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Estimation of Witch Stock in Div. 3LNO According to the Data on 1983-88 Trawl Surveys

by

S. A. Kuzmin

Polar Research Institute of Marine Fisheries and Oceanography (PINRO)
6 Knipovich Street, Murmansk 183763, USSR

ABSTRACT

Results from the 1983-1988 trawl surveys indicate some reduction in witch stocks in Div. 3L for 3 recent years and stock stability in Divs. 3NO which are confirmed by a constant length composition of fishes from catches.

INTRODUCTION

At present, stock of witch as well as of other commercial objects is estimated in trawl surveys. A complete coverage of a whole range of fish vertical distribution during survey is necessary to obtain the more precise estimate for stock. In Canadian scientists opinion the data obtained during surveys are insufficient for stock precise estimation since the surveys were, as a rule, conducted at the depth to 360 m (Bowering, 1987, 1988). They also regard the data available on commercial statistics to be insufficient for determining the fishing mortality (Bowering, 1988).

An attempt to estimate witch stock according to the results from Soviet trawl surveys conducted at the depths to 730 m in Divs. 3LNO in 1983-1988 was undertaken in the paper.

MATERIAL AND METHODS

Since 1983 Soviet stratified-random trawl surveys have been carried out according to the available methods

(Doubleday, 1981). Since 1984 a haul duration was half-hour and prior to this year it was 1 hour. Assuming that catch size depends directly on haul duration, the mean catches results for 1983 given in Tables were reduced to half-hour hauls. Mean (for each stratum and Division) number (indiv.) and fish weight (kg) in catch per 30 minutes of trawling over the swept area of 0.0135 mile² were taken as the indices for biomass and abundance. Fish measurements by sex were presented as plots of length frequencies in percentage of males and females, respectively.

RESULTS AND DISCUSSION

Tables 1, 2 and 3 present the results for witch stock estimation by strata in Divs. 3L, 3N and 3O. Fish biomass made up on the average about 50% at the depths over 360 m in Div. 3N and about 4 and 31% - in Divs. 3O and 3L, respectively. From 1983 to 1988 some increase in biomass at the depths over 360 m was observed in Divs. 3L and 3N. This agrees with Bowering's hypotheses (Bowering, 1988) that variations in the previous estimates for witch biomass were related to changes in fish distribution.

Data on fish abundance and biomass given in Table 4 indicate a possible stability of stock in Divs. 3N and 3O and a reduction in stock in Div. 3L for recent 3 years.

Analysis of fish length composition from catches taken in Divs. 3L, 3N and 3O was made for 1982-1988 (Fig. 1, 2 and 3). Similarity in witch length composition confirms the hypothesis of stable stock level on the Grand Newfoundland Bank every year.

R E F E R E N C E S

- BOWERING, W.R. 1987. The Status of the Witch Flounder Resource on the Southern Grand Bank (NAFO Divs. 3N and 3O). NAFO SCR Doc. 87/24, Ser.No.N1307, 10 p.
- BOWERING, W.R. 1988. Some Aspects of the Witch Flounder Fishery on the Southern Newfoundland Grand Bank (NAFO Divs.3NO). NAFO SCR Doc. 88/68, Ser.No. N1511, 9 p.
- DOUBLEDAY, W.G., Editor. 1981. Manual of Grandfish Surveys in the Northwest Atlantic. NAFO, Scientific Council Studies, Number 2, Dartmouth, Canada, 1981/1-55.

