The Third Turkish Arctic Scientific Expedition (TASE-III)

Report 04.07.2023-02.08.2023, Jnr. 23/5414

Project Dates: 04.07.2023-02.08.2023

Purpose of Cruise: Investigation of the anthropogenic impacts in a global scale and the effects of global climate change.

Scientist in Charge: Prof. Dr. Burcu Özsoy

Introduction

Polar Research Institute (PRI) was established in 2019 within TÜBİTAK Marmara Research Center to ensure the coordination and logistics of the national polar expeditions. The Institute aims to provide support for R&D and scientific research studies to be conducted in polar regions, to operate Türkiye's polar research infrastructure, to plan and coordinate logistics, to facilitate communication among relevant organizations, to conduct bilateral international collaborations, to develop and implement the national polar strategy in cooperation with stakeholders, to raise awareness of polar regions at national scale. As the umbrella organization for polar research in Türkiye, PRI organizes scientific expeditions to Arctic and Antarctica to provide a better understanding of the past, present and the future of the Earth, and also to investigate the impacts of global climate change and human activities. The first Turkish Arctic Scientific Expedition (TASE-I) was conducted around Svalbard between 13-26 July 2019 onboard MY Anakena. RiS ID was 11301 and Cruise Information was specified as 190620 on Directorate of Fisheries. The 2nd Turkish Arctic Scientific Expedition (TASE-II) was conducted around Svalbard between 13-24 July 2022 onboard R/V PolarXplorer. Cruise information was specified referenced number 22/9853 on Directorate of Fisheries.The 3rd Turkish Arctic Scientific Expedition (TASE-III) was carried out onboard R/V PolarXplorer between 04 July-02 Aug 2023 in Barents Sea (Figure 1). In line with the permissions obtained in accordance with "Regulations Relating to Foreign Marine Scientific Research in Norway's Internal Waters, Territorial Sea and Exclusive Economic Zone and on the Continental Shelf" the studies were conducted within the Norwegian Exclusive Economic Zone and in the Fisheries Protection Zone around Svalbard.. The overall purpose of the scientific research was to investigate the presence and intensity of the anthropogenic impacts on a global scale, as well as, to observe the parameters and effects of global climate change in the Arctic.

Conducted Projects

The following projects were carried out within The Third Turkish Arctic Scientific Expedition (TASE-III):

1. Determination of the Degree of Biodegradation of Bacterial Diversity on Microplastic Surfaces in the Barents Sea
2. Collection of Marine Meteorological Data in Arctic Conditions
3. Determination of Phytoplankton Population in the Barents Sea Using Open Source Platform and Investigation of Phytoplankton Characteristics
4. Depth Assessment in terms of Satellite Based Bathymetry
5. Investigation of Organic Micropollutants in the Arctic
6. Response of the Arctic Pelagic Ecosystem to Climate Change
7. The Impact of Global Warming on the Distribution of Cold-Adapted Fishes in the Barents Sea
8. Improving Arctic Maritime Safety and Sustainability in the Svalbard Region: Observations from a Research Vessel
9. Recovery of Crude Oil Spills from Water by Platanus Orientalis L. Adsorbent
10. Implementation of the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (2021) and the Convention for the Conservation of Antarctic Marine Living Resources (1982) and the Realities of Competence in Ensuring Conservation
11. Determination of the Level and Distribution of Anthropogenic Pollution in the Barents Sea
12. Field Studies for Increasing Education and Awareness in Polar Research
13. 2023 Summer Comparison of UV Irradiance Measurements in the Arctic and Antarctic Regions
14. Spatial Distribution of Unmeasurable Atmospheric Parameters in Turkish Arctic Scientific Expedition

The members of the expeditions and their Institutions are given in Table 1.

