

APPLICATION FOR CONSENT TO CONDUCT MARINE SCIENTIFIC RESEARCH

1. General Information

1.1 Cruise name and/or number:	F2025-018-Fire and Ice: An 8-day Sail Around Iceland
--------------------------------	--

1.2 Sponsoring institution(s):		
Name	Address	Name Of Director
National Geographic-Lindblad Expeditions	National Geographic-Lindblad Expeditions 2505 2nd Ave. Suite 300, Seattle, WA 98121 Ashley Knight (Science Operations Manager) email: ashleyk@expeditions.com	Ashley Knight
Southern Connecticut State University	Southern Connecticut State University 501 Crescent Street New Haven, CT 06515, USA Dr. Julia Irwin (Provost) email: irwinjl@southernct.edu	Julia Irwin
Werth Center for Coastal Marine Studies	Southern Connecticut State University 501 Crescent Street New Haven, CT 06515, USA Dr. Vincent Breslin (Co-Director) email: breslinv1@southernct.edu	Vincent Breslin

1.3 Scientist in charge of the project:	
Name:	Emma Cross
Country:	United States
Affiliation:	Southern Connecticut State University
Address:	501 Crescent Street New Haven, Connecticut 06371 United States
Telephone:	2038705747
Email:	crosse2@southernct.edu

1.4 Entity(ies) /Participant(s) from coastal State involved in the planning of the project:	
Name:	See Section 6.2
Country:	
Affiliation:	
Address:	
Telephone:	
Fax:	
Email:	
Website (for CV and photo):	

1.5 Submitting officer:	
Name:	Ashley Knight
Affiliation:	Lindblad Expeditions
Address:	United States
Telephone:	858-349-8231
Fax:	
Email:	ashleyk@expeditions.com

2. Description of Project

2.1 Nature and objectives of the project:

With consumption increase of Atlantic salmon grown in pristine waters, fish farming is expanding from West to East Iceland. Introducing fish farms to pristine fjords could cause habitat alteration or introduce pathogens, potentially impacting biodiversity and water quality. The nature of this research is to determine aquatic biodiversity and water quality of fjords throughout Iceland amid the growth of fish farming in the country.

The objectives of this project are to determine spatial trends in (i) zooplankton abundance and diversity, (ii) environmental DNA (eDNA), (iii) water quality parameters, and (iv) nutrient concentrations throughout and between fjords in Iceland whilst onboard M/V National Geographic Explorer's "Fire and Ice - an 8-day Sail Around Iceland" cruise on 22-29 July 2025.

Joining this National Geographic-Lindblad Expeditions voyage circumnavigating around Iceland will provide the opportunity to collect numerous samples from around the country, creating important comparative spatial and temporal biodiversity and water quality datasets. This will provide a deeper understanding of the current biodiversity and water quality in Icelandic waters as fish farming is expanding.

2.2 Relevant previous or future research projects:

In 2021, the Skálanes Nature and Heritage Center in Eastern Iceland collaborated with researchers at Southern Connecticut State University and Earlham College to begin monitoring biodiversity and water quality of Seyðisfjörður, a fjord in Eastern Iceland. In Seyðisfjörður, 41 salmon pens totaling 10,000 tons are proposed to be installed in 5 fish farms. This fjord is currently used by residents for fishing and recreation, is a major port of call for multiple cruise lines including National Geographic and Lindblad Expeditions, and is ecologically important as it is utilized by many mammals and seabirds. Many residents are opposed to the fish farm construction, and in 2023 Icelandic pop singer Björk released a song in support of the people of Seyðisfjörður and their concerns over ecosystem degradation.

In Seyðisfjörður, we collect biodiversity and water quality data from four stations within the fjord to determine a baseline before fish farming begins. Using nutrient analysis, vertical plankton tows, video footage and aquatic environmental DNA, we catalog water quality and diversity of marine life present in the fjord before fish farms are installed to be able to compare to data collected after the fish farms are constructed and operational in the future. Southern Connecticut State University, Earlham College and Liverpool John Moores University visit Skálanes Nature and Heritage Center in Eastern Iceland for Study Abroad trips through the summer and fall each year where this data collection will continue as the fish farms become installed and operational. We hope our data collected on M/V National Geographic Explorer in July 2025 and our continual datasets from Seyðisfjörður will provide quantitative evidence of the impact of fish farms on their local environments and aid in Icelanders making informed decisions regarding natural resource use.

