

# DNA barcoding enables more accurate and efficient assessment of Arctic freshwater insects

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Surveillance and assessment of Arctic invertebrate biodiversity is a challenge, particularly for species-rich groups as there are few experts and often difficult and unsorted taxonomy. One such group is non-biting midges (Diptera: Chironomidae), a species-rich and widely distributed insect family in the Arctic.

Chironomids are by far the most abundant and diverse group of insects in Arctic freshwaters.

Bio-surveillance projects in Churchill, Svalbard and Finnmark have generated a considerable number of chironomid specimens, species and species groups with northern Holarctic distributions. A selection of this material as well as collections from Greenland has been barcoded and facilitated genetic comparisons of populations of 560 species forming 784 barcode clusters (see background graph & Map in Fig. 1).

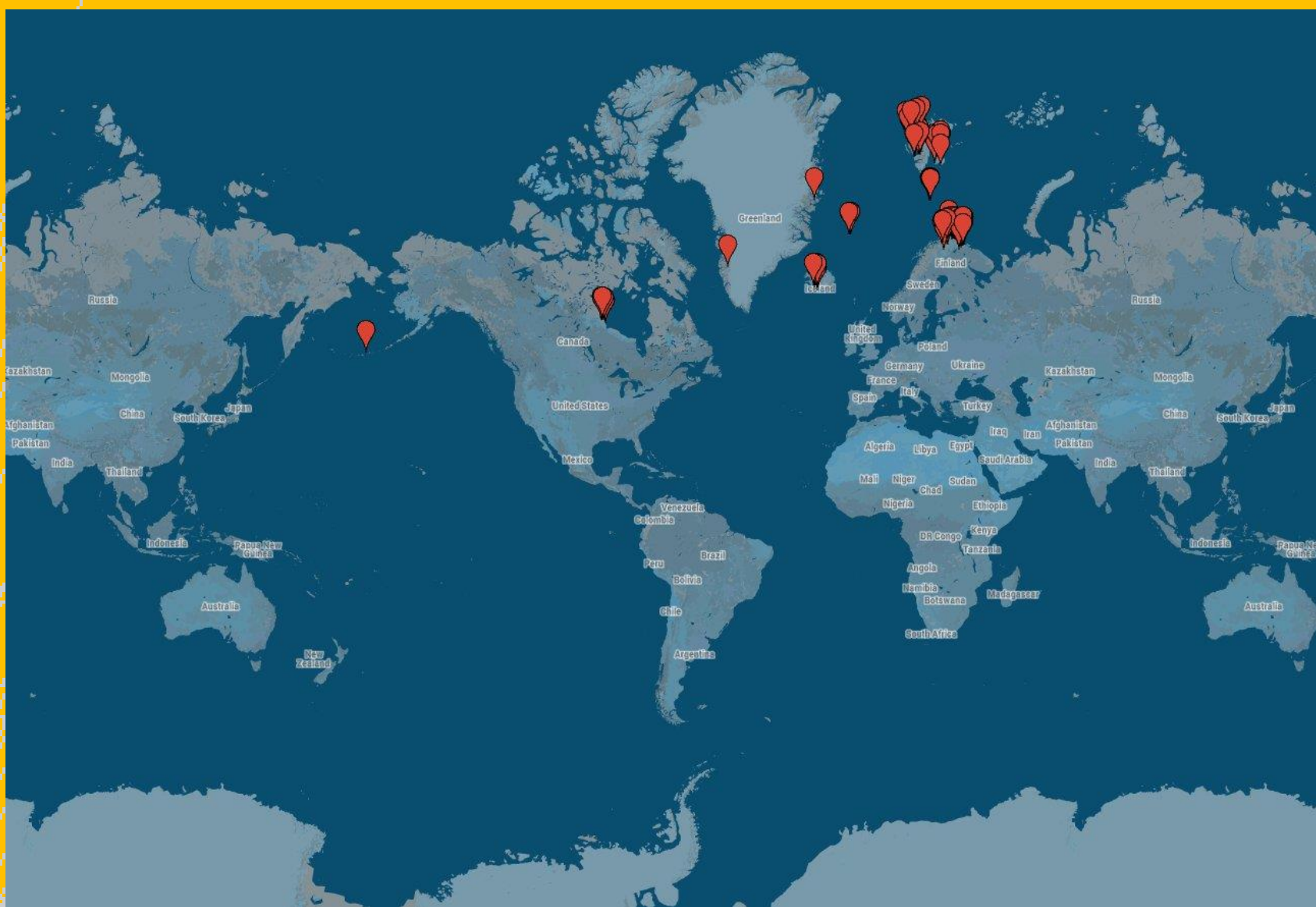
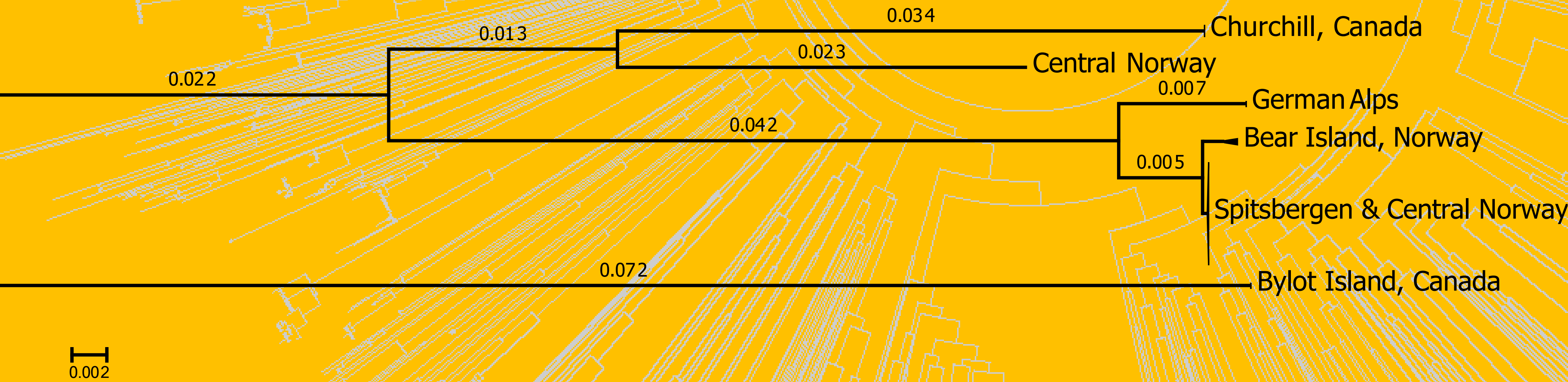


Figure 1. Sample localities of barcoded Arctic Chironomidae

DNA barcode clusters in general correspond well with morphological species concepts.

However, some populations presumed to be different species have near identical barcodes, while populations presumed to belong to widely distributed species form deeply divergent barcode clusters (Fig.2). Without genetic comparisons, these patterns would likely remain undetected and a source of error in comparisons of biodiversity assessment across regions. Thus, DNA barcoding sheds new light on the taxonomy of Arctic Chironomidae and contributes to a common baseline in the understanding of Arctic invertebrate diversity.



Male genitalia  
*Paratanytarsus austriacus*

Figure 2. More diversity than previously known. Divergent DNA barcode clusters of *Paratanytarsus austriacus* across the northern Atlantic. Branch lengths on branches.



Adult male chironomid, *Paratanytarsus austriacus* from Svalbard

The implementation of Next Generation Sequencing techniques of environmental samples (environmental barcoding) will enable efficient assessment of Arctic freshwater insects given the availability of a high-quality and well-curated reference library.