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R/V *Magnus Heinason* OW2252

# Surveys on herring and blue whiting in the Faroese area during spring 2005

by

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## INTRODUCTION

This report is based only on data from R/V *Magnus Heinason*, and therefore the estimates produced cover only the Faroese area.

Two cruises on blue whiting and herring were undertaken by the Faroese Fisheries Laboratory (FFL), the first in April 2005 targeting spawning blue whiting south of the Faroes and the second in May 2005 targeting blue whiting and Norwegian spring spawning herring in the northern part of the Faroese area. Both cruises during spring 2005 were part of joint international surveys (Faroes, Norway, Iceland, EU, Iceland, and Russia) coordinated by the ICES Planning Group on Northeast Atlantic Pelagic Ecosystem Surveys (PGNAPES, formerly PGSPFN). Five research vessels participated in the blue whiting survey west of the British Isles: *G.O.Sars* (NO), *Celtic Explorer* (IR, EU), *Tridens* (NE, EU), *Fritjof Nansen* (RU) and *Atlantniro* (RU). Six research vessels participated in the joint herring and blue whiting survey in the Norwegian Sea and Barents Sea: *Magnus Heinason* (FO), *Dana* (DK, EU), *G.O. Sars*, *Johan Hjort* (NO), *Árni Fridriksson* (IC), and *Fridtjof Nansen* (RU). Data from all vessels will be used in a joint comprehensive report during the PGNAPES meeting in 2005, covering research surveys in the Norwegian Sea during the summer 2005.

## MATERIAL AND METHODS

During 30/4-13/5 2005 (cruise 0520) R/V *Magnus Heinason* surveyed the northern part of the spawning areas of blue whiting south of the Faroe bank and Bill Bailey bank and postspawning blue whiting concentrations in the southern part of the Faroese area (Fig. 1).

During 4-18/5 2005 (cruise 0532) R/V *Magnus Heinason* covered the Norwegian spring spawning herring and blue whiting in the northern part of the Faroese area and southern Norwegian Sea (Fig. 2). The main aims were to investigate the distribution and abundance of postspawning blue whiting and Norwegian spring spawning herring in the Faroese area and in the southern Norwegian Sea.

Hydrographic data were collected along the cruise tracks only during the May (latter) survey with a CTD down to 1000 m depth or to the bottom. Water samples were taken from each station, with water bottles mounted on the CTD, for analysis of nutrients. Samples for chlorophyll 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 with 180 μm meshes.

During the surveys, continuous acoustic recordings of fish and plankton were collected using calibrated echo integration systems (Simrad EK-500 echo sounder) at 38 kHz frequency. Acoustic instruments and settings is given in Appendix 1. The average area backscattering recordings ($s_A$) per 5 nautical mile were scrutinised every 24 hrs on board using Sonar data's Echoview (V 3.25) post processing software. Data were partitioned into the following categories: plankton (<200 m depth layer), herring, mesopelagic species, blue whiting and krill. Partitioning of data into the above categories was based on trawl samples as well as on visual inspection of the echogram. No correction for drop-outs were made, and this caused some problems during the latter part of the blue whiting survey south of the Faroes.

The abundance of herring and blue whiting is calculated from the acoustic recordings. The methodology is in general terms described by Toresen *et al*. (1998). For blue whiting the following

target strength (TS) function has been used: TS = 21.8 log L – 72.8 dB, where L is fish length in centimetres. For herring 20 log(L) – 71.9 dB has been used Foote *et al*. (1987). For conversion from acoustic density ($s_A$, $m^2/nm^2$) to fish density ($\rho$) the following relationship was used: $\rho = s_A/\langle\sigma\rangle$, where $\langle\sigma\rangle = 6.72 \cdot 10^{-7} L^{2.18}$ is the average acoustic backscattering cross section ($m^2$). The total estimated abundance is redistributed into length classes using the length distribution estimated from trawl samples. Biomass estimates and age-specific estimates are calculated using age-length keys and average weight by age.

Catch from the trawl hauls was sorted and weighed; fish were identified to species. Normally a sub-sample of 100 specimens of blue whiting and herring were sexed, aged, and measured for length (mm) and weight (g), and their maturity status were estimated using established methods. An additional sample of 50-100 fish was measured for length and weight. Details of the trawls used are given in Appendix 2.

**RESULTS**

Blue whiting – April spawning survey (cruise 0520) and May survey (cruise 0532)

The average $s_A$ values of blue whiting by statistical square from the survey in the southern part of the Faroese area are shown in Fig 3. The highest concentrations of post spawning blue whiting were recorded along the eastern edge of the Faroe bank and on the Monk (Munkagrunnurin).

In the northern area blue whiting was observed in most of the Norwegian Sea with highest concentrations north of the Faro plateau, off the shelf (Fig. 4). The density of blue whiting in the central and northern part of the surveyed area in May was rather low as compared to previous years.

The length distributions of blue whiting in the Faroese area south of 62°N (cruise 0520) and north of 62°N (cruise 0532) are shown in Fig. 5a and 5b, and the age distribution in the southern area is shown in Fig. 6. Age groups 1-4 dominated, i.e. the year-classes 2000-2003.

Herring – May survey (cruise 0532)

Norwegian spring spawning herring observations in the Faroese area May 2005 (Fig. 7), were distributed in the 200-250m layer during day and during night at 30-100m depth. The herring was about 33.5cm (270g) (Fig. 8), and the 1998 year-class (7 year old) and the 1999 year-class (6 year old) dominated (Fig. 9). R/V *Magnus Heinason* registered about 1.7 mill. tonnes of herring in the area north of the Faroes. In the south-east some North Sea herring was observed in the upper layer, and this herring was smaller that the Norwegian spring spawning herring.

