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ROBERT J. BOLES

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Fish Worms

by

Robert J. Boles *

The following information is not intended to be a scientific discussion of fish parasites. It has purposely been kept simple, with a minimum of difficult terminology, so that the average fisherman will find it easy to read and understand, and to find some of the answers to his questions about the various worms that might be found in Kansas fishes.

Fishes are often hosts to various kinds of parasitic worms, such as flatworms, or flukes, tapeworms, roundworms, spiny-headed worms, and leeches. They may also harbor parasites related to the crayfish, called fish lice. Most of these parasites may be readily seen by the naked eye.

Other parasities, such as bacteria, fungi, and protozoans, require a microscope to be seen, though the damage or injury caused by these parasites can sometimes be observed on the infected fish. The mircroscopic parasites have not been included in this booklet.

FLATWORMS
(Flukes, or Trematodes)

YELLOW GRUB

One of the most common fish parasites seen in Kansas fishes, especially in fish from farm ponds, is a yellowish, worm-like form found embedded in the flesh, or more often just under the skin, often near the bases of the fins. When picked out from its covering, the worm may be seen to be about three-sixteenths of an inch long, and moves by slow extensions and contractions of its body. The common name of this parasite is "yellow grub". It is one of the stages in the complicated life cycle of a flatworm (*Clinostomum* sp.), commonly called a "fluke". Other immature stages may be found in certain species of snails, (Figure 1) while the adult form is found in the throats of herons, especially the common great blue heron, so often seen feeding in the shallow areas of lakes and ponds. The life cycle and the names of the various stages are shown in Figure 2.

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* The author is a Professor of Biology at Emporia Kansas State College.

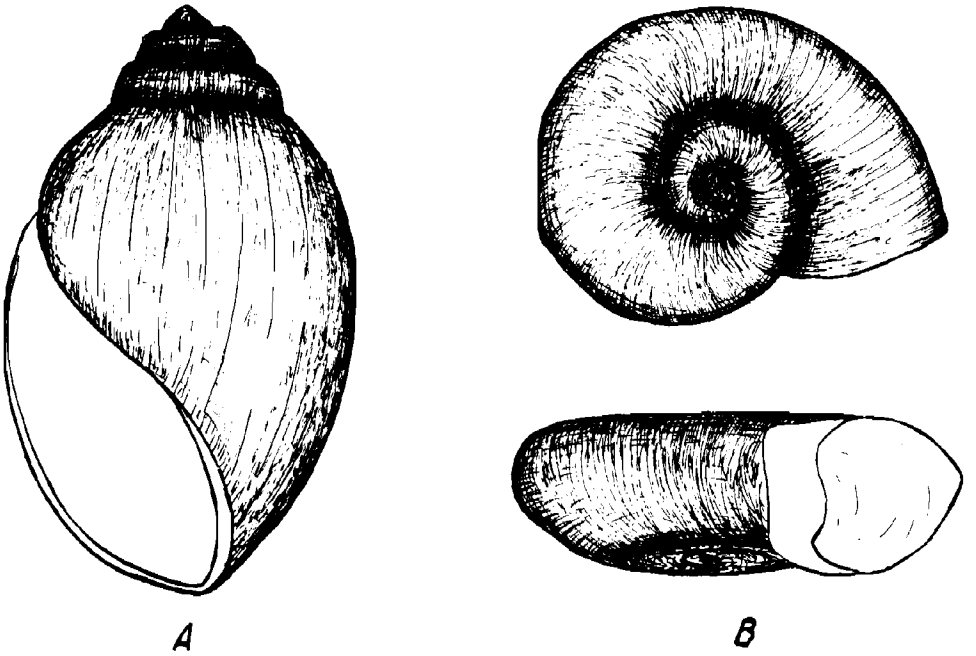

Figure 1.

The two kinds of snails (A. *Physa*, B. *Lymnaea*) that most often serve as intermediate hosts for flukes in Kansas. Both are common in most ponds and lakes in the state.

Fishes may have many of these larval flukes embedded under their skin or in their flesh with little apparent injury. This is primarily because the worm does not multiply in this stage, but takes only enough food from the host fish to keep it alive until the fish is eaten by the final host, the heron. Fishes infected with this worm need not be thrown away, as the parasite does not affect man. If the fisherman can overcome his revulsion at the thought of eating a "wormy" fish, or is willing to be deceitful enough not to tell his family or guests about the worms in the fish, no one will be the wiser, and will find the fish, when properly cooked, every bit as delicious as if the fish had had no worms at all. Were one to eat the fish raw or insufficiently cooked, the larval form might temporarily attach to the throat of the consumer, causing coughing and even vomiting. This condition has been given the rather descriptive name of "parasitic pharyngo-laryngitis", or halzoun. The attachment would, at most, be only temporary, and would have no serious effects upon its human host.

