Ribbon Tapeworms in fishes in Alberta

Common name

ribbon tapeworms

Scientific name

Ligula intestinalis

Schistocephalus solidus

Schistocephalus pungitii

What's Bugging Wild Critters?

Fact sheet #41: Ribbon Tapeworms

Significance

Ever catch a fish with a really BIG belly, one that looked "pregnant"? Chances are the swollen belly contained a large, white immature tapeworm. In some situations these larvae can cause serious damage to the fish, particularly a small fish with a large worm. Fortunately they are harmless to humans. In fact, in some countries these larval tapeworms are fried and eaten on purpose!

What? Where? How?

Small fishes occasionally have big worms in their bellies. There are two primary types of ribbon tapeworm: species of *Ligula* and *Schistocephalus*. *Ligula intestinalis*, is easy to recognize: a relatively flat white worm, usually 10 to 60 cm long and 5 to 10 mm wide – like a fleshy flat ribbon. The body wall is smooth, with no sign of segmentation over most of its length {unlike earthworms, which have conspicuous segments along their entire length). However, segments are present near the anterior end of the tapeworm, and sometimes the body looks 'wrinkled' but these are not real segments. Its most distinctive feature is a crease-like furrow or shallow channel that runs lengthwise along the surface on both flat sides of its body.

Ligula occurs in cyprinid fishes, a large family of small fishes found throughout the world. Although usually seen in minnows, *Ligula intestinalis* can live in lake whitefish, yellow perch, and various suckers and trout. Once established in the belly, the tapeworm usually outlives the fish and takes up a new life in whatever fish or bird eats the infected fish.

Similar tapeworms, *Schistocephalus* species, are near-look-alikes for *Ligula*. However, external segmentation is present along the full length of these tapeworms and they live in different fishes: sticklebacks. One species, *S. solidus*, occurs in 3-spined sticklebacks and another species, *S. pungitii*, in 9-spined sticklebacks, reflecting the different origins of these fishes in Europe and North America, respectively. Although the fishes are close relatives, there is enough difference to support the two separate species of tapeworm.

Like all tapeworms, these worms rely on other species to provide a place for them to live, eat, and reproduce. They are masters of stealing food from their host: they simply absorb nutrients through their body surface. Unlike most species of tapeworms, *Ligula* and *Schistocepahus* float freely in the body cavity of the fish, rather than lying enclosed within the intestines. They can be big, impressive animals--especially when they come out of the belly of a tiny minnow, where they can easily weigh more than the fish! In larger fish, some larvae grow up to 1.4 m long and more than a centimeter wide.

Ribbon Tapeworms in Alberta

(*Ligula* spp., *Schistocephalus* spp.)

Transmission Cycle

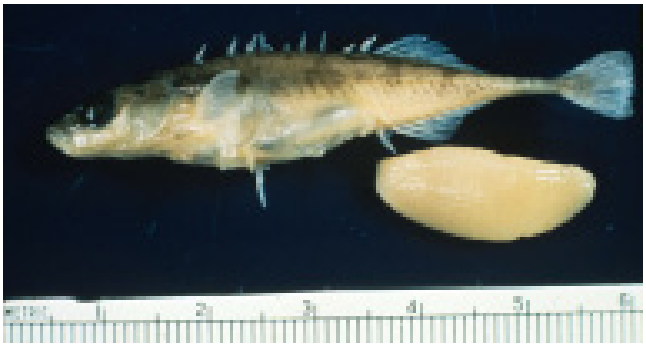
Adult ribbon tapeworms live very brief lives in the intestines of fish-eating birds such as gulls, herons, and grebes. Their eggs pass out with the bird faeces into a lake where they hatch into small larvae covered in tiny hairs, or cilia, that help them swim. Most larvae probably die but the lucky ones are eaten by little planktonic crustaceans called copepods - 'lucky' because the larvae do not die in the copepod. If the copepod, in turn, is eaten by a minnow or other fish, the larval tapeworm burrows through the intestinal wall and sets up housekeeping in the abdominal cavity of the fish.

