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Parasitology

THE OCCURRENCE OF THE PARASITE *EUBRACHIELLA GAINI*
QUIDOR, 1913 IN ANTARCTIC FISHES OF THE FAMILY
CHAENICHTHYIDAE

WYSTĘPOWANIE PASOŻYTA *EUBRACHIELLA GAINI* QUIDOR, 1913
NA RYBACH ANTARKTYCZNYCH Z RODZINY *CHAEINICHTHYIDAE*

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Infestation of five chaenichthyid species with *Eubrachiella gaini* (Copepoda Parasitica) was studied in the Atlantic sector of Antarctica in 1978/1979. A total of 6321 fish individuals were examined in detail.

Invasion incidence and intensity of each species is presented and related to the fishing areas visited.

Frequency of the parasite's occurrence on various parts of the host's body is analysed. An attempt is made to relate the degree of infestation to fish body length in the fish species studied.

INTRODUCTION

Over the recent years, Antarctic fishes have become an important commercial fishing target. In consequence, comprehensive biological studies on the commercially exploited species have been intensified. Within the frames of biological studies, the occurrence of the parasite *Eubrachiella gaini*, sometimes referred to as *E. antarctica* (Quidor, 1906), in five white-blooded fish species of the family *Chaenichthyidae* was investigated during the fishing season of 1978/1979. Along with fishes of the family *Nototheniidae*, the fish

species studied formed the bulk of Polish catches in the Atlantic sector of Antarctica (Report, 1979).

E. gaini belongs to the most frequent ectoparasites of Antarctic fishes. The parasite's occurrence in some Antarctic fish species was studied by Kock and Möller (1977) in 1975/1976 and by Siegel (1980) in 1977/1978. Thus the work presented here is to some extent a continuation of the above-mentioned studies and expands the still scant knowledge on parasitic infestation of Antarctic fishes.

MATERIALS AND METHODS

The materials were collected during the Fourth Polish Antarctic Expedition on board RV "Profesor Siedlecki" in the fishing season 1978/1979 (December 1978 – March 1979). Fishing operations were carried out in the Scotia Sea and off the Antarctic Peninsula, the region being divided – for the purpose of the study – into six areas (Fig.1).

The following five chaenichthyid species were studied: *Champscephalus gunnari*, *Chaenocephalus aceratus*, *Pseudochaenichthys georgianus*, *Chionodraco rastrosipinosus*, and *Chaenodraco wilsoni*. Table 1 summarises the numbers of individuals studied in each area.

During routine analyses, each individual was examined for the presence of the parasite *E. gaini*. (Quidor, 1913). The amount and distribution of the parasites in the fish mouth as well as on fins and skin were recorded. Mean invasion incidence and intensity (number of parasites on one infested fish) were calculated for each area, the infestation intensity of various body parts of the hosts being assessed as well. The extent of infestation was related to fish body length, statistically significant correlations being found in some species.

RESULTS

Champscephalus gunnari Lonnberg, 1905

The degree of infestation and the parasite's location on the host is discussed for each area separately. The results are summarised in Tables 2 and 3.

Shag Rocks

Individuals of the 16–42 cm length range were caught. The length frequency distribution was bimodal with peaks at 20 and 31 cm. The smaller individuals (16–22 cm) were juveniles, while the larger ones (24–42 cm) matured to spawn. The gonad development observed in the latter in March indicated the approach of spawning.

No *E. gaini* was found on 200 fish individuals examined.

