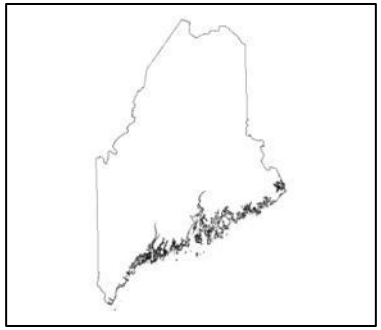
Maine Geologic Facts and Localities

May, 2004

An Underwater View of the Gulf of Maine Sea Floor



Text by
Stephen M. Dickson

Introduction

The coast of Maine has 5600 kilometers (3480 miles) of tidally influenced shoreline and is the fourth longest in the United States (Figure 1). There are about 3500 islands included in the shoreline length. State submerged lands extend from the low-tide line a distance 5.56 kilometers (three nautical miles) offshore. The sea floor below the Territorial Sea is some 1080 square kilometers (2800 square miles) or about 9% of the land area of the State of Maine.

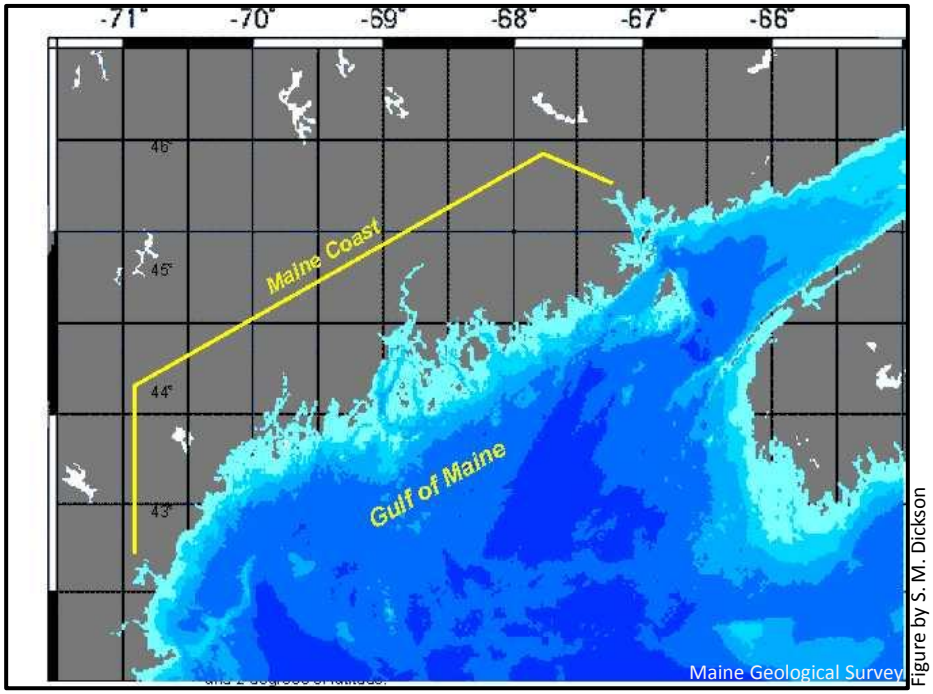


Figure by S. M. Dickson

Figure 1. Coast of Maine with a very irregular shoreline due to the influence of the underlying bedrock structure. Shallow depths (light blue) show the continuing influence of bedrock on the bathymetry of the sea floor of the Gulf of Maine.

Sea-floor Relief

The ocean floor along the Maine coast is as rugged as the shoreline itself. The hills and valleys seen on land are influenced by the bedrock structure underlying the State of Maine. In a similar manner, the sea-floor relief - or bathymetry - mimics the bedrock structure (Figure 2).

