

VIII. SEDIMENTS ON THE SHINKUROSE BANK AND IN ITS VICINITY

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Introduction

To the northeast of Hachijojima Island, which is 290 km south of Honshu, there are some banks called Shinkurose, Kitakurose, and Nakakurose. These banks lie in the path of the "Kuroshio" current and are good fishing areas.

During cruise GH80-4, the area was surveyed geologically and geophysically, and many sediment samples were obtained. The samples comprise 81 grab samples, 64 core samples, 17 dredge samples and 2 drilled core samples.

The results of this survey show that the sediment distribution on and around the Shinkurose Bank is influenced by the Kuroshio current. This fact is supported by the results of the mud-temperature analyses and sea-floor photographs. The depth of the current is now estimated to be as deep as 1000 m, which is deeper than previously thought.

Method

Sampling tools were decided on the basis of the result of seismic records. Rock-coring was used where there was a rocky bottom or where long sediment cores were not necessary. The dredge was used where the slope was relatively steep or where rock samples were necessary. In other cases, a Smith-McIntyer grab sampler was used. The drilling machine was used only at some geologically important sites to take rock cores. All sampling sites are shown in Figure I-3 of Chapter I.

The sediments in the grab sampler were all photographed, the temperature of the sediments was measured, and short core samples were extracted from the sediments in the grab. These cores were described and then Soft-X radiographs were taken. The remainder of the grab sample was sieved and described.

Results

The results of sampling work are shown in Figure VIII-1. The nature of the sea bottom in the surveyed area is divided into the following five types: 1) rocky bottom, 2) gravelly bottom, 3) sandy bottom, 4) muddy sand bottom, and 5) muddy bottom.

1. Rocky bottom

Nearly the whole of the top of the Shinkurose, Kitakurose and Nakakurose Banks, east of the "Kurose Hole" and north and east of Hachijojima Island, are rocky. The seafloors here are composed chiefly of limestone, pumice and other volcanic rocks. Sometimes the samples contained only organisms which live on the rocky surface instead of the rocky bottom itself, in which case

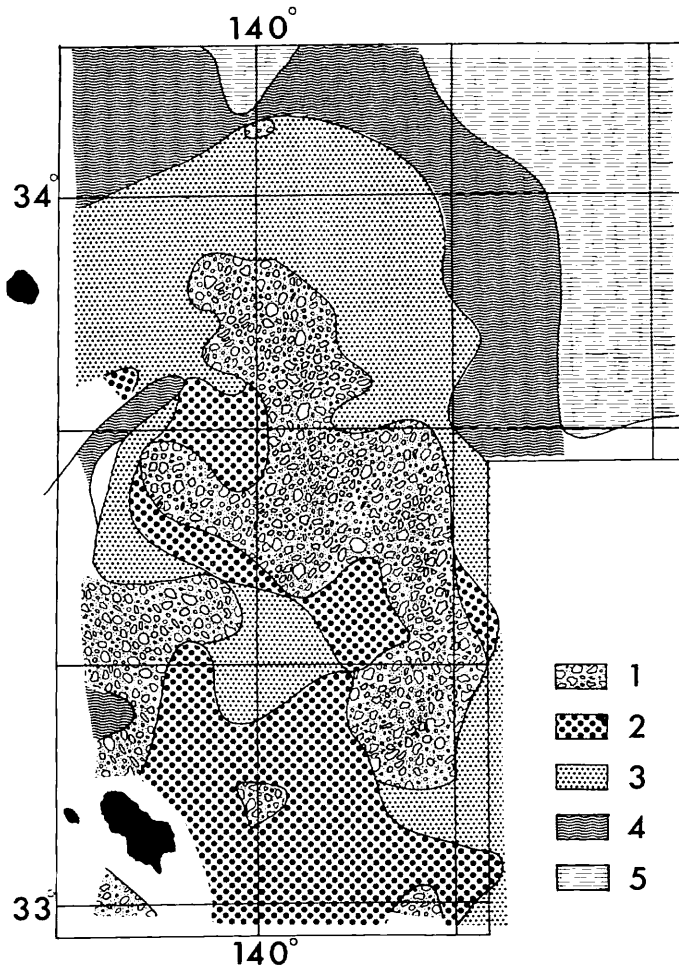


Fig. VIII-1 Distribution of bottom materials. 1: rocks, 2: gravels, 3: sand, 4: muddy sand, and 5: mud.

recognition of the type of rock was made from the sea-bottom photographs which were taken simultaneously with the attempt to sample the sediment.

