The Parasite Fauna of Mullet, *Eleginops maclovinus* (Cuv. & Val., 1830) in the Falkland Islands: a Pilot Study

by

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A Report Prepared for the Shackleton Trust

Background

The mullet, *Eleginops maclovinus,* is a medium-sized species in the family Notothenidae, attaining a maximum length of about one metre. It is an unusual member of its family in that it has a non-Antarctic distribution, is tolerant to fresh water and breeds in estuaries. It is found around the Falkland Islands and along the coast of South America as far as Uruguay (35°S) on the east coast and Talcahuano, Chile (37°S) on the west coast.

Mullet became the target species for a commercial fishery in the Falkland Islands only recently, in October 2000. For the efficient management of this new fishery it is essential to determine the stock structure and migrations of mullet around the islands. Several methods can be used for this purpose, among them the use of naturally occurring parasites as biological tags. A prerequisite for this method is a thorough knowledge of the parasite fauna of the target host species in the study area, so the purpose of the present study was to describe the parasite faunas of mullet from different localities in the Falkland Islands. Few studies have been carried out specifically on the parasites of mullet, and these have all been from the mainland of South America. The present study is the first to investigate the entire parasite fauna of mullet in the Falkland Islands.

Methods

Mullet were collected during February and March 2002 by beach-seining at three sites: Port Louis, Teal Creek and Camilla Creek. These sites were selected as representative of different ecosystems in the Falklands region. It was originally intended that 50 fish would be examined from each site, but the parasite fauna proved to be so numerous and varied that it was not possible to examine this number of fish in the time available, nor was it possible to catch sufficient fish of a suitable size from Camilla Creek. Consequently, 30 fish were examined from Port Louis, 30 from Teal Creek, and 10 from Camilla Creek. My colleague Paul Brickle of the Fisheries Department in Stanley will examine a further 20 fish from Camilla Creek before we publish the results.

Mullet were stored deep-frozen immediately after capture and subsequently defrosted individually in the laboratory. Each fish was measured and weighed before examination. Complete autopsies were carried out, beginning with scanning of the skin and fins for macroparasites under a low-power dissecting microscope. The opercula were removed and each gill arch examined separately. The mouth, pharynx, nostrils and brain were

similarly examined. The visceral cavity was opened, the sex of each fish was noted, and the internal organs were removed and examined separately. Smears were made from each organ and tissue and examined under a high-power research microscope for microparasites. Photographs were taken of any parasite and lesion found. Where possible parasites were identified to species, otherwise to genus or family.

Results

At least 22 different species of parasite were recorded. I state "at least" because some of the parasites identifiable only to higher taxa, such as genera or families, may include more than one species. Of these, possibly as many as five, and certainly two, are new to science. In fact, a new species of microparasite was found in the first fish examined and was later found to be one of the most common parasites of these fish. There were marked qualitative and quantitative differences between the parasite faunas of mullet from Port Louis and Teal Creek, with eight species showed statistically significant differences in levels of infection. (Too few fish were examined from Camilla Creek to permit a statistical comparison to be made; this will be done later when more data are available). Two of these species are larval or juvenile forms that are likely to have life spans of several years in mullet and so could be useful biological tags for stock identification. One of these species, a roundworm, matures in gulls, while the other, an acanthocephalan or thorny-headed worm, matures in seals. Both gulls and seals become infected by eating mullet or other fish infected with larvae. Another three species that occur as mature adult forms in mullet are likely to have shorter life spans of less than one year and could be useful for following seasonal migrations.

Discussion

Falklands mullet have a rich and varied parasite fauna, but it must be emphasized that it is rare to find parasites of any kind in the flesh. We found only one roundworm in the flesh of the 70 fish we examined. The same caveat, however, applies to mullet as to all fish intended for human consumption: if fish are to be eaten raw (e.g. as sushi) or lightly pickled, they should have been deep-frozen for some time beforehand. This is because some roundworms that mature in mammalian hosts such as seals or whales can infect humans and cause symptoms similar to gut ulcers. Cooked fish poses no such problems.

In recognition of the major contribution made by the Shackleton Fund to this project, we propose to name one of the new species found with the specific name "shackletoni" as, for example, *Henneguya shackletoni*, for the new species found in the first mullet examined. At least three scientific papers will be written presenting the results of this project: a general report on the overall parasite fauna and biological tag implications, plus at least two papers describing new species.

