ALBERTA invasive species COUNCIL

abinvasives.ca
info@abinvasives.ca

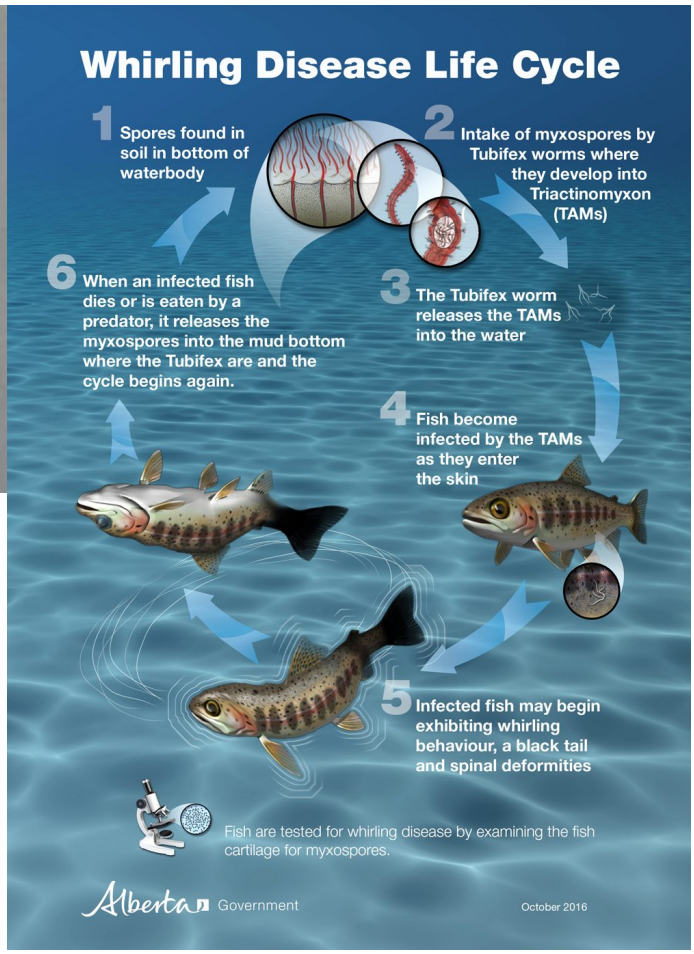
Whirling Disease

ALBERTA REGULATION: FISHERIES ACT

Last Updated: April 2019

syn. *Myxobolus cerebralis* (Hofer, 1903) *Chondrophagus* (Hofer) *Myxosoma cerebralis* (Kudo) *Lentospora cerebralis* (Plehn) *Tractinmyxon gyrosalmo* (Wolf and Markiw)

Skeletal deformity



Whirling disease life cycle

Overview:

Whirling disease is an infectious disease of salmonid fish, caused by *Myxobolus cerebralis*, a microscopic parasite that does not pose a known risk to human health.[1] In Canada it is federally reportable and anyone who suspects whirling disease in fish **must** notify the Canadian Food Inspection Agency (CFIA).[1] Salmonid fish species susceptible in Canada include trout, salmon and whitefish.[1]

The lifecycle of the parasite requires two hosts, a worm and a salmonid fish and when produced, the microscopic spores can survive in the worm, fish, decaying fish parts and sediment.[2] *M. Cerebralis* spores can also survive temperature ranges from -20°C to +30°C however the length of time they are viable, vary depending on the environment, host availability and range of temperatures over time.[2]

M.Cerebralis affects the central nervous system of salmonid fish and can result in abnormal whirling behaviour[2] however, not all infected fish will show this or other signs of the disease.[1] Other affects of the parasite can include damage to the organs of equilibrium; lesions in the gills, the skull, and the vertebrae.[2] The disease may also cause the fish to show skeletal deformities of the spine or skull, a dark or blackened tail and can lead to high mortality rates.[3] Typically the mortality rate will depend on the age and size of the salmonid host. Young fish are the most vulnerable, with mortality rates as high as 90 percent.[4]

The first description of whirling disease was in Europe in the 1890s, and it is believed to have spread via the fish farming industry.[5] Between 1950-70 the parasite was detected in a number of trout farms across a number of continents, including the Unites States (US).[5] During the 1950s-80s the only reports of the disease were with farmed fish populations until Finland, Russia and Michigan reported infections in natural populations in the 1980s.[5] During the 1950s-80s the only reports of the disease were with farmed fish populations until Finland, Russia and Michigan reported infections in natural populations in the 1980s.[5] Free-range trout in the Western US were reported to have Whirling disease in the 1990s.[5]

