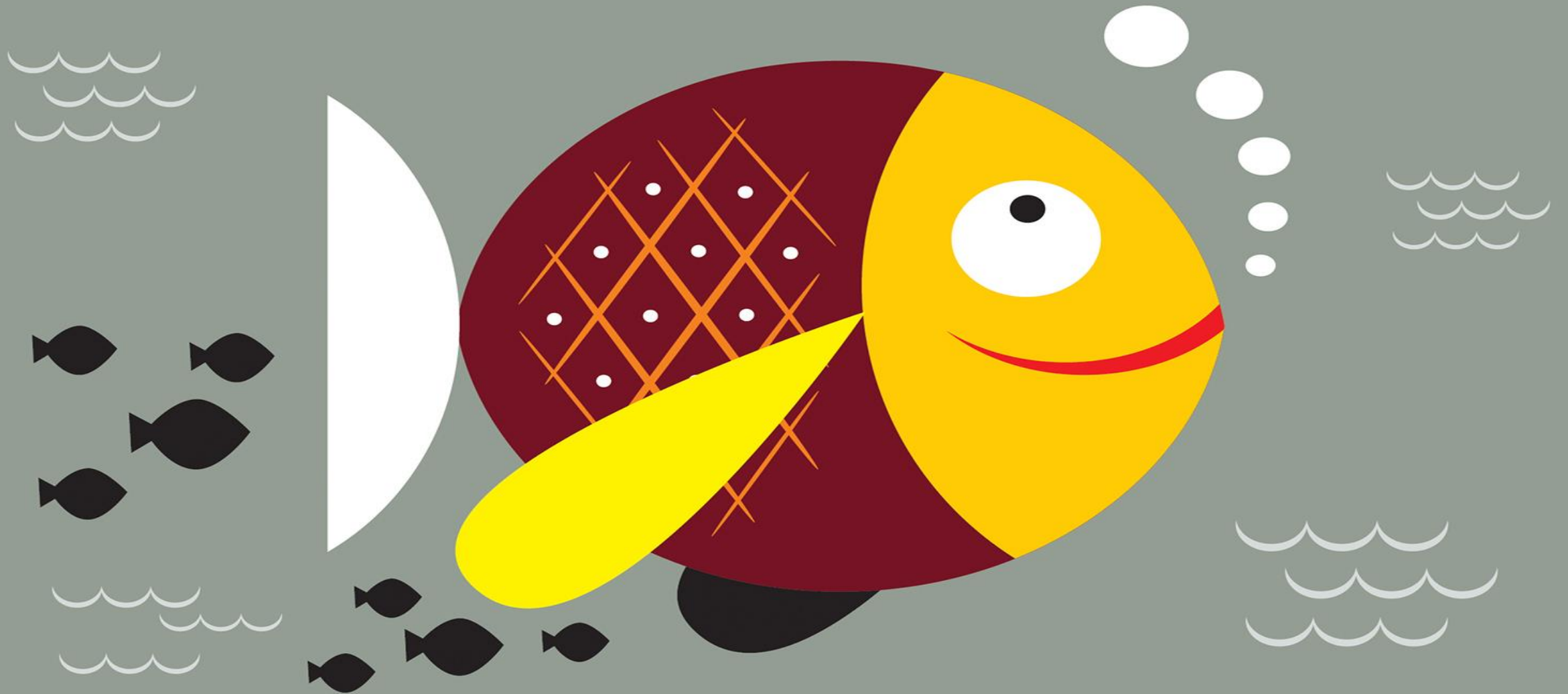


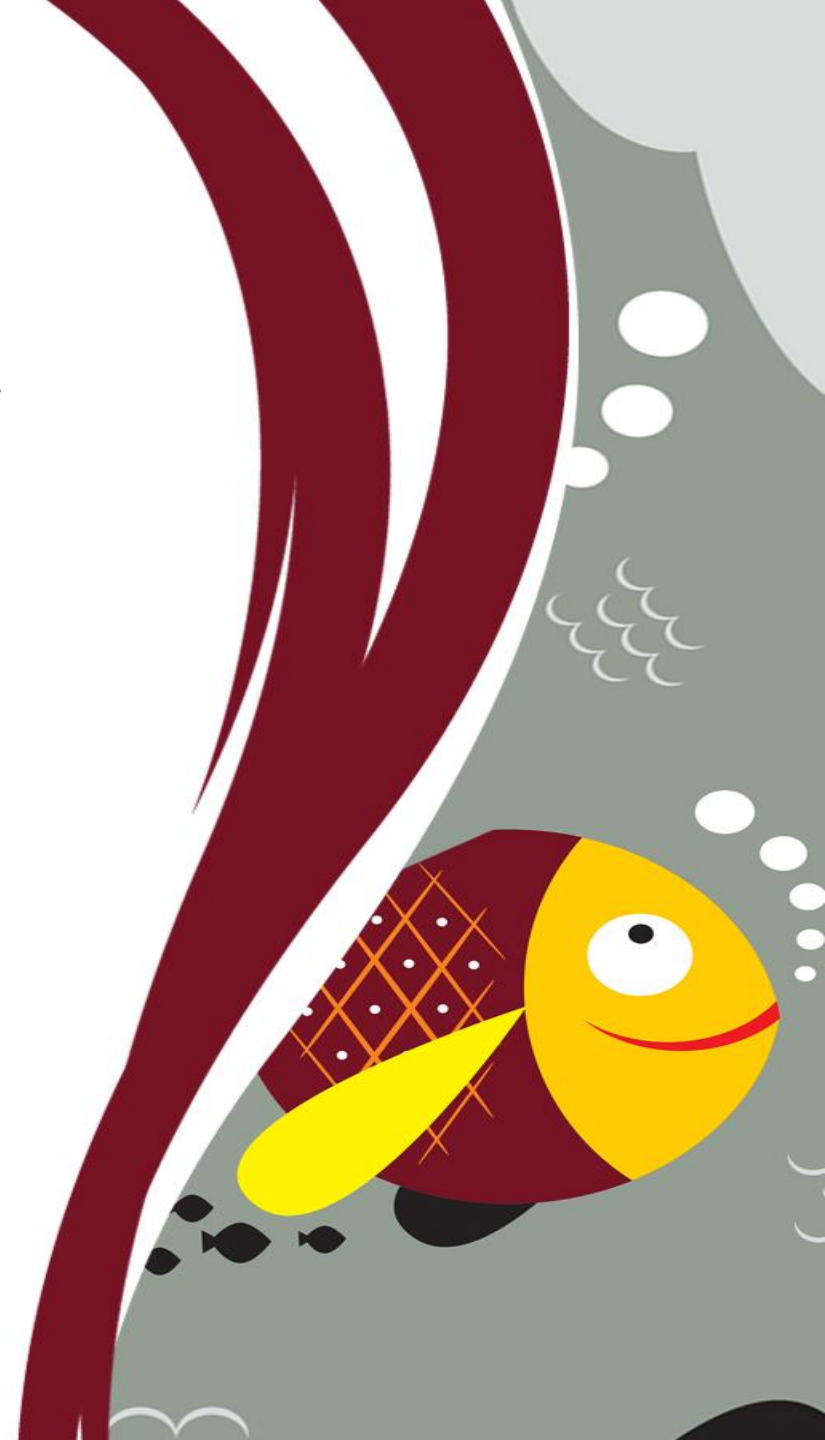
Fungal Diseases II



BRANCHIOMYCOSIS

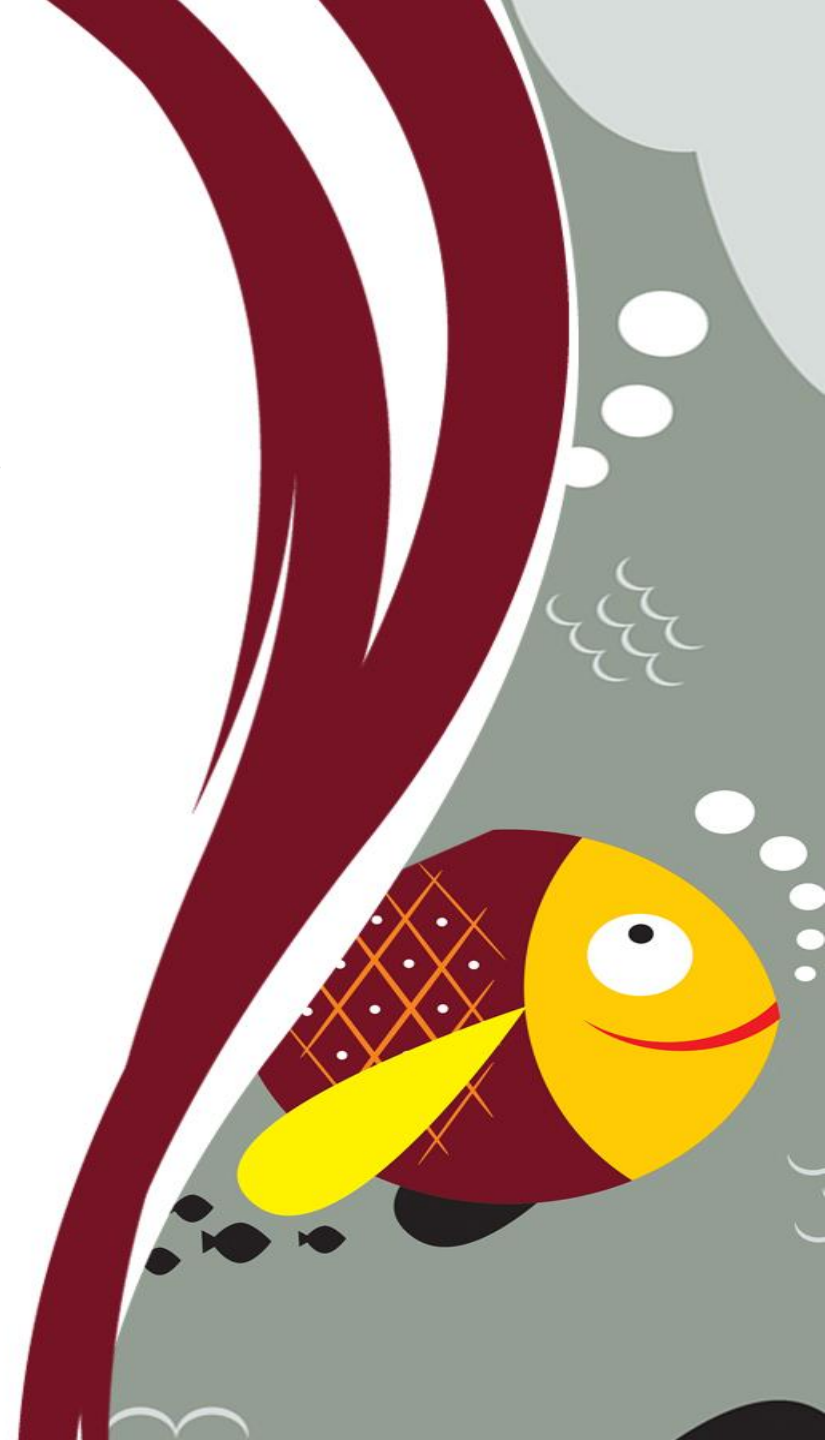
Branchiomyces demigrans or "**Gill Rot**" is caused by the fungi *Branchiomyces sanguinis* (carps) and *Branchiomyces demigrans* (Pike and Tench).

