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THE FORAMINIFERA OF PORTO RICO.

BY

JAMES M. FLINT,

*Medical Director, U. S. Navy.*

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The foraminifera belong to the subkingdom Protozoa, class Rhizopoda; that is to say, they are among the simplest forms of animal life, consisting of a minute mass of protoplasm, or an aggregation of such masses, without organs or tissues, capable of protruding any part of the body in the shape of fine threads, which flow together whenever they touch, forming a granular network. They are aquatic, mostly marine animals, generally microscopic in size, and are inclosed in shells or "tests" composed either of calcium carbonate secreted by the animal, or of available foreign material, such as mud, sand, sponge spicules, or dead shells, united by a calcareous cement. A few species are pelagic, but the greater number of species live at the bottom of the sea.

The shells of recent foraminifera are found almost everywhere on the ocean bed, the exceptions being in the polar seas, and in the abysmal depths below about 2,500 fathoms where the shells seem to be dissolved in the dense waters. As fossils they are widely distributed and of great geological significance, since they are the source of all the chalk and much of the limestone all over the world. These calcareous strata are in process of formation at the present day, the same as in past geological ages.

There is but little on record regarding West Indian foraminifera. Few dredgings have been made in that vicinity, and fewer have been studied and reported. The *Challenger* records one dredging off Culebra Island, in 390 fathoms of water, from which 177 species of foraminifera were identified, showing that foraminifera are very plentiful in these waters in depths below the coral and above the abysses. The *Albatross* also found foraminifera in great variety and quantity along the northwest coast of Cuba.

The *Fish Hawk* expedition to Porto Rico obtained foraminifera by shore collecting at Ensenada Honda, Caballo Blanco, and Mayaguez, and with the dredge or tangle at the following seven stations:

Station No.	Locality.	Depth.	Bottom.	Instrument.
6053	San Juan Harbor, NW. angle of Morro Castle $\frac{1}{2}$ mile .....	<i>Fathoms.</i> 4 to 7 $\frac{1}{2}$	Finesand.	Dredge.
6079	Off St. Thomas, Sail Rock W. by N. $\frac{1}{2}$ N. 6 miles .....	20 23	Coral .....	Tangle.
6080	Off St. Thomas, Sail Rock NW. $\frac{1}{2}$ W. 4 miles .....	20	.....do .....	Dredge.
6086	Off Culebra, Punta Mula light-house SW. $\frac{1}{2}$ S. 8 $\frac{1}{2}$ miles .....	14 $\frac{1}{2}$	Coral, sand	Do.
6091	Off Vieques, Culebritas light-house NE. $\frac{1}{2}$ N. 10 miles .....	15	Coral .....	Tangle.
6092	Off Vieques Island, Culebritas light-house NE. $\frac{1}{2}$ E. 7 $\frac{1}{2}$ miles .....	16	.....do .....	Do.
6093	Off Culebra, Culebritas light-house NE. 5 $\frac{1}{2}$ miles .....	15	.....do .....	Do.

As will be seen, all the dredgings were in quite shoal water, with coral or coral sand at the bottom. The quantity of material gathered was generally quite small, yielding few foraminifera. Station 6093 furnished only 7 individuals, Ensenada Honda 6, Caballo Blanco 3, and Mayaguez only 2 or 3 exceedingly minute ones.

A considerable number of species is represented, but without exception the individual shells are below the typical size and appear to have been starved by the more vigorous corals among which they were found. The species best represented, both in numbers and development, are *Orbiculina adunca* and *Amphistegina lessonii*.

The following lists show, by families and stations, the species represented in the collection. Descriptions and figures of these species may be found in the Report of U. S. National Museum for 1897, under the title "Recent foraminifera; a descriptive catalogue of specimens dredged by the U. S. Fish Commission steamer *Albatross*."

## LIST OF FORAMINIFERA BY FAMILIES.

## Family LITUOLIDÆ:

*Ammodiscus incertus* d'Orbigny.

## Family TEXTULARIDÆ:

*Textularia gramen* d'Orbigny.  
*Clavulina parisiensis* d'Orbigny.  
*eocæna* Gumbel.

