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Distribution, Abundance and Size Composition of Redfish (Sebastes marinus and S. mentella)

Estimated from a Stratified-Random Trawl Survey off West Greenland in 1987

by

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Introduction

Redfish is one of the most interesting species for both Japan and Greenland. The Japanese fishery in Subarea 1, mainly for redfish, has taken place since 1984.

In July/August 1987, Japan and Greenland carried out jointly a stratified random trawl survey in NAFO Subarea 1 by R/V Shinkai Maru. The survey covered Div. 1A south of 70°N to 1F at depths from 0 to 1000 m, outside the 3-mile limit (Yamada et al., MS 1988). Based on the results of the survey, the distribution, abundance and size composition of the two species of redfish (Sebastes marinus and S. mentella) occurring in Subarea 1 are described in this report.

Materials and Methods

The outline of the survey is described by Yamada et al. (MS 1988). From each trawl station, a random sample of redfish by species was taken up to around 200 specimens. Fork length was measured at 1-cm-below intervals by sex. These data were standardized to the size composition in number per km² area swept. The area swept at each station is calculated as the product of the width between the tips of wing nets and towed distance. Catchability coefficient is assumed to be 1.0. Size composition in each stratum is expressed as a mean of the standardized size compositions within the stratum. Size composition by depth zone in northern (Div. 1ABC) and southern (Div.

1DEF) areas were calculated as weighted mean of the size composition by stratum, using the stratum area as weighting factor.

In this report, sexes are combined since no clear difference occurs between sexes in their size composition in each stratum. Five strata, in which no hauls were made, are excluded from this analysis.

Results and Discussion

No other redfish species than S. marinus and S. mentella were observed in the samples.

1) S. marinus (Golden redfish)

Fig. 1 shows the distribution (kg/km^2) of S. marinus in the survey. While it was caught throughout the depth range of 200-600 m, the better catch rates were obtained at the stations in depths around 300-400 m.

The biomass estimates for this species are shown by division and depth in Table 1. The total trawlable biomass was estimated as 4,000 tons (CV : 17 %). Forty five percent of S. marinus in Subarea 1 are distributed in Div. 1F. Based on a Canadian survey covering the area between 70° and $63^\circ 30' \text{N}$ below 200 m depth Atkinson (MS 1987) estimated the trawlable biomass of S. marinus to 2,000 tons, which is in agreement with the results of this survey (1,800 tons in Div. 1ABC). The estimated biomass of Div. 1DEF is 2,200 tons, which does not correspond to landings of 3,000 tons (mainly S. marinus) in 1986 (NAFO) and 1,050 tons in 1987 (preliminary), especially when one takes into account that the fish landed are above 25 cm while this biomass estimate includes small fish.

Length ranged from 16 cm to 61 cm for male and 15 cm to 60 cm for female. Fig. 2 shows the size compositions by depth zone in northern (Div. 1ABC) and southern (Div. 1DEF) areas. The high values occurred in depth zones of 200-600 m of the southern area. Size composition shifts gradually to larger size with increasing depth, except for the 400-600 m depth zone in the southern area, where all of two stations were located at 400-410 m. The size composition for the total survey area was mono-modal, having a mode around 30-40 cm (Fig. 3).

Although S. marinus is one of the main target species in commercial fisheries, there is no information about the spawning (extrusion of larvae) or nursery grounds off West Greenland. On the other hand, some spawning grounds in the Irminger Sea are known. The East Greenland Current and the Irminger Current flow into the southern area from East Greenland. The West Greenland Current, which is the mixture of the two currents, flows northward along the West Greenland coast. Consequently, there is a possibility that S. marinus off West Greenland is transported by these currents in the larval stage. In

this survey, small fish less than 15 cm did not occur. The numbers per km² were higher in the southern area than in the northern area. These results are considered to support this hypothesis. In addition to the indicated movement from the East coast to the West coast, the present results showed the movement toward deeper water with growth.

