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A New Species of the Genus *Heteromysis* (Crustacea, Mysidacea) from the Bahama Islands, Commensal with a Sea-Anemone

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The material upon which this paper is based was collected at the Lerner Marine Laboratory, Bimini, Bahama Islands. The author wishes to express his thanks to Dr. Digby McLaren for first pointing out this interesting mysid, and to Dr. Fenner Chace for his helpful advice during the preparation of this paper.

Heteromysis actiniae, new species

Figures 1, 2, 3, and 8

Holotype Female: The general body form is robust and compact. The anterior margin of the carapace is produced into a broad, triangular rostrum, the tip of which is rounded and projects as far as the basal segment of the antennular peduncle. The cervical sulcus is apparent. The posterior margin of the carapace is deeply indented so as to expose dorsally the last two thoracic segments. The abdominal segments are of equal size, but the last is somewhat larger than its predecessors.

The antennules and antennae do not demonstrate any appreciable differences from other species of the genus. The antennal scale is small (barely equals the length of the antennular peduncle) and setose around its entire margin. On the median surface of the distal segment of the antennular peduncle near the base of the inner flagellum there is a small inflated process terminated by a seta. This structure is present in both sexes of *H. actiniae* and of *H. bermudensis,* but was not observed in *H. formosa.*

The eyes are somewhat cylindrical in shape and project well beyond the leading edges of the carapace. The deeply pigmented cornea occupies slightly more than the distal third of the eye. There is a well-pronounced ridge on the median proximal portion of the eye which gives its base a squared appearance.

The uropods, both outer and inner rami, are provided with fine, compactly set setae around their entire margins. The outer ramus is considerably longer than the inner one. The inner ramus is armed with spines along its total median border.

The telson is notched and slightly longer than the last abdominal segment. The depth of the notch is approximately one-quarter of the total length of the telson. In younger specimens, however, the proportional depth is somewhat greater. The innermost portion of the notch is usually armed with nine to 11 spinules. The lateral margins of the telson are usually provided with from nine to 11 spines. These spines are distributed only along the distal half of the margins. In mature specimens the spines are often blunt, especially the more apical ones. The foregoing numbers represent approximations as to the average condition. Below is a sample of 10 individuals:

	Spines on Lateral Margins	Spinules of Notch
Male immature	9–9	10
Male adult	11–9	10
Male adult	12–11	13
Female immature	8–9	9
Female immature	8–9	11
Female immature	9–9	9
Female adult	8–9	9
Female adult	9–10	9
Female adult	9–11	12
Female adult	10–11	11

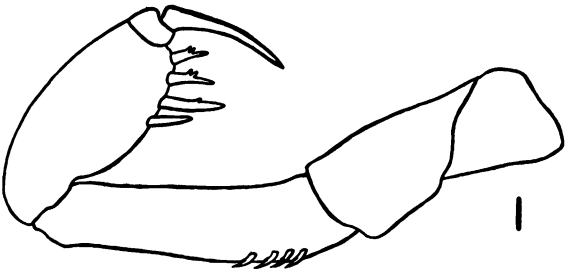

FIG. 1. Endopodite of third thoracic appendage of *Heteromysis actiniae*, new species.

The marsupium is formed by the incubatory lamellae which are developed only on the last two pairs of thoracic appendages. The incubatory lamellae are deeply incurved along the midline, but do not completely divide the marsupium into two chambers.

The third thoracic appendages are strongly developed and subchelate. The carpo-propodus bears two curious tridentate spines near the base of the dactylus besides two other spines over which the claw of the dactylus closes. The base of the merus is armed with four curved spines.

The pleopods are much reduced in the female, as well as in the male.

ALLOTYPE MALE: The male is essentially the same as the female, with the exception of secondary sexual characters, which are as follows: a small circular tuft of setae located on the inferior surface of the third article of the antennular peduncles, and the elongate tubular structures located between the last pair of thoracic appendages which represent external extensions of the sex ducts.

SIZE: Adult specimens, male and female, are of equal size (7–8 mm.).

