

**Cruise Report**  
Cruise no. 0824

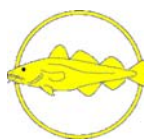
**Joint investigations on Norwegian spring-spawning herring and  
blue whiting north of the Faroes**

30/4 – 14 May 2008

R/V Magnus Heinason OW2252



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## INTRODUCTION

The main aim of this survey was to investigate the distribution and abundance of Norwegian spring-spawning herring and immature blue whiting in the areas north of the Faroes and in the Norwegian Sea. Hydrographic data and zooplankton abundance measurement were collected at specific intervals along the cruise tracks.

The cruise was part of a joint international survey (Faroes, Norway, Russia, EU (Denmark), and Iceland) coordinated by the ICES “Planning Group on Northeast Atlantic Pelagic Ecosystem Surveys” (PGNAPES). Six vessels participated in the cooperative investigations, R/V *Magnus Heinason* (FO), RV *G.O.Sars*, FV *Nybo* (NO), R/V *Árni Friðriksson* (IC), RV *Dana* (DK), and RV *Smolensk*. Combined abundance estimates of Norwegian spring spawning herring and blue whiting with data from all participating vessels will be calculated during the meeting of the PGNAPES in August 2007, and reported to the ICES WG of the “Widely Distributed Stocks” WGWDS (formerly the Working Group of the “Northern Pelagic and Blue Whiting Fisheries”, WGNPBW) in early September 2008.

## MATERIAL AND METHODS

Acoustic data were recorded with a Simrad EK-500 echo sounder. Data from the hull mounted 38 kHz transducer were logged at sea and used in the fish abundance estimation. The area backscattering recordings ( $S_A$ ) per nautical mile were averaged by each nautical mile and the recordings were scrutinised on a daily basis with the EchoView 4.3 software and allocated to herring, blue whiting, mackerel, plankton or other fish (e.g. pearlside and lantern fish) based on regular pelagic trawling aimed at the various acoustic recordings and to a limited extent on the characteristics of the echo recordings.

The hull mounted 38 kHz echo sounder was operating with settings obtained from a copper sphere calibration at 5/4 2008. Biological samples of the acoustic recordings were obtained with a pelagic 640 m trawl from Vónin. Trials to sample larger zooplankton (macrozooplankton) were done with a 9m x 9m finemeshed (8 mm knotless square mesh) plankton trawl. To sample the surface layer (upper 10 m) a specifically designed “salmon” trawl was used a couple of times.

Hydrographic data (temperature and conductivity/salinity) were collected along the cruise tracks at every 50-60 nm with a CTD cast down to 1000 m depth or to the bottom (**Fig. 1**). Water samples were taken from each station, and samples for chlorophyll analysis were collected from the upper 100m. Zooplankton samples were taken at each hydrographic station from vertical hauls 0-200m depth with a standard WP-2 net.

A detailed description of the configuration of the sampling gears is given in **Appendix 1**.

## RESULTS

The cruise tracks and hydrographic stations in the surveyed area are shown in **Fig. 1**. The weather was excellent and the survey coverage was according to the survey plans. A total of 21 trawl hauls and 42 CTD casts/WP2 plankton samples were taken during the survey. Biological samples were taken from every trawl haul, usually 150-200 fish were measured and weighted, and of these otoliths and stomachs were taken of the first 25 fish. During the cruise the pelagic trawl was monitored by use of two ADCPs mounted on top of the trawl opening and in the mid section of the trawl. These measured the flow through the trawl, and some indications were that the flow was slightly reduced in the aft part of the belly (just in front of the cod-end). At the end of the survey the hydrographic standard section “Stanndarskurðir norður”, i.e. a hydrographic section along 6°W from 66°N southwards towards the shelf north of the Faroes (**Fig. 1**).

### Norwegian spring spawning herring

Large concentrations of herring were found in the surveyed area (**Fig. 2**). The herring was rather spread out as compared to 2007 and was found in the upper 30-70 m depth as a continuous layer, well suited for acoustic registration. However, in the southeastern part of the surveyed area some herring were distributed very close to the surface and thus above the transducer and therefore not recorded, this was also the case for mackerel that was found in this surface layer, as determined by surface trawl hauls with the “salmon” trawl. The biomass estimate in the area was about 4.9 million tonnes (**Fig. 2 and 3**), over 1 million larger than last year, therefore there has been a substantial increase in the herring biomass in the area since 2005, despite the slightly larger coverage this year.

In the southeastern part of the surveyed area, i.e. eastern part of the Faroese area and in EU waters, a large proportion of the herring was of the autumn-spawning type, either from the Faroese plateau or from the northern North Sea. Therefore the  $s_A$  values of herring have been divided by two, according to the proportion of autumn-spawning herring in the trawl haul in the southeastern area (haul 08240004 on 62°39'N 1°16' W) where approximately half of the herring was judged to be autumn-spawners from the maturation stage and shape/appearance of the otoliths (type of nucleus).

The total abundance of herring from all the participating vessels will be available in late August in a joint report to ICES Working Group on “Widely Distributed Stocks” (WIDE) in September 2008.

The mean length of Norwegian spring spawning herring in the area north of the Faroes was 33 cm (mean weight 252 g), and the total length distribution is shown in **Fig. 4**. Most of the herring was 6 and 8-10 years old (the 2002 and 2000-1998 year-classes, respectively), and the oldest herring was present in the western and northwestern area (**Fig. 5**). Some of the herring fed heavily on krill (*Meganyctiphanes norvegica*) in the northwestern area, and this was large herring that formed schools at 350 m depth during the day and ascended during night. As in previous years the largest herring was in the western areas (**Fig. 12**).

### Blue whiting

The amount of blue whiting was very low in the surveyed area (**Fig 6**). They were found just north of the Faroese plateau and north of the Iceland-Faroe Ridge. This is a worrying trend that has been observed the last three years. The mean length of blue whiting in the Faroese area was 29.6 cm (151 g), and therefore no juveniles were present. The length distribution of blue whiting is shown in **Fig. 7**. Most of the blue whiting was 5 years old (the 2003 year-class) with some aged 4, 6 and 7 years (**Fig. 8**).

### Mackerel

Mackerel of about 34 cm length (286 g) was found in the southeastern part of the investigated area, i.e. east towards the EU fishery limit (**Fig. 9**). In recent years mackerel has migrated further north and west in such quantities that the Faroese vessels targeting herring had to abandon the southern part of the Faroese area in order to avoid by-catches of herring. The mean length of the mackerel was 34.3 cm and mean weight 286 g (**Fig. 10**). The mackerel were from 4-7 years old with most being 5 years old, the 2003 year class (**Fig. 11**).

