

University of Groningen

## Bird impacts on biological communitis in Arctic ponds

Jensen, Thomas C.; Schartau, Ann Kristin; Majaneva, Markus; Veraart, Annelies J.; Hessen, Dag; Eiler, Alexander; Loonen, Maarten J.J.E.; Skjelbred, Birger

**IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.**

*Document Version*

Publisher's PDF, also known as Version of record

*Publication date:*

2023

[Link to publication in University of Groningen/UMCG research database](#)

*Citation for published version (APA):*

Jensen, T. C., Schartau, A. K., Majaneva, M., Veraart, A. J., Hessen, D., Eiler, A., Loonen, M. J. J. E., & Skjelbred, B. (2023). *Bird impacts on biological communitis in Arctic ponds*. Poster session presented at Svalbard Science Conference 2023, Oslo, Norway.

### Copyright

Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the "Taverne" license. More information can be found on the University of Groningen website: <https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment>.

### Take-down policy

If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): <http://www.rug.nl/research/portal>. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.



# Bird impacts on biological communities in Arctic ponds

Thomas C. Jensen ([thomas.jensen@nina.no](mailto:thomas.jensen@nina.no))<sup>1</sup>, Ann Kristin Schartau<sup>1</sup>, Markus Majaneva<sup>1</sup>, Annelies J. Veraart<sup>2</sup>, Dag Hessen<sup>3</sup>, Alexander Eiler<sup>3</sup>, Maarten Loonen<sup>4</sup> and Birger Skjelbred<sup>5</sup>

<sup>1</sup>Norwegian Institute for Nature Research, Norway; <sup>2</sup>Radboud University, The Netherlands; <sup>3</sup>University of Oslo, Norway; <sup>4</sup>University of Groningen (UiG), The Netherlands; <sup>5</sup>Norwegian Institute for Water Research, Norway

## Introduction

Small ponds and lakes and their surrounding riparian zone are ecological hot spots in the arctic landscape. They are important for the biogeochemical cycling as well as habitats for both terrestrial and aquatic organisms (Arctic Council 2013).

Birds may have a strong impact on these small ponds. For example, seabirds may provide a substantial input of marine derived nutrients to water bodies on their fly ways or close to bird cliffs (Gonzalez-Bergonzoni et al. 2017). Also, the increasing goose populations on Svalbard and elsewhere in the Arctic are strongly associated with ponds and may have a significant influence on the chemical/physical properties and the ecological communities, for example by contributing nutrients directly via feces, and indirectly via grubbing and physical disturbance leading to increased erosion and run-off (van Geest et al 2007).

Our aim was to examine how the aquatic ecosystems, including the communities (phytoplankton, zooplankton) respond to increased bird impact.



## Results and discussion

### High bird impact implied:

- Strong increase in nutrients in the pond water but not in the sediment
- Increase in phytoplankton biomass and change in the phytoplankton community with dominance of mixotrophic species
- Reduction of metazoan zooplankton abundance and increase in ciliate abundance.
- Phytoplankton and metazoan zooplankton taxa richness decreased at the highest bird impact.
- Higher flux of methane

Thus, high bird impact was associated with hypereutrophic pond conditions characterized by decreased diversity and likely a stimulation of the microbial loop. The results may hint to some of the future changes in arctic ecosystems in ponds increasingly influenced by birds and climate change.



## Methods

A number of ponds differentially impacted by birds was sampled on Svalbard in summer 2022 during the Dutch SEES.NL/2022 expedition. Sampling and analysis:

- Goose/bird impact (droppings density)
- Water and sediment chemistry
- Phytoplankton
- Zooplankton/invertebrates
- Methane flux