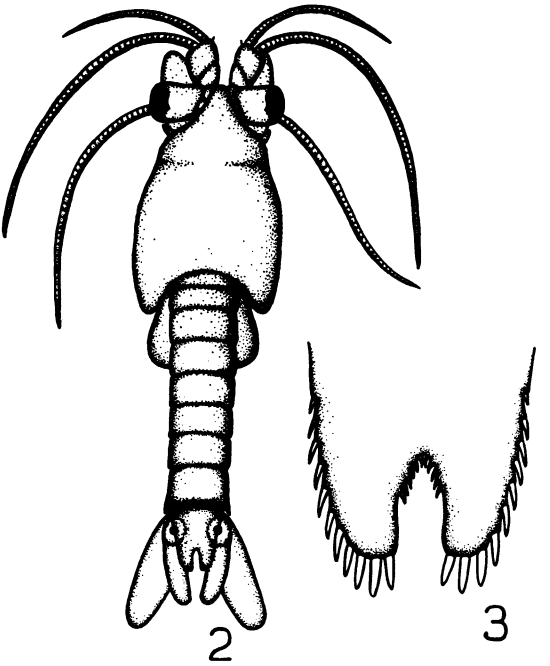

FIG. 2. Dorsal view of adult female of *Heteromysis actiniae*, new species.

FIG. 3. Detail of terminal portion of telson of *Heteromysis actiniae*, new species.

COLOR: *Heteromysis actiniae* in life is bright red in color; however, a short time after preservation virtually all traces of color disappear. This red coloring extends into the antennules and antennae as well as the uropods, but is principally localized in the tissues immediately surrounding the digestive tract. Adult specimens are more intensely colored than juveniles. The unpigmented areas of the body are translucent.

TYPE LOCALITY AND ECOLOGY: Shallow flats, varying from half of a meter to several meters in depth, around Tokas Key, Bimini, Bahama Islands. This species so far is known to occur only in small colonies in the tentacles of a sea-anemone, *Bartholomea annulata* (Leseur). Colonies range roughly from as few as five to over 20 individuals, depending on the size of the sea-anemone. Males, females, and juveniles were found to be present in all colonies observed in the field during the months of May and June (see General Discussion).

DISPOSITION OF TYPES: The holotype and allotype are in the invertebrate collections of the American Museum of Natural History, A.M.N.H. Nos. 11624 and 11625, respectively. The paratypes have been divided between the American Museum of Natural History and the United States National Museum.

This species has been named *actiniae* because of its association with the sea-anemone *Bartholomea annulata.*

Heteromysis antillensis, described by Verrill from the island of Dominica in the Lesser Antilles, poses some problems, because its description is very imperfect and the figures given are far from accurate even to gross detail. Tattersall in his "A review of the Mysidacea of the United States National Museum" states the following concerning the species *H. antillensis*: "Verrill's description is entirely inadequate and does not record any of the fundamental characters of the species." The author has been unable to locate Verrill's type in the collections at Yale University and, therefore, suggests that *H. antillensis* be considered a *nomen dubium* until topotypic material can be examined. No other specimens have subsequently been assigned to Verrill's species.

The fact that the two species *H. antillensis* and *H. actiniae* might prove synonymous has not been overlooked, but as the material herein described is from a locality 1350 miles to the northwest of the island of Dominica it does not seem advisable blithely to assign specimens so distant from the type locality to Verrill's imperfectly described species. Bermuda, which is geographically closer though admittedly more isolated, has its endemic species, *H. bermudensis.* It therefore seems less justifiable to designate the Bahama material as *H. antillensis,* because, should the two prove different, it would lead to a confused synonymy, than to

describe this material as a new species, in which case, should the two prove the same, the matter would resolve itself in a simple synonymy.

KEY TO SPECIES OF *Heteromysis* FROM THE WESTERN ATLANTIC

1. Innermost of terminal spines on apices of telson longest (fig. 4), lateral margins of telson usually armed with more than 12 spines on each side, rostrum low and rounded (fig. 5); body size, 9–10 mm. . . . . *Heteromysis formosa* Smith

   Innermost of terminal spines on apices of telson not longest (fig. 6), lateral margins of telson usually armed with 12 or fewer spines on each side . 2

2. Rostrum small and pointed (fig. 7), lateral margins of telson usually armed with from seven to nine spines on each side; body size, 6–7 mm. . . . . *Heteromysis bermudensis* G. O. Sars

   Rostrum broad and triangular (fig. 8), the tip of which is rounded, lateral margins of telson usually armed with from nine to 11 spines on each side; body size, 7–8 mm. . . . . *Heteromysis actiniae*, new species

