Cruise report outline

Cruise name

B9-2010

Research Vessel

Bjarni Sæmundsson

Cruise dates

10-25th of June 2010

Location(s)

Most cruise activities were carried out within the two main study sites (Fig. 1):
-Lónsdjúp trough (CoralFISH case study area)
-Reykjanes ridge

Additional Campod dives were carried out in the following areas:
Kötlugrunn
Skaftárdjúp
Skeiðarárdjúp
Hornafjarðadjúp
Stokksnesgrunn
Lónsdjúp/Papagrunn slope

Chief Scientist

Stefán Áki Ragnarsson (CoralFISH Iceland project leader)

Institute

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Scientific personnel

Steinunn Hilma Ólafsdóttir (project leader of the Coral Mapping project)
Julian Burgos (researcher with the CoralFISH project, in charge of acoustics)
Páll Arnar Þorsteinsson (technician and Campod pilot)
Alice Benoit-Cattin (chemical oceanography)
Hrönn Egilsdottir (chemical oceanography)
Björn Sigurðsson (technician)

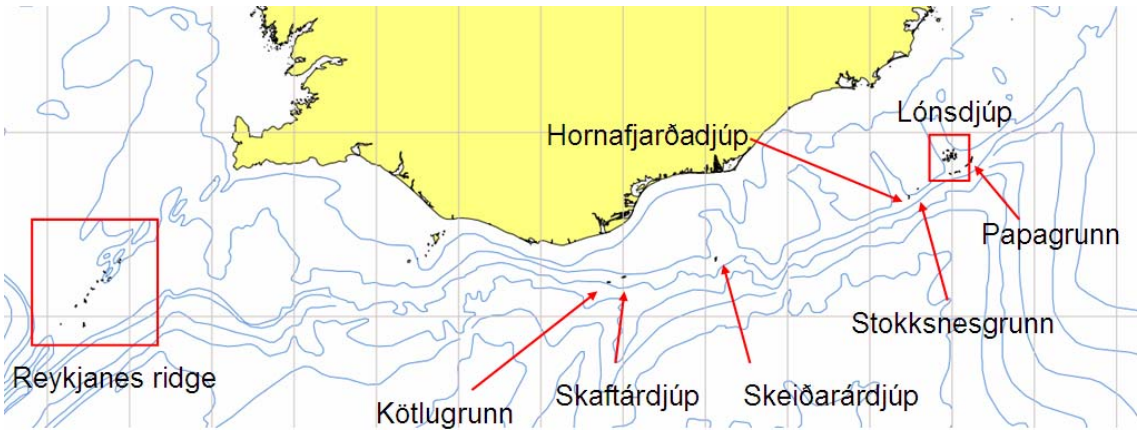

Figure 1. Location of study sites.

Cruise background & objectives

This survey was a joint effort by the coralMAP and coralFISH projects. Its two main objectives were to: a) identify, delineate and describe cold-water coral grounds and characterize their accompanying fauna and b) explore the interaction between fish and cold-water coral habitats. Approximately half of the sampling effort was placed in the Lónsdjúp trough, selected after the July 2009 cruise as the CoralFISH case study area. The remaining sampling effort was focused on the Reykjanes ridge, where anecdotal evidence indicated the prescence of coral habitats. Additional sites along the edge of the south Icelandic continental shelf were explored, in order to complement the sampling coverage of previous coral surveys.

Sampling equipment and methods

Video footage and photographs on and off coral grounds were obtained using a Campod. Echosounder data were used to identify potential coral grounds and to obtain indices of fish abundance. Bottom samples were collected with a triangular dredge. Temperature and salinity measurements were obtained with a CTD. Niskin bottles were used to obtain water samples for nutrient analysis.

