

Cruise report - «Michael Sars»

Abundance estimation of Norwegian spring spawning herring at spawning grounds 20 February - 18 March 1997.

by

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Methods

Acoustical data were registered with a 38 kHz SIMRAD EK 500 echosounder and echointegrator. In addition BEI, Bergen echointegrator system, was also applied in the interpretation of the data. Integrator values were divided into herring and «other categories» based on the density and appearance of the registrations, target strength (TS) distribution and data from trawl catches. Based on the acoustic observations and age composition in the trawl catches the distribution area was divided into sub areas. Conversion of integrator readings (S_A) to number of herring was achieved by the following relation between target strength (TS) and total fish length (L):

$$TS(\text{db}) = 20.0 \cdot \log L - 71.9$$

The number of individuals (N) within a certain area (A) was given by:

$$N = 1/\sigma \cdot S_A \cdot A \quad \text{where } 1/\sigma = 10^6 \cdot 1,23 \cdot L^{-2}$$

The area A with positive integrator values was delimited after plotting the 1 n.m. integrator values attributed to herring along the survey lines. The mean integrator value (S_A) was the arithmetic mean of all positive values within the area A.

Results

The cruise was conducted during the period 20 February - 18 March 1997. The purpose was to estimate the abundance of Norwegian spring spawning herring at the spawning grounds. However, bad weather prevented the survey from progressing. Thus, the entire spawning distribution area was not covered acoustically this year. The abundance was calculated in the following areas (For information on cruise tracks, stations, integrator values and subareas, see Figures 1-5):

- 1) Møre west/Møre east 21-28 February (Figure 1)
- 2) Frøyabanken, Haltenbanken and Folla 4-6 March (Figure 2)
- 3) Træna 10 March (Figure 3)
- 4) Stadt and Bremanger 13-14 March (Figure 3)
- 5) Siragrunnen, Losegrunnen, Egersund and Karlsmedgrunnen 15-16 March (Figure 4)
- 6) Karmøy west, Karmøy south and Bokn 16-18 March (Figure 5)

The data on abundance in the respective areas are given in Table 1. The most important result of the survey was the observation of increased abundance at the southern spawning grounds around Karmøy and at Egersund/Siragrunnen, compared to earlier years. A total of about 210000 tonnes was estimated at these spawning grounds. During the period 1990-1995 the estimates were less than 30000 tonnes.

The 1992 year class dominated together with the 1991 year class in all the areas surveyed (Figure 6). However, there was a southward increase in the proportion of older herring. In addition the mean length, condition factor and maturation stage by age (1991 and 1992 year class) also increased southwards (Figure 7).

Much of the herring north of Møre had rather small gonads compared to the herring caught further south. This was partly a result of delayed maturation, but another possible explanation is reduced fecundity. Occurrence of white eggs in the ovaries indicated also a high proportion of atresia. The ovaries were sampled during the cruise and the results of the south-north differences in maturation, fecundity and atresia will be available by the end of 1997.

Table 1: Point estimates (from north to south) of biomass (1000 tonnes), spawning stock biomass (SSB) and numbers (millions) of Norwegian spring spawning herring at spawning grounds 1997. Mean length (L) in cm and mean weight (W) in gram is added.

Area	Period	Biomass	SSB	Numbers	L	W
Træna	10.03	41,73	26,57	310,95	27,8	133
Folla	06.03	19,56	18,26	123,77	31,4	230
Haltenbanken	05-06.03	63,01	58,83	398,76	31,4	230
Frøyabanken	05-06.03	150,39	132,95	875,49	29,4	172
Møre west	21-28.02	908,73	908,73	3988,27	31,4	230
Møre east	21-28.02	458,36	458,36	2342,94	30,3	197
Stadt	13-14.03	17,17	17,17	76,36	31,3	224
Bremanger	13-14.03	359,34	359,34	1598,05	31,3	224
Karmøy west	16-18.03	90,86	90,86	379,57	32,2	243
Karmøy south	16-18.03	3,83	3,83	15,99	32,2	243
Bokn	16-18.03	17,51	17,51	76,59	31,7	233
Egersund	15-16.03	2,71	2,71	11,87	31,9	252
Losegunnen	15-16.03	8,49	8,49	30,28	32,9	281
Siragrunnen	15-16.03	91,45	91,45	406,39	31,4	232

