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Parasitology

DYNAMICS OF *EUBRACHIELLA ANTARCTICA* (QUIDOR, 1906)
(COPEPODA) OCCURRENCE IN *NOTOTHENIA ROSSII MARMORATA*
(FISCHER, 1885)

DYNAMIKA WYSTĘPOWANIA *EUBRACHIELLA ANTARCTICA*
(QUIDOR, 1906) (*COPEPODA*) U *NOTOTHENIA ROSSII MARMORATA*
(FISCHER, 1885)

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Dynamics of copepod *Eubrachiella antarctica* occurrence in *Notothenia rossii marmorata* in relation to the environmental conditions and to the total length of the fish was studied. Lack of the parasites in certain life periods of *N. rossii marmorata* and abundant occurrence in older fishes was stated.

INTRODUCTION

Quantitative parasitological studies are important because they provide supplementary information on biology and ecology of a fish infected (Siegel, 1980). Parasites serve in such cases as biological tags, enabling us to conclude about a host. Consequently, one can interpret certain biological events related to migration or host's affinities. The first attempt of quantitative studies on *Eubrachiella antarctica* incidence in 6 Antarctic fish species was the work of Kock and Möller (1977).

Certain aspects of the life cycle of *E. antarctica* from *Dissostichus eleginoides* (*Notothenidae*) and from four other species of the family *Channichthyidae* presented Siegel (1980). Other studies, regarding incidence dynamics of *E. antarctica* in *Notothenia gibberifrons* (Lönnberg, 1905) were conducted by Rokicki and Skóra (1986). There is a lack, however of quantitative data on Copepoda occurrence in *Notothenia rossii marmorata*. Particularly striking is absence of the parasites in certain life periods of *N. rossii marmorata* and their abundance in older fishes. The subspecies inhabits areas of South Georgia, S. Orkney Is., S. Sandwich Is., S. Shetland Is. as well as south areas of Scotia Sea.

The young fishes of the species discussed (in their first year of life) occur pelagically. Older but not yet sexually mature individuals inhabit fiords, living near the bottom among the coastal tallophytic algae. Adults, after reaching length of 35–40 cm, leave step by step for the high sea. They live within the depth range of 100–400 m. They reach sexual maturity in the age of 5–10 years, measuring then 40–45 cm. The spawning season takes place on the islands shelves and in the fiord extensions, from the second half of April until June (Sosiński & Skóra, 1985).

MATERIAL AND METHOD

The material being studied was collected during the following Antarctic expeditions:

14 January, 1978 S. Georgia (54°07'S & 36°19'W). 101 specimens were examined immediately after the capture. The total lengths ranged from 34 to 75 cm (mean 53.3 cm) and the weights from 510 g to 5645 g (mean 1948.8 g). Fishes were sexually mature with their gonads in the II–III stage for smaller fishes and the IV stage for bigger ones. They came from the high sea and from the depth 260 m.

11 January – 5 November, 1979 South Shetland Islands (Admiralty Bay). 50 specimens were examined immediately after the capture. The total lengths ranged from 26.5 cm to 39.0 cm (mean 34 cm) while the weights ranged from 244 g to 900 g (mean 530 g). Fishes were sexually immature and were being caught in fiord at depths of 15–30 m.

11 November, 1986 – 28 January, 1987 – South Georgia (53°39'S & 37°W). 514 frozen specimens were examined. Their lengths ranged from 34 cm to 69 cm after being brought to the country and defrosted. Most of the fishes were sexually mature and they were captured at high sea at the depths 210–280 m.

6–8 April, 1988 South Georgia (Stromness Harbour). 90 formaline preserved specimens were studied. Their lengths ranged from 12.2 cm to 43.5 cm (mean 26 cm). Fishes were being caught in the fiord at the depth 10–30 m.

In most cases the total length of the fishes was measured exact to 1 cm. and only fresh fishes were weighted exact to 5 g.

The following sites were examined: skin of head and skin of trunk, fins, mouth cavity, gill cavity and gills.

A total of 755 *Notothenia rossii marmorata* specimens was studied (Tab. 1). The state of the gonads maturity indicated that the fishes were in pre-spawning condition.

Table 1

Eubriachiella antarctica incidence in *Notothernia rossii marmorata*
from various seasons and areas

Collection area	Number of fishes		Season
	examined	infected	
South Georgia I (shelf)	101	96	1978
South Shetland Is. (fiord)	50	—	1979
S. Georgia I. (shelf)	514	47	1986/87
South Georgia I. (fiord)	90	—	1988

Some of the collected females of *Eubriachiella antarctica* bore egg-sacs filled with eggs in various developmental stages. Some of the females were juvenile, without egg-sacs yet.

RESULTS

E. antarctica occurrence in respective seasons was as follows:

1978

Out of 101 examined fishes 96 were infected (Tab. 1). 25 out of this number harbored not less than 100 parasite specimens each. Copepoda were not scrupulously counted, but it was assumed the number was 100 in each case. If the number is assumed as 100 copepods per one fish it gives a total number of 3796 individuals of *E. antarctica* but the real figure was bigger. The prevalence was 95% with the mean intensity higher than 43.3 parasites per fish.

Considering infection in length classes one may find out it is growing along with the fish length increase (Tab. 2 Fig.1). The prevalence reached 100% in four length classes.

E. antarctica infection in relationship with the host sex: out of 60 females 59 were infected by a total number of copepods higher than 2236. Out of 41 examined males, 37 were carriers of a total of more than 1556 parasite individuals.

The copepods occurred most frequently on the skin, however they started to occur on gills in bigger fishes, longer than 53 cm.