Table 1. Mean catch of witch per a valid haul in Div. 3L according to the results from 1983-1988 trawl surveys

Depth, m	Stratum	Mean number per a haul, indiv.										Mean weight per a haul, kg									
		1983!	1984!	1985!	1986!	1987!	1988!	1983!	1984!	1985!	1986!	1987!	1988!	1983!	1984!	1985!	1986!	1987!	1988!		
56-92	350	-	0.3	-	-	-	-	-	-	-	-	-	-	0.2	-	-	-	-	-	-	
	371	-	0.3	-	-	-	-	-	-	-	-	-	-	0.3	-	-	-	-	-	-	
93-183	385	-	-	2.3	-	-	-	-	-	-	-	-	-	-	2.5	-	-	-	-	-	
	390	-	-	0.8	-	-	-	-	-	-	-	-	-	-	0.6	-	-	-	-	-	
184-274	347	0.2	3.3	-	-	-	-	-	-	-	-	-	0.2	3.1	-	-	-	-	-	-	
	366	-	7.3	2.0	1.3	1.0	1.0	0.7	0.3	0.3	0.3	0.3	6.6	17.5	31.5	2.5	0.6	0.7	0.4	0.3	
	369	-	10.5	25.7	44.5	5.0	0.7	0.3	0.3	0.3	0.3	2.3	34.9	37.9	7.4	7.3	7.3	0.3	0.3	0.3	
	386	-	1.0	6.0	8.5	0.3	0.3	0.3	0.7	0.7	0.7	3.2	15.1	8.8	4.5	2.4	2.4	0.3	0.3	0.3	
	389	-	0.7	1.0	0.5	0.8	0.7	0.3	0.3	0.3	0.3	0.6	21.3	2.6	1.3	1.0	2.1	0.4	0.4	0.5	
	391	-	1.7	1.0	-	-	0.7	0.3	0.3	0.3	0.3	0.6	4.4	0.8	0.4	2.1	2.1	0.4	0.4	0.5	
275-365	345	6.4	16.3	35.3	3.0	0.7	0.7	0.7	0.3	0.3	6.6	17.5	31.5	2.5	0.6	0.6	0.6	0.3	0.3	0.3	
	346	3.9	41.3	45.3	8.3	6.3	6.3	6.3	0.3	0.3	2.3	34.9	37.9	7.4	7.3	7.3	0.3	0.3	0.3		
	368	-	0.5	4.7	6.7	3.0	0.3	0.3	0.7	0.7	3.2	15.1	8.8	4.5	2.4	2.4	0.3	0.3	0.3		
	387	3.7	22.8	11.0	1.7	0.7	0.7	0.7	0.7	0.7	0.6	21.3	2.6	1.3	1.0	2.1	0.4	0.4	0.5		
	388	0.5	30.3	2.5	1.7	0.7	0.7	0.7	0.7	0.7	0.6	21.3	2.6	1.3	1.0	2.1	0.4	0.4	0.5		
	392	0.5	7.3	1.3	0.5	4.3	4.3	4.3	1.0	1.0	0.6	4.4	0.8	0.4	2.1	2.1	0.4	0.4	0.5		
366-547	729	-	26.3	10.0	9.7	7.0	7.0	8.0	8.0	8.0	-	14.9	5.1	8.3	5.0	5.0	6.0	6.0	6.0		
	731	2.9	50.3	58.7	19.3	19.3	19.3	2.0	2.0	2.0	2.4	32.0	38.4	15.7	15.7	15.7	13.9	13.9	13.9		
	733	2.9	17.3	31.3	31.3	23.5	23.5	4.0	4.0	4.0	2.0	6.1	14.4	25.2	17.1	17.1	13.9	13.9	13.9		
	735	0.7	11.7	7.7	27.3	25.3	25.3	7.5	7.5	7.5	0.7	6.1	4.7	18.5	20.1	20.1	7.0	7.0	7.0		
548-728	730	-	12.7	23.3	6.7	14.0	14.0	9.3	9.3	9.3	-	8.7	17.6	5.6	11.4	11.4	7.0	7.0	7.0		
	732	6.0	11.5	36.5	26.7	87.0	87.0	32.3	32.3	32.3	4.6	8.8	27.0	21.0	65.9	65.9	24.4	24.4	24.4		
	734	4.5	-	1.0	9.7	52.0	52.0	4.3	4.3	4.3	3.8	-	0.6	9.2	42.7	42.7	3.7	3.7	3.7		
	736	1.8	6.3	4.3	6.0	65.3	65.3	12.3	12.3	12.3	1.9	4.6	3.4	4.4	48.6	48.6	9.6	9.6	9.6		
Mean for Division		3.4	9.7	12.2	10.6	6.1	1.9	3.0	8.1	10.3	9.2	5.0	5.0	1.6							
No. of hauls*		37	65	66	54	62	53	37	65	66	54	62	53								

* excluding the strata in which no witch catches were registered.