In 2016 whirling disease was confirmed by the CFIA in Johnson Lake in Banff National Park, Canada.[4] As of 2018, whirling disease has been further confirmed by the CFIA in the Bow River, Oldman River, North Saskatchewan River and Red Deer River watersheds.[4] There is currently no treatment for whirling disease, and while it can spread naturally, it can also be spread by human activity.[3] Albertans should thoroughly clean, drain and dry all aquatic equipment after departing any waterbody and never transport fish or partial fish between waterbodies.[3]

ALBERTA invasive species COUNCIL

ALBERTA invasive species COUNCIL
abinvasives.ca
info@abinvasives.ca

Whirling Disease *(continued)*

Identification:

While positive identification will require a laboratory test result, any salmonid fish exhibiting the following should be reported:[3]

- any 'whirling' behaviour[1]
- skeletal deformities of the head or body such as a sunken, sloped head or crooked tail[4]
- dark or black tail[1]

Ecology:

Whirling disease is caused by a small microscopic parasite whose lifecycle requires two hosts to complete, a worm and a salmonid fish. They can also be released when an infected fish decays[2] or fish-eating wildlife consume infected fish, and then excrete the remains, which can contain viable spores.[1]

The parasite is ingested by the freshwater worm, *Tubifex tubifex* (sludge worms) where triactinmyxon (TAM) spores develop within the worm gut, and eventually release mature TAM spores with fecal matter.[2] Spores become buoyant, floating around 1-15 days (depending on environment and temperatures) in the water until they come in close proximity with a susceptible fish species.[2]

These two physically different and distinct spore stages - myxospore, which infects the alternate host (*T. tubifex* worms) and a triactinomyxon (TAM) spore, which is released from the worm, both have a filament to attach to the hosts.[6] The spores are microscopic, oval, frequently asymmetrical, with 5-6 irregular coils in the filament.[2] Reproduction within the worm host is both sexual and asexual and requires about 3 months in the worm intestine before being released into the water. The new TAM spores must infect a fish within 1-15 days.[2] *M. cerebralis* then moves into the nervous system, reproduces asexually before moving into the cartilage. Development of myxospores in the fish takes about 3 months.2

Once an infected fish dies its decaying carcass will release myxospores into the sediment of the waterbody where they infect feeding *T. tubifex* worms, and the life cycle begins again.[2] An infected fish, consumed by a larger salmonid fish, will infect the consumer.[2] Salmonid eggs do not carry or spread the disease, however, the water they are carried in could.[2]

Economic Impacts:

A Ministerial Order was was implemented in 2016 that quarantined all salmonid commercial fish culture operations in Alberta, this order stands until all fish farms and hatcheries are tested and cleared for whirling disease.[4] This quarantine reduces the risk of the spread of whirling disease from fish farms and hatcheries to Alberta's wild populations.[4] Further legislative tools may be implemented to stop the spread of this disease, which may have additional economic impacts.[3]

Environmental Impacts:

Changes in composition of salmonid populations and associated ecosystems will likely occur, impacting genetic resources of salmonid species and other species within that system. Whirling disease also presents a threat to endangered fish species affected by the disease.[1]

Sociological Impacts:

While whirling disease does not pose a known risk to human health,[3] it can significantly impact juvenile fish populations with mortality rates as high as 90 percent.[1] The loss of the intrinsic value of biodiversity to these ecosystems can also be significant as a result of this disease.[7]

Prevention:

As *M. cerebralis* can be spread by infected fish (alive or deceased), infected worms, mud, sediment and water – anglers, boaters and recreational water users can help prevent the spread of the disease.[3] Insuring the safe disposal of any unused bait and fish parts into the correct waste system, and clean any aquatic equipment thoroughly can help prevent the spread of this disease.[3] Do not move live fish between waterbodies, which is illegal in Alberta[3], and remove all water from any equipment or storage areas before cleaning.[3] Always ensure you examine all equipment thoroughly before departing any waterbody, this includes any and all items that have come in contact with water.[3]

Control:

M. cerebralis currently has no known treatment, and prevention is the only known control method in salmonid fish populations.[2] If you suspect a fish may have whirling disease you are required by law to report it to the CFIA.[1] While best practices for cleaning, as outlined below, should be followed at all times, additional decontamination procedures are appropriate for researches and professional angling guides.[4] The Government of Alberta has developed a Decontamination Protocol for Watercraft and Equipment for staff and stakeholders and encourages industry and recreational users to adopt these preventatives practices.[4] Details can be found here: https://open.alberta.ca/publications/9781460134986.[4]

Sanitation – While it may not eliminate the spore lifecycle stage, cleaning and drying any equipment that came in contact with water can reduce the spread.[3] Cleaning equipment and gear (boats, motors, boat hulls, boots, waders, bait buckets and swimming toys/floaters) should be done with hot water (at least 90°C) and dried thoroughly.[3] Allow at least 24hours of drying time before entering a new waterbody.[3] If hot water is not available, spray equipment with high-pressure water; **do not** use a car wash or clean your boat or equipment near storm drains, ditches or waterways as it could spread into natural waterways.[3] Dogs can also transport this disease and they should also be cleaned with warm water and brushed and dried thoroughly.[3]

Chemical – Treatment of fish farm or hatchery intake water with chlorine has been shown to prevent the disease,[2] but currently, there are no chemical treatment options for natural bodies of water.