2) S. mentella (Beaked redfish)

Most S. mentella was caught in the depth zone of 200-600 m in the northern area (Fig. 4). High catch rates were obtained at some stations in Div. 1F, which seems to be separated from the distribution in the northern area. This is due to the few number of stations at 200-600 m depth zone in Div. 1DEF.

The biomass estimates for beaked redfish are shown by division and depth zone in Table 2. The total trawlable biomass estimate was 8,100 tons (CV : 21 %), which is in good correspondence with the Canadian estimates at 8,000 tons (Atkinson, MS 1987). This survey covers the main area where S. mentella was taken as bycatch in the shrimp fishery. The estimated trawlable biomass of 8,000 tons should be compared to an estimated bycatch of redfish of 16,000 tons (Riget et al., MS 1988). A possible explanation for this discrepancy is that the shrimp trawl used in the shrimp survey has a much higher catchability factor for redfish than the trawl used in this survey, and thus the catchability factor, 1.0, used in these calculations is too high.

Length of S. mentella ranged from 5 cm (unsexed) to 51 cm for male and to 44 cm for female. Fig. 5 shows the size compositions in northern (Div. 1ABC) and southern (Div. 1DEF) areas. The high values occurred in depth zones of 0-600 m in the northern area and in depth zone of 400-600 m in the southern area. In the northern area, size composition for the 0-200 m depth zone was characterized by a prominent mode at 6 cm. In the 200-400 m depth zone, the modes were at 10 cm and 13 cm. In the 400-600 m depth zone the number of middle- (around 30-40 cm) and large-sized (around 40-50 cm) fish increased, while the number of small fish decreased. The size composition for 600-1000 m is similar to that for 400-600 m but with lower values in number. On the other hand, fish smaller than 20 cm were scarce in the southern area. The size composition for 400-600 m depth zone was mono-modal, having a mode at 32 cm. The size composition for the total survey area (Fig. 6) was characterized by many small fish less than 15 cm with two or three modes. There is a less prominent mode at 32 cm, and these fish may be a targeted for the fishery.

Large amounts of small S. mentella are discarded in the off shore shrimp fishery (Jensen 1979) but it is not known where the larvae come from. In this survey, catches of small S. mentella (<10 cm) were also taken in the shallower waters (<400 m) of the northern area. The nursery ground for this species might be on and around the banks in the northern area (Div. 1ABC). S. mentella also moves toward deeper water as they grow up.

References

- Atkinson, D. B. MS:1987. The distribution and abundance of redfish (Sebastes marinus and S. mentella) in Davis Strait (NAFO Subareas 0+1). NAFO SCR Doc., 87/38, 11pp.
- Jensen, J. M. 1979. Redfish at West Greenland, Subarea 1. ICNAF Res. Doc., 54, 22pp.
- Yamada, H., K. Okada and O. Jørgensen. 1988. West Greenland groundfish biomasses estimated from a stratified random trawl survey in 1987. NAFO SCR Doc., 88/??, ??pp. (this meeting).

Table 1. Biomass estimates (tonnes) for Sebastes marinus by division and depth.

Division	DEPTH ZONE(m)						TOTAL
	0-100	100-200	200-300	300-400	400-600	600-1000	
1A	0	40	15	276	262	-	592
1B	42	31	123	142	552	21	912
1C	22	51	19	30	23	110	254
1D	95		59		-	43	196
1E	231		1		-	-	232
1F	318		1039		436	-	1793
TOTAL=							3980
(C.V. =							17 %)

Table 2. Biomass estimates (tonnes) for Sebastes mentella by division and depth.