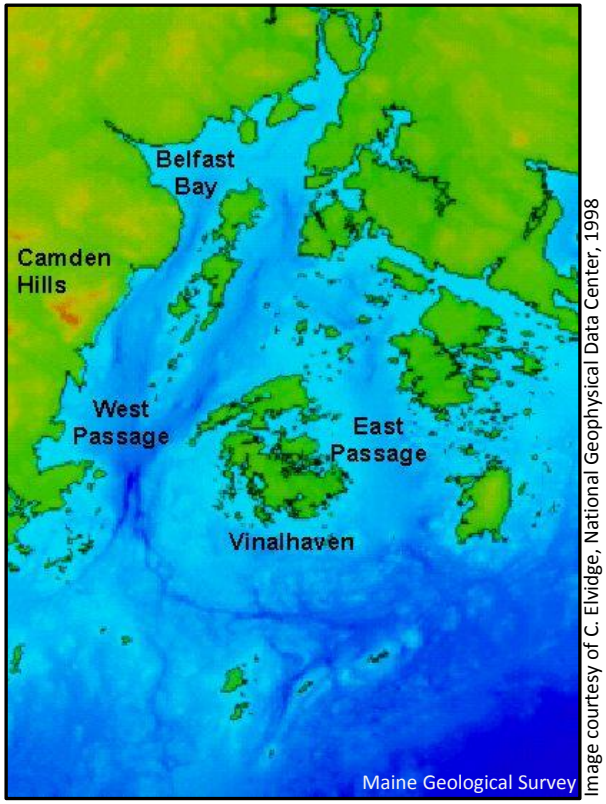


Figure 2. The coastal relief in and around Penobscot Bay shows deep sea-floor areas very close to the shoreline. Parts of the West Passage are over 130 meters (425 feet) deep (dark blue).

Sea-floor Relief

Relief along the inner continental shelf can easily reach 100 meters (over 300 feet) and often this relief is not far from the shoreline (Figure 3). The limited abundance of area deeper than 90 meters (300 feet) is an artifact of limiting the analysis to shallower water depths.

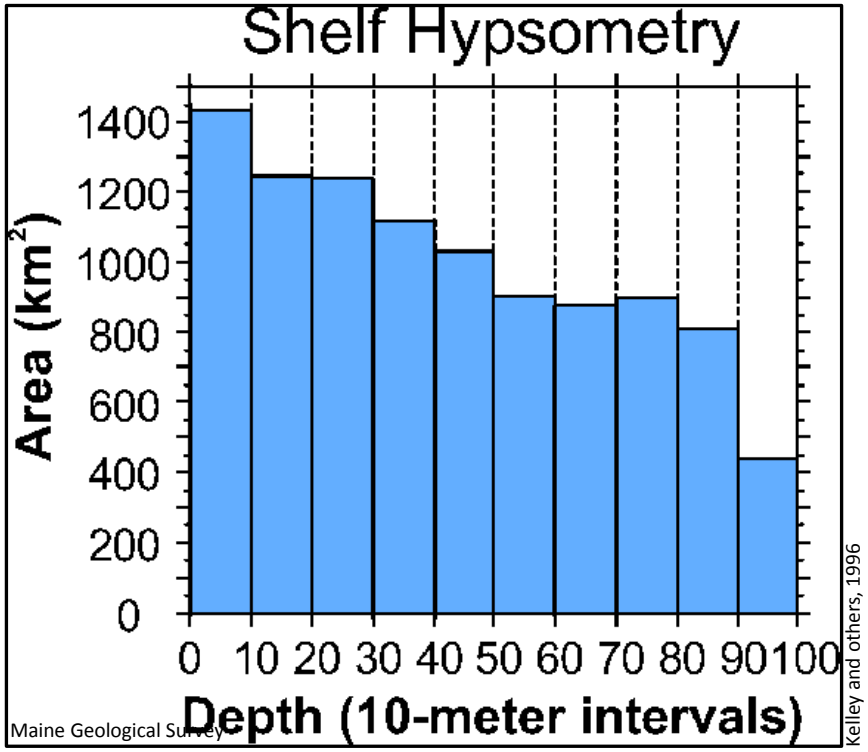


Figure 3. A graph of sea-floor area in coastal Maine shows that the largest area is composed of shallow water (less than 10 meters or 33 feet deep). Values are derived from Maine Geological Survey maps in the series Surficial Geology of the Maine Inner Continental Shelf (Barnhardt and others, 1996), and summarized further in the MGS publication The Seafloor Revealed (Kelley and others, 1998).