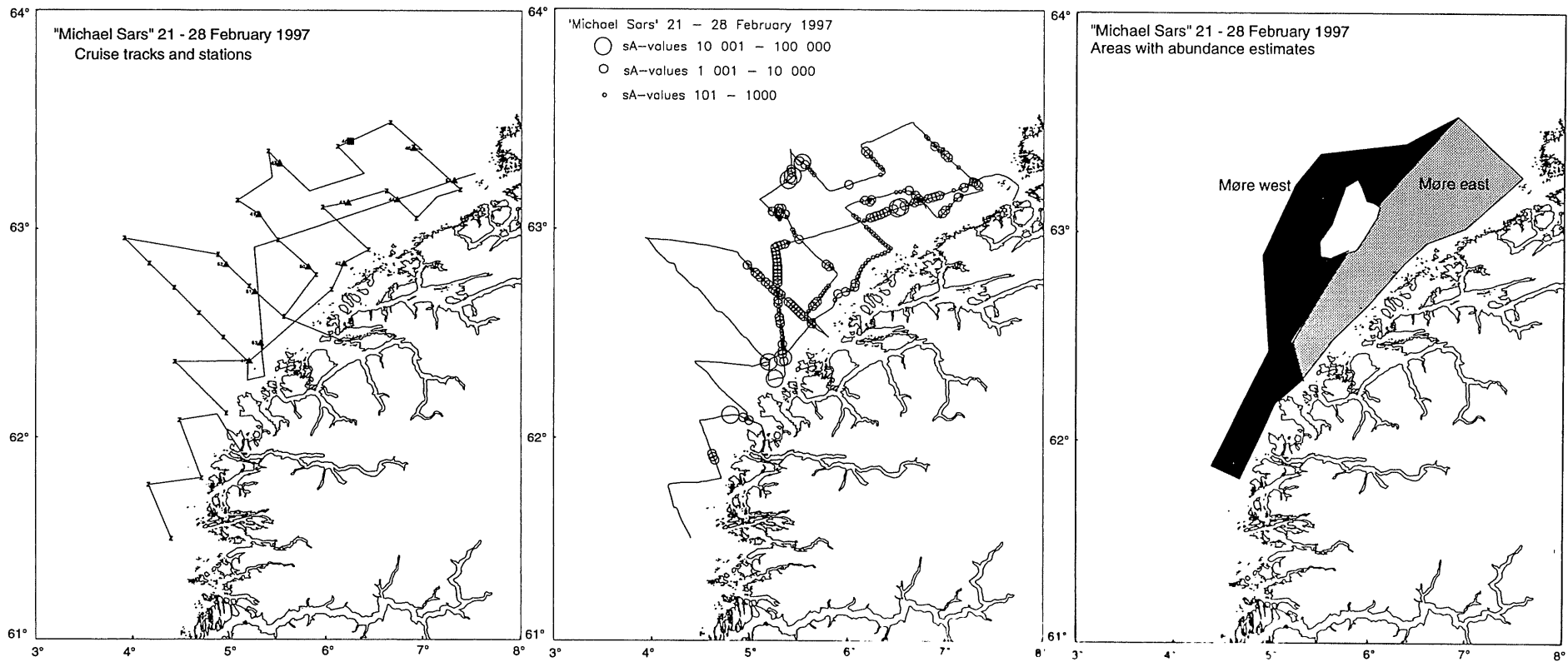


Figure 1. Cruise track with "Michael Sars" 21-28 February 1997 off Møre. Stations (CTD=Z, Trawl=black triangles) and integrator values (sA) are given. The area were divided into two sub areas (Møre west and Møre east) based on observations on age composition in the trawl samples.