Branchiomycosis is a pervasive problem in Europe, but has been only occasionally reported by U.S. fish farms.



BRANCHIOMYCOSIS

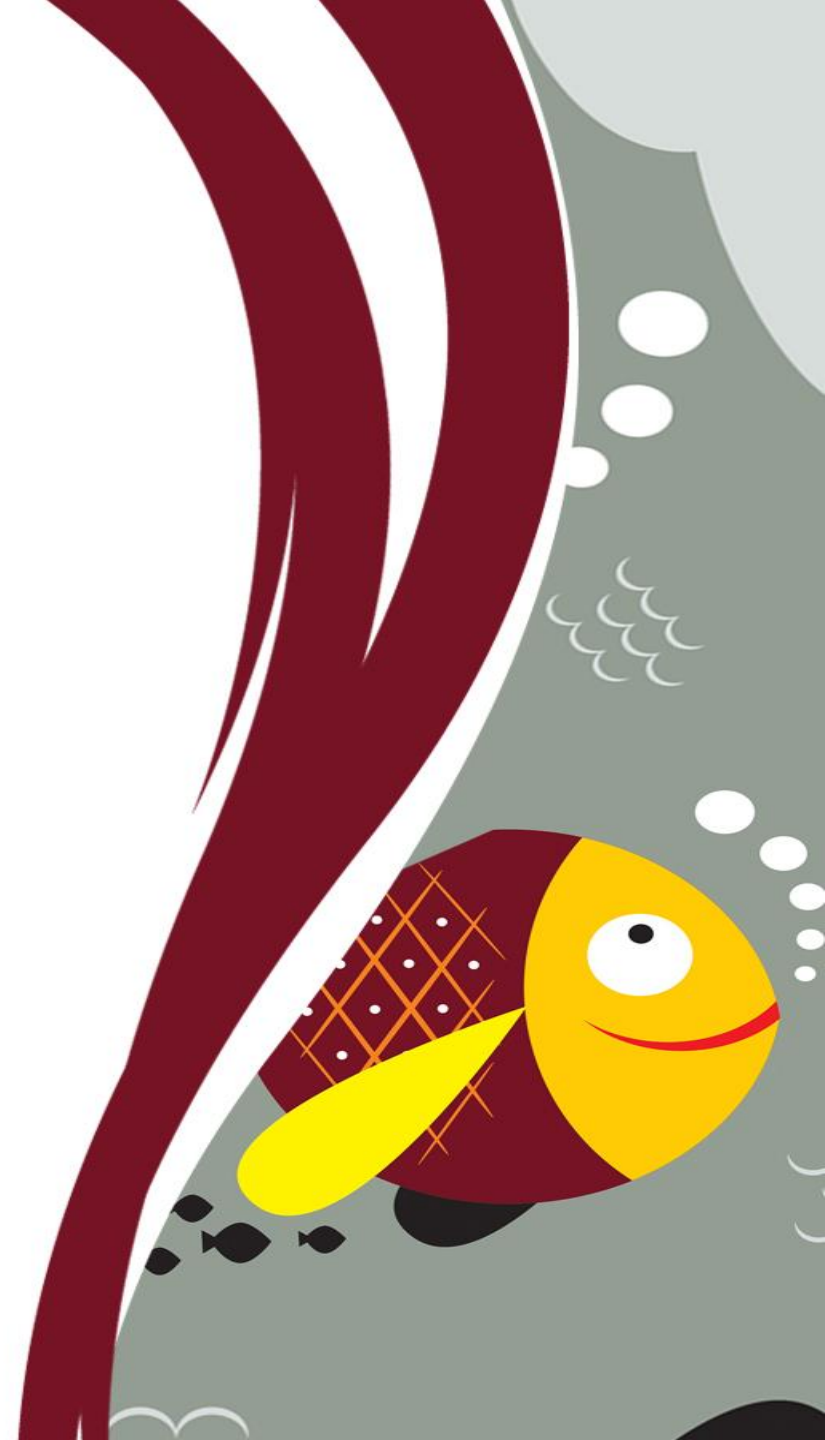
Both species of fungi are found in fish suffering from an environmental stress, such as low pH (5.8 to 6.5), low dissolved oxygen, or a high algal bloom. *Branchiomyces* sp. grow at temperatures between 14° and 35°C but grow best between 25° and 32°C. The main sources of infection are the fungal spores carried in the water and detritus on pond bottoms.