Sea-floor Geology

The sea-bed geology of Maine's inner continental shelf is primarily a complex mosaic of bedrock exposures (Figure 4) and muddy basins (Figures 5).

Photos by Maine Geological Survey

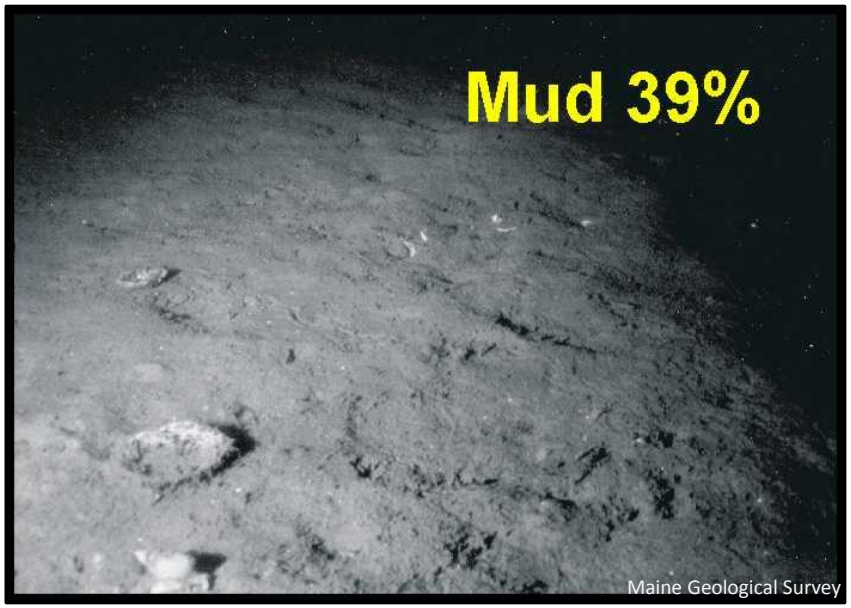


Figure 4. (Left) Rocky sea floor is the dominant geologic type on Maine's inner continental shelf. In many areas the bedrock is mantled with boulders. Fine sediment and organisms commonly cover the rocky outcrops. (Right) Muddy sea floor is very common on the inner continental shelf of Maine. Often the sea bed is uneven due to burrows and tracks of animals. Shells and occasional pebbles are common across the bottom.

Sea-floor Geology

Rocky sea floor is dominant in water depths less than 50 meters. Muddy sea floor is dominant below 50 meters. Together, these two geologic categories account for 4/5ths of the sea floor.

