

APPLICATION FOR A PROPOSED RESEARCH CRUISE

PART A: GENERAL

1. NAME OF RESEARCH SHIP **RRS Sir David Attenborough** CRUISE NO. **SD063 - GIANT**
2. DATES OF CRUISE From: **16.07.26 (depart Harwich, UK)** To: **29.08.26 (arrive Harwich, UK)**
3. OPERATING AUTHORITY: **British Antarctic Survey**
TELEPHONE: **+44 (0) 1223 221 400**
TELEFAX: **N/A**
TELEX: **N/A**
4. OWNER (if different from no. 3) : **UKRI, Natural Environment Research Council (NERC)
Polaris House, North Star Avenue, Swindon, SN2 1EU**
5. PARTICULARS OF SHIP:
Name: **RRS Sir David Attenborough**
Nationality: **Falkland Islands**
Overall length: (in meters) **128.9**
Maximum draught: (in meters) **7**
Net tonnage: **4860**
Propulsion e.g. diesel/steam: **Diesel Electric**
Call sign: **ZDLQ3**
Registration port and number (if registered fishing vessel) **N/A**
6. CREW
Name of master: **Captain Ralph Stephens**
Number of crew: **40**
7. SCIENTIFIC PERSONNEL
Name and address of scientist in charge: **Dr Kelly Hogan, British Antarctic Survey, High Cross, Madingley Road, Cambridge, CB2 0ET**
Tel/telex/fax no.: **+44 (0) 1223 221 617**
No. of scientists: **44**

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

The area for the majority of ship operations for this science cruise will take place in the fjords of East Greenland in the Greenland EEZ; a separate application has been submitted for that work. However, we will transit through the Icelandic EEZ (see Figure 1) on our way between the UK and Greenland, and we would like to turn on our acoustic instruments and collect seafloor data during the transit legs. We would also like to do up to 5 CTD deployments (in waters >500 m depth) to test our equipment, train our science party, and take a few water samples (maximum 20).

Our vessel will transit from the UK to Keflavik/Reykjavik (personnel change) and then on to East Greenland. At the end of the cruise, the vessel will do this journey in reverse, also with a stop in Keflavik/Reykjavik.