Tapeworms are very patient. The larvae can live in the fish belly for several years waiting to get into a fish-eating bird, one that provides the right conditions for the tapeworm to mature and complete its life cycle. There is some evidence that infected fish may be easier for the birds to catch, perhaps because their big belly makes them fatter, slower, and less maneuverable. They also spend more time lolling at the surface and are quicker to return to the surface if disturbed, due to increased oxygen demand as a result of presence of the tapeworm. This makes the fish more readily seen and caught by hungry birds. This of course works in favour of the tapeworm, not the fish!

Distribution in Alberta

Ribbon tapeworms occur throughout the province. In the Cold Lake region, for instance, most older (4 yrs) spottail shiners are infected. In fact, *Ligula* is much more common than most people realize, but it usually passes unnoticed because few people fish for minnows and even fewer open them up and look in the abdominal cavity. Anglers are more likely to notice *Ligula* on the occasions when it turns up in a bigger, more commonly caught fish such as a perch, whitefish, or sucker. Back in the 1980s, for example, high concentrations of *Ligula* turned up in white suckers in Lee Lake near the Crowsnest Pass, and longnose suckers in Chain Lakes Reservoir west of Nanton, and the Upper and Lower Kananaskis Lakes. It may be that most sucker populations in Alberta also share their existence with ribbon tapeworms.

Tapeworms closely related to *Ligula* also live in Alberta. In the foothills of the Rocky Mountains *Schistocephalus solidus* and *S. pungitii* are common wherever sticklebacks are found. These large white larval tapeworms have a life cycle similar to *Ligula* and they, too, are harmless to people.



WCVM, Saskatoon

Importance for Fisheries Management

A big tapeworm in a small fish is a recipe for trouble. Its sheer weight and size can swell the belly of the unfortunate fish and destroy any chance of efficient swimming. Such fish wallow through the water and are much more at risk of being caught and eaten by predatory fish or birds. And that's not all— the sheer size of the tapeworm in the body cavity takes up a lot of space and eventually interferes with sexual maturation of the fish by limiting development of the sex organs.

With all these effects, it's not surprising that these worms can play a role in affecting the number of fish in the lake. Studies in Europe suggest that fish populations crash when the tapeworms become common. However, there is an ongoing balance of life in natural systems and the situation corrects itself without human interference. When suitable fish become scarce, *Ligula* and *Schistocephalus* have a harder time completing their life cycle and their own populations crash. The cycle then starts all over again.

Alberta Government

Fish & Wildlife

November 2014

Wildlife diseases in Alberta: esrd.alberta.ca/fish-wildlife/wildlife-diseases/

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(*Ligula* spp., *Schistocephalus* spp.)

Public Significance

Anglers have no reason to be concerned about *Ligula* or *Schistocephalus*. These tapeworms cannot infect humans. In fact, they are big enough that some people eat them intentionally, often as a delicacy! A few culinary options include fried up and eaten as a main dish or served as a side dish of vermicelli vivente ("living spaghetti"). Hey, each to their own.

Prevention/Control

Severe outbreaks of ribbon tapeworms in a local fish population are self-regulating and do not require fisheries management intervention. Besides there is little that can be done to control these critters.

AB Fish & Wildlife

Summary

Although ribbon tapeworms look impressive because of their size they often go unnoticed. They usually infect small fishes like shiners and sticklebacks, but even when they turn up in bigger fish, they are easily seen and removed. Natural cycles of occurrence do not pose significant long-term risk to affected fish species. These tapeworms pose no risk to humans.

Additional Information

www.fisheriesmanagement.co.uk/fish%20dieases/ligula.htm [note: "dieases" is correct]

evolution.unibas.ch/scharer/research/former_research/schistocephalus/schisto_overview.html

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