Near-Shore Sediment Distribution Around Cape Sable Island, Nova Scotia, Canada*

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Cape Sable Island is located approximately 185 miles southwest of Halifax at the southern tip of Nova Scotia (Fig. 1). At the so-called Northeast Point, the island is connected to the mainland by a causeway that was built in 1949. The Bay of Fundy opens on the west and northwest of the island, and to the south and southeast lies the Atlantic Ocean. Most of the island is covered by Pleistocene glacial debris, and bedrock outcrops are scanty. The bedrock consists of slates and quartzites of the Meguma group (Ordovician ?) on the eastern half, and granites (Devonian) on the western half of the island.

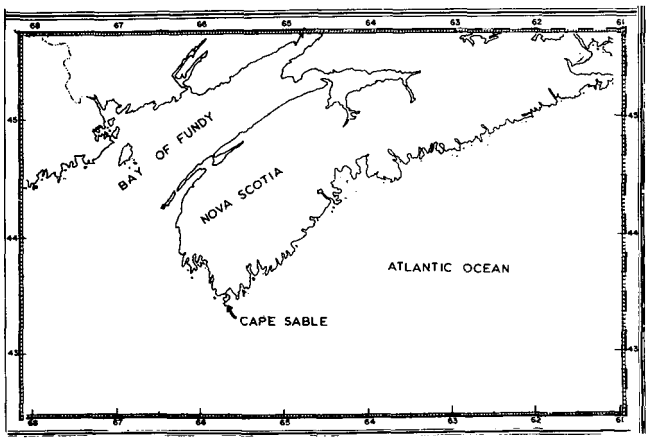

Figure 1. Index map. Arrow points to location of study area.

There is a contrasting difference in the morphology of the eastern and western coastline of the island. The eastern side is marked by sand dunes, and intertidal sand flats. By contrast, the western part of the shoreline is marked by residual glacial boulders. South of the island and separated from it by a lagoon, is the Cape sand bar. The framework elements of this island are isolated till masses, which have been joined by means of sand and pebble deposition. The whole bar comprises a tombolo series.

A 40-foot Cape Island boat was used for the bottom sampling program and, to date, nearly 250 offshore stations have been sampled. The samples were obtained by either a Dietz-Lafond snapper or a van Veen grab sampler. The sampling grid is based on a half-minute spacing both in longitude and latitude. Continuous seismic profiling is to be carried out in the near future. At some stations, samples could not be retrieved despite many attempts. This may be attributed to occurrences of coarse gravelly bottom sediments or bedrock. In the absence of sub-bottom profiles, no attempt was made to differentiate between bedrock and residual gravel bottom. All stations from which samples were not retrieved are assumed to be located over non-depositional sites.

The offshore work was carried out in depths ranging from less than one fathom to a maximum of 15 fathoms (Fig. 2). Bathymetrically, the area can be divided into two main parts: the northern half comprising Barrington Bay and Barrington Passage; and the southern half which connects the two bays to the Atlantic Ocean. The southern half of the area has a greater average depth (deeper than six fathoms). In the lower western part of Barrington Passage, many shoals and ledges are present. Of the two shoals south of the Cape, the one further to the west is a linear structure. The long axis of this structure is oriented in a north-south direction, possibly parallel to the direction of the last glacial advance.

The offshore area around Cape Sable Island can be divided into two parts on the basis of sediment distribution. Barrington Bay and Barrington Passage are characterized by depositional facies, the sediments being various mixtures of gravel, sand and mud. The southern and southeastern part of the area under investigation is characterized by non-depositional or residual type sediments, mostly gravels. Within this latter area, deposition of sand takes place in a small, relatively deep area between the two shoals south of the Cape(Fig. 3).

