

## NOTIFICATION OF PROPOSED RESEARCH CRUISE

### Part A: GENERAL

**1. Name of research ship:** RV Pelagia Cruise number: 64PE490

**2. Cruise dates:** from 30.06.2021 to 16.07.2021

**3a. Operating authority:** NIOZ Royal Netherlands Institute for Sea Research  
Telephone: (+31) (0)222-369300  
Telefax: (+31) (0)222-319674

**3b. Operating agent:** NIOZ Royal Netherlands Institute for Sea Research  
Telephone: (+31) (0)222-369300  
Telefax: (+31) (0)222-319674

**4. Owner:** NIOZ Royal Netherlands Institute for Sea Research

**5. Particulars of ship:**

name: Pelagia  
nationality: Dutch  
overall length: 66.00 meters  
maximum draught: 4.00 meters  
nett tonnage: 1553 NRT  
propulsion: 2 diesel electric Elliot White Gill  
Bow Truster  
call sign: PGRQ  
IMO nr: 9001461

**6. Crew:** name of master: B. Puijman / L. Bliemer  
number of crew: 12

**7. Chief scientist:** name: Sabine Gollner  
addresses:  
NIOZ Royal Netherlands Institute for Sea Research  
Landsdiep 4  
1797 SZ 't Horntje (Texel), Netherlands  
telephone: +31 222 369 426 ; +31 651785709  
e-mail address: sabine.gollner@nioz.nl

## 8. Geographical area in which the ship will operate: (with reference in latitude and longitude)

We would like to visit three hydrothermal vent fields (A, B, C) with a remotely operated vehicle (ROV Phoca).

Area of operation: vent field and direct surrounding (max. 5 km)

Station A: Kolbeinsey Ridge Vent

Depth: 100-106 m

Latitude: 67.0833

Longitude: -18.7167

Station B: Grimsey Vent

Depth: 400m

Latitude: 66.6067

Longitude: -17.6542

Station C: Eyjafjordur/Strytan Vent

Depth: 65 m

Latitude: 65.8500

Longitude: -18.1333



We would like to take cores from öxarfjörður and from the North-Icelandic shelf. We aim for 7 locations (1 to 7 in figure below) of which two locations (#3 and #4) are in Icelandic waters. We will map the seafloor and take a core at the best position based on the multibeam map (approximately 5 km radius around the site coordinates).

Station 1

Depth: ~365 meters

Latitude: 66.6255

Longitude: -20.8525

Station 2

Depth: ~480 meters

Latitude: 66.8912

Longitude: -18.9745

Station 3

Depth: ~200 meters

Latitude: 66.2690

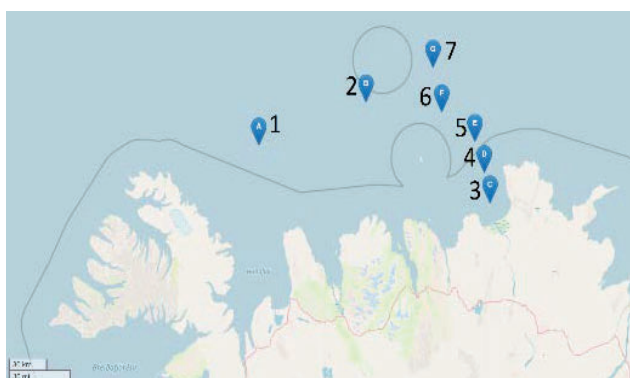
Longitude: -16.7890

Distance to shore: ~11 km

Station 4

Depth: ~240 meters

Latitude: 66.4560



Longitude: -16.8999  
Distance to shore: ~14 km

Station5  
Depth: ~260 meters  
Latitude: 66.6500  
Longitude: -17.0600

Station6  
Depth: ~330 meters  
Latitude: 66.8300  
Longitude: -17.6400

Station7  
Depth: ~380 meters  
Latitude: 67.0999  
Longitude: -17.8000

**9. Brief description of purpose of cruise:**

During the multidisciplinary expedition we aim to study (1) the ecological connectivity at vent field scale, including distribution and origin of vent faunae and their adaptations to extreme environmental conditions, (2) the role of archaeal symbionts in evolution and ecology, and (3) paleoenvironmental records.