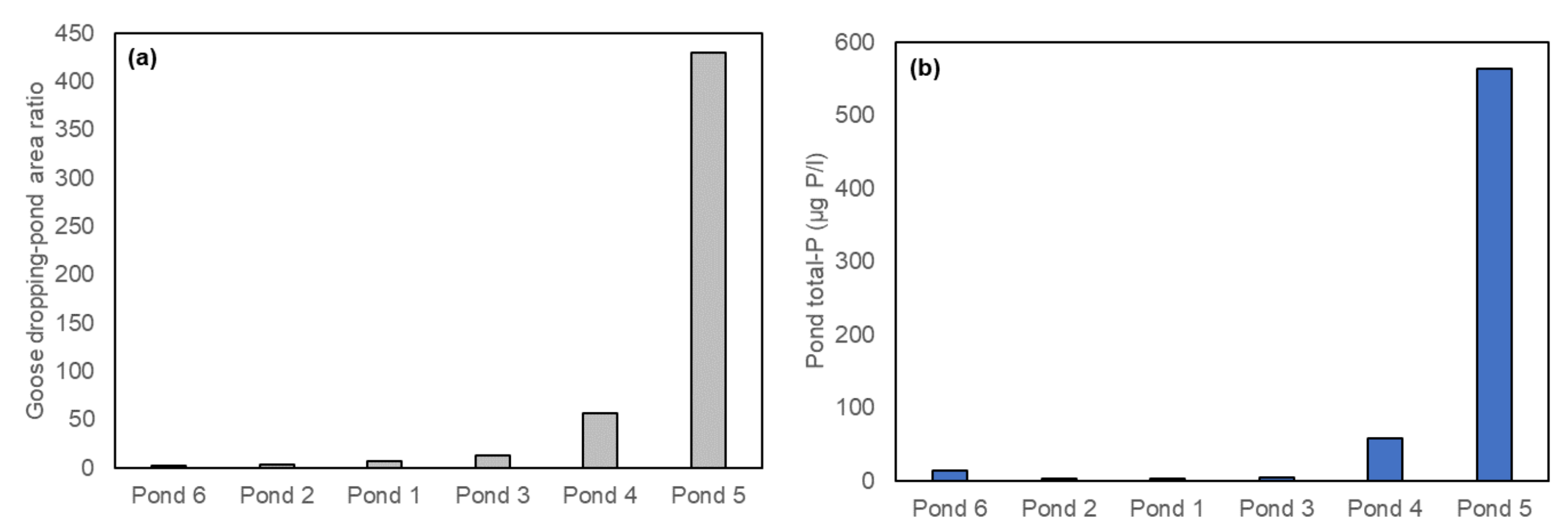


Fig. 1 Goose dropping-lake area ratio (a), order of ponds according to increasing bird impact, i.e. increasing goose dropping-pond area ratio. Additionally, pond 5 was located in front of a bird cliff, and thus received additional nutrient input from seabirds. Concentrations of total phosphorus (b).

