

# Whirling Disease

## in California:



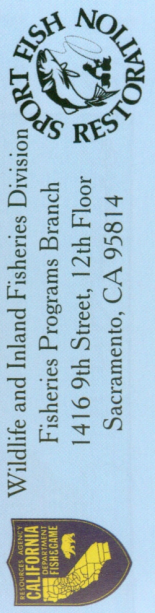
## Where it is and



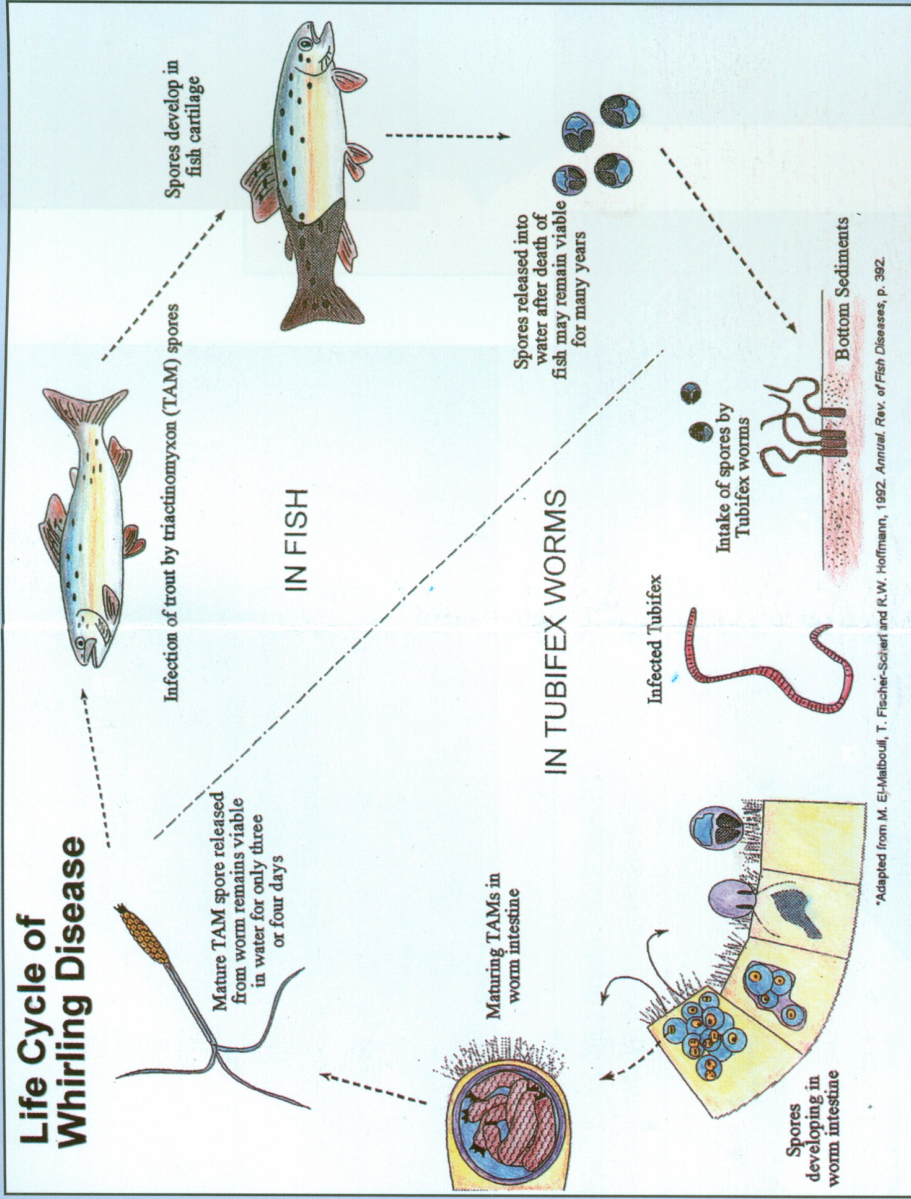
## what you can do about it!

Fish with whirling disease may have a bent or black tail.  
A crooked mouth is a typical whirling disease symptom.

