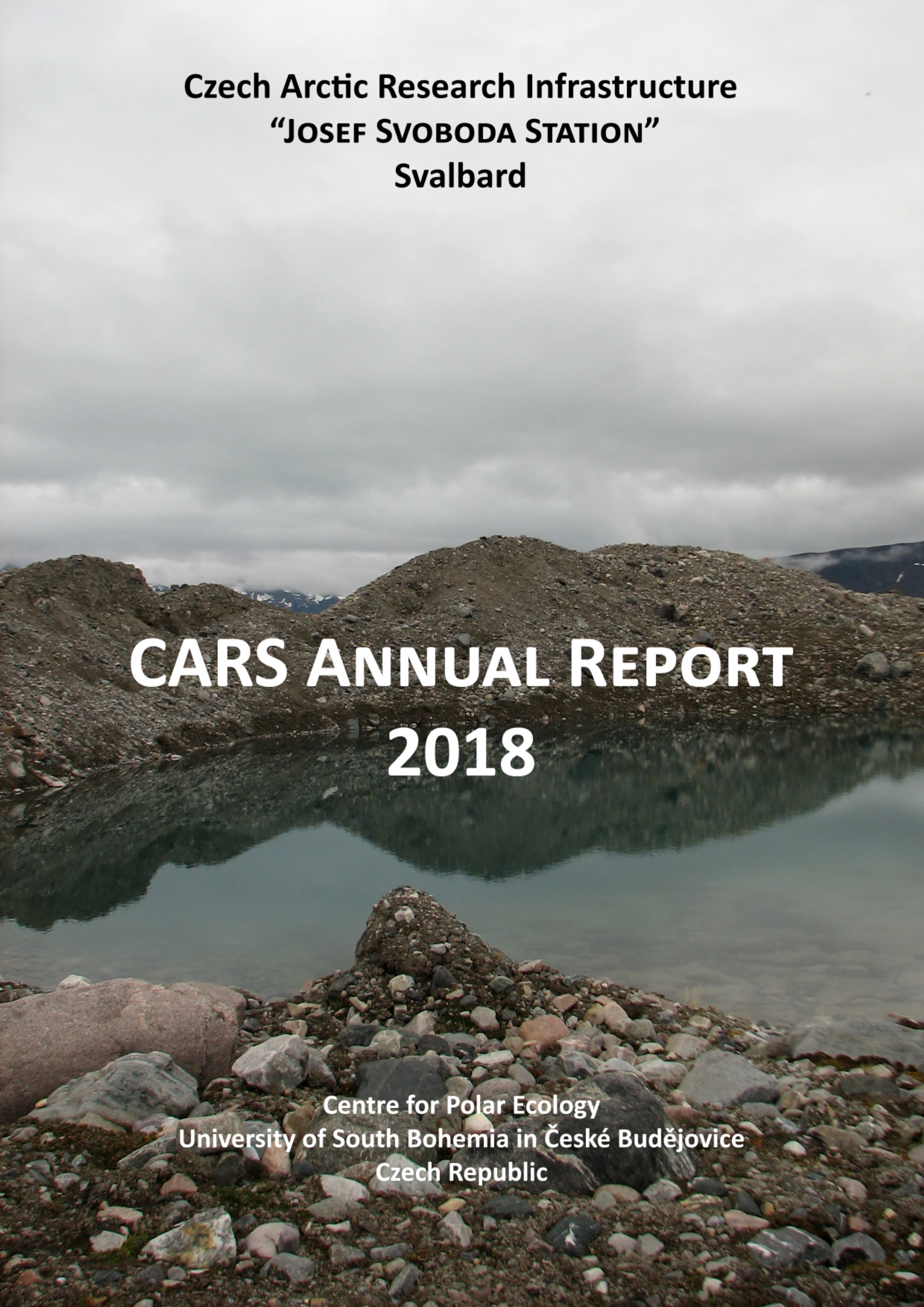

Czech Arctic Research Infrastructure
"JOSEF SVOBODA STATION"
Svalbard

CARS ANNUAL REPORT 2018

Centre for Polar Ecology
University of South Bohemia in České Budějovice
Czech Republic

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The research reported here has been also supported by the ECOPOLARIS project No. CZ.02.1.01/0.0/0.0/16_013/0001708 provided by the Czech Ministry of Education, Youth and Sports.

MINISTERSTVO ŠKOLSTVÍ,
MLÁDEŽE A TĚLOVÝCHOVY

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Jihočeská univerzita v Českých Budějovicích
University of South Bohemia in České Budějovice

Josef Svoboda Station
University of South Bohemia in České Budějovice
CENTRE FOR POLAR ECOLOGY

Cover photo: Jana Kvíderová
Editor: Jana Kvíderová
Reviewed by: Oleg Ditrich

If not mentioned otherwise, the author of photos is the first author of the contributor(s).

2018

Contents

1. Introduction

The year 2018 was the third year of the project CzechPolar2 - Czech Polar Research Infrastructure. In this year, the Winter Arctic Expedition took place in March and April (see the report at http://polar.prf.jcu.cz/docs-reports).

As in previous years, we worked in Petuniabukta and Longyearbyen areas. In this year, the RV CLIONE was used for regular transport between Longyearbyen and NOSTOC, and for research activities for the for the whole summer season, i.e. from mid-June till late September.

We had the pleasure to welcome many researchers from abroad, and to host the Polar Ecology course organized by the Centre for Polar Ecology (Fig. 1.1.; see the report at http://polar.prf.jcu.cz/docs-reports). For the first time, three projects were solved at the Czech Arctic Research Infrastructure using the Virtual Access by the INTERACT programme.

Based on the data acquired at the Infrastructure, several bachelor and master theses were worked out. Anna Polášková and Thomas Stehler defended successfully their bachelor theses Johannes Kepler University of Linz (AT). Jana Müllerová defended her master thesis at University of South Bohemia (CZ), and Margherita Lucadello and Claude Claude-Eric Souquieres at Universidade do Algarve, Faro (PT).

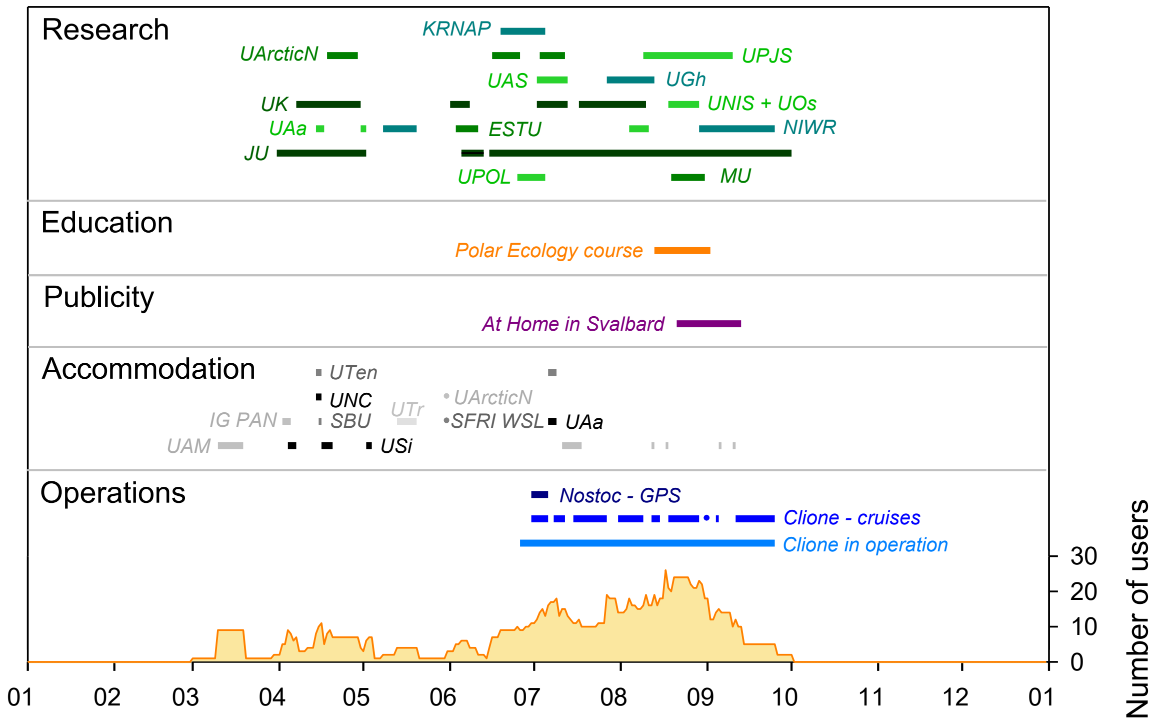


Fig. 1.1. The CARS utilization in 2018. For institution abbreviations, see Tab. 2.3.

In cooperation with Svalbard partners, a common cultural-scientific project *At Home in Svalbard 2018* took place on August 21- September 13, 2018 and it will have a reciprocal continuation in the Czech Republic in 2019. The project was based on the several exhibitions, lectures and cultural performances in Longyearbyen (Fig. 1.2.).

For more information, please visit polar.prf.jcu.cz.

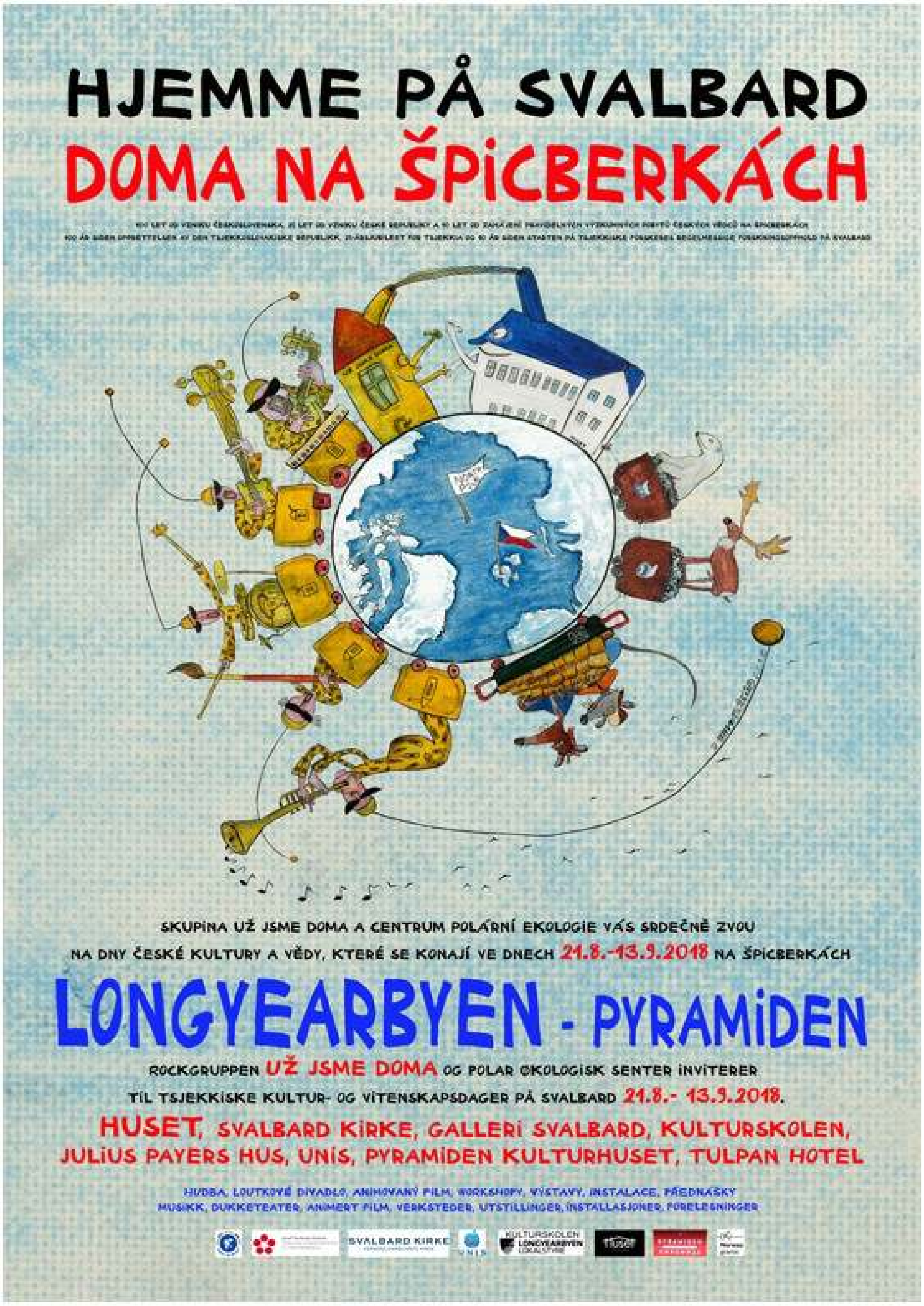


Fig. 1.2. The poster of the project *At Home in Svalbard 2018.*

1.1. Research station JULIUS PAYER HOUSE in Longyearbyen

The JULIUS PAYER HOUSE in Longyearbyen was used for research, education (Fig. 1.3.) and as short-term base accommodation for researches and students (usually after arrival and before departure to the field station or RV CLIONE) during the year 2018. The facility utilization is shown in Fig. 1.4.

Fig. 1.3. Beginning of the season at JULIUS PAYER HOUSE. Photo source: FB Centre for Polar Ecology.

