



bastian.niemeyer@awi.de

Pollen and sedimentary DNA from Siberian lakes

- Vegetation signals unraveled -

Introduction

Siberian arcto-boreal elements in Taymyr show latitudinal shifts, which are difficult to trace by time consuming vegetation surveys.

But do palynological and molecular genetic methodologies also allow evaluation of vegetation composition at high latitude areas?

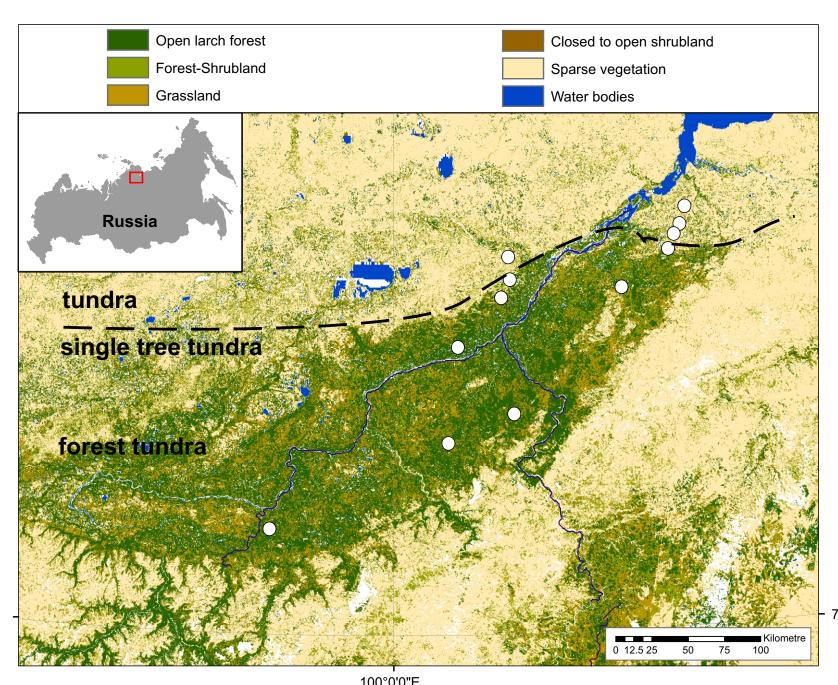


Figure 1: Overview about sample locations (white circles) at the study site. The map reflects vegetation cover based on the Global Land Cover map 2009 (www.globalforestwatch.org; accessed 17th May 2016)

Figure 2: Impression of a lake in northern Siberia, sourrounded by larch trees (*Larix gmelinii*).

Methods

Surface sediment of **31 lakes** along a treeline transect in northern Siberia were analysed by **pollen** analyses and **DNA** metabarcoding¹ and compared to vegetation surveys to reflect species composition and richness.

Principal component analyses² were conducted to reflect differences of the samples lakes, according to their **geographic location**.

