



Serial No. 2721  
(B.g.7)

ICNAF Res.Doc. 72/30  
(also ICNAF SAC No. 72/29)

ANNUAL MEETING - JUNE 1972

State of the stock and prospects for the  
fishery of haddock in the Newfoundland area

by

V.P. Shestov  
PINRO, Murmansk, USSR

Successful catches of haddock taken by all countries and especially by Soviet trawlers in Div. 3NO in the period 1960-61 (Table 1) followed by a marked decrease in the catches necessitated a detailed study of the haddock population in Subarea 3. Elucidation of the fluctuations in abundance of year-classes was of primary importance. To achieve this we undertake annually in the area of Newfoundland in winter and spring investigations to determine abundance of the young haddock population 1-3 years old.

Table 1. Yield of haddock in the Newfoundland area (in tons).

Year	Div. 3NO		Div. 3P		Total in Subarea 3	
	by all countries	by USSR	by all countries	by USSR	by all countries	by USSR
1954	12,529	-	27,179	-	55,335	-
1955	44,072	-	57,797	-	104,471	-
1956	50,246	-	29,940	-	80,436	-
1957	57,988	-	6,079	-	68,086	-
1958	39,278	-	956	-	44,384	-
1959	27,328	-	2,777	-	35,040	-
1960	62,378	36,884	4,159	-	67,062	36,884
1961	74,703	38,413	2,858	-	79,654	39,913
1962	32,759	1,614	1,557	-	35,145	1,614
1963	11,276	140	2,018	3	14,431	372
1964	7,348	140	2,346	-	12,353	1,943
1965	5,283	784	1,545	-	8,612	1,416
1966	6,520	4,167	2,574	212	9,854	4,435
1967	7,990	285	2,502	32	11,542	5,317
1968	2,646	828	2,781	343	6,545	1,173
1969	1,128	-	3,519	-	5,321	-
1970	1,652	109	4,426	48	7,058	157

The first investigations were carried out in January 1962 and the results published by Nevinsky (1962). Earlier investigations conducted by Soviet scientists in 1954 and 1956-60 established the limits of the distribution and concentrations of young haddock in the area (Bulatova, 1962). The results of the investigations carried out in January 1963 were published by Bulatova (1963).

The results of the investigations undertaken in the area of Newfoundland in the spring of 1966-71 are given below. They are compared with the data derived from the earlier investigations and scientific papers to analyze the changes in the distribution of young haddock in these years and estimate abundance of the 1964-70 year-classes, condition of the commercial stock and prospects for the haddock fishery for 1972.

Material and methods

The fishing gear used is a nylon 31-m bottom trawl with a nylon small-size net 8-12 m long mounted within the codend. The groundrope carries bobbins of 500-mm diameter. Trawl hauls were mainly of one-hour duration. Up to 1971 side trawlers of 2,800-ton displacement were used. In 1971 a stern trawler, *Persesus III*, of 3,575-ton displacement was used. In both cases the towing speed was 3.2-3.5 knots respectively. In June-July 1970 in Div. 3O and 3P a research vessel, *The Russia* (2,800 tons), and a research vessel, *Persesus III*, carried out 151 trawl hauls and 11 comparable parallel trawl hauls. To compare the catches of young haddock taken by these trawlers, a conversion factor of 1.4 calculated for young cod was used.

All species were measured. When small catches were taken the age-determination analysis was applied to all the specimens measuring not more than 41 cm. In case of large catches the analysis covered not less than 100 specimens. Since a portion of 3-year-olds exceeded 40 cm, the age-determination analysis was regularly applied to larger haddock. The analysis was based on otolith readings and controlled by scales. The age composition was calculated on the basis of length-frequency distribution.

The investigations in 1966-71 were conducted within similar periods. The grid of trawl stations was increasing each year and in 1969-71 covered a whole area of possible haddock distribution beyond the Canadian fishing zone. However, as far back as 1966-68 the investigations were carried out in the main areas of possible haddock distribution in spring and, therefore, we consider the data as comparable. Thus, it enables us to evaluate finally the relative abundance of the 1964-70 haddock year-classes of various ages. Catch-per-hour trawling of haddock 1-3 years old is regarded as a quantitative index of the abundance of a year-class.