### Salmon

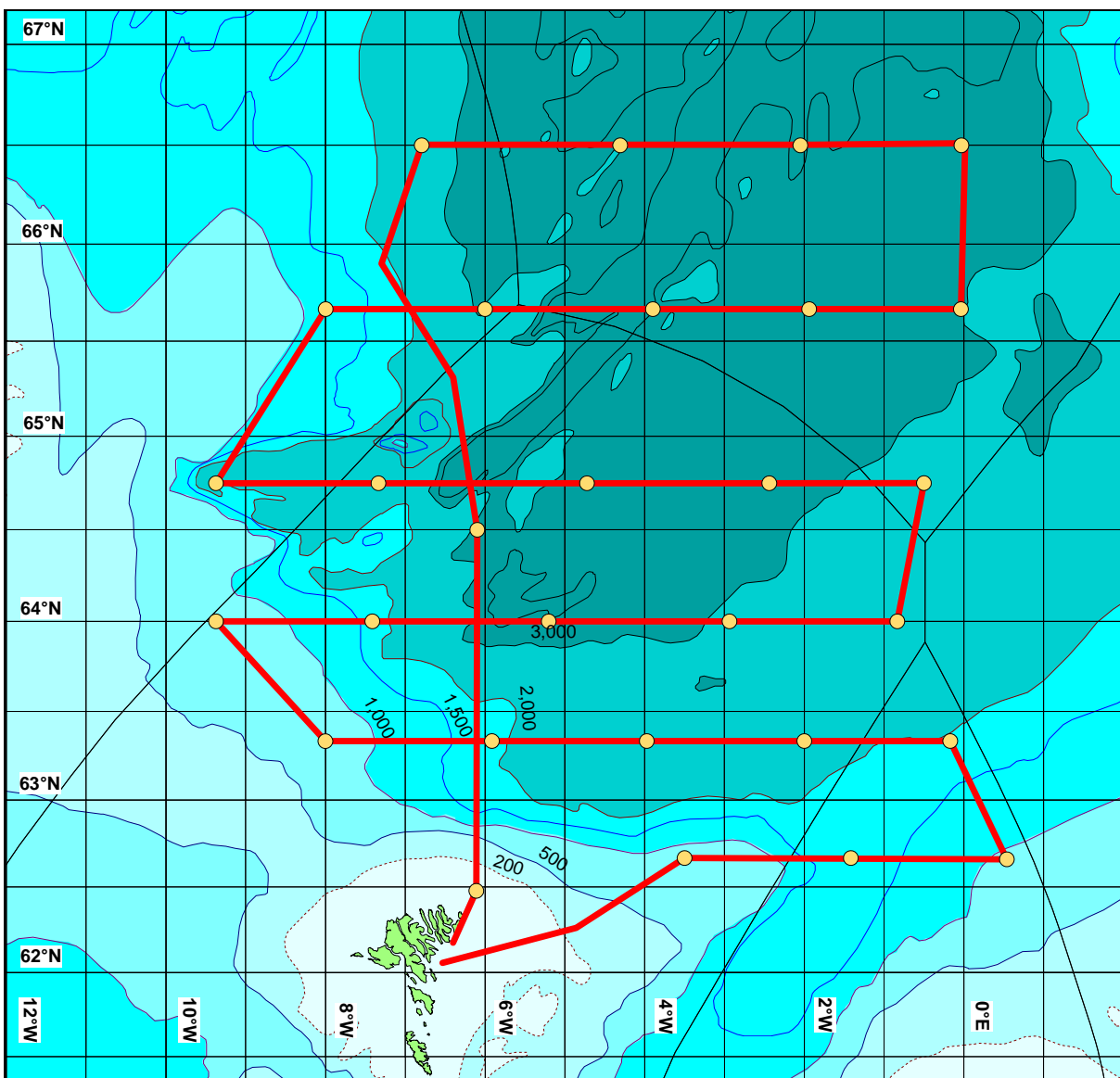
Salmon (17 specimens) were caught in two hauls with the salmon trawl, the size was between 30-40 cm (0.5-1 kg) and these fish were probably 1 SW non-maturing salmon feeding in the area.

### Zooplankton

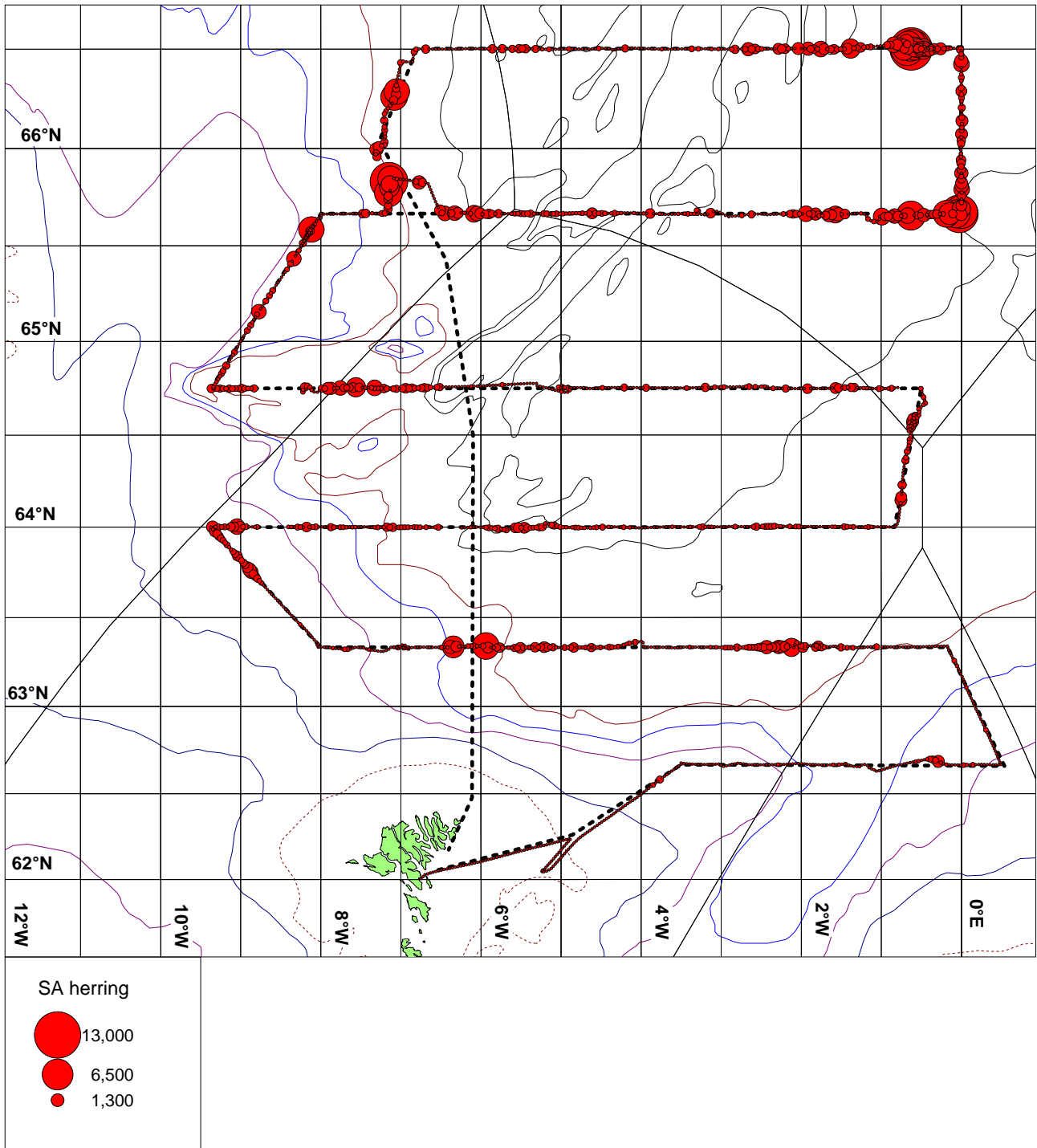
Krill (*Meganyctiphanes norvegica*) was found at depths in the whole area. The herring seemed to fed on the copepod *Calanus* spp. Most of the times, but in some areas the stomachs were full of krill. Amphipods of the genus *Themisto* were caught in the krill trawl at depths (400 m).