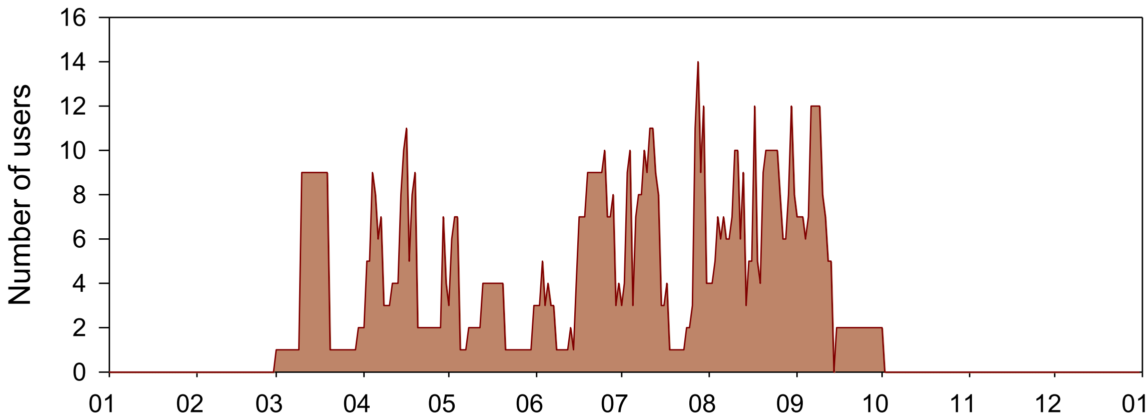


Fig. 1.4. The utilization of the JULIUS PAYER HOUSE in Longyearbyen, Svalbard in 2018.

1.2. Field Station NOSTOC in Petuniabukta

The field station NOSTOC is designed for during summer-only use, however short stays in winter are possible. The facility was used during spring (20-28/04) and summer (04-12/06 and 30/06-04/09) for research and education (Figs. 1.4. and 1.5.).

Fig. 1.5. The Field Station NOSTOC in 2018. Photo source: FB Centre for Polar Ecology.

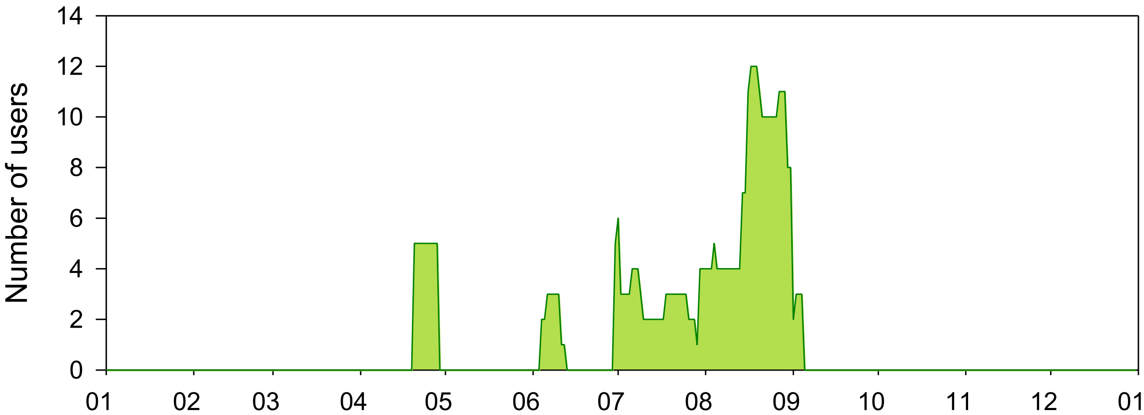


Fig. 1.6. The utilization of the field station NOSTOC in 2017.

1.3. RV CLIONE

During the season and during season itself, some defects and not-finished items that limited or prevented full-scale operation of the RV CLIONE were eliminated. Operations during the season proved the functionality of RV CLIONE in local conditions and interest of our partners for co-operation (Fig. 1.6. to 1.8.). unfortunately, the generator was damaged due to previous flooding by seawater (probably before putting into operation and following gradual damage that does not worth repairing and it is necessary to buy a new one).

Before the start of the next season 2019, other modifications of the RV CLIONE must be accomplished before launch, e.g. new generator, satellite compass and surface treatment of the submerged body parts show signs of premature wear. Other works and modifications will be discussed, and it is necessary to find feasible solution in frame of time and financial capabilities of the CPE.

Total mileage covered in 2017 was 2110 Nm.

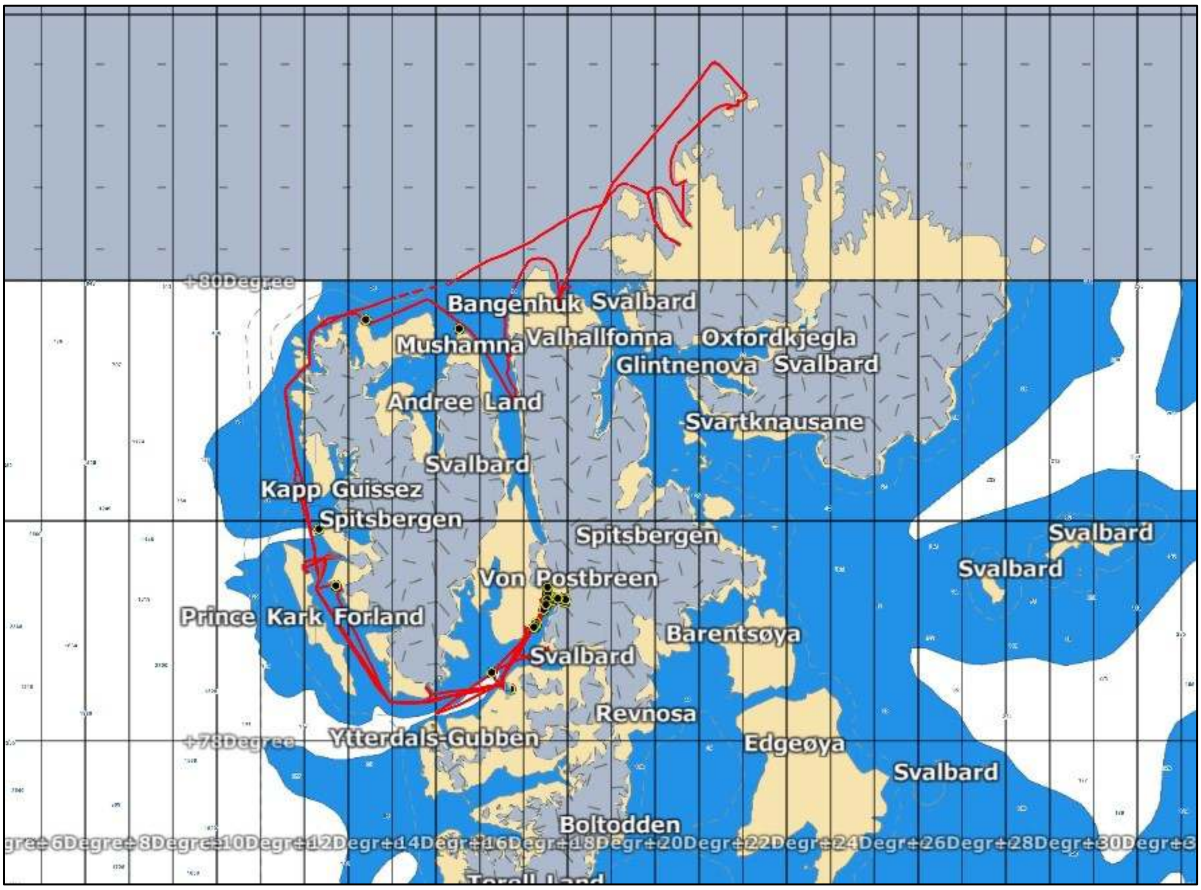


Fig. 1.x Map of RV CLIONE cruises in 2018. Source: Jan Pechar.

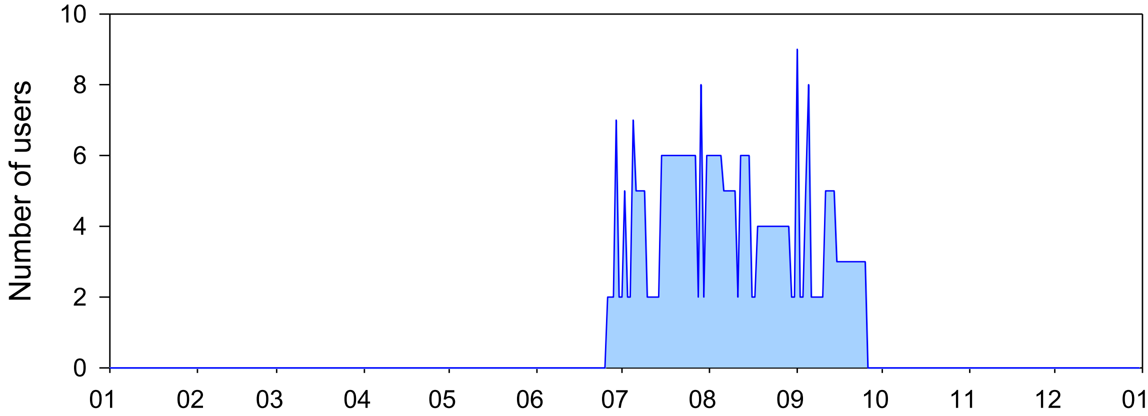


Fig. 1.7. The utilization of the RV Clione in 2018.

Fig. 1.8. First sampling trip for RV Clione this year. Photo source: FB Centre for Polar Ecology.

2. Year 2018 Programme

The Winter Arctic Expedition was organized jointly by Centre for polar Ecology, Faculty of Sciences, University of South Bohemia and the Charles University (31/03 – 02/05). The summer field research season started on June 15, 2018, and was completed on October 1, 2018. The lists of Infrastructure users from the Centre for Polar Ecology (CPE users) and from other institutions (external national and international users), their periods of stay are summarized in Tabs. 2.1., 2.2. and 2.3.

Tab. 2.1. List of internal CARS users with their affiliations, their periods of stay, their CARS utilization and person-day numbers. Refer to Tab. 2.3. for abbreviations explanations.

		Affiliation(s)	Field of research	Dates	CARS utilization	Number of person-days
Alexandra Bernardová	C	JU		03-14/09	CL	11
Marek Brož	CR	JU	ZOO	27/07-27/08	L	31
Miloslav Devetter	IR	JU + ISB	ZOO	26/06-12/07 10-31/08	CLN	37
Oleg Ditrich	IR	JU	ZOO	13/07-10/09	CLN	59
Josef Elster	CIR	JU + IBOT	MICRO	11-15/04 19-29/04 01-08/06 04/07-12/08 17/08-12/09	CLN	87
Tereza Hromádková	IR	JU	ZOO	19/06-14/09	CLN	87
Jana Kvíderová	IR	JU	MICRO	13/08-02/09	L	20
Martin Lulák	CR	JU + MU	GEO	27/07-14/09	CLN	49
Petr Macek	IR	JU	BOTA	05-13/06- 10-31/08	CLN	30
Maike Nesper	C	JU		01/03-25/06	L	117
Jakub Ondruch	CR	JU + MU	GEO	15/06-05/08	CLN	51
Václav Pavel	CIR	JU + UPOL	ZOO	25/06-15/07 29/08-14/09	CLN	35
Jan Pechar	C	JU		15/06-30/07 15/08-01/10	CL	94
Syrová Michaela	CR	JU	ZOO	26/06-31/07	CLN	35
Marie Šabacká	CIR	JU	CLIMA	30/03-02/05 09-27/07 02/08-09/09	CLN	92
Jiří Štojdl	C	JU		15/06-31/07 30/08-01/10	CL	92
Jiří Štojdl ml.	C	JU		27-07-03/09	CL	38
Petr Vojáček	C	JU		27/07-19/08	CL	23

Tab. 2.2. List of national CARS users (based on affiliation, with exception of CPE employees) with their affiliations, their periods of stay, their CARS utilization and person-day numbers. Refer to Tab. 2.3. for abbreviations explanations.

		Affiliation(s)	Field of research	Dates	CARS utilization	Number of person-days
Dovile Barcyté	R	UK	MICRO	17/07-01/08	LN	15
Daniel Bartoň	S	JU	ZOO	03/08-02/09	CLN	30
Vendula Branišová	S	JU	ZOO	20/08-02/09	CLN	13
Martins Briedis	R	CAF? UPOL?	ZOO	25/06-03/07	L	8
Viktorie Brožová	R	JU	BOTA	27/07-04/08 15/08-14/09	CLN	39
Stanislav Bureš	R	UPOL	ZOO	28/06-05/07	CLN	7
Dominika Činčarová	S	JU + MBU	MICRO	13-26/08	LN	13
Hana Dvořáková	S	JU	BOTA	20/08-02/09	LN	13
Dana Elsterová	P			04-10/09	L	7
Martina Flégrová	S	JU + ENTU	MICRO	13-26/08	LN	13
Jiří Flousek	R	KRNAP	ZOO	19/06-05/07	L	16
Tomáš Hájek	R	JU	BOTA	10-31/08	CLN	21
Eva Hejdukova	R	UK	MICRO	07-30/04 01-08/06 24/07-10/08	L	48
Dominik Horký	S	JU	ZOO	20/08-02/09	CLN	13
Karel Janko	R	IAPG	ZOO	12-31/07	CL	19
Veronika Jílková	R	ISB	ZOO	10-31/08	CLN	21
David Jindra	C	Geotronics		30/06-06/07	LN	6
Lada Klimešová	S	JU	BOTA	20/08-02/09	LN	13
Anna Leschingerová	P			04-10/09	L	7
Tomáš Machula	P	JU		03-09/09	CL	6
Jana Marešová	S	JU + ENTU	ZOO	20/08-02/09	CLN	13
Vít Náhlík	S	JU + MBU	MICRO	13-26/08	LN	13
David Novotný	S	JU	ZOO	20/08-02/03	CLN	13
Lenka Procházková	R	UK	MICRO	02-13/07	L	12
Patrick Saccone	R	JU	BOTA	27/07-03/09	CLN	38
Nikola Sagapová	C	JU		18-23/07	L	6
Luca Sanchez	S	JU	MICRO	27/07-13/06	CLN	17
Jiří Schlaghamerský	R	MU	ZOO	21-31/08	LN	12
Claude-Eric Souquieres	CR	JU	MICRO	24/04-17/08	CLN	115
Vladimír Šustr	R	ISB	ZOO	29/07-01/09	LN	12
Tereza Švecová	A			09-13/04 17-24/04	LN	13
František Trkal	S	CZU	BOTA	20/08-02/09	LN	13
František Vácha	P	JU		03-09/09	CL	6
Deborah Walter	S	JU	MICRO	13-26/08	LN	13
Stanislava Wolfová	S	JU	MICRO	13-26/08	LN	13
Veronika Žánová	R	JU	ZOO	19/06-05/07	CLN	16

Tab. 2.3. List of international CARS users (based on affiliation) with their affiliations, their periods of stay, their CARS utilization and person-day numbers.

