

NOTE

Anguillicola, a parasitic nematode of the swim bladder spreading among eel populations in Europe

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ABSTRACT: During the past 5 yr nematodes of the genus *Anguillicola*, that parasitize the swim bladder of eels, have spread throughout Europe. They are especially common in young eels among which infestation rates as high as 70 % have been recorded. These parasites were previously known only from East Asia and Australia.

Anguillicola is a genus of nematodes that live as parasites in the swim bladders of eels (Yamaguti 1935). As adults, the males can reach a size of 5 cm, and the females, 7 cm. They suck blood from the walls of the swim bladder, which gives them a dark brown to black coloration. The life cycle begins as the larvae hatch from eggs deposited in the swim bladder and exit into the surrounding water through the ductus pneumaticus and the digestive tract of the eel. There, they are consumed by planktonic copepods, in which they pass through subsequent molting and growth phases in the hemocoel (Hirose et al. 1976, Puqin & Yuru 1980). The last larval stage actively bores through the intestinal wall of the eel to reach the swim bladder, where the final molting occurs. It then takes about 8 to 10 mo for the worms to become sexually mature parasites.

Three species of the genus *Anguillicola* have already been described. These have been known for about 60 yr as parasites of East Asian and Australian eels. *A. globiceps* (Yamaguti 1935) has been known from *Anguilla japonica* since 1927. *A. australiensis* (Johnston & Mawson 1940) has been described as a parasite of *Anguilla reinhardtii* in Australia, and *A. crassa* (Kuwahara et al. 1974) was found in both *Anguilla anguilla* and *A. japonica* raised in Japanese eel farms. The species are distinguished by the number of large oval cells in the tail, the number of caudal papillae in the males, and the form of the esophageal bulb.

These nematodes were reported as parasites of *Anguilla anguilla* in Europe for the first time in 1982:

at about the same time they were found in North Italian culture facilities (Paggi et al. 1982) and in the open water of the Weser-Ems River region in Northern Germany (Neumann 1985). Since then, they have spread throughout Northern Europe with great rapidity. In the years 1985 and 1986, a 13 % occurrence rate was found among eels sampled from the Isselmeer, while 20 % of those from the Ems were infested. In the upper reaches of the Elbe, a 6 % rate of occurrence was detected, while in the Elbe Estuary, the rate was as much as 27 %. In the water bodies of Berlin, there is presently a 50 to 70 % rate of occurrence (U.A. Grosch pers. comm.). The eels first seem to become infested after they reach a length of about 20 cm and a weight of ca 10 g. At that time, they have already lived about 2 yr in fresh water. The frequency of infestation increases with the length of the individual until 40 cm is exceeded; thereafter the occurrence rate apparently decreases again. Nothing is known yet about the life cycle of *Anguillicola* in European waters. It is questionable whether copepods should be regarded as important intermediate hosts because they do not serve as a main food of the eels.

In the infested eels examined, the number of individual parasites ranged from 1 to 9. Both males and females, as well as larvae in various stages of development, could be found together in 1 swim bladder. The parasitized eels frequently contained acanthocephalans as well, and were often suffering from stomatopapillomatosis.

The damage caused by the parasites seems to vary greatly. According to our findings so far, minor to moderate infestation does not seem to influence the condition factor. A heavy infestation, however, increases the food quotient (Paggi et al. 1982) and leads to a thickening of the swim bladder wall (Yamaguti 1935, Neumann 1985). The parasitization takes on

economic importance by reducing the hardiness of the eels in captivity and thereby making it more difficult to transport and market them.

While the Italian nematodes were identified as *Anguillicola australiensis* (Paggi et al. 1982), those from Northern Germany cannot be unequivocally assigned to any of the known species. Their body length of 1.3 to 1.8 cm is far shorter than that of the 3 Asiatic species. It can be assumed that parasites of this genus were imported from Asia to Europe with eels to be used for stocking or food. Since they presumably found suitable intermediate hosts, they were able to quickly establish themselves. Because the supply of eels for culturing facilities must be obtained from wild populations the parasites represent a serious threat to this industry.

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