Combined abundance estimates of blue whiting and Norwegian spring spawning herring will be calculated during the meeting of the PGNAPES in August 2005, and reported to the ICES Northern Pelagic and Blue Whiting Fisheries Working Group (WGNPBW) in late August 2005.

Other species

A few mesopelagic fishes were captured during some of the trawl hauls, however. It should be noted that the mesh size in the cod-end (40 mm) is to large to retain such small fish. Visual inspection of the recordings on the echo sounder did not reveal any large amount of mesopelagic species in the area. Only a few saithe were caught as by-catch during the surveys.

Zooplankton

Preliminary results suggests lower abundance of zooplankton (mainly *Calanus* spp.) in the area north of the Faroes compared to 2004. However, deeper in the water column, from 150-500m depth, krill (*Meganyctiphanes norvegica*) seemed to be abundant.

Hydrography

The sea-surface temperature in the surveyed area is shown in Fig. 10. The influence of the East-Icelandic current is strong in 2005, leading to relatively cold water northwest of the Faroes.

**REFERENCES**

Foote, K. G., Knudsen, H. P., Vestnes, G., MacLennan, D. N., and Simmonds, E. J. 1987. Calibration of acoustic instruments for fish density estimation: a practical guide. ICES Coop. Res. Rep. 144: 1–57.

Toresen, R., Gjøsæter, H. and Barros de, P. 1998. The acoustic method as used in the abundance estimation of capelin (Mallotus villosus Müller) and herring (*Clupea harengus* Linné) in the Barents Sea. Fish. Res. 34: 27–37.

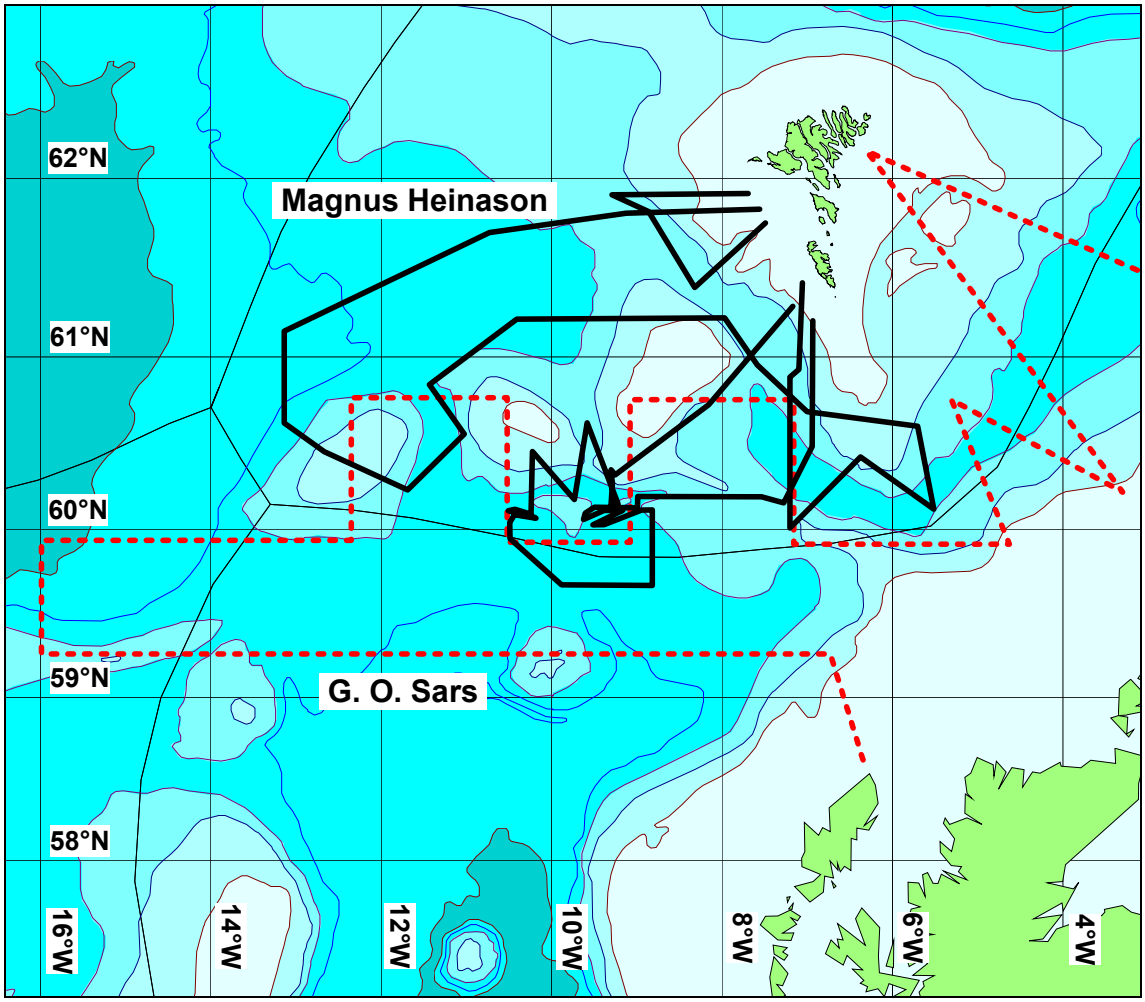


**Fig. 1.** Cruise tracks in the southern part of the Faroese area, R/V *Magnus Heinason* 30/3-13/4-2005. Cruise tracks of R/V *G.O.Sars* are also shown.

