Cruise report

Cruise name
D7-2009

Research Vessel
R/s Dröfn

Cruise dates
23-30 July, 2009

Location(s)
SE Iceland

Chief Scientist
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Institute
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Scientific personnel
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Cruise background & objectives
The objective of the cruise was to perform long-line experimental fishing on and off coral habitats and assess fish abundance and species composition.

Preliminary information
The survey was carried out in the Lónsdjúp trough, off south eastern Iceland (centred at 63°52´ latitude, -14°29´ longitude). The Lónsdjúp through was explored during a previous cruise in June 2009. During this cruise, possible coral locations were identified from high resolution bathymetry maps and from split-beam echosounder data (by visual observation of bottom structures in echograms and by frequency differencing of the bottom layer). In most cases, direct observations (video and still photographs) obtained through a remote operated vehicle (ROV) confirmed the presence of coral, either dead or alive. ROV dives were also carried out in locations where corals were unlikely to be found, for comparison purposes.

Sites explored with the ROV were classified as high coral cover, low coral cover and no coral locations, using the following criteria:

1) High coral cover area: Evidence or high probability of high density/widespread cover of corals, including reefs or large coral structures.
2) Low coral cover area: Evidence or high probability that density/cover of corals was low. In these locations, individual coral heads were observed scattered over the bottom.

3) No coral area: No evidence of live coral.

Sampling design and methods

Seven areas were selected for sampling. Two coral areas, two low coral cover areas and two non-coral areas. An additional area with rocky bottom and no corals was selected as sampling site. The objective of this last station was to provide information from areas with geometrically complex seabed but with no live coral. Given the reduced size of the study site, we aimed to separate the longlines as much as possible, both in space and time. The original sampling design included 20 longlines, with 2-3 longlines per site. Bad weather and entanglement of a rope in the propeller of the vessel restricted the time available, and only 12 long-lines could be set (two long lines in five locations and one line in the remaining two sites).

The long-line used consisted of 9 mm line, with 240 hooks (spaced at 1.4 m distance) per tub. At most locations, line consisting of 3 tubs (≈1 km long) was set. In two locations we deployed lines with 880 and 960 hooks respectively. DST tags were attached to the long-line to obtain information on bottom temperature, salinity, and depth. Hooks were baited with herring (*Clupea harengus*), squid (*Todarodes sagittatus*), and Pacific Saury (*Cololabis saira)*. Each long-line was divided into ~ 80m sections (60 hooks), and catch was registered for each section. The geographic location and weather conditions at deployment and retrieval of long lines, and the by-catch of benthic invertebrates and sea birds were registered.

All captured fish were identified to species and measured. Fish that had not everted their stomach were weighed and sexed. Otoliths and stomachs were removed for further evaluation. Captured benthic invertebrates were sampled and/or photographed and weighed.

