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On a Manganese Nodule and *Perotrochus* Dredged from the Banks near the Izu Islands, Japan.

By

Hiroshi Niino

(Tokyo Fisheries University)

1. Introduction.

It is well known that there exists a series of banks srranged in northeast to southwest in direction on the western side of the Izu Islands, Shizuoka Prefecture, Japan. The northernmost bank is known as the Toshima Tai, the second one as the Torama Guri, and the third is called Hyotan Sho. These are separated from the submatine plantform of the Izu Islands by a channel more than 200 m in depth.

Each bank of the series has a significant flat and broad plain on its top and with inclination less than 2°. The outer margin of the flat surface abruptly descends to the deep sea floor, or in other words, the inclination of the slope of the banks is very steep.

During the years of 1953 to 1955, the training ship of the Tokyo University of Fisheries dredged 22 botton samples from those banks and their environs. It is noteworthy that a manganese concretion was obtained from a station on the alope of the bank and that shells of ***Perotrochus*** were collected from seven stations.

2. The Bottom Character of the Banks.

Although not confirmed, it is proesumed by the records of the echo sounding machine, that rocks are exposed on the steep slope around the banks. the dredged samples consisted mostly of attached organisms.

Gravels and coarse sand were dredged from the flat plain on the banks. the former are well water worn and frequently encrusted with such organisms as calcareous algae, bryozoa, sponges and etc. Of the gravels collected, several were selected at random for petrographical study and their thin sections were examined under the microscope.

Microscopic examination revealed that andesite and basalt were most common. The lithological characters of these volcanic rocks are common to those building the main islands of the Fuji Volcanic Zone.

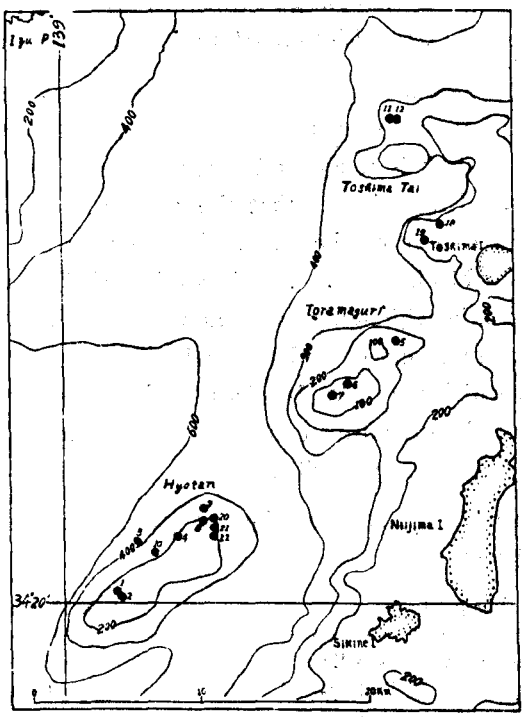


Fig. 1. Bathymetric feature of the banks.
The black spot shows surveying station.

Although the basement rock of the Banks were not obtained at the time of survey, it may be said that, if the gravels on the flat plain of the banks are derived from the basement, the lithological character of the banks may be the same as that of the main islands of the Fuji Volcanic Zone.

It is a noticeable fact that the Izu Islands near the banks above referred to, consist of liparite, thus their lithological characters show a marked contrast with that of the banks.

3. The Manganese Nodule.

The manganese nodules were dredged from St. 9, 34°23.1′ N, 139°05.3′ E, in 260 m depth at the northwestern slope of Hyotanguri, about 15 Km west of Niijima Island. The bottom sample consisted of the manganese nodule, gravels, deep sea corals, Bryozoa, Brachiopoda, calcareous Algae and Mollusca.

The gravels are covered with calcareous algae known as ***Lithothamnium***, and the surface of each gravel is well water worn. The largest gravel measured 5.9 cm in length, 3.5 cm in width and 1.8 cm in thickness, and its lithological characters are those of andesite.

