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# HELMINTH AND SPOROZOAN PARASITES OF FISHES IN THE NETHERLANDS

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## ABSTRACT

Parasites of marine and fresh water fishes, belonging to the groups of the Protozoa, Trematoda, Acanthocephala, and Cestoda, are recorded from the Netherlands. Several species are discussed.

## INTRODUCTION

During a period of six years (1959-1965) investigations were carried out concerning the life cycles, annual cycles and hostparasite relationship of fish parasites belonging to the genus Proteocephalus (Cestoda) (Willemse & Veltman, 1962; Willemse, 1965, in press). The data used in these investigations were partially obtained from experimental infections and partially by dissecting fresh-water fishes living in natural waters in the Netherlands. During the dissections we regularly observed parasites belonging to other genera than the one mentioned above. Additionally, apart from the Proteocephalus-program, we dissected many samples of sea fishes living along the Netherlands coast. In this paper a survey is given of the collected parasites which belong to the following groups: Protozoa, Trematoda, Cestoda and Acanthocephala. Although nematodes and parasitic copepods were regularly observed we did not study them and no data concerning these groups were recorded. Since the main objects of our investigations were parasites of the intestinal tract, the data presented here almost exclusively concern parasites of this system.

Dissection and examination of the fishes, and preservation, staining and mounting of the helminths was carried out as described previously (Willemse, in press). From sporozoan cysts, smear preparations and 6 $\mu$ sections were prepared. We stained the sections with haematoxylin and eosin.

## LIST OF FISHES AND THEIR PARASITES

The names of the groups of parasites are abbreviated: P = Protozoa, T = Trematoda, A = Acanthocephala, C = Cestoda. Numbers in front of the names of parasites refer to the remarks given in the next section.

ELASMOBRANCHII

Cetorhinidae

Cetorhinus maximus (Gunnerus, 1765)

Dinobothrium paciferum Sproston, 1948. C. North Sea.

Scyliorhinidae

Scyliorhinus canicula (Linnaeus, 1758)

Phyllobothrium thridax Van Beneden, 1850. C. North Sea.

Squalidae

Squalus acanthias Linnaeus, 1758

Gilquinia squali (Fabricius, 1794). C. North Sea.

TELEOSTOMI

Clupeidae

Clupea harengus Linnaeus, 1758

Hemiurus ocreatus (Rudolphi, 1802). T. Den Helder.

Alosa fallax (Lacépède, 1803)

Hemiurus appendiculatus (Rudolphi, 1802). T. Den Oever, 't Horntje.

Eubothrium fragile (Rudolphi, 1802). C. Den Oever, 't Horntje.

(1) Tetraphyllidean larvae. C. Den Oever.

Engraulidae

Engraulis encrasicolus (Linnaeus, 1758)

(1) Tetraphyllidean larvae. C. Den Helder.

Salmonidae

Salmo trutta Linnaeus, 1758

Hemiurus appendiculatus (Rudolphi, 1802). T. 't Horntje (Texel).

H. communis Odhner, 1905. T. 't Horntje (Texel); North Sea.

(2) Proteocephalus tetrastomus (Rudolphi, 1810). C. Den Helder

Eubothrium crassum (Bloch, 1779). C. Den Helder; 't Horntje (Texel); North Sea.

(1) Tetraphyllidean larvae. C. North Sea.

Osmeridae

Osmerus eperlanus (Linnaeus, 1758)

Hemiurus appendiculatus (Rudolphi, 1802). T. Wierbalg.

Proteocephalus tetrastomus (Rudolphi, 1810). C. Amsterdam Muidergracht; Amsterdam Lozingskanaal; Den Helder; IJmuiden; IJsselmeer.

P. longicollis (Zeder, 1800). C. IJsselmeer.

Pomphorhynchus laevis (Müller, 1776). A. IJsselmeer.

Esocidae

Esox lucius Linnaeus, 1758

(5) Henneguya psorospermica Thélohan, 1895. P. Ankeveen; Exloërveen; Haarlemmermeerpolder; Heemskerkerbroekpolder.

Azygia lucii (Müller, 1776). T. Vinkeveen; Wilnis

Bucephalus polymorphus von Baer, 1827. T. Edam.

Triaenophorus lucii (Müller, 1776). C. Driehuizen; Haarlemmermeerpolder; 't Noorden (Nieuwkoop); Schermerhorn; Vinkeveen; Wilnis.

(3) Proteocephalus ambiguus (Dujardin, 1845). C. Amsterdam Slotermeer.

Acanthocephalus lucii (Müller, 1777). A. Vinkeveen.

Cyprinidae

Carassius carassius (Linnaeus, 1758)

Caryophyllaeus laticeps (Pallas, 1781). C. Amsterdam Slotermeer; Maasdijk.