Fishes in small ponds are more apt to be infected than fishes in larger bodies of water or in streams, as the stage that leaves the snail can more easily find a fish to infect, due to crowding and shorter distances

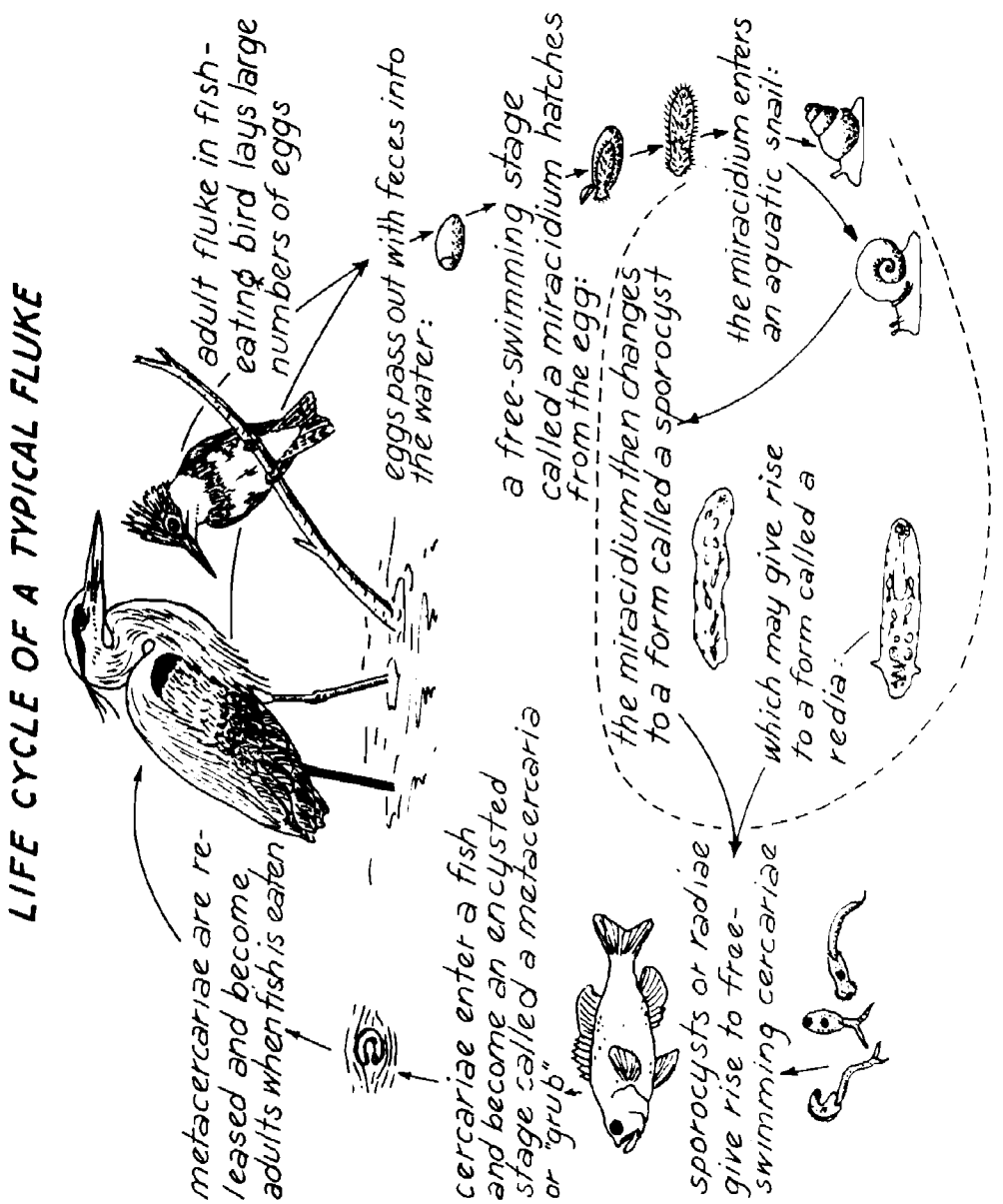
LIFE CYCLE OF A TYPICAL FLUKE
adult fluke in fish-eating bird lays large numbers of eggs
eggs pass out with feces into the water:
a free-swimming stage called a miracidium hatches from the egg:
the miracidium then changes to a form called a sporocyst
the miracidium enters an aquatic snail:
which may give rise to a form called a redia:
sporocysts or rediae give rise to free-swimming cercariae
cercariae enter a fish and become an encysted stage called a metacercaria or "grub"
metacercariae are released and become adults when fish is eaten

Figure 2.

to travel to reach the host. The parasite is not host-specific, but may attack almost any species of fish with which it comes in contact.

Black Grub

Almost as often as finding the yellow grub, the fisherman will find fish with great numbers of tiny black spots, usually just under the skin near the bases of the fins, though these tiny black spots may sometimes be found scattered throughout the musculature of the host. This, like the yellow grub mentioned earlier, is the larval stage of another flatworm (*Uvilifer ambloplitis*), often called the "black grub". The larva, or metacercaria, is actually a whitish color, but the host reaction to the parasite causes the fish to lay down a black covering of tissue about the parasite. This stage of the black grub is much smaller than the corresponding stage of the yellow grub, and never constitutes a danger to man, whether he eats the flesh of his fish cooked or raw. Like the yellow grub, this stage in the fish is not host-specific, and many species, especially sunfishes and minnows, may be infected. The life cycle, as is true of all the flukes infecting fish in Kansas, involves a snail. The final host is the kingfisher, a bird often seen along the shores of lakes and streams.

Hysteromorpha triloba

The host for the adult stage of the fluke *Hysteromorpha triloba* (no common name, unfortunately) is the cormorant or heron. The rather large metacercariae may be found in the muscles of catfish, especially the black bullhead. They are whitish, about the size of the head of a pin, and may be seen scattered through the flesh of the skinned fish. The writer has seen infected bullheads where there appeared to be more metacercariae than flesh. Such fish may be stunted in size, thin-bodied, and have a sickly, gray color. Though the cooked flesh would not be harmful to eat, the appearance is most unappetizing.

