

AN ACOUSTIC ESTIMATE OF JUVENILE ARCTIC COD (Boreogadus saida)
ABUNDANCE IN ICNAF DIVISIONS 2J and 3K 1978

by

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Introduction

During the 1978 autumn capelin acoustic survey in ICNAF divisions 2J and 3K, substantial quantities of small arctic cod were found in mid-water trawl catches throughout the survey. Concentrations of small arctic cod were recorded with the computerized echo integration system (C.E.I.S.) and an estimate of their abundance combined with length sampling data is provided in this paper.

Materials and Methods

The C.E.I.S. was operated 24 hours a day throughout the survey. Midwater trawl fishing stations were selected when the C.E.I.S. indicated fishable concentrations. Arctic cod from the midwater trawl catches were sampled for length and weight. It has been noted in capelin surveys that the C.E.I.S. density estimates taken at night are generally lower than daytime estimates due to diurnal movements of fish schools (Miller and Carscadden, 1979; Miller, Carscadden and Bennett, 1978). A similar trend was noted with arctic cod and a correction factor of 2.78 for standardizing nighttime counts to daytime counts was calculated from a comparison of average night and day densities of arctic cod as observed throughout the survey. The target strength value of -52 dB which was used for density estimation was calculated using regressions of target strength on fish length calculated for cod (Dalen, Raknes, and Rottingen, 1976) with a correction being made for expected aspect ratio in the acoustic beam (Nakken and Olsen, 1973).

Results

The length frequency distribution of specimens sampled is shown in Fig. 1. The most northerly set made contained some specimens larger than the range covered by the frequency in Fig. 1, but these were considered atypical of the arctic cod that were surveyed acoustically.

Fig. 2 a), b) show the acoustic survey track with fishing stations. Bycatch associated with arctic cod catches consisted mainly of lumpfish and small squid. Fig. 3 a), b) and c) give summaries of C.E.I.S. density

estimates for those portions of the cruise track where arctic cod were found to occur. Fig. 4 gives catch composition by weight of fishing sets during that portion of the survey where arctic cod were observed. Table 1 gives biomass estimates for the survey track shown in Fig. 3 a), b), and c). Assuming all counts were 100% arctic cod, a biomass of 97,300 metric tons of arctic cod is estimated. By using catch data from Fig. 4 to correct the biomass estimates for bycatch a more realistic estimate of 89,500 tons of arctic cod is given.

The magnitude of error in acoustic surveys may be large and the biomass estimates given in this paper do not include variance estimates. Nevertheless, the results of the survey do indicate a large quantity of small arctic cod were present in ICNAF divisions 2J and 3K during the autumn of 1978.

References

- Dalen, J., A. Raknes, and I. Rottingen. 1976. Target strength measurements and acoustic biomass estimation of capelin and 0 group fish. ICES Doc. CM 1976/B:37.
- Miller, D.S. and J.E. Carscadden. 1979. An acoustic estimate of capelin biomass in ICNAF Divisions 2J and 3K, October 1978. ICNAF Res. Doc. 79/II/34.
- Miller, D.S., J.E. Carscadden and B. Bennett. 1978. An acoustic estimate of capelin biomass in ICNAF Divisions 2J and 3K,

October and November, 1977. ICNAF Res. Doc. 78/VI/43.

Nakken, O. and K. Olsen. 1977. Target strength measurements of fish. ICES Rapports et Proces-Verbaux des Reunions, Vol. 170. Hydro-acoustics in Fisheries Research.

Table 1. Arctic cod biomass estimates.

2J (Fig. 3a)	- Total counts	5192
	Intervals	1281
	Density/m ²	4.05
	Area sampled	20030 km ²
	Mean Wt.	0.71 gms
	Biomass estimate	57643 metric tons
3K (Fig. 3b)	- Total counts	3123
	Intervals	901
	Density/m ²	3.47
	Area Sampled	12561 km ²
	Mean Wt.	0.71 gms
	Biomass estimate	30908 metric tons
3K (Fig. 3c)	- Total counts	4146
	Intervals	764
	Density/m ²	5.43
	Area Sampled	12561 km ²
	Mean Wt.	0.71
	Biomass estimate	48392