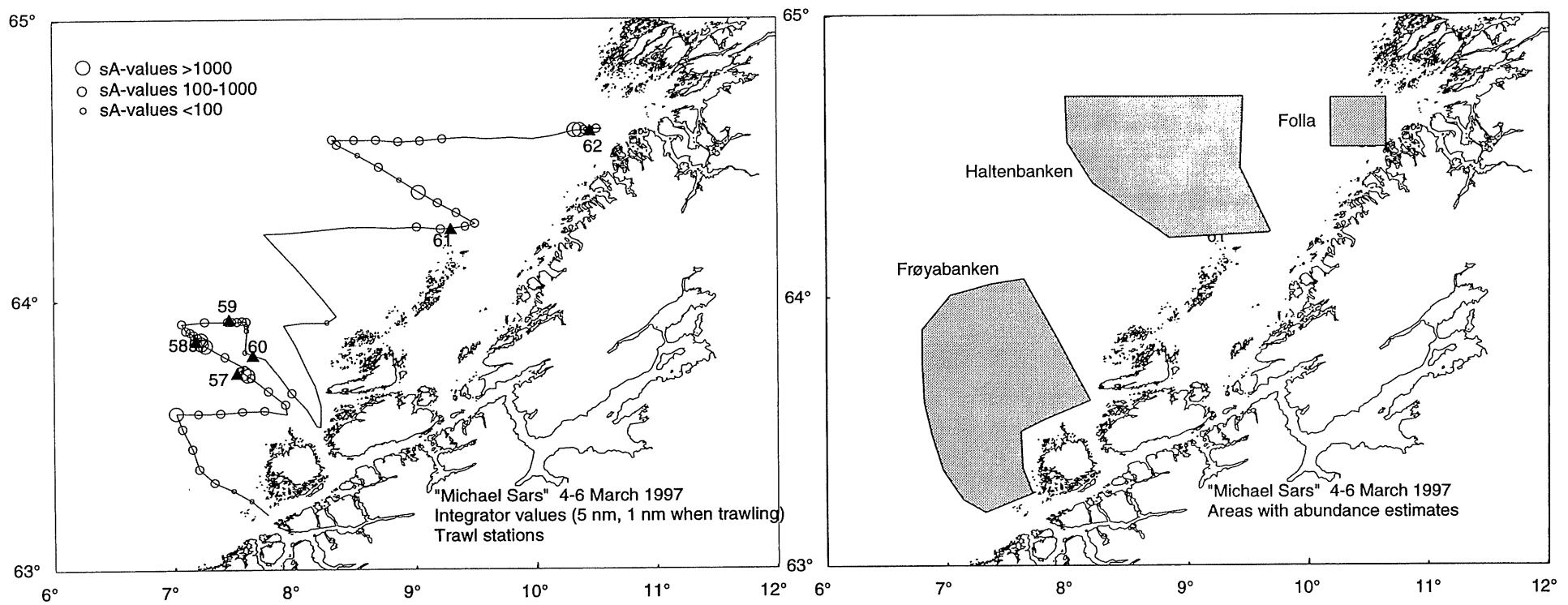


Figure 2. Cruise track with "Michael Sars" 4-6 March 1997 north off Møre. Trawl stations (black triangles) and integrator values (sA) are given. The area were divided into three sub areas (Frøyabanken, Haltenbanken and Folla) based based on the acoustic observations.

