

Species of *Galacantha* and *Munidopsis* (Crustacea: Decapoda: Anomura: Galatheidae) from the deep-waters off Taiwan, with the description of two new species

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SUMMARY: One species of the genus *Galacantha* A. Milne-Edwards, 1880, and 20 species of *Munidopsis* Whiteaves, 1874, including two new species, are reported from the deep-waters off Taiwan. *Munidopsis echinata* n. sp. closely resembles *M. colombiana* Pequegnat and Pequegnat, 1971 from the Caribbean Sea, but differs in lacking an antennal spine on the carapace and having a much longer antennal peduncle. *Munidopsis tuberosa* n. sp. appears close to *M. granosicorium* Williams and Baba, 1990 from the northeast Pacific, but the configuration of the carapace and rostrum separates these two species. Altogether 31 species of *Munidopsis* are now recorded from Taiwan, indicating a particularly rich deep-sea fauna of the island.

Keywords: Crustacea, Galatheidae, *Galacantha*, *Munidopsis*, new species, deep sea, Taiwan.

RESUMEN: ESPECIES DE *GALACANTHA* Y *MUNIDOPSIS* (CRUSTACEA: DECAPODA: ANOMURA: GALATHEIDAE) DE LAS AGUAS PROFUNDAS FRENTE A TAIWAN, CON LA DESCRIPCIÓN DE DOS NUEVAS ESPECIES. – Una especie del género *Galacantha* A. Milne-Edwards, 1880, y 20 especies de *Munidopsis* Whiteaves, 1874, incluyendo dos especies nuevas, han sido reportadas en aguas profundas de Taiwan. *Munidopsis echinata* n. sp., se parece mucho a *M. colombiana* Pequegnat y Pequegnat, 1971 del mar del Caribe, pero se diferencia por faltarle una espina antenal en el caparazón y por tener un pedunculo antenal mucho más largo. *Munidopsis tuberosa* n. sp., parece próxima a *M. granosicorium* Williams y Baba, 1990 del Pacífico noreste, pero la configuración de su caparazón y rostro separa estas dos especies. En conjunto se han reportado 31 especies de *Munidopsis* en Taiwan, indicando una fauna de profundidad particularmente rica en la isla.

Palabras clave: Crustacea, Galatheidae, *Galacantha*, *Munidopsis*, especie nueva, mar profundo, Taiwan.

INTRODUCTION

Species of the genus *Munidopsis* Whiteaves, 1874 are generally considered as typical animals from the deep sea. The genus is also the richest in the family Galatheidae, including more than 200 species from world oceans, and is distributed from the lower con-

tinental shelf to the abyssal plain, usually ranging between 700 and 3000 m (e.g. Baba, 2005; Macpherson and Segonzac, 2005; Macpherson, 2007). Although the genus *Galacantha* A. Milne-Edwards, 1880 has usually been treated as a junior synonym of *Munidopsis*, Macpherson (2007) recently revived *Galacantha* and included nine species in this genus.

In Taiwanese waters, Wu *et al.* (1997) and Wu and Chan (2000) recorded four species of *Munidopsis* based on the specimens collected by local fishing trawlers: *M. andamanica* MacGilchrist, 1905, *M. cylindrophthalma* (Alcock, 1894), *M. formosa* Wu and Chan, 2000, and *M. latimana* Miyake and Baba, 1966. Since 2000, extensive surveys on the deep-sea benthic animals of Taiwan have been carried out and abundant material of *Munidopsis* *sensu lato* (i.e. including *Galacantha*) has been collected. Seven of the species have already been reported: *M. bruta* Macpherson, 2007, *M. latiangulata* Osawa, Lin, and Chan, 2006, *M. panamae* Baba, 2005, *M. profunda* Baba, 2005, *M. sarissa* Lin, Osawa, and Chan, 2007, *M. tafrii* Osawa, Lin, and Chan, 2006, and *M. teretis* Baba, 2005 (Osawa *et al.*, 2006a, b; Lin *et al.*, 2007; Macpherson, 2007).

A comprehensive study on the material collected by the TAIWAN deep-sea cruises between 2000 and 2006 has revealed 20 more species of *Munidopsis* and one species of *Galacantha*. Among them, two *Munidopsis* species are new to science. The present work reports this result. Altogether 31 species of *Munidopsis* are now known from Taiwan, indicating a particularly rich deep-sea fauna around Taiwan.

MATERIALS AND METHODS

The specimens examined, including the type material of the two new species, are deposited in the National Taiwan Ocean University, Keelung (NTOU). The station (stn) designations CD, CP, OCP, and PCP refer to the collecting gears, Otter Trawl Le Drézén type JUNEUX (CD), a 4 m French beam trawl (CP), a 3 m ORE beam trawl (OCP) and a 2.5 m French beam trawl (PCP). The station data are shown in Table 1.

The general terminology follows that of Baba (2005). The abbreviations used in the text include: Mxp 3 (third maxilliped), P1 (pereopod 1, cheliped), and P2-4 (pereopods 2-4, first to third ambulatory legs). The postorbital carapace length (cl) is measured from the orbital margin (posterior lateral end of the ocular peduncle in dorsal view) to the posterior margin of the carapace in the dorsal midline. Lengths of the articles of P1 are measured along the mesial margins and those of P2-4 along the dorsal margins.

Four species previously known from Taiwan based on the material collected by local fishing

trawlers, i.e. *M. andamanica*, *M. cylindrophthalma*, *M. formosa*, and *M. latimana*, were also obtained through the TAIWAN deep-sea cruises. The specimens are listed below.

Munidopsis andamanica: TAIWAN 2002: stn CD194, 1 ovig. female cl 9.9 mm. TAIWAN 2006: stn PCP348, 1 male cl 16.7 mm.

Munidopsis cylindrophthalma: TAIWAN 2001: stn CP103, 1 male cl 13.9 mm. TAIWAN 2002: stn CP165, 2 ovig. females cl 12.0, 12.5 mm. TAIWAN 2006: stn PCP348, 4 males cl 8.6-11.8 mm, 2 females cl 6.6, 6.9 mm, 3 ovig. females cl 10.2-10.8 mm; stn PCP360, 1 male cl 10.1 mm, 1 female cl 9.4 mm, 3 ovig. females cl 9.0-9.8 mm.

Munidopsis formosa: TAIWAN 2001: stn CP90, 1 male cl 14.1 mm.

Munidopsis latimana: TAIWAN 2002: stn CD166, 1 male cl 13.1 mm.

SYSTEMATICS

Family GALATHEIDAE

Genus *Galacantha* A. Milne-Edwards, 1880

Galacantha valdiviae Balss, 1913

(Fig. 1A)

Galacantha valdiviae Balss, 1913: 224; Macpherson, 2007: 29 (synonymy and references), Figs. 15, 16.

Material examined: TAIWAN 2000: stn CP41, 1 male cl 10.1 mm. TAIWAN 2001: stn CD134, 2 males cl 7.1, 12.9 mm; stn CD136, 1 male cl 11.9 mm, 1 female cl 10.3 mm, 1 ovig. female cl 16.1 mm; stn CD142, 1 male cl 15.1 mm. TAIWAN 2002: stn CP179, 2 males cl 9.3, 16.8 mm; stn CD192, 1 female cl 5.2 mm. TAIWAN 2005: stn CP277, 1 ovig. female cl 21.3 mm; stn CP278, 2 females cl 9.6, 10.4 mm; stn CP281, 1 male cl 12.5 mm; stn OCP282, 1 male cl 8.9 mm; stn CP300, 1 ovig. female cl 17.3 mm; stn CD323, 1 ovig. female cl 11.3 mm. TAIWAN 2006: stn PCP342, 3 males cl 6.7-14.7 mm, 3 females cl 9.4-20.9 mm; stn PCP350, 1 male cl 15.6 mm; stn PCP351, 1 female cl 13.0 mm; stn CP363, 1 male cl 10.3 mm; stn CP364, 1 male cl 18.2 mm; stn CP366, 1 ovig. female cl 17.6 mm; stn CP372, 2 males cl 9.0, 11.1 mm, 3 females cl 9.3-11.7 mm.

Coloration (Fig. 1A): Entire body and pereopods reddish orange. Corneas orange.

Distribution: Off east coast of Somali Republic, Madagascar, Mozambique Channel, Moluccas off northwest Sulawesi, Palawan Passage, off Kii Peninsula in Japan, off Central Queensland and Solomon Islands, at depths of 1040-1644 m. The specimens from Taiwan were collected at depths of 277-1388 m. One specimen was collected at stn CD142 (277-355 m), but this information is probably incorrect

TABLE 1. – Station data of the TAIWAN expeditions and collected species.