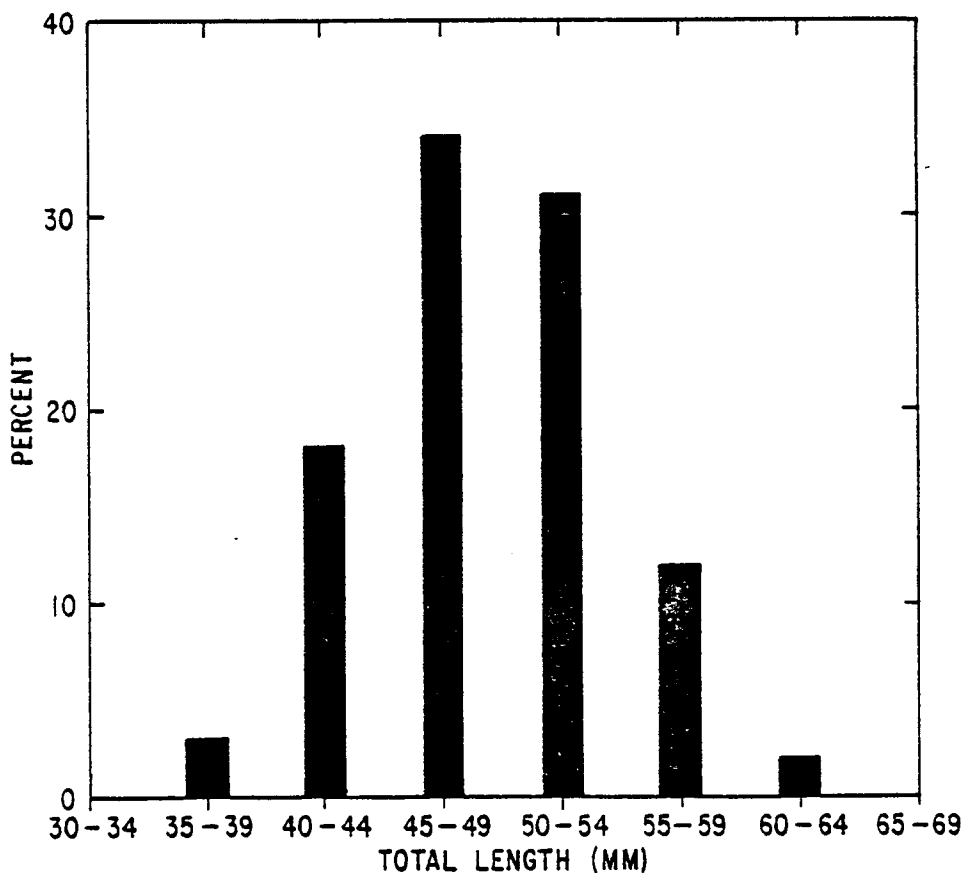


Fig. 1. Length composition of Arctic Cod samples taken during the acoustic survey.