Table 1. Expedition members, roles and Institutions

No	Participant	Role	Institution
1	Prof. Dr. Burcu Özsoy	Expedition Coordinator	TÜBİTAK Marmara Research Center, Polar Research Institute / Istanbul Technical University
2	Cpt. Özgün Oktar	Expedition Leader	TÜBİTAK Marmara Research Center, Polar Research Institute / Istanbul Technical University
3	Assoc. Prof. Dr Hakan Yavaşoğlu	Researcher	TÜBİTAK Marmara Research Center, Polar Research Institute / Istanbul Technical University
4	Cpt. Sinan Yirmibeşoğlu	Researcher	TÜBİTAK Marmara Research Center, Polar Research Institute
5	Dr. Göksu Uslular	Researcher	TÜBİTAK Marmara Research Center, Polar Research Institute
6	Zeynep Bilge Esen	Researcher	TÜBİTAK Marmara Research Center, Polar Research Institute
7	Çetin Biçer	Researcher	General Directorate of Meteorology
8	Kerem Tunç	Researcher	Aydın Adnan Menderes University
9	Semih Nart	Researcher	Turkish Naval Forces Department of Navigation

			Hydrography and Oceanography
10	Çağan Soysal	Researcher	Gebze Teknik University
11	Hulusi Diler	Researcher	Afyonkarahisar Dumlupınar Science and Art Centre
12	Şebnem Coşkun	Press	Anadolu Agency (Turkish National News Agency)
13	Dr. Meriç Karahalil	Researcher	Western Norway University of Applied Sciences
14	Assoc. Prof. Dr Jasna Vukic	Researcher	Charles University
15	Chariane Werlang	Researcher	Federal University of Rio Grande-FURG

The titles and brief information of the conducted projects are listed in Table 2.

Table 2. TASE-II projects and related information.

Project	**Information**
Determination of the Degree of Biodegradation of Bacterial Diversity on Microplastic Surfaces in the Barents Sea	Within the framework of the project, the researchers aimed to identify the bacterial biodiversity living on microplastics in the Barents Sea and playing an important role in the degradation of microplastics. For this reason, microplastics were collected from the region with a manta net in order to analyze the bacteria on them. On average, approximately 100-150 pieces of microplastics were obtained from sampling stations. The majority of sampling operations were conducted using a manta trawl. However, at selected sampling points, where

	direct microplastic sampling was unfeasible, water, ice, and filtrate samples were gathered for subsequent membrane filtration.
Collection of Marine Meteorological Data in Arctic Conditions	During the expedition, meteorological parameters such as wind speed, air temperature, humidity, pressure, global insolation, and sea water temperature were measured using a mobile Automatic Meteorological Observation Station (AWS).
Determination of Phytoplankton Population in the Barents Sea Using Open Source Platform and Investigation of Phytoplankton Characteristics	Throughout the expedition, water sampling and UAV flight studies were conducted at designated stations, and data were collected evaluate
Depth Assessment in terms of Satellite Based Bathymetry	During the expedition, two instruments named "secchi disc" and "forel scale" were employed at different times of the day to measure the color of the sea, the refraction of light, and the visibility distance in the sea. In line with these observations, the consistency of depth data in terms of satellite-based bathymetry was tested. Simultaneously, a relationship was established between the water temperature and depth data and the information obtained from the seas of Türkiye.
Investigation of Organic Micropollutants in the Arctic	During the expedition, the spatial distribution of organic micropollutants (both old and new) in the Barents Sea was analyzed to reveal the ecological risks associated with the presence of target pollutants in the main ocean transport routes and the Arctic marine area through a multidisciplinary approach. As part of the project, 7021 mL of surface water

	samples were collected for enzyme analysis, and 60 L of surface water samples were collected for pollutant analysis from the designated sampling stations.
Response of the Arctic Pelagic Ecosystem to Climate Change	Within the scope of the project, the impact of changing climatic conditions on phytoplankton communities was investigated. 116 L of surface water samples were filtered for analysis and 58 filters were kept under suitable conditions.
The Impact of Global Warming on the Distribution of Cold-Adapted Fishes in the Barents Sea	Within the scope of the project, the relationship between water temperature and the sequence diversity of genes that play an important role in cold water adaptation in various fish species in the Barents Sea was analyzed. 177 fishes were catched, 16 of them were preserved in formaldehyde the others were finclipped and released back to sea. Samples were sent to the laboratory in order to analyze the genetic diversity of selected fish species populations based on mitochondrial and nuclear genes.
Improving Arctic Maritime Safety and Sustainability in the Svalbard Region: Observations from a Research Vessel	Navigational challenges were assessed, potential risks were identified and data was collected from the ship's crew to develop practical recommendations to ensure safe and sustainable maritime practices in the Arctic.
Recovery of Crude Oil Spills from Water by Platanus Orientalis L. Adsorbent	The project was realized by combining 1 liter of sea water with crude oil in an isolated container using recyclable equipment made from the fibers of the eastern plane tree, a natural material. No water discharged back to

