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Two New Species of *Pseudosquilla* (Crustacea, Stomatopoda) from the Pacific Ocean

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ABSTRACT

Two new species of *Pseudosquilla* from localities in the Pacific Ocean are differentiated from previously recognized species primarily on the basis of color pattern. *Pseudosquilla hieroglyphica*, new species closely resembles *P. ornata* but differs in having an irregular rather than uniform color pattern. *Pseudosquilla guttata*, new species is morphologically similar to *P. oculata*, but differs in having the dark spots on the carapace surrounded by lighter spots rather than an entire light ring.

INTRODUCTION

The two new species described below were found while examining collections of stomatopods from various sources for a planned review of Indo-West Pacific species of *Pseudosquilla*. Lack of adequate material has delayed preparation of the review, so preliminary accounts are presented herein.

The genus *Pseudosquilla* has been discussed in some detail in recent publications by Serène (1962), Manning (1963, 1969), and Holthuis and Manning (1969). The genus was first restricted to *P. ciliata* and related species by Serène (1962); as noted by Manning (1969), the genus previously had included species now placed in *Eurysquilla* Manning, 1963, *Manningia* Serène, 1962, *Parasquilla* Manning, 1961, and *Pseudosquillopsis* Serène, 1962. As currently defined, the genus comprises eight species, of

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which two are described as new below.

Measurements used in the descriptive accounts here have been discussed in detail in an earlier paper (Manning, 1969).

I thank Dorothy E. Bliss of the American Museum of Natural History, for lending material of *P. guttata* and *P. hieroglyphica*, and Thomas E. Bowman for taking time to comment on the manuscript. The figures were drawn by my wife, Lilly. Types of the new species have been deposited in the American Museum of Natural History (AMNH) and the Division of Crustacea, National Museum of Natural History, Smithsonian Institution (USNM), as indicated in the text.

***Pseudosquilla hieroglyphica*, new species**

Figure 1

Pseudosquilla ornata: (?) BIGELOW, 1894, p. 500. KEMP, 1915, p. 172. KOMAI, 1927, p. 324, pl. 14, fig. 2 (part). BIGELOW, 1931, p. 160 (part [not *P. ornata* Miers, 1880]).

HOLOTYPE: 1 female, 39 mm.; lagoon reef, Latoback Island, Rongerik Atoll, Pacific Ocean; August 21, 1947; F. M. Bayer, F. C. Zimmerman, station 274; USNM 124906.

PARATYPES: 1 male, 63 mm.; Tahiti, Society Islands; sand and coral, in 40–60 ft.; R. Watkins, collector; March 2, 1962; USNM 109624.—1 female, 69 mm.; Apia, Samoa; coral reef; U. S. Fish Commission Investigations, 1902; D. S. Jordan; July 1, 1902; USNM 64891.—1 female, 31 mm.; Mataatu Harbor, Savaii Island, Samoa; eastern reef, in crevices of coral, 8 feet; October 17, 1936; “Zaca”; AMNH 9330.—3 males, 32–43 mm.; 2 females, 34–60 mm.; Santa Cruz, Padada, Gulf of Davao, Mindanao, Philippine Islands; 1938; G. R. Oesch, collector; AMNH 8211.

DIAGNOSIS: Cornea broader than stalk. Rostral plate unarmed anteriorly. Carapace with pair of large, black spots surrounded by entire ring; background color of body light with irregular dark spots and lines. Dorsal surface of telson with median carina and three pairs of carinae: accessory medians, anterior submedians, and marginals.

