

# *Ceratonova (Ceratomyxa) shasta*

## **I. Causative Agent and Disease**

The parasite *Ceratonova shasta* is not a protozoan but a metazoan in the class Myxosporidia in the phylum Cnidaria (anemones, jellyfish, corals) based on molecular studies and the feature of discharging cells (cnidocytes) known as polar capsules. The parasite produces crescent shaped spores 14-23 um long by 6-8 um wide at the suture line. A single spore contains two refractile polar capsules, each with an extensible coiled filament. Vegetative trophozoites and spores produce necrotic lesions within various tissues of salmonid fishes but the parasite has a tropism for the gastrointestinal tract, especially the intestine. High mortality may occur in susceptible juvenile fish and the parasite contributes to significant pre-spawning mortality of infected adult salmon. Depending on the host species and stock, natural exposure to the parasite may allow some fish populations to develop resistance to infection and severity of the disease. *Ceratonova* occurs seasonally (May to November) becoming more intense when water temperatures reach or exceed 10°C.

## **II. Host Species**

This organism parasitizes several different species of freshwater and anadromous salmonids and is restricted to the Pacific Northwest (PNW) and British Columbia. *Ceratonova shasta* is present in wild adult chum, coho and sockeye salmon, rainbow trout and Dolly Varden in Alaska within several south central and interior drainages including; Yetna, Yukon, Naknek, Wood, King Salmon, Togiak and Sushana Rivers and Lower Talarik, Mortenson and Russell Creeks. Clinical signs of disease, except for white gill nodules in sockeye, have been

absent in parasitized wild fish nor has the parasite been found in any hatchery stocks of Alaskan salmonids.

## **III. Clinical Signs**

Parasitized fish typically appear darkened in color with swollen or hemorrhaged vents and abdomens distended by ascites. Although lesions are variable by age and fish species, the entire digestive tract may be affected with granulomas and abscesses (boils) causing tissue necrosis that may spread to major visceral organs and skeletal musculature. These lesions contain developing multicellular trophozoites and spores. Each trophozoite forms a pansporoblast usually containing two spores.

## **IV. Transmission**

*Ceratonova shasta* is transmitted to fish through the gills by infectious actinosporidian tetractinomyxon stages in the water that are shed by parasitized freshwater polychaete worms of the species *Manayunkia speciosa* that serve as the alternate host. The worms become parasitized by ingestion of mature spores released by parasitized live or decomposing fish hosts. However, unlike other myxozoans, the parasite develops within the alternate host epidermis rather than within the intestinal epithelium.

## **V. Diagnosis**

Tissue lesions or intestinal scrapes are examined for spores having the typical size and morphology of this parasite. Identity is confirmed with fluorescein or enzyme conjugated antibody tests and by PCR specific for *Ceratonova shasta*.

## **VI. Prognosis for Host**

Depending on the fish species, stock and water temperature, prognosis may

be poor with high fish mortality. Major epizootics of juvenile salmonids in PNW hatcheries have commonly occurred when exposed to surface waters where the parasite is enzootic. Resistant fish in enzootic areas can become subclinical carriers of *Ceratonova shasta* with spores occurring in the lower intestinal tract. Prevention of exposure to the

parasite is the only effective method of control.

**VII. Human Health Significance**

Although parasitized fish tissues may be aesthetically displeasing, there are no human health concerns with *Ceratonova shasta*.



Stained spore of *Ceratonova shasta* showing polar capsules (arrow) and the medial suture line, X 1000.



Wet mount of *Ceratonova shasta* spore with two polar capsules.



Coho salmon with swollen prolapsed vent due to the parasite *Ceratonova shasta* (photo: R. Holt, Oregon Dept. of Fish and Wildlife).



Bloating due to ascites in fish parasitized with *Ceratonova shasta* (photo: R. Holt, Oregon Dept. of Fish and Wildlife).