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# Geologic Process Investigations of a Beach-Inlet-Channel Complex, North Inlet, South Carolina*

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The coastal area adjacent to North Inlet, Georgetown County, South Carolina, is ideal for the study of short-term geological and geochemical variables because it is relatively unaffected by man's activities. Climatic factors, physical and chemical characteristics of the tidal prism, substrate composition, bedform morphology, and beach and inlet processes are being currently investigated. In addition, the relationship of some biota to the physical environment will be integrated into the eco-geologic synthesis. The results of this study may be used to: (1) formulate effective coastal zone management policies, and (2) develop a model study program that could be utilized in similar investigations for obtaining "baseline" geological and geochemical information. The methodology that is being developed will be applicable to a variety of areas, but the specific results obtained at North Inlet will be characteristic only of similar areas in the southeastern United States.

The area (Fig. 1) has been subdivided into the following four units: (1) beaches, (2) the inlet and adjacent nearshore areas, (3) tidal channel bottom, mudflats and marshes, and (4) the tidal prism itself.

Since field research began in June, 1972, cycles of beach erosion and deposition have been monitored at three profile localities south of the inlet, and seven north of the inlet on Debidue Island. Profiles were surveyed using the horizon method (Emery, 1961). The erosive dune scarp was present at the start of field observations, and ridge-and-runnel systems were well developed on Debidue beach. The landward ridge migration is illustrated by five successive summer profiles (Fig. 2). Future work will include a comparison of past hydrographic surveys, which are available as far back as an 1878 edition, and of air photos to determine rates of beach recession.

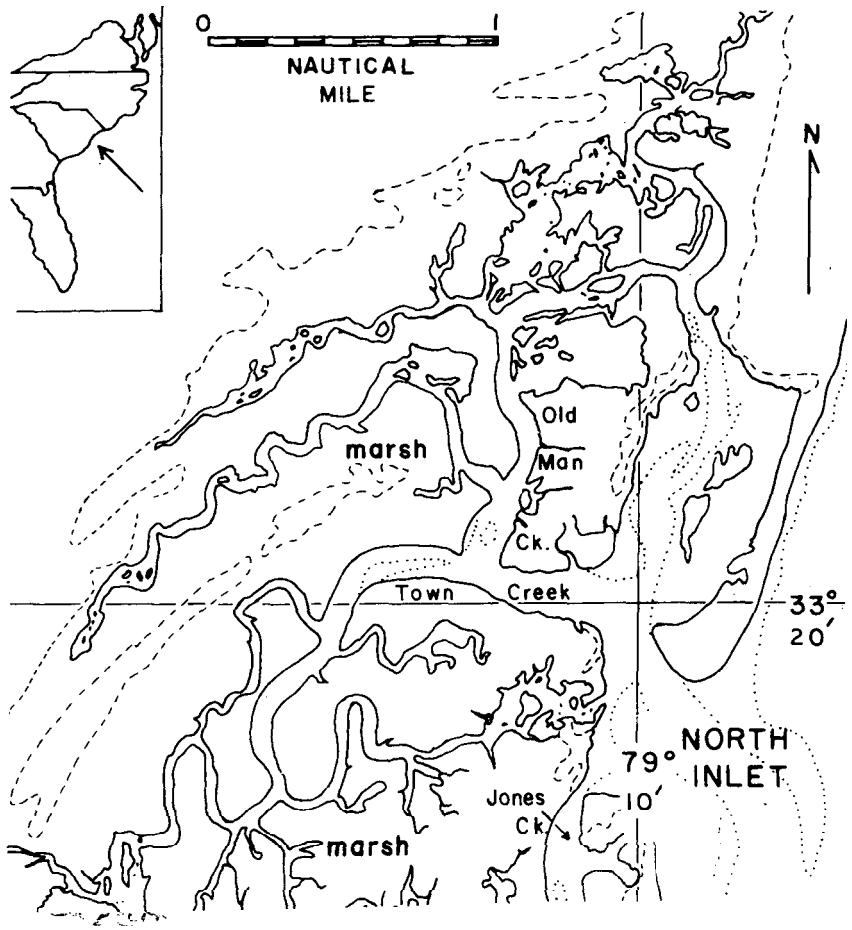


Figure 1: North Inlet and vicinity (after U,S.C. and G.S. Chart No. 787, 1970).