	sea but processed by vessel's engine department
Implementation of the Agreement to Prevent Unregulated High Seas Fisheries in the Central Arctic Ocean (2021) and the Convention for the Conservation of Antarctic Marine Living Resources (1982) and the Realities of Competence in Ensuring Conservation	During the expedition, water samples were taken from predetermined points and traces of environmental impacts in the Arctic Ocean and Barents Sea will be analysed. In addition, an Unmanned Aerial Vehicle with a multispectral camera was flown over the sampling sites to investigate the environmental impacts on the water surface. Sampling and observations were carried out to enable comparisons to be made by evaluating the newly signed Agreement on the protection of marine living resources in the region.
Determination of the Level and Distribution of Anthropogenic Pollution in the Barents Sea	Conductivity, temperature, dissolved oxygen, pH and salinity values were measured with a portable multimeter in the surface waters of the specified stations. The collected data will be used to support other marine research studies within the expedition. 15660ml water sample was taken, 54L water was filtered for 27 Filter SSM analysis and 58 liters of water and 29 filters were kept under suitable conditions for Chlorophyll A analysis.
Field Studies for Increasing Education and Awareness in Polar Research	To develop educational and awareness activities related to the area, field observations were conducted, and audio-visual and visual materials intended for this purpose were collected. A student, who experienced their first visit to the Arctic, participated in a vlog study about the project

	to enhance the interest of the younger generation in the poles.
2023 Summer Comparison of UV Irradiance Measurements in the Arctic and Antarctic Regions	UV radiation measurements were made during the expedition. With these measurements, it was aimed to investigate the parameters affecting the periodic UV radiation changes at both poles.
Spatial Distribution of Unmeasurable Atmospheric Parameters in Turkish Arctic Scientific Expedition	During the Expedition, the distribution of PM10 and PM2.5 measurements over different surfaces and the effects of other atmospheric parameters were investigated.

The coordinates of the sampling stations are given in Table 3. In addition, the stations were shown in map in Figure 1.

Table 3. Coordinates of the sampling stations.

#	Location	Lattitude	Longitude
1	Loc1	71° 19.22' N	24° 25.61' E
2	Loc2	70° 36.03' N	32° 26.90' E
3	Loc3	73° 05.17' N	35° 54.22' E
4	Loc4	73° 42.83' N	36° 46.92' E
5	Loc5	75° 32.94' N	31° 42.64' E
6	Loc6	75° 50.40' N	37° 35.55' E
7	Loc7	76° 40.90' N	37° 43.99' E
8	Loc8	77° 54.08' N	33° 54.24' E
9	Loc9	78° 34.78' N	37° 37.84' E
10	Loc10	79° 14.61' N	34° 51.40' E
11	Loc11	80° 17.02' N	31° 01.38' E
12	Loc12	81° 08.34' N	18° 03.42' E
13	Loc13	80° 52.30' N	13° 56.19' E
14	Loc14	80° 27.00' N	07° 57.43' E
15	Loc15	80° 00.63' N	02° 24.82' E
16	Loc15a	79° 59.35' N	01° 41.94' E
17	Loc16	80° 00.13' N	10° 18.41' E
18	Loc17	79° 38.84' N	09° 12.35' E
19	Loc18	79° 03.73' N	09° 33.77' E
20	Loc19	78° 32.98' N	09° 47.75' E
21	Loc20	78° 03.80' N	11° 03.44' E
22	Loc21	77° 59.35' N	12° 03.38' E

23	Loc22	77° 33.27' N	12° 51.65' E
24	Loc23	75° 54.87' N	14° 11.85' E
25	Loc24	75° 12.95' N	16° 33.44' E
26	Loc25	75° 12.33' N	20° 24.57' E
27	Loc26	76° 07.23' N	23° 17.61' E
28	Loc27	76° 15.57' N	18° 38.04' E
29	Loc27a	76° 20.30' N	17° 28.41' E