### Environment

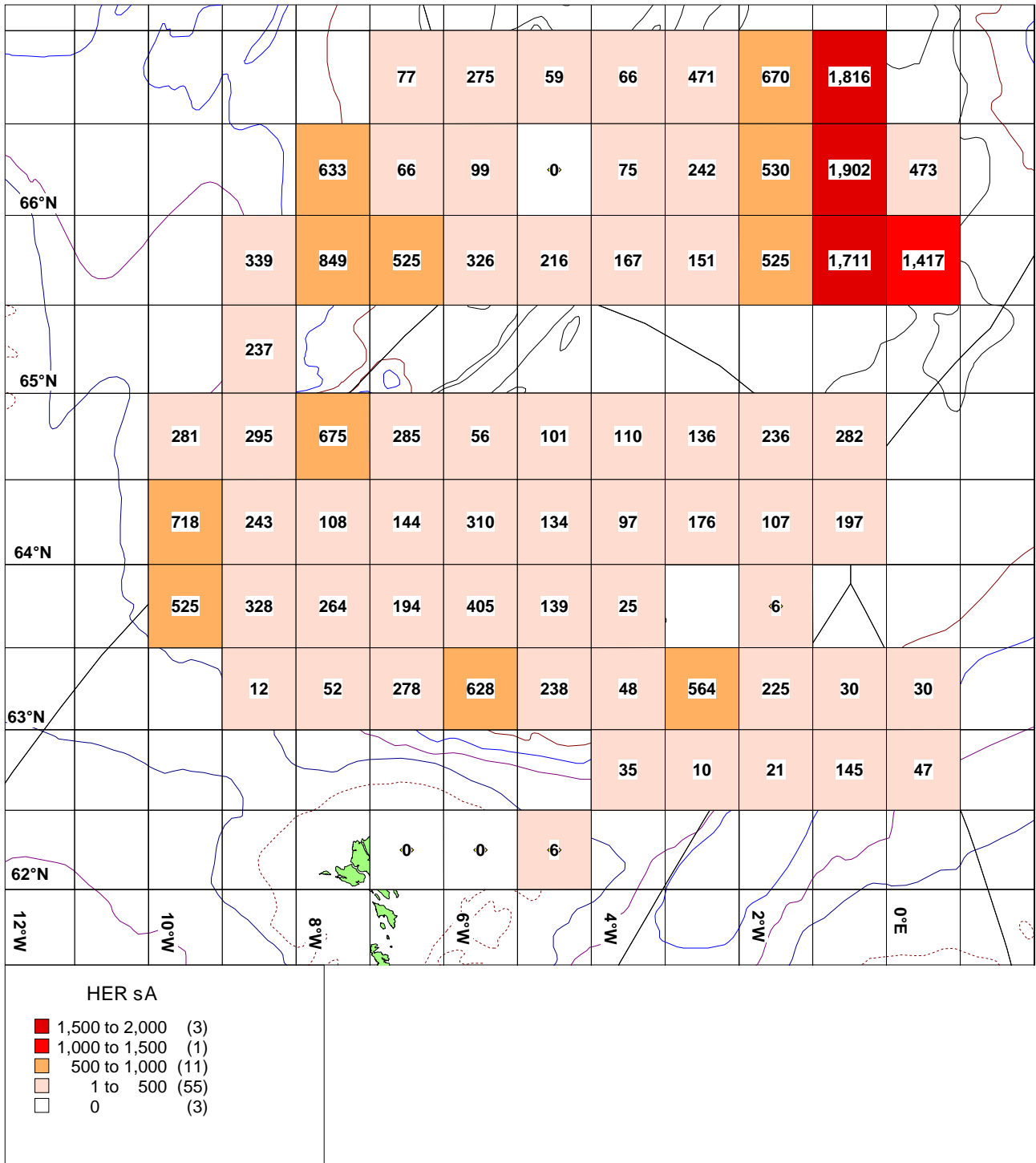
The sea-surface temperature along the cruise track is shown in **Fig. 12**. The influence of the East-Icelandic current seems to be strong in 2007, leading to relatively cold water north of the Faroes. The temperature at 300 m depth is show in **Fig. 13**, and the few blue whiting found were in the warmer part in the southwestern and southeastern areas of the investigated area close to the shelves.