2. Gravelly bottom

The areas of rocky bottoms around the Shinkurose and Nakakurose Banks and to the east of Hachijojima Island are surrounded by areas with a gravelly bottom. The two types of gravelly bottom which occur are chiefly calcareous and volcanic gravels.

3. Sandy bottom

Around the rocky or gravelly areas of the banks, there exist fine to coarse-grained sandy areas. The sediments are well sorted in general, and many ripple marks are observed in sea bottom photographs. The composition of the sand is

chiefly volcanic and biogenic and crystal sands are also observed. In general, content of Foraminifera is relatively higher than in other areas. Scoriaceous volcanic materials are often found in cored samples.

4. Muddy sand bottom

Areas of muddy sand are distributed around the sandy areas. In some places white, glassy tuffaceous layers were found in the muddy sand 5 to 10 cm beneath the surface.

5. Muddy bottom

In the north and northeast of the surveyed area, the bottom sediments are composed of mud. Here, too, there is a white, glassy tuffaceous layer 5 to 10 cm below the surface of the mud.

Mud temperature

Figure VIII-2 shows the distribution of mud temperatures in the surveyed area. The mud temperatures are low in the areas of muddy bottom, which are in the northeast of the surveyed area, and are high to the northwest of the Kitakurose Bank, and to the west of the Shinkurose Bank.

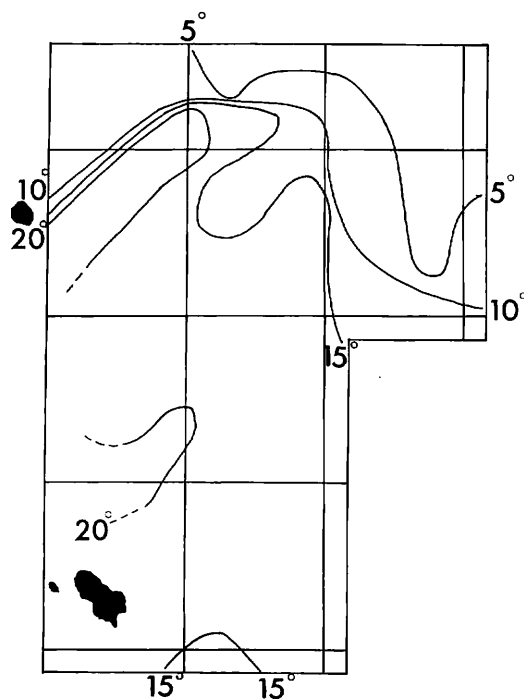


Fig. VIII-2 Distribution of mud temperatures.

Discussion

The main components of the sediments in the surveyed area are scoriae and pumice, calcareous biogenic fragments, clastic sands and muds.

Sediment from volcanic eruptions might have come from the volcanoes of Miyakejima Island, Mikurajima Island, Hachijojima Island and from submarine volcanoes.

It is unreasonable to assume that calcareous biogenic fragments and clastic sands were transported in suspension by air or by water, so the source of these sediments must be the nearest banks. As shown in the analysis of the sea bottom photographs, however, the relatively shallow tops of the banks are now covered by benthic organisms, so it is difficult to establish that they are the origin of the clastic sediments. It would be necessary for the tops of the banks to have been shallower and a part of the banks to have been at sea level for them to have been a source of sedimentary materials. This would probably have been the case during the lower sea levels of glacial times. As the banks are well below sea level at the present time, sediment supply would only be from nearby volcanic eruptions and suspended matter, and therefore sedimentation would be intermittent or very slow.

On the other hand, judging from the sea-bottom photographs and the sorting of sediments, a part of the sand is now being reworked and the sorting effect is still going on.

It is believed, therefore, that the modern sediments in this area are muddy sediments, which are distributed in the north and northeastern parts of the area, and sands and gravels, which come from nearby volcanoes.

It is reasonable to assume that one of the main factors affecting sediment dispersal is the Kuroshio current, and that wave action is not significant, because the maximum depth at which sand is being transported is greater than that of wave base.

The maximum depth of the current is estimated to be as much as 1000 m, since this is shallower the depth at which mud is deposited. This is deeper than expected, but it is reasonable considering the results of recent observations on the Kuroshio current.

Summary

The composition and distribution of the bottom sediments on and around the Shinkurose Bank are described in this paper. The modern sediments in this area are muddy sediments with some volcanogenic sediments. Sedimentary dispersion is influenced by the Kuroshio current which flows down to a depth of 1000 m.