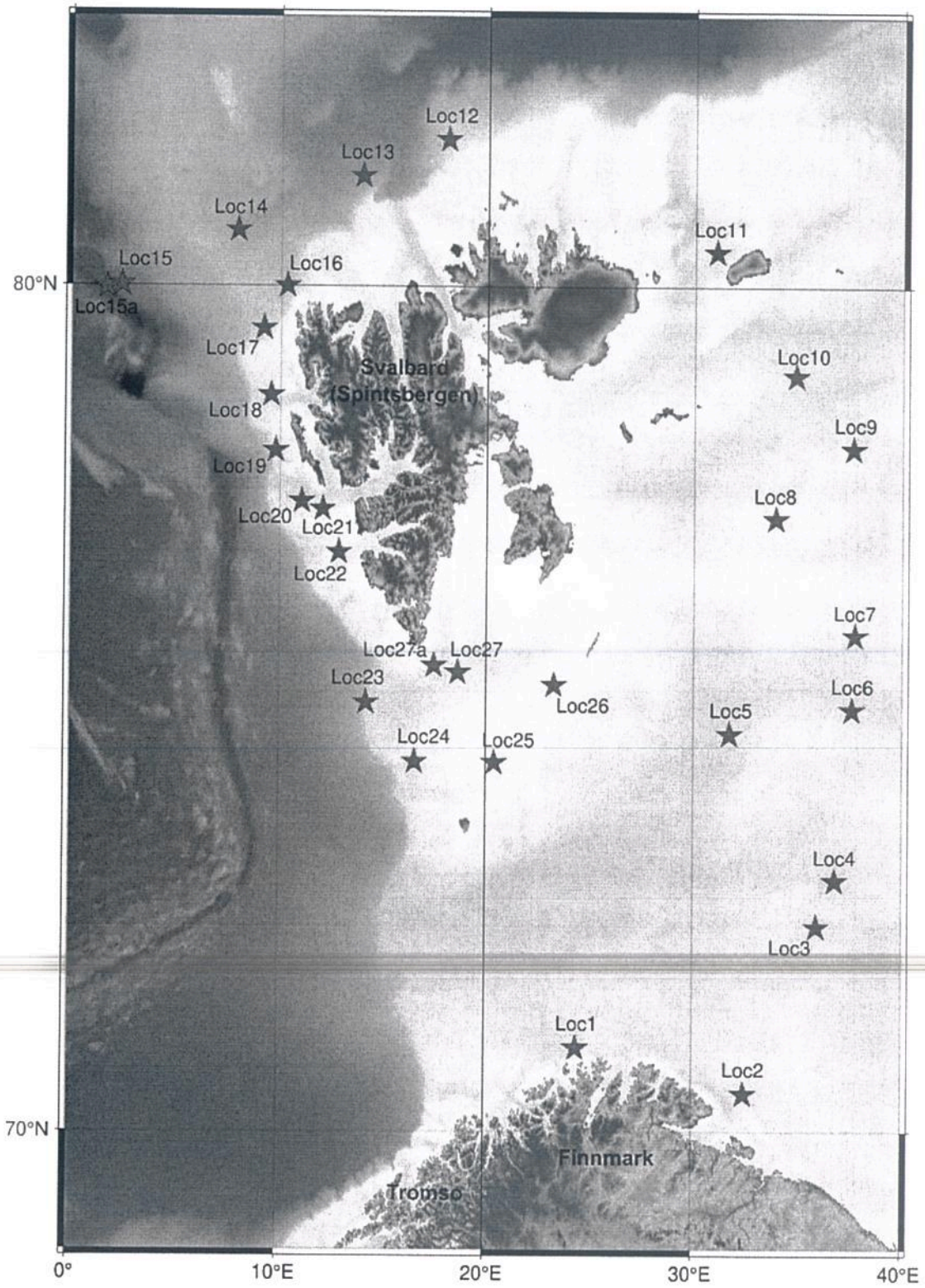

Figure 1. TASE-III sampling points

Results

In situ measurements were carried out in the surface waters of specified stations, namely pH, dissolved oxygen (DO), conductivity, total dissolved solids, sigma-T and seawater temperature (Table 4). For chlorophyll-a concentrations, the measured filters were thawed and extracted by acetone-water (90:10) solution in +4 °C overnight. Then, the samples were centrifuged for 10 minutes at 3000 rpm. The supernatant phases were measured in fluorescence spectrometer at 430 nm (excitation) and 663 nm (emission) wavelengths. The measured chlorophyll-a concentrations varied between the detection limits and 2.4 mg/m3 among the sampling stations

Table 4. Properties of surface seawater measured during the expedition route.