Finally, a mention of one of my non-scientific activities during my visit. My main hobby is music and I play the cornet. During my visit I teamed up with two local musicians, Joost Pompert of the Fisheries Department, who plays tenor saxophone, and Medical Officer Roger Diggle, who plays clarinet. I wrote some simple arrangements of jazz

standards which we rehearsed and eventually performed in public, backed by a local bass guitarist, at the "Folk Night" in the bar of the Rose Hotel. I am pleased to report that we enjoyed a wonderful reception.

Schuland 1999/2000

Acta Parasitologica, 2006, 51(1), 36–39; ISSN 1230-2821

Henneguya shackletoni sp. nov. (Myxosporea, Bivalvulida, Myxobolidae) from the Falklands mullet, *Eleginops maclovinus* (Cuvier) (Teleostei, Eleginopidae) in the Falkland Islands

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Abstract

During a survey of the parasite fauna of the euryhaline notothenioid fish *Eleginops maclovinus* (Cuvier) caught in brackish water creeks in the Falkland Islands, small white cysts were observed in the mesenteries and on the surfaces of the visceral organs and heart. On dissection these proved to be plasmodia of a species of the myxosporean genus *Henneguya*. This is the first record of a member of this genus from a marine or euryhaline fish in the south-west Atlantic. A comparison of the spore of our species with other species in the genus convinced us that our species is new. This paper describes it as *Henneguya shackletoni* sp. nov. after the Shackleton Fund which funded the study.

Key words

Henneguya shackletoni sp. nov., Myxosporea, *Eleginops maclovinus*, fish, Falkland Islands

Introduction

The Falklands mullet, *Eleginops maclovinus* (Cuvier) is a euryhaline fish found in coastal waters around the Falkland Islands and in estuaries and rivers along the coasts of the southern half of the South American continent (De Witt *et al.* 1990). During a survey of the parasites of *E. maclovinus* caught in the Falkland Islands in 2002, small white cysts were observed on the surfaces of the visceral organs and heart. On dissection these cysts were found to be plasmodia of a species of the myxosporean genus *Henneguya*. No member of this genus has been previously described from *E. maclovinus* or from any other marine or euryhaline fish in the south-west Atlantic. Our description of this species follows the guidelines of Lom and Arthur (1989).

Materials and methods

Samples of *E. maclovinus* were collected by beach seine from two brackish water creeks in East Falkland in January and February 2002. The fish were deep-frozen and later defrosted for examination in the laboratory of the Falkland Islands Government Fisheries Department in Stanley by PB and KM. Some cysts were dissected and fresh *Henneguya* spores were photographed. Pieces of gonad containing cysts (plasmodia) were fixed in 10% buffered formal saline and sent to the Department of Zoology, Andhra University, India, for examination and description by CK. Unstained spores were examined in a drop of saline under dark ground and phase contrast illuminations at magnifications of up to ×2000. Some spores were treated with Lugol's solution to detect the presence of iodinophilous vacuoles in the sporoplasm, or with Indian ink to detect the presence of a mucous envelope (Lom and Vávra 1963). Smears were either air-dried, fixed in methyl alcohol and stained with Giemsa, or wet-fixed in Schaudinn's or Carnoy's fluid and stained with either Ehrlich's haematoxylin or according to Feulgen's technique. Illustrations were made with the aid of camera lucida and measurements are given in micrometres.

Collection numbers quoted refer to specimens deposited at the Natural History Museum, London, U.K.

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Table I. A comparison of *Henneguya shackletoni* with other species of *Henneguya* with similar spore dimensions