BRANCHIOMYCOSIS

Mode of transmission:

- Fungal spores are transmitted by water to gills.
- These spores adhere to the gills, germinate and produce hyphae.
- The hyphae penetrate gills epithelium or within the blood vessels of gills depending on species of fungi.



BRANCHIOMYCOSIS

Morbidity rate among fish populations with epizootics of brachyomycosis usually reach 100% depending on fish species and susceptibility. Mortality rate may reach 30 to 50% of the fish population during late summer epizootics.



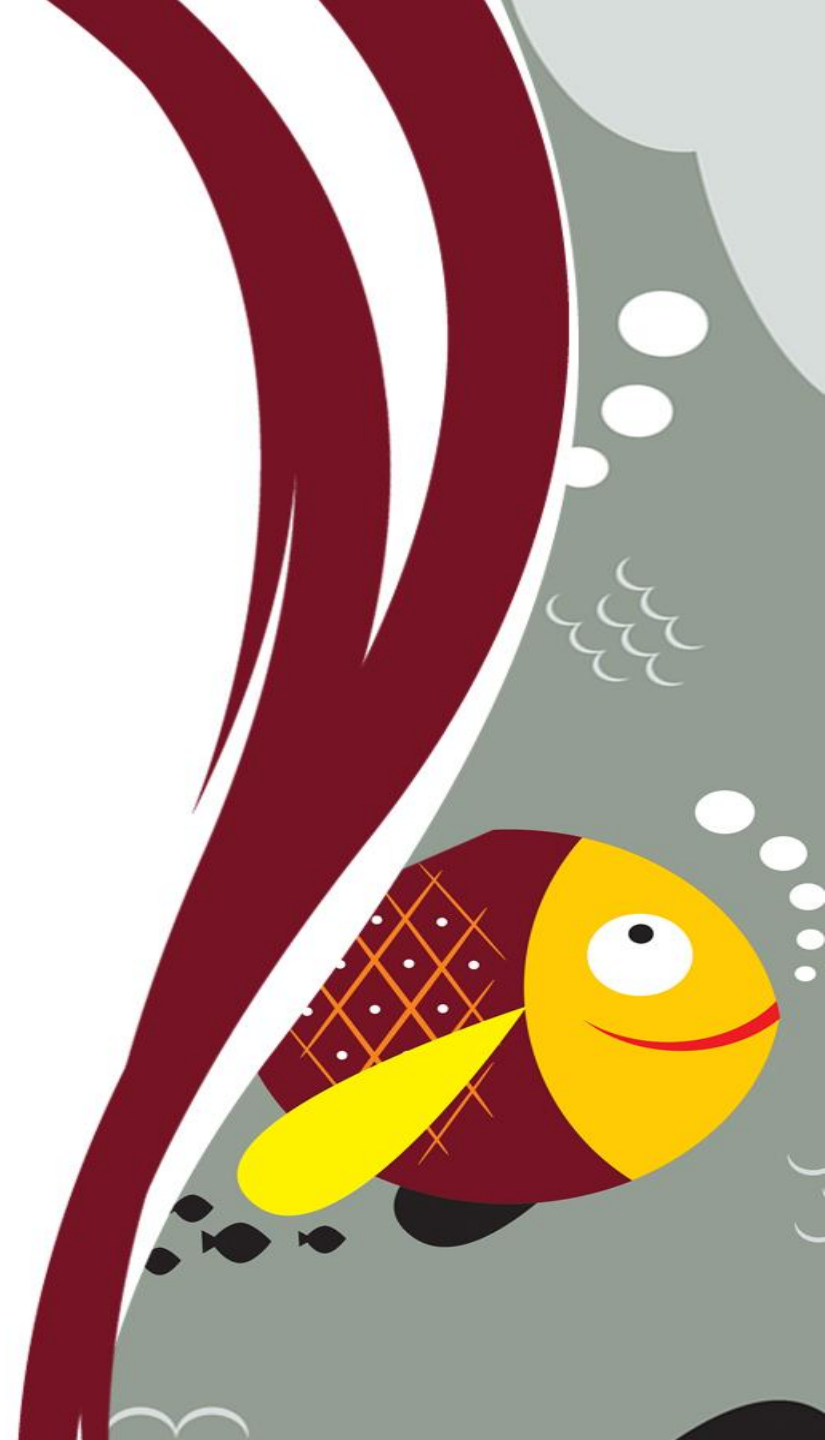
BRANCHIOMYCOSIS

- The gills start rotting and the fish suffer from breathing troubles.
- Their skin gets patches of gray colors and by then, it would be a clear indication that the fish have a serious disease.