DESCRIPTION: Eye broadened anteriorly, cornea broader than stalk but not bilobed. Corneal Indices 361–544. Ocular scales erect, separate, apices divergent, acute laterally. Antennular peduncle about two-thirds carapace length. Antennal scale slightly less than half as long as carapace, length about four times greatest width. Rostral plate unarmed, length about two-thirds width. Carapace smooth, without carinae or spines, strongly narrowing anteriorly; anterior margins of lateral plates convex, extending beyond base of rostral plate. Dactylus of raptorial claw with three teeth; propodus slender, longer than carapace, with inferior distal

spine and three movable teeth on inner proximal margin; opposable margin of propodus pectinate proximally only. Mandibular palp and five epipods present. Exposed thoracic somites smooth, strongly convex, lateral processes unarmed; lateral processes of sixth and seventh somites rounded anterolaterally, more truncate posterolaterally, process of sixth somite broader than that of seventh. Abdomen smooth, semicylindrical, anterior five somites not carinate, armed only at posterolateral angles of fifth somite. Sixth abdominal somite with three pairs of spined carinae, with at most an obscure, obtuse prominence in front of articulation of each uropod. Telson slightly broader than long, with three pairs of marginal teeth, submedians appressed basally, with long, movable apices; dorsal surface of telson ornamented with median carina and three other pairs of carinae: accessory medians, anterior submedians, and marginals; submedian and intermediate marginal teeth of telson lacking dorsal carinae. Telson lacking submedian denticles; two intermediate, inner slightly larger, and one lateral denticle present. Proximal segment of uropodal exopod about two and a half times as long as distal, outer margin with 10–11 movable spines, distalmost extending beyond distal segment. Outer spine of basal prolongation of uropod the longer; basal prolongation with rounded lobe between spines and with angled shelf on inner margin.

Color: Carapace with pair of large, black spots surrounded by entire light ring. Body covered with network of black spots, some with lighter centers, and irregular black lines forming irregular pattern on light background. Antennal scale, rostral plate, merus, carpus, and propodus of claw marked with spots. Each body segment with irregular pigment pattern dorsally, posterior margins lined with white and black spots. Telson teeth and uropods appearing banded with several dark spots alternating with lighter areas. Posterior three thoracic somites with black spot on ventral surface at base of each walking leg. Basal prolongation of uropod with large black spot on proximal portion of ventral surface, spines banded with light and dark spots.

MEASUREMENTS: Males, TL 32–63 mm.; females, TL 31–69 mm. Other measurements (in mm.) of female holotype, TL 39 mm.: carapace length 8.4; eye length 2.9; cornea width 2.0; rostral plate length 1.7, width 2.8; raptorial propodus length 10.5; fifth abdominal somite width 6.0; telson length 4.6, width 4.8.

DISCUSSION: *Pseudosquilla hieroglyphica* appears to be morphologically identical with *P. ornata* Miers, 1880, differing from the latter species only in basic color pattern. In both species the carapace is ornamented with a pair of circular black spots completely surrounded by an uninterrupted

white ring; these eye-spots with the white ring serve to distinguish both species from the other species of *Pseudosquilla*, *P. ciliata* (Fabricius, 1787) and *P. oxyrhyncha* Borradaile, 1898, which also have a median and three pairs of dorsal carinae on the telson. Whereas the background color pattern of *P. ornata* (in preserved material) is uniformly dark (Holthuis, 1941; Serène, 1951), in *P. hieroglyphica* it is made up of dark spots and irregular lines on a lighter background (fig. 1); the carapace in *P. hieroglyphica* is usually marked with dark spots, some with lighter centers anterior to the eyespots, and the rostral plate is speckled. The hieroglyphic-like pattern on the body of smaller specimens is replaced by more uniform bars in larger ones, but all show the dark spots on the anterior portions of the carapace. In addition the propodus of the claw of *P. ornata*, as noted by Holthuis (1941), is uniformly yellow in color without spots; in *P. hieroglyphica* the propodus is marked with lighter spots, as in *P. oxyrhyncha*. The color differences are constant between the type series of *P. hieroglyphica* and a larger series of *P. ornata* from the Pacific in all specimens in which the color pattern could be observed.