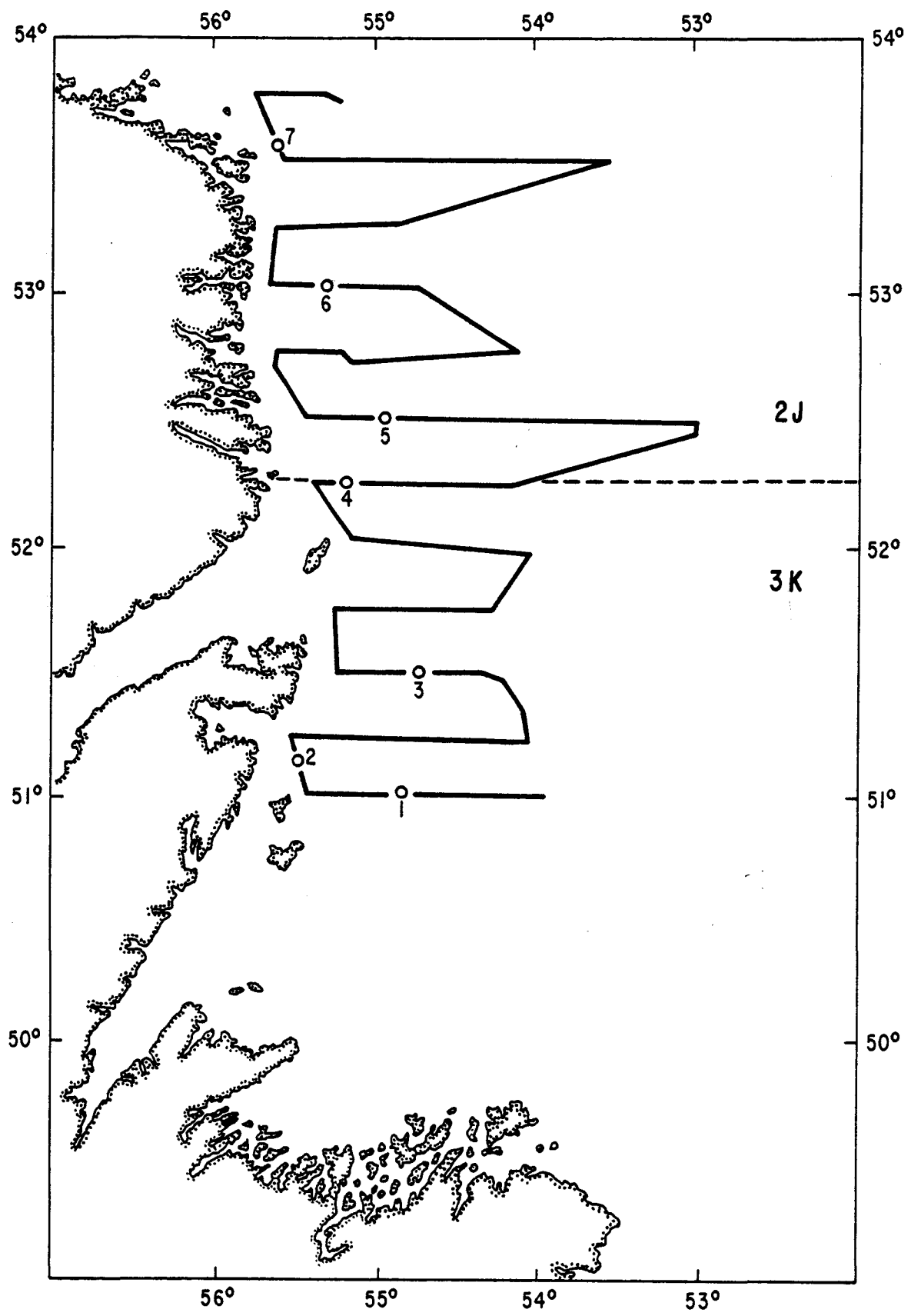


Fig. 2a. Acoustic survey track with midwater trawl fishing stations, October 12-19.