To this end we would like to: 1) & 2) sample invertebrate faunae and microbial communities at and near two hydrothermal vent sites along the Kolbeinsey Ridge in the North of Iceland as well as at one very shallow vent near Akureyi. For *in situ* sampling and video transects at the vent sites, we would like to use an ROV while CTDs will be used for water column sampling. 3) collect piston-cores and multicores to study paleoenvironmental conditions in the Arctic.

**10. Names and dates of intended ports of call:**

Reykjavik: 29.06-30.06.2021  
Reykjavik: 16.07-17.07.2021

**11. Any special logistic requirements at ports of call:**

None

## **Part B:     DETAIL**

**1. Name of research ship:   RV Pelagia**

**2. Cruise dates:** from 01.07.2021 to 15.07.2021

### **3. Purpose of research and general operational methods:**

During the multidisciplinary expedition we aim to study (1) the ecological connectivity at vent field scale, including distribution and origin of vent faunae and their adaptations to extreme environmental conditions, (2) the role of archaeal symbionts in evolution and ecology, and (3) paleoenvironmental records.

- (1) Main aim during the expedition is to investigate ecological connectivity at vent field scale. Sample collections include ROV sampling (with ROV arm, suction samples, push-cores, video-transects) and CTD sampling. Samples will be used for taxonomic and genetic analyses (population genetics, eDNA), and isotopes analyses. Sound recording at the vents are planned.
- (2) Main aim is to address the impact of archeal symbionts on the evolution of their hosts and their role in ecological food webs using meta- and population genomics approaches as well as cultivation. Sample collections include in situ samples at vent fields with ROV arm and suction sampler, and sediment boxcores for metagenome sequencing.
- (3) Main aim is to study past environmental and climatic conditions in the Arctic, with a particular focus on reconstructing past catastrophic meltwater pulses during the Holocene. These records hold important information on the sensitivity of Earth's climate to freshwater forcing and the availability of running water on Earth and even on Mars. Samples collections include multiple piston cores as well as box- and/or multicores.

The individual research projects (and especially (1)) will contribute to the **IceAGE** project (<https://www.iceage-project.org/>), whose primary goal is to investigate Icelandic communities (genetics and ecology). Our detailed study of shallow vents North of Iceland will complement recent discoveries of **IceAGE** partners of shallow and deep vents South of Iceland (e.g. Steinholl vent field). The expertise of **IceAGE** partners will be highly beneficial for the PIs, and specimens collected will be shared with **IceAGE** partners. IceAGE partners from Iceland: University of Iceland (Jörundur Svavarsson), Marine Research and Fishery Institute MFRI (Hrönn Egilsdóttir), Matís (Viggo

Morteinsson), Icelandic Institute of Natural History (Gudmundur Gudmundsson); IceAGE PI: Senckenberg, Germany (Saskia Brix).

**4. Attach chart showing (on an appropriate scale) the geographical area of the intended work, positions of intended stations/hydrographic sections:**

We would like to visit three hydrothermal vent fields (A, B, C) with a remotely operated vehicle (ROV Phoca).

Area of operation: vent field and direct surrounding (max. 5 km)

StationA: Kolbeinsey Ridge Vent  
Depth: 100-106 m  
Latitude: 67.0833  
Longitude: -18.7167

StationB: Grimsey Vent  
Depth: 400m  
Latitude: 66.6067  
Longitude: -17.6542

StationC: Eyjafjordur/Strytan Vent  
Depth: 65 m  
Latitude: 65.8500  
Longitude: -18.1333

