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# Macrura (Crustacea: Decapoda: Stenopodidea, Caridea and Palinulidea) Collected from the Northern Mariana Islands, Micronesia

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**Abstract** During the biological expedition to the northern Mariana Islands in 1992, a collection of macruran decapods was obtained in rocky intertidal and subtidal areas. A total of 26 species belonging to six families and three infraorders were identified and reported; seven alpheid specimens in three lots could not be certainly identified, because they were juveniles or much injured. *Hippolyte edmondsoni* Hayashi is recorded for the first time from outside of the Hawaiian Islands. *Rhynchocinetes* sp. may belong to an undescribed species. Most species have wide distribution in the tropical Indo-West Pacific.

**Key words:** Macrura, Crustacea, rocky intertidal, subtidal, Mariana Islands.

The macruran fauna of the northern Mariana Islands has remained poorly studied, though Eldredge *et al.* (1977) recorded eight anomurans and three brachyurans from Maug. In May and June 1992, the Natural History Museum and Institute, Chiba (NHMIC) conducted the expedition to the northern Mariana Islands in cooperation with the Division of Fish and Wildlife, Department of Natural Resources, (Commonwealth of the Northern Mariana Islands), and University of Guam Marine Laboratory. Twenty-six species of macrurans, one stenopodid, 24 carideans, and one palinuran, were identified and reported here. Six specimens of *Alpheus* and one specimen of *Synalpheus* could not be identified satisfactorily, because they are imperfect or immature.

## Methods

Collections were made on Anatahan, Sarigan, Guguan, Alamagan, Pagan, Agrihan, Asuncion, Maug East, Maug West, Maug North, and Uracas Islands of the northern Mariana Islands (see Asakura *et al.*, 1994, for detailed map and location of sampling stations). Most of specimens were collected on rocky intertidal areas, and in the following list, such collection sites are abbreviated as RI. Collections by SCUBA and skin divings were also made in the subtidal areas, and depth of the collection site was indicated. Collectors and their abbreviations are AA for Akira Asakura, TK for Taiji Kurozumi and HH for Hiroshi Harada of the NHMIC, and TP for Todd Pitlick and PS for Peter Schupp of the University of Guam Marine Laboratory. Specimen size in mm, shown in the carapace length, including the rostrum length in the alpheids and excluding the rostrum length in other families, is placed in parentheses just after the specimen number. All of the specimens were deposited in NHMIC, and registration number for each lot is indicated with code CBM-ZC.

## Infraorder Stenopodidea
## Family Stenopodidae

### 1. *Stenopus hispidus* (Olivier)

*Specimens examined.* 1 juv. (5.0), GUGUAN-st.B, rocky subtidal, 17 May, TK, CBM-ZC-1450; 1 ovig. ♀ (11.0), PAGAN-st.D, rocky subtidal, 27 May, PS, CBM-ZC-1451; 1 ovig. ♀ (12.8), MAUG EAST-st.A, RI, 2 June, HH, CBM-ZC-1452; 1 ovig. ♀, MAUG EAST-st.A, RI, 2 June, HH, CBM-ZC-1453; 1 ♂ (15.3), MAUG WEST-st. E, RI, 4 June, HH, CBM-ZC-1454.

*Distribution.* Circum tropical; previously

known in the tropical Indo-Pacific to Hawaii and Tuamotu Archipelago; eastern Pacific from Taboga Island, Panama; tropical western Atlantic from Bermuda and south Florida to Fernand de Noronha; and central Atlantic from Ascention Island; intertidal to a depth of 210 m (Manning and Chace, 1990).

### Infraorder Caridea
### Family Rhynchocinetidae

**2. *Rhynchocinetes* sp.**

*Specimens examined.* 1 ♂ (4.9), PAGAN-st.A, RI, 24 May, AA, CBM-ZC-1466; 1 ovig. ♀ (8.2), PAGAN-st.D, 4 m deep, 27 May, PS, CBM-ZC-1467; 1 ♀ (7.2), PAGAN, 8 m deep, 27 May, PS, CBM-ZC-1468; 1 ovig. ♀ (8.0), PAGAN-st.D, 10 m deep, 27 May, PS, CBM-ZC-1469.

