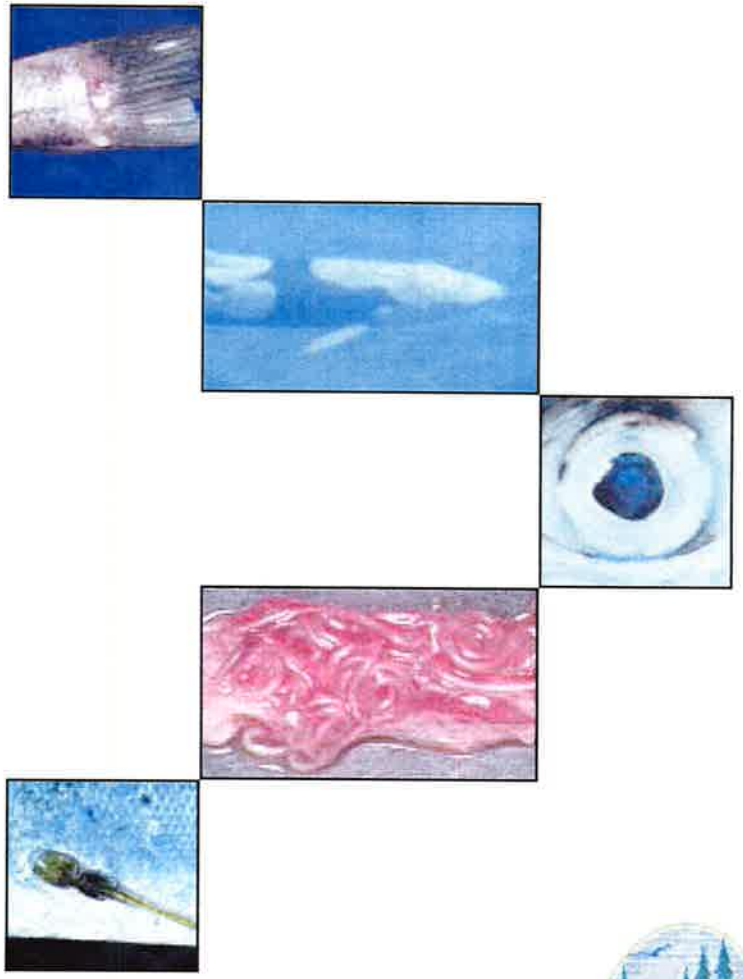
Common Parasites and Diseases in Washington Fish



Washington Department of
Fish and Wildlife

Proper Preparation

Adequate freezing and/or cooking will kill bacteria, parasite larvae and any doubt about safety. But how much cooking is enough? The following guidelines will help you enjoy your catch with confidence:

- Freezing: In home freezers, fish should be frozen for seven days to ensure parasites such as roundworms are killed. Extended freezing is necessary if fish are to be eaten raw in sashimi, sushi, ceviche or other recipes. Such freezing is not necessary if fish will be thoroughly cooked before consumption. If fish are cleaned promptly, wrapped and frozen while still fresh, the quality of the meat doesn't suffer from spending time in the freezer.

- Cooking: Fish that have not been frozen should be cooked until all translucent parts of the meat have turned solid color or white, and all parts of the meat flake easily with a fork. Filleting large fish will make thorough cooking easier. Using previously frozen fish will alleviate worries if fish is to be prepared on the rare side.

- Smoking: Contrary to popular opinion, smoking does not preserve fish. So-called "Light-smoked" fish and fish that have been prepared in smokers that do not reach high temperatures can carry the same risks as raw fish. The meat must reach tempratures of 140 degrees Farenheit throughout the fish, including the thicker portions, to kill parasites and must reach 180 degrees Farenheit to kill any bacteria. Finishing lightly smoked fish in a 250-degree oven until the proper temperatures are reached is highly recommended.

- Salting or Marinating: The safety of salted or marinated fish cannot be assured unless the meat has first been frozen for seven days. Previously frozen fish shoud be used in any recipe calling for raw, marinated or creamed fish.

Henneguya spp.

