

JOINT SURVEY REPORT

VESSELS: R/V "PINRO" and R/V "G.O. SARS"

DATE OF SURVEY: 26. May - 14. June 1992

AREA: Southern Barents Sea

PURPOSE: Estimate the abundance of Atlanto-scandian herring in the Barents Sea. Map the hydrographical regime. Plankton sampling. Study feeding habits of herring and capelin.

INTRODUCTION

Since 1984, when the 1983 year-class of the Norwegian spring-spawning herring was distributed in the eastern part of the Barents Sea, a young herring survey has been conducted every year in May/June to estimate the abundance of the component spending the adolescence in the open Barents Sea. During this time of the year, the overall distribution of herring is well apart from the distribution of capelin and the weather conditions are favourable for acoustic abundance estimation. In the years, 1984 - 1991 these investigations have been conducted by a Norwegian vessel. In many years, however, the distribution of young herring have been close to the Soviet (Russian) coast and the Norwegian vessel has been unable to cover the full area of distribution due to restrictions in entering the "fishery" zone. Therefore, and also to get a better coverage in the main distribution area in the open sea, it was suggested on the March 1992 Murmansk meeting to make joint effort in estimating the abundance of this stock. The meeting agreed on using one vessel from each country to cooperate during the survey in 1992. This is the joint report following this survey agreed upon by the participating scientists.

MATERIAL AND METHODS

During this time of the year the herring is expected to be distributed in the southern part of the Barents Sea, close to the Norwegian and the Russian coasts, mainly to the south of 73°00'N. It is also expected to find herring younger than four years of age only.

The research vessel, "G.O. Sars" started the coverage from the west on the 26. of May, and was joined by R/V "PINRO" on the 5. of June (Fig. 1). The Russian vessel started the coverage

from the east along the Russian coast. It was agreed to cover the area by north-south transects starting from west, one degree longitude apart (about 20 NM). "G.O. Sars" started along the 21°00'E longitude. In the area with highest concentrations of herring, transects were run 10 NM apart. This was the area between longitudes 32°00' and 34°00'E.

Hydrographical stations (CTD) were performed every 30 NM. Altogether 121 stations were taken, 92 on "G.O. Sars" and 29 on "PINRO".

On "G.O. Sars", different nets were used to collect plankton. Figure 2 shows how the plankton stations were distributed in the survey area. The GULF III (375 μ) was used mainly to collect capelin larvae, and hauled slowly from 60 m to the surface at 5 knots. The WP-2 net (180 μ) was used at 35 stations to sample plankton, hauled from bottom to surface and from 100 m to the surface. Half of the samples are fixed in Formalin and the other half fractioned in 2000-, 1000- and 180 μ and dried. These samples will later be used for biomass estimates of zooplankton.

On 6 stations, the MOCNESS plankton sampler was applied to sample plankton in up to 8 depths depending on the bottom depth and the depth of the main concentrations of plankton on the actual position. The nets in this gear are all 200 μ . The samples were treated in the same way as the samples from the WP-2 nets. At the stations where MOCNESS were run, samples for determination of chlorophyll, nutrition salts, suspended organic materials like POC/PON-POP-PSi were taken at standard depths.

Fluorescence measurements were made at all CTD stations for measurement of phytoplankton activity.

On both vessels, trawling was done on registrations, both pelagic and close to bottom. On "G.O. Sars", 39 trawl stations were performed, 36 pelagic and 3 on the bottom. On "PINRO", 9 trawl stations were performed, all pelagic.

When herring or capelin were caught by "G.O. Sars", a GULF III- and a WP-2 net station were performed in the same position. Stomachs of herring and capelin were sampled on all stations where these were caught to study the diet of these species in the area. More than 200 stomachs were examined during the survey, and the same amount is preserved in Formalin to be analysed later. Frozen samples of herring will also be analysed later for stomach content.