2.3 Previous publications relating to the project:

Brideau, L.*, Cross, E. L., Govindarajan, A. F., Martino, D., Martino, G., Holland, M. L.*, Triay, G.* & Heidkamp, C. P. (2022). Strengthening links between industry and academia through transdisciplinary action research: A collaborative water quality, biodiversity and aquaculture initiative. In *Blue Economy: People and Regions in Transitions*, pp. 220-233. Routledge.

Baumann, H., Jones, L. F., Murray, C. S., Siedlecki, S. A., Alexander, M. & Cross, E. L. (2022). Impaired hatching exacerbates the unusual CO₂ sensitivity of embryonic sand lance *Ammodytes dubius*. *Marine Ecology Progress Series*, 687:147-162.

Axon, S., Bertana, A., Graziano, M., Cross, E. L., Smith, A., Axon, K. & Wakefield, A. (2022) The U.S. Blue New Deal: What does it mean for Just Transitions, Sustainability and Resilience in the Blue Economy? *The Geographical Journal*, 189: 271-282.

Concannon, C. A., Cross, E. L., Jones, L. F., Murray, C. S., Matassa, C., McBride, R. S. & Baumann, H. (2021). Temperature-dependent effects on fecundity in a serial broadcast spawning fish after whole-life high CO₂ exposure. *ICES Journal of Marine Science*, 78: 3724-3734.

Cross, E. L., Murray, C. S. & Baumann, H. (2019). Diel and tidal pCO₂ × O₂ fluctuations provide physiological refuge to early life stages of a coastal forage. *Scientific Reports*, 9: 18146.

Cross, E. L., Harper, E. M. & Peck, L. S. (2019). Thicker shells compensate dissolution in brachiopods under future ocean acidification. *Environmental Science & Technology*, 53:5016-5026.

Baumann, H., Cross, E. L. & Murray, C. M. (2018). Robust quantification of fish early life CO₂ sensitivities via serial experimentation. *Biology Letters*, 14: 20180408. DOI: 10.1098/rsbl.2018.0408.

Cross, E. L., Harper, E. M. & Peck, L. S. (2018). A 120-year record of resilience to environmental change in brachiopods. *Global Change Biology*, 24: 2262-2271. British Antarctic Survey's Featured Paper in July 2018.

Cross, E. L., Peck, L. S., Lamare, M. D. & Harper, E. M. (2016). No ocean acidification effects on shell growth and repair in the New Zealand brachiopod *Calloria inconspicua* (Sowerby, 1846). *ICES Journal of Marine Science*, 73: 920-926.

Morley, S. A., Suckling, C. C., Clark, M. S., Cross, E. L. & Peck, L. S. (2016). Long-term effects of altered pH and temperature on the feeding energetics of the Antarctic sea urchin, *Sterechinus neumayeri*. *Biodiversity*, 17: 34-45.

Cross, E. L., Peck, L. S. & Harper, E. M. (2015). Ocean acidification does not impact shell growth or repair of the Antarctic brachiopod *Liothyrella uva* (Broderip, 1833). *Journal of Experimental Marine Biology and Ecology*, 462: 29-35.

3. Geographical Areas

3.1 Indicate geographical areas in which the project is to be conducted (with reference in latitude and longitude, including coordinates of cruise track/ way points):

Vigur 66°03'06.1"N 22°49'06.8"W
 Sigulfjördur 66°09'27.5"N 18°53'16.5"W
 Husavik 66°03'16.5"N 17°31'56.9"W
 Bogarfjardarhofn 65°32'38.3"N 13°46'52.7"W
 Djupivogur 64°41'02.0"N 14°17'42.9"W
 Heimaey 63°25'36.8"N 20°13'05.9"W

3.2 Attach chart(s) at an appropriate scale (1 page, high-resolution) showing the geographical areas of the intended work and, as far as practicable, the location and depth of sampling stations, the tracks of survey lines, and the locations of installations and equipment.

Chart provided - see Section 10.1.