Swimmer's Itch

A number of people each summer, especially children, who make repeated visits to Kansas ponds, lakes, or reservoirs, may find that they break out into an inflamed, itching rash after several trips to the swimming area. The rash somewhat resembles that caused by poison ivy, and is often blamed upon contact with this toxic plant. The condition, more technically known as schistosome or cercarial dermatitis, is caused by a larval stage of flukes called cercariae, (Figure 3) that normally enter other vertebrates, penetrating the skin of the swimmer.

The cercariae swarm near the surface in shallow water, and great numbers may be present in the swimming area on warm, sunny days. The normal host is some aquatic vertebrate, most often migrating ducks or other waterfowl.

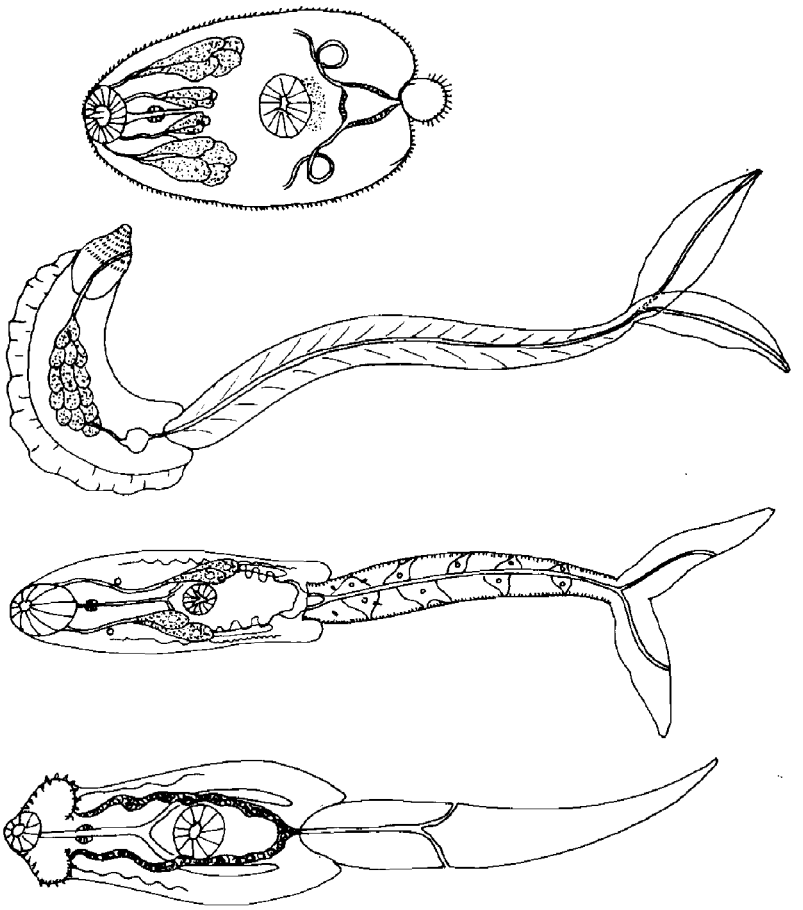

Figure 3.

Cercariae may be single-tailed, forked-tailed, or have only a tiny stump for a tail. Only those with penetration glands can gain entrance directly into the host's body. Those that encyst on vegetation usually involve a plant-eating animal in their life cycle (e.g., the sheep-liver fluke.) Cercariae escape from infected snails, and are barely visible to the naked eye.

Though cercariae do not develop to the adult stage in the human, they will readily penetrate the skin when the opportunity arises. Alternate wetting and drying, especially by children playing in shallow water near the shore, increases the chance of the cercariae successfully entering through the skin. The number of cercariae that penetrate may be reduced by wiping the skin dry immediately after leaving the water.

The first cercariae to penetrate the skin cause little if any discomfort. However, the body defenses start to build up an immune reaction against these invaders that results in the cercariae becoming trapped in the skin soon after they penetrate. After sensitization, cercariae entering the skin cause a prickly sensation, followed by the development of itchy pustules. In some cases there may also be considerable swelling.

In severe cases the itching may interfere with sleep, and highly sensitized individuals may be temporarily incapacitated. Fortunately, most cases are relatively mild and of short duration, usually lasting about a week or less.

As the cercariae causing swimmer's itch must come from a snail, the most logical control step is to apply some molluskicide, or snail killer, in the area where swimming is to be done. Several chemicals for killing snails are now available, but some are toxic to fish as well as snails, and may have an adverse effect upon the fishing of the pond or lake. Copper salts, such as copper sulfate, can be used in the shallow areas, and copper carbonate in water over two feet in depth. Apply the chemicals at the rate of three pounds of the mixture per 10,000 feet of lake or pond bottom.

Snails may be checked for infection in the following manner:

a. Place the snail in a small glass vial with some clear pond or lake water.

b. Stuff a piece of cotton in the open end of the vial to keep the snail from crawling out.

c. Place the vial in a dark place for several hours.

d. Remove the vial from the dark and place it under a bright light.

If infected, a snail will start shedding cercariae in a short time. Cercariae are barely visible to the naked eyes, and may be seen as tiny whitish objects swimming erratically through the water of the vial when it is held up to the light. Examination under a microscope will reveal whether they are single-tailed or worked-tailed. In Kansas, as high as 11 percent of the snails in a pond may be infected and shedding cercariae. Not all kinds of cercariae cause swimmer's itch, but encyst on vegetation, where they may be picked up by the final host, a plant-eating animal.