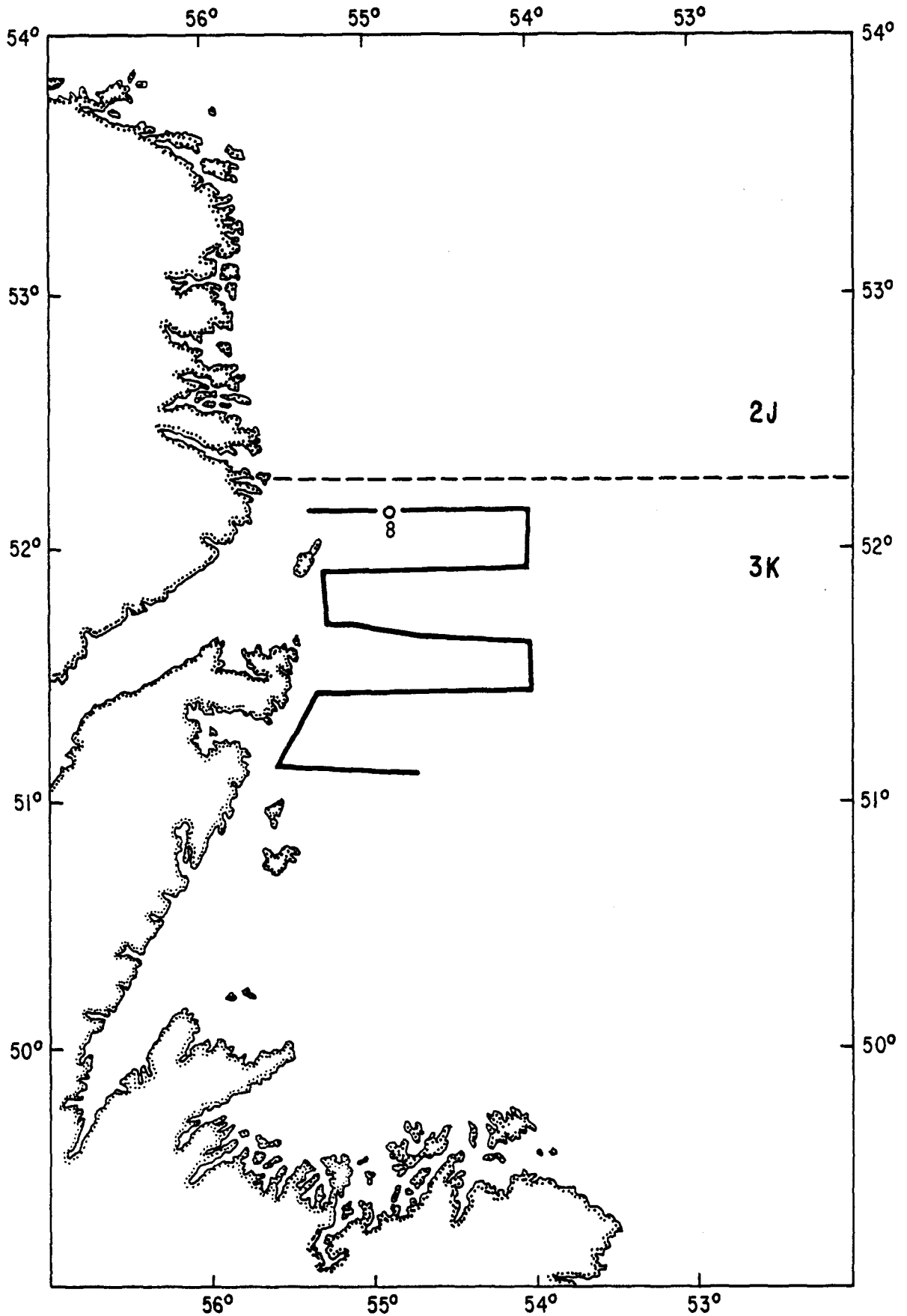


Fig. 2b. Acoustic survey track with midwater trawl fishing stations, October 20-21.

