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Isolation of Deepwater Redfish (*Sebastes mentella*) Stocks  
on the Grand Newfoundland Bank

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Abstract

Data on Sebastes mentella size-age composition collected by the Soviet ichthyologists in the period from 1963 to 1977 in the Grand Newfoundland Bank northeastern and southern slopes area are given in the present paper. By some features (growth rate, maximal duration of life, dominant sizes and ages) it was determined that Sebastes mentella of the northeastern slope (3L) differs from those of the Grand Bank southern slopes (3NO) which confirms that the stocks compared are isolated. It is noted it's expedient to determine some limits and quotas for redfish fishery in the following areas:

- a) the Grand Bank northeastern slope,
- b) the Grand Bank southern slopes.

Introduction

Some Soviet investigators as well as those abroad have studied redfish size-age composition and growth rate in the Northwest Atlantic (Jensen, 1922; Smaragdova, 1936; Kotthaus, 1952, 1958; Bigelow and Schroeder, 1953; Kelly & Wolf, 1958; Rasmussen, 1958; Sandeman, 1958, 1961; Templeman, 1959; Travin & Pechenik, 1962; Surkova, 1962, 1962a; Yamulov, 1962; Rikhter, 1967; Nikolskaya, 1969, 1972, 1973).

All the above mentioned authors characterize redfish size composition in trawl catches, indicate a relatively large length increment during the first years of life (up to 5 years), growth deceleration in the following years and also a long duration of life.

Our task is to compare age-length composition and growth rate of Sebastes mentella on the southeast and southern slopes of the Grand Bank and to find out possible isolation of stocks in the areas compared.

Redfish of the Grand Bank are very important for the Soviet and foreign trawl fishery. In catches of redfish 90-95% of specimens are presented by the most numerous and widespread species Sebastes mentella Travin. Though, according to the data presented

in papers by V.V. Barsukov (1968), V.V. Barsukov and G.P. Zakharov, (1972) and Ni (1980) there is one more species Sebastes fasciatus Störer widely spread in the South Labrador and Newfoundland area. This species is distributed in considerably lesser depths than Sebastes mentella Travin, usually from 70 to 350 m, and very seldom deeper. The existence of this species is recognized not by all ichthyologists yet. So, Yu.P. Altukhov (1974) writes: "Barsukov and Zakharov's conclusion seems to be disputable in some facts and considerations". We are to state that the conclusion on redfish distribution by depths preserves its value for trawl fishery practice even in case if it is proven that in the South Labrador and Newfoundland area besides Sebastes mentella there exists redfish of another species Sebastes fasciatus which is quite similar to S. mentella. These species are practically similar in sizes, growth and maturity rate and also in nutritive value.

The Soviet redfish trawl fishery in the Grand Bank area has started in 1958. Till 1960 this area had become very important for the redfish fishery (Table I). In the period from 1967 to 1972 the most successful fishery was on the Grand Bank southern slopes. In 1976 - 1978 catches decreased which was connected with a strict quotas for fishery. This measure had a positive influence on the redfish stock and on productivity of redfish fishery.

Nowadays mainly the USSR and Canada conduct redfish fishery in the Grand Newfoundland Bank area.

#### Material and methods

All the material had been collected in the period 1963-1977.

Length frequencies and mean lengths discussed were obtained during measuring redfish caught by conventional bottom trawls with mesh size 120 mm. Thus, our data characterize length composition of redfish commercial stock but not that of their year classes as a whole.

The material was analysed separately by males and females. The absolute length of each individual was measured in all cases. Age samples were taken from bottom trawl catches, they usually numbered 200-300 fish. The technique of scales investigations, preparation and examination of object carrier is described by E.I. Surkova (1962a). We have measured about 101 000 specimens and determined age in 5 000 specimens. The age composition data obtained were transferred into length frequencies.

Comparing mean lengths and weights of different year-classes of redfish we were able to characterize a linear growth rate. Doing this we used the observations instead of data calculated.

The material on size-age composition and growth rate is presented in Tables.

### Size composition

Data on redfish mass measurement for 1963-1977 are combined into general length frequencies for each division.

During the period of investigations (1963-1977) we found out that in the Grand Bank northeastern slope area fish of 35-36 cm long were dominant in males and those of 40-43 cm long were dominant in females. Mean lengths of males and females in the period from 1963 to 1977 fluctuated without a certain trend to a decrease or an increase (Table 2). Probably mean lengths fluctuations are caused by a certain dissimilarity of the material compared which was taken in different depths and in different seasons.