Species of *Henneguya*	Spore			Polar capsule		No. of coils in filament	Length of caudal appendage	Host species	Locality
	length	width	thickness	length	width				
H. shackletoni sp. nov.	11.8 (9.6–14.4)	8.5 (7.2–11.2)	7.0 (5.4–8.6)	3.7 (3.2–4.8)	3.1 (2.6–3.6)	6–7	37.3 (24.8–51.2)	*Eleginops maclovinus*	Falkland Islands
H. brachydeuteri Kpatcha, Faye, Diebakate, Fall et Toguebaye, 1997	11.5 (10.0–12.0)	8.3 (7.0–9.0)	ND	4.3 (4.0–5.0)	2.6 (2.0–3.0)	ND	26.9 (26.0–29.0)	*Brachydeuterus auritus*	Senegal
H. lateolabracis Yokoyama, Kawakami, Yasuda et Tanaka, 2003	10.7 (9.9–11.9)	7.5 (6.4–7.8)	6.2 (5.9–6.4)	3.4 (3.0–4.0)	1.7 (1.5–2.0)	about 3	37.7 (30.7–49.5)	*Lateolabrax* sp.	Japan
H. lutjani Kpatcha, Faye, Diebakate, Fall et Toguebaye, 1997	11.6 (11.2–13.0)	7.2 (6.0–8.0)	ND	3.8 (3.0–4.5)	2.9 (2.2–3.5)	ND	37.2 (36.0–38.2)	*Lutjanus agennes*	Senegal
H. ntemensis Fomena et Bouix, 1996	10.5 (9.2–12.0)	8.0 (7.0–8.9)	7.0 (ND)	6.0 (5.0–7.0)	3.4 (3.0–3.9)	5–6	5.1 (3.2–9.6)	*Brienomyrus brachyistius*	Cameroon
H. otolithi Ganapati, 1941	ND (10.0–12.0)	ND (6.0–8.5)	ND (4.0–5.0)	ND (3.0–4.0)	ND (2.0–2.5)	ND	ND (35.0–40.0)	*Otolithus* spp.	Bay of Bengal
H. thermalis Seenappa, Manohar et Prabhu, 1981	11.8 (12.0–13.2)	7.6 (6.0–8.0)	ND	*(4.0–5.0) (3.0–4.0)	ND	ND	12.1 (11.0–13.0)	*Lepidocephalus thermalis*	India
H. wisconsinensis Mavor et Strasser, 1916	11.5 (ND)	7.0 (ND)	ND	3.5 (ND)	2.5 (ND)	5	9.6 (ND)	*Perca flavescens*	U.S.A.
H. yoffensis Kpatcha, Faye, Diebakate, Fall et Toguebaye, 1997	13.3 (12.0–15.0)	9.1 (8.0–11.0)	ND	3.4 (3.0–4.0)	1.3 (2.0–3.0)	ND	32.1 (24.0–36.0)	*Sparus caeruleostictus*	Senegal

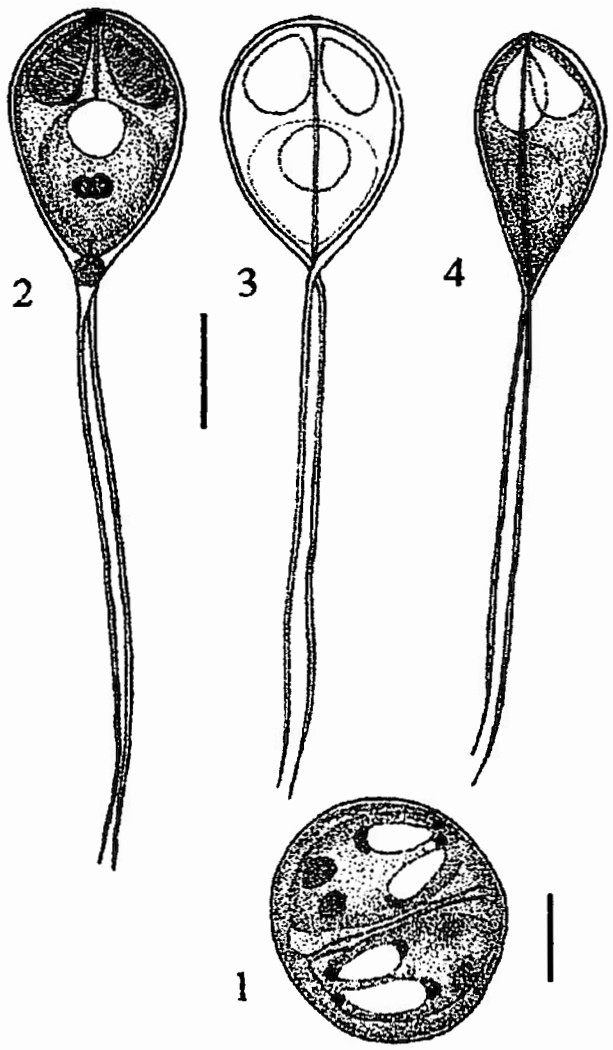
Measurements are in micrometres with ranges in parentheses below. ND = no data. *In *H. thermalis* the polar capsules are unequal.

