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Distribution and Abundance of Atlantic Wolffish, Spotted Wolffish and Northern Wolffish in the Newfoundland Area

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Abstract

Data from fixed-station bottom-trawl surveys in the Newfoundland area during 1971-80 were used to describe the distribution and abundance of Atlantic wolffish, spotted wolffish and northern wolffish by depth and temperature. The Atlantic wolffish was the most abundant of the three species, occurring mainly in depths of 101-350 m at temperatures of -0.4° to 4.0°C. The spotted wolffish was the least abundant, occurring in very small quantities mainly in 101-350 m at temperatures less than 5°C. The northern wolffish was most abundant in depths greater than 150 m at temperatures less than 5°C. Because of their widespread distribution, wolffish occur as by-catches in fisheries directed toward other groundfish species.

Introduction

The Newfoundland area is inhabited by three species of wolffishes: Atlantic wolffish (*Anarhichas lupus* L.), spotted wolffish (*A. minor* Olafsen), and northern wolffish (*A. denticulatus* Krøyer). The Atlantic and spotted wolffishes are typical benthophages, with a peculiar system of teeth adapted to feeding on bottom-living organisms (echinoderms, molluscs and crustaceans). Teeth of the northern wolffish are more adapted to feeding on mobile organisms, the stomachs being often full of ctenophores and jellyfish (Barsukov, 1959, 1961). Northern wolffish have been observed in open water for long periods, sometimes rising to the surface in search of food (Konstantinov and Shestopal, 1976). Wolffish do not appear to undertake significant seasonal migrations (Barsukov, 1959), as indicated by the results of tagging of spotted wolffish in the Barents Sea (Konstantinov, 1957, 1961) and Atlantic wolffish in Icelandic waters (Jonsson, 1966), where recaptures a year or more later occurred in the general area of tagging or not more than 150 km from the tagging area.

Wolffishes tend to be widely distributed and are found in a broad range of depth. They are not found in dense concentrations and are therefore not subject to a specialized fishery but rather occur as by-catch in trawling for other species. They are often caught with longlines, but the northern wolffish, in contrast to the other two species, are taken in large numbers with pelagic trawls. In the Northwest Atlantic during 1975-79, the average annual catch of about 14,500 tons of wolffishes (Atlantic and spotted) represents only 1.1% of the total catch of all groundfish species, and in the Newfoundland and Labrador areas (NAFO Subareas 2 and 3) the average catch of about 4,000 tons represents only 0.7% of the total groundfish catch (ICNAF, 1977-80; NAFO, 1981).

Some data have been reported on the distribution of wolffishes by depth and temperature for waters off Greenland, Iceland, Spitsbergen and Norway, and in the Barents, North and White seas (Baranenkova *et al.*, 1960; Nizovtsev, 1963; Beese and Kändler, 1969). This paper presents information on the distribution and abundance of three species of wolffish by depth and temperature for the Newfoundland area (Fig. 1).

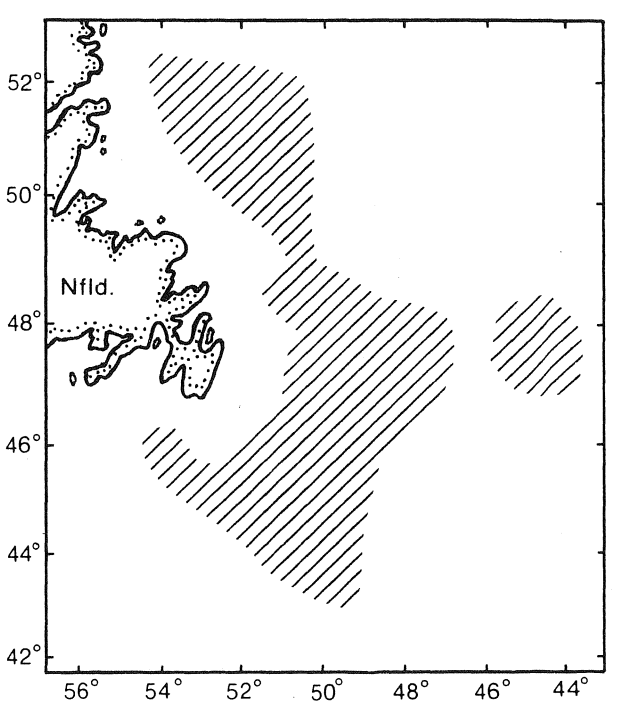

Fig. 1. Area covered by fixed-station trawl surveys, 1971-80.