Changes in the distribution of young haddock

It has been pointed out on repeated occasions that the Grand Bank haddock population differs from that of St. Pierre Bank by the rate of growth, structure of otoliths, spawning grounds, time of spawning, abundance of year-classes and some other features (Needler, 1931; Thompson, 1939; Clark and Vladikov, 1960; Beverton and Hodder, 1962; McCracken, 1965; Templeman, 1965b; Leim and Scott, 1966). The eggs, larvae and young of haddock from Div. 3P and 3NO can mix but the process is restricted by low water temperature in the troughs which separate the banks.

Both stocks are characterized by large fluctuations in abundance of year-classes. The period 1942-62 saw at the Grand Bank two very rich haddock year-classes (1949 and 1955) and four year-classes of medium abundance (1942, 1946, 1952, 1956). The 1947, 1953, 1958, 1961, and 1962 year-classes were poor and the rest very poor (Beverton and Hodder, 1962; Templeman, 1965b, 1966, 1968, 1969a; Hodder, 1966). For the same period on the St. Pierre Bank only the 1949 year-class was very rich and the 1955 year-class was of medium abundance (Templeman, 1968, 1969a). The 1949 year-class on the St. Pierre Bank was rich due to mass drift of haddock larvae from the Grand Bank. Afterwards, the young that sank to the bottom showed a rate of growth characteristic of the haddock from the St. Pierre Bank (Hodder, 1966).

Thus, in 1942-62 haddock of the Grand Bank area mainly recruited to the total stocks of haddock in the Newfoundland area. In 1954, 1956-62, main concentrations of young haddock were observed on the southern slopes of the Bank (Bulatova, 1962; Nevinsky, 1962).

In 1962-71 pre-spawning and post-spawning haddock, with a predominance of 4-5-year-olds, were mainly caught in the northern St. Pierre Bank. Since 1963 young haddock, especially 1-year-old specimens, were also abundant on St. Pierre Bank, whereas they were less abundant on Green Bank and in Div. 3O and very scarce further to the south (Bulatova, 1963; Table 2). Consequently, in 1963-71 the stocks of haddock in the Newfoundland area were recruited exclusively at the expense of spawners from St. Pierre Bank.

Lebedev (1967) considers the similarity of the growth rate in all the specimens of the primary population to be its essential feature. Such a phenomenon is observed in the 1966-70 year-classes at age 1 in two areas: in Div. 3P, on the one hand, and in Div. 3NO, on the other hand, the mean length of specimens being considerably larger in Div. 3NO (Table 3). The criterion of significance of differences,  $M$  diff, between the length of yearlings of the 1966 year-classes in Div. 3P and 3NO is 5.48; for the 1967, 1968, 1969 and 1970 year-classes it is equal to 8.11, 22.31, 47.11, and 8.98 respectively. These considerable and constant differences are indicative of the existence of two different populations.

Table 3. Mean length of haddock (in cm) on the banks of the Newfoundland area in 1966-1971\*

Area	11 May-13 June 1966			14 April-12 May 1967			19 May-12 June 1968			15 May-20 June 1969			26 May-30 June 1970			27 May-30 June 1971		
	1+	2+	3+	1+	2+	3+	1+	2+	3+	1+	2+	3+	1+	2+	3+	1+	2+	3+
Southeastern slope of the Grand Bank	29.0	35.4	31.3	31.2	26.3	33.3	42.7	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2	22.2
	128	35	41	35	91	3	20	40	20	40	20	40	20	40	20	40	20	40
Southwestern slope of the Grand Bank	29.0	38.9	28.2	31.7	22.3	35.9	43.5	25.6	25.6	25.6	25.6	25.6	25.6	25.6	25.6	25.6	25.6	25.6
	100	46	79	237	62	205	237	237	60	916	1841	140	65	130	140	65	130	140
Southern Green Bank	28.0	37.9	19.0	27.6	23.1	35.0	43.4	18.0	19.7	19.6	35.0	19.6	19.6	19.6	19.6	19.6	19.6	19.6
	86	33	123	191	11	538	11	12	47	12	20	14	14	14	14	14	14	14
Southwestern slope of the St. Pierre Bank	19.0	27.3	18.4	24.1	19.5	24.1	27.6	21.6	23.6	21.6	27.6	21.6	21.6	21.6	21.6	21.6	21.6	21.6
	75	957	410	437	1022	3581	4	633	633	1404	317	35	1075	1474	70	1474	70	70
Northwestern slope of the St. Pierre Bank	17.8	25.4	17.7	22.1	23.1	32.1	35.1	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4	20.4
	185	625	81	222	80	1457	35	328	328	353	179	73	30	134	51	134	51	51

x) In all the columns advanced a numerator denotes mean length and denominator shows the number of specimens measured.