The molluscan remains consisted of ***Tucetona shinhurosensis*** Hatai, Niino, and

Kotaka, ***Trichomusculus coralliophaga*** (Gmelin), ***Lima (Promantellum) basilanica*** (Adams and Reeve), ***Ctenoides annulatus*** (Lamarck), and ***Cymatium sp.***

The manganese nodules which were broken into several fragments at the time of collecting, measurd 5.9 cm in length, 3.5 cm in width, 1.8 cm in thickness and weighed 20 gr. The surface is rough and partly covered by encrusting bryozoa and test of annedlids. This indicates that the manganese nodule was exposed on the surface of the sea bottom of the bank. The nodules are very hard and its broken surface shows a black lustre. A thin section of the nodule observed under a microscope shows a thin white-gray layer at the surface. Tests of Foraminifera, sponge spicules, fragmente of fledspar and pyroxene are cemented by black manganese materials, which may also be observed in the inner side of the organic remains. The tests of the organisms consist of aragonite, but some parts of the test are replaced by manganese materills.

The results of chemical analyses of the manganese nodule according to Mr. Tatsumoto, is as follows:

6-N HCl soluble part			6-N HCl insoluble part	
Total oxide	Fe_2O_3, Al_2O_3	2.88%	SiO_2	1.80%
	MnO_2	58.34%	Al_2O_3+Mgo etc	0.34%
	CaO	6.55%		

On the surface of dead shells are found a thin layer of black coated material, which is spread only on one side of the shell, that is to say, that which lies on the sea bottom. The result of chemical analysis of the black layer revealed a moderate content of manganese, viz., Fe_2O_3, Al_2O_3 1.7%, CaO 40.2%, MnO_2 4.5% (6-N HCl soluble part). If the percentage of CaO originated in the shell itself, the percentage of MnO_2 in the coated layer is a little too high. It is uncertain whether the manganese nodule was deposited in situ, but it is certain that the manganese materials were deposited on the bottom of the bank.

Manganese nodules are frequently obtained from the deep sea, but in the present case it was collected from a shallow sea bottom on the bank.

4. ***Perotrochus (Mikadotrochus) beyrichi*** (Hilgendorff).

Gastropods belonging to the above stated genus are rare in the present seas and are known as "living fossils". There are several species recorded from and rarely obtained in the deep seas around Japan. Previously, the writer recorded a species from the Miocene deposits of Izu Peninsula, Shizuoka Prefecture[1].

From a total of seven stations, many specimens of ***Perotrochus beyrichi*** were obtained from clean sea bottoms, as shown in the following:

Station	North latitude	East longtude	Depth (in m)	Gravel	Calcium concretion	Coarse sand	Name of Bank
St. 2	34°20.2′	139°02.8′	134	R	A	—	Hyotan

St. 5	34°28.4′	139°12.8′	120	A	—	A	Torama
St. 6	34°27.1′	139°11.0′	104	A	A	A	Torama
St.12	34°35.3′	139°13.4′	88	A	A	—	Toshima
St.20	34°22.5′	139°05.8′	160	A	A	A	Hyotan
St.21	34°22.5′	139°05.8′	160	A	A	A	Hyotan
St.22	34°22.2′	139°05°8′	128	A	A	A	Hyotan

Remarks: A-abundant, R-rare. Organisms are very abundant, viz., calcareous algae, deep sea corals, brachiopods, bryozoas, sponges, etc.

Each dredged sample contained dead shells or fragments of ***Perotrochus veyrichi***, and in the sample form St. 12 was found a perfect living specimen, and from St. 21, an imperfect specimen of a very young living gastropod. The specimen from St. 12 measures 45 mm in height, 47 mm in width and 8 mm in diameter of operculum. The one from St. 21 is more or less broken at the lip, but still preserves the characteristic slit. This seems to be the first record of a young living specimen of ***Perotrochus*** in the world, and it is regretted that it was broken at the time of dredging.