Materials and Methods

Data on wolffish catches from bottom-trawl surveys in the Newfoundland area during 1971–80 by research and scouting vessels (BMRT-type) of the Polar Research Institute of Marine Fisheries and Oceanography, Murmansk, were summarized for presentation in this paper (Table 1). The annual survey was conducted during spring and summer (usually April–July) with trawling at fixed stations throughout the area. The duration of each trawl haul was one hour. The trawl codend was lined with small-mesh netting in order to obtain data on the distribution and abundance of young fish of both commercial and non-commercial species.

At each trawling station, the bottom depth and near-bottom temperature were recorded, and the field analysis of the catch included length measurements of all specimens caught, determination of sex and matur-

TABLE 1. Numbers of trawl hauls in the Newfoundland area and percent occurrence of three wolffish species by depth and temperature, 1971-80. (Percent occurrence not listed for single hauls.)

	Bottom temperatures (°C)																					
Depth (m)	-1.9 -1.5	-1.4 -1.0	-0.9 -0.5	-0.4 0.0	0.1 0.5	0.6 1.0	1.1 1.5	1.6 2.0	2.1 2.5	2.6 3.0	3.1 3.5	3.6 4.0	4.1 4.5	4.6 5.0	5.1 5.5	5.6 6.0	6.1 6.5	6.6 7.0	7.1 7.5	7.6 8.0	8.1 9.0	9.1 10.0	10.1 11.0
Number of 1-hour bottom trawl hauls																						
1-50	1	—	2	5	15	15	10	19	9	10	10	5	1	—	—	—	—	—	—	—	—	—
51-100	13	40	63	82	90	85	83	68	35	18	13	5	8	1	2	2	1	1	1	—	—	1	—
101-150	7	46	61	49	23	4	13	4	6	6	13	14	7	6	2	7	4	5	7	3	6	2	3
151-200	2	25	48	45	37	25	28	9	4	3	17	19	14	5	8	5	9	12	5	6	9	7	1
201-250	1	8	14	21	28	31	48	40	31	16	13	32	18	11	3	3	6	11	8	7	11	1	2
251-300	—	1	5	5	14	13	38	43	52	56	33	45	31	9	1	4	3	6	1	2	2	—	—
301-350	1	1	—	1	—	3	7	21	34	82	48	40	4	1	—	2	5	2	—	2	1	—	—
351-400	—	1	—	—	—	—	1	5	8	14	26	13	7	1	—	—	—	—	—	—	—	—	—
401-450	—	—	—	—	—	—	1	—	1	12	15	13	5	2	1	—	—	—	—	—	—	—	—
451-500	—	—	—	—	—	—	—	1	—	7	23	14	1	1	—	—	—	—	—	—	—	—	—
501-550	—	—	—	—	—	1	—	—	2	2	13	7	1	—	—	—	—	—	—	—	—	—	—
551-600	—	—	—	—	—	—	—	—	—	—	5	8	—	—	—	—	—	—	—	—	—	—	—
Total	25	122	193	208	207	177	229	210	182	226	229	215	97	37	17	23	28	37	22	20	29	11	6
Percent occurrence of Atlantic wolffish, *A. lupus*																						
1-50	—	—	0	0	27	13	30	16	33	20	10	0	—	—	—	—	—	—	—	—	—	—	—
