

PARASITES OF THE BLACK SCABBARD FISH, *APHANOPUS CARBO* LOWE, 1839 FROM MADEIRA

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Abstract

In ninety specimens of black-scabbard fish, *Aphanopus carbo*, examined from October 93 to October 94, five different helminth parasites and a myxosporean species were found infecting the digestive tract and gonads. Larval stages of Eucestoda, Trypanorhyncha, *Tentacularia coryphaenae* Bosc, 1802, *Sphyricephalus tergestinus* Pintner, 1913 and *Nybelinia lingualis* (Cuvier, 1817) Poche, 1926 were found infecting the stomach mucosa, with prevalences reaching 13.3%, 5.6% and 3.3% respectively. Larval stages of the acanthocephalan *Bolbosoma* sp. Porta, 1908 (probably *Bolbosoma vasculosum* Rudolphi, 1819) attached to the external wall of stomach, intestine and gonads reached a prevalence of 45.6% and larval stages of the nematode *Anisakis* sp. Dujardin, 1845 was found infecting the viscera of all the fish examined, particularly the external walls of stomach and intestine. Spores and plasmodial stages of the myxosporean, *Ceratomyxa tenuispora* Kabata, 1960 were found in the gall bladder, with prevalence reaching 39.4%. All parasites, except the myxosporean, are first records for the black-scabbard fish.

Introduction

The black-scabbard fish, *Aphanopus carbo* Lowe, 1839 (family Trichiuridae) is one of the most important commercially exploited marine fish species of Madeira, accounting for about 2954 tons of the fish landed on the island (30% of total fish catches) (unpubl. data from the Fisheries Department at Funchal 1994). This fish species lives at depths from 200 to 1600 meters and is distributed through temperate and tropical waters (Nakamura & Parin, 1993). Studies on the biology of this benthopelagic fish, mainly spawning behaviour and feeding habits, are part of a research program of the Fisheries Department at Funchal. However there are no studies on diseases and parasites of black-scabbard fish in Madeira. Elsewhere there are only four previous reports of parasites of the black-scabbard fish. The myxosporean *Ceratomyxa tenuispora* was originally described by Kabata (1960) from the gall bladder of a single fish caught to the west of Scotland. The same species was reported by Gaevskaya & Kovaleva (1980), as *C. magna* n. sp., from two of nine fish from the Mid-Atlantic Ridge, but Kovaleva & Gaevskaya (1983) relegated *C. magna* to

synonymy with *C. tenuispora*. Mauchline & Gordon (1984) reported unidentified nematodes from the stomach of two of 142 fish, and Pascoe (1987) described the monogenean *Octoplectanocotyla aphanopi* n. sp. from the gills of 19 out of 32 fish both from the Rockall Trough to the west of Scotland. A survey of the black-scabbard fish of Madeira was started in late 1993, aiming to study the parasitofauna and the effects of the parasites on the host. The present paper describes the occurrence of a myxosporean species, three different cestode species, one nematode species and one acanthocephalan species all from the visceral cavity. All the parasite species, except for the myxosporean, are first records for this host.

Material and Methods

Samples of black-scabbard fish, totalling ninety specimens from 100 to 130 cm long, were obtained from October 1993 to October 1994 from commercial landings at Funchal fish market. The fish were caught by longlines set at variable depths.

Total length, weight, age and sex were recorded for each fish. Parasites were located by macroscopic and microscopic examina-

tion of body muscles, gills, liver, stomach, intestine, gallbladder and gonads of each fish.

Helminths found were first relaxed in tap water. After relaxation nematodes were killed in hot 70% ethanol and kept in fresh ethanol, according to techniques described by Berland (1982). Some were alternatively fixed in Glacial Acetic Acid and than transferred to 70% ethanol. Cestodes and acanthocephalans were fixed in 4% formaldehyde and stored in 70% ethanol, according to techniques described by Schmidt (1986). Cestode identification was based on Dollfus (1942), Schmidt (1986) and Khalil *et al.* (1994).

Nematodes were identified according to Berland (1989) and Smith and Wootten (1984) and the acanthocephalan according to Meyer (1932), Van Cleave (1953) and Amin (1982,1985).

Ecological parasitological terminology follows Margolis *et al.* (1982).

Results

One myxosporean species, larval stages of three species of trypanorhynch cestodes, juvenile forms of one acanthocephalan species and of a larval nematode were found in several organs of the visceral cavity as specified below:

Myxozoa: Bivalvulida

Ceratomyxa tenuispora Kabata, 1960 (Ceratomyxidae). Spores and plasmodial stages of this myxosporean were found in 24 out of 69 gall bladders examined. Length of spores ranged from 375 to 500 μm ($n\pm 4$) (measurements from fresh spores). Infected bladders could change colour from bright green to yellowish, but this proved not to be consistently so in all cases. Intensity of infection was not recorded.