Division	DEPTH ZONE(m)						TOTAL
	0-100	100-200	200-300	300-400	400-600	600-1000	
1A	0	14	39	408	288	-	750
1B	15	58	312	625	2070	22	3102
1C	1	119	117	140	727	1672	2776
1D	4		6		-	15	24
1E	0		0		-	-	0
1F	8		690		759	-	1457
TOTAL=							8109
(C.V. =							21 %)

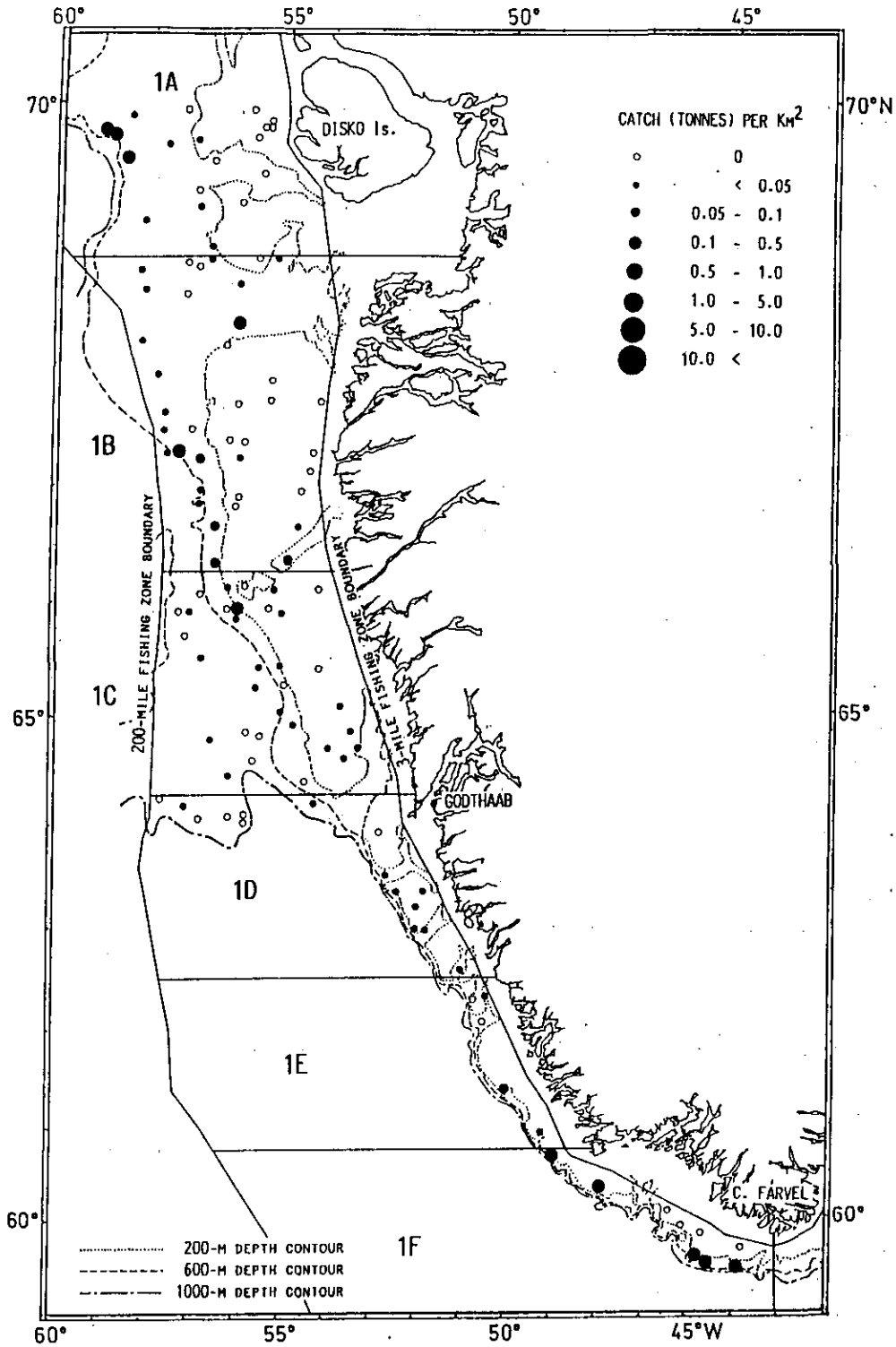


Fig. 1. Distribution of *S. marinus* in summer 1987. Div. 1ABC and 1DEF are taken as northern and southern area, respectively.

