. — Designated here as lectotype series; Red Sea and Perim, coll. Dr Jousseume, 1892; lectotype, ovig. ♀ 6.7 × 7.5 (MNHN B 17008); allolectotype, ♂ 5.9 × 6.6 (MNHN B 28616); paralectotypes, 1 ♂ 5.9 × 6.6, 1 young ♂ 5.1 × 5.7, 3 ovig. ♀ 6.5 × 7.3-8.2 × 9.4, 2 ♀ 7.5 × 8.4, 8.2 × 9.4, 5 young ♀ 3.8 × 4.3-5.7 × 6.4 (MNHN B 28617); 1 ovig. ♀ 6.4 × 7.0 (NSMT-Cr 15530); Obock, 1892, coll. Dr Jousseume, 1 young ♀ 3.6 × 4.0 (MNHN B 17009).

DISTRIBUTION. — Red Sea; Gulf of Aden-Perim (Yemen), Obock (Djibouti).

REDESCRIPTION

Carapace (Fig. 1A) subcircular in general outline, 1.1 times broader than long, strongly convex dorsally at center of carapace, armed with median and epibranchial ridges, ridges furnished with pearly granules; margin rimmed with beaded line except frontal region; upper surface see-

ingly smooth, but entirely covered with microscopic flat granules. Front moderately produced, concave medially on dorsal surface; margin subtruncate, with median small tooth. Orbit with only one fissure on roof (mesial fissure absent). Mesogastric region longitudinally convex for its broad part, with shallow median groove. Gastrocardiac region prominently raised; gastric region covered with pearly granules on both sides; cardiac region with median prominent tubercle, tubercle marked with several pearly granules. Intestinal region dorsally prominent, with median row of pearly granules, weakly pointed and marked with some pearly granules around apex. Hepatic region weakly demarcated; margin slightly concave inwards, separated from epibranchial margin by small V-shaped notch; hepatic facet developed, medially concave, with horizontal suture along ventral third. Pterygostomian margin ventrally projecting, concealed beneath hepatic region at posterior end. Epibranchial region sloping anteriorly from epibranchial ridge; margin thin, weakly upturned, roundly convex antero-laterally; epibranchial ridge conspicuous, obliquely extending from near gastric granules to triangular tooth of metabranial margin, furnished with pearly granules; metabranial region deeply concave between epibranchial ridge and median elevation; margin almost straight, converging, thin, with small triangular tooth at anterior end. Posterior margin weakly trilobate, thin; median tooth broadest; lateral lobe continuous to metabranial margin.

Ocular peduncle (Fig. 1B) short; antero-dorsal extension onto cornea rectangular with rounded tip. Antennule somewhat obliquely folded in fossa, basal segment concealed. Basal segment of antenna transversely ovate; second segment triangularly subsquamate, fused with infraorbital lobe, but separated by shallow groove, sparsely covered with microscopic granules. Afferent channel with weak oblique ridge, with short setae along ridge; lateral margin with V-shaped notch near anterior end.

Mandible (Fig. 2A, B) well calcified; cutting edge triangular in outline, pointed medially, finely