The echo recordings were processed applying the standard echo integration method. The registrations were daily scrutinized and the S_x -values for herring were used to calculate the abundance. The following TS function was applied to convert the S_x -values to fish densities:

$$TS = 20 \log L - 71.9 \text{ dB}$$

where L is the total length of the fish. The two vessels had radio contact every day to exchange sailing diary, S_A -values and trawl data. An intercalibration was performed between the two participating vessels on the night 12. - 13. June. A separate report on this calibration was written on the 13. June in the sea. This report which includes the settings of the instruments of the two vessels, concludes that the acoustic performance of the two vessels is 1:1.

The estimate of herring divided in age groups in three separate areas is based on the length and age distribution as shown in Figure 5 a-c. The calculations were done on EXCEL (v. 3.0) sheets, especially designed for this purpose.

After the survey, on the 13. June, a meeting was held onboard "G.O. Sars" to finish this report.

RESULTS

Hydrography

The overall hydrographic regime in the surveyed area is shown in Figures 3 a-d. In the area there is an inflow of Norwegian coastal water close to the coast and an inflow of Atlantic water in the northern part of the area. In the water where herring was recorded, that is in about 150 m depth to the west of $31^{\circ}00'E$ and in about 50 m to the east of this longitude, the mean temperature was about $4.5^{\circ}C$.

Plankton

The plankton samples from this survey will be analysed at IMR later. However, in the western part of the survey area, high concentrations of plankton was recorded on the echo sounder, giving mean S_A -values pr 5 NM of 1000-2000. The plankton consisted mainly of *Calanus* sp., *Oicopleura* sp., krill and phytoplankton. In the central and east parts of the survey area, much less dense concentrations of planktonic organisms were recorded.

Herring

Three main centres of distribution were found (Fig. 4). One to the west of $31^{\circ}00'E$, one to the east of this longitude, between $70^{\circ}15'N$ and $71^{\circ}00'N$ and one close to the Murman coast. The herring in the western part of the survey area consisted mainly of 3-year olds while the concentrations in the eastern part mainly consisted of 1-year olds. In the Murman coast area 2-year olds dominated (Fig. 5). In the western area, the herring was found mainly in about 60 - 150 m depth, while in

the east, it was found closer to surface, at about 30 - 50 m depth. Length and age distributions for the three main centres of herring concentrations are shown in Figures 5 a, b and c. Estimates of the abundance in the three areas in terms of number and weight is shown in Table 1. This year, a relatively large amount of 3-year olds were found. The estimated number is somewhat higher than the number estimated last year for the same year-class. However, last year, the area close to the Murman coast was not covered. This is the area where most two year olds were found in 92. In addition bias in the sampling of the two dominating age groups (1 and 2) last year could disfavour the 2-year olds, as stated in last years report.

The estimated number of 1-year olds is relatively high. This is in agreement with last years 0-group survey index which rated this year-class (1991) as the best since 1983. This years estimate of the 1-year olds should be better than the one made last year since the age groups were more separated during this years survey, hence allocation of S_x -values to the age-groups should be more correct.

Also a few 4-year olds were recorded in the west this year. This is interesting as no 3-year olds were found last year.

Discussion

Points: The concentrations in the west has separated to migrate out of the Barents Sea.

The estimate of the 3-year olds is probably not suffering from significant sources of error as these were concentrated in layers 60 - 150 m depth.

The sources of error due to mixing with capelin may be rated as low. Only small concentrations of capelin were recorded.

The overall coverage of the stock in the area is good. It is not likely to believe that herring is distributed to the north or to the east of the surveyed area.

The estimate of the 1-year olds may be too low due to avoidance reations.

At sea, 13. June 1992

Alexander Kryssov
(sign.)

Reidar Toresen
(sign.)

Vladimir Borovkov
(sign.)

Table 1. Estimate of Atlanto-scandian herring in the Barents Sea. Number (N) in millions. Weight (W) in thousand tonnes.