The Kuroshio, the warm current extends throughout the surveyed area, sometimes attaining more than 7 miles perhour. The sea water temperature is very warm, for example, on October 23 rd, 1954, the surface temperature at St. 8 was 23.6^{cw}, and even at 100 meters depth it was recorded at 20.3°C.

The bottom character and associated fauna of the stations where the shells of ***Perotrochus beyrichi*** were dredged are quite the same, therefore, it is certain that they lived on those banks. The following lists are the specific names of the molluscs found in association with ***Perotrochus***, namely:—

Station 2.

Perotrochus (***Mikadotrochus***) ***beyrichi*** (Hilgendorf)
Bolma sp.
Bufonariella ranelloides Sowerby
Chicoreus sp.
Tucetona hanzawai (Nomura and Zinbo)
Limopsis tajimae (Yokoyama)
Miratacar uwaensis (Yokoyama)
Plicatula muricata (Sowerby)
Pecteu albicans (Shröter)
Spondylus acanthus Mawe
Lucinoma spectabilis (Yokoyama)
Vasticardium sp.

Station 5.

Boluma sp.
Bittium sp.
Capulus sp.

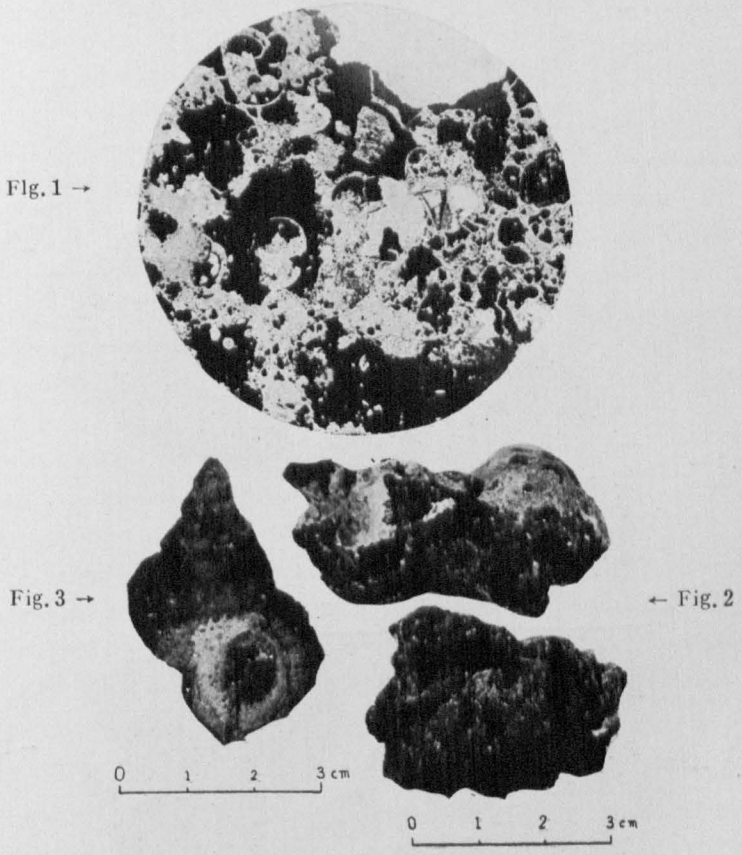
Limopsis tajimae Sowerby
Limopsis cumingi A. Adams
Tucetona shikurosensis Hatai, Niino and Kotaka
Tucetona hanzawai (Nomura and Zinbo)
Samarcar pacifica (Nomura and Zinbo)
Acar congenita (E. A. Smith)
Barbatia tenella (Reeve)
Septifer keenae Nomura
Mallens irregularis (Jousseaume)
Plicatula muricate (Sowerby)
Chlamys lemnicate (Reeve)
Aequipecten vesiculosus (Dunker)
Spongylus anacanthus Mawe
Pycnodonta musashiana (Yokoyama)
Crassatellites sp.
Venericardia kiinsis (Sowerby)
Glans sp.
Lucinoma spectabilis (Yokoyama)
Chama sp.