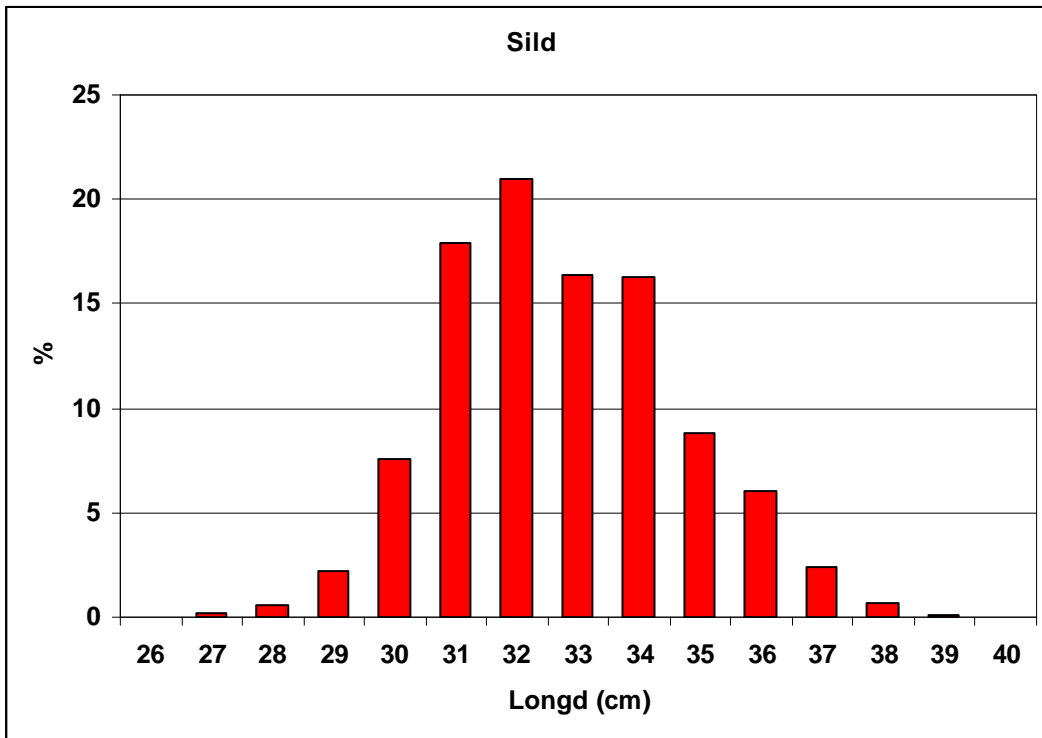
**Figure 1.** Cruise tracks (red line) with hydrographic stations (light yellow circles) north of the Faroes, *Magnus Heinason* cruise 0824, 30/4-14/5 2008.



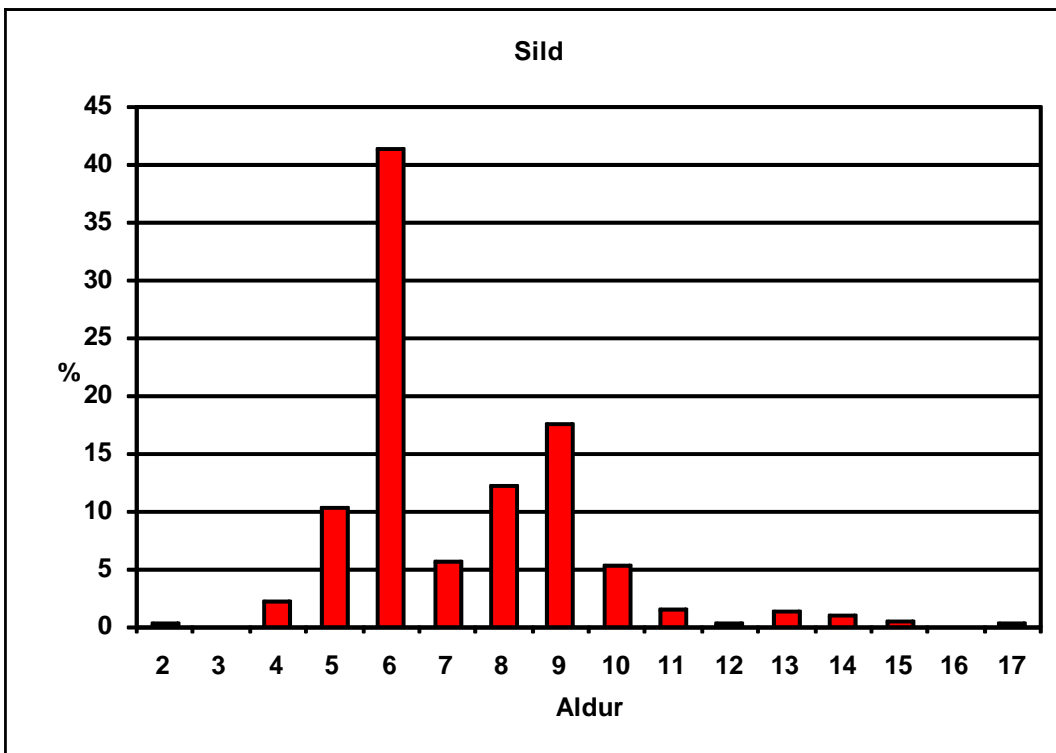
**Figure 2.** Integration values ( $s_A$ ,  $m^2/nm^2$ ) of Norwegian spring spawning herring per 1 nm along the cruise tracks, *Magnus Heinason* cruise 0824, 30/4-14/5 2008.



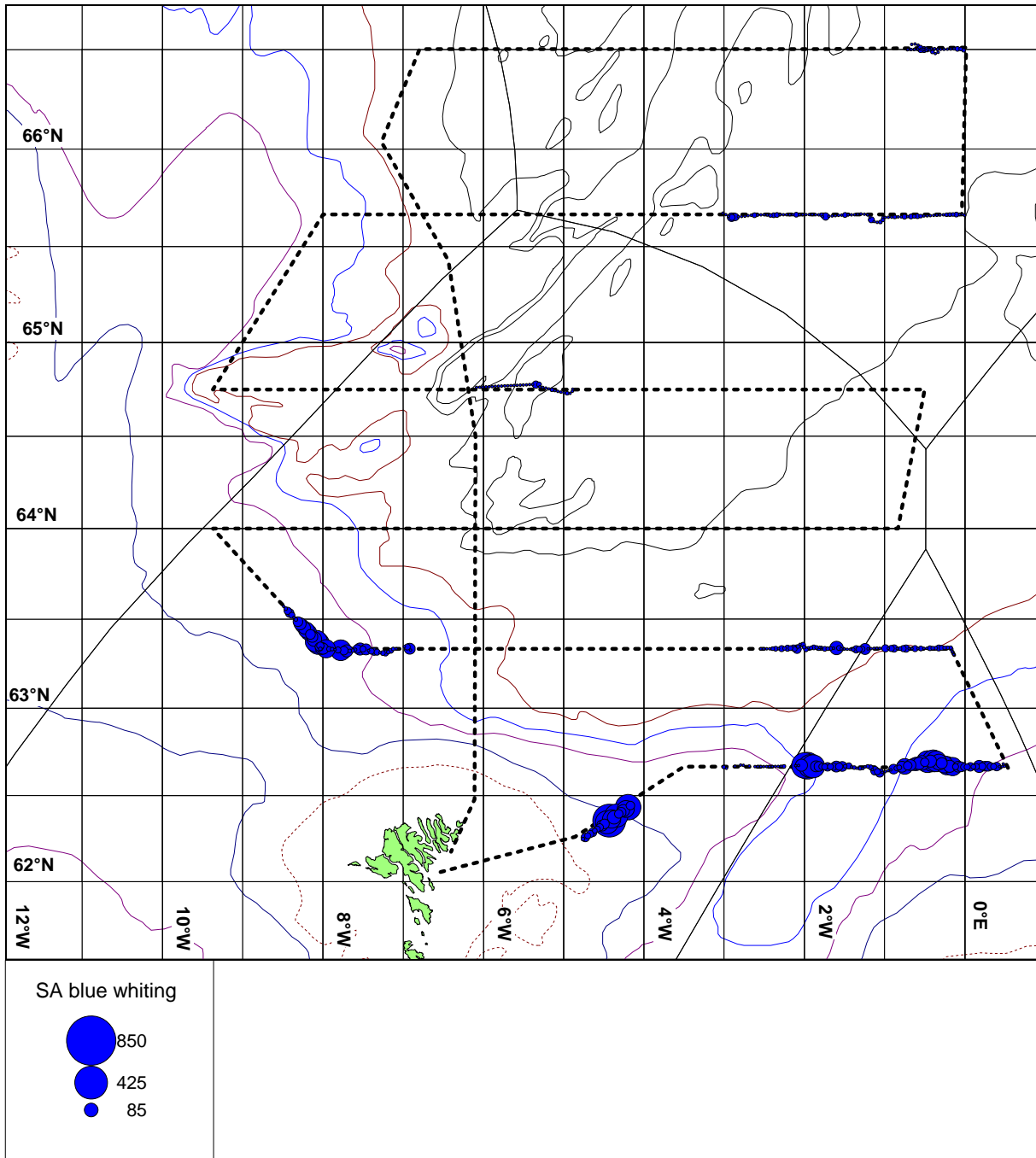
**Figure 3.** Mean integration values ( $s_A$ ,  $m^2/nm^2$ ) of Norwegian spring spawning herring per statistical square (1x2 degrees), *Magnus Heinason* cruise 0824, 30/4-14/5 2008.