TAPEWORMS

Tapeworms are very common in Kansas fishes. Two stages of the life cycle may be seen: (1) adult worms that live primarily in the fish's intestine, and (2) a larval stage, the plerocercoid, which may be found embedded in the muscles and such internal organs as the liver. In the case of fish tapeworms there is another larval stage, the procercoid, which lives in tiny aquatic arthropods. Small fishes become infected with the plerocercoid stage by eating procercoid-infected arthropods. Larger fishes, eating the small fishes with the plerocercoid stage, develop the adult tapeworms in their digestive tracts (Figure 4).

The adult stage usually causes little if any damage to the fish that can be observed. It is disconcerting, however, to be dressing a fish

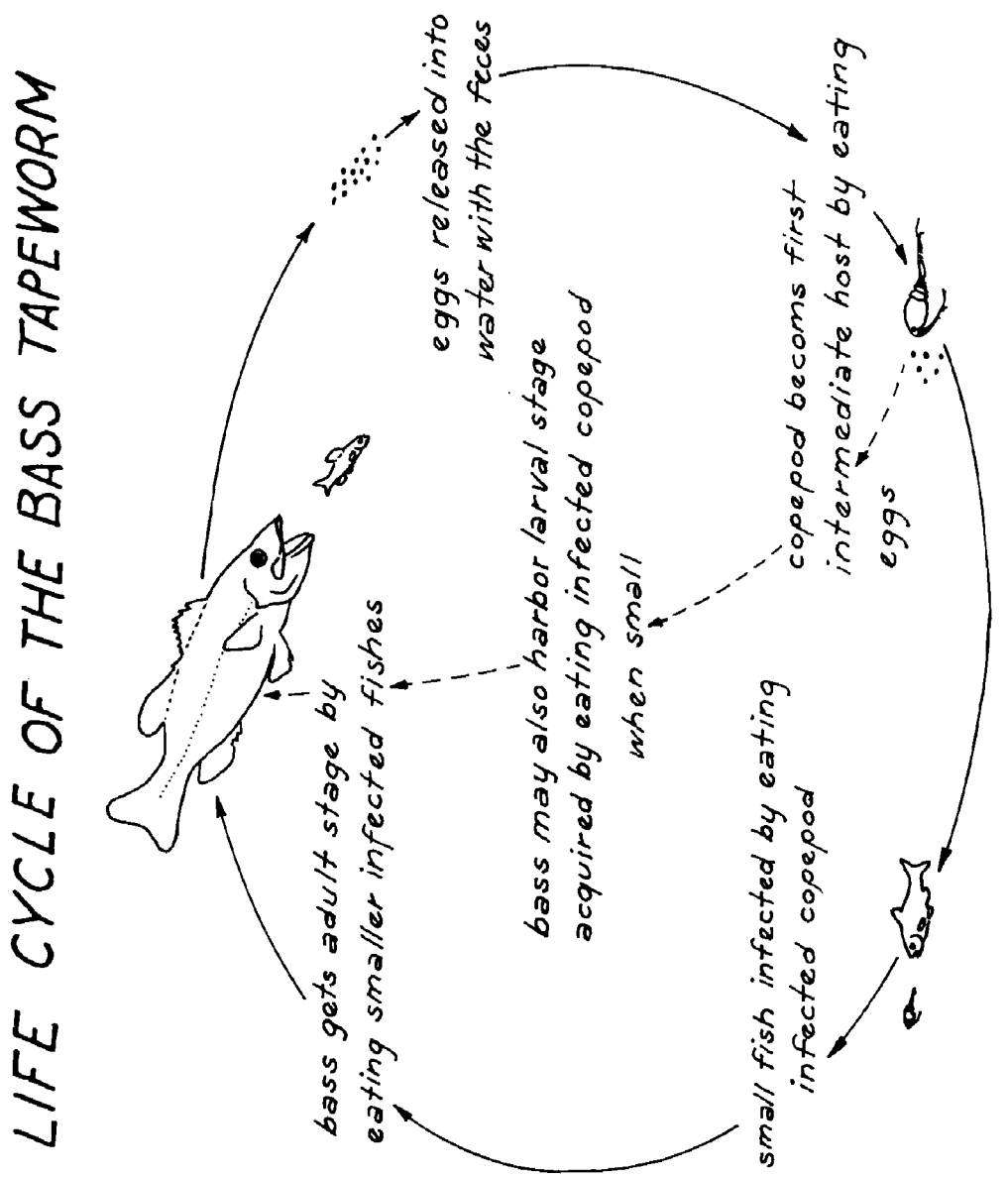
LIFE CYCLE OF THE BASS TAPEWORM
eggs released into water with the feces
copepod becoms first intermediate host by eating eggs
small fish infected by eating infected copepod
bass gets adult stage by eating smaller infected fishes
bass may also harbor larval stage acquired by eating infected copepod when small

Figure 4.