## Family MILIOLIDÆ:

*Biloculina levis* DeFrance.  
*bulloides* d'Orbigny.  
*Spiroloculina grata* Terquem.  
*Vertebralina insignis* Brady.  
*Miliolina linnæana* d'Orbigny.  
*seminulum* Linn.  
*bicornis* Walker & Jacob.  
*tricarinata* d'Orbigny.  
*reticulata* d'Orbigny.  
*venusta* Karrer.  
*bucculenta* var. *placentiformis* Brady.  
*angularis* Flint.  
*circularis* Bornemann.  
*Orbiculina adunca* Fichtel & Moll.  
*Orbitolites duplex* Carpenter.

## Family MILIOLIDÆ—Continued.

*Orbitolites marginalis* Lamarck.  
*Peneroplis pertusus* Forskal.

## Family LAGENIDÆ:

*Cristellaria cultrata* Montfort.  
*gibba* d'Orbigny.  
*Uvigerina pygmæa* d'Orbigny.

## Family GLOBIGERINIDÆ:

*Orbulina universa* d'Orbigny.  
*Globigerina bulloides* d'Orbigny.  
*sacculifera* Brady.  
*dubia* Egger.

## Family ROTALIDÆ:

*Pulvinulina menardii* d'Orbigny.  
*tumida* Brady.  
*Truncatulina rosea* d'Orbigny.  
*pygmæa* Hantkin.  
*precincta* Karrer.  
*Anomalina ariminensis* d'Orbigny.

## Family NUMMULINIDÆ:

*Polystomella striatopunctata* Fichtel & Moll.  
*Amphistegina lessonii* d'Orbigny.

## LIST OF FORAMINIFERA BY STATIONS.

- Station 6053: *Clavulina eocæna* Gumbel, *Biloculina levis* DeFrance, *Spiroloculina grata* Terquem, *Miliolina linnæana* d'Orbigny, *M. seminulum* Linn., *M. bicornis* W. & J., *M. tricarinata* d'Orbigny, *Orbiculina adunca* F. & M., *Orbitolites marginalis* Lamarck, *O. duplex* Carp., *Peneroplis pertusus* Forsk., *Cristellaria cultrata* Montf., *C. gibba* d'Orbigny, *Uvigerina pygmæa* d'Orbigny, *Orbulina universa* d'Orbigny, *Globigerina bulloides* d'Orbigny, *G. dubia* Egger, *Pulvinulina menardii* d'Orbigny, *P. tumida* Brady, *Truncatulina rosea* d'Orbigny, *T. pygmæa* Hantk., *Anomalina ariminensis* d'Orbigny, *Amphistegina lessonii* d'Orbigny.
- Station 6079: *Ammodiscus incertus* d'Orbigny, *Textularia gramen* d'Orbigny, *Clavulina parisiensis* d'Orbigny, *Miliolina seminulum* L., *M. reticulata* d'Orbigny, *M. venusta* Karrer, *M. bucculenta* var. *placentiformis* Brady, *Orbiculina adunca* F. & M., *Orbitolites duplex* Carp., *Amphistegina lessonii* d'Orbigny.
- Station 6080: *Clavulina parisiensis* d'Orbigny, *Miliolina linnæana* d'Orbigny, *Orbiculina adunca* F. & M., *Truncatulina precipincta* Karrer, *Amphistegina lessonii* d'Orbigny.
- Station 6086: *Vertebralina insignis* Brady, *Orbiculina adunca* F. & M., *Polystomella striatopunctata* F. & M.
- Station 6091: *Orbiculina adunca* F. & M.
- Station 6092: *Biloculina bulloides* d'Orbigny, *Miliolina linnæana* d'Orbigny, *M. reticulata* d'Orbigny, *Orbiculina adunca* F. & M., *Orbitolites marginalis* Lamarck, *Globigerina sacculifera* Brady, *Truncatulina pygmæa* Hantk., *Polystomella striatopunctata* F. & M., *Amphistegina lessonii* d'Orbigny.
- Station 6093: *Textularia gramen* d'Orbigny, *Orbiculina adunca* F. & M., *Orbitolites marginalis* Lam., *Globigerina bulloides* d'Orbigny, *Truncatulina pygmæa* Hantk., *Polystomella striatopunctata* F. & M.
- Ensenada Honda, Culebra Island: *Miliolina angularis* Flint, *M. circularis* Bornem, *Polystomella striatopunctata* F. & M.
- Caballo Blanco Reef: *Miliolina bicornis* W. & J., *Truncatulina rosea* d'Orbigny, *Pulvinulina tumida* Brady.
- Mayaguez: Collection consists of fine sand, with an occasional minute foraminifer.