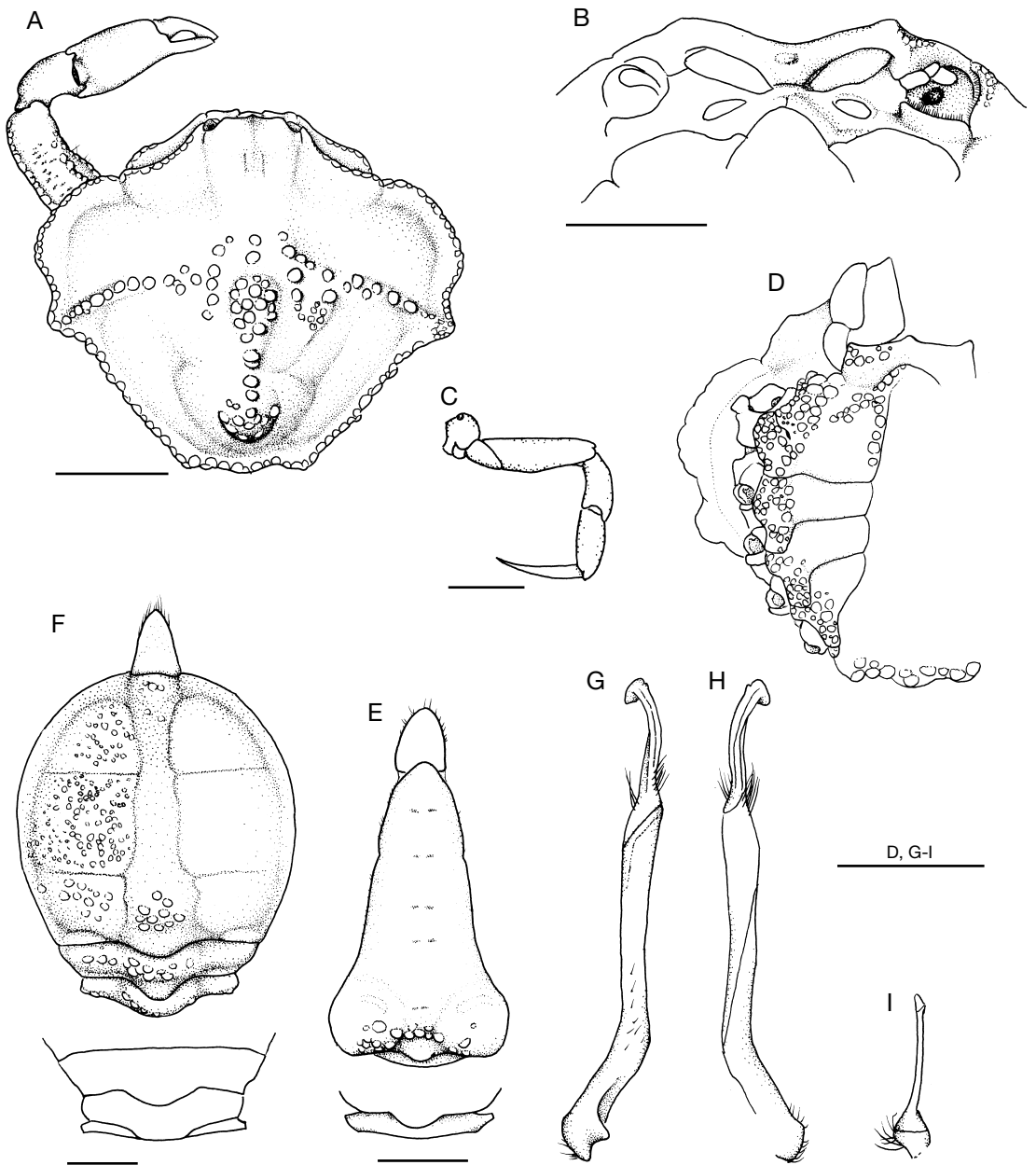


FIG. 1. — *Nobiliella jousseaumei* (Nobili, 1905) n. comb.; **A-C, F**, lectotype, ovig. ♀ 6.7 × 7.5 mm (MNHN B 17008) from Red Sea and Perim; **D, E, G-I**, allotype, ♂ 5.9 × 6.6 mm (MNHN B 28616) from Red Sea and Perim; **A**, carapace, dorsal view; **B**, frontal region, frontal view; **C**, right third ambulatory leg, dorsal view; **D**, male sternites, ventral view; **E**, male abdomen, ventral view; **F**, female abdomen, ventral view; **G**, right first male pleopod, external view; **H**, same, internal view; **I**, right second male pleopod, external view. Scale bars: A, D, 2 mm; B, 0.5 mm; C, E-I, 1 mm.

dentate on anterior 0.2; endopod palp three-segmented; terminal segment fringed with short setae. Maxillule (Fig. 2C): coxal endite subcylindrical, directed mesially, with some terminal setae; basal endite triangular, with stout setae and thin setae on mesial margin; endopod reduced. Maxilla (Fig. 2D): coxal and basal endites and endopod missing; exopod (scaphognathite) longitudinally expanded into ovate structure, entirely fringed with short plumose setae. First maxilliped (Fig. 2E): coxal endite semiglobular, with dense plumose setae; basal endite lobular, expanded into triangular structure, fringed with long plumose setae; endopod lobular, longitudinally expanded, fitting in efferent channel, highly plicate on upper surface, with long setae along plication; anterior margin of endopod fringed with short plumose setae; exopod reduced, about half as long as endopod, filiform, with some subterminal, long plumose setae, without flagellum. Second maxilliped (Fig. 2F): ischium with long plumose setae along inner margin; merus with long simple setae along inner margin, with short simple setae along outer margin; propodus with distally denticulate setae along outer margin; dactylus fringed with stout setae around tip; exopod filiform, tapering distally, with long plumose setae on distal portion of mesial margin, without flagellum.