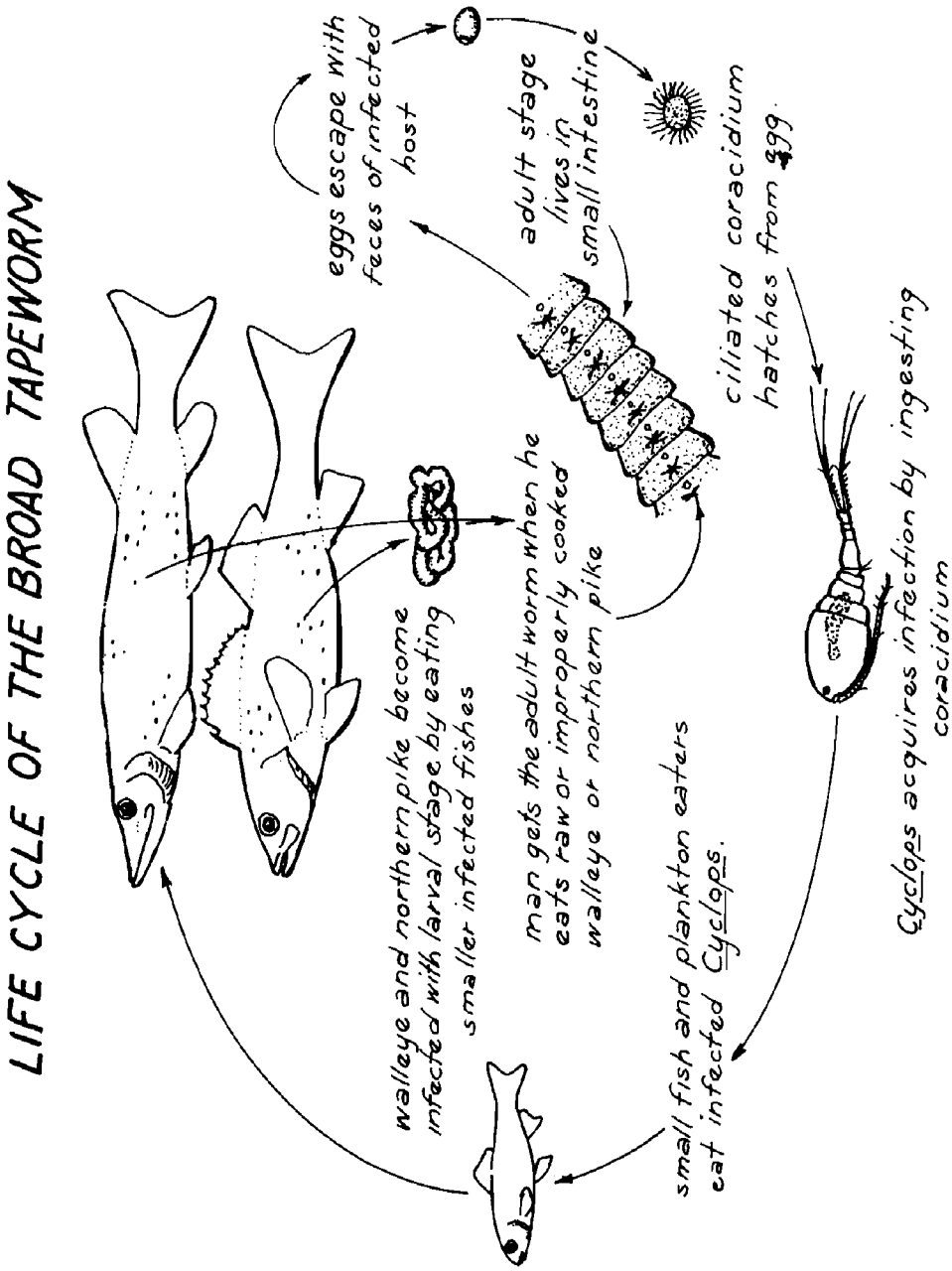
LIFE CYCLE OF THE BROAD TAPEWORM
eggs escape with feces of infected host
adult stage lives in small intestine
ciliated coracidium hatches from egg.
walleye and northern pike become infected with larval stage by eating smaller infected fishes
man gets the adult worm when he eats raw or improperly cooked walleye or northern pike
small fish and plankton eaters eat infected Cyclops.
Cyclops acquires infection by ingesting coracidium

Figure 5.

and discover the ribbon-like tapeworm being extruded from a cut in the intestinal wall. A heavy infection of adult tapeworms may well interfere with the normal growth of the infected fish.

The plerocercoid stage may be much more injurious to the fish than the adult stage of the tapeworm. Vital organs may be damaged, the number of eggs produced by the female reduced, or, when the larvae invade the reproductive organs, the parasitized fish may become sterile.

No fish tapeworms in Kansas present any danger to man. The adult stage is discarded along with the internal organs when the fish is dressed, and any larval stages in the muscle tissue are killed when the fish is cooked.

ROUNDWORMS

Kansas fishes have a number of roundworm parasites (Figure 6), most of which are small, almost transparent, and do not normally invade

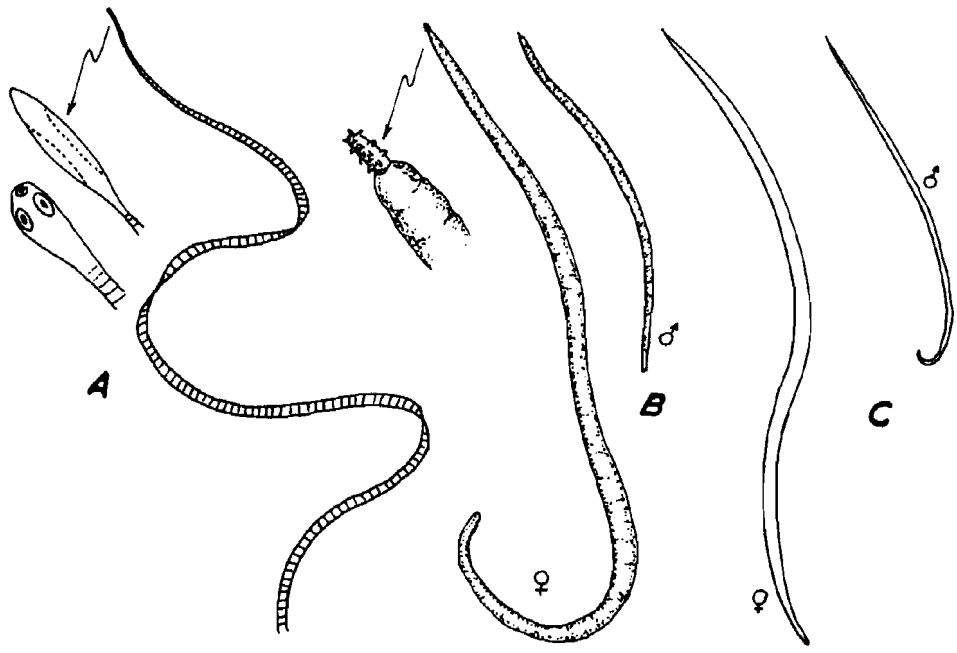

Figure 6.