*Remarks.* The four specimens, which represent a single species, belonging to the species group characterized by having three median teeth on the carapace behind the incomplete articulation with the rostrum, in which *Rhynchocinetes hiatti* Holthuis and Hayashi, *R. hendersoni* Kemp, *R. rigens* Gordon, and *R. striatus* Nomura and Hayashi (Nomura and Hayashi, 1992) are included. The specimens resemble mostly *R. rigens* in having a rounded pterygostomian angle and the distolateral tooth of the scaphocerite just reaching or feebly overreaching the blade, and are compared with the description of *R. rigens* of Fujino (1972) based on material from the Ryukyus. The differences between the present specimens and Fujino's *R. rigens* include a shorter stylocerite of the antennular peduncle falling short of the distal end of the peduncle, rather than extending to or slightly beyond it; a much slender propodus of the third pereopod (more than 12 times as long as the distal depth vs. 8 times as long as); a shorter dactyls of the posterior three pairs of pereopods with a higher accessory spinules count (less than 0.2 times as long as the propodus with 3 accessory spinules vs. more than 0.2 times as long with 2 accessory spinules); the appendix interna of the male first pleopod is narrow, not bell-shaped. These differences would suggest that these specimens belong to an undescribed species of *Rhynchocinetes*.

### Family Palaemonidae
### Subfamily Palaemoninae

**3. *Brachycarpus biunguiculatus* (Lucas)**

*Specimen examined.* 1 ♂ (4.6), ASUNCION-st. A, 5 m deep, 1 June, TP, CBM-ZC-1455.

*Distribution.* Circum tropical; eastern Atlantic (Mediterranean and West Africa); western Atlantic (West Indies); eastern Pacific (Gulf of California to Colombia; Clipperton Island, Revillagigedo Islands, Cocos Island, Galapagos Archipelago; Indo-West Pacific (Red Sea, Ceylon, Wake Island, and Hawaiian and Tuamotuan Archipelagoes; Easter Island) (Holthuis, 1972).

### Subfamily Pontoniinae

**4. *Harpiliopsis beaupresii* (Audouin)**

*Specimens examined.* 1 ♂ (2.1), MAUG EAST-st.C, 3 m deep, on coral (species unidentified), 5 June, TK, CBM-ZC-1460; 1 ovig. ♀ (3.0), MAUG EAST-st.B, 3 m deep, on *Pocillopora* sp., 5 June, TK, CBM-ZC-1461.

*Distribution.* Widely distributed in tropical and subtropical region of the Indo-West Pacific to eastern Pacific (Bruce, 1990).

**5. *Harpiliopsis depressa* (Stimpson)**

*Specimens examined.* 1 ovig. ♀ (5.0), GUGUAN-st.B, 3 m deep, 17 May, TK, CBM-ZC-1456; 1 ♂ (3.3), MAUG EAST-st.B, *Pocillopora* sp., 5 June, TK, CBM-ZC- 1457; 1 ♂ (2.8), MAUG EAST-st.B, 3 m deep, on coral (species unidentified), 5 June, TK, CBM-ZC-1458; 1 ovig. ♀ (3.4), MAUG EAST-st.C, 3 m deep, *Pocillopora* sp., 5 June, TK, CBM-ZC-1459.

*Distribution.* Widely distributed in tropical and subtropical region of the Indo-West Pacific to eastern Pacific (Bruce, 1990).

**6. *Ischnopontonia lophos* (Barnard)**

*Specimen examined.* 1 ♂ (2.9), AGRIHAN-st. B, 10 m deep, 29 May, TP, CBM-ZC-1463

*Distribution.* Indo-West Pacific from Madagascar to Fiji (Bruce, 1990).

**7. *Jocaste japonica* (Ortmann)**

*Specimens examined.* 3 ♂ (2.3–2.5), 3 ovig. (2.4–5.6), AGRIHAN-st.B, 20 m deep, 28 May, TP, CBM-ZC-1465.

*Distribution.* Tropical and subtropical regions of the Indo-West Pacific from East Africa to Micronesia (Bruce, 1990).

**8. *Onycocaris quadratophthalma* (Balss)**

*Specimens examined.* 1 ♂ (1.0), 1 ♀ (1.1), MAUG NORTH-st.F, RI, on *Pocillopora* sp., 3 June, AA, CBM-ZC-1464.

*Distribution.* South China Sea, northwestern Australia, Micronesia, and Hawaii (Bruce, 1990).