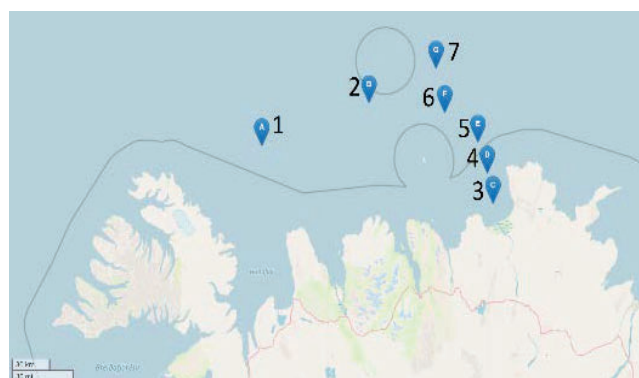


We would like to take cores from öxarfjörður and from the North-icelandic shelf. We aim for 7 locations (1 to 7 in figure below) of which two locations (#3 and #4) are in Icelandic waters. We will map the seafloor and take a core at the best position based on the multibeam map (approximately 5 km radius around the site coordinates)

Station1  
Depth: ~365 meters  
Latitude: 66.6255  
Longitude: -20.8525

Station2  
Depth: ~480 meters  
Latitude: 66.8912  
Longitude: -18.9745

Station3  
Depth: ~200 meters  
Latitude: 66.2690



Longitude: -16.7890  
Distance to shore: ~11 km

Station4  
Depth: ~240 meters  
Latitude: 66.4560  
Longitude: -16.8999  
Distance to shore: ~14 km

Station5  
Depth: ~260 meters  
Latitude: 66.6500  
Longitude: -17.0600

Station6  
Depth: ~330 meters  
Latitude: 66.8300  
Longitude: -17.6400

Station7  
Depth: ~380 meters  
Latitude: 67.0999  
Longitude: -17.8000

**5a. Type of samples required:**

Station A, B, C

- organisms for genetic connectivity and ecology studies
- microorganisms for enrichments and co-cultivation of symbionts with their hosts
- sediment samples for metagenome sequencing
- sediment samples for isotope studies
- water samples for vent plume and isotope studies
- sound samples for sound studies

Station 1-7

- sediment samples for paleoclimate and paleoenvironmental studies, both sediment surface samples (multi core up to 50 cm) and deeper samples (piston core up to 18 m)
- sediment and water samples for isotope, and genetic studies
- sediment samples for metagenome sequencing and enrichment of symbionts

**5b. Methods by which samples will be obtained (including dredge/core/drill techniques):**

Station A, B, C:

- in situ sample collections with ROV Phoca. The usage of a remotely operated vehicle allows high precision and minimal impact sampling. We

- aim to collect organisms which will be later analysed in the lab (taxonomy, connectivity ecology). The ROV arm will be used to directly collect specimens, biofilms on vents, and/or sediment cores (push-core, diameter of ~12 cm) in vent vicinity, from which small organisms and nucleic acid will be extracted. Furthermore, these samples can be used for the enrichment of microorganisms. Sediments from sediment cores will also be used for isotope studies and metagenome sequencing.
- boxcores (diameter 50 cm, sampling depth 30 cm) or multicores (diameter 12 cm, sampling depth 30 cm) may be used in addition but only at greater distance (>500 meters) to the vent field. This method will be used only after the extend of the vent field was observed with the ROV.
  - video and photos from hydrothermal vent field with ROV Phoca
  - CTD will be used to measure the extension of the plume (e.g. temperature, turbidity) and to take water samples for DNA and isotope studies
  - a sound-recorder will be positioned by the ROV at the vent field for a couple of days (deployment and recovery during expedition)

Station 1-7:

- multibeam to select piston-core location
- piston-coring is used to reconstruct past climate and environment in the Arctic
- boxcores (diameter 50 cm, sampling depth 30 cm) or multicores (diameter 12 cm, sampling depth 50 cm) are used for paleoclimate, isotope, and metagenomic studies
- CTD will be used to take water samples for DNA and isotope studies

**6. Details of moored equipment:**

No moored equipment

**7. Explosives:**

No explosives

**8. Detail and reference of:**

**a. Any relevant previous/future cruises:**

Within the IceAGE project several cruises have been undertaken. <https://www.iceage-project.org/>. In 2018 the Steinaholl vent field was studied for the first time, in 2020 a new vent field was discovered during IceAGE3 expedition. The aim is to compare the different vent fields around Iceland.