		Affiliation(s)	Field of research	Dates	CARS utilization	Number of person-days
Carol Arnosti	A	UNC + MPI-MM		14-16/04	L	3
Martin Bačkor	R	UPJS	MICRO	09/08-10/09	CLN	32
Grzegorz Baliga	A	UAM		10-19/03	L	10
Barbara Barzycka	A	USi		04-07/04 02-04/05	L	7
Barbora Bator	A	UAM		17-18/08	L	1
Jan Bolanowski	A	UAM		10-19/03	L	10
Eva Breitschopf	R	UArcticN	BOTA	16-25/06	L	10
Tomasz Budzik	A	USi		04-07/04 02-04/05	L	7
Nathalie Carrasco	A	UTr		13-20/05	L	8
Lotte De Maeyer	R	UGh	MICRO	27/07-13/08	CL	17
Leo Decaux	A	USi		04-07/04 02-04/05	L	7
Ulrike Dietrich	R	UArcticN	MICRO	18-29/04 03-12/07	CLN	22
Christine Dybwad	R	UArcticN	MICRO	18-29/04 03-12/07	CLN	22
Marek Ewertowski	A	UAM		11-18/07	L	7
Alyssa Findlay	A	UAa		05-09/07	L	4
Aline Frossard	A	SFRI WSL		31/05	L	1
Lisa Herbert	A	SBU		15-16/04	L	2
Johann Hollop	A	UAa		07-09/07	L	3
Krzysztof Chwowanski	A	UAM		17-18/07	L	1
Sebastian Kendzierski	A	UAM		13-14/08 05-06/09	L	2
Magdalena Kugiejko	A	UAM		13-14/08	L	1
Rafał Kukulski	A	UAM		10-19/03	L	10
Tomasz Kurczaba	A	UAM		10-19/03	L	10
Michal Laska	A	USi		04-07/04 02-04/05	L	7
Lauri Laanisto	R	ESTU	BOTA	03-11/06	CN	8
Catherine Larose	A	IG PAN		02-05/04	L	4
Kristine Larssen	R	UNIS		18-29/08	C	12
Katja Laufer	R	UAa	MAR	06-09/07 04-11/08	L	11
Bartek Lux	A	IG PAN		02-04/04		3
Łukasz Małarzewski	A	USi		16-19/04 03-04/05		6
Jakub Malecki	A	UAM		11-12/09	L	1

Maeve McGovern A	NIWR		08-25/05	L	13
Alex Michaud R	UAa	MAR	14-16/04 30/04-02/05 04-11/08	L	13
Alex Michaud [2nd user] R		MAR	04-11/08	L	7
Mikel Moriana A	UArcticN		16-25/06	L	10
Tomoki Morozumi A	UArcticN		16-26/06	L	10
Lauren Mullen A	UTen		14-16/04 06-06/07	L	7
Mart Paadik R	ESTU	BOTA	03-11/06	LN	8
Natalia Pilewska A	UAM		10-19/03	L	10
Madeleine Pulver A	NIWR		29/08-10/09	L	12
Daniel Remias R	UAS	MICRO	02-13/07	L	12
Karolina Rogula A	UAM		17-18/08	L	1
Taylor Royalty A	UTen		06-09/07	L	4
Krzysztof Rymer A	UAM		10-19/03 17-18/08	L	11
Koen Sabbe R	UGh	MICRO	27/07-07/08	CL	11
Christophe Seppey A	UArcticN		31/05	L	1
Niklas Schaaf R	UNIS + UOs	GEO	18-29/08	C	12
Katie Sipes A	UTen		14-16/04	L	3
Boguslaw Smiechowicz A	UAM		17-18/08	L	1
Helena Sobieska A	UAM		17-18/08	L	1
Janne E. Søreide [+2] A	NIWR	MAR	14-27/01	C	15[×3]
Andrea Spolaor A	IG PAN		02-05/04	L	4
Andrew Steen A	UTen		15-16/04	L	2
Jaromir Szwedo A	UAM		10-19/03	L	10
Aleksandra Tomczyk A	UAM		11-18/07	L	7
Arkadiusz Tomczyk A	UAM		13-14/08	L	1
Aleksander Uszczyk A	USi		16-19/04 03-04/05	L	6
Emilie Vereide A	UOs		13-20/05	L	8
Elie Verleyen R	UGh	MICRO	27/07-13/08	CL	17
Tobias Vonnahme R	UArcticN	MICRO	18-29/04 03-12/07	L	16
Damian Wabnic A	UAM		10-19/03	L	10
Magda Wolowiec A	UAM		17-18/08	L	1

Abbreviations:

Purpose of the stay:

- A – accommodation and equipment use only
- C – construction, operation or management of the Svalbard infrastructure
- E – scientific education (with exception of Polar Ecology course organized by the Centre for Polar Ecology)
- I – instructor of the Polar Ecology course
- R – research
- P – publicity
- S – student of the Polar Ecology course

Affiliations:

- CAF – Czech Antarctic Fund, Poděbrady (CZ)
- CZU – Czech University of Life Sciences, Prague (CZ)
- ENTU - Institute of Entomology, Biology CAS, České Budějovice (CZ)
- ESTU – Estonian University of Life Sciences, Tartu (EE)
- IAPG – Institute of Animal Physiology and Genetics AS CR, Liběchov (CZ)
- IBOT – Institute of Botany CAS, Třeboň (CZ)
- IG PAN – Institute of Geophysics, Polish Academy of Sciences, Warzawa (PL)
- ISB – Institute of Soil Biology, Biological Centre CAS, České Budějovice (CZ)
- JU – University of South Bohemia, České Budějovice (CZ)
- KRNAP – Krkonoše National Park, Vrchlabí (CZ)
- MBU – Institute of Microbiology, Třeboň (CZ)
- MPI-MM – Max Planck Institute for Marine Microbiology, Bremen (DE)
- MU – Masaryk University, Brno (CZ)
- NIWR – Norwegian Institute for Water Research, Oslo (NO)
- SBU – Stony Brook University, Stony Brook (US)
- SFRI WSL - Swiss Federal Research Institute WSL, Birmensdorf (CH)
- UAa – Aarhus University, Aarhus (DK)
- UAM - University Adam Mickiewicz, Poznań (PL)
- UAS – University of Applied Sciences Upper Austria, Wels (AT)
- UArcticN - The Arctic University of Norway, Tromsø (NO)
- UGh – University of Ghent, Ghent (BE)
- UK – Charles University, Prague (CZ)
- UOs – University of Oslo, Oslo (NO)
- UNC – University of North Carolina at Chapel Hill, Chapel Hill (USA)
- UNIS - University Centre of Svalbard, Longyearbyen, Svalbard
- UPJS – University of Pavel Josef Štefánik, Košice (SK)
- UPOL – Palacký University, Olomouc (CZ)
- USi - University of Silesia in Katowice, Katowice (PL)
- UTr – University of Tromsø, Tromsø (NO)
- UTen – University of Tennessee, Knoxville (US)

Field of research:

- BOTA - botany/plant physiology
- CLIMA - climatology/glaciology
- GEO - geology/geomorphology
- MAR – marine sciences
- MICRO - microbiology/phycology
- ZOO - zoology/parasitology.

CARS utilization:

- C – RV CLIONE
- L – JULIUS PAYER HOUSE (Longyearbyen)
- N – field camp NOSTOC (Petuniabukta)

In frame of remote access provided by INTERACT programme, samples and/or data were provided to three investigators:

- Beat Frey (Swiss Federal Research Institute WSL, CH)
  permafrost soil samples and active layers
- Maija Marushchak, (University of Eastern Finland, FI)
  static chamber measurement and soil gas sampling for determination of N_2O fluxes and concentrations; surface soil sampling; temperature and moisture measurements; vegetation description
- Sonja Wipf (WSL Institute for Snow and Avalanche Research SLF, CH)
  plant traits measurements, vegetation releves

3. Research activities

3.1. Marine sciences

3.1.1. Biogeochemistry of carbon, iron and sulfur cycling in West-Svalbard fjords

Alex B .Michaud, Katja Laufer, Hans Røy & Bo B. Jørgensen

We used the Czech Research Station in Longyearbyen as a place to conduct sediment core collection and analysis from Dicksonfjorden near Longyearbyen, Svalbard from 5 through 11 August 2018. We collected a transect of cores while aboard MV Farm (Fig. 3.1.1.), then further processed the cores at the Czech station over the course of four days. The lab inside the Czech station was used for basic laboratory needs like weighing, packaging and storing samples. The "garden" area behind the house was used for sectioning cores at closer to in situ conditions. The samples are still being analyzed, so we do not have any results to report here.

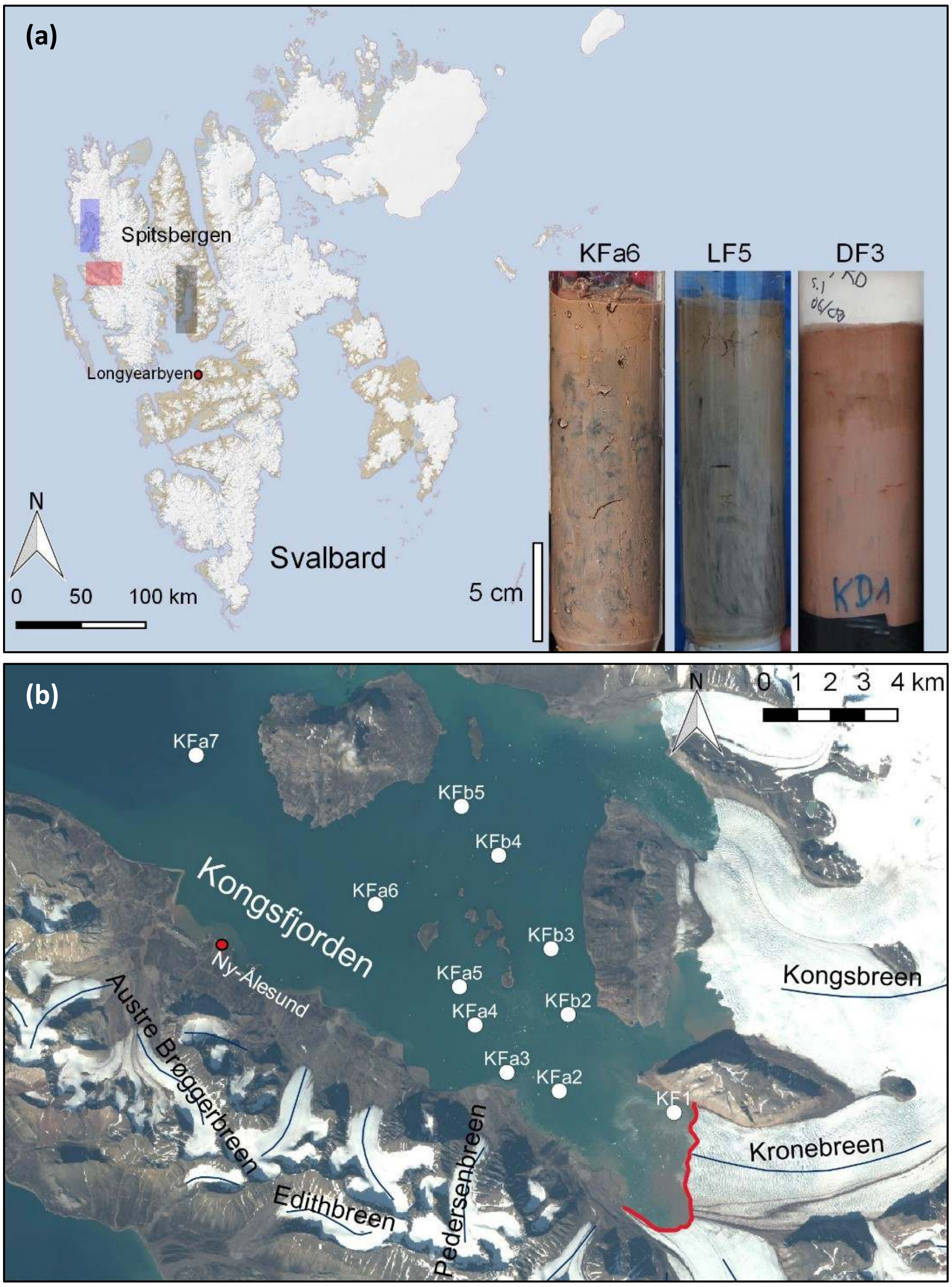
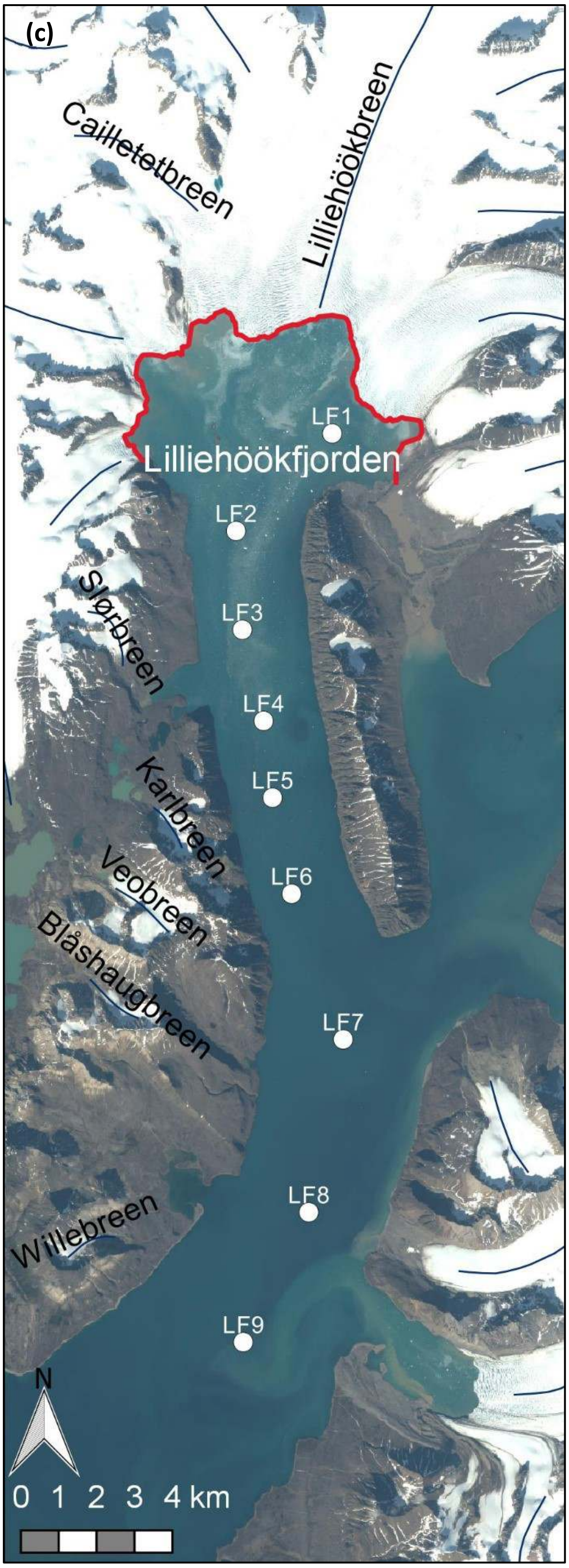


Fig. 3.1.1. Sampling sites from Svalbard fjords. **(a)** Overview map of Svalbard, **(b)** Sampling sites in Kongsfjorden. Geospatial support for this work provided by the Polar Geospatial Center under NSF OPP awards 1043681 & 1559691.