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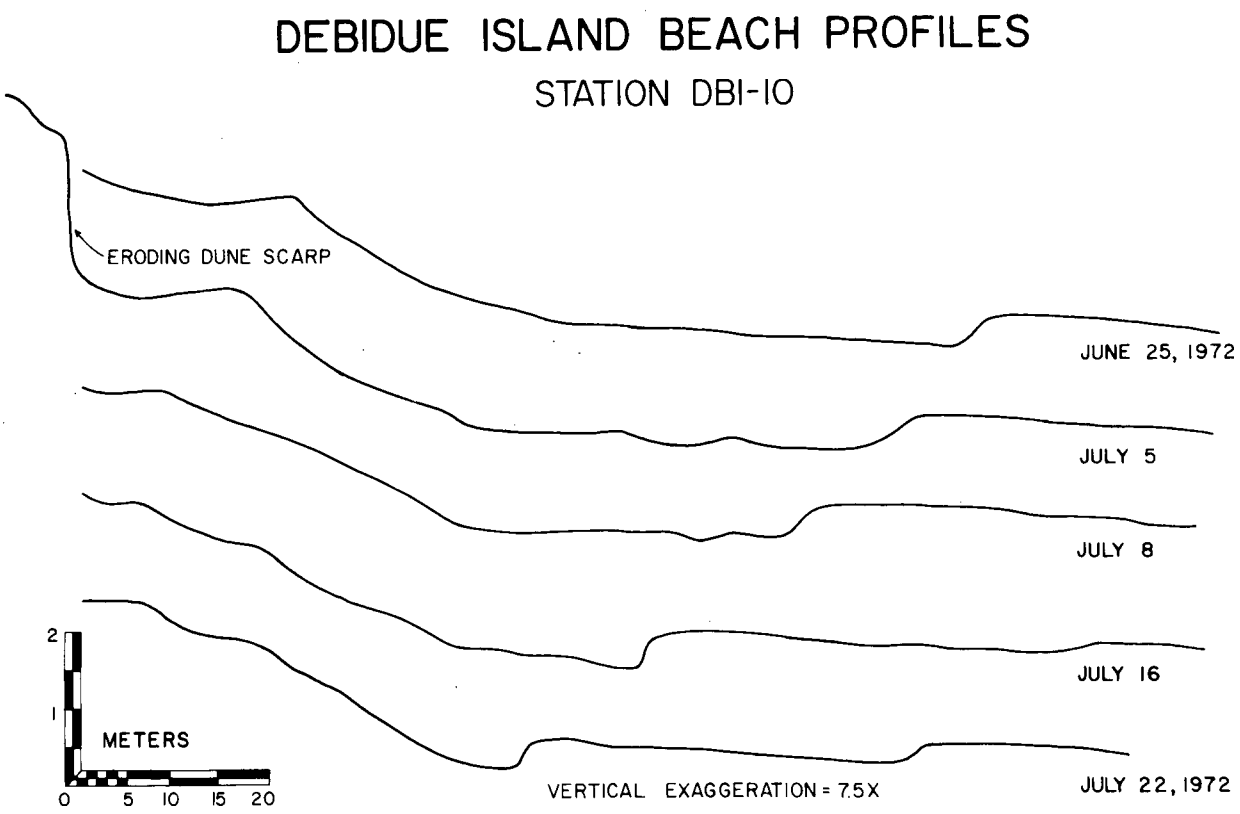


Figure 2: Beach profiles north of the Inlet.

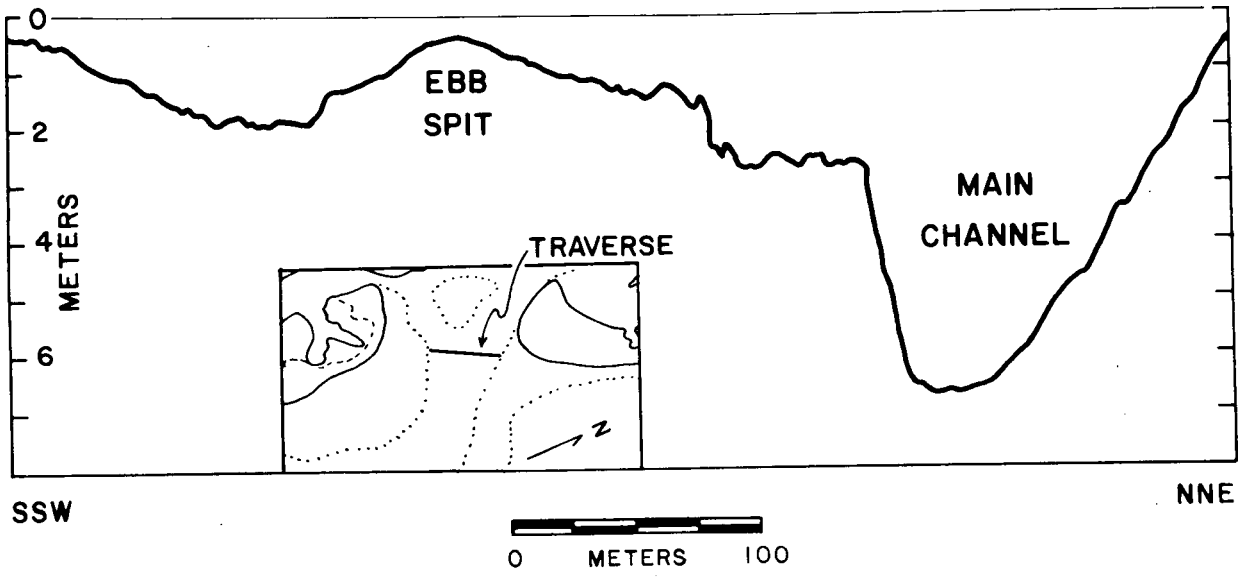


Figure 3: - A fathometer traverse across North Inlet; inset same sacle as Fig. 1.