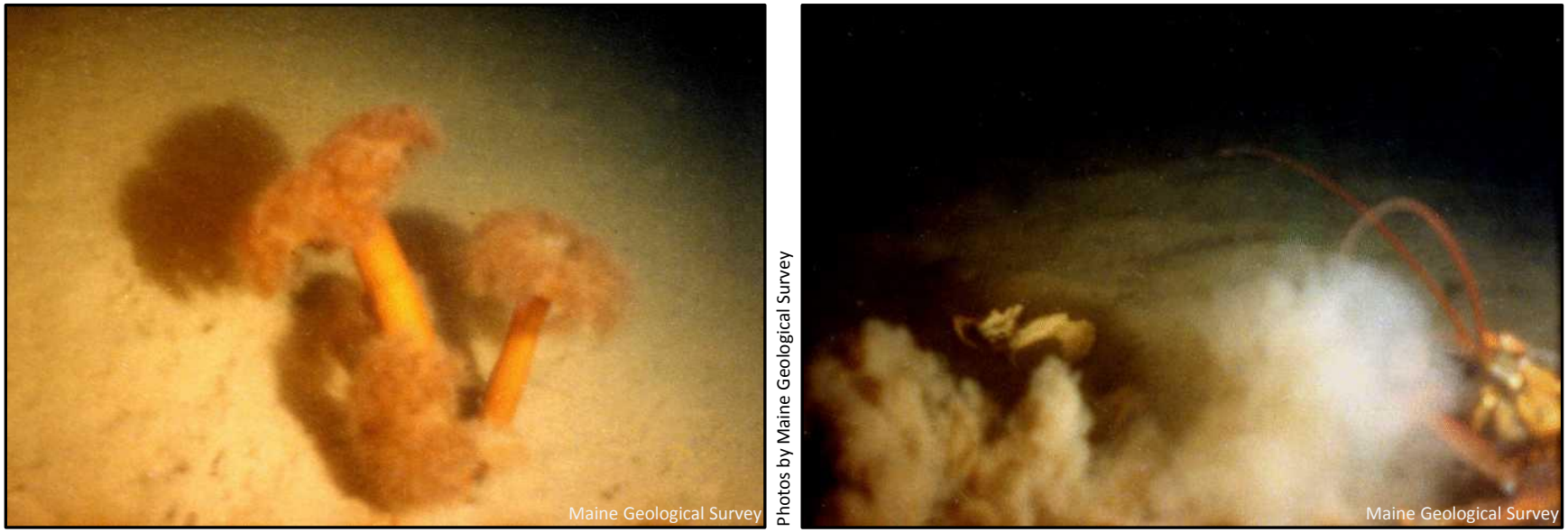


Figure 5. (Left) Sea anemones rise above a muddy sea floor in Penobscot Bay. (Right) A lobster retreats from the camera and suspends the muddy sea floor in Penobscot Bay.

Sea-floor Geology

Gravel plains and sandy sea floor make up about 1/5th of the ocean floor of state submerged lands. Gravel (including boulders) is a minor bottom type at all depths, but is most common in the 10 to 30 meter (30 to 100 feet) depth range (Figure 6-7).