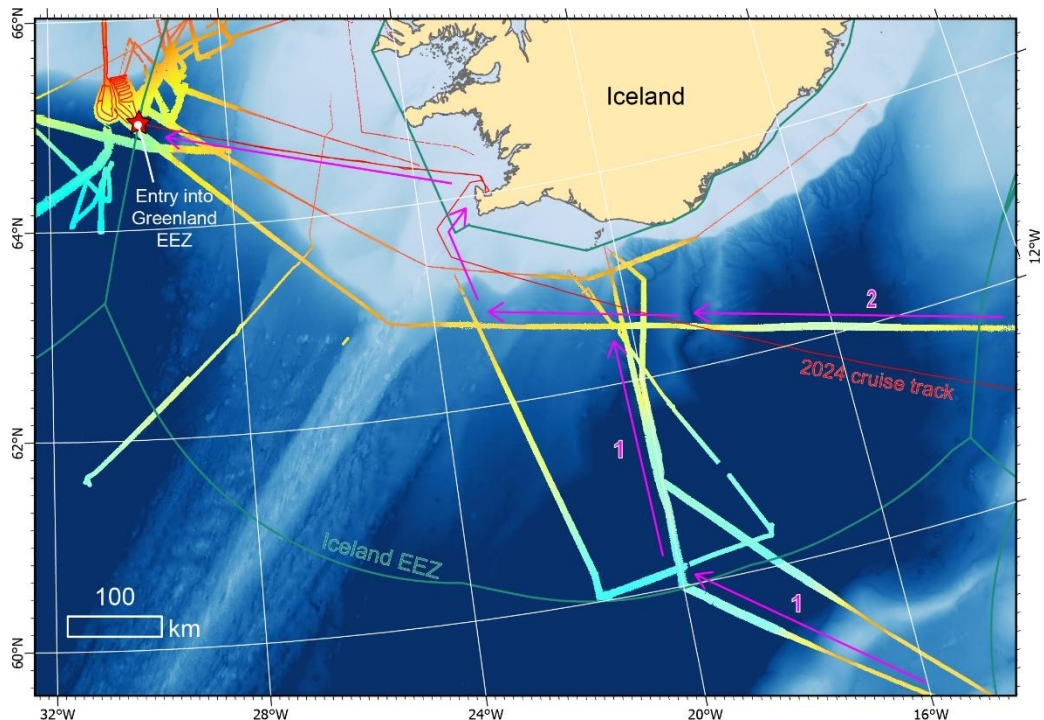


Figure 1: Proposed transit route/s through the Iceland EEZ on transit from the UK to Greenland, with stops at Keflavik. The route taken will depend on the UK port of departure which is still to be confirmed (1 = southern route from a southern England port; 2 = northern route from a northern England or Scottish port). The red star shows our entry point into the Greenland EEZ (029° 58.69' W; 65° 00.57' N). Rainbow colourscale shows existing multibeam bathymetry data in UK data centres; green lines are the borders of the EEZs in the area; red line is the 2024 cruise (SD041).

BRIEF
DESCRIPTION
OF
PURPOSE
OF
CRUISE

The proposed research cruise and marine science forms a cornerstone of the UK's Advanced Research Innovation Agency (ARIA) funded project "GIANT" - Greenland Ice sheet to Atlantic Tipping points. You can also see the project on the Isaafiik website: <https://isaafiik.org/>. The project is the largest funded by ARIA and we have a strong partnership with scientists at the Greenland Institute of Natural Resources (GINR), with GINR scientists joining the cruise.

The overall scientific goal of GIANT is to significantly improve our understanding of glacier melting and iceberg calving in Greenland's fjords, and how we model these processes in global climate models. To do this we need detailed, bespoke observations of how warm ocean waters approach glacier faces and interact with cold meltwater coming from the ice sheet. Ultimately, these ocean/ice interactions enhance direct melting of the glacier faces as well as iceberg calving leading to accelerating mass loss from the Greenland Ice Sheet. The societal goal of the project is to identify early warning signals of glacier change in Greenland's fjords to inform local communities and global governments of future tipping points related to our warming climate.

We aim to achieve our goals through an integrated programme of geophysical and oceanographic investigations in East Greenland fjords in summer 2026. For this project, we have 42 days of ship time allocated to us on the UK's polar research vessel, the RRS *Sir David Attenborough* (RRS *SDA* from now on).

The work will consist of the following activities, **only (i) is within the Iceland EEZ:**

- i. Transit between UK and Greenland via Keflavik for personnel transfer. During the transit legs we would like to collect several CTD casts and use our seafloor echosounders to add to existing data coverage in the area.

Greenland EEZ operations:

- ii. Collection of an ocean mooring (from a previous project, KANG-GLAC).
- iii. Ship-based activities on the continental shelf and in selected fjords.
- iv. Small workboat and autonomous vehicle (AUVs, drones) deployments at glacier fronts.
- v. Helicopter-deployed activities on glaciers and rock.
- vi. Deployment of float profilers in collaboration with Greenland Institute of Natural Resources.

Breakdown of activities in Iceland EEZ: Ship-based activities will include CTDs, and seafloor acoustics. The CTD casts will be done to test the instrument/electronics and to train our early career researchers (ECRs). A few samples may be kept and analysed as part of the GIANT project. We would like to turn on our multibeam bathymetry (MBES), sub-bottom profiler (SBP), and acoustic doppler current profilers (ADCP) to test their performance and train ECRs. We will collect MBES data on a track alongside previous tracks to expand the coverage of this data (see Figure 1).