Survey Map

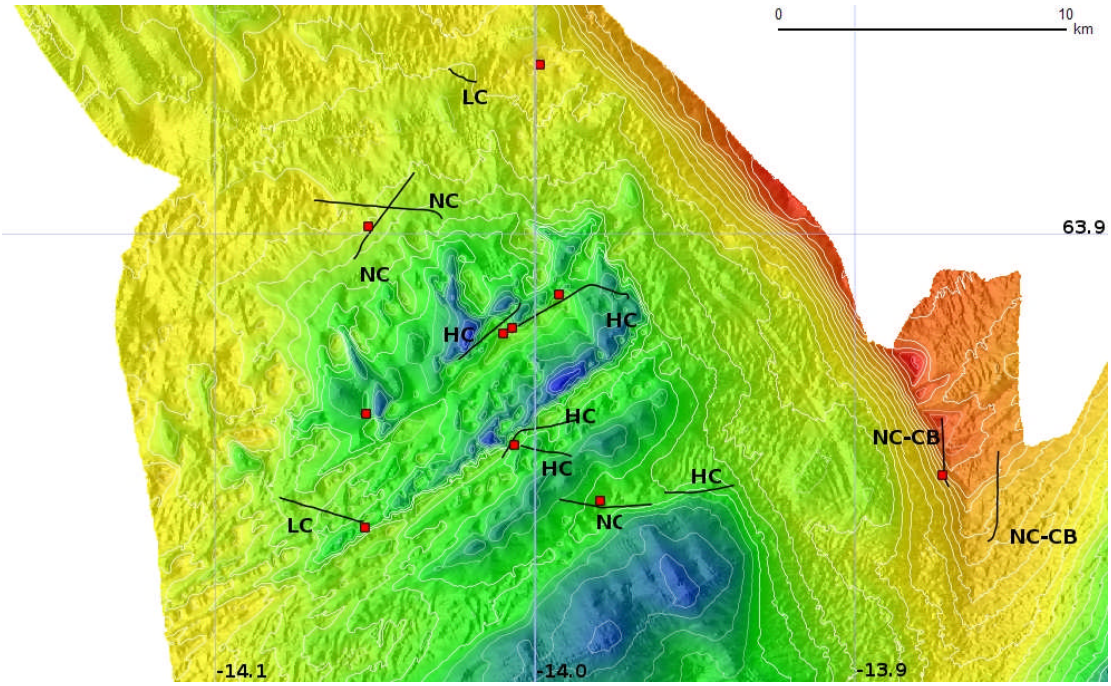

Figure 1. Location of the 12 long-lines successfully deployed in the Lónsdjup through. The lines are labelled as HC (high coral cover area), LC (low coral cover area) and NC (no coral area). CB denotes rocky complex bottom. Red squares indicate the locations of ROV dives during a previous survey in June, 2009.

Preliminary results

As a result of coral by-catch, one of the lines deployed in one of the non coral areas was included in the analyses as a high coral area sample. This typifies one limitation of our

sampling design. The classification of sampling areas as having high and low coral cover and areas lacking corals altogether was based on observations made during ROV dives during the June 2009 cruise. Attempts were made to deploy the long lines as close as possible to dive locations, while at the same time avoiding excessive spatial and temporal overlaps between lines. Nevertheless, the distribution of corals is patchy, and compared to the length of a long-line, the area explored in each ROV dive was significantly smaller. As a result, there is some uncertainty about the density/cover coral in locations where the lines were deployed. In the case of this non coral area, no corals were caught as by-catch from the long line deployed directly above the dive site. On the other hand, several coral fragments were obtained from another line deployed approximately 500m to the east. To reduce the uncertainty with regard to estimation of coral cover in the analysis of long-line catches, additional video and underwater camera transects (CAMPOD and ROV) are planned for the June 2010 survey. The locations of the long-lines will be further determined on the basis of the findings from the June 2010 survey.

A total of 826 fish were captured in the 2009 long-line survey. The most abundant species was tusk (*Brosme brosme*, n=695), followed by ling (*Molva molva*, n=45), haddock (*Melanogrammus aeglefinus*, n=42), cod (*Gadus morhua*, n=34), and blue ling (*Molva dypterygia*, n=15). Fish abundance was 114.9, 93.1 and 63.5 per 1000 hooks in high, intermediate and low coral cover areas. Numbers of tusk were significantly greater in areas of high coral cover compared to off coral areas ($p<0.001$). No significant differences were found between areas of high and low coral cover. Species richness was lower in high coral cover areas (2.2 species per 1000 hooks) than in low coral cover or no coral areas (4.4 and 4.2 species per 1000 hooks, respectively). Tusk was more abundant in high coral cover locations (Fig. 2). Cod and starry ray (*Amblyraja radiate*) were more abundant in low coral cover and no coral locations. Ling and blue ling were more abundant in no coral locations than in low and high coral cover locations. Catches of wolfish (*Anarhichas lupus*) and saithe (*Pollachius virens*) were low and only occurred in no-coral locations. Other species were captured very sporadically.

Comparisons of size distributions among coral cover levels were only possible for tusk (Fig. 5). Fish larger than 67cm were only observed in high coral locations. Mean size of tusk was significantly greater at coral grounds ($p<0.0001$) compared to off coral and low cover areas.

Benthic invertebrate by-catch is listed in Table 1. By-catch rate of invertebrate was 0.7%. Coral fragments accounted for nearly half of the bycatch (0.3%). A total of 54 northern fulmars (*Fulmarus glacialis)* were captured by the long-lines (0.6% of the total).