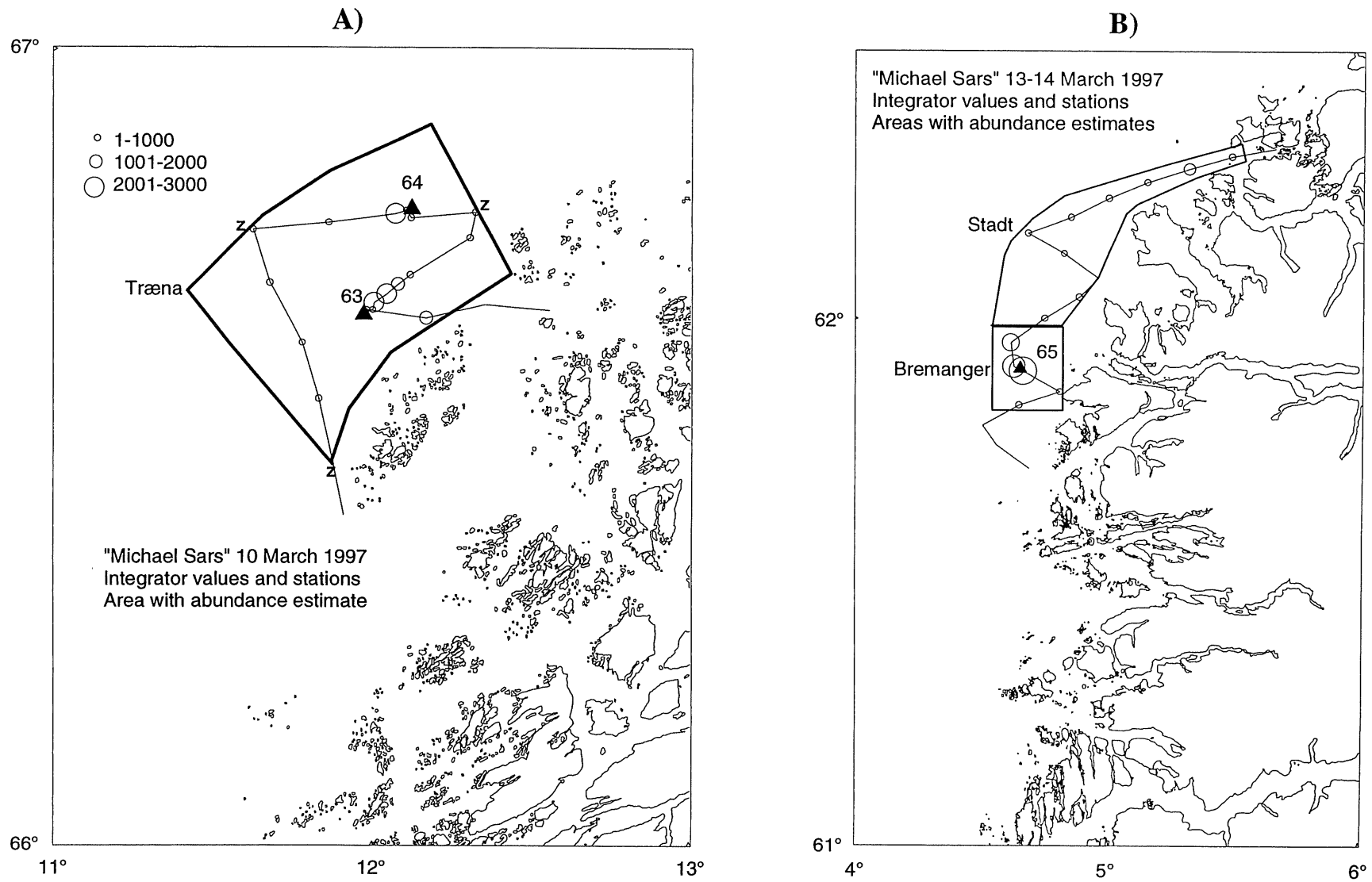


Figure 3. Cruise tracks with "Michael Sars" A) 10 March 1997 off Træna and B) 13-14 March 1997 off Stadt and Bremanger. Trawl stations (black triangles), CTD-stations=Z and integrator values (sA) are given.

