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The trawling survey of groundfish in the Newfoundland Area

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Abstract

This paper presents the results of the trawling survey of groundfish in the Newfoundland area in 1972. Compared with 1971 the biomass and abundance of main commercial fishes have diminished which, however, can be accounted for by the fact that the survey in 1972 started earlier. The author considers the ways to improve survey methods with the aim to obtain representative data.

Every year since 1962 the Polar Research Institute undertook trawling surveys of the cod and haddock juveniles in the Newfoundland and Flemish Cap areas to give a quantitative estimate of the Gadidae juveniles and study their distribution depending on hydrological conditions.

In recent years it was necessary to survey for all groundfishes. There exist some methods of trawling surveys. The surveys in the areas of Nova Scotia, Georges Bank and the Gulf of St. Lawrence (Halliday and Kohler, 1971) follow the method worked out by Grosslein (1969) which is considered more reliable than the others. At the present using the method of stratified random stations the Canadian scientists conducted trawling surveys in the areas of the northeast and southern slopes of the Grand Newfoundland Bank as well as on St. Pierre Bank (Pinhorn and Pitt, 1972).

From 1971 the Polar Research Institute also started the investigations to determine the abundance of all groundfish in the Newfoundland area but due to some reasons the comprehensive determination of groundfish abundance is done simultaneously with the determination of abundance of the Gadidea juveniles (Baranenkova, 1968; Bulatova, 1968; Bulatova, 1970). The investigations were carried out by scientific-commercial vessel *Perseus III* with a bottom trawl. The codend of a trawl had a small-meshed capron liner (knot-to-knot distance 8 mm). Only accident-free trawlings of 1-hour duration were considered. When the catch was less than one ton all the fishes were counted and measured. If the catch exceeded one ton only a part of it was measured and weighed and on this basis the total number of fishes was determined. The trawlings were made to a depth of 400 meters.

To determine the biomass of main commercial fishes (cod, redfish, flounders) and some other non-commercial fishes the size-weight keys were drawn up. When we use the term "biomass" we mean an average catch in kg per hour trawling. The term "abundance" means an average number of specimens taken per hour of trawling.

Tables 1 to 6 give the results of the 1972 surveys which are compared with the 1971 surveys in Table 7. The sequence of description of the species and their latin names were taken from the works of Andriashev, Lindberg and Svetovidov (1954, 1971, 1948). We must compare very cautiously the results of 1971 and 1972, for the survey in 1972 began a month earlier than in 1971, and the difference in the distribution of fish could affect the results.

The data on abundance and biomass in 1971 were given only for main commercial fishes (Postolaki, 1972). In 1972 these data were given for some other species (Table 7).

Table 1. Average number of groundfish specimens caught per hour trawling on the North Newfoundland Bank in 24 June - 5 July 1972.

Species	Depth (m) 201-300 Number of specimens	201-300 Average length (cm)	301-400 Number of specimens	301-400 Average length (cm)
Raja radiata	3.7	35.30	3.6	37.00
Raja senta	1.4	54.30	4.7	43.30
Urophycis chestery	2.0	-	2.0	-
Melanogrammus aeglefinus	1.5	-	1.0	-
Gadus morhua	186.7	42.58	95.3	46.27
Nezumia bairdii	2.5	-	10.1	43.23
Anarhichas latifrons	1.9	89.22	1.3	90.55
Anarhichas lupus	19.0	36.71	13.5	39.37
Anarhichas minor	2.4	54.51	2.7	76.18
Lycodes sp.	13.0	-	22.0	-
Sebastes marinus	149.5	42.07	16.8	48.98
Sebastes mentella	406.7	35.27	721.9	26.63
Reinhardtius hippoglossoides	5.8	39.45	4.0	47.39
Hippoglossoides platessoides	110.5	29.93	29.2	29.72
Clyptocephalus cynoglossus	17.5	48.38	62.8	47.46
Number of trawlings	14		11	

Table 2. Average number of groundfish specimens caught per hour trawling on the northeast slope of the Grand Newfoundland Bank in 3-15 June 1972.

