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Characteristics of Parasitofauna and Some Comments on Intraspecific Structure of American plaice (Hippoglossoides platessoides platessoides (Febricius)

by

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ABSTRACT

144 individuals of American plaice from several areas of the northwest Atlantic were examined (Hamilton, Flemish Cap, Ritou banks, northern, southwestern and southeastern slopes of the Grand Newfoundland bank). 20 parasite species were discovered. Differences were recorded in the parasite specific composition and degree of infestation of fish from different areas. It was concluded that the groupings under study were local.

INTRODUCTION

Most aspects of biology of American plaice are at present studied well enough. The parasitofauna of the fish is on the whole determined and includes according to a number of authors (Stafford, 1904, 1907; Huntsman, 1918; Bere, 1930; Scott, 1950, 1953, 1954; Wolfgang, 1954, 1955; Wolfgang, Myers, 1954; Ronald, 1957, 1958 a,b, 1960, 1963; Templeman et al., 1957; Scott, Black, 1960; Myers, 1960; Laird, Bullock, 1969; So, 1972; Scott, 1975 a, b, 1982; Templeman et al., 1976; Khan, 1977; Bray, 1979; Zubchenko, 1980) 41 species of parasites (Tripanosoma murmanica, Haemohormidium terranovae, Haemohormidium sp., Ceratomyxa drepanopsettae, Myxidium sphaericum, Myxoproteus sp., Ortholinea divergens, Bothriomonus sturionis, Scolex pleuronectis l., Aporocotyle simplex, Otodistomum sp.mtc., Derogenes varicus, Progonus muelleri, Gonocerca macroformis, Hemiurus levinseni, Hemiurus sp., Brachyphallus crenatus, Genolinea laticauda, Lecithaster gibbosus, Steringophorus

furciger, Steringotrema ovacutum, Zoogonoides viviparus, Diphterostomum microacetabulum, Stenakron vetustum, Prosorhynchus scuamatus, Cryptocotyle lingua, Stephanostomum baccatum, Trematoda gem. sp., Anisakis sp.l., Hysterothylacium (=Thynascaris, Contracaecum) aduncum, Pseudoterranova (=Terranova, Phocanema) decipiens, Contracaecum sp., Anisakinae gen.sp.l., Capillaria kabatai, Nematoda gen. sp., Echinorhynchus gadi, E.laurentianus, Corynosoma sp.l., Acanthochondria cornuta, Lernaeocera branchialis). At the same time our knowledge of peculiarities of the parasitofauna of American plaice and its populational structure is quite fragmentary.

MATERIAL AND METHODS

The present paper considers material collected in some areas of the northwest Atlantic (Hamilton, Flemish Cap, Ritou banks, northern, southwestern and southeastern slopes of the Grand bank) in June-July 1978. 144 individuals of American plaice were examined using the method of total parasitological autopsy. Data processing and identification of parasites were later conducted in the PINRO laboratory of parasitology and in a similar laboratory in Atlant-NIRO (Kaliningrad). 20 species of parasites (Table 1) relating to 6 main taxonomic groups (Myxosporidia-4, Cestoda-2, Trematoda-3, Nematoda-4, Acanthocephala-1, Crustacea-1 species) were found.

RESULTS

The Hamilton bank. 16 species of parasites were found. Among parasites with a direct developmental cycle the infestation with Ceratomyxa drepanopsettae is most significant. As for parasites with a complex developmental cycle fish were found to be most heavily infested with Aporocotyle simplex, the cercariae of which penetrate actively the fish and with Steringotrema ovacutum, Pseudoterranova decipiens l., Echinorhynchus gadi, which infest the fish during their feeding on gastropods, bottom copepods and amphipods. The infestation with the latter 3 species shows that the aforesaid animals are of equal importance in the feeding of American plaice.The infestation with other parasites having a complex developmental cycle is of poor significance and is associated with both benthos (Steringophorus furciger, Diphterosto-

mum microacetabulum, Stenacron vetustum, Genolinea laticauda, Ascarophis arctica) and plankton (Scolex pleuronectis l., Lecithaster gibbosus, Anisakis simplex l., Hysterothylacium aduncum l.).

The Ritou bank. 11 species of parasites were found. Infestation with C.drepanopsettae was somewhat lower than in the above mentioned area and with S.ovacutum was notably higher which was indicative of closer links between fish and the bottom (and increased infestation with Aporocotyle simplex) and a more important role of gastropods in the feeding of American plaice. The infestation of fish with Scolex pleuronectis l., the developmental cycle of which is associated with plankton, was also significant.