Third maxilliped (Fig. 2G, H) almost flat, smooth, with very sparse granules; basis completely fused, but with vestigial suture on internal surface; merus slightly bent dorsally, as long as ischium along mesial margin; dactylus with distally denticulate, subterminal setae; exopod subsquamate, with longitudinal row of granules along midline, arcuate and rimmed with short plumose setae along lateral margin, internal exopodal ridge short, exceeding beyond ischial-meral border; epipod reduced; podobranch vestigial.

Cheliped (Fig. 1A) moderate; coxal condyles concealed beneath sternites in both sexes; merus weakly compressed, covered with pearly granules except upper surface and distal half of lower surface, outer margin slightly convex outwards; carpus short, convex dorsally, sloping outwards,

covered with microscopic granules around inner and outer margins; palm convex dorsally, convex outwards in proximal half of inner margin, with submarginal, ridged row of small granules along inner margin, inner and outer margins rimmed with small granules; fingers tapering distally, 0.7–0.8 time as long as palm along outer margin; cutting edges blunt and ovally gaping for proximal 0.7, thin and meeting for distal 0.3.

Ambulatory legs (Fig. 1C) similar in shape, gradually decreasing in length from first to fourth, covered with microscopic granules; coxal condyles completely concealed beneath carapace in both sexes; meri, carpi and propodi subcylindrical; dactyli subconical, slightly incurved, with simple acute tips.

Male thoracic sternites as in Figure 1D; episternites not divided entirely, coarsely covered with pearly granules of various sizes; first to fourth sternites fused together; first sternite divided from second by transverse groove; sutures between fourth and fifth sternites to seventh and eighth sternites interrupted medially; abdominal cavity reaching to medial portion of first segment, ridged on margin at first sternite; margin rimmed with pearly granules along first to fourth sternites.

Female thoracic sternites covered with closely-set, flattened, round granules of various sizes; first sternite divided from second by deep groove; second to fourth sternites fused together; abdominal cavity reaching to buccal cavern; margin of abdominal cavity weakly ridged along first sternite.

Male abdomen (Fig. 1E) appears smooth, but actually entirely covered with inconspicuous flat granules, with formula of 1+R+T; first segment short, transversely subrectangular; main fused section composed of second to sixth segments, elongate trapezoidal, weakly swollen at both sides of proximal fourth, sulcate between swells, roundly convex proximally at median part of proximal margin, with pearly granules around proximal margin, with small notch at remnant border between fifth and sixth segments on lateral margin; distal margin of main section triangularly protruded, slightly hooked at tip; telson tongue-shaped, fringed with very short setae.