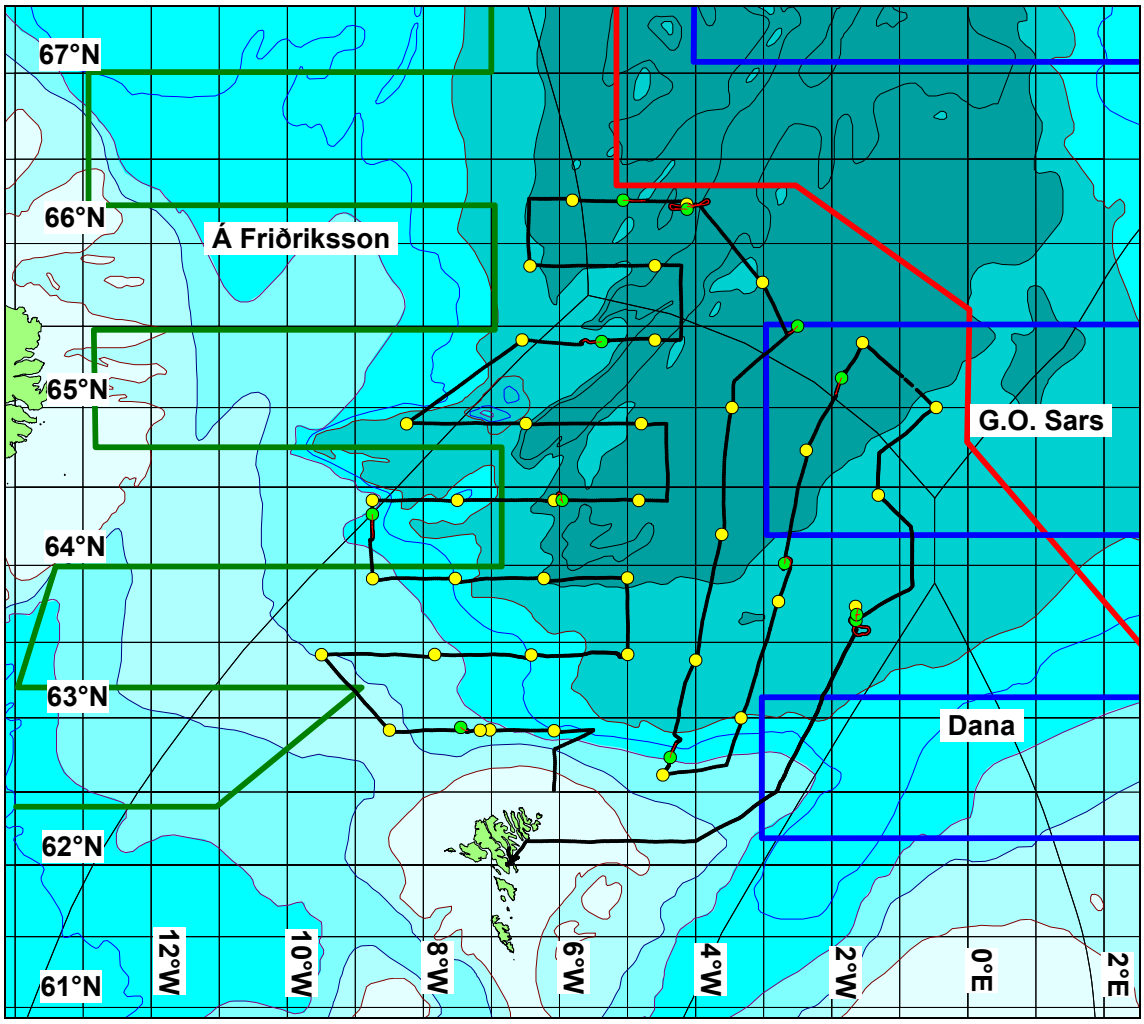


**Fig. 2.** Cruise tracks with hydrographic stations (light yellow ) and trawl stations (dark green ) in the Faroese area and in the southern part of Norwegian Sea, R/V *Magnus Heinason* 28/4-26/5 2005. Cruise tracks of R/V *G.O.Sars*, *Dana*, and *Árni Friðriksson* are also shown.