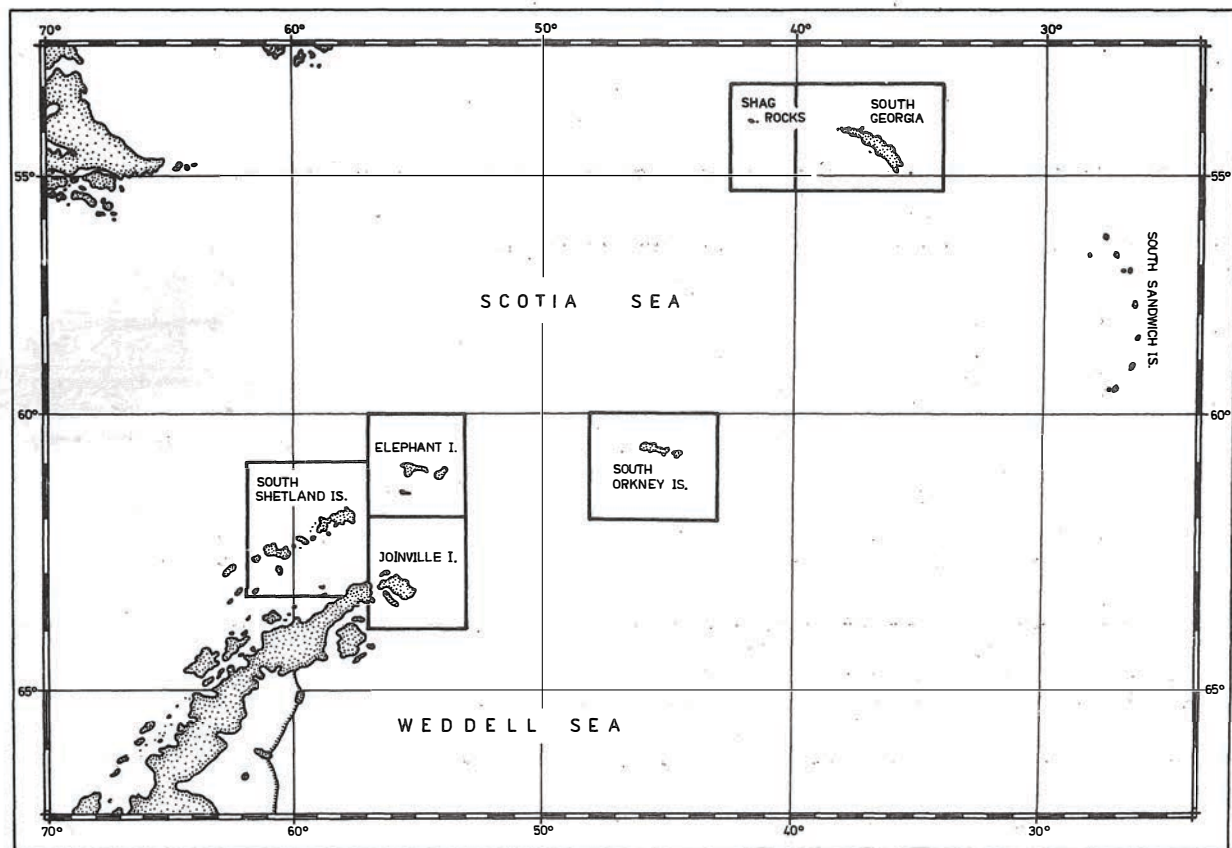


Fig. 1. The areas of study

Table 1

Number of chaenichthyid fish investigated during the Antarctic Expedition 1978/1979

Species	Fishing area						Total
	Shag Rocks	South Georgia	South Orkney Is	Elephant I.	South Shetland Is.	Joinville I.	
<i>Champscephalus gunnari</i>	200	759	297	600	484	—	2340
<i>Chaenocephalus aceratus</i>	—	700	—	200	539	—	1439
<i>Pseudochaenichthys georgianus</i>	—	576	100	—	83	—	759
<i>Chiono draco rastros pinosus</i>	—	—	190	141	752	—	1083
<i>Chaeno draco wilsoni</i>	—	—	100	—	—	600	700
Total	200	2035	687	941	1858	600	6321

Table 2

The *Eubrachiella gaini* invasion incidence and mean invasion intensity in *Champscephalus gunnari*

Fishing areas	Males			Females			Total		
	E	I	n	E	I	n	E	I	n
Shag Rocks	0.0	0.0	70	0.0	0.0	130	0.0	0.0	200
South Georgia	17.8	1.7	394	16.2	1.8	365	17.0	1.7	759
South Orkney Is.	30.4	1.6	158	29.5	1.9	139	30.0	1.7	297
Elephant I.	8.2	2.1	355	20.4	1.8	245	13.2	1.9	600
South Shetland Is.	40.5	2.3	264	31.8	2.2	220	36.6	2.3	484
Total	20.5	2.0	1241	20.0	2.0	1099	20.3	2.0	2340

E – invasion incidence (%), I – mean invasion intensity, n – No. of fish examined

Table 3

Frequency of *Eubrachiella gaini* location on *Champscephalus gunnari*

Fishing areas	Invasion incidence (%)							n _p
	Bc	S	D	A	C	P	V	
Shag Rocks	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0
South Georgia	0.5	1.3	4.5	1.3	29.4	63.0	0.0	224
South Orkney Is.	0.0	0.7	7.8	8.4	16.9	66.2	0.0	154
Elephant I.	0.0	0.7	12.5	6.6	25.6	52.6	2.0	152
South Shetland Is.	0.0	1.8	14.7	3.7	22.9	56.4	0.5	401
Total	0.1	1.3	10.7	4.4	24.0	59.0	0.5	931

Bc – buccal cavity, S – skin, D – dorsal fins, A – anal fins, C – caudal fins, P – pectoral fins, V – ventral fins, n_p – No. of parasites

South Georgia

The stock contained individuals of the 16–53 cm length range. Length classes of 22–28 cm were the most abundant ones. The fishes were maturing to spawn, as evidenced by their gonad development.

