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ECTOPARASITES OF THE HAKES *MERLUCCIUS MERLUCCIUS CAPENSIS* (CASTELNAU) AND *MERLUCCIUS MERLUCCIUS PARADOXUS* (FRANK) AS AN AID TO HOST SYSTEMATICS

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M. m. capensis *and* M. m. paradoxus *caught in ICSEAF Division 1.5 were examined and the following ectoparasites were found:* Chondracanthus merluccii *(Holten 1802),* Neobrachiella insidiosa f. insidiosa *(Kabata 1970), and* Anthocotyle merluccii *(Beneden and Hesse 1863). As different sets of parasites might suggest the long-term geographical isolation of these two hake subspecies and would serve as further indication of fairly considerable differences in their features, the parasites found may constitute evidence in support of Wysokiński's hypothesis that the fish belong to two paragroups of the genus* Merluccius.

L'examen de M. m. capensis *et* M. m. paradoxus *pêchés dans la division 1.5 de l'ICSEAF a fait apparaître les ectoparasites suivants:* Chondracanthus merluccii *(Holten 1802),* Neobrachiella insidiosa f. insidiosa *(Kabata 1970) et* Anthocotyle merluccii *(Beneden et Hesse 1863). Comme un parasitisme différent trahirait peut-être l'isolement géographique prolongé des deux sous-espèces en question et indiquerait que leurs caractéristiques sont assez particulières, la découverte de ces parasites est sans doute un argument de plus en faveur de l'hypothèse de Wysokiński selon laquelle ces poissons appartiennent à deux paragroupes du genre* Merluccius.

Como consecuencia del examen de ejemplares de M. m. capensis *y* M. m. paradoxus *capturados en la División 1.5 de ICSEAF, se encontraron los siguientes ectoparásitos:* Chondracanthus merluccii *(Holten 1802),* Neobrachiella insidiosa f. insidiosa *(Kabata 1970) y* Anthocotyle merluccii *(Beneden y Hesse 1863). La diferencia entre estos parásitos podría indicar el gran aislamiento geográfico de ambas subespecies de merluza y servir para resaltar las considerables desigualdades entre sus características. Los parásitos hallados podrían consitituir una evidencia para apoyar la hipótesis de Wysokiński de que dichos peces pertenecen a dos grupos paralelos del género* Merluccius.

INTRODUCTION

The systematic position of the hakes M. merluccius capensis and M. merluccius paradoxus found in the Southeast Atlantic is controversial. Two copepod species specific to the genus Merluccius and one monogenean species were found on hake individuals from the area. These parasites may provide support for the hypothesis that these hakes belong to two paragroups of subspecies of the genus Merluccius originating in the sub-Antarctic and temperate zones.

MATERIALS AND METHODS

The material was collected from 2 200 M. m. capensis (July, November, January, and March) and 781 M. m. paradoxus (June and January) caught in ICSEAF Division 1.5 during 1975-1979. The hauls were made at depths of 80-380 m between 22°37' - 27°28' S and 13°23' - 14°37' E.

The hakes were classified by species on the basis of their external morphological features (Soliman 1973; Wysokiński, Sea Fisheries Institute, Swinoujście, unpublished manuscript).

DESCRIPTION OF PARASITES FOUND

Chondracanthus merluccii (Holten 1802)

Geographical distribution: this species has been found off the coasts of Angola, Brazil, and Great Britain and in the North Sea and the Mediterranean Sea, as well as in the Northwest Atlantic.

Location on the host: the parasites were found attached along the edges of the oral cavity and on the tongue of M. m. capensis.

Incidence of infestation: 14,3 %.

Intensity of infestation: 1-6 (mean: 1,8 individuals; mode: 1 individual).

Male C. merluccii were most frequently

attached to the forepart and genital region of female hakes. No more than four were found on any one female.

The occurrence of C. merluccii varies according to the season (Table 1). Grabda and Soliman (1975) found this copepod on five of twenty-eight M. m. capensis from the Southeast Atlantic region examined in March.

Neobrachiella insidiosa f. insidiosa (Kabata 1970)

Geographical distribution: this species has been recorded in the South Atlantic.

Location on the host: parasites were found on the gills of M. m. capensis.

Incidence of infestation: 8,4 %.

Intensity of infestation: 1-29 (mean: 3,3 individuals; mode: 2 individuals).

Stunted male N. insidiosa f. insidiosa were found attached to the upper forepart or genital region of female hakes. No more than two males were found on any one female.

An infestation level of 7,0 % was recorded in March, whereas Grabda and Soliman (1975) reported 10,9 % for the same period off the coast of Angola but did not record the occurrence of this parasite further south, i.e., in Division 1.5. This was probably the result of insufficient sampling (only 28 specimens).

N. insidiosa f. insidiosa was most frequently found on gill arch II and much less frequently on the first and last arches.

Anthocotyle merluccii (Beneden and Hesse 1863)

Geographical distribution: this species has been recorded off the Atlantic coasts of Canada, the United States, Ireland, and England, as well as in the North Sea.

Location on the host: on the gills.

Incidence of infestation on M. m. paradoxus: 34,8 %.