Species	Depth (m) <100 No. of spec.	<100 Av. length (cm)	101-200 No. of spec.	101-200 Av. length (cm)	201-300 No. of spec.	201-300 Av. length (cm)	301-400 No. of spec.	301-400 Av. length (cm)
Raja radiata	9.4	58.65	30.3	24.38	70.6	25.53	27.8	53.29
Raja senta	1.5	-	-	-	1.0	-	2.0	-
Notacanthus macrorhynchus	-	-	-	-	2.0	-	-	-
Urophycis chestery	-	-	-	-	-	-	2.7	24.25
Urophycis tenuis	-	-	-	-	-	-	1.0	-
Melanogrammus arglefinus	-	-	1.0	-	2.0	-	1.0	-
Gadus morhya	146.1	38.83	150.8	37.24	342.8	41.41	141.4	49.80
Nezumis bairdii	-	-	1.0	-	21.4	41.02	17.8	45.79
Anarhichas latifrons	-	-	1.0	-	3.0	89.38	1.2	-
Anarhichas lupus	-	-	9.6	41.57	16.6	37.54	12.4	38.67
Anarhichas minor	-	-	1.7	77.20	6.5	62.85	4.7	53.50
Lycodes sp.	6.0	-	11.5	-	19.3	-	14.0	-
Ammodytes sp.	-	-	303.0	-	-	-	-	-
Sebastes marinus	-	-	-	-	187.3	40.14	2.0	-
Sebastes mentella	-	-	4.0	19.50	53.4	23.91	250.2	29.92
Myoxocephalus aeneus	43.0	25.70	1.0	-	-	-	-	-
Hemitripterus americanus	3.0	-	-	-	-	-	-	-
Reinhardtius hippogloss.	-	-	5.0	-	5.1	41.50	13.8	46.95
Hippoglossoides plates.	261.7	32.89	338.8	29.19	96.4	30.03	20.6	29.55
Limanda ferruginea	137.6	33.71	1.0	-	-	-	-	-
Glyptocephalus cynog.	1.0	-	2.0	49.65	20.7	49.11	40.3	48.13
Number of trawlings	12		18		16		6	

Table 3. Average number of groundfish specimens caught per hour trawling on the Flemish Cap Bank 4-7 April 1972.

Species	Depth (m) 101-200 No. of spec.	101-200 Av. length (cm)	201-300 No. of spec	201-300 Av. length (cm)	301-400 No. of spec.	301-400 Av. length (cm)	401-500 No. of spec.	401-500 Av. length (cm)
Raja radiata	1.5	-	2.0	-	3.0	-	-	-
Raja senta	1.0	-	-	-	-	-	-	-
Melanogrammus aeglefinus	3.0	65.95	14.0	66.73	-	-	-	-
Gadus morhua	95.0	23.63	54.6	39.19	66.3	60.76	53.0	65.86
Micromesistius poutassou	-	-	-	-	17.0	-	-	-
Nezumia bairdii	-	-	-	-	4.0	-	2.0	-
Anarhichas latifrons	-	-	-	-	-	-	1.0	-
Anarhichas lupus	10.2	42.70	6.8	33.05	6.0	45.85	-	-
Anarhichas minor	-	-	6.4	73.08	2.5	69.80	-	-
Sebastes marinus	18.0	20.47	855.8	35.78	25.5	24.75	-	-
Sebastes mentella	-	-	30.0	31.85	1750.4	28.09	3612.0	33.43
Hippoglossoides plates.	52.0	38.35	40.7	37.19	21.5	34.59	-	-
Number of trawlings	4		10		4		1	

Table 4. Average number of groundfish specimens caught per hour trawling on the southeast slope of the Grand Newfoundland Bank 11-22 April 1972.

Species	Depth (m) <100 No. of spec.	<100 Av. length (cm)	101-200 No. of spec.	101-200 Av. length (cm)	201-300 No. of spec.	201-300 Av. length (cm)	301-400 No. of spec.	301-400 Av. length (cm)
Raja radiata	29.4	44.23	65.1	35.29	51.3	41.83	2.0	-
Raja senta	-	-	-	-	2.0	-	-	-
Notacanthus macrorhynchus	-	-	-	-	3.0	-	3.0	-
Urophycis chestery	-	-	-	-	-	-	6.0	28.00
Urophycis tenuis	-	-	3.0	-	12.0	-	35.0	75.49
Pollachius virens	-	-	1.0	-	-	-	-	-
Melanogrammus aeglefinus	1.0	18.05	152.0	16.49	9.3	17.93	-	-
Gadus morhua	7.7	41.44	93.3	28.94	203.3	32.86	1103.5	39.85
Nezumia bairdii	2.0	-	3.0	-	7.6	49.06	58.0	29.07
Anarhichas latifrons	1.5	113.55	1.0	73.55	1.0	78.55	-	-
Anarhichas lupus	1.0	-	2.5	64.97	3.4	38.55	1.5	56.88
Anarhichas minor	1.0	-	-	-	1.2	-	-	-
Lycodes sp.	2.2	-	4.6	-	5.0	-	1.0	-
Ammodytes sp.	5915.0	-	-	-	-	-	-	-
Sebastes mentella	3.0	-	3189.2	18.21	410.0	20.06	245.0	25.93
Triglops sp.	-	-	-	-	5.0	-	-	-
Myoxocephalus aeneus	10.8	27.85	-	-	2.0	-	-	-
Hemitripterus americanus	11.2	48.36	1.0	-	-	-	-	-
Cyclopterus sp.	2.0	-	9.0	-	4.2	-	-	-
Reinhardtius hippogloss.	-	-	1.0	-	-	-	-	-
Hippoglossoides plates.	176.1	31.29	395.3	30.49	273.4	33.83	42.0	35.25
Limanda ferruginea	256.8	33.75	16.0	29.17	1.0	-	-	-
Clyptocephalus cynogl.	10.7	48.65	50.2	46.80	53.1	45.80	57.5	46.70
Number of trawlings	21		15		13		2	

