

Chapter 3. Fungal Disease

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ICHTHYOPHONIOSIS

The incidence of ichthyophoniosis in groupers has been reported in *Plectropomus* sp. in Singapore and *Cromileptes altivelis* in Indonesia. It has also been known to infect at least 80 other species of teleost fish from marine, estuarine and freshwater habitats in both temperate and tropical regions (e.g., rainbow trout, yellowtail, mackerel, herring, flounder and cod). The etiologic agent of this disease is reportedly of uncertain taxonomic affinity but is often described as a fungus.

Causative agent:

The disease is caused by *Ichthyophonus* sp.

Stages affected:

Due to the chronic progression of ichthyophoniosis, the disease has been diagnosed only in market-sized grouper fish.

Gross clinical signs:

External manifestations include nonspecific signs such as loss of appetite, emaciation, lethargy and color changes. Infected fish exhibits rough skin texture or “sandpaper effect” and occasional skin ulcerations (Fig. 3-1).



Fig. 3-1. Skin ulcer of *Plectropomus* sp. due to *Ichthyophonus* sp. infection (Photo from Chong and Chao, 1986).

Effects on host:

Internal organs such as the spleen, liver and kidney become swollen and develop numerous white or cream-colored nodular lesions, up to 2 mm in diameter. Infected fish could also develop these nodules in the muscle tissues (Fig. 3-2). These nodular lesions in affected tissues are granulomas consisting of inflammatory cells surrounding spores or invading fungal hyphae (Fig. 3-3). When viewed under the microscope, these nodules could include the various life stages of the organism (early cyst, developed cyst and hyphae) in the affected tissues. The prevalence of ichthyophoniosis in most fish species affected increases with age.

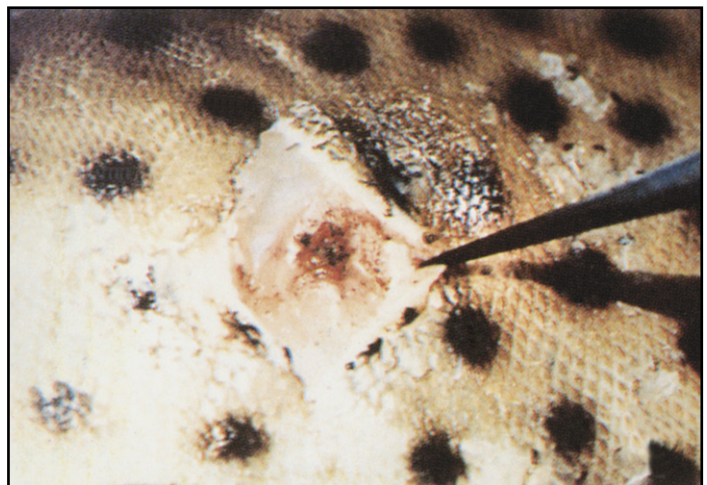


Fig. 3-2. Whitish nodular lesions or granulomas observed in the muscle tissues of *Cromileptes altivelis* (Photo from Zafran et al., 1998).

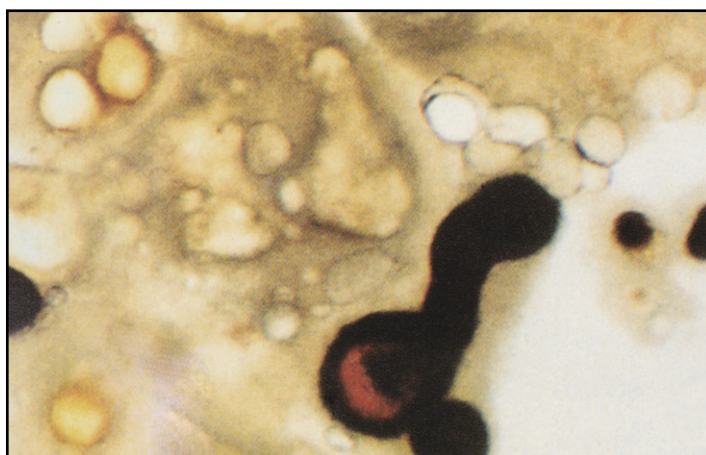


Fig. 3-3. Growing fungal hyphae surrounded by the host's cells which form the nodular lesions in affected tissues of *Cromileptes altivelis* (Photo from Zafran et al., 1998).

Transmission:

The disease was experimentally reproduced in some fish species through exposure to pure cultures of the pathogen by injection or by feeding healthy fish with tissues infected with the organism. Zooplankton may possibly facilitate transmission of the causative organism.

Diagnosis:

Ichthyophoniosis may be diagnosed based on gross clinical signs, and confirmed by microscopic examination. Fresh squash preparations and histological analyses of infected fish tissues will show the presence of 50-100 µm cyst-like structures. Hyphae may be seen branching from the cysts. Alternatively, *in-vitro* culture of the heart, liver and spleen tissue excised from fish with ichthyophoniosis was reported effective in detecting subclinical infections. Tissues are cultured in Leibovitz medium supplemented with 10% fetal bovine serum, 2 mM glutamine, 100 µg/ml Gentamicin, 100 units Penicillin and 25 µg/ml Streptomycin and buffered to pH 7.2 with 10 mM HEPES buffer. Tissue cultures are incubated at 12, 15 or 20°C for 10-14 days. In tissue culture, the pathogen is confirmed by the presence of fungal spores and hyphae.

Preventive and control methods:

There is no reported treatment for this disease. Infections in farms or culture areas have been commonly associated with the use of contaminated marine fish as feed; therefore caution should be exercised when using raw trash fish feed as these could be infected with the pathogen.

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