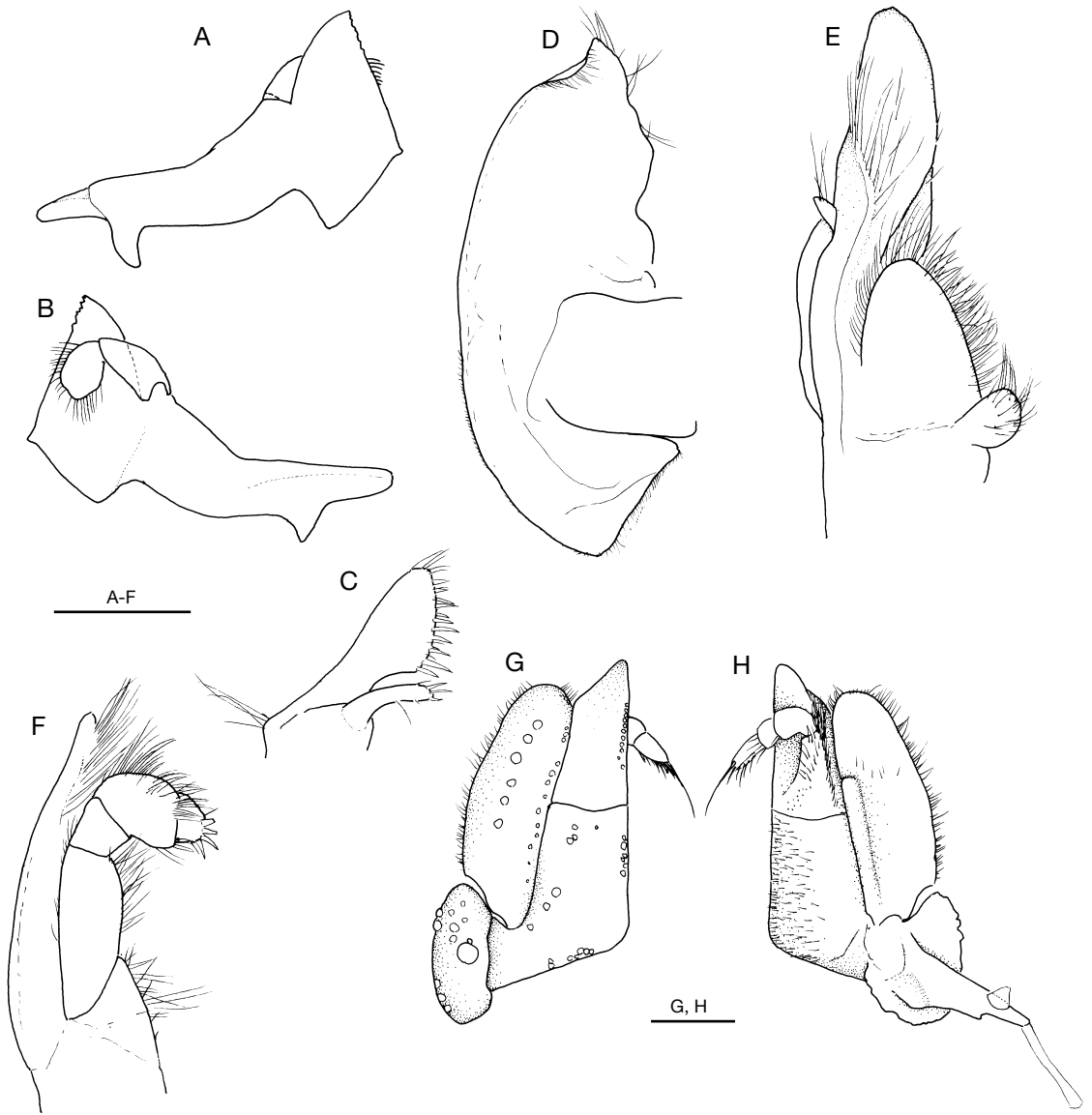


FIG. 2. — *Nobiliella jousseaumei* (Nobili, 1905) n. comb., allolectotype, ♂ 5.9 × 6.6 mm (MNHN B 28616) from Red Sea and Perim; **A**, mandible, external view; **B**, same, internal view; **C**, maxillule, external view; **D**, maxilla, external view; **E**, first maxilliped, external view; **F**, second maxilliped, external view; **G**, third maxilliped, external view; **H**, same, internal view. Scale bars: 0.5 mm.

Female abdomen (Fig. 1F) entirely covered with inconspicuous flat granules, with formula of (1)+2+3+R+T; first segment very short, transversely subrectangular, medially concealed beneath carapace; second and third segments short, transversely subrectangular, medially convex posteroventrally, covered with pearly granules, proximal

margins medially convex proximally; main fused section composed of fourth to sixth segments, ovate, moderately convex ventrally, shallowly sulcate along midline, but evenly convex at proximal and distal portions of sulcus, with two transverse sutures between remnant segments, sutures interrupted medially and marginally; telson elongate

tongue-shaped, pointed at tip, fringed with short setae.