Table 5. Average number of groundfish specimens caught per hour trawling on the southwest slope of the Grand Newfoundland Bank 27 April - 2 June 1972.

Species	Depth (m) 100 No. of spec.	100 Av. length (cm)	101-200 No. of spec.	101-200 Av. length (cm)	201-300 No. of spec.	201-300 Av. length (cm)	301-400 No. of spec.	301-400 Av. length (cm)
Raja radiata	13.1	37.82	23.9	58.78	3.7	35.30	2.5	87.25
Raja senta	-	-	3.7	47.91	3.0	48.00	-	-
Argentina silus	-	-	13.0	-	13.7	-	-	-
Paralepis rissoi	-	-	-	-	46.0	-	-	-
Myctophum glaciale	-	-	108.0	-	698.7	-	-	-
Notacanthus macrorhynchus	-	-	-	-	1.0	-	-	-
Urophycis chestery	-	-	5.0	28.63	26.7	25.86	91.0	30.76
Urophycis tenuis	-	-	35.6	47.86	82.3	52.82	4.0	-
Merluccius bilinearis	-	-	3.2	-	-	-	-	-
Pollachius virens	-	-	1.0	-	2.0	-	-	-
Melanogrammus aeglefinus	2.4	38.25	33.6	26.90	3.3	39.14	1.0	47.06
Gadus morhua	93.1	40.36	36.4	43.46	14.3	65.59	7.0	74.29
Nezumia bairdii	-	-	2.0	-	39.1	24.36	-	-
Anarhichas lupus	2.4	53.96	2.2	62.80	2.2	59.66	-	-
Lycodes sp.	1.0	-	2.7	-	2.0	-	-	-
Ammodytes sp.	165.0	-	-	-	-	-	-	-
Sebastes mentella	-	-	1926.7	18.75	286.0	18.81	322.0	22.20
Myoxocephalus aeneus	33.1	24.69	-	-	-	-	-	-
Hemitripterus americanus	5.5	-	-	-	-	-	-	-
Cyclopterus sp.	1.0	-	-	-	-	-	-	-
Hippoglossus hippoglossus	-	-	2.0	-	-	-	-	-
Hippoglossoides plates.	218.9	31.85	138.4	27.83	20.6	29.06	-	-
Limanda ferruginea	175.9	35.00	17.7	34.79	-	-	-	-
Clyptocephalus cynogl.	23.5	44.44	42.4	41.67	29.3	45.99	-	-
Lophius piscatorias	-	-	1.0	-	-	-	-	-
Number of trawlings	19		20		6		1	

Table 6. Average number of groundfish specimens caught per hour trawling on St. Pierre bank 12-20 May 1972.