E. gaini was found in 17.0% of the individuals, the invasion intensity ranging within 1–13 parasites on a fish (a mean of 1.74). The parasites were located on fins (except for the ventral ones) and, less commonly, on the skin and in the mouth. Most parasites (63%) were observed on the pectoral fins and on the caudal fin (29%) (Table 3).

South Orkney Is.

Relatively larger individuals were found here, with the length range of 24–49 cm and classes of 34–41 cm predominating. Similarly to other areas, the fishes were maturing to spawn.

The invasion incidence reached almost 30%. The invasion intensity ranged from 1 to 6 parasites on a fish (a mean of 1.73). The parasites were found on fins (except for the ventral ones) and, less commonly, on the skin. Most parasites (66%) were found on the pectoral fins and on the caudal fin (17%).

Elephant I.

The fish caught measured 19–52 cm, length classes of 34–45 cm prevailing. Gonad development indicated the spawning to occur soon. The fishes were relatively poorly infested: the invasion incidence and intensity amounted to 13% and 1–11 parasites (1.92 on the average), respectively. The parasites occurred on all the fins and, occasionally, on the skin. Pectoral fins were the most common location (52.6%), followed by the caudal fin (25.6%).

South Shetland Is.

Biological parameters of the fishes were similar to those found off Elephant I. The area showed the highest invasion incidence (36.6%). The invasion intensity, too, was high, with a mean of 2.27 (from 1 to 10 parasites on a fish). Similarly to the previously described area, the parasites were found on all the fins, pectoral ones being the preferred location (56.4%).

The invasion incidence in *Ch. gunnari* is closely correlated with fish body length ($r = 0.69$). An increase in the incidence is of a complex nature. The younger fishes, up to 36 cm, were infested in 10–20% the incidence increasing rapidly in older groups. The relationship is best described by a parabolic curve, $y = 104.42 - 6.47x + 0.11x^2$ (coefficient of determination $r^2 = 0.62$).

The invasion intensity is linearly correlated with fish growth, the correlation coefficient $r = 0.42$ being significant at $\alpha = 0.01$. The relationship is described by the equation $y = 0.62 + 0.35x$.

Fig. 2 illustrates the relationships found.

Chaenocephalus aceratus Lönnberg, 1906)

Detailed data on the extent of infestation and parasites' location are summarised, by fishing area, in Tables 4 and 5.

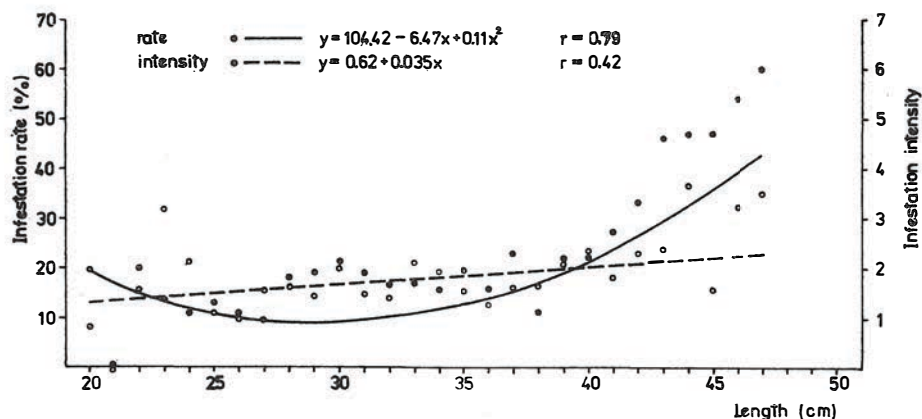


Fig. 2. Regression lines fitted to the *Eubrachiella gaini* infestation incidence vs. fish length and infestation intensity vs. fish length relationships in *Champscephalus gunnari*.