Table 2. Mean catch of witch per a valid haul in Div. 3N according to the results from 1983-1988 trawl surveys

Depth, m	Stratum	Mean number per a haul, indiv.											Mean weight per a haul, kg										
		1983	1984	1985	1986	1987	1988	1983	1984	1985	1986	1987	1988	1983	1984	1985	1986	1987	1988				
56-92	360	2.8	3.0	1.6	-	-	-	1.8	1.6	1.6	-	-	-	-	-	-	-	-	-				
93-183	359 377 382	2.5 0.7	5.2 25.3 1.0	54.0 0.5	4.3	-	-	1.1 0.3	2.4 9.9 0.5	34.0 0.5	-	-	-	2.7	-	-	-	-	-				
184-274	358 378 381 357 379 380	- 2.3 0.4 2.0 3.9	0.2 2.0 2.3 17.0 9.8	12.0 4.3 3.0 4.0 5.5 1.0	9.6 1.0 10.5 2.7 0.3	4.2 6.0	4.7 1.3	1.5 0.2 1.8 2.0	0.2 0.9 2.0 17.9 5.7	7.3 2.3 1.9 2.5 2.4 0.6	7.0 0.4	3.0 2.6	3.4 0.5	-	-	-	-	-	-				
275-365	723 725 727	3.3 3.0 3.4	- 46.7 52.5	29.8 26.0 9.3	3.0 13.3 13.0	58.3 29.0 14.3	15.3 54.7 24.3	1.8 1.8 2.1	17.5 10.1 19.2	22.1 10.1 4.0	1.6 8.2 6.2	43.8 15.3 8.7	9.1 24.0 15.5	-	-	-	-	-	-				
548-728	724 726 728	3.0 1.3	5.0 6.7 64.7	8.3 16.7	15.0 21.7 16.7	9.3 47.0 19.0	25.0 18.3 40.0	1.5 1.8 5.5	2.2 1.8 26.1	2.5 - 7.3	5.3 11.0 -	3.4 15.5 7.8	8.6 7.2 21.5	-	-	-	-	-	-				
Mean for Division		3.1	7.7	8.8	7.6	18.7	17.9	1.8	3.3	5.6	4.2	11.1	9.3										
No. of hauls		45	51	56	37	37	34	45	51	56	37	37	34										

Table 3. Mean catch of witch per a valid haul in Div. 30 according to the results from 1983-1988 trawl surveys