TAIWAN 2000, R.V. “Fisheries Researcher I”	
CP32, 22°01.7'N, 120°11.1'E, 910–1129 m, 30 Jul 2000:	<i>M. kensleyi</i>
CP38, 21°57.5'N, 121°03.2'E, 1316–1317 m, 1 Aug 2000:	<i>M. pilosa</i>
CP41, 22°21.3'N, 121°07.7'E, 1124–1138 m, 1 Aug 2000:	<i>G. valdiviae</i>
CP53, 24°15.7'N, 122°11.6'E, 2903–2947 m, 3 Aug 2000:	<i>M. centrina</i>
CP55, 24°26.9'N, 122°18.1'E, 638–824 m, 4 Aug 2000:	<i>M. kensleyi</i>
TAIWAN 2001, R.V. “Ocean Researcher I”	
CP90, 24°53.60'N, 122°01.39'E, 300–330 m, 10 May 2001:	<i>M. formosa</i>
CP103, 24°48.83'N, 122°06.03'E, 367–424 m, 19 May 2001:	<i>M. cylindrophthalma</i>
CD134, 22°16.56'N, 120°06.11'E, 736–1040 m, 22 Nov 2001:	<i>G. valdiviae</i> , <i>M. cidaris</i> , <i>M. kensleyi</i>
CD136, 22°07.75'N, 120°00.87'E, 998–1211 m, 22 Nov 2001:	<i>G. valdiviae</i> , <i>M. pilosa</i>
CD142, 22°21.64'N, 120°13.44'E, 277–355 m, 24 Nov 2001:	<i>G. valdiviae</i>
TAIWAN 2002, R.V. “Ocean Researcher I”	
CP165, 22°24.06'N, 120°13.03'E, 300 m, 25 May 2002:	<i>M. similior</i> , <i>M. cylindrophthalma</i>
CP166, 22°23.85'N, 120°15.29'E, 200 m, 25 May 2002:	<i>M. latimana</i>
CP179, 22°21.22'N, 119°54.78'E, 1063–1212 m, 25 Aug 2002:	<i>G. valdiviae</i> ,
CP185, 22°00.54'N, 119°27.94'E, 2334–2543 m, 26 Aug 2002:	<i>M. centrina</i>
CD192, 22°17.19'N, 120°01.01'E, 960–1302 m, 28 Aug 2002:	<i>G. valdiviae</i>
CD194, 22°11.60'N, 120°23.82'E, 402–505 m, 29 Aug 2002:	<i>M. andamanica</i>
CD199, 24°25.38'N, 122°12.41'E, 1138–1187 m, 12 Sep 2002:	<i>M. bispinoculata</i> , <i>M. pilosa</i> , <i>M. sinclairi</i>
TAIWAN 2003, R.V. “Ocean Researcher I”	
CD203, 22°00.20'N, 120°28.94'E, 635–868 m, 29 May 2003:	<i>M. bispinoculata</i> , <i>M. serricornis</i>
CP214, 24°28.59'N, 122°12.66'E, 490–1027 m, 27 Aug 2003:	<i>M. analoga</i> , <i>M. bispinoculata</i>
CD226, 22°19.15'N, 121°04.63'E, 1171–1212 m, 29 Aug 2003:	<i>M. pilosa</i>
CD227, 22°12.04'N, 121°05.29'E, 1232–1260 m, 29 Aug 2003:	<i>M. pilosa</i>
CD229, 22°13.35'N, 120°01.90'E, 880–1060 m, 30 Aug 2003:	<i>M. kensleyi</i>
CD230, 22°19.32'N, 120°03.30'E, 795–840 m, 30 Aug 2003:	<i>M. trifida</i>
TAIWAN 2004, R.V. “Ocean Researcher I”	
CP235, 25°22.95'N, 122°43.63'E, 765–806 m, 22 Jul 2004:	<i>M. bispinoculata</i> , <i>M. pilosa</i> , <i>M. subchelata</i>
CD241, 25°09.51'N, 122°31.87'E, 970–975 m, 24 Jul 2004:	<i>M. pilosa</i>
TAIWAN 2005, R.V. “Fisheries Researcher I”	
CP277, 24°23.57'N, 122°14.12'E, 1222–1261 m, 14 Jun 2005:	<i>G. valdiviae</i>
CP278, 24°23.63'N, 122°14.13'E, 1222–1239 m, 14 Jun 2005:	<i>G. valdiviae</i> , <i>M. nitida</i>
CP281, 24°24.08'N, 122°14.06'E, 1173–1248 m, 15 Jun 2005:	<i>G. valdiviae</i> , <i>M. bispinoculata</i>
OCP282, 24°23.90'N, 122°14.10'E, 1200–1250 m, 15 Jun 2005:	<i>G. valdiviae</i> , <i>M. pilosa</i>
CP284, 24°16.34'N, 122°11.67'E, 2220–2424 m, 15 Jun 2005:	<i>M. centrina</i> , <i>M. edwardsii</i>
CP300, 22°14.56'N, 119°58.72'E, 960–972 m, 11 Aug 2005:	<i>G. valdiviae</i> , <i>M. bispinoculata</i> , <i>M. sarissa</i>
OCP301, 22°19.39'N, 120°06.89'E, 687–712 m, 11 Aug 2005:	<i>M. hirsutissima</i>
CD323 (near Pratas Island in the South China Sea), 20° 38.80' N, 117° 47.84' E, 1237–1388 m, 19 Aug 2005:	<i>G. valdiviae</i>
TAIWAN 2005, R.V. “Ocean Researcher III”	
PCP334, 22°16.71'N, 120°00.11'E, 975–994 m, 5 Oct 2005:	<i>M. sarissa</i>
TAIWAN 2006, R.V. “Ocean Researcher III”	
PCP342, 22°16.65'N, 119°59.96'E, 988–1010 m, 8 Mar 2006:	<i>G. valdiviae</i> , <i>M. bispinoculata</i> , <i>M. sarissa</i>
PCP343, 22°15.70'N, 120°02.13'E, 945–1059 m, 8 Mar 2006:	<i>M. kensleyi</i> , <i>M. tuberosa</i> n. sp.
PCP344, 22°15.95'N, 120°00.11'E, 995–1073 m, 8 Mar 2006:	<i>M. bispinoculata</i> , <i>M. dasyopus</i>
PCP348, 22°21.64'N, 120°11.61'E, 334–430 m, 9 Mar 2006:	<i>M. andamanica</i> , <i>M. cylindrophthalma</i>
PCP350, 22°20.89'N, 121°07.66'E, 1149–1152 m, 2 Jun 2006:	<i>G. valdiviae</i>
PCP351, 22°18.24'N, 121°07.52'E, 1151–1168 m, 2 Jun 2006:	<i>G. valdiviae</i> ,
PCP358, 22°09.56'N, 121°07.17'E, 1257–1262 m, 2 Jun 2006:	<i>M. bispinoculata</i> , <i>M. nitida</i> , <i>M. pilosa</i>
TAIWAN 2006, R.V. “Ocean Researcher I”	
CP360, 22°22.80'N, 121°14.10'E, 287–292 m, 23 Aug 2006:	<i>M. cylindrophthalma</i>
CP363, 22°09.30'N, 121°07.35'E, 1262–1269 m, 24 Aug 2006:	<i>G. valdiviae</i> , <i>M. pilosa</i>
CP364, 22°06.33'N, 121°08.22'E, 1260–1275 m, 24 Aug 2006:	<i>G. valdiviae</i> , <i>M. nitida</i> , <i>M. pilosa</i>
CP365, 22°04.32'N, 121°09.20'E, 1291–1295 m, 24 Aug 2006:	<i>M. pilosa</i>
CP366, 22°02.87'N, 121°10.08'E, 1301–1302 m, 24 Aug 2006:	<i>G. valdiviae</i> , <i>M. centrina</i> , <i>M. sinclairi</i>
CP369, 24°18.96'N, 122°04.20'E, 3030–3070 m, 25 Aug 2006:	<i>M. centrina</i> , <i>M. pallida</i>
CP372, 22°23.62'N, 122°14.14'E, 1220–1280 m, 26 Aug 2006:	<i>G. valdiviae</i> , <i>M. pilosa</i>
CP373, 24°16.29'N, 122°11.65'E, 2233–2551 m, 26 Aug 2006:	<i>M. arietina</i> , <i>M. centrina</i> , <i>M. edwardsii</i> , <i>M. pallida</i>
CP374, 24°19.20'N, 122°04.22'E, 3032–3065 m, 26 Aug 2006:	<i>M. granosa</i> , <i>M. pallida</i> , <i>M. echinata</i> n. sp.
CP375, 24°16.24'N, 122°11.72'E, 2216–2497 m, 26 Aug 2006:	<i>M. centrina</i> , <i>M. edwardsii</i>

and the specimen may in fact have been obtained from the preceding stn CD141 (985–1110 m). Most of the specimens examined were collected at depths

of over 1000 m. Station CD323 is located near Pratas Island in the South China Sea, a territory of Taiwan. Genus *Munidopsis* Whiteaves, 1874

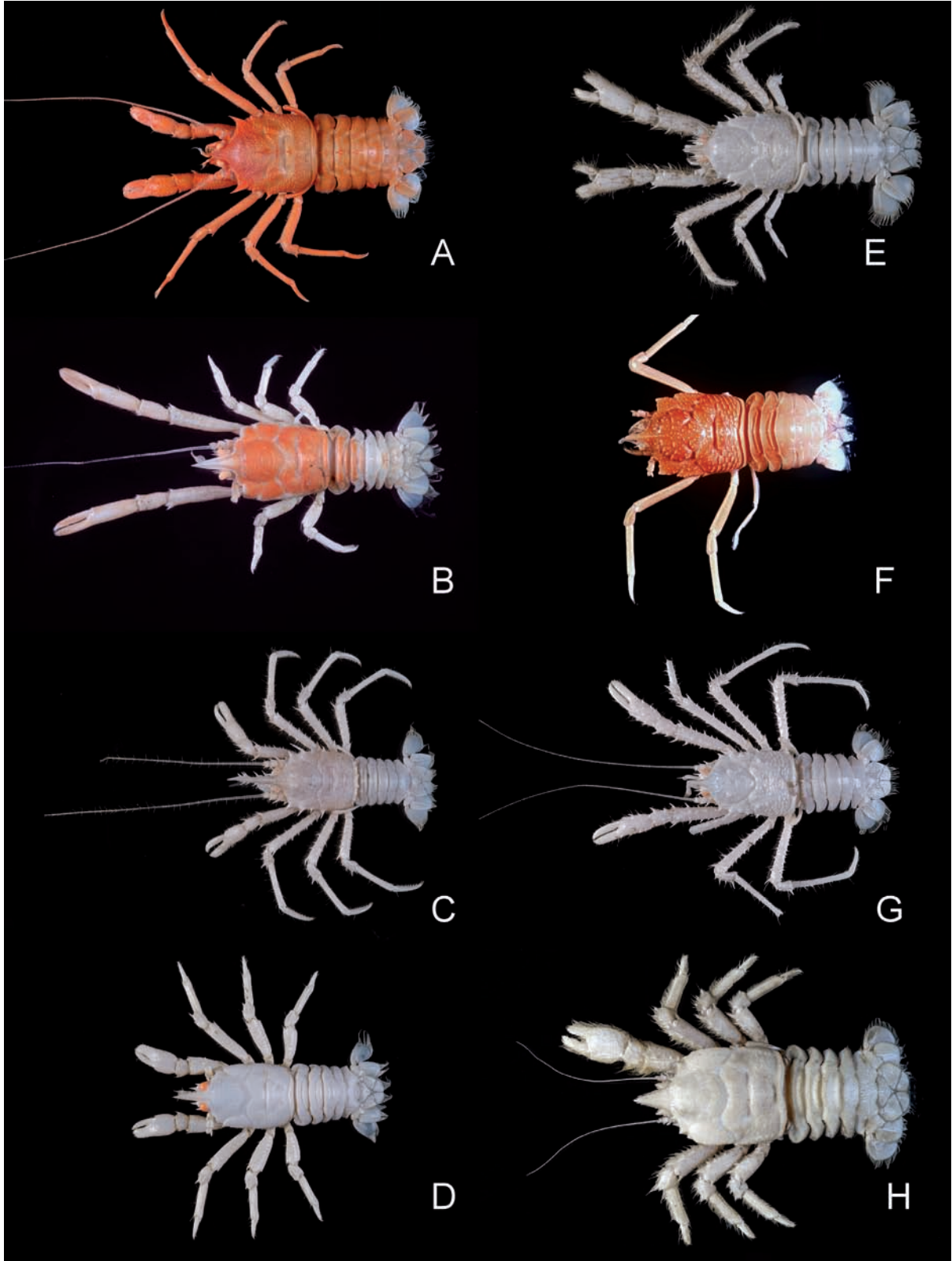


FIG. 1. – Fresh specimens, dorsal view. A, *Galacantha valdiviae* Balss, 1913, stn CP277, ovig. female (cl 21.3 mm); B, *Munidopsis analoga* Macpherson, 2007, stn CP214, male (cl 8.8 mm); C, *Munidopsis arietina* Alcock and Anderson, 1894, stn CP373, male (cl 10.3 mm); D, *Munidopsis bispinoculata* Baba, 1988, CP300, male (cl 11.8 mm); E, *Munidopsis centrina* Alcock and Anderson, 1894, stn CP369, male (cl 20.4 mm); F, *Munidopsis cidaris* Baba, 1994, stn CP134, female (cl 12.3 mm); G, *Munidopsis echinata* n. sp., stn CP374, holotype female (cl 19.7 mm); H, *Munidopsis edwardsii* (Wood-Mason, 1891), stn CP284, male (cl 29.1 mm).

***Munidopsis analoga* Macpherson, 2007**
(Fig. 1B)

Munidopsis analoga Macpherson, 2007: 34, Fig. 19.

Material examined: TAIWAN 2003: stn CP214, 1 male cl 8.8 mm.

Coloration (Fig. 1B): Carapace generally reddish orange, anterior part of rostrum and cervical grooves whitish. Abdomen reddish orange on second and third segments but whitish on fourth to sixth segments, telson, and uropods. Corneas orange pink. Pereopods white to pale orange.

Remarks: The specimen examined agrees well with the description of Macpherson (2007).

Munidopsis analoga closely resembles *M. cylindrophthalma*, which also occurs in Taiwan. In addition to the difference in the length of P1 discussed by Macpherson (2007), the two species are distinguished by the armature on the merus of P1. This segment has three distal spines (lateral, mesial, and dorsal) in *M. analoga*, but it possesses only one distolateral spine in *M. cylindrophthalma*.

Distribution: New Caledonia and Fiji, at depths of 600-1180 m. The Taiwan specimen was collected at depths of 490-1027 m.

***Munidopsis arietina* Alcock and Anderson, 1884**
(Fig. 1C)

Munidopsis arietina Alcock and Anderson, 1894: 171; Baba, 2005: 137, Fig. 55, 285.

Material examined: TAIWAN 2006: stn CP373 1 male cl 10.3 mm, 1 female cl 10.4 mm.

Coloration (Fig. 1C): Carapace, abdomen, and pereopods entirely whitish or pale pink. Corneas orange pink.

Remarks: In the specimens examined, there are two spines on the anterior branchial margin of the carapace, and the posterior spine is much smaller than the anterior (no posterior spine for *M. arietina* as described in Alcock and Anderson, 1894 and Baba, 2005). This armature agrees fairly well with that of a close relative, *M. bairdii* (Smith, 1884). However, *M. arietina* can be distinguished from *M. bairdii* by the eye-spine being directed anterolaterad (Baba, 2005).

The two specimens examined are different in the arrangement of spines on the carapace and rostrum.