Area		Age			
		1	2	3	4
West	N		2158.25	5669.00	143.88
	W		135.54	589.58	22.26
East	N	31731.70	1942.76	161.90	
	W	333.18	80.82	10.36	
Coast	N	882.27	9925.49		
	W	10.15	484.36		
Total	N	32613.97	14026.50	5830.90	143.88
	W	343.33	700.72	599.94	22.26

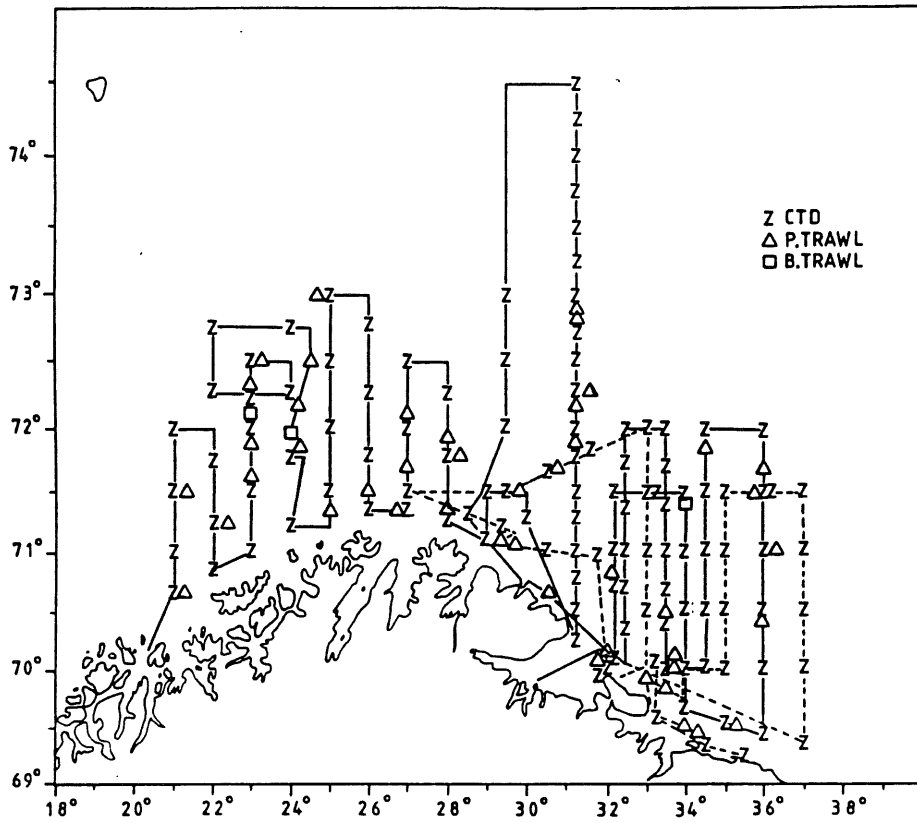


Figure 1. Survey grid, hydrographic and trawl stations for R/V "G.O.Sars" and R/V "Pinro".