Table 2. Average catch of young haddock (number of specimens) per hour trawling in the Newfoundland area in 1966-1971

Area	11 May-13 June 1966			14 April-12 May 1967			19 May-12 June 1968			15 May-20 June 1969			26 May-22 June 1970			27 May-30 June 1971													
	No. of hrs	No. of hrs	Total	No. of hrs	No. of hrs	Total	No. of hrs	No. of hrs	Total	No. of hrs	No. of hrs	Total	No. of hrs	No. of hrs	Total	No. of hrs	No. of hrs	Total											
Southeastern slope of the Grand Bank	15	9	2	11	16	3	5	3	14	7	7	43	2	1	3	52	1	1	73										
	36	3	4	20	4	1	11	16	36	2	2	42	5	10	1	16	46	1	3	46									
Total on the Grand Bank	51	5	1	6	36	3	1	3	12	50	4	1	10	85	4	1	13	119	1	5									
	8	11	4	15	7	18	27	79	124	11	22	11	34	10	3	16	1	1	7	1	2								
Southwestern slope of the St. Pierre Bank	12	6	73	27	106	6	323	70	159	552	21	361	956	15	51	30	42	123	15	94	21	3	118	12	65	86	5	156	
	4	31	81	8	123	6	32	32	218	282	14	28	62	25	18	14	13	45	20	17	9	4	30	12	18	12	3	33	
Total on the Green and St. Pierre Banks	24	8	54	16	78	21	110	41	155	306	45	174	804	4	382	50	16	20	61	51	35	10	2	47	31	32	38	4	74
	3	21	6	30	57	43	15	62	120	90	64	102	2	188	135	12	6	8	26	282	10	8	1	19	150	7	10	2	19

Increase in the number of yearlings in Div. 3NO in the spring of 1969 and 1970, compared with previous years, is indicative of a gradual recovery of the local stock of haddock.

The distribution and age-size composition of haddock of the 1963-70 year-classes in the spring of 1966-71 have been analyzed (Tables 2 and 3). It is seen that in the spring and summer of 1964-68 young haddock, especially at an age of 2-3 years, were gradually migrating from St. Pierre Bank to the coastal areas; they moved in smaller numbers to Green Bank and Div. 3NO. This coastal migration was particularly marked in the spring and summer of 1968-70. In 1968 it was apparently caused by abnormally high temperatures in Div. 3P (Burmakin, 1969; Templeman, 1969b), and in 1969-70 by a large influx of cold waters onto the southern and western slopes of St. Pierre Bank. In the spring of 1971 there was observed a small amount of cold water on the southern and western slopes of St. Pierre Bank and, therefore, the main quantities of young haddock concentrated there.

Relative abundance of the 1964-70 year-classes of haddock and prospects for haddock fishery in 1972

On the basis of mean catches of young haddock per hour trawling (Table 4) and yield of older haddock (Table 5) in the spring of 1966-71, the 1964-70 year-classes of haddock of the Grand Bank stock should be considered as very poor. On St. Pierre Bank the 1966 year-class of haddock is most abundant after the 1955 year-class which is of medium abundance. The abundance of the 1964 and 1969 year-classes is next in abundance to the 1966 year-class, however, their abundance is considerably less and they can be considered poor. The 1965 and 1968 year-classes are, undoubtedly, very poor. The 1967 year-class was apparently numerous during the first year of life. However, the abundance of this year-class sharply decreased during the second year of life for reasons that will be considered below. The 1970 year-class can be preliminarily estimated as very poor.

Table 4. Average catch of young haddock of different ages per hour trawling taken by experimental trawl (number of specimens).

Year-class	1(1+)	2(2+)	3(3+)	Notes			
1959	-	-	68	Preliminary results of assessments in 1962-65			
1960	-	7	3				
1961	7	5	12				
1962	8	1	14				
1963	1	3	2	17			
1964	1	18	4	55	6	153	
1965	1	13	1	41	1	4	Results of assessments in 1966-71
1966	3	110	8	191	1	20	
1967	1	183	1	16	1	2	
1968	4	25	8	10	1	4	
1969	4	35	3	38	-	-	
1970	1	32	-	-	-	-	

These assessments of the abundance of the 1964-69 year-classes of haddock in Div. 3P and 3NO agree with the data obtained by Templeman (1968, 1969a, 1970, 1971). They also indicate that the abundance of the 1966 year-class is high on St. Pierre Bank in 1967-70. Having compared the distribution of haddock of the 1966 year-class in the spring of 1967 with the distribution of the 1955 year-class of medium abundance in the spring of 1956, Templeman considers the 1966 year-class to be less abundant. In this case he states that by the time haddock of the 1955 year-class reached commercial length, they were not numerous on St. Pierre Bank.