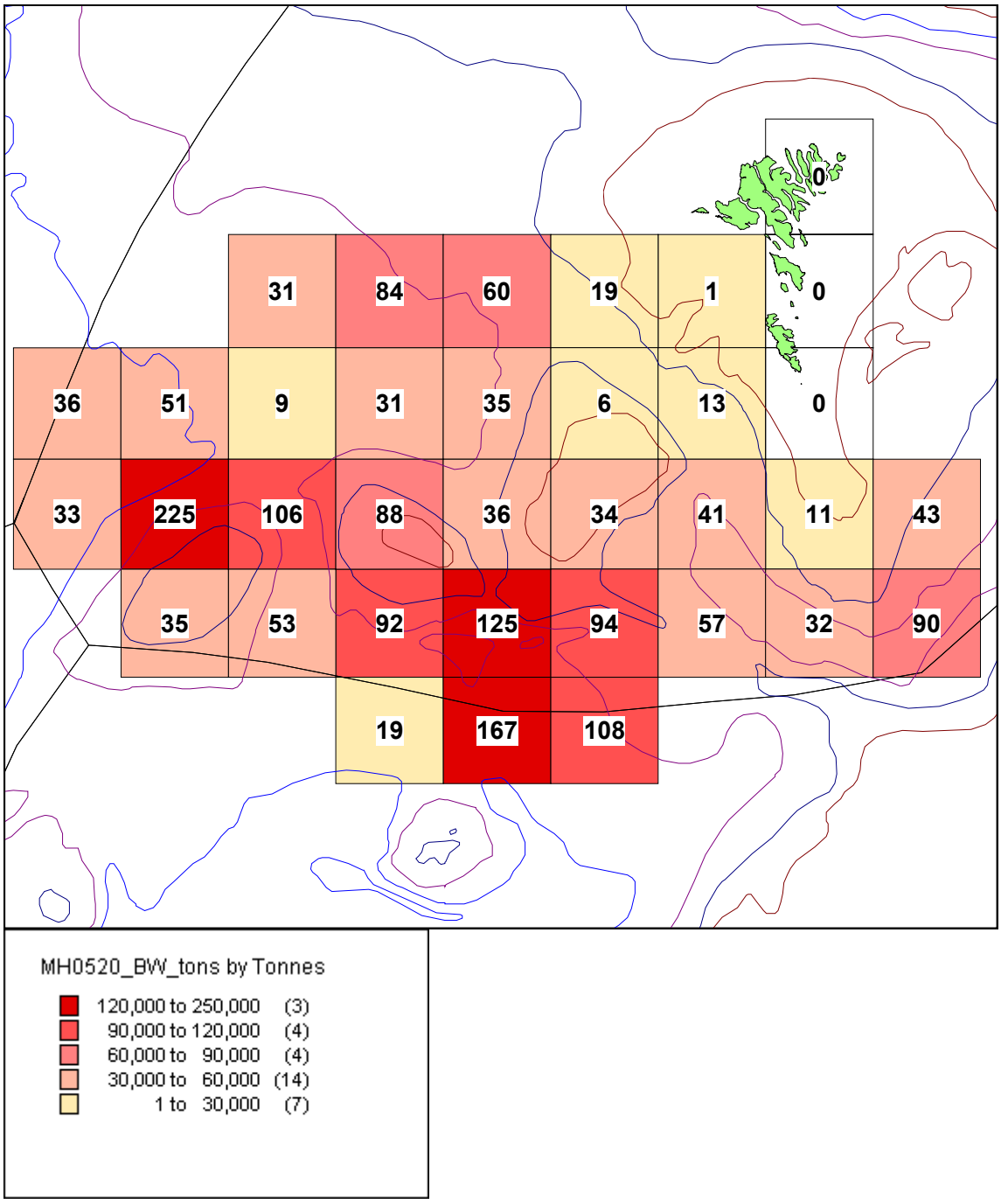


**Fig. 3.** Mean integration values ($s_A$, $m^2/nm^2$) of blue whiting per statistical square (1x2 degrees) in the southern part of the Faroese area, May 2005. Approximately 1.9 million tonnes.

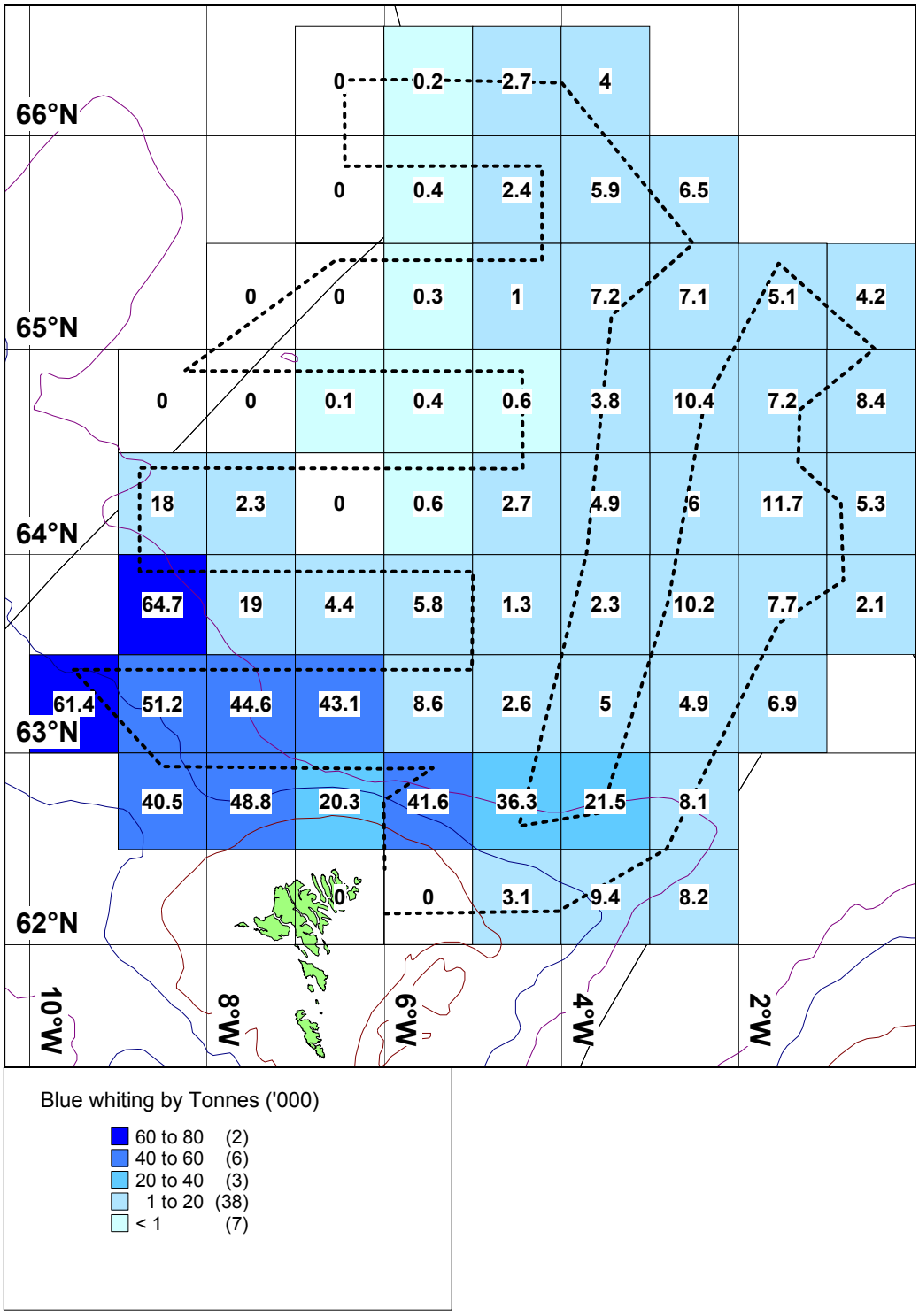


**Fig. 4.** Mean integration values ($s_A$, $m^2/nm^2$) of blue whiting per statistical square (1x2 degrees) in the Faroese area and in the southern part of Norwegian Sea, May 2005. Approximately 710 thousand tonnes.