In summer 2019, Gollner was performing research at the more shallow parts of Strytan vent (scuba-diving, master-thesis project of E. Paulus).

**b. Any previous published research data relating to the proposed cruise:**

**(Attach separate sheet if necessary)**

The international project IceAGE (Icelandic marine Animals: Genetics and Ecology) was initiated in 2008, with the mission to explore the diversity of animals that live on the deep continental slope and in abyssal waters around Iceland. In total, an international team of over 80 renowned experts for various animal groups has been involved in the processing of the extensive material. So far, the results of the IceAGE project have been published in three special volumes (*Polish Polar Research* 35: 2: 2014, *Zookeys* 1775: 2018, *Marine Biodiversity* 2018), plus many additional publications. IceAGE encompasses basic questions about deep-sea biodiversity and the correlation between genetic, morphological, and environmental patterns.

The manuscript "The geological and faunal composition of Steinahóll Vent Sites, Reykjanes Ridge, Iceland" (Taylor, Devey, Le Saout, Petersen, Frutos, Linse, Loerz, Pałgan, Tandberg, Svavarsson, Thorhallsson, Tomkowicz, Egilsdottir, Ragnarsson Renz, Markhaseva, Gollner, Paulus, Kongrud, Beermann, Kocot, Meißner, Bartholomä, Hoffman, Vannier, Marteinsson, Rapp, Diaz, Tato & Brix) is under review at *Frontiers in Marine Science*.

The manuscript "Slackwater sediments refine the timing of Late Holocene Icelandic canyon-carving floods and confirm they were smaller than reported" (Van der Bilt, Barr, Berben, Hennekam, Lane, Adamson, Bakke) is revised after peer-review for *Nature Communications: Earth & Environment*.

The first representatives of the archaeal symbionts we are interested in (i.e. *Ignicoccus hospitalis* and *Nanoarchaeum equitans*), have been enriched from Kolbeinsey hydrothermal vent by Harald Huber and co-workers.

See for instance: <https://bacdive.dsmz.de/strain/4191>

Walter Paper, Ulrike Jahn, Michael J. Hohn, Michaela Kronner, Daniela J. Näther, Tillmann Burghardt, Reinhard Rachel, Karl O. Stetter, Harald Huber: *Ignicoccus hospitalis* sp. nov., the host of 'Nanoarchaeum equitans'. *IJSEM* 57: 803 - 808 2007 ( DOI 10.1099/ij.s.0.64721-0)

## **9. Names and addresses of scientists of the coastal state in whose waters the proposed cruise takes place with whom previous contact has been made:**

- Jörundur Svavarsson, University of Iceland, jorundur@hi.is
- Hrönn Egilsdóttir, Marine Research and Fishery Institute MFRI, hronn.egilsdottir@hafogvatn.is
- Viggo Morteinsson, Matis, viggo@matis.is
- Gudmundur Gudmundsson, Icelandic Institute of Natural History, gg@ni.is
- Erlendur Bogason, Commercial Diver/PADI instructor, Strytan Divecenter, erlendur@stryan.is



**10. State:**

**a. Whether visits to the ship in port by scientist of the coastal state concerned will be acceptable:** YES, but pending on covid-19 situation in June/July 2021.

**b. Whether it will be acceptable to carry on board an observer from the coastal state for any part of the cruise and dates and ports of embarkation/-disembarkation:** YES, a place is reserved for Icelandic IceAGE partners. Number of places on board not determined yet due to covid-restrictions.