Depth, m	Stratum	Mean number per a haul, indiv.												Mean weight per a haul, kg											
		1983	1984	1985	1986	1987	1988	1983	1984	1985	1986	1987	1988	1983	1984	1985	1986	1987	1988						
56-92	330	1.3	1.3	1.3	1.3	1.3	1.3	0.9	0.9	0.9	0.9	0.9	0.9	0.7	0.7	0.7	0.7	0.7	0.7						
	331	5.3	5.3	5.3	5.3	5.3	5.3	2.9	2.9	2.9	2.9	2.9	2.9	6.8	6.8	6.8	6.8	6.8	6.8						
	338	3.3	3.3	3.3	3.3	3.3	3.3	1.8	1.8	1.8	1.8	1.8	1.8	1.4	1.4	1.4	1.4	1.4	1.4						
	340	0.3	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	3.3	3.3	3.3	3.3	3.3	3.3						
	351	1.8	1.8	1.8	1.8	1.8	1.8	1.4	1.4	1.4	1.4	1.4	1.4	5.8	5.8	5.8	5.8	5.8	5.8						
	352	5.6	5.6	5.6	5.6	5.6	5.6	3.2	3.2	3.2	3.2	3.2	3.2	10.7	10.7	10.7	10.7	10.7	10.7						
93-183	329	7.5	7.5	7.5	7.5	7.5	7.5	0.4	0.4	0.4	0.4	0.4	0.4	0.2	0.2	0.2	0.2	0.2	0.2						
	332	2.5	2.5	2.5	2.5	2.5	2.5	1.0	1.0	1.0	1.0	1.0	1.0	25.8	25.8	25.8	25.8	25.8	25.8						
	337	34.0	34.0	34.0	34.0	34.0	34.0	23.9	23.9	23.9	23.9	23.9	23.9	11.4	11.4	11.4	11.4	11.4	11.4						
	339	4.0	4.0	4.0	4.0	4.0	4.0	1.2	1.2	1.2	1.2	1.2	1.2	3.2	3.2	3.2	3.2	3.2	3.2						
	354	2.0	2.0	2.0	2.0	2.0	2.0	0.5	0.5	0.5	0.5	0.5	0.5	1.3	1.3	1.3	1.3	1.3	1.3						
	333	2.3	2.3	2.3	2.3	2.3	2.3	0.8	0.8	0.8	0.8	0.8	0.8	0.4	0.4	0.4	0.4	0.4	0.4						
184-274	336	1.8	1.8	1.8	1.8	1.8	1.8	1.0	1.0	1.0	1.0	1.0	1.0	1.7	1.7	1.7	1.7	1.7	1.7						
	335	6.8	6.8	6.8	6.8	6.8	6.8	3.9	3.9	3.9	3.9	3.9	3.9	2.1	2.1	2.1	2.1	2.1	2.1						
	334	0.8	0.8	0.8	0.8	0.8	0.8	0.1	0.1	0.1	0.1	0.1	0.1	3.4	3.4	3.4	3.4	3.4	3.4						
	335	1.7	1.7	1.7	1.7	1.7	1.7	1.0	1.0	1.0	1.0	1.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0						
	356	3.7	3.7	3.7	3.7	3.7	3.7	1.3	1.3	1.3	1.3	1.3	1.3	25.6	25.6	25.6	25.6	25.6	25.6						
	717	10.3	10.3	10.3	10.3	10.3	10.3	2.0	2.0	2.0	2.0	2.0	2.0	0.4	0.4	0.4	0.4	0.4	0.4						
275-365	719	2.0	2.0	2.0	2.0	2.0	2.0	0.9	0.9	0.9	0.9	0.9	0.9	0.4	0.4	0.4	0.4	0.4	0.4						
	721	22.7	22.7	22.7	22.7	22.7	22.7	37.0	37.0	37.0	37.0	37.0	37.0	7.7	7.7	7.7	7.7	7.7	7.7						
	718	4.7	4.7	4.7	4.7	4.7	4.7	2.3	2.3	2.3	2.3	2.3	2.3	0.1	0.1	0.1	0.1	0.1	0.1						
	720	3.0	3.0	3.0	3.0	3.0	3.0	0.8	0.8	0.8	0.8	0.8	0.8	1.1	1.1	1.1	1.1	1.1	1.1						
	722	4.0	4.0	4.0	4.0	4.0	4.0	1.2	1.2	1.2	1.2	1.2	1.2	4.3	4.3	4.3	4.3	4.3	4.3						
	18.0	18.0	18.0	18.0	18.0	18.0	18.0	6.5	6.5	6.5	6.5	6.5	6.5	9.4	9.4	9.4	9.4	9.4	9.4						
Mean for Division	5.6	4.2	6.2	20.3	11.4	14.1	2.6	2.5	3.1	10.1	7.3	9.4	38	50	67	38	50	68							
No. of hauls*	25	61	67	38	50	68	25	61	67	38	50	68	25	61	67	38	50	68							

* excluding the strata in which no witch catches were registered.