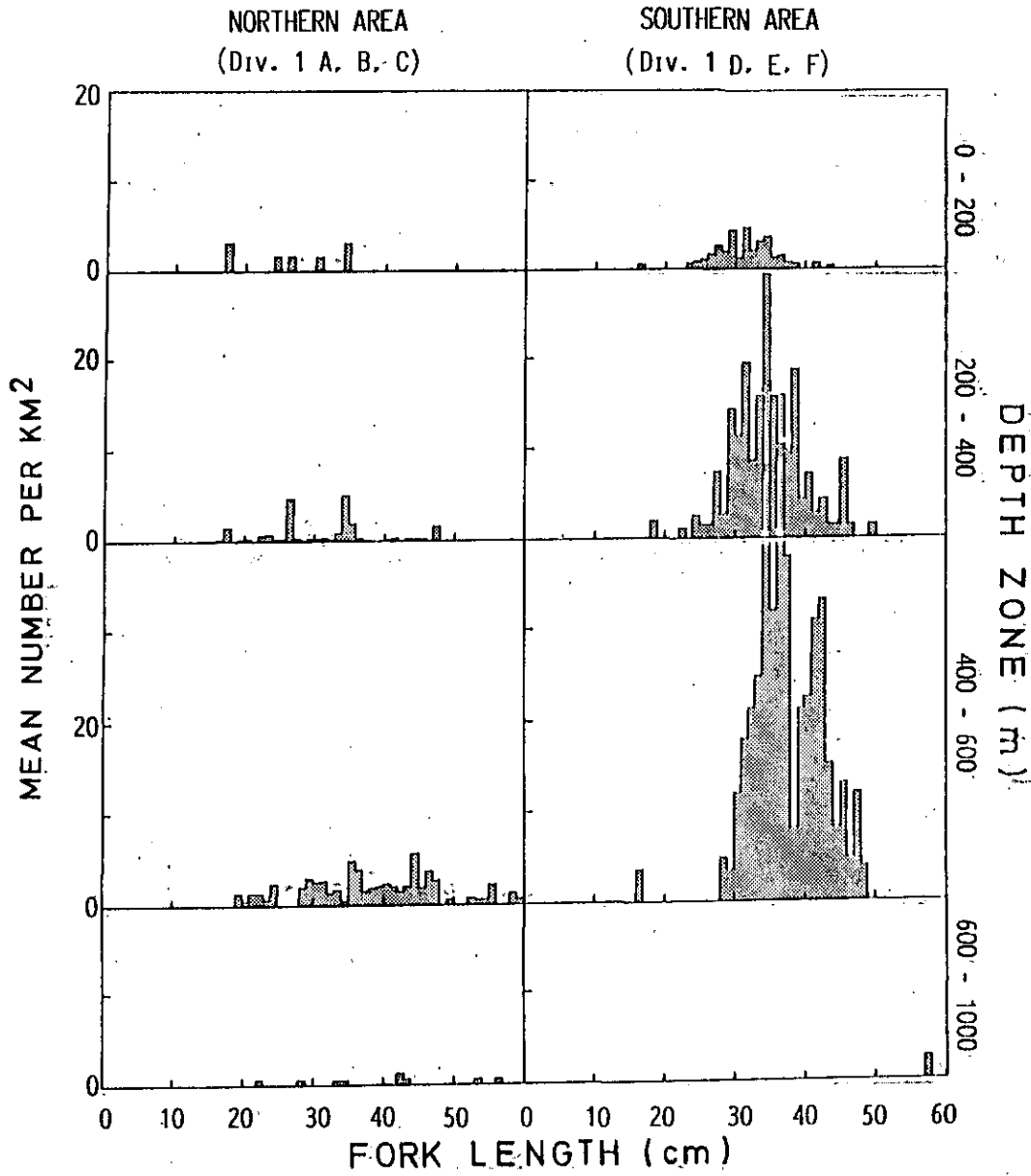


Fig. 2. Size compositions of *S. marinus* by depth zone in the northern and the southern area.