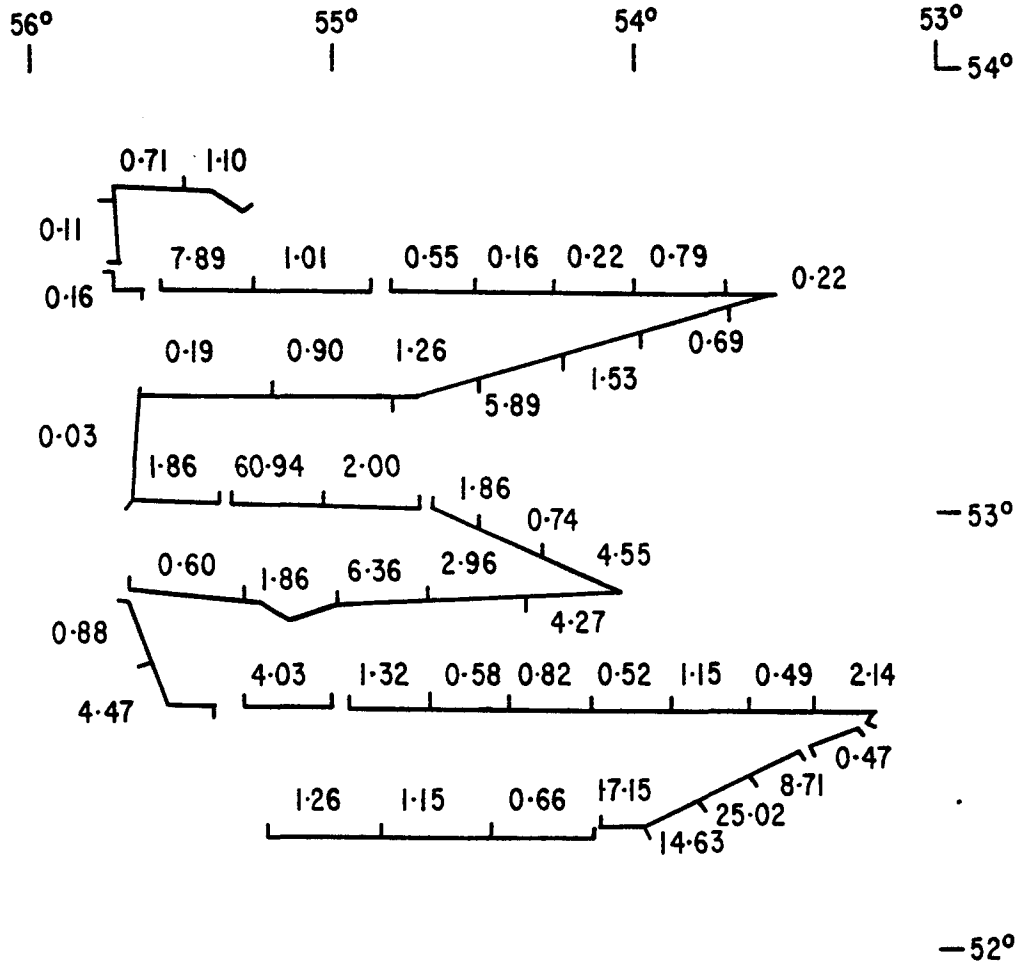


Fig. 3a. Div. 2J Arctic cod density estimates (no/m² averaged over 20 km interval).