51-100	8	2	8	12	20	14	19	34	31	28	15	40	12	—	50	0	—	—	—	—	—	—	—
101-150	0	9	18	26	26	25	31	25	17	69	64	54	29	33	0	57	75	60	43	33	40	0	0
151-200	100	32	44	29	43	48	43	44	75	67	82	68	50	40	75	40	33	50	60	33	44	0	—
201-250	—	75	78	90	78	71	83	82	94	100	92	96	78	36	33	0	0	36	25	14	28	—	0
251-300	—	—	80	100	71	92	84	79	90	95	94	84	86	44	—	25	0	33	—	50	50	—	—
301-350	—	—	—	—	—	100	100	86	85	84	81	95	75	—	—	50	40	0	—	100	—	—	—
351-400	—	—	—	—	—	—	—	40	100	78	50	85	86	—	—	—	—	—	—	—	—	—	—
401-450	—	—	—	—	—	—	—	—	—	17	33	62	20	0	—	—	—	—	—	—	—	—	—
451-500	—	—	—	—	—	—	—	—	—	28	30	43	—	—	—	—	—	—	—	—	—	—	—
501-550	—	—	—	—	—	—	—	—	50	0	60	14	—	—	—	—	—	—	—	—	—	—	—
551-600	—	—	—	—	—	—	—	—	—	—	25	12	—	—	—	—	—	—	—	—	—	—	—
Percent occurrence of spotted wolffish, *A. minor*																						
1-50	—	—	0	0	0	0	0	5	0	0	0	0	—	—	—	—	—	—	—	—	—	—	—
51-100	0	0	2	4	2	0	4	2	3	6	0	0	0	—	0	0	—	—	—	—	—	—	—
101-150	0	11	26	18	17	25	15	25	0	15	31	14	29	0	0	29	25	0	0	0	0	0	0
151-200	50	24	35	24	30	28	41	22	50	0	53	16	0	0	12	0	0	0	0	0	20	0	—
201-250	—	50	50	71	36	36	45	45	48	44	54	62	35	33	33	0	0	0	0	14	0	—	0
251-300	—	—	40	80	43	38	50	56	54	48	45	61	68	22	—	0	0	0	—	0	0	—	—
301-350	—	—	—	—	—	67	86	33	50	49	56	68	25	—	—	0	20	0	—	0	—	—	—
351-400	—	—	—	—	—	—	—	25	38	71	31	38	43	—	—	—	—	—	—	—	—	—	—
401-450	—	—	—	—	—	—	—	—	—	17	47	46	20	0	—	—	—	—	—	—	—	—	—
451-500	—	—	—	—	—	—	—	—	—	0	22	36	—	—	—	—	—	—	—	—	—	—	—
501-550	—	—	—	—	—	—	—	—	50	50	31	57	—	—	—	—	—	—	—	—	—	—	—
551-600	—	—	—	—	—	—	—	—	—	—	40	25	—	—	—	—	—	—	—	—	—	—	—
Percent occurrence of northern wolffish, *A. Denticulatus*																						
1-50	—	—	50	0	7	29	20	10	11	40	20	0	—	—	—	—	—	—	—	—	—	—	—
51-100	8	2	3	0	4	3	2	4	17	11	8	20	12	—	0	0	—	—	—	—	—	—	—
101-150	0	2	11	13	9	25	15	25	0	17	23	14	14	0	0	0	0	0	0	0	0	0	0
151-200	0	8	14	11	12	12	11	33	0	0	6	5	7	0	12	40	0	8	0	0	0	0	0
201-250	—	25	43	24	18	29	23	48	42	19	8	31	6	18	33	0	0	0	0	14	50	—	0
251-300	—	—	0	40	7	23	29	44	38	52	42	33	29	11	—	0	0	0	—	0	0	—	—
301-350	—	—	—	—	—	0	43	43	35	60	46	45	25	—	—	—	0	0	—	0	—	—	—
351-400	—	—	—	—	—	—	—	20	50	57	38	33	57	—	—	—	—	—	—	—	—	—	—
401-450	—	—	—	—	—	—	—	—	—	33	47	54	40	100	—	—	—	—	—	—	—	—	—
451-500	—	—	—	—	—	—	—	—	—	43	56	50	—	—	—	—	—	—	—	—	—	—	—
501-550	—	—	—	—	—	—	—	—	100	0	77	100	—	—	—	—	—	—	—	—	—	—	—
551-600	—	—	—	—	—	—	—	—	—	—	50	38	—	—	—	—	—	—	—	—	—	—	—

