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Parasitology

PARASITIC FAUNA OF THE BARRACOUTA, *THYRSITES ATUN*  
(EUPHRASEN, 1791) FROM OFF NEW ZEALAND

PARAZYTOFAUNA ATUNA *THYRSITES ATUN*  
(EUPHRASEN, 1791) z WÓD NOWEJ ZELANDII

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Detailed parasitologic examinations were made on 53 individuals of the barracouta. The parasitic fauna was found to consist of 8 species belonging to the *Monogenea*, *Cestoda*, *Trematoda*, *Nematoda*, and *Crustacea*. Two of those species are harmful for man. The magnitude of infestation and the location of parasites are reported on; the invasion was found to depend, to some extent, on the size of the host.

INTRODUCTION

The barracouta (*Thyrsites atun*) is, from the parasitologic point of view, relatively well known. Most studies were made off New Zealand. A list of parasites from those fishing grounds is given by Hewitt and Hine (1972) who reported 17 species belonging to 6 higher taxa: *Protozoa*, *Monogenea*, *Cestoda*, *Digenea*, *Nematoda*, and *Copepoda*. Parasites of the fish species in question were studied off the Banks Island by Kagei et al. (1977) who examined 5 fish individuals only. They reported the presence of 7 parasitic species belonging to 5 higher taxa. Manter (1954) found, in stomachs of the barracouta off Wellington, the digeneans *Lecithochirium australis* sp.n. and *Syncoelium thyrstitae* (Crowcroft, 1948). Materials obtained in the Cook Strait and off the Campbell Cape were

studied by Robinson (1959 a,b) who found for the first time and described a new cestode, *Gymnorhynchus thyrsitae* in muscles, and reported *Nybelinia* sp. in the body cavity of the fish. Johnston and Mawson (1943) recorded *Anisakis* sp. larvae in the viscera of the fish caught off Chalmers. Additionally, Mehl (1970) studied 236 individuals of the barracouta from the Cook Strait and showed the relationship between the occurrence of *Gymnorhynchus thyrsitae* and *Anisakis simplex* (Rudolphi, 1809) and the size of the host. The crustaceans *Paralernanthropus foliaceus* (Goggio, 1905) parasitising the New Zealand barracouta gills were observed and described by Hewitt (1968). The monogeneans *Udonella caligorum* (Johnston, 1835) from the barracouta gills were reported by Robinson (1961). Hughes (1928) described a new parasitic species, *Winkenthughesia thyrsitae*, from the barracouta off Victoria (SE Australia), the parasites being subsequently reported by Yamaguti (1963).

The present work aims at describing the parasitic fauna of the barracouta caught at a New Zealand fishing ground off the Snares Islands, and at comparing the results obtained with the literature data.

## MATERIALS AND METHODS

The materials were collected by Dr. Wiesław Ślósarczyk of the Sea Fisheries Institute, on board RV „Profesor Bogucki” during the Third Polish Antarctic Expedition. The Expedition involved, i.e., a 17-day survey on the shelf waters off New Zealand and surrounding islands. The hauls made south of the Snares Islands on 22 Februar 1979 yielded the barracouta which contributed 80% of the catch (Ślósarczyk, 1979). The individuals to be examined were frozen on board at  $-20^{\circ}\text{C}$ .

The detailed parasitologic examination was made on 53 individuals which varied in weight and length (*longitudo totalis/longitudo corporis*) within 980–3600 g and 61.0/52.0 – 98.0/80.0 cm, respectively. The following organs were examined: skin, eyes, gills, body cavity, heart, liver, gall gladder, kidney, stomach, intestine and muscles. The skin and gills were examined by naked eye. The hyaline body and eye lenses were checked under a stereo microscope. The gall bladder suspension was examined under a microscope. The digestive tracts were prepared by decantation. The liver and muscles were divided into small pieces and examined by naked eye.