Station	pH	Dissolved Oxygen (%)	Dissolved Oxygen (mg/L)	Electrical Conductivity (mS/cm)	Total Dissolved Solids (ppt)	Salinity (PSU)	Seawater Density (σ_t)	Seawater Temperature (°C)
LOC1	8.13	108.9	9.96	52.24	26.12	34.25	26.4	10.06
LOC2	8.11	118.2	11.11	52.91	26.46	34.66	26.9	8.86
LOC 3	8.09	115.6	11.44	54.52	27.26	35.53	28.0	5.90
LOC 4	8.05	113.9	11.47	54.52	27.26	35.44	28.0	5.22
LOC 5	8.11	110.8	10.93	54.46	27.23	35.51	27.9	6.17
LOC 6	7.98	106.4	11.07	54.06	27.01	34.92	27.7	3.95
LOC 7	8.06	108.5	11.42	54.05	27.03	34.83	27.7	3.44
LOC 8	8.08	103.5	10.70	53.37	26.69	34.44	27.3	4.0
LOC 9	8.11	106.6	11.37	53.79	26.90	34.58	27.5	3.05
LOC 10	8.11	108.1	11.48	51.89	25.95	33.23	26.5	3.09
LOC 11	8.24	110.9	12.92	52.12	26.07	32.58	26.2	-0.83
LOC 12	8.22	98.6	11.16	48.57	24.29	30.32	24.3	-0.09
LOC 13	8.20	98.8	11.23	50.62	25.31	31.77	25.5	0.13
LOC 14	8,17	101,8	11,7	49,75	24,88	31,07	24,9	-0.36
LOC 15	8,14	105,2	11,91	51,68	25,84	32,51	26,1	0.15
LOC 15.a	8,2	101.7	11.98	26.18	13.09	15.33	12.2	-1.35
LOC 16	8.08	102.7	9.93	54.00	27.00	35.23	27.7	6.53
LOC 17	8,03	101,2	9,85	54,17	27,09	35,32	27,8	6,26
LOC 18	8.09	106.7	9.87	53.69	26.85	35.22	27.3	8.71
LOC 19	8.09	110.9	10.43	53.61	26.81	35.11	27.3	8.25
LOC 20	8.10	108.0	9.73	53.58	26.79	35.25	27.1	10.30
LOC 21	8.08	109.4	10.00	53.10	26.55	34.85	26.9	9.62
LOC 22	8.13	112.4	10.40	53.96	26.98	35.43	27.5	8.96
LOC 23	8.07	100.6	9.56	54.21	27.11	35.53	27.7	8.06
LOC 24	8.07	107.1	10.42	54.39	27.20	35.56	27.9	6.96
LOC 25	8.01	101.1	10.42	54.25	27.13	35.11	27.8	4.32
LOC 26	8.01	103.3	10.76	54.16	27.08	34.98	27.8	3.90
LOC 27	8.12	108.4	10.57	54.44	27.22	35.55	27.9	6.51
LOC 27a	8.09	103.9	10.24	54.30	27.15	35.39	27.9	6.09

Zooplankton and phytoplankton samples were collected by using 200 μm and 20 μm mesh size plankton nets, respectively. Additionally, surface sea water samples were collected from and filtered through filters with a 0.45 μm filters for pigment analysis. To assess the microbial community composition through eDNA metabarcoding the sampled water samples were filtered through 0.22 μm filters. In addition, 3 mL of water samples were collected for flow cytometric analysis for pico- and nanoplankton counts and were stored in Eppendorf tubes. The phytoplankton and zooplankton samples will be studied under the binocular and dissection microscopes, respectively. The biomass amounts and species composition will be compared according to the stations. In eDNA metabarcoding study, bacterioplankton will be identified with next generation sequencing and bacterioplankton community compositions will be assessed. The abundances of pico- and nanophytoplanktonic groups at each station will be determined using the BD Accuri Flow Cytometer. For phytoplankton pigments which includes fucoxanthin, diadinoxanthin, peridinin, 19′-hexanoyloxyfucoxanthin, zeaxanthin, chlorophyll-b (Chl-b) and Chllorophyl-a (Chl-a) will be measured by using HPLC. The distribution of phytoplankton groups will be determined from the pigment additive ratios. Diagnostic pigments (DP), the sum of 7 selected biomarker pigments, will be used to estimate the contribution of phytoplankton size classes.