ity, collection of scales and otoliths for subsequent age determination, analysis of fat content, and evaluation of food items from stomach contents. The summarized data on the frequency of occurrence and the mean catch per haul for the three species of wolffish are based on 2,550 trawl hauls made during 1971–80. The catch weights were estimated by applying a length-weight key to the length frequencies.

Results

The three species of wolffish in the Newfoundland area occurred over a wide range of depth and temperature (Table 1, Fig. 1). The Atlantic wolffish was more prevalent in the catches than either of the other two species, as indicated by their occurrence in more than 50% of the trawl catches at different depth and temper-

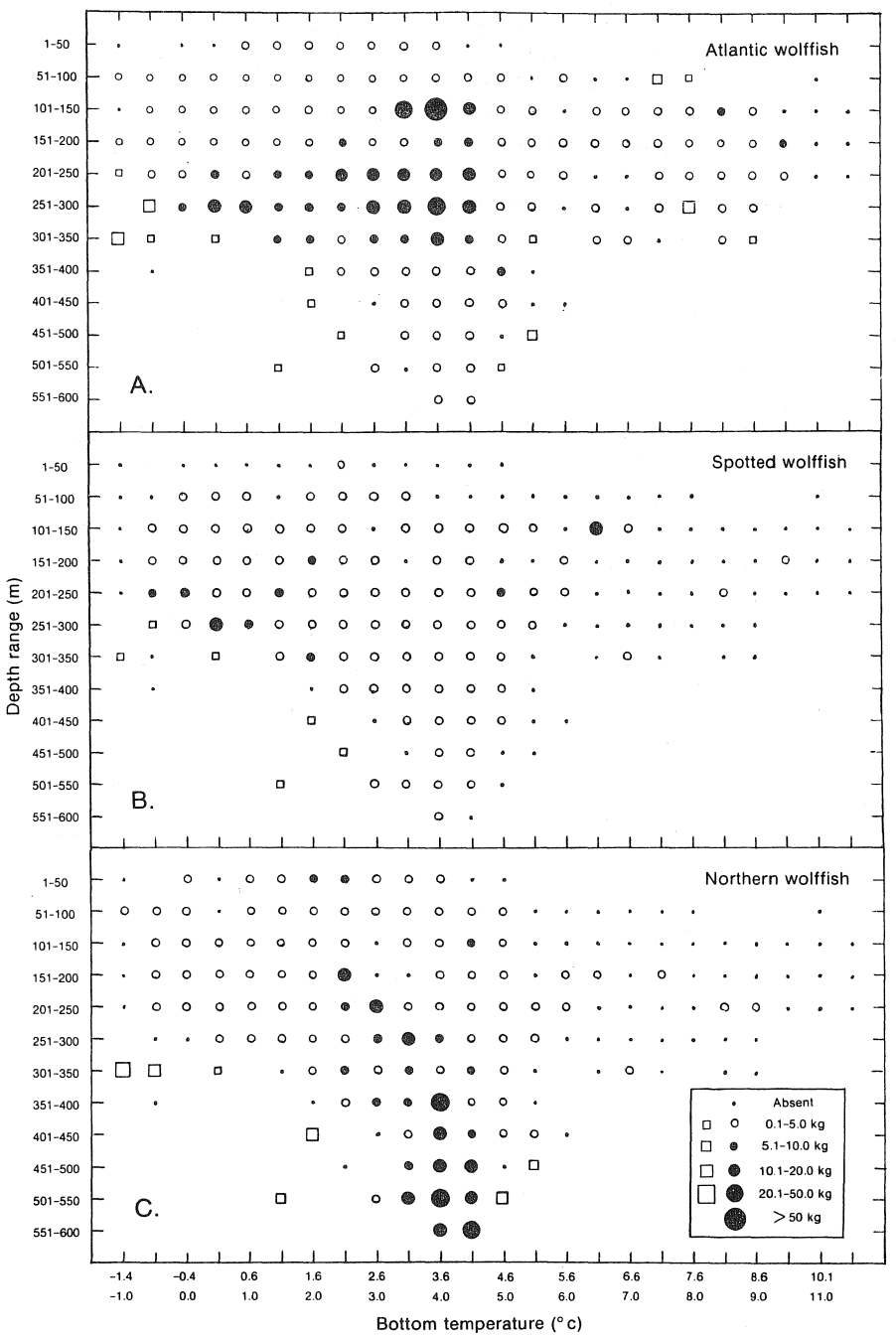

Fig. 2. Distribution and mean catch per hour trawling of Atlantic wolffish, spotted wolffish and northern wolffish by depth and bottom temperature in the Newfoundland area, 1971–80. (Open squares represent single catches.)

ature ranges (51 instances for Atlantic wolffish in contrast to 15 for spotted wolffish and 10 for northern wolffish). The Atlantic wolffish was also more prevalent at low (<0°) and high (>5° C) temperatures, but the northern wolffish generally occurred more frequently at the greatest depths (>400 m). The spotted wolffish occurred less frequently at the shallower depths (≤100 m) than the other species.

The Atlantic wolffish was the most abundant of the three species in the Newfoundland area (Fig. 2A). Mean catches in excess of 10 kg per hour trawling occurred as by-catch in many instances at depths of 201–350 m where bottom temperatures ranged from -0.4° to 4.0° C and at 101–200 m where temperatures were 2.6° to 4.0° C. Except for occasional catches exceeding 5 kg per hour at higher temperatures, catches were generally low at depths greater than 350 m and at most stations where temperatures exceeded 4.0° C.