The characteristic color pattern of *P. hieroglyphica* was described by Kemp (1915) and Bigelow (1931), who reported on material from the Philippine Islands and Samoa, respectively, as *P. ornata*, and was illustrated by Komai (1927) from a specimen taken in the Ogasawara Islands, Japan. Komai reported on two female specimens which he identified as *P. ornata*; one apparently had an apical spine on the rostral plate and must be identifiable with *P. oxyrhyncha*. The other is probably *P. hieroglyphica*, for the color pattern figured by Komai agrees well with the material reported herein.

Although the color pattern of the carapace and body has faded in some of the specimens from the Philippine Islands discussed herein, as well as in the large female from Samoa reported on by Bigelow (1931), all these specimens have traces of the dark spots on the carapace and rostral plate or traces of the light spots on the propodus of the claw.

The specimen from Mauritius identified as *P. ornata* by Bigelow (1894), a male 77 mm. in length, is tentatively identified with *P. hieroglyphica*; although most of the color pattern has faded, the dark spots on the anterior portions of the lateral plates of the carapace are still visible. The specimen was purchased from H. A. Ward; however, since the locality data associated with another specimen purchased from the same source was erroneous (Manning, 1968) the locality given for this specimen, Mauritius, is suspect. The occurrence of *P. hieroglyphica* in the western Indian Ocean requires verification; I have seen no other specimens of *P. hieroglyphica* from localities outside of the Pacific Ocean.

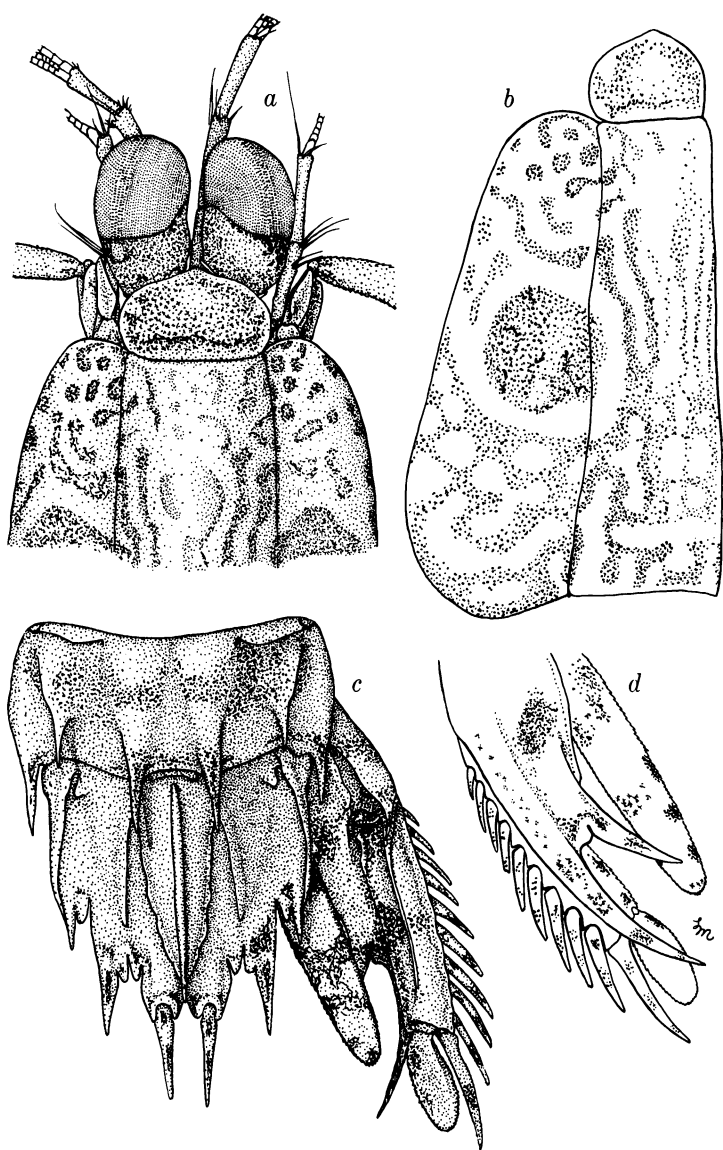


FIG. 1. *Pseudosquilla hieroglyphica*, female holotype, TL 39 mm., Latoback Island, Rongerik Atoll, Pacific Ocean (USNM 124906): a, anterior portion of body; b, color pattern of carapace, in oblique lateral view; c, sixth abdominal somite, telson, and uropod; d, uropod, ventral view (setae omitted).

