

Diphyllobothrium

I. Causative Agent and Disease

Six species of diphyllobothrid cestodes (tapeworm) occur in Alaska, all of which use fish as a second intermediate and/or as a paratenic host. Three species of larval *Diphyllobothrium* that most commonly occur in Alaskan salmonid fishes include *D. ditremum*, *dendriticum* and *nihonkaiense*. The cestode larvae can be found free in the visceral cavity or encysted in the viscera or muscle tissues.

II. Host Species

Planktivorous and carnivorous freshwater fishes are potential hosts in North/South America and Eurasia including salmonids, whitefish, perch, northern pike, sticklebacks, burbot, and blackfish.

III. Clinical Signs

The larval *Diphyllobothrium* can be found (sometimes encysted) in the muscles, viscera and connective tissues of the fish host causing adhesions, hemorrhaging (particularly the liver) and ascitic fluid resulting in abdominal distension. Severe infestations in juvenile fish can cause mortality.

IV. Transmission

Infestation of the fish host is part of a 3-host life cycle for this parasite. Adult worms are found in the small intestine of definitive hosts that are fish eating birds or mammals (including humans). Eggs from adult worms are released into the water with feces where they develop into a free swimming coracidium larval stage that is ingested by copepods, the first intermediate host. The plerocercoid develops in the copepod and, when eaten by the fish second intermediate host, develops into the plerocercoid stage. Plerocercoids re-encyst near the gut of

predatory fish that become paratenic hosts when other infested fish are eaten. The life cycle is complete when the fish host is eaten by a mammal or bird definitive host where the worm becomes an egg-producing adult.

V. Diagnosis

Diagnosis is made by visual identification of the cestode during necropsy of a parasitized fish. Plerocercoid stages of *Diphyllobothrium* have a compressed scolex with characteristic bothria or grooves. The body is usually slightly wrinkled, suggesting segmentation. PCR has been useful in confirming species that has resulted in changing taxonomy.

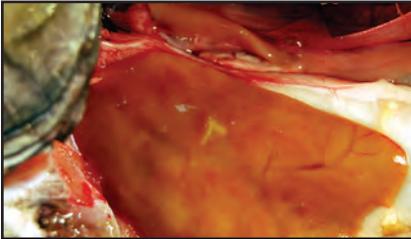
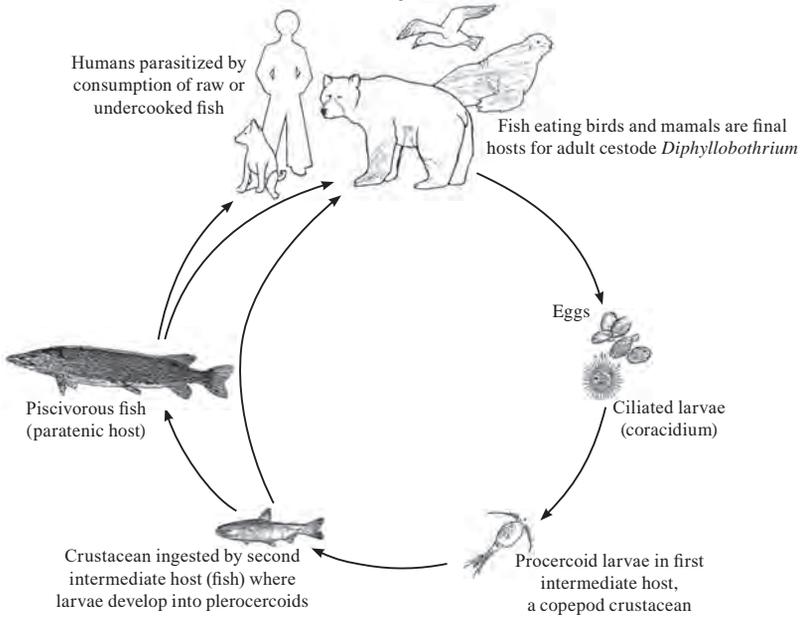
VI. Prognosis for Host

Prognosis for the host is good provided the infestation is low and there are not other stressors involved. Juvenile fish are more adversely affected than older fish and can die from severe plerocercoid infestations.

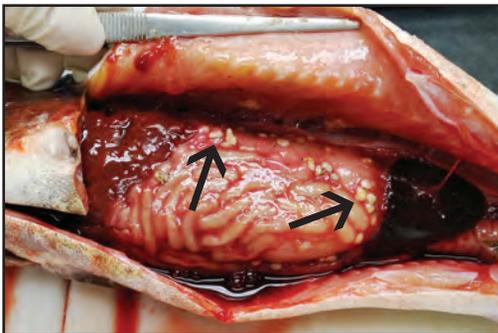
VII. Human Health Significance

Species of this cestode group can successfully parasitize humans. Most human infestations are accidental since the natural hosts are fish eating birds and mammals. Infestation in man occurs by ingestion of raw or lightly smoked fish that contain viable plerocercoid larvae. The Center for Disease Control recommends cooking fish at 67°C for 5 minutes or freezing fish at -20°C for at least 7 d to kill worm parasites before ingestion.

**Diphyllobothrium
Life Cycle**



Left: Subsurface white cysts (center) in brook trout liver with plerocercoids of *Diphyllobothrium* sp.; **Right:** *Diphyllobothrium* sp. plerocercoid with wrinkled body suggesting segmentation.



Encysted plerocercoids in viscera of rainbow trout (black arrows).



Bothria (grooves) in plerocercoid scolex characteristic of *Diphyllobothrium* sp.