

Diversity and biogeography of moss diatoms from two contrasting regions in the Canadian Arctic Archipelago

Ella Vanlaere

Ghent University

Paul B. Hamilton

Canadian Museum of Nature, Research and Collections

Charlotte Goeyers

`charlotte.goeyers@ugent.be`

Ghent University

Research Article

Keywords: Canadian Arctic Archipelago, diatoms, biogeography, moss, Arctic

Posted Date: September 29th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-10917987/v1>

License:   This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Additional Declarations: No competing interests reported.

Abstract

The Canadian Arctic is experiencing enhanced climatic warming, impacting terrestrial ecosystems and their resident communities. Moss diatoms provide a potential tool to monitor the impact of climate change on terrestrial environments in this understudied region, yet, in contrast to their freshwater relatives, they remain mostly underexplored. In this study, we provide a detailed floristic and biogeographic study of two contrasting regions in the Eastern and Western Canadian Arctic Archipelago, including regions in Cambridge Bay and Katannilik Territorial Park. Diatoms in 17 terrestrial moss samples were analysed by light microscopy. We identified two remarkably distinct communities, with those in the Western Canadian Arctic being exceptionally rich and diverse. Of all 178 taxa, 86% were restricted to a single region. Similar to other organisms, our analysis indicates a west-to-east decline in diversity, potentially resulting from differences in climate and/or glaciation history. Our results serve as a benchmark for future research on terrestrial moss diatoms in the Canadian Arctic and their potential application as bio-indicators for climate change in this region.

Introduction

The Arctic is among the most rapidly warming regions on Earth, with temperatures rising up to four times faster compared to the global average (Rantanen et al. 2022). Given that the majority of this warming is occurring close to the soil surface (Callaghan et al. 1999, Cohen et al. 2020), terrestrial ecosystems in the highest northern latitudes, including those in the Canadian Arctic Archipelago, are particularly impacted. The Canadian Arctic Archipelago (CAA) (1.4 million km²) forms the largest land mass in the High Arctic and consists of more than 36,000 islands with numerous bays, straits, and interconnected channels. Next to Antarctica and Greenland, the CAA contains the largest volume of glacier ice on Earth and stores about 10% of the total sea ice in the Northern Hemisphere (Lenaerts et al. 2013). It also plays a key role in the freshwater outflow from the Arctic to the Atlantic Ocean (Zhang et al. 2016). Additionally, as its sea ice extent is related to the Arctic Oscillation and El Niño-Southern Oscillation, and its freshwater influx impacts the Atlantic Meridional Overturning Circulation, the CAA plays a key role in the global climate system (Liu et al. 2004, Jahn and Holland 2013). Nevertheless, despite its characterization as a high-priority research area (Virkkala et al. 2019), studies on the CAA remain extremely limited due to difficult access and harsh climatic conditions, and the lack of detailed (historical) meteorological data further complicates long-term predictions on the impact of climate change (Maxwell 1981, Mariani et al. 2022, Saarela et al. 2023).

Diatoms (siliceous microalgae, SAR group) are essential components of the terrestrial microbial community and form close associations with soil, vascular plants, and moss. In Arctic tundra ecosystems, where mosses often constitute the dominant vegetation, moss diatoms are remarkably abundant (Beyens 1989, Van Kerckvoorde et al. 2000, Van de Vijver et al. 2003, Goeyers et al. 2024b, 2026). In addition, due to their finely tuned optima and tolerances for many environmental parameters, including moisture level, temperature, pH, and conductivity, moss diatoms have an enormous potential to serve as bio-indicators to assess the impact of climate change on sensitive terrestrial ecosystems,

including those in the CAA. Nevertheless, past studies have almost exclusively focused on the aquatic habitats of the Canadian Arctic Archipelago (e.g. Cleve 1896, Lowe 1923, Ross 1947, Wheldon 1947, Sutherland 1952, Smol 1983, Douglas and Smol 1995, Wolfe 1996, Antoniadou and Douglas 2002,, Bouchard et al. 2004, Antoniadou et al. 2005a, b, 2008, 2014, Stewart et al. 2005, Michelutti et al. 2006, 2007, 2013, Finkelstein and Gajewski 2008, Keatley et al. 2008, Hadley et al. 2013, Duda et al. 2019), while work on Arctic moss diatoms is mostly concentrated on Greenland and the Atlantic region of the Arctic (Beyens 1989, Van Kerckvoorde et al. 2000, Goeyers et al. 2024b, c, a), with only a limited number of studies on the CAA (e.g. Douglas & Smol 1995, Van de Vijver et al. 2003, Goeyers et al. 2026). Therefore, before their application as bio-monitor in the CAA can be validated, establishing a comprehensive baseline of moss diatom biodiversity and distribution is necessary.

The objectives of this study are to provide (1) a detailed floristic analysis of CAA's terrestrial moss diatom flora; and (2) a biogeographical analysis of the diatom flora in the Eastern and Western Canadian Arctic (ECA and WCA, respectively), with sampling locations in Katannilik (Baffin Island, Qikiqtaaluk Region, Nunavut) and Cambridge Bay (Victoria Island, Nunavut), based on a dataset of 17 moss samples. We hypothesize that (1) CAA moss diatom communities are characterized by a high diversity and contain many undescribed taxa likely unique to the CAA; (2) communities in the ECA and WCA differ significantly and show biogeographical patterns. This work will serve as a baseline for the future use of moss diatoms as bio-monitors for climate change in Arctic terrestrial ecosystems.

Material & methods

We generated a dataset of mosses from the ECA and WCA (1992–2012), covering two opposite regions in the CAA. Mosses from the WCA were already included in previous studies of Goeyers et al. (2026) and Van de Vijver (2003) and were sampled in 1992 in Cambridge Bay, Victoria Island, whereas ECA mosses have not yet been investigated and were sampled in 2010–2012 near Soper River in Katannilik (Inuit for 'where there are waterfalls') Territorial Park, southern Baffin Island. Both regions fall within subzone D of the Circumpolar Arctic Vegetation Map (Walker et al. 2005), which indicates a 7–9°C mean July temperature, 50–80% vascular plant cover, 5–10 cm thick moss layer, 10–40 cm herbaceous and dwarf shrub layers, and 125–250 vascular plant species. Figure 1 provides an overview of the sampling locations.

Slide preparation and counting

Diatoms were prepared for light microscopy (LM) by first digesting the moss material. Subsamples of mosses were cleaned by adding ca. 50 ml of 30% H₂O₂ and ca. 50 ml of distilled H₂O and heating to 200°C for one hour. The remaining liquid containing the diatom valves was centrifuged (2 x 10 minutes at 5,100 rpm) at 21°C with a Sigma 6K15 bench centrifuge, with removal of supernatant and rinsing with distilled H₂O in between. After centrifugation, cleaned material was diluted with distilled H₂O to avoid excessive concentrations of diatom valves. Drops of vortexed liquid were pipetted onto glass cover slips and dried, and cover slips were mounted on slides with Naphrax. LM analysis was conducted using an

Olympus BX51 microscope equipped with Differential Interference Contrast (Nomarski) and a ToupTek camera connected to the ToupLite program. For each slide, 400 valves were identified and enumerated on random transects at 1000× magnification (N.A. 1.30) using Zeiss Immersol oil (518N). Diatom species identification was based on: (Foged 1953, 1955, 1964, 1974, 1977, Hein 1990, Crawford and Likhoshway 1999, Lange-Bertalot 1999, Wolfe and Kling 2001, Houk and Klee 2004, Van de Vijver et al. 2004a, 2022b, a, Werum and Lange-Bertalot 2004, Antoniadou et al. 2008, 2009, Kulikovskiy et al. 2010, Zimmermann et al. 2010, Potapova 2014, Potapova et al. 2014, Lange-Bertalot et al. 2017, Pinseel et al. 2017, Furey et al. 2020, Heudre et al. 2021, Goeyers et al. 2024c, a). Taxa that could not be identified are indicated by 'sp' and a numeric identifier (e.g., 'sp1'). Distributions were assigned to: Arctic (present in the Arctic Region), Northern Hemisphere (present in the Northern Hemisphere), cosmopolitan (present in the Northern and Southern Hemisphere), and unknown.

Data analysis

Data analysis was conducted in R version 2022.7.1.554 (www.r-project.org), with key packages including 'vegan' ver. 2.6-4 (Oksanen et al. 2019), 'BiodiversityR' ver. 2.15-1 (Kindt and Coe 2005), 'dendextend' ver. 1.17.1 (Galili 2015), and 'ggOceanMaps' ver. 1.3.4 (Vihtakari 2022). The basic diversity unit is any subgeneric taxon (i.e., (sub)species or varieties), hereafter referred to as 'taxon'. Relative abundances were calculated by dividing the number of individuals of a taxon by the total number of taxa in a sample. Taxon richness, Shannon–Wiener diversity, and Shannon's equitability (evenness) were calculated using 'vegan'. We discriminate between α -diversity (mean richness per sample within each (sub)region, i.e. local diversity) and γ -diversity (total number of taxa across all samples in (sub)region, i.e. regional diversity). Kruskal-Wallis test followed by Dunn's Test (Holm-Bonferroni correction) were used to compare richness, diversity, and evenness between the Eastern and Western Canadian Arctic samples.