Timeline: After departing the UK, we expect to enter the Icelandic EEZ sometime on 17 or 18 July 2026. We will depart the EEZ late on 19 July. On the return leg, we expect to enter the Iceland EEZ on 24 August and leave again by late on 26 August.

8. DATES AND NAMES OF INTENDED PORTS OF CALL

Port	Arrive	Depart	Operations and Science/Notes
Harwich, UK		16/07/2026	Mobilise Arctic cruise (GIANT)
Keflavik, Iceland	21/07/2026	21/07/2026	Small boat transfer only
Tasiilaq, Greenland	22/07/2026	23/07/2026	Public Engagement Event
Reykjavik, Iceland	23/08/2026	24/08/2026	Private Engagement Event
Harwich, UK	29/08/2026	02/09/2026	Demobilise Arctic cruise

9. ANY SPECIAL REQUIREMENTS AT PORTS OF CALL

In conversation with the UK Embassy in Reykjavik, we aim to host a Reception on board the RRS SDA on 24 or 25 August for UK, Iceland and Greenland stakeholders. At this point, we are planning this event but the details are still being worked out. Our Ship Operations team is actively investigating whether it is possible to book to come alongside in Keflavik for this event. The contact for this Randolph Sliester, Head of BAS Ship Operations (raines@bas.ac.uk).

1. **PART B: DETAILS**

1. NAME OF RESEARCH SHIP: **RRS Sir David Attenborough** CRUISE NO.: **SD063 - GIANT**
2. DATES OF CRUISE From: **16.07.26** To: **29.08.26**
3. a) PURPOSE OF RESEARCH

The proposed research cruise is part of the ARIA GIANT project that aims to improve our ability to model melting and iceberg calving at Greenland tidewater glaciers, and thus improve our ability to predict tipping points in ice loss from Greenland (and export to the North Atlantic). One major observational component of the project will be achieved through this research cruise with integrated geophysical, oceanographic, and biogeochemical observations in East Greenland fjords. We will transit across the continental shelf to our work area selecting 2-3 fjords with the best conditions for near-ice face work (Figure 1).

The objectives of the project include:

- i. To make detailed observations of melting and calving at vertical ice faces and to survey the most seaward 5-20 km of the glacier;
- ii. To obtain detailed fjord ocean measurements to reconstruct the transfer of heat to the glaciers, the turbulence regime, and the freshwater export out of the fjords;
- iii. To perform the first AUV survey under floating ice – icebergs and sea ice – in front of a vertical glacier face.
- iv. To sample ocean waters for nutrient analyses (biogeochemistry) and eDNA profiling (marine mammals including narwhales, polar bears, other seals and whales). This work is part of the joint project with GINR.
- v. Follow-on work after the cruise will use these observations in numerical models of iceberg calving, ice-face melting, fjord circulation and then plug these improved models into the UK's Earth System Model.

The objectives within the Iceland EEZ are:

- i. To test seafloor and water column echo sounders (MBES, ADCP, SBP) and to train ECRs in their use before arriving in Greenland.
- ii. To test the CTD rosette and take a maximum of 5 casts and 20 water samples to contribute to questions about North Atlantic water masses, specifically how warm waters approach the East Greenland shelf.

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

We plan to run 24-hour science operations during the research cruise and this can be broken down into night and day work. In the Iceland EEZ we will collect MBES, SBP and ADCP data around the clock and perform a small number of CTD casts during the day.

The operational methods and gear to be used includes:

- **Acoustic echo sounders** to survey the seafloor and water column to select optimal sites for CTD and profiling floats and to locate moorings to be recovered. We will use the EM124/EM712 for bathymetry (operational frequencies 12kHz and 40-100 kHz); TOPAS sub-bottom profiler to image seafloor sediment layers (secondary frequency 3.5 kHz); EK80 biological echo sounder for water column studies (10-500 kHz). These instruments will be operational for the majority of the cruise but broken into specific blocks as data is required.
- **ADCP systems** to measure current speeds and directions. We will use the SDA's hull-mounted ADCP with operational frequencies 75 and 150 kHz continuously during the cruise. We will also use a lowered-ADCP (L-ADCP) during CTD deployments (see below).
- **Water measurements/sampling** to determine circulation of warm ocean water. This will be done using ship-based conductivity-temperature-depth (CTD) rosette. Maximum number of casts: 5.