The anterior carapace has two mesogastric spines in both specimens, but the protogastric spine is present only in the male. The median end of the cervical grooves also possesses a pair of small spines only in the male. The cardiac region is armed with two pairs of spines. The posterior pair is much smaller than the anterior pair in the male, and it is reduced to a minute tubercle or a short ridge in the female. The posterior elevated ridge bears seven spines in the male, but two median spines in the female. The lateral margin of the rostrum is armed with six left and five right spines in the male, and three left and two right spines in the female. Moreover, the male specimen has a small antennal spine on the right frontal margin of the carapace.

Distribution: Bay of Bengal at depths of 2782-2935 m, and Taiwan at depths of 2233-2551 m. The present record greatly extends its geographical distribution eastwards into the Pacific Ocean.

***Munidopsis bispinocolata* Baba, 1988**
(Fig. 1D)

Munidopsis bispinocolata Baba, 1988: 142, Fig. 54; 2005: 137, 285; Macpherson, 2007: 44, Fig. 55D.

Material examined: TAIWAN 2002: stn CD199, 1 male cl 7.0 mm, 1 female cl 8.6 mm. TAIWAN 2003: stn CD203, 1 male cl 8.4 mm; stn CP214, 1 ovig. female cl 7.8 mm. TAIWAN 2004: stn CP235, 4 ovig. females cl 10.3-12.7 mm. TAIWAN 2005: stn CP281, 1 male 10.2 mm; stn CP300, 2 males cl 10.0, 11.8 mm. TAIWAN 2006: stn PCP342, 1 male cl 9.6 mm, 1 ovig. female cl 7.4 mm; stn PCP344, 1 female cl 8.4 mm; stn PCP358, 1 male cl 11.4 mm.

Coloration (Fig. 1D): Entire body and pereopods whitish. Corneas orange.

Remarks: The specimens examined have short transverse ridges bearing short setae on the carapace, and the corneas are sometimes rounded rather than subtriangular.

Distribution: Madagascar, Philippines, Indonesia, New South Wales, Solomon Islands, Vanuatu and Fiji, at depths of 443-2363 m. The specimens from Taiwan were collected at depths of 490-1262 m.

***Munidopsis centrina* Alcock and Anderson, 1894**
(Fig. 1E)

Munidopsis centrina Alcock and Anderson, 1894: 170; Baba, 2005: 139, Fig. 57, 286 (synonymy and references); Macpherson, 2007: 49.

Material examined: TAIWAN 2000: stn CP53, 1 female cl 15.3 mm.

TAIWAN 2002: stn CP185, 1 ovig. female cl 17.1 mm. TAIWAN 2005: stn CP284, 1 male cl 9.6 mm. TAIWAN 2006: stn CP366, 3 males cl 14.5-19.5 mm, 2 females cl 14.2, 16.6 mm; stn CP369, 1 male cl 20.4 mm; stn CP373 1 ovig. female cl 23.7 mm; stn CP375 1 female cl 10.8 mm.

Coloration (Fig. 1E): Entire body and pereopods whitish. Corneas orange pink.

Distribution: Madagascar, Mozambique Channel, Reunion Island, Bay of Bengal, Tasman Sea and New Caledonia, at depths of 2300-3485 m. The specimens from Taiwan were collected at depths of 1301-3030 m.

***Munidopsis cidaris* Baba, 1994**
(Fig. 1F)

Munidopsis cidaris Baba, 1994: 16, Fig. 7; Macpherson, 2007: 53.

Material examined: TAIWAN 2001: stn CP134, 1 female cl 12.3 mm.

Coloration (Fig. 1F): Carapace, abdomen, and pereopods generally reddish orange. Propodi and dactyli of P2-4 lighter coloured. Fifth and sixth segments of abdomen also lighter in colour, and telson and uropods mostly whitish. Corneas orange.

Remarks: Although the only specimen collected lacks both P1, it generally agrees with the original description of *M. cidaris*. The squamiform ridges on the gastric region of the carapace are larger in the present specimen than the holotype. The corneas are subtriangular in the Taiwanese specimen instead of rounded as they are in the holotype.

Distribution: Off central Queensland, Australia, the Philippines and Solomon Islands, at depths of 975-1200 m. The Taiwan specimen was obtained from depths of 736-1040 m.

***Munidopsis dasypus* Alcock, 1894**
(Fig. 2A)

Munidopsis dasypus Alcock, 1894: 329; Baba 2005: 148, 287 (synonymy and references); Macpherson, 2007: 59.

Material examined: TAIWAN 2006: stn PCP344, 1 ovig. female cl 14.4 mm.

Coloration: Not recorded.

Remarks: The sole specimen has a small spine at the lateral end of the anterior cervical groove of

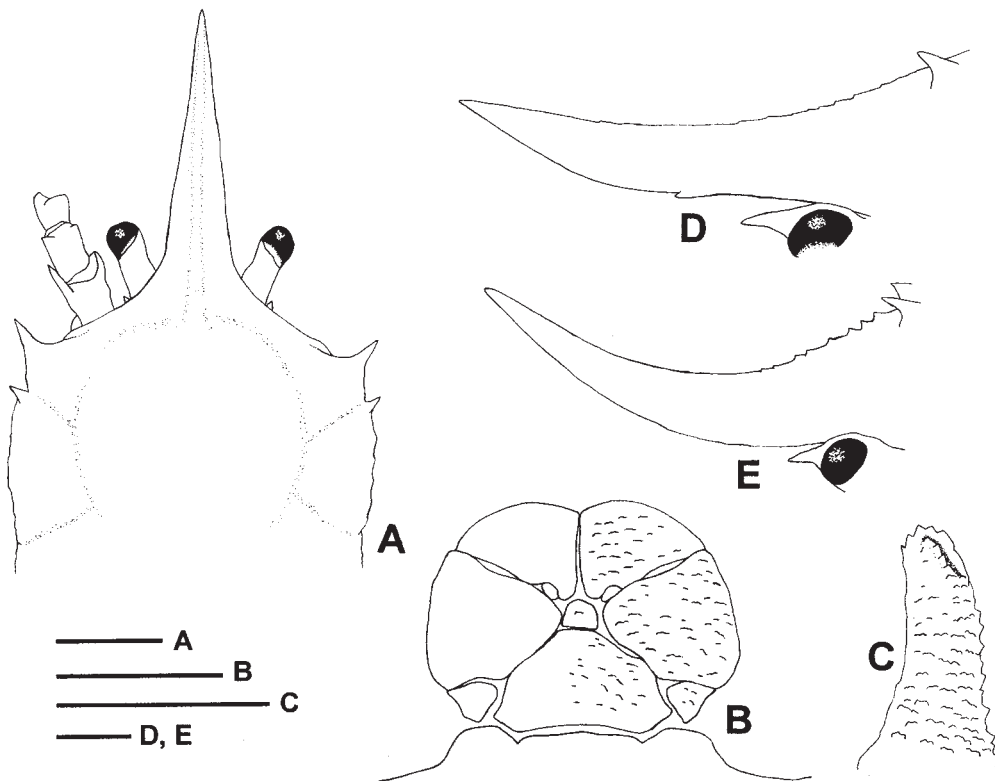


FIG. 2. – *Munidopsis dasypus* Alcock, 1894, stn PCP344, ovig. female (cl 14.4 mm) (A); *Munidopsis granosa* Alcock, 1901, stn CP374, male (cl 11.3 mm) (B, C); *Munidopsis pallida* Alcock, 1894, stn CP369, female (cl 40.1 mm) (D), stn CP374, male (cl 29.5 mm) (E). A, anterior carapace, and left ocular and antennal peduncles, dorsal view; B, posterior part of sixth abdominal segment and telson, ventral view (short ridges omitted from right side); C, fixed finger of first pereopod, lateral view; D, E, rostrum, left lateral view. Scales equal 3.0 mm.

the carapace (Fig. 2A), but the spine is absent in the Taiwanese material of its close relative *M. kensleyi* Ahyong and Poore, 2004. Although Ahyong and Poore (2004) mentioned that *M. dasypus* differs from *M. kensleyi* in having longer and more upright spines on the P1-4, our material of these two species shows no clear differences in the spines. The deep excavation on the anterior median part of the thoracic sternite 4 illustrated in Baba (1988: Fig. 60b) is not clearly seen in the present specimen, which is similar to the “Galathea” material identified as *M. dasypus* by Baba (2005). The Taiwanese specimens of *M. kensleyi* also have the excavation weakly marked or indistinct.

Distribution: Madagascar, Arabian Sea, Gulf of Aden, Bay of Bengal, Laccadive Sea, Andaman Sea, Exmouth Plateau (Western Australia), Kei Islands, off southwest coast of Halmahera and South China Sea, at depths of 214-1480 m. The Taiwan specimen was collected at depths of 995-1073 m.

***Munidopsis echinata* n. sp.**
(Figs. 1G, 3, 4)

Material examined: TAIWAN 2006: stn CP374, holotype female cl 19.7 mm (NTOU A00831).

Etymology: The specific name is derived from the Latin, *echinatus*, prickly, in reference to the armature on the carapace and abdomen.

Description: Carapace (Fig. 3A, B), exclusive of rostrum (postorbital carapace), approximately 1.3 times longer than broad; dorsal surface moderately convex from side to side; anterior and posterior cervical groove distinct but not deep; spines, tubercles, and ridges with few short setae. Gastric region moderately convex, covered with small and moderate-sized spines and tubercles as figured; pair of epigastric spines well developed. Hepatic region with few minute tubercles. Anterior half of branchial and cardiac regions with small spines and tubercles. Posterior part of carapace bearing elevated, interrupted transverse ridges. Posterior cardiac region subtriangular, preceded by shallow transverse depression. Posterior margin preceded by elevated ridge with 4 median spines. Lateral margins subparallel, nearly straight on anterior half and slightly convex on posterior half, not crested; anterior half with strong spines; first spine anterolateral, smaller

than second, somewhat divergent anteriorly, located distinctly mesial to level of remaining spines; second spine largest, directed slightly more laterad than preceding; remaining spines small or subequal to first (some spines in broken condition); small spine present at lateral end of posterior cervical groove. Frontal margin strongly oblique, slightly convex; antennal spine absent. Rostrum (distal part broken) (Fig. 3A, B) narrow, weakly upturned in lateral view; lateral margins with minute denticles; dorsal surface slightly convex, with rounded, median longitudinal carina; ventral surface with weak, rounded, longitudinal ridge in midline.

Pterygostomian flap (Fig. 3B) with flattened small tubercles on anterior half and elevated, interrupted oblique ridges on posterior half; anterior margin narrowly rounded, bearing spinule.

Sternal plastron as long as wide when measured along midline, maximum width at sternite 7. Sternite 3 (Fig. 3C) approximately 3.3 times as broad as long when measured along midline; anterior margin divided into 2 round lobes by median notch, each lobe with small spine at each mesial and lateral end. Sternite 4 (Fig. 3C) anteriorly narrowed, not contiguous with posterior margin of sternite 3; greatest width approximately 3.2 times that of sternite 3; anterior margins oblique, somewhat concave, each with row of flattened tubercles and setae; surface depressed in midline, with pair of tufts of short setae. Sternites 5-7 nearly smooth on surface, with row of setae on each anterior ridge.

Abdomen (Fig. 3A, B) with short and moderately long setae on transverse ridges and pleura; segments 2-4 each with 2 moderately elevated, blunt transverse ridges separated by transverse groove, anterior ridges with 3 spines on segments 2 and 3 but 1 spine on segment 4; segment 5 without distinct transverse ridges, weakly convex on median surface; segment 6 (Fig. 3D) flattish, with posteromedian lobe strongly produced, overreaching weakly convex posterolateral lobes. Telson (Fig. 3D) composed of 8 calcified plates.

Ocular peduncle (Fig. 3A, B, E) immovable, with strong distomesial eye-spine directed anterolaterally; lateral margin unarmed; cornea lateral, moderately large, approximately 0.9 of width of article 3 of antennal peduncle in dorsal view, semicircular, cupped within broad-base eyestalk.