First male pleopod (Fig. 1G, H) slender, calcareous in proximal 0.7, translucent in distal 0.3, with aperture on proximal 0.2 of mesial margin; distal 0.3 narrowed, with long setae on proximal part; tip curving laterally, broadened, lobular, with small notch on mesial margin. Second male pleopod (Fig. 1I) short, filiform, about 0.3 time as long as first one; tip triangular. Male genital pore with coxal-sternal opening

REMARKS

Nursia jousseaumei was originally and subsequently described by Nobili (1905, 1906) on the basis of 10 males and nine females which are heterocollection from the Red Sea and Perim and one male from Obock. However, only 15 specimens from Red Sea and Perim are extant, and the material from Obock is actually a young female.

The lectotype series of *N. jousseaumei* and *N. jousseaumei* var. *cornigera* are designated to fix the taxonomy of two closely allied species and to stabilize their nomenclature. Comparison of these two species is shown in the Remarks section of *Nobiliella cornigera* n. comb.

Nobiliella cornigera (Nobili, 1905) n. comb.
(Figs 3; 4E, F)

Nursia jousseaumei var. *cornigera* Nobili, 1905: 398 (type locality: Red Sea); 1906: 152.

TYPE MATERIAL. — Designated here as lectotype series; Red Sea, coll. Dr Jousseume, 1891; lectotype, ♀ 4.3 × 5.2 (MNHN B 17010); paralectotypes, 2 ovig. ♀♀ 4.1 × 4.9, 4.4 × 5.8 (broken at frontal region in larger one) (MNHN B 28618).

DISTRIBUTION. — Red Sea.

REDESCRIPTION

Carapace (Fig. 3A) subrhomboidal in general outline, 1.2–1.3 times broader than long, strongly convex dorsally at center of carapace, armed with median and epibranchial ridges, ridges furnished with pearly granules; margin rimmed with beaded line except frontal region; upper surface seemingly

smooth, but entirely covered with microscopic flat granules. Front moderately produced, medially concave; margin divided into two lobes. Orbit bears only one fissure on dorsal roof, without mesial fissure. Mesogastric region weakly convex longitudinally, shallowly grooved medially. Gastro-cardiac region prominently raised, with pair of gastric low tubercles and cardiac tubercle; gastric tubercles marked with pearly granules; cardiac tubercle prominent, marked with pearly granules. Intestinal region strongly prominent dorsally, with median row of pearly granules, pointed and marked with pearly granules around apex. Hepatic region weakly demarcated; margin concave inwards, separated from epibranchial margin by small V-shaped notch; hepatic facet developed, medially concave behind orbit. Pterygostomian margin projecting antero-ventrally, angled at posterior end. Epibranchial region sloping anteriorly from epibranchial ridge; margin thin, weakly upturned, rounded, strongly convex antero-laterally; epibranchial ridge conspicuous, obliquely extending from near gastric tubercle to triangular tooth of metabranchial margin, furnished with pearly granules; metabranchial region deeply concave between epibranchial ridge and median elevation; margin almost straight, converging, thin, with large triangular tooth at anterior end. Posterior margin weakly trilobate, forming obtuse angle with metabranchial margin; median lobe small; lateral lobes large, triangular.

Ocular peduncle (Fig. 3B) short; antero-dorsal extension onto cornea rectangular, with rounded tip. Antennule obliquely folded in fossa, basal segment concealed. Basal segment of antenna transversely ovate; second segment triangularly subsquamate, fused with infraorbital lobe, but separated by shallow groove. Afferent channel with weak oblique ridge, with short setae along ridge; lateral margin with V-shaped notch near anterior end.

Mandible (Fig. 3C, D) well calcified; cutting edge triangular in outline, pointed medially, finely dentate on anterior 0.2; endopod palp missing. Maxillule (Fig. 3E): coxal endite subcylindrical, directed mesially, with some terminal setae; basial endite triangular, with stout setae and thin setae