Abramis brama (Linnaeus, 1758)

Caryophyllaeus laticeps (Pallas, 1781). C. Amsterdam, IJsselmeer.

Neoechinorhynchus rutili (Müller, 1780). A. IJsselmeer.

Blicca bjoerkna (Linnaeus, 1758)

Caryophyllaeus laticeps (Pallas, 1781). C. Amsterdam.

Rutilus rutilus (Linnaeus, 1758)

(6) Neodiplostomum cuticula (von Nordmann, 1832). T. Maas (Appeltern).

Ligula intestinalis (Goeze, 1782). C. Amsterdam.

Caryophyllaeides fennica (Schneider, 1902). C. Amsterdam.

Neoechinorhynchus rutili (Müller, 1780). A. Amsterdam.

Scardinius erytrophthalmus Linnaeus, 1758

Diplostomum spataceum (Rudolphi, 1890). T. Ouderkerk aan de Amstel.

Caryophyllaeides fennica (Schneider, 1902). C. Amsterdam (Nieuwe Meer).

Neoechinorhynchus rutili (Müller, 1780). A. Amsterdam (Nieuwe Meer).

Cobitidae
Misgurnus fossilis Linnaeus, 1758
(7) Myxobolus pfeifferi (Thélohan, 1895). P. Doornenburg (Arnhem).

Anguillidae
Anguilla anguilla (Linnaeus, 1758)
(8) Glugea anomala (Moniez, 1887). P. IJsselmeer.
Bothriocephalus claviceps (Goeze, 1782). C. Amsterdam Oosterdok; Amsterdam Zeeburg; Aalsmeer; IJsselmeer; Ruurlo.
Proteocephalus macrocephalus (Creplin, 1825). C. Aalsmeer; Amsterdam; Oosterdok; Amsterdam Zeeburg; North Sea ; Ritthem; IJsselmeer.
Acanthocephalus anguillae (Müller, 1780). A. IJsselmeer.

Congridae
Conger conger (Linnaeus, 1758)
Lecithochirium rufoviride (Rudolphi, 1802). T. North Sea.

Belonidae
Belone belone (Linnaeus, 1758)
Lecithaster gibbosus (Rudolphi, 1802). T. 't Horntje (Texel).
Ptychobothrium belones (Dujardin, 1845). C. 't Horntje (Texel).
Lacistorhynchus tenuis (van Beneden, 1861). C. North Sea.
(1) Tetraphyllidean larvae. C. 't Horntje (Texel); North Sea.

Gadidae
Odontogadus merlangus (Linnaeus, 1758)
Diclidophora merlangi (Kuhn, 1832). T. North Sea.
Lota lota Linnaeus, 1758
Echinorhynchus clavula Dujardin, 1845. A. Vinkeveen.
E. truttae Schrank, 1788. A. Vinkeveen.

Gasterosteidae
Gasterosteus aculeatus Linnaeus, 1758
Hemiurus appendiculatus (Rudolphi, 1802). T. Den Helder.
H. communis Odhner, 1905. T. Den Helder; De Kooi.
Podocotyle atomon (Rudolphi, 1802). T. Den Helder; De Kooi.
Lecithaster gibbosus (Rudolphi, 1802). T. Den Helder.
Schistocephalus solidus (Müller, 1776). C. Arnhem.
Proteocephalus filicollis (Rudolphi, 1810). C. Amsterdam (Slotermeer); Den Helder; De Kooi; Hoorn; Middelburg; Ransdorp; Schellingwoude.
(1) Tetraphyllidean larvae. C. Achter 't Bord (Texel); Den Helder; De Kooi.
Pygosteus pungitius (Linnaeus, 1758)
Glugea anomala (Moniez, 1887). P. Schellingwoude.
Bunodera luciopercae (Müller, 1776). T. Amsterdam (Slotermeer).
(4) Caryophyllaeus laticeps (Pallas, 1781). C. Amsterdam (Slotermeer).
Proteocephalus ambiguus (Dujardin, 1845). C. Amsterdam (Slotermeer); Amsterdam (Watergraafsmeer); Diemerpolder; Middelburg; Ransdorp: Schellingwoude.
Neoechinorhynchus rutili (Müller, 1780). A. Amsterdam (Slotermeer).

Zeidae
Zeus faber Linnaeus, 1758
(1) Tetraphyllidean larvae. C. Zuiderhaaks.

Carangidae
Trachurus trachurus (Linnaeus, 1758)
Zoogonoides viviparus (Olsson, 1868). T. Molengat (Texel).