This myxozoan parasite forms small white or yellow cysts about the size of a rice grain in the flesh of marine fishes like salmon, rockfish and flatfish. These usually do not affect the flavor, texture or safety of the meat, but one species, ***H. salmincola*** may produce visible cysts filled with milky fluid in coho and sockeye salmon, reducing the attractiveness of the flesh. However, this is not a common problem.

(Henneguya cysts in coho salmon, Norm Nelson)

Kudoa spp.

Myxozoan parasites of the genus ***Kudoa*** form white cysts in the muscle of salmon and many other local marine fishes. The frequency of this problem is very low in wild-caught salmon. The cysts may be large enough to form noticeable white patches or streaks in the meat. After the death of the fish, the parasites release an enzyme that breaks down muscle tissue and causes the flesh to become soft and less desireable as food. The enzyme is fairly heat-stable and may continue to breakdown tissue even if the meat is smoked.

Is it safe to eat?

When the fish at the end of the line looks a bit "grubby," parasites or disease are generally the cause. Parasites and fish disease are part of the ecosystem, so the occasional infected fish is only natural. But anglers naturally wonder if a fish showing signs of infection is safe to eat.

The answer is usually yes–with proper preparation. Although extra care should be taken when handling fish affected by certain parasites, proper freezing and/or cooking will make your catch safe to eat.

Evidence of parasites or disease in an occasional fish doesn't automatically indicate an unhealthy environment. It also doesn't mean that every fish in the area will be affected in the same way.

This booklet is intended to help anglers recognize the signs of fish parasites or disease and the recommended methods of fish preparation.

Virus, Bacteria or Parasite?

This booklet illustrates common fish disorders that are the result of parasites, bacteria or viruses.

Sport fishers are more likely to come into contact with fish affected by bacteria or parasites than those with viral infections. That's because wild fish with viral infections are generally weak and unlikely to bite, so natural predators catch them before anglers do. Hatchery fish with viral infection such as IHN (infectious hematopoietic necrosis) are detected while they are still at the fry stage. Although it is possible that an adult salmonid with a viral infection might be caught by an angler, there is no threat to human health from fish viruses.

Parasitic infections may be more noticeable at certain times of the year. Parasites go through as many as six different stages from egg through adult, and most parasites spend only part of their life cycle in fish. Lake fish are the more susceptible to parasites because of warmer water temperatures and the abundance of other organisms through which parasites may be transmitted.

Parasite precautions

Most common North American fish parasites are not harmful to humans, but a few–including tapeworms, flukes and roundworms–can infect people.

To be on the safe side, it's a good idea to protect open cuts on your hands when cleaning or handling raw fish.

Persons with weakened immune systems, in particular should wear protective gloves when handling raw fish, or have someone else clean their catch.

Best Guide is Common Sense

Using common sense is the first step in selecting fish for consumption. Don't eat fish that are found dead or dying. If the fish smells bad or if the flesh is obviously affected throughout, don't take a chance on eating it. Dispose of the fish, taking care that the carcass will be secure from scavenging pets or wildlife.

Bacterial and Myxozoan Parasites in the Meat

In most bacterial and internal myxozoan diseases, affected areas can be cut away and the rest of the fish eaten after thorough cooking or freezing. However if the infection is extensive or the fish has a puffy body and swollen eyes (dropsy), the meat should not be eaten. Myxozoans are very small multicellular parasites, some of which cause serious problems in fishes. Myxozoans are not infectious to humans.

Columnaris-Coldwater Disease
(Flavobacterium columnare, Flavobacterium psychrophilus)

The bacterium, *F. columnare,* is widespread in freshwater environments, affecting spiny-rayed fish and catfish as well as trout and salmon. Outbreaks occur most often when the water temperatures are above 55 degrees Farenheit. The disease shows up as grey-white spots on the head and fins, although gills and sides of the body may also be affected. As the disease progresses, the spots grow into small circular lesions and the fins become frayed. Yellowish slime may cover tissue exposed by the lesions. In trout and salmon, cold water disease bacteria *(F. psychrophilus)* produces similar disease signs, usually in water temperatures below 55 degrees F. Columnaris, or coldwater disease, may occur together with fungus in spawning or spawned-out salmon. Neither columnaris nor coldwater disease bacteria pose any threat to human health.