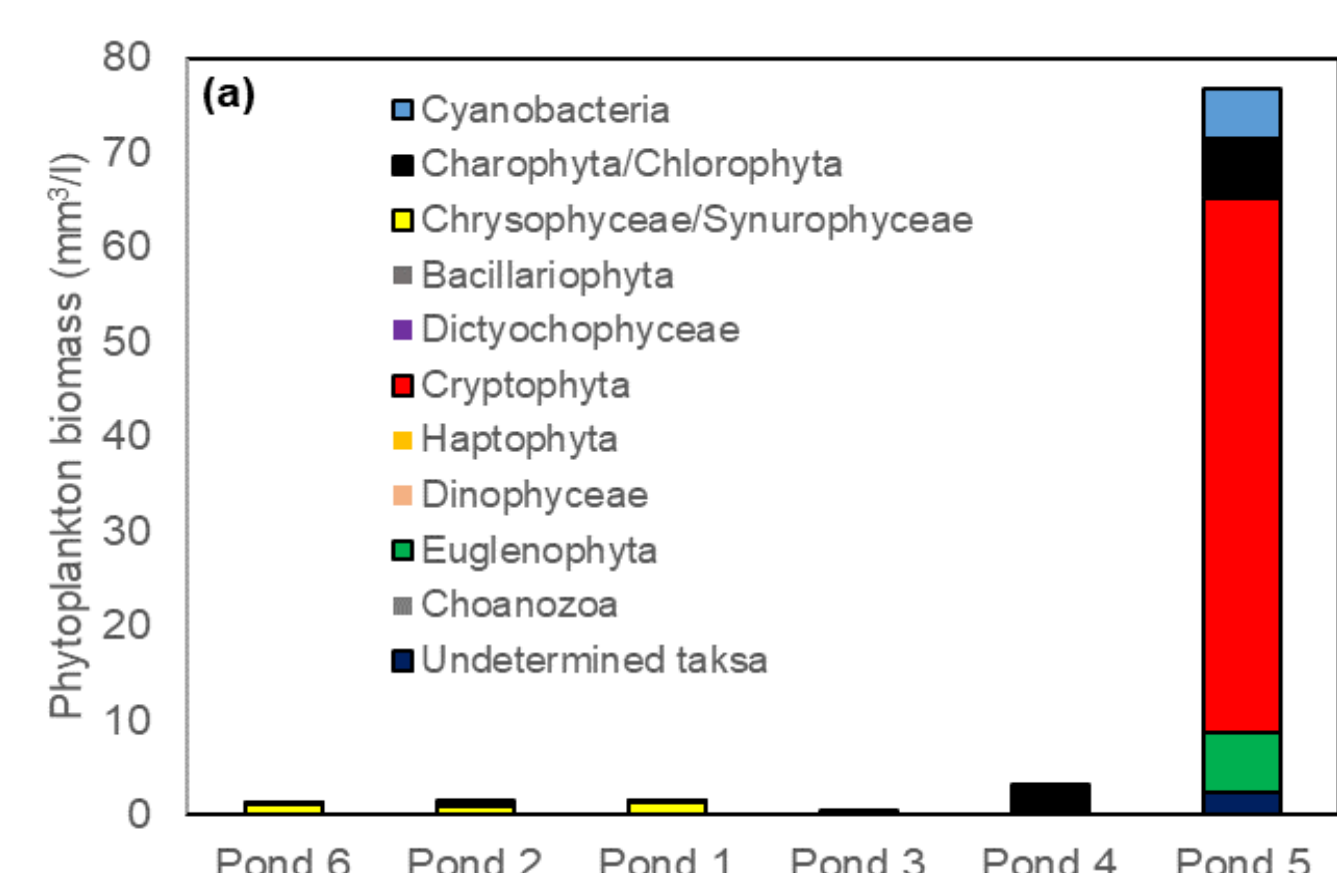


Fig. 2 Phytoplankton biomass (a). Abundance of ciliates (b) and metazoan zooplankton, rotifers, cladocerans and copepods (c).