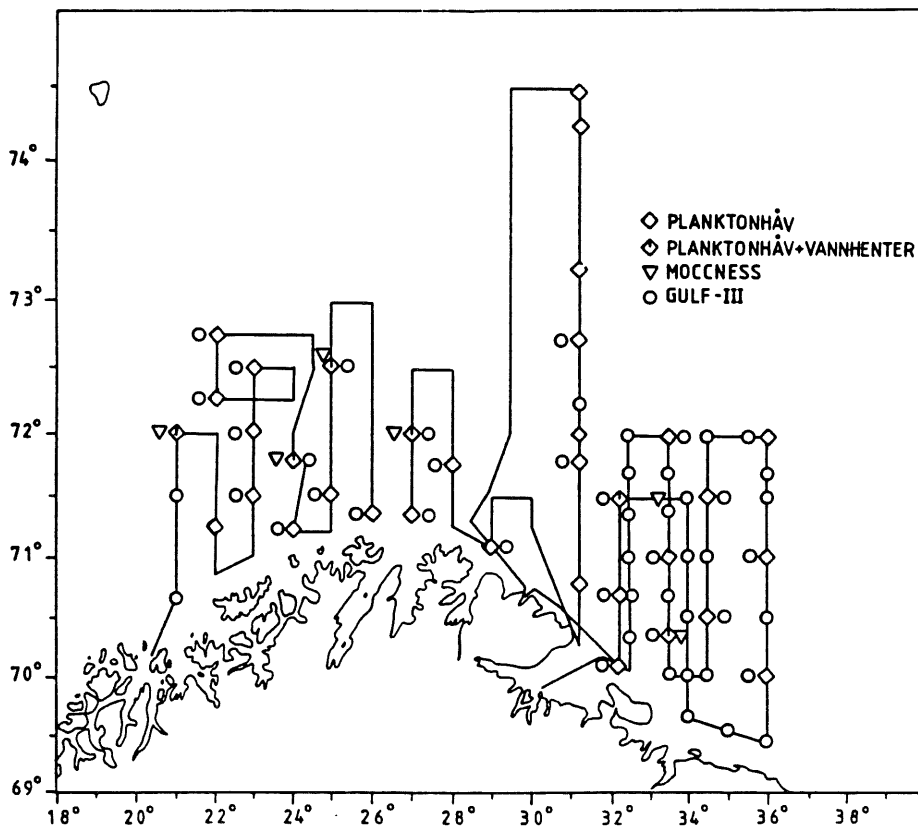


Figure 2. Plankton sampling stations for R/V "G.O.Sars".