Percidae
Perca fluviatilis Linnaeus, 1758
Bunodera luciopercae (Müller, 1776). T. Amsterdam (Slotermeer); IJsselmeer.
Bucephalus polymorphus von Baer, 1827. T. Amsterdam.
Triaenophorus lucii (Müller, 1776). C. IJsselmeer.
Proteocephalus ocellatus (Rudolphi, 1802). C. Amsterdam (Slotermeer).
(2) P. tetrastomus (Rudolphi, 1810). C. IJsselmeer.
Acanthocephalus lucii (Müller, 1777). A. Amsterdam (Geuzenveld); Amsterdam (Slotermeer); Velsen; IJsselmeer .
Acerina cernua (Linnaeus, 1758)
Bunodera luciopercae (Müller, 1776). T. IJsselmeer.
(9) Cotylurus variegatus (Creplin, 1825). T. IJsselmeer.
(4) Caryophyllaeus laticeps (Pallas, 1781). C. IJsselmeer.
Proteocephalus cernuae (Gmelin, 1790). C. Amsterdam (Lozingskanaal); Amsterdam (Muidergracht); IJsselmeer.

*Lucioperca lucioperca* (Linnaeus, 1758)
*Bucephalus polymorphus* von Baer, 1827. T. Velsen; IJsselmeer.

Zoarcidae
*Zoarces viviparus* (Linnaeus, 1758)
*Pomphorhynchus laevis* (Müller, 1776). A. Molengat (Texel).

Cottidae
*Myxocephalus scorpius* (Linnaeus, 1758)
*Podocotyle atomon* (Rudolphi, 1802). T. Molengat (Texel).
*Zoogonoides viviparus* (Olsson, 1868). T. Molengat (Texel).
(1) Tetraphyllidean larvae. C. Molengat (Texel).

Pleuronectidae
*Pleuronectes platessa* Linnaeus, 1758
(1) Tetraphyllidean larvae. C. 't Horntje (Texel).
*Limanda limanda* (Linnaeus, 1758)
(1) Tetraphyllidean larvae. C. 't Horntje (Texel); Molengat (Texel); Zuidmeep.
*Platichthys flesus* (Linnaeus, 1758)
*Podocotyle atomon* (Rudolphi, 1802). T. De Balg; Lange Dam; Molengat (Texel); IJsselmeer (Den Oever).
(4) *Caryophyllaeus laticeps* (Pallas, 1781). C. IJsselmeer.
*Bothriocephalus scorpii* (Müller, 1776). C. De Balg; Den Helder.
(2) *Proteocephalus tetrastomus* (Rudolphi, 1810). C. De Balg; IJsselmeer (Den Oever).
(1) Tetraphyllidean larvae. C. Den Oever.

## REMARKS ON SOME PARASITES LISTED ABOVE

(1) In the intestines of many sea fishes tetraphyllidean plerocercoids are found, sometimes more than one hundred in a single fish. Definitive hosts are Selachii. Commonly the name "*Scolex pleuronectis* Müller, 1788" is used for these larvae. They are almost identical to plerocercoids of the genus *Proteocephalus*.

(2) Some host records of intestinal parasites of fishes need an additional explanation. It was shown (Willemse, in press) that in the intestine of predatory fishes cestodes may be found which originally lived in the intestines of prey fishes and were released during the digestion of the prey. These cestodes (from plerocercoids through ripe worms) may even survive their transmission for a few days, but they will always die after a short period in the alien host and they never settle down or develop normally. The occurrence of *Proteocephalus tetrastomus* in *Salmo trutta*, *Perca fluviatilis* and *Platichthys flesus* must be attributed to this phenomenon.

(3) It is not certain whether two small pikes (5 and 13 cm) obtained their infection with *Proteocephalus ambiguus* plerocercoids by eating the intermediate host, *Cyclops*, or by eating the definitive host, *Pygosteus pungitius*. Anyhow the high degree of host specificity of *P. ambiguus* will prevent further development in fish species other than *Pygosteus*.

(4) Only in one out of 3165 dissected Ten-spined Sticklebacks *Caryophyllaeus laticeps* was found. It was a plerocercoid, released shortly before the dissection from the intermediate host. A similar phenomenon was observed while dissecting a specimen of *Acerina cernua* and *Platichthys flesus*. We do not expect that further development occurs in these hosts.

(5) Although *Henneguya psorospermica* cysts usually are reported from the gills of host fishes, we observed them only once in this site. As a rule we found the cysts in the ripe female gonads, about 1% of the eggs being transformed into cysts.

(6) Metacercariae encysted in the skin of the host.

(7) The gonads of this fish were represented by a large mass of sporozoan cysts. The spores in these cysts correspond with the description of *Myxobolus pfeifferi* in every detail, although *Misgurnus* is not a common host of this parasite.

(8) A similar situation is found here. The gonads of an eel were transformed into a large mass of cysts. The spores corresponded with the description of *Glugea anomala* in every detail,

although this species usually occurs in Sticklebacks only.

(9) Metacercariae encysted in large numbers in mesenteriae and pericardium of almost every fish dissected. Metacercariae of this species are sometimes referred to as Tetracotyle ovata von Linstow, 1877.

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