Heteromysis actiniae most closely resembles *H. bermudensis* which G. O. Sars described from a single female specimen taken in shallow waters of the Bermuda Islands during the Challenger Expedition. Since

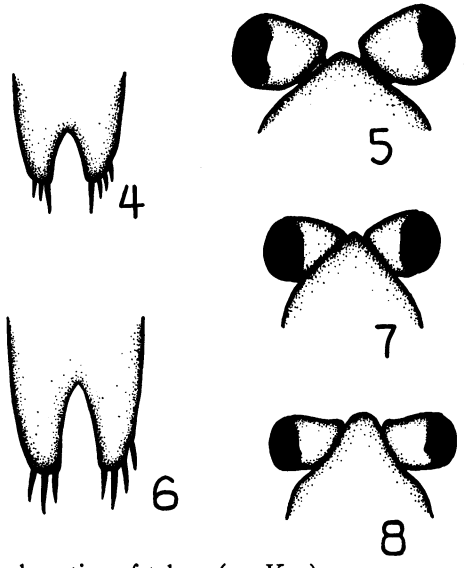

FIG. 4. Terminal portion of telson (see Key).
FIG. 5. Eyes and anterior portion of carapace of *Heteromysis formosa* Smith.
FIG. 6. Terminal portion of telson (see Key).
FIG. 7. Eyes and anterior portion of carapace of *Heteromysis bermudensis* G. O. Sars.
FIG. 8. Eyes and anterior portion of carapace of *Heteromysis actiniae*, new species.

that time Verrill has referred specimens taken in the Bermuda area to Sars's species. Two specimens collected by G. Brown Goode and mentioned by Verrill (1922) have been subsequently reëxamined by Tattersall who comments that the specimens, although rather badly damaged, agree substantially with Sars's description and figures of *H. bermudensis*. The author has also examined these specimens as well as fresh material from Bermuda and compared them with *H. actiniae*. Although the two species are closely related, there are certain consistent characters of *H. actiniae* which cannot be reconciled with Sars's description of *H. bermudensis*. Both species have a compact, robust facies. They may be distinguished, however, by the following differences: In *H. actiniae* the anterior margin of the carapace is produced into a broad, triangular rostrum the tip of which is rounded and projects as far as the basal segment of the antennular peduncle, whereas in *H. bermudensis* the rostrum is shorter and more pointed. Viewed dorsally the eyes of *H. bermudensis* are somewhat inflated by comparison and project less beyond the leading edges of the carapace than in *H. actiniae*. When viewed laterally the eyes of *H. bermudensis* are dorsoventrally compressed, having an ovoid cross section, whereas in *H. actiniae* they are cylindrical and have a circular cross section.

The inner ramus of the uropod, as indicated by Sars and observed in specimens of *H. bermudensis*, terminates rather sharply, whereas in *H. actiniae* this structure ends more ovately with a slight incurving of the terminal portion. The inner margin of the inner ramus of *H. bermudensis* is armed with spines along its entire length, a point Sars failed to mention in his description. This condition is also the case in *H. actiniae* and *H. formosa*.

Finally the telson of *H. actiniae* demonstrates considerable differences. The notch is equal in depth to about one-quarter, as compared to one-third in *H. bermudensis*, of the total length of the telson in adult specimens. However, in younger specimens the proportional depth of the notch is greater and tends to approximate more closely the condition found in *H. bermudensis*. The small spinules arming the inner portion of the notch usually vary from nine to 11 in *H. actiniae*, whereas in *H. bermudensis* they are roughly double this number (18–20). The number of spines arming the lateral margins of the telson usually varies from nine to 11 in *H. actiniae* while *H. bermudensis* averages one or two spines less. The matter is somewhat confused by Sars's description of *H. bermudensis*, for he states that the number of spines arming the lateral margin is about six, although his enlarged illustration of the telson indicates eight spines.

The specimen Sars described was 6 mm. in length and evidently sex-

ually mature because it carried partially developed embryos in its marsupium. None of the Bahama specimens of *H. actiniae* were found to be sexually mature at this size, the incubatory lamellae being small and imperfectly developed. Most adult females were found to range from 7 to 8 mm.