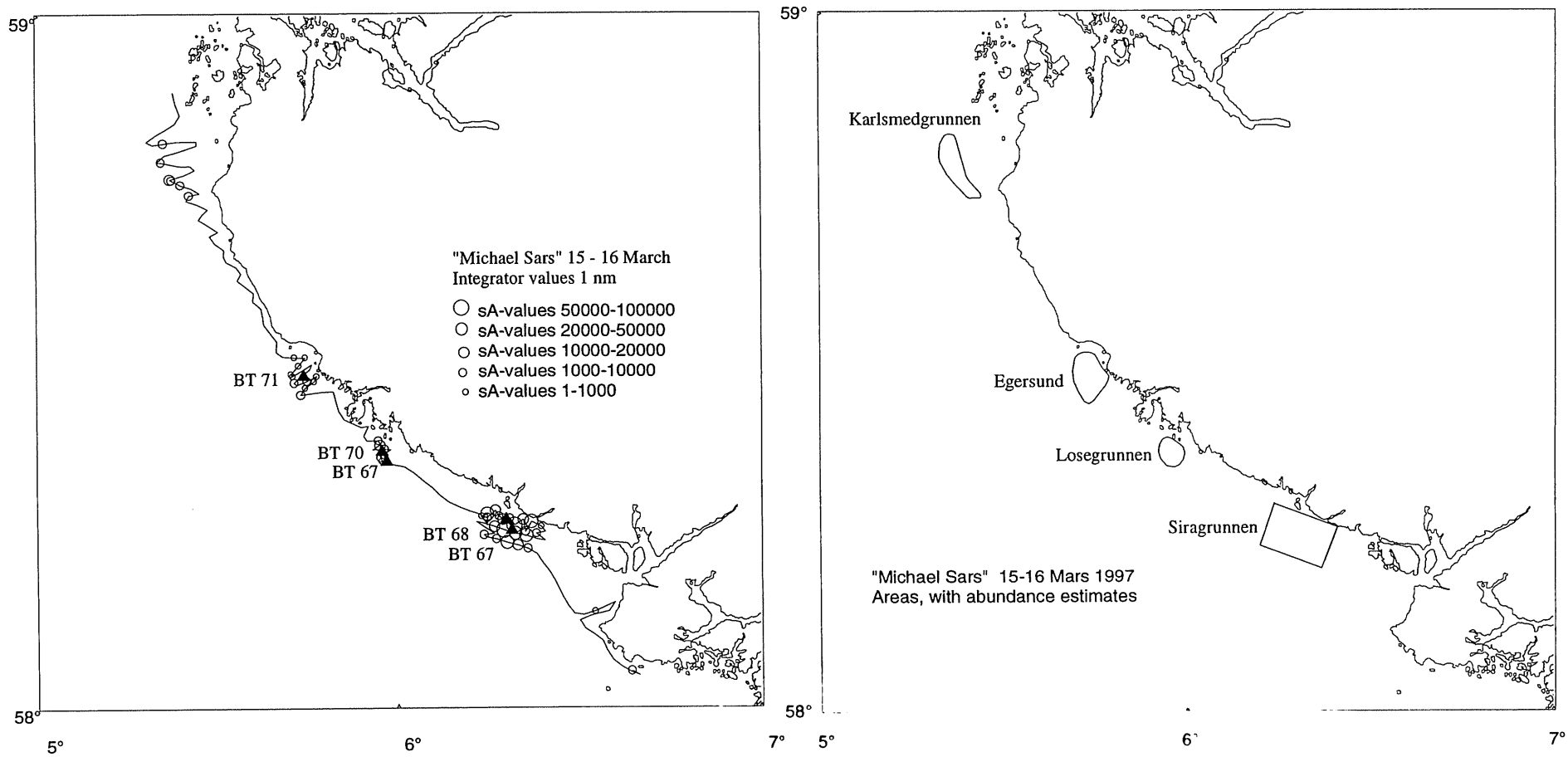


Figure 4. Cruise track with "Michael Sars" 15-16 March 1997 off Rogaland. Trawl stations (black triangles) and integrator values (sA) are given. The area were divided into four sub areas (Siragrunnen, Losegrunnen, Egersund and Karlsmødgrunnen) based on the acoustic observations.

