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by

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During June, 1960, the M/V Hermes of the Gulf Coast Research Laboratory made several trawl hauls south of Horn Island, Mississippi. One haul was made June 27 at a depth of 20 m. on sandy mud botton at 30°04'30" N., 88°36' W., or about 10 nautical miles south of Horn Island. A considerable number of animals, including starfish, hermit crabs and tube worms, were caught in the trawl. Pieces of the parchment-like worm tube of *Chaetopterus variopedatus* (Renier) were caught in the meshes of the net and were also collected.

A small bivalve mollusk, *Notocorbula operculata* (Philippi 1848) was found to be attached to most of the *Chaetopterus* tubes. Microscopic examination showed that the bivalves were attached at the anterior ventral margin with a byssal thread. This little clam has been found under similar conditions at Dry Tortugas, Florida (Harvey R. Bullis, Jr., personal communication). It has been reported as abundant in 22-65 m. of water on mud bottom along the entire northern coast of the Gulf of Mexico (Parker 1960). It was also noticed that a single species of Foraminifera was attached to many of the clams. The attachment was not very strong, seeming to consist merely of a weak cement holding the ventral surface of the foraminifer to the bivalve shell, nor was it confined to a particular area on the bivalve, but occurred in any position on either valve (see Figs. 1, 3, 4).

The Foraminifera was identified as *Hanzawaia strattoni* (Applin 1925). This species was reported by Applin (1925) from the upper Miocene in wells from coastal areas of Texas and Louisiana. Since then it has been reported from the Recent of the northern coast of the Gulf of Mexico by several workers (Bandy, 1954, 1956, Langford, 1959, Parker, 1954, Phleger, 1954, Phleger & Parker, 1951, and Parker, Phleger & Peirson, 1953). All reported it as an "Open Gulf" species with abundant occurrences at 12 to 100 m., lesser occurrences at less than 12 m. and from 100 to 250 m., and rare occurrences at depths greater than 250 m., although the latter may be due to displacement.

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Most Foraminifera are motile, but some are securely attached to the substrate. Genera such as *Sagenina, Tolypammina, Hospitella, Textularoides, Homotrema* and *Mineacina* all are securely attached to mollusk shells, echinoderm tests, rocks, other Foraminifera tests, corals or other hard objects on the sea floor. Specimens of these genera are usually broken if they are removed from their place of attachment. *Hanzawaia strattoni,* however, is loosely attached and specimens may be removed intact, suggesting that this foraminifer may have the ability to break its attachment and change its position, as *Sorites marginalis* (Lamarck) and *Planorbulina acervalis* Brady, two species found attached to blades of the sea grass *Thalassia testudinum* Konig, are able to do.

It is interesting that both mullusk, *Notocorbula operculata*, and foraminifer, *Hanzawaia strattoni* had climbed above the bottom at the Mississippi locality. A considerable load of fine sediment is carried by the water in this area and quantities of sediment must accumulate on the bottom during calm summer months. Animals that feed on very small organisms have their feeding processes disrupted when the load of fine sediment becomes too great at the sea-bottom interface. Such animals must move or perish under these conditions. Both the mollusk and the protozoan, in this case, solved their dilemma by climbing above the flocculent layer close to the bottom. Another possibility is, of course, that *H. strattoni* was merely using the bivalve as a substrate. However, the bottom centimeter or two would be just as unfavorable an environment for the foraminifer as for a bivalve mollusk (Langford 1959, Murray 1963).

In this case *H. strattoni* apparently gained all the advantage from the association between the two animals, using the bivalve as a means of elevating itself above the silt laden sediment-water interface. It appears to be a true commensal relationship for *H. strattoni* attached itself only to specimens of *N. operculata* and to no other bivalve present. Also in the "Open Gulf" fauna reported by Phleger (1954) south of Horn Island, there are several other species of Foraminifera capable of attachment, but none of these were observed on *N. operculata.* There may also have been some competition for food between mollusk and foraminifer. However, in no way could *H. strattoni* be called a parasite, for there was no absorption of shell material or holes penetrating into the mantle cavity at the points of attachment on *N. operculata* such as those reported by Todd (1965) made by *Rosalina carnivora* Todd on *Lima (Acesta) angolensis* Adam & Knudsen. *N. operculata* was in no way damaged. Another little clam with habits similar to that of *Notocorbula operculata* has recently been reported on by Harry (1966). He states that about half of the live specimens of *Crassinella lunulata* (Conrad, 1834) from off False Cape, Florida, had one or two live Foraminifera attached to the posterior ventral part of the shell. However, he did not attempt to identify any of this material, so it is not known if *Hanzawaia strattoni* was the species involved.