GENERAL DISCUSSION

The genus *Heteromysis* was created by S. I. Smith in 1873 to receive a new and interesting species of mysid from the eastern coastal waters of North America. Since that time some 16 species have been referred to this genus:

H. formosa Smith, 1873; eastern coastal waters of North America and coastal waters of Europe
SYN.: *H. norvegica* G. O. SARS, 1882
H. microps (G. O. Sars), 1877; coastal waters of Tunisia, Africa (Gulf of Goletta)
SYN.: *Chiromysis microps*
H. harpax (Hilgendorf), 1879; eastern coastal waters of Africa (Ibo, Mozambique, and Massaua, Eritrea)
SYN.: *Chiromysis harpax*
Gnathomysis gerlachei Bonnier and Pérez, 1902
H. bermudensis G. O. Sars, 1885; Bermuda
H. odontops Walker, 1898; western coastal waters of North America
SYN.: *H. spinosus* Holmes, 1900
H. proxima Tattersall, 1922; coastal waters of southeastern India (Gulf of Manaar)
H. zeylanica Tattersall, 1922; coastal waters of southeastern India (Gulf of Manaar)
H. gymnura Tattersall, 1922; coastal waters of southeastern India (Gulf of Manaar)
H. antillensis Verrill, 1923; Dominica, Lesser Antilles
H. digitata Tattersall, 1927; Lake Timsah, Suez Canal, Africa
H. waitei Tattersall, 1927; coastal waters of South Australia (St. Vincent Gulf)
H. tasmanica Tattersall, 1927; coastal waters of South Australia (St. Vincent Gulf) and Tasmania (D'Entrecasteaux Channel)
H. cotti Calman, 1932; Lanzarote, Canary Islands
H. armoricana Nouvel, 1940; Atlantic coastal waters of France
H. eideri Bacesco, 1941; coastal waters of southern France (Mediterranean)
H. tattersalli Nouvel, 1942; Boa Vista, Cape Verde Islands
H. actiniae, new species; Bimini, Bahama Islands

It is of interest to note that all the species of *Heteromysis* so far described are in-shore, shallow-water forms (arbitrarily defined as waters from 0 to 50 meters in depth), with the exception of certain populations of *H. formosa* that occur in deep water off the southeastern and Gulf coasts of North America as well as in the Mediterranean and *H. eideri*, which, although an in-shore form, occurs in somewhat deeper waters

(30–100 meters). Species of *Heteromysis* are conspicuously absent from oceanic plankton, although specimens (principally males and juveniles, more rarely females) have been taken in coastal waters by plankton nets and night-light collecting. Apparently the species of this genus are for the most part cryptic in habits, and their collection has been rather accidental in a great many cases.

Heteromysis formosa often occurs in small colonies within the empty shells of large bivalves and gastropods. Consequently it has quite often been taken in dredges on bottoms where there is a mixture of shells and other sediments. Nouvel has also reported collecting this species and *H. armoricana* from the pierced bulbs of *Saccorhiza.* The southern records of *H. formosa,* both in Europe and North America, are of interest in that they occur in considerably deeper waters. The "Albatross" obtained specimens of this species at stations 2402 (off the west coast of Florida) and 2603 (off North Carolina), the latter station recording a depth of 225 meters. Bacesco has also reported *H. formosa* from two stations in the Mediterranean (off the southern coast of France) with the respective depths of 200 and 300 meters. Thus in its northern distribution *H. formosa* is found to be an in-shore, shallow-water form commonly ranging into the inter-tidal zone, whereas in its southern distribution it is found only in deeper waters and is totally lacking from the warmer shallow waters, suggesting that temperature is possibly the limiting factor.

Heteromysis harpax and *H. odontops* are of particular interest in that they have been collected from gastropod shells inhabited by pagurid crabs. Bonnier and Pérez collected four specimens of *H. harpax* in this situation at Massaua, Eritrea, East Africa, two males in separate shells and a male and female from a third shell. These specimens were originally described by Bonnier and Pérez as a new genus and species, *Gnathomysis gerlachei,* but Tattersall in his paper on Indian Mysidacea synonymized these forms with *H. harpax.* Although *H. odontops* has been collected in tow-nets, Mortensen obtained seven males and 16 females of this species at Taboga Island, west coast of Panama, from shells inhabited by pagurid crabs. The distribution of this species needs further investigation, because there is some question as to synonymy. Tattersall in his "A review of the Mysidacea of the United States National Museum" synonymized *H. spinosus* with *H. odontops* and assigned material collected from the west coast of Panama to the latter species. Although the Panamanian specimens differ somewhat from the descriptions of *H. spinosus* and *H. odontops,* Tattersall's assumption as to their being one and the same is probably correct. If this be true, *H. odontops* has the widest known range in latitude (Puget Sound, Washington to

the Perlas Islands, Panama) of any species of this genus, and indicates certain interesting clines in variation of characters throughout its range.

