

NPC application Project Summary

Objectives:

Arctic driftwood originating from large river systems in North America and Eurasia is carried by currents across the northern oceans and deposited on Arctic coastlines free of sea ice. The spatial and temporal transport and deposition history, and the tree-ring characteristics of the driftwood, represent an exceptional proxy record for environmental change over multiple spatio-temporal scales.

The objectives of the proposed research are to collect and analyse driftwood from Arctic coastlines to reconstruct ocean current dynamics, changes in sea-ice extent and relative sea level over the last centuries to millennia. In addition, we expect to gain information on past climate during the life cycle of the tree itself through the analysis of growth-ring characteristics. The majority of driftwood samples collected to date are from East Greenland, Svalbard and northwest Iceland. Collecting and analysing driftwood from Arctic coastlines along the Northwest Passage will contribute substantially to our enhanced understanding of the ocean transport and temperature history of the area.

The MV Balto ship travelling through the Northwest Passage in 2020 provides an excellent opportunity for sampling driftwood from remote beaches and to begin to fill gaps in this important area of scientific knowledge. This project will build on and expand the geographical range of a successful 2018 pilot study carried out around Baffin Island and West Greenland approved by the NPC and NRI. The pilot study was conducted by the Scott Polar Research Institute (SPRI) and the new Tree-Ring Unit (TRU); both are part of the Department of Geography at Cambridge University. We are collaborating with both groups, working directly with Professor Ulf Büntgen, founder of TRU, and Professor Julian Dowdeswell, director of the SPRI.

The collection of samples will be filmed as part of an observational documentary following a few people on board the Balto. Filming is being organised in consultation with local communities, Nunavut Film Development Corporation and Arctic fixer David Reid.

Methods:

The Balto is scheduled to sail to the Northwest Passage for three weeks between 11 August to 01 September. To allow for changing weather conditions, we need some flexibility with our route. The Balto intends to travel from Greenland to Pond Inlet then around Somerset Island via Bellot Strait to Resolute. We will then travel around Devon Island to Grise Fiord and, conditions permitting, then possibly further north to Tanquary Fiord or up the east or west coast of Ellesmere Island. In case ice conditions prevent the Balto reaching Grise Fiord, we may need to amend our plans and travel further south to around Gjoa Haven. Passenger shore excursions by 'Zodiac' will be built into the itinerary of the Balto. During these excursions, we hope to land on uninhabited beaches at and adjacent to the locations shown on the Project Map. Flexibility is needed for sampling locations as the whereabouts of the driftwood shifts, however, the utmost care will be taken to avoid any protected areas or national parks. We estimate there will be around ten shore excursions however the number of these landing sites achieved is dependent upon weather and sea-ice conditions.

At each location, we intend to collect driftwood samples, if present, by removing a section of wood through the centre of-exposed-logs. The removal of driftwood wedges, and in some cases slices, would be by manual saw and/or chainsaw maintained on board the Balto. Any residual cuttings: or driftwood material would be removed and the site returned to its natural state. It is our intent to use hand saws in as many cases as possible, reserving the chain saw only where necessary and where it would have no impact on wildlife.

The driftwood samples would be taken back to the ship via 'Zodiac' and then to the d then to the Tree-Ring Unit.. There the samples will be analysed as to age, provenance, transport-history and climate fluctuations using state of the art technology including radiocarbon dating, tree-ring counting, species determination, DNA mapping of selected samples and stable isotope tracing.

Outcome:

The intention is to increase and expand on the data available to the new tree-ring laboratory and the SPRI at Cambridge University. The samples will form the basis of an archive essential for answering urgent questions across the fields of archaeology, biology, climatology, ecology, and oceanography at a time when more data on climate change is urgently needed.