(Columnaris lesion of pink salmon, M. Chen, WDFW)

colored patches may appear on the skin and secondary bacterial or fungal infections may occur. Ich will not affect humans. Ich and *Lernaea* are common to game fish, goldfish and bait minnows. This should remind not only anglers but all citizens that releasing unwanted goldfish or minnows into the wild is not only illegal but can cause harm by spreading disease.

Leeches
(Piscicola spp.)

Leeches are annelid worms, that is they have segmented bodies. Leeches have two suckers, one at each end, and are dark-colored from their diet, which is blood. Leeches have no effect on the quality of the meat and cannot transmit diseases to humans. Adult leeches of *P. salmonsitica* are often found on the skin and gills of adult salmonids after re-entry into freshwater. Other adult leeches are found on the body surface and gills of many different freshwater fishes.

Fungal Diseases

Fish Fungi
(Saprolegnia spp.)

Physical injury or infection stemming from the invasion of other parasites usually provides the initial foothold for this fungus. The fungi appears as 1/3 inch or longer cottony patches, white or off-white in color, growing on or out of the fish. Threads of the fungus may appear grey or brown if the water is muddy. Fish fungus can occur both internally and externally, usually growing in small patches but spreading in later stages. In Washington, fungus is often seen on spawning or spawned-out adult salmon. Generally, this is a good indication that the fish is no longer desireable as table food.

(Fungus on adult salmon, S. Roberts, WDFW)

Parasites

Parasites can be divided into two categories: internal and external. Internal parasites are found in muscle tissue, eyes, under the skin and in or around the internal organs. External parasites are most often found attached to the outside of the skin, fins or gills of fish.

Internal Parasites

Yellow Grub
(Clinostomum complanatum –previously known as C. marginatum)

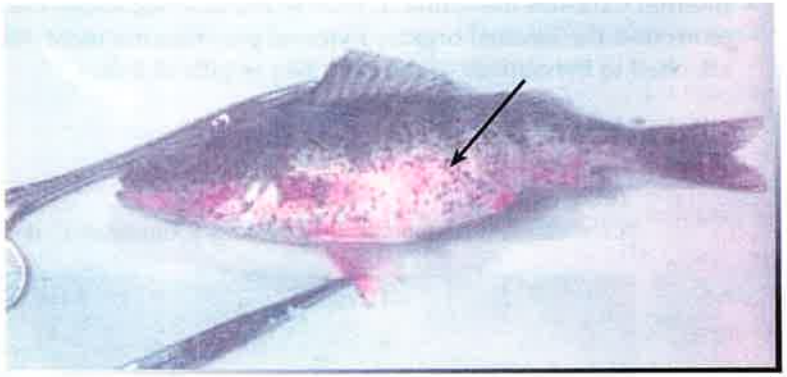
(Large cysts of yellow grub, B. Lassee, USFWS)

The yellow grub is one of the most common North American fish parasites. It infests a variety of freshwater fishes such as largemouth bass, bluegill and the catfishes. It is seldom found in trout species. The ¼ inch-long grub is flat, yellow and encased in a cyst just under the skin in the muscle where it forms are wart-like bump. These bumps are often visible at the base of the fins, especially the dorsal fin, and the tail. Cysts may also be found in the body cavity or on the gills. These worms make active leechlike movements when they pop out of a fish fillet headed for the frying pan. There is no threat to humans from this parasite.

Black Grub or Black Spot
(Uvulifer ambloplitis)

Larvae of black grubs are most noticeable in fillets of white meated-fish. Infection from the larvae creates small, raised black spots which look like pepper in the skin and flesh. The actual

larvae are white but the fish produces a black pigment that surrounds the thick-walled cysts. Skinning infected fish will remove most grubs as the majority of cysts occur in the skin.



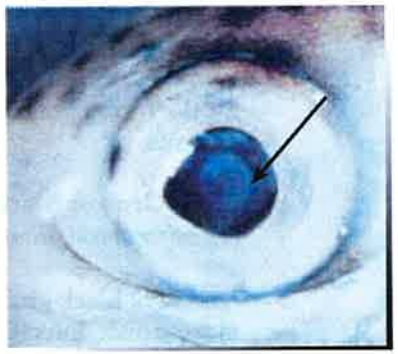
(Yellow Perch with black spot Disease, J. Hnath, Michigan DNR)

White Grub
(Posthodiplostomum minimum)

The white grub forms tiny white cysts in the liver of black bass and other members of the sunfish family. Heavy infestations may be noticeable when cleaning fish.