4. Methods and Means to be Used

4.1 Particulars of Vessel:	
Name:	National Geographic Explorer
Type/Class:	Ship : R/V
Nationality (Flag state):	Bahamas
Identification Number/Lloyds #/MMSI #:	309 336 000
Owner:	Lindblad Maritime Enterprises
Operator:	Lindblad Expeditions
Overall length:	112
Maximum draught:	4.7m
Displacement/Gross tonnage:	6,471.0
Propulsion:	Ulstein Bergen Diesel KVM-16 Pitch Propeller; x2 bow thruster Rolls Royce TV 90CP
Cruising:	10
Maximum speed:	
Call sign:	
INMARSAT number and method and capability of communication (including emergency frequencies):	
Name of master:	Yuriy Tupikov & Peik Aalto
Number of crew:	100
Number of scientists on board:	1

4.2 Other craft in the project, including its use:

A landing craft (Zodiac) will be used to collect samples in each fjord. The Zodiac will be deployed from the mother ship (M/V National Geographic Explorer).

4.3 Particulars of methods and scientific instruments:

Types of samples and measurements	Methods to be used	Instruments to be used
Water quality parameters: seawater temperature, salinity, conductivity, dissolved oxygen, pH and turbidity.	In each port, all data will be collected from two depths (2m and 20m) at three stations representing inner, middle and outer fjord. At each sampling station, a Eureka Manta multi-probe attached to rope will be deployed from a Zodiac to collect water parameters at each depth.	Eureka Manta 30+ continuously logging multi-probe.
Environmental DNA (eDNA)	In each port, all data will be collected from two depths (2m and 20m) at three stations representing inner, middle and outer fjord. At each sampling station, a 1.7 L Niskin bottle will be deployed from a Zodiac to collect seawater at each depth. Collected seawater samples would be transported in a cooler with ice to M/V National Geographic Explorer. Back onboard, seawater samples would be filtered using a peristaltic pump. Sterevix filters will then be placed in a 50 mL falcon tube and preserved in a -20C freezer.	1.7 L Niskin bottle and a peristaltic pump.

Zooplankton	In each port, all data will be collected from two depths (2m and 20m) at three stations representing inner, middle and outer fjord. At each sampling station, a Sea-Gear plankton net will be deployed from a Zodiac down to 20m depth. Back onboard, the collected zooplankton will be preserved in ethanol.	Sea-Gear plankton net assembly with a 50cm diameter opening and 250 micron mesh.
Filtered seawater for nutrient concentrations	In each port, all data will be collected from two depths (2m and 20m) at three stations representing inner, middle and outer fjord. At each sampling station, a 1.7 L Niskin water bottle will be deployed from a Zodiac to collect seawater at each depth. Collected seawater will be transported in a cooler with ice back to M/V National Geographic Explorer where the samples will be syringe filtered and preserved in a -20C freezer.	1.7L Niskin bottle and 50 mL syringes

4.4 Indicate nature and quantity of substances to be released into the marine environment:
No
4.5 Indicate whether drilling will be carried out. If yes, please specify:
No
4.6 Indicate whether explosives will be used. If yes, please specify type and trade name, chemical content, depth of trade class and stowage, size, depth of detonation, frequency of detonation, and position in latitude and longitude:
No
4.7 Indicate whether protected species be studied. If yes, please specify:
No
4.8 Indicate whether scientific acoustic equipment will be used.:
No
4.9 Indicate whether fishing/trawling will be used.:
No

5. Installations and Equipment

5.1 Details of installations and equipment (including dates of laying, servicing, method and anticipated timeframe for recovery, locations and depth, and measurements):
No

6. Dates

6.1 Estimated overall project start and end dates:
Project Start Date: 7/22/2025
Project End Date: 7/29/2025

6.2 Coastal State-specific details:	
Coastal Area	Iceland
Estimated Entry Date:	7/22/2025
Estimated Departure Date:	7/29/2025
Estimated Research Start Date:	7/22/2025
Estimated Research End Date:	7/29/2025
Explanation of multiple entries:	N/A
Research will be performed:	within 12 nm
Extent to which Iceland will be enabled to participate or to be represented in the research project:	N/A
Name, affiliation and contact information for all participants from Iceland:	N/A