The *Monogenea*, *Cestoda*, and *Trematoda* found were flattened, and fixed in 75% ethyl alcohol; to fix the *Nematoda* and *Crustacea* 4% formalin with physiological salt solution was used. The *Monogenea* as well as some cestodes and trematodes were stained with alun carmine, dehydrated in ethyl alcohol, treated with xylene, and mounted in Canada balsam. Nematodes were not mounted permanently; their glycerine mounts were identified.

## RESULTS

The barracouta individuals examined yielded 8 parasitic species belonging to 5 higher taxa: *Monogenea*, *Cestoda*, *Trematoda*, *Nematoda*, and *Crustacea*.

### *MONOGENEA*

*Winkenthughesia thyrstitae* (Hughes, 1928) Price, 1943

The parasites were found on gills. The materials examined yielded 10 specimens of the species only. The invasion incidence was 9.4%. The invasion intensity was relatively low as well, from 1 to 4 specimens in a fish, with a mean population infestation of 0.19 specimens in a fish.

### *CESTODA*

*Gymnorhynchus thyrstitae* Robinson, 1959 (larva)

Larvae of the cestode dwelled in muscles. The bubble-like scolexes with their long larval „tails“ sometimes exceeded 30 cm. Plerocercoids grew in the skeletal muscles and were found most often in the ventral muscles. The parasites were very common in the fish individuals examined; the invasion incidence was 88.6%. The invasion intensity was fairly high, too, and reached up to 19 specimens in a fish, with a population mean of 4.28. A relationship between the extent of the infestation and the size of the host was observed: the fish individuals measuring 61–80 cm housed 3 larvae on the average, an average of 7 larvae occurring in 81–96 cm long hosts. A stronger invasion was accompanied by a somewhat loosened tissue texture in a host.

*Hepatoxylon trichiuri* (Holten, 1802) (larva)

Plerocercoids occurred in the body cavity; two encysted specimens were found in two fish individuals on the liver. The invasion incidence was very low (3.7%), a mean invasion intensity in the population amounting to 0.04.

### *TREMATODA*

*Syncoelium thyrstitae* (Crowcroft, 1948) Yamaguti, 1953

The trematodes occurred most often in the gill cavity, single or few individuals being found in the stomach and intestine. The species occurred in all the barracouta individuals dissected (100% invasion incidence). The number of individuals in a fish was on occasion very high, reaching the maximum of 585, the minimum being 2 trematodes. A mean population invasion intensity was very high and amounted to 100.6 specimens in a fish.

The 61–80 cm long barracouta housed an average of 80 trematodes, 111 parasites occurring, on the average, in the 81–96 cm long individuals.

### NEMATODA

#### *Anisakis simplex* (Rudolphi, 1809) (larva)

The parasites found were stage 3 larvae; 1544 larvae were distributed among 52 fish individuals in the materials examined. The invasion incidence was as high as 98.1%. The invasion intensity was fairly high as well, ranging with 4–80 parasites in a fish, with a population mean intensity of 29.06 larvae. The number of nematodes was observed to increase with fish size: up to 80 cm long barracouta were inhabited by an average of 18 parasites, twice that number (39 nematodes) occurring on the average in larger fishes. The *A. simplex* larvae were located mainly on the stomach, intestine, and peritoneal membrane, and very seldom (3 parasites) in the liver.

#### *Thynnascaris adunca* (Rudolphi, 1802)

The species was found in 10 barracouta individuals (18.8% invasion incidence) and was represented by adult nematodes (males and females) located in the digestive tract: 12 specimens were found in the stomach and 18 in the intestine. The numbers of parasites in a fish ranged from 1 to 14, with a mean population invasion intensity of 0.56.

#### *Phocanema decipiens* (Krabbe, 1878) Myers, 1958 (larva)

Stage 3 larvae of the species were found, similarly to *A. simplex*. The larvae were most frequently located in the skeletal muscles of older fishes. The invasion intensity ranged from 1 to 4 parasites in a fish. A total of 26 larvae were found in 15 barracouta individuals. The invasion incidence and population mean invasion intensity were 28.3% and 0.49 specimens in a fish, respectively.