Eye Fluke
(Diplostomum spathaceum)

These flukes seem to be most abundant in rainbow trout, but also occur in other species of trout as well as bass, sunfish, catfish and minnow species. The larval fluke occurs in the lens and liquid portion of the fish's eye. A "popeye" effect is sometimes created from accumulation of fluids in the eyeball. In advanced cases the eye becomes opaque white and the fish becomes partially or totally blind. Yellow, white, black grub and eye fluke all develop to adult worms in fish-eating birds when the infected fish is consumed. However, there is no threat to humans from eating fish infected with these four parasites.



(Cloudy lens due to infection by eyefluke, source unknown)

Other External Parasites

Parasitic Marine Isopods
(Nerocila spp., Rocinela spp., Lironeca spp.)

These resemble large, flattened sowbugs, which they are related to. They may be attached to nearly any part of the fish with their biting and sucking mouthparts. The body is segmented with sharp-tipped legs attached to each segment. Often they occur within the mouth or gill cavities of rockfish and surfperch. If found internally, they are usually white-colored, but may be dark colored if found on the exterior of the fish. Although large and unpleasant-looking, marine isopods are not a human health threat.

Ich
(Icthyopthirius multifilis)

Ich, a disease familiar to home aquarium enthusiasts, is common among the warm water gamefish species, but can also attack salmon and trout and cause high mortality, particularly when fish are stressed by summer water temperatures.
Pinpoint grayish-whitish salt-grain sized swellings or bumps on the body and fish are prominent signs of ich infection. Ich also occurs on the gills. In cases of heavy infection, irregular, light-

(Three-spined stickleback with Ich, F. Meyer, USFWS)

(Freshwater copepod on fin of trout, M. Chen, WDFW)

Anchor Worms
(Lernaea spp.)

These ½ inch or longer "worms" are actually adult copepods in which the head has developed into a four-pronged anchoring device embedded in the flesh of the fish, (or frog) while the rest of the body with paired egg sacs trails outside the fish. Anchor worms often attach at the base of fins, but can occur elsewhere on the body, including the eyes, causing blindness. Anchor worms attack many species of freshwater fish, including trout, warmwater fish and especially members of the minnow family. Heavy infections can cause fish mortality.

(Catfish with anchorworm, USFWS)

Salmon Poisoning Disease of Dogs
(Nanophyetus salmincola)

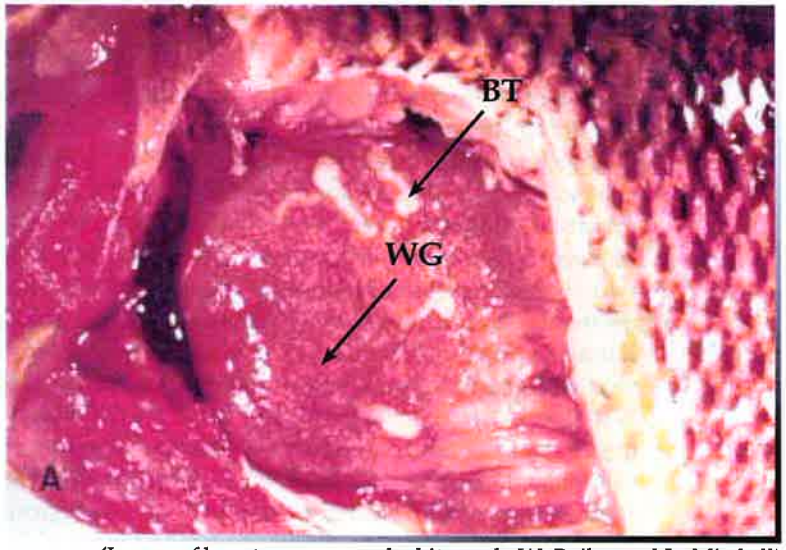
Tiny, almost microscopic cysts containing larvae of the salmon poisoning fluke are found in salmon and trout from northern California, and in areas of Oregon and Washington west of the Cascade mountains. When the fish is eaten by a bird or mammal, the larvae develop into adult worms in the intestine. The worm is a vector of a rickettsia (bacteria-like organism) which causes salmon poisoning disease of dogs. The disease is up to 90% fatal if untreated. Dog owners across the state should not allow their pets to eat raw salmon or trout. Dogs develop clinical signs like loss of appetite, fever, vomiting and diarrhea 5-10 days after exposure. Prompt treatment with oxytetracycline may save the dog. After recovery the dog is immune to the rickettsia. Humans can also become infected with the fluke *(Nanophyetus salmincola)* but do not become sick from the rickettsia. After cleaning fish you should thoroughly wash your hands to minimize transmitting this parasite.