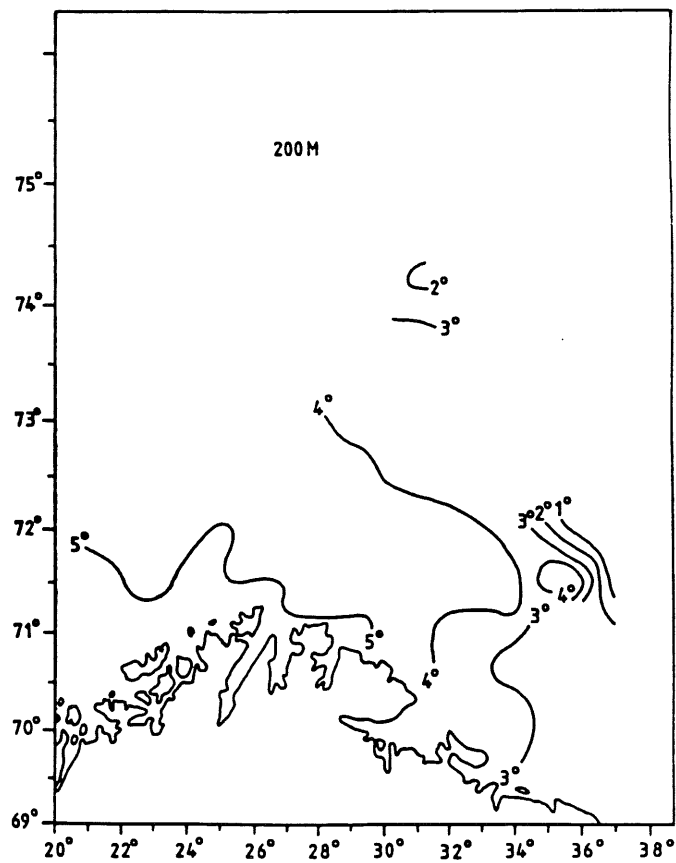
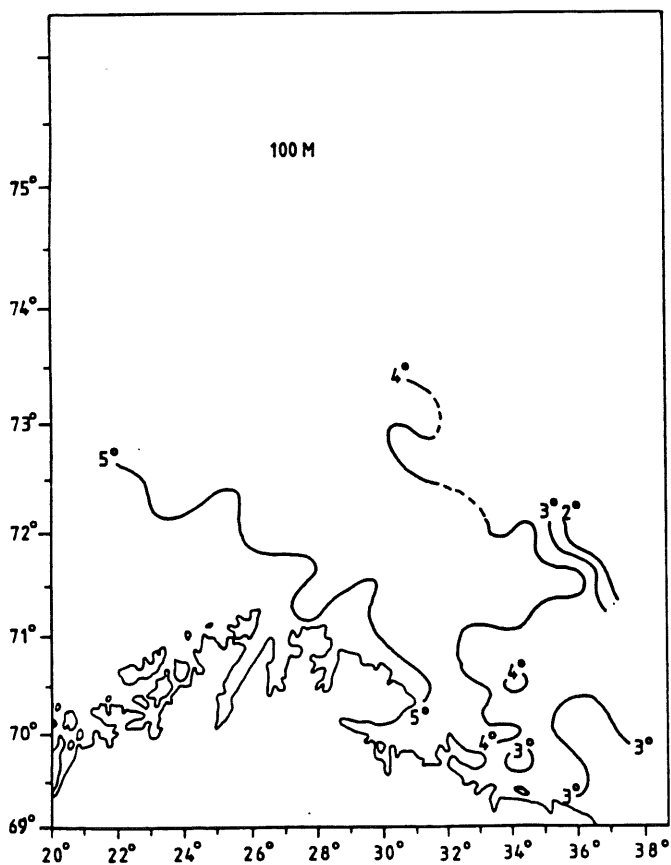
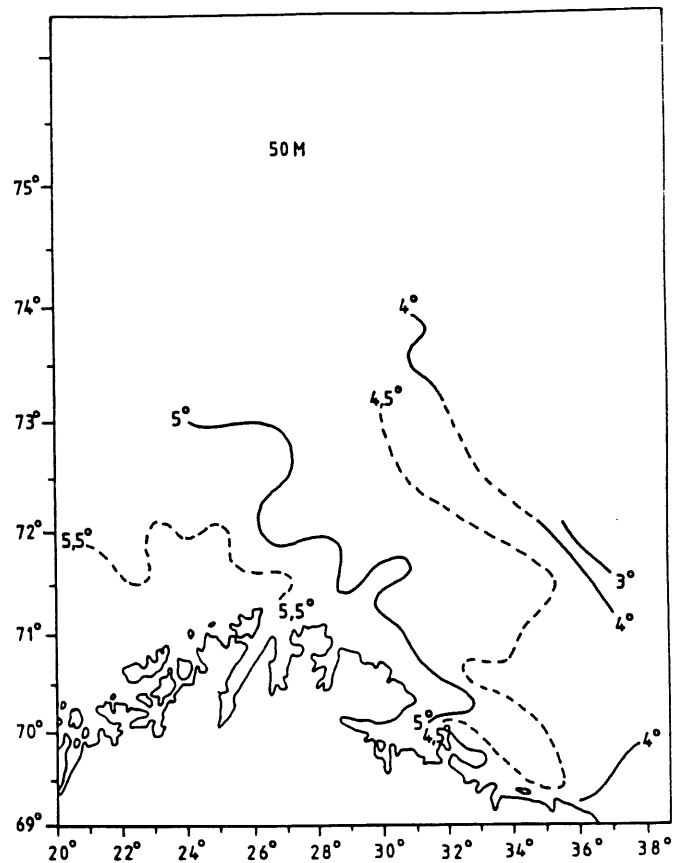
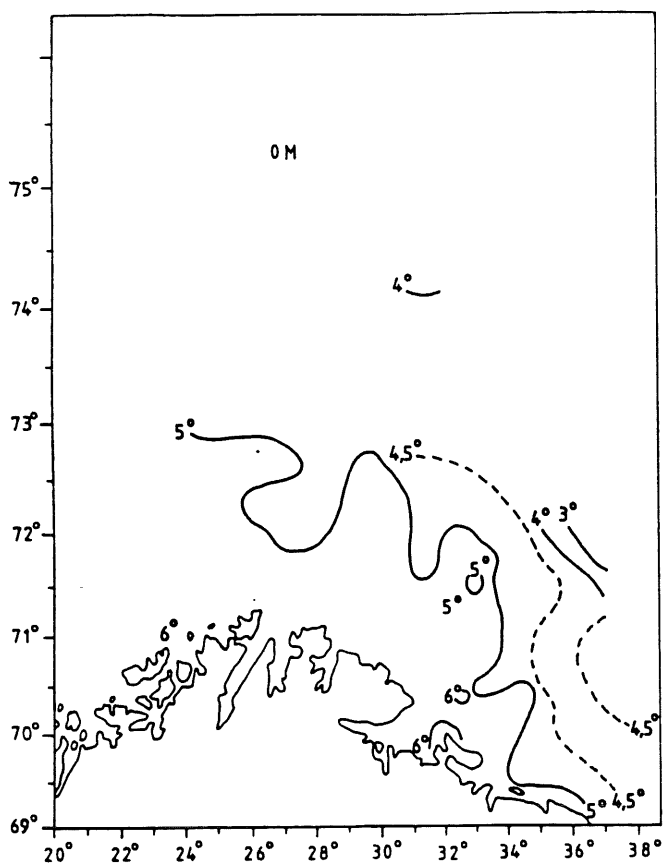