The association of living Foraminifera with algae or with sea grass has often been reported in the literature (Cushman, 1920, 1921, 1922, 1941).

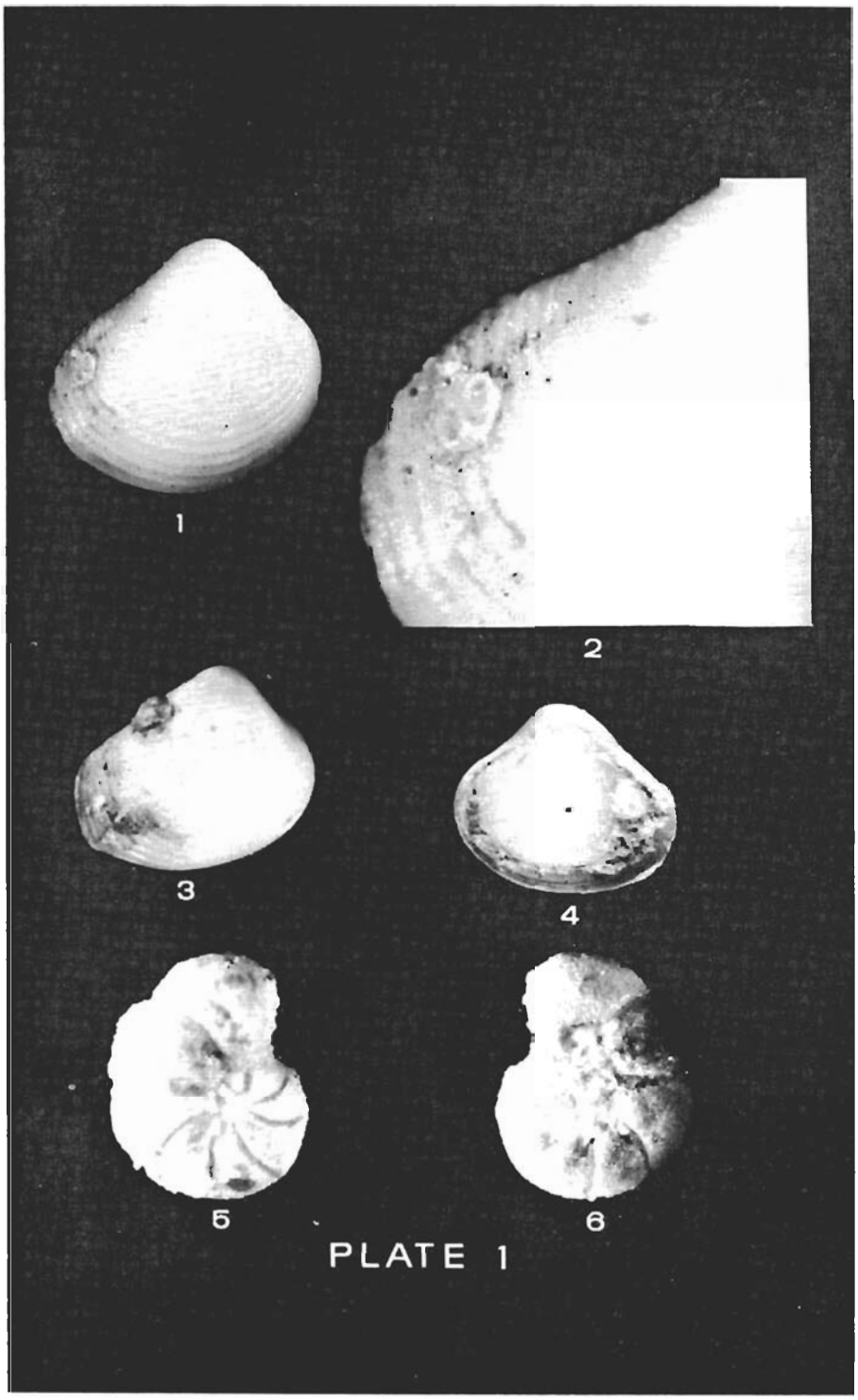
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PLATE 1

SYNONYMY

NOTOCORBULA Iredale, 1930

NOTOCORBULA OPERCULATA (Philippi, 1848)

(Plate 1, Figs. 1, 3, 4)

Corbula operculata Philippi, 1848, Zeitschr. fur Malakozool., 13.

Varicorbula operculata Abbott, 1954, American Seashells, p. 456.

Notocorbula operculata Warmke & Abbott, 1961, Caribbean Seashells, p. 207, fig. 31h.

