

Notes

Amoebic gill infestation in pallid sturgeon, *Scaphirhynchus albus*

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Abstract

An outbreak of an amoebic gill infestation in pallid sturgeon (*Scaphirhynchus albus*) is reported. The infestation was successfully treated with a combination of formalin and sodium chloride.

The aquaculture of sturgeon species has become increasingly popular worldwide, as well as, increasingly important since legislation was passed in 1998 by CITES to protect the international importation and exportation of all species of sturgeon and paddlefish. As the commercial industry of sturgeon aquaculture expands, the recognition of previously unreported pathogens and disease syndromes will undoubtedly also increase.

A federal hatchery in the northern USA raising endangered freshwater pallid sturgeon (*Scaphirhynchus albus*), experienced high mortality rates (up to 100%) in fingerling (1.5 - 2.0 grams) stock in late summer of 2000. The sturgeon had been hatched the previous spring, and were being reared in flow-through systems maintained at 17-18°C. Fish were being provided a semi-moist diet (Biodiet, Bio-Oregon, Inc. Warrenton, OR, USA). The hatchery water source was an open supply coming from a reservoir lake supplied by the Missouri River. Water quality was generally considered good except during periods of heavy

siltation following high wind or reservoir turn over. Other species of fish maintained at the facility included salmonids (coho salmon, cutthroat trout, brown trout, and rainbow trout), walleye and northern pike.

A sample of the affected pallid sturgeon population was sent to the Aquatic Medicine Laboratory of the Virginia-Maryland Regional College of Veterinary Medicine at the Virginia Polytechnic Institute and State University, Blacksburg, VA, USA for diagnostic evaluation. Gross external examination revealed generally healthy looking fish with slightly pale, clumped gills. Wet mount biopsies of gill tissue revealed excessive mucus associated with the gill filaments, but no obvious bacteria or external parasites were observed. Bacterial cultures taken from the posterior kidney yielded a moderate growth of a mixed bacterial infection.

Samples of representative tissues (gills, skin, muscle, heart, liver, kidney, spleen, and gastrointestinal tract) were collected in 10%

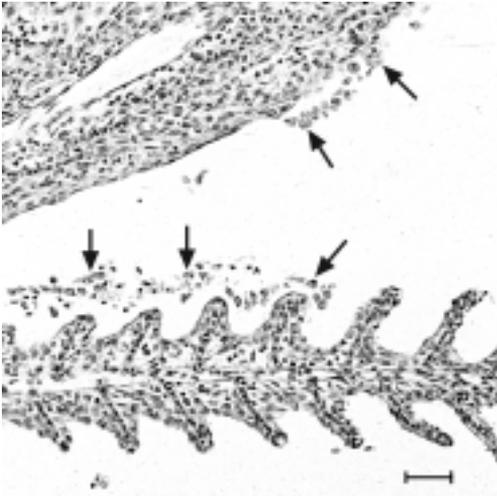


Figure 1 - Hematoxylin and eosin stained tissue section of gill tissue with amoebae (arrows) concentrated in areas of epithelial proliferation.

buffered formalin for routine histology. Histopathological results showed a moderate to severe epithelial hyperplasia and multifocal lamellar fusion of the gill tissue. The presence of numerous amoeba was also detected in gill tissue with the majority of the parasites concentrated on the gill surface in areas of epithelial proliferation (Figure 1). Though microscopic examination of wet mounts was unrewarding, stained smears of gill mucus may have revealed the parasite (Zilberg *et al.*, 1999). However, the amoebae were readily detectable on hematoxylin and eosin (H&E) stained histological preparations. Small numbers of amoeba were often difficult to distinguish from epithelial cells in H&E stained tissues sections, but were more easily visualization in tissue sections stained with Feulgen stain (Lom and Dykova, 1992) (Figure 2). In addition to the amoeba infestation, a fungal infection was noted on the gills of a few fish.

A variety of treatments for gill disease caused by amoeba have been reported in the litera-

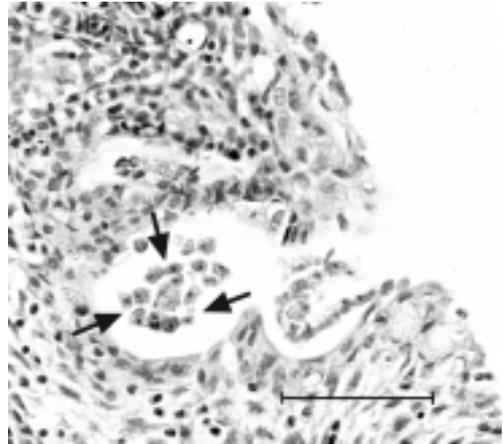


Figure 2 - Feulgen stained tissue section of gill tissue with multiple amoebae (arrows) lining the epithelial surface of the gill lamellae.

ture, though it appears that repeated formalin treatments are the most rewarding as a therapeutic for amoebic gill disease in freshwater fishes (Bullock, *et al.*, 1994; Wolf and Smith, 2000). A single combined treatment of Chloramine-T (Argent Chemical Laboratories, Inc., Redmond, WA, USA) (15 ppm) and sodium chloride (salt) (1 ppt) was ineffective in decreasing mortality in this case. However, fish were successfully treated with multiple formalin bath (100 ppm) treatments and sequential sodium chloride exposure (0.5 ppt). Following three treatments of the formalin/sodium chloride therapy, mortality rates approached 0%.

Natural infestations of amoeba on the gills of freshwater fish (commonly called "nodular gill disease" in freshwater salmonids) have been previously reported in rainbow trout, Atlantic salmon, coho salmon, arctic char and tilapia (Daoust and Ferguson, 1985; Noble *et al.*, 1997; Sawyer *et al.*, 1974; Speare and Ferguson, 1989; Speare, 1999; Taylor, 1977;

Wolf and Smith, 2000). Culture and specific identification of the amoeba parasite collected from the gills of these fish were not successful, but genera reported to infest gills of freshwater fish include *Acanthamoeba* and *Thecamoeba* (Noble and Noble, 1966; Sawyer *et al.*, 1974; Taylor, 1977).

To our knowledge, this is the first report of an amoebic gill infestation in any sturgeon species. The mortality exhibited during this disease episode suggests that sturgeon do not tolerate this parasite well. However, the concomitant bacterial and fungal infections suggested that the fish were also succumbing to secondary opportunistic pathogens. The source of the infestation is unknown, but given the history of these sturgeon, it is possible that cross-infection from salmonids in the same hatchery or transmission from wild fish populations could have occurred.

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