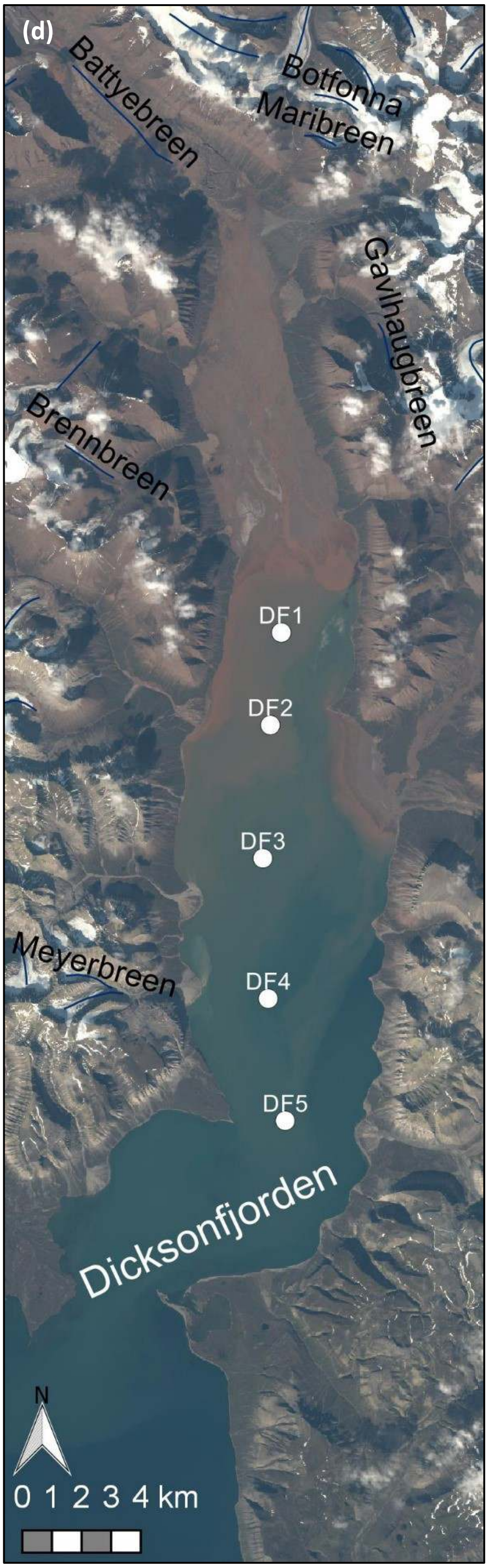


Fig. 3.1.1. (cont). Sampling sites from Svalbard fjords. **(c)** Sampling sites in Lilliehöökfjorden, **(d)** Sample sites in Dicksonfjorden collected while at the Czech Research Station in Longyearbyen.
Geospatial support for this work provided by the Polar Geospatial Center under NSF OPP awards 1043681 & 1559691.

3.2. Microbiology and Phycology

3.2.1. Annual cycle of freshwater diatoms in the High Arctic

Eva Hejduková

Natural conditions in Polar Regions are characterized by many extremes and could seem unfavorable for life. Despite this fact, diatoms (Bacillariophyceae) apparently adapted well and belong to important primary producers in a wide range of habitats in both Arctic and Antarctic environments. However, it remains unknown, which strategy enables them to survive long polar winters. Generally, for microorganisms a strategy to overcome unfriendly conditions is formation of dormant stages, but morphologically distinct resting stages are rarely observed in diatoms. Their long-term survival is thus probably connected with the adaptation of vegetative cells to low temperatures and desiccation. Nevertheless, vegetative cells of temperate benthic diatoms were shown as very sensitive to desiccation, freezing and abrupt heating[1] and the stress tolerance of temperate benthic diatoms seems to depend on a type of habitat[2].

The main aim of this project was to study the annual cycle of polar freshwater diatoms to reveal their overwintering strategy. Morphology and viability of diatom cells was studied in natural samples collected for one year starting vegetative season in summer 2017. Four locations (two streams, shallow wetland, and seepage) with high abundance of diatoms were chosen as study sites (Fig. 3.2.1.): Bjørndalen 1 (78.217129°N, 15.333050°E), Bjørndalen 2 (78.218626°N, 15.339754°E), Endalen 1 (78.183551°N, 15.763844°E) and Endalen 2 (78.186742°N, 15.791057°E).

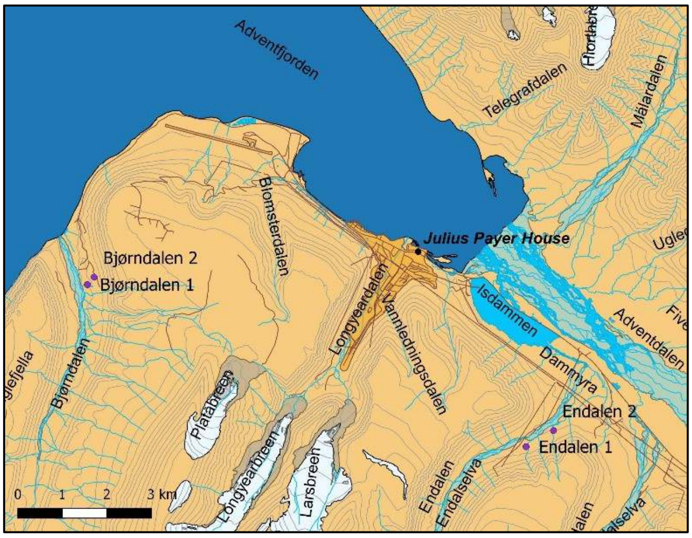


Fig. 3.2.1. Map of sites. QGIS. Map source © Norwegian Polar Institute.

Two poles, three Petri dishes and two or three perforated plastic boxes were installed per location. Diatom biomass was caught in the boxes and Petri dishes to ensure multiple sampling of the same population. The installations were fixed by sticks to avoid loss. The poles were installed to find the exact location in winter when the surface is covered with snow.

The viability of cells was evaluated five times a year following key events for survival (summer vegetative season, autumn freezing, winter, spring melting, summer season) using a multiparameter fluorescent staining protocol originally developed for filamentous cyanobacteria[3]. This method was combined with light microscopy evaluation which enabled us to evaluate physiological state of single cells. The staining process was based on combination of three fluorescent stains (SYTOX Green, CTC and DAPI) which helped us to classify the cells in four following groups: active healthy cells, inactive and injured dead cells, damaged but active cells and inactive but intact dormant cells.

As we hypothesized only a small number of cells survived winter season and diatoms did not form any morphologically different stages for survival. Remarkably high proportions of cells were detected as "active healthy cells" during winter season suggesting diatoms are capable of a fast recovery from a frozen state.

References:

[1]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(4), 309–324.

[2]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(3), 246–255.

[3]Tashyreva, D., Elster, J. (2016): Annual cycles of two cyanobacterial mat communities in hydro-terrestrial habitats of the High Arctic. Microbial Ecology, 71, 887–900.

3.2.2. Sampling of midsummer snow algae blooms around Longyearbyen, Svalbard

Daniel Remias, Lenka Procházková & Linda Nedbalová

Snow algae are extremophilic organisms that are specialized to live in slowly melting snowfields. Blooms of these microalgae cause green, yellowish or red snow discoloration. Due to morphological similarities these unicells are difficult to distinguish at the species level. Consequently, the true biodiversity of cryoflora is still unknown, also global distribution patterns (e.g. regional, polar, bipolar, cosmopolite) are still under discussion.

In course of a three years project to compare the biodiversity between European Alpine and Arctic habitats, we sampled snow algae in the surroundings of Longyearbyen, Spitsbergen. Cells were harvested for DNA extraction and subsequent molecular marker sequencing (18S rRNA, rbcL, ITS2). For that, virtually monospecific blooms were needed and a field microscope was used to find suitable locations. Green snow made of vegetative flagellate-like cells was used to make cultures for future life cycle and metabolomics studies. Frozen cells were lyophilized for extraction and analysis of compounds typically for such algae like carotenoids or fatty acids. Especially the red spores of certain Chlamydomonadaceae are known to accumulate high amount of protective and reserve metabolites. Green, yellow and red snow was melted and light-dependent photosynthesis measured fluorometrically at the Czech Josef-Svoboda-House in Longyearbyen. We found that snow algae possess a quite variable adaptation of the photosynthetic apparatus.

During our stay in July 2018, we frequently found red snow in upper Longyeardalen (Fig 3.2.2.) and Bjørndalen, and sometimes occurred a more orange-reddish variation with cells that apparently contained less carotenoids. Yellowish snow caused by a Chrysophyceae, most likely unicellular stages of an unknown species of

Fig. 3.2.2. Red Snow caused by cf. *Chlamydomonas nivalis* close to Longyeardalen. To the left of the shovel is a spot of the dark red form, to the right an orange-red variety.

Hydrurus, thrived at the lower margins of either very wet snowfields or close to surficial run-offs related to snow covered glaciers (Fig. 3.2.3). Green snow was sparse and restricted to protected, less irradiated spots close to rocks (Fig 3.2.4.).

In summary, coastal regions of Svalbard are suitable for the collection of a variety of snow algae by hiking, and due to the different climate and irradiation regimes compared to alpine regions we expect taxonomic and physiologic differences between these regions.

Fig. 3.2.3. Yellow snow slush at Longyearbreen.

Fig. 3.2.4. Locally rare midsummer green snow close to rocks caused by *Chloromonas* sp.

3.2.3. Terrestrial ecology field report, Summer 2018 - Czech-Belgian collaborative project

Elie Verleyen, Koen Sabbe, Josef Elster, Lotte De Maeyer, & Claude-Eric Souquieres

Project summary

During Summer 2018, from the 27th of July to the 17th of August, a scientific campaign was conducted across the Norwegian archipelago of Svalbard as part of a recent Czech-Belgian joint project. This initial campaign consisted of two field explorations and one scientific workshop. The field explorations included one ecological assay of High Arctic limnic microbiomes in addition with snow fence protected terrestrial microbiomes (CLIMARCTIC european project: http://www.climarctic.ugent.be) and one ecological study of High Arctic microbiomes from the soil crust located across various bedrock types across western Svalbard.

CLIMARCTIC Project

Over the course of the first field exploration, spanning from July the 31st to August the 6th, five lakes and two different types of snow fence protected habitats located across Kongsfjorden were investigated. Lake cores, filtered water samples and benthic samples were collected from the selected limnic microbiomes. Top and deep sediment samples were taken from the snow fence protected terrestrial microbiomes. Despite few technical issues encountered during the coring of the respective lakes a total number of 34 lake cores, five filtered water samples of 60 ml each and five benthic samples were collected. Furthermore, a total of 24 top sediment samples and 24 deep sediment samples constitute the complete samples' inventory of this first field exploration. Additional parameters were registered throughout the sampling to characterize the sites' ecological abiotic features. The aim of this first survey was to study the effects of climate change on the diversity and genetic functional attributes of High Arctic microbiomes both in terrestrial and limnic habitats.

Biological Soil Crust (BSC) Project

The second field exploration followed in the continuity of the first one, from August the 6th to August the 13th. A collection of sediment samples from the soil crust in several locations across western Svalbard was carried out. The selected sites encompassed a variety of bedrock types from Kongsfjorden to Isfjorden. A total of nine different locations were picked including: sedimentary, metamorphic and igneous rock types. A total of 27 plots were sampled. The plots are divided in 3 different categories based on their vegetation stages. Plots of the first category, referred as stage 1, consist of barren soil crusts while stage 2 plots consist of soil crusts with up to 20% mosses. Finally stage 3 plots consist of soil crust with more than 50% mosses and vascular plants. For each plot 2 types of sample were taken: one for amplicon sequencing and one for chemical analysis. In both cases, top and deep samples of the soil crust were collected. The BSCs project aims at studying the impact of different bedrock types on the microbial diversity of High-Arctic terrestrial microbiomes.