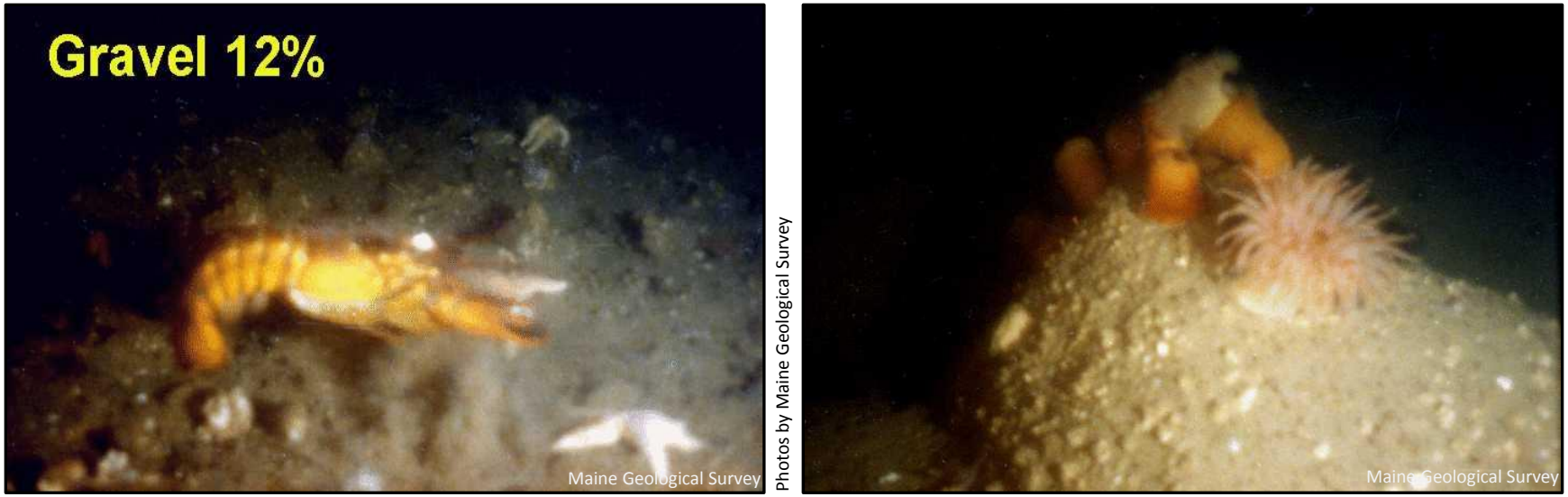


Figure 6. (Left) A lobster swims over a gravel bottom and past a starfish in Penobscot Bay. Gravel bottom makes up about 12% of the sea floor on the inner continental shelf of Maine. (Right) Sea anemones attach to a boulder rising off the sea floor in Penobscot Bay.

Sea-floor Geology

Sandy sea floor is rare but present at all depths to 100 meters; sand is only slightly more abundant in water less than 30 meters deep (Figure 7).

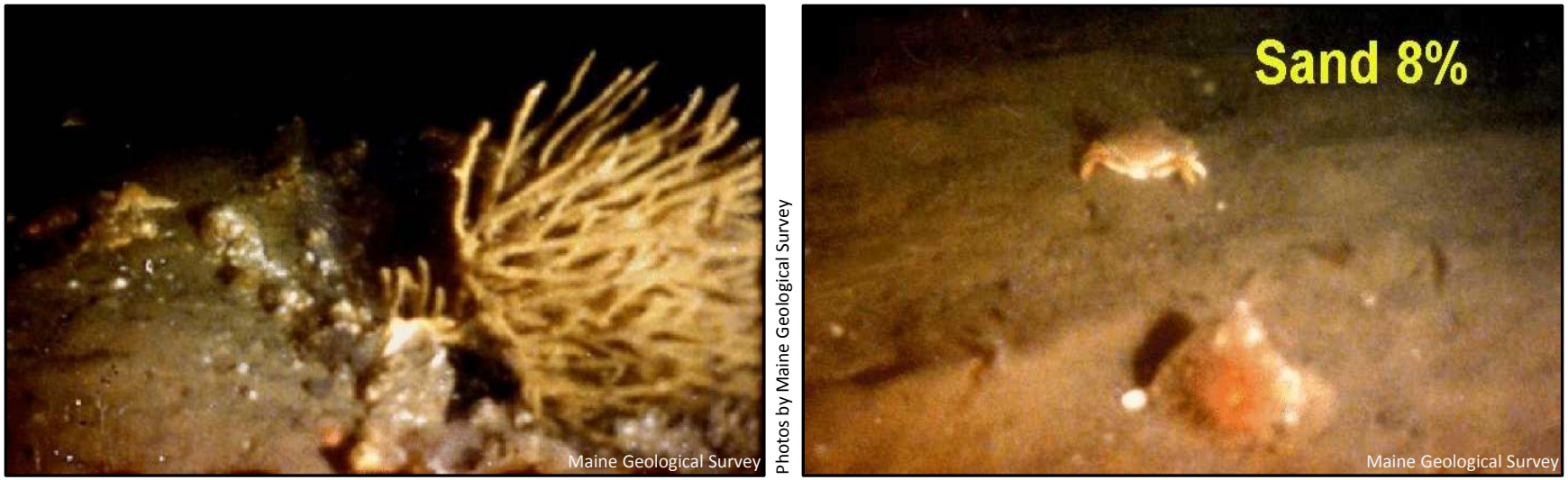


Figure 7. (Left) Coraline algae on a gravel sea floor in Penobscot Bay. (Right) A crab traverses wave oscillation ripples on a muddy sand sea bed in Penobscot Bay. Sandy sea floor makes up about 8% of the inner continental shelf of Maine.

Abundance of Sea-floor Types

The spatial complexity and details of sea floor geology are shown on MGS Open-File maps in the series entitled Surficial Geology of the Maine Inner Continental Shelf.