ETYMOLOGY: From the Greek *hieros*, sacred, and *glypho*, engrave, alluding to the color markings on the body.

***Pseudosquilla guttata*, new species**

Figure 2

HOLOTYPE: 1 female, 35 mm.; Midway Island, Pacific Ocean; Phil Spicer, collector; February-March 1941; AMNH 9621.

PARATYPES: 1 male, 33 mm.; 1 male postlarva, 25 mm.; same data as holotype; AMNH 9621a.

DIAGNOSIS: Cornea broader than stalk. Rostral plate with apical spine. Carapace with pair of black spots surrounded by white spots. Dorsal surface of telson with median carina and four pairs of carinae: accessory medians, anterior submedians, intermediates, and marginals.

DESCRIPTION: Eye broadened anteriorly, cornea broader than stalk but not bilobed. Corneal Indices 357 and 329 in female holotype and male paratype, respectively. Ocular scales erect, separate, apices truncate. Antennular peduncle about two-thirds carapace length. Antennal scale less than half as long as carapace, length about four times greatest width. Rostral plate with apical spine, length about two-thirds width. Carapace smooth, without carinae or spines, strongly narrowing anteriorly; anterior margins of lateral plates convex, extending beyond base of rostral plate. Dactylus of raptorial claw with three teeth; propodus slender, subequal to carapace length, with inferior distal spine and three movable teeth on inner proximal margin; opposable margin of propodus pectinate proximally only. Mandibular palp and five epipods present. Exposed thoracic somites smooth, strongly convex, lateral processes unarmed; lateral processes of sixth and seventh thoracic somites rounded anterolaterally, more truncate posterolaterally, process of seventh somite broader than that of sixth. Abdomen smooth, semicylindrical, anterior five somites not carinate, armed only at posterolateral angles of fifth somite. Sixth abdominal somite with three pairs of spined carinae, with blunt projection ventrally in front of articulation of each uropod. Telson slightly broader than long, with three pairs of marginal teeth, submedians appressed basally, with long movable apices; dorsal surface of telson ornamented with median carina and four other pairs of carinae: accessory medians, anterior submedians, intermediates, and marginals; submedian and intermediate marginal teeth of telson lacking dorsal carinae. Telson lacking submedian denticles; two intermediate, inner larger, and one small lateral denticle present. Proximal segment of uropodal exopod less than two and a half times as long as distal, outer margin with 10-11 movable spines, distalmost extending beyond distal segment. Outer spine of basal pro-