Table 5. Age composition (%) of haddock in the Newfoundland area in the spring of 1966-71 (data on age determination were calculated on the basis of length frequencies).

Year-class	Grand Bank						St. Pierre and Green Banks					
	1966	1967	1968	1969	1970	1971	1966	1967	1968	1969	1970	1971
1970	-	-	-	-	-	12.5	-	-	-	-	-	42.5
1969	-	-	-	-	25.6	60.4	-	-	-	-	64.2	-
1968	-	-	-	67.7	51.3	21.1	-	-	-	39.5	18.8	4.3
1967	-	-	11.6	8.2	4.1	1.4	-	-	30.8	25.4	4.1	0.7
1966	-	12.7	71.1	19.1	14.9	3.8	-	33.0	64.4	32.2	10.4	0.4
1965	0.3	2.0	5.8	0.2	1.8	0.1	8.0	11.8	2.1	0.5	1.2	+
1964	22.7	29.1	6.3	1.3	1.4	0.6	56.4	42.0	2.2	1.4	0.7	0.1
1963	8.6	9.4	-	0.2	0.1	0.1	9.7	5.0	0.1	+	0.1	+
1962	46.2	33.1	3.7	2.2	0.6	-	12.8	4.7	0.2	0.4	0.3	-
1961	16.4	9.9	1.5	-	0.1	-	7.0	1.2	0.1	-	+	-
1960	2.6	1.5	-	-	-	-	1.0	0.4	+	-	-	-
1959	1.9	0.4	-	0.3	-	-	1.5	0.8	-	0.3	0.2	-
1958-1957	0.9	1.3	-	0.6	0.1	-	1.7	0.7	0.1	0.3	+	-
-1952	0.4	0.6	-	0.2	-	-	1.9	0.4	-	+	-	-

Table 5 shows that haddock of older year-classes are scarce in Div. 3P and 3NO in recent years, that is noted by Templeman as well (1971). The main reason is a weak recruitment to the haddock stocks after 1955. It is also seen that in Div. 3P the abundance of haddock of different year-classes sharply decreased at an age of 4-5 years.

We have already mentioned that in spring and summer a proportion of young haddock migrates from St. Pierre Bank to the coastal areas. Templeman and Hodder (1965b) mention such migration in the pelagic layer towards Burin Peninsula. In summer haddock often migrate in a warm surface layer from Div. 3NO towards Avalon Peninsula and further to the north along the eastern coasts of Newfoundland as far as southern Labrador (Templeman, 1965a, 1965c; Templeman and Hodder, 1965a). Cod from Div. 3P (Templeman, 1971) and 3NO (Templeman and Fleming, 1962; Templeman, 1965a) perform the same migrations. In autumn haddock migrate back to the banks, but a proportion of them spend winter in warm deep offshore waters. When entering the bays with a moderate depth at this time of the year, haddock perish from the low water temperature. In winter and spring a proportion of haddock perish during migrations in the pelagic layers on the shallows of the banks. Templeman (1965a) concluded from this that in winter and spring a mass mortality of haddock occurs in the coastal area of Newfoundland.

The summer-spring migration of haddock to the coastal area of Newfoundland and their subsequent mortality is apparently responsible for: 1) a decrease in the abundance of young on St. Pierre Bank with age, especially in the abundance of the 1966 year-class at the third year of life and the 1967 year-class at the second year of life; 2) a sharp decrease (especially after 1968) in the abundance of haddock of different year-classes at an age of 4-5 years in Div. 3P. An increase in the yield of haddock in recent years not only on St. Pierre Bank (Table 1) but in the coastal area (Templeman, 1971) was undoubtedly responsible for such situation as well.

From the facts mentioned it follows that in recent years the stocks of haddock in the Newfoundland area are at a low level. In 1972 the fishing stocks of the haddock were not recruited by any abundant year-class. Consequently, haddock will not be the object of a special fishery and they will be found in catches of cod and flounders only in small quantities.