To reveal patterns in community structure, ordination and SIMPROF were conducted, while PERMANOVA was used to confirm differences between communities using 'pairwise.adonis' in the 'pairwiseAdonis' package (Martinez 2020). Detrended correspondence analysis (DCA) (Hill and Gauch 1980) was conducted on species abundance data, while SIMPROF (Clarke et al. 2008) was used to group samples into clusters based on Bray-Curtis dissimilarities with 999 iterations, Ward clustering, and $\alpha = 0.05$. Indicator species per region were derived by calculating indicator values (IndVal) (Roberts 2023), based on the method of Dufrene and Legendre (Dufrene and Legendre 1997), with the 'indval' function in the 'labdsv' package.

Results

Biodiversity analysis

Our analysis of 17 moss samples revealed a total of 178 taxa belonging to 52 genera. γ -diversity was highest in the WCA (124 taxa in 43 genera), and lowest in the ECA (79 taxa in 30 genera). On average, 31 taxa per sample were observed in the complete dataset (median = 28 taxa), with a mean of 42 taxa in the WCA, and 18 taxa in the ECA. The maximum number of taxa was 55 per sample (WCA), while the

minimum was 8 (ECA). *Eunotia* and *Pinnularia* were the most important genera in the complete dataset with 22 and 14 taxa, respectively, although important differences were found between both regions. *Gomphonema* (10 taxa), *Eunotia* (9 taxa), *Encyonema* (8 taxa), and *Pinnularia* (8 taxa) were the most species-rich genera in the WCA, whereas in the ECA, *Eunotia* (19 taxa) was the most speciose, followed by *Navicula* (6 taxa) and *Pinnularia* (6 taxa). Taxa with the highest relative abundance in the WCA were *Nitzschia fossilis* (10% of the total relative abundance), *Denticula kuetzingii* (9%), *Nitzschia amphibia* (8%), and *Eunotia islandica* (7%), while *Tabellaria acidodelicata* (20%), *Eunotia zackenbergensis* (7%), and *Pinnularia* cf. *borealis* (6%) were dominant in the ECA. An overview of the most abundant taxa can be found in Figure 2.

Both regions differed significantly in α -diversity and Shannon-Wiener diversity (see Figure 3a–c). The moss diatom flora of the WCA samples was significantly richer (42) and more diverse (2.8) compared to the ECA (18.4 and 1.95, respectively). However, no significant differences were found in evenness.

Ordination

DCA axes 1 and 2 captured 17% of the total variation in the species data (Figure 3d). Samples from the WCA were clearly separated from those obtained from the ECA. Almost all ECA samples were located on the positive side of DCA1. Three samples were positioned on the positive side of DCA2, while 5 samples were situated on the negative side of DCA2. WCA samples were all positioned on the negative side of DCA1 and the positive side of DCA2. In addition, ECA samples were clearly more spread out across the diagram compared to WCA samples.

SIMPROF (Figure 3e) separated all moss samples into clusters based on Bray–Curtis dissimilarities. The two resulting clusters follow the biogeographical separation of the ECA and WCA almost perfectly, except for sample NUNA92.M299. PERMANOVA also confirmed that communities from both regions differed significantly ($p < 0.001$).

Indicator species analysis (Figure 4a) furthermore identified *Tabellaria acidodelicata* and *Psammothidium acidoclinatum* as the only indicator species for the ECA samples, whereas 12 indicator species were found for the WCA. Of these, *Caloneis fusus*, *Denticula tenuis*, and *Nitzschia fossilis* had the highest indVals (1, 1, and 0.97, respectively).

Biogeography

Both the ECA and WCA shared 25 diatom taxa (14% of all taxa in the complete dataset), whereas 99 taxa (56%) were unique to the WCA, and 54 taxa (30%) to the ECA. The genera *Gomphonema* (9 taxa), *Encyonema* (8 taxa), and *Pinnularia* (8 taxa) had the highest unique species numbers in the WCA, and *Eunotia* (13 taxa) in the ECA. Both regions also showed differences in their proportions of taxa with Arctic, Northern Hemisphere, cosmopolitan, and unknown distributions (see Figure 4b). Most taxa had cosmopolitan distribution types (43% of all taxa in the ECA versus 42% in the WCA). The proportion of taxa with unknown distributions (which were mostly taxa we were unable to identify) was higher in the

ECA (39%) compared to the WCA (30%). Northern Hemisphere and Arctic distributions were more common in the WCA (23% and 5%, respectively) than in the ECA (13% and 3%, respectively).

The unknown taxa fraction of the WCA was largely dominated by *Gomphonema* (5 taxa) and *Hantzschia* (4 taxa), whereas *Eunotia* dominated both the unknown and Arctic fractions of the ECA with 6 and 2 taxa, respectively. *Eunotia* was also dominant in the cosmopolitan fraction of the ECA with 10 taxa, while *Eunotia* and *Nitzschia* were the most speciose genera in the cosmopolitan fraction of the WCA, both with 4 taxa. Of the Northern Hemisphere distribution type, especially *Pinnularia* was well-represented with 5 taxa in the WCA (and none in the ECA).

Discussion

Biodiversity patterns

This study provides a floristic and biogeographical analysis of the terrestrial moss diatom flora in the CAA, advancing our knowledge on terrestrial diatoms in boreo-alpine regions. A highly diverse flora of 178 unique diatom taxa was found in our relatively small dataset of 17 samples, with particularly the WCA being remarkably speciose. While the γ -diversity was 'only' 124 in the WCA, the mean number of taxa per sample equaled 42, which is exceptionally high compared to the numbers reported globally by other moss diatom studies (4–36) (Beyens 1989, Van de Vijver and Beyens 1999, Van Kerckvoorde et al. 2000, Nováková and Pouličková 2004, Van de Vijver et al. 2004b, Buczkó 2006, Chen et al. 2012, Kopalová et al. 2014, Das et al. 2020, Bishop et al. 2021, Chattová et al. 2021, 2022, Goeyers et al. 2022, Radhakrishnan et al. 2022, Goeyers et al. 2024b, 2026). Moreover, it is possible that our study still underestimates the true diversity, since many taxa in our analysis (e.g., *Achnantheidium* cf. *minutissimum*, *Hantzschia amphioxys*, *Pinnularia* cf. *borealis*) belong to (semi)cryptic species complexes that can hardly be distinguished by morphology alone.

Important differences were found with the Canadian Arctic's freshwater flora. While *Eunotia* and *Pinnularia* were generally dominant in our analysis, corresponding to moss studies conducted globally, representatives of the genera *Achnanthes*, *Cymbella*, *Fragilaria*, *Navicula*, and *Nitzschia* are commonly reported as dominant freshwater genera, together with small benthic taxa within the genera *Staurosira*, *Staurosirella*, and *Pseudostaurosira* (Lim et al. 2001, Antoniadès and Douglas 2002, Bouchard et al. 2004, Antoniadès et al. 2005a, 2008, Keatley et al. 2008, Duda et al. 2019, Armstrong et al. 2025). This difference is not surprising, given that *Pinnularia* and *Eunotia* contain many taxa that are able to resist the intermittently dry conditions in terrestrial moss habitats, including taxa in the species complex *Pinnularia* cf. *borealis* (Souffreau et al. 2010, 2013). However, at the species-level, the WCA's most prominent species were also reported to have high abundances in freshwater habitats of other Canadian regions, e.g., *Denticula kuetzingii*, *D. tenuis*, *Hygropetra balfouriana*, and *Nitzschia amphibia* (e.g., Antoniadès et al. 2005b, 2008, 2014, Keatley et al. 2008, Sokal et al. 2008). Contrastingly, the ECA contained species also found in high abundances in moss habitats of the wider Arctic region, e.g., *Eunotia zackenbergensis*, *Pinnularia* cf. *borealis*, and *Tabellaria acidodelicata* (Goeyers et al. 2024b, 2026).