**Figure 4.** Length distribution of Norwegian spring spawning herring north of the Faroes, *Magnus Heinason* cruise 0824, 30/4-14/5 2008.

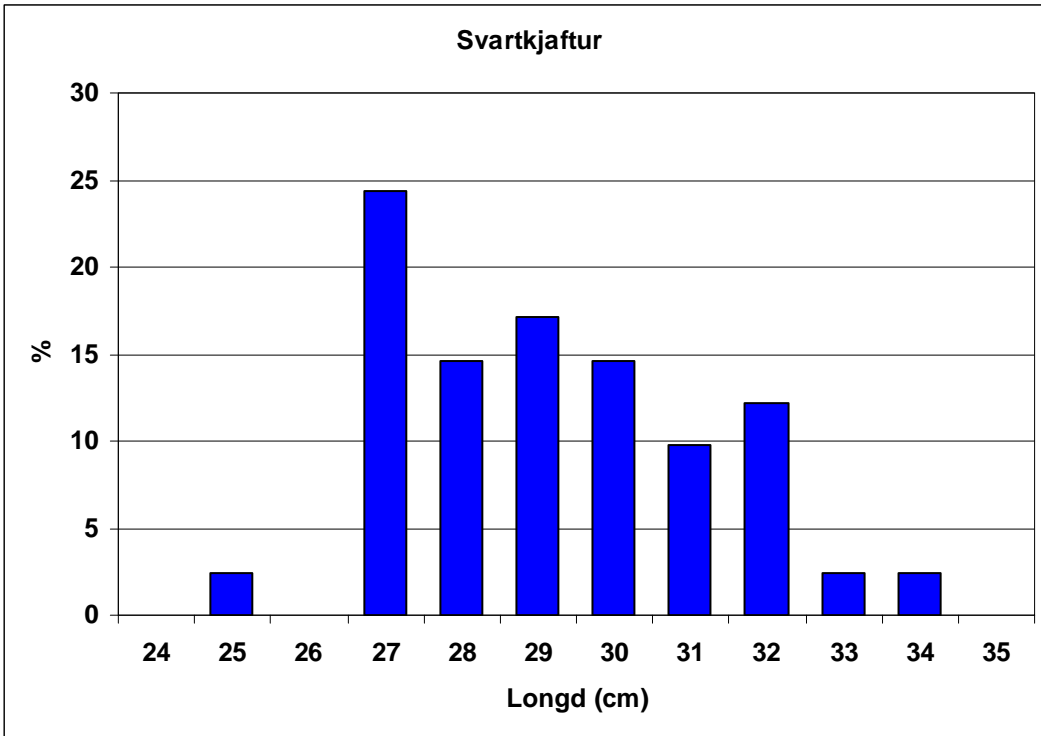


**Figure 5.** Age distribution of Norwegian spring spawning herring north of the Faroes, *Magnus Heinason* cruise 0824, 30/4-14/5 2008.

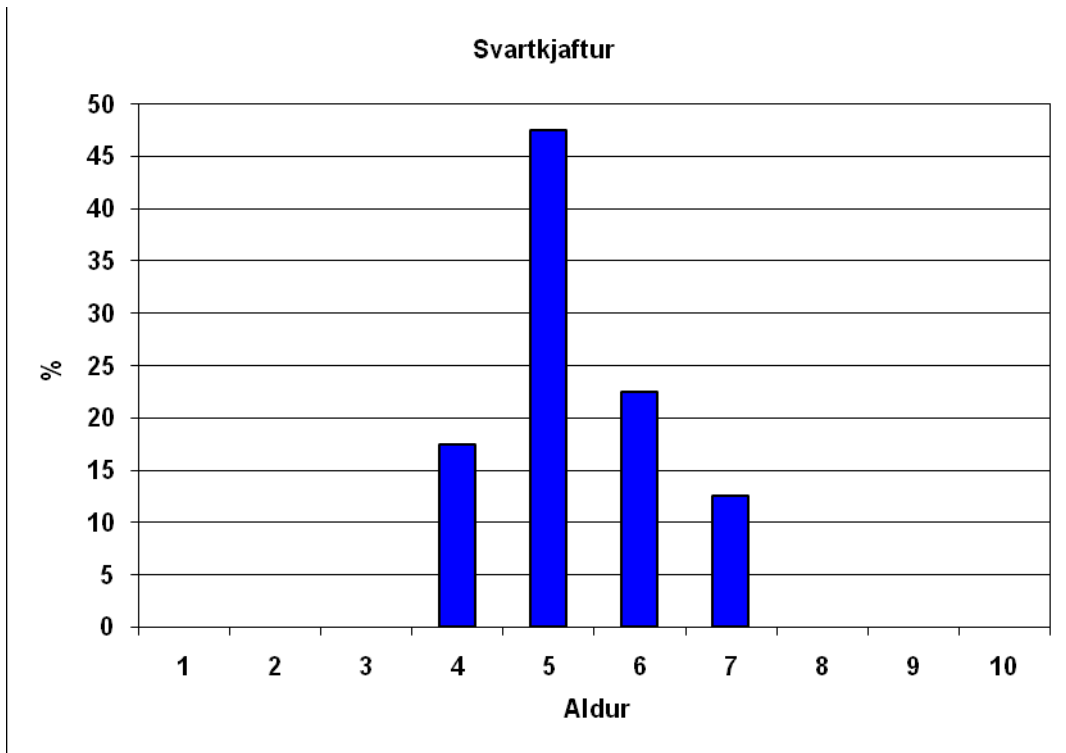


**Figure 6.** Integration values ( $s_A$ ,  $m^2/nm^2$ ) of blue whiting per 1 nm along the cruise tracks, *Magnus Heinason* cruise 0824, 30/4-14/5 2008.

