Title	Records of three species of callianassid ghost shrimp from the genera Glypturus Stimpson, 1866 and Corallianassa Manning, 1987 (Crustacea: Decapoda: Axiidea) from the Ryukyu Islands, Japan, with remarks on the taxonomic status of the two genera
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Records of three species of callianassid ghost shrimp from the genera *Glypturus* Stimpson, 1866 and *Corallianassa* Manning, 1987 (Crustacea: Decapoda: Axiidea) from the Ryukyu Islands, Japan, with remarks on the taxonomic status of the two genera

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Abstract. Three callianassid ghost shrimp species from the two genera, *Glypturus armatus* (A. Milne-Edwards, 1870), *Corallianassa borradailei* (De Man, 1928a) and *C. martensi* (Miers, 1884), are reported from the Ryukyu Islands, southern Japan; of them *G. armatus* and *C. borradailei* are new to the Japanese fauna. These three species occur in easily accessible intertidal to shallow subtidal soft sediments. Detailed descriptions of them are given for better understanding of the diagnostic characters for species recognition. Some points of taxonomic confusion relating to the three species are clarified. The validity of *C. borradailei* is confirmed, although the taxon has been generally regarded as a junior synonym of *C. coutierei* (Nobili, 1904). The synonymy of *Callianassa* (*Callichirus*) *nakasonei* Sakai, 1967 with *C. martensi* is confirmed. A taxonomic overview on *Glypturus* Stimpson, 1866, *Corallianassa* Manning, 1987 and *Corallichirus* Manning, 1992 is provided. Potential diagnostic characters of *Glypturus* and *Corallianassa* are discussed.

Introduction

Callianassid ghost shrimps represent a major component of the deeply burrowing infauna in shallow coastal soft sediments, but their faunal documentation in the Ryukyu Islands, southern Japan, remains far from complete in spite of expected high species richness and ecological importance (cf. Dworschak 2000, 2005; Dworschak et al. 2012). Recent collections made by the authors, using suction pumps (yabby pumps), have revealed the presence of species previously unknown from the area (e.g., Komai & Fujita 2014; Komai, Fujita & Maenosono 2014; Komai, Maenosono & Fujita 2014). In this study, three species from the two genera of the subfamily Callichirinae Manning & Felder, 1991, *Glypturus* Stimpson, 1866 and *Corallianassa* Manning, 1987, are reported: *Glypturus armatus* (A. Milne-Edwards, 1870), *Corallianassa borradailei* (De Man, 1928a), and *C. martensi* (Miers, 1884). All species occur in the easily accessible intertidal to shallow subtidal zone at low tide, and *G. armatus* and *C. borradailei* are formally recorded from Japanese waters for the first time.

The taxonomic status of *Glypturus*, *Corallianassa* and *Corallichirus* Manning, 1992 has been subject to debate. Since the establishment of *Corallianassa* by Manning (1987), many researchers working on the callianassid taxonomy have accepted *Corallianassa* as a valid genus (e.g., Manning & Felder 1991; Manning 1992; Dworschak 1992, 2013, 2014; Poore 1994, 2004, 2008; Hernández-Aguilera 1998; Abed-Navandi 2000; Tudge et al. 2000; Kensley 2001; Ngoc-Ho 2002, 2005; De Grave et al. 2009; Felder & Robles 2009; Dworschak et al. 2012; Hyžný & Müller 2012; Santos et al. 2012; Sepahvand et al. 2013), while K. Sakai consistently regarded *Corallianassa* as a junior synonym of *Glypturus* in his recent publications (Sakai 1999, 2005, 2011). Since establishment by Manning (1992), *Corallichirus* had been accepted by several workers (e.g., Poore 1994; Tudge et al. 2000; Kensley 2001), but recent authors (e.g., De Grave et al. 2009; Dworschak 2013, 2014) have followed the proposal by Ngoc-Ho (2005) to synonymize *Corallichirus* with *Corallianassa*. Sakai (2011) resurrected *Corallichirus* as a valid genus, although the concept of the genus was greatly changed from the original.

In this study, an overview on the taxonomic history regarding the three genera is provided. We accept the taxonomic action by Ngoc-Ho (2005) in recognizing *Glypturus* and *Corallianassa* to be distinct while synonymizing *Corallichirus* under *Corallianassa*. Examination of the present material has revealed that many minor but important characters have not been properly described for these three species, and detailed descriptions accompanied with many illustrations are provided for a better

understanding of the diagnostic characters of them. Characters potentially useful in diagnosing *Glypturus* and *Corallianassa* are also discussed.

Material and methods

Most specimens from intertidal or shallow subtidal sediments were extracted with a stainless steel yabby pump (Alvey Co. Ltd.). Specimens were chilled on iced seawater or kept in freezers before they were preserved in 75% ethanol. Material used in this study is deposited in the following museums: Florida Museum of Natural History, University of Florida, Gainesville (FMNH UF), USA; Kitakyushu Museum of Natural History and Human History (KMNH), Kitakyushu, Japan; Natural History Museum and Institute, Chiba (CBM), Japan; the University Museum, Fujukan, University of the Ryukyus (RUMF), Japan. Size is expressed as carapace length (cl), measured from the tip of the rostrum to the midpoint of the posterodorsal margin of the carapace.

In this study, the structure of the fourth pereopod is referred to "semichelate", instead of "subchelate", in reference to McLaughlin (1997: 435). Generally in callianassids, the development and/or structure of the first and second pleopods is different according to the sex (e.g., Sakai 1999, 2011; Dworschak et al. 2012), whereas the third to fifth pleopods are generally similar between male and female. Consequently, in the following descriptions, similarities in the third to fifth pleopods between male and female are not particularly mentioned.

Clarification of the structure of anterolateral spines on the carapace of species assigned to *Glypturus* or *Corallianassa* would be necessary. In previous references, the anterolateral spines on the carapace in species assigned to these two genera were often described as articulated to or separated from the carapace by a decalcified membrane (e.g., Manning 1987, 1988; Dworschak 1992; Abed-Navandi 2000; Sakai 1999, 2005). The presence of such a membrane at the base of the anterolateral spine was considered to be of generic significance diagnosing *Glypturus* and/or *Corallianassa* (e.g., Manning 1987; Sakai 1999), but intraspecific variation in the presence or absence of the decalcified part has been reported in species having well-developed anterolateral spines, e.g., *G. armatus* (cf. Poore & Suchanek 1988, as *G. motupore* Poore & Suchanek, 1988) and *Neocallichirus vigilax* (De Man, 1916) (cf. Dworschak 2011). During this study, we confirmed that the basal parts of the anterolateral spines in *C. borradailei*, *C. martensi* and *C. assimilis* are often chitinous but always rigid, and not membranous or hinge-like. There is no real articulation between these spines and the carapace. Furthermore, the degree of decalcification varies individually in these three *Corallianassa* species, as well as in *G. armatus*.

For comparison, the following material was examined.

Corallianassa assimilis (De Man, 1905): North of Alutom Island, Agat Bay, Guam, Mariana Islands, 5 m, fore reef, coral rubble, 15 November 2000, coll. H. Conley, 4 females (cl 6.0–8.7 mm), 2 ovigerous females (cl 8.7, 8.8 mm), FMNH UF 41.

Corallianassa coutierei (Nobili, 1904): Kadamath Island, Lakshadweep, southwestern India, intertidal, June 2015, coll. A. Biju Kumar, 1 ovigerous female (cl 15.7 mm), will be deposited in the Western Ghat Regional Centre, the Zoological Survey of India.

Overview on the taxonomy of the genera *Glypturus*, *Corallianassa* and *Corallichirus*

The historical transition of the composition of *Glypturus*, *Corallianassa* and *Corallichirus* is extremely complicated, as summarized in Table 1. An overview of major references relating to these three genera is given below.

Glypturus was originally established by Stimpson (1866) with the type species *G. acanthochirus* Stimpson, 1866, along with *Callichirus* Stimpson, 1866. These two genera, however, had been considered synonyms of *Callianassa* Leach, 1814 or as subgenera of *Callianassa* (e.g., Borradaile 1903; Schmitt 1935; Biffar 1971). Later, *Callichirus* was recognized as a valid genus distinct from *Callianassa* (de Saint Laurent & Le Loeuff 1979; Manning & Felder 1986). Manning (1987) redefined *Glypturus* as a distinct genus, providing a proper diagnosis. The primary characters diagnosing *Glypturus* were: the sharply pointed, upturned rostrum; the anterolateral spines of the carapace each separated from the carapace by a non-calcified membrane; the merus and palm of each cheliped armed with spines on the dorsal margins. Manning (1987) recognized only *G. acanthochirus* in *Glypturus* with *Callianassa armata* synonymized with the type species, though he listed four other Indo-West Pacific species that were possibly attributable to *Glypturus*: *Callianassa* (*Callichirus*) *nakasonei* Sakai, 1967; *Callichirus intesi* de Saint Laurent & Le Loeuff, 1979; *Callianassa haswelli* Poore & Griffin, 1979; and *Callichirus laurae* de Saint Laurent, in de Vaugelas & de Saint Laurent, 1984. He hesitated to formally assign the latter four

Table 1. Summary of transition of generic assignments of species assigned to *Glypturus* or *Corallianassa* in selected major references. Fossil species are not considered.
表 1. トゲスナモグリ属とホソスナモグリ属に帰属する種の属の変遷の要約. 化石種は考慮していない.

References/Genus	*Glypturus*	*Corallianassa*	*Corallichirus*
Manning (1987)	*G. acanthochirus* (= *G. armatus*)	*C. borradailei* (= *C. oahuensis*), *C. longiventris*	
Manning (1988)	Not mentioned.	*C. borradaiei*, *C. hartmeyeri*, *C. longiventris*, *C. placida*, *C. xutha*	
Poore & Suchanek (1988)	*G. acanthochirus*, *G. armatus*, *G.laurae*, *G. motupore*	Not mentioned	
Sakai (1988)	*G. acanthochirus*, *G. collaloy*, *G. martensi* (= *C. haswelli*), *G. mucronatus*, *G. karumba*	Not mentioned	
Manning & Felder (1991)	*G. acanthochirus*, *G. armatus*, *G. laurae*, *G. motupore*	*C. borradailei*, *C. hartmeyeri*, *C. longiventris*, *C. placida*, *C. xutha*	
Manning (1992)	Not mentioned	*C. borradailei*, *C. longiventris*	*C. hartmeyeri*, *C. placidus*, *C. xuthus*
Sakai (1999)	*G. acanthochirus*, *G. armatus* (= *G. laurae*), *G. articulatus*, *G. assimilis*, *G. coutierei* (= *C. borradailei*, *C. placida*, *C. oahuensis*), *G.hartmeyeri*, *G. haswelli*, *G. intesi*, *G. lanceolatus*, *G. longiventris*, *G. martensi* (= *C. nakasonei*), *G.winslowi*, *G. xuthus*.	Synonym of *Glypturus*	Synonym of *Glypturus*
Tudge et al. (2000)	*G. acanthochirus*, *G. armatus*, *G.karumba*, *G. laurae*, *G. martensi*, *G. motupore*, *G. mucronata*	*C. articulata*, *C. borradailei*, *C. collaroy*, *C. longiventris*	*C. hartmeyeri*, *C. placidus*, *C. tridentatus*, *C. xuthus*
Ngoc-Ho (2005)	*G. acanthichirus*, *G. armatus* (= *G. motupore*), *G. laurae*	*C. coutierei* (= *C. placida*), *C. longiventris*, *C. xutha*	Synonym of *Corallianassa*
Sakai (2005)	*G. acanthochirus*, *G. armatus* (= *G. laurae*), *G. articulatus*, *G. assimilis* (= *C. bayeri*), *G. collaroy*, *G. coutierei* (= *C. placida*, *C. borradailei*, *C. oahuensis*), *G. intesi*, *G. hartmeyeri*, *G. haswelli*, *G. lanceolatus*, *G. longiventris*, *G. martensi* (= *C. nakasonei*), *G. winslowi*, *G. xuthus*, *G. rabalaisae* (nomen nudum)	Synonym of *Glypturus*	Synonym of *Glypturus*
Sakai (2011)	*G. acanthichirus*, *G. armatus* (= *G. laurae*, *G. motupore*), *G. articulatus*, *G. assimilis* (= *C. bayeri*), *G. borradailei*, *G. collaroy*, *G. haswelli*, *G. lanceolatus* (= *C. nakasonei*), *G. longiventris* (= *C. coutierei*, *C. placida, C. hartmeyeri, C. oahuensis*), *G. martensi*, *G. rabalaisae* (nomen nudum)	Synonym of *Glypturus*	*C. bayeri*, *C. intesi*, *C. xuthus*
This study	*G. acanthochirus*, *G. armatus* (= *G. motupore*), *G. laurae*	*C. articulata*, *C. assimilis* (= *C. bayeri*), *C. borradailei* (= *C. oahuensis*), *C. collaroy*, *C. coutierei* (= *C. placida*), *C. haswelli*, *C. hartmeyeri*, *C. intesi*, *C. lanceolata*, *C. longiventris*, *C. martensi* (= *C. nakasonei*), *C. winslowi*, *C. xutha*	Synonym of *Corallianassa*

taxa to *Glypturus*, because they differ from the type species primarily in having the anterolateral spines not separated from the carapace by a non-calcified membrane. In the same article, the new genus *Corallianassa* (gender feminine) was established for two species, *Callianassa longiventris* A. Milne-Edwards, 1870 (type species) and *Callianassa borradailei* De Man, 1928a (with *Callianassa oahuensis* Edmondson, 1944 as a junior synonym). The primarily diagnostic characters for *Corallianassa* included "the large eyes, with a large, well formed, distinct cornea, three-spined front, with the anterolateral spines distinctly articulated, the chelipeds with a cristate carpus and propodus, and the long second abdominal somite" (Manning 1987: 394).

Manning (1988) clarified the identity of *Callianassa hartmeyeri* Schmitt, 1935, referring the species to *Corallianassa*. The eastern Pacific specimens previously identified with *Callianassa hartmeyeri* or *C. placida* De Man, 1928b (cf. Hult 1938; Chace 1962; Hernándes Aguilera et al. 1986) were referred to a new species, *Corallianassa xutha* Manning, 1988. Manning recognized the following five specific taxa in *Corallianassa*, viz., *C. borradailei*, *C. hartmeyeri*, *C. longiventris*, *C. placida* and *C. xutha*, and presented a key for identification of them.

Poore & Suchanek (1988), who described a new species *Glypturus motupore*, disagreed with the synonymization of *C. armata* with *G. acanthochirus* proposed by Manning (1987), recognizing them as separate species of *Glypturus* together with *Callichirus laurae*. They accepted the definition of *Glypturus* by Manning (1987), but suggested that the presence or absence of non-calcified part of the anterolateral spines of the carapace is not so important in diagnosing *Glypturus* in light of other morphological similarities exhibited by the four taxa.

Sakai (1988) assigned the following four Australian species to *Glypturus*: *Callianassa collaroy* Poore & Griffin, 1979, *C. martensi* Miers, 1884 (with *C. haswelli* Poore & Griffin, 1979 as a junior synonym), *C. mucronatus* Strahl, 1862, and *C. karumba* Poore & Griffin, 1979. He (on page 53) stated Manning (1987) "distinguished *Glypturus* from the all the other callianassid genera by the combination of characters such as chelipeds, rostrum, lateral rostral spines and the cornea, however the chelipeds of *Callianassa* sensu lato are known to be sexually dimorphic (Poore 1975: 205), so it seems that the characters of rostrum, lateral rostral spines and cornea are not so homogeneous in the respective genera." Poore (on page 61) gave a brief generic diagnosis for *Glypturus*, but did not provide further comments or justification about his classification.

Manning & Felder (1991) recognized four taxa in *Glypturus*, viz., *G. acanthochirus*, *G. armatus*, *G. laurae* and *G. motupore*, following Poore & Suchanek (1988); three American species, *C. longiventris*, *C. hartmeyeri* and *C. xutha*, as well as the two Indo-West Pacific taxa, *C. borradailei* and *C. placida*, were assigned to *Corallianassa*.

Dworschak (1992) reported on two species of *Corallianassa*, *C. articulata* (Rathbun, 1906) and *C. longiventris*, of which the former was reassigned to *Corallianassa* in this article.

Manning (1992) established a new genus, *Corallichirus* (gender masculine), for the three species formerly assigned to *Corallianassa*, viz., *C. hartmeyeri*, *C. placidus*, and *C. xuthus* (type species). He diagnosed *Corallichirus* as having the second pleomere being subequal in length to the sixth pleomere, while *Corallianassa* was characterized by the second pleomere being distinctly longer than the sixth pleomere.

In his reappraisal of the thalassinidean families and genera using cladistic approach, Poore (1994) proposed an identification key to the genera of Callianassidae, in which *Corallianassa* and *Corallichirus* were accepted. He remarked, however, "The key seems unlikely to work for many Indo-West Pacific species". Species composition of the respective genera was not given.

Although Sakai (1988) did not accept *Corallianassa*, Sakai (1992) assigned *Callianassa collaroy* to *Corallianassa*, instead of *Glypturus*, with a comment "This species is clearly a member of *Corallianassa*." No further comments or justifications were given by him.

In his monographic treatment of Callianassidae, Sakai (1999) regarded *Corallianassa* and *Corallichirus* as junior synonyms of *Glypturus*, and thus species referred to the latter two genera, together with some other taxa previously placed in *Callianassa* or *Callichirus*, were all placed in *Glypturus*: *G. acanthochirus*, *G. armatus* (with *Callichirus laurae* as a junior synonym), *G. articulatus*, *G. assimilis* (De Man, 1905), *G. coutierei* (with *Callianassa borradailei*, *C. placida* and *C. oahuensis* as junior synonyms), *G. hartmeyeri*, *G. haswelli*, *G. intesi*, *G. lanceolatus* (Edmondson, 1944), *G. longiventris*, *G. martensi* (with *Callianassa nakasonei* as a junior synonym), *G. winslowi* (Edmondson, 1944), and *G. xuthus*. In addition, he transferred *Glypturus karumba* (Poore &

Griffin, 1979), *G. motupore* and *G. mucronatus* to *Neocallichirus* Sakai, 1988, and this was the basis of his belief that the spinose chelipeds were not unique for *Glypturus*. Other characters mentioned by Manning (1987) were not critically examined by Sakai (1999).

Tudge et al. (2000) performed a cladistic analysis of 107 thalassinidean taxa based on 93 morphological characters. They listed seven species in *Glypturus*, viz. *G. acanthochirus*, *G. armatus*, *G. karumba*, *G. laurae, G. martensi, G. motupore* and *G. mucronata,* four species in *Corallianassa*, viz., *C. articulata*, *C. borradailei, C. collaroy*, and *C. longiventris*, and four species in *Corallichirus*, viz., *C. hartmeyeri*, *C. placidus*, *C. tridentatus* (von Martens, 1868), and *C. xuthus*.

Kensley (2001) described a new species of *Corallichirus*, *C. bayeri* Kensley, 2001, and compared his new taxon with *C. hartmeyeri*, *C. placidus*, *C. tridentatus* and *C. xuthus*, following the list by Tudge et al. (2000). He criticized the classification by Sakai (1999), stating "Sakai (1999) regards *Corallichirus*, along with *Corallianassa* Manning, 1987, as synonyms of *Glypturus* Stimpson, 1866, but does not present a single unique advanced character that unites these three genera. As a result, Sakai's definition of *Glypturus* does not appear to reflect a genuine monophyletic clade, and his synonymy is not regarded as useful."

Ngoc-Ho (2002) pointed out the close relationship between *Calliapagurops* de Saint Laurent, 1973 and *Corallianassa*. Ngoc-Ho (2005) also criticized the classification by Sakai (1999) and adopted Manning's (1987) definitions of *Glypturus* and *Corallianassa*. On the other hand, she proposed to synonymize *Corallichirus* with *Corallianassa*.

In his second monographic work on Callianassidae and related taxa (Callianassoidea), Sakai (2005) followed the classification proposed by himself (Sakai 1999), though some changes were proposed. He reassigned *Neocallichirus collaroy* (cf. Sakai 1999) to *Glypturus*; *Corallichirus bayeri* was placed in the synonymy of *G. assimilis*; *C. tridentatus* was referred to *Lepidophthalmus* Holmes, 1904. In particular, Sakai (2005) critically examined the proportion between the second and sixth pleomeres, and this led him to conclude that there was no merit to recognize *Corallichirus* being distinct from *Glypturus*. Furthermore, a new taxon, *G. rabalaisae*, was proposed for specimens referred to *G. acanthochirus* by Rabalais et al. (1981), but he failed to designate any name bearing type, as pointed out by Dworschak (2007b).

In the compilation of living and fossil genera of decapod crustaceans, De Grave et al. (2009) followed the classification proposed by Ngoc-Ho (2005), recognizing *Corallianassa* as a valid genus and *Corallichirus* as a junior synonym of the former.

Sakai (2011) substantially changed his previous classification (Sakai 1999, 2005). *Corallichirus* was resurrected as a valid genus, and the three species, *C. bayeri*, *C. intesi* and *C. xuthus*, were referred to this genus. He differentiated *Corallichirus* from *Glypturus* by the male second pleopod having a distally located appendix interna but lacking an appendix masculina (*Glypturus* was said to have distomesially located appendix masculina on the endopod of the second pleopod in males, but appendix interna is present or absent). On the other hand, however, *Corallianassa* remained under the synonym of *Glypturus*. Synonymies of some specific taxa were also changed, but most of these changes brought serious confusion: *Corallichirus bayeri* was treated as valid (Sakai 2011: 424), but placed in the synonymy of *G. assimilis* (Sakai 2011: 433); *Glypturus borradailei*, which had been considered to be a junior subjective synonym of *G. coutierei* by Sakai (1999; 2005), was resurrected as a valid species, but no justification or comments were given; *Callianassa nakasonei* was moved to the synonymy of *G. lanceolatus* from the synonymy of *G. martensi* as proposed by Sakai (1999; 2005), but again without any justification or comments; *G. coutierei* (Indo-West Pacific) and *G. hartmeyeri* (Caribbean), which have been regarded as valid species by Sakai (1999; 2005), were placed in the synonymy of *G. longiventris* (western Atlantic), along with *Callianassa placida*, but his logic is difficult to understand; *Neocallichirus motupore* was placed in the synonymy of *G. armatus*. In addition, he again proposed a new taxon *G. rabalaisae* for the specimens referred to *G. acanthochirus* by Rabalais et al. (1981) with the designation of holotype, because Sakai's (2005) name was unavailable. However, he did not reveal the location of the holotype. In summary, the following 11 taxa were listed under *Glypturus* by Sakai (2011): *G. acanthochirus*, *G. armatus* (with *G. laurae* and *G. motupore* as junior synonyms), *G. articulatus*, *G. assimilis* (with *Corallichirus bayeri* as a junior synonym), *G. borradailei*, *G. collaroy*, *G. haswelli*, *G. lanceolatus* (with *Callianassa nakasonei* as a junior synonym), *G. longiventris* (with *Callianassa coutierei*, *C. placida*, *C. hartmeyeri* and *C. oahuensis* as junior synonyms), *G. martensi* and *G. rabalaisae*.

Hyžný & Müller (2012), who reviewed the fossil taxa assigned to *Glypturus*, gave a brief overview of the genus. They also accepted the classification

proposed by Ngoc-Ho (2005). Furthermore, they pointed out that *G. rabalaisae* proposed by Sakai (2011) was an unavailable name again, because the name did not satisfy the requirements of the article 16.4 of the code (ICZN 1999), in which explicit fixation of name-bearing types is required.

In summary, the generally accepted composition of the two genera is shown below.

Glypturus (three species): *G. acanthochirus* Stimpson, 1866, *G. armatus* (A. Milne-Edwards, 1870) (with *G. motupore* Poore & Suchanek, 1988 as a junior synonym), and *G. laurae* (de Saint Laurent, in de Vaugelas & de Saint Laurent, 1984).

Corallianassa (12 species): *C. articulata* (Rathbun, 1906), *C. assimilis* (De Man, 1928b) (with *Corallichirus bayeri* Kensley, 2001 as a junior synonym), *C. collaroy* (Poore & Griffin, 1979), *C. coutierei* (Nobili, 1904) [with *Callianassa borradailei* De Man, 1928a, *C. placida* De Man, 1905 and *C. oahuensis* Edmondson, 1944 as junior synonyms], *C. hartmeyeri* (Schmitt, 1935), *C. haswelli* (Poore & Griffin, 1979), *C. intesi* (de Saint Laurent & Le Loeuff, 1979), *C. lanceolata* (Edmondson, 1944), *C. longiventris* (A. Milne-Edwards, 1870), *C. martensi* (Miers, 1884) [with *Callianassa nakasonei* Sakai, 1967 as a junior synonym], *C. winslowi* (Edmondson, 1944) and *C. xutha* Manning, 1988.

Species account

Glypturus armatus (A. Milne-Edwards, 1870)

[New Japanese name: Toge-sunamoguri]
(Figs. 1–7)

Callianassa armata A. Milne-Edwards, 1870: 90, 101, pl. 1 [type locality: Fiji]. — De Man 1902: 754. — Kensley 1975: 48, fig. 1. — Manning 1987: 392.

Callianassa (*Callichirus*) *armata*. — Borradaile 1903: 547. — De Man 1928b: 28 (list), 93 (list), 109 (key).

Glypturus acanthochirus. — Manning 1987: 390 (in part), figs. 4, 5.

Glypturus motupore Poore & Suchanek, 1988: 198, figs. 1–3, 4a [type locality: Motupore Island, Papua New Guinea]. — Manning & Felder 1991: 778. — Tudge et al. 2000: 144. — Dworschak et al. 2012: 192 (list).

Glypturus armatus. — Poore & Suchanek 1988: 201, fig. 4b. — Manning & Felder 1991: 778 (no new locality). — Sakai 1999: 76 (in part; Indonesia); 2005: 137 (in part); 2011: 432 (in part); 2015: 432 (in part). — Tudge et al. 2000: 144 (no new locality). — Dworschak et al. 2006: 4 (Nha Trang, Vietnam; Panglao, Philippines); 2012: 192 (list). — Dworschak 2007a: 305, 307 (New Caledonia). — Poupin & Junker, 2010: 80 (Tuamotu), fig. d (Panglao, Philippines). — Hyžný & Müller 2012: 973, figs. 3D–H, 4A, 5A–D. — Sakai & Türkay 2014: 177 (South Sea). — Sakai et al. 2014: 491, Tab. 1 (in part).

Neocallichirus motupore. — Sakai 1999: 105 (no new locality); 2005: 182.

