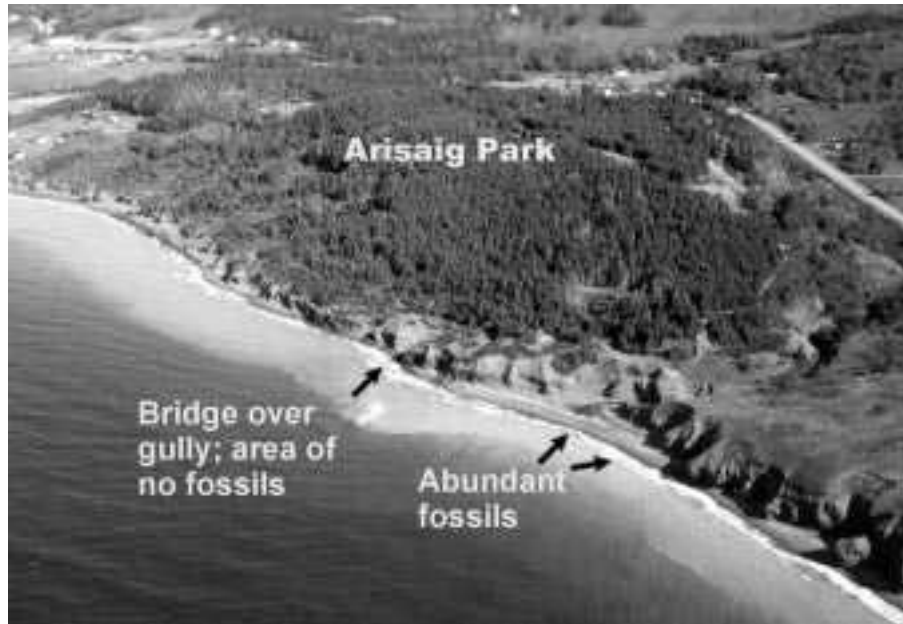


ARISAIG — So much to Sea

By Howard Donohoe



Aerial view of Arisaig Provincial Park looking to the east. Route 245 is in the background.

Arisaig Provincial Park connects with the sea. The exposed rocks were deposited along the edge of a small continent in the Iapetus Ocean 440 million years ago (mya) and have a rich collection of fossil marine life. Wave action by the sea prior to the last ice age produced a level, wave cut platform covered by beach gravel 3 to 5 m (10 to 16 ft) above sea level. Present day wave action by the sea is creating sea cliffs and another wave cut platform.

Environment and Fossils

At the beginning of the Silurian period (about 440 mya), the land surface was slowly subsiding and being covered by the waters of the Iapetus Ocean. With a few exceptions, the rocks from Arisaig Park southwestward to McAras Brook (about 4 km [2.5 mi]) represent the deposition of mud, silt and sand on a shallow continental shelf in water

depths of 10 to 200 m (33 to 656 ft). This ancient environment persisted through 23 million years. The abundance of life forms (fossils) suggests that the ocean water was rich in food and oxygen and well circulated by currents.

Some parts of the bedrock in the park called the Ross Brook Formation, have no evidence of life: no fossils, no burrows and no surface feeding trails. From the eastern boundary of the park to the bridge over a coastal gully near Arisaig Brook few fossils have been found. From the gully westward to the park boundary at Arisaig Brook and beyond there are abundant fossils. Geologists interpret these observations to indicate that bottom currents stopped circulating oxygen and nutrient rich water thereby killing most life forms. Later the currents resumed their movement and life flourished again.

Timing the Events at Arisaig

Years before present

0 Our time to view the park.

8 000 to present Erosion of bedrock forming sea cliffs and the second wave cut platform.

11 000 End of last ice age.

130 000 Erosion of bedrock creating the first wave cut platform during a warm period between ice ages.

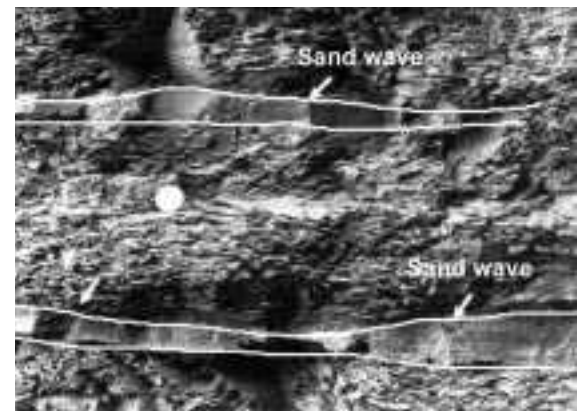
65 million End of the dinosaurs.

100 million Possible beginning of weathering and erosion that created the flat topped hills of the Antigonish Highlands.

220 million .. Beginning of the dinosaurs.

440 to 417 million ... Deposition of mud, silt and sand (at Arisaig) in shallow continental shelf waters on the edge of the small continent Avalonia.

600 million Age of the resistant Precambrian rocks in the Antigonish Highlands.