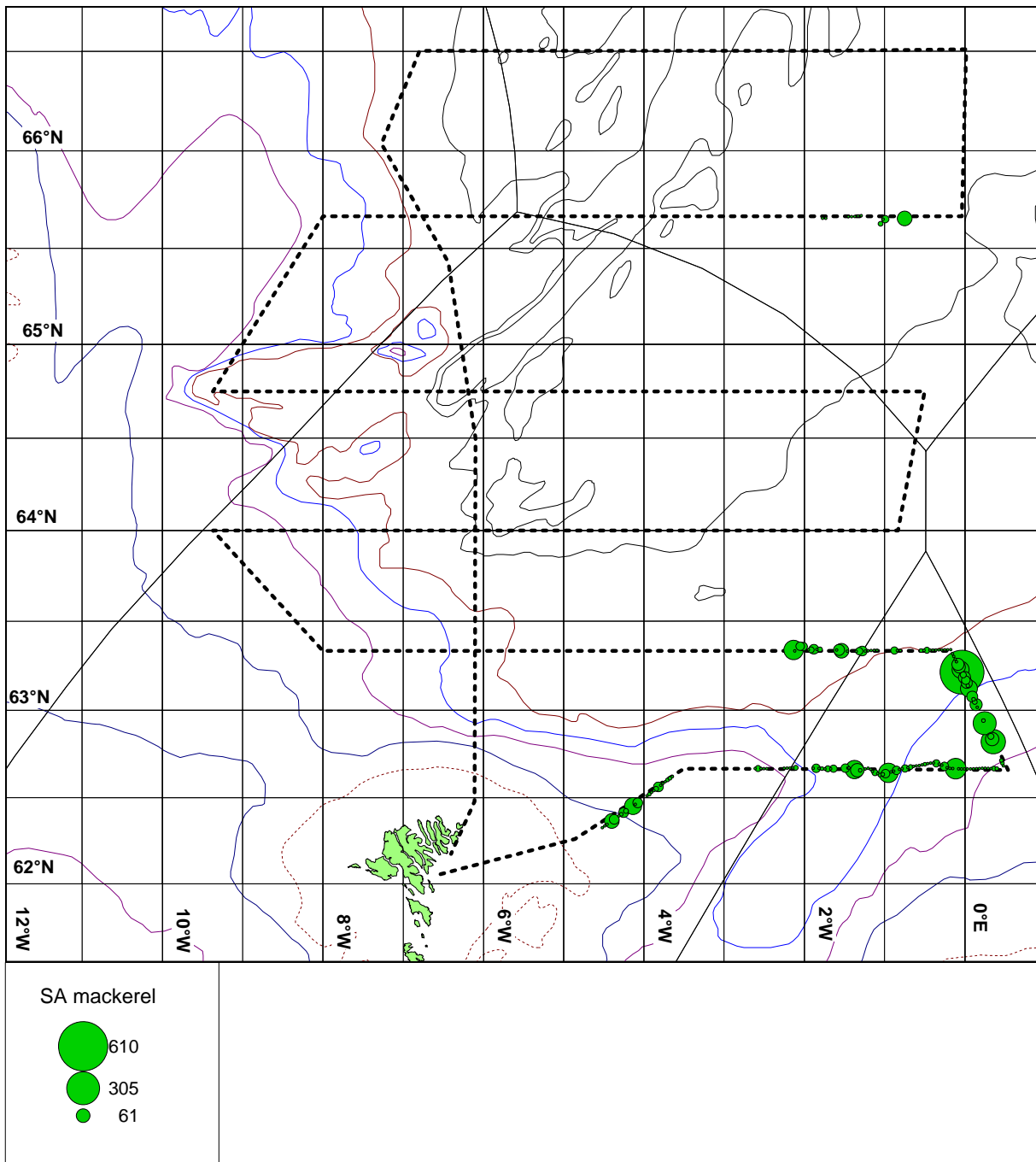




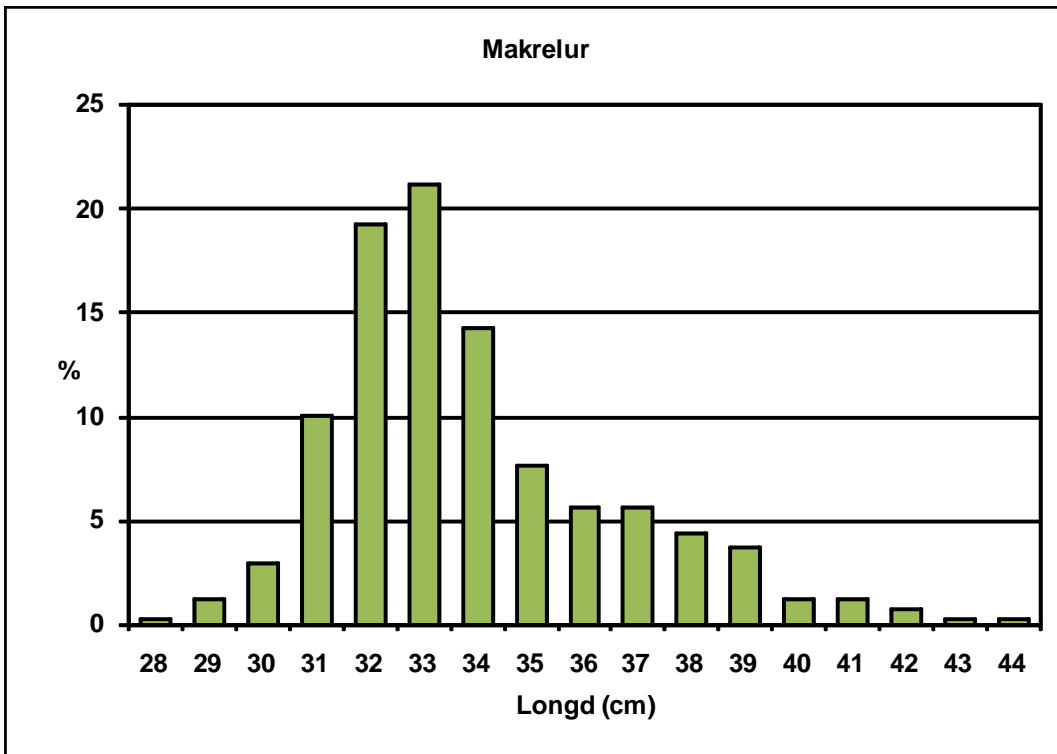
**Figure 7.** Length distribution of blue whiting north of the Faroes, *Magnus Heinason* cruise 0824, 30/4-14/5 2008.