Basal article of antennular peduncle (Fig. 3E) with dorsolateral spine distinctly smaller than ventrolateral, smooth; ventrolateral spine also smooth,

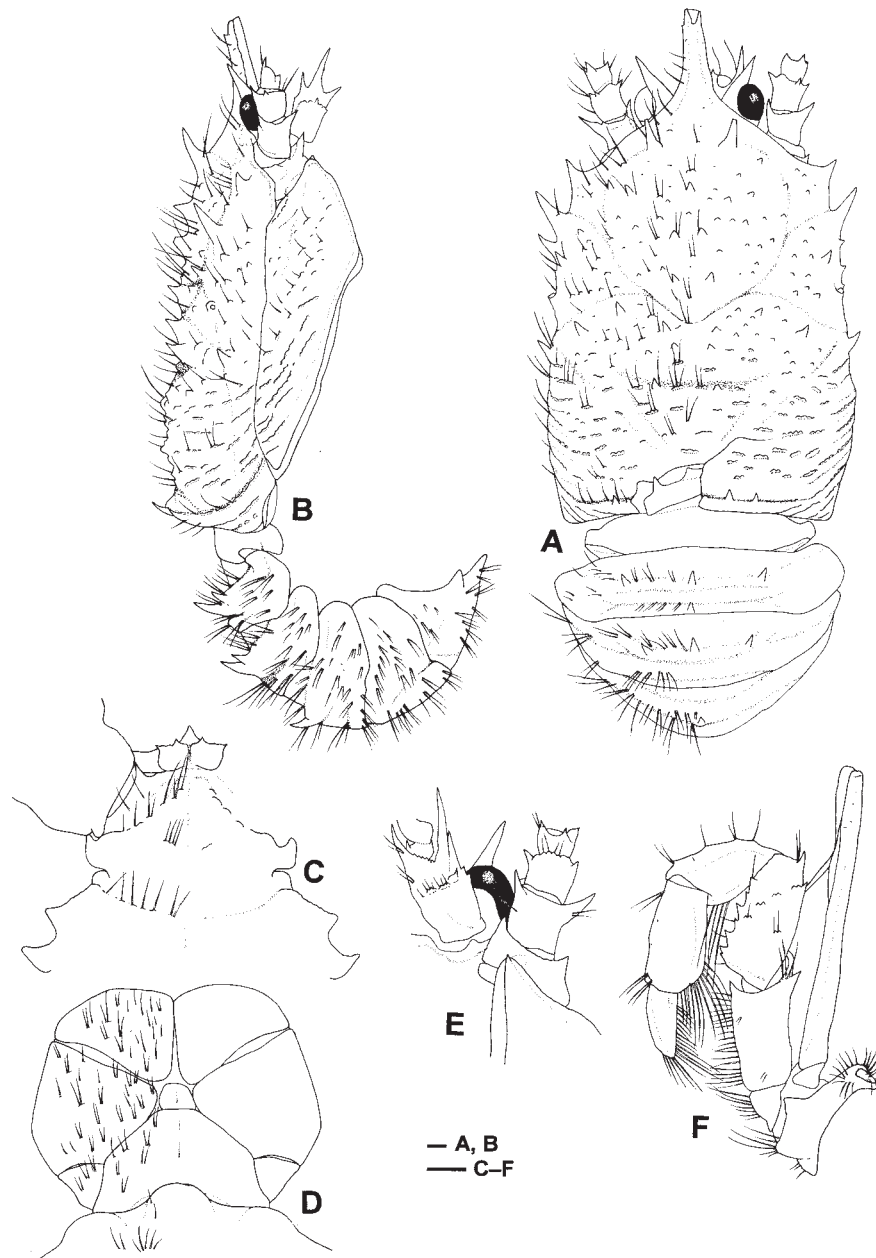


FIG. 3. – *Munidopsis echinata* n. sp., holotype female (cl 19.7 mm). A, carapace, abdomen, and ocular and antennal peduncles, dorsal view (setae omitted from right side); B, same, right, lateral view; C, anterior part of sternal plastron, ventral view (setae omitted from left side); D, telson and posterior part of sixth abdominal segment, ventral view (setae omitted from left side); E, left pterygostomial flap, basal article of antennular peduncle, and antennal and ocular peduncles, lateral view; F, left third maxilliped, lateral view. Scales equal 1.0 mm.

slender; lateral margin with spinules; ventral surface with transverse row of short denticulate scales and small spine; distomesial margin with row of small denticles and strong spine at mesial angle, small dorsal spine present.

Antennal peduncle (Fig. 3E) overreaching anterior margin of cornea by length of article 4 and reaching tip of eye-spine by distal margin of article 5. Article 1 with short, distomesial and distolateral spines; distomesial spine slightly longer than dis-

tolateral, barely reaching half of article 2. Article 2 also bearing distomesial and distolateral spines, distomesial spine smaller than distolateral. Article 3 with dorsodistal, distomesial, and distolateral spines, distomesial spine largest; ventrodistal margin tuberculate. Article 4 with dorsodistal, distomesial, distolateral, and ventrodistal spines; dorsodistal spine largest, distolateral spine minute.

Mxp 3 ischium (Fig. 3F) slightly shorter than merus when measured on extensor margin; extensor

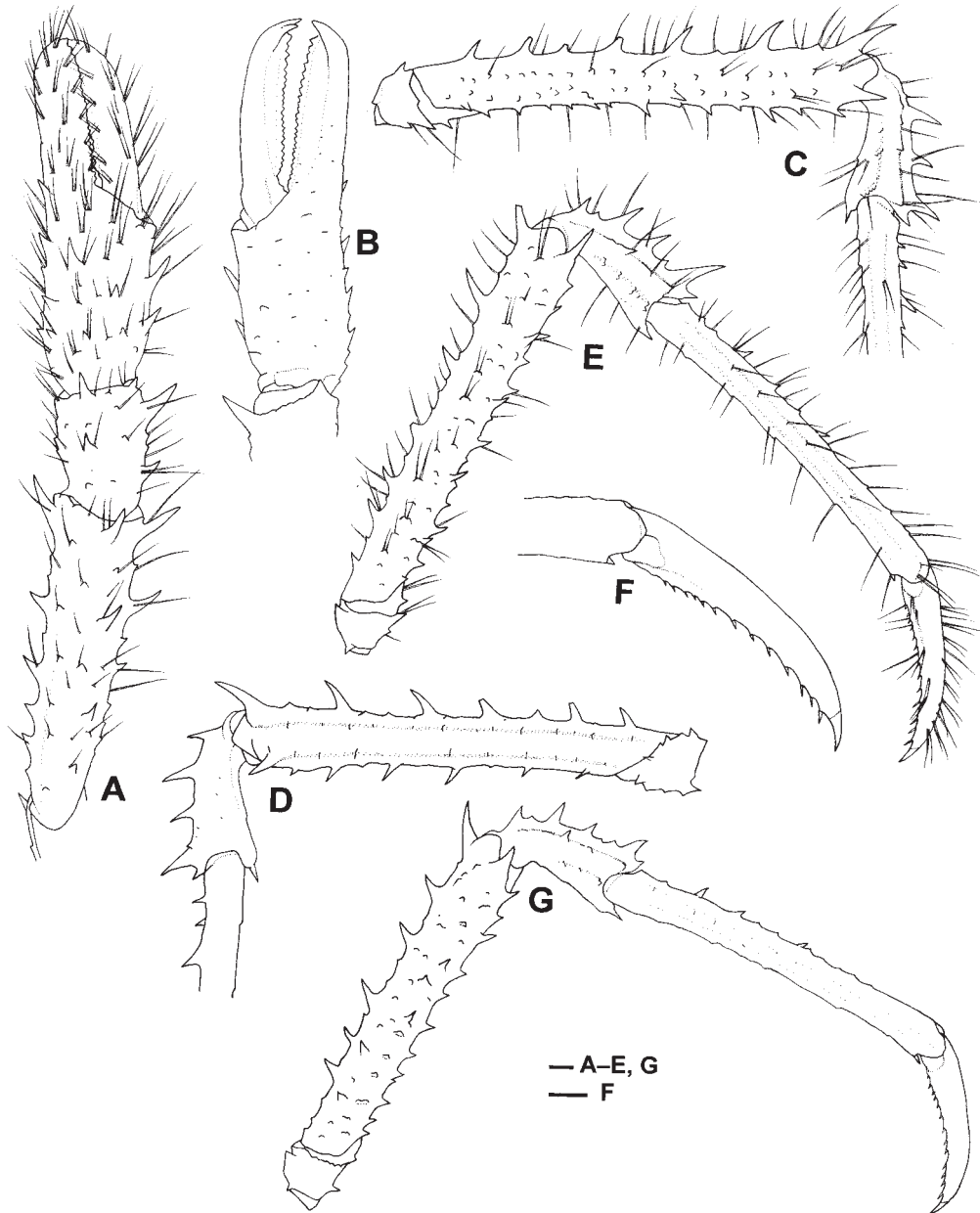


FIG. 4. – *Munidopsis echinata* n. sp., holotype female (cl 19.7 mm). A, left first pereopod, dorsal view; B, same, chela and distal part of carpus, ventral view; C, right second pereopod, lateral view (distal articles broken); D, same, mesial view (setae omitted); E, right third pereopod, lateral view; F, same, dactylus and distal part of propodus, lateral view (setae omitted); G, right fourth pereopod, lateral view (setae omitted). Scales equal 1.0 mm.

margin with small distal spine; flexor margin sharply ridged, terminating in small spine; mesial ridge (crista dentata) with row of 19-23 small corneous teeth; lateral surface nearly smooth. Merus with few short ridges on lateral surface; flexor margin with 3 moderate-sized spines and several smaller spines; extensor margin with small distal spine and subdistal spinule. Carpus with low processes on extensor surface. Propodus and dactylus nearly smooth. Exopod distinctly overreaching distal margin of merus. Epipod reduced.

P1 (Fig. 4A, B), subequal, moderately slender, 1.7 times longer than postorbital carapace (excluding rostrum); spines, protuberances, and short transverse ridges accompanied with setae. Ischium with small spine on each of dorsodistal, distolateral, and ventrolateral margins; ventral surface with some small spines; ventromesial margin with row of spines, distal spine strongest. Merus 3.5 times as long as broad when measured on dorsodistal margin excluding spines, armed with 4 rows of spines

(dorsomesial, dorsolateral, ventrolateral, and ventromesial), distal spine strongest among spines of same row; surfaces also with some smaller spines. Carpus 1.5 times longer than broad when measured on dorsodistal margin; dorsomesial and dorsolateral margins each with 2 distinct spines, distal spines larger; surfaces with some much smaller spines and protuberances. Palm comparatively slender, moderately inflated, 1.2 times length of carpus, 1.5 times as long as broad when measured at bases of fingers; lateral margin weakly concave at base of fixed finger, armed with irregular row of spines along each of dorsomesial and dorsolateral margins, dorsomesial row composed of 2 strong spines and dorsolateral row of 2 or 3 moderately large spines; dorsal surface also with 2 irregular rows of 2 spines and scattered short ridges, distolateral spine much larger; ventral surface with scattered short ridges. Fingers 1.2 times as long as palm; opposable margins nearly straight, not gaping, distally spooned; prehensile edges each with row of small subacute teeth, proximal teeth obsolete; distal margins each with row of small, rounded teeth; fixed finger without denticulate carina on distolateral surface.

P2-4 (Fig. 4C-G) long, slender, subcylindrical; both P2 missing dactyli and distal parts of propodi; left P3 lacking dactylus; right P3 overreaching tip of P1 by entire length of dactylus; P3 longer than P4; surfaces with sparse, short to moderately long setae, most numerous on dactyli. Ischia each with elevated ridge on dorsal surface; ventral surface also with few short, elevated ridges; ventrodistal margin with row of short spines. Meri longest on P2, decreasing in length posteriorly, elongate, subrectangular in lateral view, each with dorsal crest bearing row of strong spines continued onto corresponding crest on carpus, distal spine largest; lateral surface with some small spines, and also with elevated, short transverse ridges on P4; distolateral margin with rounded lobe; ventrolateral margin with irregular rows of spines, distal spine prominent; mesial surface flattish, smooth; dorsomesial and ventromesial margins each delimited by row of elevated, very short transverse ridges, and also with small spines on P4; ventrodistal margin with small spine, largest on P3; ventral surface with elevated, short transverse ridges and small spines. Carpi each with row of spines on dorsal crest, distal spine largest; lateral surface also with elevated crest bearing small proximal spine and few short ridges somewhat dorsally along midline, and oblique row of few short ridges ventrally, dis-

tal ridge denticulate; ventral surface nearly smooth; ventrodistal margin produced, with slender spine; mesial surface with few very short ridges. Propodi, exclusive of distal rounded projection, 8.0-8.4 times as long as high when measured at base of distal projection; dorsal surface flattish, nearly smooth; dorsolateral and dorsomesial margins each delimited by row of elevated and flattened short ridges, few spines present on proximal half; lateral surface with weakly elevated short ridges in midline; ventral surface somewhat flattish, bearing short, transverse ridges; ventrodistal margin with 1 or 2 short corneous spines, lateral spine always present, mesial spine minute or absent; mesial surface with scattered small protuberances. Dactyli 0.5-0.6 length of propodi, each terminating in slender corneous claw; dorsal, lateral, and mesial surfaces nearly smooth; ventral margin gently curved, with row of 12 or 13 low, proximally diminishing processes, each process supporting slender corneous spine or bristle.

