

White Spot Disease

I. Causative Agent and Disease

White Spot Disease in marine fish is caused by a large ciliated protozoan, *Cryptocaryon irritans*. The disease also occurs in freshwater fish but is caused by a distantly related larger ciliate, *Ichthyophthirius multifiliis*. Infections by both parasites cause significant disease problems for marine and freshwater aquarists and commercial aquaculture worldwide. Both protozoa are obligate parasites infecting mostly the epidermis of the skin, fins and gills causing rapid mortality. Major differences between the parasites exist regarding salinity tolerance and duration of life cycle.

II. Host Species

Both parasites are distributed worldwide and infect a broad spectrum of wild and cultured marine and freshwater fish species. In Alaska, *Cryptocaryon* has been reported at two large aquarium facilities parasitizing captive greenling, sculpins, wolf eels and rockfish. These infections occurred at colder seawater temperatures of 8°C suggesting a strain of the parasite better adapted to lower temperatures. In the late 1970s, *Ichthyophthirius* caused pre-spawning mortality in Alaskan sockeye salmon and in 3-spine sticklebacks. More recently, *Ich* has been reported in captive goldfish, pike and in feral Arctic grayling.

III. Clinical Signs

Both protozoa produce coalescing white spots, nodules or patches on the surface of the skin, gills and fins. Excessive mucus production or changes in skin color may be accompanied by flashing behavior and increasing fish mortality.

IV. Transmission

The parasites divide by simple fission, are highly contagious and are transmitted horizontally fish to fish. There are three stages of the parasites: encysted trophont (feeding stage) that drops from the fish to become a tomont cyst (reproductive stage) producing tomites; tomites escape the cyst becoming theronts (free-swimming infective stage). Depending on the fish host, strain of parasite and water temperature, the life cycle may take from days to weeks. The freshwater life cycle is completed in 5 to 7 d at 21°C and 30 to 40 d at 10°C. Water temperatures of 32°C kill the *Ich* theront. About 10% of the *Ich* trophonts on a fish may reproduce within the host epithelium adding to the infection intensity. Marine white spot occurs between 15 and 30°C with an average life cycle of 1 to 2 wks, but may range from 6 d to 11 wks.

V. Diagnosis

External white spots on the skin or gills are examined by wet mounts that demonstrate the large ciliated trophont stage (48-452 um for marine form; 500-1000 um for freshwater form) with a lobed macronucleus for *Cryptocaryon* and one that is horseshoe-shaped for *Ichthyophthirius*.

VI. Prognosis for Host

Wild fish generally have light infections with negligible mortality, acquire at least partial resistance and are reservoirs for the parasites. Culture conditions allow explosive parasite reproduction causing extensive and rapid fish mortality. External treatment with copper sulfate pentahydrate is the most effective therapy against the theronts but must be repeated for 3-6 wks to prevent

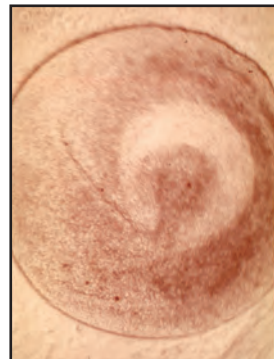
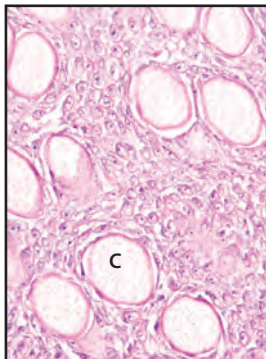
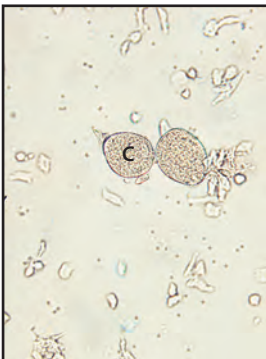
reinfection by theronts still to come from the remaining resistant trophonts embedded in surviving fish tissues and tomont cysts in the substrate.

VII. Human Health Significance

There are no human health concerns with white spot disease in fish.



Marine white spot on the dorsal skin and pectoral fins of a captive copper rockfish (photo: Lynn Wilbur).



Left: Wet mount of rockfish white spot lesion with two *Cryptocaryon* trophonts (C), X 400; **Center:** Histology section of parasitized rockfish epidermis with encysted *Cryptocaryon* trophonts (C), X 400; **Right:** Wet mount of freshwater white spot lesion from pike with *Ichthyophthirius* trophont showing horseshoe-shaped macronucleus, X 1000.