**9. *Palaemonella spinulata* Yokoya**

*Specimen examined.* 1 ♂ (1.9), AGRIHAN-st. B, 10 m deep, 29 May, TP, CBM-ZC-1462

*Distribution.* East Africa, Madagascar, eastern Australia, and Japan (Bruce, 1990).

## Family Alpheidae

**10. *Alpheopsis* sp.**

*Specimen examined.* 1 ovig. ♀ (7.7), AGRIHAN-st.B, 10 m deep, 29 May, TP, CBM-ZC-1485.

*Remarks.* The single specimen examined is an ovigerous female without either first pereopod. The frontal margin is devoid of ocular teeth, the carapace is smooth without longitudinal carinae, there are five articles in the carpus of the second pereopod, the dactyls of the three posterior pairs of pereopods are simple, and there is a strap-like epipod on the first to fourth pereopod. This combination of characters is shared by only two of the known species of the genus. *A. labis* Chace, and *A. yaldwyni* D. M. and A. H. Banner. Banner and Banner (1985) attempted to make clear the affinities between *A. labis* and *A. yaldwyni*, but the specific status of *A. labis* still remains unclear due to immaturity of the holotype. Chace (1988), who contrasted his unidentified specimen from the *Albatross* Philippine Expedition material with *A. yaldwyni*, noted that his specimen was similar to the latter in having the dorsolateral antennular flagellum, in which the fused portion, is only one-half to three-fourths as long as the shorter of the free branches. In the present specimen, the fused portion of the dorsolateral flagellum is subequal to the shorter of the free branches. The taxonomic problem and the lack of the first pair of pereopods prevent the certain identification of the Mariana specimen.

**11. ? *Alpheus bidens* (Olivier)**

*Specimens examined.* 1 ♂ (2.7), 6 ♀ (2.3–3.0), GUGUAN-st. B, RI, on algaeC, 17 May, AA, CBM-ZC-1479.

*Distribution.* Madagascar and Hong Kong, Ryukyus, Philippines, Indonesia, Australia, Tasmania, Caroline, and Marshall Islands; intertidal to 83 m (Chace, 1988).

*Remarks.* Immaturity and the lack of the first pair of pereopods in all of the specimens examined make difficult the certain identification. The specimens show the following characteristics: the base of the rostrum is not abruptly delimited from the adrostral furrows; the orbital hood is unarmed, and its anterior margin bears a definite keel which becomes confluent with the orbitorostral margin; the carapace has a prominent median tubercle on the gastric region; the merus of the third pereopod is armed with a subterminal tooth on its flexor margin; the propodus of the third pereopod bears two rows of spines on its flexor margin; the dactyl of the third pereopod is simple, not subspatulate. As far as we can determine, the combination of these characters is found only in *Alpheus bidens* regarding the Indo-Pacific members of the genus, though the Mariana specimens apparently lack the paired acute teeth on the carapace which are present in *A. bidens*. However, two relatively large specimens (3.0 mm in the carapace length) show a pair of small tubercles somewhat anterior to the median tubercle. The absence or poorly developed condition of the paired acute teeth on the carapace in the present specimens are probably due to the immaturity.

**12. *Alpheus* cf. *crinitus* Dana**

*Specimen examined.* 1 juv.(2.1), AGRIHAN-st. B, 8 m deep, 29 May, TP, CBM-ZC-1480.

*Distribution.* Recorded from the Red Sea, in addition to the type locality in Balabac Strait, the southernmost passage between the Sulu Sea and the South China Sea (Chace, 1988).

*Remarks.* The present small specimen, in which the minor cheliped (left first pereopod) is missing, is consistent with the account of *Alpheus crinitus* given by Dana (1852; 1855) and Chace (1988) except for a minor but distinct respect. In the Mariana specimen, the proximal carpal article is distinctly shorter than the second article (about 0.6 times as long as), but it is slightly shorter than the second article in *A. crinitus*.

**13. *Alpheus frontalis* H. Milne Edwards**

*Specimens examined.* 1 ♂ (10.1), 1 ovig. ♀ (10.5), PAGAN-st.D, 3 m deep, boulder bottom, 27 May, TK, CBM-ZC-1483; 1 juv.(6.8), MAUG EAST-st.B, 3 m deep, *Pocillopora* sp., June, TK, CBM-ZC-1484.