The spotted wolffish occurred more rarely than the other two species (Fig. 2B), with mean by-catches per hour trawling generally less than 5 kg except in a few scattered instances, the largest mean catches (>10 kg) being observed in 101–150 m at 5.6° to 6.0° C and in 251–300 m at -0.4° to 0.0° C. Spotted wolffish were rarely caught in shallow areas and at stations where the bottom temperature exceeded 5° C.

The northern wolffish occurred more frequently over a greater range of depth than the other species (Fig. 2C). The frequency of mean catches greater than 10 kg per hour trawling generally increased with depth from 151 to 600 m at preferred temperatures from 1.6° to 4.0° C. Catches greater than 20 kg per hour occurred more frequently at depths greater than 350 m. Occasional catches exceeding 100 kg per hour have been taken in exploratory trawling at depths to 750 m. Like the spotted wolffish, the northern wolffish tends to prefer water temperatures less than 5° C.

Conclusions

The Atlantic wolffish is the most numerous of the three species inhabiting the continental shelf off Newfoundland, with largest mean catches per hour trawling (>10 kg) in depths of 101–350 m at bottom temperatures of -0.4° to 4.0° C. The spotted wolffish is the least abundant of the three species, with catches usually not exceeding 5 kg per hour trawling. It occurs rarely at temperatures exceeding 5° C and in depths less than 50 m. The northern wolffish inhabits a wide range of depth, with largest mean catches (>10 kg) in depths of 151 to 600 m at bottom temperatures of 1.6° to 4.0° C.

All three species of wolffish are widely distributed spatially and by depth over a broad range of temperature. For this reason, wolffish generally occur only as by-catch in fisheries directed for other groundfish species and the stocks are likely to be underexploited.

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