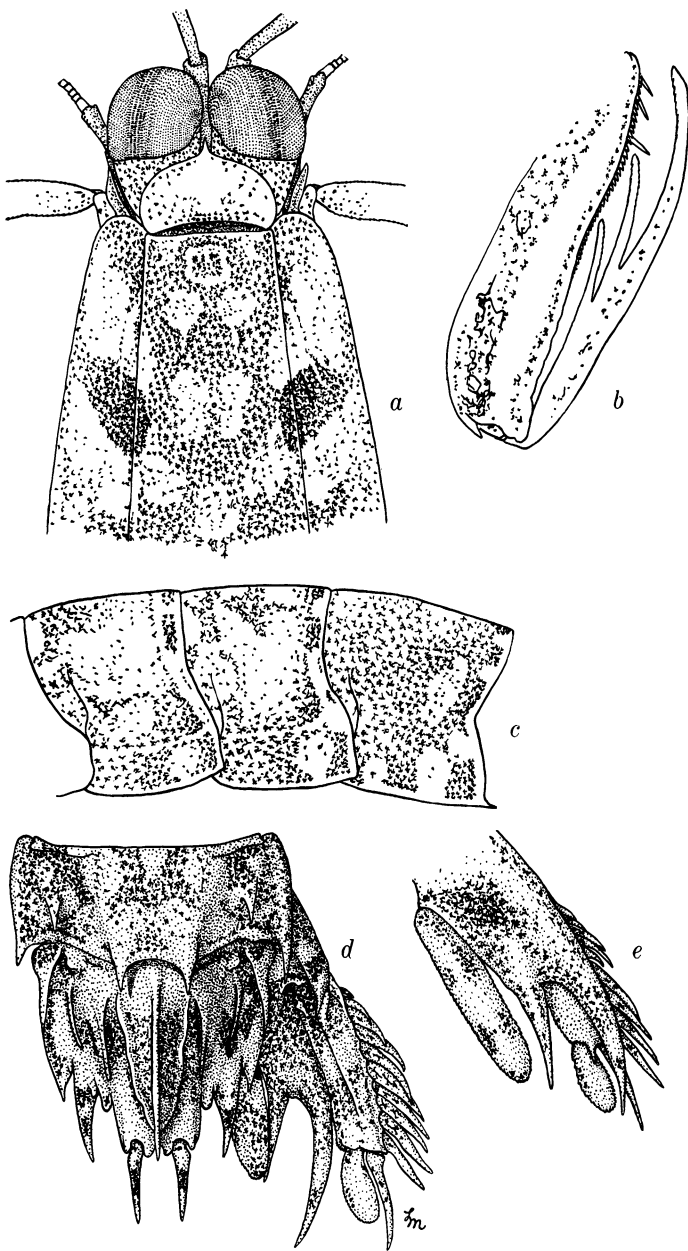


FIG. 2. *Pseudosquilla guttata*, female holotype, TL 35 mm., Midway Island, Pacific Ocean (AMNH 9621): *a*, anterior portion of body; *b*, propodus and dactylus of claw; *c*, third, fourth, and fifth abdominal somites, lateral view; *d*, sixth abdominal somite, telson, and uropod; *e*, uropod, ventral view (setae omitted).

longation of uropod the longer; inner margin of basal prolongation smooth.

Color: Body appearing mottled, with large white spots irregularly situated on darker background. Median area of carapace ornamented with, from front to back, an irregular median white spot, a pair of medial white spots, a pair of lateral white spots, a pair of median white spots, and four irregular white spots in a band across the posterior margin. Paired black spots on carapace irregular in outline, surrounded by white spots, not a white ring. Lateral plates of carapace with two large white spots anteriorly and numerous smaller white spots posteriorly. Merus of claw with large white spots, propodus covered with scattered dark chromatophores. Body segments each with band of white spots on darker background. Central area of telson dark, remainder of dorsal surface with scattered white spots, marginal teeth with white band. Posterior three thoracic somites each with pair of dark spots, one near base of each walking leg. Uropod banded, basal portion of basal prolongation with large dark spot on ventral surface.

MEASUREMENTS: Male and male postlarva, TL 33 and 25 mm.; female, TL 35 mm. Other measurements (in mm.) of female holotype: carapace length 7.5; eye length 2.8; cornea width 2.1; rostral plate length 1.7, width 2.5; raptorial propodus length 7.4; fifth abdominal somite width 5.3; telson length 3.5, width 4.1.