Species	Depth (m) <100 No. of spec.	<100 Av. length (cm)	101-200 No. of spec.	101-200 Av. length (cm)	201-300 No. of spec.	201-300 Av. length (cm)	301-400 No. of spec.	301-400 Av. length (cm)
Squalus acanthias	-	-	8.0	-	6.0	-	-	-
Raja radiata	34.1	30.56	29.2	44.11	1.0	-	-	-
Raja senta	1.5	-	-	-	-	-	-	-
Argentina silus	-	-	23.0	-	295.0	-	-	-
Brosme brosme	-	-	-	-	1.0	-	-	-
Urophycis chestery	-	-	4.1	29.32	34.2	27.82	-	-
Urophycis tenuis	5.0	-	20.2	53.71	20.0	58.30	-	-
Merluccius bilinearis	-	-	5.0	-	15.7	-	-	-
Pollachius virens	1.0	-	1.2	-	2.0	-	-	-
Melanogrammus aeglefinus	15.0	52.72	47.5	34.97	6.5	58.17	1.0	-
Gadus morhua	112.1	38.34	181.5	32.73	2.7	38.09	-	-
Nezumia bairdii	-	-	30.0	25.61	10.0	25.20	-	-
Anarhichas latifrons	12.0	88.96	1.0	-	-	-	-	-
Anarhichas lupus	6.8	59.43	3.0	66.85	1.5	-	-	-
Anarhichas minor	-	-	1.0	-	1.0	-	-	-
Lycodes sp.	1.0	-	1.5	-	-	-	-	-
Ammodytes sp.	328.0	-	-	-	-	-	-	-
Sebastes mentella	-	-	2413.8	17.38	27.4	21.00	-	-
Myoxocephalus arneus	44.8	27.80	4.3	28.38	1.0	-	-	-
Hemitripterus americanus	8.7	40.74	3.0	45.22	1.0	-	-	-

Table 6. Continued

Species	Depth (m) <100 No. of spec.	<100 Av. length (cm)	101-200 No. of spec.	101-200 Av. length (cm)	201-300 No. of spec.	201-300 Av. length (cm)	301-400 No. of spec.	301-400 Av. length (cm)
Reinhardtius hippogloss.	-	-	8.0	33.62	-	-	-	-
Hippoglossus hippoglossus	-	-	2.0	-	-	-	-	-
Hippoglossoides plates.	190.3	28.67	189.2	25.69	24.6	22.96	-	-
Limanda ferruginea	76.2	35.43	1.7	31.85	-	-	-	-
Clyptocephalus cynogl.	35.0	38.63	61.0	37.79	55.0	35.70	-	-
Lophius piscatorius	-	-	1.8	-	1.0	-	-	-
Number of trawlings	13		29		6		1	

Table 7. Average catches in specimens and kg taken per hour trawling by areas in 1971-1972.

Species	Year	North Newfoundland Bank Av. no. of spec.	North Newfoundland Bank Av. weight (kg)	Northeast slope of Grand Newfoundland Bank Av. no. of spec.	Northeast slope of Grand Newfoundland Bank Av. weight (kg)	Flemish Cap Bank Av. no. of spec.	Flemish Cap Bank Av. weight (kg)	Southeast slope of Grand Newfoundland Bank Av. no. of spec.	Southeast slope of Grand Newfoundland Bank Av. weight (kg)	Southwest slope of Grand Newfoundland Bank Av. no. of spec.	Southwest slope of Grand Newfoundland Bank Av. weight (kg)	St. Pierre Bank Av. no. of spec.	St. Pierre Bank Av. weight (kg)
Raja radiata	1972	-	-	41.2	27.3	-	-	46.3	59.6	18.0	39.5	29.6	41.2
Urophycis tenuis	1971	-	-	-	-	-	-	-	-	46.5	118.5	60.8	125.1
	1972	-	-	-	-	-	-	12.5	44.8	47.0	77.1	19.2	33.8
Melanogrammus aeglefinus	1972	-	-	-	-	-	-	46.4	3.1	18.8	5.4	35.0	16.9
Gadus morhua	1971	150.3	114.6	300.9	245.8	82.1	73.1	270.0	182.0	90.2	67.5	190.0	65.6
	1972	151.5	128.7	209.0	165.7	65.5	75.0	138.9	72.1	58.7	69.9	147.8	77.0
Sebastes marinus	1971	175.0	188.0	-	-	120.0	114.0	-	-	-	-	-	-
	1972	43.1	64.6	141.0	147.4	647.6	528.0	-	-	-	-	-	-
Sebastes mentella	1971	605.0	260.0	255.0	102.0	-	-	3632.0	693.0	2264.0	206.0	2324.0	231.0
	1972	588.5	256.1	121.0	50.6	1122.9	484.9	1332.6	157.2	1232.4	153.0	1885.1	323.0
Myoxocephalus aeneus	1972	-	-	22.0	4.2	-	-	10.2	2.3	33.1	5.8	29.9	6.7
Reinhardtius hippogl.	1971	46.2	32.4	12.1	12.1	-	-	-	-	-	-	-	-
	1972	5.1	4.5	8.0	7.4	-	-	-	-	-	-	-	-
Hippoglossoides plates.	1971	94.0	28.6	778.0	304.0	64.0	42.7	333.0	214.0	360.0	140.0	394.0	125.2
	1972	74.0	9.3	516.0	132.1	41.0	21.8	387.0	117.0	167.0	41.9	213.0	29.0
Limanda ferruginea	1971	-	-	211.0	100.0	-	-	550.0	145.2	457.0	188.0	218.0	102.0
	1972	-	-	126.0	57.1	-	-	326.0	139.6	128.0	46.0	44.0	18.5
Clyptocephalus cynogl.	1971	6.4	7.2	5.7	5.1	-	-	4.5	2.8	20.0	10.5	35.5	14.9
	1972	38.1	35.6	18.5	15.3	-	-	43.9	36.9	34.5	20.7	64.5	25.8

