

Parasites in Marine Fishes

Questions and Answers for Seafood Retailers

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This publication has been prepared in response to many questions from seafood retailers about parasites in marine fish products. Customers who find parasites in fish they purchase need to have good answers for some obvious questions.

Your customers need to understand two key points: First, parasites are a natural occurrence. Second, although certain roundworms (nematodes) and tapeworms found in fish can infect people, thorough cooking of fish renders these parasites totally harmless.

Public health problems arise only when people eat raw or lightly preserved fish, such as cold-smoked products or sashimi and ceviche. When fish is to be prepared according to these recipes, it first should be completely frozen for at least 24 hours to kill any parasites that may be present.

Here are some of the most commonly asked questions about parasites.

1. What are those worms that I sometimes see in fish I catch or purchase?

Fish, like all living organisms, can be infected with various parasites. Modern technology has allowed us to drastically reduce—but not eliminate—the parasites that occur in domesticated food animals and in people.

Fish, of course, are wild animals, and people have little or no control over their environment. This makes it difficult to avoid an occasional encounter with a naturally occurring parasitic worm.

The most commonly observed parasites in marine food fishes are roundworms called *nematodes*. Certain nematodes are common parasites of animals; others attack plants. Even more common are the microscopic, free-living nematodes that occur in soil everywhere.

The nematodes seen most commonly in fish often are called *herring worms* or *cod worms*. Actually, a number of different species are involved, and it is difficult to distinguish between them. All are in the family *Anisakidae* and are properly referred to as *anisakid nematodes*.

Other fish, especially freshwater and anadromous fish, may carry larvae of the tapeworm *Diphylllobothrium*. These small, whitish, and somewhat flabby worms are especially common in salmon from Alaska.

2. How do fish get infected?

In the case of both anisakid nematodes and *Diphylllobothrium* tapeworms, fish become infected when they eat small crustaceans that have themselves previously eaten parasite eggs or parasite larvae.

In the fish, the worms may locate in the muscle or internal organs, where they develop into the stage that can infect people.

3. Will parasites hurt me if I accidentally eat one?

Because nematodes are relatively uncommon in fish filets and are easily destroyed by normal processing and cooking procedures, they rarely cause health problems. However, under some circumstances, swallowing a live nematode larva can cause—and has caused—severe gastric upset called *anisakiasis*, requiring medical intervention.

These nematodes do not find people to be suitable hosts and do not live long in human digestive tracts. Nevertheless, infections have been reported to cause severe abdominal pain and intestinal upset for as long as 10 days.

Tapeworms that occur in fish can infect people and other fish-eating mammals if they swallow living larvae. The tapeworms may live in the

intestinal tract for several years, and eggs and tapeworm sections can be found in human feces.

The infection is not fatal. Symptoms in infected individuals may vary from none to abdominal pain, weakness, loss of weight, and anemia.

4. How long do you have to cook fish to eliminate the possibility of parasite infection?

According to most authorities, cooking fish to an *internal* temperature of 140°F (60°C) will kill all nematodes and fish tapeworms. This temperature is reached during normal cooking procedures.

5. How about pickling, salting, and smoking fish?

Hot-smoked fish should be brought to at least 160°F (71°C) to prevent outgrowth of food-poisoning bacteria. If this is done, parasites should be no problem. The 140°F (60°C) temperature necessary to kill parasites likely would be achieved in any hot-smoking process.

Hard-salting (curing) fish before pickling (as described in PNW 183, *Fish Pickling for Home Use*) is reported to kill any nematode or tapeworm present. However, pickling without salt curing *first* may not destroy some nematodes.

One researcher found 4% acetic acid and 6% brines *would not* kill anisakid after 26 days in a herring brine solution

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with equal volumes of brine and fish. It's reasonable to expect that pickled herring will be eaten as soon as 2 weeks after preparation.

6. How about raw and lightly marinated recipes? Are they safe?

Considering recent research on the subject, advise your customers against raw or lightly marinated recipes unless they are sure that the fish is free of parasite larvae. While it's true that only a small percentage of fish are infected with larvae, they may be present but hard to detect.

In countries where raw fish dishes are traditional, it's a common practice to freeze the fish before preparation. Researchers indicate that complete freezing at normal freezer temperatures (-4°F, -20°C) for 24 hours is 100% effective, but they caution that large fish take more time than small fish to reach that temperature—perhaps 5 to 7 days in inefficient freezers.

7. Why don't fish processors remove parasites from fish fillets before they sell them?

They do remove most of them during the filleting process. (This process removes the parasites in the gut and belly walls of the fish, where most parasites occur.) When they can see larvae in the edible portion, they remove them or withhold the fish from sale.

However, even examining fillets by transmitted light (candling) is less than 70% effective under the best of circumstances. Larvae more than 1/4-inch deep in the flesh or in dark tissue may not be detected.

In a 1981 lawsuit against an Oregon grocery chain, the court held that the store had no obligation to eliminate all nematodes before sale. While no store should knowingly sell a parasite-infested fish, it is impossible to insure that the product is free of them.

Parasite infestation is common in fish just as insect infestation is common in fruits and vegetables. If we want to eat fish, we have to expect a certain incidence of parasites to occur.

8. What should retailers tell people about parasites when they ask?

First, tell people that parasites are unlikely to be a serious health problem.

Consumers can't have fish in their diet without accepting the fact that nematodes or tapeworms may be present.

The danger to people is far less than that presented by "unseen" pathogenic bacteria likely to be present in *all* foods.

However, don't try to hide the fact that certain parasites can be harmful if swallowed alive. Suggest these steps:

- Cook all fish until it flakes and loses its translucent (raw) texture. Smoking fish to 160°F (71°C) is recommended for other reasons; see PNW 238, *Smoking Fish at Home—Safely*, under "For further reading."
- Use only frozen marine fish for raw or cold-smoked fish dishes. Freezing to -4°F center temperature (-20°C) for 24 hours is adequate. Remember, 5 to 7 days may be required in inefficient home freezers.

9. What else is known about parasites in fish?

Not nearly enough, according to most researchers. But enough is known to be confident that there is no reason to be overly concerned.

Some additional points that are useful to know:

- Older fish (usually the larger ones) tend to have a greater infestation rate than younger fish. They've had longer exposure to parasite sources.
- The life cycles of parasites aren't understood well enough that experts can predict when and where they will occur in fish—or how long larvae might live in a human host.
- Good handling practices on board boats and in processing plants help

to minimize some types of nematode infestation. Industry practices have been much improved over the past 30 years.

- While certain types of parasites seem to have been found everywhere, there are significant seasonal, geographic, and species variations.
- Fish infected with nematodes and tapeworms are not "sick." In most cases, infestations are a normal part of the fish's life. The fish is simply acting as an intermediate host for these parasites, which have a very complicated life history.

For further reading

Hilderbrand, Kenneth S., Jr., *Fish Pickling for Home Use*, Pacific Northwest Extension publication PNW 183 (Corvallis, Oregon State University, reprinted 1993). No charge.

Hilderbrand, Kenneth S., Jr., *Smoking Fish at Home—Safely*, Pacific Northwest Extension publication PNW 238 (Corvallis, Oregon State University, reprinted 1993). 50¢

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