



Serial No. 5391

ICNAF Res. Doc. 79/VI/51

ANNUAL MEETING - JUNE 1979

A Contribution on the Beaked Redfish Commercial Fishery  
at Flemish Cap Bank

by

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Annotation.

Flemish Cap Bank beaked redfish size, sex and distribution at depths, and seasons data are given in the paper.

Relative stability of size composition is noted. The basis of catches by bottom trawl is formed of specimens of more than 30 cm at length. Since maximum catch amount per recruit is provided when the redfish length is 21 - 23 cm the trawls used now at Flemish Cap Bank seem to have inordinately large mesh.

Materials and methods.

The material is collected in 1958 - 1978 by scientific and scouting cruises using conventional trawls at fishing concentrations. Analysing the beaked redfish possible incidental catch as well as determining the correlation of beaked redfish to "golden redfish" the total survey data were used ( Chekhova, 1976 ). However trawl surveys were made at depths less than 400 m thus providing only part of deepwater redfish range, and only in 1978 this sort of survey was managed to be done at 600 m depth at Flemish Cap Bank.

Before 1972 only bottom fishing was executed and after this redfish catches were taken in pelagic waters ( Chekhova and Konstantinov, 1978 ).

We have analyzed mainly the material collected by a bottom conventional trawl. In those cases when midwater concentration data were used special reservations are made.

The total trawl survey was realized by a conventional trawl with a smallmeshed ( 20 mm ) polyamide netting fixed in its codend.

The whole redfish year cycle was conventionally divided into periods; with the same biological processes characteristic for each of them. March - June - extrusion of larvae and the beginning of summer foragin excursion; July - October - summer fattening and copulation; November - February - wintering and maturity of females. Year length composition is given only according to March - June period - the most complete and regular from the point of view of observations.

Fish length was always taken from the end of the snout to the end of the caudal fin.

When determining maturity Sorokin's scale was embraced ( Sorokin, 1958, 1960 ).

#### Results of investigations.

There are two species of redfish: beaked redfish ( *Sebastes mentella* Travin ) and "golden redfish" ( *Sebastes marinus* L ) at Flemish Cap Bank. In spite of the proved isolation of the two species, their different depth distribution and the possibility of specialized catching, international statistics include both "golden fish" and beaked redfish into the comprehension of "redfish".

Beaked redfish prevail in the catches quantitatively ( Table 1 ).

Table 1. Specimens number of redfish caught at different depths during 1978 trawl survey.

Depth, m	Number of specimens per trawl hour	
	Beaked redfish	Golden redfish
101-200	6,7	36,7
201-300	87,5	214,5
301-400	2734,5	30,2
401-500	648,5	1,0
501-600	827,0	-

In 1978 when the trawl survey was provided till the depth of 600 m the correlation of beaked redfish and golden redfish in the total catch at Flemish Cap Bank is possible to consider close to the real number correlation of the populations compared.

Beaked redfish is distributed at Flemish Cap Bank everywhere excluding some shallow water districts of the central part ( Fig.1 ). But its length composition is not uniform: there is quite a number of small immature specimens met in the catches on the northern slope ( Fig.2 ).

Beaked redfish length composition analysis from the very first years of Flemish Cap Bank exploitation shows that in 1958 - 1968 bottom trawl catches basis is formed of more than 30 cm length specimens ( Fig.3 ). In some of the recent years ( 1969, 1973, 1974, 1978 ) thanks to new productive year classes redfish length at the Bank reduced slightly ( Fig.4 ).

Redfish in midwater trawl catches is larger ( Chekhova and Konstantinov, 1978 ).

The connection between beaked redfish length and its dwelling depth has got one characteristic point: redfish is larger at deeper layers ( Fig. 5).

The dependence mentioned above is traced more brightly

among demersal accumulations' redfish and is slightly shaded in midwater ones thanks to females migration to large depths before extrusion of larvae and their following coming back to small depths ( March - June ).

