Government of Alberta, Environment and Parks

INFECTIOUS DISEASE

Whirling disease

Myxobolus cerebralis

OCTOBER 2025

Invasive Species Council of BC

BCINVASIVES.CA

ABOUT

Whirling disease is an infectious disease of salmonids caused by the freshwater parasite *Myxobolus cerebralis* (myxosporean parasite). The parasite has a two-host lifecycle, infecting both a common aquatic worm, *Tubifex tubifex*, and salmonids, i.e., fish from the family Salmonidae. The disease affects this large family, including trout, salmon, and whitefish. In Canada, *M. cerebralis* was first detected in Alberta in 2016. In infected juvenile salmonids, mortality rates can reach up to 90%. Whirling disease is not known to cause any harmful effects to humans or non-host animals, whether from eating contaminated fish or ingesting contaminated water.

LEGAL STATUS

Whirling disease is a federally reportable disease, meaning it's a disease of significant importance to aquatic animal health and/or the Canadian economy. Anyone who knows of or suspects whirling disease in the aquatic animals they own or work with is required by law to notify the Canadian Food Inspection Agency (CFIA). Whirling disease is a reportable disease in respect of finfish under Section 5(h) of the Reportable and Notifiable Disease Regulation under British Columbia's *Animal Health Act*.

DISTRIBUTION

Originating in Europe, whirling disease was first identified in North America in Pennsylvania in 1956. Canada's first confirmed detection came from Johnson Lake in Banff National Park in 2016, and by 2018 it was present in Alberta's Bow, Oldman, Red Deer and the North Saskatchewan River watersheds. Whirling disease is also present in 25 US states, including the bordering states of Idaho, Montana and Washington.

Whirling disease was confirmed for the first time in B.C. in December 2023 in Yoho National Park's Emerald Lake, while another case in B.C. was confirmed in December 2024 from the southern arm of Kootenay Lake.

Due to the connectivity to upstream locations where whirling disease has been detected within Yoho National Park and Kootenay Lake, the entire Columbia River watershed is considered to be a high-risk area for whirling disease.

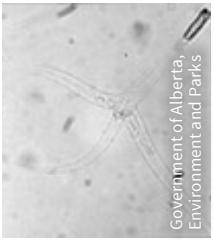
IDENTIFICATION

Behavioural: Whirling disease is named for the erratic circular, or "whirling" swimming behavioural symptom exhibited by infected fish. This behaviour is the result of the parasite impairing the nervous system and feeding on spinal cartilage.

Physical: Infected fish have skeletal deformities of the body and/or head. The mandible (lower jaw) is often shortened, and indentations appear on the top of the head. The tail of infected fish may appear dark or black due to damage to the caudal nerves controlling pigment deposition. However, *NOT ALL* infected fish exhibit physical symptoms, so laboratory testing is required for diagnosis. Fry or juvenile fish are more susceptible to infection by the parasite and more likely to show symptoms of the disease.


S. Hallett, fishpathogens.net

ECOLOGICAL CHARACTERISTICS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Life Cycle: The cycle begins with the release of parasite spores (myxospores) from the cartilage of infected fish. The spores are then ingested by the parasite's first host, a common aquatic worm (*Tubifex tubifex*). Once ingested by the worm, the spores develop into triactinomyxons (TAM), the parasite's free-swimming form (lasting approximately 74-120 days), which are then released from the worm into


S. Atkinson; Oregon State University

the water. The TAMs can penetrate into the skin or gills of salmonid hosts and inject a sporoplasm. The latter can be completed within one minute after contact. The fish can also become infected by ingesting the infected worms. Once in the salmonid host, the sporoplasm moves to the central nervous system and begins feeding on cartilage as it matures. About 80 days after entering the fish, the parasite produces spores, starting the life cycle again.

Juvenile fish are more susceptible to becoming infected by *M. cerebralis* than older fish due to the presence of more cartilage as a food source. Juvenile fish can also become infected through exposure to fewer TAMS, while older fish require exposure to more TAMS to become infected. Fish eggs cannot become infected, though juvenile fish can become infected as young as two days old.