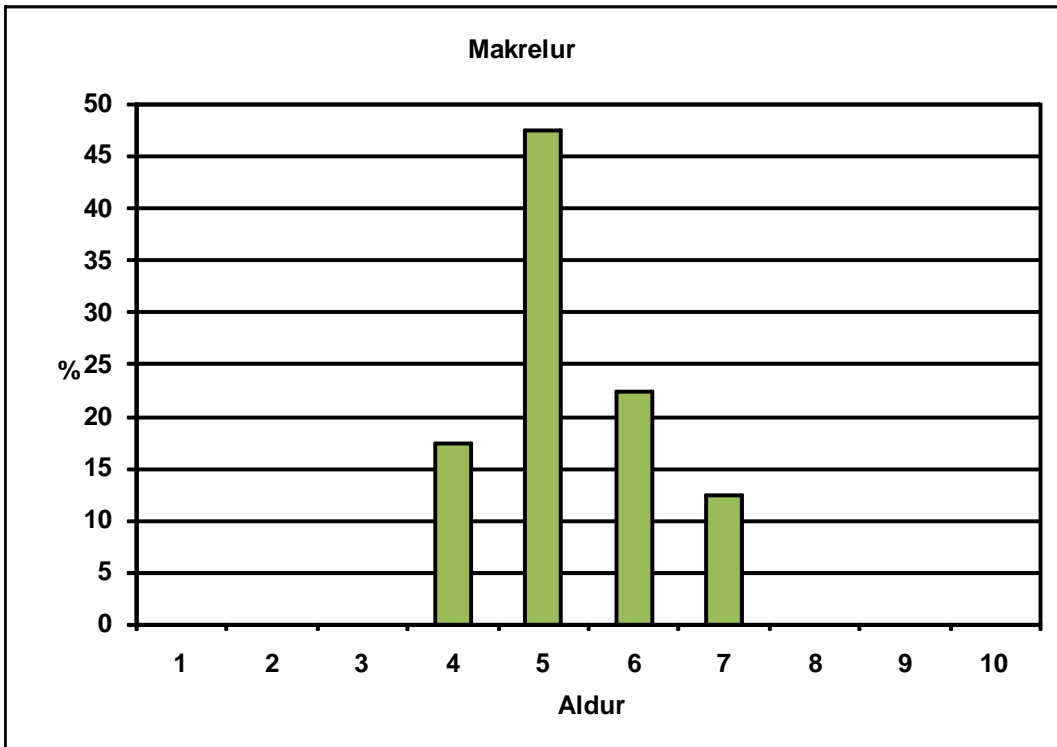
**Figure 8.** Age distribution of blue whiting north of the Faroes, *Magnus Heinason* cruise 0824, 30/4-14/5 2008.



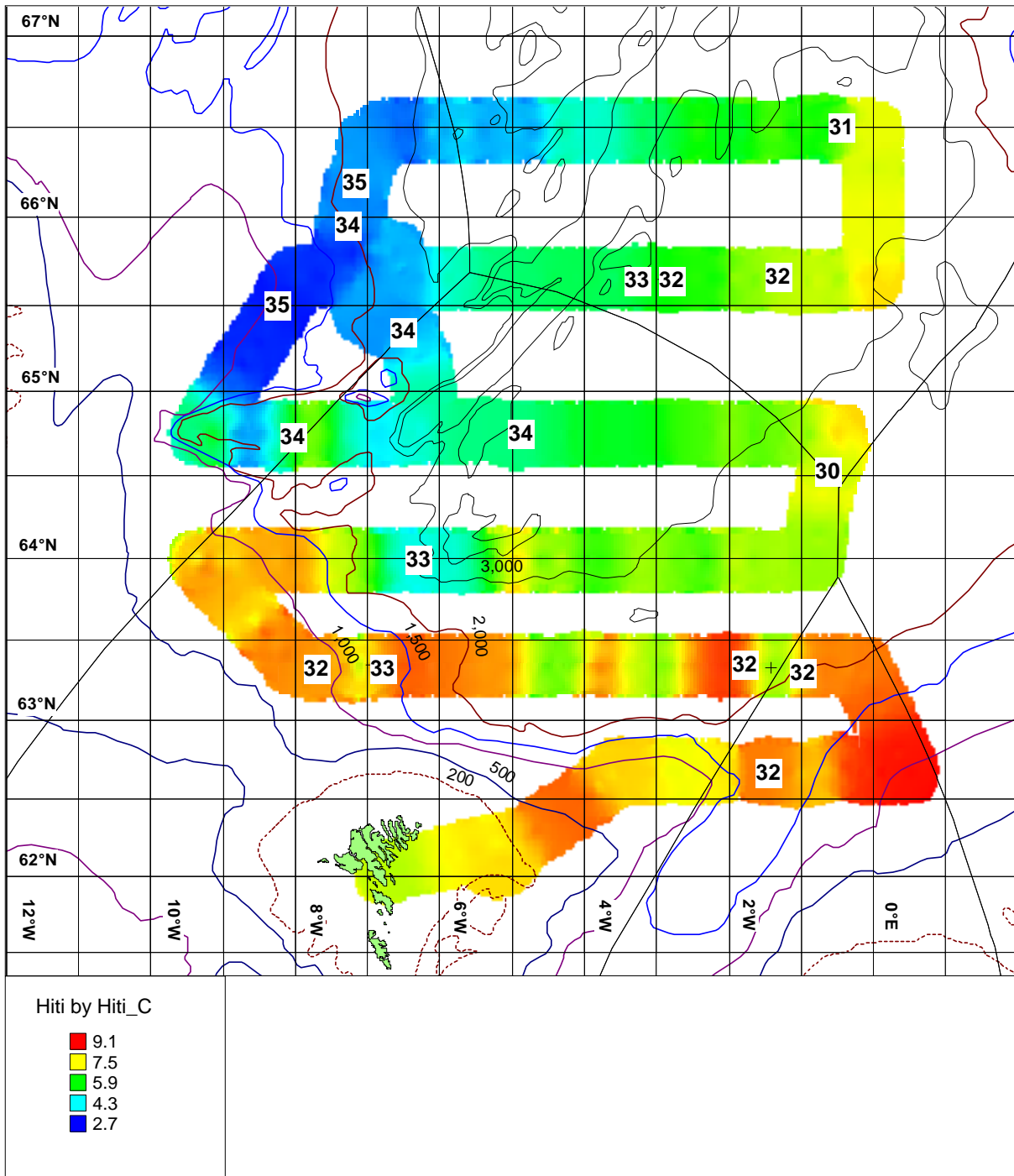
**Figure 9.** Integration values ( $s_A$ ,  $m^2/nm^2$ ) of mackerel per 1 nm along the cruise tracks, 30/4-14/5 2008.