During the expedition we performed sampling on 29 stations. Surface water samples were collected using a 1.7 L Niskin® bottle. 72 samples of water were (1.5-2 L) filtered onto either Whatman ® GF/F filters (nominal pore size 0.7 μm and 25 mm diameter) for High Performance Liquid Chromatography (HPLC), or Sterivex filtering units (nominal pore size 0.22 μm) for posterior eucaryotic DNA sequencing. All samples were filtered by using a 50 ml syringe connected to a Millipore® 25 mm filtering system. Filters were transferred to cryotubes (Prolab®– 2 ml) and kept stored in a freezer (-4 °C) until transportation. After that, each sample was packed in zip lock plastic containers, stored on Styrofoam box containing dry ice (-80 °C), and transported by air to Brazil. A Hanna® HI98194 Multiparameter probe was be used to register and note environmental variables: seawater surface pH, salinity (psu), sigma-T, dissolved oxygen (mg L -1) and temperature (°C).

Sampling took place between in places with 107 and 3800 m of local deeps. HPLC and DNA sequencing analysis are not finalized, so is still soon to discuss biological data. However, the environmental parameters indicate some variation, specially regarding temperature, which variated between -1.35 °C and 10.28 °C within the expedition. Salinity displayed an interval of 35.59 to 30.03. Less saline waters were present in the northernmost part of the sampling plan,

which could indicate an important contribution of meltwater coming from sea ice. Northern stations also seem to be ventilation spots where dissolved oxygen was usually higher ~ 12.92 mg L-1, probably favored by higher sigma-t (26 -27) which indicates higher water column stratification. On the other hand, pH levels remained relatively stable (7.96-8.18). We still are working on analyzing the rest of the samples so we can better access how the variation in the environmental parameters observed could be affecting the eucaryotic communities in the Arctic.

Within the scope of project Effect of global warming on distribution of cold-adapted fishes, during the Third Turkish Arctic Scientific Expedition in July 2023, 177 samples of fish were collected for the project Effect of global warming on distribution of cold-adapted fishes of the Barents Sea from thirteen localities in the Norwegian Economic Zone and in the Fisheries Protection Zone around Svalbard. For the sampling, the rod was used. The predominant species collected was Gadus morhua, 80 % of all sampled individuals. Altogether samples of eleven species were collected. Finclips were taken and preserved in 96 % ethanol for the DNA analysis and subsequently, the fish were released. A subset of samples was also preserved in RNAlater for the RNA analysis. In total, sixteen fish individuals were preserved in formaldehyde as voucher specimens. Their total weight was 5 kg, and now, they are stored in the National Museum in Prague, Czech Republic. The laboratory procedures have started, and the DNA extraction from the finclips is ongoing. We plan to use the samples for population genetic study on Gadus morhua, and to study genes known to be important in cold-adaptation in fish by the use of molecular and subsequent bioinformatic analyses. As a first outcome from the expedition, a chapter of the book Arktida by Zdeněk Lyčka, Josef Elster et al. (Academia, Prague 2024) dealing with the fish from the Arctic region and their adaptation to cold environment was written. The book will be published in 2024.

The meteorological studies carried out during the Third Turkish Arctic Scientific Expedition aimed to conduct Marine Meteorology research in the Arctic region, accumulate knowledge on this subject, observe the Arctic region's climate, and make the acquired data accessible to researchers. Throughout the entire expedition, sea water temperature, air temperature, air humidity, air pressure, global insolation intensity, wind speed, and direction were measured and recorded at minute intervals. High-precision, calibration-certified sensors were employed for these measurements. The data were collected in accordance with the World Meteorological Organization (WMO) standards, with a total of 37,000 meteorological data records obtained during the expedition.

Meteorological data at sampling stations are given in Table 5.

Table 5. Meteorological data at sampling stations.