South Georgia

Fish individuals of body length ranging within 12–72 cm were found. The length frequency distribution curve was polymodal with length classes of 16, 26, and 32 cm dominating during the season of study.

The adults showed gonads maturing to spawn.

The extent of parasitic infestation was low: the invasion incidence and intensity amounted to 2% and 1–3 parasites on a fish infested (a mean of 1.71), respectively. The parasites were located on the pectoral and anal fins only.

Elephant I.

The fish length range was similar to that found off South Georgia. Younger fishes prevailed here, too, although the older individuals' contribution to the stock was higher. The larger individuals appearing in the area had gonads maturing to spawn. The invasion incidence was high (34%); the invasion intensity ranged from 1 to 4 parasites (1.84 on the average).

The parasites were present on all the fins and, occasionally, on the skin. Most frequent were the parasites occurring on the anal and pectoral fins.

South Shetland Is.

The *Ch. aceratus* stock off South Shetlands showed its biological parameters to be similar to those described above.

The extent of infestation was rather high, too, with about 30% of the individuals of the stock housing the parasites; 1 to 7 parasites were found on a fish affected (2.01 on the average). The parasites occurred on all the fins; some of them were found also on the skin. Most frequent were the parasites on the pectoral fins.

The correlation between the invasion incidence and body length of *Ch. aceratus* ($r = -0.43$) is significant at $\alpha = 0.01$. The incidence of infestation decreased with fish length, the relationship being described by a linear equation $y = 28.67 - 0.30x$.

Table 4

The *Eubrachiella gaini* infestation incidence and mean intensity on *Chaenocephalus aceratus*

Fishing areas	Males			Females			Total		
	E	I	n	E	I	n	E	I	n
South Georgia	2.5	1.5	323	1.6	2.0	377	2.0	1.7	700
Elephant I	30.4	1.7	102	37.8	1.9	98	34.0	1.8	200
South Shetland Is.	28.2	2.0	273	31.2	2.0	266	29.7	2.0	539
Total	16.6	1.9	698	17.0	2.0	741	16.9	1.9	1439

for explanations see table 2

Table 5

Frequency of *Eubrachiella gaini* location on *Chaenocephalus aceratus*

Fishing areas	Invasion incidence (%)							n _p
	Bc	S	D	A	C	P	V	
South Georgia	0.0	0.0	0.0	0.0	41.7	58.3	0.0	24
Elephant I.	0.0	1.6	4.0	7.2	40.8	36.8	9.6	125
South Shetland Is.	0.0	0.3	10.9	5.9	29.9	46.8	6.2	321
Total	0.0	0.6	8.5	6.0	33.4	44.7	6.8	470

for explanations see Table 3

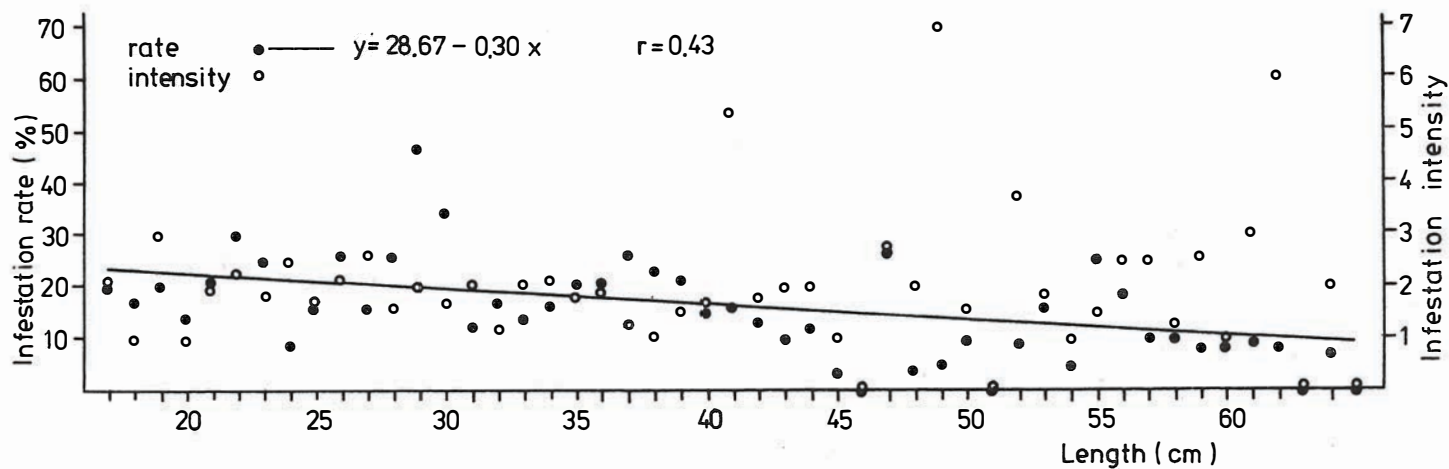


Fig. 3. Regression line fitted to the *Eubrachiella gaini* infestation incidence vs. fish length relationship in *Chaenocephalus aceratus* and mean intensities in fish length classes.