Cruise dates: 01.07.2021 to 15.07.2021

Cruise ports: Reykjavik, 29 – 30.06 and 16 – 17.07

**c. When research data from intended cruise is likely to be made available to the coastal state and if so, by what means:**

Scientific results will be shared and published in peer-reviewed journals. Samples will be shared (IceAGE cooperation partners, see above). Specimens can be deposited in the Icelandic museum.

**COASTAL STATE: Iceland  
SCIENTIFIC EQUIPMENT**

**11. Complete the following table - include a separate copy for each coastal state (indicate "Yes" or "No" if applicable)**

Marine scientific equipment used	water depth (m)	fisheries research	distance of research to coast in nautical miles			
				< 3	3-12	12-50
ROV	30-400	no	yes	no	no	no
pushcore	30-400	no	yes	no	no	no
multicore	30-480	no	yes	no	no	no
boxcore	30-400	no	yes	no	no	no
Video & Photo	30-400	no	yes	no	no	no
Sound-recorder	30-400	no	yes	no	no	no
Multi-beam	30-480	no	yes	no	no	no
Piston-core	200-480	no	no	yes	no	no

## List of intended sampling stations during Pelagia cruise

StationA: Kolbeinsey Ridge Vent  
Depth: 100-106 m  
Latitude: 67.0833  
Longitude: -18.7167

StationB: Grimsey Vent  
Depth: 400m  
Latitude: 66.6067  
Longitude: -17.6542

StationC: Eyjafjordur/Strytan Vent  
Depth: 65 m  
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Palaeoclimate records:  
Station1  
Depth: ~365 meters  
Latitude: 66.6255  
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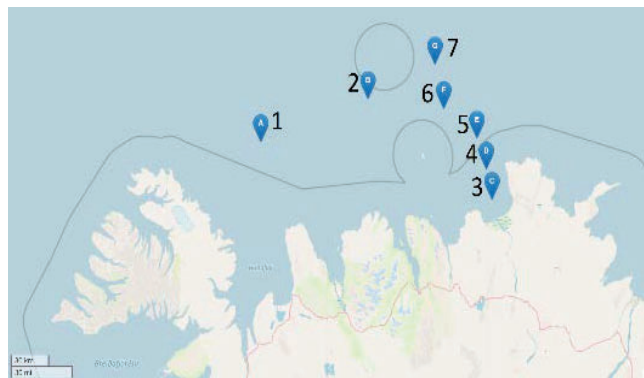
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Depth: ~380 meters  
Latitude: 67.0999  
Longitude: -17.8000

## **References**

**The Strýtan hydrothermal vent is protected cf. regulation no. 249/2001. Researches and collection of specimens are subject to a permit from the Environment Agency.**

<https://ust.is/english/nature-conservations/permits-on-protected-areas/>

According to our information the Environmental Agency of Iceland charges a fee for processing applications for permits in protected areas on the basis of Article no. 92 of Act no. 61/2013 on Nature conservation. The fee is according to the agency's tariff no. 535/2015.

- 39.400 ISK for operational licence and research permits
- 52.600 ISK for cinematography and photography permits

There is funding available to pay for the research permit.

### **Application information**

Research Vessel: RV Pelagia, Dutch flag  
Contact: erica.koning@nioz.nl  
PI: Sabine Gollner  
NIOZ Royal Netherlands Institute for Sea Research  
Landsdiep 4  
1797 SZ 't Horntje (Texel), Netherlands  
telephone: +31 222 369 426; +31 651785709  
e-mail address: sabine.gollner@nioz.nl

### **About project:**

Project title: Ecological connectivity of hydrothermal vents

Name of protected area: Strytan vent

Location: Strytan vent

Dates and project duration: the area shall be visited for maximal three days in the time period of 30.06.2021 to 16.07.2021. Aimed dates are 10-12.07.2021, but depend on weather conditions and success of sampling at other location during the Pelagia research expedition

Number of participants: no persons, only a remotely operated vehicle will dive at the Strytan vent (65-15 meters depth). The ROV will be operated by people onboard of the research vessel Pelagia

Short description of research project:

During the multidisciplinary expedition we aim to study the ecological connectivity at vent field scale, including distribution and origin of vent faunae and their adaptations to extreme environmental conditions. The research project will contribute to the **IceAGE** project (<https://www.iceage-project.org/>), whose primary goal is to investigate Icelandic communities (genetics and ecology). Our detailed study of shallow vents North of Iceland will complement recent discoveries of **IceAGE** partners of shallow and deep vents South of Iceland (e.g. Steinaholl vent field).