Results

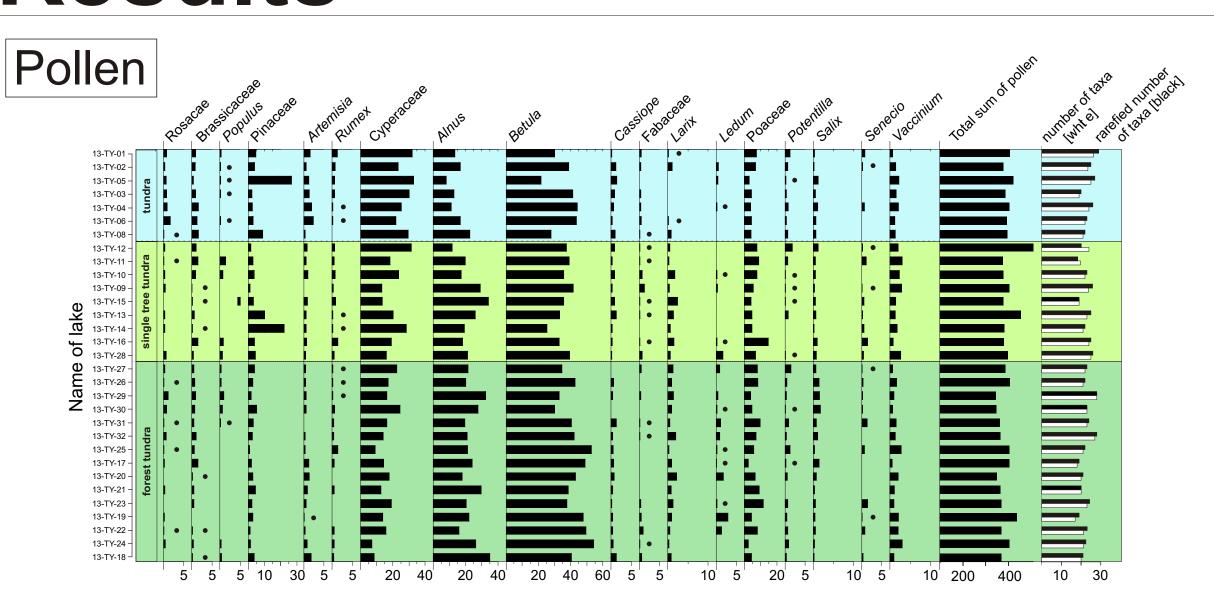
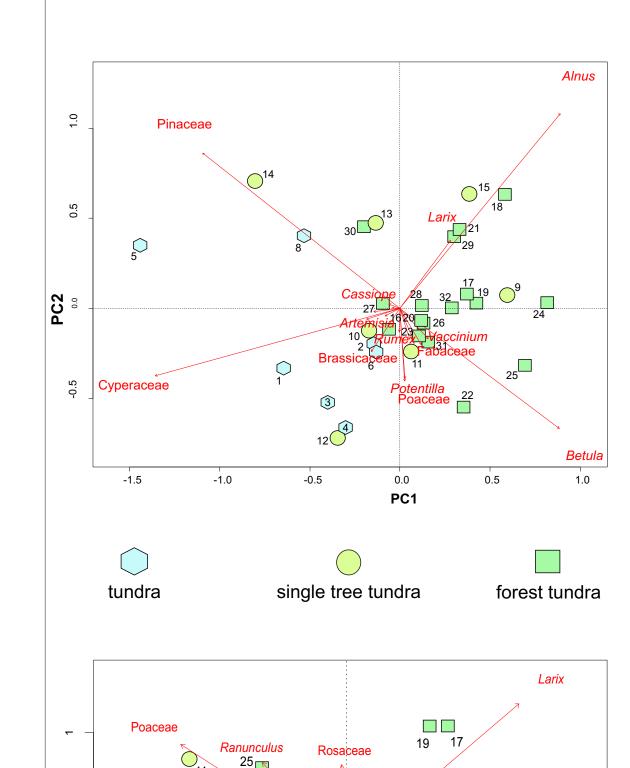


Figure 3: Pollen records for 31 lakes along a tundra-forest tundra transect show percentages for some important taxa in northern Siberia (taxa are sorted according their ordination scores). Taxa like *Betula* or *Alnus* are generally overestimated due to high pollen production³.

Similar vegetation composition is reflected in pollen and DNA records.

DNA reveals higher species richness and taxonomical resolution as pollen.

Plant detritus is the source of DNA, which is of local origin from within a few metres around the lakes.



Taxa composition reflected by the two apporaches is in agreement with the vegetation surveys results

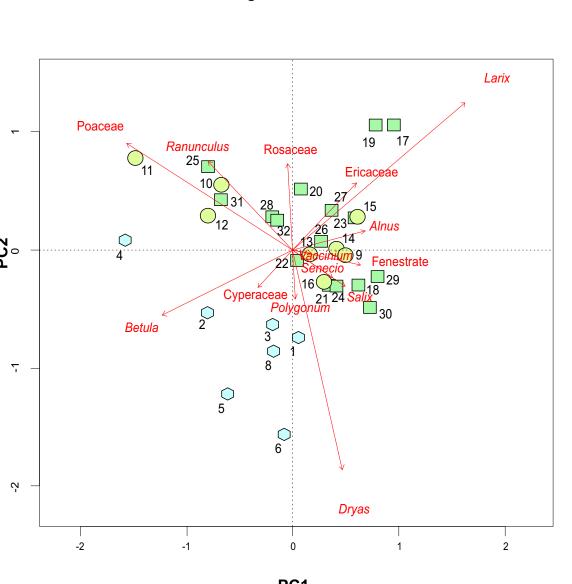


Figure 5: Principal component analyses of pollen (top) and DNA (bottom) reflect similar species compositionobtained rom the lacustrine sediments. DNA allows to differentiate more clearly between tundra (light blue) and non-tundra (greenish) vegetation

DNA allows better differenciation between locations of tundra and non-tundra sites.

Conclusions

- → DNA is a suitable proxy to investigate presence of taxa and to allow geographical differentiation of tundra and non-tundra vegetation types, rather than pollen provide
- → DNA captures a 2/3 higher vegetation taxa richness mostly on species level⁴



DNA

Recording vegetation composition at the Siberian boreal treeline: A comparison between sedimentary DNA and pollen

Figure 4: The DNA record reflects percentages of metabarcoding sequence reads for the same 31 lakes

as presented in the pollen record (taxa are sorted according their ordination scores). Specific taphonomic

conditions may cause higher percentages for some taxa (i.e. Salix), as for other taxa.

* Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research - Germany