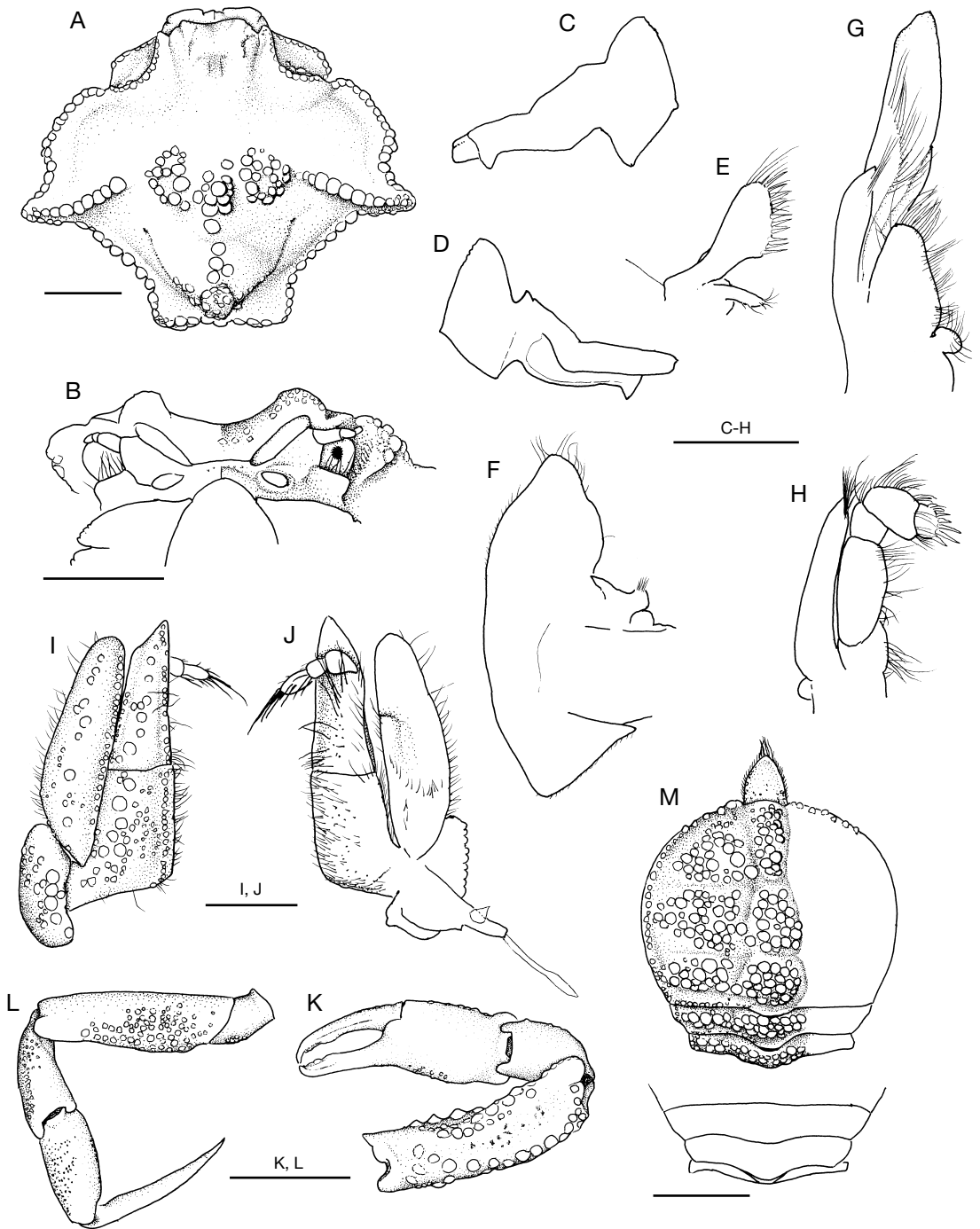


FIG. 3. — *Nobiliella cornigera* (Nobili, 1905) n. comb., lectotype, ♀ 4.3 × 5.2 mm (MNHN B 17010) from Red Sea; **A**, carapace, dorsal view; **B**, frontal region, frontal view; **C**, mandible, external view; **D**, same, internal view; **E**, maxillule, external view; **F**, maxilla, external view; **G**, first maxilliped, external view; **H**, second maxilliped, external view; **I**, third maxilliped, external view; **J**, same, internal view; **K**, cheliped, dorsal view; **L**, left ambulatory leg, dorsal view; **M**, female abdomen, ventral view. Scale bars: A, K-M, 1 mm; B-J, 0.5 mm.

