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On Distribution and Spawning of Witch Flounder in the Newfoundland Area

by

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ABSTRACT

The comparison of the length composition of witch trawl catches in various divisions of the Newfoundland subarea and also the comparison of the length of the primarily spawning fish make it possible to suggest the existence of a single population over the vast area from the Labrador to the southern extremity of the Grand Bank. On the Saint Pierre Bank a distinct population seems to exist.

INTRODUCTION

Witch (*Glyptocephalus cynoglossus*) in the north-western Atlantic is distributed over the vast area and wide depth range (Leim & Scott, 1966). From the scientific and practical point of view it is very important to know whether this species is subdivided into local populations or there is a continuous interchange of individuals within the whole species range.

TAGGING

The possibility of free interchange of individuals could be cleared out with the help of mass tagging. Like many other fish having no air bladder (Konstantinov, 1977), the adult witch don't lose their vitality when extracted from the deepest layers of the ocean. Unfortunately, there is still no information on recapture of any individual of those very few which being tagged by the Soviet scientists on the Grand Bank (Table 1).

The author hopes that if any of those tagged individuals is (or will be) taken, the data on recapture area and the time of recapture will be sent to PINRO.

Table 1. Tagging of witch on the Grand Bank in 1969, 1970, 1973.

No.	Date	Coordinates of release		Depth of release m	Tag No	Total fish length, cm
		Latitude (N)	Longitude (W)			
1	03.10.1969	45°41'0''	50°38'0''	76	211057	49
2	"	"	"	"	211058	51
3	"	"	"	"	211061	51
4	"	"	"	"	211065	47
5	"	"	"	"	211066	50
6	"	"	"	"	211067	50
7	26.06.1970	45°51'0''	53°36'3''	85	208574	40
8	"	"	"	"	203577	51
9	"	"	"	"	208578	44
10	"	"	"	"	208579	44
11	"	"	"	"	208580	42
12	"	"	"	"	208581	47
13	"	"	"	"	208582	48
14	"	"	"	"	208583	46
15	"	"	"	"	208589	47
16	"	"	"	"	208600	44
17	12.06.1973	45°37'0''	53°29'5''	74	241453	48
18	28.07.1973	46°49'0''	49°49'0''	85	265144	48

LENGTH COMPOSITION

We tried to reveal the existence of witch local populations in the North West Atlantic by indirect methods. Fig.1 shows the length composition of witch catches, obtained by total trawl survey in the Newfoundland subarea. The methods and the main results of this survey are given in some works, e.g. in the last report by Chekhova (1978). All trawling is carried out by the bottom trawl with a small-meshed net inserted into the cod-end, thus giving the notion of the length composition of the whole population, including small individuals.

