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NEW DATA ON THE LOCATION OF *DANICONEMA ANGUILLAE* (NEMATODA: DRACUNCULOIDEA) ADULT STAGES IN EELS

K. MOLNÁR
Veterinary Medical Research Institute, Hungarian Academy of Sciences, H–1581 Budapest, POB 18, Hungary

Abstract

Although *Daniconema anguillae* has been detected infrequently and in few countries only, this nematode can be regarded as one of the most common parasites of the European eel (*Anguilla anguilla*). These extremely thin, fragile helminths are tissue parasites and, thus, difficult to detect. The most likely site of detection is the fin of the eel, where imagoes are occasionally accompanied by large numbers of third-stage larvae of arrested development.

Introduction

Since Moravec and Køie described *Daniconema anguillae* from the swimbladder of eel in 1985, very few data have been published on the occurrence and prevalence of that parasite. Data on its occurrence in Europe can be found only in the papers of Køie (1988a and b), Molnár and Moravec (1994), and Molnár and Székely (1995). In addition to recording the occurrence of the parasite in a given habitat, Køie (1988b) mentioned that it was detectable also from the gut in addition to the swimbladder, and that in the swimbladder adult specimens occurred together with third-stage larvae. Further data can be found in the work of Marcoliese and Cone (1993) who drew up a list of metazoan parasites of the European eel (*Anguilla anguilla*) and the American eel (*Anguilla rostrata*), and remarked that *D. anguillae* occurred also in the American eel. In view of the fact that since the introduction of *Anguillicola crassus* to Europe the eel has become the fish species best studied for nematode infections, the low number of *Daniconema* infections recorded to date could suggest that this parasitosis should be considered sporadic in Europe. This is, however, at variance with the observation of Molnár and Moravec (1994), who reported the presence of third-stage *D. anguillae* larvae in the fins or under the skin of about 50% of the eels collected for examination from Lake Balaton (Hungary).

The high prevalence of larvae already suggested that a more thorough examination of the same fish would probably reveal the presence of imago stages. Therefore, the eels were thoroughly examined for the occurrence of *Daniconema* imagoes. In contrast with the previous practice, the examination was extended also to organs other than the swimbladder, the organ specified as the site of occurrence in the original description.

Materials and Methods

Detection of these parasites requires a special technique. The examinations must always be performed in physiological saline solution. Therefore, the internal organs, the skin of flayed eels and the severed fins were placed into saline solution. To help the helminths get out, the fins cut off the eels' body were pulled apart with two dissecting needles in the plane of the fin rays. The helminths and their larvae migrated out into the saline solution within 1–2 hours, and could easily be identified and collected under stereomicroscope by their vigorous motion. Identification of the helminths was done partly in live condition, partly after fixation

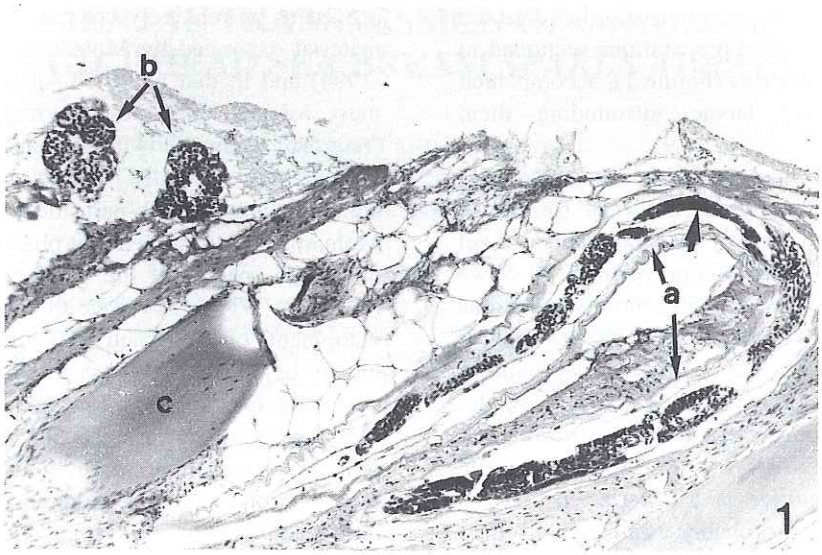

Figure 1. Histological section of an adult female specimen of *Daniconema anguillae* wriggling in an eel's fin. (a) Longitudinal section of female located in the connective tissue of the fin. This part of the female helminth's body contains mature (arrowhead) and developing larvae. (b) Cross section of the same female *D. anguillae.* This part of the body is filled by eggs. (c) Cartilaginous fin rays. Haematoxylin and eosin (H. & E.), × 110