Tapeworms

Tapeworms found in fish occur as larvae in the meat or internal organs, or as long, segmented adults in the intestine. While the adults may be large, they pose no threat to human health. The larvae are more likely to be noticed by anglers cleaning their catch.

Bass Tapeworm
(Proteocephalus ambloplitis)

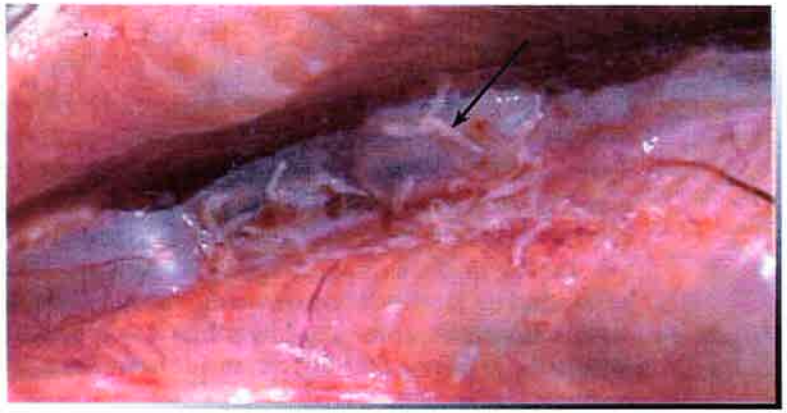
The bass tapeworm is fairly common in the sunfish family and can be very damaging to largemouth, smallmouth and rock bass: the bass tapeworm is not transmissible to humans. The adult worm reaches lengths of up to two and a half feet in the intestine of bass. However, the larvae actually do the most damage to the fish. Larvae migrate through internal organs and cause adhesions: connective tissue scarring that can bind reproductive organs, intestines, spleen and liver into a single mass if the infestation is heavy. Sterility can result from damage to the fish's reproductive organs.



(Larvae of bass tapeworm and white grub, W. Bailey and L. Mitchell)

Trout Tapeworm
(Diphyllobothrium cordiceps)

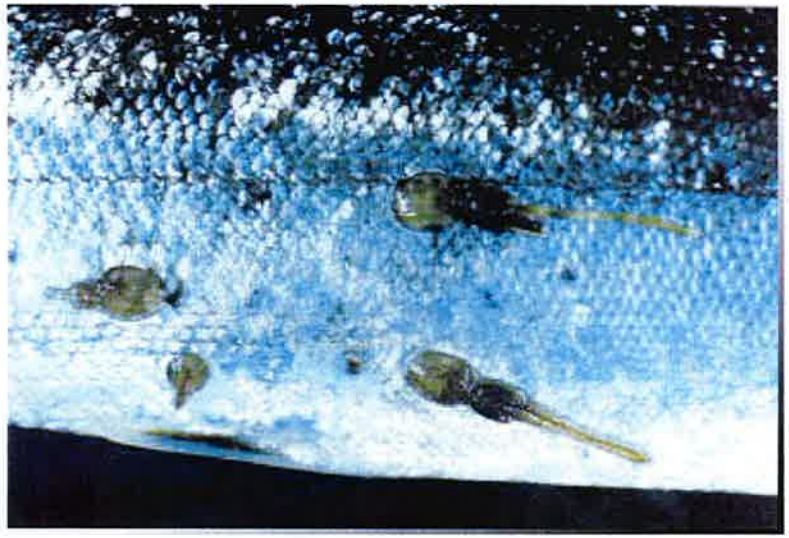
The larvae of this tapeworm appear as white cysts in the abdominal organs and body cavity of trout. When heavily infected, the fish becomes listless and swims lazily near the surface. Only fish host the larvae of this parasite. Adult trout tapeworm are found in birds, dogs, cats and bears.