HANZAWAIA Asano, 1944

HANZAWAIA STRATTONI (Applin, 1925)

(Plate 1, Figs. 2, 5, 6)

Truncatulina americana Cushman, var. *strattoni* Applin, 1925, in: Applin, Ellisor & Kniker, Amer. Assoc. Petrol. Geol. Bull., 9, no. 1, p. 99, pl. 3, fig. 3.

Cibicides concentricus Phleger & Parker, 1951, Geol. Soc. America, Mem. 46, pt. 2, p. 29, pl. 15, figs. 14a, b, 15a, b.

Cibicidina strattoni Parker, 1954, Bull. Mus. Comp. Zool., 11, no. 10, p. 544, pl. 13, figs. 8, 11.

Hanzawaia strattoni Bandy, 1954, U. S. Geol. Surv. Prof. Paper 254-F, pl. 31, fig. 4.

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REFERENCES

Applin, E. R.

1925. Subsurface stratigraphy of the Coastal plain of Texas and Louisiana. In: Applin, Ellisor & Kniker, Bull. Amer. Assoc. Petrol. Geol., 9 (1) : 79-122.

Bandy, O. L.

1954. Distribution of some shallow-water Foraminifera in the Gulf of Mexico. U. S. Geol. Surv. Prof. Paper 243-F: 125-140.

1956. Ecology of Foraminifera, northeastern Gulf of Mexico. U. S. Geol. Surv. Prof. Paper 274-G: 179-204.

Cushman, J. A.

1920. Observations on living specimens of *Iridia diaphana,* a species of Foraminifera. Proc. U. S. Nat. Mus., 17: 153-158.

1921. Foraminifera from the north coast of Jamaica. Proc. U. S. Nat. Mus., 59: 47-82.

1922. Shallow-water Foraminifera of the Tortugas region. Carnegie Inst. Washington, Publ. 311: 1-85.

1941. Recent Foraminifera from Old Providence Island collected on the Presidential cruise of 1938. Smithson. misc. Coll., 99 (9) : 1-14.

Harry, H. W.

1966. Studies on bivalve mollusks of the genus *Crassinella* in the Northwestern Gulf of Mexico: anatomy, ecology and systematics. Publ. Inst. Mar. Sci., Univ. of Texas, 11: 65-89.

Langford, R. R.

1959. Distribution and ecology of Foraminifera from east Mississippi delta margins. Bull. Amer. Assoc. Petrol. Geol., 43 (9) : 2068-2099.

Murray, J. W.

1963. Ecological experiments on Foraminiferida. Journ. mar. biol. Assoc. U. K., 43 (3) : 621-642.

Parker, F. L.

1954. Distribution of the Foraminifera in the northeastern Gulf of Mexico. Bull. M. C. Z., 111 (10) : 453-588.

———————, Phleger, F. B. & Peirson, J. F.

1953. Ecology of Foraminifera from San Antonio Bay and Environs, Southwest Texas. Cush. Found. Foram. Res. Spec. Publ. 2:1-75.

Parker, R. H.

1960. Ecology and distributional patterns of marine micro-invertebrates, northern Gulf of Mexico, in: Recent Sediments, Northwest Gulf of Mexico, a symposium. Amer. Assoc. Petrol. Geol., Tulsa, Okla. 302-381.

Phleger, F. B.

1954. Ecology of Foraminifera and associated micro-organisms from Mississippi Sound and environs. Bull. Amer. Assoc. Petrol. Geol., 38(4):584-648.

———————, & Parker, F. L.

1951. Ecology of Foraminifera, northwest Gulf of Mexico, Pt. II. Foraminifera species. Geol. Soc. America, Mem. 46:1-64.

Todd, Ruth

1965. A new *Rosalina* (Foraminifera) parasitic on a bivale. Deep-Sea Res., 12:831-837.

EXPLANATION OF PLATE 1

Fig. 1. *Hanzawaia strattoni* (Applin) attached to posterior dorsal margin of *Notocorbula operculata* (Philippi). x 8.4.

Fig. 2. Close-up of posterior dorsal margin of the specimen of *Notocorbula operculata* shown in Fig. 1 x 21.

Fig. 3. *Hanzawaia strattoni* attached to the dorsal margin of a specimen of *Notocorbula operculata.* x 8.4.

Fig. 4. *Hanzawaia strattoni* attached to *Notocorbula operculata* near the posterior dorsal margin. x 8.4.

Figs. 5, 6. *Hanzawaia strattoni* (Applin). Specimen removed from the posterior dorsal margin of *Notocorbula operculata.* Fig. 5. Dorsal view. Fig. 6. Ventral view. x 38.