On the other hand, no clear relationship between the invasion intensity and fish length was detected, the correlation coefficient being very low ($r = 0.13$).

The relationships are illustrated by Fig. 3.

Pseudochaenichthys georgianus Norman, 1937

Tables 6 and 7 give details on *P. georgianus* infestation with *E. gaini* by study area.

South Georgia

The length range of fishes caught was 8–58 cm. The length distribution curves show 3 peaks: 19–21 cm; 31–37 cm; and 51–53 cm. Usually, individuals from the latter two length groups predominated. The fishes were getting ready to spawn; the spawning takes place in April. The stock was poorly parasitised, the invasion incidence and intensity amounting to 4.5% and 1–5 (a mean of 1.46) parasites on a fish. The parasites were most common on the pectoral and dorsal fins, and less common on the caudal fin and skin.

South Orkney Is.

The fishes caught were larger than those off South Georgia, their length ranging within 34–53 cm and the 47 cm class predominating. Gonads were at an advanced stage of development. The parasitic infestation was very low. Only 1 out of 100 individuals examined revealed two specimens of *E. gaini*: one on the pectoral fin and another on the caudal one.

South Shetland Is.

The fishes were similar in their length range and gonad maturity stage to those caught off South Orkneys. A low-level parasitic infestation was found here as well, the invasion incidence and intensity amounting to 7.2% and 1.0, respectively. The parasites were located on the pectoral, caudal, and anal fins.

The *P. georgianus* shorter than 40 cm were parasite-free. The infestation in the subsequent length classes remained within 4–19%, without any correlation with fish length. In the most affected individuals, the invasion intensity was 1.0 and did not correlate with fish length, either.

Fig. 4 illustrates the mean invasion incidence and intensity in various length classes.

*Chionodraco rastropinosus** De Witt et Hureau, 1979

Data on details of the parasitic invasion of the species can be found in Tables 8 and 9.

South Orkney Is.

The fish length ranged within 21–49 cm, the length distribution being unimodal with a peak (mode) at 36 cm in Dec. 1978 and 39 cm in March 1979. In March, some individuals were getting ready to spawn. A relatively low-level invasion was found. The invasion incidence and intensity were 2.1% and 1.0, respectively.

* The species was referred to as *Ch. hamatus* (Lönnberg, 1905) by Kock and Möller (1977) and as *Ch. sp.* by Sigel (1980).

Table 6

The *Eubrachiella gaini* infestation incidence and mean infestation intensity on *Pseudochaenichthys georgianus*

Fishing areas	Males			Females			Total		
	E	I	n	E	I	n	E	I	n
South Georgia	3.8	1.2	289	5.2	1.9	287	4.5	1.5	576
South Orkney Is.	2.1	2.0	47	0.0	0.0	53	1.0	2.0	100
South Shetlands Is.	8.3	1.0	48	5.7	1.0	35	7.2	1.0	83
Total	4.2	1.2	384	4.5	1.6	375	4.4	1.4	759

for explanations see table 2

Table 7

Frequency of *Eubrachiella gaini* on *Pseudochaenichthys georgianus*

Fishing areas	Invasion incidence (%)							n _p
	Bc	S	D	A	C	P	V	
South Georgia	0.0	5.3	15.8	0.0	7.9	71.0	0.0	38
South Orkney Is.	0.0	0.0	0.0	0.0	50.0	50.0	0.0	2
South Shetland Is.	0.0	0.0	0.0	16.7	33.3	50.0	0.0	6
Total	0.0	4.4	13.0	2.2	13.0	67.4	0.0	46