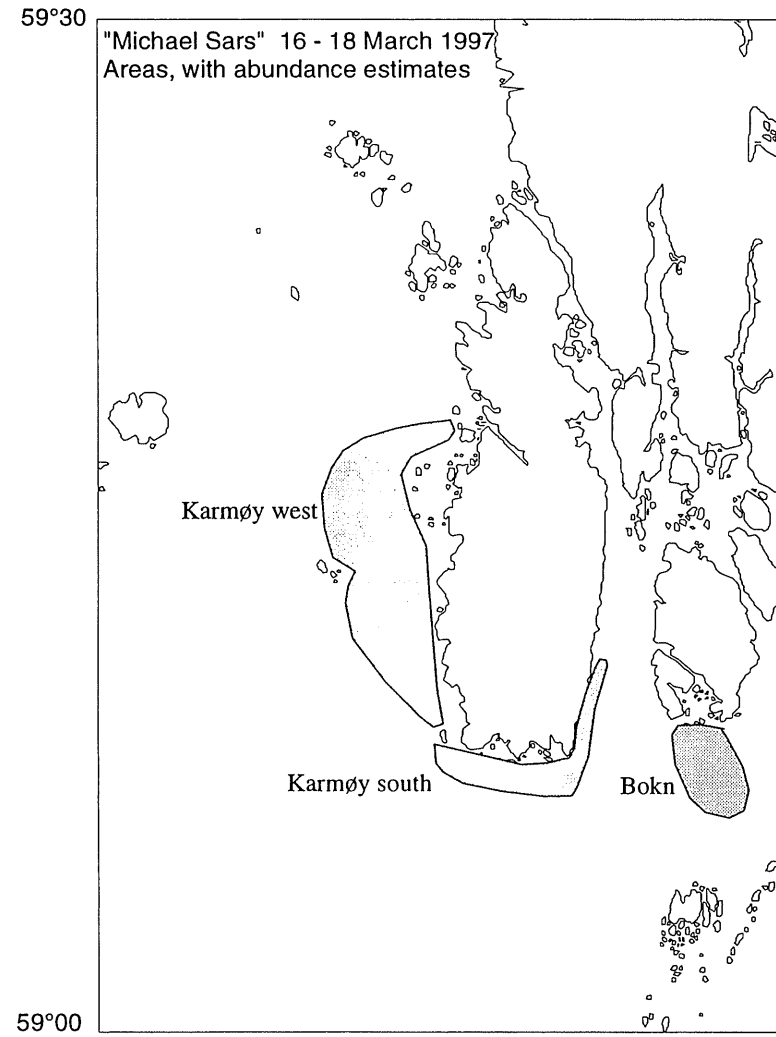
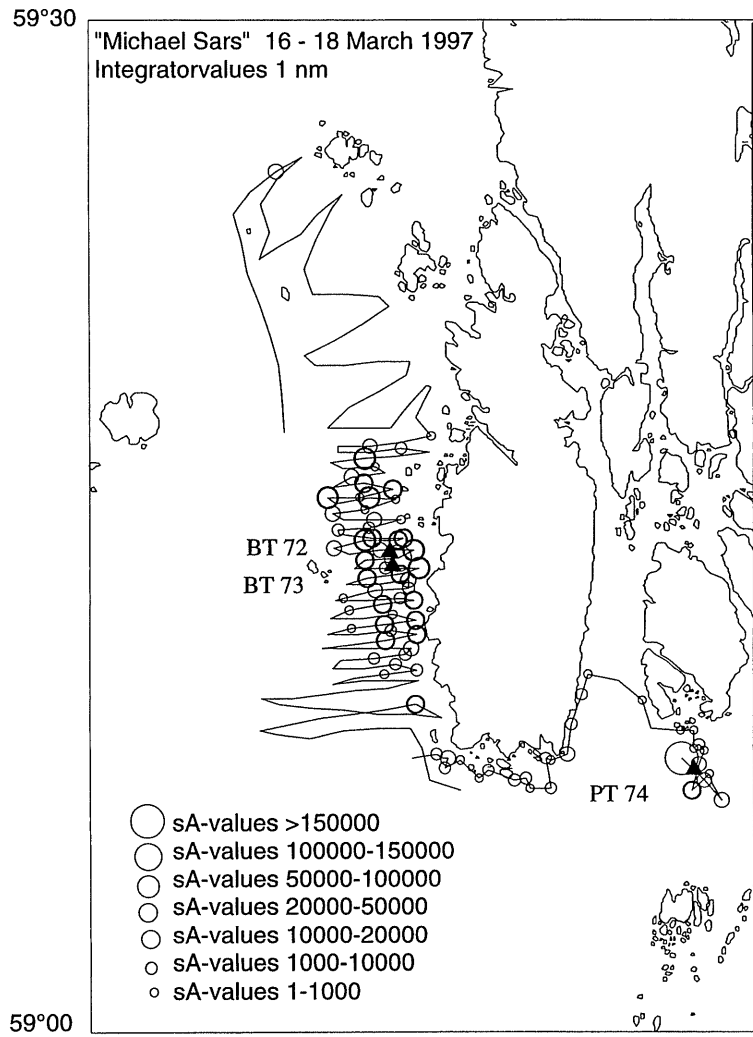


Figure 5. Cruise track with "Michael Sars" 16-18 March 1997 in the Karmøy area. Trawl stations (black triangles) and integrator values (sA) are given. The area were divided into three sub areas (Karmøy west, Karmøy south and Bokn) based on the acoustic observations.

