Bull. Natl. Mus. Nat. Sci., Ser. A, Suppl. 3, pp. 175–181, March 22, 2009

A New Species of the False Spider Crab Genus *Halicarcinus* (Decapoda: Brachyura: Hymenosomatidae) from Okinawa Island, Japan

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Abstract A new species of the hymenosomatid crab genus *Halicarcinus* White, 1846, *H. ginowan* sp. nov., is described based on a single male specimen from Okinawa Island, Ryukyu Islands, Japan. The new species is morphologically similar to *H. keijibabai* Takeda and Miyake, 1971, however they are clearly distinguished by the structure of the rostrum, and the shape of the male chelipeds. The taxonomy of *Halicarcinus* is reviewed and is evidence that it is polyphyletic.
Key words: Decapoda, Brachyura, Hymenosomatidae, *Halicarcinus*, new species, Ryukyu Islands, Japan.

False spider crabs of the family Hymenosomatidae mainly occur in shallow marine coastal habitats of tropical to temperate regions in the Indo-West Pacific, although some species also occur in freshwater, and some extend their distributions to sub-Antarctic areas (Lucas, 1980; Chuang and Ng, 1994). Among 111 known hymenosomatid species (Ng *et al.*, 2008; Naruse *et al.*, 2008), twelve species have been recorded from Japan (Nakasone and Takeda, 1994; Sakai, 2004; Naruse *et al.*, 2005), however, there is little doubt that this has been underestimated. In this study, we describe a new species provisionally assigned to *Halicarcinus* White, 1846 based on a single male specimen collected at a small port in Ginowan, Okinawa Island, Ryukyu Islands. A brief review on the taxonomy of the genus is also presented.

Specimens examined are deposited in the National Museum of Nature and Science, Tokyo (NSMT); the Natural History Museum and Institute, Chiba (CBM); the Osaka Museum of Natural History, Osaka (OMNH); Zoological Laboratory, Kyushu University, Fukuoka, Japan (ZLKU) (specimens that have been transferred to the Kitakyushu Museum of Natural History and Human History, Fukuoka, Japan); and the Zoological Reference Collection of the Raffles Museum of Biodiversity Research, National University of Singapore (ZRC). The terminology essentially follows Ng and Chuang (1996) and Guinot and Richer de Forges (1997). Measurements provided are of the carapace length (measured along the midline from the posterior margin to the anterior margin of the hymenosomian groove) by the carapace width (measured across the widest point). The total length indicates a sum of the carapace and rostral lengths.

For comparative purposes, the following specimens were examined.

Halicarcinus bedfordi Montgomery, 1931: ZRC 2002.0605, 2 males (2.8×3.2, 3.1×3.6 mm), 2 ovigerous females (2.8×3.1, 3.1×3.4 mm), Irian Jaya, Indonesia, coll. 11 September 1997; ZRC 2002.0606, 1 male (2.5×3.0 mm), 1 female (2.8×3.2 mm), Ajkwa Island, Irian Jaya, Indonesia, coll. 12 June 2001.

Halicarcinus coralicola (Rathbun, 1909): ZRC

1989.3552–3576, 8 males (1.7×1.6 to 2.0×2.2 mm), 16 ovigerous females (1.8×2.1 to 2.4×2.5 mm), 1 female (1.7×1.8 mm), Labrador Beach, Singapore, coll. P. K. L. Ng, 14 December 1989; NSMT-Cr 10410, 1 male (3.3×3.8 mm), Aburatsubo, west coast of Miura Peninsula, Sagami Bay, Japan, coll. N. Shikatani; ZRC 1994.4232, 1 male (2.7×2.9 mm), Yamada, Ishikawa, Okinawa, Japan, coll. T. Kosuge, 18 February 1992; ZRC 1994.4239, 4 males (2.2×2.2 to 3.0×3.5 mm), Miyara, Ishigaki Island, Ryukyu Islands, Japan, coll. T. Kosuge, 23 March 1993.

Halicarcinus keijibabai (Takeda and Miyake, 1971): ZLKU, holotype, male (2.0×2.0 mm), Plum, New Caledonia, coll. K. Baba, 9 June 1968; ZRC 1994.4283, 1 male (1.6×2.0 mm), Marée à Ouemo, Nouméa, New Caledonia, intertidal, coll. B. Richer de Forges, 2 July 1992; ZRC, 2 males (1.6×1.7, 1.8×2.0 mm), 1 female (2.2×2.4 mm), Ricaudy Reef, New Caledonia, coll. P. Bouchet, 10 April 1993.