Platyhelminthes: Trypanorhyncha

1- *Tentacularia coryphaenae* Bosc, 1802

(Tentaculariidae)

Postlarvae were found either encapsulated or free in the inner stomach wall as well as free in the visceral cavity. Body length of fixed specimens ranged from 7 to 12 mm long ($n\sim 10$) and length of tentacles from 0.5 to 0.9 mm ($n=17$). Prevalence was 13.3%. Only 1 or 2 specimens of *Tentacularia* were found per host, except in one case where 6 parasites were recovered.

2- *Sphyriocephalus tergestinus* Pintner 1913 (Sphyriocephalidae)

Postlarvae stages were found free in the inner stomach wall. Body length ranged from 4 to 9 mm long ($n=6$) and the length of the tentacles from 0.4 to 1.25 mm ($n=6$), although they were not completely extruded. Prevalence reached 5.6%. Intensity was low, with a maximum of 2 per fish.

3- *Nybelinia lingualis* (Cuvier, 1817) Poche 1926 (Tentaculariidae)

Postlarvae were found encapsulated in the inner stomach wall. Length ranged from 1 mm to 8.5 mm long ($n= 4$). Smaller specimens of 1 mm were found inside a rounded white capsule. They had very small tentacles of about 0.24 mm compared with 1.80 mm of the postlarva stages. Prevalence of this parasite was only 3.3 %.

Nematoda : Ascaridida

1 - *Anisakis* sp. Dujardin, 1845 (Anisakidae)
The nematode *Anisakis* sp., III-stage larvae, was found with a prevalence of 100%. This nematode was encapsulated or freely attached to the outer walls of stomach, intestine, gonads and liver. Some of the liver nematodes, were within a capsule of connective tissue of host origin, almost completely destroyed. Total body length of the nematodes was 2 to 3 cm ($n=10$). Intensity ranged from 30 up to 200 nematodes per fish.

Acanthocephala: Polymorphida

Bolbosoma sp. Porta 1908 (Polymorphidae).
Bolbosoma sp. Porta 1908 (probably *Bolbosoma vasculosum* Rudolphi 1819) was found freely attached to the outer walls of stomach, intestine and pyloric caeca of several black-scabbard fish (prevalence of 45.6%). Total body length was 12-15 mm (n=8), length of the proboscis was 1 mm with 18 to 19 rows of 8 hooks. Detailed studies of this parasite species are currently under way and will be published elsewhere.

Discussion

The parasite fauna of the ninety black-scabbard fish examined from Madeira Islands is confined to one myxosporean species, *Ceratomyxa tenuispora*, three different cestode species, *Tentacularia coryphaenae*, *Sphyriocephalus tergestinus*, *Nybelinia lingualis*, one nematode species, *Anisakis* sp., and one acanthocephalan species, *Bolbosoma* sp., probably *Bolbosoma vasculosum*. This is in accordance with other studies of parasites from mesopelagic and bathypelagic fish, which have fewer parasite species compared with pelagic fish species (Noble and Orias, 1975; Campbell *et al.*, 1980; Campbell, 1990).

The observations on the general morphology of the larval stages of the three different cestode species in the present work, are in accordance with those described in Dollfus (1942), Schmidt (1986) and Khalil *et al.* (1994). These cestode parasites infect a variety of fish species, which act as intermediate hosts, for the definitive host elasmobranchs (Dollfus, 1942; Schmidt, 1986). This is in perfect accordance with Madeira, where the elasmobranchs species, *Chlamydoselachus anguineus*, *Centrophorus granulosus* among others, live in deep waters, feed on bottom fishes and deep water cephalopods and could therefore act as the definitive hosts for the cestodes. These parasites are possibly transmitted to black-

scabbard fish by cephalopods which are part of its diet.

The morphological characteristics (body length, colour, length of proboscis, number of rows of proboscis hooks and number of hooks per row) of the larval stages of *Bolbosoma* sp., were identical with those described for the species *Bolbosoma vasculosum* (Meyer, 1932; Van Cleave, 1953). The same acanthocephalan was recovered from a dead dolphin, *Delphinus delphis* Linnaeus, 1758 during this survey. However it is not clear whether the dolphin is the true definitive host or an accidental host, as the acanthocephalans found had no development of genitalia. Detailed studies of the acanthocephalan are in progress

Spores of the myxosporean *C. tenuispora* were found to be identical, both in respect to morphology and dimensions with those reported by Kabata (1960). In the specimens examined from Madeira plasmodial stages were also found in the infected bladders.

The nematode species found in the black-scabbard fish is still under identification. Although similar to *Anisakis simplex* there are some grounds to believe that it could be *A. typica*.

Larval nematodes predominated in the helminth fauna of black-scabbard fish of Madeira (prevalence 100%, intensity up to 200 worms per fish), followed by the larval acanthocephalans. Little is known to date on parasites of the black-scabbard fish. A long term survey to study the parasites of this fish species is planned, including inspection of juveniles for studies of prevalence and intensity of these infections.

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