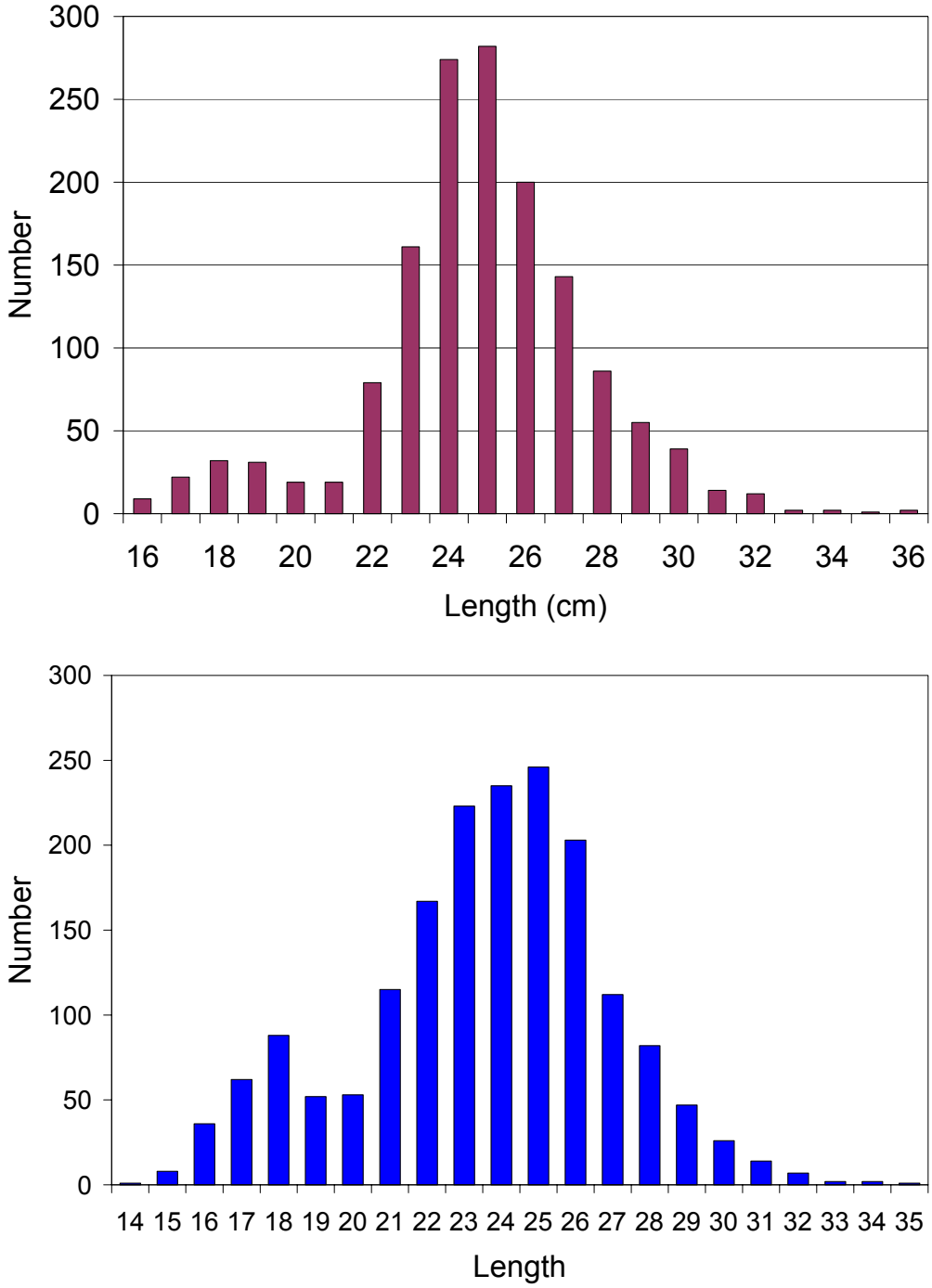


**Fig. 5.** Length distribution of blue whiting **a**) upper panel in the southern part in April 2005 (<62°N, dark blue bars) and **b**) lower panel in the northern part in May 2005 (light bars) of the Faroese area, R/V *Magnus Heinason*.