California Department of Fish and Game



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The life cycle of the parasite that causes whirling disease is complex. It involves two hosts, a small worm that lives in the muddy bottom of a body of water, and trout or salmon. The microscopic-sized parasite itself has two distinct spore phases: a large, complex-shaped trichinomyxon (TAM) spore stage, and a small, spherical spore stage. The TAM emerges from the worm, enters the water column, and penetrates the skin of a small trout. Within the fish the parasite finds its way to head and spinal cartilage where it multiplies very rapidly causing cartilage and nerve damage. If the infection is extensive, cartilage and nerve damage may be severe enough to cause loss of equilibrium and the characteristic "whirling" swimming pattern. Within the cartilage of the fish, a spherical spore stage develops. These spores are released into the water when a host fish dies and decomposes, or after passing through the digestive system of a predator. The small, spherical spores can remain viable in the aquatic environment for up to 30 years. If ingested by the specific *Tubifex* worm host, the spore releases an amebula which penetrates the worm intestine, and develops into a TAM. After approximately 80 days, mature TAMs are released into the water. TAMs survive only three to four days after emerging from the worm, if they do not find a susceptible host fish. A single worm can produce thousands of TAMs. Depending on water temperature, the complete life cycle takes about three to four months.

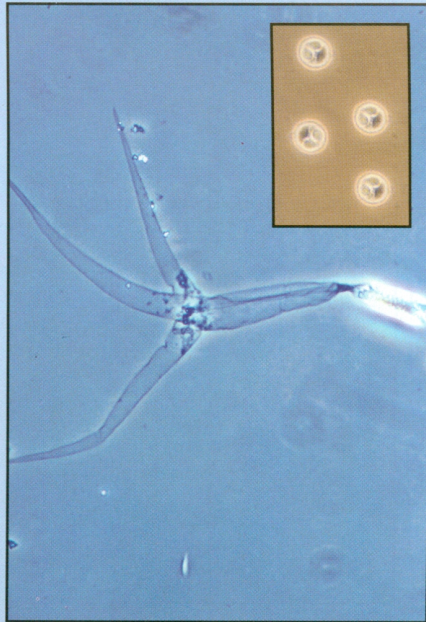


DFG photo by Robert Waldron

**Prevent spreading whirling disease by cleaning mud from waders before leaving the fishing area.**



**Cleaning equipment before leaving the haulout site prevents the spread of whirling disease.**



**Microscopic view of mature triactinomyxon (TAM) spore that infects salmonid fish. Inset, spores that infect tubifex worms.**

## What is it, and why is it here?

Whirling disease is suspected of causing severe declines in rainbow trout populations in some western states, particularly in Colorado and Montana. Although California has escaped significant impacts from this disease, the threat of outbreaks and declines in rainbow trout populations cannot be ignored.

Whirling disease is caused by a protozoan parasite of trout and salmon that was introduced to the eastern U.S. from Europe in the 1950s. The parasite (*Myxobolus cerebralis*) has been detected in a number of fish populations in California since its discovery in a small private hatchery near Monterey in 1965. It has a two-host life cycle, involving a salmonid fish and a tiny, bottom-dwelling aquatic worm, *Tubifex tubifex*. The parasite attacks only cartilage of the host fish, and if sufficiently abundant within the host, can cause a variety of skeletal deformities, including depressions in the skull, crooked jaw, bent or black tail, and an erratic, tail-chasing or “whirling” behavior. Mortalities result from only the most severe infections that occur in earthen aquaculture facilities where large tubifex worm populations are found. The lower-grade infections that occur in some wild fish populations in California are prevented from becoming more severe because of a combination of climate and topography (periodic high water, winter flooding, heavy snowmelt, and fast-flowing streams) that is unfavorable for supporting large tubifex worm populations. Availability of tubifex worm habitat may explain why major impacts have been reported in Montana and Colorado, but not in California and many other states.

Since its discovery in California, waters throughout the state have been tested for the presence of whirling disease, and it has been found in a number of watersheds. However, despite its wide distribution, there is little evidence of significant impacts on wild

salmonids in California. In some waters, fish are found with minor symptoms of whirling disease but it has not caused decreases in population numbers. Fortunately, the anticipated severe ecological and economic impacts to the valuable California fishery resources from this parasite have not materialized.

The major factor which caused its spread in California is the unintentional transfer of infected, cultured fish. Other causes may be migrating anadromous fish, fish-eating birds, and contaminated boots, equipment, and boats used in aquatic habitats.

## What you can do?

To prevent the spread of this potentially serious parasite, everyone engaged in aquatic activities should take precautions. Since worms and microscopic spores can be present in mud, water, or fish, you should:

- **Clean** mud and debris from waders, boats, and equipment before leaving the specific lake or stream.
- **Drain** water from boats at the haul-out site.
- **Never** take fish or fish parts from where they were caught and place them into another body of water.

Once established, it is extremely difficult, if not impossible, to remove the parasite from a body of water. By taking these precautions you help prevent the transfer of infected fish and mud to waters where the disease might result in trout population declines similar to those reported in other states.

# Watersheds in California where whirling disease has been detected