Station	Coordinates	Date	Time	Wind Direction (°)	Wind Speed (m/s)	Air Temperature (°C)	Air Humidity (%)	Pressure (mB)	Global Insolation (w/m²)	Sea Water Temperature (°C)
1	71° 19.22' N, 24° 25.61' E	08.07.2023	11:15	8.73	86	13.53	67	1015	637	9.82
2	70° 36.03' N, 32° 26.90' E	09.07.2023	16:52	-	-	-	-	-	109.4	8.86
3	73° 05.17' N, 35° 54.22' E	10.07.2023	15:23	2.646	3.373	6.243	90	1017	93.8	5.832
4	73° 42.83' N, 36° 46.92' E	10.07.2023	22:52	3.375	67.42	6.067	90	1016	16.28	5.182
5	75° 32.94' N, 31° 42.64' E	11.07.2023	19:02	4.99	175.8	5.987	100	1015	29.31	6.287
6	75° 50.40' N, 37° 35.55' E	12.07.2023	08:56	2.657	265.8	5.238	97	1017	265	3.942
7	76° 40.90' N, 37° 43.99' E	12.07.2023	19:00	1.274	293	4.643	100	1018	53.42	3.373
8	77° 54.08' N, 33° 54.24' E	13.07.2023	09:00	8.33	118	3.398	100	1017	46.92	4.071
9	78° 34.78' N, 37° 37.84' E	13.07.2023	21:25	5.288	158.4	1.461	100	1017	89.9	3.002
10	79° 14.61' N, 34° 51.40' E	14.07.2023	08:58	2.265	356.3	2.89	94.9	1015	493.5	2.96
11	80° 17.02' N, 31° 01.38' E	15.07.2023	13:15	0.735	312.9	2.546	93.3	1014	156.3	-0.842
12	81° 08.34' N, 18° 03.42' E	17.07.2023	22:05	3.962	193.2	-1.77	100	1014	137.5	0.11
13	80° 52.30' N, 13° 56.19' E	18.07.2023	09:00	4.133	216.9	-0.365	100	1013	219	1.064
14	80° 27.00' N, 07° 57.43' E	18.07.2023	20:52	5.263	205.5	0.638	100	1013	46.93	-0.12
15	80° 00.63' N, 02° 24.82' E	19.07.2023	09:00	6.022	183.9	0.81	100	1013	149.9	0.201
16	79° 59.35' N, 01° 41.94' E	19.07.2023	13:00	2.116	16.56	1.375	100	1013	284.1	1.411
17	79° 38.84' N, 09° 12.35' E	19.07.2023	09:10	5.362	183.4	0.851	100	1014	242.4	0.199
18	79° 03.73' N, 09° 33.77' E	20.07.2023	15:40	3.533	356.9	5.666	100	1011	171.3	8.75
19	78° 32.98' N, 09° 47.75' E	20.07.2023	00:17	2.826	12.93	4.123	100	1010	141.4	5.258

The "Determination of Bacterial Diversity and Biodegradation Degrees on Microplastic Surfaces in the Barents Sea" project aims to investigate the natural degradation of microplastics in the region and the role of bacteria in this process. This project represents a crucial step in combating environmental pollution. Primarily, samples collected were derived from sticky trapping organisms such as macroalgae and microalgae. On average, approximately 100-150 pieces of microplastics were obtained from sampling stations. The majority of sampling operations were conducted using a manta trawl. However, at selected sampling points, where direct microplastic sampling was unfeasible, water, ice, and filtrate samples were gathered for subsequent membrane filtration. The collected samples, including microplastics, were transported to the country under cold chain conditions. Presently, bacterial isolation from these samples is in progress within the laboratory setting. Our ongoing studies involve recording microplastic properties and initiating the production of various bacterial strains. As the project progresses, the subsequent stages will involve identifying these isolates through molecular diagnostics. Biodegradation measurements against PE and PET polymers, along with microplastics directly sourced from the environment, are planned. Anticipated outcomes involve the discovery of significant psychrophilic bacteria, including new bacterial strains, and the determination of substantial levels of biodegradation.

Within the scope of the project comparing UV radiation measurements in the Arctic and Antarctic regions during the summer of 2023, aimed at investigating the factors influencing UV radiation, data on UV radiation were measured and recorded on the SD-card using the Arduino-based SI1145 sensor module connected to the ship's deck during the third Arctic scientific expedition. Additionally, ozone, albedo, and cloudiness data were obtained from the NEO NASA Earth Observatory. Based on the data gathered from the expedition, the average UV, Visible, and IR values for the Arctic region are 1.41, 521.4, and 2335.52, respectively.

Conclusion

The collected samples were stored at refrigerator (+4 C) and freezer -18 depending on the sample type. The samples were then transferred to Türkiye, Czech Republic and Brazil via air transportation and distributed to the related laboratories for analyses and further examination. Although the finalization period of the studies may vary (months to years), the reports or

scientific publications prepared from these studies will be shared with the relevant authorities of Norway once they are published.