*Distribution.* Across the Indo-West Pacific from East Africa to the Society Islands (D. M. and A. H. Banner, 1982).

*Remarks.* Banner (1956) recorded *A. frontalis* from Saipan.

**14. *Alpheus lottini* Guérin**

*Specimens examined.* 1 ovig. ♀ (8.5), ANATAHAN, 14 m deep, on *Pocillopora cydouxi*, 13 May, TP, CBM-ZC-1470; 1 ovig. ♀ (10.1), ASUNCION, west side, 10 m deep, on *Pocillopora* sp., 1 June, TP, CBM-ZC-1471; 1 ♂ (17.7), MAUG EAST-st.B, 3 m deep, on coral (species unidentified), 5 June, TK, CBM-ZC-1472.

*Distribution.* Widely distributed in the tropical and subtropical regions of the Indian Ocean and Pacific Ocean to the Gulf of California (D. M. and A. H. Banner, 1982).

**15. *Alpheus obesomanus* Dana**

*Specimens examined.* 1 ♂ (4.0), 1 ♀ (4.2), MAUG EAST-st.B, 3 m deep, 2 June, TK, CBM-ZC-1482.

*Distribution.* Red Sea, eastern Africa, and Madagascar to the Society Islands, including Japan and Australia, but not Hawaii (Chace, 1988).

*Remarks.* The two specimens examined here lack the first pair of pereopods, but they can be referred to *Alpheus obesomanus* by the combination of the following characters: the squamous portion of the scaphocerite is poorly developed; there are a few heavy, spiniform setae on the inferodistal margin of penultimate segment of the third maxilliped; the second carpal article of the second pereopod is at least 2.0 times as long as the first carpal article; and the posterior margin of the telson is relatively narrow (Banner and Banner, 1982).

*Alpheus* sp. 2 recorded from Saipan by Banner (1956) has been referred to *A. obesomanus* by A. H. and D. M. Banner (1966).

**16. *Alpheus pacificus* Dana**

*Specimens examined.* 1 ♀ (3.8), GUGUAN, 3 m deep, 17 May, TK, CBM-ZC-1473; 1 ♂ (8.8), GUGUAN-st.B, RI, tide pool, 17 May, TK, CBM-ZC-1474; 1 ovig. ♀ (9.0), GUGUAN-st.B, RI, tide pool, 17 May, TK, CBM-ZC-1475; 1 ♀ (4.7), MAUG EAST-st.A, RI, 2 June, AA, CBM-ZC-1476; 1 ovig. ♀ (6.8), MAUG WEST-st.E, RI, 4 June, AA, CBM-ZC-1477; 1 ♂ (6.0), 1 ♀ (3.4), ALAMAGAN-st.B, RI, 9 June, CBM-ZC-1478.

*Distribution.* Throughout the Indo-West Pacific area from the Red Sea and Madagascar to Clipperton Island in the far eastern North Pacific (Banner and Banner, 1982).

*Remarks.* Banner (1956) recorded *A. pacificus* from Saipan.

**17. *Alpheus pearcyi* Coutière**

*Specimen examined.* 1 ♂ (6.2), ASUNCION-st. A, 10 m deep, 1 June, TP, CBM-ZC-1481.

*Distribution.* Indian Ocean (Coutiére, 1921); Hawaii (Banner, 1953).

*Remarks.* The sole specimen examined lacks the first pair of pereopods. The combination of the following characters separates the specimen from all but two Indo-Pacific species of the genus *Alpheus*: the dorsal surface of the rostrum is feebly carinate in the dorsal midline; the rostral base is abruptly delimited from the adrostral furrows; the carapace bears a median tubercle on the gastric region; the merus of the third pereopod is armed with a subterminal tooth on the flexor margin. The relatively long and slender rostrum reaching the level of distal margin of the first segment of antennular peduncle and the rostral carina gradually diverging posteriorly place the specimen in *A. pearcyi*. In *A. diadema*, the rostrum falls short of the distal margin of first segment of the antennular peduncle and the rostral carina is abruptly diverging posteriorly (Banner, 1953).

**18. *Alpheus* sp.**

*Specimens examined.* 3 juv.(0.6–1.8), GUGUAN-st.B, RI, on algae, 17 May, AA, CBM-ZC-1486; 1 juv.(2.6), ALAMAGAN-st.A, RI, 19 May, AA, CBM-ZC-1487; 2 juv., MAUG EAST-st.A, RI, on *Pocillopora* sp., 2 June, AA, CBM-ZC-1489.