for explanations see Table 3

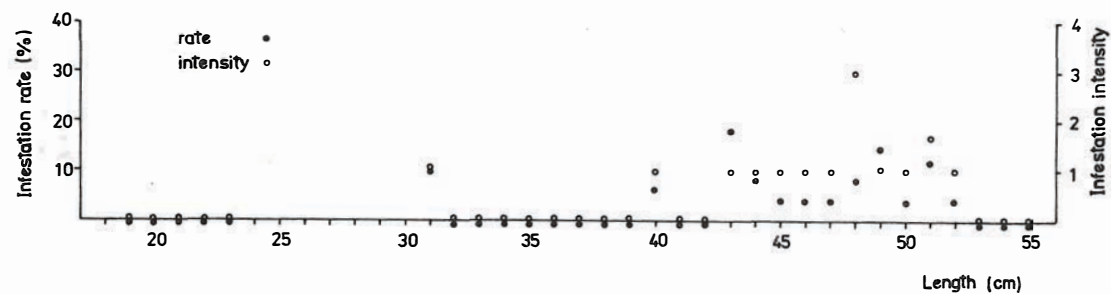


Fig. 4. *Eubrachiella gaini* infestation incidence and intensity in *Pseudochaenichthys georgianus* length classes.

Table 8

The *Eubradiella gaini* infestation incidents and mean infestation intensity on *Chionodraco rostratospinosus*

Fishing areas	Males			Females			Total		
	E	I	n	E	I	n	E	I	n
South Orkney Is.	0.0	0.0	49	2.8	1.0	141	2.1	1.0	190
Elephant I.	33.3	1.9	45	32.3	3.7	96	32.6	3.2	141
South Shetland Is.	23.7	3.0	355	25.2	2.7	397	24.5	2.8	752
Total	22.1	2.8	449	21.3	2.9	634	21.6	2.9	1083

for explanations see Table 2

Table 9

Frequency of *Eubradiella gaini* location on *Chionodraco rostratospinosus*

Fishing areas	Invasion incidence (%)							n _p
	Bc	S	D	A	C	P	V	
South Orkney Is.	0.0	75.0	0.0	0.0	25.0	0.0	0.0	4
Elephant I.	100.0	0.0	0.0	0.0	0.0	0.0	0.0	145
South Shetland Is.	98.6	0.6	0.4	0.0	0.2	0.2	0.0	519
Total	98.3	0.9	0.3	0.0	0.3	0.2	0.0	668

For explanations see Table 3

Out of 4 specimens of *E. gaini* found, 3 were located on the skin and 1 on the caudal fin.

Elephant I.

The length range resembled that found in the previously discussed area and covered 22–47 cm with a mode at 35 cm. Larger fishes (39–45 cm) were relatively more numerous in the stock. The fishes were maturing to spawn, some mature individuals being observed in March.

As opposed to the South Orkneys stock, the invasion incidence was high (32.6%). The invasion intensity ranged from 1 to 8 parasites, the mean intensity being high (3.15). The parasites occurred in the mouth only.

South Shetland Is.

The length distribution and gonad maturity stage were similar to those characteristics found in the stock fished on off Elephant I.

The invasion incidence was 24.5%; the invasion intensity ranged within 1–19 (a mean of 2.82). The parasites occurred mainly in the mouth; they were less common on the skin, dorsal, pectoral, and caudal fins.

In *Ch. rastrispinosus*, both the invasion incidence and intensity increase with fish length. Correlation coefficients are high (0.70 and 0.84, respectively) and significant ($\alpha = 0.01$). The relationships are well described by the following linear equations:

$y = -25.13 + 1.34x$ for the invasion incidence, and

$y = -7.02 + 0.28x$ for the invasion intensity.

The relationships are presented in Fig. 5.

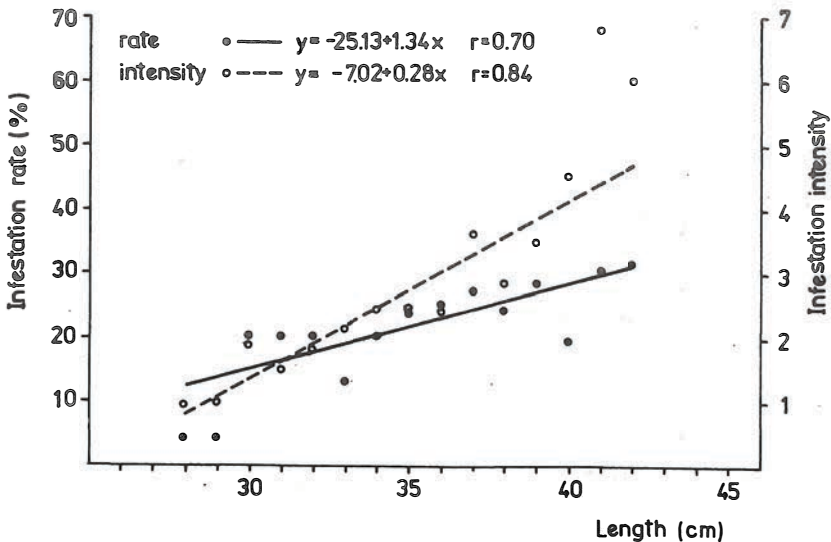


Fig. 5. Regression lines fitted to the *Eubrachiella gaini* infestation incidence vs. fish length and infestation intensity vs. fish length relationships in *Chionodraco rastrispinosus*.

