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## Infection of Threadfin Shad (*Dorosoma petenense*) by Larvae of Codworm (*Terranova decipiens* Krabbe) and Herringworm, *Anisakis simplex* (Nematoda: Ascaridoidea) in Umpqua River, Oregon

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Two nematode species, *Terranova decipiens* and *Anisakis simplex* were recovered from the intestine and omentum of threadfin shad, *Dorosoma petenense* caught in Umpqua river, Oregon in June, 2002. *T. decipiens* larvae were found in the intestine and *A. simplex* larvae were located in the omentum, respectively. The prevalence of the threadfin shad were 42.9%, infected by *Terranova decipiens* and 14.4% by *Anisakis simplex*. The intensity of *Terranova decipiens* larvae showed a range of 3 to 6 and a mean of 4.5 worms per fish, while the *Anisakis simplex* larvae were 0 to 2 with a mean of 1.0.

*Anisakis*-type larvae have been observed in the gastrointestinal tract of many species of fish, and assumed larvae to have an almost cosmopolitan distribution (Davey 1971). It is possible for *Anisakis*-type larvae to be transmitted to man through either raw or insufficiently cooked sea fish, which is preferred by man. Encysted larvae nematodes may be the cause of much financial loss and the symptoms in clinical cases are severe epigastric pain, sometimes accompanied by nausea, vomiting and other abdominal discomfort (Chittwood 1970). Pathological changes may include edema, inflammation, thickening of the mucosa, and bleeding at the point of penetration (Van Thiel *et al.* 1960; Oshima 1972; Doi 1973; Nagano 1974). The infection of the musculature and/or viscera by larval anisakid nematodes like *Anisakis simplex* and *Terranova decipiens* are of significance as potential human pathogens (Suzuki and

Oishi 1974).

This study was initiated to determine the prevalence and intensity of parasitic nematodes occurring in the gastrointestinal track of threadfin shad from Umpqua River, Oregon.

Threadfin shad, *D. petenense* were taken on rod and line in Umpqua River, Oregon, USA. The fish moved to the laboratory alive and preserved in ten percent formaline solution. The fish were examined immediately upon capture. A total of samples, ranging from 45.6 to 52.2cm in length, during June, 2002, and whole mounts for identification were prepared of each of species found. Host specimens were measured and the alimentary tract from fish was removed. The whole gastrointestinal tract was opened in a petri dish under water. Anisakine species larvae were cleared using glycerine for morphological examination. The specimens were examined under a stereomicroscope with magnifications up to 50x. Each host specimens was examined for endoparasites by use of conventional parasitological techniques.

Hosts were identified with the aid of the keys and descriptions of Love and Moser (1983). The parasite species were identified by using the keys in Dawes (1947) and Bykhovsky *et al.* (1962). The prevalence of infection was determined as a percentage of the number of shad sampled, and intensity was determined by the number of larvae per fish.

A total of 21 host specimens representing two species were examined. Infections of these species occurred by the threadfin shad. Mean length of 21 hosts was 48.9 cm, and mean length of 33 worms was 31.4 mm. Of all

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**Table 1.** Number of specimens of *Dorosoma potense* examined, percentage and distribution of nematode parasites in umpqua River, Oregon

No. examined	Length (mean) mm	No. infected	Infection rate (%)	No. of total larvae	Distribution (%)	
					Intestine	Omentum
21	25.9~34.0 (31.4)	9	42.9	33	91.0	9.0

**Table 2.** Details of the infection of twenty-one specimens of *Dorosoma potense*

Parasites	No. infected	% infected	No. worms recovered	Intensity		Position in host
				Range	Mean	
<i>Terranova decipiens</i> Krabbe, 1878	9	42.9	27	3-6	4.5	Intestine
<i>Anisakis simplex</i> Rudolohi, 1809	3	14.3	6	0-2	1.0	Omentum

hosts examined, 42.9% were parasitized by nematodes. The common nematodes recovered from *T. decipiens* were the larvae of codworm, *Terranova decipiens*, Krabbe 1878. In addition, the herringworm, *Anisakis simplex* was found, but at low levels of prevalence. Nematodes infested 9 hosts and 12 fishes examined were parasite-free (Table 1). *Terranova decipiens* was the predominant form of two parasite species, while *Anisakis simplex* showed a low rate of infection.

*Terranova decipiens* was only found in the intestine, whereas *Anisakis simplex* in the omentum. One of the infected hosts harbored six *T. decipiens* specimens in the intestine and two *A. simplex* in the omentum. Ensheathed larvae were extremely active, alternately coiling and uncoiling.

The prevalence showed that 42.9% of the fish were infected by *Terranova decipiens*, whereas only 14.3% were infected by *Anisakis simplex*. In all, the infected fish carried 33 nematodes, 27 of which were *Terranova decipiens*. Of the fish infected with *T. decipiens*, host specimens harboured 3-6 worms. The mean number of *T. decipiens* larvae per fish was 4.5 and in *A. simplex*, intensity averaged 1.0, with a range of 0 to 2. The mean number of worms per fish was 5.5, with a range of 3 to 8. Intensity of infection was low and prevalence low to moderate, with difference between species (Table 2).

*Terranova decipiens* larvae, codworm is a parasitic nematoda belonging to the family Anisakidae of the order Ascaridida. Larval *Terranova decipiens* known as codworm in the vernacular occurs in the musculature of the marine fishes in both hemispheres, particularly in

the temperature and polar climatic zones. Larvae *Anisakis simplex* may cause the so-called herring worm disease in man (Dailey 1975; Myers 1975).

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