

NOTIFICATION OF PROPOSED RESEARCH CRUISE

PART A: GENERAL

1. NAME OF RESEARCH SHIP : "Le Commandant Charcot"

2. DATES OF CRUISE: 22 June 2023 – 10 July 2023

3. OPERATING AUTHORITY: PONANT

TELEPHONE: +47 23411080 / +881 677 105 461

TELEFAX: N/A

TELEX: N/A

4. OWNER (if different from no. 3)

5. PARTICULARS OF SHIP:

Name: "Le Commandant Charcot"

Nationality: French

Overall length: 149.9 m

Maximum draught: 10.2 m

Net tonnage: 9384

Propulsion e.g. diesel/steam: diesel - LNG

Call sign: FMNB

6. CREW

Name of master: Captain Etienne Garcia and/or Captain Patrick Marchesseau

Number of crew: 216

7. SCIENTIFIC PERSONNEL

Prof. Dr. Andreas Oschlies, GEOMAR, Kiel, Germany

Tel/telex/fax no.: +49 431 6001936

No. of scientists: 4

8. GEOGRAPHICAL AREA IN WHICH SHIP WILL OPERATE (with reference to latitude and longitude)

From Reykjavik, Iceland, along east Greenland (Denmark) to Longyearbyen, Svalbard (Norway) (64°N – 80°N / 30°E – 15° E), see map below.

9. BRIEF DESCRIPTION OF PURPOSE OF CRUISE

The cruise is carried out in the framework of the UN Ocean Decade of Ocean Science for Sustainable Development, led by the UN Ocean Decade programmes “Global Ocean Oxygen Decade” (GOOD, co-chair Prof. Andreas Oschlies) and “Ocean Acidification Research for Sustainability” (OARS). The cruise will focus on the role of climate change and ocean pollution in the Atlantic sector of the Arctic Ocean, in particular on the role of warming and meltwater on upper-ocean stratification, deoxygenation and acidification and the resulting impacts on marine ecosystems, and the distribution and sources of microplastics.

The planned cruise will repeat a similar section sampled successfully in 2022 (reference number UTN22030273/34.R.423).

10. DATES AND NAMES OF INTENDED PORTS OF CALL

22 June 2023, Reykjavik, Iceland
10 July 2023, Longyearbyen, Svalbard

11. ANY SPECIAL REQUIREMENTS AT PORTS OF CALL NOTIFICATION OF PROPOSED RESEARCH CRUISE

no

PART B: DETAILS

1. **NAME OF RESEARCH SHIP:** "Le Commandant Charcot"
CRUISE NO. CC220623

2. **DATES OF CRUISE:** 22 June 2023 – 10 July 2023

3. a) **PURPOSE OF RESEARCH**

The cruise is carried out in the framework of the UN Ocean Decade of Ocean Science for Sustainable Development, led by the UN Ocean Decade programmes "Global Ocean Oxygen Decade" (GOOD, co-chair Andreas Oschlies) and "Ocean Acidification Research for Sustainability" (OARS). The cruise will focus on the role of climate change and ocean pollution in the Atlantic sector of the Arctic Ocean, in particular on the role of warming and meltwater on upper-ocean stratification, deoxygenation and acidification and the resulting impacts on marine ecosystems, and the distribution and sources of microplastics. Specific research objectives are:

1/ Assess the role of warming and meltwater input on upper ocean oxygen levels on waters in Denmark Strait, on the east Greenland shelf, in the East Greenland Current and around Spitsbergen.

2/ Assess ocean acidification (OA) and address the impacts due to climate change, such as warming, increased freshwater from melting glaciers, sea ice and increased land-river runoff, and permafrost melting due to climate change.

3/ Monitor the biomass and taxonomic composition of zooplankton (the crucial trophic link between primary producers and higher trophic levels) in relation to changing environmental parameters.

4/ Document the distribution of microplastics, identify individual components that constrain the sources of the observed microplastics pollution, and identify biofilm organisms transported with plastics

