Northwest Atlantic Fisheries Organization

Serial No. N1654 NAFO SCR Doc. 89/73

SCIENTIFIC COUNCIL MEETING - SEPTEMBER 1989

Results of Parasitological Investigations as an Index of Stock Delimitations Concerning Occurrences of Greenland Halibut (Reinhardtius hipplglossoides Walb.) in the Northwest Atlantic

by

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Introduction

Since the end of the sixties the occurrences of Greenland halibut in the North Atlantic have been increasingly fished at an international level. This trend went along with the scientific research work. Main object of the biological research work on stocks is the elaboration of statements on stock delimitation and identification of occurrences forming the basis of information on population dynamics. Despite of a partially different point of view the fundamental biological work concerning stocks (CHUMAKOV 1982, CHUMAKOV and SEREBRYAKOV 1984, ERNST 1987) show that the occurrences of Greenland halibut existing north of 47°30'N within the sea areas East Canada and West Greenland belong to a homogeneous stock. These statements are supported by meristic (TEMPLEMAN 1973) and biochemical (FAIRBAIRN 1981) investigations. The investigations by KHAN et al. (1982) and KHAN (1986) concerning the infestation of Greenland halibut by blood protozoans in the Northwest-Atlantic represent the first parasitological results referring to stock delimitation.

Our investigations carry on with the works by ZUBCHENKO (1980) containing results of the parasitic fauna of Greenland halibut, in which results given by REIMER (1981) have been incorporated as a further index of stock identification concerning the occurrences of Greenland halibut in the North Atlantic.

Materials and Methods

Sampling materials (Tab. 1) were taken on sea aboard of fishing or research vessels. The samples were randomly collected. At the end of the fishing process specimens destined for investigation had been gradually frozen. After thawing microscopic and macroscopic investigations had been carried out on the material in a laboratorium ashore. The collection of the samples was arranged in such a way, that materials from the southern fishing area worked on by the GDR fishing fleet (NAFO Division 3K) as well as from the northern zone (NAFO Division 2H) had been submitted for assessment.

Results

Figure 2 and 3, respectively represent the results of our investigations on the extensity and intensity of parasitic infestation of Reinhardtius hippoglossoides as well as a comparison of these results with those obtained by other authors.

During the investigations of samples from 1987 the number of parasites increased in relation to rpevious results. Initially cysts had been observed in the tissue specially in the wall of the stomach, which on their part contained small cysts as well. This could be the fungoid genus Ichthyophonus. From the Monogenea a juvenile specimen of Entobdella spec. had been observed. This genus is known to be associated with Greenland halibut. But no assignment to a well-known species was possible because of the lack of maturity. Concerning Trematoda and specially Hemiuridae specimens of the genus Lecithophyllum had been observed. Cestoda were represented by one larva of the genus Nybelinia. Besides larvae of the order Cestoda namely Pseudophyllidea had been found in the cysts of the tissue, but these larvae may be identical with already known larvae of the species Bothriocephalus scorpii. For the first time during own investigations in the sample 4 one specimen of the parasitic copepod Sphyrion lumpi had been observed.

Discussion

If we want to compare the infestation by protozoa - though only Myxosporidia had been registered - according to own results from 1986 and 1987, we recognize, that Ceratomyxa drepanopsetta were represented by 100 % each time. In sample 3 a maximum of Myxidium sphaericum was ascertained. A decrease can be observed in the northern direction an in temporal comparison.

A similar frequency can be observed with Ortolinea divergens. Concerning Myxoproteus spec. a significant decrease is to be stated in 1987 as compared with 1986. Within the group of Helminths a temporal dynamic as well as a decrease from north to south is to be ascertained. Concerning Trematoda the infestation by specimens of Steringophorus furciger increases northward. The same applies to the infestation by larvae of Tetraphyllidea, the group of larvae Scolex pleuronectis. Within the frame of investigations from 1986/1987 this applies to the infestation by Anisakis larvae as well. Referring to some other species the situation is a bit more differentiated. For Derogenes varicus there is an increase to be observed between sample 1, 2 and 3. The same applies to Lecither confusus. But there are differences concerning the results within the range of 56°N, i.e. between the samples 3 and 4. The infestation by some species of Trematoda and Scolex pleuronectis decreases. This species are transfered by Copepoda and other small planctonts being the intermediate hosts. In relation herewith it is naturally not clear whether Greenland halibut is the final host or a post-cycle host, i.e. whether it reerly feeds on plancton belonging to this age group, or whether it takes up these parasites together with smaller planctonic feeders amoung fish, Cephalopods and others.