4. ATTACH CHART showing (on an appropriate scale) the geographical area of intended work, positions of intended stations, tracks of survey lines, positions of moored/seabed equipment, areas to be fished

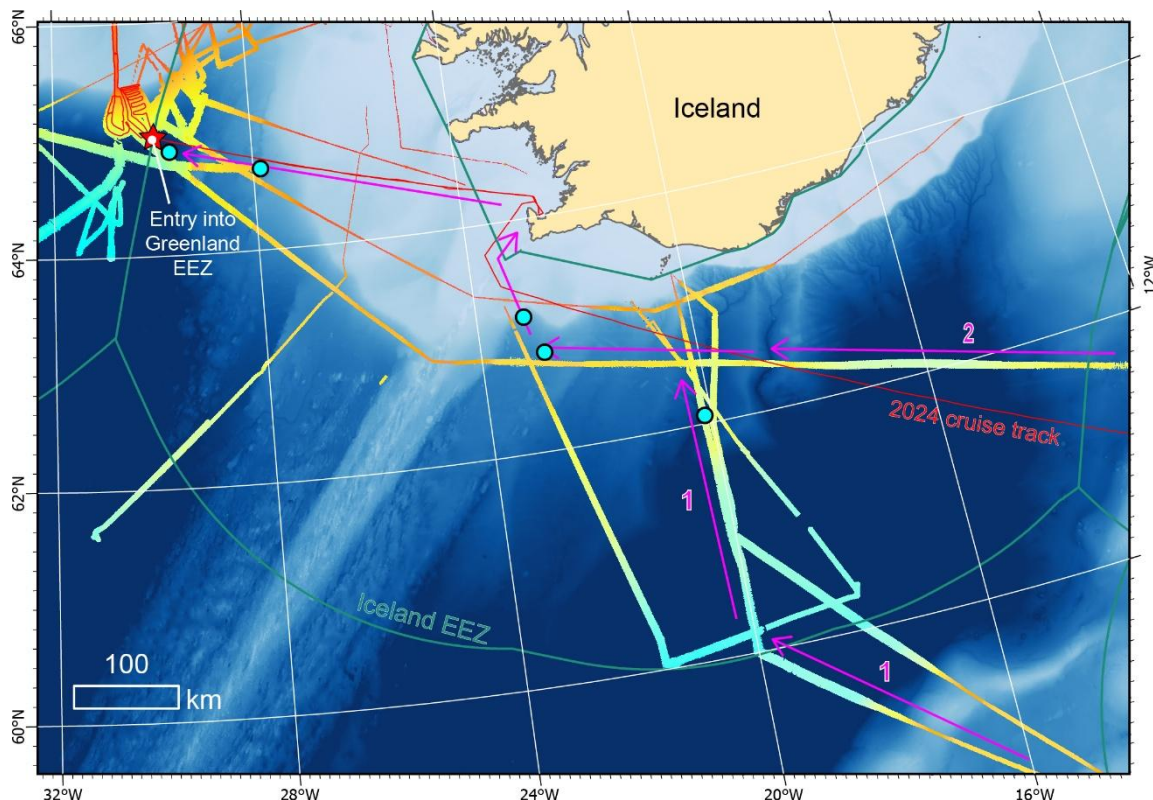


Figure 1 (repeated with CTD stations): Proposed transit route within the Iceland EEZ with approximate CTD locations (blue circles). The red star shows our entry point into the Greenland EEZ (029° 58.69' W; 65° 00.57' N). Rainbow colourscale shows existing multibeam bathymetry data in UK data centres; green lines are the borders of the EEZs in the area; red line is the 2024 cruise (SD041).