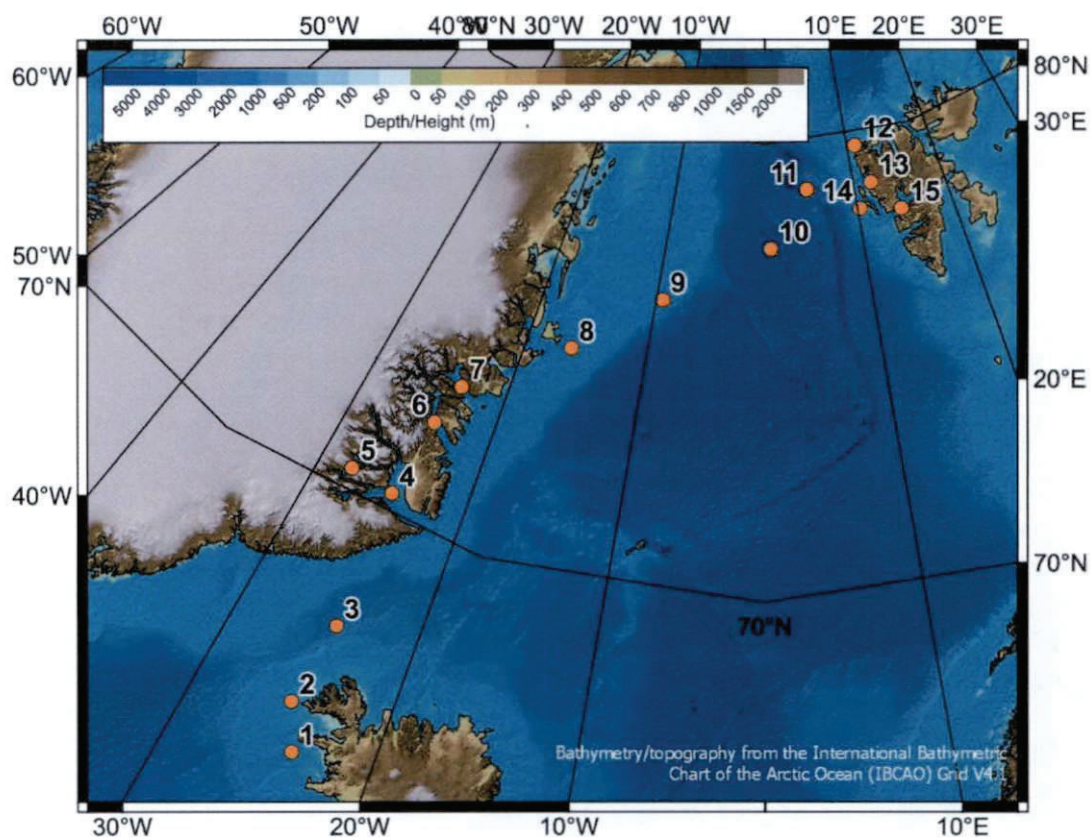
b) **GENERAL OPERATIONAL METHODS** (including full description of any fish gear, trawl type, mesh size, etc.)

Sampling planned at 15 Stations (see map below)

- CTD (Conductivity, Temperature, Depth) profiles down to maximum depth of 1000m, with attached oxygen sensor and 8 Niskin bottles with 8L volume each. Calibration of oxygen sensor by Winkler titration using 100ml of 2 Niskin bottles per profile.
- Filtration of water samples from the Niskin bottles to determine chlorophyll concentrations (500ml) and particulate organic matter concentration and elemental (N, P, C) composition (500ml)

- Collection of 500ml water samples for later analysis for inorganic carbon chemistry (analysed in the lab of Agneta Fransson, Norwegian Polar Institute, Tromsøe, Norway)
- Collection of 500ml water samples for onboard analysis of phytoplankton (microscopy and camera system).
- Collection of plastic particles with a plankton net to determine plastic polymer type and biofilm composition covering the plastic surface.
- Continuous collection of microplastic particles over the entire cruise track with an underway sieve system connected to the ship's clean, near-surface seawater supply. Polymer type and biofilm composition of the collected particles will be determined similar to net-collected particles.
- Profiles with *in situ* zooplankton camera system. Acquisition of underwater images for analysis of zooplankton biomass, abundance, and taxonomic classification / biodiversity assessment.

4. ATTACH CHART showing (on an appropriate scale) the geographical area of intended work and positions of intended stations.



Map of approximate locations of planned stations (subject to modifications due to weather and ice conditions)

5. a) TYPES OF SAMPLES REQUIRE
(e.g., geological/water/plankton/fish/radionuclide)

Water (approx. 2 liters per Niskin Bottle, i.e. 8 bottles taken at 8 different depths per station)

- 100ml for calibration of oxygen sensor by Winkler titration
- 500ml Filtration to determine chlorophyll concentrations
- 500ml filtration to determine carbon, nitrogen and phosphorus content of particulate organic matter
- 500ml for analysis of inorganic carbon chemistry (analysed in the lab of Agneta Fransson, Norwegian Polar Institute, Tromsø, Norway)
- 500ml for analysis of phytoplankton
- Suspended particles for plastic polymer and biofilm analysis

b) METHODS OF OBTAINING SAMPLES (e.g., dredging/coring/drilling/fishing, etc. When using fishing gear, indicate fish stocks being worked, quantity of each species required, and quantity of fish to be retained- on board).