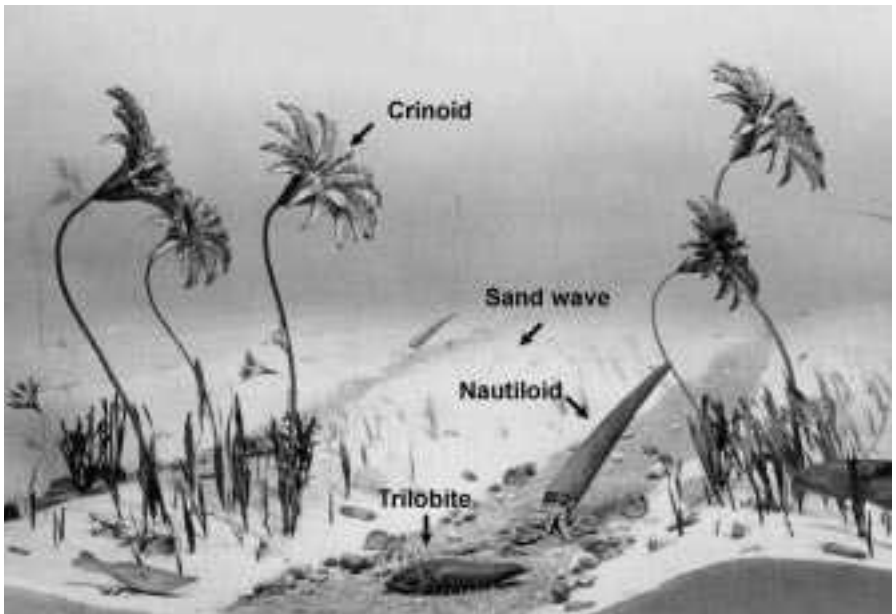


Sand waves produced by storms on the ancient continental shelf. The arrows point to the crests of the sand waves and the lines show the shape.

The fossils tell geologists a lot about the ancient environment. The photograph of the diorama from the Nova Scotia Museum of Natural History shows the reconstruction of a sea floor dominated by large and small sand waves, which were generated by storms. These waves 'touched' bottom and moved the sediment into parallel ridges. Crinoids (sea lilies) and various plants anchored themselves on the sand ridges. Small fish were present as well as nautiloids, trilobites, snails, brachiopods, clams, bryozoans and graptolites. By burrowing into the soft sediment of mud, silt and sand on the sea floor clams and worms greatly disturbed the layers of sediment. You can actually see the disturbed layers of rock near Arisaig Brook.

Land Forms

The landforms at Arisaig tell quite a story. Wherever rocks are soft, broken or crushed, weathering and erosion can proceed quickly resulting in lower areas such as valleys. If the rocks are hard and resistant to weathering and erosion, then the land stands at a higher elevation. Two kilometres (1.2 mi) southeast of the park on the south side of the Hollow Fault the land rises abruptly to 300 m (984 ft). The flat topped hills of the Antigonish Highlands are underlain by very resistant Precambrian rocks (more than 600 mya). The flatness probably represents a long period of weathering and erosion reducing the land to a uniform elevation. Some geologists feel this land surface could be as old as 100 million years. Later the land was uplifted and dissected by stream erosion.



The diorama at the Nova Scotia Museum of Natural History. This is a reconstruction of the ancient environment at Arisaig about 435 million years ago. Crinoids and 'sea weed' are anchored to the sand waves. The trilobite scavenges food while the nautiloid searches for prey.



Wave cut platform created by erosion of bedrock after the last ice age.



Wave cut platform on top of the bedrock cliffs created by erosion about 130 000 years ago.

Please Use Caution!

All fossils belong to the Province of Nova Scotia and a permit is required to collect them from the bedrock. Please report all important fossil finds to the Nova Scotia Museum of Natural History. You may collect fossils from the loose beach rock.

Most of the cliffs are above your head. Please keep away from the cliffs or wear a hard hat.

Check tide tables to know when high and low tide are predicted. None of the beaches at Arisaig Park are protected by life guards. Use caution and swim at your own risk.

The softer rock was preferentially removed leaving valleys and low areas. The thick deposits of sand, silt and mud in the offshore that host Nova Scotia's oil and gas reserves are the products of this long period of weathering and erosion.

The coastal exposures exhibit more of the sea-related geological history. As you view the cliffs from the trails, you will see flat tops. This flat surface is a wave cut platform eroded by the sea 130 000 years ago during a warm period before the last ice age. When the climate cooled enough to begin the next ice age, glaciers covered the region and deposited several layers of till (non-layered mud, sand and gravel) on top of the beach gravels. When the glaciers melted and retreated away from the province about 11 000 years ago, the land rose allowing the sea to attack the bedrock creating sea cliffs and another wave cut platform.

Getting There

You can get to Arisaig Provincial Park on Route 245 by driving north from Antigonish or east from Sutherlands River on the Trans Canada Highway. Which ever way you choose, you will be enchanted with the rolling pasture land and interesting land forms as you approach the park. Take along a picnic lunch and your bathing suit. After you arrive, plan to spend some time at the information kiosk learning more about the geological history of the park. Your guide to finding fossils is the park brochure. Arisaig is a great location to spend a warm, lazy, sunny day lounging on the beach, searching for fossils or just contemplating the geological past.

Howard Donohoe is with DNR's Mineral Development and Policy Section in Halifax and is a frequent contributor to Nature's Resources.