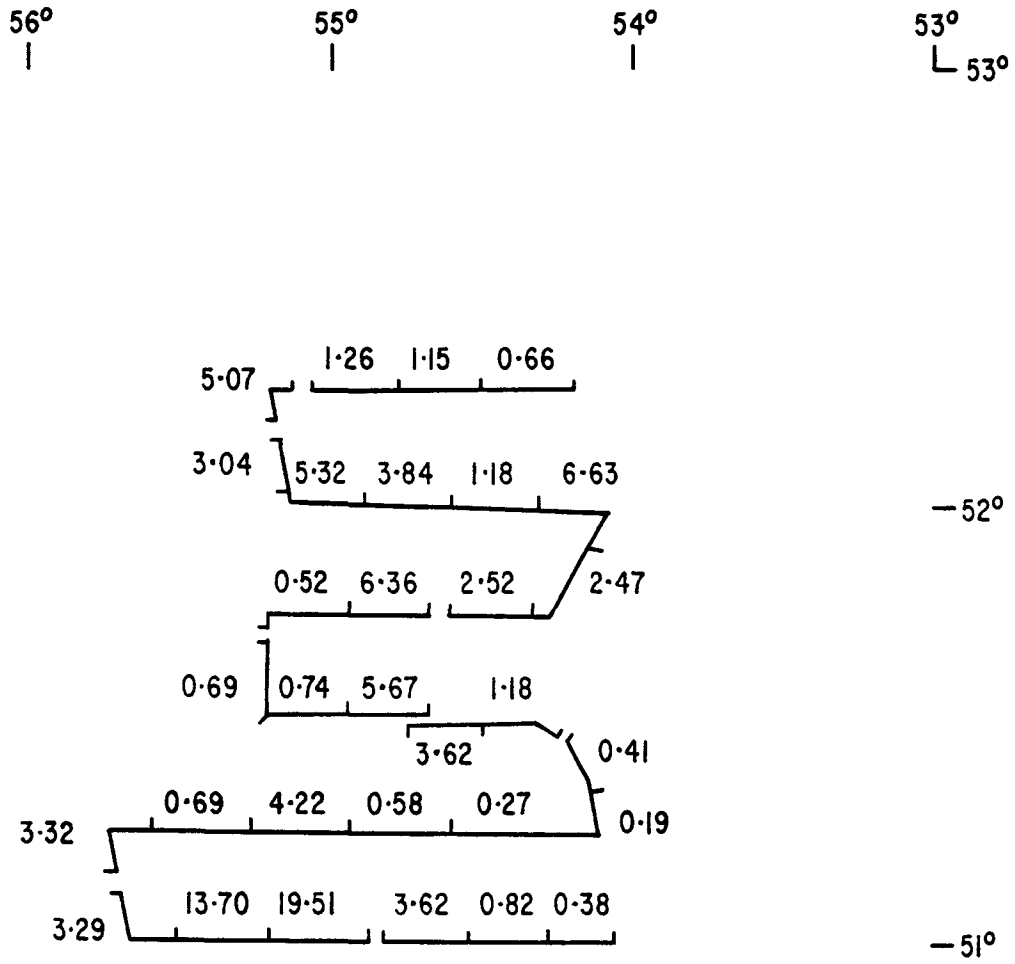


Fig. 3b. Div. 3K Arctic cod density estimates (no/m² averaged over 20 km interval) October 12-14.

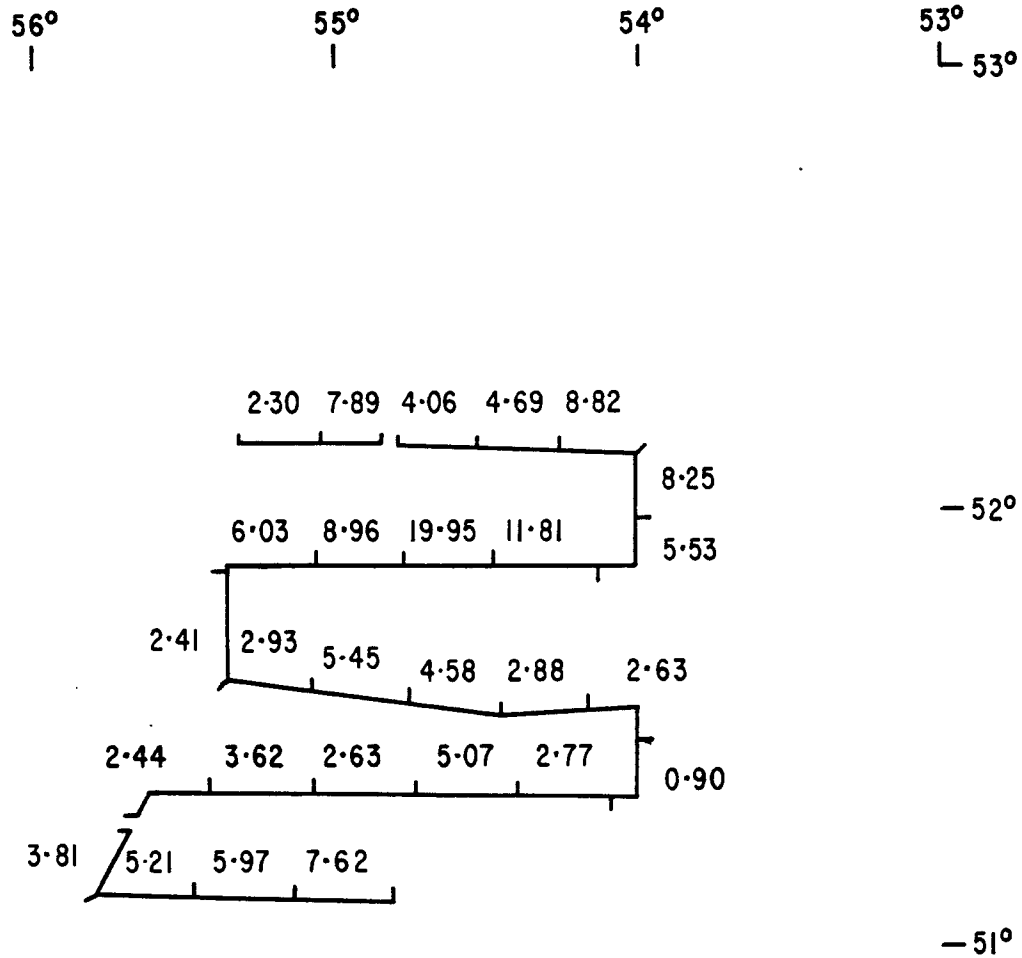


Fig. 3c. Div. 3K Arctic cod density estimates (no/m² averaged over 20 km interval) October 20-21.