Halicarcinus messor (Stimpson, 1858): OMNH-Ar. 7656, 1 male (4.5×5.1 mm), Nagasaki Coast, Misaki, Sennan, Osaka Prefecture, Japan, coll. Y. Shibata, 15 May 1960; OMNH-Ar. 7657, 1 male (5.1×6.3 mm), Mukaijima, Mitsugi-gun, Hiroshima Prefecture, Japan, coll. A. Inaba, July 1976; OMNH-Ar. 7658, 1 male (3.7×4.2 mm), 1 female (2.7×3.3 mm), Nagasaki Coast, Misaki, Sennan, Osaka Prefecture, Japan; OMNH-Ar. 7659, 1 male (4.6×5.4 mm), Takino-chaya, Tarumi, Kobe, Hyogo Prefecture, Japan, coll. Y. Shibata, 13 May 1960.

Halicarcinus orientalis Sakai, 1932: ZRC 1994.4247, 1 male (1.7×2.2 mm), 2 females (1.5×2.0, 1.8×2.1 mm), Kisami, Izu Peninsula, Shizuoka Prefecture, Japan, 33–41 m, coll. K. Nakamura.

Halicarcinus ovatus Stimpson, 1858: ZRC 1993.6518–6519, 1 male (4.4×4.9 mm), 1 ovigerous female (4.2×4.8 mm), Durras, New South Wales, Australia, coll. M. Takeda, 1 April 1997.

Halicarcinus setirostris (Stimpson, 1858): ZRC 1999.1223, 1 male (1.6×2.0 mm), East China Sea, on fine sand, 135 m, 28 August 1976; ZRC 1999.1224, 1 ovigerous female (3.1×3.4 mm), Jiao-Jhou Wan, Qingdao, China, on sand and broken shells, 25 m, 15 September 1980.

Taxonomy

Family **Hymenosomatidae**

Genus ***Halicarcinus*** White, 1846

Halicarcinus ginowan sp. nov.

[New Japanese name: Ginowan-yawara-gani]

(Figs. 1–3)

Material examined. Holotype: NSMT-Cr 19742, male (2.1×1.9 mm), small fishing port nearby Ginowan Marina, Okinawa Island, Ryukyu Islands, Japan, 2–3 m, mooring rope, coll. T. Komai, 18 March 2006.

Description of holotype. Carapace, including rostrum, elongate triangular in shape, total length 1.91 times carapace width (Figs. 1, 2a). Rostrum

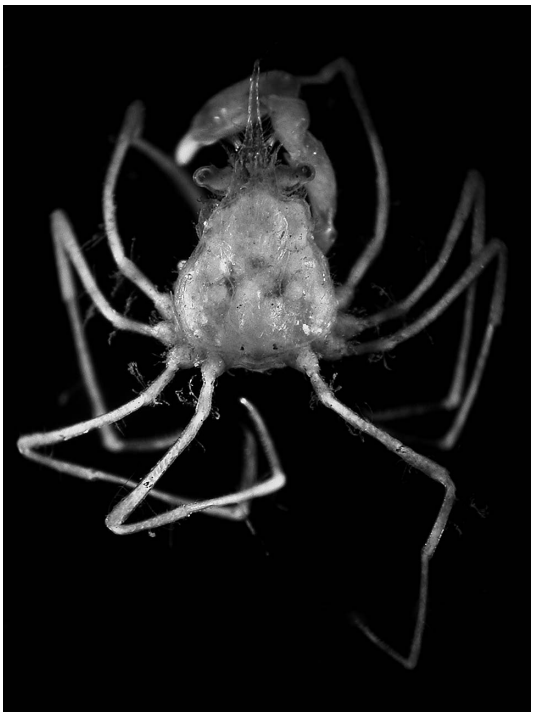

Fig. 1. *Halicarcinus ginowan* sp. nov. Holotype, male (2.1×1.9 mm), NSMT-Cr 19742, entire animal in dorsal view.