Epipods absent from P1-4.

Coloration (Fig. 1G): Entire body and pereopods whitish. Corneas orange pink.

Remarks: The new species is most closely allied to *M. colombiana* Pequegnat and Pequegnat, 1971 known from the Colombian Basin in the Caribbean Sea in almost all aspects except in having no antennal spine on the frontal margin of the carapace (a distinct antennal spine is present in *M. colombiana*), a long spine on the distomesial margin of the antennular basal article (two or three spines in *M. colombiana*, and these spines may bear accessory spinules), and the antennal peduncle overreaching the anterior margin of the cornea by the length of the article 4 (antennal peduncle not reaching anterior margin of cornea in *M. colombiana*).

Munidopsis echinata also resembles *M. abyssicola* Baba, 2005 known from Kermadec Deep in the southwest Pacific and the Atlantic Ocean, and *M. gladiola* Macpherson, 2007 from Walvis Ridge in the southeast Atlantic and southwest Indian Ocean. The common characters found in these three species include the carapace with some spines on the gastric region, the abdominal segment 6 with the posteromedian lobe well produced, the ocular peduncle bearing a distinct distomesial eye-spine, the P1 without epipod and a denticulate carina on the lateral surface of the fixed finger, and the P2-4 dactyli not cristate on the lateral and mesial surfaces. *Munidopsis echi-*

nata and *M. abyssicola* also have the abdominal segment 6 with a strongly produced posteromedian lobe, a large distomesial eye-spine clearly overreaching the distal margin of the cornea, and the P2-4 propodi bearing some small spines on the dorsal crests and dactyli being moderately curved on the ventral margin. Moreover, the new species and *M. gladiola* both have a pair of prominent epigastric spines and the P1 palm armed with spines on the mesial margin. However, *M. echinata* is distinguished from these two species by the armature of the posterior margin of the carapace and abdominal segments 2-4. The elevated ridge along the posterior margin of the carapace has four median spines in the new species, whereas it possesses only two median spines in *M. gladiola* and a row of spines along the entire margin in *M. abyssicola*. The abdominal segments 2, 3, and 4 of *M. echinata* are armed with three, three, and one spines on the anterior transverse ridge, respectively, but those of *M. abyssicola* and *M. gladiola* are all unarmed.

Distribution: Taiwan, in 3032-3065 m.

Munidopsis edwardsii (Wood-Mason, 1891)
(Fig. 1H)

Elasmonotus edwardsii Wood-Mason in Wood-Mason and Alcock, 1891: 201.

Munidopsis edwardsii: Baba, 2005: 149, 288 (synonymy and references); Macpherson, 2007: 67.

Material examined: TAIWAN 2005: stn CP284, 1 male cl 29.1 mm. TAIWAN 2006: stn CP373, 1 female cl 29.0 mm; stn CP375 1 male cl 15.6 mm.

Coloration (Fig. 1H): Entire body and pereopods whitish. Corneas orange pink.

Remarks: P2 only extends to the base of the P1 dactylus in the specimen of stn CP284. In the other Taiwanese specimens as well as the material of Baba and Poore (2003) and Baba (2005), P2 overreaches P1.

Distribution: Bay of Bengal, southwest of Sri Lanka and New South Wales, at depths of 1379-2610 m. The Taiwan specimens were collected at depths of 2220-3065 m.

Munidopsis granosa Alcock, 1901
(Figs. 2B, C, 5A)

Munidopsis (Orophorhynchus) granosa Alcock, 1901: 266, pl. 3: Fig. 1.

Munidopsis granosa: Baba, 2005: 149, 289 (synonymy and references).

Material examined: "TAIWAN 2006": stn CP374, 1 male cl 11.3 mm.

Remarks: The specimen examined agrees well with the recent diagnosis of *M. granosa* given by Baba (2005), except the abdominal segment 6 with the distolateral lobes distinctly overreaching the slightly convex posteromedian margin, the telson composed of ten calcified plates (a small plate is present between the lateromedian and distal plates; Fig. 2B), and the P1 fixed finger with a short denticulate carina on the distolateral margin (Fig. 2C).

Coloration (Fig. 5A): Carapace, abdomen, and pereopods entirely whitish. Corneas orange pink.

Distribution: Mozambique Channel and Bay of Bengal at depths of 2610-3485 m, and Taiwan at depths of 3032-3065 m. The present record greatly extends its geographical distribution eastwards into the Pacific Ocean.

Munidopsis hirsutissima Balss, 1913
(Fig. 5B)

Munidopsis hirsutissima Balss, 1913a: 223; Macpherson, 2007: 70 (synonymy and references).

Material examined: TAIWAN 2005: stn OCP301, 1 female cl 21.4 mm.

Coloration (Fig. 2B): Carapace, abdomen, and pereopods entirely whitish; setae brown.

Remarks. In the specimen examined, the P1 palm is robust, somewhat flattish, and about 1.4 times as long as the dactylus, and a small antennal spine is present on the left side but absent on the right side of the frontal margin of the carapace.

Distribution: West of Sumatra, Solomon Islands and Fiji at depths of 495-1280 m, and Taiwan at depths of 687-712 m.

Munidopsis kensleyi Ah Yong and Poore, 2004
(Fig. 5C)

Munidopsis kensleyi Ah Yong and Poore, 2004b: 50, Fig. 50; Baba, 2005: 290 (synonymy and references); Macpherson, 2007: 73, Fig. 55I.

Material examined: TAIWAN 2000: stn CP32, 1 male cl 9.0 mm, 1 female cl 5.3 mm; stn CP55, 1 female cl 11.9 mm. TAIWAN 2001: stn CD134, 2 males cl 14.6, 14.2 mm, 1 female cl 11.5 mm, 1 ovig. female cl 10.8 mm. TAIWAN 2003: stn CD229, 2 males cl 14.3, 14.7 mm, 2 females cl 11.1, 11.3 mm. TAIWAN 2006: stn PCP343, 1 male cl 12.4 mm, 2 ovig. females cl 12.6, 13.6 mm.

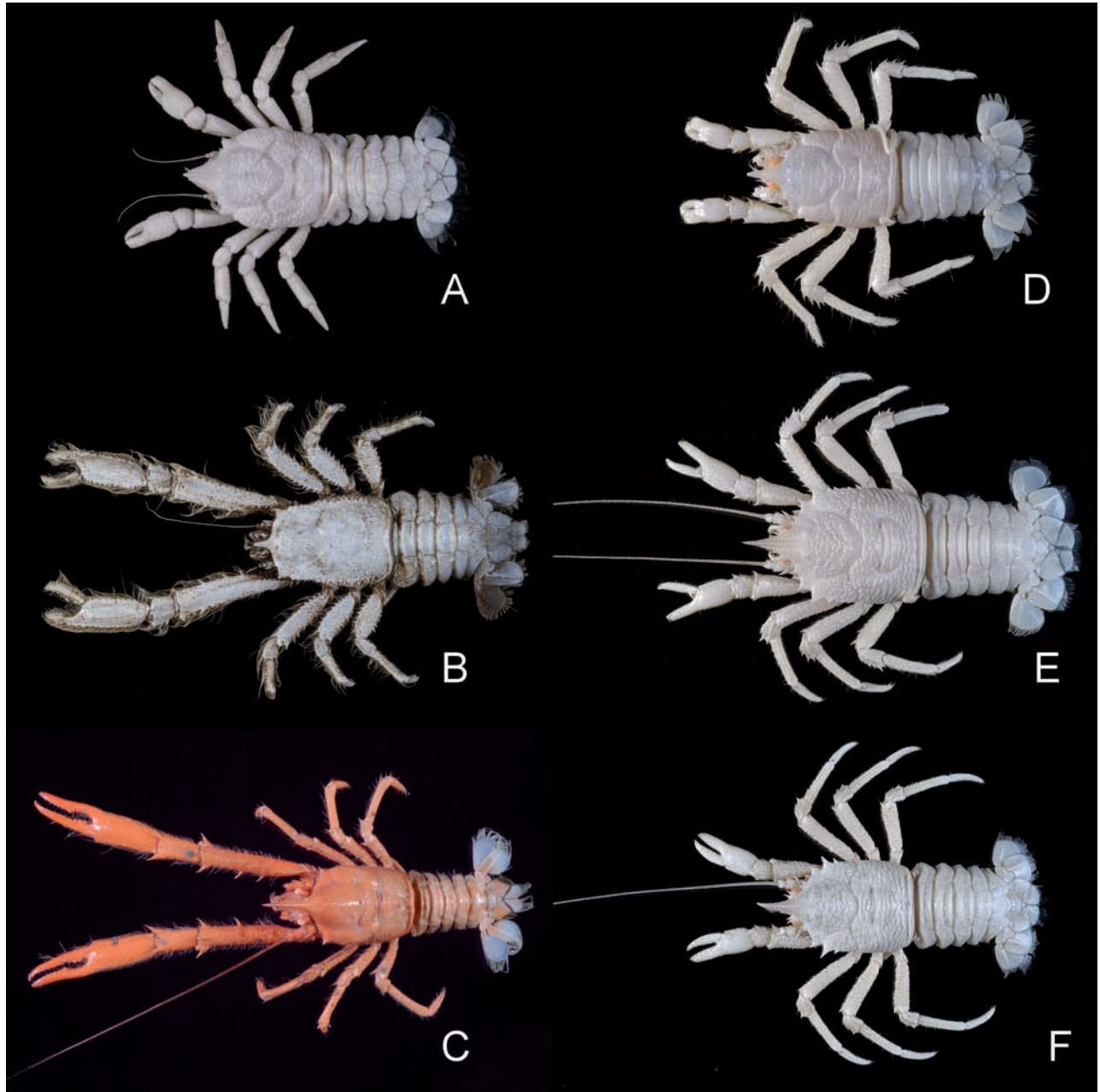


FIG. 5. – Fresh specimens, dorsal view. A, *Munidopsis granosa* Alcock, 1901, stn CP374, male (cl 11.3 mm); B, *Munidopsis hirsutissima* Balss, 1913, stn ÖCP301, female (cl 21.4 mm); C, *Munidopsis kensleyi* Ahyong and Poore, 2004, stn CD229, male (cl 14.7 mm); D, *Munidopsis nitida* (A. Milne-Edwards, 1880), stn CP364, female (cl 20.0 mm); E, *Munidopsis pallida* Alcock, 1894, stn CP369, female (cl 40.1 mm); F, *Munidopsis pallida* Alcock, 1894, stn CP374, 1 male (cl 29.5 mm).

Coloration (Fig. 5C): Entire body generally reddish orange; grooves on carapace, telson, and uropods paler coloured, whereas P1 deeper coloured. Corneas pink.

Remarks: The lateral end of the anterior cervical groove is unarmed or has a small blunt projection in the specimens examined. The armature on the lateral margin of the carapace is a primary difference between *M. kensleyi* and *M. dasyopus* (Baba, 2005: 148).

Distribution: Off northwest of South Africa, New South Wales, Chesterfield Islands, Solomon Islands, New Caledonia, Wallis and Futuna and Vanuatu, at depths of 476–1313 m. The Taiwan specimens were collected at depths of 638–1129 m.

Munidopsis nitida (A. Milne-Edwards, 1880)
(Fig. 5D)

Orophorhynchus nitidus A. Milne Edwards, 1880: 59.

Munidopsis nitida: Baba, 2005: 158, Figs. 72, 73, 291 (synonymy and references); Macpherson, 2007: 85.

Material examined: TAIWAN 2005: stn CP278, 1 female cl 18.4 mm. TAIWAN 2006: stn PCP358, 1 male cl 17.8 mm; stn CP364, 1 female cl 20.0 mm.