on mesial margin; endopod reduced. Maxilla (Fig. 3F): coxal endite small, rounded; basal endite rounded, with some terminal setae; endopod triangular, directed laterally; exopod (scaphognathite) longitudinally expanded into ovate structure, entirely fringed with short plumose setae. First maxilliped (Fig. 3G): coxal endite semiglobular, with dense plumose setae; basal endite lobular, expanded into triangular structure, fringed with long, plumose setae; endopod lobular, longitudinally expanded, fitting in efferent channel, highly plicate on upper surface, with long setae along plication; exopod reduced, about half as long as endopod, longitudinally filiform, with long subterminal, plumose setae, without flagellum. Second maxilliped (Fig. 3H): endopod with long plumose setae along inner margins of ischium and merus, with short submarginal setae along lateral margin of merus of internal surface, with denticulate setae along outer margin of propodus, dactylus fringed with stout setae around tip; exopod filiform, tapering distally, with long plumose setae on distal portion of mesial margin, without flagellum.

Third maxilliped (Fig. 3I, J) almost flat, covered with granules of various sizes, rimmed with small round granules along mesial margins of ischium, merus and exopod; basis completely fused, but with vestigial suture on internal surface; ischium longitudinally convex in lateral 0.7, with longitudinal row of pearly granules on convexity; merus slightly bent dorsally, 1.3 times longer than ischium along mesial margin, convex medially, with row of sparse pearly granules along midline; dactylus with distally denticulate, subterminal setae; exopod subsquamate, with longitudinal row of sparse pearly granules along midline, arcuate and rimmed with short plumose setae along lateral margin; internal exopodal ridge short, exceeding beyond ischial-meral border; epipod reduced; podobranch vestigial.

Cheliped (Fig. 3K) moderate, as long as carapace in female; coxal condyle concealed beneath sternite in female; merus subcylindrical, covered with pearly granules except upper surface, slightly arcuate on outer margin, subflat on upper surface; carpus short, convex dorsally, sloping out-

wards, covered with microscopic granules around outer margin; palm convex dorsally, convex outwards on inner margin, rimmed with small granules along inner and outer margins; fingers tapering distally, as long as palm along outer margin; cutting edges blunt and leaving oval gape for proximal 0.7, thin, finely dentate and meeting along distal 0.3.

Ambulatory legs (Fig. 3L) similar in shape, gradually decreasing in length from first to fourth, covered with microscopic granules; coxal condyles completely concealed beneath carapace in female; meri and carpi subcylindrical; propodi weakly compressed; dactyli subconical, slightly incurved, with simply acute tips.

Female thoracic sternites covered with closely-set, round granules of various sizes; first sternite divided from second sternite by transverse groove; second to fourth sternites fused together; abdominal cavity reaching to buccal cavern.

Female abdomen (Fig. 3M) entirely covered with round flat granules except on grooves, with formula of (1)+2+3+R+T; first segment very short, transversely subrectangular, medially concealed beneath carapace; second and third segments short, transversely subrectangular, medially convex, covered with pearly granules, proximal margins weakly convex medially; main fused section composed of fourth to sixth segments, ovate, moderately convex, divided into subregions by two longitudinal and three transverse shallow grooves, its margins rimmed with small round granules; telson elongate tongue-shaped, pointed at tip, fringed with short setae.

REMARKS

Nursia jousseaumei var. *cornigera* can easily be distinguished from *N. jousseaumei* s.s. by the following features: 1) the frontal margin divided into two lobes, whereas that of *N. jousseaumei* s.s. is subtruncate with small median tooth; 2) the triangular tooth of metabranchial margin is larger than that of *N. jousseaumei* s.s.; 3) the lateral lobe of posterior margin is distinctly triangular, whereas that of *N. jousseaumei* s.s. is small; and 4) the female abdomen is covered with round flat granules, whereas that of *N. jousseaumei* s.s. is