The Flemish Cap bank. 14 species of parasites were found. In addition to a heavy infestation with C.drepanopsettae characteristic of all flatfishes, fish from this area were found to be strongly infested with Myxidium sphaericum as well as with some parasites (Grillotia erinaceus l., Derogenes varicus, Lecithaster gibbosus, Anisakis simplex l., Hysterothylacium aduncum l.) which developmental cycle is associated with plankton and with Steringophorus furciger and E.gadi which penetrate the fish during their feeding on bivalve molluscs and amphipods.

The Grand Newfoundland bank. Northern slope. 11 species of parasites were found. The parasitofauna is characterized by a rather heavy infestation with C.drepanopsettae and S.ovacutum, intermediate hosts of the latter, gastropods together with bottom copepods (intermediate hosts of P.decipiens l.), are evidently major prey of American plaice in this area.

The Grand Newfoundland bank. Southwestern slope. 12 species of parasites were found. The infestation with C.drepanopsettae, S.ovacutum, S.vetustum and Anisakis simplex l. is most significant. Gastropods, different pelagic animals and decapods are intermediate hosts of the latter two species.

The Grand Newfoundland bank. Southeastern slope. The infestation with C.drepanopsettae is the lowest. As for parasites with a complex developmental cycle the infestation with S.furciger and S.ovacutum is significant they penetrate the fish during their feeding on bivalve molluscs and gastropods, respectively.

DISCUSSION

A comparison of parasitofauna of American plaice from surveyed areas shows notable differences in both specific composition of parasites and the degree of infestation, which result from peculiarities of fish living conditions and their trophic links. Quantitative differences in the infestation with parasites are most pronounced in fish from the Hamilton bank, Flemish Cap and Ritou banks. In the first area a heavy infestation of American plaice with Aporocotyle simplex and Echinorhynchus gadi was recorded which was evidently due to a significant biomass of intermediate hosts, prevalence of amphipods in the food of fish, shallower distribution depths (where the concentration of intermediate hosts is the highest) and closer links to the bottom. No A.simplex was found in fish from the second area (with American plaice inhabiting greater depths). In contrast to the first area the infestation with Myxidium sphaericum, Grillotia erinaceus l., Scolex pleuronectis l., Steringophorus furciger, Steringotrema ovacutum, Anisakis simplex l., Hysterothylacium aduncum l. was heavier. Some parasites (G.erinaceus l., A.simplex l., H.aduncum l.) probably penetrate the American plaice when fish consume plankton and nektobenthos rather than fish, which is confirmed by the absence of mature nematodes of H.aduncum. The fish grouping living on the Ritou bank is characterized by a strong infestation with Scolex pleuronectis l., Aporocotyle simplex and Steganoderma ovacutum. Differences in the infestation of fish from three different slopes of the Grand Newfoundland bank are less pronounced, excluding a heavy infestation of fish with Stenakron vetustum on the southwestern slope and with P.decipiens l. on the northern slope.

However, no trematode S.vetustum peculiar to all flatfishes and acanthocephalan E.gadi occurring in all other areas were found on the northern slope, nematode Ascarophis arctica recorded on other slopes of the bank was not found on the southeastern slope. On the whole American plaice at the Grand Newfoundland bank are characterized by a low infestation with Aporocotyle simplex and a lower infestation compared to other areas with M.sphaericum, C.drepanopsettae, S.ovacutum and with some other parasites.

The parasitofauna of two fish groupings living at the Hamilton and Flemish Cap banks besides quantitative differences has some alternative features. Schulmania aenigmatosa, Diphterostomum microacetabulum, Acanthochondria cornuta, which were not recorded in other areas, were found in fish from the first grouping. In fish of the second grouping living at the Flemish Cap bank Ortholinea divergens was found which was not recorded in fish from other areas. It is worth noting that the aforesaid parasites (the former two as Myxoproteus sp. and Trematoda gen.sp.) we had previously found in fish from the Labrador and Flemish Cap (Zubchenko, 1980). S.aenigmatosa and A.cornuta are typical of this flatfish species. The trematode D.microacetabulum is characteristic of catfishes. Gastropods Cnoba aculeus, Sipho islandicus, Buccinum finmarchianum (Zelikman, 1966; Chubrik, 1966) are named as its possible intermediate hosts living in the litoral and epicontinental zones, which is indicative of links between the American plaice from the Hamilton bank and coastal areas. O.divergens is a secondary deepwater species. In the areas under study it is commonly found in Greenland halibut (Reinhardtius hippoglossoides (Walbaum), living at great depths, and evidently penetrates American plaice in the course of their vertical migrations.