Material examined. Okinawa Island: Awase, Okinawa, mud flat, 5 April 2010, yabby pump, coll. M. Osawa, 1 male (cl 14.5 mm), RUMF-ZC-3905; Misaki, Kitanakagusuku, sand flat with sea grass, 29 April 2010, yabby pump, coll. M. Osawa, 1 female (cl 19.3 mm), RUMF-ZC-3906; Ohmine, Naha, tidal flat, 15 May 2011, yabby pump, coll. T. Maenosono, 1 female (cl 18.6 mm), CBM-ZC 13083; same locality, tidal flat, 7 May 2012, yabby pump, coll. M. Osawa, 1 female (cl 21.5 mm), CBM-ZC 13084; same locality, sand flat near grass beds, 28 April 2013, yabby pump, coll. T. Komai, 1 male (cl 25.8 mm), CBM-ZC 12711; same data, 1 male (cl 32.5 mm), 1 female (cl 11.2 mm), CBM-ZC 12720.
Iriomote Island, Yaeyama Islands: Sonai, intertidal, sand flat with grass beds, 10 July 2002, digging with shovel, coll. T. Komai, 1 male (cl 17.0 mm), CBM-ZC 8807; Uehara Port, subtidal, sand flat, 28 June 2007, yabby pump, coll. T. Komai, 1 female (cl 25.4 mm), CBM-ZC 9771.

Description. Carapace (Figs. 1A, 2A) with rostrum (Fig. 3A–C) triangular in dorsal view, terminating in acute spine, overreaching midlength of eyestalks, but not reaching their apices, directed forward or slightly upward; dorsal surface of rostrum non-carinate, with pair of tufts of short setae slightly proximal to midlength, lateral surface with short carina merging into orbital margin, ventral surface bluntly carinate in proximal half, abruptly becoming deep proximally. Frontal margin (Fig. 3A–C) with sharp anterolateral spine on either side of rostrum, reaching to level of midlength of rostrum, directed forward in dorsal view, directed forward or slightly ascending in lateral view, basal part calcified or non-calcified (translucent). Orbital margin between rostrum and anterolateral spine slightly concave. Anterior part of dorsum gently sloping to rostral base; dorsal oval marked posteriorly by deep cervical groove at 0.7 of carapace length and sharp carina slightly posterior to cervical groove (space between cervical groove and transverse carina forming narrow, sloping facet), laterally by groove extending anteroventrally to either side above linea thalassinica,

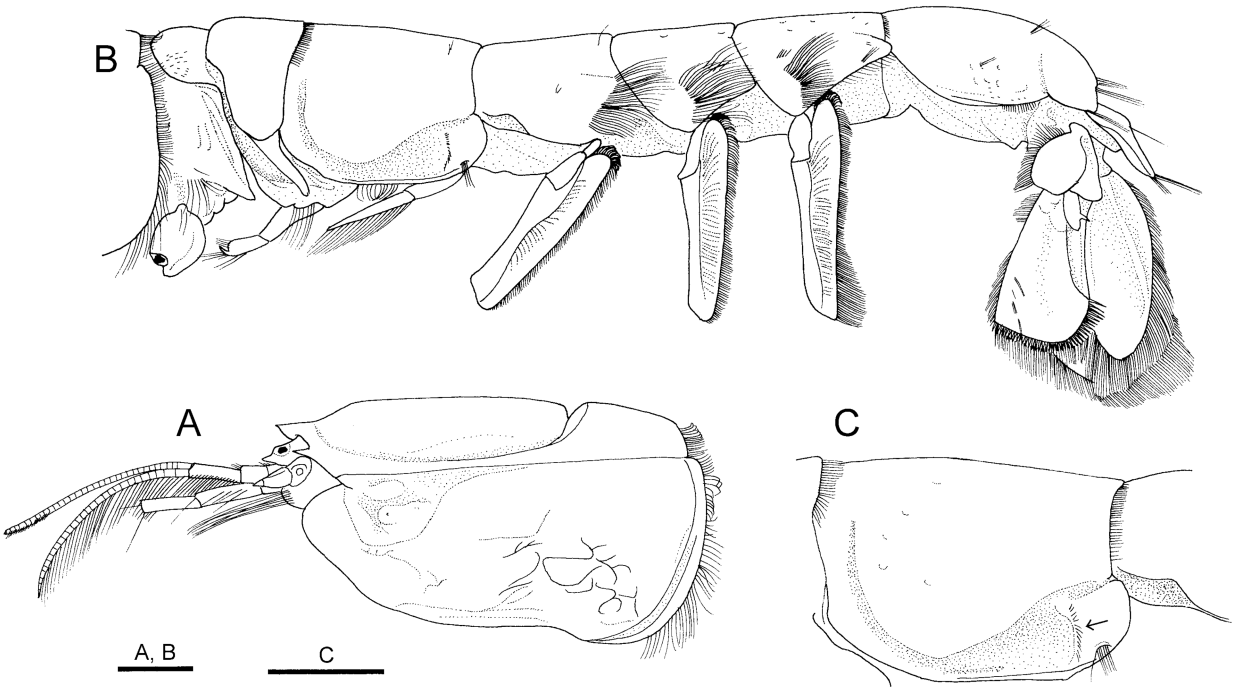


Fig. 1. *Glypturus armatus* (A. Milne-Edwards, 1870), male (cl 25.8 mm), CBM-ZC 12711. A, carapace and cephalic appendages, lateral view; B, pleon, telson and pleonal appendages, lateral view; C, second pleomere, lateral view (arrow indicating vertical setal row). Scale bars: 5 mm.
図 1. *Glypturus armatus* (A. Milne-Edwards, 1870) (新称: トゲスナモグリ), 雄 (頭胸甲長 25.8 mm), CBM-ZC 12711. A, 頭胸甲と頭部付属肢, 側面観; B, 腹部, 尾節, 腹部付属肢, 側面観; C, 第 2 腹節, 側面観 (矢印は毛列を指示). スケールバー: 5 mm.

and anteriorly by shallow groove reaching to midline slightly proximal to rostral base; cardiac region posterior to cervical groove slightly sloping posteriorly, nearly as high as dorsal oval; posterodorsal margin fringed with short setae. Linea thalassinica running over entire length of carapace. Anterolateral notch very deep, broadly V-shaped. Branchiostegite anteriorly with low, calcified plate (Fig. 3A, D), bearing 2 low elevations, lower elevation having 1 or 2 tiny, pointed granules, this calcified part extending posteriorly as narrow band to level of midlength of carapace along linea thalassinica; remainder part membranous, without any sclerite, but with irregularly reticulate pattern of sutures (Fig. 1A).

Shield on seventh thoracic sternite (Fig. 2E) strongly calcified; main part subrhomboidal, posterolateral margins strongly rimmed; ventral surface with shallow groove along each posterolateral rim, merging into median groove posteriorly; anterior prolongation also subrhomboidal, bluntly carinate medially.

Pleon (Figs. 1B, 2B–D) generally glabrous dorsally, about 2.3 times as long as carapace; length ratio of first to sixth pleomeres and telson measured along midline, 1.0:1.2:0.9:0.8:1.0:1.5:0.3, first and second pleomeres combined distinctly shorter than third to fifth pleomeres combined (2.2: 2.7). First pleomere slightly narrowing anteriorly in dorsal view, about 1.2 times as long as greatest width, clearly bisected by transverse carina running at anterior two-fifths of dorsal length of somite; pleuron with faintly defined ventral margin, continuous with chitinous frame defining posterior part of sternite (first pleopods arising from this part); no longitudinal setal row on lateral surface. Second pleomere not particularly elongate, becoming slightly wider posteriorly, about 1.3 times as wide as long; pleuron having posterolateral margin slightly expanded, lateral surface with distinct groove running along anterolateral to ventral margin on anterior part and crossing obliquely surface on posterior part, and with vertical row of setose punctae at posterior 0.9 and small tuft of setae adjacent to posteroventral angle (Fig. 1C). Third to fifth pleomeres each with short longitudinal sulcus posterolaterally on either side; third to fifth pleura each with patch of soft plumose setae, position of

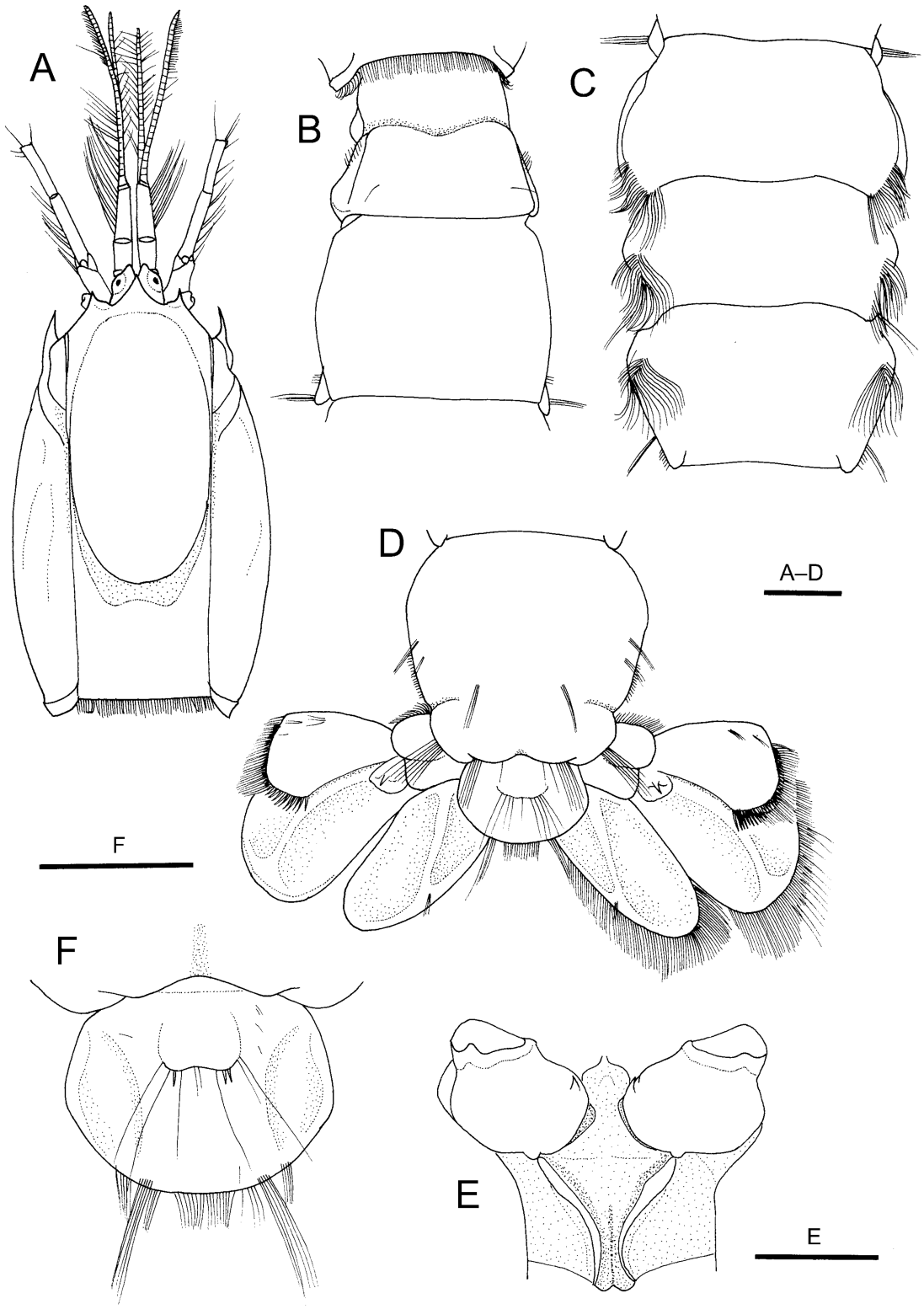


Fig. 2. *Glypturus armatus* (A. Milne-Edwards, 1870), male (cl 25.8 mm), CBM-ZC 12711. A, carapace and cephalic appendages, dorsal view; B, first and second pleomeres, dorsal view; C, third to fifth pleomeres, dorsal view; D, sixth pleomere, telson and uropods, dorsal view; E, shield on thoracic sternite 7 and coxae of fourth pereopods, ventral view; F, telson, dorsal view. Scale bars: 5 mm.

図 2. *Glypturus armatus* (A. Milne-Edwards, 1870) (新称: トゲスナモグリ), 雄 (頭胸甲長 25.8 mm), CBM-ZC 12711. A, 頭胸甲と頭部付属肢, 背面観; B, 第 1, 第 2 腹節, 背面観; C, 第 3–第 5 腹節, 背面観; D, 第 6 腹節, 尾節, 尾肢, 背面観; E, 第 7 胸節の楯板と第 4 胸脚の底節, 腹面観; F, 尾節, 背面観. スケールバー: 5 mm.

setal patch becoming more anterior in posterior somites; posterolateral margins slightly expanded; third pleuron with distinct excavation ventrally in anterior half to accommodate posterior margin of second pleuron; ventral margins of these pleura roundly angular. Sixth pleomere roundly subrectangular in dorsal view, almost as long as wide; tergite strongly convex longitudinally and transversely, with submedian tufts of setae on posterior one-third and laterally with short transverse groove at posterior one-fourth; lateral surfaces each with field of dense setae anterior to transverse groove, extending anteriorly to about midlength of pleomere; posterior margin slightly bilobed by short median groove, with 2 pairs of tufts of long setae laterally.

Telson (Fig. 2D, F) small, much narrower than sixth pleomere, about 1.3 times wider than long, subcircular with strongly convex lateral margins in dorsal view, broadest at level of midlength, merging into unarmed, nearly straight posterior margin, posterolateral angles faintly delimited, but indicated by tuft of long setae; lateral margins slightly sinuous, unarmed; dorsal surface anteriorly forming low, rounded elevation with posterior margin delimited by distinct transverse carina, this transverse ridge bearing short rows of long setae flanked by 1 or 2 pairs of spiniform or cuspidate setae.

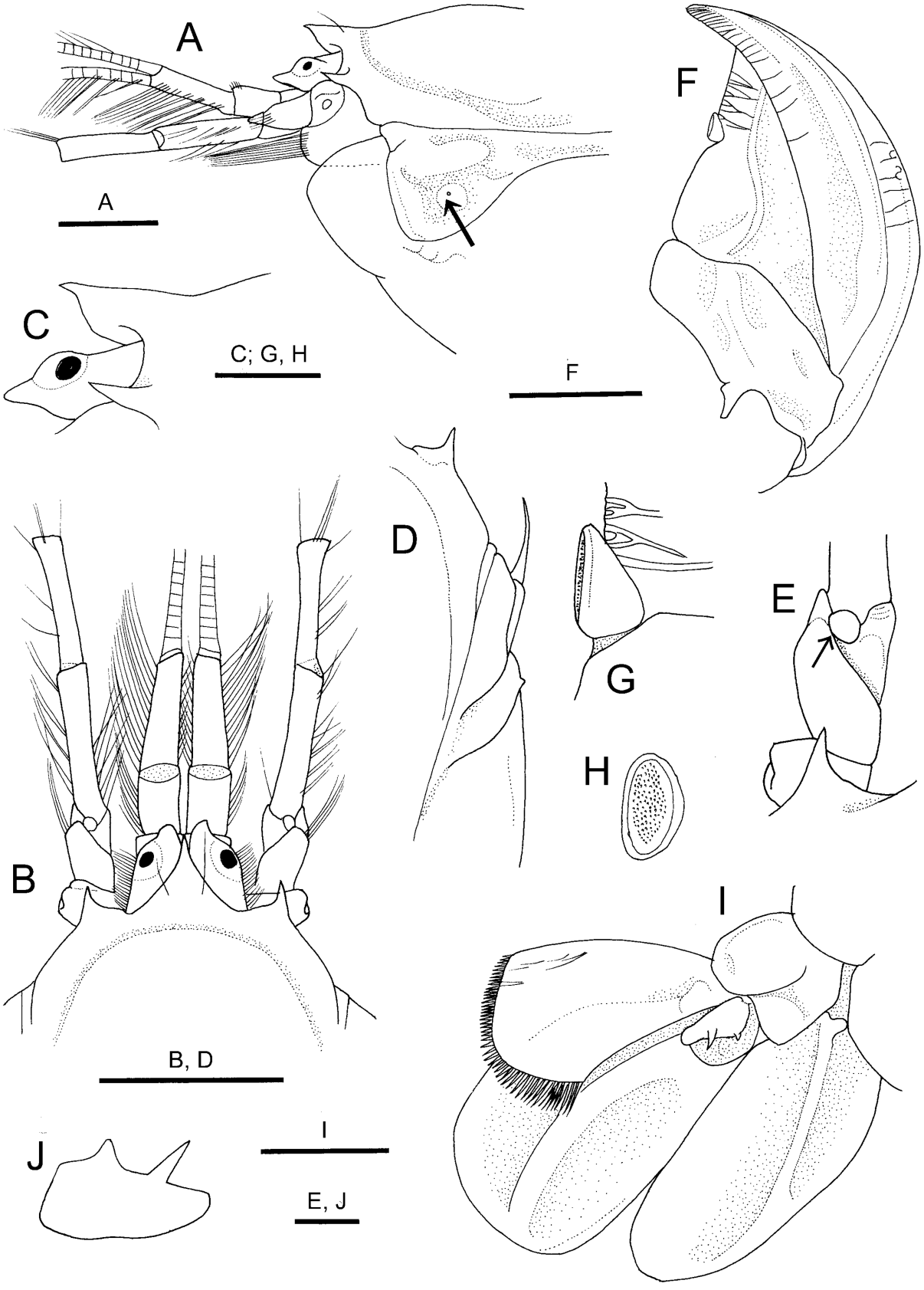
Eyestalks (Fig. 3A–C) stout, somewhat depressed dorsoventrally, contiguous, narrowing distally; distomesial projection distinct, rounded terminally, reaching beyond distal end of first segment of antennular peduncle; dorsal surface other than cornea sloping anteriorly; cornea located dorsolaterally and subterminally, dome-like, darkly pigmented, occupying less than half length of eyestalk. Length of exposed eyestalk in dorsal view not exceeding twice of basal width.

Antennular peduncle (Figs. 1A, 2A, 3A, B) shorter and slightly stouter than antennal peduncle, 0.3–0.4 times as long as carapace. First segment stout, dorsolateral margin distinctly carinate. Second segment stout, 1.2–1.3 times as long as wide. Third segment about twice as long as second segment, reaching proximal 0.1–0.2 of fifth segment of antennal peduncle, narrowing distally. Distal 2 segments with ventromesial and ventrolateral rows of long setae, those of ventrolateral row longer; rows of setae continued onto ventral flagellum. Proximal articles of ventral flagellum bearing very long midventral setae. Dorsal flagellum about half length of carapace, subequal to or slightly shorter than ventral flagellum; articles in distal 0.4 bearing aesthetascs becoming longer and denser distally.

Antennal peduncle (Figs. 1A, 2A, 3A, B) about half the length of carapace. First segment short, forming slightly produced, sparsely setose lobe above laterally produced excretory pore. Second and third segments obliquely jointed; second segment distolaterally with single tuft of setae; third segment with partially fused condylar process articulated to distolateral extreme of second segment. Fourth segment as wide as fifth segment, with sparse row of long setae on lateral face. Fifth segment 0.8–0.9 times as long as fourth segment. Scaphocerite small but well differentiated, showing as subcircular plate (Fig. 3E). Antennal flagellum about 3.0 times as long as dorsal flagellum of antennule, with 2 or 3 long setae every 3 articles.

Mouthparts as figured by Poore & Suchanek (1988; as *G. motupore*). Third maxilliped (Fig. 4A, B) without exopod. Endopod with long setae on ventral margins of ischium-merus, distal 3 segments also with long setae on extensor and flexor margins. Length of merus-ischium exceeding 2.5 times width, with distinct notch on ventral margin at joint between these 2 segments; ischium subrectangular, longer than broad, proximoventral margin broadly rounded, not produced, mesial surface with well developed crista dentata (Fig. 4C) consisting of 2 parts divided by distinct hiatus, distal part longitudinally oriented elevation bearing row of sharp, closely spaced denticles, posterior part short and oblique, with 4 or 5 spiniform denticles; merus roundly subrectangular, approximately as wide as long, dorsal margin gently convex, ventral margin more strongly convex; mesial surface with distinct longitudinal row of setae medially in distal half. Carpus subequal in length to merus, abruptly narrowing in proximal half, jointed at distodorsal portion of merus; lateral surface with shallow excavation proximoventrally; mesial surface with dense field of fine setae distally. Propodus large, subquadrate with nearly straight dorsal (extensor) margin and strongly convex ventral (flexor) margin, height subequal to or exceeding length; distal margin inferior to base of dactylus slightly concave, forming rounded flexor distal angle, with prominent tuft of setae medially; mesial surface with patch of dense setae proximally. Dactylus narrow, nearly straight, tapering distally, terminating in small corneous claw, subequal in length to propodus.

First pereopods (chelipeds) unequal and dissimilar, major cheliped strongly compressed laterally; coxae each with prominent process at ventromesial distal angle, bearing tuft of stiff setae. Major cheliped of adults (Fig. 5A) strongly calcified. Ischium slender, slightly widened distally; dorsal margin gently sinuous, non-carinate; ventral margin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with row of sharp, obliquely erect spines noticeably increasing in size distally, ventrodistal end slightly produced ventrally. Merus (Fig. 5A, B) about 1.9 times as long as high; dorsal margin nearly straight, bluntly carinate, armed with row of small, widely spaced spines; ventral margin also with row of sharp, forwardly directed spines increasing in size proximally, proximalmost spine located distinctly lateral to other spines; lateral surface elevated along midline into blunt ridge; mesial surface slightly uneven. Carpus subrectangular, distal height subequal to or slightly greater than length; dorsal margin nearly straight, forming sharp keel terminating in blunt distal corner, sharply keeled proximoventral to ventral margin rounded in general outline, but armed with row of forwardly directed spines; lateral surface evenly convex transversely; mesial surface with upturned ventral margin, weakly convex medially. Chela heavy, length (including fixed finger) in adults about 1.8 times of height, height greatest at about midlength of palm; length of palm slightly exceeding height; dorsal margin of palm distinctly carinate in proximal half, rounded in distal half, armed with row of small, forwardly directed spines (Fig. 5C); ventral margin with distinct keel extending to base of fixed finger, keel lined by small, low tubercles becoming obsolete on fixed finger, and with row of tufts of long stiff setae extending onto tip of fixed finger; lateral surface of palm evenly convex transversely, glabrous; mesial surface very slightly convex medially, ventromesial margin slightly upturned. Fixed finger feebly curved in distal half, terminating in acute or subacute tip; occlusal margin with prominent blunt tooth over proximal two-fifths, remainder smooth; lateral surface with row of tufts of stiff setae along occlusal margin. Dactylus subequal to or shorter than palm, slightly curving mesially in dorsal view, strongly curving ventrally in distal part in lateral view, terminating in blunt to acute tip; dorsal surface non-carinate, with row of tufts of long stiff setae; lateral surface also non-carinate, with row of tufts of stiff setae adjacent to occlusal margin; occlusal margin with trace of tooth slightly proximal to midlength, distal half forming sharp, smooth or faintly denticulate edge.

Minor cheliped (Fig. 5D, E) similar to major cheliped in general setation and structure, but distinctly more slender. Ischium widened distally; dorsal margin slightly sinuous, non-carinate, unarmed; ventral margin with row of spines or spinules noticeably increasing in size distally, distal end slightly produced ventrally. Merus subrectangular, length about 1.8 times height; dorsal margin distinctly carinate in distal half, armed with 2 or 3 spines including one at distal end; ventral margin armed with row of forwardly directed spines; lateral surface convex transversely, without ridge. Carpus subrectangular, narrowing proximally, subequal in length to merus, length about 1.8 times height and about 1.5 times length of palm, height greatest at distal end; dorsal and ventral margins sharply keeled, latter armed with row of small spines. Chela as high as carpus; palm subrectangular, length about 1.2 times height; dorsal margin sharply keeled in proximal half and rounded in distal half, armed with 3 small spines in distal half; ventral margin also with distinct, non-tuberculate keel extending to base of fixed finger; fixed finger subequal in length to palm, gradually tapering to acute or subacute tip, occlusal margin sharply edged entirely, with prominent blunt tooth at proximal 0.3; narrow hiatus between fingers; dactylus subequal in length to fixed finger, gently curving, terminating in acute or subacute tip, occlusal margin sharply edged, without conspicuous teeth.

Second pereopod (Fig. 4D) chelate, strongly compressed laterally, numerous long setae on ventral margins of ischium to chela, setae of dorsal margins of carpus, palm and dactylus set in series of tufts.

Fig. 3. *Glypturus armatus* (A. Milne-Edwards, 1870), male (cl 25.8 mm), CBM-ZC 12711. A, anterior part of carapace and cephalic appendages, lateral view; B, same, dorsal view; C, rostrum and left eyestalk, lateral view (setae omitted); D, right anterolateral part of carapace in dorsal view, showing details of calcified hepatic plate; E, basal part of antennal peduncle, dorsal view (setae omitted; allow indicating scaphocerite); F, right third pleopod, dorsal (anterior) view; G, same, appendix interna, dorsal (anterior) view; H, same, mesial view; I, left uropod, dorsal view (perpendicular; setae partially omitted); J, proximomesial article of exopod of left uropod, dorsal view. Scale bars: A, B, D, H, 5 mm; C, 2 mm; E–G, J, 1 mm.

図 3. *Glypturus armatus* (A. Milne-Edwards, 1870) (新称: トゲスナモグリ), 雄 (頭胸甲長 25.8 mm), CBM-ZC 12711. A, 頭胸甲前方と頭部付属肢, 側面観; B, 同, 背面観; C, 額角と左眼柄, 側面観(剛毛は省略); D, 頭胸甲の右前側部, 背面観 (肝域の石灰化板の細部を表示); E, 左第 2 触角柄部の基部, 背面 (剛毛は省略; 矢印は触角鱗を指示); F, 右第 3 腹肢, 背面 (前面) 観; G, 同, 内肢突起の拡大, 背面 (前面) 観; H, 同, 内面観; I, 左尾肢, 背面観 (剛毛は一部省略); J, 左尾肢外肢の内側基部節, 背面. スケールバー: A, B, D, H, 5 mm; C, 2 mm; E–G, 1 mm.