Results

Family: Myxobolidae
Genus: *Henneguya* Thélohan, 1892

***Henneguya shackletoni* sp. nov.** (Figs 1–4)

Description: Plasmodia opaque white, spherical or ellipsoidal, measuring 500–800. Large plasmodia contained spores only, while smaller ones measuring < 200 also contained sporoblasts in their peripheral regions (Fig. 1). These sporoblasts were spherical, lightly staining and disporous, diameter 15.0–26.5 (based on 20 fixed specimens).



Figs 1–4. *Henneguya shackletoni* sp. nov.: **1.** Fixed sporoblast stained with Giemsa. **2.** Fixed spore in frontal view, stained with Giemsa. **3.** Fixed unstained spore in frontal view. **4.** Fixed unstained spore in sutural view. Scale bar = 5 µm

Spore (Figs 2–4) pyriform with rounded anterior and pointed posterior ends in frontal view (Figs 2 and 3), lenticular in sutural view (Fig. 4). Spore valves thin, smooth, extending into two long, thin, straight caudal processes that are usually parallel throughout their lengths. At the junction of the caudal processes there is a deeply staining body. Polar capsules equal, pyriform, subterminal, converging anteriorly and occupying one third of the spore length. Polar filament with 6–7 coils. At the anterior tips of the polar capsules there is a distinct deeply staining body. Sporoplasm lightly staining with two nuclei. One large vacuole (diameter 2.0–3.0) between the posterior ends of the polar capsules and the sporoplasm. Dimensions, based on 50 fixed spores, as ranges with means ± SD in parentheses: spore length, including caudal processes 34.5–65.5 (49.0 ± 9.0); spore length excluding caudal processes 9.5–14.5 (11.5 ± 1.5); spore width 7.0–11.0 (8.5 ± 1.0); spore thickness 5.4–8.6 (7.0 ± 1.0); length of caudal processes 25.0–51.0 (37.0 ± 8.0); polar capsule length 3.0–5.0 (3.5 ± 0.5); polar capsule width 2.5–3.5 (3.1 ± 0.5); sporoplasm length 3.0–5.0 (4.5 ± 0.5). Spore length:spore width ratio = 1.3:1. Spore length:polar capsule length ratio = 2.3–4.3:1.

Host: *Eleginops maclovinus* (Cuvier), Eleginopidae.

Site of infection: Wall of alimentary tract, mesenteries and surfaces of gonad and heart.

Localities and dates: (1) 51°40′S, 59°36′W (Port Louis, East Falkland), 21 January, 2002; (2) 51°48′S, 58°55′W (Teal Creek, East Falkland), 27 February, 2002.

Prevalence: (1) 10 of 30 (23%); (2) 7 of 30 (33%).

Host length range: (1) 24–51 cm; (2) 16–76 cm.

Collection numbers: 2005:4:14:1, 2005:4:14:2, 2005:4:14:3, 2005:4:14:4.

Discussion

In his synopsis of the species in the genus *Henneguya*, Eiras (2002) listed 146 species. A further fifteen species have since been described. The majority of the hosts are freshwater fishes. The species described above is closest in spore size to the eight others shown in Table I, but differs markedly from each of them in some aspect of dimensions and/or form. In spore size it most closely resembles *H. lateolabracis* and *H. lutjani*, but differs from the former in the number of coils of the polar filament (6–7 compared to "about 3") and from both species in the overall shape of the spore, which is pyriform in *H. shackletoni* but more ovoid in *H. lateolabracis* and *H. lutjani*. In fact the only species in Table I with a pyriform spore shape similar to *H. shackletoni* is *H. thermalis*, but in the latter species the caudal processes are quite different, being shorter, thinner and bifurcated. *Henneguya otolithi* differs principally in having a distinct transverse band across the spore. These differences, together with its occurrence in a host and locality from which no species of *Henneguya* has previously been reported, convinced us that this is a new species. It is named *Henneguya shackletoni* because it was found during a visit to

the Falkland Islands by KM funded by a Shackleton Fund Science Scholarship.

Acknowledgements. We thank the Shackleton Fund for funding the study during which this new species was found, John Barton for providing the laboratory facilities at the Falkland Islands Government Fisheries Department, and the Right Honourable Alexandra Shackleton for approving the use of her family name in the naming of this species.

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(Accepted September 21, 2005)