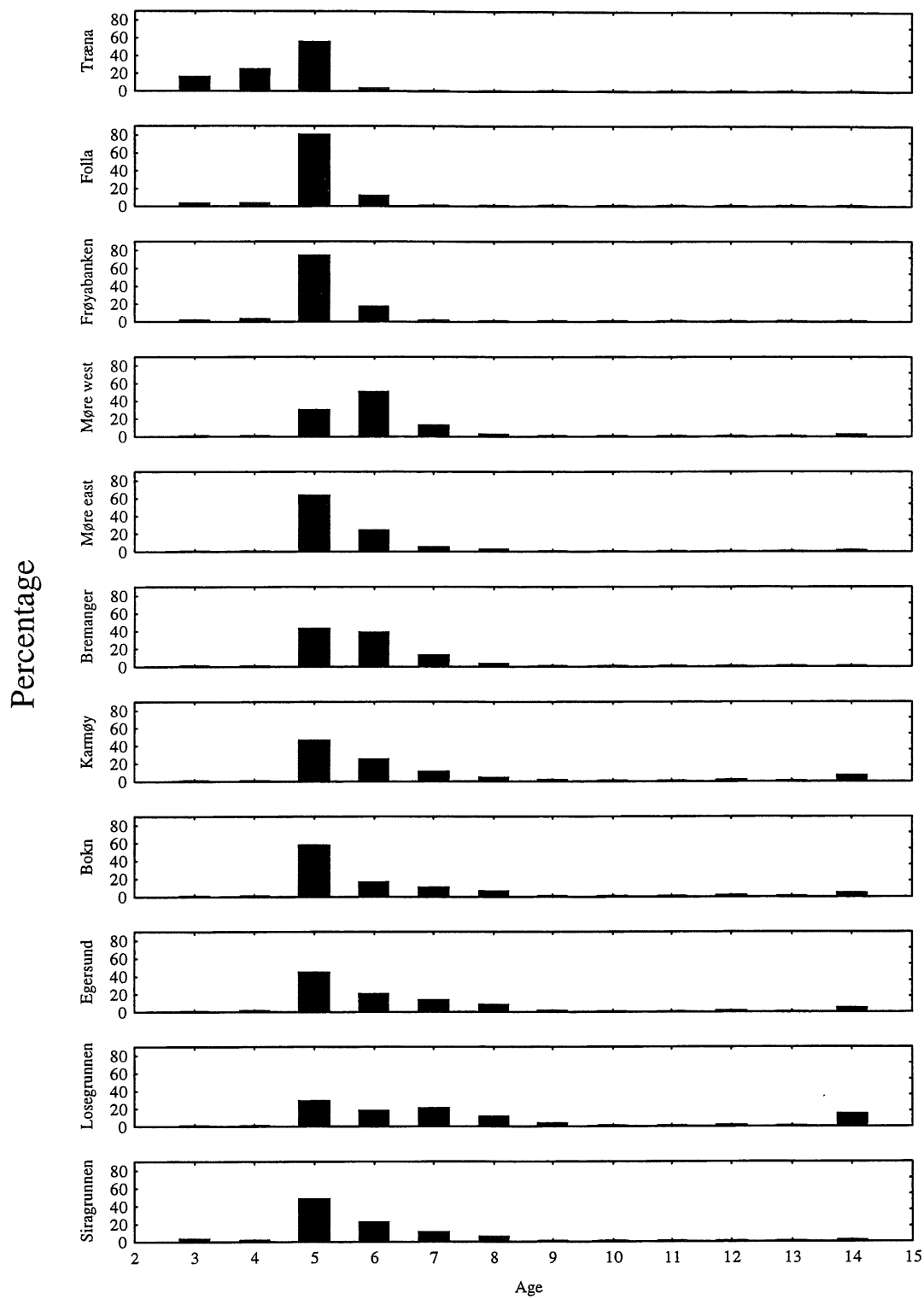


Figure 6. The age composition recorded in different areas from north to south during 21 February - 18 March 1997 (see Figures 1-5 for details on areas and trawl stations).