Floor Type	Abundance %
Rock	41
Mud	39
Gravel	12
Sand	8

Figure by Maine Geological Survey

Maine Geological Survey

Table 1. Relative abundance of sea-floor types on the Maine inner continental shelf.

Sea-floor Geology

A simplified illustration of the geology of the sea floor in a central location along the Maine coast from Cape Small to Schoodic Point is shown in Figure 8. This image is available for use in geographic information systems through the Island Institute web site.

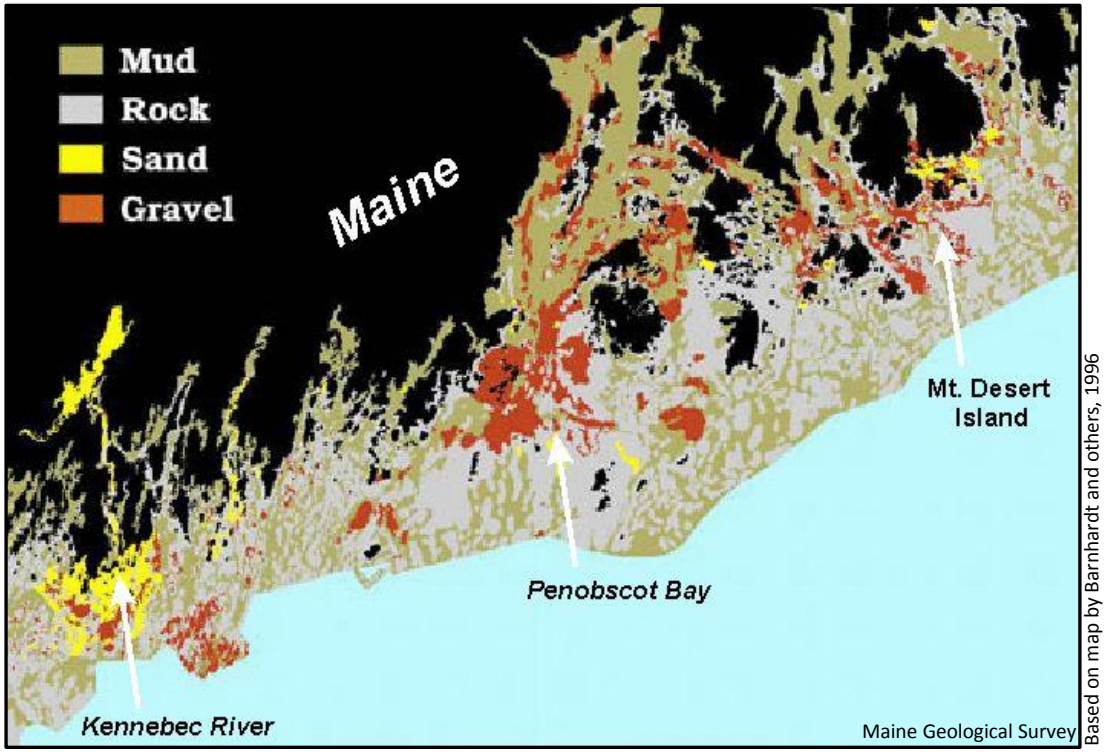


Figure 8. Generalized surficial geology of the Maine inner continental shelf from Cape Small in the vicinity of the Kennebec River to Schoodic Point and Englishman Bay including Mount Desert Island. Based on MGS Open-File maps in the series: Surficial Geology of the Maine Inner Continental Shelf by Barnhardt and others (1996).

Sea-floor Geology

In this illustration, sandy sea floor is most abundant offshore of the Kennebec River mouth. The outer portions of Penobscot Bay have abundant gravel areas and habitat suitable for juvenile lobsters. This region of Penobscot Bay sustains the most abundant lobster harvests along the Maine coast (Figure 9).