*Remarks.* These specimens are too young to make a certain identification.

**19. *Athanas areteformis* Coutière**

*Specimens examined.* 1 ovig. ♀ (3.0), 1 juv. (1.6), MAUG WEST-st.E, RI, on *Pocillopora* sp., 4 June, AA, CBM-ZC-1518.

*Distribution.* Red Sea to South Africa, Maldive and Laccadive Islands, Philippines, Aus-

tralia, and Marshall, Fiji, Tonga, Samoa, and Society Islands (Chace, 1988).

*Remarks.* This species was recorded from Saipan by Banner (1956) under the name of *Athanas dubius* Banner (A. H. and D. M. Banner, 1960).

**20. *Automate dolicognatha* De Man**

*Specimens examined.* 1 ovig. ♀ (4.2), AGRIHAN-st. B, RI, 29 May, CBM-ZC- 1505; 1 ovig., AGRIHAN-st.B, RI, 29 May, CBM-ZC-1506.

*Distribution.* Circumtropical, except for eastern Atlantic; intertidal to shallow subtidal (Chace, 1988).

**21. *Metalpheus rostratipes* (Pocock)**

*Specimens examined.* 2 juv.(3.0, 3.1), MAUG EAST-st.A, RI, on *Pocillopora* sp., 2 June, AA, CBM-ZC-1488; 1 ovig. ♀ (5.2), MAUG EAST-st. A, RI, on algae, 2 June, AA, CBM-ZC-1508; 1 ♀ (2.6), MAUG EAST-st.A, RI, on *Pocillopora* sp.2, 2 June, AA, CBM-ZC-1509; 1 ♀ (2.6), MAUG EAST-st.A, RI, on *Pocillopora* sp.3, 2 June, AA, CBM-ZC-1510; 1 ovig. ♀ (4.4), MAUG NORTH-st.F, RI, on *Pocillopora* sp.3, June, AA, CBM-ZC-1512; 1 ovig. ♀ (4.4), MAUG NORTH-st.F, RI, on *Pocillopora* sp.2, 3 June, AA, CBM-ZC-1513; 1 ♂ (3.4), MAUG NORTH-st.F, RI, on *Pocillopora* sp.3, 3 June, AA, CBM-ZC-1514; 2 ♂ (2.8, 3.4), 1 ovig. ♀ (3.3), MAUG NORTH-st.F, RI, on *Pocillopora* sp.4, 3 June, AA, CBM-ZC-1515; 2 ♂ (2.8, 4.3), MAUG WEST-st.E, RI, on *Pocillopora* sp., 4 June, AA, CBM-ZC-1516; 1juv.(1.8), URACAS-st.A, on algae, 6 June, AA, CBM-ZC-1517.

*Distribution.* Circum tropical; Indo-West Pacific to Hawaiian and Tuamotuan Archipelagoes; East Pacific from Clipperton Island; western Atlantic from Caribbean and Fernando de Noronha, eastern Atlantic from the Gulf of Guinea (D. M. and A. H. Banner, 1982).

**22. *Racilius compressus* Paulson**

*Specimen examined.* 1 ♂ (2.9), AGRIHAN, 10 m deep, 29 May, TP, CBM-ZC-1507.

*Distribution.* Suez Canal, Red Sea, East Africa, South Africa, Singapore, Thailand, Philippines, and Queensland, Australia (Chace, 1988).

**23. *Synalpheus charon* (Heller)**

*Specimens examined.* 1 juv. (2.5), MAUG EAST-st.A, RI, on *Pocillopora* sp., 2 June, AA, CBM-ZC-1495; 1 ♀ (4.4), MAUG EAST-st.A, RI, 2 June, AA, CBM-ZC-1496; 1 ♀ (3.2), MAUG EAST-st.A, RI, on *Pocillopora* sp.2, 2 June, AA, CBM-ZC-1497; 1 ♀ (3.8), MAUG NORTH-st.F, RI, on *Pocillopora* sp., 3 June, AA, CBM-ZC-1498; 1 ♀ (2.9), MAUG NORTH-st.F, RI, on *Pocillopora* sp.2, 3 June, AA, CBM-ZC-1499; 1 juv.(2.9), MAUG WEST-st.E, RI, on *Pocillopora* sp., 4 June, AA, CBM-ZC-1500; 1 ovig. ♀ (3.8), MAUG EAST-st.B, 3 m deep, 5 June, TK, CBM-ZC-1501; 1 ♀ (4.6), 1 juv.(5.9), MAUG EAST-st. C, on coral (species unidentified), 5 June, TK, CBM-ZC-1502; 1 ovig. ♀ (4.8), MAUG EAST-st. D, on coral (species unidentified), 5 June, TK, CBM-ZC-1503