Compared with previous investigations a temporal increase can be ascertained for Hysterothylacium spec. larv. Numbers of the extensity and intensity of infestation by Acanthocephala point more to a uniform infestation with small differences. Concerning the infestation by Anisakis larvae there can principally by ascertained that there was an increase in northern direction. One has to bear in mind, that samples situated more to the north present an increased mean age at the same time. Explaining this by means of both the samples from 1986, then sample 1 descends from 51°14'N and here the fishes show an average age of 6,2 years. Sample 3 descends from 56°34'N and shows an average age of 6,8 years.

Together with the way northward and the increasing age the extensity of the infestation by Anisakis larvae increases from 31,6 % to 43,5 % and concerning intensity from 0,5 to 2,1 Anisakis larvae in relation to the investigated fishes.

In 1987 similar values had been achieved. The distance between the samples is smaller (sample 2 : 53°15'N, sample 4 : 56°25'N), but the age varies (6.7-8.0). Between these samples the intensity of the infestation increases from 1.3 to 5.2.

Compering the results from 1986 and 1987 an increasement was obtained as well. This is also demonstrated by the infestation of the muscles. In 1986 only the sample from 56°N showed 2 Anisakis larvae in the muscles of one of 23 specimens. On the whole there were within this fish 26 larvae, but in 1987 the infestation had been increased. In 1987 three halibuts showed an infestation in the muscles (3, 3, 15) at 56°N, the fishes belonged to the age groups 10, 7 and 8. Concerning 56°N for instance, this implies an increase from 4.3 % to 10.3 %. Referring to the intensity the difference is significantly enlarged.

KHAN (1986) examined the infestation by Haematozoa. He found Trypanosoma murmanensis NIKITIN, Haemohormidium terraenovae SO and Haemogregarina platessae LEBAILLY. Referring to the distribution of samples he found one group near sample 2 and another one near the samples 3 and 4. The genera Trypanosoma and Haemohormidium had been observed within this area, whereas the infestation decreases a little northward. But there are larger differences within the area of sampling in the Ungava-Bay.

Investigations concerning ectoparasitism (Neobranchiella rostrata/ KROYER 1937/, Sphyrion lumpi/KROYER 1845/, Aegapsora/LINNAEUS 1758/) are presented from the sea area Labrador (57°47'N-55°30'N; 60°22'W-57°58'W) (ROKICKI 1982), but it is not possible to discuss them because of missing and statistically not ensured comparative investigations, respectively from other areas of the Northwest Atlantic concerning the identification of stocks.

The parasitological investigations of sampling materials from southern and northern distribution areas of the Greenland halibut as presented here do not show any significant differences concerning the rates of extensity and intensity of the infestation. Herewith they can be considered as an index for the allocation of these surveyed occurrences to one stock.

According to own results and to those of KHAN (1986) this is conformed by the relative uniform parasitic infestation by protozoa. There are differences within the group of Helminths because of differences of age and certain specifications of the regions. These differences can be estimated as a decrease and it is not possible to recognize any limits. Besides Protozoans there was peculiar uniformity of results concerning the infestation by the copepod Parabranchiella rostrata.

The results concerning the parasitology of the Greenland halibut from the NAFO Divisions 2H, 2J and 3K as presented here suggest that the investigated occurrences have to be allocated to one stock. Herewith the results support the biological

investigations of stocks by CHUMAKOV (1982), CHUMAKOV and SEREBRYAKOV (1982), BOWERING (1984) and ERNST (1987) which ascertained, that the occurrences within the NAFO subareas and Divisions 0, 1, 2 and 3K and 3L, respectively belong to a unit stock of Greenland halibut.