References

Beverton, R.J.H., and V.M. Hodder. 1962. Report of Working Group of Scientists on Fishery Assessment in Relation to Regulation Problems. *Annu. Proc. int. Comm. Northw. Atlant. Fish.*, Supplement, Vol. 11.

B 4

22

- Bulatova, A.Yu. 1962. Some data on distribution of young cod and haddock off Labrador and Newfoundland. *Int. Comm. Northw. Atlant. Fish., Redbook 1962, Part III.*
1963. Results of determining the abundance of the young of commercial fishes in the Labrador and Newfoundland areas (December 1962) (January 1963). *Annu. Meet. int. Comm. Northw. Atlant. Fish., Res. Doc. 63/61.*
- Burmakin, V.V. 1969. Hydrographic conditions in the Labrador and Newfoundland areas, 1968. *Int. Comm. Northw. Atlant. Fish., Redbook 1969, Part III.*
- Clark, J.R., and V.B. Vladikov. 1960. Definition of haddock stocks of the northwestern Atlantic. *Fish. Bull. U.S. 169, Vol. 60, Washington.*
- Hodder, V.M. 1966. Trends in the haddock fishery of Subarea 3. *Res. Bull. int. Comm. Northw. Atlant. Fish., No. 3.*
- Lebedev, N.V. 1967. Fish primary populations. Moscow.
- Leim, A.H., and W.B. Scott. 1966. Fishes of the Atlantic coast of Canada. *Bull. Fish. Res. Bd. Can., No. 155, Ottawa.*
- McCracken, F.D. 1966. Distribution of haddock off the eastern Canadian mainland in relation to season. Depth and bottom temperature. *Spec. Publ. int. Comm. Northw. Atlant. Fish., No. 6.*
- Needler, A.W.H. 1931. The haddock. *The Biological Board of Canada, Bull. No. XXV.*
- Nevinsky, M.M. 1962. Preliminary estimation of young cod, haddock and redfish found in the Northwest Atlantic Ocean. *Int. Comm. Northw. Atlant. Fish. Redbook 1962, Part III.*
- Templeman, W. 1965a. Mass mortalities of marine fisheries in the Newfoundland area presumably due to low temperature. *Spec. Publ. int. Comm. Northw. Atlant. Fish., No. 6.*
- 1965b. Relation of periods of successful year-classes of haddock on the Grand Bank to periods of success of year-classes for cod, haddock, and herring in areas to the north and east. *Spec. Publ. int. Comm. Northw. Atlant. Fish., No. 6.*
- 1965c. Some instances of cod and haddock behaviour and concentrations in the Newfoundland and Labrador areas in relation to food. *Spec. Publ. int. Comm. Northw. Atlant. Fish., No. 6.*
1966. Marine resources of Newfoundland. *Bull. Fish. Res. Bd. Can., No. 154, Ottawa.*
1968. Canadian research report, 1967. *Int. Comm. Northw. Atlant. Fish. Redbook 1968, Part II.*
- 1969a. Canadian research report, 1968. *Int. Comm. Northw. Atlant. Fish. Redbook 1969, Part II.*
- 1969b. Temperatures and salinities 1968, at Station 27 and in the St. John's-Flemish Cap Section. *Int. Comm. Northw. Atlant. Fish., Redbook 1969, Part II.*
1970. Canadian research report, 1969. A. Subareas 1, 2 and 3. *Int. Comm. Northw. Atlant. Fish., Redbook 1970, Part II.*
1971. Canadian research report, 1970. A. Subareas 1, 2 and 3. *Int. Comm. Northw. Atlant. Fish., Redbook 1971, Part II.*
- Templeman, W., and A.M. Fleming. 1962. Cod tagging in the Newfoundland area during 1947 and 1948. *J. Fish. Res. Bd. Can., Vol. 19.*
- Templeman, W., and V.M. Hodder. 1965a. Distribution of haddock on the Grand Bank in relation to season, depth and temperature. *Spec. Publ. int. Comm. Northw. Atlant. Fish., No. 6.*

- Templeman, W., and V.M. Hodder. 1965b. Distribution of haddock on St. Pierre Bank (ICNAF Division 3P) by season, depth and temperature. *Spec. Publ. int. Comm. Northw. Atlant. Fish., No. 6.*
- Thompson, H.D. 1939. The occurrence and biological features of haddock in the Newfoundland area. *Dept. Natural Resources, Newfoundland Res. Bull. (Fish), No. 6.*