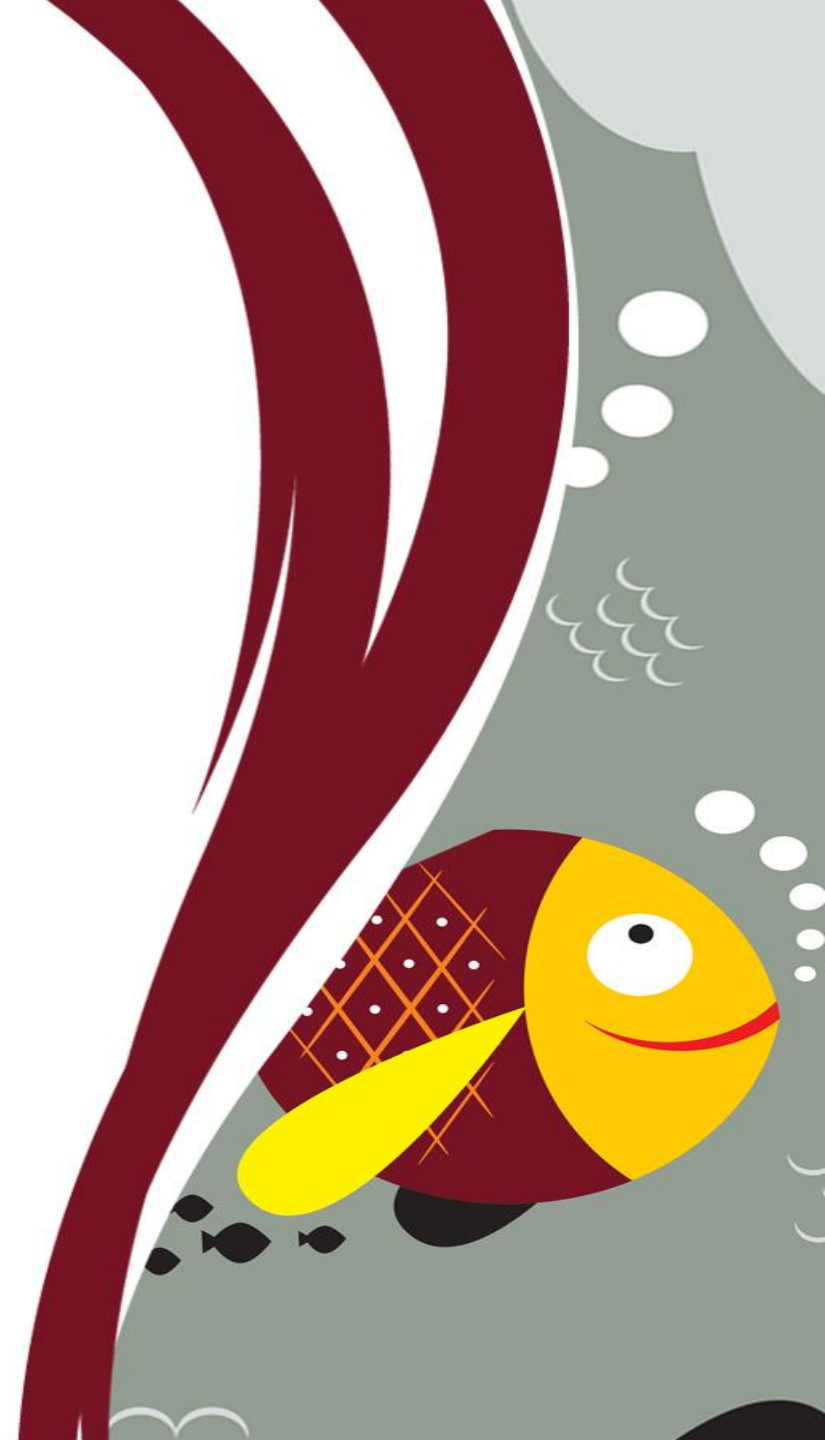
BRANCHIOMYCOSIS

- The infection so caused first attacks the gills. Once it has infected the gills, it spreads all over the skin in a gradual way.
- Being sluggish can be a very common symptom. Respiratory issues will often lead to lethargy. The fish may also isolate themselves because they will feel extremely sick.