Ny-Ålesund Terrestrial Flagship workshop

At last, from August the 14th to August the 16th took place the scientific workshop in Ny-Alesund to which Dr. Elster and Dr. Verleyen participated. It discussed the present state-of-the-art and future of Polar terrestrial ecology in a climate change embedded context. Key points addressed during this meeting were to increase international scientific cooperation for the study of Polar terrestrial ecosystems by facilitating and promoting data exchange, use and publications. Furthermore, by enhancing online access and feedbacks to present and forthcoming research with access to site locations, general scientific questions and plans for improvement of study sites.

3.2.4. Microbial communities and fluxes in the cryosphere

Tobias R. Vonnahme, Ulrike Dietrich & Christine Dybwad

The aim of the Arctic field grant financed project lead by UiT PhD Candidates was to characterize the impact of the tidewater outlet glacier Nordenskiøldbreen on microbial communities and fluxes in Billefjorden. We compared the systems in April with frozen cryoconites on the glacier, some subglacial runoff and sea ice on the fjord with July, were the fjord was ice-free and the glacier was melting. One main station was established at the ice edge as a reference station with low glacial impacts and compared to a main station on the northern site of the glacier. Transect stations were sampled at 8 additional sites (Fig 3.2.5a.). Sampling was done via snowmobile in winter and via RV Clione in summer.

Samples for the characterizations of microbial communities (microscopy, DNA/RNA sequencing), biogeochemical (e.g. Nutrients, Chlorophyll, POC/PON, EPS), and physical (e.g. Temperature, Salinity) parameters were taken from sea ice, different depths of the water column, glacial meltwater and cryoconites. At the main stations, sediment traps were deployed for 24 hours in order to estimate the vertical flux of biological, organic and inorganic matter to the seafloor.

The first results in April indicate great differences between the stations. Our first station was close to the ice edge. The sea ice was thick (70 cm) and covered by photosyntetically active (Quantum yield: 0.6) sea ice algae (mainly *Nitzschia frigida* and *Pleurosigma*, Fig 3.2.5b.) on a skeletol layer (Fig 3.2.5d.) at the bottom of the sea ice. No Chlorophyll maximum could be found in the water column, but both phytoplankton and zooplankton net hauls were filled with the arctic copepod *Calanus glacialis* (mostly male), and a few other arctic species, such as *Clione*, Krill and Pteropods. CTD profiles showed two different water masses with temperatures between -1.5 and -2°C. Overall, the ice edge appeared to be a typical sea ice ecosystem. C:N ratios were rather high (>8) and POC values were rather low and increased with depth.

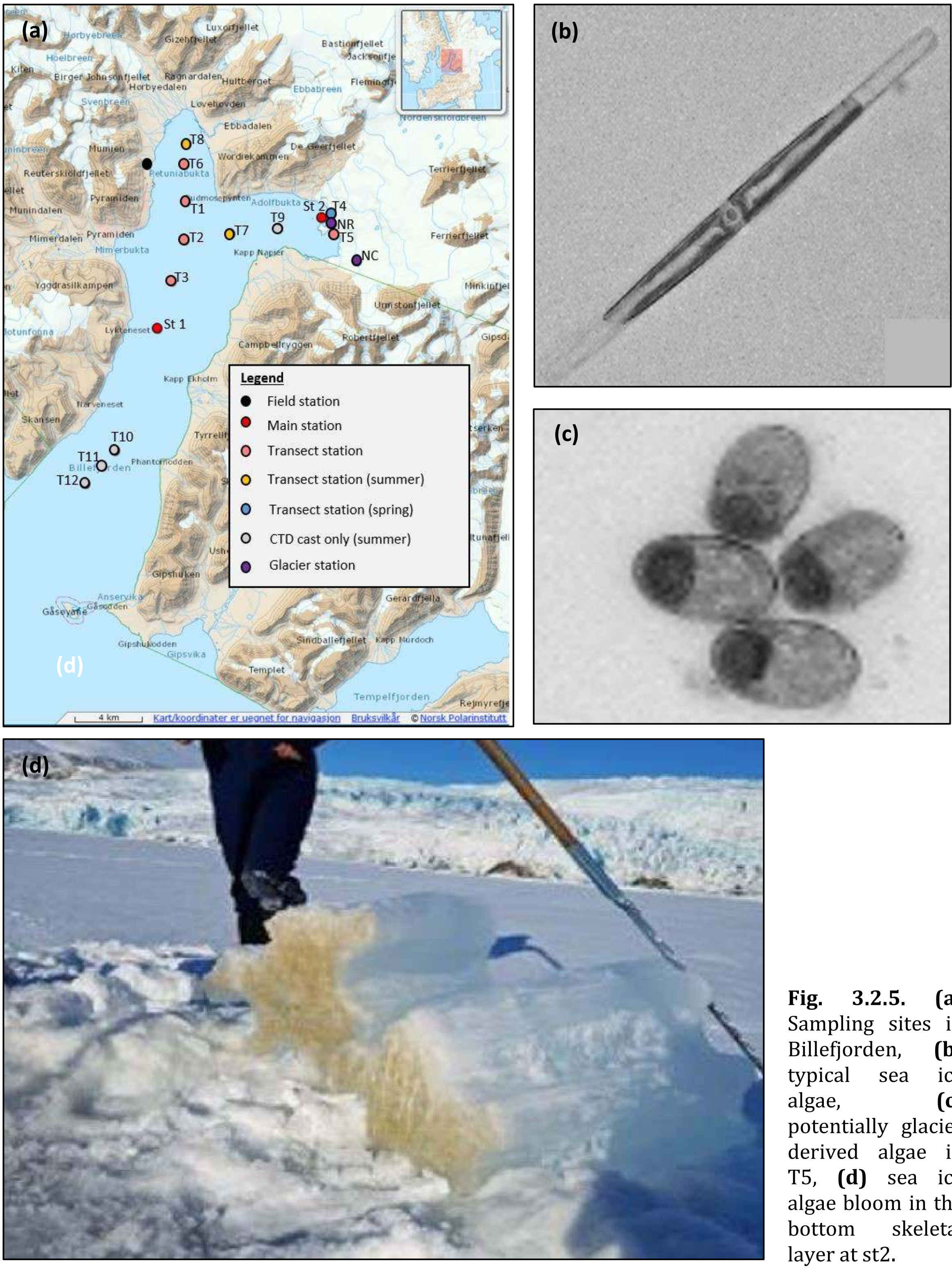


Fig. 3.2.5. (a) Sampling sites in Billefjorden, **(b)** typical sea ice algae, **(c)** potentially glacier derived algae in T5, **(d)** sea ice algae bloom in the bottom skeletal layer at st2.

The second main station was close to the glacier front of Nordenskiøldbreen. The ecosystem was quite similar to the ice edge, but the CTD profile was lacking the two water masses. A fresh surface layer indicating some glacial outflow could be seen and got more clear closer to the glacier. Visible bedrock along the glacier front indicated that the northern site of Nordenskiøldbreen is land-terminated.

At the southern part (T5), the glacier appeared to be a shallow tidewater outlet glacier terminating in the fjord. We found water depths of 20-40 m very close to the glacier and a clear layer of freshwater (Salinity between 6 and 10) down to 6 m depth indicating subglacial and supraglacial outflow having a significant impact on the fjord. The microalgae community was characterized by potentially glacier derived organisms (Fig 3.2.5c) frozen into the sea ice at 10-24 cm and a clear bottom layer with significantly lower biomass (POC values). Temperature and salinity profiles of the ice core show a cold and fresh bottom layer, which is different from all other stations with a warmer and more saline bottom layer.

In summer, the stations appeared more comparable with high sediment loads in front of the glacier. C:N ratios were lower and POC values were higher decreasing with depth. The vertical carbon flux appeared to be higher in summer. At 50 m (st1) depth the highest carbon export fluxes have been measured (3 x the surface values). First visual inspections of the sediment trap material indicate that fecal pellets of copepods are a major contributor to the exported biomass at 50m, potentially via diel vertical migration. Phytoplankton biomass in the net hauls appeared to be generally low with only a few nanoflagellates visible. Further analyses of the water samples will show if this trend holds true for smaller phytoplankton.

The next step is the analyses of all samples and parameters, and outreach activities and collaborative interpretations and publications of the data. Katharina Badinger from NTNU (Trondheim, Norway) will investigate the role of larger Zooplankton. Fernanda Vasconcelos from SLU (Sweden) will look into the biotechnological potential of sea ice algae. Maeve McGovern and Amanda Poste from NIVA (Tromsø, Norway) provided additional samples for other seasons and received samples from us for analyses of heavy metal contaminations and food web analyses. Based on this study, we are planning to submit a proposal under the lead of Josef Elster (CPE, Ceske Budejovice) for further work on microbial activities and survival strategies. In collaboration with Eva Hejdukova, we submitted further Arctic field grant proposals for the field work related costs of this project. In collaboration with UNIS (Longyearbyen, Norway) and NIVA (Tromsø, Norway) we submitted a proposal for covering costs related to next generation sequencing aiming to investigate the functional potential of various taxa in different fjords and seasons in the Arctic.

3.2.5. Algal cultivation in late Arctic summer conditions

Jana Kvíderová & Josef Elster

The polar cyanobacteria and algae developed a broad spectrum of adaptation-acclimation mechanisms to survive in harsh conditions. Some of them, like poly-unsaturated fatty acids or antioxidation pigments, represent high-value compounds for biotechnology. Since the summarized diel doses of solar radiation during a polar day are comparable to the tropical regions, the mass cultivation of cyanobacteria and/or microalgae in the Polar Region is being considered seriously[1].

In this year, we focused on

- Assessment of risks during transportation of a closed cultivation unit (2 l) to Svalbard
- Development of methods for media preparation, inoculation, prevention of contamination and biomass harvest at the polar station
- Performance of cultivation hardware in conditions of late Arctic summer
- Biomass production (green alga *Chlorella mirabilis*) and its correlation to environmental conditions.

The experimental cultivation was preformed from August 14 to September 1, 2018 on the roof of the storage container near JULIUS PAYER HOUSE in Longyearbyen. The experimental strain was cultivated in culture volumes of 200 µl, 20 ml and 2 l to get data for up-scaling (Fig. 3.2.6.). During the cultivation, air temperature and photosynthetic active radiation (PAR, in range 400 – 700 nm). The number of cells in the suspension was counted every day.

The cultivation lasted 10 days. While only low growth was observed in culture volumes of 200 µl and 20 ml, the growth rate of cultures in 2 l unit was higher (Fig. 3.2.7.). The biomass was lyophilized for analyses. So far, no correlation between growth rate and environmental conditions were found.

Fig. 3.2.6. The cultivation unit on the roof of the container.

Fig. 3.2.7. The algal cultures in 2 l cultivation vessels before harvest grown in **(a)** 2×Z-medium[2], **(b)** BBM medium[3].

References

[1]Kvíderová, J., Shukla, S.P., Pushparaj, B., Elster, J. (2017) Perspectives of low-temperature biomass production of polar microalgae and biotechnology expansion into high latitudes. In: Margesin, R., (ed.) Psychrophiles: From Biodiversity to Biotechnology. Cham: Springer, p. 585-600.

[2]Staub, R. (1961): Ernährungsphysiologisch-autökologische Untersuchungen an der planktonische Blaualge *Ocillatoria rubescens* DC. Schweizerische Zeitschrift für Hydrologie, 23, 82-198.

[3]Andersen, R.A., Berges, J.A., Harrison, P.J., Watanabe, H. (2005) Appendix A - Recipes for freshwater and seawater media. In: Andersen, R.A., (ed). Algal culturing techniques. Amsterdam, Boston, Heidelberg, London, New York, Oxford, San Diego, San Francisco, Singapore, Sydney, Tokyo: Elsevier Academic Press, p. 429-538.

3.3. Botany and Plant Physiology

3.3.1. Productivity-plant diversity relationship in global scale: Nutrient Network meta-experiment

Lauri Laanisto & Mart Paadik

First night and the last two night we spend in Payer´s House in Longyearbyen, and the rest of the time we spent in NOSTOC Field Station.

The purpose of our visit was to maintain Nutrient Network long-term meta-experiment site (ID: sval.no) that we set up in 2016. Nutrient Network http://nutnet.org/, that begun in 2006, is a global research initiative focusing on assessing the ecological relationship between productivity and (plant) diversity.

A NutNet site consists of 30 5x5 m permanent plots that is set up in proximity to NOSTOC Field Station. In 2018 we carried out the annual plant diversity census and implemented nutrient (fertilization) treatment. We did it together with Petr Macek. Obtained data will be added to NutNet global dataset, from where NutNet members can extract this data for their analysis. In 2019 we will return to Petuniabukta and continue with the experiment.

There are no publications yet that use sval.no NutNet data. Though, at least one manuscript is nearly ready.

3.3.2. Playing hide and seek with intraspecific trait variability s

Tiit Hallikma, Piia Jaksi & Lauri Laanisto

During the visit to Nostoc Field Camp in 2016 Lauri Laanisto and Tiit Hallikma made an observational study of intraspecific trait variability with *Betula nana, Vaccinium uliginosum, Equisetum arvense* and *Polygonum viviparum* (Fig. 3.3.1.), that were collected from the northern edge of their distribution (Svalbard) and southern edge or center of their distribution (Estonia). The results of comparison intraspecific trait dynamics in different species in different parts of the distribution area were presented in IBS 2018 Evora meeting (http://www.ibs2018.uevora.pt/) as a poster titled: „Playing hide and seek with intraspecific trait variability".

Fig. 3.3.1. *Polygonum viviparum.* Photo: CPE/Jana Kvíderová.

3.4. Zoology and Parasitology

3.4.1. Migration of Arctic terns (*Sterna paradisaea*) from Svalbard

Tereza Hromádková, Martins Briedis, Jiří Flousek & Václav Pavel

During the summer season 2018, we continued with the migration study of the Arctic tern. During the incubation period in 2017, we equipped 30 adults of Arctic terns with small archival loggers called as geolocators to follow their autumn and spring migration paths. The main aim this year was to recapture as many birds with geolocators as possible. We registered 22 birds with geolocator in the locality of Longyearbyen (Hotellneset, Sjøområdet, around Veg 400) and we were able to recapture 16 of them. Fifteen birds were wearing active geolocator and only one was not working properly for whole migration. After taking off the geolocator, we evaluated the body condition of catch birds and take a cloacal swab for a comparison of a composition of a microbial community especially bacteria.