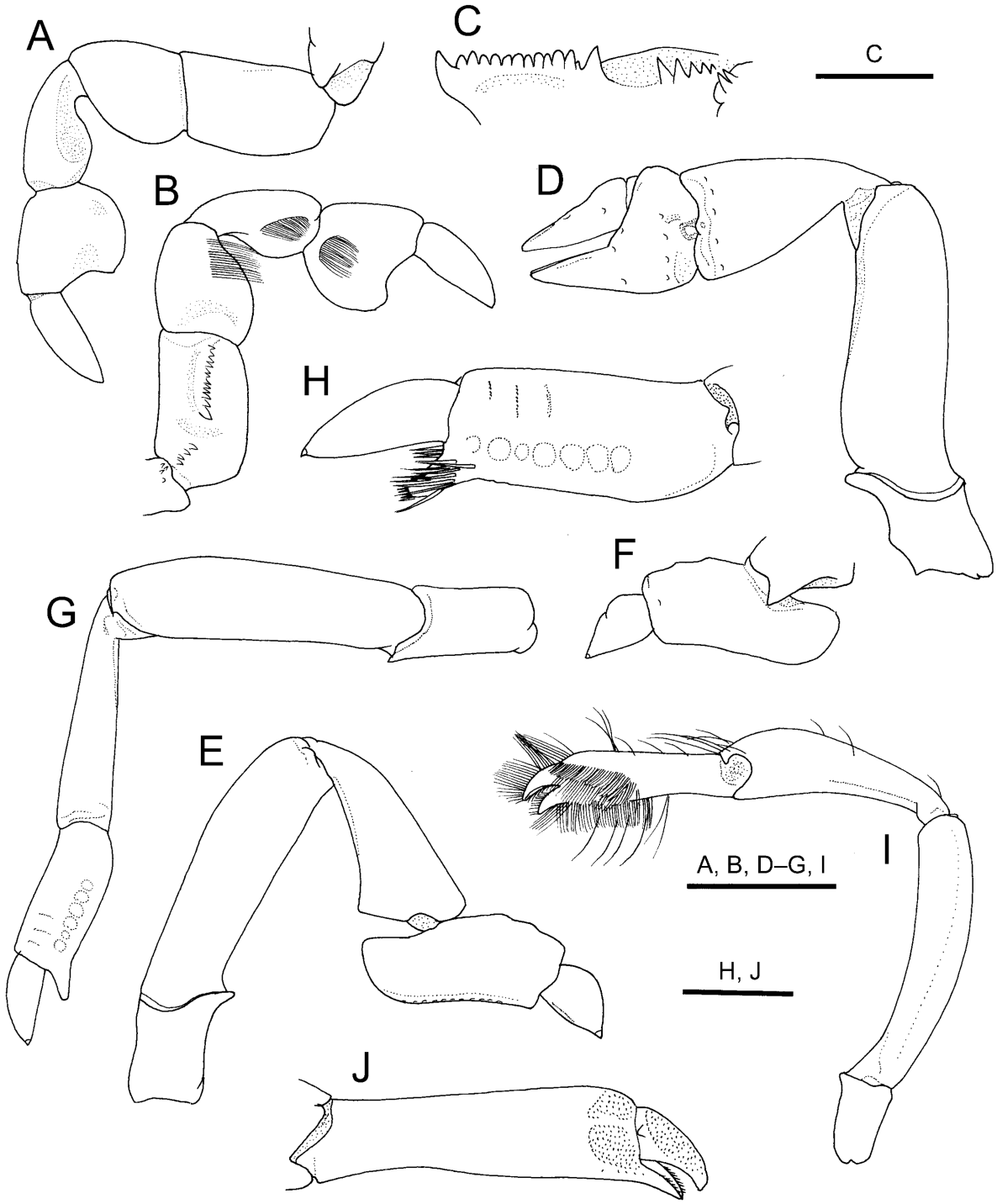


Fig. 4. *Glypturus armatus* (A. Milne-Edwards, 1870), male (cl 25.8 mm), CBM-ZC 12711. A, left third maxilliped, lateral view (setae omitted); B, same, mesial view (setation partially shown); C, same, details of crista dentata, dorsal view; D, left second pereopod, lateral view (setae omitted); E, right third pereopod, lateral view (setae omitted); F, same, propodus and dactylus, mesial view; G, left fourth pereopod, lateral view (setae omitted); H, same, propodus and dactylus (setation on fixed finger shown); I, left fifth pereopod, lateral view; J, same, propodus and dactylus, mesial view (setae omitted). Scale bars: A, B, D–G, I, 5 mm; C, H, J, 2 mm.

図 4. *Glypturus armatus* (A. Milne-Edwards, 1870) (新称: トゲスナモグリ), 雄 (頭胸甲長 25.8 mm), CBM-ZC 12711. A, 左第 3 顎脚, 側面観 (剛毛は省略); B, 同, 内面観 (剛毛を部分的に表示); C, 同, 内面歯列の細部, 背面観; D, 左第 2 胸脚, 側面観 (剛毛は省略); E, 右第 3 胸脚, 側面観 (剛毛は省略); F, 同, 前節と指節, 内面観; G, 左第 4 胸脚, 側面観 (剛毛は省略); H, 同, 前節と指節 (不動指上の剛毛を表示); I, 左第 5 胸脚, 側面観; J, 同, 前節と指節, 内面観 (剛毛は省略). スケールバー: A, B, D–G, I, 5 mm; C, H, J, 2 mm.

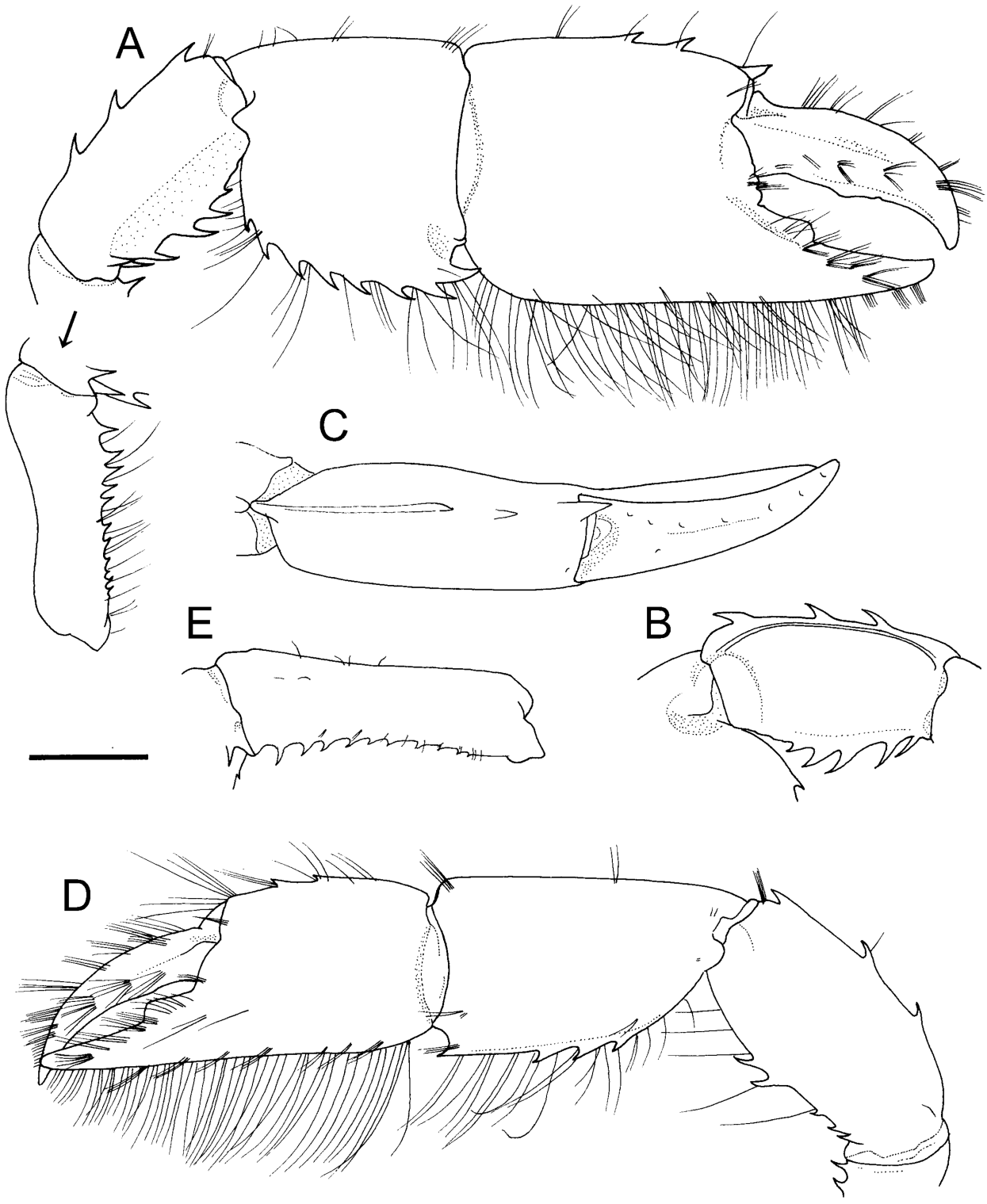


Fig. 5. *Glypturus armatus* (A. Milne-Edwards, 1870), male (cl 25.8 mm), CBM-ZC 12711. A, major (right) cheliped, lateral view; B, same, merus, mesial view; C, same, chela, dorsal view (setae omitted); D, minor (left) cheliped, merus to chela, lateral view; E, same, ischium, lateral view. Scale bar: 5 mm.

図 5. *Glypturus armatus* (A. Milne-Edwards, 1870) (新称: トゲスナモグリ), 雄 (頭胸甲長 25.8 mm), CBM-ZC 12711. A, 大鉗脚 (右第 1 胸脚), 側面観; B, 同, 長節, 内面観; C, 同, 鉗部, 背面観 (剛毛は省略); D, 小鉗脚 (左第 1 胸脚), 長節–鉗部, 側面観; E, 同, 坐節, 側面観. スケールバー: 5 mm.

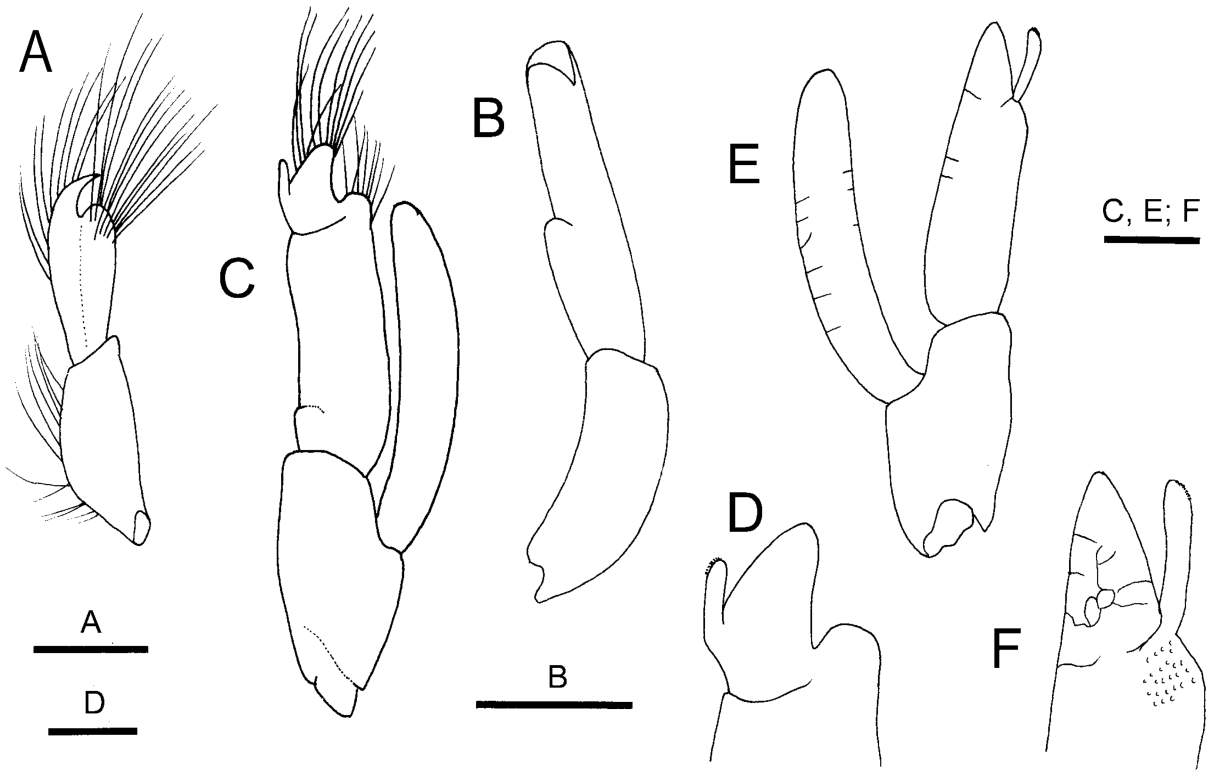


Fig. 6. *Glypturus armatus* (A. Milne-Edwards, 1870). A, C, D, male (cl 25.8 mm), CBM-ZC 12711; B, E, F, female (cl 25.4 mm), CBM-ZC 9771. A, male left first pleopod, outer view; B, female left first pleopod, inner view (setae omitted); C, male left second pleopod, ventral view (setae partially omitted); D, same, distal part of endopod, showing details of appendices masculina and interna (setae omitted); E, female left second pleopod, dorsal view (setae omitted); F, same, distal part of endopod, dorsal view (setae omitted). Scale bars: A–C, E, 2 mm; D, F, 1 mm.
図 6. *Glypturus armatus* (A. Milne-Edwards, 1870) (新称: トゲスナモグリ). A, C, D, 雄 (頭胸甲長 25.8 mm), CBM-ZC 12711; B, E, F, 雌 (頭胸甲長 25.4 mm), CBM-ZC 9771. A, 雄左第 1 腹肢, 外面観; B, 雌左第 1 腹肢, 内面観 (剛毛は省略); C, 雄左第 2 腹肢, 腹面観 (剛毛は部分的に省略); D, 同, 先端部, 雄性突起と内肢突起の細部を示す (剛毛は省略); E, 雌左第 2 腹肢, 背面観 (剛毛は省略); F, 同, 内肢の先端部, 背面観 (剛毛は省略). スケールバー: A–C, E, 2 mm; D, F, 1 mm.

Coxa with concave mesial face, unarmed. Ischium with dorsal margin slightly sinuous, glabrous; ventral margin strongly sinuous, terminating in small, well-marked tubercle directed ventrally. Merus with dorsal margin slightly sinuous, almost glabrous, with tuft of setae at dorsodistal margin; lateral surface almost glabrous, with few tufts of setae arranged longitudinally; ventral margin sinuous, forming narrow facet. Carpus triangular, with transverse row of tufts of short setae adjacent to distal margin on lateral surface. Chela also triangular; dorsal margin of palm convex; lateral surface of palm with several tufts of short setae; fingers straight, each terminating in small corneous tip, occlusal margins microscopically pectinate with row of corneous spinules; dactylus 2.3 times as long as palm.

Third pereopod (Fig. 4E, F) with coxa having flattish mesial face. Ischium with dorsal margin nearly straight, ventral margin also straight, terminating in small tubercle. Merus highest at distal one-third, length exceeding 3 times height; margins and lateral surface glabrous. Carpus subtriangular, length exceeding 2 times distal height, distally with patches of stiff setae. Propodus subrectangular, with proximally-directed lobe of inferior margin (heel) not reaching beyond broadest part of carpus, lobe terminally with dense, long distally-directed setae, inferodistal margin faintly concave, with row of tufts of shorter setae, superior margin with fields of long setae grading to small patterned tufts of shorter setae on lateral face of segment. Dactylus tear-shaped, densely setose on lateral surface, terminating in minute corneous tip directed to external side.

Fourth pereopod (Fig. 4G, H) semichelate. Coxa (Fig. 2E) enlarged, subovate, weakly flattened dorsoventrally, armed with small, outwardly directed spine on mesial face. Ischium with dorsal and ventral margin nearly straight, latter terminating in minute

Fig. 7. *Glypturus armatus* (A. Milne-Edwards, 1870), male (cl 25.8 mm), CBM-ZC 12711, entire animal in dorsal view, showing coloration in life.
図 7. *Glypturus armatus* (A. Milne-Edwards, 1870) (新称: トゲスナモグリ), 雄 (頭胸甲長 25.8 mm), CBM-ZC 12711. 全形の背面観, 生時の色彩を示す.

tubercle. Merus wider, longer than carpus. Carpus elongate, slightly widened distally, length about 4.5 times distal height. Propodus shorter than carpus; dorsal margin nearly straight, ventral margin slightly convex; ventrodistal corner produced into short fixed finger (less than half length of dactylus) bearing stout, microscopically serrate setae on external side and short bristles at truncate tip; dense setation on outer surface of propodus and dactylus, that of propodus divided into upper and lower fields, densest in lower field and continuing onto lower half of inner surface; dactylus terminating in minute corneous tip directed toward external side.

Fifth pereopod (Fig. 4I, J) chelate. Coxa with well-defined lateral facet. Ischium short, ventrodistal margin slightly raised. Merus longest, gently arcuate. Carpus slightly longer than propodus, greatest width at about distal one-third; dorsal margin convex distally. Propodus slightly widened distally; opposable surfaces of propodus and small dactylus excavate, spooned, terminally rounded, forming beak-like chela obscured by dense fields of setation on distal half of propodus and superior surface of dactylus; distal margins of tips of fingers microscopically pectinate.

First pleopod uniramous in both male and female, composed of 2 segments. In male (Fig. 6A), distal segment ovate, subequal in length to but not wider than proximal segment, subdivided into 2 lobes by deep V-shaped notch; superior lobe terminally rounded, bearing long stiff setae marginally and submarginally, inferior lobe terminally acute, hook-like, with tip strongly curved dorsally, distinctly overreaching superior lobe. In female (Fig. 6B), both articles moderately slender and elongate; proximal segment gently curved; distal segment with weakly produced shoulder proximal to midlength.

Second pleopod biramous in male and female. In male (Fig. 6C, D), setation short and sparse overall; protopod widened distally; endopod only faintly narrowed, with weak shoulder on mesial margin proximally; appendix masculina located at distomesial portion of endopod, demarcated basally by incomplete transverse suture, roundly triangular in general outline, bearing long setae on mesial to terminal margin; appendix interna arising slightly proximal to midlength of appendix masculina; distolateral lobe of endopod separated from appendix masculina by deep U-shaped notch, rounded, bearing long marginal setae; exopod blade-like, slightly narrowed to rounded distal margin, reaching distolateral lobe of endopod, without transverse sutures. In female (Fig. 6E, F), both rami with long setae on margins; protopod slightly widened distally; endopod slightly narrowing distally, part distal to appendix interna gradually tapering, basally demarcated by incomplete transverse suture; appendix interna digitiform, slender, slightly widened distally, located at about distal 0.2 of mesial margin of endopod, not reaching terminal margin of distal lobe; exopod not reaching distal margin of endopod, having some incomplete transverse sutures.

Third to fifth pleopods (Fig. 3F) forming large, wide, posteriorly cupped fans when cross-linked by cincinnuli of appendices internae on contiguous

opposed margins of endopods. Each protopod strongly flattened, subrectangular in general outline; anterior (dorsal) surface with blunt median ridge extending from base to joint with endopod; posterior (ventral) surface with median area being membranous; mesial lobe broadly truncate, reaching as far as mesial margin of endopod. Endopods subtriangular, each with distinct, sinuous submedian keel on anterior surface; distomesial part distal to appendix interna having transverse, dendritic sutures, distolateral part with irregularly reticulate pattern of sutures. Appendix interna (Fig. 3G, H) located proximal to midlength of endopod, clearly demarcated basally, subtriangular in anterior or posterior views, stubby, basally embedded into mesial margin of endopod; mesial surface oval in outline, flattish, bearing numerous cincinnuli entirely. Exopods attached to lateral margin of protopods, embracing endopods; anterior surfaces each with median keel running over entire length, lateral part with row of dendritic sutures, distomesial part with irregularly reticulate pattern of sutures.

Uropod (Fig. 3I) with protopod roundly subrectangular in general shape, dorsally divided into 3 parts by distinct grooves, with prominent process at posteromesial angle (hidden by telson). Endopod far falling short of exopod in distal extension, suboval in general outline with posteromesial margin more strongly convex than anterolateral margin, about twice as long as broad, margins fringed with thick setae, tapering to rounded terminus bearing marginal fringe of long setae, distal end exceeding as far as anterodorsal plate on flexed exopod; dorsal surface with distinct submedian carina reaching to posteromesial margin. Exopod roundly subtriangular in general outline, with very thick anterodorsal plate falling far short of distal margin, posterodistal edge of plate rounded, with short, thick, spiniform setae grading to thinner, dense, elongate setae of exopodal margin; dorsal surface with blunt longitudinal carina mesial to dorsolateral plate; distal margin of exopod with dense fringe of setation, longest mesially; proximomesial article well demarcated, with 2 unequal spines (distal spine shaper and longer than proximal spine); directed dorsomesially (Fig. 3J).

Coloration in life. Body generally light brown; dorsal oval and chelipeds wood brown (Fig. 7).

Distribution. Western Pacific: Vietnam (Dworschak et al. 2006); Ryukyu Islands, Japan (new record, this study); Philippines (Dworschak et al. 2006); Indonesia (Sakai 1999); Papua New Guinea (Poore & Suchanek 1988); Fiji (A. Milne-Edwards 1870); New Caledonia (Dworschak 2007a); intertidal to 30 m.

Habitat. Poore & Suchanek (1988) reported on habitats, behavior, and burrow characteristics of *G. armatus* (as *G. motupore*). The present specimens were collected from shallow subtidal sand/mud bottom or tidal sand flat with vegetation of various sea grasses. It is known that this species constructs a complex burrow system with volcano-shaped mounds on the sediment surface (Poore & Suchanek 1988). Although specimens were not collected, numerous mounds were seen in some tidal flats in Okinawa Island (e.g., Misaki and Ohmine) and Iriomote Island (e.g., Funaura, Sonai, and Shirahama). It is known that burrows of *G. armatus* are used as habitats by other smaller-sized decapod crustaceans, e.g., *Jengalpheops rufus* Anker & Dworschak, 2007, *Leptalpheus denticulatus* Anker & Marin, 2009 (Caridea: Alpheidae), and *Naushonia carinata* Dworschak, Marin & Anker, 2006 (Gebiidea: Laomediidae) (cf. Anker et al. 2015).

Remarks. Manning (1987) regarded *Glypturus armatus* as a junior synonym of *G. acanthochirus*, whereas he felt hesitation to refer *Callichirus laurae* to *Glypturus* because of the lack of material of that taxon. Poore & Suchanek (1988) argued that *G. acanthochirus*, *G. armatus*, *G. laurae*, and their new taxon *G. motupore* were distinct. Sakai (1999) synonymized *Glypturus laurae* under *G. armatus*, and this synonymy was followed in his subsequent publications (Sakai 2005, 2011; Sakai & Türkay 2014). Sakai (1999; 2005) referred *G. motupore* to a different genus *Neocallichirus*, but later Sakai (2011) synonymized *G. motupore* with *G. armatus*. Dworschak (2007a) did not agree with Sakai's (1999; 2005) synonymy of *G. laurae*, though he did not provide further details. Hyžný & Müller (2012) also recognized *G. laurae* as valid, but followed Sakai (2011) in recognizing *G. motupore* as a junior synonym of *G. armatus*. We concur with the view of Hyžný & Müller (2012).

Although Poore & Suchanek (1988) discussed on the differentiating characters among *Glypturus armatus*, *G. acanthochirus* and *G. laurae* (+ *G. motupore*), viz., the shape of the rostrum and telson, the size of the cornea, and the form of the uropodal exopod, many of them seem to be unreliable because of intraspecific variation. As shown by palaeontologists (Hyžný & Müller 2012; Hyžný et al. 2013; Klompmaker et al. 2015), the tuberculation of the major cheliped palm is one of the obvious characters differentiating the three species. In *G. armatus*, the major cheliped palm is smooth and has no tubercles on both the lateral and mesial surfaces; whereas in *G. acanthochirus* and *G. laurae*, at least

the lateral surface of the major cheliped palm bears scattered small tubercles proximal to the base of the fixed finger. Furthermore, the lateral surface of the major cheliped merus has a sharp keel on the midline in *G. acanthochirus*, but this keel is blunt and weak in *G. armatus* and *G. laurae*; the ventral facet inferior to the median keel is smooth in *G. armatus*, rather than tuberculate or granular in *G. acanthochirus* and *G. laurae*. So far, *G. laurae* is known only from the Red Sea (Vaugelas & de Saint Laurent 1984).

***Corallianassa borradailei* (De Man, 1928a)**
[New Japanese name: Moba-hoso-sunamoguri]
(Figs. 8–13, 20A–C)

Callianassa (*Callichirus*) *longiventris*. — Borradaile 1904: 752, pl. 58, fig. 2 (Male Atoll, Maldives).
Callianassa (*Callichirus*) *longiventris* var. *Borradailei* De Man, 1928a: 27 [type locality: Goidu, Goifurfehendu Atoll, Maldives]; 1928b: 29 (list), 108 (key).
Callianassa (*Callichirus*) *borradailei*. — Ward 1942: 62 (Chagos, Diego Garcia).
Callianassa (*Callichirus*) *oahuensis* Edmondson, 1944: 56, fig. 10 [type locality: Hanauma Bay, Oahu, Hawaii].
Corallianassa borradailei. — Manning 1987: 394, figs. 7–9 (Fiji; Hawaii). — Manning & Felder 1991: 778 (no new locality). — Tudge et al. 2000: 144 (list). — Ngoc-Ho 2002: 541.
Corallianassa borradalei (sic). — Manning 1988: 888 (key).
Glypturus coutierei. — Sakai 1999: 78 (in part).
Corallianassa coutierei. — Poupin & Juncker 2010: 80 (Marquesas), fig. a–c (Moorea).