As can be noted from Fig. 5 in March-June and in November - February redfish are smaller in fishing stocks than in July - October.

We showed formerly that the most rational exploitation of beaked redfish stocks is taking place when the fish caught is 21-23 cm at length. In this case the catch per recruit (  $\frac{V}{R}$  ) is maximum ( Chakhova, Konstantinov, Shafran, 1977 ).

According to the Soviet selectivity investigations ( Treshchev, 1974 ) at Flemish Cap Bank bottom trawls with the mesh of 107,2 mm loses 50% of beaked redfish specimens 28,5 cm long. Consequently 107,2 mm mesh is inordinately large because it exceeds the size providing the maximum catch per recruit. 102,8 mm size is closer to the optima one: 50% of specimens 27,5 cm long come through such a mesh ( Treshchev, 1974 ). Manila codend with 117,2 cm mesh size has equal selectivity. Thus commercial trawls used now at Flemish Cap Bank have inordinately large mesh which doesn't provide maximum catch per recruit.

Beaked redfish fishing is conducted till the depth of 700 m. But according to our previous observations the most abundant bottom concentrations are located at the depth of 301-600 m ( Chakhova, 1970 ).

Basing on the total trawl survey we have analyzed depth species composition distribution till 400 m. We cover completely the range of cod, golden redfish, long rough dab and partly beaked redfish whose concentrations are observed even deeper than the districts inspected.

Timing each species to a definite depth is obvious. Thus cod are chiefly observed at the depth of 101 - 300 m, long rough dab - 201 - 300 m, "golden redfish" - 201 - 300 m, beaked redfish - 301 - 400 m and even deeper (Table 2 ).

Table 2. Distribution of the main commercial fishes at Flemish Cap Bank at depths (total trawl survey data, 1971-1978).

Depth, m	God	Beaked redfish	Golden redfish	Long rough dab
101-200	54,2	2,9	13,2	26,0
201-300	30,0	18,4	42,5	7,5
301-400	13,0	76,5	4,7	1,7

Hereby, within the depths scienened when specialized fishing of beaked redfish takes place only insignificant number of cod, long rough dab, "golden redfish" could be met in incidental catches: lessening of commercial trawls mesh size recommended above woldn't threaten these species stocks.

Beaked redfish males begin to mature when reaching 27 cm at length, females - 28 cm. In the mass males become mature at 33 cm of length, females - 35 cm. At the time of productive generations appearance in the fishing ( 1973, 1978 ) more immature redfish were met in the catches. Thus in 1978 on the southern Bank slope beaked redfish 27 cm long made up 16,9%, on the northern one - 25,4% of the catch. But even then most of the specimens in the catches were larger.

Since there are distinctions traced in the vertical distribution of different length groups the correlation of mature and immature specimens by depth is also changing.(Table 3). Among beaked redfish fished off at 301-600 m deep 17,7% of immature specimens are met.

Table 3. Correlation of mature and immature deepwater redfish at Flemish Cap different depths in 1969-1976. (From commercial concentrations bottom trawl catches.)

Depth, m	Males		Females		Males and females	
	MATURE	immature	mature	immature	mature	immature
201-300	609	135	1411	60	91,2	8,8
301-400	2684	641	4340	540	85,6	14,4
401-500	3075	983	4697	687	82,3	17,7
501-600	481	40	1035	27	95,8	4,2
601-700	327	29	1022	51	94,4	5,6

#### Conclusions.

1. Beaked redfish is the most common fishing species whose concentrations at Flemish Cap Bank are located chiefly at 301-600 m of depth.

2. The dependence of the depth of redfish dwelling and their length: in deeper layers the fish are larger. Length composition at Flemish Cap Bank is not uniform: there are quantities of small immature redfish on the northern slope.

3. Specimens 33 cm long form the basis of beaked redfish catches. Redfish begin to mature when reaching the length of 27-28 cm and in the mass become mature when they reach 33-35 cm. Among redfish caught off when specialized fishing is taking place about 17,7% of mature specimens are met.