Comparison of body conditions in 2017 and in 2018 indicate no significant impact of geolocator on the weight of birds (Fig. 3.4.1.). The average weight of birds in 2017 was 104.63 g whereas in 2018 the average weight was 110.87 g. We can imply that the difference in body weight among years was caused mainly by other aspects - for example, food availability.

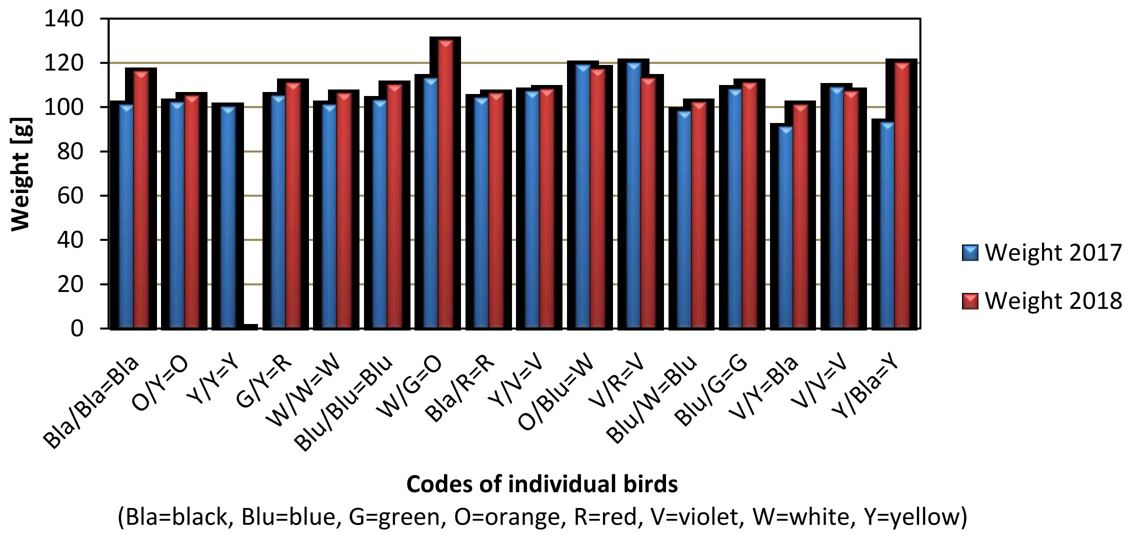


Fig. 3.4.1. A bar graph showing the body weight of birds in 2017 (blue) and in 2018 (red).

Data from geolocators are still analyzed but as a preliminary result, we can compare the main migration routes and wintering areas with other studies (Fig. 3.4.2a-d.). Arctic terns from Svalbard used both autumn migration routes: along the west coast of Africa (Fig. 3.4.2e. - Y/Y=Y) or along the east coast of South America (Fig. 3.4.2e. - W/W=W) similarly to terns from Greenland[1] (Fig. 3.4.2a.). As a wintering area, they used an area of the Weddell sea (Fig. 3.4.2e. - Y/V=V) as well as an area of the Indian ocean (Fig. 3.4.2e. - Blu/G=G) similarly to terns from Greenland[1] (Fig. 3.4.2a.) Alaska[2] (Fig. 3.4.2c.) or Farne Islands[3] (Fig. 3.4.2d.) and terns from the Netherlands[4] (Fig. 3.4.2b.) respectively. Spring migration routes followed the west coast of Africa (Fig. 3.4.2e. - Y/V=V, Blu/G=G) or the west coast of Africa and the east coast of North America (Fig. 3.4.2e. - Y/Y=Y, W/W=W) similarly to terns from the Netherlands[4] (Fig. 3.4.2b.) or Farne Islands[3] (Fig. 3.4.2d.) and from Greenland[1] (Fig. 3.4.2a.), respectively. Preliminary results indicate that Arctic terns from Svalbard are using combinations of all migration routes and wintering areas which are known in this species until today. More detail results are still under progress.

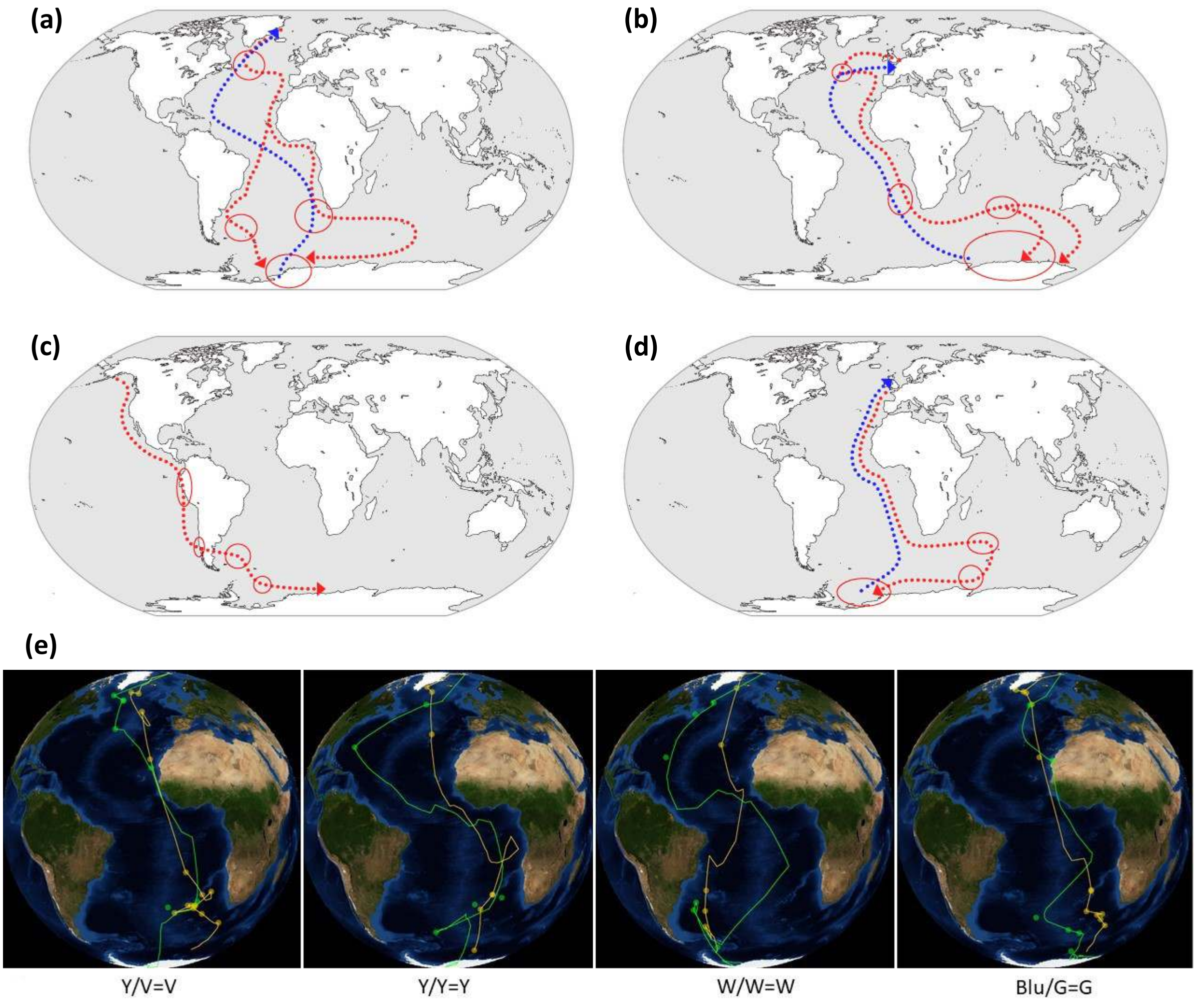


Fig. 3.6.2. The preliminary result of the migration study showed in maps with the comparison of migration routes, wintering areas and stop-overs of Arctic terns from different studies. **(a)** Egevang et al. 2010[1], **(b)** Fijn et al. 2013[2], **(c)** McKnight et al. 2013[3], **(d)** Bevan and Redfern 2016[4], **(e)** our study.
Legend: (a)-(d): red dotted line = autumn migration route and blue dotted line = spring migration route.
(a) yellow line = autumn migration route and green = spring migration route.
Authors of the maps (a)-(d): Ondřej Hromádko and of map (e): Martins Briedis.

Reference:

[1]Egevang, C., Stenhouse, I. J., Phillips, R. A., Petersen, A., Fox, J. W., Silk, J. R. (2010): Tracking of Arctic terns *Sterna paradisaea* reveals longest animal migration. Proceedings of the National Academy of Sciences, 107(5), 2078-2081.

[2]McKnight, A., Allyn, A. J., Duffy, D. C., & Irons, D. B. (2013): 'Stepping stone' pattern in Pacific Arctic tern migration reveals the importance of upwelling areas. Marine Ecology Progress Series, 491, 253-264.

[3]Bevan, R., Redfern, Ch. (2016): Record-breaking Arctic tern migration secrets revealed. Published online on 7 June 2016 by Christina Holvey. http://www.bbc.com/earth/story/20160603-mystery-migration-solved

[4]Fijn, R.C., Hiemstra, D., Phillips, R.A., Winden, J.V.D. (2013): Arctic Terns *Sterna paradisaea* from the Netherlands migrate record distances across three oceans to Wilkes Land, East Antarctica. Ardea, 101(1), 3-12.

3.4.2. Antipredation behaviour of Arctic terns (*Sterna paradisaea*) in Svalbard

Michaela Syrová, Tereza Hromádková, Václav Pavel & Petr Veselý

Nest defense is one of the most important expressions of breeding ecology of birds as it significantly increases the fitness of parents. Parents have to be able to identify predator appropriately because no response to a predator is lethal while the stronger response to non-predator is a waste of time and energy. Colonially nesting Arctic terns are a perfect model for studying nest defense as it vigorously defends their nest against intruders. Nest content of the Arctic tern is threatened by several mammalians (Arctic fox, Polar bear, weasel, cat) and avian predators (gull, skua, corvids). Adults are hunted mainly by raptors (gyrfalcon, peregrine falcon). Nevertheless, the population of Arctic terns on archipelago Svalbard faces a significantly reduce spectrum of predators. Svalbard is one of the most isolated archipelagoes in the Arctic region and some of the otherwise widespread arctic species like Peregrine falcon, Snow owl or raven do not occur here.

Our aim was to simulate occurrence of several predators in colonies of Arctic terns breeding in Svalbard in Longyearbyen colonies (namely Hotellneset, Sjøområdet, around Veg 400), and in Adolfbukta colony. Varying response to a different kind of birds was tested by presenting textile dummies in colonies as follows: as predators Peregrine falcon and Great black-backed gull, as a familiar predator Great black-backed gull and as a non-familiar predator Common raven, and as a harmless control Common eider. Experiments were consisting of the successive presentation of all four dummies in random order. Each dummy was presented for ten minutes with at least one-hour break between presentations.

Because of weather conditions, high predation pressure in both colonies and time possibilities we conducted study only in Adolfbukta colony. Bird's response was recorded by two cameras, first close to the dummy and second 15 meter away from the dummy watching the colony, and by researcher hidden and masked in the terrain. Preliminary results showed that terns in Adolfbukta colony react strongly to the gull – terns used both swoops and alarm calls against the dummy. The reaction against other dummies was significantly weaker, terns did not attack the dummy, they went back to their nests fast and used also fewer alarm calls (for illustration Fig. 3.4.4.). We would like to continue and complete our study next summer season 2019.

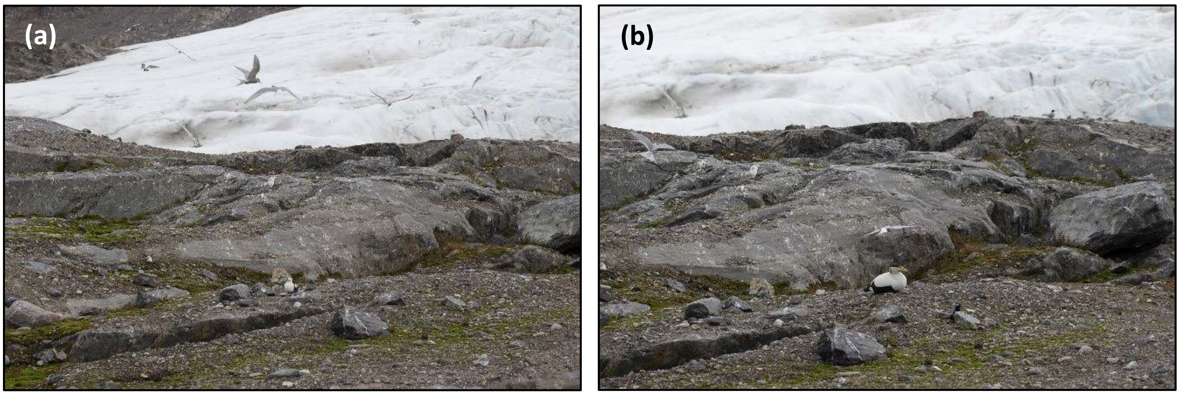


Fig. 3.4.4. Photos showing the reaction of Arctic terns to **(a)** dummy of Great black-backed gull representing predator and to **(b)** dummy of Common eider representing harmless control.

3.4.3. Parasites of terrestrial animals

Marek Brož, Oleg Ditrich & Eva Myšková

The research on parasites of terrestrial animals has been aimed to intestinal parasites of Arctic foxes, sibling voles and sledge dogs.

Using classical coprological methods and molecular analyses, we identified unicellular and multicellular parasites of Arctic foxes in Svalbard. We found parasites that have not been yet detected in Svalbard, such as *Eucoleus aerophilus*, *Uncinaria stenocephala*, *Toxocara canis*, *Trichuris* sp., *Eimeria* spp., and E*nterocytozoon bieneusi*. We also examined sibling voles *Microtus mystacinus* (syn. *Microtus levis*) as a potential source of parasites of Arctic foxes. Only intestinal parasite found in this host is *Cryptosporidium alticolis*[1]. This parasite has been with high probability introduced to Svalbard with his host.