Campod

The Campod is a three-legged platform tethered by a 600 m umbilical cable. During operations the campod was towed ~3m off the seabed at 1-1.5 kts. Video footage of the seabed was recorded continuously during each dive. The Campod was placed on the seabed to obtain photographs (both digital and film) or scan the vicinity with the video using pan-and-tilt. The geographical position of the Campod was obtained using a portable hydroacoustic positioning reference system (Kongsberg HPR 410P). The transducer was attached to a 10.5m metal pole placed along the portside of the vessel, extending well below its keel. The Campod was equipped with a Kongsberg MST 319 transponder. The positional data was transferred to the Olex navigation software that displayed high resolution bathymetry data. This system allowed us to track the position of the Campod relative to the seabed landscape in real-time.

Figure 2. Campod using during the survey.

The Campod was fitted with a 5 megapixel digital still camera (Kongsberg OE14-208) and a colour video camera (Kongsberg OE14-366). Light was provided by an underwater Flashgun (Kongsberg OE11-242). The Campod also was equipped with a forward-looking sonar (Tritech SeaKing DST). The sonar was used to detect changes in the seabed topography in the path of the Campod and to identify abrupt features rising above the seabed (e.g. ghostnets, large rocks or coral mounds).

Collection of acoustic data

Study areas were surveyed using an EK60 echosounder operating at 12, 38 and 120 kHz. Acoustic data was collected continuously during the cruise. In addition, a set of 13 parallel transects were carried out over the Lónsdjúp though in order to characterize the distribution of fish and zooplankton over the CoralFISH case study area. Acoustic data was analyzed using the Echoview® software. Weak scatterers in the water column were sampled with a Tucker trawl at two locations. A pelagic trawl was also available during the survey but no fish aggregations were observed over the Lónsdjúp though and thus it was not used.

Triangular dredge

Five samples were collected with a triangular dredge to provide general information on the fauna at these locations and to facilitate identification of animals from the video footage and the underwater photographs. Live coral and other conspicuous animals were removed from the triangle catch and fixed in formaldehyde for later processing. Sessile animals were removed from rocks. Samples of live specimens of *Lophelia pertusa*, *Primnoa resedaeformis* and *Eunice* spp. were collected for genetic analyses.

Hydrography

Vertical temperature, salinity (conductivity), O_2 and fluorescence profiles were obtained with a CTD (Seacat SBE 19 *plus* V2) equipped with O2 and fluorescence sensors at 38 stations (Fig. 3). At 11 CTD stations, discrete samples were also obtained using Niskin bottles, 8 stations at Lónsdjúp area and 3 stations around Steinhóll. The discrete samples were used to measure O_2, pH, TCO_2 (total inorganic carbon), pCO_2 (partial pressure of CO_2), nutrients (PO_4, SiO_2, NO_2+NO_3) and salinity.