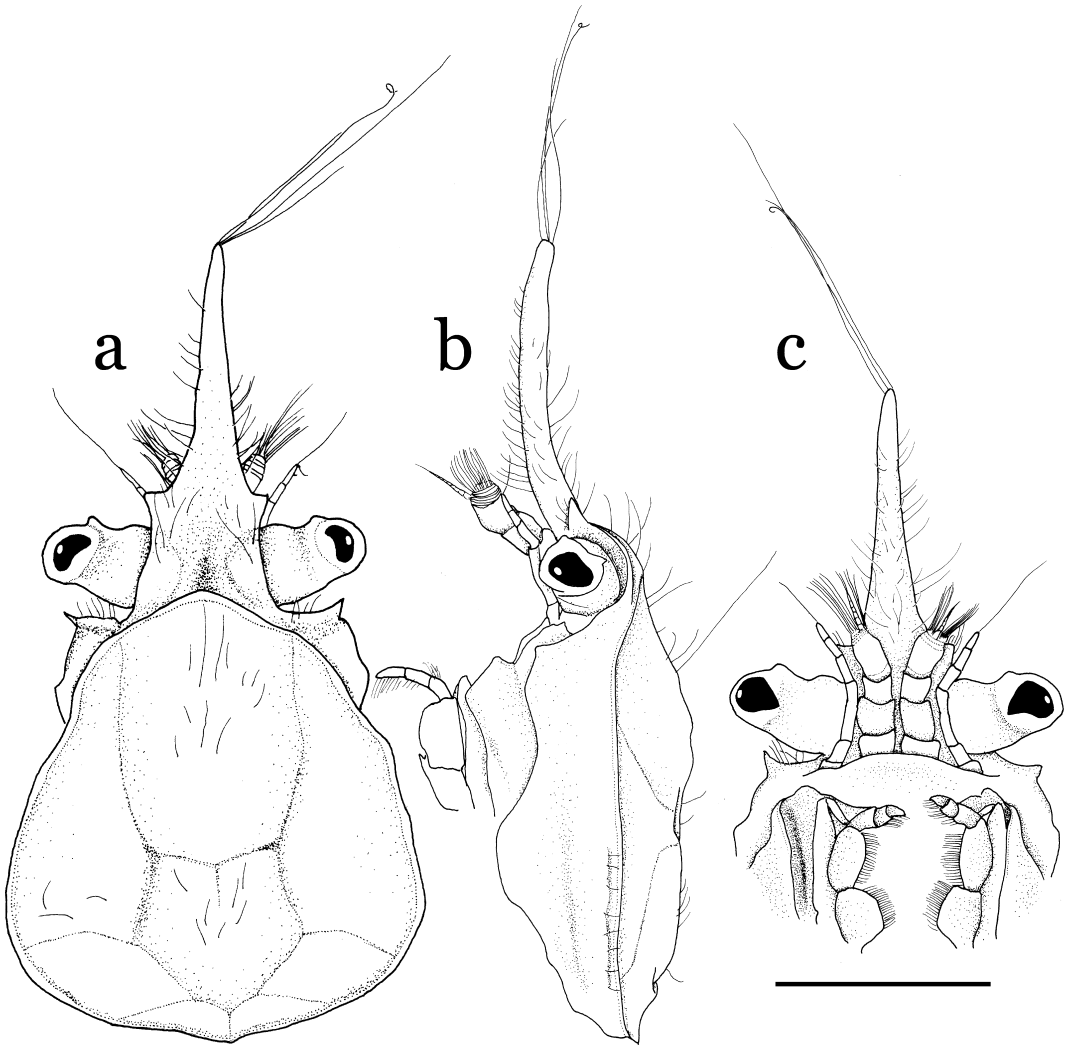

Fig. 2. *Halicarcinus ginowan* sp. nov. Holotype, male (2.1×1.9 mm), NSMT-Cr 19742. a, cephalothorax, dorsal view; b, cephalothorax, lateral view; c, anterior part of cephalothorax, ventral view. Scale bar: 1 mm.

(Fig. 2a–c) slender, elongate, 0.73 times as long as carapace, tapering distally, demarcated from carapace by hymenosomian groove, principally trilobed; lateral lobes small, triangular, situated at about proximal one-third of rostrum; lateral margins above eyestalk only slightly diverging posteriorly in dorsal view, notably arched in lateral view, forming narrow supraocular eave; rostral tip subacute, with tuft of long setae (longest setae only slightly shorter than rostrum). Carapace (Fig. 2a–c) with hymenosomian groove, regions clearly demarcated by gastro-cardiac, cervical and thoracic grooves; gastric and branchial regions convex; hymenosomian groove and epimeron lacking teeth or lobes; subhepatic region weakly inflated, visible in dorsal view, anteriorly continuous with supraocular eave, bearing small lobe on posterolateral margin, anterolateral angle terminating acutely. Orbit incomplete, ventral part basal to eyestalk without crista or demarcation.