We examined fecal samples of 130 dogs from 4 dog kennels (3 in Logyearbyen, 1 in Barentsburg). No dog harboured adult stage of *Echinococcus multilocularis*. One sample from dog was positive for *Toxascaris leonina* egg (Fig. 3.4.6.).

Remarcable results were achieved in case of microsporidia: 4 of dog samples were positive for *Enterocytozoon bieneusi*. In previous examination of another 36 dogs in 2016, 7 samples were also positive. Genetic analysis revealed genotype similar to unusual genotype that had been recorded in Switzerland and Portugal (Fig. 3.4.7.).

Fig. 3.4.6. Egg of *Toxascaris leonina*.

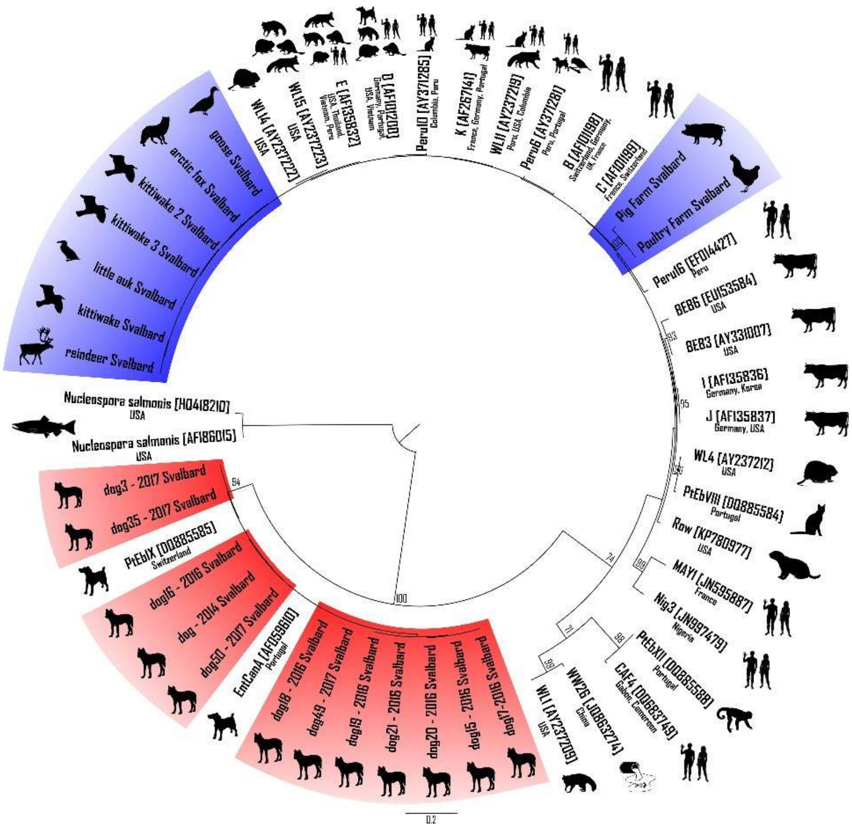


Fig. 3.4.7. Phylogenetic tree of microsporidia *Enterocytozoon bieneusi* based ongene for Internal Transcribed Spacer (ITS) rRNA. Sequences of *E. bieneusi* from dogs from Svalbard (red), from wildlife and livestock of Svalbard (blue), and reference sequences from GenBank (without highlight). Maximum-Likelihood; supports based on 1000x bootstrap.

References

[1]Horčičková, M., Čondlová, Š., Holubová, N., Sak, B., Květoňová, D., Hlásková, L., Konečný, R., Sedláček, F., Clark, M., Giddings, C., McEvoy, J. (2018): Diversity of *Cryptosporidium* in common voles and description of *Cryptosporidium lticolis* sp. n. and *Cryptosporidium microti* sp. n. (Apicomplexa: Cryptosporidiidae). Parasitology, *in press*, doi: 10.1017/S0031182018001142.

3.4.4. Parasites of marine animals

Oleg Ditrich & David Novotný

Blood fluke *Aporocotyle simplex* Odhner, 1900 (Sanguinicolidae, Fig. 3.4.8a.) was found in 39 % of American plaice (*Hippoglossoides platessoides*, Fig. 3.4.8b.) cropped near Longyearbyen (Fig. 3.4.8a.).

Morphological details of the flukes is studied using scanning electron microscopy and selected genes from isolated DNA samples are used for phylogenetic analyses of the species.

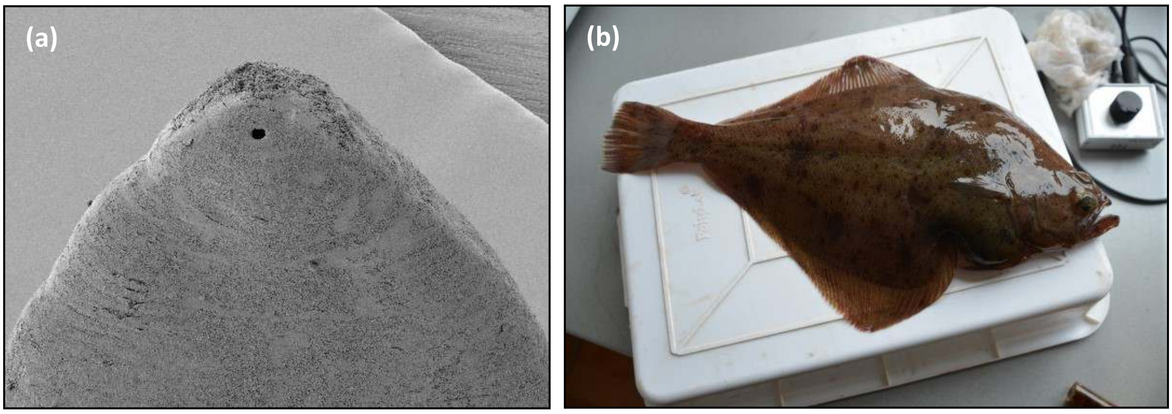


Fig.3.4.8. (a) Tiny acetabulum of *Aporocotyle simplex,* **(b)** *Hippoglossoides platessoides*.

Two species of Monogenea infecting Thorny skate (*Amblyraja radiata*) cropped near Longyearbyen were studied in details (Fig. 3.4.9.). On gills *Rajonchocotyle emarginata* Olson 1876 (Fig. 3.4.10a) has been recorded with the prevalence of 23%. On the surface of fins and on all the ventral side, *Pseudacanthocotyla verrilli* Goto 1899 (Fig. 3.4.10b.) has been found with the prevalence of 81 %. Selected genes from DNA isolated from both species are used for phylogenetic analyses.

Fig. 3.4.9. *Amblyraja radiata*.

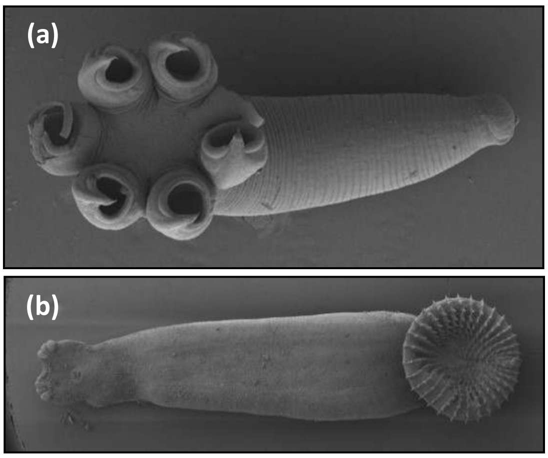


Fig. 4.9.10. (a) *Rajonchocotyle emarginata* Olson 1876, **(b)** *Pseudacanthocotyla verrilli* Goto 1899.

4. Educational activities

4.1. Polar Ecology - field course

Organizer: University of South Bohemia

August, 13 – September 2, 2018

Students of the Polar Ecology course participated at lectures, seminars and field trips at UNIS. During the course, they worked on different projects

- Microbiology and Phycology
  - Algae & Cyanobacteria in Svalbard - a small overview (Deborah Walter)
  - Searching for valuable fatty acids in Svalbard microbial communities (Dominika Činčarová)
  - Use of wild samples from Svalbard in cell cycle research (Vít Nahlík)
  - Entomopathogenic nematodes on Svalbard (Martina Flegrová)
  - Metazoan fauna in cryoconite holes of Svalbard. Genetics and ecological features (Luca Sanchez)
- Botany and Plant Physiology
  - Tree-ring analysis of *Empetrum hermaphroditum* in Svalbard (František Trkal)
  - Climate impact on growth rate of *Silene acaulis* (Stanislava Wolfová)
  - Influence of OTCs on reproductive traits of plants living inside and outside cushions (Hana Dvořáková)
  - Research of arbuscular mycorrhiza by selected plant species of snowbeds (Lada Klimešová)
- Zoology and Parasitology
  - Change of benthic fish fauna in Petuniabukta, Svalbard (Daniel Bartoň)
  - Invertebrate predation of freshwater zooplankton (Dominik Horký)
  - Macrofauna associated with the kelp forests in Adventfjorden (Svalbard) (Jana Marešová)
  - Trematoda of the family Hemiuridae on Svalbard (Vendula Branišová)
  - Parasitic trematodes (Opecoelidae) of marine organisms of Svalbard (David Novotný)
  - Intestinal parasites of Svalbard wild birds (Veronika Žánová)

The preliminary results were presented at a student seminar at Centre for Polar Ecology in České Budějovice November 3, 2018.

For detailed information, see report on Polar Ecology course at http://polar.prf.jcu.cz/docs-reports.

5. Outputs in 2017

5.1. CPE employees (present)

5.1.1. Journal articles

Barcytė, D., Elster, J., Nedbalová, L. (2018): Plastid-encoded rbcL phylogeny suggests widespread distribution of *Galdieria phlegrea* (Cyanidiophyceae, Rhodophyta). Nordic Journal of Botany, 36(6), e01794. (IF2017: 0.846; Q3: *Plant Sciences*).

Barcyté, D., Hodač, L., Nedbalová, L., Elster, J. (2018): *Chloromonas arctica* sp. nov., a psychrotolerant alga from snow in the High Arctic (Chlamydomonadales, Chlorophyta). International Journal of Systematic and Evolutionary Microbiology, 68(3), 851-859. (IF2017: 1.932; Q3: *Microbiology*).

Barcytė, D., Hodač, L., Nedbalová, L., Elster, J. (2018): *Chloromonas svalbardensis* n. sp. with insights into the phylogroup Chloromonadinia (Chlorophyceae). Journal of Eukaryotic Microbiology, 65(6), 882-892. (IF2017: 2.537; Q2: *Microbiology*).

Bjorkman, A.D., Myers-Smith, I.H., Elmendorf, S.C., Normand, S., Thomas, H.J.D., Alatalo, J.M., Alexander, H., Anadon-Rosell, A., Angers-Blondin, S., Bai, Y., Baruah, G., Beest, M.T., Berner, L., Björk, R.G., Blok, D., Buchwal, A., Buras, A., Carbognani, M., Christie, K., Collier, L.S., Cooper, E.J. Cornelissen, J.H.C., Dickinson, K., Dullinger, S., Elberling, B., Eskelinen, A., Forbes, B.C., Frei, E.R., Garcia, M.I., Good, M., Grau, O., Green, P., Grogan, P., Hájek, T., Martin Hallinger, M., Harper, K.A., Heijmans, M.M.P.D., Henry, G.H.R., Hermanutz, L., Hollister, R.D., Hudson, J., Hülber, K., Iversen, C.M., Jaroszynska, F., Johnstone, J., Jorgensen, R.H., Kaarlejärvi, E., Klady, R., Klimešová, J., Korsten, A., Kuleza, S., Kulonen, A., Lamarque, L.J., Lantz, T., Lavalle, A., Levesque, E., Little, C.J., Macek, P., Michelsen, A., Milbau, A., Molau, U., Morgan, J.W., Mörsdorf, M.A., Nabe-Nielsen, J., Nielsen, S.S., Ninot, J.M., Oberbauer, S., Olofsson, J., Onipchenko, V.G., Petraglia, A., Pickering, C., Prevéy, J.S., Rixen, C., Rumpf, S.B., Schaepman-Strub, G., Semenchuk, P., Shetti, R., Soudzilovskaia, N.A., Spasojevic, M., Speed, J.D.M., Street, L., Suding, K., Tape, K.D., Tomaselli, M., Trant, A., Treier, U., Tremblay, J.P., Tremblay, M., Venn, S., Vowles, T., Weijers, S., Wilmking, M., Wipf, S., Zamin, T. (2018): Tundra Trait Team: A database of plant traits spanning the tundra biome. Global Ecology and Biogeography, 27(12), 1402-1411. (IF2017: 5.958; Q1: *Ecology*).

Bohuslavová, O., Macek, P., Redčenko, O., Láska, K., Nedbalová, L., Elster, J. (2018): Dispersal of lichens along a successional gradient after deglaciation of volcanic mesas on northern James Ross Island, Antarctic Peninsula, Polar Biology, 41(11), 2221-2232. (IF2017: 1.954; Q3: *Ecology*).

Kvíderová, J. (2018): Internal structure and photosynthetic performance of *Nostoc* sp. colonies in the High Arctic. Acta Societatis Botanicorum Poloniae, 87(4), 3602. (IF2017: 0.876; Q3: *Plant sciences*).

Macek, P., Schöb, C., Núñez-Ávila, M., Hernández Gentina, I.R., Pugnaire, F.I., Armesto, J.J., (2018): Shrub facilitation drives tree establishment in a semiarid fog-dependent ecosystem. Applied Vegetation Science, 21, 113-120. (IF2017: 2.331; Q1: *Forestry*).