Heteromysis cotti is known only from the type locality and represents a highly specialized population living in a very limited ecology. The type locality is a subterranean salt-water pool, Jameo de Agua, of Lanzarote, the northeasternmost major island of the Canary group. Fage and Monod adequately describe the grosser aspects of this grotto in their paper on the fauna of Jameo de Agua. They reported that *H. cotti* was very numerous, especially on the bottom among debris of cephalopods. The functional eye elements of this species are much reduced, which is quite probably correlated with their cavernicolous environment. Fage and Monod also reported that in the female the incubatory lamellae form two separate chambers, of which each contains but a single larva. This is an exceptionally small number of larvae, for *H. formosa* and other species are known to incubate as many as 10 or more larvae at one time.

Heteromysis eideri, as reported by Bacesco, occurs in water of 30 to 100 meters in depth off Monaco where the bottom consists of shells, plant detritus, and other sediments.

Heteromysis actiniae is most interesting in that it occurs in small colonies among the tentacles of a sea-anemone, *Bartholomea annulata* (Leseur). This sea-anemone is quite abundant at Bimini, especially in fairly sheltered, shallow waters where the bottom is composed of loose sand, shell fragments, and calcarinite.[1] It is commonly found on the shallow flats around Tokas Key attached to uninhabited conch shells (*Strombus gigas*), usually just inside the aperture, or to the under surface of the shell as it rests on the bottom. This species also attaches to the under surface of stones and in crevices among rocks on the bottom. The sea-anemone is generally so oriented that when expanded the oral surface and tentacular crown are fully exposed; however, upon contraction the animal is for the most part drawn out of sight, under or within the object to which it is attached depending on whether this be a stone or shell. *Bartholomea annulata* is not gregarious and most often occurs singly, although two individuals are sometimes found attached to the same shell. During the day, this sea-anemone is usually well expanded, and the mysids are quite evident, swimming back and forth through the numerous tentacles. In this expanded condition the sea-anemone projects well above the surrounding bottom, and the tentacles are cast back and forth with the movements of the water. The sea-anemone is a dull, translucent brown in color (a few specimens have a definite green tint) and therefore presents considerable contrast to the mysids which are a bril-

[1] Calcarinite is a consolidated calcareous sand.

liant red color. The mysids never stray more than a centimeter or two from the tentacles and spend most of their time coursing up and down the length of the tentacles or spiraling around the bases of the tentacles. In their coursing back and forth, the mysids pass over the crescentic cream-colored batteries of nematocysts, which arm the tentacles, with apparent immunity. When the sea-anemone is particularly expanded, the mysids will often course across the oral disk, or congregate in the space between the tentacles and the body column. When not actively swimming about, the mysids usually settle on the basal portions of the tentacles where there are fewer nematocysts. Some specimens of *B. annulata* lack the crescentic, cream-colored batteries of nematocysts on the basalmost portions of the tentacles. *Heteromysis actiniae* demonstrates a definite preference for these individuals and, when placed in an aquarium containing several sea-anemones, seeks the one lacking the batteries of nematocysts on the bases of the tentacles. At no time was there observed any irritable behavior in either sea-anemone or mysid. The sea-anemone's responses remained the same whether the mysids were present or not.

Several specimens of *B. annulata* and their accompanying mysids were placed in aquaria in order better to observe their interbehavior. During this time the sea-anemones were fed bits of fish and spiny lobster. Although the sea-anemones would quickly contract the tentacles upon which the food touched and rapidly transport it to the gullet, there was no perceptible change in the behavior of the mysids. They would continue their usual swimming pattern to and fro in the tentacles. However, upon ejection of undigested material, the mysids would immediately seize upon this material and commence to feed while swimming about in their usual manner. At this time the gnathopods (third thoracic appendages), which are stoutly developed and subchelate, serve well in grasping and tearing apart the ejected particles so that they may be more readily engulfed. The fact that *H. actiniae* has been observed to feed on ejected wastes of the sea-anemone *B. annulata* possibly suggests that some of the other species of the genus *Heteromysis* may have similar tendencies. *Heteromysis harpax* and *H. odontops* in particular should be investigated, as they are known to inhabit shells occupied by pagurid crabs and may well feed upon the fecal material passed by these creatures.