Chaenodraco wilsoni Regan, 1914

The species was found in two areas: off South Orkney Is. (20–45 cm length range) and off Joinville I. (20–37 cm).

In both areas, the 20–26 cm long fishes prevailed. Presumably, the species spawns later in the year than other white-blooded fishes.

Among the five species studied, *Ch. wilsoni* showed the lowest level of parasitic infestation. Off South Orkney Is., the *E. gaini* invasion incidence was 4.0%; only 4 out of 100 individuals examined revealed the presence of 1 parasite each. In 3 cases the parasites were located on the caudal fin and once on the pectoral fin.

Off Joinville I., the incidence was still lower (0.67%). Only 4 out of 600 individuals examined were infested with single parasites. Two parasites were found on the dorsal fins, the caudal and anal fins revealing 1 specimen each.

SUMMING-UP AND CONCLUSIONS

Studies on the occurrence of *E. gaini* on five chaenichthyid fish species in the Atlantic sector of Antarctica, carried out in the fishing season 1978/1979 revealed considerable differences to exist between the infestation levels of each species. Generally, higher levels were typical of *Champsocephalus gunnari*, *Chaenocephalus aceratus*, and *Chionodraco rastrospinosus*. On the other hand, low infestation levels were recorded in *Pseudochaenichthys georgianus* and *Chaenodraco wilsoni*. The differences involved both the invasion incidence and intensity.

Spatial (between-areas) differences in the extent of infestation were observed in those species of a higher level of infestation.

The lowest level of infestation was recorded off South Georgia and Shag Rocks. The highest level was observed in the southern fishing grounds off Elephant I. (except for *Champsocephalus gunnari*) and South Shetland Is.

Kock and Möller (1977) made similar observations with respect to *Champsocephalus gunnari* in the 1975/1976 season; they showed a lower infestation level to occur off South Georgia as compared to that off South Orkneys. The authors associated their finding to a more intensive exploitation of the South Georgia fishing grounds. At the same time, they suggested different stocks of *Champsocephalus gunnari* and *Chaenocephalus aceratus* to occur, based on differing length distributions and infestation levels, off South Georgia and South Orkneys. With respect to *Champsocephalus gunnari*, taxonomic works of Kock (1981) and Sosiński (1981) confirmed the presence of different stocks. Kock (1981) separated 4 populations of the species in the Atlantic sector of Antarctica. Sosiński's (1981) studies show *Champsocephalus gunnari* to be a polytypic species consisting of many allopatric populations. He distinguished between two ecological races within the Atlantic sector: a northern one (South Georgia, Shag Rocks) and a southern one (South Orkneys, Elephant I., South Shetland Is.) with local stocks.

Different levels of parasitic infestation in various areas can be treated as a proof of the existence of local populations of a given species.

The parasites were located on various parts of fish body. In four species, more than 95% of the parasites found were located on fins, particularly frequently on the pectoral and caudal ones. On the other hand, most (more than 98%) parasites found in *Chionodraco rastrispinosus* were located in the mouth, which confirms earlier (the season of 1977/1978) observations of Siegel (1980).

In two species (*Champocephalus gunnari* and *Chionodraco rastrispinosus*), the magnitude of the invasion was correlated with fish length: both the invasion incidence and intensity increased with fish length. Similarly to Siegel's (1980) finding, linear equation is the best fit to the relationship in *Chionodraco rastrispinosus*, while the parabolic curve describes the relationship in *Champocephalus gunnari* most adequately.

On the other hand, the invasion incidence in *Chaenocephalus aceratus* decreased with increasing fish length. No significant effect of fish length on the magnitude of invasion was detected in *Pseudochaenichthys georgianus*.