Macek, P., Schöb, C., Núñez-Ávila, M., Pugnaire, F.I., Armesto, J.J., (2018): Shrubs mediate forest start-up and patch dynamics in a semiarid landscape. Perspectives in Plant Ecology, Evolution and Systematics, 34, 140-149. (IF2017: 2.820; Q2: *Plant sciences*).

Maliniemi, T., Kapfer J., Saccone, P., Skog, A., Virtanen, R. (2018): Long-term vegetation changes of treeless heath communities in northern Fennoscandia: links to climate change trends and reindeer grazing. Journal of Vegetation Science, 29, 469-479. (IF2017: 2.658; Q1: *Plant sciences*).

Müllerová, J., Elsterová, J., Černý, J., Ditrich, O., Žárský, J., Culler, L.E., Kampen, H., Walther, D., Coulson, S.J., Růžek, D., Grubhoffer, L. (2018): No indication of arthropod-vectored viruses in mosquitoes (Diptera: Culicidae) collected on Greenland and Svalbard. Polar Biology, 41(8), 1581–1586. (IF2017: 1.954; Q2: *Biodiversity conservation*).

Petkov, B. H., Vitale, V., Svendby, T. M., Hansen, G. H., Sobolewski, P. S., Láska, K., Elster, J., Pavlova, K., Viola, A., Mazzola, M., Lupi, A., Solomatnikova, A. (2018): Altitude-temporal behaviour of atmospheric ozone, temperature and wind velocity observed at Svalbard. Atmospheric Research, 207, 100–110. (IF_{2017}: 3.817; Q1: *Meteorology & Atmospheric Sciences*).

Pessi, I.S., Pushkareva, E., Lara, Y., Borderie1, F., Wilmotte, A., Elster, J. (2018): Marked succession of cyanobacterial communities following glacier retreat in the High Arctic. Microbial Ecology, 77 (1), 136–147. (IF_{2017}: 3.614; Q1: *Ecology*).

Pistón, N., Michalet, R. Schöb, C., Macek, P., Armas, C., Pugnaire, F.I. (2018): The balance of canopy and soil effects determines intraspecific differences in foundation species' effects on associated plants. Functional Ecology 32: 2253–2263. (IF_{2017}: 5.491; Q1: *Ecology*).

Roy, J., Bonneville, J.M., Saccone, P., Ibanez S., Albert, H. C., Boleda, M., Gueguen, M., Ohlman, M., Rioux, D., Clément, J.C., Lavergne, S., Geremia, R. (2018): Differences in the fungal communities nursed by two genetic groups of the alpine cushion plant, *Silene acaulis*. Ecology and Evolution, 8(23): 11568–11581. (IF_{2017}: 6.915; Q2: *Ecology*).

Schaeffner, B.C., Ditrich, O., Kuchta, R. (2018): A century of taxonomic uncertainty: re-description of two species of tapeworms (Diphyllobothriidea) from Arctic seals. Polar Biology, 41 (12), 2543–2559. (IF_{2017}: 1.954; Q2: *Biodiversity conservation*).

Smykla, J., Porazinska, D.L., Iakovenko, N.S., Devetter, M., Drewnik, M., Hii, S.Y., Emslie, S.D. (2018): Geochemical and biotic factors influencing diversity and distribution patterns of soil microfauna across ice-free coastal habitats in Victoria Land, Antarctica. Soil Biology and Biochemistry 116 265–276 10.1016/j.soilbio.2017.10.028. (IF_{2017}:4.857 Q1 *Soil Science*).

Tyml, T., Lisnerová, M., Kostka, M., Dyková, I. (2018): Current view on phylogeny within the genus *Flabellula* Schaeffer, 1926 (Amoebozoa: Leptomyxida). European Journal of Protistology, 64, 40-53. (IF_{2017}: 2.430; Q3: *Microbiology*).

Tyml, T., Dyková, I. (2018): *Sappinia* sp. (Amoebozoa: Thecamoebida) and *Rosculus* sp. (SAR: Cercozoa) isolated from king penguin guano collected in the Subantarctic (South Georgia, Salisbury Plain) and their coexistence in culture. Journal of Eukaryotic Microbiology, 65, 544-555. (IF_{2017}: 2.537; Q2: *Microbiology*).

5.1.2. Theses

Lucadello, M.: Metazoan fauna of cryoconite holes in high Arctic glaciers of Svalbard, Genetic and Ecological features. MSc. thesis, Universidade do Algarve, Faro, Portugal, 2018.

Müllerová, J.: Detekce zoonotických virů v biologických vzorcích z Arktidy [Detection of zoonotic infection in samples from Arctic.]. MSc. thesis. Faculty of Science, University of South Bohemia in České Budějovice, 2018.

Polášková, A.: Determination of polycyclic aromatic hydrocarbons in soil from Svalbard. BSc. thesis, Institute of Analytical Chemistry, Johannes Kepler University of Linz, Austria, 2018.

Souquieres, C.-E.: Ecology and photosynthetic activity of a *Vaucheria* sp. dominated Arctic microphytobenthos, Svalbard. MSc. thesis, Universidade do Algarve, Faro, Portugal, 2018.

Stehrer, T.: Heavy metal contamination of soil in Longyearbyen, Svalbard. BSc. thesis, Institute of Analytical Chemistry, Johannes Kepler University of Linz, Austria, 2018.

5.1.3. Conference contributions

Bernardová, A., Šabacká, M., Elster, J., Callaghan, T.: Rapid response to environmental emergency Alerts. An INTERACT Initiative. Polar 2018, Davos, Switzerland, June 19-23, 2018.

Bernardová, A. The involvement of Czech Arctic Research Station in the international INTERACT project. AT HOME IN SVALBARD 2018, The Days of Czech Culture and Science on the Occasion of Czechoslovakia's Centenary, 25th Anniversary of the Czech Republic and 10th Anniversary of Regular Scientific Research Stays of Czech Scientists in Svalbard, Longyearbyen, Svalbard, Norway August 21 - September 13, 2018.

Bernardová, A., Šabacká, M., Elster, J., Callaghan, T.: Rapid response to environmental emergency alerts. An INTERACT Initiative. Arctic Biodiversity Congress 2018, Rovaniemi, Finland, October 9-12, 2018.

Elster, J., Ditrich, O., Kvíderová, J., Nývlt, D., Kapler, P.: Czech Polar Research Infrastructure. Polar 2018, Davos, Switzerland, June 19-23, 2018.

Elster, J, Kvíderová, J., Přibyl, P., Nedbalová, L., Šabacká, M., Lukavský J., Barták, M., Váczi, P., Hájek, J., Brányik, T., Kaštánek, P., Brányiková, I.: Algal biomass production in Central European non-summer and Arctic conditions. Polar 2018, Davos, Switzerland, June 19-23, 2018.

Hromádková, T., Briedis, M., Syrová, M., Pavel., V.: Past and present of Arctic terns' studies. Students in Polar and Alpine Research Conference 2018, Brno, Czechia, April 16-18, 2018.

Kvíderová, J., Souquieres, C.-E., Elster, J.: Hyperborean microphytobenthos (*Vaucheria* sp.) of coastal tidal flats, central Svalbard. 5th International Symposium on Arctic Research, Tokyo, Japan, January 15-18, 2018

Lukavský, J., Cepák, V., Nedbalová, L., Iliev, I., Kvíderová, J.: Cryoseston of European mountains. The 59th conference of the Czech Phycological Society. Olomouc, Czechia, September 17-19, 2018.

Lukavský, J., Cepák, V., Nedbalová, L., Iliev, I., Kvíderová, J.: Sněžné řasy evropských pohoří [Cryoseston of European mountains]. Bioprospekce, sněžné řasy a jiné biotechnologicky zajímavé kmeny, Třeboň, Czechia, October 16, 2018.

Lukavský, J., Cepák, V., Nedbalová, L., Iliev, I., Kvíderová, J.: Cryoseston of European mountains. 2nd Snow Algae Meeting, Potsdam, Germany, November 15-16, 2018.

Lulák, M., Hanáček, M., Nývlt, D., Nehyba, S.: Early Holocene shallow marine mollusc palaeodiversity, Billefjorden, Svalbard. Polar 2018, Davos, Switzerland, June 19-23, 2018.

Luláková, P., Perez-Mon, C., Ruethi, J., Frey, B.: Are high-alpine microbial communities able to deal with temperature extremes? Polar 2018, Davos, Switzerland, June 19-23, 2018.

Macek, P., Saccone, P., Frei, E.R., Hájek, T., Klimešová, J., Bernardová A.: Nurse effect of cushion plants: Plant interactions in Arctic tundra ecosystems in the face of climate change. ITEX meeting, Stirling, UK, April 25-27, 2018.

Myšková, E, Ditrich, O.: Pandora's fox: Overview of zoonotic agents carried by Arctic foxes. poster Arctic Biodiversity Congress 2018. Arctic Biodiversity Congress 2018, Rovaniemi, Finland, October 9-12, 2018.

Saccone, P., Bernardová, A., Bryndová, M., de Bello, F., Devetter, M., Hájek, T., Háněl, L., Jílková, V., Kotas, P., Macková, J., Polická, P., Starý, J., Macek, P.: Linking C sequestration service and High Arctic ecosystem multi-trophic functionality. SFEcologie 2018, Rennes, France, October 22-25, 2018.

Stehrer, T., Polášková, A., Himmelsbach, M., Buchberger, W., Hassel., A. W., Kolender, J. P., Luláková, P., Elster, J.: Heavy metal and PAH contamination in soil from Svalbard, Longyearbyen. Students in Polar and Alpine Research Conference 2018, Brno, Czechia, April 16-18, 2018.

Šabacká, M, Zawierucha, K, Janko, K, Devetter, M, Elster, J.: The ecology of small glacier animals: A Case Study from the Arctic. Polar 2018, Davos, Switzerland, June 19-23, 2018.

Šabacká, M, Hodson, A. Nowak, A., Jungblut, A., Pearce, D., Navarro, F., Convey, P., Vieira, G.: Ecology of algae from maritime Antarctic snowpacks. The 59th conference of the Czech Phycological Society. Olomouc, Czechia, September 17-19, 2018.

Souquieres, C.-E., Kvíderová, J., Elste,r J.: Diversity and ecophysiology of *Vaucheria* sp. in coastal tidal flats of Svalbard. Polar 2018, Davos, Switzerland, June 19-23, 2018.

Vinšová, P., Luláková, P., Čapek, P., Falteisek, L., Yde, J. C., Skoblia, S., Šantrůčková, H., Stibal, M.: Soil development on a High Arctic glacier forefield: how is the microbial community limited by nutrient availability? EGU 2018, Vienna, Austria, April 7-12, 2018.

5.1.4. Popularizing articles

Kvíderová, J. (2018): Neviditelní kosmonauti - sinice a řasy. 1. díl. Experiment Chlorella [Invisible astronauts – cyanobateria and algae. Part 1. Experiment Chlorella]. Nová botanika 1(1): 25-27.

Kvíderová, J. (2018): Neviditelní kosmonauti - sinice a řasy. 2. díl. Kdo a proč se podíval na orbitu? [Invisible astronauts – cyanobateria and algae. Part 1. Who and when did fly to space?]. Nová botanika 1(2): 40-42.

5.1.5. Presentations in media

27.06. ČRo: Leonardo. Výzkum ledovců pomůže s hledáním života mimo naši planetu, vysvětluje polární ekoložka [Glacier research will help with search for life byond our planet, polar ecologist explains] (link) (in Czech)

18.05. ČT: Sama doma. [Home alone] (link) (in Czech)

01.04. Aktualne.cz: Tající tropické ledovce připomínají vyhořelou Alexandrijskou knihovnu, říká vědkyně Šabacká [Melting tropical graciers resemble burned Alexandrian Library, scientist Šabacká says] (link) (in Czech)

22.03. ihned.cz: Česká vědkyně prozkoumá ohrožené africké ledovce. Za několik let zřejmě úplně zmizí, tvrdí Šabacká [Czech scientist will explore endangered African glaciers. They will diappear apparently in a few years, Šabacká says] (link) (in Czech)

31.03. ČT: Na vlastní nohy [On own feet] (link) (in Czech)

5.2. External Infrastructure users

5.2.1. Journal articles

Kavan, J. (2018): Observation of polar bear (*Ursus maritimus*) feeding on Svalbard reindeer (*Rangifer tarandus platyrhyncus*) – exceptional behaviour or upcoming trend? Czech Polar Reports, 8(2), *in press.*

Zawierucha, K., Podkowa, P., Marciniak, M., Gąsiorek, P., Katarzyna Zmudczyńska-Skarbek, K., Janko, K., Włodarska-Kowalczuk, M. (2018): Temperature (latitude) and nutrient (seabird guano) effects on limno-terrestrial Tardigrada (*Testechiniscus spitsbergensis* and *Pilatobius recamieri*) body size. Polar Research, 37, 1492297. (IF_{2017}: 1.500; Q3 *Ecology*)

5.2.2. Conference contributions

Kavan, J. (2018): On the origin and evolution of proglacial lake Ragnar, central Spitsbergen. Students in Polar and Alpine Research Conference 2018 (SPARC), Brno, Czechia, April 16– 18, 2018.

Kavan, J., Anděrová, V. (2018): Environmental factors influencing Svalbard reindeer (*Rangifer tarandus*) populations as seen through antler characteristics. Students in Polar and Alpine Research Conference 2018 (SPARC), Brno, Czechia, April 16– 18, 2018.

Láska, K., Chládová, Z., Hošek, J. (2018): The surface wind circulation over a complex terrain of central Spitsbergen. In: Where the Poles come together. Polar 2018, Davos, Switzerland, June 19-23, 2018.

Ondráčková, L., Hanáček, M., Nývlt D. (2018): Axial transport and sources of fluvial gravel in Munindalen, Svalbard. 2018. Polar 2018, Davos, Switzerland, June 19-23, 2018.

Ondruch, J., Kavan, J., Láska, K., Nývlt, D. (2018): Hydrometeorology of three Arctic catchments in different stages of deglaciation. Polar 2018, Davos, Switzerland, June 19-23, 2018.