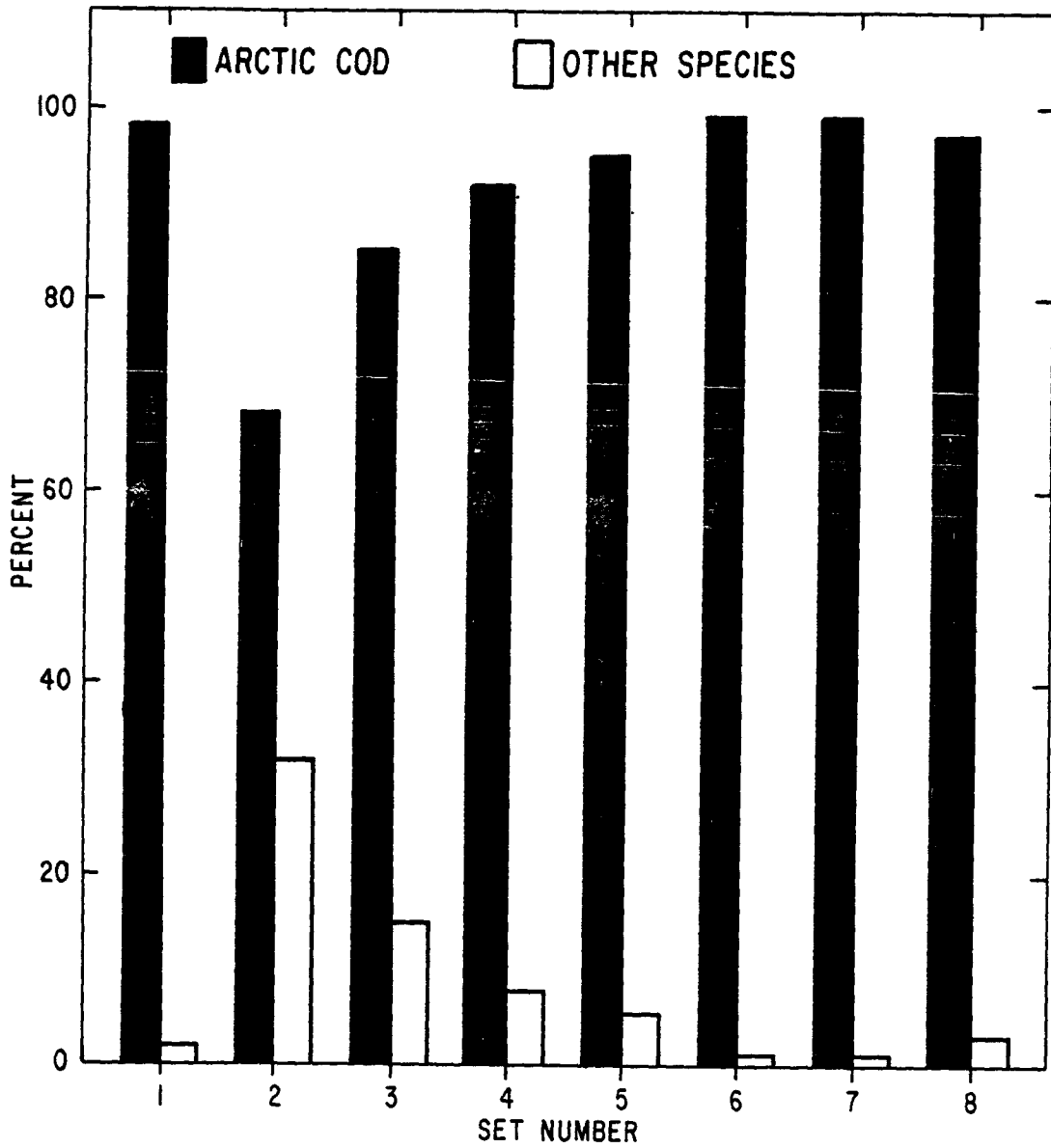


Fig. 4. Arctic cod catch composition by weight.