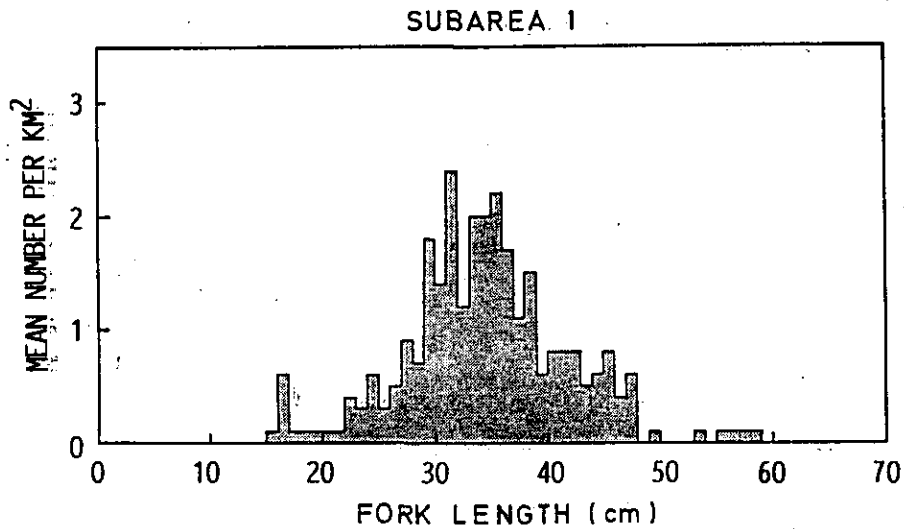


Fig. 3. Size composition of *S. marinus* off West Greenland during the Shinkai Maru survey in 1987.