Community composition

Our DCA ordination, SIMPROF, and PERMANOVA all indicated a clear differentiation between the moss diatom communities of the ECA and WCA. This ECA–WCA distinction can be explained by two main factors: (1) the environmental differences between the two regions, with the colder and drier WCA experiencing a more continental climate similar to the nearby mainland, whereas a maritime climate prevails in the overall warmer and wetter ECA (Brown 1972, Maxwell 1981). Additionally, the WCA is mainly underlain by carbonate bedrock (alkaline waters), while the ECA is part of the Canadian Shield and mostly contains silicates (predominantly acidic waters) (Alkire et al. 2017). While no environmental data was included in our dataset, it is widely known that pH level, conductivity, moisture availability, and temperature strongly influence diatom species richness and composition (DeNicola 2000, Poulícková et al. 2004, Souffreau et al. 2010, 2013, Poulícková et al. 2013, Das et al. 2020, Chattová et al. 2021, Goeyers et al. 2022, 2026). The relevance of climate and the underlying bedrock and associated pH level is substantiated by the dominance of alkaline (e.g., *Nitzschia amphibia*, *N. fossilis*) species in the WCA versus the more circumneutral/acidic species indicating low pH habitats with abundant moisture and a marine influence (e.g., *Eunotia*, *Aulacoseira distans*, *Tabellaria acidodelicata*, *Cosmioneis pusilla*) in the ECA; (2) both regions are characterized by distinct (de)glaciation histories (Mooney and Billings 1961, Funder 1979, Ritchie 1987, 1992, Steig et al. 1998, Tremblay and Schoen 1999, Dyke et al. 2002, Miller et al. 2002, Weider and Hobæk 2003, Briner et al. 2009, Margreth et al. 2016) and their present-day communities evolved from different glacial refugia. For example, in the WCA, post-glacial colonization may have originated from Beringia, which has repeatedly been identified as a principal refugium for Arctic biota (Abbott et al. 2000, Weider and Hobæk 2003), while the ECA may have been colonized from the ice-free areas above the High Arctic Archipelago and/or the ice-free oceanic headlands and nunataks in the eastern Arctic.

The ECA–WCA distinction we found in our study may be further enhanced by climate change, given the impact of temperature and moisture on diatom communities. Particularly the ECA is presently experiencing rapid climate warming, especially during the coldest seasons which are warming twice as fast compared to the warmest months, leading to stark reductions in snow and ice cover (Brown et al. 2018). The melting of ice and snow lowers the albedo, leading to warmer and drier microclimatic conditions near the soil, which directly impacts moss diatom communities (Goeyers et al. 2025).

Biogeography

In agreement with other studies on Arctic moss diatom assemblages, we were unable to identify numerous diatom taxa in our dataset with the currently available taxonomic literature. It is very likely that a large proportion of these is effectively new to science. While this may point to possible endemism, it is important to note that the recolonization of the region since the last glaciation is only recent (< 8000 yBP), our dataset is still small, and the terrestrial habitats in the CAA and by extension the wider Arctic Region remain poorly sampled, which may result in an underestimation of geographic ranges (Lee and Patterson 2000, Finlay 2002). Nevertheless, many studies have already described new species from the

Arctic (Lange-Bertalot and Genkal 1999, Van de Vijver et al. 2004a, 2022b, Antoniadou et al. 2009, Pinseel et al. 2014, Veselá and Potapova 2014, Furey et al. 2020, Goeyers et al. 2024c, a), indicating that at least part of the undescribed taxa in our study might be unique to the region.

Surprisingly, 86% of all taxa in our dataset were unique to a single region, suggesting extremely restricted distribution patterns. This agrees with studies on other organisms (e.g., *Alnus*, *Cassiope*, *Daphnia*, *Saxifraga*) in this region revealing non-overlapping lineages that likely originated in spatially distinct refugia (Abbott et al. 2000, Weider and Hobæk 2003, Napier et al. 2019, Elphinstone et al. 2024). Distributions were especially restricted in the terrestrial genera *Eunotia*, *Gomphonema* and *Pinnularia*. As Verleyen et al. (2021) already argued for the Antarctic region, it is possible that terrestrial representatives within these genera survived in ice-free refugia during glacials due to their higher tolerance to desiccation and freezing, and subsequently recolonized and radiated in the numerous terrestrial moss habitats during post-glacial periods. Interestingly, the proportion of unique taxa was higher in the WCA. This observation, together with the increased richness and diversity in the region, is consistent with broader phylogeographic studies demonstrating a west-to-east decline in genetic diversity (Abbott et al. 2000, Weider and Hobæk 2003, Elphinstone et al. 2024), which likely results from the ECA being more recently deglaciated than the WCA. Nonetheless, the Arctic terrestrial diatom flora is still incompletely known, and more research, including molecular investigations, is needed to reveal whether the observed ECA–WCA distinction partly reflects the combined effects of history, environmental filtering, and/or incomplete taxonomic knowledge rather than glacial refugia alone.

Statements and Declarations

Acknowledgements

We thank Tine Verstraete for her help with constructing a protocol for preparing the LM slides. Koen Sabbe is thanked for his feedback on the manuscript. We thank the following people for their help collecting the moss samples in the field: J.M. Saarela, L.J. Gillespie, P.C. Sokoloff, R.D. Bull, L. Consaul, M. Ip, D. Charette, E. Kattuck, C. Ekiolak, B. Meeko, L. Ippak, J. Narlik, M. Narlik, S. Uppik, L. Ippak, J. Kavik, S. Ippak, R. Ippak, M. Inuktaluk.

The authors declare no competing interests.

Funding declaration

CG was funded by the Fund of Scientific Research – Flanders (FWO) (aspirant grant no. 12A8K26N).

Ethics and Consent to Participate declarations

Not applicable.

Author contribution statement

PBH arranged the samples. CG conceived and designed the research. EV conducted the LM analysis. CG and EV conducted the species identifications and statistical analyses. All authors contributed to and approved the manuscript.

References

1. Abbott RJ, Smith LC, Milne RI, Crawford RMM, Wolff K, Balfour J (2000) Molecular Analysis of Plant Migration and Refugia in the Arctic. *Science* 289:1343–1346. DOI: 10.1126/science.289.5483.1343
2. Alkire MB, Jacobson AD, Lehn GO, Macdonald RW, Rossi MW (2017) On the geochemical heterogeneity of rivers draining into the straits and channels of the Canadian Arctic Archipelago. *Journal of Geophysical Research: Biogeosciences* 122:2527–2547. DOI: <https://doi.org/10.1002/2016JG003723>
3. Antoniades D, Douglas MS (2002) Characterization of high Arctic stream diatom assemblages from Cornwallis Island, Nunavut, Canada. *Canadian Journal of Botany* 80:50–58. DOI: 10.1139/B01-133
4. Antoniades D, Douglas MSV, Smol JP (2005a) Quantitative estimates of recent environmental changes in the Canadian High Arctic inferred from diatoms in lake and pond sediments. *Journal of Paleolimnology* 33:349–360. DOI: <https://doi.org/10.1007/s10933-004-6611-3>
5. Antoniades D, Douglas MSV, Smol JP (2005b) Benthic diatom autecology and inference model development from the Canadian High Arctic Archipelago. *Journal of Phycology* 41:30–45. DOI: <https://doi.org/10.1111/j.1529-8817.2005.04049.x>
6. Antoniades D, Hamilton PB, Douglas MSV, Smol JP (2008) *Iconographia Diatomologica*, Volume 17: Diatoms of North America: Freshwater Floras of Prince Patrick, Ellef Ringnes and Northern Ellesmere Islands from the Canadian Arctic Archipelago. ARG Gantner Verlag KG, Rugell.
7. Antoniades D, Hamilton PB, Hinz F, Douglas MSV (2009) Seven new species of freshwater diatoms (Bacillariophyceae) from the Canadian Arctic Archipelago. *Nova Hedwigia* 88:57–80. DOI: 10.1127/0029-5035/2009/0088-0057
8. Antoniades D, Douglas MSV, Michelutti N, Smol JP (2014) Determining diatom ecotones and their relationship to terrestrial ecoregion designations in the central Canadian Arctic Islands. *Journal of Phycology* 50:610–623. DOI: <https://doi.org/10.1111/jpy.12195>
9. Armstrong I, Medeiros AS, Eamer J, Zimmermann C, Narancic B, Pienitz R (2025) Climate and catchment influence the postglacial succession of three lakes in south-central Baffin Island (Nunavut), Canada. *Journal of Quaternary Science* 40:1377–1391. DOI: <https://doi.org/10.1002/jqs.70019>
10. Beyens L. (1989) Moss dwelling diatom assemblages from Edgeoya (Svalbard). *Polar Biology* 9:423–430. DOI: <https://doi.org/10.1007/BF00443228>
11. Bishop JM, Wasley J, Waterman MJ, Kohler TJ, Van de Vijver B, Robinson SA, Kopalová K (2021) Diatom communities differ among Antarctic moss and lichen vegetation types. *Antarctic Science* 33:118–132. DOI: 10.1017/S0954102020000620