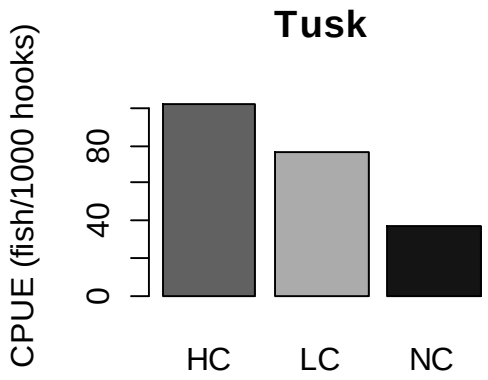

Fig. 2. Catch per unit effort (number of fish per 1000 hooks) of tusk (*Brosme brosme*) in areas of high (HC), low (LC) and no coral cover (NC).

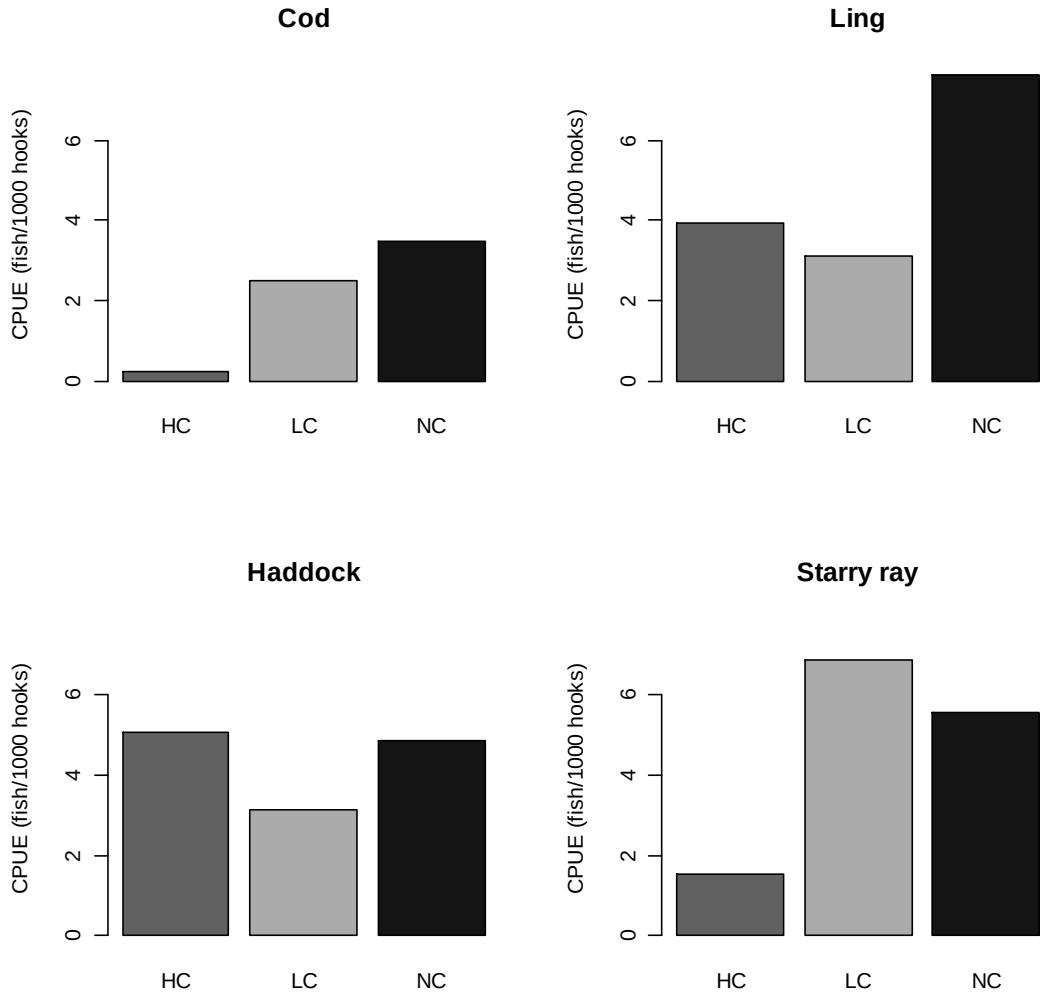

Fig. 3. Catch per unit effort (number of fish per 1000 hooks) of Atlantic cod (*Gadus morhua*), ling (*Molva molva*) haddock (*Melanogrammus aeglefinus*), and starry ray (*Amblyraja radiate*), in areas of high (HC), low (LC) and no coral cover (NC).