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WYSTĘPOWANIE PASOŻYTA *EUBRACHIELLA GAINI* QUIDOR, 1913
NA RYBACH ANTARKTYCZNYCH Z RODZINY *CHAENICHTHYIDAE*

STRESZCZENIE

W sezonie 1978/1979 na łowiskach atlantyckich sektora Antarktyki prowadzono badania nad występowaniem pasożyta *Eubrachiella gaini* określanego niekiedy jako *E. antarctica* (Quidor, 1906) (Copepoda) na pięciu gatunkach ryb z rodziny *Chaenichthyidae*. Ogółem przebadano 6.321 ryb.

W pracy przedstawiono wyniki badań nad ekstensywnością i intensywnością inwazji pasożytniczej na poszczególnych gatunkach ryb i w rejonach połowów. Stwierdzono, że najbardziej zapasożycone w całym badanym obszarze były ryby z gatunku *Chionodraco rastrospinosus* (21,6%), *Champsoccephalus gunnari* (20,3%) i *Chaenocephalus aceratus* (16,8%). Najmniej zarażone były ryby z gatunku *Chionodraco wilsoni* (1,1%) i *Pseudochaenichthys georgianus* (4,4%). Średnia intensywność zarażenia najwyższa była również u *Chionodraco rastrospinosus* – 2,85 pasożyta na jedną rybę zarażoną, a najmniejsza u *Chionodraco wilsoni* – 1,0.

Generalnie stwierdzono, że ryby poławiane na łowiskach South Georgia i Shag Rocks były mniej zapasożycone niż na łowiskach południowych.

Różny stopień zapasożycenia ryb w poszczególnych rejonach może być potwierdzeniem istnienia lokalnych populacji danego gatunku. Odnosi się to szczególnie do ryb z gatunku *Champsoccephalus gunnari*.

Analiza rozmieszczenia *Eubrachiella gaini* na różnych częściach ciała ryb wykazała, że ponad 95% pasożytów umiejscowionych było na płetwach (głównie piersiowych i odbytowej) u czterech badanych gatunków ryb. Jedynie u *Chionodraco rastrospinosus* pasożyty preferowały zdecydowanie jamę gębową, gdzie występowały w ponad 98%.

W pracy podjęto próbę analizy zależności wielkości zapasożycenia od długości ryb. U ryb z gatunków: *Champsoccephalus gunnari*, *Chaenocephalus aceratus* i *Chionodraco rastrospinosus* stwierdzono, że ekstensywność zarażenia zmienia się w sposób istotny wraz z długością ryby. Zależności takiej nie stwierdzono u *Pseudochaenichthys georgianus*.

Ю. Сосинский, Е. Януш

ПОЯВЛЕНИЕ ПАРАЗИТА *EUBRACHIELLA GAINI* QUIDOR,
1913 НА АНТАРКТИЧЕСКИХ РЫБАХ СЕМЕЙСТВА
CHAENICHTHYIDAE

Р е з ю м е

В сезоне 1978–79 г.г. в промысловых водах атлантического сектора Антарктики проведены иссле-

дования, связанные с появлением паразита *Eubrachiella gaini* Quidor, 1913 (Copepoda) на пяти видах рыб семейства Chaenichthyidae. Всего исследовано 6321 особей.

В работе представлены результаты исследований экстенсивности и интенсивности инвазии паразитов на указанные ниже виды рыб и районы промысла. Определено, что во всём исследуемом районе, больше всего были заражены паразитами рыбы вида *Chionodraco rastrispinosus* (21,6%), *Champsocephalus gunnari* (20,3%), *Chaenocephalus aceratus* (16,8%). Меньше всего были заражены рыбы вида *Chionodraco wilsoni* (1,1%), *Pseudochaenichthys georgianus* (4,4%). Средняя интенсивность заражения самая высокая была также у *Chionodraco rastrispinosus* - 2,85 паразита на одну заражённую рыбу, а наименьшая у *Chionodraco wilsoni* - 1,0.

Определено, что рыбы, вылавливаемые на промысле Южной Георгии и Shag Rocks имели меньше паразитов, чем рыбы южных районов промысла.

Разная степень заражения паразитами рыб в отдельных районах может быть подтверждением существования местных популяций данного вида. Это в основном относится к рыбам вида *Champsocephalus gunnari*.

Анализ размещения *Eubrachiella antarctica* на разных частях тела рыбы показал, что больше чем 95% паразитов находятся на плавниках (особенно тораксальных и анальном) у четырёх исследуемых видов рыб.

Только у *Chionodraco rastrospinosus* паразиты находились, преимущественно, в полости рта, где их было больше чем 98%.

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