12. Bouchard G, Gajewski K, Hamilton PB (2004) Freshwater diatom biogeography in the Canadian Arctic Archipelago. *Journal of Biogeography* 31:1955–1973. DOI: <https://doi.org/10.1111/j.1365-2699.2004.01143.x>
13. Briner JP, Davis PT, Miller GH (2009) Latest Pleistocene and Holocene glaciation of Baffin Island, Arctic Canada: key patterns and chronologies. *Quaternary Science Reviews* 28:2075–2087. DOI: [10.1016/j.quascirev.2008.09.017](https://doi.org/10.1016/j.quascirev.2008.09.017)
14. Brown R, Barrette C, Brown L, Chaumont D, Grenier P, Howell S, Sharp M (2018) Climate Variability, Trends and Projected Change. In: *From Science to Policy in the Eastern Canadian Arctic: An Integrated Regional Impact Study (IRIS) of Climate Change and Modernization*. ArcticNet, Quebec City.
15. Brown RJE (1972) Permafrost in the Canadian Arctic Archipelago. *Zeitschrift für Geomorphologie* 13:102–130.
16. Buczkó K (2006) Bryophytic diatoms from Hungary. 18th international diatom symposium:1–15.
17. Callaghan TV, Press MC, Lee JA, Robinson DL, Anderson CW (1999) Spatial and temporal variability in the responses of Arctic terrestrial ecosystems to environmental change. *Polar Research* 18:191–197. DOI: <https://doi.org/10.3402/polar.v18i2.6574>
18. Chattová B, Zotov A, Parnikoza I (2022) Moss inhabiting diatoms of Galindez Island, Argentine Islands (the maritime Antarctica) exhibit low diversity and pronounced differentiation. *Czech Polar Reports* 12:60–77. DOI: <https://doi.org/10.5817/CPR2022-1-5>
19. Chattová B, Lebouvier M, Syrovátka V, Van de Vijver B (2021) Moss-inhabiting diatom communities from Ile Amsterdam (TAAF, southern Indian Ocean). *Plant Ecology and Evolution* 154:63–79. DOI: <https://doi.org/10.5091/plecevo.2021.1767>
20. Chen X, Bu Z, Yang X, Wang S (2012) Epiphytic diatoms and their relation to moisture and moss composition in two montane mires, Northeast China. *Fundamental and Applied Limnology* 181:197–206. DOI: [10.1127/1863-9135/2012/0369](https://doi.org/10.1127/1863-9135/2012/0369)
21. Clarke KR, Somerfield PJ, Gorley RN (2008) Testing of null hypotheses in exploratory community analyses: similarity profiles and biota-environment linkage. *Journal of Experimental Marine Biology and Ecology* 366:56–69. DOI: <https://doi.org/10.1016/j.jembe.2008.07.009>
22. Cleve P (1896) Diatoms from Baffin Bay and Davis Strait. *Bihang till Kongl. Svenska Vetenskaps-Akademiens Handlingar* 24:1–26.
23. Cohen J, Zhang X, Francis J, Jung T, Kwok R, Overland J, et al. (2020) Divergent consensus on Arctic amplification influence on midlatitude severe winter weather. *Nature Climate Change* 10:20–29. DOI: [10.1038/s41558-019-0662-y](https://doi.org/10.1038/s41558-019-0662-y)
24. Crawford RM, Likhoshway Y (1999) The frustule structure of original material of *Aulacoseira distans* (Ehrenberg) Simonsen. *Diatom Research* 14:239–250. DOI: [10.1080/0269249X.1999.9705468](https://doi.org/10.1080/0269249X.1999.9705468)
25. Das SK, Rawat DS, Dash SS, Banerjee A, Sinha BK, Singh P (2020) Moss-inhabiting diatoms as ecological indicators in Neora Valley National Park (Eastern Himalaya), India. *Tropical Ecology* 61:226–237. DOI: [10.1007/s42965-020-00083-9](https://doi.org/10.1007/s42965-020-00083-9)

26. DeNicola DM (2000) A review of diatoms found in highly acidic environments. *Hydrobiologia* 433:111–122. DOI: <https://doi.org/10.1023/A:1004066620172>
27. Douglas MSV, Smol JP (1995) Periphytic diatom assemblages from high Arctic ponds. *Journal of Phycology* 31:60–69. DOI: <https://doi.org/10.1111/j.0022-3646.1995.00060.x>
28. Duda MP, Hargan KE, Michelutti N, Smol JP (2019) Freshwater diatom assemblages from seabird-inhabited ponds in Hudson Strait, sub-Arctic Canada. *Polar Biology* 42:1549–1560. DOI: [10.1007/s00300-019-02541-0](https://doi.org/10.1007/s00300-019-02541-0)
29. Dufrene M, Legendre P (1997) Species assemblages and indicator species: the need for a flexible asymmetrical approach. *Ecological Monographs* 67:345. DOI: [https://doi.org/10.1890/0012-9615\(1997\)067\[0345:SAAIST\]2.0.CO;2](https://doi.org/10.1890/0012-9615(1997)067[0345:SAAIST]2.0.CO;2)
30. Dyke AS, Andrews JT, Clark PU, England JH, Miller GH, Shaw J, Veillette JJ (2002) The Laurentide and Innuitian ice sheets during the Last Glacial Maximum. *Quaternary Science Reviews* 21:9–31. DOI: [10.1016/S0277-3791\(01\)00095-6](https://doi.org/10.1016/S0277-3791(01)00095-6)
31. Elphinstone C, Hernández F, Todesco M, Légaré J, Cheung W, Sokoloff PC, et al. (2024) Multiple Pleistocene refugia for Arctic Bell-Heather revealed with genomic analyses of modern and historic plants. *Journal of Biogeography* 51:1958–1973. DOI: <https://doi.org/10.1111/jbi.14961>
32. Finkelstein SA, Gajewski K (2008) Responses of Fragilarioid-dominated diatom assemblages in a small Arctic lake to Holocene climatic changes, Russell Island, Nunavut, Canada. *Journal of Paleolimnology* 40:1079–1095.
33. Finlay BJ (2002) Global Dispersal of free-living microbial Eukaryote species. *Science* 296:1061–1063. DOI: [10.1126/science.1070710](https://doi.org/10.1126/science.1070710)
34. Foged N (1953) Diatoms from West Greenland. *Medd. Grønland* 147:1–86.
35. Foged N (1955) Diatoms from Peary Land, North Greenland. *Medd. Grønland* 194:1–66.
36. Foged N (1964) Freshwater diatoms from Spitsbergen. *Tromsø Museums Skrifter* 11:1–205.
37. Foged N (1974) Freshwater diatoms in Iceland. *J. Cramer, Vaduz*.
38. Foged N (1977) Diatoms from four postglacial deposits at Godthabsfjord, West Greenland. *Medd. Grønland* 199:1–64.
39. Funder S (1979) Ice-age plant refugia in east Greenland. *Palaeogeography, Palaeoclimatology, Palaeoecology* 28:279–295. DOI: [https://doi.org/10.1016/0031-0182\(79\)90123-8](https://doi.org/10.1016/0031-0182(79)90123-8)
40. Furey PC, Manoylov KM, Lowe RL (2020) New and interesting aerial diatom assemblages from southwestern Iceland. *Phytotaxa* 428:173–208. DOI: <https://doi.org/10.11646/phytotaxa.428.3.2>
41. Galili T (2015) dendextend: an R package for visualizing, adjusting, and comparing trees of hierarchical clustering. *Bioinformatics* 31(22): 3718–3720. DOI: <https://doi.org/10.1093/bioinformatics/btv428>
42. Goeyers C, Vitt DH, Van de Vijver B (2022) Taxonomic and biogeographical analysis of diatom assemblages from historic bryophyte samples from Campbell Island (sub-Antarctic). *Plant Ecology and Evolution* 155:107–122. DOI: <https://doi.org/10.5091/plecevo.84543>