Bartholomea annulata is quite sensitive to sudden changes in light intensity. When a shadow is passed over a normally expanded individual, it quickly contracts. Often this contraction is so rapid that the mysids swimming in the tentacles are left momentarily behind. During this contraction from the fully expanded condition the sea-anemone is reduced to one-fourth or one-fifth of its original size. This reduction in

size is accomplished by the contraction of muscles in the body wall and expulsion of water from the body cavities. Recovery from the contracted condition is less rapid and requires from five to 10 minutes.

Another crustacean, a snapping shrimp (*Alpheus armatus* Rathbun), is found regularly in association with *Bartholomea annulata*. Generally two individuals are found living with each sea-anemone. These shrimp post themselves near the base of the sea-anemone and continually busy themselves, pushing the tentacles back and forth with their antennae. There is evidently no real competition between these shrimp and *Heteromysis actiniae*. Both may be found living with the same sea-anemone.

Heteromysis bermudensis may also occur in association with the sea-anemone *Bartholomea annulata,* in that Verrill's remarks as to the ecology of this species are found to present a situation remarkably similar to that found in the Bahamas. He states that he found *H. bermudensis* in shallow waters under flat stones at low tide, and that it was also dredged in waters from 3 to 10 fathoms, where the bottom consisted of broken shells and shell sand. This is precisely the ecology of *B. annulata* and *H. actiniae* in the Bahamas. The exact ecology of *H. bermudensis* should be more thoroughly investigated.

Bartholomea annulata has a very wide distribution in the West Indies. It is known from Barbados, Guadeloupe, St. Thomas, Bahamas, Bermudas, Jamaica, Puerto Rico, Curaçao, and from Texas and Florida.

Little is known concerning the exact ecologies of other species of the genus *Heteromysis*. At best they are known to occur in the lower extremes of the intertidal zone and adjacent shallow waters (*H. microps* in water of 11 meters depth, *H. proxima* and *H. zeylanica* from pools on exposed reef, *H. gymnura* among seaweeds, in water of 2 to 4 meters depth, *H. antillensis* among corals in shallow water, *H. waitei* and *H. tasmanica* in water of 9 meters depth). *Heteromysis tattersalli* should be mentioned at this point, as it is somewhat of an exception to the above-mentioned species. Nouvel described this species from a single male specimen taken at a depth of 91 meters to the south of Boa Vista, Canary Islands. The depth at which it occurs would indicate that it is more comparable to *H. eideri* in ecology.

Red, as in many other crustaceans, seems to be the common color for the genus *Heteromysis*. Smith states that *H. formosa* is rose-colored. However, some specimens described by Nouvel appear to be an exception. *Heteromysis harpax* was reported by Bonnier and Pérez as being red in color. Verrill describes *H. bermudensis* as pinkish white. Finally, *H. actiniae* is bright red in color.

BIBLIOGRAPHY

BACESCO, MIHAI
1941. Les mysidacés des eaux méditerranéennes de la France (spécialement de Banyuls) et des eaux de Monaco. Bull. Inst. Océanogr., Monaco, vol. 38, no. 795, pp. 1–46, 16 figs.

BONNIER, JULES, AND CHARLES PÉREZ
1902. Sur un crustace commensal des pagures, *Gnathomysis gerlachei*, nov. sp., type d'une famille nouvelle de schizopodes. Compt. Rendus Acad. Sci., Paris, vol. 134, pp. 117–119.

CALMAN, W. T.
1932. A cave-dwelling crustacean of the family Mysidae from the Island of Lanzarote. Ann. Mag. Nat. Hist., ser. 10, vol. 10, pp. 127–131.

CARLGREN, O.
1951. A survey of the Ptychodactiaria, Corallimorpharia and Actiniaria. K. Svenska Vetensk. Handl., ser. 4, vol. 1, no. 1, pp. 1–121.
1952. Actiniaria from North America. Arkiv Zool. K. Svenska Vetensk. Akad., Stockholm, ser. 2, vol. 3, no. 4, pp. 373–390, 10 figs.