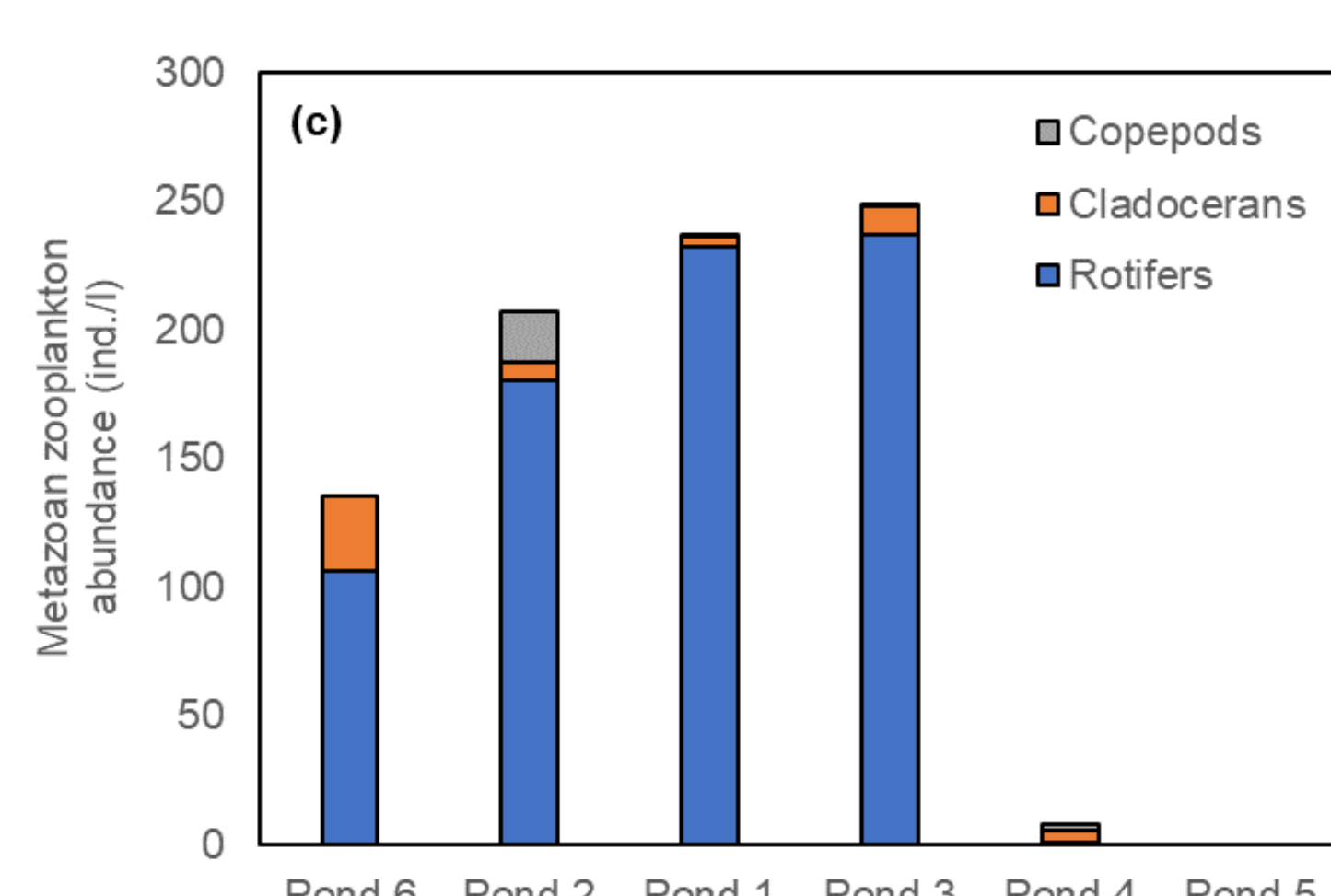
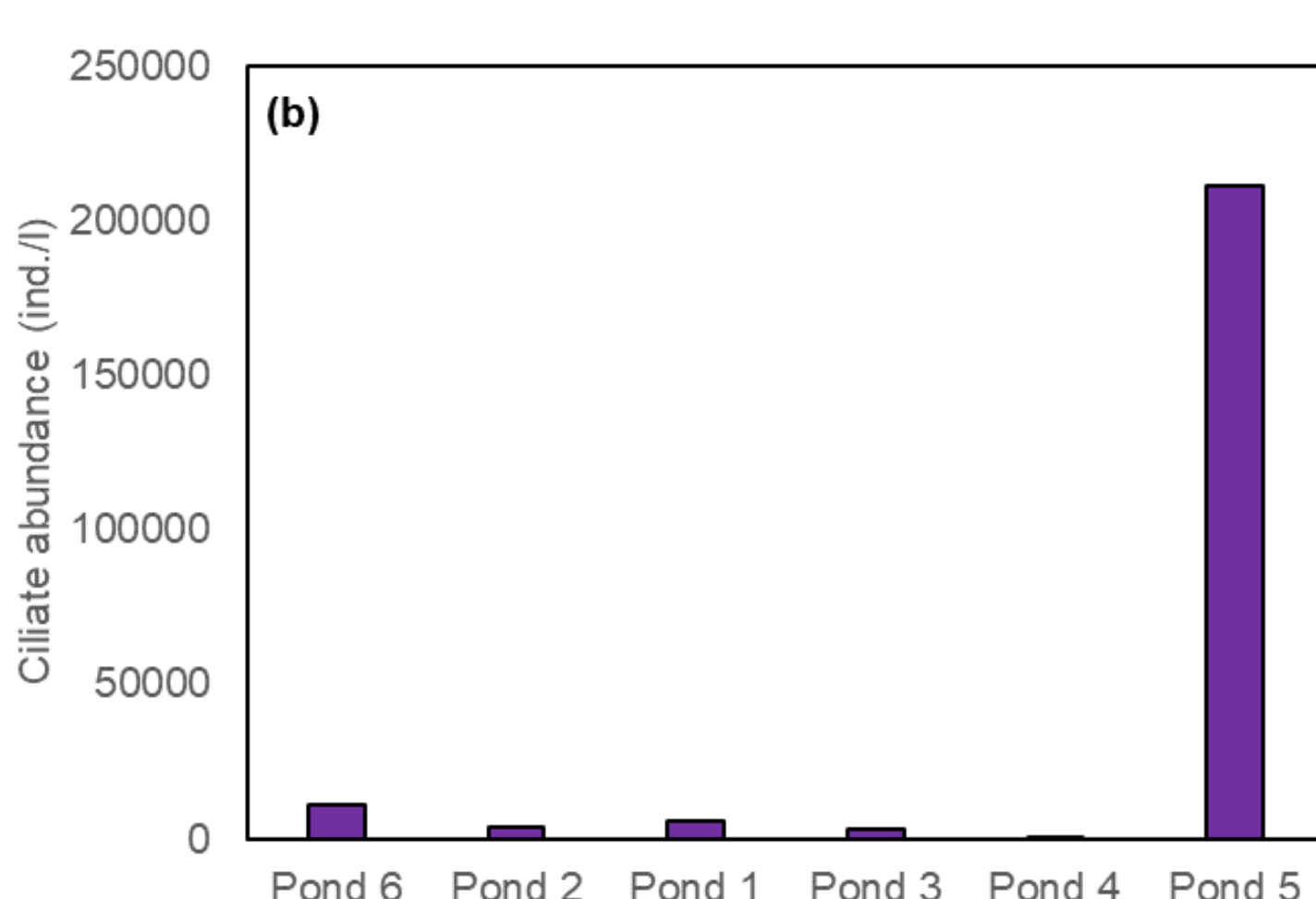
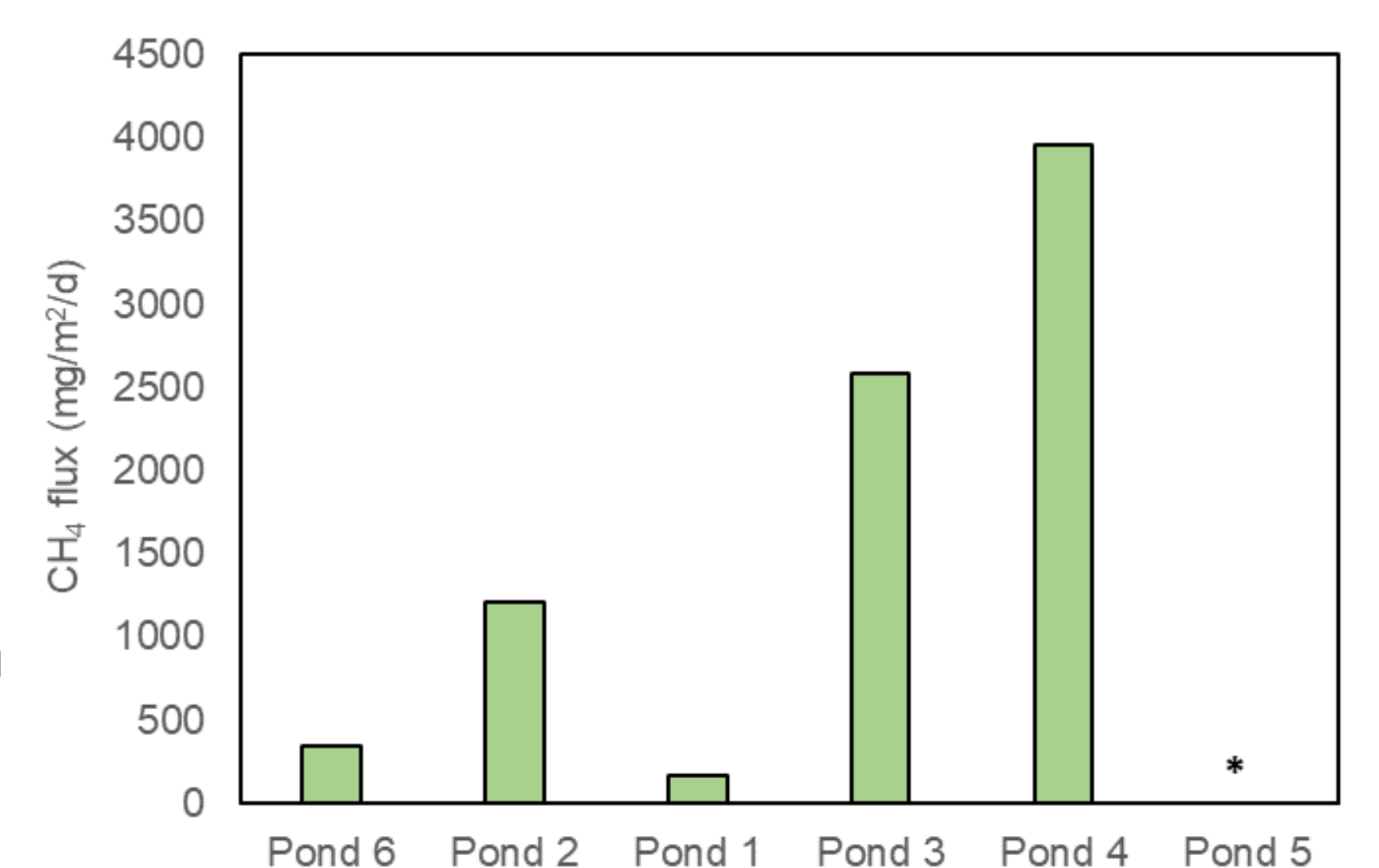


Fig. 3 Methane flux. Missing values ("\*") in pond 5.



**References:** Arctic Council, A., Iceland. CAFF: Arctic Biodiversity Assessment. 2013; , I., Johansen, K. L., Mosbech, A., et al. (2017). Small birds, big effects: The little auk (*Alle alle*) transforms high Arctic ecosystems. *Proc. R. Soc. B: Biol. Sci.*, 284, 10; van Geest, G., Hessen, D., Spierenburg, P., Dahl-Hansen, et al. (2007). Goose-mediated nutrient enrichment and planktonic grazer control in arctic freshwater ponds. *Oecologia*, 153, 653–662.