Material examined. Amami-ohshima Island: Ohse, Kasari, intertidal, 27 April 2006, yabby pump, coll. T. Komai, 1 male (cl 7.9 mm), 1 female (cl 9.6 mm), CBM-ZC 12270. Okinawa Island: Ohmine, Naha, intertidal, sea grass beds, 11 November 2011, yabby pump, coll. T. Maenosono, 1 female (cl 12.5 mm), CBM-ZC 13085; same locality, 7 May 2012, tidal flat with sea grass, yabby pump, coll. M. Osawa, 2 males (10.9, 12.2 mm), RUMF-ZC 3907; same locality, 4 July 2012, yabby pump, coll. T. Komai, 2 males (cl 5.6, 7.5 mm), 1 female (cl 10.2 mm), 1 ovigerous female (cl 14.3 mm), CBM-ZC 12268; same locality, grass beds, 25 April 2013, yabby pump, coll. T. Komai, 4 males (cl 8.8–13.4 mm), 11 females (8.9–14.0 mm), CBM-ZC 12712. Ishigaki Island, Yaeyama Islands: Sukuji Beach, intertidal, sand flat, 27 June 2005, yabby pump, coll. T. Komai, 1 juvenile (cl 4.3 mm), CBM-ZC 12834; Kabira, intertidal, sand flat with sea grass beds, 18 December 2008, yabby pump, coll. T. Komai, 2 males (cl 12.0, 13.6 mm), 1 female (cl 12.7 mm), CBM-ZC 10753. Iriomote Island, Yaeyama Islands: Ohmijya River estuary, intertidal, sand flat, sea grass beds, 29 June 2007, yabby pump, coll. T. Komai, 2 males (cl 8.8, 9.0 mm), 1 ovigerous female (cl 12.8 mm), CBM-ZC 9775.

Description. Carapace (Figs. 8A, 9A) with rostrum (Figs. 8B, 10A–C) narrowly triangular, spiniform, falling slightly short of to slightly overreaching distal corneal margins, directed forward or slightly ascending; dorsal surface of rostrum non-carinate, with pair of tufts of short setae slightly proximal to midlength, lateral surface with short carina merging into orbital margin, ventral surface with poorly developed midventral ridge in proximal half. Frontal margin with sharp anterolateral spine on either side of rostrum, reaching to midlength of rostrum, directed forward or slightly mesially in dorsal view, directed forward or slightly ascending in lateral view, with basal part non-calcified (translucent); orbital margin between rostrum and anterolateral spine concave. Anterior part of dorsum slightly sloping to rostral base; dorsal oval marked posteriorly by deep cervical groove crossing midline at 0.8 of carapace length, laterally by groove extending anteroventrally to either side above linea thalassinica, and anteriorly by very shallow groove reaching to midline, comparatively narrow (Fig. 20C); cardiac region posterior to cervical groove slightly sloping posteriorly, slightly higher than dorsal oval, posterodorsal margin fringed with short setae. Linea thalassinica running over entire length of carapace. Anterolateral notch very deep, V-shaped. Hepatic region on branchiostegite with calcified plate smooth, devoid of low elevations, extending posteriorly as narrow band to level of cervical groove along linea thalassinica; remainder part membranous, smooth, without any sclerite or reticulate pattern of rugosity.

Shield on seventh thoracic sternite (Fig. 10D) strongly calcified, longer than wide, subpentagonal in general outline, anteromedian portion well produced; ventral surface flattish, with Y-shaped groove.

Pleon (Figs. 8C, 9B–D) generally glabrous dorsally, about 2.9 times as long as carapace, first and second pleomeres combined distinctly longer than carapace; length ratio of first to sixth pleomeres and telson measured along midline, 1.0:1.3:0.7:0.5:0.5:0.9:0.3; first and second

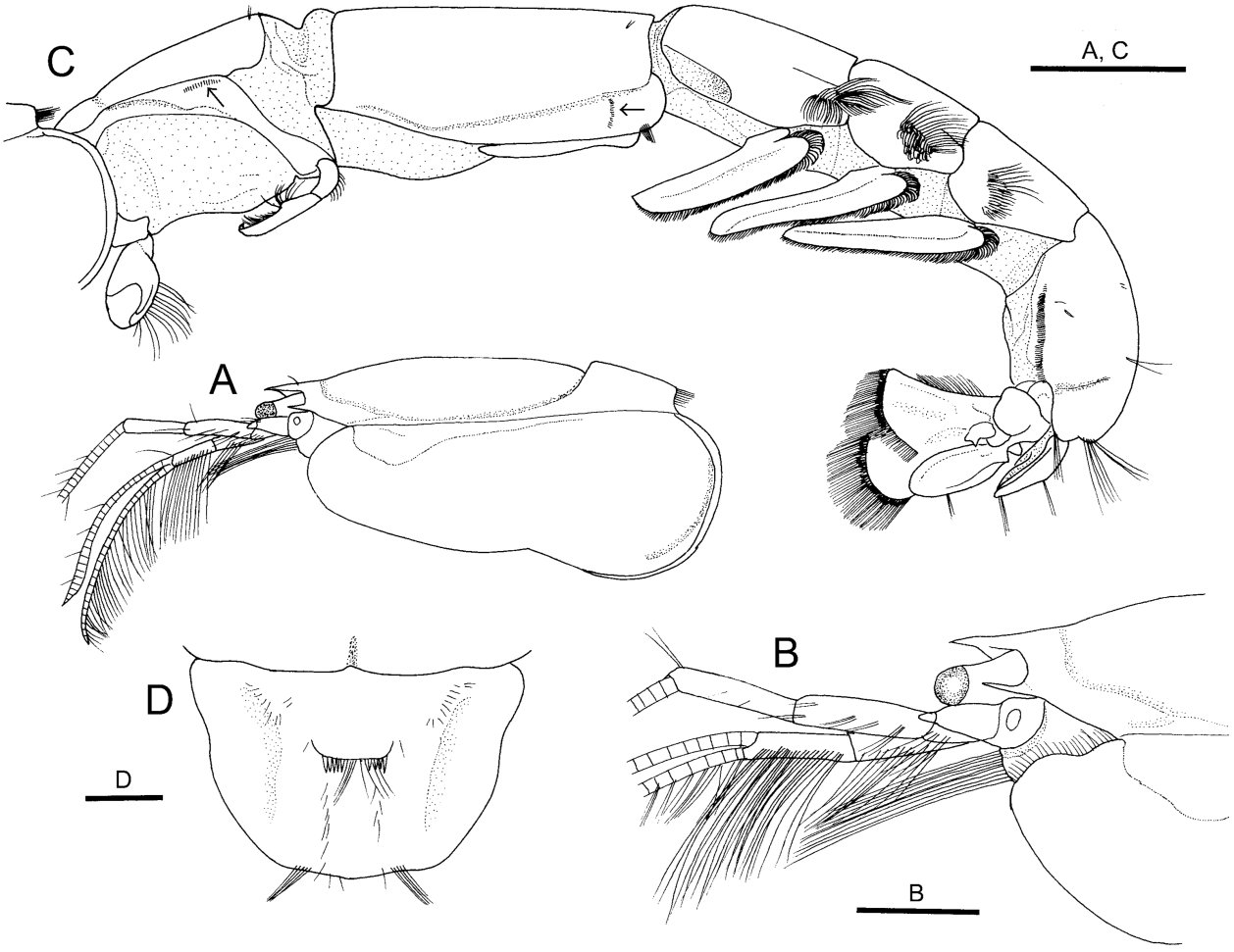


Fig. 8. *Corallianassa borradailei* (De Man, 1928a), female (cl 13.6 mm), CBM-ZC 12712. A, carapace and cephalic appendages, lateral view; B, anterior part of carapace and cephalic appendages, lateral view (antennular and antennal flagella partially omitted); C, pleon, telson and pleonal appendages, lateral view (arrows indicating setal rows); D, telson, dorsal view. Scale bars: A, C, 5 mm; B, 2 mm; D, 1 mm.
図 8. *Corallianassa borradailei* (De Man, 1928a) (新称: モバホソスナモグリ), female (頭胸甲長 13.6 mm), CBM-ZC 12712. A, 頭胸甲と頭部付属肢, 側面観; B, 頭胸甲前部と頭部付属肢, 側面観 (触角鞭は部分的に省略); C, 腹部, 尾節, 腹部付属肢, 側面観 (矢印は毛列を指示); D, 尾節, 背面観. スケールバー: A, C, 5 mm; B, 2 mm; D, 1 mm.

pleomeres combined distinctly longer than third to fifth pleomeres combined (2.3:1.7). First pleomere narrowing anteriorly in dorsal view, about 1.6 times as long as greatest width, without transverse groove bisecting tergite; pleuron with poorly defined ventral margin, continuing to chitinous frame bordering posterior part of sternite; short setal row adjacent to ventral margin of chitinous tergite slightly posterior to midlength; remaining part of sternite membranous. Second pleomere elongate, slightly widened posteriorly, about 1.7 times as long as wide; pleuron having posterolateral margin slightly expanded, lateral surface with distinct groove along margin and posteriorly with vertical, crescentic row of setose punctae on low, short carina and small tuft of setae adjacent to posteroventral angle. Third to fifth pleura each with patch of soft plumose setae, position of setal patch becoming more anterior in posterior somites; posterolateral margins slightly expanded; third pleuron with distinct longitudinal depression ventrally in anterior half, dorsal margin of depression defined by sharp carina. Third and fourth pleomeres each with longitudinal sulcus posterolaterally. Sixth pleomere subsemicircular in dorsal view, almost as long as wide; tergite strongly convex longitudinally and transversely, laterally with short transverse groove at approximately about posterior 0.3; lateral surfaces each with field of dense short setae anterior to lateral groove; posterior margin slightly bilobed by short median groove, with 2 pairs of tufts of long

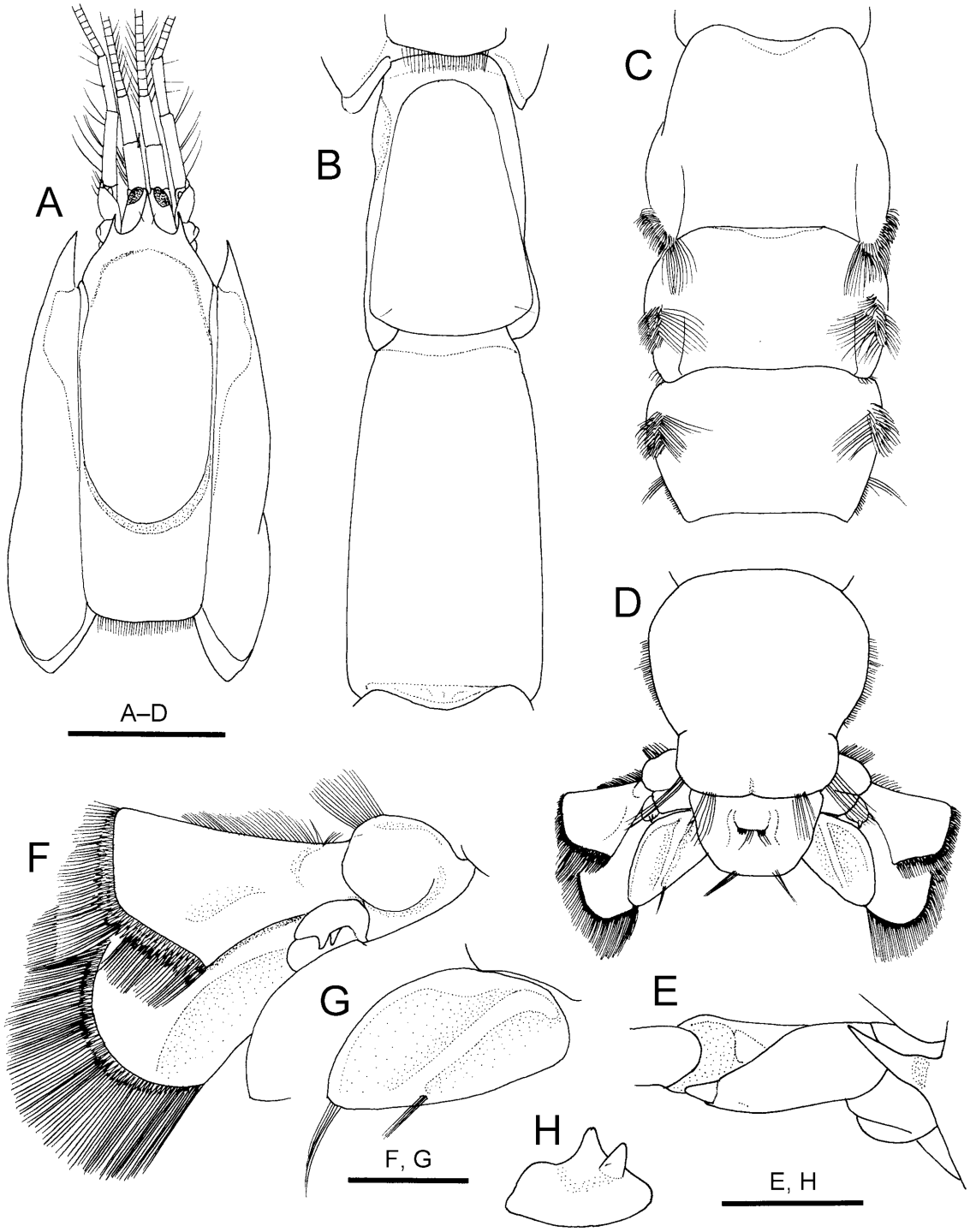


Fig. 9. *Corallianassa borradailei* (De Man, 1928a), female (cl 13.6 mm), CBM-ZC 12712. A, carapace and cephalic appendages, dorsal view (antennular and antennal flagella partially omitted); B, first and second pleomeres, dorsal view; C, third to fifth pleomeres, dorsal view; D, sixth pleomere, telson and uropods, dorsal view; E, proximal part of left antennal peduncle, dorsal view (setae omitted); F, left uropod, exopod, dorsal (perpendicular) view; G, same, endopod, dorsal (perpendicular) view; H, proximomesial article of exopod of left uropod, dorsal view. Scale bars: A–D, 5 mm; E, H, 1 mm; F, G, 2 mm.

図 9. *Corallianassa borradailei* (De Man, 1928a) (新称: モバホソスナモグリ), 雌 (cl 13.6 mm), CBM-ZC 12712. A, 頭胸甲と頭部付属肢, 背面観 (触角鞭は部分的に省略); B, 第 1, 第 2 腹節, 背面観; C, 第 3–第 5 腹節, 背面観; D, 第 6 腹節, 尾節, 尾肢, 背面観; E, 左第 2 触角柄部の基部, 背面 (剛毛は省略); F, 左尾肢外肢, 背面観; G, 同内肢, 背面観; H, 左尾肢外肢の内側基部節, 背面. スケールバー: A–D, 5 mm; E, H, 1 mm; F, G, 2 mm.

setae laterally.

Telson (Figs. 8D, 9D) about 1.6 times wider than long, subtrapezoidal, broadest at base, posteriorly subtruncate to faintly produced medially; posterolateral corners broadly rounded, each bearing tuft of long setae; dorsal surface anteromedially elevated, posterior margin of this median elevation with transverse row of spiniform or cuspidate setae and long, slender setae; lateral margins slightly sinuous, unarmed.

Eyestalks (Figs. 8B, 10A–C) subcylindrical, contiguous, slightly narrowing distally, slightly overreaching distal end of first segment of antennular peduncle; distomesial projection ventral in location, obtusely angular or rounded, occasionally slightly overreaching distal corneal margin; cornea located terminally, not inflated, darkly pigmented, occupying much less than half length of eyestalk. Length of exposed eyestalk in dorsal view slightly exceeding twice of basal width.

Antennular peduncle (Figs. 8A, B, 9A, 10A) shorter and slightly stouter than antennal peduncle, 0.3–0.4 times as long as carapace, Third segment 1.2–1.3 times as long as second segment, reaching midlength of fifth segment of antennal peduncle. Distal 2 segments with ventromesial and ventrolateral rows of long setae, those of ventrolateral row longer; rows of setae continued onto ventral flagellum. Dorsal flagellum about half the length of carapace, subequal to or slightly shorter than ventral flagellum; articles in distal half bearing aesthetascs.

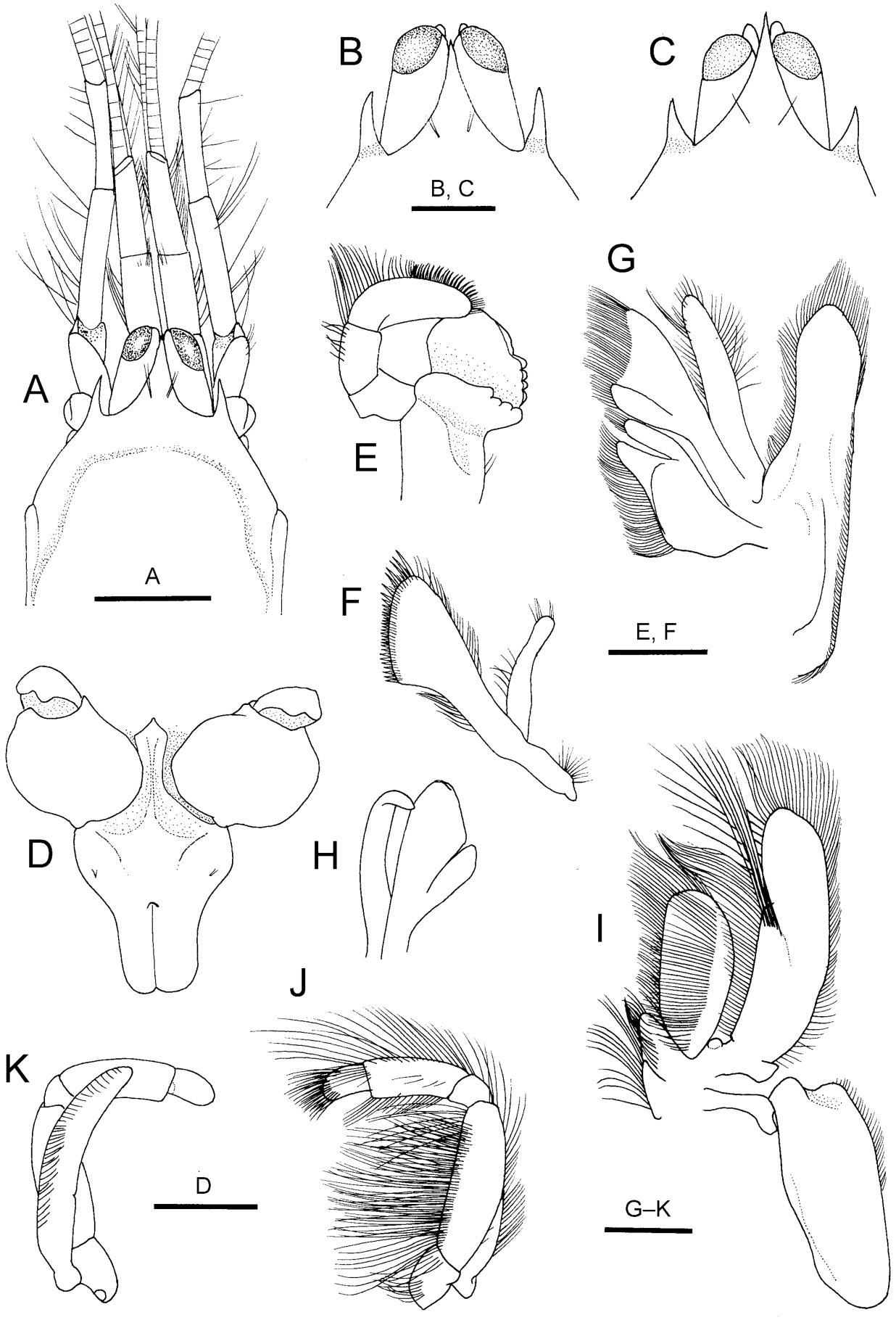
Antennal peduncle (Figs. 8A, B, 9A, 10A) about half the length of carapace. First segment short, forming slightly produced, sparsely setose lobe above laterally produced excretory pore. Second and third segments obliquely jointed, third segment greatly hidden by second segment in lateral view; second segment distolaterally with single tuft of setae; third segment with partially fused condylar process articulated to distolateral extreme of second article. Fourth segment slightly broader than fifth segment, with sparse row of tufts of long setae on lateral face. Fifth segment 0.7–0.8 times as long as fourth segment. Scaphocerite apparently absent (Fig. 9E). Antennal flagellum 2.5–3.0 times as long as dorsal flagellum of antennule, each article with 1–5 short to long, simple or plumose setae (up to twice length of 1 article) on distal margin.

Mandible (Fig. 10E) with stout molar process bearing bluntly denticulate edge; incisor process with row of blunt teeth proximally on mesial edge; palp 3-articulated, terminal segment longest, with stiff setae. Maxillule (Fig. 10F) with distal endite widened terminally, with rows of small spiniform setae on mesial margin; endopod slender, curved distally. Maxilla (Fig. 10G, H) with proximal and distal endites each divided into unequal lobes; proximal lobe of proximal endite tapering; endopod elongate, flattened, strongly curved dorsally, thus not exceeding beyond terminal margins of distal endite or of scaphognathite; scaphognathite moderately narrow. Second maxilliped (Fig. 10J, K) with moderately slender; pediform endopod consisting of 4 articles (merus and ischium fused); exopod well developed, flattened, distinctly overreaching distal margin of merus-ischium fused segment.

Third maxilliped (Fig. 11A, B) without exopod. Endopod with long setae on ventral margins of ischium-merus, distal 3 segments also with long setae on extensor margins. Length of merus-ischium exceeding 2 times width; ischium subrectangular, slightly longer than broad, proximoventral margin rounded, not strongly produced, mesial surface with well-developed crista dentata (Fig. 11C) consisting of prominent elevation with row of sharp, closely spaced denticles in distal 0.5, followed by widely separated spine and cluster of spines; merus subrectangular, slightly broader than long, dorsal and ventral margins broadly convex. Carpus slightly longer but much narrower than merus, abruptly narrowing in proximal half; mesial surface with

Fig. 10. *Corallianassa borradailei* (De Man, 1928a), A, D–K, female (cl 13.6 mm), CBM-ZC 12712, B, female (cl 10.8 mm), same lot; C, female (cl 10.8 mm), same lot. A, anterior part of carapace and cephalic appendages, dorsal view; B, C, frontal part of carapace and eyestalks, dorsal view; D, shield of thoracic sternite 7 and coxae of fourth pereopods, ventral view; E, left mandible, inner view; F, left maxillule, outer view (proximal endite broken off); G, left maxilla, outer view; H, same, endopod and distal endite, inner view (setae omitted); I, left first maxilliped, outer view; J, left second maxilliped, outer view; K, same, inner view (setae omitted). Scale bars: A, D, 2 mm; B, C, E–K, 1 mm.

図 10. *Corallianassa borradailei* (De Man, 1928a) (新称: モバホソスナモグリ), A, D–K, 雌 (頭胸甲長 13.6 mm), CBM-ZC 12712; B, 雌 (頭胸甲長 10.8 mm), 同ロット; C, 雌 (頭胸甲長 10.8 mm), 同ロット. A, 頭胸甲前部と頭部付属肢, 背面観; B, C, 額部と眼柄, 背面観; D, 第 7 胸節の楯板と第 4 胸脚の底節, 腹面観; E, 左大顎, 内面観; F, 左第 1 小顎, 外面観 (基節内葉は破損); G, 左第 2 小顎, 外面観; H, 同, 先内葉と内肢, 内面観 (剛毛は省略); I, 左第 1 顎脚, 外面観; J, 左第 2 顎脚, 外面観; K, 同, 内面観 (剛毛は省略). スケールバー: A, D, 2 mm; B, C, E–K, 1 mm.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dense field of fine setae distally. Propodus large, subquadrate with nearly straight dorsal (extensor) margin and broadly convex ventral (flexor) margin, height subequal to or exceeding length; distal margin inferior to base of dactylus faintly concave, with prominent tuft of setae medially; mesial surface with patch of dense setae at proximal end of shallow median sulcus. Dactylus narrow, slightly arcuate, shorter than propodus, terminally with small brush of stiff setae.

First pereopods (chelipeds) unequal and dissimilar (Fig. 20A, C), strongly compressed laterally; no significant sexual dimorphism seen; coxae each with shallowly excavate mesial surface. Major cheliped of adults (Fig. 12A) strongly calcified. Ischium slender, somewhat widened distally; dorsal margin gently sinuous, non-carinate; ventral margin with row of sharp, obliquely erect spines noticeably increasing in size distally (proximal teeth occasionally minute). Merus about 1.9 times as long as high; dorsal margin gently arcuate, unarmed, distinctly carinate; ventral margin with row of sharp, forwardly directed spines increasing in size proximally on distinct carina; lateral surface elevated along midline into blunt ridge, ventral half forming shallow concavity accommodating proximoventral portion of carpus when cheliped flexed; mesial surface slightly uneven. Carpus widened distally, distal height greater than length, relatively shorter and higher in adults than in immature specimens; dorsal margin nearly straight, forming keel terminating in blunt corner, proximoventral to ventral margin regularly rounded and smooth in outline, forming keel terminating in blunt or subacute corner; lateral surface evenly convex transversely; mesial surface with upturned ventral margin, weakly convex medially, and shallowly concave proximally near joint to merus. Chela heavy, length (including fixed finger) in adults 1.5–1.6 times of greatest height at about midlength of palm; dorsal margin of palm forming smooth, sharply edged keel over entire length, terminating in small, blunt or subacute tooth (Fig. 12B); ventral margin with sharply edged keel extending onto midlength of fixed finger, keel lined on mesial side by row of tufts of long stiff setae extending onto tip of fixed finger; lateral surface of palm evenly convex transversely, with few tufts of stiff setae distally; mesial surface very slightly convex medially. Fixed finger feebly curved in distal half, terminating in acute or subacute tip; occlusal margin with low, marginally minutely denticulated tooth occupying proximal one-third, remainder forming sharp, minutely denticulate or smooth edge. Dactylus subequal to or shorter than palm, slightly curving mesially in dorsal view, terminating in curved, blunt to acute tip; dorsal surface bluntly carinate in proximal one-third, with row of tufts of long stiff setae; lateral surface medially elevated into blunt ridge proximally, with row of tufts of stiff setae ventral to midline; occlusal margin with obtuse tooth proximal to midlength, distal half forming sharp, smooth or faintly denticulate edge.

Minor cheliped (Fig. 12C, D) similar to major cheliped in general setation and structure, but distinctly more slender. Ischium widened distally; dorsal margin faintly sinuous, unarmed; ventral margin with row of spines noticeably in size distally. Merus elongately ovoid, length approximately twice height; armature on ventral margin considerably variable individually, unarmed or armed with 1 or more small, forwardly curved spines or minute to tiny denticles; lateral surface elevated along midline, ventral half shallowly depressed to accommodate proximoventral margin of carpus. Carpus subrectangular, narrowing proximally, slightly longer than merus, about 1.3 times length of palm, length about 1.5 times height, height greatest at distal end; dorsal and ventral margins sharply keeled. Chela as high as carpus; palm subrectangular, length subequal to or slightly greater than height, dorsal margin sharply keeled, terminating in small, blunt or subacute tooth, ventral margin also with sharp keel extending onto midlength of fixed finger; fixed finger 1.3–1.5 times as long as palm, gradually tapering to acute or subacute tip, occlusal margin sharply edged entirely, usually with small obtuse tooth at proximal 0.3; narrow hiatus between fingers; dactylus in adults equal in length to fixed finger, terminating in weakly curved tip, occlusal margin sharply edged, unarmed or with obtuse tooth proximally.

