

Synoptic Arctic Survey 2022 North Pole Cruise

Carin Ashjian and Jackie Grebmeier, Co-Chief Scientists

Synoptic Arctic *Survey*



<https://synopticarcticsurvey.w.uib.no>

Research Expedition Details

Dates: September 4 – October 28, 2022

Departs from: Dutch Harbor, AK

Returns to: Dutch Harbor, Ak

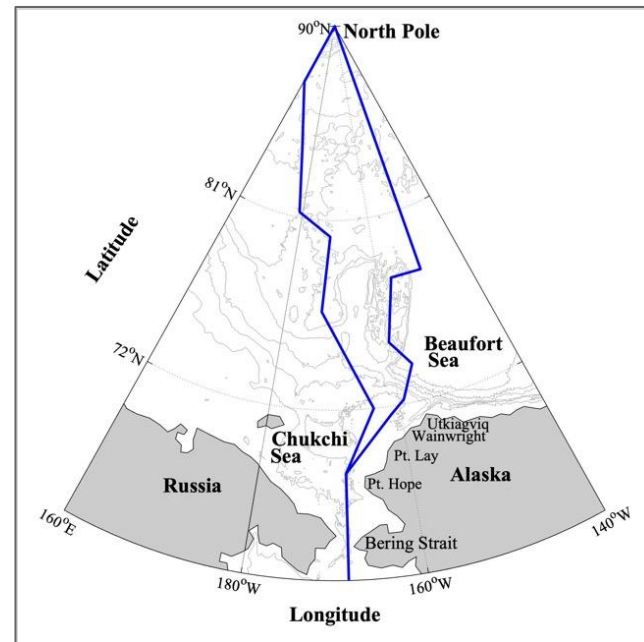
Research Area Location: Central Arctic Ocean

Vessel: USCGC Healy

Research website: <https://www2.whoi.edu/site/ussas>

Project supported by: National Science Foundation

Contact information: Carin Ashjian or Jackie Grebmeier



**Contact Us: Carin Ashjian, Woods Hole Oceanographic Institution, cashjian@whoi.edu;
Jackie Grebmeier, University of Maryland Center for Environmental Science, jgrebmei@umces.edu**

Key Scientific Questions & Motivations

Central Question: What are the present state and major ongoing transformations of the Arctic marine system? (specifically the ecosystem and carbon system)

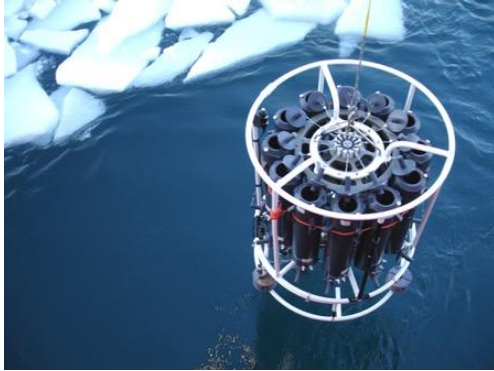
Objective: Describe the present state of the Arctic Ocean to provide the foundation against which future states can be compared to quantify change (note, this will be achieved through synthesis with other international cruises that are part of the International SAS Effort)

Key Foci:

- 1) State of the ecosystem
- 2) State of the carbon cycle and ocean acidification
- 3) Physical characteristics which drive the ecosystem and carbon cycle

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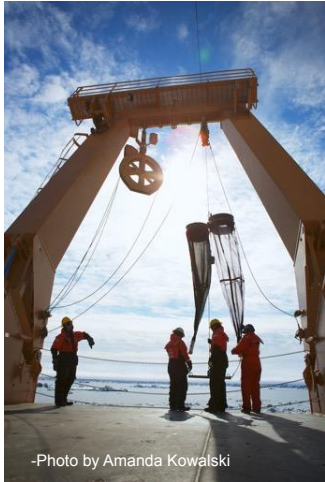
Key Activities & Data to be collected



- Temperature, salinity, fluorescence, etc.
- Ocean currents
- Nutrients
- Chlorophyll
- $\delta^{18}\text{O}$ of water and dissolved oxygen
- Mesozooplankton
- Macrobenthos
- Sediments-grain size, carbon, $\delta^{13}\text{C}$, metabolism
- Carbon—dissolved, particles, organic, inorganic
- Carbon sinking rates
- New production
- Air-sea CO_2 exchange
- Marine mammal distributions
- Seabird distributions
- All underway sensors will be running



-Photo by Carin Ashjian



-Photo by Amanda Kowalski



-Photo by Andrew Trites

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Key Project Activities & Data to be collected

PI	Affiliation	Topic Areas
Carin Ashjian	Woods Hole Oceanographic Institution	Mesozooplankton distributions and composition from nets, mesozooplankton distributions from VPR, US SAS coordination office, Co-Chief Scientist
Nick Bates	Bermuda Institute for Ocean Sciences	Seawater carbonate chemistry, underway measurements and air-sea CO ₂ gas exchange, and net community production (using DIC)
Robert Campbell	University of Rhode Island	Mesozooplankton respiration, reproductive activity, condition, trophic (stable isotopes) and population structures, and genetics
Lee Cooper	University of Maryland	Water column and sediment chlorophyll, nutrients, and oxygen (stable and clumped isotopes); sediment TOC and C/N; water column DOC
Seth Danielson	University of Alaska Fairbanks	Hydrography; real-time assessment of physical oceanographic properties to ascertain locations of major water- mass boundaries
Jackie Grebmeier	University of Maryland	Macrobenthic composition, abundance, biomass; benthic respiration, nutrient and carbon flux, sediment characterization; Co-Chief Scientist
Laurie Juranek	Oregon State University	Dissolved gas tracers (O ₂ , O ₂ /Ar, ¹⁷ Δ) and nutrient data to track rates of photosynthesis, respiration, and net community production
Cindy Pilskaln	University of Massachusetts Dartmouth	Water column POC, PON, δ ¹³ POC, δ ¹⁵ PON, PIC & microscopic analysis of large volume-filtered suspended and sinking particles, POC and PIC (CaCO ₃), POC remineralization, and PIC dissolution; particle size distribution and flux estimates from VPR
Mary-Louise Timmermans	Yale University	Hydrography; real-time assessment of physical oceanographic properties to ascertain locations of major water- mass boundaries

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Implications & Broader Impacts

- Establish contemporary baseline for the Pan-Arctic system that can be used to detect ongoing and future change (International SAS objective)
- Provide key data on the Central Arctic ecosystem important to evaluate conditions prior to the development of an Arctic fishery (international Arctic fishery agreement)
- Share understanding of Central Arctic ecosystem with local Alaskan coastal communities
- Education of undergraduate and graduate students and Alaskan Indigenous students through UAF's Tamamta project (Danielson)

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Potential Areas of Collaboration

Is there available berth space? Not anymore

Is there space for other equipment and/or to collect data for other teams? We are pleased to have included additional projects outside of and complementary to our funded work on the cruise.

- Methane studies
- Seabird and marine mammal observations
- Meiobenthos
- Sediment microbes
- Plankton genomic composition

Can you make your data available for other teams to collaborate on? And how? Data will be available to the SAS international collaborators for synthesis during the year following the cruise and to the scientific community through the Arctic Data Center and R2R repository according to NSF requirements. Individual scientists can contact US SAS Team Members for specific access questions.

Opportunities to work with Indigenous and local communities? Team members, particularly from Alaska, are working together with local communities on complementary, coastal projects

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