Biological – Management of T. *tubifex* populations in hatcheries can serve as a biocontrol of *M. cerebralis* by preventing sediment accumulation.[2]

ALBERTA invasive species COUNCIL

Whirling Disease *(continued)*

REFERENCES:

1. Canadian Food Inspection Agency Whirling Disease Fact Sheet http://www.inspection.gc.ca/animals/aquatic-animals/diseases/reportable/whirling-disease/fact-sheet/eng/1336686597267/1336686806593 Accessed: April, 2019.
2. Myoxbolus cerebralis USGS Nonindigenous Aquatic Species Database, Gainesville, FL, and NOAA Great Lakes Aquatic Nonindigenous Species Information System, Ann Arbor, MI. http://nas.er.usgs.gov/queries/GreatLakes/FactSheet.aspx?SpeciesID=2364 Accessed: April, 2019.
3. Whirling disease. Alberta Government. May 2017. https://open.alberta.ca/dataset/9d48881e-07a2-4636-a8b2-719c13324116/resource/bc32b92a-dd93-49ad-b878-8caeba7d02e7/download/whirlingdisease-may25-2017.pdf Accessed: April, 2019.
4. Whirling disease. Alberta Government. https://www.alberta.ca/whirling-disease.aspx Accessed: April, 2019.
5. Bartholomew, J.L. & Reno, P.W. The History and Dissemination of Whirling Disease. American Fisheries Society Symposium. 26:1-22, 2002.
6. Invasive Species Compendium. Datasheet Report for Myxobolus cerebralis (whirling disease agent). https://www.cabi.org/ISC/datasheet/73782. Accessed: April, 2019.
7. National Research Council (US) Committee on Noneconomic and Economic Value of Biodiversity. Perspectives on Biodiversity: Valuing Its Role in an Everchanging World. Washington (DC): National Academies Press (US); 1999. 3, The Values of Biodiversity. Available from: https://www.ncbi.nlm.nih.gov/books/NBK224412/ Accessed: April, 2019.

PUBLICATIONS

Decontamination protocol for watercraft & equipment

Summary | Detailed Information | Related

DESCRIPTION

Aquatic invasive species (AIS) and fish disease pose significant risks to the conservation and sustainability of our native species and their habitat. This manual provides consistent protocols for the inspection and cleaning of vehicles, watercraft, and water-based equipment, which will help prevent the spread of AIS during all field activities of government staff. The manual is accompanied by a quick reference guide, an equipment list, and a map of aquatic invasive species decontamination risk zone.

TAGS

AQUATIC ECOSYSTEMS | AQUATIC INVASIVE SPECIES | DECONTAMINATION PROTOCOLS | DECONTAMINATION ZONES | FISH DISEASES | WATERCRAFTS | WHIRLING DISEASE

RESOURCES

Decontamination protocol for watercraft & equipment

MORE INFORMATION | DOWNLOAD

DOWNLOADS: 768

Equipment list for decontamination purposes

MORE INFORMATION | DOWNLOAD

DOWNLOADS: 164

Contact government

PUBLICATIONS

Decontamination protocol for watercraft & equipment

Summary | Detailed Information | Related

DESCRIPTION

Aquatic invasive species (AIS) and fish disease pose significant risks to the conservation and sustainability of our native species and their habitat. This manual provides consistent protocols for the inspection and cleaning of vehicles, watercraft, and water-based equipment, which will help prevent the spread of AIS during all field activities of government staff. The manual is accompanied by a quick reference guide, an equipment list, and a map of aquatic invasive species decontamination risk zone.

TAGS

AQUATIC ECOSYSTEMS | AQUATIC INVASIVE SPECIES | DECONTAMINATION PROTOCOLS | DECONTAMINATION ZONES | FISH DISEASES | WATERCRAFTS | WHIRLING DISEASE

RESOURCES

Decontamination protocol for watercraft & equipment

MORE INFORMATION | DOWNLOAD

DOWNLOADS: 769

Equipment list for decontamination purposes

MORE INFORMATION | DOWNLOAD

DOWNLOADS: 164

Contact government