Results

The cod (*Gadus morhua*). The biomass of cod in the investigated areas is not great (Table 7). As compared with 1971 the biomass has not changed with the exception of the northeast and southeast slopes of the Grand Bank but the abundance of cod in all areas except the North Newfoundland Bank has diminished.

The highest cod catches were taken on the North Newfoundland Bank and on the northeast slope of the Grand Bank.

The haddock (*Melanogrammus aeglefinus*). In all investigated areas haddock was found very rarely. The maximum catch by abundance was taken on the southeast slope of the Grand Bank, the maximum catch by biomass - on the St. Pierre Bank. Compared with 1971 the abundance of haddock on the southern slopes of the Grand Bank has increased, on the St. Pierre Bank it has diminished (Postolaki, 1972).

The redfishes. The beaked redfish (*Sebastes mentella*) is the most abundant species on the southern slopes of the Grand Bank, St. Pierre and Flemish Cap Banks. Compared with 1971, the abundance and biomass of the beaked redfish has decreased in all areas. On the southern slopes of the Grand Bank and on the St. Pierre Bank the beaked redfish is very little of size, prevalent length 16-20 cm; on the Flemish Cap Bank 25-27 cm and 35-38 cm. The greatest concentrations of the golden redfish (*Sebastes marinus*) were registered on the Flemish Cap Bank. Compared with 1971 the biomass and abundance of the golden redfish have increased. In other areas the golden redfish were taken as a by-catch. The golden redfish did not form commercial concentrations.

Flounders. The American plaice (*Hippoglossoides plat.*) and the yellowtail flounder (*Limanda ferruginea*) dominated in the catches of flounders. The greatest catches of the American plaice were taken on the northeast slope of the Grand Bank, those of the yellowtail flounder - on the southeast slope. Biomass and abundance of both species in 1972 were lower than in 1971.

The long flounder (*Glyptocephalus cynoglossus*) in the investigated period did not form commercial concentrations up to a depth of 400 meters. However, its biomass and abundance have increased.

The Greenland halibut (*Reinhardtius hippoglossoides*) within the investigated depth occurred singly in the area of the North Newfoundland Bank and on the northeast slope of the Grand Bank. Biomass and abundance in 1972 have sharply decreased.

The burbots. The white hake (*Urophycis tenuis*) and longfin hake (*Urophycis chestery*) were taken as a by-catch on the southern slopes of the Grand Bank and on the St. Pierre Bank. The white hake was taken more frequently. Compared with 1971 the biomass and abundance of the white hake have decreased.

The wolffishes. The Atlantic wolffish (*Anarhichas lupus*) and the spotted wolffish (*Anarhichas minor*) were taken more frequently on the North Newfoundland Bank and on the northeast slope of the Grand Bank. On the southern slopes of the Grand Bank these species were taken very rarely. In all areas, with the exception of the St. Pierre Bank, the Northern wolffish (*Anarhichas latifrons*) was found in single specimens (Table 6).

Of other species of groundfish which are not exploited commercially at the present we can note the sand eel (*Ammodytes sp.*). The catches of sand eel in different areas varied from 5 to 240.5 kg per hour trawling. The greatest sand eel concentrations were found on the southeast slope of the Grand Bank. Prevalent length was 21-23 cm.

Conclusion

A 2-year durvey of groundfish in the Newfoundland areas gave the more preliminary results. So far we can speak only about relative abundance and biomass of the species. The survey, without any doubt, should be continued to solve the question about the correctness of the chosen methods.

For the time being it is quite obvious that the survey must be carried out within the same period otherwise judgement on the variation in abundance may be erroneous. The survey of 1972 showed that the biomass of the majority of species compared with 1971 has diminished. However, the survey on the St. Pierre Bank carried out within about the same period showed in 1972 the increase in the biomass of the beaked redfish, long flounder and cod. Apparently due to an earlier survey in 1972 we fialed to determine the abundance of a part of the stock.

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