(Trout tapeworm larvae, W. Brunson, WDFW)

Sea Lice
(Lepeoptheirius salmonis, Caligus clemensi)

These adult copepods of these two marine parasites look somewhat like dark-colored tadpoles one inch or more long, attached loosely to the skin of a bright salmon. The long "tail" of the copepod are the egg sacs of the female. While *L. salmonis* infects only salmonid fish, *C. clemensi* can also be found on many of our local marine fishes, including herring, copper rockfish and greenling. The damage to the fish is dependent on density of infection, and a few sea lice on the flank of a large salmon do not present a significant problem.



(Sea lice on salmon, M. Kent, Canada DFO)

Salmincola beani

When anglers see "wormy" or "grubby" trout, this is often an infestation of a freshwater copepod, *S. beani*. The yellowish-white "grub" is about the size of a grain of rice and is usually found in gills, mouth or the fins of rainbow, cutthroat trout or steelhead, although salmon can be infected. The head of the copepod is attached firmly in the flesh with the remainder of the worm, including two long egg sacs hanging from the wound. When the copepod dies and falls off, an inflamed wound may be left.

External Parasites

Copepods

Copepods are among the largest group of tiny aquatic crustaceans. Abundant in both freshwater and saltwater and often considered part of zooplankton, they form an important part of the food chain for fish and plankton-eating marine animals. However, some copepods have turned the tables and adapted to life as parasites. None of the fish-parasitic copepods pose any risk to human health.

Fish Lice
(Argulus spp.)

The 17 known species of freshwater fish lice have been found in almost all warm water and anadromous fish (anadromous fish spend part of their lives in freshwater and part in saltwater). The lice can be found attached to the skin, fin or gills. At first glance, fish lice look somewhat like large (1/8-3/4 inch) dark scales, but are actually saucer-shaped on closer inspection. The lice have jointed legs and two prominent disk-shaped suckers which are sometimes mistaken for eyes (eyespots are present but are much smaller than the suckers).

(D. Sutherland)

Broad Fish Tapeworm
(Diphyllobothrium latum)

The larvae and life history of this tapeworm are similar to that of trout tapeworm, and can be found as cysts in internal organs and body cavity, or as coiled but unencysted white larvae in the meat of salmon, trout, walleye, yellow perch and pike. Unlike the trout tapeworm, the broad fish tapeworm will infect humans eating raw or undercooked fish, developing into a large adult worm in the human intestine.

Ligula
(Ligula intestinalis)

The larvae of this tapeworm are very large (up to 12 inches), white-colored and exist in the body cavity of fish, especially those of the minnow family, but may infect trout also. The size of the larvae may enlarge and distort the shape of the fish, making it easy prey for diving and wading birds, in which the larvae develop into adults.

Spiny-Headed Worms
(Acanthocephala)

(Acanthocephala in intestine of salmon, Wisconsin DNR)