Table 4. Abundance and biomass of witch in Divs. 3L, 3N and 3O according to the 1983-1988 Soviet trawl surveys

Stock	Div.	Abundance, indiv. ($\times 10^{-6}$)						Biomass, t ($\times 10^{-3}$)					
		1983	1984	1985	1986	1987	1988	1983	1984	1985	1986	1987	1988
Total stock	3L	1.35	9.42	12.01	6.53	4.23	0.94	1.20	7.93	10.14	5.68	3.47	0.82
Upper limit		2.29	13.39	17.13	10.88	5.27	1.30	2.24	11.49	14.27	9.36	4.45	1.14
Lower limit		0.42	5.45	6.90	2.17	3.20	0.57	0.16	4.38	6.01	1.99	2.50	0.50
Total stock	3N	1.07	3.15	3.30	1.00	2.11	2.01	0.62	1.37	2.14	0.55	1.25	1.04
Upper limit		2.33	4.80	5.13	1.50	3.56	2.84	1.42	2.12	3.30	0.86	2.28	1.42
Lower limit		-0.19	1.50	1.56	0.50	0.66	1.18	-0.19	0.62	0.97	0.24	0.22	0.66
Total stock	3O	2.81	4.27	6.62	11.81	6.02	10.30	1.28	2.51	3.36	5.90	3.86	6.83
Upper limit		4.77	6.14	12.03	23.28	9.74	19.23	2.19	3.63	5.68	11.55	6.51	12.64
Lower limit		0.83	2.40	1.22	0.35	2.31	1.36	0.38	1.38	1.04	0.24	1.21	1.02

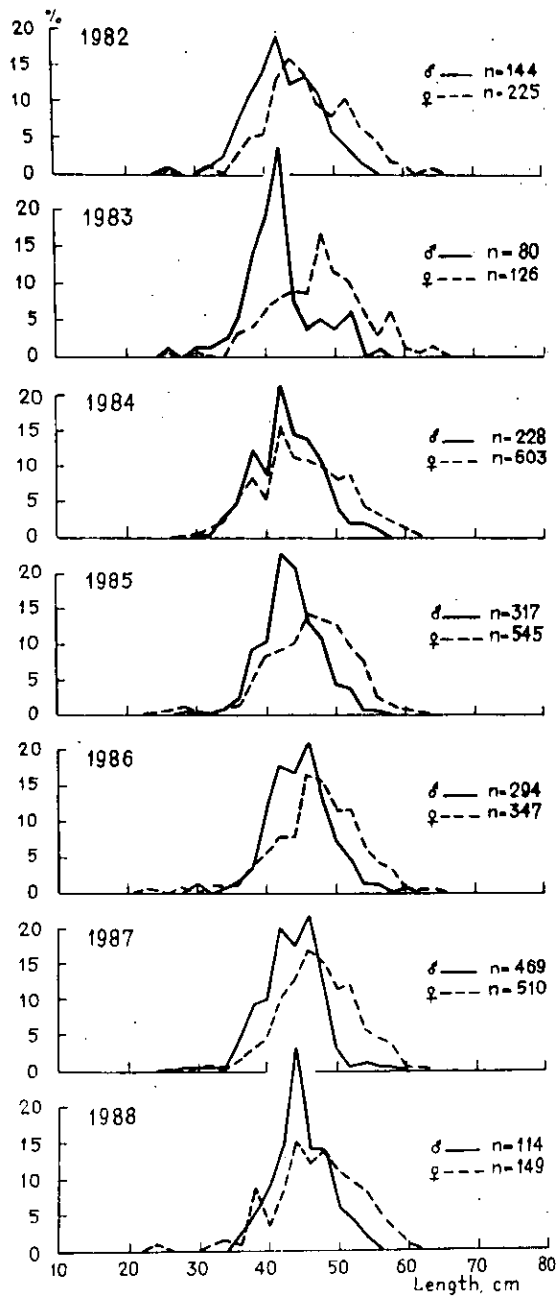


Fig. 1. Length composition of witch in Div. 3L according to the data of trawl surveys