4. It is possible to obtain the maximum redfish catch per recruit beginning fishing with the specimens 21-23 cm long. Therefore trawls used now at the Bank have inordinately large mesh for beaked redfish fishing. Its size should be less than 100 mm (having polyamide codend). Cod, golden redfish and long rough dab are observed at lesser depths than beaked redfish and almost won't get into trawls with the mesh recommended.

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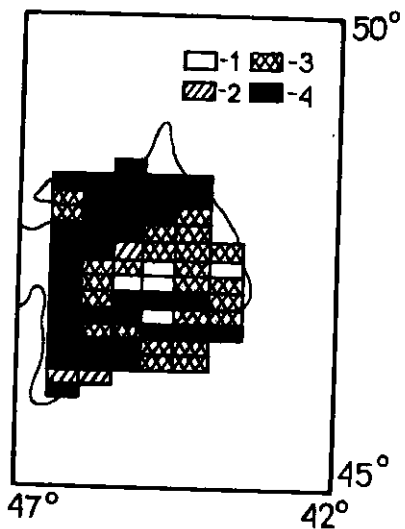


Fig. 1. Beaked redfish spreading at Flemish Cap Bank.

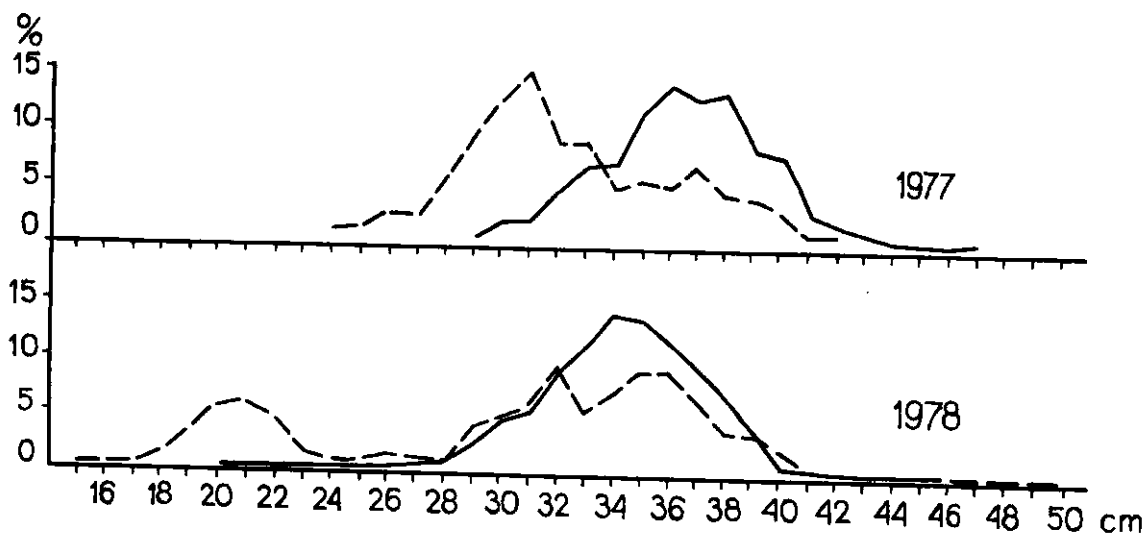


Fig. 2. Beaked redfish length composition at Flemish Cap Bank in 1977-1978. (Continuous line - southern slope, dotted line - northern slope.)