Table 2

Dynamics of *Eubrachiella antarctica* incidence in connection with the body length of *Notothenia rossii marmorata* (South Georgia 1978)

Length classes	Number of fishes		Number of parasites	Prevalence %	Mean intensity of infection (specimens)
	examined	infected			
34–39	4	3	7	(75.0)	2.33
40–45	17	14	138	(82.3)	9.86
46–51	26	25 (2)	506	(96.15)	20.24
52–57	25	25 (6)	1080	(100)	43.2
58–63	21	21 (11)	1425	(100)	67.86
64–69	5	5 (3)	386	(100)	77.2
70–75	3	3 (2)	250	(100)	83.33
Total	101	96 (24)	3792	93.4	43.4

Table 3

Dynamics of *Eubrachiella antarctica* incidence in connection with the body length of *Notothenia rossii marmorata* (S. Georgia 1986/87)

Length classes	Number of fishes		Number of parasites	Prevalence %	Mean intensity of infection (specimens)
	examined	infected			
34–39	57	2	2	3.5	1.0
40–45	85	7	19	8.2	2.7
46–51	162	15	32	9.3	2.1
52–57	124	12	26	9.7	2.2
58–63	41	5	14	12.2	2.8
64–69	45	6	18	13.3	3.0
Total	514	47	111	9.1	2.4

1979. Fishes were not infected (Tab. 1)

1986/1987

The prevalence was 9.1% with mean intensity equal to 2.4 specimens. Fishes of the total length 64–69 cm demonstrated the highest infection rate (13.3%) with mean

Fig. 1. Infection with *Eubriachiella antarctica* in connection with the body length of *Notothenia rossii marmorata* (S. Georgia 1978)

solid line ————— prevalence
dashed line - - - - - mean intensity of infection

intensity equal to 3.0 individuals. The lowest infection rate occurred in the length classes 34–39 cm (3.5% and 1.0 individ.). Remarkable increase of the prevalence and intensity of infection in the sample studied was observed to be in direct proportion to the fish length (Tab. 3 Fig. 2).

1988

The fishes were not infected.

Fig. 2. Dynamics of *Eubrachiella antarctica* incidence in connection with the body length of *Notothenia rossii marmorata* (S. Georgia 1986/87)

solid line — prevalence
dashed line — mean intensity of infection

Table 4

Infection of *Notothenia rossii marmorata* in respective six — cm classes

Length classes	Number of fishes		Prevalence %
	examined	infected	
11-16	5	—	—
17-22	27	—	—
23-28	31	—	—
29-33	32	—	—
34-39	61	5	8.2
40-45	102	21	20.6
46-51	188	40	21.3
52-57	149	37	24.8
58-63	62	26	41.9
64-69	50	11	22.0
70-75	3	3	(100.0)
Total	710	143	

DISCUSSION

Comparing the prevalence of the fishes from South Georgia with *E. antarctica* within nine years time interval, one may conclude that it was higher in 1978 than in 1986/87. The same was the case of intensity. It could be influenced by the fact that in 1978 fishes were studied directly after the capture but those collected in 1986/87 were examined after being brought to the country and defrosted.

During the rinsing, freezing and defreezing processes many copepods could fall off, because *E. antarctica* is not too firmly attached to its host.

The other reason that could influence the infection picture is the size of captured fishes. In 1978 were more big fishes than it was in 1986/87. (Tab. 2, 3).

Copepod infection changes considerably accordingly to the host's environment. Young fishes living among *Thallophyta* in fiords, collected mainly from the depths 10–30 m, were not infected with *E. antarctica*. Their total length ranged from 12.2 to 43.5 cm. The fishes enter subsequently the neritic zone where they reach sexual maturity. The present study revealed that there are also smaller fishes measuring 34–39 cm (61 specimens) on the shelf, infected in low degree yet (only 5 fish specimens) (Tab. 2, 3). Infection rate increased in direct proportion to the fish length (Tab. 3) the weight and the stage of gonads maturity. Starting from the fish length 52 cm the prevalence may reach 100%. (Tab. 2). The fishes free of parasites, quickly become infected while performing their migrations within a shelf, being repeated each year. It is probably the result of mixing with individuals highly infected, living on the shelf for long time already.

Higher prevalence of bigger fishes may be connected with a kind of their food. Within the trophic period, bigger fishes live in the bottom zone and they prefer polychetes as their food. Mature but smaller fishes feed on crustaceans, mainly krill, the later inhabiting rather pelagic zone. It seems that neritic bottom zone creates higher likelihood for invasion of the copepod's infective stages on the fishes. The other Antarctic fish species demonstrate remarkably lower prevalence and intensity of infection of the parasite studied (Kock & Möller, 1977; Siegel, 1980; Rokicki & Skóra, 1986). Infection dynamics is greatly variable in dependence on fish species and also on the collection area. According to Kock & Möller (1977) this is connected with the existence of local populations of a given species. None of the fish species being studied so far showed so high infection with *Eubriachiella antarctica* as *Notothenia rossii marmorata* did.

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STRESZCZENIE

Zbadano 755 ryb *Notothenia rossii marmorata* z fiordów i szelfu Południowej Georgii i Pd. Szetlandów pod kątem infestacji widłonogiem *Eubrachiella antarctica*, w zależności od długości całkowitej żywiciela i środowiska jego przebywania. Ryby młode, długości 12,2–43,3 cm, bytujące w fiordach nie były zainfestowane przez *E. antarctica*. Ryby długości 34–39 cm łowione na szelfie były zainfestowane w małym stopniu (8,2%, Tab. 4). Ryby wpływające do strefy nerytycznej szelfu ulegają stopniowo infestacji. Począwszy od 52 cm długości ryb ekstensywność infestacji wzrasta (Tab. 4) a nawet może być całkowita (tab. 2). Również znaczna liczba ryb większych jest opadnięta więcej jak 100 widłonogami.

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