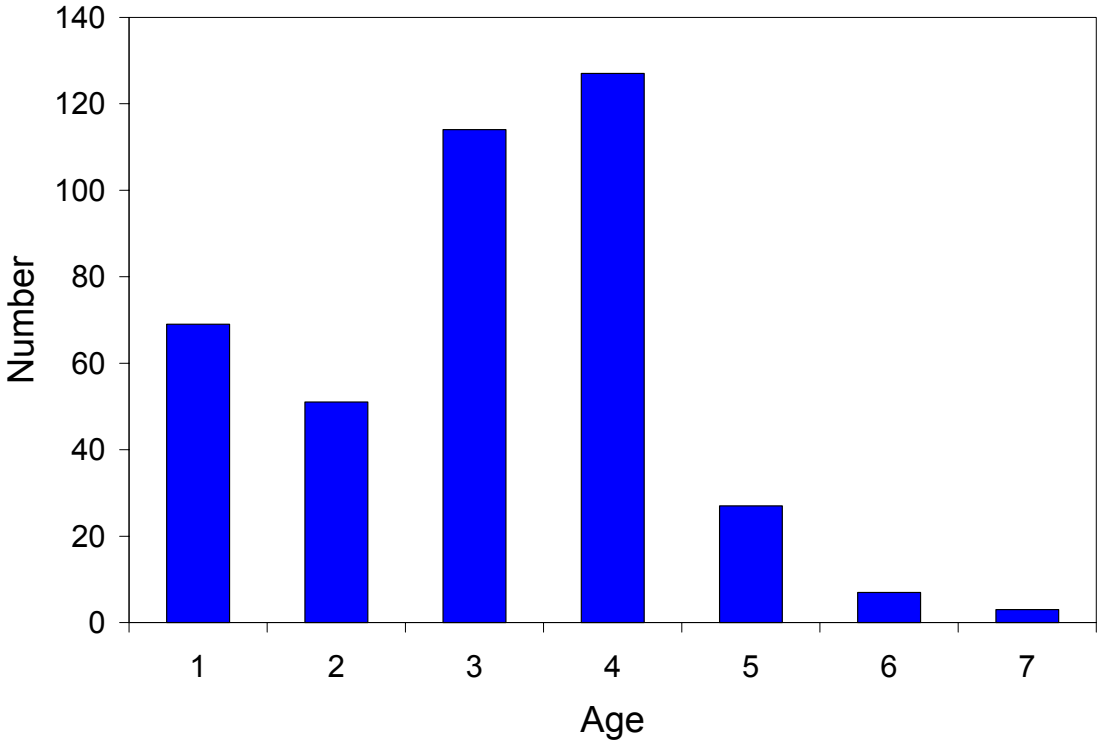


**Fig. 6.** Age distribution of blue whiting a) in the southern part in April 2005 (< 62°N, dark blue bars) and b) in the northern part in May 2005 (light bars) of the Faroese area, R/V *Magnus Heinason*.

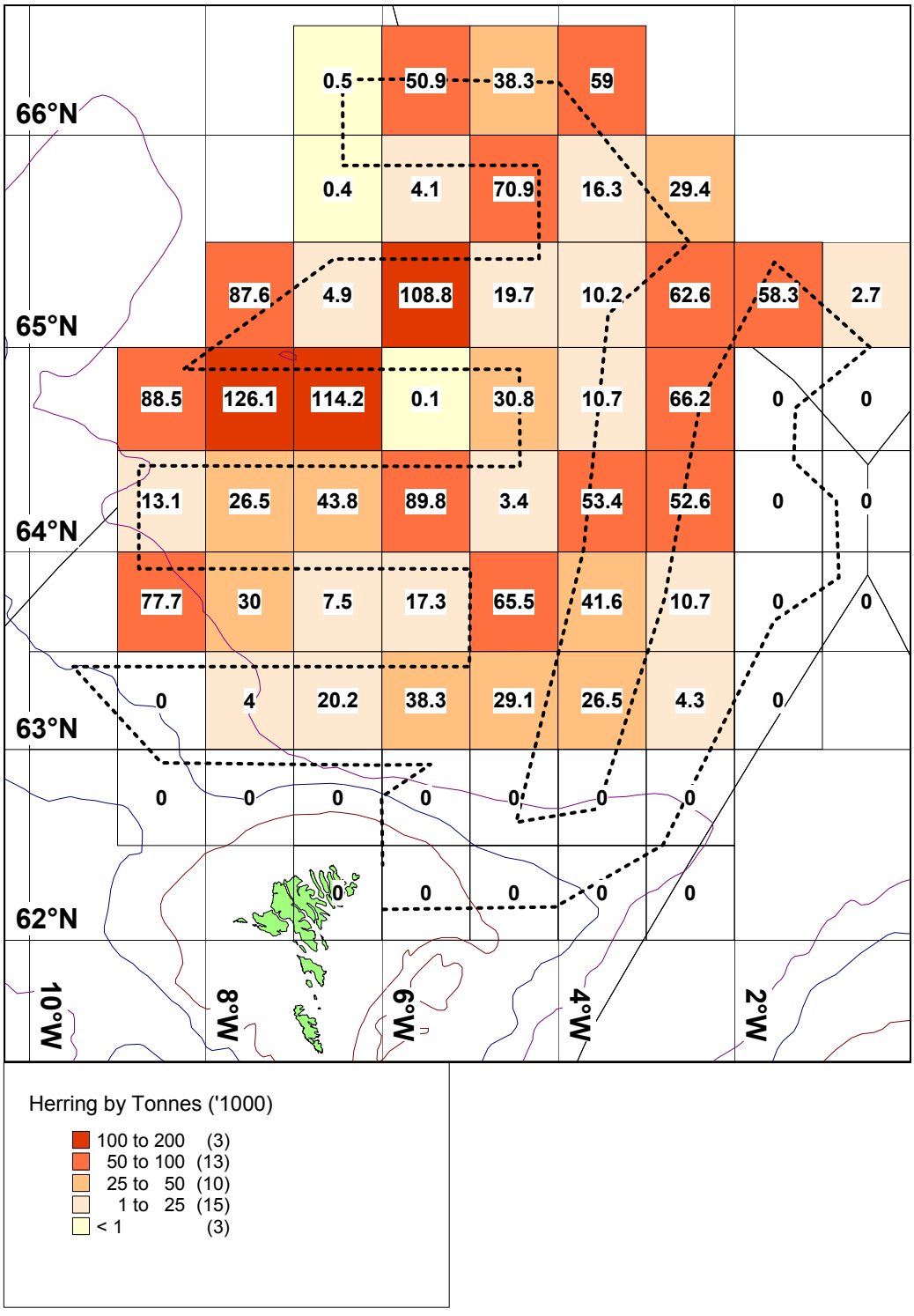


**Fig. 7.** Mean integration values ($s_A$, $m^2/nm^2$) of herring per statistical square (1x2 degrees), May 2005. Approximately 1.7 million tonnes.