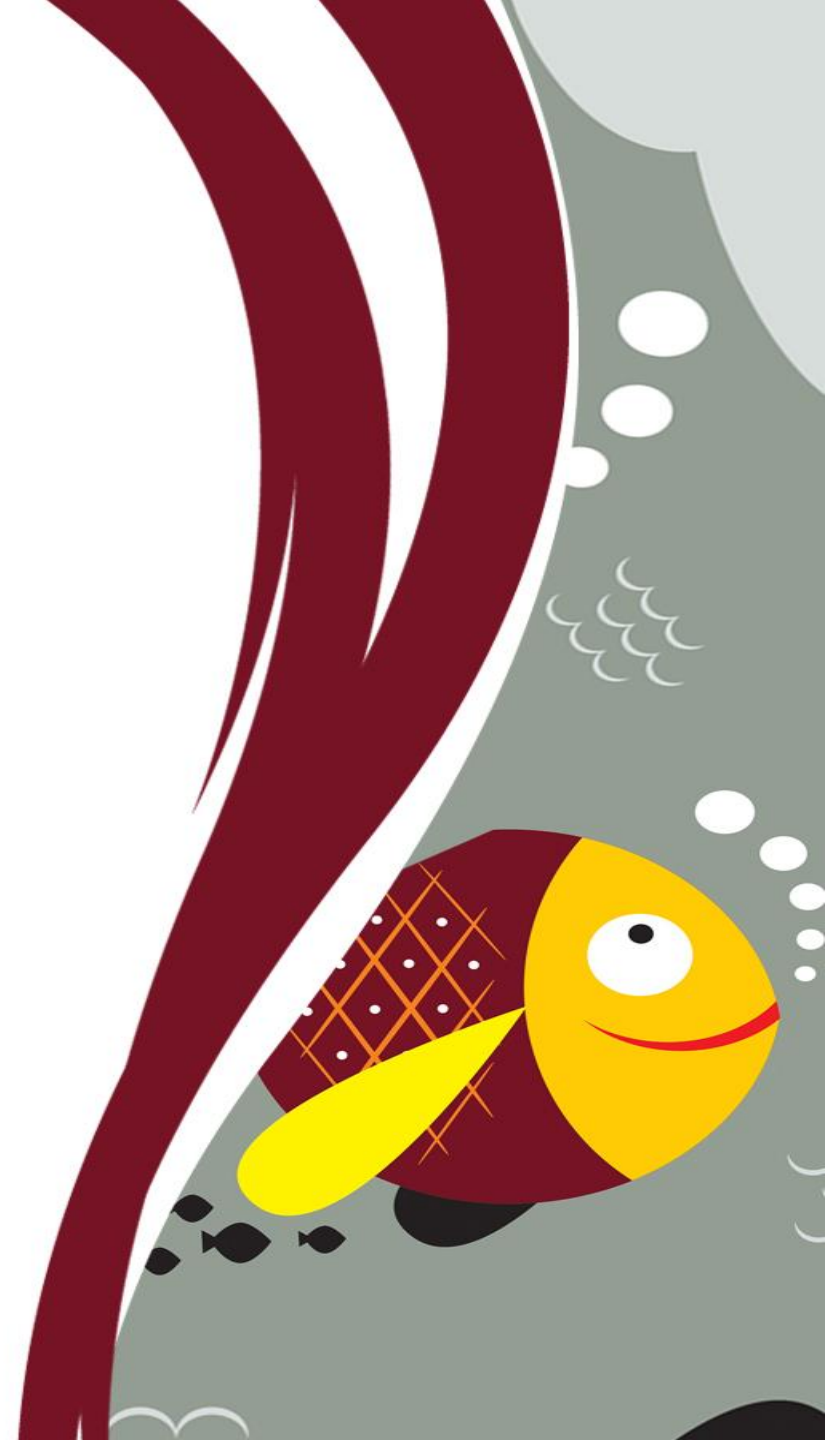
BRANCHIOMYCOSIS

Healthy gills are reddish brown in color. When tissues start dying in the gills, they become mottled. (Mottles are the patches or the spots of various shades formed on the body.)