The mentioned above allows to draw some conclusions on the intraspecific structure of American plaice in the surveyed areas. Fish groupings living at the Hamilton, Flemish Cap, Ritou banks and Grand Newfoundland bank are surely geographically isolated, which is probably due to the presence of deepwater areas between those banks making any notable exchange of fish between them impossible. In view of this the parasitological data confirm the conclusions reached by Pitt (1963, 1969, 1975) which are based on the difference of some meristic characters and on tagging re-

sults. As far as the spawning of American plaice occurs virtually in all parts of its distribution area (Pitt, 1965), hence, ecological isolation of mentioned groupings is quite feasible. However, southern groupings of American plaice are not genetically isolated, because the observed transport of eggs (by the Labrador current) from northern areas into southern ones (Nevinsky, Serebryakov, 1973; Pitt, 1975) results in a mixing in southern areas of genotypes from different groupings. At the same time the degree of panmixia is high enough to consider them as populations.

The situation is more complicated for groupings of American plaice inhabiting the Grand Newfoundland bank, but different slopes of it. Parasitological studies evidenced no pronounced differences in the infestation, which would permit to draw some definite conclusions, though Pitt (1969, 1975) noted insignificant migrations of fish within each area, and was apt to think that there are several populations of American plaice in those areas. Our data show that, on the one hand, there is a number of characters (given above) confirming these groupings to be local, on the other hand, the infestation with specific parasites (C.drepanopsettae, S.ovacutum) is almost equal in the three areas. No distinctive mark-parasites uncommon to American plaice but characteristic of particular ecological niche as,for instance, Ortholinea divergens at the Flemish Cap bank, were found in fish from the sueveyed areas. Therefore, we are inclined to think, that there is no complete isolation of groupings at the Grand bank. Adequate living conditions are probably the reason.

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Table 1. Parasitofauna of Hippoglossoides platessoides platessoides from different areas of the northwest Atlantic.

Parasite	Hamilton bank	Ritou bank	Grand Newfoundland bank			Flemish Cap bank
			Northern slope	South-western slope	South-eastern slope	
	Infestation	Infestation	Infestation	Infestation	Infestation	Infestation
1	2	3	4	5	6	7
Myxidium sphaericum	29,2(+)	33,3(+)	10,0(+)	13,3(+)	10,3(+)	53,3(+)
Schulmania aenigmatosa	29,2(+)					
Ortholinea divergens						20,0(+)
Ceratomyxa drepanopsettae	95,8(+)	73,3(+)	63,3(+)	70,0(+)	55,2(+)	93,3(+)
Grillotia erinaceus l.					10,3(0,14)	66,7(5,07)
Scolex pleuronectis l.	4,2(0,08)	40,0(4,47)	16,7(0,67)	3,3(0,07)	24,1(0,62)	33,3(2,30)
Aporocotyle simplex	41,7(0,88)	66,7(1,27)	6,7(0,13)	10,0(0,13)	13,8(0,14)	
Steringophorus furciger	4,2(0,58)	20,0(2,33)	26,7(1,03)	23,3(1,33)	34,5(2,50)	86,6(18,7)
Steringotrema ovacutum	37,5(2,08)	73,3(3,0)	56,7(7,0)	46,7(14,0)	44,8(9,24)	60,0(8,6)
Diphterostomum microacetabulum	4,2(0,73)					

Table 1 (contd).

1	2	3	4	5	6	7
Stenakron vetustum	4,2(0,04)	6,7(0,2)		36,7(0,8)	10,3(9,9)	
Genolinea laticauda	12,5(0,29)	26,7(0,4)			6,6(0,07)	
Derogenes varicus			6,7(0,1)		6,9(0,1)	20,0(0,26)
Lecithaster gibbosus	8,4(0,13)					26,7(0,33)
Anisakis simplex l.	4,2(0,04)		6,7(0,07)	33,3(0,37)	10,3(0,14)	46,6(0,27)
Hysterothylacium aduncum l.	16,7(0,13)	13,3(0,13)	13,3(0,29)	6,7(0,13)	17,2(0,28)	86,7(5,33)
Pseudoterranova decipiens l.	25,0(0,46)	13,3(0,13)	36,7(2,1)	6,7(0,13)	10,3(0,1)	25,0(0,46)
Ascarophis arctica			3,3(0,2)	10,0(0,13)		
Echinorhynchus gadi	54,2(3,54)	6,7(0,07)		6,7(0,07)	20,7(0,34)	54,2(3,54)
Acanthochondria cornuta	4,2(0,04)					