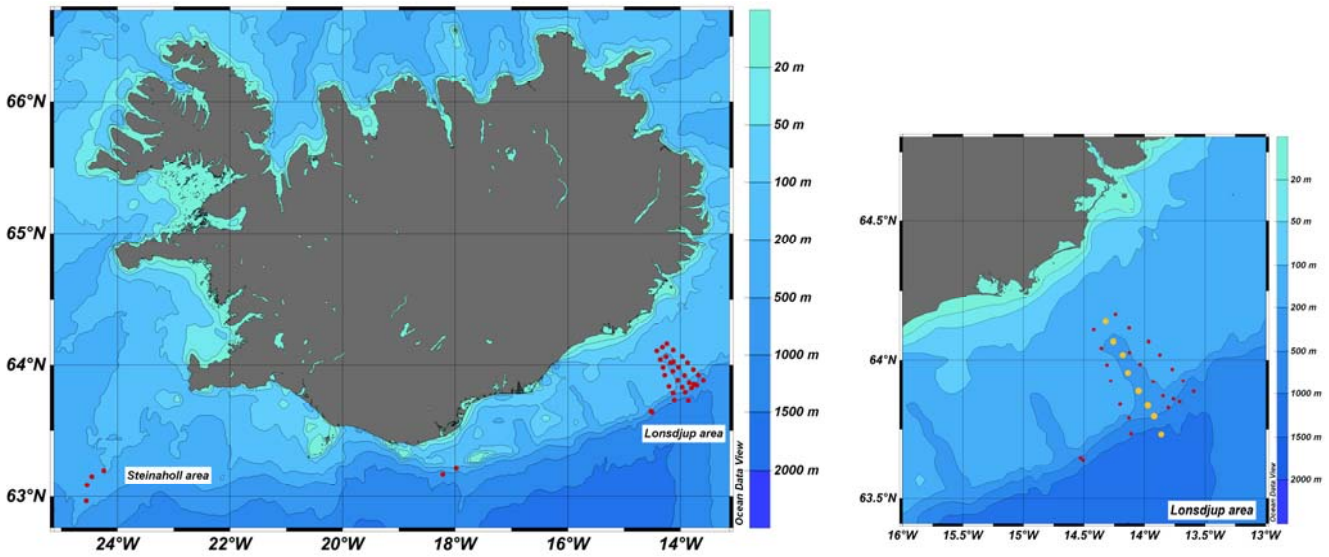

Figure 3. Hydrographic stations. Color indicate sampling method: CTD (red) and CTD plus Niskin bottles (yellow).

Preliminary results

Lónsdjúp trough

A total of 22 video transects were carried out in the Lónsdjúp area. Of these, 14 transects were placed within nine experimental plots (1 km x 1 km) selected based on the analysis of high resolution bathymetric data and the results of the July 2009 survey. Plots were classified as having high (2), low (3) and no coral coverage (4). Within each plot, one or two video transects (~1 km long), were carried out. Eleven additional video transects were carried out outside the experimental plots, three of them on the shelf break, with the objective of mapping more accurately the distribution of coral habitats. Length of these transects ranged between 0.4 and 3 km.

The overall distribution of coral habitat matched the observations from the 2009 survey: High coral densities along the central parallel ridges, in particular towards the east, and along the shelf edge. In the 2009 survey, ROV dives were carried out at locations where the echosounder and multibeam data suggested coral presence. The ROV footage provided detailed information on small areas, but due to operational constraints, it was not possible to explore large areas. The campod on the other hand allowed much longer survey tracks, providing more detailed information on the large scale spatial distribution of corals. Observations with the campod suggested that the distribution of coral habitats in the Lónsdjúp is more patchy and the total coral coverage may be lower than estimated after the 2009 survey.

Based on information from fishermen we performed 4 video transects in the Lónsdjúp/Papagrunn slope. Extensive coral reefs were located in the eastern part of the slope, ≈2.6 x 1.5 km. These are the most extensive coral grounds found to this date in Icelandic waters.