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Table 1: Listing of samplings

Sampling No.	Date	Position	NAFO-Division	Depth of catching (m)	number of examples
1	5.11.1986	51°14'N 49°50'W	3K	1000	19
2	25.08.1987	53°13'N 53°12'W	2J	540	24
3	9.12.1986	56°34'N 58°03'W	2H	1350	23
4	20.11.1987	56°25'N 57°44'W	2H	1150	29

Table 2: Comparison of extensity of parasitic infestion of Reinhardtius hippoglossoides with the results of other authors

Sampling	1	2	3	4	Zubchenko	Reimer
Year	1986	1987	1986	1987	1980	1981
Position	51°N	53°N	56°N	56°N	50-63°N	54-65°N
Ceratomyxa drepanopsettae	100	100	100	100	75	
Ceratomyxa ramosa					5	
Myxidium sphaericum	31,6	41,7	52,2	24,1	10	
Myxoproteus spec.	84,2	37,5	69,6	37,9	35	
Ortholinea divergens	47,4	62,5	73,9	51,7	25	
Steganoderma formosum	5,3	16,7	21,7	3,4		
Steringophorus furciger	15,8	20,8	13	51,7	30	41,8
Stenakron vetustum		20,8		13,8		5,5
Hemiurus levinseni			4,5	3,4		
Brachyphallus crenatus			4,5			
Lecithophyllum spec.		8,3				
Lecithaster confusus		42	56,5	34,5	35	29,1
Derogenes varicus	57,9	45,8	82,6	58,6	70	65,5
Bucephalopsis gracil. l.						9,1
Entobdella spec. juv.				3,4		
Scolex pleuronectis	21,1	33,3	52,2	44,8	65	60
Grillotia spec. l.			4,3	3,4	5	5,5
Nybelinia spec. l.		4,2				
Bothriocephalus spec. l.		8,3	8,7			3,6
Phocanema spec. l.	5,3	4,2		24,1		
Phocascaris spec. l.	73,7		52,2			29,1
Anisakis spec. l.	31,6	70,8	43,5	62	25	27,3
Hysterothylacium sp. l.		100	30,4	89,7	20(55)	
Capillaria spec.	10,5		8,7			
Corynosoma strumosum l.	21,1	4,2	8,7	6,9	10	14,5
Echinorhynchus laurentianus	10,5	25	8,7	17,2		1,8
Parabrachiella rostrata	5,3	8,3	8,7	6,9		7,3
Sphyrion lumpi				3,4		

Table 3: Comparison of intensity of parasitic infestion of Reinhardtius hippoglossoides with the results of other authors

Sampling	1	2	3	4	Zubchenko	Reimer
Year	1986	1987	1986	1987	1980	1981
Position	51°N	53°N	56°N	56°N	50-63°N	64-65°N
Steganoderma formosum	0,5	0,27	0,3	0,03		
Steringophorus furciger	0,6	1,05	1,3	1,3	1,3	1,6
Stenakron vetustum		0,4		0,31		0,24
Hemiurus levinseni			0,04	0,14		
Brachyphallus crenatus			0,04			
Lecithophyllum spec.		0,6				
Lecithaster confusus		0,45	1,9	1,5	1,6	1,8
Derogenes varicus	1,5	2,7	5,3	4	4,7	4,6
Bucephalopsis gracil. l.						0,18
Entobdella spec. juv.				0,03		
Scolex pleuronectis	0,9	1,05	5,2	3,2	8	23,6
Grillotia spec. l.			0,04	0,03	0,1	0,05
Nybelinia spec. l.		0,05				
Bothriocephalus spec. l.		0,05	0,3			0,07
Phocanema spec. l.	0,05	0,05		0,28		
Phocascaris spec. l.	2,1		1,3			1,04
Anisakis spec. l.	0,5	1,3	2,1	5,2	1	3,13
Hysterothylacium spec. l.		10,3	1,2	5,4	1	
Capillaria spec.	0,4		0,13			
Corynosoma strumosum l.	0,2	0,05	0,09	0,28	1	0,25
Echinorhynchus laurentianus	0,2	0,54	0,4	0,5		0,04
Parabrachiella rostrata	0,05	0,05	0,13	0,28		0,09
Sphyrion lumpi				0,14		