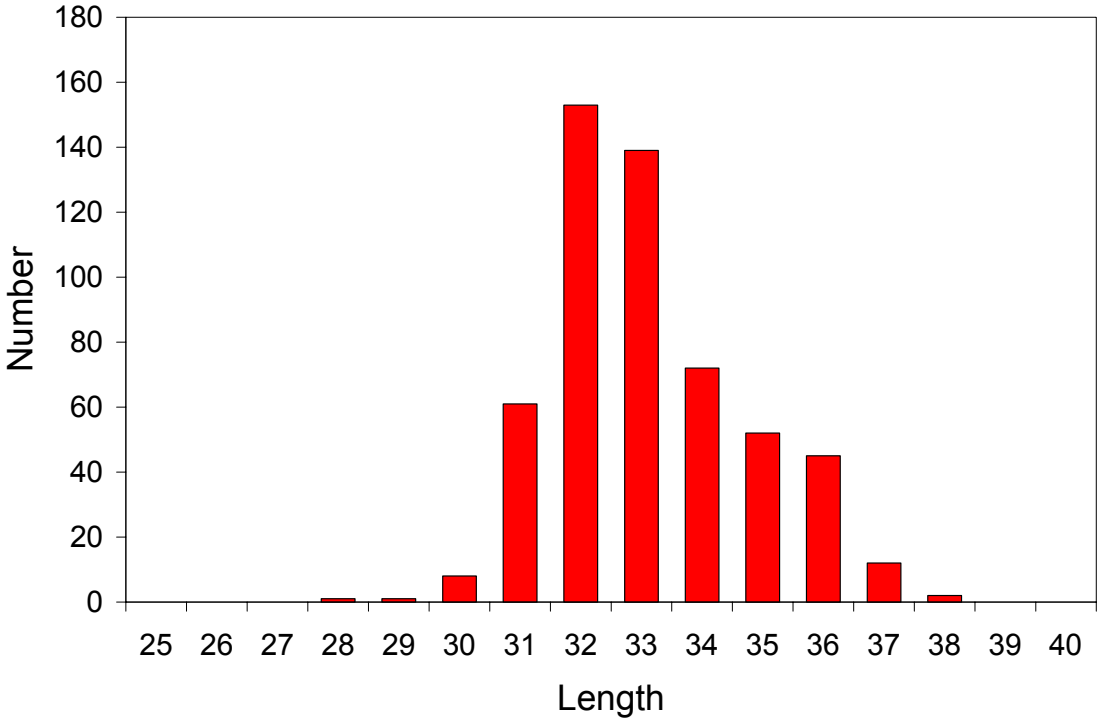


**Fig. 8.** Length distribution of herring in the northern part of Faroese area sampled from R/V *Magnus Heinason*, May 2005.

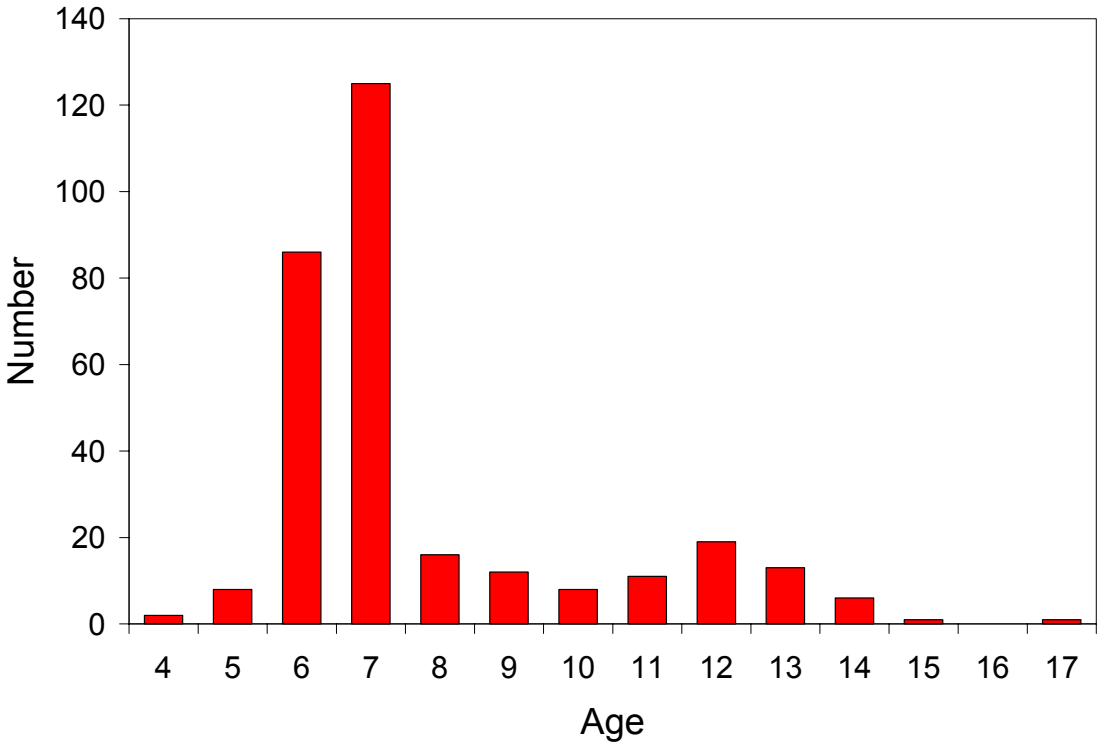


**Fig. 9.** Age distribution of Norwegian spring spawning herring north of the Faroes. The most abundant year-classes are the 1998 (7 year old) and the 1999 (6 year old) year-classes. R/V *Magnus Heinason*, May 2005.