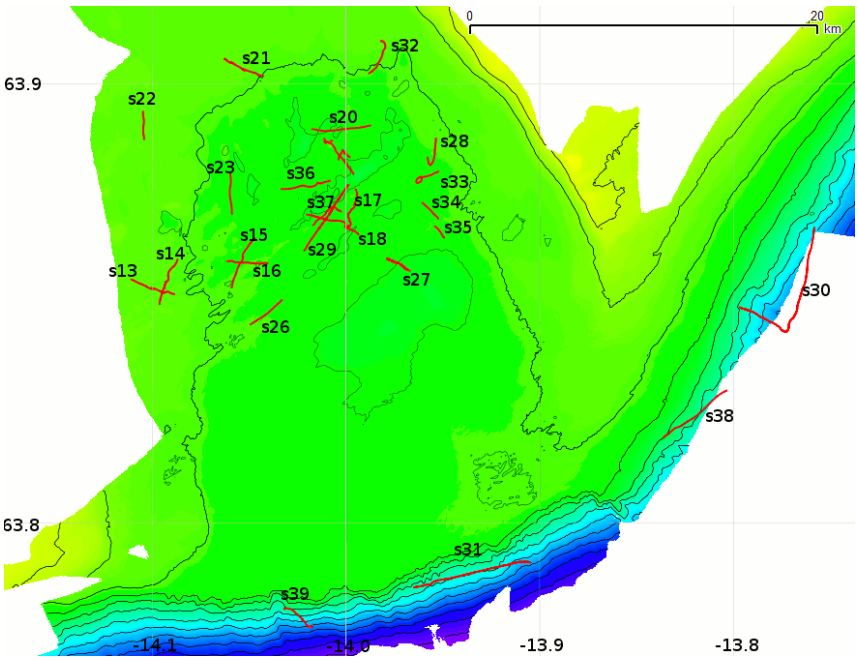

Figure 4. Location of the campod transectsin the Lónsdjúp trough and Lónsdjúp/Papagrunn slope.

Acoustic recording over the Lónsdjúp indicated the presence of very little fish or zooplankton, and no pelagic trawl samples were collected. Towards the south and east a near surface layer of weak scatterers was observed. The layer was sampled with a Tucker trawl, and consisted of euphausids and ichthyoplankton.

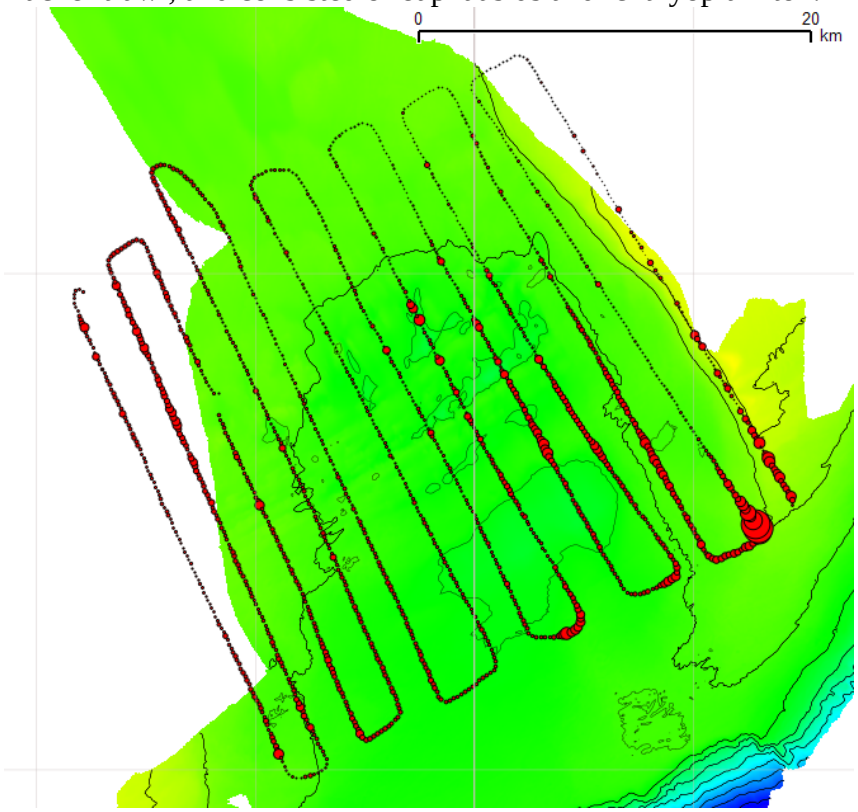

Figure 5. Acoustic transects over the central Lónsdjúp. The area of circles is proportional to the NASC (Nautical Area Scattering coefficient) measured in 100 m bins. Values ranged between 0.4 and 3814.3 m^2/m^2.