Possible disturbance of geological features, soil, flora and fauna:

At Strytan we would like to make videos and photos to study the distribution of fauna at the chimney (no disturbance). In addition, we would like to collect some animal specimens to verify the species seen on video and to perform genetic analyses in order to better understand the animals connectivity to the other vent fields and to the surrounding. The ROV allows sampling with very little disturbance. The geological feature will not be disturbed. There won't be dedicated microbial sampling.

Is there any use of chemicals and/or chemical compounds?

No

Will there be any mitigation for disruption?

The disturbance will be very little (a few animal specimens will be collected for research purpose only, by a remotely operated vehicle).

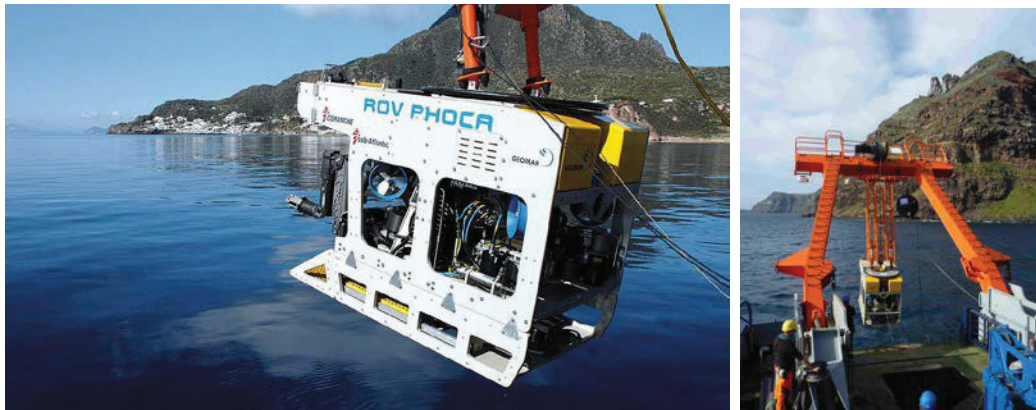
The ROV team from PHOCA (Geomar) is one of the most experienced ones in the world and has a lot of experience with high precision sampling and maneuvering the ROV.

Sampling

Specify the use of motorized equipment within the area:

In the area (under water) we use the ROV Phoca

<https://www.geomar.de/en/centre/central-facilities/tlz/rovphoca/overview>



ROV PHOCA has complemented the underwater-vehicle-fleet of the GEOMAR | Helmholtz Centre For Ocean Research, Kiel in 2010.

PHOCA has been designed as a Work-Class- and Intervention-ROV, and is characterised by the following features:

- 2 manipulators facilitate different sampling procedures
- digital video cameras on pan-&-tilt units are used as survey and mapping devices

- it is fitted with the following auto-functions: depth, heading and altitude
- the digital telemetry system SubCan™ provides real time data transmission
- a payload of up to 100 kg allows the integration of different additional scientific equipment
- ROV PHOCA is deployed in the so-called live-boating mode, i.e. it is directly connected to the respective vessel via a steel armoured optical fibre cable

PHOCA will be operated from the vessel Pelagia

Specify the need for going off roads and paths:  
Not needed

Location of sampling and number of samples.  
Strytan vent (chimney), at 3 different depths, at each depth 3 samples.

Other information:  
Gollner was performing research (scuba-diving with Erlendur Bogason) at the shallower parts of the Strytan vent in 2019. Gollner has informed Erlendur Bogason, Commercial Diver/PADI instructor, of the Strytan Divecenter about the plans of this research expeditions.