# Influence of seabirds on vascular plant composition above the bird cliffs on Bjørnøya

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## Introduction

- The effect of seabird-supplied nutrients, mainly through direct guano deposition, on plant abundance and species diversity in the High Arctic is quite well documented beneath their colonies but not above them.
- Several-hundred meters high cliffs of southern Bjørnøya (Fig. 1), descending straight to the sea, are home to one of the largest colonies of guillemots (Uria sp.) and kittiwakes (Rissa tridactyla) in the world, creating a unique habitat on land at their edge.
- We assess the effect of the colony on vascular plant species composition above the bird cliffs.

## Methods

Data were collected on six 450 meter-long transects starting from the cliffs' edge and going perpendicularly from it (Fig. 1):

- three transects in the **SEABIRD** areas,
- three transects in the **CONTROL** areas (no nests on the cliffs were present),
- each transect consist of ten 1x1 m sample plots (Fig. 2), every 50 m alongside.

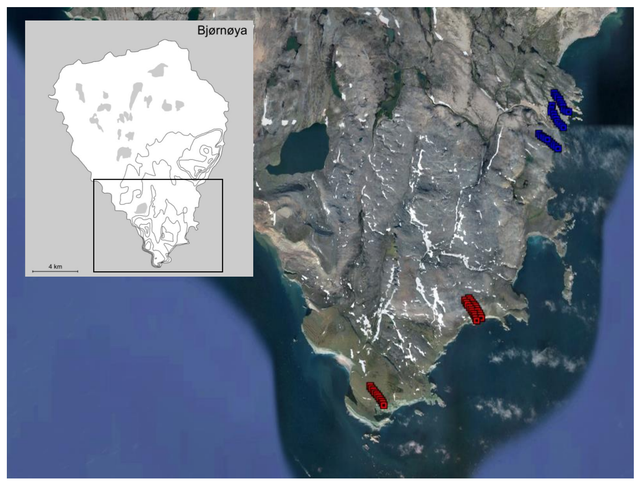



Fig. 1. Localization of **SEABIRD** and **CONTROL** transects in southern Bjørnøya.

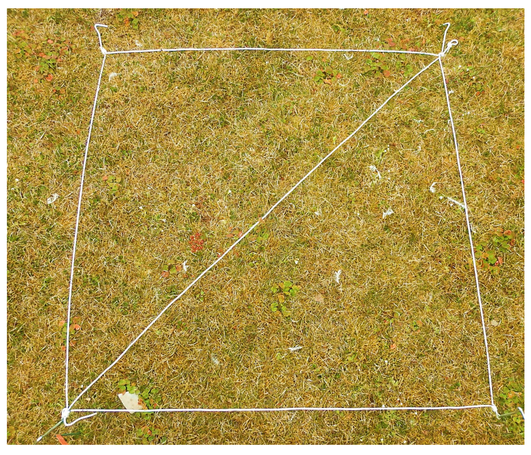
- on each sample plot we assess:
  - the percentage cover of identified vascular plant species,
  - physical and chemical soil parameters: pH, total N, P and K.

## Results

- We observed increased vegetation cover in the immediate vicinity of the bird cliffs as compared with the CONTROL areas, decreasing with distance in both areas types (Fig. 2 and 3).
- Plant species composition observed close to bird cliffs differed significantly from that of the CONTROLs and changed with the distance from the cliff in both (Table 1, Fig. 3A).
- Significant interaction between both factors proved that changes with distance from the cliff did not follow the same pattern in the SEABIRD and CONTROL areas.
- SEABIRD and CONTROL differed in soil parameters, e.g. SEABIRDS showed a higher level of total nitrogen (Fig. 3B).

Fig. 2. Examples of sampling plots located closest to the cliff on SEABIRDS and CONTROL transects.

SEABIRDS



CONTROL

Table 1. PERMANOVA results showing the influence of seabirds and distance from the cliff on the vascular plant composition.

| Components | df | SS | MS | Pseudo-F | P |
|---|---|---|---|---|---|
| SEABIRD/CONTROL | 1 | 3.09 | 3.09 | 2.10 | 0.096 |
| Transect (nested in S/C) | 4 | 5.89 | 1.47 | 1.91 | 0.003 |
| Distance from the cliff | 1 | 3.65 | 3.65 | 4.74 | <0.001 |
| SEABIRD/CONTROL*Distance | 1 | 1.75 | 1.75 | 2.28 | 0.023 |
| SEABIRD/CONTROL*Transect | 4 | 3.76 | 0.94 | 1.22 | 0.191 |
| Residulals | 47 | 36.16 | 0.77 | | |
| Total variation | 58 | 54.291 | | | |

Fig. 3. Comparison of vascular plant composition (A) and (B) physical and chemical parameters of soil between SEABIRDS and CONTROL transects presented as centroids calculated each distance form the cliff.