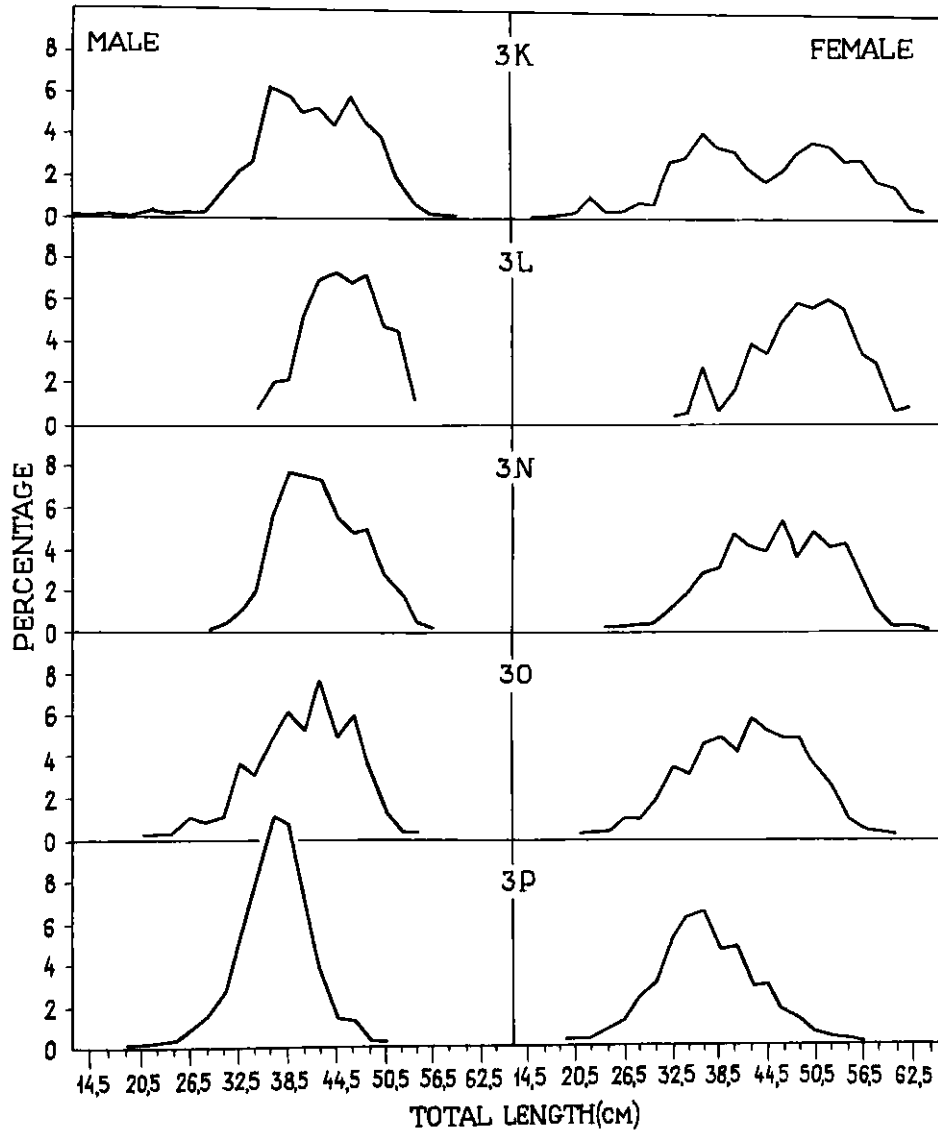


Fig. 1. Length composition of witch from trawl catches in the Newfoundland Subarea.

The survey is carried out yearly, always in spring-autumn period, covering the whole shelf and upper part of the continental slope. Each trawling lasts exactly one hour.

As seen from Fig.1 and Table 2 in divisions 3K, 3L, 3N and 3O, the with length composition is rather the same (insignificant exceeding of the witch length in division 3L is apparently connected with relatively poor abundance of individuals measured there). However, the witch length composition in division 3P is markedly different.

Table 2. Number of specimens measured and mean total witch length in Newfoundland Subarea in 1972-1977.

ICNAF Div.	Month, Year	No. of specimens measured		Mean total length (cm)	
		Male	Female	Male	Female
3K	March 1975, June 1976	1352	1292	41.74	44.74
3L	March 1976, June 1977	303	375	45.30	48.74
3N	April 1972, May 1973	1064	990	42.43	45.96
3O	April 1972, July 1974, April 1976	882	999	40.17	41.71
3P	July 1974, July 1975, April 1976	2730	2542	36.65	38.18

Thus it is permissible to suggest that in division 3P there exists the distinct population of witch, meanwhile in the rest of the surveyed area there is no local populations. This suggestion corresponds to the data on the growth rate of witch (Bowering, 1976). Namely, on all the slopes of the Grand Bank and northward the growth rate of witch is the same, whereas on the Saint Pierre Bank and also in the Saint Laurence Bay they grow slower.

Disunity of populations living on the Saint Pierre Bank and Grand Bank is also revealed among other bottom fishes as, for instance, beaked redfish (Nikolskaya, 1969) and haddock (Shestov, 1972). This disunity obviously depends on the way of the branch of the cold Labrador current, which passes approximately along the border between the two compared banks.

This branch separates only a small part of the south-western slope from the Grand Bank.

SEXUAL MATURITY

To find out whether there are any other differences between witch of various subareas, the data on sexual maturity would be compared. Regularly, in the Newfoundland subarea, the Soviet fishery scientists dissect witch registering length, sex and maturity stage for each individual. Table 3 shows the smallest lengths when witch reach pre-spawning or spawning state, i.e. stage IV (sexual products being already definitive but not yet running), stage V (the sexual products are running), stage VI (the sexual products have been spent). Apparently in division 3P the witch first spawn having somewhat smaller length than in the rest of surveyed area (in April 1976 in division 30 the samples were taken near the Saint Pierre Bank and possibly consisted of individuals from both populations). In division 3K, 3L, 3N and in the great part of division 30 the length of the first spawning witch is rather the same.