A certain trend towards declining of males and females mean lengths was observed on the Grand Bank southeastern and southwestern slopes in 1963-1975 (Table 2). On the southwestern slope there were smaller redfish than on the southeastern slope (Table 2).

On both slopes redfish are considerably less in maximal and mean lengths than those from the northeastern slope (Table 2).

### Age composition

Redfish age composition in the three areas compared is given by catches of 1964-1966 (Table 3), just in the period when an intensive redfish fishery had not started yet. Thus, the Table reflects age composition of the stock that wasn't exploited yet.

An analysis of the age composition showed that in 1964-1966 in the Grand Bank northeastern slope area mean age of males was 13.8 years and that of females was 17.5 years (Table 3).

On the Grand Bank southeastern and southwestern slopes mean age of males and females had gradually decreased during the same period (Table 3).

As a rule, redfish of the southeastern slope were larger and older than those of the southwestern slope (Table 2 and 3). Though there are reasons to consider that on both southern slopes of the Grand Bank a single stock of redfish is distributed. These slopes haven't any natural boundaries and subdividing of the Grand Bank southern part into two areas (along the meridian of 51°W) is merely conventional.

According to morphological and parasitological data (Yamulev, 1962) redfish dwelling on the Grand Bank southeastern slope may intermingle with those from the southwestern slope.

Our results of growth rate determination (see below) also testify to a complete similarity of redfish from both southwestern and southeastern slopes. We explain the differences in the size-length composition of redfish from these slopes in the following way: the largest and oldest individuals migrate from the southwestern slope to southeastern one (Konstantinov and Noskov, 1980). Hence, for instan-

oe, redfish older than 18 years may be found on the southeastern slope more often than on southwestern one. Relative abundance of the older year-classes (from 15 to 22 years) was 18% on the southeastern slope and 19% - on southwestern (Nikolskaya, 1969).

#### Growth rate

The Grand Newfoundland Bank redfish growth rate was investigated by E.I. Surkova (1962), V.A. Rikhter (1967); the latter had available only materials from the southwestern slope of the Bank (30). Comparison of the results obtained by E.I. Surkova and those of ours indicates that in 1963-1968 growth rate of redfish on the Bank southern slopes has to some extent increased comparing with 1957-1960 (when Surkova collected her material). We consider that the growth rate has increased due to the stock thinning out as a result of intensive fishery (in 1961-1975 redfish fishery had been developing mainly on the Bank southern slopes, see Table I). Growth rate of redfish on the Bank northeastern slope had retained actually the same. Besides, if a single stock was distributed on all the slopes of the Bank and redfish would freely migrate northward from the South, - then it would be possible to register the growth rate acceleration on the northeastern slope as well.

According to our data redfish on both southern slopes of Grand Bank (3N,30) had in 1963-1968 the same growth rate, and on the northeastern slope the growth rate was decelerated. This difference is peculiar for both males and females of all age groups from 8 to 16 years (Table 4).

In the following years the difference between growth rates on the northeastern slope, on one hand, and on the southern slopes, on the other, remains the same as in 1963-1968 (Konstantinov and Noskov, 1979).

If our supposition is true then an impairment of fishery on the northern slopes of the Grand Bank would result in redfish abundance growth in the nearest years and, therefore, in deceleration of their growth rate.

#### Conclusion

We have compared redfish age-length composition and growth rate in the area of the Grand Bank northeastern and southern slopes.

It should be noted that on the Grand Bank northeastern slope redfish are larger and older, their growth is slower and takes a longer part of their life. These important differences allow us to regard redfish from the northeast and southern slopes of the Grand Bank as fish of two different stocks, which confirms the Yanulov's opinion (1962).

Besides, while determining quotas on redfish catches in the ICNAF

Area the Grand Bank northeastern and southeastern slopes are combined and the southwestern slope is isolated. It may not be considered as a biologically valid aspect. Separated quotas should be appointed for: a) the Grand Bank northeastern slope and b) the southern slopes.

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Table 1.