Epistome (Fig. 2c) long; posterior margin with rounded, deflexed median lobe. Lateral margin of buccal cavern upturned, forming keel.

Eyestalk (Fig. 2a-c) directed laterally, slightly constricted submedially, anteriorly with small tubercle proximal to base of cornea; cornea narrower than eyestalk. Antennule (Fig. 2b, c) with relatively stout basal article. Antennal peduncle (Fig. 2b, c) slender, six-segmented, arising posterolateral to base of eyestalk, second to fifth segments not fused to cephalon, not developed into infraorbital margin.

Third maxillipeds (Figs. 2c, 3a) covering more than two-thirds of buccal cavern when closed. Ischium as long as merus, distomesial angle produced. Merus ovoid in shape. Mesial margins of ischium and merus with row of long stiff setae. Exopod stout, about two-thirds of ischium, reaching beyond distal margin of merus, bearing long flagellum.

Thoracic cavity without delineation of anterior border; lateral side raised between levels of anterior third of coxa of cheliped to posterior end of coxa of second pereopod; penis arising at level of posterior margin of coxa of third pereopod.

Right cheliped (Figs. 1, 3b), somewhat elongate, but relatively stout. Merus elliptical in cross-section, weakly curving inwards. Carpus about 1.5 times longer than merus, broadened distally, dorsodistal inner angle and ventrodistal outer angle clearly delineated. Chela slightly longer than carapace; palm slightly inflated in general, but outer and inner surfaces with shallow depressions, slightly carinate dorsally; fingers slightly longer than half length of palm, immovable finger with small triangular teeth; dactylus with molar-like tooth medially. Left cheliped missing. Ambulatory legs (second to fifth pereopods) (Figs. 1, 3c) slender, very long, decreasing in length posteriorly; combined length of merus to dactylus of second pereopod 3.29 times carapace length, merus of second pereopod 1.12 times carapace length. Meri and carpi cylindrical in cross-section. Propodi as long as respective meri, slightly broadened distally; dactylo-propodal articulation of each leg forming specialized locking mechanism consisting of distoflexor semicircular extensions with distoextensor concavity of propodus and basal tubercle on either side of dactylus (Fig. 3d). Dactyli (Fig. 3d) compressed dorsoventrally, about half-length of respective propodi, terminating in slender, sharp claws, each with 11–15 small teeth on flexor surface.

Abdomen (Fig. 3e) 5-segmented with third and fourth segments completely fused; first segment longer than second segment, with concave lateral margins; third-fourth fused segment with convex lateral margins, widest at proximal two-fifths; fifth segment, sixth segment and telson demarcated by thin sutures on outer surface.

First gonopod (Fig. 3f) simple, tapering distally, weakly curved mesially, with single thin groove extending from ventroproximal part through mesial margin to distal end. Second gonopod (Fig. 3g) small, proximal outer and inner regions membranous, distal part tube-like.

Distribution. Known only from Ginowan, Okinawa Island, Ryukyus, 2–3 m.

Habitat. The holotype was attached to a mooring rope covered with fine mud.

Remarks. During this study, we briefly reviewed species presently referred to *Halicarcinus* for comparative purposes. Sakai (1938) distinguished *Halicarcinus* from *Rhynchoplax* Stimpson, 1858, by its short median robe of the rostrum and relatively stout male cheliped. Lucas (1980), however, considered these characters to be too variable, and he regarded *Rhynchoplax* as a junior synonym of *Halicarcinus*. Lucas (1980) characterized *Halicarcinus* by the possession of a hymenosomian groove separating the base of the rostrum from the carapace, the presence of a well-developed epistome, the relatively broad third maxilliped, and the presence of rows of teeth on the flexor margins of the ambulatory dactyli. The genus now contains 21 species, including *H. ginowan* sp. nov. After comparisons of several *Halicarcinus* species based on specimens and literature, we found that four groups can be recognized within the genus. The first group includes eight species, viz., *H. cookii* Filhol, 1885, *H. innominatus* Richardson, 1949, *H. orientalis* Sakai, 1932, *H. ovatus* Stimpson, 1858, *H. planatus* (Fabricius, 1775) (the type