Measurements of breaker height, air and water temperature, wind velocity and direction, wave period, breaker type and longshore drift are made each time profiles are run and additionally at other times. Use of flourescein dye has indicated that the dominant drift is to the south. A northerly drift has been observed just south of the inlet that may be the result of wave refraction around the ebb-tidal delta. Dyed sand experiments are planned to give additional information on sediment transport along these beaches.

Although no development is contemplated on this shore because the North Inlet area and adjacent beaches are held by a private foundation, this investigation already indicates the unsuitability of this beach for permanent structures. Studies during the next twelve months will further evaluate seasonal cycles of beach change, and in particular storm effects will be monitored both by ground observations and aerial photographs.

Fathometer profiles at the inlet show the main channel to be on the northeast side (Fig. 3). Landward of the inlet, tidal flow runs primarily along the south side of Town Creek (Fig. 1). The main flow through Jones Creek closely follows the northwest bank and the south side of the flood-tidal delta near the inlet. Much of the channel bottom near the inlet is sandy and contains abundant oyster shell, *Crassostrea virginica*. The south side of the ebb spit of the flood-tidal delta is completely paved with oyster shells, probably the result of differential sorting by tidal currents. The shells are derived from reefs and the oyster growth on the muddy, intertidal zones of the creek banks.

Mean tidal range at North Inlet is 1.4 m. Results of hydrographic work run over tidal cycles of 13 hours show no temperature or salinity stratification. There is no major fresh water influx to the tidal channels. Summer water temperatures ranged from 26.5°C to 29°C, and sampling at any one station shows that variation with depths up to 8 m rarely exceeded a few tenths of a degree Centigrade. Measurements in October of 1972, made after a week of cool weather when air temperatures dropped to 4.0°C, gave water temperatures of 15.5°C to 16.1°C.

Salinity values for the summer show a similar, restricted set of values ranging from 32.5°/oo to 34.0°/oo. Vertical variation rarely exceeded 0.80°/oo at any one station, with one exception where rainfall may have diluted surface water. It was thought that brackish water from adjacent Winyah Bay may reach the ocean through North Inlet, but this has not been detected.

The waters at North Inlet carry substantial suspended matter, both organic and inorganic. Secchi disc extinction depths usually range from 0.6 m to 1.2 m, depending on tide stage, wind conditions and locality. With a flooding spring tide at locations near the inlet, extinction depths of 1.8 m to 1.9 m have been recorded, indicating the presence of clearer ocean water. A turbidimeter, which measures light attenuation over a 10-cm light path, has been used as an indication of total turbidity. Transmittance ranges from 40% to 50% for ebb flow from small completely marsh-enclosed creeks, to values of 80% to 90% for flooding ocean water. The light beam is attenuated due to both absorption and scattering by water molecules, and by naturally occurring suspended material. An attempt is being made to correlate turbidimeter readings with Secchi disc results and actual suspended sediment determinations from over forty litre-volume water samples.

Many of the physical and chemical characteristics mentioned above, in addition to pH and dissolved oxygen, have been measured over complete thirteen-hour tidal cycles. In some cases, stations have been reoccupied for both neap and spring tides. Tidal current velocities and direction are significant parameters in the nearshore zone, and these have been measured hourly at one-metre depth intervals during complete tidal cycles. Maximum ebb and flood tidal velocities measured in the main channel north of the inlet reached 68 cm/sec. At the junction of Town and Old Man Creeks (Fig. 1), where water depths reach 8.6 m, flood currents with velocities of 75 cm/sec were measured.

Work in progress in the North Inlet area includes continued monitoring of all the above variables throughout the year to detect seasonal changes. Twenty-four hour stations are planned, as well as experiments to study the surface and bottom distribution of potential pollutants. Mapping of ebb and flood-tidal deltas and recurved spits at the inlet is continuing.

Before development commences, a lead time of at least a year usually exists in the planning of major industrial, residential or municipal projects affecting the coastal zone. An aim of this work is to develop a compact, programmed plan of field investigation to be applied in similar areas during a one year time period. Maximizing return of critical data for a given expense is an important consideration. The large amount of data being gathered over approximately a two-year time span will be used to formulate the "baseline" geologic study plan.

## References cited

EMERY, K.O., 1961, A simple method of measuring beach profiles. Limnology and Oceanography, v. 6, p. 90-93.