### CRUSTACEA

#### *Paralernanthropus foliaceus* (Goggio, 1905)

The parasites were found to occur on gills, attached to gill lamellae with their hook-like 2nd antennae. As many as 90.5% of the fishes examined were found to contain 1 to 11 parasites on gills. A total of 239 specimens (141 females and 98 males) were collected. A population mean invasion intensity was 4.51 crustaceans in a fish.

## DISCUSSION

The parasitic fauna of the barracouta caught off the Snares Islands was represented by 8 species, the extent of infestation varying strongly from species to species. Some species proved very common and showed also high invasion intensities.

One of the most common parasite was the trematode *Syncoelium thyrsitae*, with its 100% invasion incidence. A similarly high incidence was recorded by Kagei et al. (1977), the number of parasites in their materials being lower, with a maximum of 137 specimens in a fish. The main location of *S. thyrsitae* was the digestive tract. In a dead host the parasites penetrate the gill cavity where they were mainly found in this study. Also Kagei et al. (1977) recorded the species from the gill cavity only.

The second commonest species, found in as many as 98.1% of the fish individuals examined, is *Anisakis simplex*. Kagei et al. (1977) report a 100% infestation of the barracouta as well and the invasion intensity similar to that in the present study. On the other hand, Mehl (1970) recorded a very low (5.5%) invasion incidence and a low intensity in the same host species. The *Anisakis* sp. nematodes in the New Zealand barracouta were reported by Hewitt and Hine (1972). In the present study, the larvae were found on the internal organs; some workers were finding them also in muscles (Mehl, 1970).

The parasitic copepod *Paralernanthropus foliaceus* turned out to be a very common species as well, its invasion incidence amounting to 90.5%. A lower incidence (60%) was noted by Kagei et al. (1977). On the other hand, their data on the invasion intensity are similar to ours. Hewitt (1968) described in detail a female and a male of the species.

The cestode *Gymnorhynchus thyrsitae* was quite common in the materials studied (88.6% incidence). Kagei et al. (1977) found the species larvae in all the barracouta examined by them. In the present study the maximum invasion intensity was 19 parasites in a fish, while Robinson (1959b) and Mehl (1970) recorded much higher numbers. The cestode location in muscles found in the present study agrees with observations reported by Robinson (1959b) and Mehl (1970). Out of 286 larvae, the maximum number of parasites observed by Robinson in a single barracouta, 15 only were located in the dorsal part; the remaining ones occurred in the ventral part of the fish.

Some parasitic species were found to occur more abundantly in larger fishes. This was particularly the case with *Gymnorhynchus thyrsitae*, *Syncoelium thyrsitae*, and *Anisakis simplex*. The available literature shows a similar relationship to be recorded for *G. thyrsitae* by Mehl (1970). He recorded the invasion intensity to be higher in those fishes longer than 80 cm; the barracouta measuring 85–89 cm housed about 80 larvae in a fish.

The remaining parasitic species were much less common in the barracouta. It was only the nematode *Phocanema decipiens* larvae that could be regarded as slightly more common. They were found in muscles of 28.3% of the fish. These parasites were recorded in the barracouta and other New Zealand fish by Hewitt and Hine (1972). The present study showed 18.8% of the fish examined only to be infested by the nematode

*Thynnascaris adunca*, while Kagei et al. (1977) observed an incidence four times as high. Hewitt and Hine (1972) include *Thynnascaris* sp. larvae into their list of the barracouta parasites.

The monogeneans *Winkenthughesia thyrsitae* were seldom (9.4% incidence) encountered in the materials examined. On the other hand, Kagei et al. (1977) found those parasites to occur in as many as 80% of their barracouta. The invasion intensities were low in both studies. The rarest parasite was *Hepatoxylon trichiuri*. Kagei et al. (1977) obtained different results on this parasite; all their individuals were infested with the larvae, up to 14 plerocercoids being found in one host.