The adult stage of each of the above worms lives in the digestive tract of the fish host. Tapeworms (A) attach themselves by means of suckers. Each segment of the worm contains both male and female sex organs. Spiny-headed worms (B) and roundworms (C) have separate sexes, the male being much smaller than the female. The spiny proboscis of the spiny-headed worm is buried in the wall of the intestine for attachment.

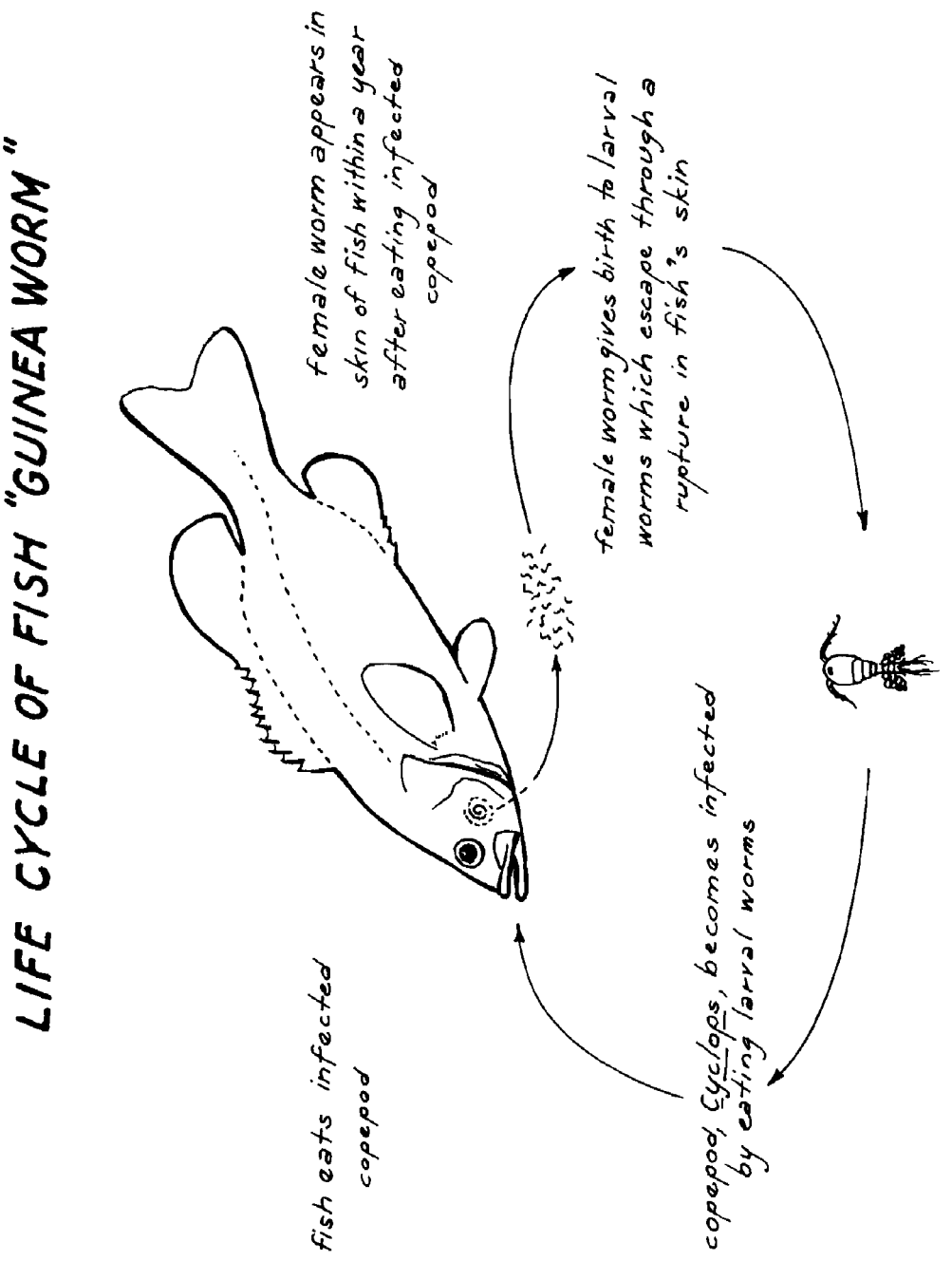
LIFE CYCLE OF FISH "GUINEA WORM"
female worm appears in skin of fish within a year after eating infected copepod
female worm gives birth to larval worms which escape through a rupture in fish's skin
copepod, Cyclops, becomes infected by eating larval worms
fish eats infected copepod

Figure 7.

the edible portions of the fish. One, however, the fish "guinea worm," *Philometra nodulosa,* may catch the attention of some fishermen (Figure 7).