Coloration (Fig. 5D): Entire body and pereopods whitish. Corneas orange pink.

Distribution: Western Atlantic in the West Indies, Gulf of Mexico, southwest Brazil, and Gulf of Guinea. Indo-Pacific from the Mozambique Channel, Madagascar, southwest Indian Ocean, Gulf of Aden, Bay of Bengal, between Papua and Admiralty Islands, Indonesia, Philippines, Japan, Solomon Islands, New Caledonia, Vanuatu and Gulf of Panama. At depths of 222-3680 m. Macpherson (2007) noted that the shallow record from the Solomon Islands (222-228 m) should be considered with caution, because most of the records were well below 800 m. The Taiwan specimens were collected at depths of 1222-1275 m.

***Munidopsis pallida* Alcock, 1894**
(Figs. 2D, E, 5E, F)

Munidopsis subsquamosa var. *pallida* Alcock, 1894: 331.
Munidopsis pallida: Baba, 2005: 161, Figs. 74, 75, 292 (synonymy and references).

Material examined: TAIWAN 2006: stn CP369, 1 female cl 40.1 mm; stn CP373, 1 female cl 14.0 mm; stn CP374, 1 male cl 29.5 mm.

Coloration (Fig. 5E, F): Entire body and pereopods whitish. Corneas orange pink.

Remarks: The present specimens differ in some characters from the recent description of *M. pallida* given by Baba (2005). The rostrum of the specimen from stn CP374 (Fig. 2E) is much more strongly upturned than the other specimens examined (Fig. 2D) and the specimen from the Bay of Bengal of Baba (2005). In the specimens from stn CP369 and CP374, the anteroateral spine of the carapace is directed somewhat anterolaterally (vs. directed straight forward). The dactyli of the P2-4 are considerably narrowed distally in the Taiwanese specimens (vs. relatively broad distally).

Distribution. Bay of Bengal at depths of 2610-3299 m, and Taiwan at depths of 2233-3070 m. The present record greatly extends its geographical distribution eastwards into the Pacific Ocean.

***Munidopsis pilosa* Henderson, 1885**
(Fig. 6A)

Munidopsis pilosa Henderson 1885: 415; Baba, 2005: 293 (references); Macpherson, 2007: 93.

Material examined: TAIWAN 2000: stn CP38, 5 males cl 4.3-10.8 mm, 7 females 3.3-9.3 mm. TAIWAN 2001: stn CD136, 1 female cl 8.6 mm. TAIWAN 2002: stn CD199, 2 males cl 9.3, 9.6 mm. TAIWAN 2003: stn CD226, 1 male cl 5.4 mm; stn CD227, 12 males cl 5.1-10.6 mm, 4 females cl 5.8-11.1 mm, 1 ovig. female cl 10.5 mm. TAIWAN 2004: stn CP235, 3 males cl 4.4-12.2 mm, 1 female cl 5.9 mm, 1 ovig. female cl 9.9 mm; stn CP241, 1 male cl 9.1 mm. TAIWAN 2005: stn OCP282, 1 male cl 11.5 mm, 1 ovig. female cl 10.1 mm. TAIWAN 2006: stn PCP358, 1 ovig. female cl 9.3 mm; stn CP363, 5 males cl 7.6-11.4 mm, 2 females cl 5.9, 8.4 mm, 4 ovig. females cl 8.0-10.2 mm; stn CP364, 6 males cl 6.2-12.1 mm, 2 females cl 9.6, 11.3 mm, 12 ovig. females cl 7.3-11.3 mm; stn CP365, 1 ovig. female cl 11.5 mm; stn CP372, 2 ovig. females cl 8.6, 11.6 mm.

Coloration (Fig. 6A): Entire body and pereopods whitish; setae pale brown. Corneas orange pink.

Remarks: The specimens from stn CP235 were found to be in association with sunken wood, together with *M. subchelata*.

Distribution: Madagascar, Andaman Sea, Indonesia, Philippines, Solomon Islands, Vanuatu and Tonga Islands, at depths of 732-1640 m. The Taiwan specimens were collected at depths of 970-1317 m.

***Munidopsis serricornis* (Lovén, 1852)**
(Fig. 6B)

Galathea serricornis Lovén, 1852: 22.
Munidopsis serricornis: Baba, 2005: 185, 295 (synonymy and references); Macpherson and Segonzac, 2005: 42; Macpherson, 2007: 97.

Material examined: TAIWAN 2003: stn CD203, 1 male cl 7.7 mm.

Coloration (Fig. 6B): Body and pereopods generally pinkish orange, P1 deeper coloured. Corneas pink.

Remarks: The present specimen has a pair of small blunt, granulate epigastric processes and four small spines on the anterior half of the lateral margin of the carapace. The anterolateral spine is distinct but the second to fourth spines are obsolescent and the fourth spine is situated at the end of the posterior cervical groove.

Distribution: Eastern Atlantic from Norway and Iceland to Cape Verde Islands. Western Atlantic from southeast of United States to northwest of Gulf of Mexico. Indo-Pacific from Madagascar to Indo-

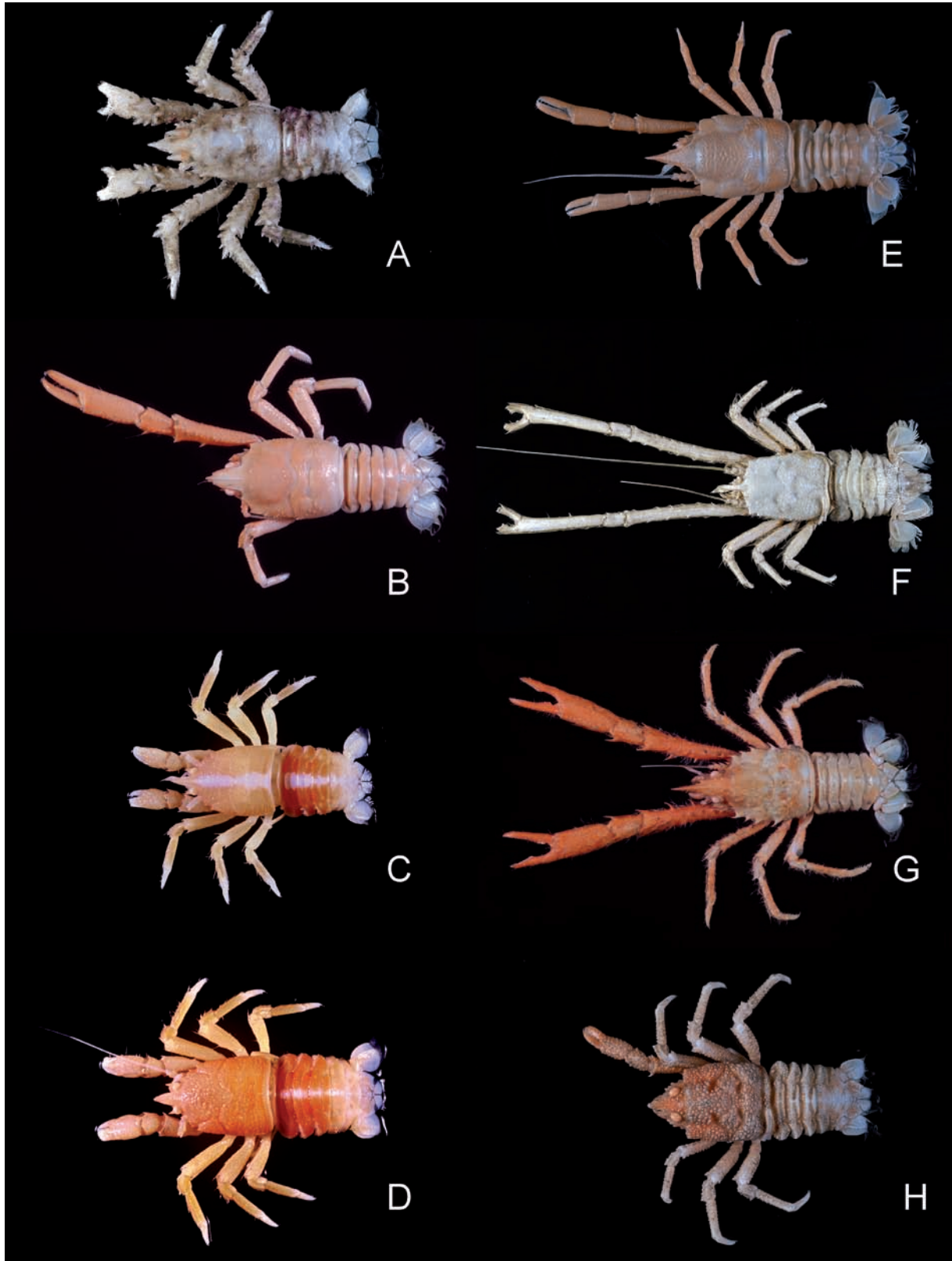


FIG. 6. – Fresh specimens, dorsal view. A, *Munidopsis pilosa* Henderson 1885, stn CP241, male (cl 9.1 mm); B, *Munidopsis serricornis* (Lovén, 1852), stn CD203, male (cl 7.7 mm); C, *Munidopsis similior* Baba, 1988, stn CP165, female (cl 9.1 mm); D, *Munidopsis similior* Baba, 1988, stn CP165, ovig. female (cl 6.8 mm); E, *Munidopsis sinclairi* McArdle, 1901, stn CP366, female (cl 15.8 mm); F, *Munidopsis subchelata* Balss, 1913, stn CP235, male (cl 36.7 mm); G, *Munidopsis trifida* Henderson, 1885, stn CD230, male (cl 14.1 mm); H, *Munidopsis tuberosa* n. sp., stn PCP343, holotype female (cl 7.7 mm).

nesia, Philippines, Tasmania and Victoria. At depths of 96-2091 m. Macpherson (2007) suggested that the geographical distribution of this species should be reviewed as some of the previous records may belong to recently described species such as *M. treis* Ahyong and Poore, 2004 and *M. ternaria* Macpherson, 2007. The Taiwan specimen was collected at depths of 635-868 m.

***Munidopsis similior* Baba, 1988**
(Fig. 6C, D)

Munidopsis similior Baba, 1988: 164, Fig. 65; Macpherson, 2007: 97, Fig. 55L.

Material examined: TAIWAN 2002: stn CP165, 1 female cl 9.1 mm, 1 ovig. female cl 6.8 mm.

Coloration (Fig. 6C, D): Body generally orange; distal segments of pereopods, abdominal segment 6, telson, and uropods lighter coloured or whitish. Abdomen with white, median longitudinal line. Carapace with or without white, median longitudinal line continuous with line on abdomen. Corneas orange.

Distribution: Madagascar, Philippines, South China Sea, Indonesia, Solomon Islands, Vanuatu and Fiji, at depths of 267-798 m. The Taiwan specimens were collected at a depth of 300 m.

***Munidopsis sinclairi* McArdle, 1901**
(Fig. 6E)

Munidopsis (Elasmonotus) Sinclairi McArdle, 1901: 524.
Munidopsis sinclairi: Baba, 2005: 295 (synonymy and references); Macpherson, 2007: 98, Fig. 45.

Material examined: TAIWAN 2002: stn CD199, 1 female cl 9.8 mm. TAIWAN 2006: stn CP366, 3 females cl 10.3-15.8 mm.

Coloration (Fig. 6E): Body and pereopods generally orange-brown; grooves on carapace, median part of rostrum, and telson and uropods pale coloured or whitish. Corneas orange-brown.

Remarks: This species has strong rugosities on the carapace, and rippled rugae are present on the gastric region.

Distribution: South coast of Sri Lanka, Philippines, Indonesia, New Caledonia, Vanuatu and Solomon Islands, at depths of 527-1750 m. The Taiwan specimens were collected at depths of 1138-1302 m.

***Munidopsis subchelata* Balss, 1913**
(Fig. 6F)

Munidopsis subchelata Balss, 1913a: 222; Baba, 2005: 296 (synonymy and references); Macpherson, 2007: 110.

Material examined: TAIWAN 2004: stn CP235, 2 males cl 32.3, 36.7 mm, 1 female cl 28.4 mm.

Coloration (Fig. 6F): Body, pereopods, and corneas entirely whitish; setae greyish brown.