DISCUSSION: *Pseudosquilla guttata* closely resembles *P. oculata* (Brullé, 1837), from the Indo-West Pacific region and the Atlantic, and *P. adialtata* Manning, 1964, from the eastern Pacific region; all three species have broad eyes, an anterior spine on the rostral plate, a median and four other pairs of dorsal carinae on the telson, and paired dark spots on the carapace. The three species can be distinguished on the basis of their color pattern alone. In *P. oculata* the dark spots on the carapace are surrounded by a light ring; the merus and propodus of the claw are marked with light spots, and smaller light spots are scattered over the body. In *P. adialtata* the dark spots on the carapace lack the encircling white ring and the white spots on the carapace and body are smaller and more numerous; the white spots may be superimposed on the larger, black spots of the carapace, and as in *P. oculata*, the merus and propodus of the claw is marked with white spots. In *P. guttata* the dark spots also lack the white ring but the white spots on the carapace are large and few in number; *P. adialtata* may have 10 or more white spots on the midline of the carapace, but *P. guttata* has but five. The propodus of the claw in *P. guttata* is not ornamented with white spots, although these are present on the merus.

ETYMOLOGY: From the Latin *guttatus*, spotted.

CONCLUSIONS

The genus *Pseudosquilla* now contains eight species, seven of which occur in the Indo-West Pacific region. Members of the genus are known only from shallow tropical waters; most species occur on coral or coralline reefs.

Within the genus color pattern, particularly that of the carapace, can be used as a major taxonomic character. Six of the species are ornamented with a pair of large, dark spots often described as eye-spots on the carapace; one species, *P. megalophthalma*, has a median black spot on the carapace and one, *P. ciliata*, lacks distinctive dark spots. The eye-spots are surrounded by an uninterrupted lighter ring in *P. hieroglyphica*, *P. oculata*, and *P. ornata*, but in *P. guttata* and *P. oxyrhyncha* the rings are replaced by a series of irregular, large light spots. In *P. adiastalta* the eye-spots are surrounded by neither a ring nor large light spots; numerous small, light spots on the carapace surround and may be superimposed over the eye-spots.

Although most of the species of *Pseudosquilla* can be distinguished by a combination of morphological features and color pattern, two groups of species within the genus contain members which apparently are identical morphologically but can be distinguished by their color pattern. *Pseudosquilla ornata* and *P. hieroglyphica*, sympatric in the Pacific Ocean, form one of these groups. In *P. ornata* the background color of the body is uniformly dark, whereas in *P. hieroglyphica*, as the name implies, the background pattern is formed by a series of small, dark spots and irregular lines on a lighter background; in preservative often only the eye-spots and the small dark spots on the anterior portion of the carapace are visible.

A similar situation is found in *P. oculata* and its allies, *P. adiastalta* from the eastern Pacific region and *P. guttata* from Midway Island, which are apparently indistinguishable morphologically but which have distinctive color patterns. In *P. oculata* the dark eye-spots are surrounded by an uninterrupted light ring. In *P. guttata* the light ring is replaced by a series of large, white spots, and in *P. adiastalta* the large light spots are replaced by numerous small, white spots.

The functional significance and possible adaptive values of these color patterns are not readily apparent. Color pattern in these species may play a role in species recognition, or, as Dingle and Caldwell (1969) have observed in some species of *Gonodactylus*, may be utilized in some form of display behavior; color spots on the merus of the claw in *Gonodactylus* play an important role in display activities.

Color pattern in *Pseudosquilla* does not appear to be correlated with the three main morphological features that can be used to distinguish species

or groups of species, eye shape, armature of rostral plate, and dorsal carination of telson. However, all the species with broad corneas also have paired eye-spots on the carapace. *Pseudosquilla ciliata*, the only species with narrow eyes, lacks eye-spots, and *P. megalophthalma*, the only species with bilobed eyes has a single median spot on the carapace.

LITERATURE CITED

BIGELOW, R. P.

- 1893. Preliminary notes on the Stomatopoda of the Albatross collections and on other specimens in the National Museum. Johns Hopkins Univ. Circ., vol. 12, no. 106, pp. 100-102.
- 1894. Report on the Crustacea of the Order Stomatopoda collected by the steamer Albatross between 1885 and 1891, and on other specimens in the U. S. National Museum. Proc. U. S. Natl. Mus., vol. 17, pp. 489-550, figs. 1-28, pls. 20-22.
- 1931. Stomatopoda of the southern and eastern Pacific Ocean and the Hawaiian Islands. Bull. Mus. Comp. Zool. Harvard, vol. 72, no. 4, pp. 105-191, figs. 1-10, pls. 1-2.