The female of this worm is a long, slender worm that may be coiled just under the skin below and between the gills, in the cheeks, or may extend across the lips of the fish. They cause a raised, inflamed ridge, but seem to cause little other damage.

Though related to the large guinea worm, or "fiery serpent," that causes considerable human suffering in Africa and Asia, the Kansas form does not cause any diseased condition in humans.

SPINY-HEADED WORMS

A number of species of spiny-headed worms may parasitize Kansas fishes (Figure 6). These parasites are rather small, and are confined to the intestine and other abdominal organs. Fish usually become infected by eating insects containing the larval stage of this worm. Unless the fish is too heavily infected, they cause little or no visible damage, and are discarded when the fish is dressed. Man is not a host for the spiny-headed worms of fish.

LEECHES

A leech looks something like a large external fluke (Figure 8). However, leeches have segmented bodies, like earthworms, while flukes do not.

Several species of Kansas leeches will attack fish. They usually attach themselves to the fish, take a large blood meal, and leave the fish until hungry again. A few leeches cause little damage, but a fish attacked by large numbers of leeches may be severely harmed. Leeches, in the role of the intermediate host, may also serve to help spread several fish diseases. Most of our fishes, however, have few leeches.

A leech may occasionally attach itself to a human who is swimming or wading in water. It may even decide to vary its diet with some human blood while attached. The sucker by which they attach themselves is powerful, and a leech is difficult to remove. Kansas leeches do not cause or carry any diseases that affect humans, but the wound left after the removal of a feeding leech may bleed profusely for some time, due to the anticoagulant the leech has introduced into the wound, slowing down the clotting process of the blood.

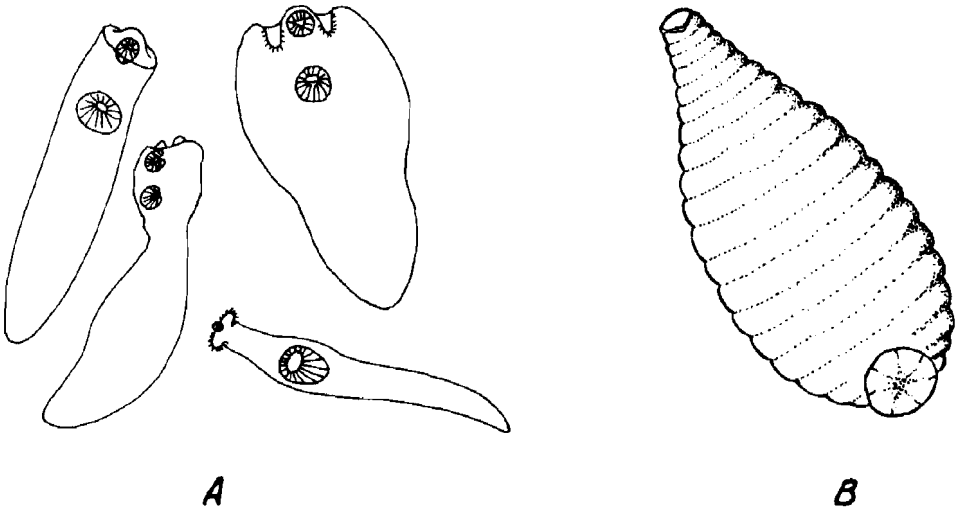

Figure 8.

Adult flukes (A) show a slight resemblance to leeches (B). Both are parasitic, and both have suckers for attachment. However, flukes are small, some hardly visible to the naked eye. They have complicated life cycles, unsegmented bodies, and most are internal parasites. Leeches, on the other hand, have segmented bodies like earthworms, are easily seen without magnification, and attach themselves to the outside of the body of the host.

SOME FISH PARASITES OTHER THAN WORMS

A number of parasites other than worms attack Kansas fishes. Several of the more common of these parasities are discussed below.

PARASITIC ARTHROPODS

Arthropods (e.g., insects, crayfish) have their skeletons on the outside of their bodies, and possess jointed appendages (e.g., legs, antennae). There are perhaps 750,000 different kinds, and some have taken up a parasitic existence in or on fish. Many, also, are important items in the diet of fishes. The latter permits the arthropod to serve as one of the links in the life cycle of a number of fish parasites, the fish getting the parasite when an infected arthropod is eaten.

Fish Lice

Fish lice are parasites that live on the outside of fishes, and are related to the crayfish (Figure 9). They may occasionally occur in such numbers that they kill large numbers of fishes in a lake or pond, especially if the water is low and the fishes are crowded closely together.

Infected fish may be observed to scrape their fins and bodies along the bottom or on rocks, until their fins may become frayed and almost

gone. Inflammed and irritated sores may develop, and some fishes may become infected with a fungus, or water mold, which gains entrance through the broken protective mucous layer and skin of the weakened fish.

Fish lice soon leave a fish after it is removed from the water. The flattened, almost transparent parasites are overlooked by most fishermen.

These parasites do not attack humans, and, unless one should get into the eye of a person swimming in a lake or pond, need not be a cause of worry in Kansas waters.