DEBOUTTEVILLE, DELAMARE
1950. Une station nouvelle du mysidacé *Heteromysis armoricana* Nouvel et le biotope de cette espèce. Bull. Lab. Arago, Vie et Milieu, Paris, vol. 1, no. 1, pp. 81–82.

DUERDEN, J. E.
1902. Report of the actinians of Porto Rico. Bull. U. S. Fish Comm., 1900, vol. 20, pt. 2, pp. 323–374, 12 pls.

FAGE, LOUIS, AND THÉODORE MONOD
1936. La faune marine du Jameo de Agua, lac souterrain de l'Ile de Lanzarote (Canaries). Arch. Zool. Exp. Gén., vol. 78, pp. 97–113.

HILGENDORF, F.
1879. Die von Herrn W. Peters in Mocambique gesammelten Crustaceen. Monatsber. Akad. Wiss. Berlin, 1878, pp. 782–851, 4 pls.

HOLMES, SAMUEL J.
1900. Synopsis of California stalk-eyed Crustacea. Occas. Papers California Acad. Sci., vol. 7, 262 pp., 4 pls.

KOSSMANN, R.
1880. Malacostraca. *In* Zoologische Ergebnisse einer Reise in die Kuestengebiete des Rothen Meeres. Leipzig, Wilhelm Engelmann, pt. 2, no. 1, pp. 1–140, 15 pls.

NOUVEL, HENRI
1940. Observations sur la sexualité d'un mysidacé, *Heteromysis armoricana* n. sp. Bull. Inst. Océanogr., Monaco, vol. 37, no. 789, pp. 1–11, 7 figs.
1942. Diagnoses préliminaires de mysidacés nouveaux provenant des campagnes du Prince Albert Ier de Monaco. *Ibid.*, vol. 39, no. 831, pp. 1–11, 23 figs.
1943. Mysidacés. Résultats des campagnes scientifiques accomplies sur son yacht par Albert Ier. Monaco, fasc. 105, pp. 1–128, 5 pls.

SARS, G. O.
1877. Nye bidrag til kundskaben om middelhavets invertebratfauna. Arch. Math. Naturv., Kristiania, vol. 2, pp. 10–119, 36 pls.
1883. Oversigt af Norges Crustaceer med foreløbige Bemaerkninger over de

nye eller mindre bekjendte Arter. Forhandl. Vidensk. Selsk. Kristiania, for the year 1882, pp. 1–124, 6 pls.

1885. Schizopoda. *In* Report on the scientific results of the voyage of H.M.S. "Challenger" during . . . 1873–76. London [etc.], Zoology, vol. 13, pt. 37, pp. 1–228, 38 pls.

SMITH, S. I.

1873. Crustacea. *In* Verrill, A. E., Report upon the invertebrate animals of Vineyard Sound and the adjacent waters, with an account of the physical characters of the region. Rept. U.S. Comm. Fish., 1871–1872, pt. 1, pp. 545–580.

TATTERSALL, W. M.

1922. Indian Mysidacea. Rec. Indian Mus., vol. 24, pp. 445–504.

1927. Report on the Crustacea Mysidacea. Trans. Zool. Soc. London, vol. 22, pt. 2, no. 8, pp. 185–199, 3 figs.

1928. Australian opossum shrimps (Mysidacea). Rec. South Australian Mus., vol. 3, pp. 235–257, 11 figs.

1951. A review of the Mysidacea of the United States National Museum. Bull. U. S. Natl. Mus., no. 201, pp. i–x, 1–292, 103 figs.

TATTERSALL, W. M., AND OLIVE S. TATTERSALL

1951. The British Mysidacea. London, Ray Society, vii + 460 pp., 118 figs.

VERRILL, A. E.

1900. Additions to the Anthozoa and Hydrozoa of the Bermudas. Trans. Connecticut Acad. Arts Sci., vol. 10, pp. 551–572, 3 pls.

1922. Crustacea of Bermuda. Schizopoda, Cumacea, Stomatopoda and Phyllocarida. *Ibid.*, vol. 26, pp. 181–211.

WALKER, ALFRED O.

1898. Crustacea collected by W. A. Herdman, F.R.S., in Puget Sound, Pacific Coast of North America, September 1897. Proc. Trans. Liverpool Biol. Soc., vol. 12, pp. 268–287.