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NORWEGIAN ARMED FORCES

Action officer
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Our date 2023-06-01

Our reference 2023/001634-037/DEFNON/ 414

Previous date

Previous reference

To

Master of RV PolarXplorer
By Email
0310 OSLO
Norge

Copy to

Permission to enter Norwegian Territorial Waters - RV PolarXplorer- c/s LAOS8

1. Permission is granted for the NORWEGIAN registered vessel RV PolarXplorer c/s LAOS8 to enter Norwegian territorial waters (NTW) in the time period 04th of July 2023 to 02nd of August 2023 for the purpose of a port call to Tromsoe during their cruise, as described in the application. If any changes, Norwegian authorities must be contacted for new approval. Exact date and time for arrival are to be forwarded to Norwegian Joint Headquarters without delay.

2. The ship must comply with the regulations given in Royal Decree of 20th December 2018 no 2056", concerning the entry of foreign vessels into Norwegian Territorial Waters. The use of lifeboats, landing crafts etc. is prohibited unless approval from local Police authorities is given. Use of seismic and research equipment within Norwegian Internal waters is prohibited without explicit permission from Norwegian authorities.

3. The Master of the ship is to notify Norwegian authorities at least 24 hours prior to crossing the Norwegian baseline by sending an Arrival Notification electronically using Safe Sea net Norway (www.shiprep.no), alternatively directly to Norwegian Joint Headquarters (phone +4775536298, fax+4775536354) or email csc@coss.mil.no . Furthermore, the ships Master is to send a Reporting point Notification, by same means, when crossing the Norwegian baseline upon entering and leaving Norwegian internal waters.

Liv Judith Olsen
Colonel
Chief of Current Operations
Norwegian Joint Headquarters

Electronically approved document, no handwritten signature is applied.

DIRECTORATE OF FISHERIES

Division:Section of Environment
Inquiries to: Agny Laukeland Bygnes
Telephone: +47 55238000
Our reference: 23/5414
Your reference:
Date: **09.06.2023**

Embassy of the Republic of Türkiye

RV PolarXplorer. Consent to conduct marine scientific research in the period 04.07.2023-02.08.2023

The Directorate of Fisheries, MSR Office refers to the Embassy's application dated 14th April 2023 concerning the planned research cruise (TASE-III). The Directorate of Fisheries hereby informs the Embassy that Norwegian authorities have granted consent in accordance with regulations laid down by Royal Decree of 30th March 2001 No. 360.

The marine scientific research is to be conducted by Tűrkiye

with the research vessel "PolarXplorer", call sign LAOS8,
during the period from 4th July to 2nd August 2023
in the Norwegian Economic Zone and
in the Fisheries Protection Zone around Svalbard,

The purpose of this cruise is to investigate the presence and intensity of the anthropogenic impacts on a global scale, as well as, to observe the parameters and effects of global climate change.

Please be informed that utilisation of this consent is regarded as an acceptance of conditions given by authority of § 11 in the Royal Decree of 30th March 2001 No. 360. The consent granted is subject to compliance with the following conditions:

Final results and conclusions (§ 11 litra b) second alternative) from the planned cruise should be made available to the Directorate of Fisheries *within six - 6 - months* after the completion of the cruise.
If final results cannot be presented within six months, a preliminary report (§ 11 litra b) first alternative) should be made available pending the research state's final scientific results and conclusions. The report(s) is(are) to be presented to us as a data file, preferably in PDF format, or in RTF/MS Word or ASCII formats. The report(s) are to be sent to us on our e-mail address:

info@fiskeridir.no

Results and conclusions should be marked "14.04.2023, 04.07.2023-02.08.2023, Jnr. 23/5414".

We attach (./.) the Norwegian Joint Headquarters' permission of 1st June 2023, granting the vessel entrance of a port call to Tromsø during the cruise, as described in the application. The vessel should comply with the Royal Decree of 20th December 2018 No. 2056, concerning the entry of foreign vessels into Norwegian territorial waters.

It is requested that a copy of these document shall be kept on board the research vessel.

Yours sincerely

Trond Ottemo
Head of Section

Agny Laukeland Bygnes
Senior Advisor

This letter is approved for electronic submission and does not need a handwritten signature.

List of recipients:
Embassy of the Republic of Türkiye

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UD Seksjon for traktat og havrett			

Attachments:
EC RV PolarXplorer 04.07.23 - 02.08.23