Intensity of infestation: 1-7 (mean: 1,9 individuals; mode: 1 individual).

Incidence of infestation on M. m. capensis: 3,5 %.

Intensity of infestation: 1-17 (mean: 3 individuals; mode: 1 individual).

The intensity of infestation on the gill arches by A. merluccii varies, with the highest incidence on gill arches II and III, as can be seen in Table 2.

Gayevskaya and Umnova (1977) reported an incidence of 21,0 % and an intensity of 1-4 parasites per individual for M. bilinearis in the North Atlantic.

DISCUSSION

The usefulness of parasites of fish of the genus Merluccius as indicators was adopted by Szidat (1955), who suggested that hake may have originated in the North Pacific, reaching the Atlantic from the north and south and there evolving into different species. Kabata (1970) and Ho (1974) used parasitic copepods as biological indicators providing information on the distribution of the genus Merluccius. Based on such copepods, Grabda and Soliman (1975) suggested a closer relationship between hakes from the Eastern Atlantic than between those on either side of that ocean. It is thought that Merluccius in the Eastern Atlantic has subdivided into several forms, but the systematic position of these forms continues to be the subject of debate. Soliman (1973) classified the Eastern Atlantic hakes - M. merluccius atlanticus, M. merluccius mediterraneus, M. merluccius senegalensis, M. merluccius capensis, and M. merluccius paradoxus - as subspecies.

The ranges of M. m. capensis and M. m. paradoxus partially overlap, and hence there may be mixing between these two subspecies. In Division 1.5 M. m. capensis occurs at depths of 100-300 m (maximum: 400 m) and M. m. paradoxus at depths of 300-400 m (minimum: 210 m). The thermal and salinity requirements of these species differ in accordance with their vertical distribution. M. m. capensis exhibits a preference for a temperature range of 7-9,5 °C and salinity levels of 34,6 - 34,9 ‰, whereas M. m. paradoxus prefers temperatures of 5,1 - 8,4 °C and salinities of 34,4 - 34,7 ‰ (Kuderskii 1973, Chyapowski 1975).

Wysokiński (1974) hypothesized that M. m. paradoxus, M. australis, and M. polylepis belonged to the group of sub-Antarctic hakes. Species such as M. m. capensis, M. m. merluccius, and M. hubbsi would comprise a second group of hakes originating in the temperate zone. The former group has a much smaller range of ectoparasites; Kabata and Ho (1981) found the copepod N. insidiosa f. lageniformis only on M. australis.

In the four years of investigations in Division 1.5, three species of ectoparasites were found: Chondracanthus merluccii, Neobrachiella insidiosa f. insidiosa, and Anthocotyle merluccii on M. m. capensis and Anthocotyle merluccii only on M. m. paradoxus.

It was observed that parasitic copepods specific to the genus Merluccius - Chondracanthus merluccii and Neobrachiella insidiosa f. insidiosa - did not occur on M. m. paradoxus. In the case of Chondracanthus merluccii, this parasite may have been lost during the evolution of the host. According to Ho (1974), this parasite underwent a similar process on M. gayi, where it was lost and replaced by Acanthochondria phycidis.

On the other hand, the absence of Neobrachiella insidiosa f. insidiosa can be explained by the more southerly geographic range of the hakes.

M. m. paradoxus has lost both these copepod parasites, which have not yet been replaced by others. Kabata and Ho (1981) suggested the fairly rapid propagation of hake along the Southwest African coast. Different sets of parasitic copepods suggest long-term geographic isolation of the hake subspecies and are further indication of fairly considerable differences in their features. The parasites found may thus

provide additional support for Wysokiński's hypothesis (1974) that these hakes belong to two paragroups of the genus Merluccius originating in the sub-Antarctic and temperate zones.

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TABLE 1. Hake species and their parasites by season

Host species	Month caught	Number of individuals examined	Number of individuals infested			Number of parasites		
			M. merluccii	N. insidiosa f. insidiosa	A. merluccii	C. merluccii	N. insidiosa f. insidiosa	A. merluccii
M. m. capensis	Jul 1978	100	9 (9,0 %)	5 (5,0 %)	50 (50 %)	12	18	191
	Nov 1976	700	116 (16,6 %)	70 (10,0 %)		190	218	
	Jan 1977	700	24 (3,4 %)	57 (8,1 %)	28 (4,0 %)	32	201	37
	Mar 1977	700	160 (22,8 %)	49 (7,0 %)		312	156	
M. m. paradoxus	Jun 1977	700			247 (35,7 %)			458
	Dec 1979	81			17 (21,2 %)			24

TABLE 2. Location and number of A. merluccii on M. m. paradoxus and M. m. capensis

Location		M. m. paradoxus		M. m. capensis	
		Incidence (%)	Number of parasites	Incidence (%)	Number of parasites
Right arches	I	12	1,1	8,3	1,1
	II	17	1,2	25	1,5
	III	17	1,2	8,3	2,0
	IV	8	1,4	8,3	1,6
Left arches	I	8	1,0	8,3	1,0
	II	16	1,2	16,6	1,7
	III	16	1,2	16,6	1,7
	IV	6	1,0	8,3	2,3