Reykjanes ridge

Reports from fishermen indicated the prescence of coral habitat in several locations in the Reykjanes ridge. The complex bottom topography of the area hinders bottom trawling, increasing the probability of finding pristine coral sites. A number of sites were selected for exploration (Fig 6), including the Þjóðverjahola, Þríburar and Steinahóll, and areas we referred as Reykjanes Grid 1, Reykjanes Grid 3 and Reykjanes South. A total of 21 video transects were carried out in the Reykjanes ridge. One of the sites, the Steinahóll area, that is known for its hydrothermal activity, was investigated. The exact geographical locations of vents were revealed by the bubble-rich plumes that were clearly detected by the echosounder. Three video transects (0.5 – 1.4 km) were carried out over the area. The area closest to the vents was characterised by a very rugged landscape dominated by large pillow lava. The rocks surrounding the vents were covered with fluorescent bacteria (possibly methane assimilating) and white deposits. The areas closest to the vents were more or less devoid of epibenthic organisms, and those that were seen (mainly sea anemones) appeared to be of small size. Interestingly, colonies of *L. pertusa* were found amongst the lava, and sometimes it appeared that the lava had covered part of the colony. Another surprise was the extremely high amount of redfish amongst the barren pillow lava close to the vents. Further away from the vent sites the diversity of epibenthic organisms increased gradually, particularly amongst habitat forming groups such as sponges. In one of the dives a sudden transition between habitat types was noted, with the bivalve *Acesta excavata* dominating closer to the vents and sponges being more common further away. These findings could suggest that the area closest to the vents had been formed during a recent eruption.

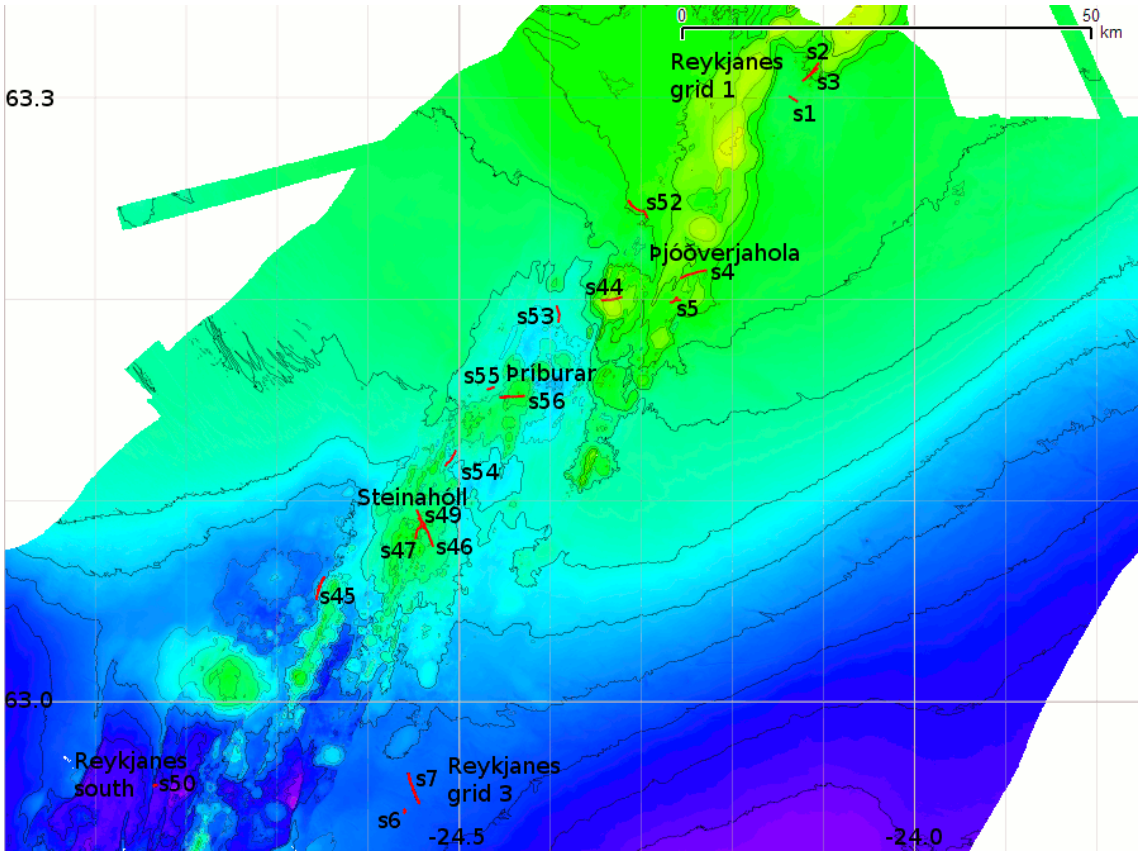

Figure 6. Location of the campod dives in the Reykjanes ridge.