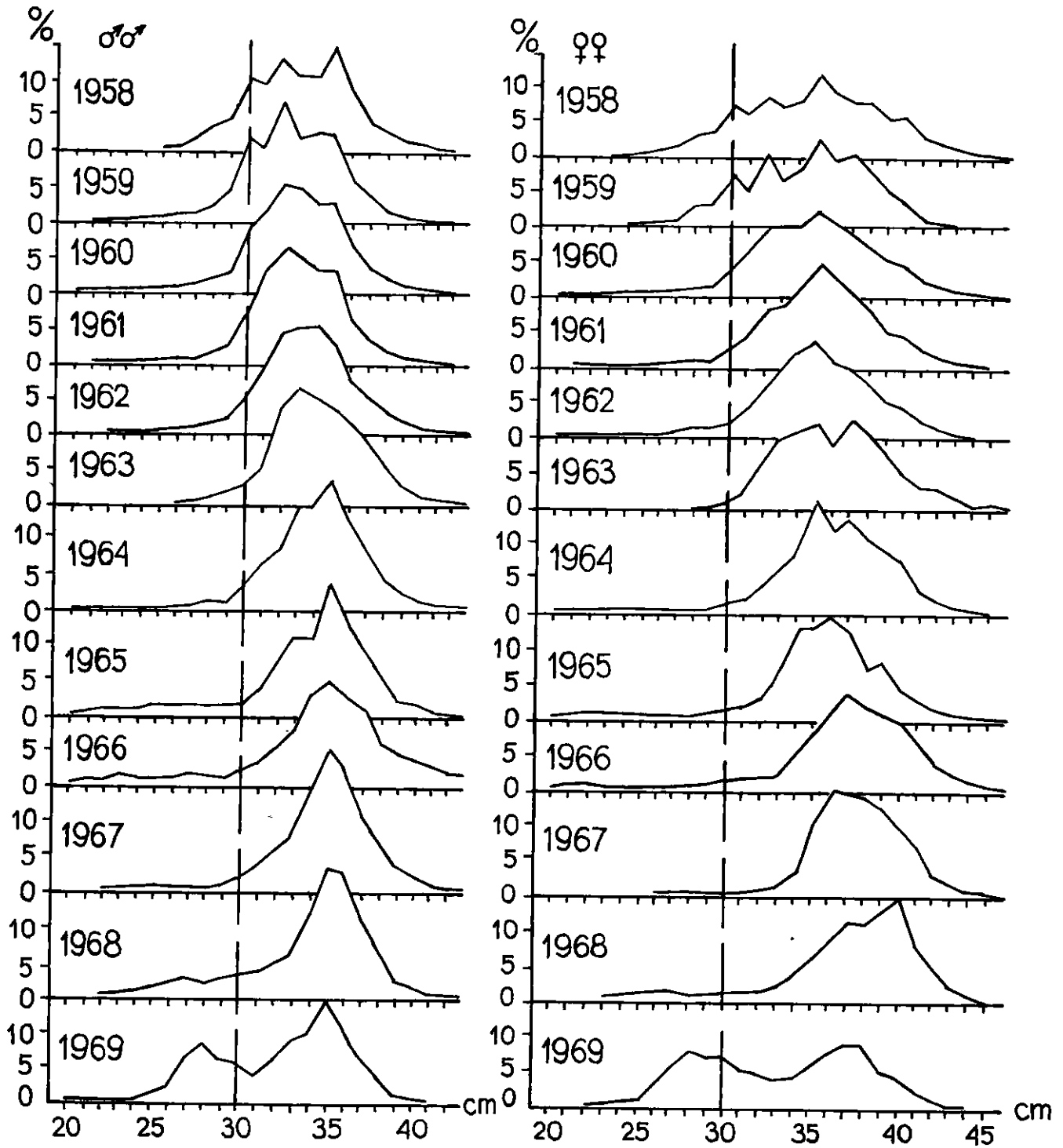


Fig. 3. Beaked redfish length composition at Flemish Cap Bank in 1958-1969.