43. Goeyers C, Sabbe K, Verleyen E, Van de Vijver B (2024a) The genus *Brachysira* (Brachysiraceae, Bacillariophyceae) in the Arctic with the description of two new species. *Phycologia*:1–9. DOI: 10.1080/00318884.2024.2377845
44. Goeyers C, Van de Vijver B, Kohler TJ, Verleyen E, Tytgat B, Gradstein SR, Sabbe K (2024b) Local and regional, not latitudinal, variation in microclimate and bedrock shapes moss-associated diatom communities in Greenland. *Journal of Biogeography* 52:479–494. DOI: 10.1111/jbi.15050
45. Goeyers C, Sabbe K, Verleyen E, Hamilton PB, Kohler TJ, Van de Vijver B (2024c) The genus *Humidophila* (Bacillariophyta) in Greenland with the description of two new species. *Fottea* 24(2):198–221. DOI: 10.5507/fot.2024.004
46. Goeyers C, Verleyen E, Van de Vijver B, Kohler TJ, Gradstein SR, Sabbe K (2026) Moss diatoms show regional structuring, high potential endemism, and an inverse latitudinal diversity gradient in the Arctic. *Ecography* 2026(3):e08362. DOI: <https://doi.org/10.1002/ecog.08362>
47. Hadley KR, Douglas MSV, Lim D, Smol JP (2013) Diatom assemblages and limnological variables from 40 lakes and ponds on Bathurst Island and neighboring high Arctic islands. *International Review of Hydrobiology* 98:44–59. DOI: <https://doi.org/10.1002/iroh.201201449>
48. Hein M (1990) Flora of Adak Island, Alaska Bacillariophyceae (Diatoms). In: *Bibliotheca Diatomologica* 21. J. Cramer, Berlin.
49. Heudre D, Wetzel CE, Lange-Bertalot H, Van de Vijver B, Moreau L, Ector L (2021) A review of *Tabellaria* species from freshwater environments in Europe. *Fottea* 21:180–205. DOI: 10.5507/fot.2021.005
50. Hill MO, Gauch H (1980) Detrended correspondence analysis: An improved ordination technique. *Vegetatio* 42:47–58. DOI: <https://doi.org/10.1007/BF00048870>
51. Houk V, Klee R (2004) The stelligeroid taxa of the genus *Cyclotella* (Kutz.) Brébisson (Bacillariophyceae) and their transfer to the new genus *Discostella* gen. nov. *Diatom Research* 19:203–228. DOI: <https://doi.org/10.1080/0269249X.2004.9705871>
52. Jahn A, Holland MM (2013) Implications of Arctic sea ice changes for North Atlantic deep convection and the meridional overturning circulation in CCSM4-CMIP5 simulations. *Geophysical Research Letters* 40:1206–1211. DOI: <https://doi.org/10.1002/grl.50183>
53. Keatley BE, Douglas MSV, Smol JP (2008) Evaluating the influence of environmental and spatial variables on diatom species distributions from Melville Island (Canadian High Arctic). *Botany* 86:76–90. DOI: <https://doi.org/10.1139/B07-118>
54. Kindt R, Coe R (2005) Tree diversity analysis. A manual and software for common statistical methods for ecological and biodiversity studies. World Agroforestry Centre (ICRAF), Nairobi.
55. Kopalová K, Ochrya R, Nedbalová L, Van de Vijver B (2014) Moss-inhabiting diatoms from two contrasting Maritime Antarctic islands. *Plant Ecology and Evolution* 147:67–84. DOI: <http://dx.doi.org/10.5091/plecevo.2014.896>
56. Kulikovskiy MS, Lange-Bertalot H, Witkowski A, Dorofeyuk NI, Genkal SI (2010) Diatom assemblages from *Sphagnum* bogs of the world. In: *Bibliotheca Diatomologica*. J. Cramer in der Gebrüder

Borntraeger Verlagsbuchhandlung, Stuttgart.

57. Lange-Bertalot H (1999) Diatomeen aus Sibirien, I: Inseln im Arktischen Ozean (Yugorsky - Shar Strait). In: *Iconographia Diatomologica Annotated Diatom Micrographs*, Koeltz Scientific Books, Königstein.
58. Lange-Bertalot H, Genkal SI (1999) *Iconographia diatomologica: annotated diatom micrographs Inseln im Arktischen Ozean (Yugorsky-Shar Strait)*. In: *Iconographia diatomologica*. ARG Gantner Verlag KG, Vaduz.
59. Lange-Bertalot H, Hofmann G, Werum M, Cantonati M (2017) *Freshwater Benthic Diatoms of Central Europe: Over 800 Common Species Used in Ecological Assessment*. Koeltz Botanical Books, Schmitten-Oberreifenberg.
60. Lee WJ, Patterson DJ (2000) Heterotrophic flagellates (Protista) from marine sediments of Botany Bay, Australia. *Journal of Natural History* 34:483–562. DOI: <https://doi.org/10.1080/002229300299435>
61. Lenaerts JTM, Van Angelen JH, Van Den Broeke MR, Gardner AS, Wouters B, Van Meijgaard E (2013) Irreversible mass loss of Canadian Arctic Archipelago glaciers. *Geophysical Research Letters* 40:870–874. DOI: <https://doi.org/10.1002/grl.50214>
62. Lim DSS, Douglas MSV, Smol JP (2001) Diatoms and their relationship to environmental variables from lakes and ponds on Bathurst Island, Nunavut, Canadian High Arctic. *Hydrobiologia* 450:215–230. DOI: <https://doi.org/10.1023/A:1017553112643>
63. Liu J, Curry JA, Hu Y (2004) Recent Arctic Sea Ice Variability: Connections to the Arctic Oscillation and the ENSO. *Geophysical Research Letters* 31:2004GL019858. DOI: <https://doi.org/10.1029/2004GL019858>
64. Lowe CW (1923) *Report of the Canadian Arctic Expedition 1913-18. Part A: Freshwater algae and freshwater diatoms, Southern Party 1913-1916*. Printer of the King's Most Excellent Majesty, Ottawa.
65. MacArthur RH, Wilson EO (1967) *The theory of island biogeography*. In: *Princeton Landmarks in Biology*. 13th printing and first Princeton landmarks in biology. Princeton university press, Princeton Oxford.
66. Margreth A, Gosse JC, Dyke AS (2016) Quantification of subaerial and episodic subglacial erosion rates on high latitude upland plateaus: Cumberland Peninsula, Baffin Island, Arctic Canada. *Quaternary Science Reviews* 133:108–129. DOI: [10.1016/j.quascirev.2015.12.017](https://doi.org/10.1016/j.quascirev.2015.12.017)
67. Mariani Z, Huang L, Crawford R, Blanchet J-P, Hicks-Jalali S, Mekis E, et al. (2022) Enhanced automated meteorological observations at the Canadian Arctic Weather Science (CAWS) supersites. *Earth System Science Data* 14:4995–5017. DOI: <https://doi.org/10.5194/essd-14-4995-2022>
68. Martinez AP (2020) pairwiseAdonis: Pairwise multilevel comparison using adonis. – R package ver. 0.4, <https://github.com/pmartinezarbizu/pairwiseAdonis>.
69. Maxwell JB (1981) Climatic Regions of the Canadian Arctic Islands. *Arctic* 34:225–240.
70. Michelutti N, Smol JP, Douglas MSV (2006) Ecological characteristics of modern diatom assemblages from Axel Heiberg Island (High Arctic Canada) and their application to

- paleolimnological inference models. Canadian Journal of Botany 84:1695–1713. DOI: <https://doi.org/10.1139/b06-122>
71. Michelutti N, Douglas MSV, Smol JP (2007) Evaluating diatom community composition in the absence of marked limnological gradients in the high Arctic: a surface sediment calibration set from Cornwallis Island (Nunavut, Canada). Polar Biology 30:1459–1473. DOI: <https://doi.org/10.1007/s00300-007-0307-x>
72. Michelutti N, McCleary K, Douglas MSV, Smol JP (2013) Comparison of Freshwater Diatom Assemblages from a High Arctic Oasis to Nearby Polar Desert Sites and Their Application to Environmental Inference Models. Journal of Phycology 49:41–53. DOI: <https://doi.org/10.1111/jpy.12024>
73. Miller GH, Wolfe AP, Steig EJ, Sauer PE, Kaplan MR, Briner JP (2002) The Goldilocks dilemma: big ice, little ice, or “just-right” ice in the Eastern Canadian Arctic. Quaternary Science Reviews 21:33–48.
74. Mooney HA, Billings WD (1961) Comparative Physiological Ecology of Arctic and Alpine Populations of *Oxyria digyna*. Ecological Monographs 31:1–29. DOI: <https://doi.org/10.2307/1950744>
75. Napier JD, De Lafontaine G, Heath KD, Hu FS (2019) Rethinking long-term vegetation dynamics: multiple glacial refugia and local expansion of a species complex. Ecography 42:1056–1067.
76. Nováková J, Pouličková A (2004) Moss diatom (Bacillariophyceae) flora of the Nature Reserve Adršpašsko-Teplické Rocks (Czech Republic). Fottea 4:75–86. DOI: <https://doi.org/10.12911/22998993/92673>
77. Oksanen J, Blanchet FG, Friendly M, Kindt R, Legendre P, McGlinn D, et al. (2019) vegan: Community Ecology Package. R package version 2.5–6.
78. Pinseel E, Kopalova K, Van de Vijver B (2014) *Gomphonema svalbardense* sp. nov., a new freshwater diatom species (Bacillariophyta) from the Arctic Region. Phytotaxa 170:250. DOI: <https://doi.org/10.11646/phytotaxa.170.4.2>
79. Pinseel E, Vanormelingen P, Hamilton PB, Vyverman W, Van de Vijver B, Kopalova K (2017) Molecular and morphological characterization of the *Achnanthes minutissimum* complex (Bacillariophyta) in Petuniabukta (Spitsbergen, High Arctic) including the description of *A. digitatum* sp. nov. European Journal of Phycology 52:264–280. DOI: <https://doi.org/10.1080/09670262.2017.1283540>
80. Potapova M (2014) Diatoms of Bering Island, Kamchatka, Russia. Nova Hedwigia 143:63–102. DOI: [10.1127/1438-9134/2014/004](https://doi.org/10.1127/1438-9134/2014/004)
81. Potapova M, Hamilton P, Kopyrina L, Sosina N (2014) New and rare diatom (Bacillariophyta) species from a mountain lake in Eastern Siberia. Phytotaxa 156:100. DOI: <https://doi.org/10.11646/phytotaxa.156.3.2>
82. Pouličková A, Hájková P, Krenková P, Hájek M (2004) Distribution of diatoms and bryophytes on linear transects through spring fens. Nova Hedwigia 78:411–424. DOI: [10.1127/0029-5035/2004/0078-0411](https://doi.org/10.1127/0029-5035/2004/0078-0411)