Figure 3. Isotherms at 0, 50, 100 and 200 m. for R/V "G.O.Sars" and R/V "Pinro".

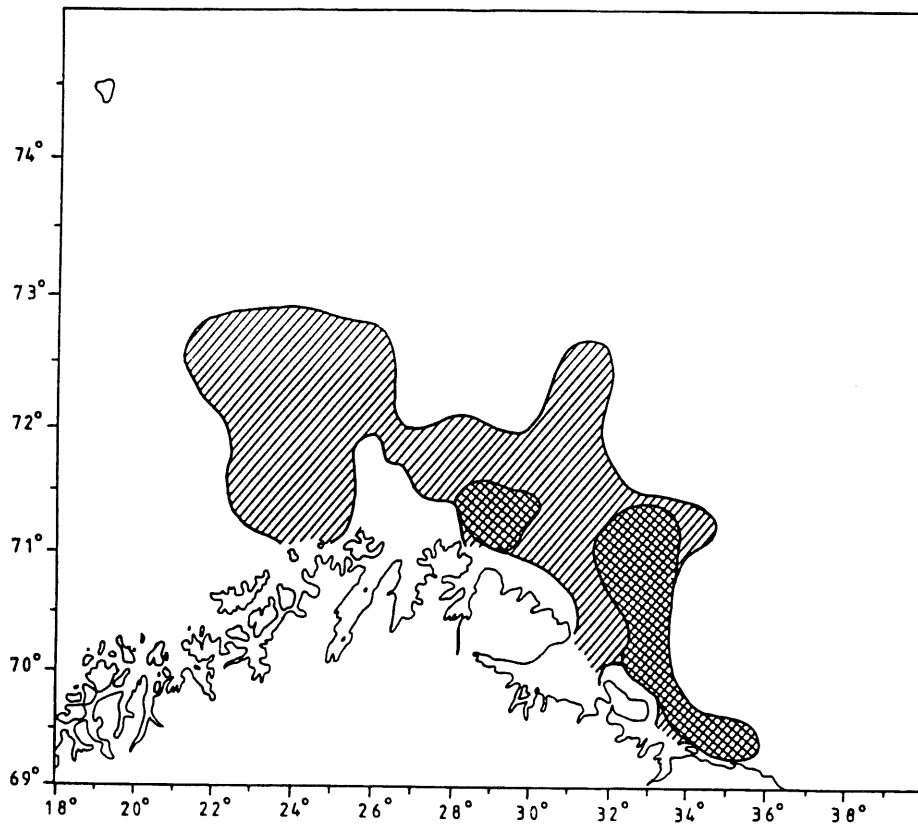


Figure 4. Distribution of immature herring. Double hatched area indicate highest density.