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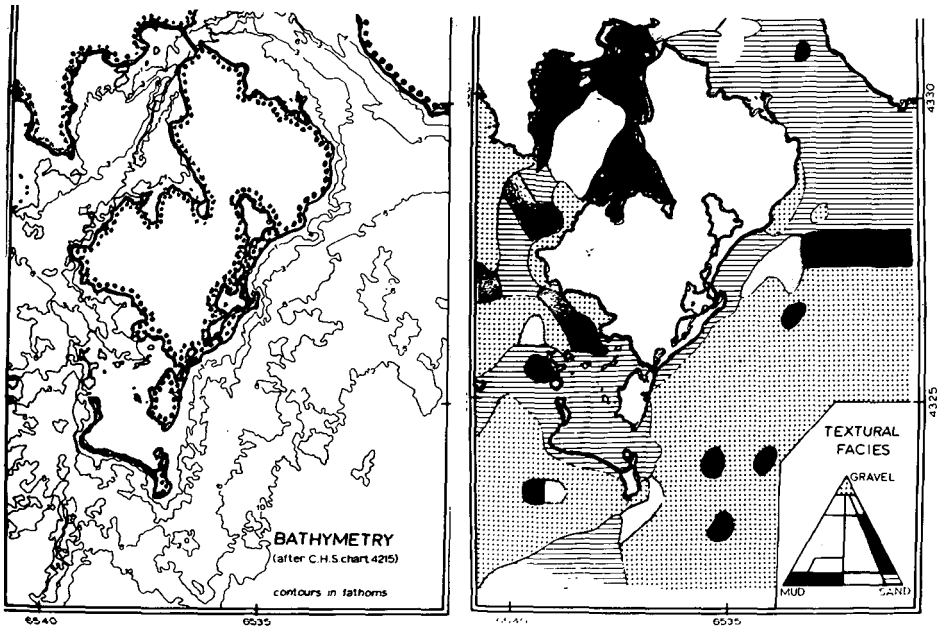

Figure 2.(left) Bathymetry of area around Cape Sable Island, N.S.

Figure 3.(right) Textural facies of bottom sediments, Cape Sable Island, N.S.

Sand is the main deposit of the area, occupying most of the northern part of Barrington Bay, a small central part of Barrington Passage, and flanking the sandy beaches on the eastern side of Cape Sable Island. In addition, sand is also deposited in the intertidal Hawk Lagoon. The sands are generally well sorted with practically no admixtures of gravel and mud. The depositional areas of muddy sands are the upper parts of Barrington Bay and the central parts of Barrington Passage. Smaller areas of gravelly sand occur in the southeast, but their extent is not sufficiently known. A band of gravelly sand has been located in Barrington Bay. It seems to form a delta-type deposit which merges into the gravelly sediments of the bay floor further to the south. Gravelly muddy sands have been encountered in the upper central part of Barrington Bay. The upper parts of Barrington Passage are sites of mud deposition. Mud is also deposited in the upper parts of Barrington Bay.

South of the Cape, between the shoals and at a depth of six fathoms, sands consisting of approximately 60 per cent mineral grains and 40 per cent shell fragments were found. The mineral grains are in the size range from 1/2 to 1 mm in diameter, the shell fragments range in size from 1 to 2 mm. Both fractions are well sorted in themselves.

The colour of the "muds" is usually black and mostly they contain considerable amounts of organic material. To date only three of these samples were analyzed which contained approximately 90 per cent of silt and clay size fractions. These samples were all collected in the Barrington Passage area. In all the other "mud" samples the content of the -62μ grain size fraction was considerably lower.

The gravels are composed mainly of granite pebbles, as well as slate and quartzite pebbles. The latter two are almost certainly derived from the Meguma Group. This gravel represents a residual facies, that is, the pebbles are washed, residual, coarse material from parent glacial debris. The pebbles are well rounded, and are commonly encrusted with algal material (lithothamnion).

The results of the preliminary survey show a wide variety in the textural composition of the bottom sediments around Cape Sable Island. Various lithologic units reflect differences in the hydrodynamic regime of the bottom currents of the area. To date no successful bottom current measurements have been made. Preliminary results obtained with a Kelvin Hughes direct-reading current meter appear to be ambiguous. A new attempt to measure and record the bottom currents will be made in the near future. For this purpose self-recording current meters moored to the ocean bottom will be used. The observation time at each station will be extended to 29 days. This survey is expected to provide the data from which a regional picture of the hydrodynamic energy pattern and its changes can be derived. Subsequently an attempt will be made to correlate this pattern with the various bottom sediments of the environments around Cape Sable Island.

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