

Summer Observations on Rising Sea-level, Dead Trees and Eider Ducks

By Philip Finck

Why would a geologist be writing about rising sea-level, dead trees and sea birds rather than rocks and minerals? Well, part of the answer is that the Mineral and Energy Branch also has a mandate to provide basic geological information, not only about mineral resources, but also about basic geological processes.

After Hurricane Juan, with its associated coastal flooding and property loss, what could be more important (and topical) than rising sea-level? This is especially interesting if you believe in global warming, a very poor term which is actually a red herring. Climate change is more accurate, as there have been repeated cycles of global warming and cooling over the last 3,000 years.

The popular idea that recent warming trends are being driven by rising levels of carbon dioxide in the atmosphere and that sea-level will dramatically rise due to melting glaciers is a simplistic model at best and is unsupported by the body of scientific research. For example, warming trends can be equally correlated with varying levels of solar energy. It is clear that temperatures have been rising since the end of the Little Ice Age (about 1450 to 1850 AD) when temperature in the northern Hemisphere was much colder than at present. Prior to that time we were in what is termed the Medieval warm period.

Regardless of your belief or bias, the measurement of sea-level rise in Maritime Canada is important and is a fact over the last 14,000 years. During the summer of 2004, I spent time on several islands in Mahone Bay mapping glacial geology, but in particular I was studying tree stumps and logs found in and along the base of beaches. These stumps and logs grew behind paleo-beaches (beaches formed at a lower elevation and in a different location in response to lower sea-level), or were thrown into swamps and ponds behind the paleo-beaches by storms (possibly hurricanes) at a time when sea-level was lower than at present. I measured the elevation of the paleo-wood samples below HHWL (highest high water level as defined by Environment Canada for the Blandford tide gauge), collected and froze samples of wood, and sent these samples to the Geological Survey of Canada Radiocarbon Laboratory in Ottawa for testing. The youngest wood dated from about 1820 AD (think the War of 1812). The oldest wood dated was about *3070 C14 years old (circa 1100 BC, around the time of the 20th dynasty of the Egyptian Pharaohs).

Researchers have found that sea-level has risen about 125 metres (410 ft.) in

southern Nova Scotia over the last 12,000-14,000 years. However, most of that rise took place in the first 6000 years after the melting of the glaciers. Published research indicates that sea-level has been rising only about 30 cm (11.8 in.) per 100 years for the last 6000 years (a total of about 20 metres or 65.6 feet). As time passes, the rate of sea-level rise in southern Nova Scotia is decreasing. In-situ wood (in its original growth position) dated on Flat Island ranged from about 130 to 750 C14 years BP. This suggests that net sea-level rise has slowed even further over the last 500 years to about 15 cm (6 in.) per 100 years. I say "net" sea-level because what we measure is a combination of land going up and down as well as the sea going up and down—it all depends on when and where you measure it.

I also visited Pearl Island, a Wildlife Management Area in September after the birds were finished nesting. Pearl Island is protected since it is one of the few breeding sites for puffins in



At Flat Island, tree roots exposed on the beach, are normally covered by the tide.



Two gull eggs (speckled) lie to the right an eider egg.



One gull chick, two eider chicks (black) and two eider eggs share nest on Flat Island.

Nova Scotia. It has no trees and has been this way since the earliest maps were drawn by the British Admiralty in the late 1700's. To my surprise, near the landing site blasted out by the Federal Government, I found stumps on a small gravel beach that dated at 3070 C14 years old. This suggests that around 1200 to 1400 years BC, (the final days of the Pharaohs) Pearl Island was still covered(?) with trees. This is interesting from a paleo-environment point of view, though it doesn't tell us why the trees disappeared.

I mentioned eider ducks in the title. What do eider ducks and rising sea-level have in common? Actually nothing. However, when geologists are "in the field" looking at rocks we also look at the living environment around us with appreciation. In our travels we get to visit many remote and beautiful locations and see many different types of flora and fauna. Flat Island, located about 7 km (4.3 mi.) northwest of Pearl Island, is an important breeding area for the common eider as well as various types

of gulls. A visit around Flat island in June will commonly reveal 500 or more young ducks with their mothers in broods along the shore. Many of these eider have wintered along the New England coast, returning to begin nesting in late April or early May. Our winter eider population includes birds that breed in Nova Scotia and others that have migrated south from their breeding colonies in the St. Lawrence estuary and further north in Labrador and Newfoundland.

On Flat Island nests of eiders and gulls are numerous along the rocks and in the grass. They are so common in fact that as recently as the early 1900's, residents along the bay used to go to Flat Island to collect gull and duck eggs for food. What is interesting is that in many nests both eider and gull eggs can be found together. I reported this observation to Ducks Unlimited. According to their research biologist, the two "species are fighting for the same nest bowl and eventually one wins out". I gather that either species may win as some nests are all

duck eggs except for one gull egg and other nests are all gull eggs except for one duck egg. According to DU, this behaviour is also seen between gulls, King Eiders and Canada Geese up North and occasionally between eiders and gulls in Newfoundland. Unfortunately, the orphaned young birds ultimately die as the mother of the dominant species in the nest brings the wrong type of food. However, "because of imprinting, the young are not aware of their identity and due to brooding hormones, the moms apparently accept the 'odd' children as their own (similar to a Robin raising Brown-headed Cowbird young)".

* Note: Unless otherwise noted calendar ages are estimated based on C14 normative ages. The calendar ages are not corrected, they are approximate, and are given only as guidelines for the general reader.

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Many of the islands along Nova Scotia's southern coast are vital bird breeding habitats. It should be noted that the author visited Pearl Island, a Wildlife Management Area, in September after the nesting period. Pearl Island is out-of-bounds to human visitation between mid-April and mid-August when nesting is taking place. While Flat Island is privately owned and visitation is at the owner's discretion, anyone travelling near

any of the islands in this region should be prepared to respect the sensitivity of these habitats to many bird species and to stay away during nesting times. Disturbing nests of migratory birds, including eider, is prohibited under both the provincial Wildlife Act and the federal Migratory Bird Convention Act. If you have questions, contact the nearest DNR office and ask to speak to the regional Biologist.

Light tower and "coffin stones" located on Pearl Island.