- Lowered CTD rosette sampler for on-station, full-depth, measurements of temperature, salinity, O₂, fluorescence (phytoplankton), and water sampling. Water samples from the CTD rosette will be analyzed for chlorophyll a, concentration and elemental composition (C, N, P) of particulate organic matter, microscopy to determine phytoplankton community composition, dissolved organic compounds
- Underway near-surface water sampling for the determination of suspended particulates and solutes
- Towed manta net on station for collection of suspended particles at the sea surface
- Underwater analysis of zooplankton with a special imaging system that will be deployed in vertical profiles using the ship's winch (similar to the CTD).

6. DETAILS OF MOORED EQUIPMENT

none

7. ANY HAZARDOUS MATERIALS (chemicals/explosives/gasses/radioactives, etc.)
(Use separate sheet if necessary)

N/A (no hazardous chemicals)

a) Type and trade name

N/A

b) Chemical content (and formula)

N/A

c) IMO IMDG code (reference and UN no.)

N/A

d) Quantity and method of storage on board

N/A

e) If explosives give dates of detonation

- Method of detonation
- Position of detonation
- Position of detonation
- Frequency of detonation
- Depth of detonation
- Size of explosive charge in kg.

N/A

8. DETAIL AND REFERENCE OF

a) Any relevant previous/future cruises

Similar follow up cruises are envisaged with the same ship for the next 5 years to initiate a time-series monitoring of deoxygenation, acidification and microplastic pollution in the same area.

b) Any previously published research data relating to the proposed cruise

Bergmann, M., Collard, F., Fabres, J., Gabrielsen, G.W., Provencher, J.F., Rochman, C.M., van Sebille, E. and Tekman, M.B., Plastic pollution in the Arctic. *Nature Reviews Earth & Environment*, 1-15 (2022).

Oschlies, A., A committed fourfold increase in ocean oxygen loss. *Nature Communications*, 12, doi:10.1038/s41467-021-22584-4 (2021).

Schulz, K. G. *et al.* Temporal biomass dynamics of an Arctic plankton bloom in response to increasing levels of atmospheric carbon dioxide. *Biogeosciences* 10, 161-180, doi:10.5194/bg-10-161-2013 (2013).

Taucher, J. *et al.* Changing carbon-to-nitrogen ratios of organic-matter export under ocean acidification. *Nature Climate Change*, doi:10.1038/s41558-020-00915-5 (2020).

9. NAMES AND ADDRESSES OF SCIENTISTS OF THE COASTAL STATE(S) IN WHOSE WATERS THE PROPOSED CRUISE TAKES PLACE WITH WHOM PREVIOUS CONTACT HAS BEEN MADE

Dr. Agneta Fransson, Norwegian Polar Institute, Tromsø, Norway

10. STATE

a) Whether visits to the ship in port by scientists of the coastal state concerned will be acceptable

Yes

b) Participation of an observer from the coastal state for any part of the cruise together with the dates and the ports for embarkation and disembarkation

possible at port, but not possible during the cruises (no place available).
embarkation at Reykjavik (22/06/2023)
disembarkation at Longyearbyen (10/07/2023)

c) When research data from the intended cruise are likely to be made available to the coastal state and by what means

Cruise data and highlights of the findings will be disseminated by publication in scientific peer-reviewed literature, at scientific conferences and via public media interviews, and in the ship cruise report. All data will be published through the German research portal www.pangaea.de approx. one year and in any case no later than two years after the cruise.

PART C. SCIENTIFIC EQUIPMENT

Coastal state: Greenland (Denmark)

Port of call: --

Dates: 22/06/2023 to 10/07/2023

Indicate "YES" or "NO"

				distance	from the	Coast
<u>List scientific work by function</u> e.g.	Water column including sediment sampling of the seabed	Fisheries research within fishing limits	Research concerning the natural resources of the continental shelf or its physical characteristics	Within 4 nm	between 3-12 nm	between 12-200 nm
Underway measurements, pumping of surface water (thermosalinograph)	yes	no	no	yes	yes	yes
Water sampling with Niskin bottles	yes	no	no	yes	yes	yes
Microplastic sampling with nets at the sea surface	yes	no	no	yes	yes	yes
Underwater camera system for zooplankton	yes	no	no	yes	yes	yes

Prof. Andreas Oschlies, Dated 10.03.2023
(Principal Scientist)

NB IF ANY DETAILS ARE MATERIALLY CHANGED REGARDING DATES/AREA OF OPERATION AFTER THIS FORM HAS BEEN SUBMITTED, THE COASTAL STATE AUTHORITIES MUST BE NOTIFIED IMMEDIATELY