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

We propose to acquire the following samples:

- **Water samples:** Approximately 5 CTD casts from the SDA with 12-24 bottles deployed each time. We will collect samples from approximately 3 casts (maximum 72 water samples in total).

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).

Water samples will be acquired using a CTD rosette with sampling bottles attached. The CTD deployed from RRS SDA has 24 sampling bottles.

6. DETAILS OF MOORED EQUIPMENT

<u>Dates</u> <u>Laying</u>	<u>Recovery</u>	<u>Description</u>	<u>Depth</u>	<u>Latitude</u>	<u>Longitude</u>
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**Not
applicable**

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

- Formaldehyde (4% solution). Only within biological sediment trap on recovered KANG-GLAC mooring (Greenland EEZ).
- Lithium batteries for profiling floats and mooring instruments to be deployed in Greenland.

a) Type and trade name

b) Chemical content (and formula)

- Formaldehyde: CH₂O

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

- Formaldehyde (4% solution), UN1198, Hazard Class 3, Packing group III.
- Lithium metal batteries contained in equipment (profiling floats). 120 kg gross, 1 kg net. UN3091, Hazard class 9, Packing group II.
- Lithium batteries for mooring instruments, 3 kg net. UN3090, Hazard class 9, Packing group II.

d) Quantity and method of storage on board

- 7.5L of formaldehyde. This is contained within the sediment trap on the KANG-GLAC mooring. The tubes will be recovered, sealed, and transported back to the UK for analyses. The samples will be stored in a refrigerated (reefer) container.

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.

No explosives will be used.

8. DETAIL AND REFERENCE OF

a) Any relevant previous/future cruises

The last time the SDA transited through the Iceland EEZ was in 2024 (see trackline in Figure 1) on cruise SD041. This was the transit leg also to East Greenland and we intend to follow this track but adding bathymetry data coverage, in 2026.

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

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

10. STATE

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

Yes. They will be actively invited to the ship if the Reception goes ahead.

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

No (this is transit only).

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

A full cruise report detailing cruise activities and scientific samples will be submitted to the UK's Polar Data Centre (PDC; <https://www.bas.ac.uk/data/uk-pdc/>) and British Oceanographic Data Centre (BODC; <https://www.bodc.ac.uk/>), where they are publicly available.

All research data from the cruise will be archived at the UK-PDC after the cruise and made publicly available after a scientific moratorium period of 2 years from the end of the cruise. CTD data will be archived at UK-BODC as is common practice for these datasets.

The cruise report will be sent to the coastal state as soon as possible after the cruise (within 1 year). A copy of the marine datasets will be formally submitted after 2 years, via the Marine & Freshwater Research Institute, as per their guidance.

PART C. SCIENTIFIC EQUIPMENT

Complete the following table
using a separate page for
each coastal state

Coastal state Iceland

Port of call Keflavik

Dates 16.07.26 - 29.08.26

Indicate "YES" or "NO"

				DISTANCE FROM 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 conti- nental shelf or its physical characteris- tics	Within 3 nm	Between 3-12 nm	Between 12-200 nm
Magnetometry	NO	None	NO	-	-	-
Gravity	NO		NO	-	-	-
Diving	NO		NO	-	-	-
Seismics	NO		NO	-	-	-
Seabed sampling	NO		NO	-	-	-
Bathymetry	YES		YES	YES	YES	YES
Trawling	NO		NO	-	-	-
Echo sounding	YES		YES	YES	YES	YES
Water sampling	YES		YES	YES	YES	YES
U/W/TV	YES		YES	YES	YES	YES
Moored instr.	NO		NO	NO	NO	NO
Towed instr.	NO		NO	-	-	-

Dated 30.01.2026

Principal Scientist)



(On behalf of the

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