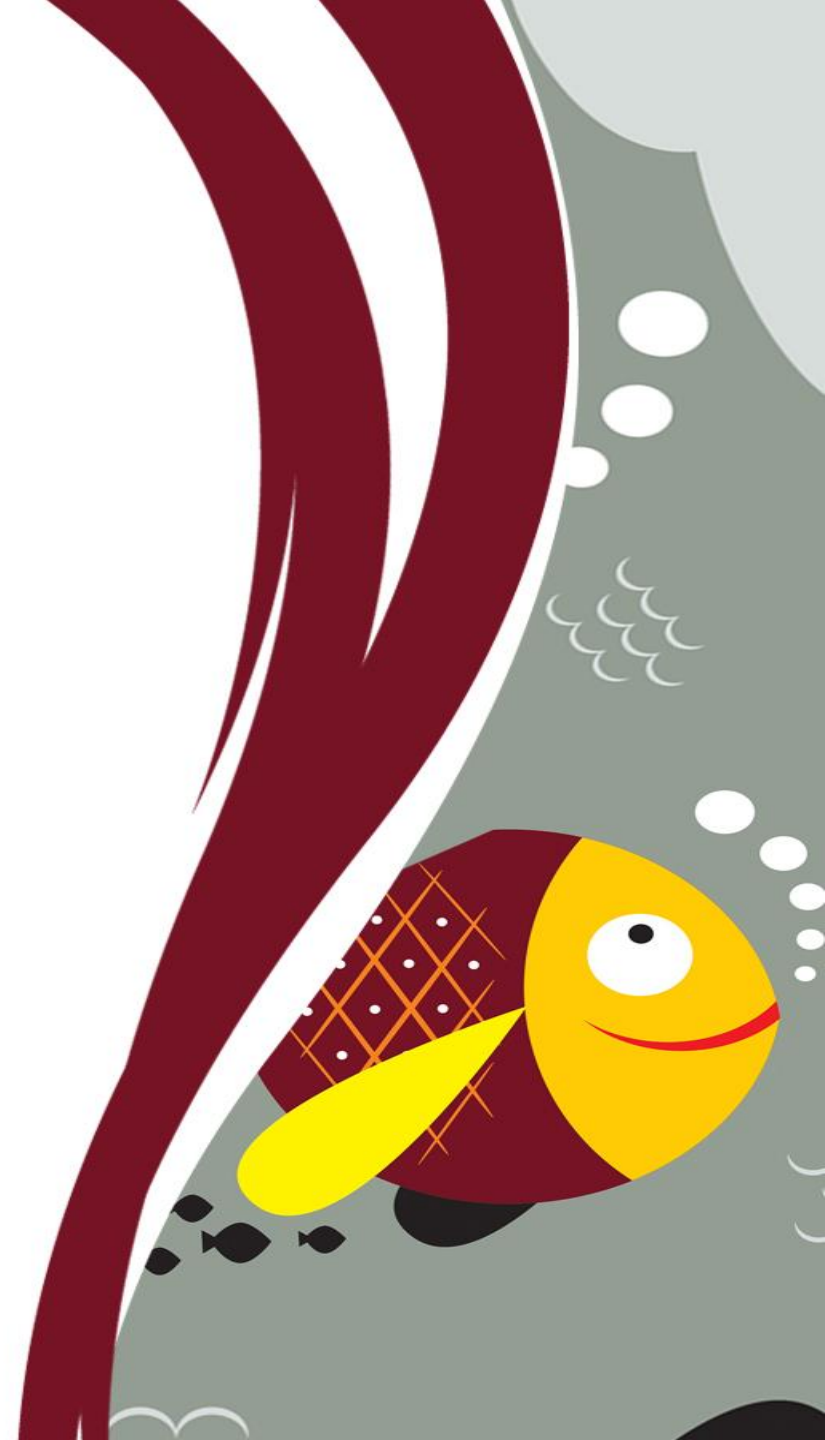
BRANCHIOMYCOSIS

- Using special stains for fungi (periodic acid Schiff's (PAS) or silver stains), oomycete hyphae and spores can be easily seen in the gill vasculature and in extravascular gill tissues.