Second pereopod (Fig. 11D) chelate, strongly compressed laterally, numerous long setae on ventral margins of ischium to chela, setae of dorsal margin of carpus, palm and dactylus set in series of tufts. Coxa with shallowly concave mesial surface. Ischium with dorsal margin nearly straight, glabrous; ventral margin sinuous, terminating in small, well-marked tubercle. Merus with dorsal margin faintly sinuous, almost glabrous, with tuft of setae on dorsodistal margin; lateral surface almost glabrous, with few tufts of setae arranged longitudinally; ventral margin sinuous, distal part forming narrow facet. Carpus triangular, with transverse row of tufts of short setae adjacent to distal margin on lateral

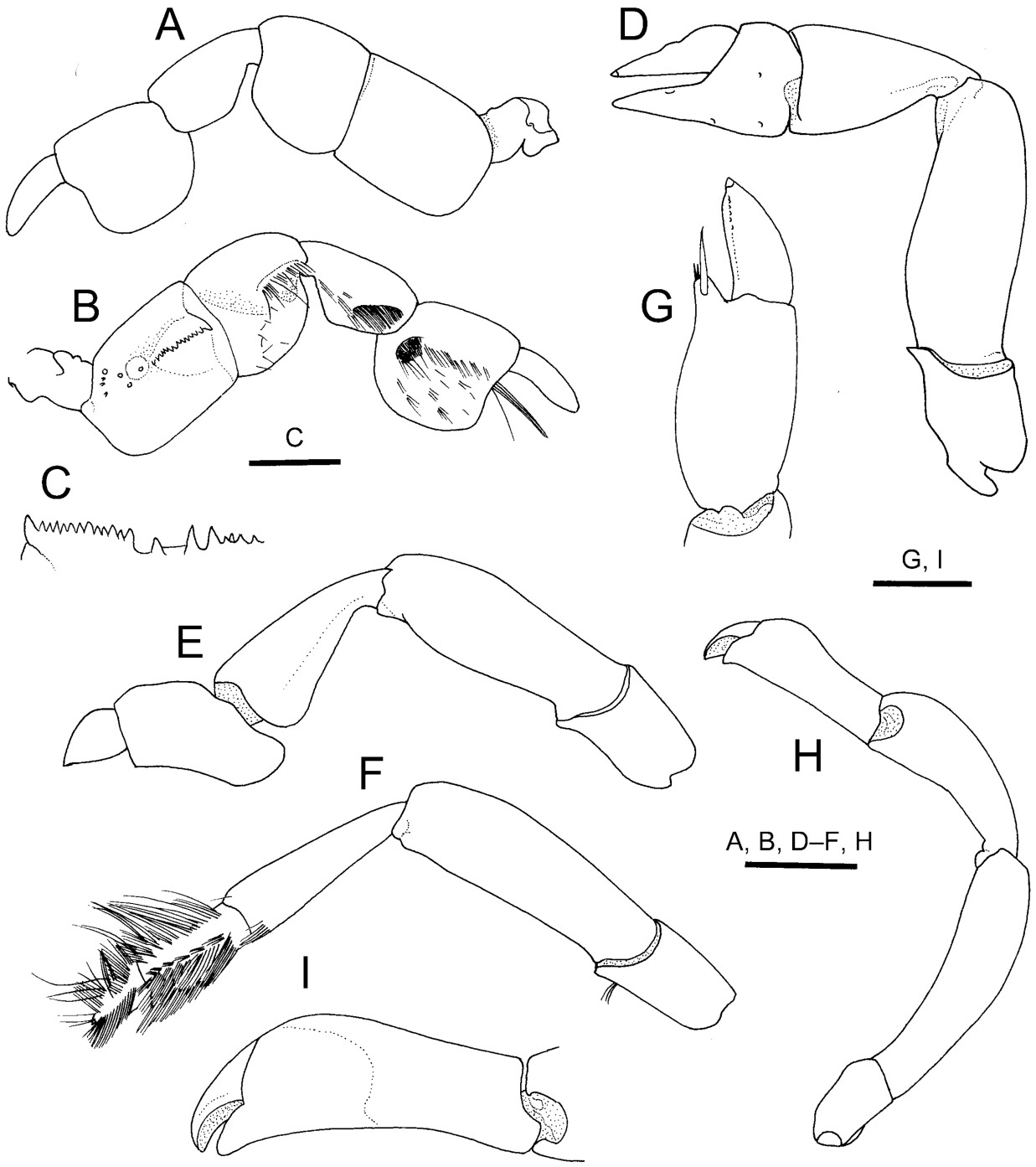

Fig. 11. *Corallianassa borradailei* (De Man, 1928a), female (cl 13.6 mm), CBM-ZC 12712, left thoracic appendages. A, third maxilliped, lateral view (setae omitted); B, same, mesial view (setation partially shown); C, same, crista dentata on ischium, dorsal view; D, second pereopod, lateral view (setae omitted); E, third pereopod, lateral view (setae omitted); F, fourth pereopod, lateral view; G, same, propodus and dactylus, lateral view (setae and bristle on fixed finger shown); H, fifth pereopod, lateral view (setae omitted); I, same, chela, extensor view (setae omitted). Scale bars: A, B, D–F, H, 2 mm; C, G, I, 1 mm.

図 11. *Corallianassa borradailei* (De Man, 1928a) (新称: モバホソスナモグリ), 雌 (頭胸甲長 13.6 mm), CBM-ZC 12712, 左側胸部付属肢. A, 第 3 顎脚, 側面観 (剛毛は省略); B, 同, 内面観 (剛毛を部分的に表示); C, 同, 内面歯列の細部, 背面観; D, 第 2 胸脚, 側面観 (剛毛は省略); E, 第 3 胸脚, 側面観 (剛毛は省略); F, 第 4 胸脚, 側面観; G, 同, 前節と指節 (不動指上の棘状剛毛を表示); H, 第 5 胸脚, 側面観 (剛毛は省略); I, 同, 前節と指節, 背面観 (剛毛は省略). スケールバー: A, B, D–F, H, 2 mm; C, G, I, 1 mm.

surface. Chela also triangular; dorsal margin of palm convex; lateral surface of palm with several tufts of short setae; fingers straight, each terminating in small corneous tip, occlusal margins microscopically pectinate; dactylus 2.5 times as long as palm.

Third pereopod (Fig. 11E) with coxa having flattish mesial surface. Ischium with dorsal margin nearly straight, ventral margin gently sinuous and terminating in small tubercle. Merus broadest in distal one-third, length less than 3 times height; margins and lateral surface glabrous. Carpus broadest distally, length exceeding 2 times distal height, terminally with patches of long setae overreaching propodus. Propodus with proximally-directed lobe of inferior margin (heel) not reaching beyond broadest part of carpus, lobe terminally with long distally-directed setae, inferodistal margin sinuous, with row of tufts of short setae, superior margin with fields of long setae grading to small patterned tufts of short setae on lateral face of segment. Dactylus tear-shaped, densely setose on lateral surface, terminating in corneous tip directed to external side.

Fourth pereopod (Fig. 11F) strongly compressed laterally, semichelate. Coxa (Fig. 10D) enlarged, transversely suboval, unarmed. Ischium with dorsal and ventral margins nearly straight, latter terminating in low tubercle. Merus wider and longer than carpus. Propodus (Fig. 11G) shorter than carpus; dorsal margin nearly straight; ventral margin gently sinuous, ventrodistal corner produced into short fixed finger bearing stout, microscopically serrate seta on external side and short bristles at tip; dense setation on outer surface of propodus and dactylus, that of propodus divided into upper and lower fields, densest in lower field where continued onto lower half of inner surface; dactylus terminating in narrow tip directed toward external side.

Fifth pereopod (Fig. 11H) chelate. Coxa with flattish outer surface. Ischium short, subcylindrical. Merus longest, gently arcuate. Carpus slightly longer than propodus, greatest height at about distal one-third; dorsal margin noticeably convex distally. Propodus (Fig. 11I) highest at distal one-fourth; opposable surfaces of propodus and small dactylus excavate, spooned, terminally rounded, forming beak-like chela obscured by dense fields of setation on distal half of propodus and superior surface of dactylus; distal margins of tips of fingers microscopically pectinate.

First pleopod of male and female uniramous, composed of 2 segments. In male (Fig. 13A), distal segment ovate, subequal in length to but not much wider than proximal segment, subdivided into 2 lobes by small V-shaped notch; superior lobe terminally rounded in mature specimens, inferior lobe terminally acute or subacute with tip directed distally, slightly overreaching superior lobe. In female (Fig. 13B), both articles moderately slender and elongate, proximal segment strongly curved, distal segment with weakly produced shoulder slightly proximal to midlength.

Second pleopod of male and female biramous. In male (Fig. 13C–E), setation short and sparse overall; protopod widened distally; endopod only faintly narrowed distally with rounded or subtruncate distal margin; appendix interna present or absent, when present, very small and slender, located at distomesial angle of endopod; exopod slightly narrowed distally, exceeding endopod distally, with faint transverse sutures, suggesting incomplete multi-articulation. In female (Fig. 13F), both rami with long setae; protopod slightly widened distally; endopod slender, mesial margin markedly sinuous, terminal lobe triangular, directed slightly laterally; appendix interna stout with convex mesial margin, located mesial to base of terminal lobe, slightly overreaching tip of terminal lobe, bearing cluster of cincinnuli on distal half of mesial surface (Fig. 13G); exopod shorter than endopod, with some complete or incomplete transverse sutures.

Third to fifth pleopods (Fig. 13H) forming large, wide, posteriorly cupped fans when cross-linked by cincinnuli of appendices internae on opposed margins of endopods. Protopods flattened, strongly produced distomesially into prominent, rounded lobes. Endopods each with low median keel on anterior (or dorsal) side; mesial part distal to appendix interna having row of short, transverse, dendritic sutures. Each appendix interna (Fig. 13I) subtriangular, short, stubby, basally embedded into straight mesial margin of endopod; opposable surface ovoid, bearing coupling hooks. Exopods articulated to lateral margin of protopods, embracing endopods.

Uropod (Fig. 9F, G) with protopod roundly subrectangular in general shape, dorsally divided into 2 parts by distinct transverse suture, with prominent rounded process at posteromesial angle (hidden by telson). Endopod falling short of exopod in distal extension, subsemicircular in general outline with more strongly convex anterolateral margin than posteromesial margin, about twice as long as broad, margins almost glabrous, tapering to rounded posterolateral terminus bearing marginal fringe of long setae; dorsal surface with obsolete carina extending from base, but not reaching posterolateral angle. Exopod subtriangular in general

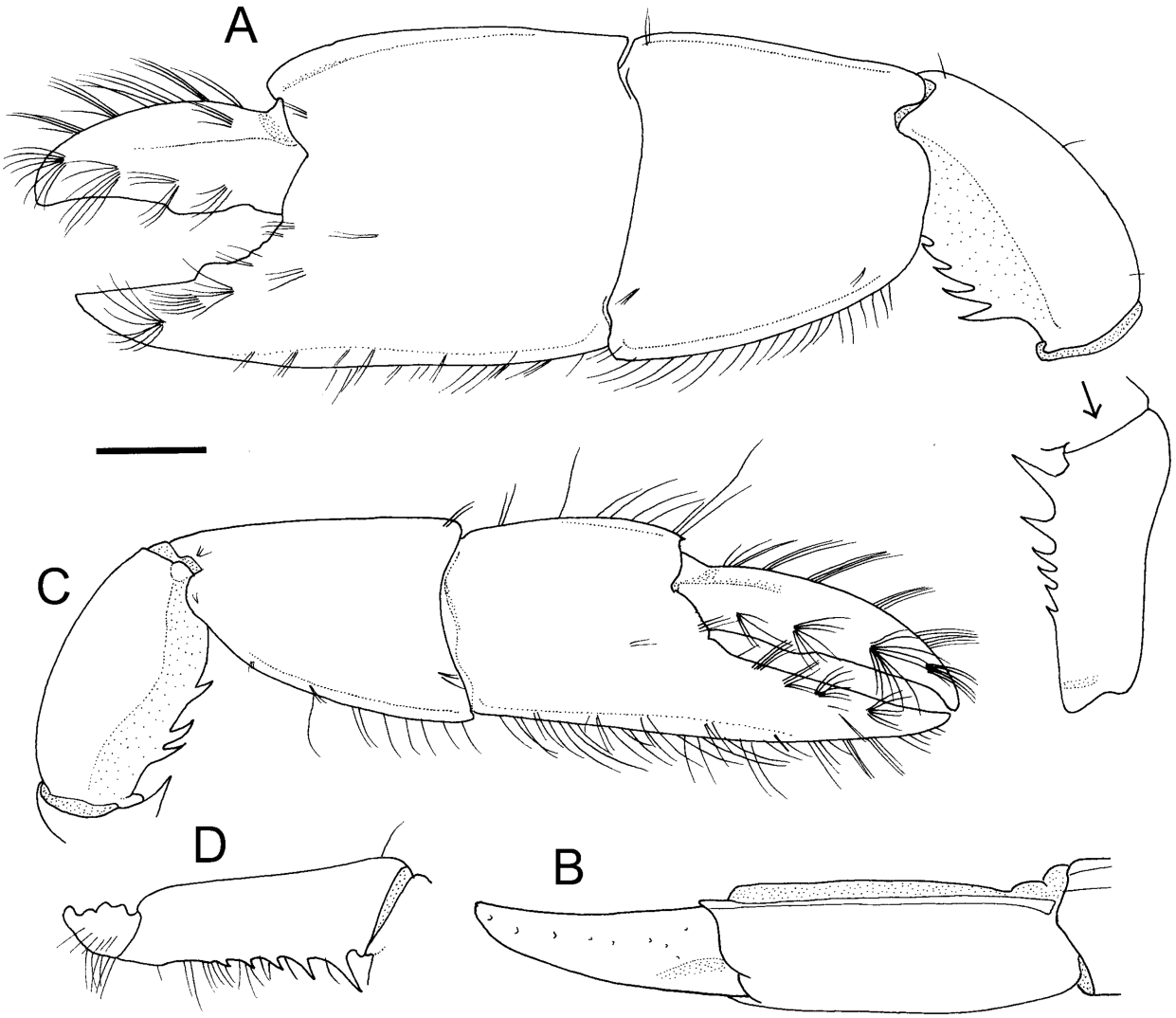

Fig. 12. *Corallianassa borradailei* (De Man, 1928a), female (cl 13.6 mm), CBM-ZC 12712. A, major (left) cheliped, lateral view; B, same, chela, dorsal view (setae omitted); C, minor (right) cheliped, merus to chela, lateral view; D, same, ischium, lateral view. Scale bar: 2 mm.
図 12. *Corallianassa borradailei* (De Man, 1928a) (新称: モバホソスナモグリ), 雌 (頭胸甲長 13.6 mm), CBM-ZC 12712. A, 大鉗脚 (左第 1 胸脚), 側面観; B, 同, 鉗部, 背面観 (剛毛は省略); C, 小鉗脚 (右第 1 胸脚), 長節–鉗部, 側面観; D, 同, 坐節, 側面観. スケールバー: 2 mm.

outline, with very thick upper (anterodorsal) plate falling well short of distal margin, posterodistal edge of upper plate gently convex, with short, thick, spiniform setae grading to thinner, dense, elongate setae of exopodal margin; outer margin of exopod angular at junction between upper and lower plates, distal margin with dense fringe of setation, longest distomesially; dorsal surface of lower plate faintly concave mesially; inner margin faintly sinuous, almost glabrous; proximomesial article well demarcated, with 2 subequal or slightly unequal tubercles or spines directed mesially (Fig. 9H).

Coloration in life. Body generally whitish or yellowish translucent. Carapace with tinge of yellowish brown on anterior and lateral parts of dorsal oval. Cornea dark brown. First maxilliped with dense cluster of scarlet chromatophores on distal part of exopod. Third maxilliped with vivid scarlet spots on articulating membranes between dactylus and propodus and between propodus and carpus. Chelae and carpi of chelipeds mottled with white and light brown; merus with tinge of brown dorsodistally. Second pereopod with scarlet spot on propodus just proximal to base of dactylus. See Fig. 20A–C.

Variation. The development of the ventromesial

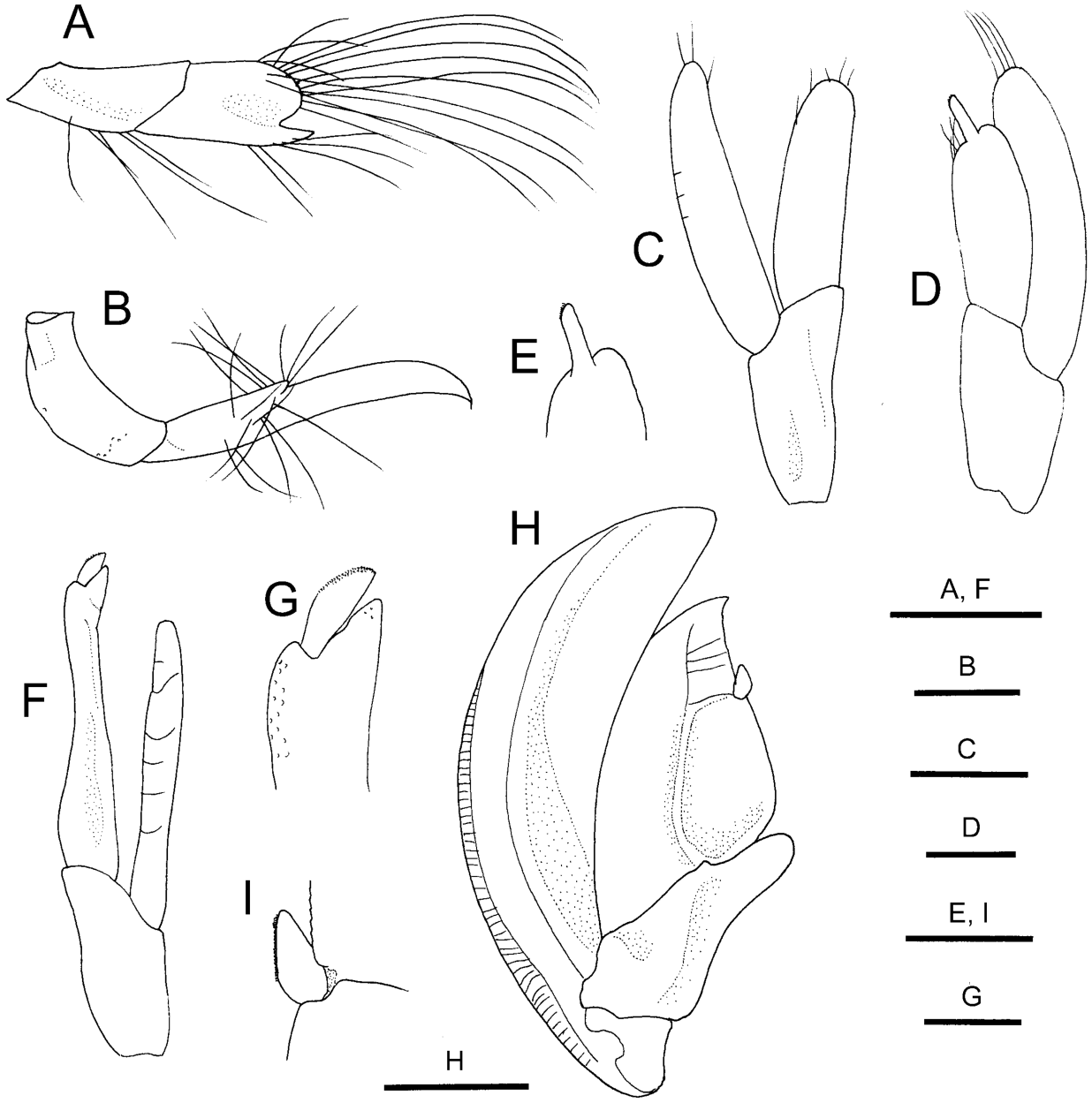

Fig. 13. *Corallianassa borradailei* (De Man, 1928a). A, C, male (cl 11.9 mm), CBM-ZC 12712; B, F, G–I, female (cl 13.6 mm), same lot: D, E, male (cl 7.9 mm), CBM-ZC 12270. A, male left first pleopod, inner view; B, female left first pleopod, inner view (setae partially omitted); C, male left second pleopod, dorsal view; D, same, ventral view; E, same, distal part of endopod, ventral view (setae omitted); F, female left second pleopod, ventral view (setae omitted); G, same, distal part of endopod, ventral view (setae omitted); H, left third pleopod, dorsal (anterior) view (setae omitted); I, same, appendix interna, ventral (posterior) view. Scale bars: A, H, 2 mm; B, C, F, 1mm; D, E, I, G, 0.5 mm.

図 13. *Corallianassa borradailei* (De Man, 1928a) (新称: モバホソスナモグリ). A, C, 雄 (頭胸甲長 11.9 mm), CBM-ZC 12712; B, F, G–I, 雌 (頭胸甲長 13.6 mm), 同ロット; D, E, 雄 (頭胸甲長 7.9 mm), CBM-ZC 12270. A, 雄第 1 腹肢, 内面観; B, 雌左第 1 腹肢, 内面観 (剛毛は部分的に省略); C, 雄左第 2 腹肢, 背面観; D, 雄左第 2 腹肢, 腹面観; E, 同, 内肢の先端部 (剛毛は省略); F, 雌左第 2 腹肢, 腹面観 (剛毛は省略); G, 同, 内肢の先端部, 腹面観 (剛毛は省略); H, 左第 3 腹肢, 背面 (前面) 観 (剛毛は省略); H, 同, 内肢突起, 腹面 (後面) 観. スケールバー: A, H, 2 mm; B, C, F, 1mm; D, E, I, G, 0.5 mm.

burrow construction, behavior, and burrow type of a distal projection of the eyestalk is variable as figured (Fig. 10A–C).

The major cheliped is relatively slightly larger in males than in females, but structurally similar between sexes.

In males, the development of the appendix interna on the second pleopod is highly variable from well developed, digitiform in small specimens (Fig. 13D, E) to reduced or absent in large specimens (Fig. 13C).

Distribution. Because of the taxonomic confusion with *Corallianassa coutierei* (type locality: Djibouti, Red Sea), the real distribution of the present species remains unclear. Known with certainty from Maldives (Borradaile 1904; De Man 1928a, b), Chagos Archipelago (Ward 1942), Fiji (Manning 1987) and Hawaii (Edmondson 1944; Manning 1987; Ngoc-Ho 2002); intertidal to shallow subtidal. Newly recorded from the Ryukyu Islands, Japan (Amami-ohshima Island to Yaeyama Islands); intertidal.

Habitat. Vast majority of the present specimens were collected from tidal sand flats with sparse to moderate vegetation of sea grass. Kneer et al. (2008) reported on callianassid species inhabiting grass beds, identified with *Corallianassa coutierei*. Judging from the habitat, the species reported by Kneer et al. (2008) seems to actually represent *C. borradailei*, instead of *C. coutierei*.

Remarks. When Manning (1987) established the genus *Corallianassa*, he recognized two species as valid in his new genus, viz., *C. longiventris* and *C. borradailei*. Comparing the material from Fiji and Hawaii, Manning (1987) concluded that *Callianassa oahuensis* was conspecific with *Corallianassa borradailei*, and suggested that *Callianassa coutierei* might be also synonymous with *C. borradailei*. Sakai (1999) examined one male specimen he referred to a lectotype of *Callianassa coutierei* (no explicit lectotype designation was made by him) and two syntypes of *Callianassa placida*, as well as other specimens from various Indo-West Pacific localities. He concluded that De Man's (1928b) taxon was conspecific with Nobili's (1904) taxon, and thus synonymized *C. placida* with *C. coutierei* (as *Glypturus*). Furthermore, Sakai (1999) concluded that *C. coutierei* and *C. borradailei* were conspecific, with the former as the senior synonym, although he did not examine the type material of *C. borradailei*. Ngoc-Ho (2002) examined three female specimens from the Sandwich Islands (= Hawaii), identified with *C. borradailei*, in comparison with two species of *Calliapagurops*, but she did not comment on the identification of those three specimens. Ngoc-Ho (2005), who examined the type material and additional material from Marquesas Islands in French Polynesia, Arabian Gulf and Madagascar, supported the synonymy between *C. coutierei* and *C. placida*, but she did not discuss about *C. borradailei*. Sakai (2011) synonymized *C. coutierei* with "*Glypturus*" *longiventris*, a species distributed in the tropical western Atlantic, and resurrected "*Glypturus" borradailei*. However, no comments justifying the resurrection of "*G.*" *borradailei* were given. Sakai & Türkay (2012, 2014) follow Sakai (2011).

Initially, we identified our specimens from the Ryukyu Islands with *C. coutierei*. However, examination of a specimen from southwestern India, kindly sent to the first author for identification by Dr. A. Biju Kumar, has disclosed that two species are actually involved in *C. coutierei*. The Ryukyuan specimens differ from the Indian specimen in having a sharp dorsal carina on the palm of the major cheliped, extending to the distal end of the palm and being flange-like [this character has been already mentioned by Manning (1987) in differentiating between *C. borradailei* and *C. longiventris*], and the apparently narrower second pleomere. In the Indian specimen, the dorsal carina on the major palm is restricted to the proximal part, like in *C. martensi* (cf. Fig. 18A, B). Sakai (1999) provided a description of the lectotype (male) of *C. coutierei* (as *Glypturus*) and figures from the lectotype of *C. coutierei* and the lectotype (female) of *Callianassa placida*, but he did not mention about the development of the dorsal carina on the major cheliped palm. Dr. Peter C. Dworschak (personal communication, 30 June 2015) kindly informed us that in the type specimens of *C. coutierei*, the dorsal carina of the major cheliped palm is restricted only to the proximal part, like in the Indian specimen. Finally we came to the conclusion that our specimens from the Ryukyu Islands represent *Corallianassa borradailei*, confirming its validity as a full species. Indeed, the figure provided by Borradaile (1904: pl. 58, fig. 2a, b), though rather diagrammatic, clearly shows that the strongly elongate second pleomere and the sharp dorsal carina on the major cheliped palm, well agreeing with our Japanese specimens. We follow previous authors (e.g., Ngoc-Ho 2005) in regarding *Callianassa placidus* to be a junior synonym of *C. coutierei*. The synonymy of *C. oahuensis* with *C. borradailei* is confirmed.