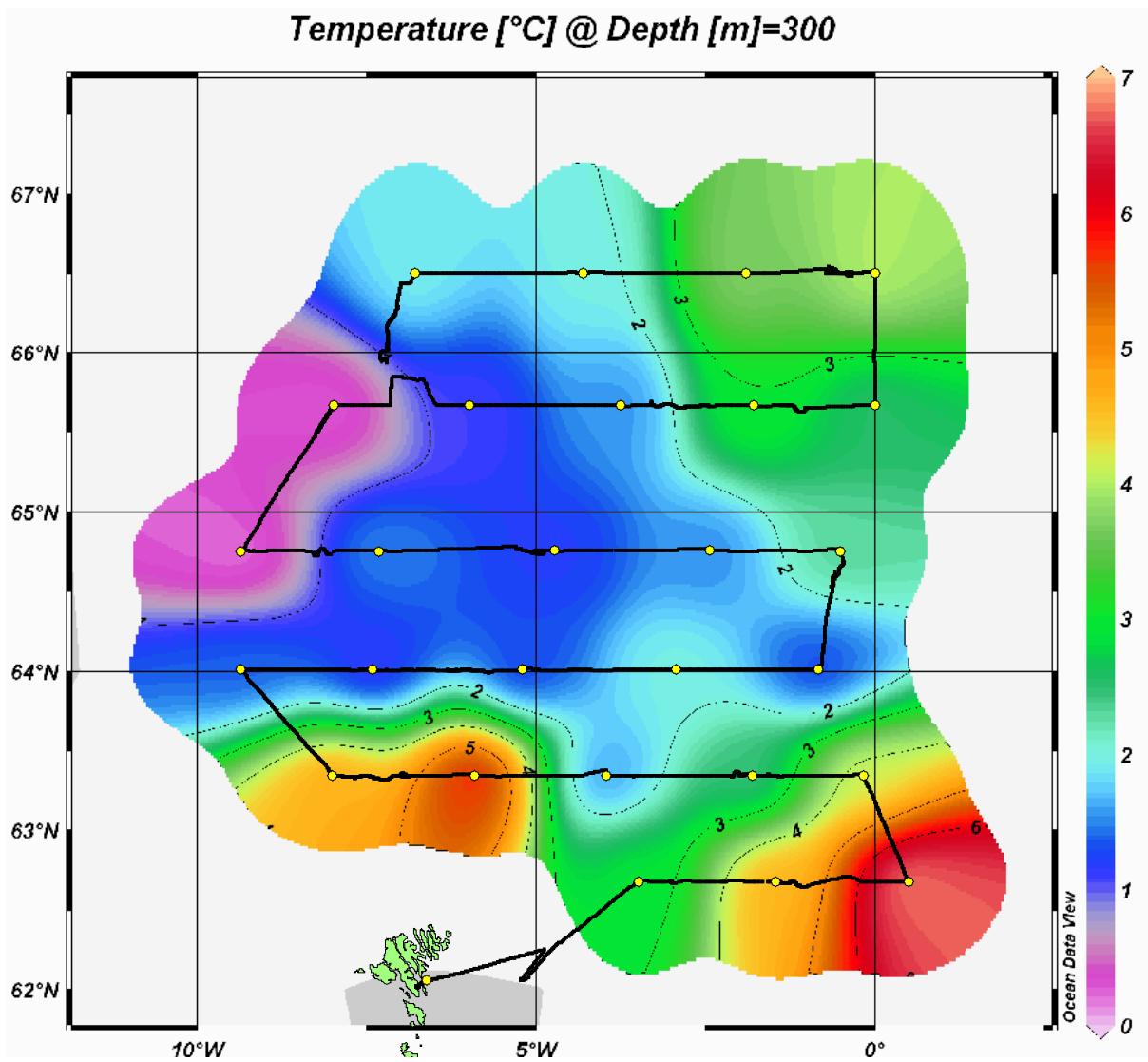
**Figure 10.** Length distribution of mackerel (mean length 34.3 cm) north of the Faroes, *Magnus Heinason* cruise 0824, 30/4-14/5 2008.



**Figure 11.** Age distribution of mackerel north of the Faroes (mostly the 2003-2005 year-classes), *Magnus Heinason* cruise 0824, 30/4-14/5 2008.



**Figure 12.** Sea-surface temperature along the cruise track with the mean length of herring at each trawl station superimposed on the map, *Magnus Heinason* cruise 0824, 30/4-14/5 2008.



**Figure 13.** Temperature (°C) at 300 m depth, cruise 0824, 30/4-14/5 2008.

## **APPENDIX 1: Configuration of sampling gears**

### Pelagic trawl used to collect the biological samples during the survey:

Type: “Vónin”, 640 m circumference  
Vertical opening 45-55 m (average 47 m)  
Horizontal opening 58-62 (average 60 m)  
Mesh size in the mouth is 16 m, gradually decreasing to 40 mm in the cod-end  
Towing speed 3.0-4.0 knots (average 3.5 knots)  
Weights on each side on lower bridles 800 kg.  
Trawl doors: Faroese “Vágslemmar” injector type 750 kg, 5.5 m<sup>2</sup>

### Salmon trawl (to be towed at the surface):

Circumference 257 m, headline length 170 m  
Vertical opening 10 m  
Horizontal opening approximately 40 m  
Mesh size in the wings 160 cm, and 80 cm in the mouth, gradually decreasing to 20 mm in the aft part, the cod-end was 40 mm  
Towing speed 3.5 - 4.5 knots (on average 4 knots)  
Weights on each side on lower bridles 60 kg  
The whole headline was of the “floating” type, in addition one 125” buoy attached on each wingtip, and three large “fenders” were tightly attached to the headline  
Trawl doors: “Vágslemmar” injector type 390 kg, 2.3 m<sup>2</sup>

### Plankton trawl/krill trawl

A 9mx9m fine meshed (8 mm knotless square mesh) 45 m long plankton trawl for macrozooplankton

### WP2 net

A WP2 plankton net (0.5 m diameter and 180 µm mesh size) was hauled vertically from 200 m up to the surface

### CTD

CTD rigged with a rosette for water sample bottles and a fluorometer