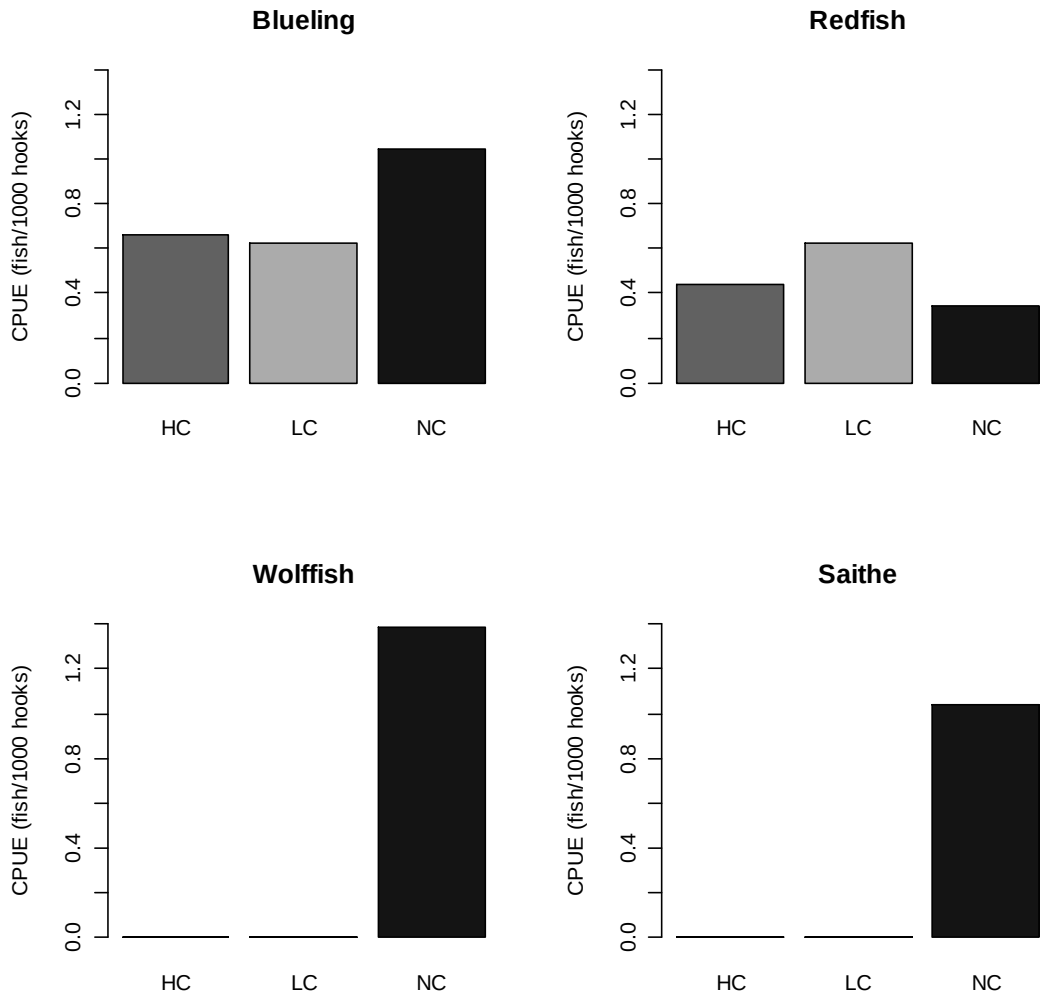

Fig. 4. Catch per unit effort (number of fish per 1000 hooks) of blue ling (sp), red fish (*Sebastes* spp.), wolfish (*Anarhichas lupus*), and saithe (*Pollachius virens*), in areas of high (HC), low (LC) and no coral cover (NC).