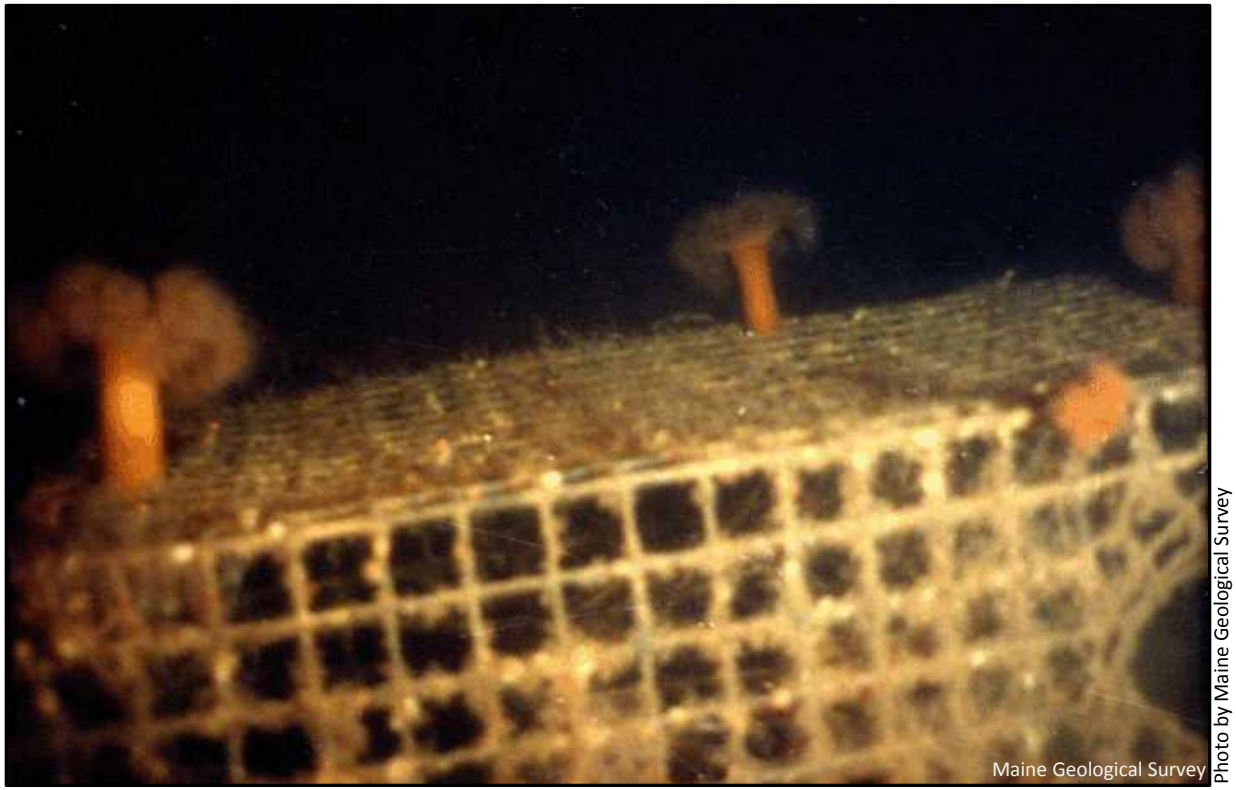


Figure 9. Close-up view of a ghost lobster trap covered with marine growth and sea anemones in Penobscot Bay.

References and Additional Information

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MGS Field Locality Penobscot Bay 10,000 years ago

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The Gulf of Maine Council on the Marine Environment

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Acknowledgments

Funding to support some of the field work and mapping of sea-floor habitats in Penobscot Bay was made possible with funding from the National Oceanic and Atmospheric Administration, National Environmental Satellite, Data, and Information Service as part of the Penobscot Bay Marine Resources Collaborative through the Island Institute. Underwater images were taken by the M-Rover operated by Guy Meadows and Hans van Sumeren of the University of Michigan for a joint Maine Geological Survey - University of Maine effort to ground-truth sea-floor mapping with side-scan sonar. Additional funding to map the inner continental shelf was provided by the Department of Interior, Minerals Management Service to the Maine Geological Survey.