In conclusion the wtier wishes to express his sincere thanks to Dr. Kotora Hatai for his kind halp.

Reference

1) S. Nomura and H. Niino, Fossil Mollusca from Izu and Hakone. Sci. Rep. Tohoku Imp. Univ., Ser. 2, Vol. XV, No. 3, pl. XII, 1932.

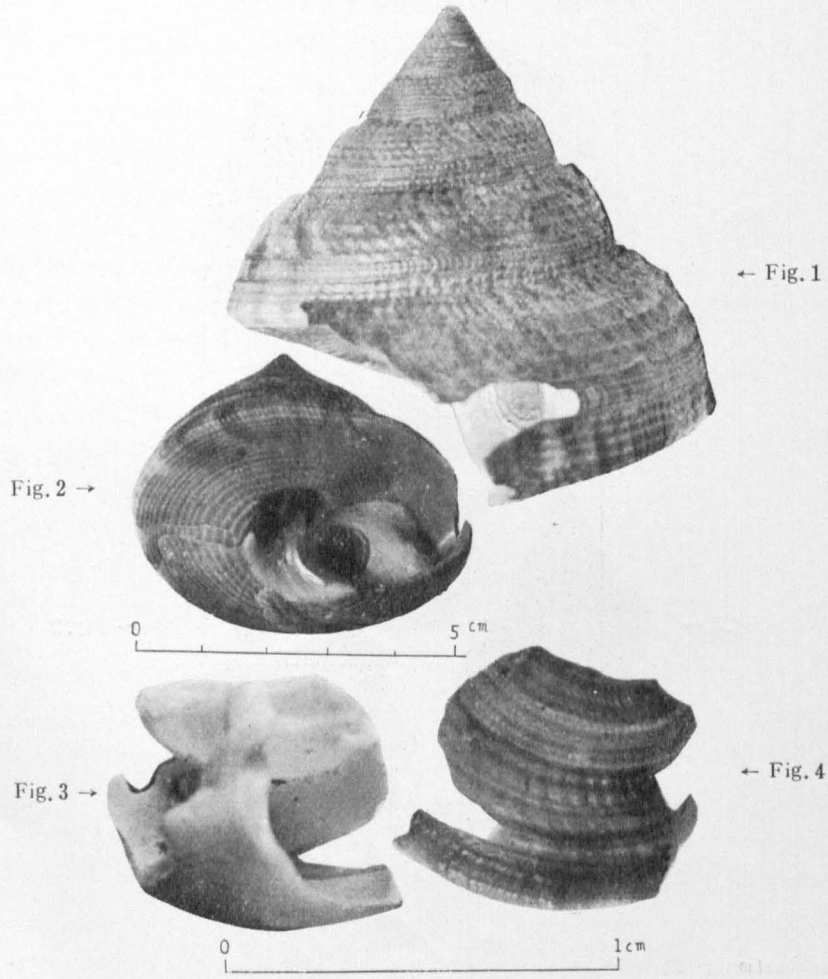
Plate I.



Explanation to Plate I·

Figure 1. Photomicrograph of the thin section of manganese nodule. Locality St. 9. x 30.
Figure 2. External view of the manganese nodule partly covered with Bryozoa. Locality St. 9.
Figure 3. A thin black layer covering the surface of the dead shell of *Cymatium* sp. Locality St. 9.

Plate II.



Explanation to Plate II.

Figures 1, 2. *Perotrochus* (*Mikadotrochus*) *beyrichi* (Hilgendorf). Locality St. 12.
Figures 3, 4. A broken shell of a young specimen of *Perotrochus* (*Mikadotrochus*) *beyrichi* (Hilgendorf). Fig. 3 External view of the specimens. Fig. 4 Inner view the specimen.