Redfish catches (in tonnes) in the Grand Newfoundland Bank area;  
data from ICNAF Statistical Bulletins

Year	Grand Bank north-eastern slope (3L)		Grand Bank southeastern slope (3N)		Grand Bank southwestern slope (3O)	
	All countries	Including USSR	All countries	Including USSR	All countries	Including USSR
1958	13328	12947	7741	-	6071	-
1959	34107	20347	10478	844	9268	328
1960	11467	2778	16547	7054	5030	200
1961	8349	2328	14826	3307	11394	2536
1962	3425	741	18009	679	7557	5901
1963	8191	6330	12906	-	9180	3568
1964	3698	2850	4206	35	16044	12786
1965	9451	6932	4042	68	19612	19300
1966	6927	282	10047	5851	15305	14667
1967	7684	769	18586	12793	19037	17707
1968	2348	109	15265	14686	6424	6364
1969	927	391	22142	22068	15878	15344
1970	1029	185	13359	12926	13192	12795
1971	10043	462	24310	24043	19792	18216
1972	3095	1201	25838	25429	16117	15501
1973	4709	845	28588	26392	8797	8156
1974	11419	10040	10867	10335	13124	12747
1975	3838	640	14033	13857	15110	15000
1976	15971	7691	4541	3914	15348	11663
1977	13452	3231	3064	2645	10850	7376
1978	6318	1395	5725	4532	6860	4647

Table 2.

Mean length of redfish (cm) from the Grand Newfoundland Bank

Year	Grand Bank north eastern slope (3L)		Grand Bank south- eastern slope (3N)		Grand Bank south- western slope (30)	
	males	females	males	females	males	females
1963	35,9	40,3	33,3	39,4	28,0	29,3
1964	35,4	38,8	33,2	37,1	33,0	34,9
1965	34,7	36,8	32,4	34,8	33,9	34,6
1966	35,8	40,5	34,8	37,1	27,9	31,8
1967	36,5	40,1	-	-	-	-
1968	34,0	37,6	-	-	-	-
1969	34,0	38,4	30,3	33,2	25,3	30,3
1970	26,0	30,4	30,8	31,4	-	-
1971	37,1	40,8	-	-	-	-
1972	40,0	43,3	-	-	25,1	25,3
1973	32,9	36,0	27,4	32,3	28,0	33,2
1974	34,3	38,0	-	-	-	-
1975	33,8	40,8	22,6	23,9	22,2	23,9
1976	31,8	33,3	-	-	-	-
1977	34,1	35,8	-	-	-	-
Mean for 1963-1977 period	34,4	38,1	30,6	33,6	27,9	30,4



Table 3. Mean age of redfish in the Grand Bank area (in years)

Year	Grand Bank north- eastern slope (3L)		Grand Bank south- eastern slope (3N)		Grand Bank south- western slope (3O)	
	males	females	males	females	males	females
1964	14,4	16,9	12,2	14,9	13,5	14,6
1965	12,6	16,7	11,3	12,7	12,9	12,9
1966	14,5	18,8	10,0	12,4	8,1	10,2
Mean for 1964-1966	13,8	17,5	11,2	13,3	11,5	12,6

Table 4.

Mean length (cm) in different age-groups of redfish on the Grand  
Newfoundland Bank during 1963-1968

Age, in years	Grand Bank north- eastern slope (3L)		Grand Bank south- eastern slope (3N)		Grand Bank south- western slope (3O)	
	males	females	males	females	males	females
6	-	-	24,7	25,3	23,0	23,4
7	-	-	26,7	27,2	25,6	25,9
8	27,2	27,2	28,3	29,2	28,0	28,6
9	27,7	28,4	28,8	29,9	29,9	30,9
10	28,9	29,6	29,6	30,9	31,4	32,1
11	31,1	31,6	31,2	32,2	31,5	32,8
12	33,4	33,8	33,5	33,9	33,6	34,3
13	34,5	35,2	34,8	35,5	35,0	35,5
14	35,8	36,3	36,3	36,8	36,1	36,5
15	36,9	37,6	37,6	38,3	37,4	37,7
16	38,0	38,9	39,7	39,4	38,9	39,1
17	39,2	39,8	-	41,2	-	39,5
18	39,6	40,8	-	42,0	-	41,1
19	40,4	41,5	-	42,8	-	-
20	42,1	42,5	-	44,4	-	-
21	42,7	43,3	-	44,8	-	-
22	44,4	44,4	-	45,6	-	-
23	-	45,3	-	-	-	-
24	-	46,8	-	-	-	-
25	-	47,6	-	-	-	-
26	-	48,4	-	-	-	-