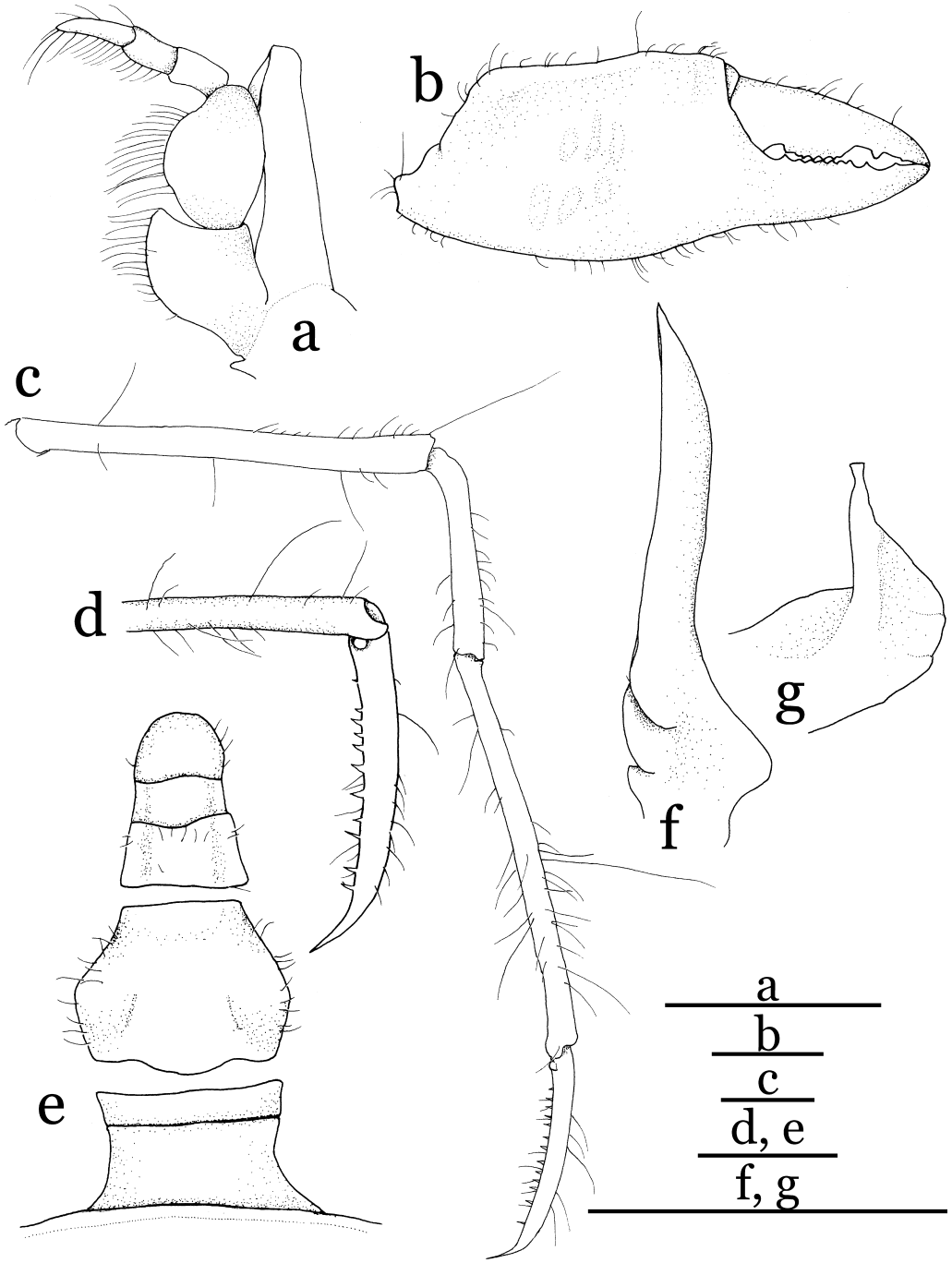

Fig. 3. *Halicarcinus ginowan* sp. nov. Holotype, male (2.1×1.9 mm), NSMT-Cr 19742. a, left third maxilliped, outer view; b, right chela, outer view; c, right second pereopod, outer view; d, dactylo-propodal articulation of right third pereopod, outer view; e, abdomen and telson, outer view; f, first gonopod; g, second gonopod. Scale bars: 0.5 mm.

species of the genus), *H. tongi* Melrose, 1975, *H. varius* (Dana, 1851), and *H. whitei* (Miers, 1876), and is united by the following features: (1) rostrum short, trilobate with prominent lateral lobes; (2) chelipeds not markedly elongate in males; (3) distal part of male first gonopod thin, markedly curved; and (4) dactylo-propodal articulations of ambulatory legs not modified (Gordon, 1940; Garth, 1958; Melrose, 1975; present study).

