

## Atlantic water inflow in the early Holocene Northwest Passage marked by planktonic foraminifera (*Neogloboquadrina pachyderma*)

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**Abstract:** Four marine piston cores from the central Canadian Arctic Archipelago (CAA), investigated for sedimentology, micropalaeontology, and biogeochemistry (52 AMS radiocarbon dates), uniformly show the prominent early Holocene (~10 cal ka BP) appearance of planktonic foraminifera immediately following deglaciation. These planktonic populations are exclusively composed of *Neogloboquadrina pachyderma* [sensu Darling et al. 2006], including morphotypes previously described from the Arctic Ocean, and aberrant, right-coiling forms. Today, planktonics are rare in the central CAA, dwelling in adjacent offshore areas influenced

by Atlantic water. The early Holocene planktonics signal is interpreted reflecting the inflow of deep Atlantic-sourced water into the archipelago, likely facilitated by higher deglacial sea-levels (due to glacio-isostatic depression) permitting increased flow across inter-channel sills at the CAA entrances. The planktonic influx intervals are accompanied by the benthic foraminifer

*Cassidulina neoteretis*, an indicator of chilled Atlantic water. Collectively, this indicates an early Holocene oceanographic circulation and water mass structure different from today, marked by greater oceanic connection to adjacent basins, notably Baffin Bay.

Though the precise pathway of Atlantic water is cryptic, an eastern source via Baffin Bay Atlantic Water is likely, given shallow palaeo-water-depths to the west across the oceanographically critical Lowther sill. As glacio-isostatic rebound progresses, deeper waters carrying planktonics are progressively excluded from the central CAA as channels and sills shoal. Essentially modern oceanographic circulation is established by ~6 cal ka BP. This early Holocene planktonics peak is noted throughout Parry Channel (the main east-west axis of the Northwest Passage), from Lancaster Sound in the east to as far west as southern McDougall

Sound/Barrow Strait. This suggests planktonic foraminifera can constitute a valuable regional marker for the entry of Atlantic-derived oceanic waters upon deglaciation into the CAA. Furthermore, the signal highlights the potential for major oceanographic change in complex archipelago settings occurring independently of climatic forcing.