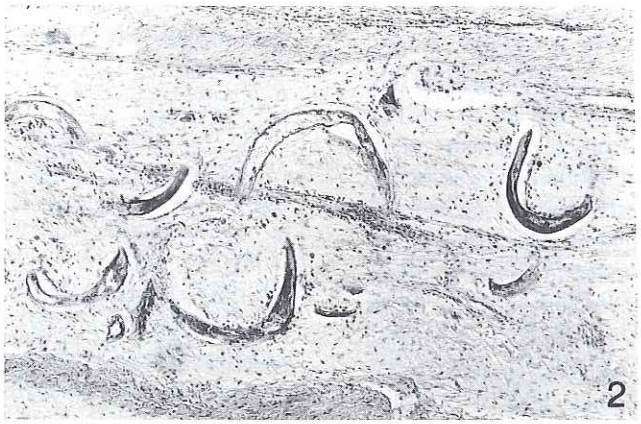

Figure 2. Third-stage (retarded) *Daniconema anguillae* larvae in an eel's fin. H. & E., × 110

in 10% hot formalin, under a coverslip, after they had been cleared in lactophenol.

Results

Before the occurrence of adult *Daniconema* stages in the fins was recognised and the new examination technique of pulling apart the fins was introduced, attempts to collect *Daniconema* adults had succeeded only from 9 out of 293 eel swimbladders examined (3%) during full parasitological dissection of the fish. In contrast, after introduction of the new method adult specimens could be collected from 8 out of 42 fins examined (19%).

Adult specimens could easily be detected also in histological preparations sectioned in the plane of the fins (Figure 1), accompanied by third-stage larvae surrounding them (Figure 2).

Discussion

Although in the cases observed by me *D. anguillae* infection in the swimbladder of eel never reached the high prevalence (30–50%) reported by Køie (1988b), the investigations presented in this paper prove that *D. anguillae* is an extremely common eel parasite whose female specimens can easily be detected not only from the swimbladder but also from the fins. My observations indicate that *D. anguillae* is a "filaria-type" tissue parasite which probably establishes itself in the loose connective tissue. The site of establishment is not restricted to the swimbladder and the fins; however, the latter organs represent the location from where detection of the parasite is the easiest. As the extremely thin and fragile parasite can be recognised only by its motion, its presence may be overlooked even in cases of intensive infection. Since the body of females simultaneously contains all developmental stages from eggs to first-stage larvae, a constant shedding of larvae from the parasite obviously occurs. Dissemination of larvae to different parts of the body probably takes place via the lymph circulation. The life cycle of the parasite undoubtedly involves an intermediate host. As members of the genus *Skrjabillanus* closely related to *Daniconema* develop in the fish-parasitic crustacean *Argulus* spp. as intermediate host, it is highly probable that *Daniconema* larvae also reach their maturity necessary for infectivity (i.e. the third larval stage) in that crustacean. On the basis of the special location, Molnár and Moravec (1994) could have assumed that the larvae found in the fins corresponded to the first-stage larvae of *D. anguillae* awaiting an intermediate host. However, the specimens found actually proved to be third-stage larvae. Since the size of larvae found in the fins proved to be relatively constant both in the material examined by Molnár and Moravec (1994) and in that collected subsequently, I must assume that these corresponded to "retarded" forms showing arrested development. Such "retarded" forms are rather common among fish-parasitic nematodes: Molnár (1969) observed that phenomenon in numerous species of the genus *Philometra* (*Twaitia*). While, however, the arrested development of philometrid nematodes can mostly be traced back to development in an unsuitable host, the large number of retarded forms seen in the case of *D. anguillae* is probably attributable to immunity induced by a previous infection, more specifically to the fact that some adult *Daniconema* specimens having established themselves in the host earlier impede the development of subsequently acquired specimens.

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