The second group, including three species, *H. keijibabai* (Takeda and Miyake, 1971), *H. coralicola* (Rathbun, 1909), and *H. ginowan* sp. nov., is characterized as follows: (1) rostrum trilobed, but median lobe greatly elongate and lateral lobes small or rudimentary; (2) chelipeds moderately to noticeably elongate in males; (3) male first gonopod gradually tapering distally to slightly curved distal part (as seen in *Neorhynchoplax* species); and (4) dactylo-propodal articulations of ambulatory legs strongly modified, forming specialized locking mechanism (Takeda and Miyake, 1971; Ng and Chuang, 1996; present study).

The third group, containing three species, *H. messor* (Stimpson, 1858), *H. hondai* (Takeda and Miyake, 1971) and *H. setirostris* (Stimpson, 1858), is characterized by the following features: (1) rostrum long, unilobate, compressed dorsoventrally; (2) chelipeds only moderately elongate in male; (3) distal part of male first gonopod noticeably bent outward proximally; and (4) dactylo-propodal articulations of ambulatory legs not modified (Takeda and Miyake, 1971; Lucas, 1980; Sakai, 1976; Dai and Yang, 1991; present study).

The fourth group is monospecific, containing only *Halicarcinus bedfordi* Montgomery, 1931. This species possesses the following characters: (1) rostrum unilobate, triangular; (2) chelipeds moderately elongate in male; (3) male first gonopod very stout, straight (as seen in *Amarinus* species); (4) dactylo-propodal articulations of ambulatory legs strongly modified into a specialized locking mechanism (Montgomery, 1931; Lucas, 1980; present study).

Lucas (1980) considered that the characters we have used to define these groupings tended to be too variable among species to be useful for generic separation, but to us the present groupings seem quite clear. Future studies may reveal that these four grouping deserve generic ranking.

Halicarcinus ginowan sp. nov. is morphologically most similar to *H. keijibabai* in their general shape of the carapace. Takeda and Miyake (1971) did not recognize dorsal grooves other than H-shaped groove in *H. keijibabai*, but our careful reexamination of the holotype revealed that *H. ginowan* and *H. keijibabai* even share similar dorsal grooves. However, *H. ginowan* can be immediately distinguished from *H. keijibabai* by the proportionally longer rostrum (0.73 times as long as the carapace versus less than 0.50 times as long) and the laterally directed eyestalk (versus directed anterolaterally in *H. keijibabai*). In the new species, the eyestalks are attached ventral to the subparallel supraocular eaves, which makes the eyestalk stick-out laterally. In contrast, the eyestalks of *H. keijibabai* are attached ventral to the strongly divergent proximal margins of the rostral base, and thus the eyestalks are directed anterolaterally. Furthermore, the male cheliped appears less elongate in the new species than in *H. keijibabai*. *Halicarcinus ginowan* is readily distinguished from *H. coralicola* by its much longer rostrum, the lack of marginal anterolateral teeth on the carapace, the much more elongate ambulatory legs, the palm of the male chela being less elongate, and the opposable margins of the fingers of *H. ginowa*n not forming a broad hiatus as they do in *H. coralicola*.

Etymology. This new species is named after the type locality, Ginowan, Okinawa Island. Used as a noun in apposition.

Acknowledgments

We thank Bertrand Richer de Forges (Institut de Recherche pour le Développement, Nouméa) and Peter J. F. Davie (Queensland Museum) for reviewing this manuscript. The first author also thanks Peter K. L. Ng (Raffles Museum of Biodi-

versity Research, National University of Singapore), So Ishida (Osaka Museum of Natural History), and Michitaka Shimomura (Kitakyushu Museum of Natural History and Human History) for providing him with museum facilities.

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Manuscript received 14 May 2008; revised 12 November 2008; accepted 21 November 2008.

Associate editor: T. Komai