### CONCLUSIONS

1. The parasitic fauna of the barracouta caught off the Snares Islands consists of 8 species belonging to the following higher taxa: *Monogenea* (1 species); *Cestoda* (2); *Digenea* (1); *Nematoda* (3); and *Copepoda* (1).
2. The parasites differed widely in extent of their invasion.
3. The most common parasites were: *Syncoelium thyrsitae*, *Anisakis simplex*, *Paralernanthropus foliaceus*, and *Gymnorhynchus thyrsitae*.
4. The invasion of larval *Gymnorhynchus thyrsitae* and *Anisakis simplex* in the barracouta is host size-related.
5. The presence of two species harmful for man, *Anisakis simplex* and *Phocanema decipiens* was revealed in the barracouta studied; the fishes should be therefore gutted and thermally treated before consumption.
6. The fish strongly invaded by plerocercoids of *Gymnorhynchus thyrsitae* are regarded by consumers with aversion; such fish should not be brought on the market.

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(EUPHRASEN, 1791) Z OBSZARU NOWEJ ZELANDII

STRESZCZENIE

Szczegółowym badaniom parazytologicznym poddano 53 atuny. Ryby pochodziły z okolic wysp Snares, odłowiono je 22 lutego 1978 roku. Stwierdzono 8 gatunków pasożytów należących do *Monogenea*, *Cestoda*, *Digenea*, *Nematoda* i *Copepoda*. Zarażenie pasożytami było silnie zróżnicowane. Ekstensywność zarażenia poszczególnymi gatunkami wynosiła 3,7–100%, intensywność zarażenia była też bardzo różna. Najczęściej występującymi okazały się *Syncoelium thyrsitae* (100%), *Anisakis simplex* (98,1%), *Paralernanthropus foliaceus* (90,5%) i *Gymnorhynchus thyrsitae* (88,6%). Zarażenie atuna larwami *G.thyrsitae* i *A.simplex* oraz przywrami *S.thyrsitae* wzrasta wraz z wielkością żywiciela.

W badanym materiale znaleziono dwa gatunki patogenne dla człowieka. Były nimi *Anisakis simplex* obserwowane w jamie ciała i *Phocanema decipiens* znajdowane w mięśniach (28,3% zarażenia). W celu zlikwidowania inwazyjnych larw, ryby należy wypatroszyć i poddać obróbce termicznej. Poza tym z badań własnych i danych literatury wynika, że mięśnie atuna są często silnie zarażone plerocerkoidami *Gymnorhynchus thyrsitae*, które budzą odragę konsumenta. Ryby silnie zarażone tym tasiecem nie powinny być dopuszczane do konsumpcji.

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ПАРАЗИТОФАУНА СТЕКА - THYRSITES ATUN 2 (EUPHRASEN, 1791)  
ИЗ ТЕРРИТОРИИ НОВОЙ ЗЕЛАНДИИ

Р е з ю м е

Проводились подробные паразитологические исследования 53 стеков. Рыбу получено из отлова проведённого 22 февраля 1978 г. в окрестностях острова Снарес. Установлено присутствие 8 видов паразитов, принадлежащих к: Monogenea, Cestoda, Digenea, Nematoda и Copepoda. Заражение паразитами являлось дифференцированным. Экстенсивность заражения отдельными видами составляла 3,7 - 100%, интенсивность заражения проявляла также большие различия. Чаще всего встречались: *Synocoelium thyrstitae* (100%), *Anisakis simplex* (98,1%), *Paralernanthropus foliaceus* (90,5%) и *Gymnorhynchus thyrstitae* (88,6%). Инфекция стека личниками *G. thyrstitae* и *A. simplex*, а также трематодами *S. thyrstitae* увеличивалась по мере увеличения размеров хозяина.

В исследованном материале присутствовали два вида паразитов патогенных для человека, а именно: *A. simplex*, находящийся в полости тела и *Phocanema decipiens* - в мышцах (28,3% заражения). Для уничтожения инвазионных личинок нужно выпотрошить рыбу и она должна подвергаться термической обработке. На основании результатов полученных авторами и литературных данных установлено, что в мышцах стека часто присутствует большое количество плевроцеркоидов *Gymnorhynchus thyrstitae*, что возбуждает отвращение у потребителей. В большой степени зараженная этим солитером рыба не должна употребляться.

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