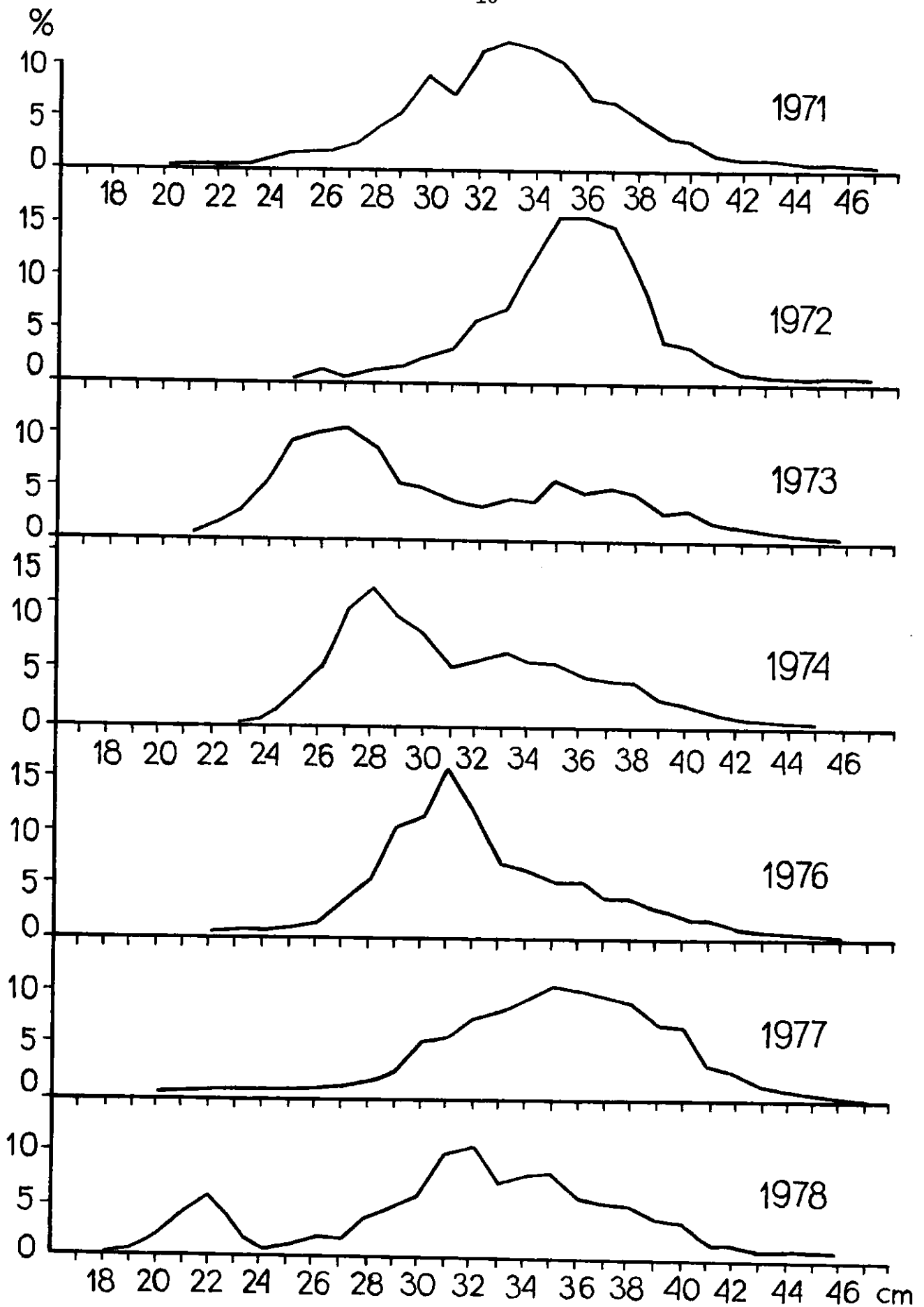


Fig. 4. Beaked redfish length composition at Flemish Cap Bank in 1971-1978.