Remarks: In the specimens examined, the P1 palm is long, subcylindrical, and 3.2-3.9 times as long as the dactylus.

The present specimens were found to be in association with sunken wood.

Distribution: West of Sumatra, Makassar Strait, Okinawa Trough in Japan, and Solomon Islands, at depths of 560-1080 m. The Taiwan specimens were collected at depths of 765-806 m.

***Munidopsis trifida* Henderson, 1885**
(Fig. 6G)

Munidopsis trifida Henderson, 1885: 415; Baba, 2005: 193, 298 (synonymy and references); Macpherson, 2007: 115.

Material examined: TAIWAN 2003: stn CD230, 1 male cl 14.1 mm, 1 female cl 14.7 mm, 1 ovig. female cl 14.7 mm.

Coloration (Fig. 6G): Carapace and abdomen orange pink, with irregular pale coloured patches, and telson and uropods mostly whitish. Corneas pink. P1 entirely reddish orange, P2-4 orange pink with lighter coloured patches.

Remarks: The specimens examined have the body and appendages covered with fine setae and the P1 palm unarmed on the mesial margin. These characters agree with the observations of the western Pacific material by Baba (1969, 2005) and Macpherson (2007).

Distribution: Madagascar, Laccadive Sea, southern Arabian coast, Gulf of Aden, Bay of Bengal, Indonesia, South and East China Seas, Okinawa Trough, Suruga Bay, Sagami Bay, Solomon Islands, New Caledonia, Straits of Magellan and south of Chile, at depths of 280-1270 m. The Taiwan specimens were collected at depths of 795-840 m.

***Munidopsis tuberosa* n. sp.**
(Figs. 6H, 7, 8)

Material examined: TAIWAN 2006: stn PCP343, holotype female cl 7.7 mm (NTOU A00832).

Etymology: This specific name is derived from the Latin, *tuberosus*, full of humps, in reference to the body and pereopods entirely covered with tubercles and protuberances.

Description: Carapace (Fig. 7A, B), exclusive of rostrum, 1.1 times longer than broad; dorsal surface convex from side to side, covered with numerous, small protuberances bearing short setae (Fig. 7C); regions well delineated by furrows including distinct anterior and posterior cervical grooves, low but large swelling present behind posterior cervical groove. Epigastric lobes distinct, somewhat elevated, bordering base of rostrum. Posterior cardiac region subtriangular, strongly elevated, preceded by deep transverse depression. Posterior margin preceded by elevated ridge of small protuberances. Lateral margins subparallel, weakly convex, not crested; anterior corner unarmed, rounded; anterior end of anterior cervical groove and lateral end of posterior cervical groove each with very shallow notch. Frontal margin weakly concavely oblique behind ocular peduncle, leading to low, blunt external orbital angle, then transverse toward anterolateral corner of carapace. Rostrum (Fig. 7A, B) subtriangular in dorsal view, relatively narrow, 0.2 of breadth between anterolateral angles of carapace when measured dorsally at anterior bases of ocular peduncles, approximately 0.4 length of remaining carapace (postorbital carapace), horizontal in lateral view, terminating bluntly; lateral margins somewhat convex on median part; dorsal surface flattish, median longitudinal carina composed of small protuberances extending onto epigastric lobes; ventral surface with rounded longitudinal ridge in midline.

Pterygostomian flap (Fig. 7B) with numerous small protuberances; anterior margin narrowly rounded.

Sternal plastron as long as wide when measured along midline, maximum width at sternite 7. Sternite 3 (Fig. 7D) approximately 5.0 times as broad as long when measured along midline; anterior margin divided into 2 roundly triangular lobes by median notch; lateral margin of each lobe convex, with narrowly rounded projection anteriorly. Sternite 4 (Fig. 7D) not contiguous with and distant from posterior

margin of sternite 3; greatest width 2.5 times that of sternite 3; anterior margins slightly oblique, each with row of small tubercles and setae; surface depressed in midline, with short setae. Sternites 5-7 each with row of setae on anterior ridge and scattered short setae on surface.

Abdomen (Fig. 7A, B) unarmed; segments 2-6 covered with small protuberances on transverse ridges and pleura; segments 2-4 each with 2 elevated, blunt transverse ridges separated by medially interrupted transverse groove; segment 5 without distinct transverse ridges, convex on median surface; segment 6 (Fig. 7E) flattish, with weakly produced posterolateral lobes, posteromedian margin slightly convex and not exceeding laterals. Telson (Fig. 7E) composed of 8 calcified plates.

Ocular peduncle (Fig. 7A, B, F) immovable, without eye-spines; dorsolateral margin with small protuberances; cornea lateral, relatively large, approximately 1.5 times width of article 3 of antennal peduncle in dorsal view, semicircular, cupped within broad-base eyestalk.

Basal article of antennular peduncle (Fig. 7F, G) with dorsolateral spine distinctly smaller than ventrolateral; ventrolateral spine with small marginal tubercles; lateral margin with small processes; distomesial margin with row of small tubercles but without dorsal spine; ventral surface with transverse protuberances.

Antennal peduncle (Fig. 7F) overreaching anterior margin of cornea by length of article 4. Article 1 with distomesial tuberculate process barely reaching distal margin of article 2; distolateral angle produced. Article 2 bearing blunt spine on each of distomesial and distolateral angles, distomesial spine smaller than distolateral; lateral margin tuberculate. Article 3 unarmed marginally or with minute distolateral spine, minute tubercles present on distal margin. Article 4 nearly smooth, with small distolateral spine.

Mxp 3 ischium (Fig. 7H) approximately as long as merus when measured on extensor margin; extensor margin with small distal spine; flexor margin sharply ridged, terminating in small spine; mesial ridge (crista dentata) with row of 19-21 small corneous teeth, proximal teeth reduced; lateral surface with small protuberances. Merus with small protuberances on lateral surface; flexor margin with 2 distinct spines on proximal half and several smaller spines; extensor margin with row of small spines, distal spine largest. Carpus with small blunt spines

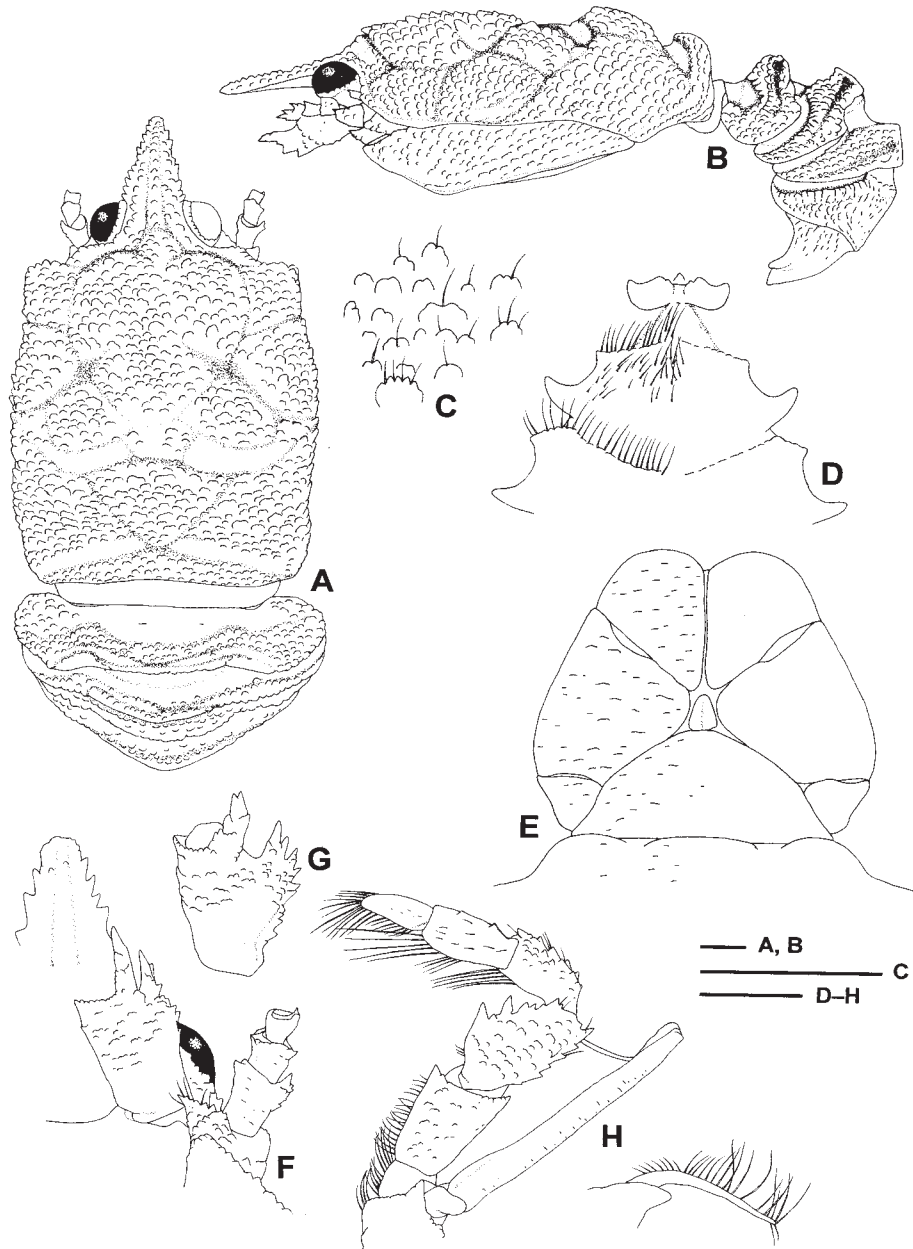


FIG. 7. – *Munidopsis tuberosa* n. sp., holotype female (cl 7.7 mm). A, carapace, abdomen, and ocular and antennal peduncles, dorsal view; B, same, left, lateral view; C, protuberances on median gastric region, dorsal view; D, anterior part of sternal plastron, ventral view (setae omitted from left side); E, telson and posterior part of sixth abdominal segment, ventral view (striae omitted from left side); F, rostrum and left pterygostomian flap, basal article of antennular peduncle, and antennal and ocular peduncles, lateral view; G, left basal article of antennular peduncle, ventrolateral view; H, left third maxilliped, lateral view. Scales equal 1.0 mm.

and tubercles on extensor surface. Propodus and dactylus nearly smooth. Exopod distinctly overreaching distal margin of merus. Epipod elongated.

Left P1 missing. Right P1 (Fig. 8A) moderately slender, 1.4 times longer than postorbital carapace (excluding rostrum); dorsal and ventral surfaces covered with numerous small protuberances bearing short setae; mesial surface of carpus and palm with some moderately long setae. Ischium unarmed. Merus 2.6 times as long as broad when measured

along dorsodistal margin excluding spines, with rounded crest in dorsal midline; dorsomesial margin with strong distal spine; ventrolateral margin with small, blunt distal spine. Carpus 1.7 times longer than broad when measured along dorsodistal margin, unarmed. Palm relatively slender, moderately inflated, 1.1 times length of carpus, 1.6 times as long as broad when measured at bases of fingers; lateral margin somewhat concave at base of fixed finger. Fingers approximately as long as palm; opposable