Spores of *M. cerebralis* can survive freezing conditions at -20 °C and survive digestion by some fish and bird species. Fish-eating birds can spread the parasite to uninfected water bodies.

IMPACTS

Ecological: Whirling disease can infect many salmonid hosts, some of which are species at risk that are already impacted by other stressors such as climate change, chemical pollution, and habitat loss. Specific species at risk include the Westslope cutthroat trout (Special Concern) under the *Species at Risk Act* (SARA), as well as the Pacific population of bull trout (Special Concern) and Okanagan Chinook salmon population (Endangered), both by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC). Salmonid ecosystems may also be impacted if the number of salmon-like species changes and local population losses impact food webs and nutrient cycles.

Ecosystems may also be impacted if declines in salmonid populations result in their population being replaced by other fish species. This can also impact food chains and nutrient cycles.

Economic: Whirling disease can impact B.C.'s sport fishing and angler tourism, fisheries, and aquaculture industries. In aquaculture facilities, whirling disease could

cause economic losses due to closure, disinfection, and renovation of facilities. In Colorado, more than $11 million (USD) was spent renovating hatcheries due to whirling disease between 1987 and 2006.

MANAGEMENT

There is no treatment for whirling disease currently available. Therefore, containment of infested areas, identification of new infestations, and prevention of spread to uninfected water bodies are the best management practices.

Prevention: Whirling disease is spread by humans through the transport of infected live or dead fish and fish parts, contaminated worms, equipment, or water sources. Please remember that the parasite can live in mud and water.

ATTENTION TO ANGLERS! To prevent the spread of the disease, do not use fish as bait, including store-bought fish. Do not move fish (alive or dead) or fish parts from one body of water to another. When cleaning and gutting fish, use a fish cleaning station on site if available, or dispose of fish parts in the municipal solid waste system. Avoid disposing of fish or fish parts down kitchen garbage disposal systems and drains. The movement of equipment or gear from recreational activities such as angling, boating, paddling and swimming can spread whirling disease, so it is important to CLEAN DRAIN DRY.

1. **CLEAN** off all plants, animals, sand and mud from your boat and gear.
2. **DRAIN** all water from your boat and gear onto land.
3. **DRY** all parts of your boat and gear completely.

“Pull the Plug” is an important element of Clean, Drain, Dry. In B.C. it is illegal to transport watercraft (including boats, kayaks, canoes and paddle boards), water-related equipment or aircraft on land, unless all drainage holes, valves or other devices used to drain water are left open. The use of felt-soled waders is strongly discouraged, as they are a potential pathway for the movement of aquatic invasive species and diseases. Rubber-soled alternatives are available on the market, and provide the same non-slip qualities, but are much easier to effectively clean, drain and dry.

Ensure pets are cleaned and dried off before allowing them to enter another waterbody.

Decontamination Protocol: To help regulate the movement of potentially infected fish, CFIA declared the Columbia River watershed as an infected area, with the rest of B.C. declared as a buffer area. In addition to practicing CLEAN DRAIN DRY, please follow the recommended decontamination procedures for all watercraft, equipment, and gear being used in water within the Columbia River Watershed. Stay current with up to date procedures by visiting the province’s whirling disease webpage.

- Ensure equipment is cleaned away from any water sources.
- Remove any mud or organic debris on surfaces before cleaning to ensure disinfectants work effectively.
- Any submersible parts that were in contact with potentially contaminated water, fish, or mud must be submerged in disinfectant for at least 10 minutes.