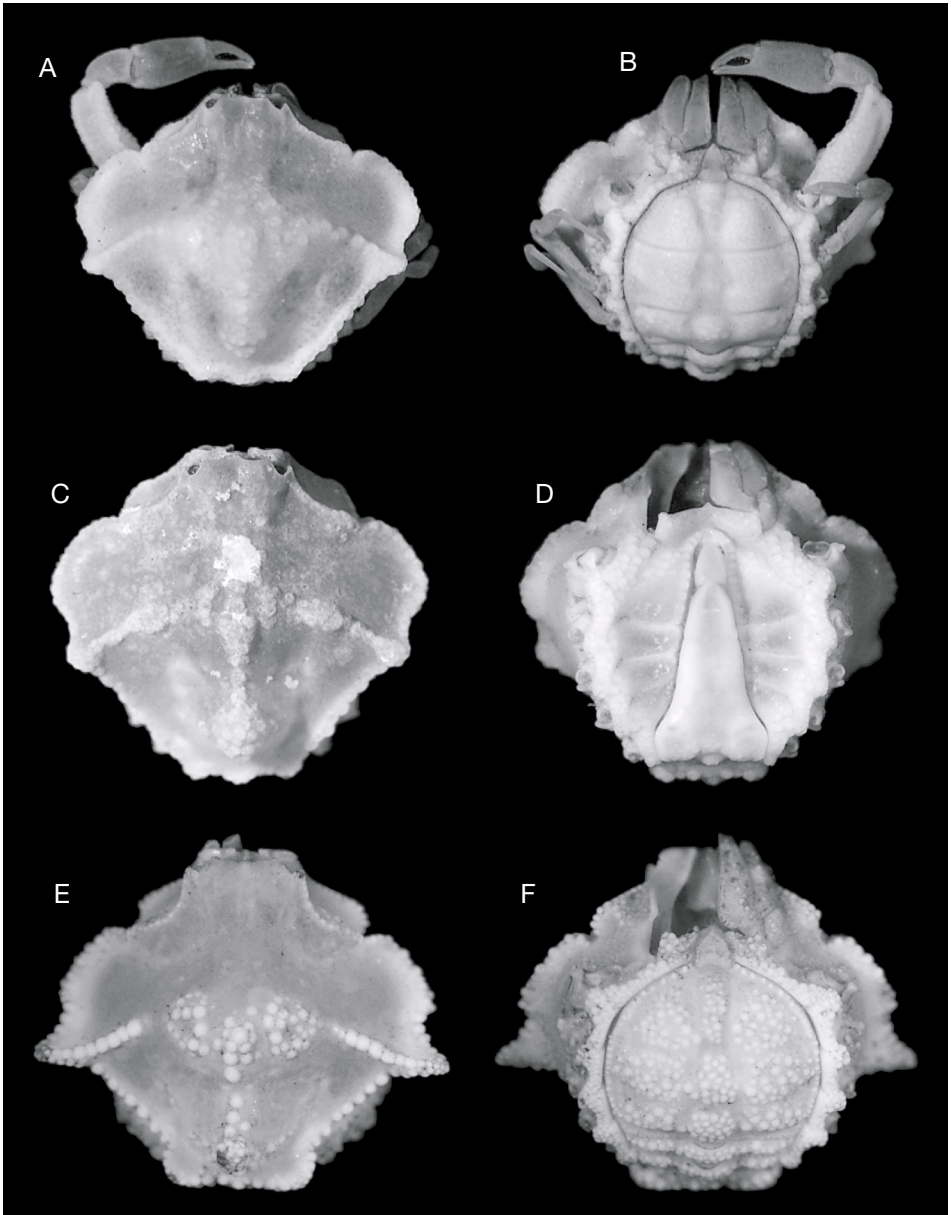


FIG. 4. — **A-D**, *Nobiliella jousseaumei* (Nobili, 1905) n. comb.; **A, B**, lectotype, ovig. ♀ 6.7 × 7.5 mm (MNHN B 17008) from Red Sea and Perim in dorsal and ventral views; **C, D**, allolectotype, ♂ 5.9 × 6.6 mm (MNHN B 28616) from Red Sea and Perim in dorsal and ventral views; **E, F**, *Nobiliella cornigera* (Nobili, 1905) n. comb., lectotype, ♀ 4.3 × 5.2 mm (MNHN B 17010) from Red Sea in dorsal and ventral views.

covered with inconspicuous flat granules. We thus believe that it should be recognized as a distinct species.

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