*Distribution.* Widely distributed in the Indo-West Pacific from Red Sea to Mexico, from Japan to Great Barrier Reef, Australia (Banner and Banner, 1975).

*Remarks.* Banner (1956) recorded *S. charon* from Saipan under the name of *S. charon obscurus* Banner.

**24. *Synalpheus paraneomeris* Coutière**

*Specimens examined.* 2 ovig. ♀ (3.9, 4.1), MAUG EAST-st. A, RI, on *Pocillopora* sp., 2 June, AA, CBM-ZC-1511.

*Distribution.* Red Sea and western Indian Ocean to (Thailand excepted?) Japan(?), Philippines, Indonesia, Australia, and the Pacific islands at least as far eastward as Hawaii; shallow subtidal to 126 m (Chace, 1988).

**25. *Synalpheus tumidomanus* (Paulson)**

*Specimens examined.* 1 ♀ (3.3), GUGUAN-st. B, tide pool, 17 May, TK, CBM-ZC-1490; 2 ♂ (2.8, 2.9), 1 ovig. ♀ (4.1), MAUG EAST-st.A, RI, on *Pocillopora* sp., 2 June, AA, CBM-ZC-1491; 1 ♂ (3.2), 1 ♀ (3.1, 4.3), MAUG NORTH-st.F, RI, on *Pocillopora* sp., AA, CBM-ZC-1492; 2 ♀ (3.1, 3.2), MAUG NORTH-st.F, RI, on *Pocillopora* sp., 3 June, AA, CBM-ZC- 1493; 2 juv., MAUG EAST-st. B, on coral (species unidentified), 5 June, TK, CBM-ZC-1494.

*Distribution.* Widely distributed in the Indo-West Pacific from East Africa to the Phoenix Archipelago; and Mediterranean coast of Israel (Banner and Banner, 1975).

**26. *Synalpheus* sp.**

*Specimen examined.* 1 ♀(3.0), MAUG EAST-st. A, RI, on *Pocillopora* sp., 2 June, AA, CBM-ZC-1504.

*Remarks.* Due to small size of the specimen and lack of the first pair of pereopods the iden-

tification could not be made satisfactorily.

### Family Hippolytidae

**27. *Hippolyte edmondsoni* Hayashi**

*Specimens examined.* 3 ♀ (1.2–1.9), GUGUAN-st.B, RI, on algae, 17 May, AA, CBM-ZC-1519

*Distribution.* Known only from Oahu, Hawaiian Islands (Hayashi, 1981).

*Remarks.* The present specimens agree in general with the original description of *Hippolyte edmondsoni* given by Hayashi (1981) except for a few minor respects. Hayashi described that the dactyls of the third to fifth pereopods bear six or seven accessory spinules other than one strong subterminal spine on its flexor margin in female, but in the present three female specimens the dactyls are armed with seven to nine accessory spinules. The branchiostegal spine is marginal without a basal articulation in the present specimen rather than submarginal with a distinct basal articulation in the type series. In one specimen (CL 1.2 mm), the carapace lacks the median spine as against to bearing one or two median spines in the original description.

The present record represents a considerable range extension of the known distribution of *H. edmondsoni* and clearly indicate that it is not restricted to the Hawaiian Islands.

### Infraorder Palinuridea
### Family Palinuridae

**28. *Panulirus penicillatus* (Oliver)**

*Specimens examined.* 1 ♂ (99.9), 1 carapace (83.1), MAUG EAST-st.A, RI, 2 June, HH, CBM-ZC-1520.

*Distribution.* Indo-West Pacific and eastern Pacific; Red Sea, East Africa to Japan, Hawaii, Samoa, Tuamotu, west coast of America and Mexico (Holthuis, 1991).

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