- All non-submersible gear such as lifejackets and flotation devices, non-waterproof gear, and large equipment should be wiped and sprayed. Spray surfaces heavily with disinfectant, both outside and inside of equipment and allow to stay damp with for 15 minutes before wiping. Dispose of items used to wipe down equipment.
- Disinfectants:
  - Quaternary ammonium compounds (QACs) such as Quat plus are safe for use on most equipment, machinery and vehicles when used at recommended concentrations (Soaking: 1500 ppm; Spraying and wiping: 1500 ppm).
  - Household bleach at a 1:10 (volume to volume) mixture of bleach to freshwater, but keep in mind that bleach can cause corrosion to fabrics, rubber, plastics and metal. If using bleach, ensure that the solution is not disposed of or rinsed off into municipal storm drains or water systems.
- Thoroughly rinse off disinfectant with water from a separate source and not from a high-risk waterbody. Small amounts of Quat or bleach may be disposed through a sanitary sewer if diluted with an equal volume of water as indicated on the product label or MSDS sheet. If disposing of large quantities of disinfectant down sanitary sewer, please contact local authorities operating the municipal wastewater treatment facilities.
- Allow the gear to dry fully for a minimum of 24 hours before entering a new water body. Anglers can do their part by ensuring all their gear is CLEAN DRAIN AND DRY on site and felt-soled waders are fully cleansed with Tech Wash® or a similar detergent.

REPORT

Please stay vigilant and immediately report any suspect infected fish to the Province of B.C. at whirlingdisease@gov.bc.ca and include photos. Do not attempt to remove or transport any fish suspected of having whirling disease. As whirling disease is designated by the CFIA as a federally reportable disease, anyone working or who owns fish suspected to have the disease must report to the CFIA at 1-800-442-2342 or contact your local CFIA Animal Health Office. Any invasive species reports may also be submitted to ISCBC through the website, info@bcinvasives.ca or 1-888-933-3722.

REFERENCES/LINKS

Government of Canada (2016) News release: First case of whirling disease in Canada. https://www.canada.ca/en/food-inspection-agency/news/2016/08/first-case-of-whirling-disease-in-canada.html

Canadian Food Inspection Agency. Gilbert, M. A., & Granath Jr, W. O. 2003) Whirling disease of salmonid fish: life cycle, biology, and disease. *Journal of Parasitology, 89*(4), 658-667. https://bioone.org/journals/journal-of-parasitology/volume-89/issue-4/GE-82R/WHIRLING-DISEASE-OF-SALMONID-FISH--LIFE-CYCLE-BIOLOGY-AND/10.1645/GE-82R.short

Bartholomew, J. L., & Reno, P. W. (2002) The history and dissemination of whirling disease. In *American fisheries society symposium* (pp. 3-24). American Fisheries Society. https://www.researchgate.net/profile/Jerri-Bartholomew/publication/285691216_The_history_and_dissemination_of_whirling_disease/links/5840855808ae2d21755f37c1/The-history-and-dissemination-of-whirling-disease.pdf

Veillard, M and C. James (2020) Status of Whirling Disease in the Crowsnest River 2019: Technical Report. Government of Alberta, Ministry of Environment and Parks. ISBN 978-1-4601-4840-2. https://open.alberta.ca/dataset/564d1c08-bf40-4f5e-bef4-b80d2c8d205e/resource/70d3f48e-3a7e-4224-86b7-7ac3bad5e6b1/download/aep-whirling-disease-2019-technical-report-crowsnest-river-2020-09.pdf

Steinbach Elwell, L.C., Stromberg, K.E., Ryce, E.K.N., J.L., Bartholomew. (2009) Whirling disease in the United States. *A summary of progress in research and management, 2009*, p.61. http://myxozoa.org/files/WD%20in%20the%20United%20States_2009_sc.pdf

Alava,J.J. pers. comm., Ocean Pollution Research Unit, Institute for the Oceans and Fisheries, University of British Columbia, November 10, 2023.

Canadian Food Inspection Agency (2024, March 28) Whirling Disease – Fact sheet. https://inspection.canada.ca/en/animal-health/aquatic-animals/diseases/reportable-diseases/whirling-disease/fact-sheet

Province of British Columbia (2025, January 14) Whirling disease. Province of British Columbia. https://www2.gov.bc.ca/gov/content/environment/plants-animals-ecosystems/fish/aquatic-species/aquatic-invasives/whirling-disease

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ADDITIONAL CONTACT INFO