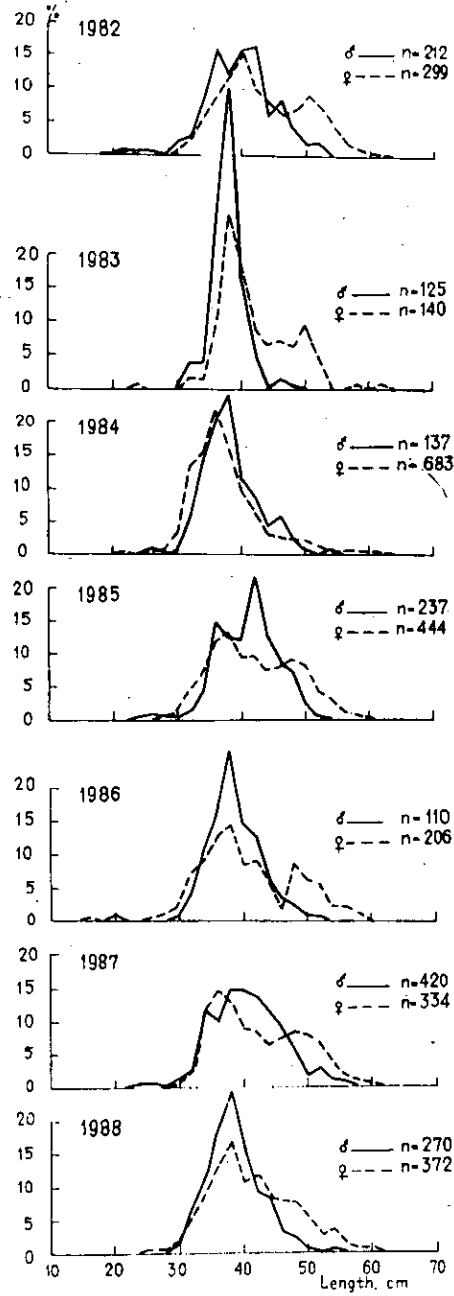


Fig. 2. Length composition of witch in Div. 3N according to the data of trawl surveys

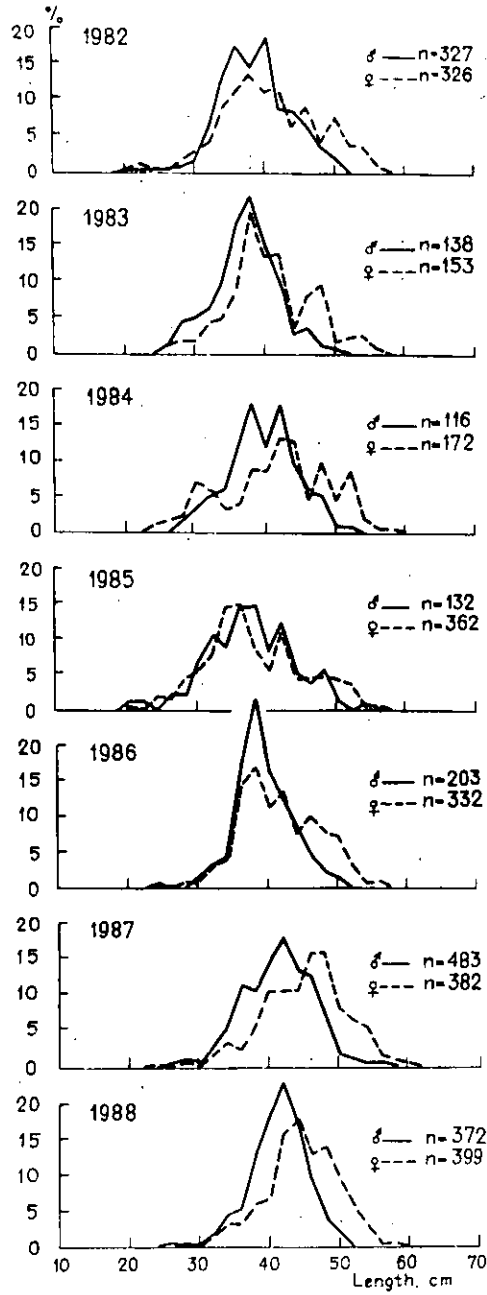


Fig. 3. Length composition of witch in Div. 30, according to the data of trawl surveys