7. Port Calls

7.1 List of Port Calls				
Port	Arrival Date	End Date	Special Logistical Requirements	Shipping Agent
Reykjavik	7/22/2025	7/22/2025	N/A	National Geographic-Lindblad Expeditions
Siglufjordur - hofn	7/24/2025	7/24/2025	N/A	National Geographic-Lindblad Expeditions
Husavik - hofn	7/25/2025	7/25/2025	N/A	National Geographic-Lindblad Expeditions
Djupivogur	7/27/2025	7/27/2025	N/A	National Geographic-Lindblad Expeditions
Vestmannaeyjar - hofn	7/28/2025	7/28/2025	N/A	NAtional Geographic Expeditions

8. Participation of the representative of the coastal State

8.1 Modalities of the participation of the representative of the coastal State in the research project:
See Section 6.2
8.2 Proposed dates and ports for embarkation/disembarkation:
See Section 6.2

9. Access to Data, Samples and Research Results

9.1 Expected dates of submission to coastal State of preliminary report, which should include the expected dates of submission of the data and research results:
No more than 3 months from the end date of the research as provided in Section 6.1.
9.2 Anticipated dates of submission to the coastal State of the final report:
No more than 2 years from the end date of the research as provided in Section 6.1.
9.3 Proposed means for access by coastal State to data (including format) and samples:
Data will be provided through official channels at no cost to the coastal State(s). Samples will be provided upon request.
9.4 Proposed means to provide coastal State with assessment of data, samples and research results:
Assessment of data, samples and research results will be provided at no cost to the coastal State(s).
9.5 Proposed means to provide assistance in assessment or interpretation of data, samples and research results:
Assistance in further assessment or interpretation will be provided upon request.
9.6 Proposed means of making results internationally available:

We will write a preliminary report within 30 days from the end of the cruise and submit to National Geographic-Lindblad Expeditions. We will present our findings in oral and poster presentations at international conferences such as the biennial Ocean Sciences Meeting and World Aquaculture Society conferences. We will also publish our data in internationally peer-reviewed marine science publications to share our data with the academic community with interests in biodiversity, water quality, aquaculture and human impacts to our marine environment.

10. List of Supporting Documentation

10.1 List of attachments, such as additional forms required by the coastal State, etc.:			
Attachment Type	Description	Attachment	Submission Date
Consent Letter	Hosting Letter from National Geographic-Lindblad Expeditions for a Visiting Scientist onboard M/V National Geographic Explorer from 22-29 July 2025 circumnavigating Iceland.	Hosting Letter for VSs - Cross.pdf	2/21/2025 1:56 AM
Proposed Cruise Track	Proposed detailed itinerary of ports visiting during National Geographic-Lindblad Expedition's M/V National Geographic Explorer cruise from 22-29 July 2025.	Proposed cruise track - ports.png	2/21/2025 2:00 AM
Proposed Cruise Track	Map detailing proposed cruise track.	Proposed cruise track - map.png	2/21/2025 12:34 PM

Executed: 2/26/2025 9:47:27 PM (Coordinated Universal Time)

18 February 2025

Dear Emma Cross,

We look forward to hosting you onboard our tourism vessel *M/V National Geographic Explorer* from 22-29 July 2025 as we travel to/from Reykjavic on a circumnavigation of Iceland. As we take guests/passengers on our itinerary "[Fire and Ice: An 8-day Sail Around Iceland](#)" we will, when possible, support your collection of plankton, seawater, and water quality measurements as part of your research project *Assessing Biodiversity and Water Quality Amid Growth of Icelandic Fish Farming*.

As a part of this "Platform of Opportunity" we will supply you with a cabin and meals onboard. We will endeavor to support you in collection of plankton, seawater, and water quality measurements, provided you have acquired the appropriate access, research, and sampling permits required by local authorities and other bodies as needed.

You are responsible for your own research permits, collection permits, sample transport permits and arrangements, as well as any large equipment transport (beyond what can be provided on charter flights).

Thank you,
Ashley Knight



National Geographic-Lindblad Expeditions
Science Operations Manager
ashleyk@expeditions.com

DATE	PLACE
22-Jul-25	REYKJAVIK, ICELAND
23-Jul-25	DYNJANDI WATERFALL
	VIGUR
24-Jul-25	SIGLUFJORDUR
	Husavik
25-Jul-25	Husavik
26-Jul-25	Bogarfjardarhofn
27-Jul-25	DJUPIVOGUR
28-Jul-25	HEIMAEY, WESTMAN IS
	SURTSEY, WESTMAN IS
29-Jul-25	REYKJAVIK, ICELAND