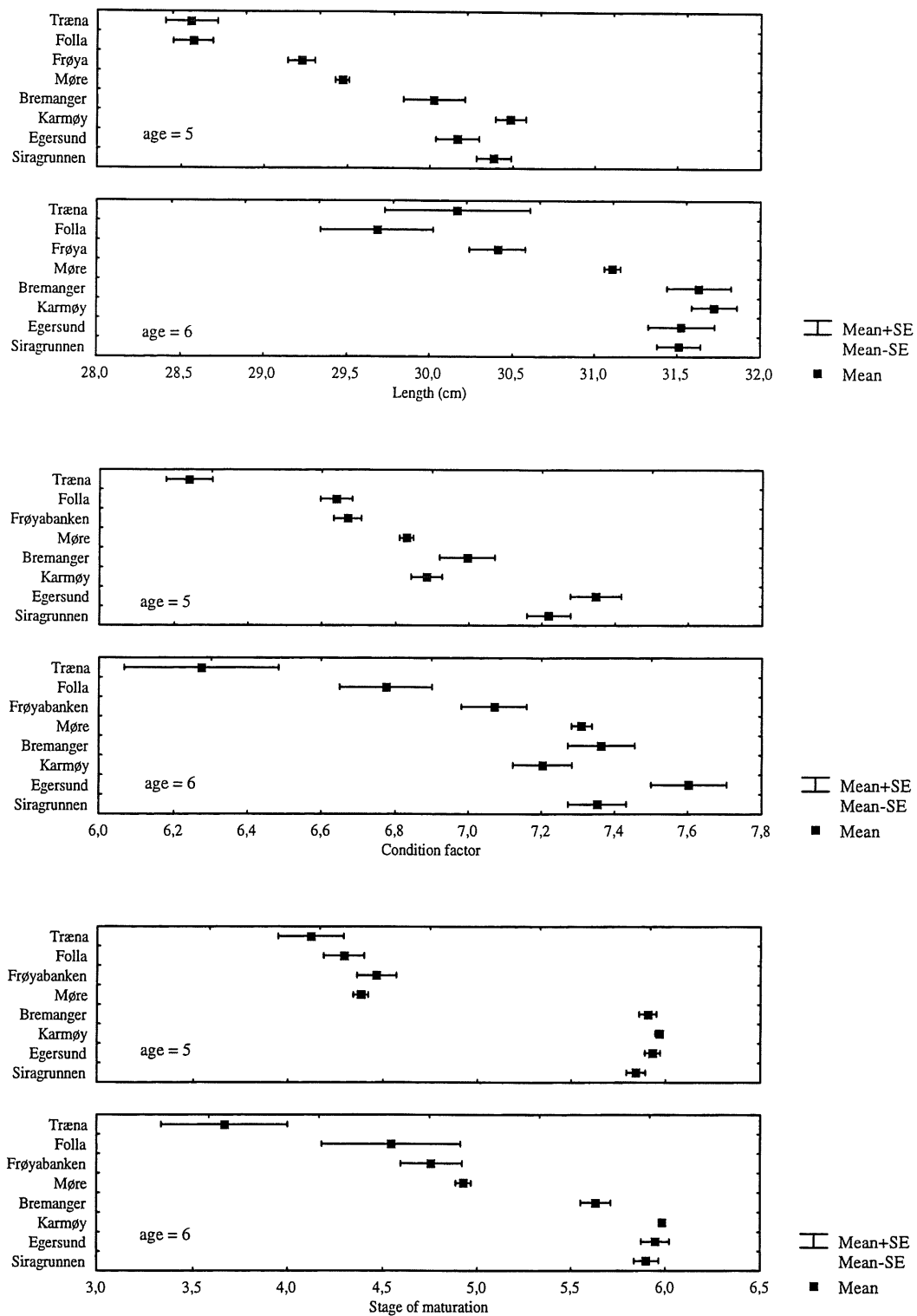


Figure 7. Latitudinal differences in length, condition factor and maturation among 5 and 6 year old herring (1992 and 1991 year class) during the spawning period 1997.