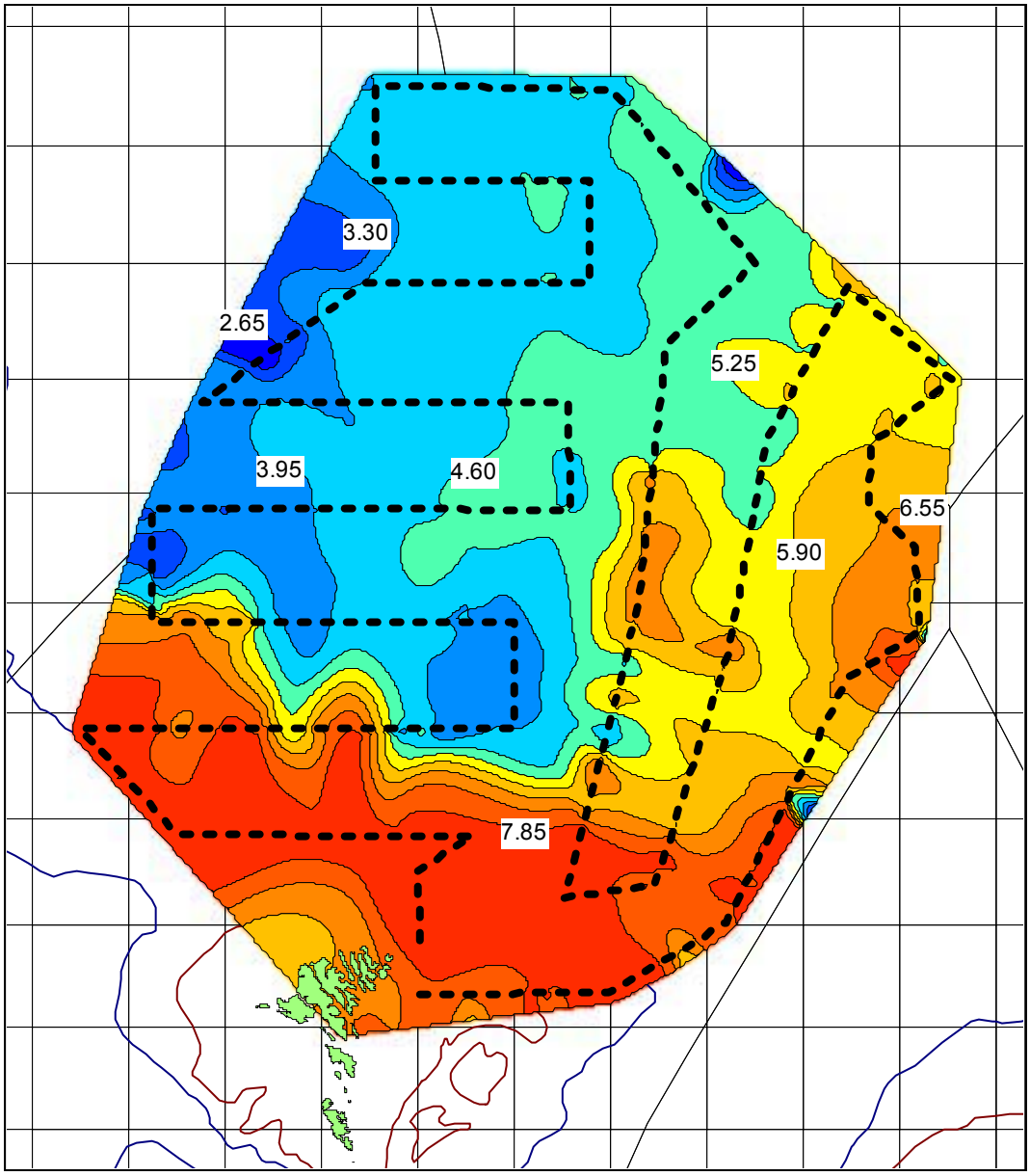


**Fig. 10.** Sea-surface temperature (°C), R/V *Magnus Heinason*, May 2005.

**Appendix 1. Acoustic instruments and settings**

Acoustic instruments and settings for the primary frequency (38 kHz) on the R/V *Magnus* Heinason, during the surveys in April-May 2005. The 38 kHz Echo sounder was calibrated prior to the survey following standard procedures.

| | |
|---|---|
| Echo sounder | Simrad EK 500 |
| Frequency (kHz) | 38 |
| Primary transducer | ES38B |
| Transducer installation | Hull |
| Transducer depth (m) | 3 |
| Upper integration limit (m) | 7 |
| Absorption coeff. (dB/km) | 10 |
| Pulse length (ms) | Medium |
| Band width (kHz) | Wide |
| Transmitter power (W) | 2000 |
| Angle sensitivity (dB) | 21.9 |
| 2-way beam angle (dB) | -20.6 |
| Sv Transducer gain (dB) | 25.32 |
| Ts Transducer gain (dB) | 25.33 |
| $s_A$ correction (dB) | none |
| 3 dB beam width (dg) | |
| alongship: | 7.03 |
| athw. ship: | 6.93 |
| Maximum range (m) | 750 |
| Post processing software | Sonardata Echoview |

**Appendix 2. Configuration of the pelagic trawl**

Details of the blue whiting trawl (Svartkjaftatrol) used to collect most of the biological samples during the surveys in spring 2005 are listed below:

Circumference (m) 640
Vertical opening (m) 38-48
Mesh size in codend (mm) 40
Typical towing speed 3.0-4.0

In addition a couple of hauls were made with a shallow pelagic salmon trawl (Laksatrol) towed near the surface.