Other sites

One or two video transects were carried out in the following areas: Kötlugrunn, Skaftárdjúp, Skeiðarárdjúp, Hornafjarðadjúp, and Stokksnesgrunn. The objective of exploring these sites was verify reports from fishermen of coral presence, do additional explorations on areas visited in previous cruises, and to obtain a more complete spatial coverage of the sampling effort along the south Icelandic continental shelf. Live coral habitat was observed in the Skeiðarárdjúp and Hornafjarðadjúp areas only.

Appendix: Daily log for the cruise B9-2010

Date	Area	Cambod dive number / Sampling method
10.06.10	Departure from Reykjavík	
11.06.10	Reykjanes Ridge	Dives 1-3
11.06.10	Reykjanes Ridge - Þjóðverjahola	Dives 4-5
11.06.10	Reykjanes Ridge	CTD
12.06.10	Reykjanes Ridge	Dives 6-7
12.06.10	Reykjanes Ridge	CTD
13.06.10	Skaftárdjúp	Dives 8-9
13.06.10	easter Kötlugrunn	Dives 10-11
13.06.10	easter Kötlugrunn	CTD
14.06.10	Skaftárdjúp	CTD
14.06.10	Lónsdjúp	CTD (n=10)
15.06.10	Lónsdjúp	Triangle dredge (n=2)
15.06.10	Lónsdjúp	Dive 12
15.06.10	Lónsdjúp	Tucker trawl
16.06.10	Lónsdjúp	Dives 13-17
16.06.10	Lónsdjúp	CTD (n=2)
17.06.10	Lónsdjúp	CTD (n=5)
17.06.10	Lónsdjúp	Triangle dredge (n=3)
17.06.10	Lónsdjúp	Tucker trawl
17.06.10	Lónsdjúp	Dives 18-19
18.06.10	Lónsdjúp	CTD (n=4)
18.06.10	Lónsdjúp	Dives 20-25
19.06.10	Lónsdjúp	Dive 26
19.06.10	Lónsdjúp	CTD (n=5)
19.06.10	Lónsdjúp	Dives 27-29
20.06.10	Lónsdjúp	CTD
20.06.10	Papagrunn (shelf break)	Dive 30
20.06.10	Lónsdjúp (shelf break)	Dive 31
20.06.10	Lónsdjúp	Dives 32-33
21.06.10	Lónsdjúp	CTD
21.06.10	Lónsdjúp	Dives 34-37
21.06.10	Lónsdjúp (shelf break)	Dives 38-39
21.06.10	Hornafjarðadjúp (shelf break)	Dive 40
22.06.10	Stokksnesgrunn (shelf break)	Dive 41
22.06.10	Skeiðarárdjúp	CTD (n=2)
22.06.10	Skeiðarárdjúp	Dives 42-43
23.06.10	Reykjaneshryggur	Dives 44-45

23.06.10	Reykjanes Ridge – Steinahóll	Dive 46
24.06.10	Reykjanes Ridge – Steinahóll	CTD
24.06.10	Reykjanes Ridge – Steinahóll	Dives 47-49
24.06.10	Reykjanes Ridge – south	Dives 50-51
24.06.10	Reykjanes Ridge	Dives 52-53
25.06.10	Reykjanes Ridge	CTD (n=2)
25.06.10	Reykjanes Ridge	Dives 54-55
25.06.10	Reykjanes Ridge – Þríburar	Dive 56
25.06.10	Return to Reykjavík	