83. Radhakrishnan C, Yogeshwaran M, Karthick B (2022) Hanging in the air: tree moss diatoms from Indo-Burma biodiversity hot spot of India. *Aerobiologia* 38:557–566. DOI: <https://doi.org/10.1007/s10453-022-09766-3>
84. Rantanen M, Karpechko A, Yu Lipponen A, Nordling K, Hyvärinen O, Ruosteenoja K., et al. (2022) The Arctic has warmed nearly four times faster than the globe since 1979. *Communications Earth & Environment* 3:168. DOI: <https://doi.org/10.1038/s43247-022-00498-3>
85. Ritchie JC (1987) *Postglacial vegetation of Canada*. Cambridge University Press, New York.
86. Ritchie JC (1992) Aspects of the floristic history of Canada. *Acta Botanica Fennica* 144:81–91. DOI: <https://doi.org/10.1046/j.1365-294X.2003.01731.x>
87. Roberts DW (2023) *Labdsv: ordination and Multivariate Analysis for Ecology*.
88. Ross R (1947) Freshwater Diatomae (Bacillariophyta). In: *Botany of the Canadian Eastern Arctic*. National Museum of Canada, Ottawa, pp 178–233.
89. Saarela JM, Sokoloff PC, Gillespie LJ, Bull RD (2023) Vascular plant biodiversity of Katannilik Territorial Park, Kimmirut and vicinity on Baffin Island, Nunavut, Canada: an annotated checklist of an Arctic flora. *PhytoKeys* 217:1–135. DOI: <https://doi.org/10.3897/phytokeys.217.90573>
90. Smol JP (1983) Paleophycology of a high arctic lake near Cape Herschel, Ellesmere Island. *Canadian Journal of Botany* 61:2195–2204.
91. Sokal MA, Hall RI, Wolfe BB (2008) Relationships between hydrological and limnological conditions in lakes of the Slave River Delta (NWT, Canada) and quantification of their roles on sedimentary diatom assemblages. *Journal of Paleolimnology* 39:533–550. DOI: <https://doi.org/10.1007/s10933-007-9128-8>
92. Souffreau C, Vanormelingen P, Sabbe K, Vyverman W (2013) Tolerance of resting cells of freshwater and terrestrial benthic diatoms to experimental desiccation and freezing is habitat-dependent. *Phycologia* 52:246–255. DOI: <https://doi.org/10.2216/12-087.1>
93. Souffreau C, Vanormelingen P, Verleyen E, Sabbe K, Vyverman W (2010) Tolerance of benthic diatoms from temperate aquatic and terrestrial habitats to experimental desiccation and temperature stress. *Phycologia* 49:309–324. DOI: <https://doi.org/10.2216/09-30.1>
94. Steig EJ, Wolfe AP, Miller GH (1998) Wisconsinan refugia and the glacial history of eastern Baffin Island, Arctic Canada: Coupled evidence from cosmogenic isotopes and lake sediments. *Geology* 26:835. DOI: [https://doi.org/10.1130/0091-7613\(1998\)026<0835:WRATGH>2.3.CO;2](https://doi.org/10.1130/0091-7613(1998)026<0835:WRATGH>2.3.CO;2)
95. Stewart KA, Lamoureux SF, Forbes AC (2005) Hydrological controls on the diatom assemblage of a seasonal arctic river: Boothia Peninsula, Nunavut, Canada. *Hydrobiologia* 544:259–270. DOI: <https://doi.org/10.1007/s10750-005-0864-3>
96. Sutherland PC (1952) *Journey of a voyage in Baffin Bay and Barrow Straits, in the years 1850-1851, Performed by H.M. ships "Lady Franklin" and "Sophia", under the command of Mr. William Penny, in search of the missing crews of H.M. ships "Erebus" and "Terror."* Longman, Brown & Green, London.
97. Tremblay NO, Schoen DJ (1999) Molecular phylogeography of *Dryas integrifolia*: glacial refugia and postglacial recolonization. *Molecular Ecology* 8:1187–1198. DOI: <https://doi.org/10.1046/j.1365->

98. Van de Vijver B, Beyens L (1999) Moss diatom communities from Ile de la Possession (Crozet, Subantarctica) and their relationship with moisture. *Polar Biology* 22:219–231. DOI: <https://doi.org/10.1007/s003000050414>
99. Van de Vijver B, Kerckvoorde A, Beyens L (2003) Freshwater and terrestrial moss diatom assemblages of the Cambridge Bay area, Victoria Island (Nunavut, Canada). *Nova Hedwigia* 76:225–243. DOI: 10.1127/0029-5035/2003/0076-0225
100. Van de Vijver B, Beyens L, Lange-Bertalot H (2004a) The genus *Stauroneis* in the Arctic and (sub-)Antarctic regions: with 7 tables. In: *Bibliotheca Diatomologica*. Cramer in der Gebr.-Borntraeger-Verl.-Buchh, Berlin Stuttgart.
101. Van de Vijver B, Beyens L, Vincke S, Gremmen NJM (2004b) Moss-inhabiting diatom communities from Heard Island, sub-Antarctic. *Polar Biology* 27:532–543. DOI: <https://doi.org/10.1007/s00300-004-0629-x>
102. Van de Vijver B, Goeyers C, Ector L, Kusber W-H (2022a) On the taxonomic identity of *Humidophila contenta* (Grunow) R.L.Lowe & al. and *H. biceps* (Grunow) Furey & al. (Diadesmidaceae, Bacillariophyta). *Notulae Algarum* 265:1–11.
103. Van de Vijver B, Lange-Bertalot H, Goeyers C, Mertens A, Schuster TM, Ector L (2022b) The identity of *Eunotia paludosa* Grunow 1862 (Eunotiaceae, Bacillariophyta), a revision, and the description of three new species of *Eunotia* Ehrenberg. *Phytotaxa* 545:261–277. DOI: <https://doi.org/10.11646/phytotaxa.545.3.2>
104. Van Kerckvoorde A, Trappeniers K, Nijs I, Beyens L (2000) The epiphytic diatom assemblages from terrestrial mosses in Zackenberg (Northeast Greenland). *Systematics and Geography of Plants*:301–314. DOI: <https://doi.org/10.2307/3668649>
105. Verleyen E, Van de Vijver B, Tytgat B, Pinseel E, Hodgson DA, Kopalová K, Tubić B, Paunović M (2021) Diatoms define a novel freshwater biogeography of the Antarctic. *Ecography* 44:548–560. DOI: <https://doi.org/10.1111/ecog.05374>
106. Veselá J, Potapova M (2014) *Surirella arctica* comb. et stat. nov. (Bacillariophyta)—a rare arctic diatom. *Phytotaxa* 166:222. DOI: <https://doi.org/10.11646/phytotaxa.166.3.3>
107. Vihtakari M (2022) ggOceanMaps: Plot Data on Oceanographic Maps using 'ggplot2'_. R package version 1.3.4.
108. Virkkala A-M, Abdi AM, Luoto M, Metcalfe DB (2019) Identifying multidisciplinary research gaps across Arctic terrestrial gradients. *Environmental Research Letters* 14:124061. DOI: 10.1088/1748-9326/ab4291
109. Walker DA, Reynolds MK, Daniëls FJA, Einarsson E, Elvebakk A, Gould WA, et al. (2005) The Circumpolar Arctic vegetation map. *Journal of Vegetation Science* 16:267–282. DOI: <https://doi.org/10.1111/j.1654-1103.2005.tb02365.x>
110. Weider LJ, Hobæk A (2003) Glacial refugia, haplotype distributions, and clonal richness of the *Daphnia pulex* complex in arctic Canada. *Molecular Ecology* 12:463–473. DOI:

<https://doi.org/10.1046/j.1365-294X.2003.01746.x>

111. Werum M, Lange-Bertalot H (2004) Diatoms in Springs from Central Europe and elsewhere under the influence of hydrogeology and anthropogenic impacts. In: Iconographia Diatomologica. Annotated Diatom Micrographs, Ecology–Hydrology–Taxonomy, Vol. 13. ARG Gantner Verlag KG, Ruggell, pp 3–417.
112. Wheldon RM (1947) Algae. In: Botany of the Canadian Eastern Arctic. Part II: Thallophyta and Bryophyta, Vol. 97, National Museum of Canada, Ottawa.
113. Wolfe AP (1996) Spatial patterns of modern diatom distribution and multiple paleolimnological records from a small arctic lake on Baffin Island, Arctic Canada. Canadian Journal of Botany 74:435–449. DOI: <https://doi.org/10.1139/b96-054>
114. Wolfe AP, Kling HJ (2001) A consideration of some North American soft-water *Brachysira* taxa and description of *B. arctoborealis* sp. nov. In: Wolfe AP, Kling HJ (Eds.), Lange-Bertalot-Festschrift: studies on diatoms: dedicated to Prof. Dr. Dr. h.c. Horst Lange-Bertalot on the occasion of his 65th birthday. Gantner, Ruggell.
115. Zhang Y, Chen C, Beardsley RC, Gao G, Lai Z, Curry B, Lee CM, Lin H, Qi J, Xu Q (2016) Studies of the Canadian Arctic Archipelago water transport and its relationship to basin-local forcings: Results from AO-FVCOM. Journal of Geophysical Research: Oceans 121:4392–4415. DOI: <https://doi.org/10.1002/2016JC011634>
116. Zimmermann C, Lange-Bertalot H, Poulin M, Pienitz R (2010) Iconographia diatomologica: annotated diatom micrographs the Pliocene-Pleistocene freshwater flora of Bylot Island, Nunavut, Canadian high Arctic. ARG Gantner, Ruggell.

Figures

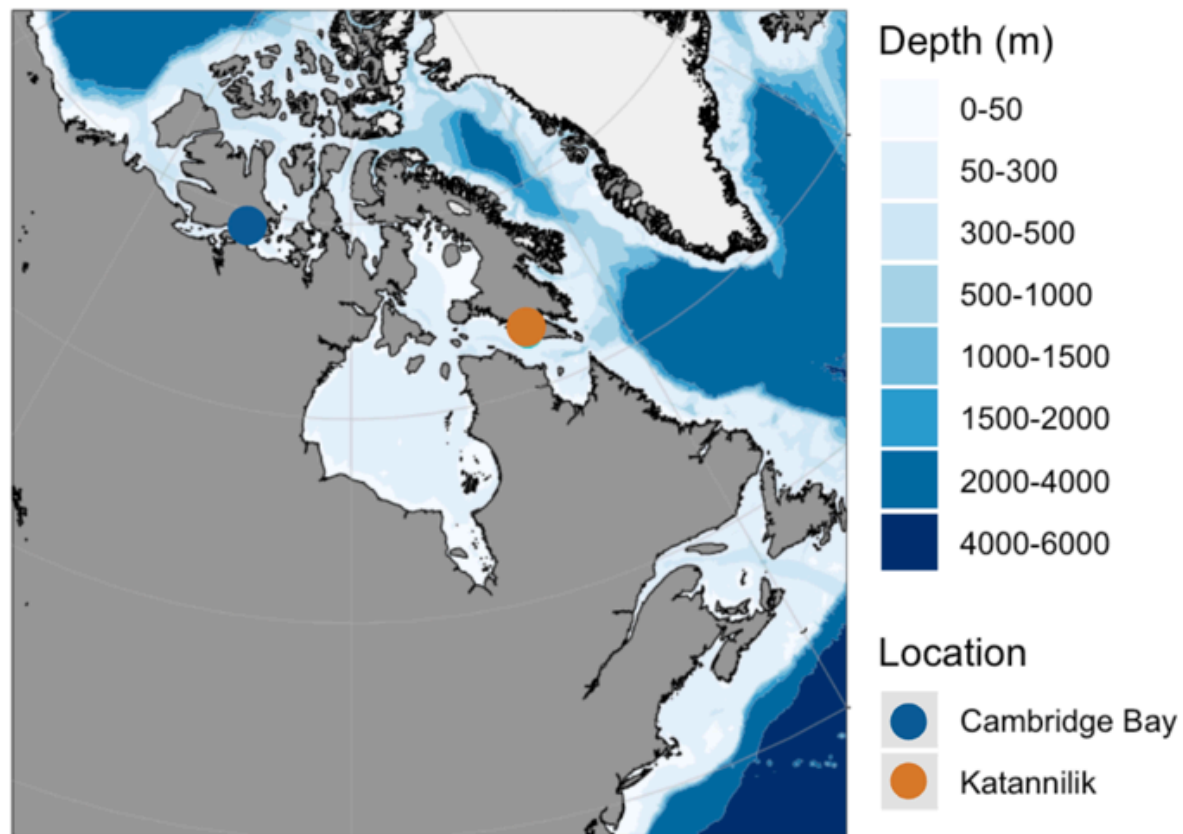


Figure 1

map of all sampling regions. Katannilik (Baffin Island) is located in the Eastern Canadian Arctic (ECA), and Cambridge Bay (Victoria Island) in the Western Canadian Arctic (WCA)

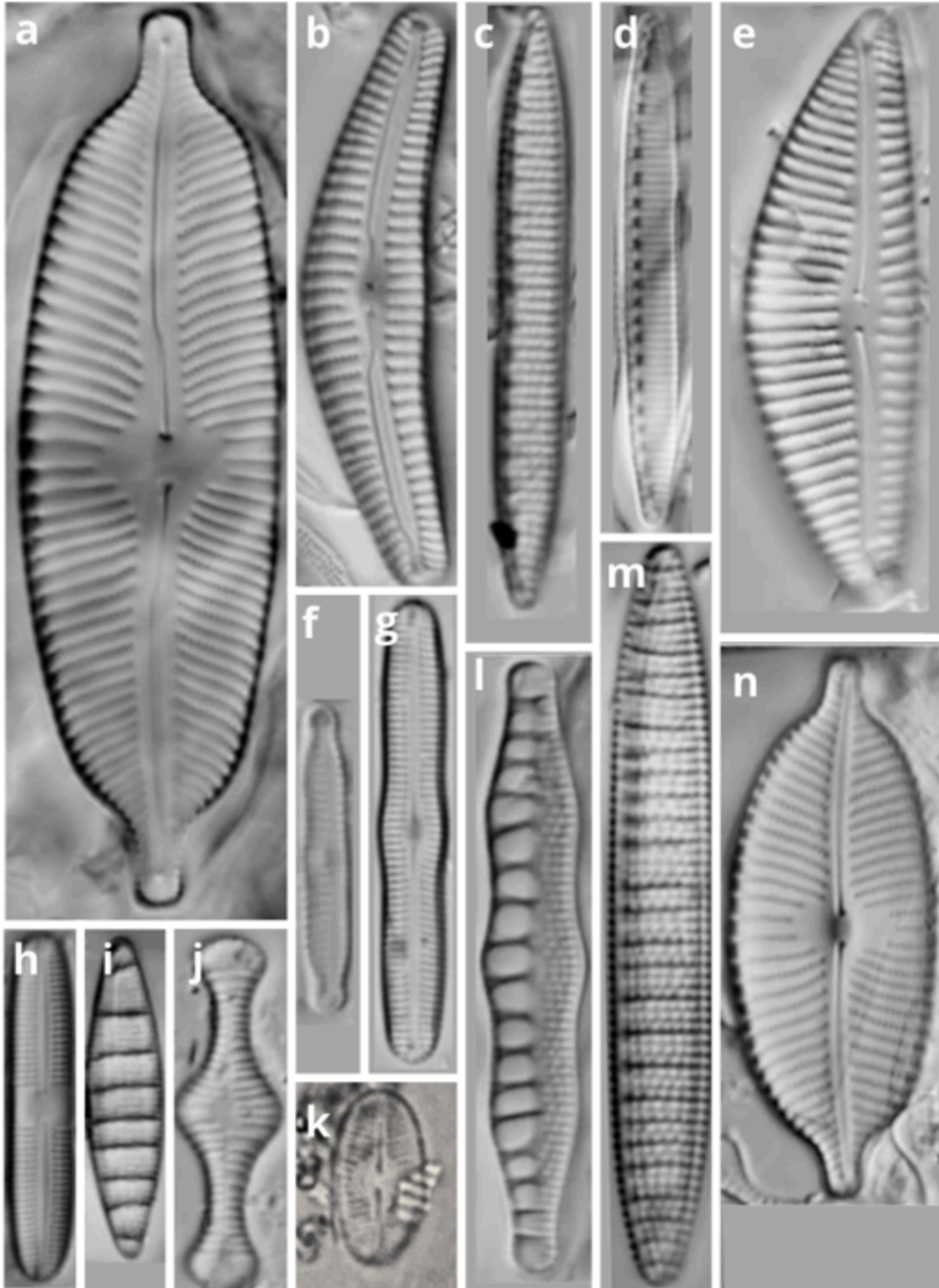


Figure 2

The top 14 dominant species in Canadian Arctic Archipelago mosses (based on IndVals). (a) *Cymbopleura angustata* var. *spitsbergensis*; (b) *Cymbella weslawskii*; (c) *Nitzschia amphibia*; (d) *Nitzschia fossilis*; (e) *Encyonema elginense*; (f) *Encyonopsis* sp1; (g) *Caloneis fusus*; (h) *Caloneis* cf. *fasciata*; (i) *Denticula tenuis*; (j) *Tabellaria acidodelicata*; (k) *Psammothidium acidoclinatum*; (l) *Nitzschia sinuata*; (m) *Denticula kuetzingii* (n) *Cymbopleura anglica*