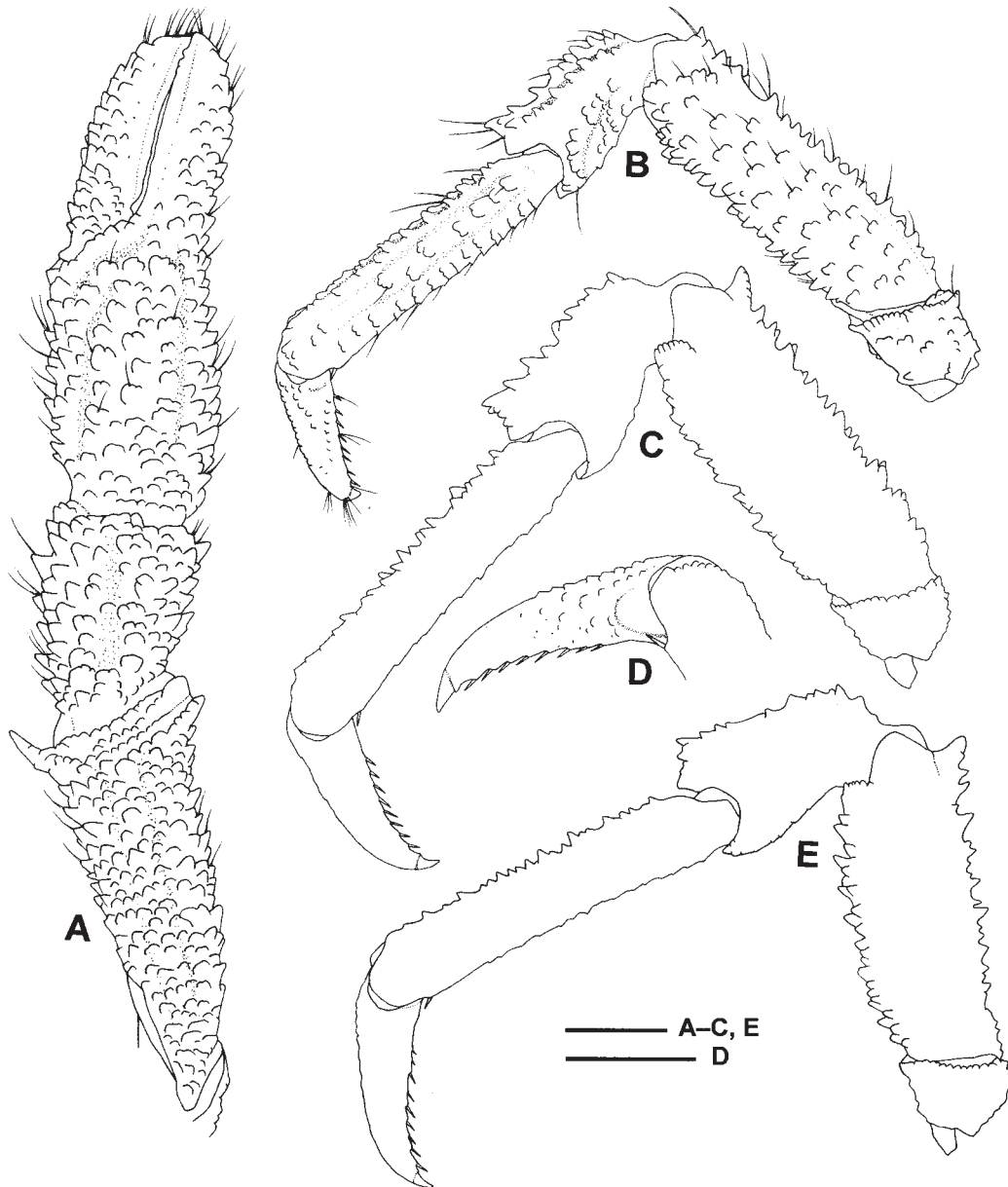


FIG. 8. – *Munidopsis tuberosa* n. sp., holotype female (cl 7.7 mm). A, left first pereopod, dorsal view; B, left second pereopod, lateral view; C, left third pereopod, lateral view (setae and lateral structure omitted); D, same, dactylus and distal part of propodus, lateral view; E, left fourth pereopod, lateral view (setae and lateral structure omitted). Scales equal 1.0 mm.

margins nearly straight, narrowly gaping, distally spooned; prehensile edges each with row of low, indistinct teeth, proximal teeth obsolete; distal margins each with row of small rounded or subtriangular teeth; fixed finger without denticulate carina on distolateral surface.

P2-4 (Fig. 8B-E) moderately slender, subcylindrical, somewhat compressed laterally, covered with protuberances; P4 shorter than P2 and P3; right P2 larger than left, not reaching tip of but barely reaching base of P1 fingers; dorsal and ventral margins with sparse, moderately long setae; protuberances

with sparse short setae. Meri elongate, subrectangular in lateral view, each with row of protuberances on dorsal crest, distal protuberance pronounced; lateral surface, except rounded distal lobe, with numerous protuberances; ventrolateral margin with irregular rows of small protuberances, distally somewhat produced; mesial surface also with small protuberances, with broad rounded projection at ventrodial end. Carpi each with irregular rows of protuberances on dorsal crest, distal protuberance pronounced; lateral surface with elevated crest of protuberances somewhat dorsally along midline and oblique row of pro-

tuberances ventrally; ventral surface also with small protuberances; ventrodiscal margin produced, protuberant but unarmed; mesial surface with small protuberances. Propodi, exclusive of distal rounded projection, 3.9-4.2 times as long as high when measured at base of distal projection; dorsal surface flattish, with small protuberances; dorsolateral and dorsomesial margins rounded, delimited by irregular row of protuberances; lateral surface with weakly elevated ridge of irregular protuberances in midline; ventral surface protuberant; ventrodiscal margin with 2 small corneous spines, lateral spine larger than mesial; mesial surface with scattered small protuberances. Dactyli 0.6-0.7 length of propodi, each terminating in relatively short corneous claw (in left P2, shortened by regeneration); dorsal surface with small flattened protuberances; ventral margin nearly straight or weakly curved, with 8 or 9 low teeth decreasing in sizes proximally, each with slender corneous spine; lateral surface with small flattened protuberances; mesial surface with some small protuberances proximally.

Epipods present on P1-3.

Coloration (Fig. 3H): Carapace, abdomen, and pereopods orange brown; protuberances of carapace and abdomen, distal segments of P2-4, posterior abdomen, telson, and uropods lighter coloured or whitish. Corneas orange pink.

Remarks: The new species appears close to *M. granosicorium* Williams and Baba, 1990 from Cascadia Basin of the eastern Pacific in having the carapace strongly tuberculate but lacking distinct spines on the dorsal surface and lateral margins, rostrum subtriangular and without distinct lateral spines, eye-spines absent, sternite 4 with anterior margins weakly oblique and not contiguous with the posterior margin of the sternite 3, abdomen unarmed, and epipods present on the P1-3. *Munidopsis granosicorium* is described on the basis of a single specimen lacking all pereopods. Nonetheless, *M. tuberosa* clearly differs from *M. granosicorium* in the carapace (excluding the rostrum) being longer than broad (as long as broad in *M. granosicorium*), a large swelling present behind the posterior cervical groove (no such structure in *M. granosicorium*), and the rostrum being much narrower and horizontal in lateral view (upwardly directed in *M. granosicorium*).

Distribution: Taiwan, in 945-1059 m.

DISCUSSION

In the Indo-West Pacific, where extensive surveys of deep-sea decapod crustacean fauna have been made, 42 species of *Munidopsis* have been recorded from the western Indian Ocean, including the Red Sea, 27 from the Andaman Sea and the Bay of Bengal in the eastern Indian Ocean, 21 from Japan, 35 from the Philippines and Indonesia, 23 from the Solomon Islands, 17 from Australia, 15 from Vanuatu, 18 from New Caledonia, and 14 from Fiji (Baba, 2005; Cubelio *et al.*, 2007a, b; Jones and Macpherson, 2007; Macpherson, 2007; Osawa and Takeda, 2007). The present study has increased the number of *Munidopsis* species from Taiwan to 31. The high number of species recorded reflects the recent intensive sampling efforts in the area. Since 2000, 375 deep-sea stations have been sampled around Taiwan, with 85 stations at depths between 1000 and 4455 m. Nevertheless, the many *Munidopsis* species found also indicate a particularly rich deep-sea fauna around Taiwan, an island only slightly bigger than New Caledonia and much smaller than the Philippines.

Of the 31 *Munidopsis* species in Taiwan, six were collected from abyssal depths below 3000 m: *M. granosa*, *M. panamae*, *M. profunda*, *M. tafrii*, *M. teretis* and *M. echinata* n. sp. The remaining 25 species were found at depths between 200 and 3000 m (Table 2). However, *M. centrina*, *M. edwardsii* and *M. pallida* are sometimes found at abyssal depths. On the other hand, *M. andamanica*, *M. bruta*, *M. cylindrophthalma*, *M. formosa*, *M. latimana* and *M. similior* only occur in the upper bathyal depths above 700 m. *Munidopsis profunda* represents the deepest Taiwan record for galatheids (and for any animals). It was collected from a station at depths of 4430-4455 m (Osawa *et al.*, 2006b).

Most species from Taiwan were obtained from previously recorded depth ranges. *Munidopsis arietina*, *M. bruta*, *M. panamae*, *M. profunda* and *M. tafrii* were found from shallower depths in Taiwan. *Munidopsis arietina*, *M. granosa* and *M. pallida* are previously known only from the Bay of Bengal and the Mozambique Channel in the western Indian Ocean. The Taiwan records greatly extend their geographical distribution eastwards into the Pacific Ocean.

Species of *Munidopsis* are generally known to have a wide geographical distribution, assuming that current taxonomy is correct. Besides the two new species described above, *M. latiangulata* and

TABLE 2. – Bathymetrical ranges of *Munidopsis* species recorded from Taiwan.

Species	Taiwan	Other waters
<i>M. latimana</i>	200 m	135-620 m
<i>M. cylindrophthalma</i>	287-430 m	188-1475 m
<i>M. similior</i>	300 m	267-798 m
<i>M. formosa</i>	300-500 m	217-448 m
<i>M. bruta</i>	329-377 m	399-1203 m
<i>M. andamanica</i>	334-505 m	333-1598 m
<i>M. analoga</i>	490-1027 m	600-1180 m
<i>M. bispinoculata</i>	490-1262 m	443-2363 m
<i>M. serricornis</i>	635-868 m	96-2091 m
<i>M. kensleyi</i>	638-1129 m	476-1313 m
<i>M. hirsutissima</i>	687-712 m	495-1280 m
<i>M. cidaris</i>	736-1040 m	975-1200 m
<i>M. subchelata</i>	765-806 m	560-1080 m
<i>M. trifida</i>	795-840 m	280-1270 m
<i>M. tuberosa</i> n. sp.	945-1059 m	
<i>M. sarissa</i>	960-1010 m	
<i>M. dasypus</i>	995-1073 m	214-1480 m
<i>M. sinclairi</i>	1138-1302 m	527-1750 m
<i>M. pilosa</i>	1171-1317 m	732-1640 m
<i>M. nitida</i>	1222-1275 m	222-3680 m
<i>M. centrina</i>	1301-3030 m	2300-3485 m
<i>M. latiangulata</i>	2220-2424 m	
<i>M. edwardsii</i>	2220-3065 m	1379-2610 m
<i>M. arietina</i>	2233-2551 m	2782-2935 m
<i>M. pallida</i>	2233-3070 m	2610-3299 m
<i>M. echinata</i> n. sp.	3032-3065 m	
<i>M. granosa</i>	3032-3065 m	2610-3485 m
<i>M. panamae</i>	3564-3579 m	3800 m
<i>M. tafrii</i>	3564-3579 m	3680 m
<i>M. teretis</i>	3564-3579 m	3520-3930 m
<i>M. profunda</i>	3564-4455 m	5163-5243 m

M. sarissa are so far known only from Taiwan. As deep-sea benthic surveys are generally limited in the Indo-West Pacific, it is likely that some or all these four species will later be found in other waters. On the other hand, more species probably still await discovery in Taiwan. For example, *M. antonii* (Filhol, 1884), *M. cylindropus* Benedict, 1902 and *M. subsquamosa* Henderson, 1885 have been reported from both Japan and other Indo-West Pacific localities (Baba, 2005), but not yet from Taiwan. Further surveys are needed from the island as well as its adjacent waters for a better understanding of the character of the Taiwanese galatheid fauna.

ACKNOWLEDGEMENTS

This study was supported by grants from the National Science Council, Taiwan, R.O.C., the Centre for Marine Bioscience and Biotechnology of the National Taiwan Ocean University, and the 21st Century COE program “The Comprehensive Analyses on Biodiversity in Coral Reef and Island Ecosystems in Asian and Pacific Regions” of the Ministry

of Education, Culture, Sports, Science and Technology, Japan (Monbukagakusho). We are indebted to E. Macpherson of the Centro de Estudios Avanzados de Blanes (CSIC), S.T. Ahyong of the National Institute of Water and Atmospheric Research (NIWA), New Zealand, and an anonymous reviewer for providing us with valuable comments to improve the manuscript. We would also like to thank P. Castro of California State Polytechnic University, Pomona for reading the English.

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Scient. ed.: E. Macpherson.

Received April 27, 2007. Accepted September 7, 2007.

Published online January 24, 2007.