BORRADAILE, L. A.

- 1898. On some crustaceans from the South Pacific. Pt. I, Stomatopoda. Proc. Zool. Soc. London, 1898, pp. 32-38, pls. 5, 6.

BRULLÉ, M.

- 1837-1839. Crustacés. In Barker-Webb, P., and S. Berthelot, Histoire Naturelle des Iles Canaries. Zool., vol. 2, no. 2, Entomologie, pp. 13-18 (1839). Atlas (1837), pl. unique. Béthune, Paris.

DINGLE, H., AND ROY L. CALDWELL

- 1969. The aggressive and territorial behaviour of the mantis shrimp *Gonodactylus bredini* Manning (Crustacea: Stomatopoda). Behaviour, vol. 33, nos. 1-2, pp. 115-136, figs. 1-8.

FABRICIUS, J. C.

- 1787. Mantissa insectorum sistens eorum species nuper detectas adjectis characteribus genericis, differentiis specificis, emendationibus, observationibus, vol. 1, xx+348 pp., Christ. Gottl. Proft., Copenhagen.

HOLTHUIS, L. B.

- 1941. The Stomatopoda of the Snellius Expedition. Biological Results of the Snellius Expedition, XII. Temminckia, vol. 6, pp. 241-294, figs. 1-9.

HOLTHUIS, L. B., AND RAYMOND B. MANNING

- 1969. Stomatopoda. In Moore, R. C. (ed.), Treatise on Invertebrate Paleontology, Part R, Arthropoda 4, vol. 2. Lawrence, Univ. Kansas Press, pp. 535-552, figs. 343-363.

KEMP, S.

- 1915. On a collection of stomatopod Crustacea from the Philippine Islands. Philippine Jour. Sci., ser. D, vol. 10, no. 3, pp. 169-187, pl. 1.

KOMAI, T.

- 1927. Stomatopoda of Japan and adjacent localities. Mem. Coll. Sci. Kyoto Imp. Univ., ser. B, vol. 3, no. 3, pp. 307-354, pls. 13-14, text-figs. 1-2.

MANNING, RAYMOND B.

- 1961. Stomatopod Crustacea from the Atlantic coast of northern South America. Allan Hancock Atlantic Exped., Rept. no. 9, pp. 1-46, pls. 1-11.
- 1963. Preliminary revision of the genera *Pseudosquilla* and *Lysiosquilla* with descriptions of six new genera. Bull. Marine Sci. Gulf and Carib., vol. 13, no. 2, pp. 308-328.
- 1964. A new west American species of *Pseudosquilla* (Stomatopoda). Crustaceana, vol. 6, no. 4, pp. 303-308, fig. 1.
- 1968. Correction of the type locality of *Squilla mantoidea* Bigelow (Stomatopoda). *Ibid.*, vol. 14, no. 1, p. 107.
- 1969. Stomatopod Crustacea of the western Atlantic. Stud. Trop. Oceanogr. Miami, no. 8, viii+380 pp., figs. 1-91.

MIERS, E. J.

- 1880. On the Squillidae. Ann. Mag. Nat. Hist., ser. 5, vol. 5, pp. 1-30, 108-127, pls. 1-3.

SERÈNE, R.

- 1951. Observations sur deux *Pseudosquilla* d'Indochine. Treubia, vol. 21, no. 1, pp. 11-25, figs. 1-8.
- 1962. Révision du genre *Pseudosquilla* (Stomatopoda) et définition du genres nouveaux. Bull. Inst. Océanogr. Monaco, no. 1241, pp. 1-27, figs. 1-5.