The spawning of witch is very continuous and prolonged, especially the spawning of males: prespawning, spawning and postspawning individuals are found from March to July in many stations of the Newfoundland subarea, mainly in the outer edge of the shelf. Pelagic eggs and larvae are transferred by the Labrador current over the vast region covering divisions 2J, 3K, 3L, 3N and 30. Within this region the active migrations of adults are not prevented by any of natural barriers. Thus between the Labrador and southern extremity of the Grand Bank the local populations are hardly probable to exist. Only the presence of almost closed current system on the Saint Pierre Bank makes it possible to suggest that there a distinct population exists which may be connected with that of the Saint Lawrence Bay. This conclusion is conformed by Fig.10 of Bowering paper (1976).

STOCK EXPLOITATION

From the mentioned above, two separate witch catch limits do not seem to be quite justified in divisions 2J + 3KL and 3NO.

Table 3. The shortest total length of prespawning and spawning witch specimens in Newfoundland subarea.

Division	Month, Year	Number of dissected specimens	The shortest total length of prespawning and spawning individuals, cm	
			male	female
3K	August 1974	186	35	-
3K	March 1975	529	36	41
3K	June 1976	277	34	39
3L	June 1972	99	43	45
3L	March 1976	22	40	42
3L	May 1976	241	36	47
3N	April 1972	50	39	43
3N	May 1977	163	38	44
3O	April 1972	150	38	42
3O	July 1974	94	33	45
3O	April 1976	386	29	39
3P	May 1972	100	33	37
3P	June 1973	454	30	37
3P	July 1974	471	30	36
3P	April 1976	867	29	33

Efficient specialized witch fishery is usually carried out in divisions 2J and 3K (Table 4) in February-April. Thus the realization of limit on divisions 2J + 3KL is not connected with many difficulties. It is more difficult to realize the limit in divisions 3NO where witch seldom constitute dense fishing shoals. The introduction of the total limity for subareas 2J + 3KLNO would be rational for the witch fishery, for on the whole area mentioned there exists a single stock.

Apparently there are no reasons to fear if there will be a heavy fishing effort on the northern part of the witch population. The relationship between fishing mortality and the catch per recruit of witch in divisions 2J + 3KL is shown by a curve,

having no peak (Bowering & Pitt, 1978). In other words, a slight increase in fishing mortality will not result in immediate decrease of productivity of witch fishery.

Table 4. Average yearly catch of witch (tons) in 1974-1976. Data taken from the ICNAF Statistical Bulletin.

Division	Country	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year
2J	Canada	-	4	-	-	-	-	-	-	-	1	-	-	5
	FRG	63	180	33	-	-	-	-	-	-	-	-	-	276
	GDR	18	28	8	-	1	-	-	-	-	-	-	-	55
	Poland	40	73	110	34	17	35	40	801	18	7	-	-	1175
	Portugal	10	11	12	19	3	1	1	2	2	4	-	5	70
	USSR	67	51	1	1	-	14	11	7	5	7	3	14	181
	England	-	-	-	-	-	2	6	-	-	-	-	-	8
3K	Canada	-	1	14	-	4	21	106	174	164	33	-	2	519
	FRG	6	248	167	-	-	-	-	-	-	-	-	-	421
	GDR	-	170	3	-	25	-	-	-	-	-	-	-	198
	Poland	84	410	1454	860	73	2	-	1	-	71	78	210	3243
	Portugal	15	38	27	33	17	3	3	4	37	20	17	12	226
	USSR	354	447	98	189	466	907	361	330	170	281	485	487	4625
3L	Canada	10	3	17	21	18	40	298	366	269	126	42	34	1244
	France	-	-	-	-	-	-	-	-	1	3	-	-	4
	FRG	-	-	15	-	-	-	-	-	-	-	-	-	15
	Poland	1	3	126	4	-	-	-	-	-	-	-	-	134
	Portugal	12	34	98	27	6	17	30	74	27	17	21	49	412
	USSR	11	8	4	6	17	21	5	4	1	1	13	6	97
3N	Canada	74	119	109	141	44	10	4	3	11	50	75	89	729
	Portugal	-	-	4	-	-	-	-	-	-	-	-	-	4
	USSR	13	3	151	274	154	426	135	132	64	48	155	111	1666
3O	Canada	227	300	349	437	128	49	28	5	13	14	28	22	1600
	USSR	11	1	223	295	431	760	116	115	81	97	278	338	2746
3P	Canada	24	35	167	317	261	148	126	155	216	86	111	106	1752
	France	3	1	13	3	10	2	4	1	4	3	4	-	48
	Portugal	1	13	4	-	-	-	-	-	-	-	-	-	18
	USSR	-	-	-	-	1	-	-	-	-	-	1	-	2

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