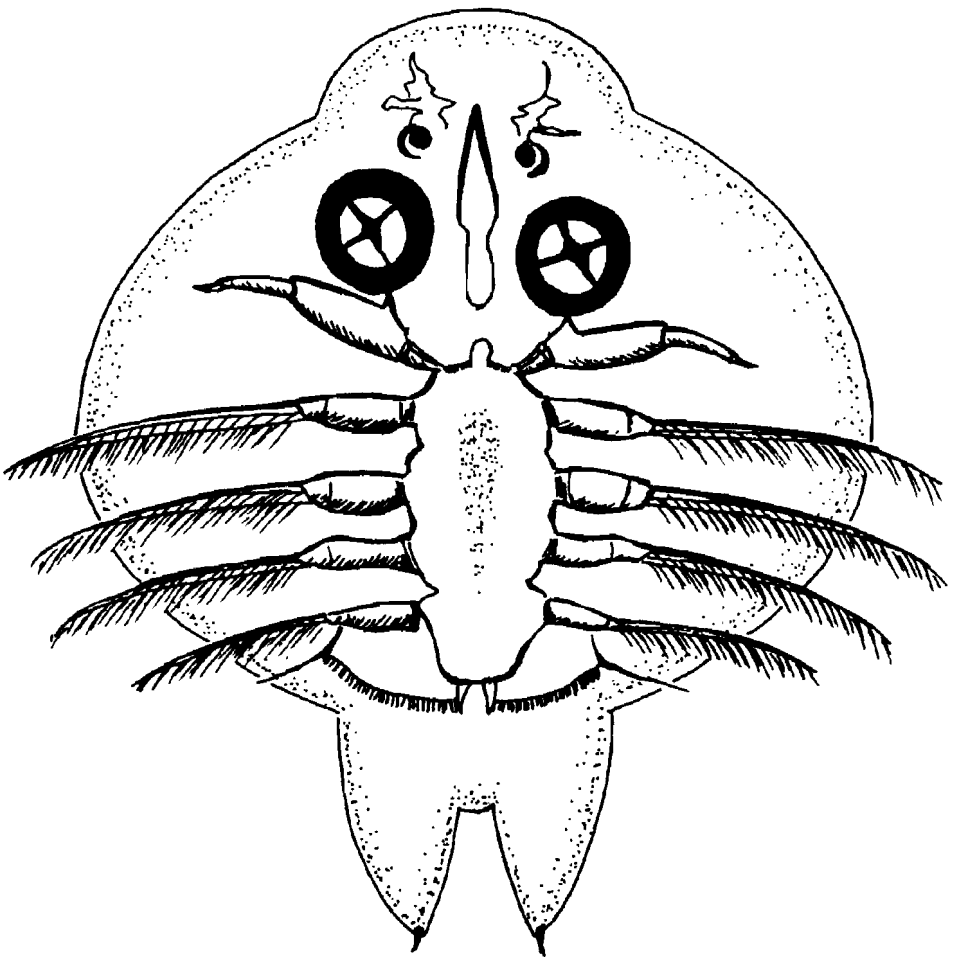

Figure 9.

Fish lice, like anchor worms, are arthropods that have adapted to a parasitic way of life. Both male and females are parasitic. They pierce the fish's skin and feed on the blood of the host. The flattened, almost transparent parasite is easily overlooked by the fisherman or aquarist.

Anchor Worms

This parasitic arthropod gets its common name fro mthe anchor-shaped body that has evolved during its parasitic existence (Figure 10). The adult female buries the anterior half or her body in the flesh of the fish, and feeds on the blood and lymph of the victim. If in sufficient numbers, they may cause serious damage to fish, especially when fish are confined in close contact, as in fish farms, or when lakes or ponds become low during times of drought. An infected fish introduced into an aquarium will soon result in most, if not all, of the fish becoming infected. In the laboratory, the writer has found bullhead catfish to be particularly resistant to anchor worm infection.

Anchor worms do not attack humans. They are usually removed when the fish is scaled, skinned, or filleted, and unless the fish is conspicuously injured, are no cause for discarding the fish as unfit for human consumption.

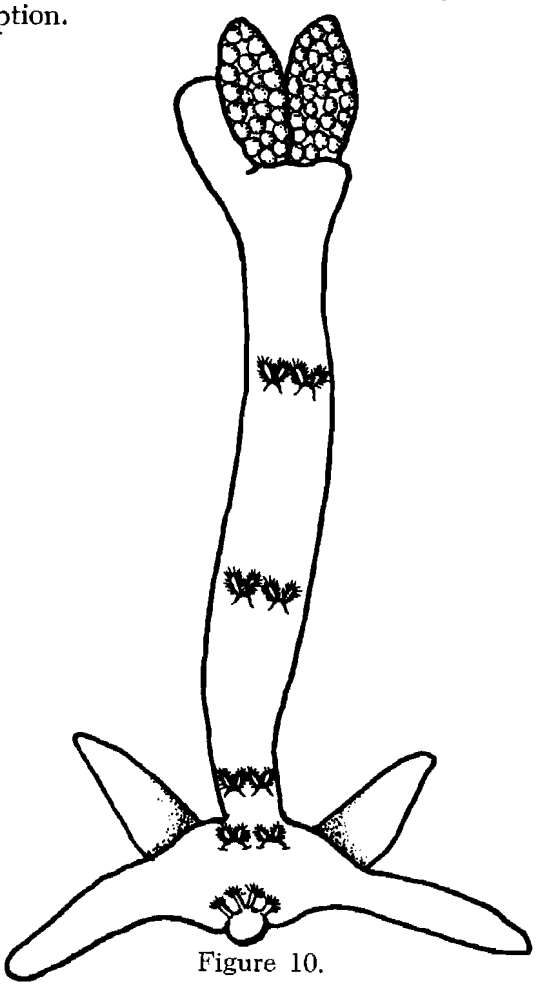

Figure 10.

Anchor worms are not really worms, but are parasitic arthropods related to crayfish. The head end is the "anchor", which is embedded in the flesh of the fish. The posterior end of the "worm" hangs free in the water. The sketch is of a female with egg sacks attached.