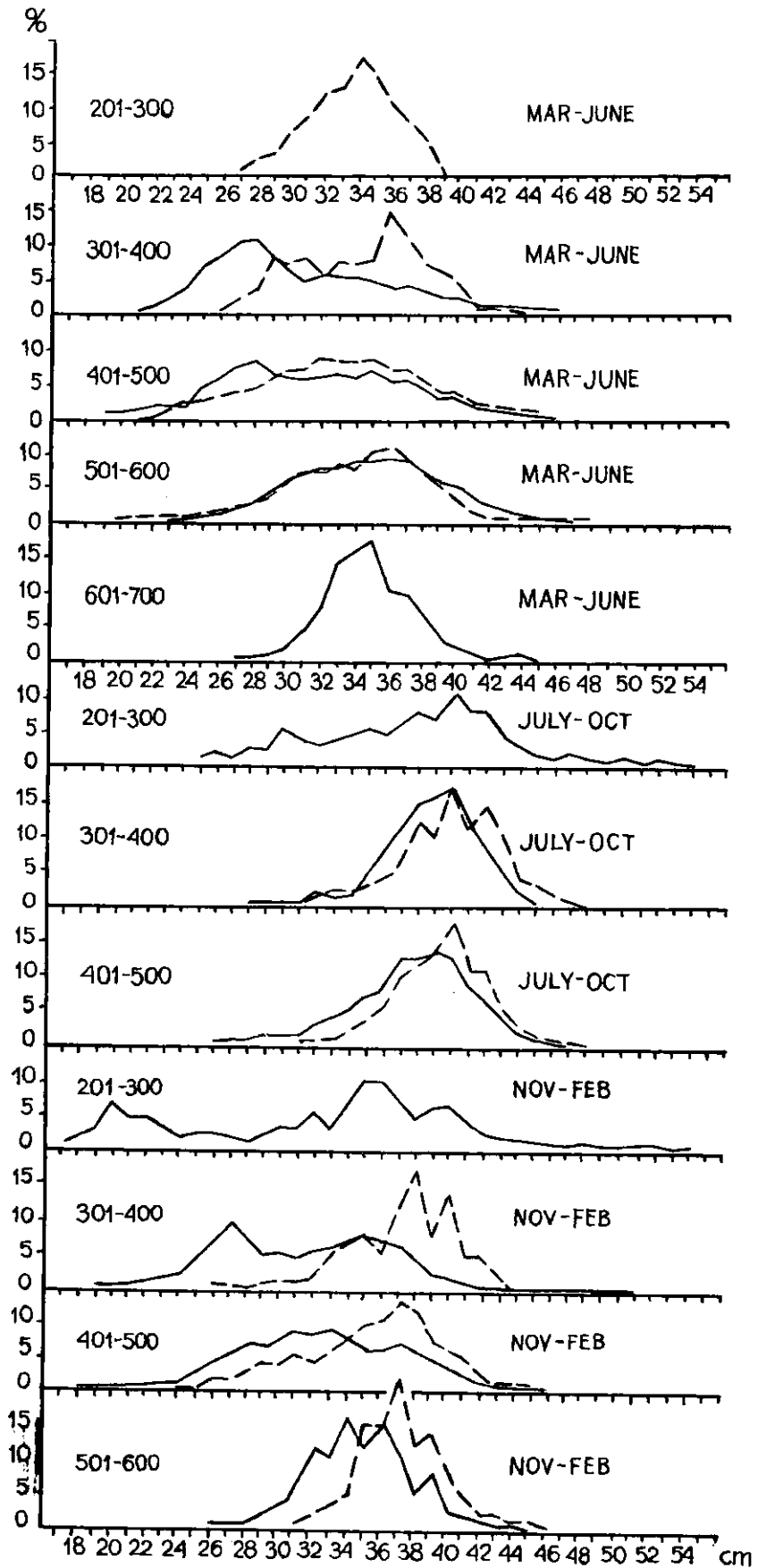


Fig. 5. Beaked redfish length composition and pelagic concentrations data in different seasons (continuous line - bottom concentrations, dotted line - pelagic concentrations).