Distinction between *C. coutierei* and *C. longiventris* remains unclear, although Sakai's (2011) argument on the two species is not convincing. Considering the isolated distributional pattern shown by the two taxa (Indo-West Pacific versus tropical

western Atlantic), it seems appropriate to regard they are specifically distinct for the time being.

In addition, Sakai (2011) included "East coast of Tonaki Island, Okinawa Island, Ryukyu Archipelago" in the distribution of his "*Glypturus longiventris*", but it could be an error because this location is the type locality of *Callianassa nakasonei*, a junior subjective synonym of *Corallianassa martensi*. As discussed below in the account of *C. martensi*, Sakai's (2011) treatment of *C. nakasonei* is extremely inconsistent.

Assessment of identifications of *Corallianassa coutierei* in previous references (Sakai 1999, 2005; Ngoc-Ho 2005; Poupin & Junker 2008) is not easy without reexamination of the specimens. The record of *C. coutierei* by Poupin & Junker (2010) can be referred to *C. borradailei*, because the given photos clearly indicate the presence of a sharp carina extending over the entire length of the major cheliped palm.

Corallianassa borradailei is easily distinguished from *C. martensi*, another representative of the genus known from the study area, by the narrower dorsal oval of the carapace, more strongly elongate first and second pleomeres, the possession of short rows of spiniform or cuspidate setae on the dorsal transverse ridge on the telson, flanking the median tuft of long setae (no spiniform or cuspidate setae are present in *C. martensi*), the presence of a row of conspicuous spines on the ventral margins of the ischia and meri of both chelipeds (in *C. martensi*, the ventral margins of the ischium and merus of the major cheliped have only few minute denticles or granules, whereas those of the minor cheliped bears one or two small spines), the sharply keeled dorsal margin of the major cheliped palm (that margin is rounded in the distal half in *C. martensi*), the completely fused rami of the male first pleopod (incompletely fused in *C. martensi*), the suboval uropodal endopod (it is lanceolate in *C. martensi*) and the nearly straight posterior (or inner) margin of the uropodal exopod (the margin is strongly concave in *C. martensi*) and the possession of two spines or tubercles on the proximomesial article of the uropodal exopod (there is only one tubercle on that article in *C. martensi*). The coloration in life is also different between the two species. In particular, the carapace has brownish tinges on the anterior and anterolateral parts of the dorsal oval in *C. borradailei* (Fig. 20C), in contrast having brownish tinge on the rostrum and postrostral region anterior to the transverse groove delimiting the dorsal oval and the central part of the dorsal oval in *C. martensi* (Fig. 20F); the flagella of antennule and antenna have red rings in *C. martensi*, whereas such red rings are absent in *C. borradailei*.

***Corallianassa martensi* (Miers, 1884)**
[New Japanese name: hoso-sunamoguri]
(Figs. 14–19, 20D–F)

Callianassa martensi Miers, 1884: 13, pl. 1, fig. 1 [type locality: Mauritius]. — Sakai 1984: 99, fig. 3 (Heron Island, Queensland; holotype). — Dworschak 1992: 200, fig. 8 (Sri Lanka).
Callianassa (*Callichirus*) *Martensi*. — Borradaile 1903: 547 (no new locality). — Nobili 1906b: 111, fig. 7 (holotype).
Callianassa (*Callichirus*) *Martensii* — De Man 1928b: 29 (list), 109 (key).
Callianassa (*Callichirus*) *nakasonei* Sakai, 1967: 46, pl. 5 [type locality: east coast of Tonaki Island, Okinawa Islands].
Callianassa (*Callichirus*) *martensi*. — Tirmizi 1974: 286, figs. 1–4 (Arabian Sea).
Callichirus martensi. — De Saint Laurent & Le Loeuff 1979: 97 (list).
Callianassa nakasonei. — Sakai 1987: 306 (list).
Glypturus martensi. — Sakai 1988: 55 (key), 61 (list); 1999: 75 (key), 83, fig. 19 (holotype); 2005: 142 (no new locality); 2011: 430 (key), 437 (no new locality). — Tudge et al. 2000: 144 (list). — Davie 2002: 460 (no new locality).
Corallianassa martensi. — Dworschak 2014: 233, figs. 2, 10c (Cocos Islands).
Not *Callianassa Martensi*. — De Man 1888: 482, pl. 21, fig. 1 [= *Corallianassa assimilis* (De Man, 1928b)].
Not *Callianassa Martensi*. — Lanchester 1900: 261, pl. 12, fig. 4, 4a.

Material examined. Okinawa Island: Mizugama, Kadena, 6 m, 6 July 1998, SCUBA diving, coll. Y. Fujita, 1 female (cl 16.0 mm), CBM-ZC 9818; Misaki, Kitanakagusuku, intertidal, sea grass beds, 29 April 2010, yabby pump, coll. M. Osawa, 2 females (cl 16.9, 18.2 mm), RUMF-ZC 3908; same locality, 5 March 2010, yabby pump, coll. M. Osawa, 1 female (cl 16.9 mm), CBM-ZC 13086; same locality, 25 June 2010, yabby pump, coll. M. Osawa, 1 ovigerous female (cl 16.4 mm), CBM-ZC 13087; Ohmine, Naha, intertidal, sea grass beds, 11 November 2011, yabby pump, coll. T. Maenosono, 2 males (cl 5.9, 7.0 mm), CBM-ZC 13088; same locality, intertidal, sea grass beds, 23 November 2011, yabby pump, coll. T. Maenosono, 1 male (cl 10.7 mm), RUMF-ZC 3909; same locality, intertidal, sand flat with sea grass, 7 May 2012, yabby pump, coll. M. Osawa, 1 male (cl 13.1 mm), 1 female (cl

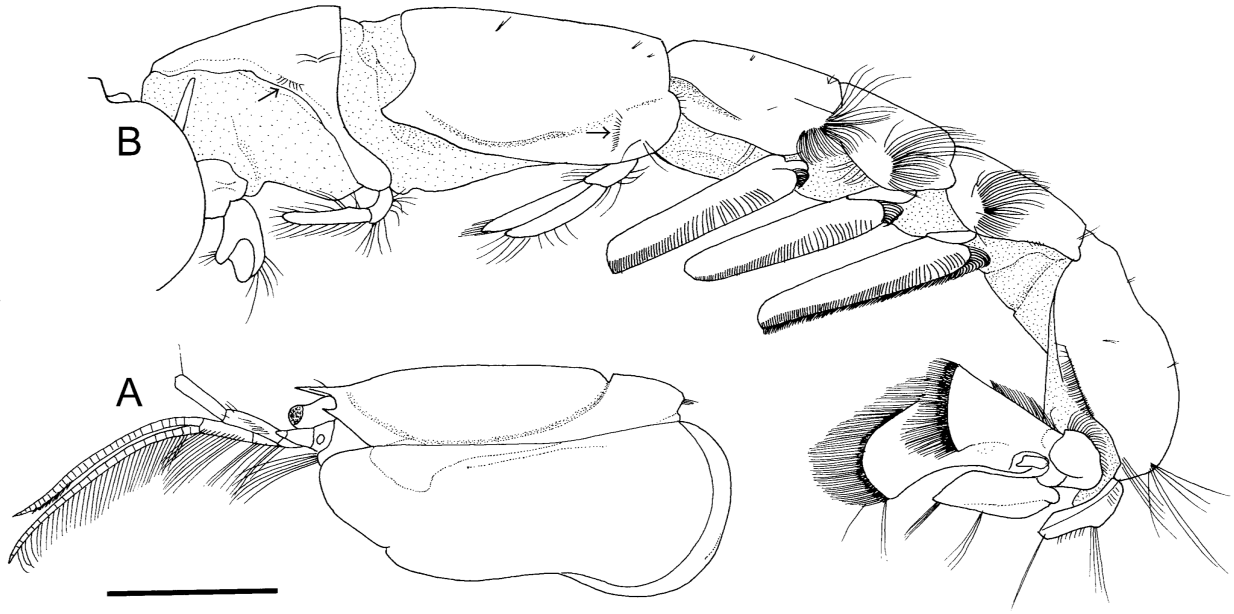

Fig. 14. *Corallianassa martensi* (Miers, 1884), female (cl 11.3 mm), CBM-ZC 12713. A, carapace and cephalic appendages, lateral view; B, pleon, telson and pleonal appendages, lateral view (allows indicating setal rows). Scale bar: 5 mm.
図 14. *Corallianassa martensi* (Miers, 1884) (新称: ホソスナモグリ), 雌 (頭胸甲長 11.3 mm), CBM-ZC 12713. A, 頭胸甲と頭部付属肢, 側面観; B, 腹部, 尾節, 腹部付属肢, 側面観 (矢印は毛列を指示). スケールバー: 5 mm.

11.5 mm), CBM-ZC 13089; same locality, 25 April 2013, yabby pump, coll. T. Komai, 1 female (cl 11.3 mm), CBM-ZC 12713. Tonaki Island, Okinawa Islands: east coast, sand beach, 9 July 1963, coll. Y. Nakasone, 1 female (cl 9.0 mm), holotype of *Callianassa* (*Callichirus*) *nakasonei* Sakai, 1967, KMNH-ZLKU 12408. Miyako Island: Irie, intertidal, 16 May 1999, coll. K. Nomura, 1 male (cl 7.0 mm), CBM-ZC 8802.

Description. Carapace (Figs. 14A, 15A) with rostrum (Fig. 16A, B) narrowly triangular, spiniform, slightly falling short of or reaching distal ends of eyestalks, directed forward; dorsal surface of rostrum non-carinate, with pair of tufts of short setae proximal to midlength, lateral margin merging into orbital margin, ventral surface with low, blunt ridge in proximal half. Frontal margin with sharp anterolateral spine on either side of rostrum, falling short of midlength of rostrum, directed forward, basal part calcified or non-calcified (translucent); orbital margin between rostrum and anterolateral spine concave. Anterior part of dorsum slightly sloping to rostral base; dorsal oval marked posteriorly by deep cervical groove at 0.8 of carapace length, laterally by groove extending anteroventrally to either side above linea thalassinica, and anteriorly by shallow groove reaching nearly to midline, comparatively broad (Fig. 20F); cardiac region posterior to cervical groove slightly sloping posteriorly, as high as dorsal oval; posterodorsal margin fringed with short setae being subequal in length. Linea thalassinica running over entire length of carapace. Anterolateral notch very deep, V-shaped. Branchiostegite with low, calcified plate on hepatic region, calcified part extending posteriorly as narrow plate along linea thalassinica, not extending to level of posterior end of dorsal oval; remainder part membranous, without any sclerite.

Shield on seventh thoracic sternite (Fig. 16C) strongly calcified, longer than wide, subpentagonal in general outline; anteromedian portion well produced forwardly, constricted at base; ventral surface flattish, with oblique short grooves anterolaterally and median groove in posterior one-third, these grooves not connected for each other.

Pleon (Figs. 14B, 15B–D) generally glabrous dorsally, about 3.5 times as long as carapace; length ratio of first to sixth pleomeres and telson measured along midline, 1.0:1.2:0.8:0.6:0.8:1.2:0.4; first and second pleomeres combined equal to third to fifth pleomeres combined. First pleomere narrowing anteriorly in dorsal view, about 1.2 times as long as greatest width; pleuron not clearly defined ventrally, continuing to chitinous frame bordering posterior part of sternite; short setal row adjacent to ventral margin of chitinous tergite slightly posterior to

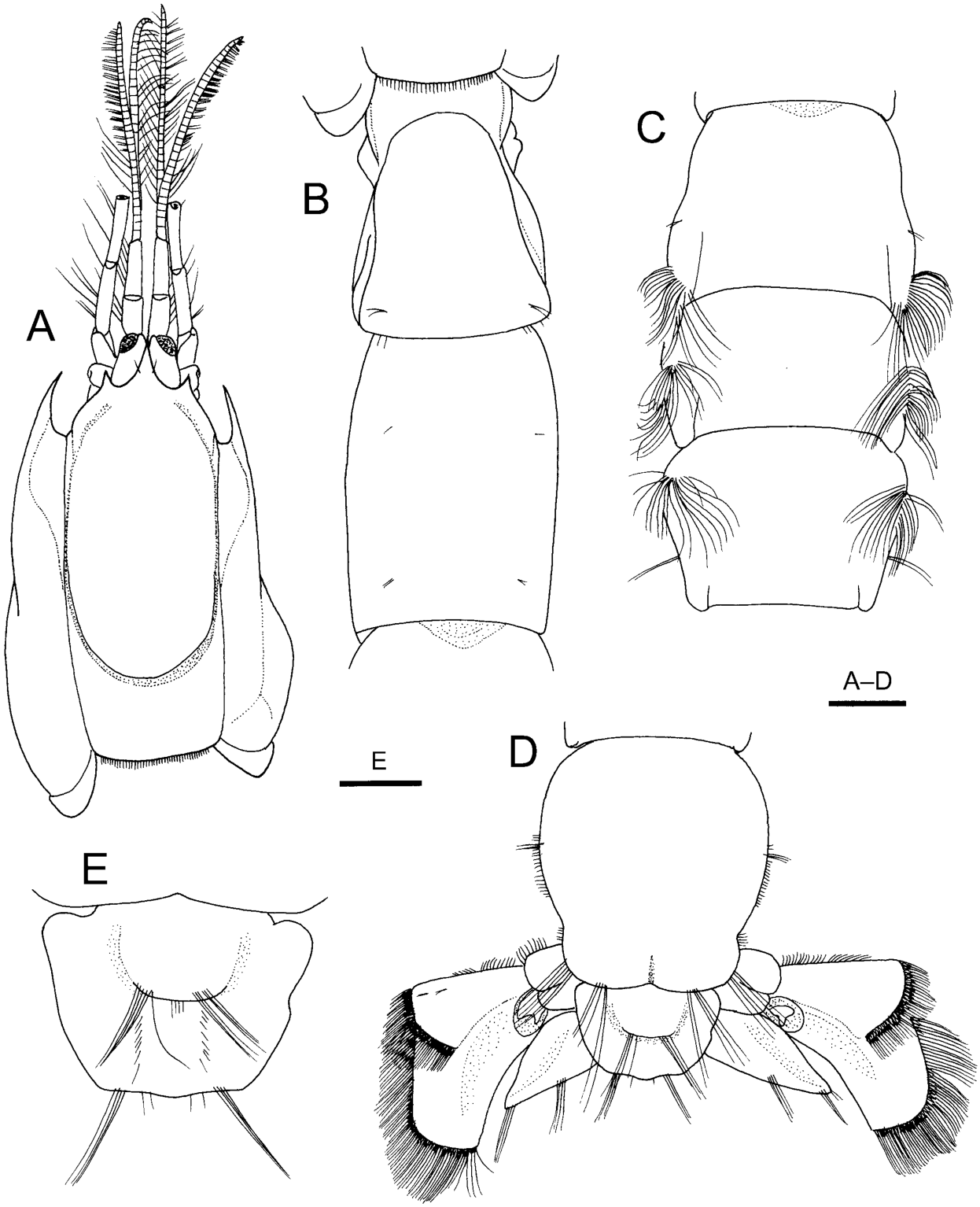

Fig. 15. *Corallianassa martensi* (Miers, 1884), female (cl 11.3 mm), CBM-ZC 12713. A, carapace and cephalic appendages, dorsal view; B, first and second pleomeres, dorsal view; C, third to fifth pleomeres, dorsal view; D, sixth pleomere, telson and uropods, dorsal view; E, telson, dorsal view. Scale bars: A–D, 2 mm: E, 1 mm.
図 15. *Corallianassa martensi* (Miers, 1884) (新称: ホソスナモグリ), 雌 (頭胸甲長 11.3 mm), CBM-ZC 12713. A, 頭胸甲と頭部付属肢, 背面観; B, 第 1, 第 2 腹節, 背面観; C, 第 3–第 5 腹節, 背面観; D, 第 6 腹節, 尾節, 尾肢, 背面観; E, 尾節, 背面観. スケールバー: A–D, 2 mm: E, 1 mm.

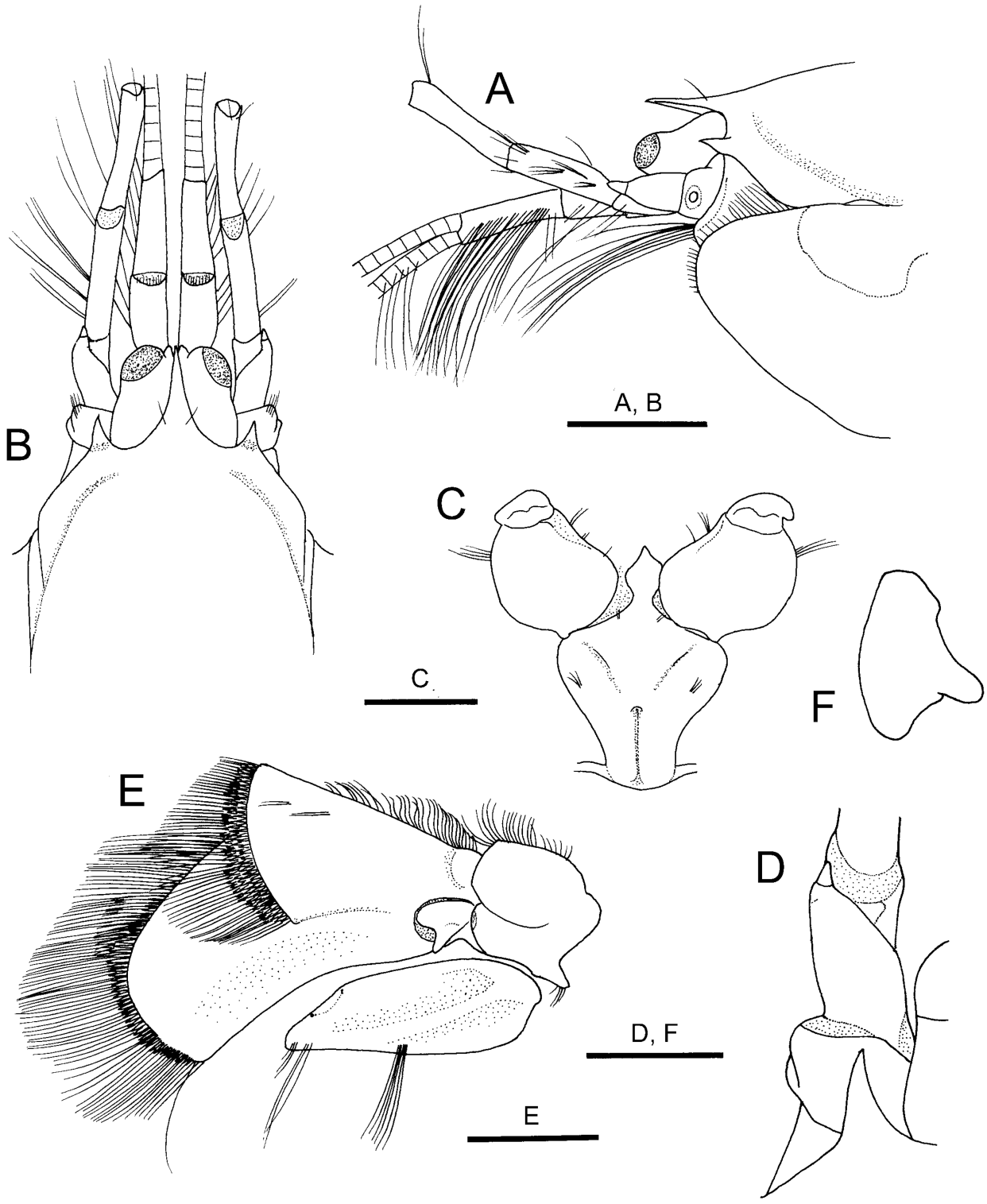

Fig. 16. *Corallianassa martensi* (Miers, 1884), A–C, E, female (cl 11.3 mm), CBM-ZC 12713; D, F, male (cl 13.1 mm), CBM-ZC 13089. A, anterior part of carapace and cephalic appendages, lateral view; B, same, dorsal view; C, shield on thoracic sternite 7 and coxae of fourth pereopods, ventral view; D, proximal part of left antennal peduncle, dorsal view (setae omitted); E, left uropod, dorsal view (perpendicular); F, proximomesial article of exopod of left uropod, dorsal view. Scale bars: A, B, E, 2 mm; C, D, F, 1 mm.

図 16. *Corallianassa martensi* (Miers, 1884) (新称: ホソスナモグリ), A–C, E, 雌 (頭胸甲長 11.3 mm), CBM-ZC 12713; D, F, 雄 (頭胸甲長 13.1 mm), CBM-ZC 13089. A, 頭胸甲前方と頭部付属肢, 側面観; B, 同, 背面観; C, 第 7 胸節の楯板と第 4 胸脚の底節, 腹面観; D, 左第 2 触角柄部の基部, 背面 (剛毛は省略); E, 左尾肢, 背面観; F, 左尾肢外肢の内側基部節, 背面. スケールバー: A, B, E, 2 mm; C, D, F, 1 mm.

midlength; remaining part of sternite membranous. Second pleomere elongate, greatest width at midlength, about 1.3 times as long as wide; pleuron having posterolateral margin slightly expanded, lateral surface with distinct groove along ventral margin and with vertical, crescentic row of short setae on low, short ridge at 0.8–0.9 length of somite, and with small tuft of setae adjacent to posteroventral angle. Third to fifth pleura each with patch of soft plumose setae, position of setal patch becoming more anterior in posterior somites; posterolateral margins slightly expanded; third pleuron with distinct longitudinal depression ventrally in anterior half, dorsal margin of depression bordered by sharp carina. Third to fifth pleomeres each with short longitudinal sulcus posterolaterally. In dorsal view, third pleomere slightly widened posteriorly, wider than second pleomere; fourth pleomere with subparallel lateral margins; fifth pleomere slightly narrowing posteriorly. Sixth pleomere roundly subrectangular in dorsal view, 1.1 times as long as wide; tergite strongly convex longitudinally and transversely, laterally with short transverse groove at posterior one-third; lateral surfaces each with field of dense short setae anterior to lateral groove; posterior margin slightly bilobed by short median notch, with 2 pairs of tufts of long setae laterally; sternite laterally and posteriorly bordered by well-calcified plate, lateral plate only shallowly concave posteriorly, median U-shaped part membranous.

Telson (Fig. 15D, E) about 1.3 times wider than long, subtrapezoidal, broadest at base; posterior margin faintly to distinctly produced medially, posterolateral corners obtusely angular, each bearing tuft of long setae; dorsal surface anteromedially elevated, posterior margin of this median elevation forming blunt ridge bearing median cluster of very short stiff setae flanked by clusters of long stiff setae; lateral margins slightly sinuous, unarmed.

Eyestalks (Fig. 16A, B) subcylindrical, contiguous, slightly narrowing distally, reaching distal end of first segment of antennular peduncle; distomesial projection obtusely angular or rounded, reaching as far as distal corneal margin; cornea located distolaterally, subglobular, slightly inflated in lateral view, darkly pigmented, occupying much less than half length of eyestalk. Length of exposed eyestalk in dorsal view less than twice of basal width.

Antennular peduncle (Figs. 14A, 15A, 16A, B) shorter and slightly stouter than antennal peduncle, about 0.3 times as long as carapace. Third segment 1.3–1.4 times as long as second segment and slightly falling short of midlength of fifth segment of antennal peduncle. Distal two segments with ventromesial and ventrolateral rows of long setae, those of ventrolateral row longer; rows of setae continued onto ventral flagellum, proximal articles of flagellum also bearing very long midventral setae. Dorsal flagellum about half the length of carapace, subequal to or slightly shorter than ventral flagellum; articles in distal 0.7 bearing aesthetascs.

Antennal peduncle (Figs. 14A, 15A, 16A, B) about half the length of carapace. First segment short, forming slightly produced, sparsely setose lobe above laterally produced excretory pore. Second and third segments obliquely jointed; second segment distolaterally with single tuft of setae; third segment with partially fused condylar process articulated to distolateral extreme of second article. Fourth segment slightly broader than fifth segment, with sparse row of tufts of long setae on lateral face. Fifth segment slightly widened distally, subequal in length to fourth segment. Scaphocerite apparently absent (Fig. 16D). Each article of antennal flagellum having 1–5 short to long, simple or plumose setae (up to twice length of 1 article) on distal margin.

Mouthparts generally similar to those of *C. borradailei* (see above), as illustrated by Tirmizi (1974). Third maxilliped (Fig. 17A, B) without exopod. Endopod with long setae on ventral margins of ischium-merus, distal 3 segments also with long setae on extensor and flexor margins. Length of merus-ischium exceeding 2 times height; ischium subrectangular, 1.2 times as long as high, proximoventral margin rounded, not strongly produced, mesial surface with well developed crista dentata (Fig. 17C) bearing row of sharp, closely spaced spines in distal half (distalmost denticle prominent), followed by row of widely separated spines; merus subrectangular, approximately as long as high, dorsal margin slightly convex, ventral margin gently convex, distal margin obliquely truncate. Carpus subequal in length to merus, abruptly narrowing in proximal one-third; mesial surface with dense field of fine setae distally. Propodus large, subquadrate with nearly straight dorsal (extensor) margin and broadly rounded ventral (flexor) margin, height subequal to or exceeding length; distal margin inferior to base of dactylus nearly straight, with prominent tuft of setae medially; mesial surface with patch of dense setae at proximal end of shallow median sulcus. Dactylus narrow, slightly curved, subequal in length to propodus, with small brush of stiff setae on blunt tip.