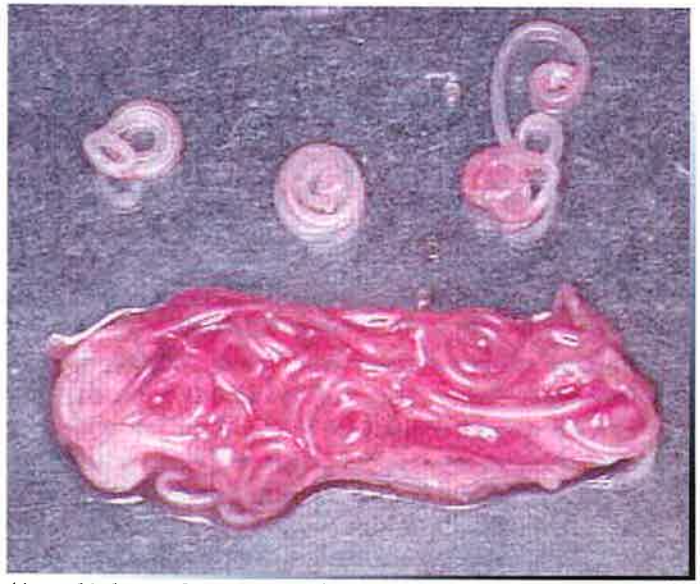
Various species of these small worms are found in almost all the freshwater fishes. They are also found in marine fish. Spiny-headed worms, usually no longer than 3/8 of an inch, are found embedded in the intestine. They are easily identified by their short, cylindrical bodies. They can be white or pale yellow, but are often a bright orange color. Their tube-like snout is covered with spines which are used to attach to the fish. They have no effect on humans.

Roundworms *(Nematodes)*

Roundworms can be identified by their round, thin, elongated bodies and lack of segmented bodies and suckers. Most roundworm larvae found in fish pose little danger to humans. However, if raw or undercooked fish containing certain nematode species are eaten, larvae can attempt to penetrate the intestinal lining, causing pain and inflammation. Thorough freezing and/or cooking will prevent this from happening.

Marine Fish Roundworms
(Anisakis spp. Pseudoterranova spp.)

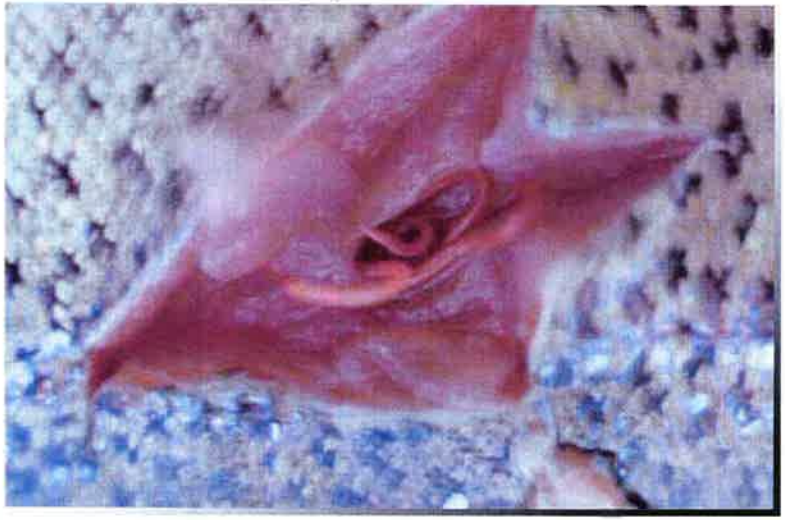
Larvae of these marine roundworms can be found in many marine fish species including herring, cod, wild-caught salmon, rockfish and flatfishes. They encyst in the liver, membranes of body cavity, and muscle tissue. The worms are usually coiled, whitish and range from ½-1.5 inches in length. These worms are eventually ingested by fish-eating marine mammals, where they develop into adults. When improperly prepared fish containing these roundworms are eaten, the larval worms can cause painful gastric upset as they attempt to penetrate and otherwise migrate in the human digestive system. Again, proper freezing and/or cooking will prevent this from occurring.



(Anasakis larvae from viscera of Pacific herring, M. Kent, Canada DFO)

Red Roundworm
(Eustrongyloides spp.)

Red roundworm is one of the most common nematodes in freshwater fish, including largemouth and smallmouth bass, other sunfish such as rock bass and crappie, walleye and yellow perch. Red roundworm larvae are found in the fish's flesh, internal organs and associated membranes, and are easily recognized by their deep red color. Occasionally, the numbers of worms in the meat may result in the fish being unusable as food. Like the bass tapeworm, red roundworm larvae can cause adhesions of the internal organs of the fish. Although unlikely due to the size and color of the worms, if humans ingest red roundworm by eating raw, undercooked or whole fish, serious gastric upset may occur similar to that caused by marine fish roundworms.



(Red roundworm, W. Brunson, WDFW)