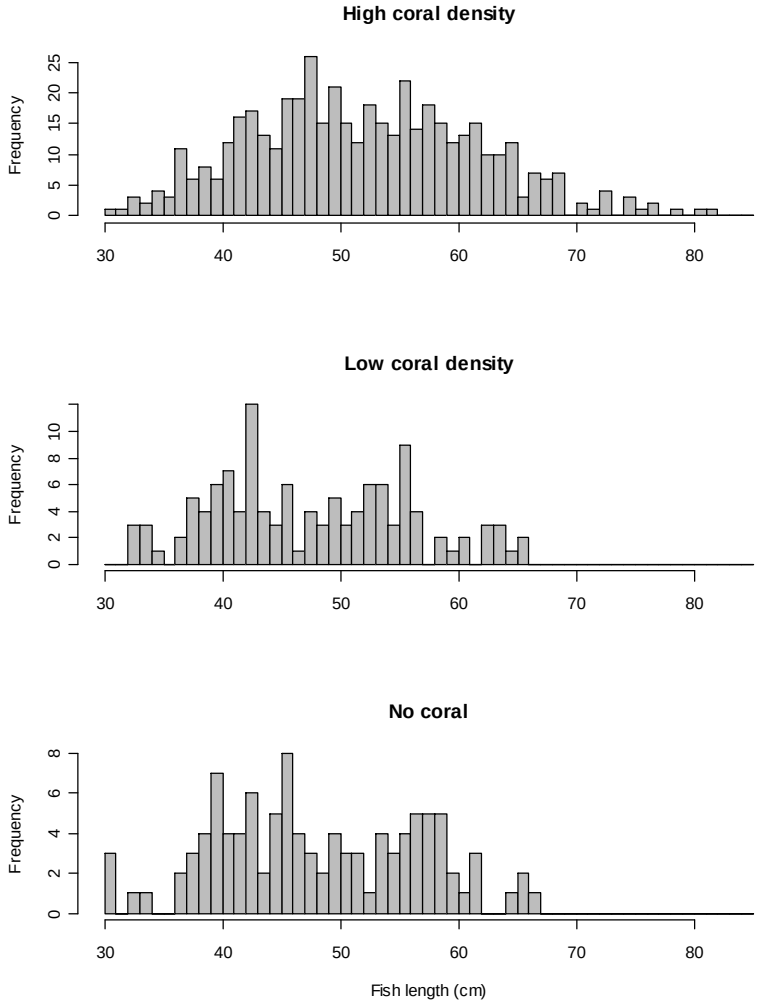

Fig. 5 Length distributions of tusk (*Brosme brosme*) captured in areas of high and low coral cover and off coral areas.

Table 1. By-catch of benthic invertebrates, expressed as number of individuals or fragments per 1000 hooks, in areas of high (HC), low (LC) and no coral cover (NC).

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Species group	HC	LC	NC
Brisinga spp.	1.04		
Block of *Lophelia pertusa* (60x20 cm)	0.26		
Coral fragment	6.51	1.25	
Gorgonacea	0.52		
Lophelia pertusa (live)	0.26		
Pennatulacida	0.26		0.27
Primnoa resedaeformis	0.78		
Actinaria	1.04		0.83
Porifera (sponges)	1.04		
Asellota spp.	0.62		
Asteroidea	0.62		
Bryozoa and other animals on a ghost net	0.28		
Buccinum undatum with Alcyonidiidae epibiosit	0.28		

Appendix: Daily log for the cruise

Date	Remarks
23	Departure from Reykjavík
24	Steaming/sailing to Lónsdjúp
25	4 long-lines were set, all in off-coral areas. First line (line 1) came up entangled and was regarded invalid. Hauling up the lines 2-4 was time consuming due to problems with the long-line winch. In Line 3, which was laid in a supposedly off-coral area, a large block (60 x 40 cm)of dead coral was caught in addition to numerous coral fragments. A rope from a ghostnet caught by the long-line got entangled in the propeller, forcing us to sail to the nearest village (Höfn í Hornafirði, 45 nms)
26	Repair of the long-line system and removal the rope from the propeller. Sail back to Lónsdjúp and 5-6 lines were set (in low and high coral cover area respectively) in the afternoon that were retrieved in the evening.
27	Rough weather, return to Höfn to wait until the weather had improved.
28	Depart to Lónsdjúp in the early morning. Wind and wave height was much less. Lines 7-10 were set around lunchtime and retrieved in the afternoon. Line 7 was set in low cover coral area, 8 and 9 in coral areas and line 10 off corals.
29	Lines 11 and 12 were set off corals while line 13 in coral areas. Departed Lónsdjúp 12:30, sail to Reykjavík
30	Arrival to Reykjavík at 22:00