

Geology And Resource Potential Of The Nares Strait Region, Arctic Canada And Greenland

Harrison, J.C.*

Geological Survey of Canada, 3303-33rd St. NW, Calgary, AB T2L2A7
charriso@nrcan.gc.ca

ABSTRACT

Five years of cooperative field work, recently completed by the German Federal Institute for Geoscience and Natural Resources (BGR) and the Geological Survey of Canada (GSC), has provided new observations bearing on the geology and resource potential of the Nares Strait region and northern Baffin Bay; a region that contains the offshore international boundary between Nunavut in Arctic Canada and northwest Greenland. A major product of this collaborative work includes a new 1:1,000,000 scale bedrock geology map of onshore and offshore areas between approximately 73 and 83 degrees north latitude. The onshore compilation has been prepared from thirty regional scale bedrock geology maps produced by the Geological Survey of Denmark and Greenland (GEUS) and the GSC. Offshore geology is drawn from the interpretation of petroleum industry reflection profiles, bathymetry, and government reflection and refraction seismic and aeromagnetic data. This includes new marine and airborne surveys arising from co-operative field work involving GSC, BGR, the Danish Lithosphere Centre and the Canadian Coast Guard.

Major features of the map area include 1) crystalline rocks and mid-Proterozoic sedimentary cover of the Canada-Greenland shield, 2) mid-Proterozoic through Silurian rocks of Pearya, a composite terrane on northern Ellesmere Island accreted to ancestral North America in the mid-Silurian, 3) Neoproterozoic (Vendian) to Devonian strata of the Franklinian succession, 4) Carboniferous to Paleogene strata of Sverdrup Basin erected on the erosional roots of the Upper Devonian-Lower Carboniferous Ellesmerian orogenic belt, and 5) Cretaceous through Neogene strata located in fault-bounded basins that record the depositional history of Baffin Bay rifting and spreading, and contemporaneous strike slip faulting and thrusting in the Paleogene Eureka Orogen adjacent to Nares Strait.

Mineral and energy resource potential is associated with: 1) Cu-Pb-Zn-Ag-Au settings in basinal facies lower Paleozoic rocks of northern Ellesmere Island and North Greenland; 2) Mississippi Valley-type Pb-Zn showings and hydrocarbons in Lower Cambrian through Lower Silurian shelf and shelf-edge carbonate build-ups of northeast Ellesmere and western North Greenland; 3) kimberlitic diamond potential and Pb-Zn in cratonic Neoproterozoic rocks and craton cover of northern Baffin Island, eastern Devon Island, and the Thule region of Greenland, and; 4) coal and hydrocarbon resources of the Cretaceous-Tertiary basins of Baffin Bay and its rifted continental margins.

There are fourteen named basins of Cretaceous and younger age in the report area. These include: a foreland basin and three intermontane basins, to 4000 m thick, of the Eureka Orogen; four basins of half-graben type, to 6000 m thick, of the circum Baffin continental margins, three of which are partly inverted; four basins, to 11000 m thick, developed in transtensional continental margin settings, and; two basins, to 12000 m thick, constructed on Paleogene oceanic crust. Source rocks are likely present in the Upper Cretaceous and possibly also in the Paleocene. Ten giant structural culminations with closure areas ranging from 50 to 400 km², and numerous smaller structures, are located in Lancaster Sound Basin and in northern Baffin Bay. These have been erected by a combination of Cretaceous rifting and probable Paleocene-Eocene inversion.

The entire region remains untested, and largely unexplored beyond the reconnaissance stage.