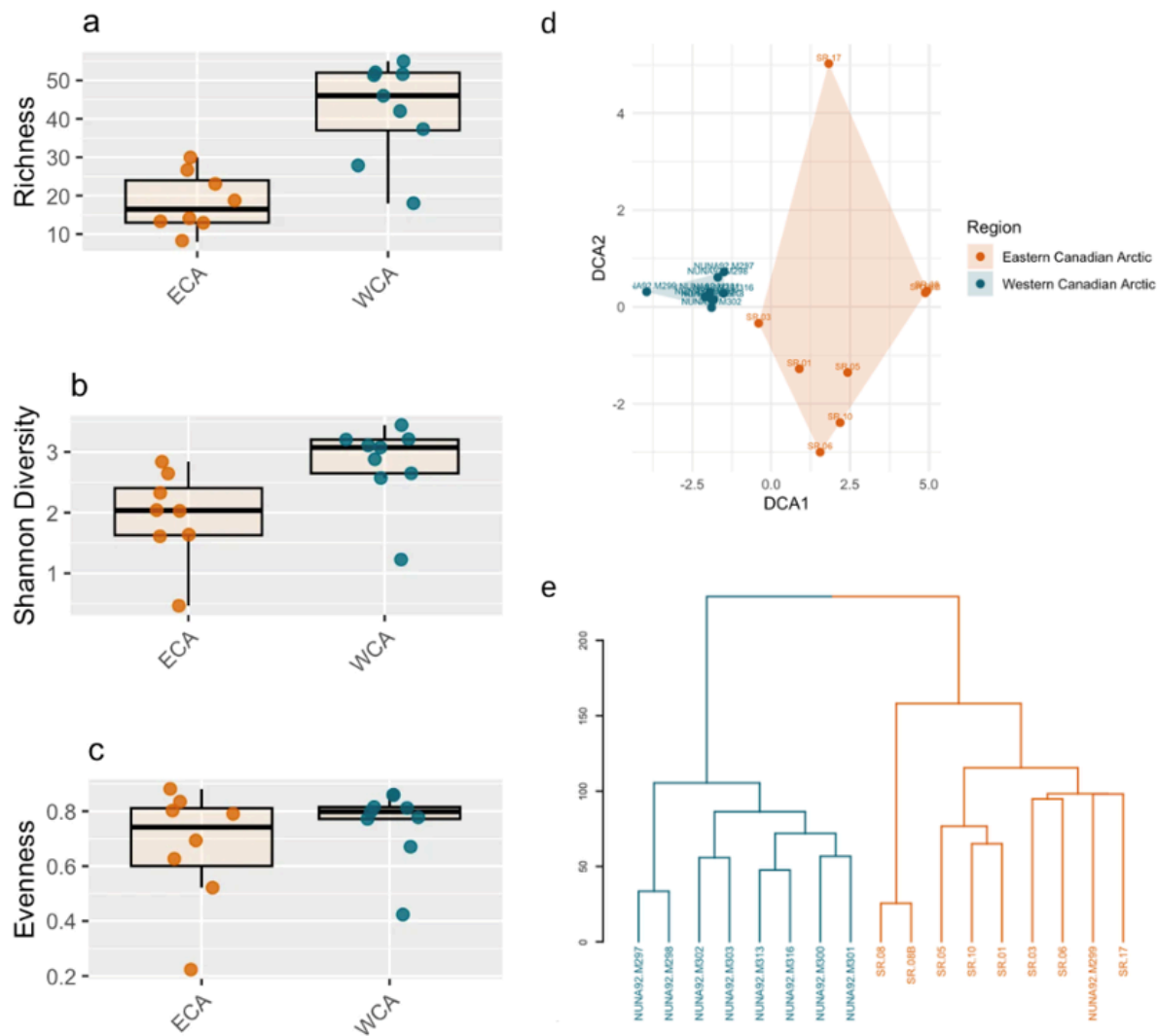


Figure 3

Boxplots of (a) α-diversity, (b) Shannon–Wiener diversity and (c) evenness (Shannon equitability index). Kruskal–Wallis identified a significant difference in α-diversity and Shannon–Wiener diversity, which were lower in the ECA than in the WCA; (d) DCA ordination separated ECA and WCA samples into two separate groups; and (e) dendrogram with 2 clusters resulting from SIMPROF analysis

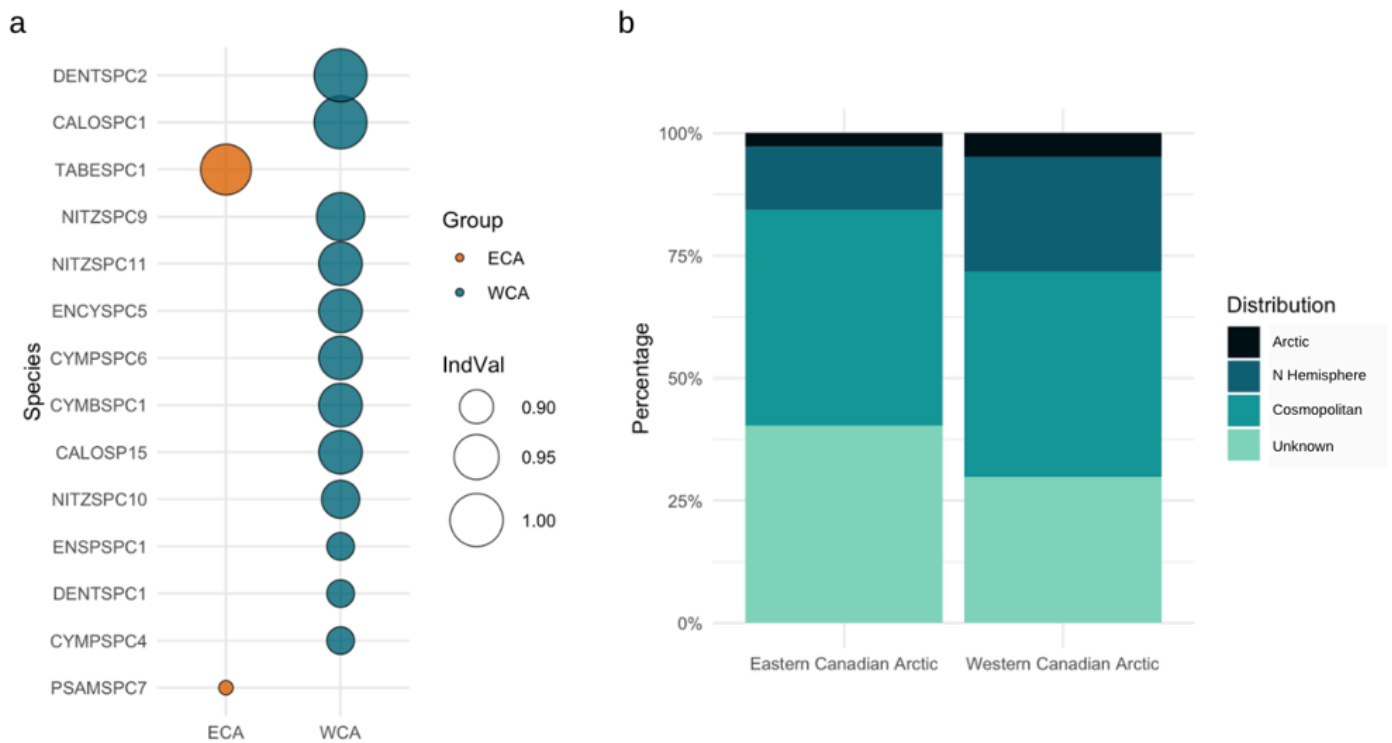


Figure 4

(a) IndVal identified 2 indicator species for the ECA and 12 for the WCA; (b) proportion of distribution types 'Arctic', 'Northern Hemisphere', 'cosmopolitan' and 'unknown' for the ECA versus WCA