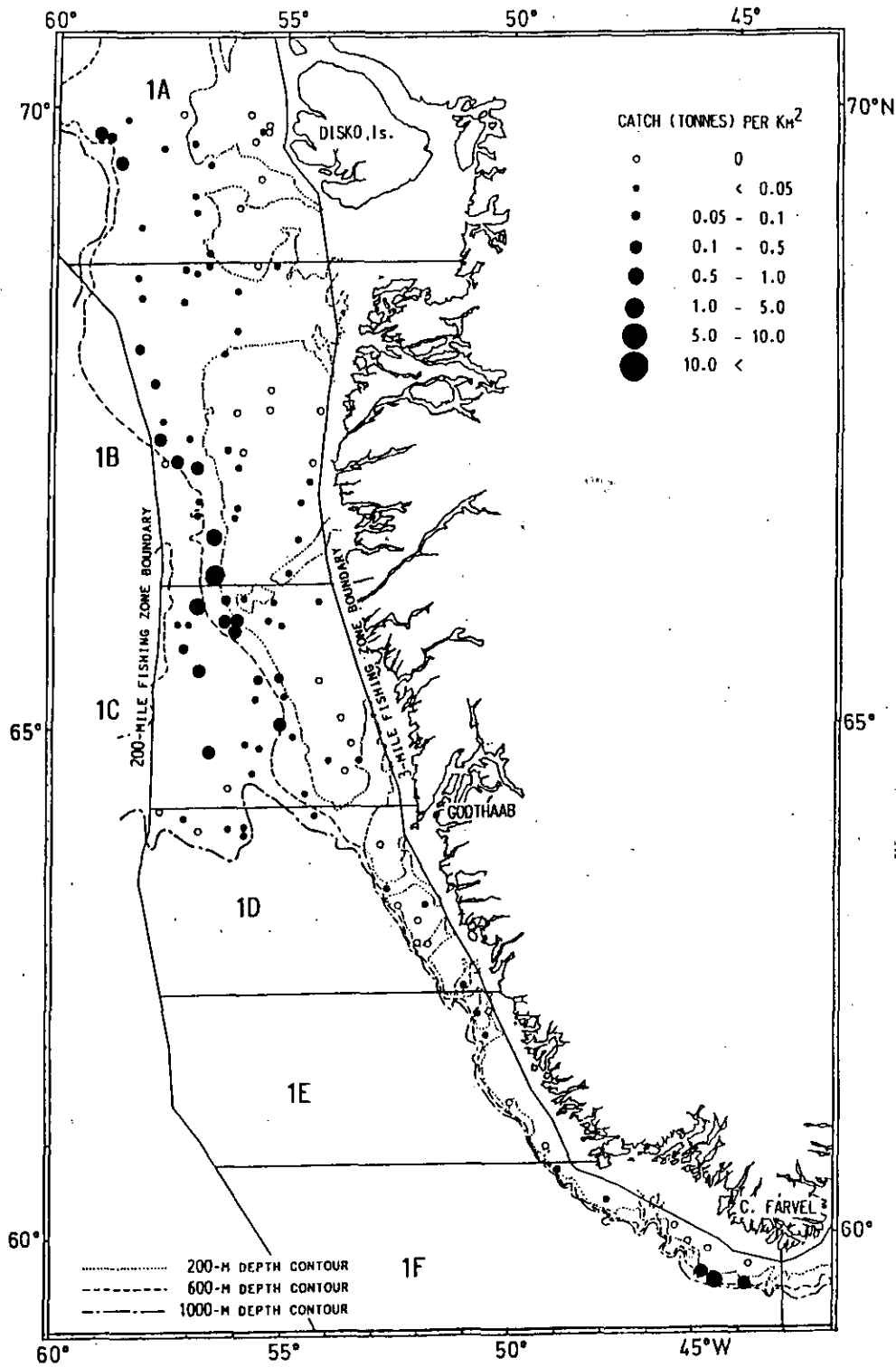


Fig. 4. Distribution of *S. mentella* in summer 1987. Div. 1ABC and 1DEF are taken as northern and southern area, respectively.