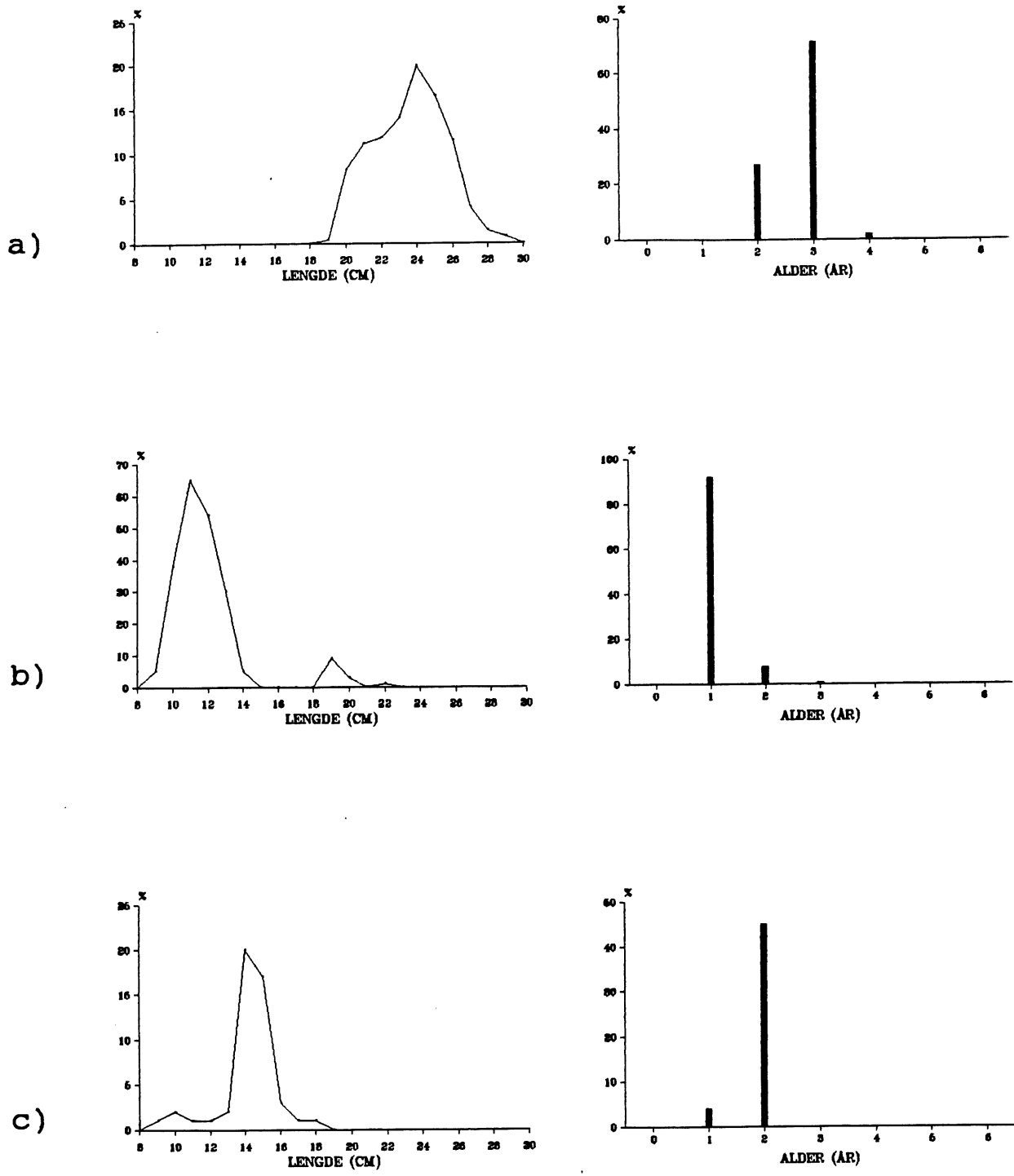


Figure 5. Length- and age distribution of immature herring for R/V "G.O.Sars" and R/V "Pinro".
 a) West of 31°00'E
 b) East of 31°00'E and north of 70°00'N
 c) Coastal areas to the east of 31°00'E