First pereopods (chelipeds) unequal and dissimil-

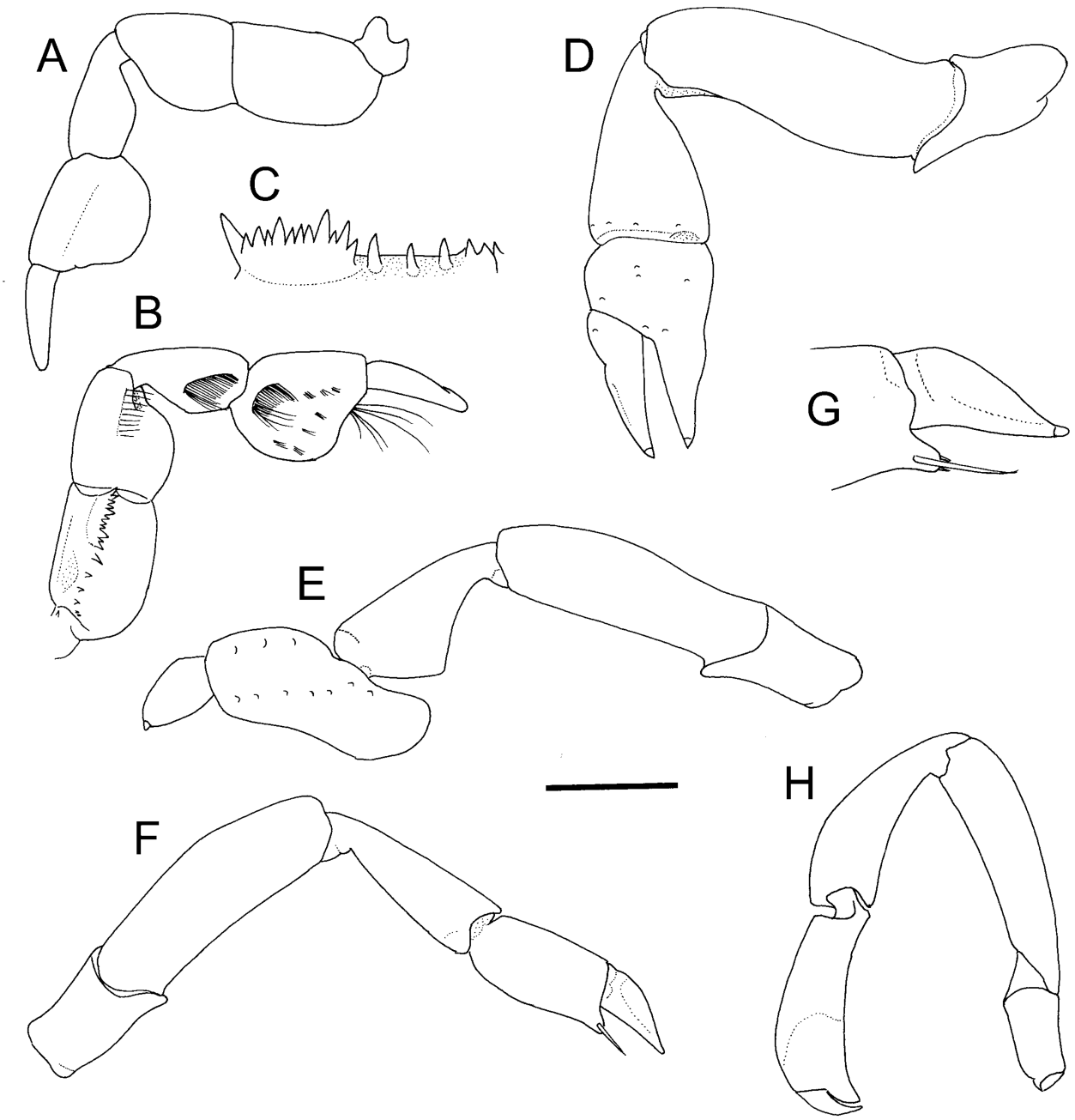

Fig. 17. *Corallianassa martensi* (Miers, 1884), female (cl 11.3 mm), CBM-ZC 12713. A, left third maxilliped, lateral view (setae omitted); B, same, mesial view (setation partially shown); C, same, details of crista dentata, dorsal view; D, left second pereopod, lateral view (setae omitted); E, left third pereopod, lateral view (setae omitted); F, right fourth pereopod, lateral view (setae omitted); G, same, distal part of propodus and dactylus, lateral view (setae and bristle on fixed finger shown); H, left fifth pereopod, lateral view (setae omitted). Scale bar: A, B, D–F, H, 2 mm; C, G, 1 mm.
図 17. *Corallianassa martensi* (Miers, 1884) (新称: ホソスナモグリ), 雌 (頭胸甲長 11.3 mm), CBM-ZC 12713. A, 左第 3 顎脚, 側面観 (剛毛は省略); B, 同, 内面観 (剛毛を部分的に表示); C, 同, 内面歯列の細部, 背面観; D, 左第 2 胸脚, 側面観 (剛毛は省略); E, 左第 3 胸脚, 側面観 (剛毛は省略); F, 右第 4 胸脚, 側面観 (剛毛は省略); G, 同, 前節の先端部と指節 (不動指上の棘状剛毛を表示); H, 左第 5 胸脚, 側面観 (剛毛は省略). スケールバー: A, B, D–F, H, 2 mm; C, G, 1 mm.

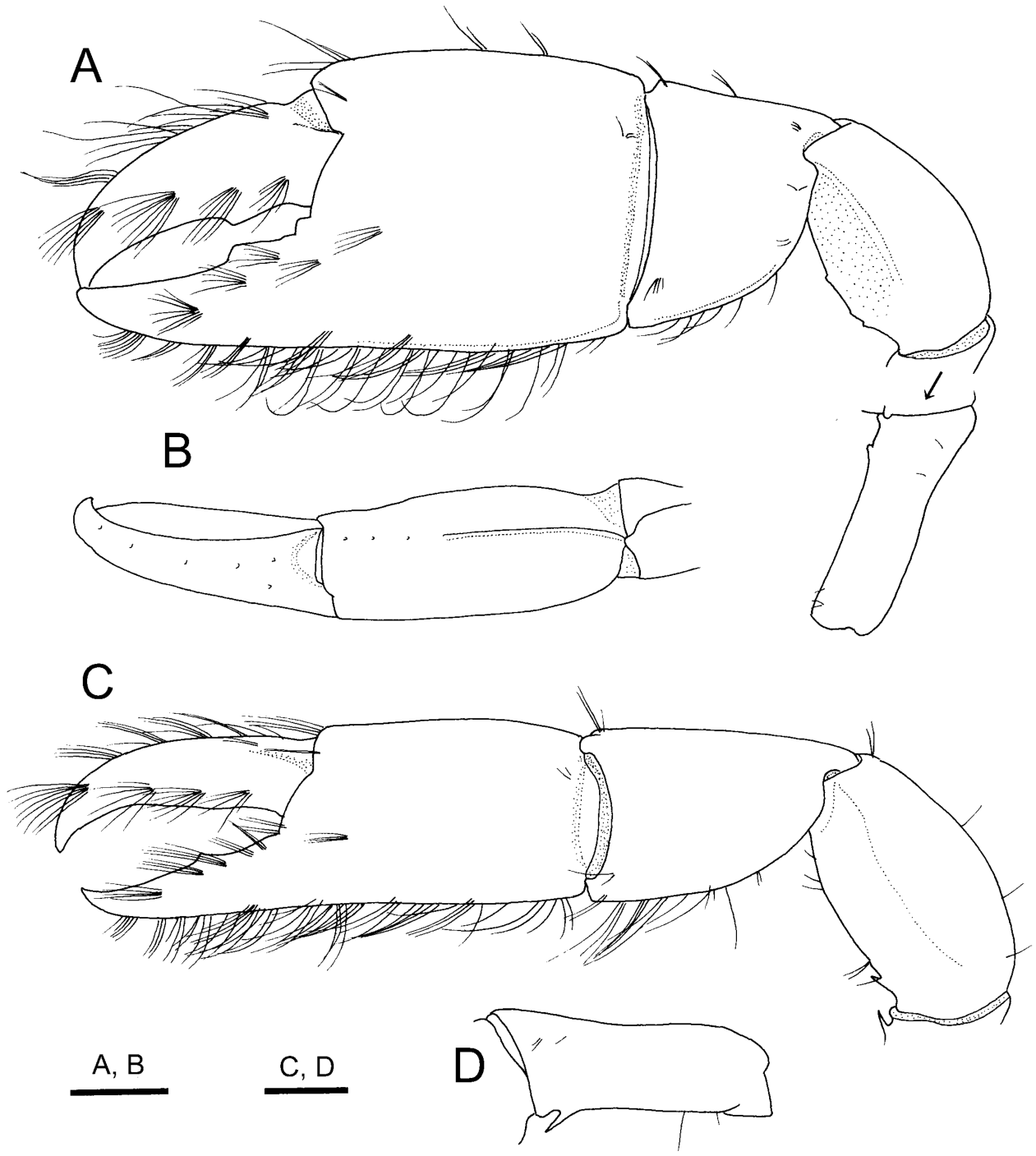

Fig. 18. *Corallianassa martensi* (Miers, 1884). A, B, female (cl 11.3 mm), CBM-ZC 12713; C, D, female (cl 16.0 mm), CBM-ZC 9818. A, major (left) cheliped, lateral view; B, same, chela, dorsal view (setae omitted); C, minor (left) cheliped, merus to chela, lateral view; D, same, ischium, lateral view. Scale bars: 2 mm.
図 18. *Corallianassa martensi* (Miers, 1884) (新称: ホソスナモグリ). A, B, 雌 (頭胸甲長 11.3 mm), CBM-ZC 12713; C, D, 雌 (頭胸甲長 16.0 mm), CBM-ZC 9818. A, 大鉗脚 (左第 1 胸脚), 側面観; B, 同, 鉗部, 背面観 (剛毛は省略); C, 小鉗脚 (左第 1 胸脚), 長節–鉗部, 側面観; D, 同, 坐節, 側面観. スケールバー: 2 mm.

ar (Fig. 20D, E), strongly compressed laterally; no significant sexual dimorphism seen; coxae each with shallowly excavate mesial face. Major cheliped (Fig. 18A) with ischium slender, somewhat widened distally; dorsal margin gently sinuous, non-carinate; ventral margin with few minute granules distally. Merus about 2.8 times as long as high; dorsal margin gently arcuate, unarmed, distinctly carinate; ventral margin also carinate, with few minute denticles or granules; lateral surface elevated along midline into

blunt ridge, surface either side of median ridge gently sloping; mesial surface slightly uneven. Carpus widened distally, distal height greater than length; dorsal margin nearly straight, forming keel terminating in blunt distal corner, proximoventral to ventral margin regularly rounded and smooth in outline, forming keel terminating in blunt or subacute corner; lateral surface evenly convex transversely; mesial surface not particularly upturned along ventral margin, slightly convex medially, and shallowly concave proximally near joint to merus. Propodus heavy, length (including fixed finger) in adults 1.5–1.6 times of height, height greatest at about midlength of palm; dorsal margin of palm distinctly carinate in proximal 0.6, rounded in remaining portion (Fig. 18B); ventral margin with sharply edged keel extending onto midlength of fixed finger, keel lined on mesial side by row of tufts of long stiff setae extending onto tip of fixed finger; lateral surface of palm evenly convex transversely, glabrous, with few tufts of stiff setae distally; mesial surface very slightly convex medially, nearly glabrous, with few tufts of short setae distally. Fixed finger feebly curved near tip, terminating in acute or subacute tip; occlusal margin with low tooth occupying proximal one-third, remainder forming sharp, smooth edge. Dactylus subequal in length to palm, slightly curving mesially, terminating in curved, blunt to acute tip; dorsal surface entirely rounded, with row of tufts of long stiff setae; lateral surface also rounded, with row of tufts of stiff setae ventral to midline; occlusal margin with obtuse tooth proximal to midlength, distal half forming sharp, smooth edge.

Minor cheliped (Fig. 18C, D) similar to major cheliped in general setation and structure, but distinctly more slender. Ischium slightly widened distally; dorsal margin faintly sinuous, bluntly carinate, unarmed; ventral surface rounded, unarmed or armed with 1 slender spine subterminally, ventrodistal angle terminating in small tubercle. Merus elongately ovoid, length approximately twice height, dorsal and ventral margins bluntly carinate, latter unarmed or armed with 1 tiny spine proximally; lateral surface not markedly elevated along midline, but transversely convex. Carpus subrectangular, narrowing proximally, slightly longer than merus, subequal in length to palm, length about 1.6 times greatest height at distal end; dorsal and ventral margins sharply keeled, both unarmed. Chela as high as carpus; palm subrectangular, length 1.4 times height, dorsal margin bluntly carinate in proximal half and rounded in distal half, ventral margin bluntly carinate in proximal half; fixed finger 0.9 times as long as palm, gradually tapering to acute or subacute tip, occlusal margin sharply edged proximally with small triangular tooth located at proximal one-third, margin distal to tooth blunt; tip of fingers crossing, very narrow hiatus present between fingers; dactylus slightly longer than fixed finger, terminating in weakly curved, acute or subacute tip, occlusal margin bluntly edged, without conspicuous teeth.

Second pereopod (Fig. 17D) chelate, strongly compressed laterally, numerous long setae on ventral margins of ischium to chela, setae of dorsal margin of carpus, palm and dactylus set in series of tufts. Coxa unarmed, mesial face shallowly concave. Ischium with dorsal margin gently sinuous, glabrous; ventral margin more strongly sinuous, terminating in prominent, rounded lobe-like process. Merus with dorsal margin slightly sinuous, almost glabrous, with tuft of setae on dorsodistal margin; lateral surface almost glabrous, with few tufts of setae arranged longitudinally; ventral margin sinuous, ventral surface narrowly faceted. Carpus triangular, with transverse row of tufts of short setae adjacent to distal margin on lateral surface. Chela triangular; dorsal margin of palm convex; lateral surface of palm with some tufts of short setae; fingers straight, each terminating in small corneous tip, occlusal margins microscopically pectinate; dactylus 2.5 times as long as palm.

Third pereopod (Fig. 17E) with coxa unarmed, mesial face distinctly faceted, flattish. Ischium with dorsal margin slightly sinuous, ventral margin more sinuous, terminating in prominent tubercle. Merus broadest in distal one-third, length slightly more than 3 times height; margins and lateral surface almost glabrous except for few tufts of setae. Carpus broadest distally, length exceeding 2 times distal height, terminally with patches of long setae not overreaching distal margin of propodus. Propodus with proximally-directed lobe of inferior margin (heel) not reaching beyond broadest part of carpus, lobe terminally with long distally-directed setae, inferodistal margin slightly sinuous, with row of tufts of short setae, superior margin with fields of long setae grading to small patterned tufts of short setae on lateral face of segment, mesial face nearly glabrous except for some setae arranged in longitudinal row adjacent to midline. Dactylus tear-shaped, densely setose on lateral surface, nearly glabrous on mesial surface, terminating in tiny corneous tip directed to external side.

Fourth pereopod (Fig. 17F) strongly compressed laterally, semichelate. Coxa (Fig. 16C) enlarged, transversely suboval, unarmed. Ischium with dorsal

and ventral margins nearly straight, latter terminating in tiny tubercle. Merus wider and longer than carpus, dorsal margin slightly convex, ventral margin nearly straight. Carpus widened distally. Propodus shorter than carpus; dorsal margin nearly straight; ventral margin gently sinuous, ventrodistal corner produced into short fixed finger bearing stout, microscopically serrate seta on external side and short bristles at tip (Fig. 17G); dense setation on outer surface of propodus and dactylus, that of propodus divided into upper and lower fields, densest in lower field where continued onto lower half of inner surface. Dactylus lance-shaped, terminating in narrow corneous tip directed toward external side, lateral surface thickly setose.

Fifth pereopod (Fig. 17H) chelate. Coxa with flattish outer surface. Ischium short, subcylindrical. Merus longest segment, slightly arcuate. Carpus subequal in length to propodus, gently arcuate, greatest height at about distal one-third. Propodus highest at distal one-fourth; opposable surfaces of propodus and small dactylus excavate, spooned, terminally rounded, forming beak-like chela obscured by dense fields of setae on distal half of propodus and superior surface of dactylus; distal margins of tips of fingers microscopically pectinate.

First pleopod of male (Fig. 19A) with endopod and exopod incompletely fused, division between 2 rami clearly indicated by membranous suture; endopod terminating in slightly upturned, acutely pointed lobe distinctly exceeding distal margin of exopod; exopod elongate suboval; protopod longer than endopod. First pleopod of female (Fig. 19B) uniramous, composed of 2 segments; protopod short, gently curved; ramus about twice length of protopod, with numerous transverse sutures widely interrupted, and with weakly produced shoulder at proximal one-third.

Second pleopod of male (Fig. 19C) biramous; protopod slightly widened distally; endopod distinctly wider than exopod, elongate subovate in general outline, subterminally with short, rudimentary appendix interna not reaching rounded terminus of endopod (Fig. 19D); exopod slightly exceeding endopod. Second pleopod of female (Fig. 19E) also biramous; both rami with long setae; protopod slightly widened distally, distal margin jointing rami strongly oblique; endopod moderately narrow, mesial margin faintly sinuous, terminal lobe triangular with blunt apex, directed distally; appendix interna digitiform, located mesial to base of terminal lobe, overreaching tip of terminal lobe, bearing cluster of cincinnuli on distomesial part (Fig. 19F); exopod slightly overreaching distal margin of endopod, tapering to rounded apex.

Third to fifth pleopods (Fig. 19G) forming large, wide, posteriorly cupped fans when cross-linked by cincinnuli of appendices internae on opposed margins of endopods. Protopods flattened, each strongly produced distomesially into prominent, rounded lobe. Endopods each with low median keel on anterior (or dorsal) side; mesial part distal to appendix interna with row of transverse, dendritic sutures. Each appendix interna (Fig. 19H) subtriangular, short, stubby, basally embedded into straight mesial margin of endopod; opposable surface oval, bearing numerous cincinnuli. Exopods each articulated to lateral margin of protopod, embracing endopod.

Uropod (Figs. 15D, 16E) with protopod roundly subrectangular in general shape, dorsally divided into two parts by distinct transverse groove, with prominent rounded process at posteromesial angle (hidden by telson). Endopod far falling short of exopod in distal extension, distorted quadrilateral, tapering toward subacute, upturned posterolateral angle; dorsal surface with blunt but distinct carina extending from base to posterolateral angle, and with 2 prominent submarginal tufts of long setae, one at midpoint of posterior margin and another adjacent to posterolateral angle. Exopod subtriangular in general outline, with very thick upper (anterodorsal) plate falling well short of distal margin; posterodistal edge of upper plate gently convex, with short, thick, spiniform setae grading to thinner, dense, elongate setae of exopodal margin; outer margin angular at junction between upper and lower plates; distal margin of exopod with dense fringe of setae, longest distally; dorsal surface of lower plate shallowly concave; inner margin gently concave, almost glabrous; proximomesial article well demarcated, with 1 prominent spine or tubercle directed mesially (Fig. 16F).

Coloration in life. Body generally whitish or yellowish translucent; carapace with tinge of yellowish brown on rostrum to postrostral area and transverse band of similar color medially on dorsal oval. Cornea light gray. Antennular peduncle with red distal ring on second segment; antennular flagella with red rings on white background. Antennal peduncle white; flagellum also with red rings on white background. Chelae and carpi of chelipeds mottled with white and yellow brown; merus with tinge of yellow brown dorsodistally. See Fig. 20D–F.

Distribution. Widely distributed in the Indo-West Pacific: Mauritius (Miers 1884); Arabian Sea (Tirmizi 1974); Sri Lanka (Dworschak 1992); Cocos

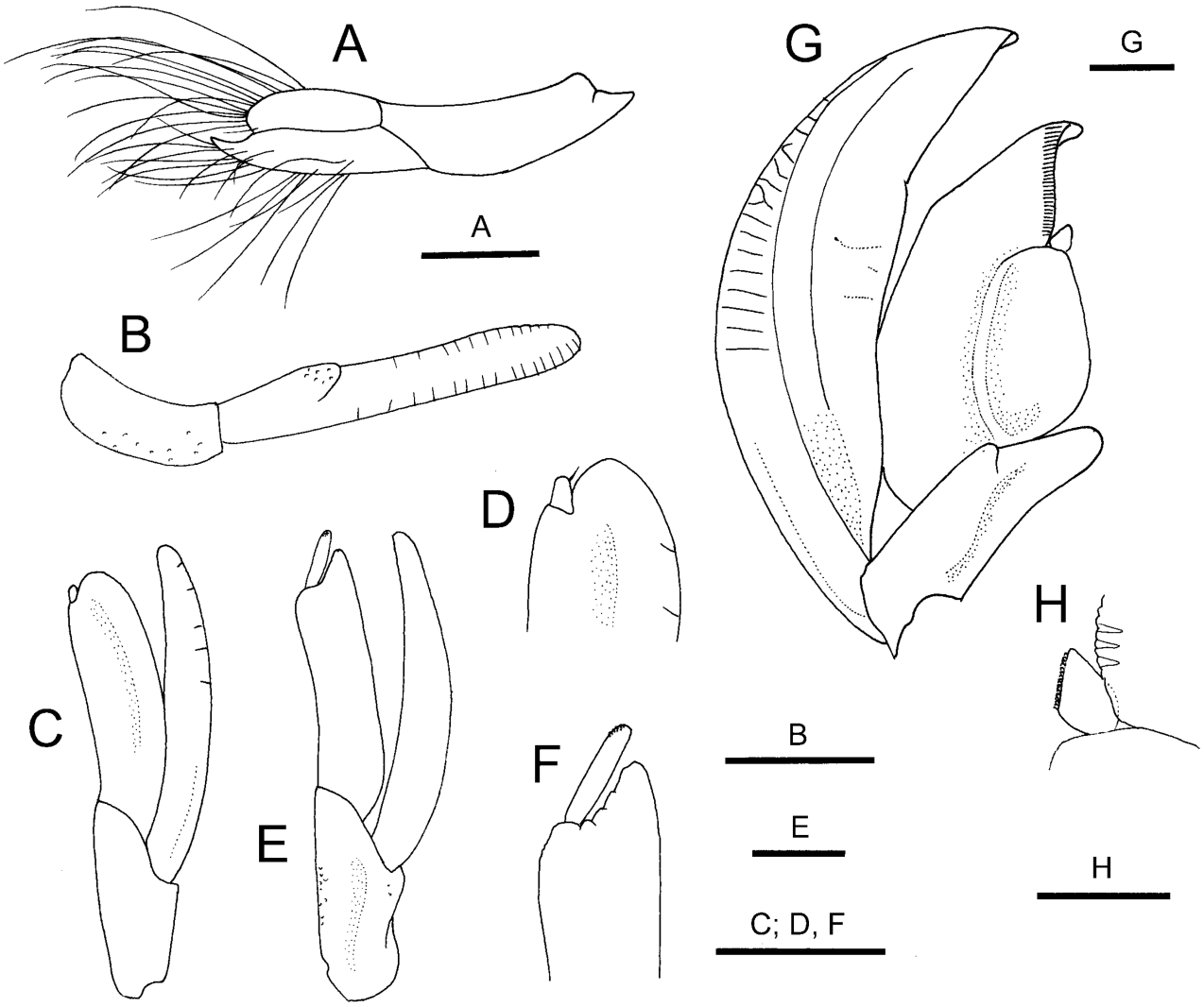

Fig. 19. *Corallianassa martensi* (Miers, 1884). A, C, D, male (cl 13.1 mm), CBM-ZC 13089; B, E–H, female (cl 11.3 mm), CBM-ZC 12713. A, male left first pleopod, outer view; B, female left first pleopod, inner view (setae omitted); C, male left second pleopod, ventral (posterior) view (setae omitted); D, same, distal part of endopod (setae omitted); E, female left second pleopod, ventral (posterior) view (setae omitted); F, same, distal part of endopod; G, left third pleopod, dorsal (anterior) view (setae omitted); H, same, appendix interna, ventral (posterior) view. Scale bars: A, B, D, F, G, 1 mm; C, E, 2 mm; H, 0.5 mm.

図 19. *Corallianassa martensi* (Miers, 1884) (新称: ホソスナモグリ). A, C, D, 雄 (頭胸甲長 13.1 mm), CBM-ZC 13089; B, E–H, 雌 (頭胸甲長 11.3 mm), CBM-ZC 12713. A, 雄左第 1 腹肢, 外面観; B, 雌左第 1 腹肢, 内面観 (剛毛は省略); C, 雄左第 2 腹肢, 腹面観 (剛毛は省略); D, 同, 内肢の先端部 (剛毛は省略); E, 雌左第 2 腹肢, 腹面 (後面) 観 (剛毛は省略); F, 同, 内肢の先端部; G, 左第 3 腹肢, 背面 (前面) 観 (剛毛は省略); H, 同, 内肢突起, 腹面 (後面) 観. スケールバー: A, B, D, F, G, 1 mm; C, E, 2 mm; H, 0.5 mm.

Islands (Dworschak 2014); Indonesia; Queensland, Australia (Sakai 1984); and Ryukyu Islands, Japan (Sakai 1967, as *Callianassa nakasonei*; this study); intertidal to 6 m.

Habitat. Vast majority of the present specimens were collected from intertidal to shallow subtidal sand flats with sparse to moderate vegetation of sea grass.