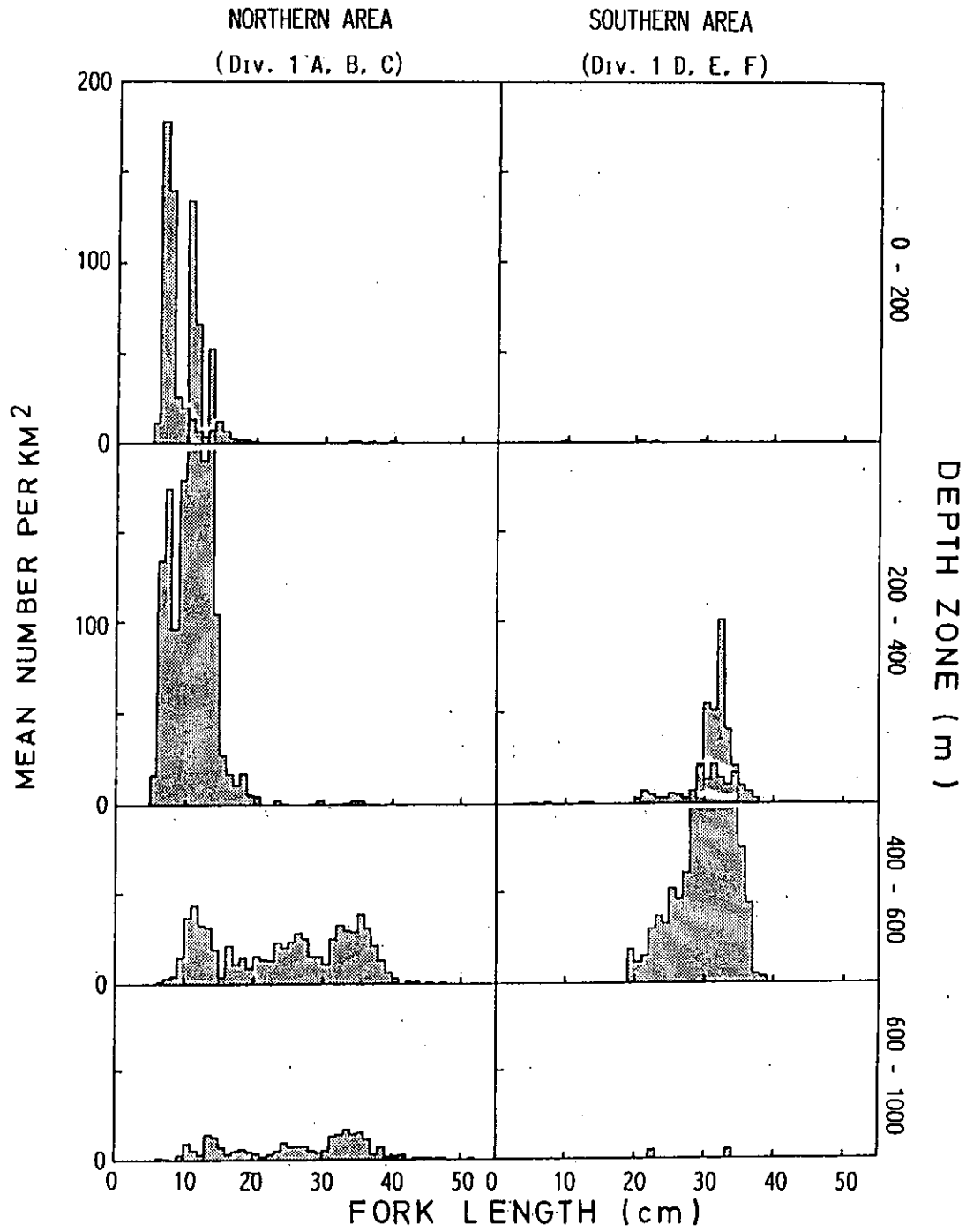


Fig. 5. Size compositions of *S. mentella* by depth zone in the northern and the southern area.

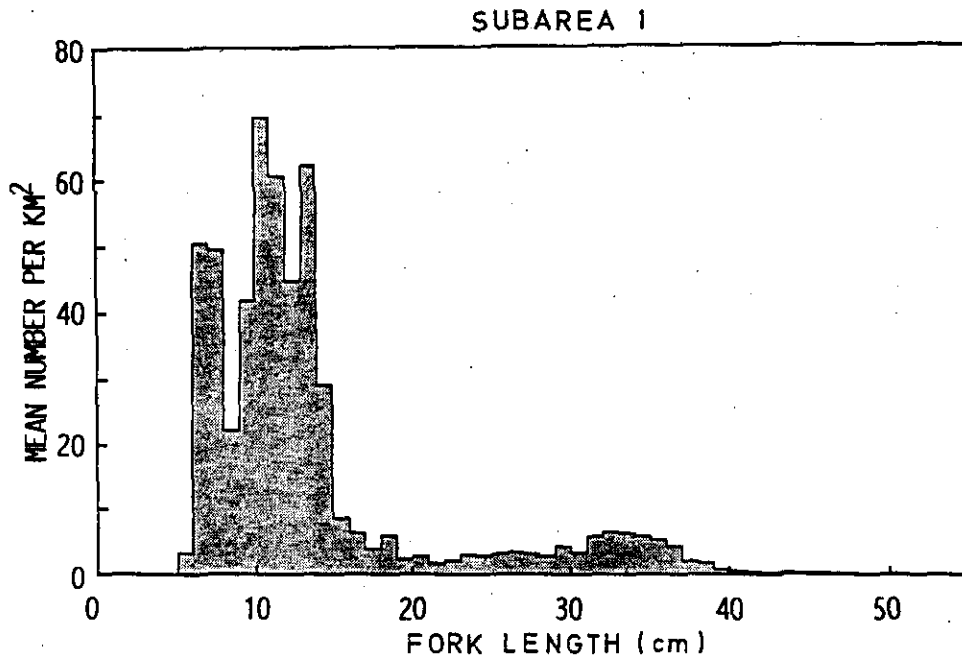


Fig. 6. Size composition of S. mentella off West Greenland during the Shinkai Maru survey in 1987.