Remarks. The present specimens agree well with the original description by Miers (1884, as *Callianassa*) and a recent redescription of the holotype by Sakai (1999, as *Glypturus*). Tirmizi (1974), Sakai (1984) and Dworschak (1992, 2014) presented detailed accounts or descriptions of their specimens identified with the species. Tirmizi's (1974) illustration shows a non-elongate second pleomere, but this could be an artistic error. According to the description (Tirmizi 1974: 286), the

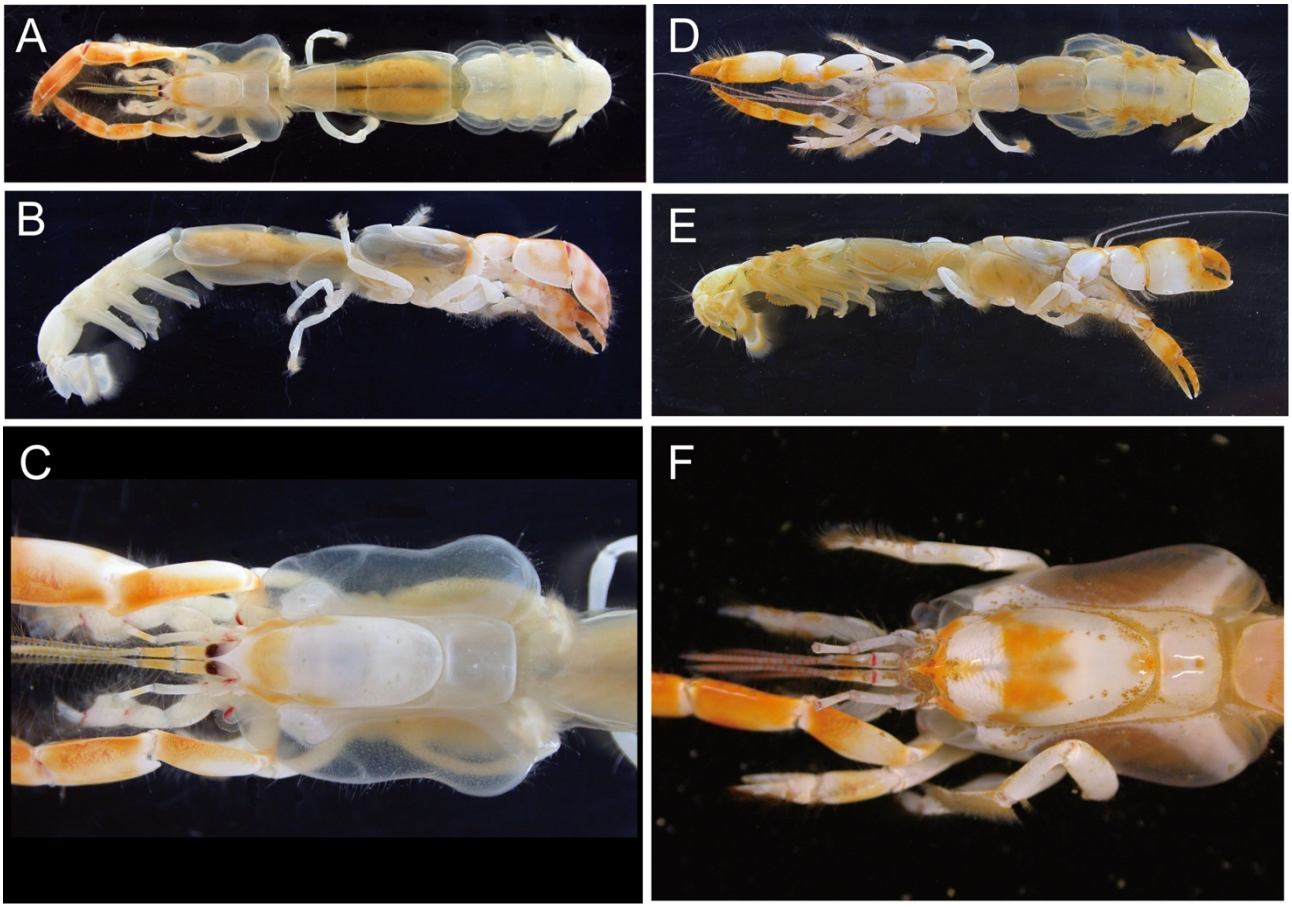

Fig. 20. Images showing coloration in life of the two species of *Corallianassa*. A–C, *Corallianassa borradailei* (De Man, 1928a), male (cl 12.2 mm), RUMF-ZC 3907; D–F, *C. martensi* (Miers, 1884), male (cl 13.1 mm), CBM-ZC 13089 (D, E), female (cl 16.9 mm), CBM-ZC 13086 (F). A, D, entire animals in dorsal view; B, E, entire animals in lateral view; C, F, close up of anterior part of the body, dorsal view.

図 20. ホソスナモグリ属 (新称) 2 種の生時の色彩. A–C, *Corallianassa borradailei* (De Man, 1928a) (新称: モバホソスナモグリ), 雄 (頭胸甲長 12.2 mm), RUMF-ZC 3907; D–F, *C. martensi* (Miers, 1884) (新称: ホソスナモグリ), 雄 (頭胸甲長 13.1 mm) (D, E), CBM-ZC 13089, 雌 (頭胸甲長 16.9 mm) (F), CBM-ZC 13086. A, D, 全形背面観; B, E, 全形側面観; C, F, 体前方, 背面観.

second pleomere is described as "large, being a little less than one and a half times as long as the first", well coinciding the other published accounts and the present specimens. As shown in the above synonymy, the generic assignment of this species had not been settled until Dworschak (2014) assigned the species to *Corallianassa*. We fully concur with Dworschak (2014).

The taxonomic identities of the two nominal taxa, viz., *Callianassa* (*Callichirus*) *nakasonei* (type locality: Tonaki Island, Okinawa Islands, Japan) and *Callianassa haswelli* (type locality: Queensland, Australia), have not been fully settled. Manning (1987) suggested that these two taxa might be synonymous. Sakai (1984; 1988) formally placed *Callianassa haswelli* in the synonymy of *Callianassa martensi*, but later Sakai (1999; 2005; 2011) recognized *Callianassa haswelli* as a valid species (as *Glypturus*). Sakai (1999; 2005) regarded *Callianassa* (*Callichirus*) *nakasonei* as a junior synonym of *Glypturus martensi*. Sakai's (2011) treatment of *Callianassa nakasonei* is curiously inconsistent. In the account of *Glypturus haswelli*, Sakai (2011: 434–435) argued as if *Callianassa nakasonei* was distinct from *G. martensi* with citation of his previous reference to *C. nakasonei* (Sakai 1987) in the synonymy of *G. haswelli*, whereas Sakai (2011: 435) placed *C. nakasonei* in the synonymy of "*Glypturus*" *lanceolatus* without any comments or justification.

Comparison of the present specimens with the type description of *Callianassa haswelli* by Poore & Griffin (1979) shows that *C. haswelli* differs from *Corallianassa martensi* in the proportionally shorter third segment of the antennular peduncle and the different shape of the propodus of the third

maxilliped. In particular, the antennular peduncle just reaches the distal end of the fourth segment of the antennal peduncle in *C. haswelli*, but distinctly overreaches it and reaches to the midlength of the fifth segment in *C. martensi*. In his key to the species of *Glypturus*, Sakai (1999) characterized *C. haswelli* as "A1 [= antennule] peduncle reaching distal margin of A2 [= antenna] terminal segment", but this is not correct. The distal margin of the propodus of the third maxilliped is nearly vertical in *C. haswelli*, rather than oblique in *Corallianassa martensi*. The shape of the female second pleopod may be different between the two species: the endopod seems to be shorter in *Callianassa haswelli* than in *Corallianassa martensi*. According to the illustration given by Poore & Griffin (1979: Fig. 27h), there is no appendix interna on the endopod of the female second pleopod, but this could be due to damage to the specimen or omission. As such, we concur with Sakai (1999; 2005; 2011) in recognizing *Callianassa haswelli* as a valid species, and refer it to *Corallianassa*.

Reexamination of the holotype of *Callianassa nakasonei* (KMNH-ZLKU 12408) confirms Sakai's (1999; 2005) synonymy that the taxon is conspecific with *Corallianassa martensi*, not with *C. haswelli*, because the holotype of *C. nakasonei* agrees with *Corallianassa martensi* in every diagnostic aspect. As mentioned above, under his account of *Glypturus haswelli*, Sakai (2011) remarked that *Callianassa nakasonei* was different from *G. martensi* by the non-denticulate distal margin of the palm of the major cheliped and the presence of a median convexity on the posterior margin of the telson. No previous works have reported a denticulate distal margin of the major cheliped palm in *Corallianassa martensi*; the published illustration (Tirmizi 1974) and the present specimens show the presence of a median convexity on the posterior margin of the telson, although the prominence of the convexity is rather variable in the present specimens. Sakai's (2011) synonymy of *C. nakasonei* with *C. lanceolata* cannot be justified anymore. According to the original description by Edmonson (1944), *C. lanceolata* is characterized by an upturned rostrum, the eyestalk with a strongly produced distomesial portion, which makes the cornea dorsolateral in the position, the distinctly spinose ventral margins of the ischium and merus of the major cheliped, and the more slender, fusiform endopod of the uropod.

De Man (1888) referred two specimens from Ambon, Indonesia, to "*Callianassa Martensi*", but later De Man (1928b) described a new species, "*Callianassa assimilis*" on the basis of these two specimens.

Lanchester (1900) reported "*Callianassa Martensi*" on the basis of a single specimen from Buntal, Sarawak, Malaysia. He remarked that his specimen exhibited certain differences in comparison with the type specimen of Miers' species. Indeed, the illustration given by Lanchester (1900: pl. 12, fig. 4) shows the carapace frontal margin with a triangular, non-spiniform rostrum and bluntly triangular anterolateral spines and the dorsoventrally flattened eyestalks with small medial cornea and somewhat produced distomesial angle. De Man (1928b) suggested that Lancherster's specimen might represent a species other than *C. martensi*. We concur with De Man's (1928b) view, and suggest that the specimen most probably represents a species of *Neocallichirus*.

Discussion

Through the examination of the present material, we concur with Ngoc-Ho (2005) in maintaining *Corallianassa* being distinct from *Glypturus* and in treating *Corallichirus* as a junior synonym of *Corallianassa*. As argued by previous authors (e.g., Manning 1987; Manning & Felder 1991; Poore 1994; Hyžný & Müller 2012; Hyžný et al. 2013; Klompmaker et al. 2015), *Glypturus* can be easily differentiated from the other genera in the subfamily Callichirinae by the spinose dorsal margins of the meri and palms of the chelipeds, but other diagnostic characters are rather obscure. As discussed below, we have tried to preliminarily evaluate other characters potentially useful in differentiating *Glypturus* and *Corallianassa*. The following species are in consideration here: three species of *Glypturus* (*G. acanthochirus, G. armatus* and *G. laurae*); and 13 species of *Corallianassa* (*C. articulata*, *C. assimilis*, *C. borradailei*, *C. coutierei*, *C. collaroy*, *C. hartmeyeri*, *C. haswelli*, *C. intesi*, *C. lanceolata*, *C. longiventris*, *C. martensi*, *C. winslowi* and *C. xutha*).

(1) Structure of rostrum: Manning (1987) cited the "upturned" rostrum as one of the diagnostic characters of *Glypturus*. However, in our specimens of *G. armatus*, the rostrum is directed forward or very slightly ascending (cf. Fig. 3C), although in the species assigned to *Corallianassa*, the rostrum is directed forward (*C. borradailei*, *C. coutierei* and *C. martensi*) or ascending (*C. assimilis*). Through literature examination, it has been confirmed that the rostrum is directed forward in *C. collaroy*, *C. hartmeyeri*, *C. intesi*, *C. longiventris* and *C. xutha* (cf. de Saint Laurent & Le Loeuff 1979; Poore & Griffin 1979; Manning 1987, 1988; Dworschak 1992) or

more or less upturned in *C. haswelli*, *C. lanceolata* and *C. winslowi* (cf. Edmondson 1944; Poore & Griffin 1979). Consequently, the direction of the rostrum might not be of generic significance. However, we have noticed that the development of the midventral ridge of the rostrum is substantially different between *G. armatus* and the three species of *Corallianassa* available for examination: in the former, the midventral ridge is much deeper and thicker than in the latters, particularly in the proximal portion. Examination of literature suggests that such a midventral carina does not develop also in other species assigned to *Corallianassa* (de Saint Laurent & Le Loeuff 1979; Poore & Griffin 1979; Manning 1987, 1988; Dworschak 1992).

(2) Structure of calcified plate on hepatic region of carapace: In *C. assimilis, C. borradailei, C. coutierei* and *C. martensi*, the calcified plate on the hepatic region of the carapace is almost smooth without prominent elevations, whereas in *G. armatus*, this plate has two low, but prominent elevations, of which the lower one bears one or two pointed granules in adults. This character needs to be verified for the other species, because it has not been properly described, but may be potentially useful in distinguishing the two genera.

(3) Ornamentation of branchiostegite: During this study, we have found that there are irregularly reticulate patterns of sutures or grooves on the branchiostegite of the carapace in *G. armatus*, whereas such sutures or grooves are absent in *C. assimilis, C. borradailei, C. coutierei* and *C. martensi*. Little attention was paid to this character before, and needs verification for the other discussed species.

(4) Structure of pleon: In the original diagnosis of *Corallianassa*, Manning (1987) stated that "Second abdominal somite long and slender, the longest abdominal somite, almost as long as sixth somite and telson combined". On the other hand, with regard to *Glypturus*, Manning (1987) mentioned only on the sixth pleomere, stating "Sixth abdominal somite inflated, longest of all abdominal somites". As mentioned above, Manning (1992) erected *Corallichirus* for species placed in *Corallianassa* having the second abdominal somite being subequal in length to the sixth abdominal somite. *Corallianassa* was restricted to species having the second abdominal somite being distinctly longer than the sixth somite, and almost equal in the length to the sixth somite and telson combined. Subsequently, however, some authors (e.g., Sakai 1999; Ngoc-Ho 2005) indicated that the relative length of the second pleomere against the sixth pleomere and the telson combined is not so distinctive, and does not provide any good utility in recognizing *Corallichirus* as distinct from *Corallianassa*. Nevertheless, we confirm that the anterior two pleomeres are actually fairly elongate in *C. assimilis, C. borradailei, C. coutierei* and *C. martensi*, with the combined length of the first and second pleomeres being distinctly greater than the carapace length (*C. borradailei*, *C. coutierei* and *C. martensi*) or subequal (*C. assimilis*), rather than being shorter than the carapace in *G. armatus*. With regard to the other species, *C. intesi* has elongate first and second pleomeres, which are longer than the carapace (de Saint Laurent & Le Loeuff 1979).

Furthermore, the first pleomere is bisected by a distinct transverse groove in *G. armatus*, whereas such a division is not seen in *C. borradailei*, *C. coutierei* and *C. martensi* or is faint in *C. assimilis*. Manning (1987: Fig. 3g) clearly shows the presence of a distinct transverse groove in the first pleomere in *G. acanthochirus*. This character needs to be verified for the other species under consideration.

(5) Setal row on first pleomere: The three species of *Corallianassa* examined in this study have a short longitudinal setal row laterally on the tergite of the first pleomere, though the setal row is less developed in *C. assimilis*. In contrast, such a setal row is absent in *G. armatus*. This character needs to be verified for the other species assigned to *Corallianassa* or *Glypturus*.

(6) Structure of eyestalk: With regard to the structure of the eyestalk, Manning (1987) stated for *Glypturus*: "Eye large, extending almost to end of first segment of antennular peduncle. Cornea small, subterminal, situated laterally.", and for *Corallianassa*: "Eye large, with ventromesial anterior projection extending beyond cornea; eye extending to or almost to end of first segment of antennular peduncle, cornea terminal, large, occupying distal third of eye". We confirm that the three species of *Glypturus* (cf. Poore & Suchanek 1988) have the cornea as dorsolateral and subterminal in location, and that the two Japanese species of *Corallianassa* have a terminally (*C. borradailei* and *C. coutierei*) or distolaterally (*C. martensi*) located cornea. The eyestalks of *C. assimilis* are somewhat different from those of *C. borradailei*, *C. coutierei* and *C. martensi* in having more developed distomesial part slightly exceeding beyond the distal corneal margin, then the cornea occupies the distolateral portion of the eyestalk (cf. Kensley 2001: Fig. 1B). Our literature survey revealed that the cornea is terminal in *C. articulata*, *C. hartmeyeri*, *C. longiventris*, *C. winslowi* and *C.*

xutha, whereas it is distolateral in *C. collaroy*, *C. haswelli*, *C. intesi* and *C. lanceolata*.

(7) Development of antennal scaphocerite: We have noticed that the development of the antennal scaphocerite differs between *G. armatus* and the three species of *Corallianassa*, *C. borradailei*, *C. coutierei* and *C. martensi*. In *G. armatus*, the scaphocerite is small but clearly discernible, showing as a subcircular articulated plate, whereas in the three *Corallianassa* species, there is no trace of a scaphocerite on the antennal peduncle. *Corallianassa assimilis* also has a subsemicircular scaphocerite, though the size is greatly reduced. It is known that the development of the scaphocerite is interspecifically variable in the other callichirine genera, i.e., *Lepidophthalmus* and *Neocallichirus* (Tudge et al. 2000), and consequently, more careful assessment will be necessary. It is remarkable that *C. collaroy* has a prominent, scaphocerite-like spine on the antennal peduncle (Poore & Griffin 1979; Sakai 1992), although no detailed description has been given for this peculiar structure.

(8) Structure of thoracic shield: We have noticed that the structure of the thoracic shield (on the sternite of the seventh thoracomere) is considerably different between *G. armatus* and the four species of *Corallianassa* examined during the present study. In *G. armatus*, the posterolateral margins of the shield are strongly rimmed and the surface flanked by the lateral limbs is depressed below. On the other hand, in *C. assimilis, C. borradailei, C. coutierei* and *C. martensi*, the shield is relatively wide with the entire ventral surface being generally flattened and having a Y-shaped shallow sulcus, without posterolateral rims. However, the structure of the thoracic shield has not been sufficiently described for the other species under consideration, and thus the significance of this character needs to be verified.

(9) Armature of coxae of fourth pereopods: In *G. armatus*, each coxa of the fourth pereopod bears a small spine on the mesial surface, whereas there is no such a spine in *C. assimilis, C. borradailei, C. coutierei* and *C. martensi*. The presence of the coxal spine was confirmed in *G. acanthochirus* (cf. Biffar 1971), while its absence needs to be confirmed in the other species referred to *Corallianassa*.

(10) Development of appendix masculina of male second pleopod: Sakai (2011) proposed to resurrect *Corallichirus* from the synonymy of *Glypturus* (Table 1) on the basis of the features of the male first and second pleopods, although he did not particularly argue about the structural difference. In the key to the genera of Callichirinae (Sakai 2011: 413–414), *Corallichirus* and *Glypturus* are differentiated for one another only by the feature of the male second pleopod. *Corallichirus* was characterized by "Male Plp2 endopod with appendix interna distally, but without appendix masculina", while *Glypturus* was characterized by "Male Plp2 endopod with appendix masculina mesiodistally, but with or without appendix interna". Contrary to Sakai's (2011) diagnosis, we confirmed that, in *C. borradailei* and *C. martensi*, the male second pleopod is devoid of an appendix masculina, though the appendix interna is variably present or absent in *C. borradailei* (when present, it is located at the distomesial portion of the endopod), and always present in *C. martensi*. In *G. armatus*, the endopod of the male second pleopod bears a subtriangular, lobe-like appendix masculina located at the distomesial angle of the endopod, which has an appendix interna arising at the midlength of the mesial margin; the base of the appendix masculina is demarcated by a transverse suture. From literature examination, it has been confirmed that the appendix masculina is actually absent in the following species referred to *Glypturus* by Sakai (2011): *C. collaroy* (cf. Poore & Griffin 1979: Fig. 24l), *C. haswelli* (cf. Poore & Griffin 1979: Fig. 27n), and *C. longiventris* (cf. Biffar 1971: Fig. 14e). Unfortunately, the morphology of the male second pleopod remains to be described for *C. assimilis*, *C. coutierei*, *C. hartmeyeri*, *C. lanceolata*, *C. winslowi* and *C. xutha*. Consequently, it can be said that Sakai's resurrection of *Corallichirus* was based on misinterpretation of the structure of the male second pleopod. The presently available data would seem to support that the absence of the appendix masculina distinguishes *Corallianassa* from *Glypturus*, in which the male second pleopod is provided with an appendix masculina.

Based on the above observation, we propose preliminary diagnoses of the two genera, *Glypturus* and *Corallianassa*. Characters, which need verification, are inserted with brackets.

Genus *Glypturus* Stimpson, 1866

[New Japanese name: Toge-sunamoguri-zoku]

Glypturus Stimpson, 1866: 46 [type species: *Glypturus acanthochirus* Stimpson, 1866]. — Manning 1987: 390. — Manning & Felder 1991: 778. — Poore 1994: 102 (key). — Sakai 1999: 72 (part); 2005: 130 (part); 2011: 429 (part).

Diagnosis. Carapace with distinct dorsal oval; rostrum spiniform, with well-developed, deep midventral ridge proximally; anterolateral

projections spiniform (anterolateral spines), their bases sometimes translucent, non-calcified; calcified plate on hepatic region with two low protuberances or elevations]. [Shield on seventh thoracic sternite relatively narrow, posterolateral margins strongly rimmed, surface between rims depressed below]. Pleon moderately narrow, not particularly elongate, first and second pleomeres combined shorter than carapace; first pleomere bisected by distinct transverse ridge, [without short longitudinal setal row]. Eyestalks somewhat depressed dorsoventrally, bearing distinct distomesial projection, thus cornea located dorsolaterally and subterminally, disc-shaped. Antennular peduncle not longer but slightly stouter than antennal peduncle. Third maxilliped without exopod; ischium-merus subpediform or narrowly operculiform, ischium with well developed crista dentata; distal margin of merus not projecting beyond articulation with carpus; propodus with height subequal to or exceeding length. Chelipeds unequal, dissimilar, major cheliped lacking meral hook; merus and palm of major cheliped armed with spines on dorsal margin. [Coxae of fourth pereopods each with small spine on mesial surface]. First pleopod slender, uniramous in both sexes; in males, ramus terminally bifurcate. Second pleopod biramous in both sexes; in females appendix interna digitiform, subterminal in location; appendix masculina located distomesially on endopod, demarcated basally, with appendix interna arising at midlength of its mesial margin. Third to fifth pleopods forming cup-like fan, each with stubby appendix interna slightly projecting mesial margin of endopod.

Composition. *Glypturus acanthochirus* Stimpson, 1866 (western Atlantic), *G. armatus* (A. Milne-Edwards, 1870) (Indo-West Pacific), *G. laurae* de Saint Laurent, in de Vaugelas & de Saint Laurent, 1984 (Red Sea).

Distribution. Tropical Indo-West Pacific and western Atlantic; intertidal to shallow subtidal to depth 30 m.

Genus *Corallianassa* Manning, 1987

[New Japanese name: Hoso-sunamoguri-zoku]

Corallianassa Manning, 1987: 392 [type species: *Callianassa longiventris* A. Milne-Edwards, 1870].— Poore 1994: 102 (key); 2004: 184. — Manning & Felder 1991: 776. — Ngoc-Ho 2005: 71.

Corallichirus Manning, 1992: 571 [type species: *Corallianassa xutha* Manning, 1988]. — Sakai 2011: 422.

Glypturus. — Sakai 1988: 61 (in part); 1999: 72 (in part); 2005: 130 (in part); 2011: 429 (in part).

Diagnosis. Carapace with distinct dorsal oval; rostrum spiniform, with poorly developed, low midventral ridge; anterolateral projections spiniform (anterolateral spines), their bases sometimes translucent, non-calcified; [calcified plate on hepatic region without low protuberances or elevations]; [branchiostegite without irregular reticulate pattern of sutures]. [Shield on seventh thoracic sternite relatively wide, posterolateral margins not limbed, surface nearly flat]. Pleon narrow, sometimes more or less elongate, first and second pleomeres combined distinctly longer than carapace; first pleomere entire, without transverse groove on dorsal surface, [with short longitudinal setal row on each lateral side]. Eyestalks subcylindrical or slightly depressed dorsoventrally, bearing minute to moderately large distomesial projection, cornea located terminally or distolaterally, subglobose in shape. Antennular peduncle not longer but stouter than antennal peduncle. Third maxilliped without exopod; ischium-merus subpediform or suboperculiform, ischium with well developed crista dentata; distal margin of merus not projecting beyond articulation with carpus; propodus with height subequal to or exceeding length. Chelipeds unequal, dissimilar, major cheliped lacking meral hook; merus and palm of major cheliped unarmed on dorsal margin. [Coxae of fourth pereopods unarmed]. First pleopod slender, uniramous in both sexes; in male, ramus or incompletely fused rami terminally bifurcate. Second pleopod biramous in both sexes; in females, appendix interna digitiform, subterminal in location; [appendix masculina absent]. Third to fifth pleopods forming cup-like fan, each with stubby appendix interna slightly projecting mesial margin of endopod.

Composition. The following 13 species are assigned to *Corallianassa* for the time being: *C. articulata* (Rathbun, 1906) (West Pacific: Hawaii, Kermadec Islands, and Gilbert Islands); *C. assimilis* (De Man, 1928b) (West Pacific: Indonesia to Mariana Islands); *C. borradailei* (De Man, 1928a) (Indo-West Pacific: Maldives to Hawaii); *C. collaroy* (Poore & Griffin, 1979) (West Pacific: Australia to French Polynesia); *C. coutierei* (Nobili, 1904) (Indo-West Pacific: Djibouti to French Polynesia); *C. haswelli* (Poore & Griffin, 1979) (Australia); *C. hartmeyeri* (Schmitt, 1935) (West Atlantic: Caribbean Sea and Ascension), *C. intesi* (de Saint Laurent & Le Loeuff, 1979) (East Atlantic: Senegal); *C. lanceolata* (Edmondson, 1944) (Hawaii), *C.*

longiventris (A. Milne-Edwards, 1870) (West Atlantic: Florida to Brazil); *C. martensi* (Miers, 1884) (Indo-West Pacific); *C. winslowi* (Edmondson, 1944) (Hawaii); and *C. xutha* Manning, 1988 (East Pacific: Baja California to Colombia, Galapagos Islands, Clipperton Island).

Distribution. Worldwide, tropical or subtropical regions; intertidal to shallow subtidal.

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琉球諸島の沿岸域から得られたトゲスナモグリ属 (新称) とホソスナモグリ属 (新称) に帰せられる３種の報告と，これら２属についての分類学的考察 (甲殻亜門: 十脚目: アナエビ下目)

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要旨. 奄美諸島から八重山諸島の沿岸域で採集された標本に基づき，スナモグリ科の 3 種，*Glypturus armatus* (A. Milne-Edwards, 1870) (新称: トゲスナモグリ), *Corallianassa borradailei* (De Man, 1928a) (新称: モバホソスナモグリ), および *C. martensi* (Miers, 1884) (新称: ホソスナモグリ) を報告した. いずれの種も, 海草類の植生を伴った干潟域において確認された. *Corallianassa borradailei* は *C. coutierei* (Nobili, 1904) の異名とされてきたが, 別種であることが確認された. これら 3 種のうち, トゲスナモグリとモバホソスナモグリは本邦から初記録となる. 3 種の帰属と種の同一性についてはかなり混乱がある上, 研究者間で見解の不一致がある. そのため, それらの分類学的な概要を示すことに加え, 種の特徴となる形態の細部を明らかにする目的で, 各種について詳細な記載と図を与えた. さらに, グアム産の *Corallianassa assimilis* (De Man, 1905) およびインド産の *Corallianassa coutierei* の標本も加え, *Glypturus* Stimpson, 1866 (新称: トゲスナモグリ属) と *Corallianassa* Manning, 1987 (新称: ホソスナモグリ属) の比較を行い, 属の標徴形質となりうる可能性のある形質について論じた. 和名の安定のため, 3 種の和名の基準標本を次のとおりとする: トゲスナモグリ (CBM-ZC 12711, 雄); モバホソスナモグリ (CBM-ZC 12712, 雌); ホソスナモグリ(CBM-ZC 12713, 雌).

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