BRANCHIOMYCOSIS

- There is little host response to hyphae within blood vessels, but extravascular hyphae provoke an inflammatory granulomatous response.
- Necrosis of filament tips occurs distal to regions where the gill vasculature has been damaged or blocked.



BRANCHIOMYCOSIS

Treatment and control:

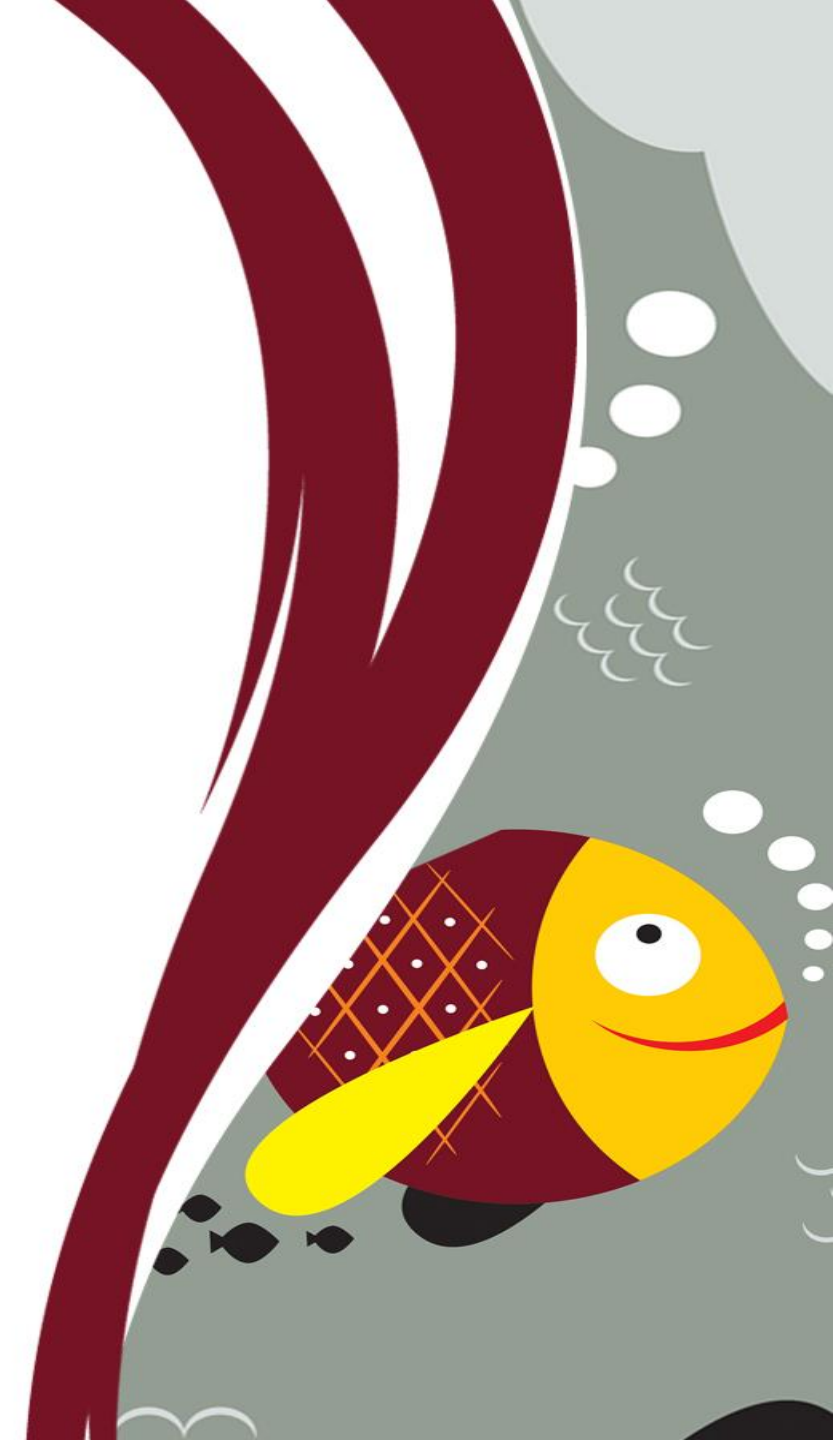
1. Strict sanitation and disinfection are essential for disease control.
2. Dead fishes should be collected and daily and burned or deeply buried.
3. Ponds with enzootic branchiomycosis should be dried and treated with calcium oxide (quicklime) or 2 to 3 kg copper sulphate per hectare.



BRANCHIOMYCOSIS

Treatment and control:

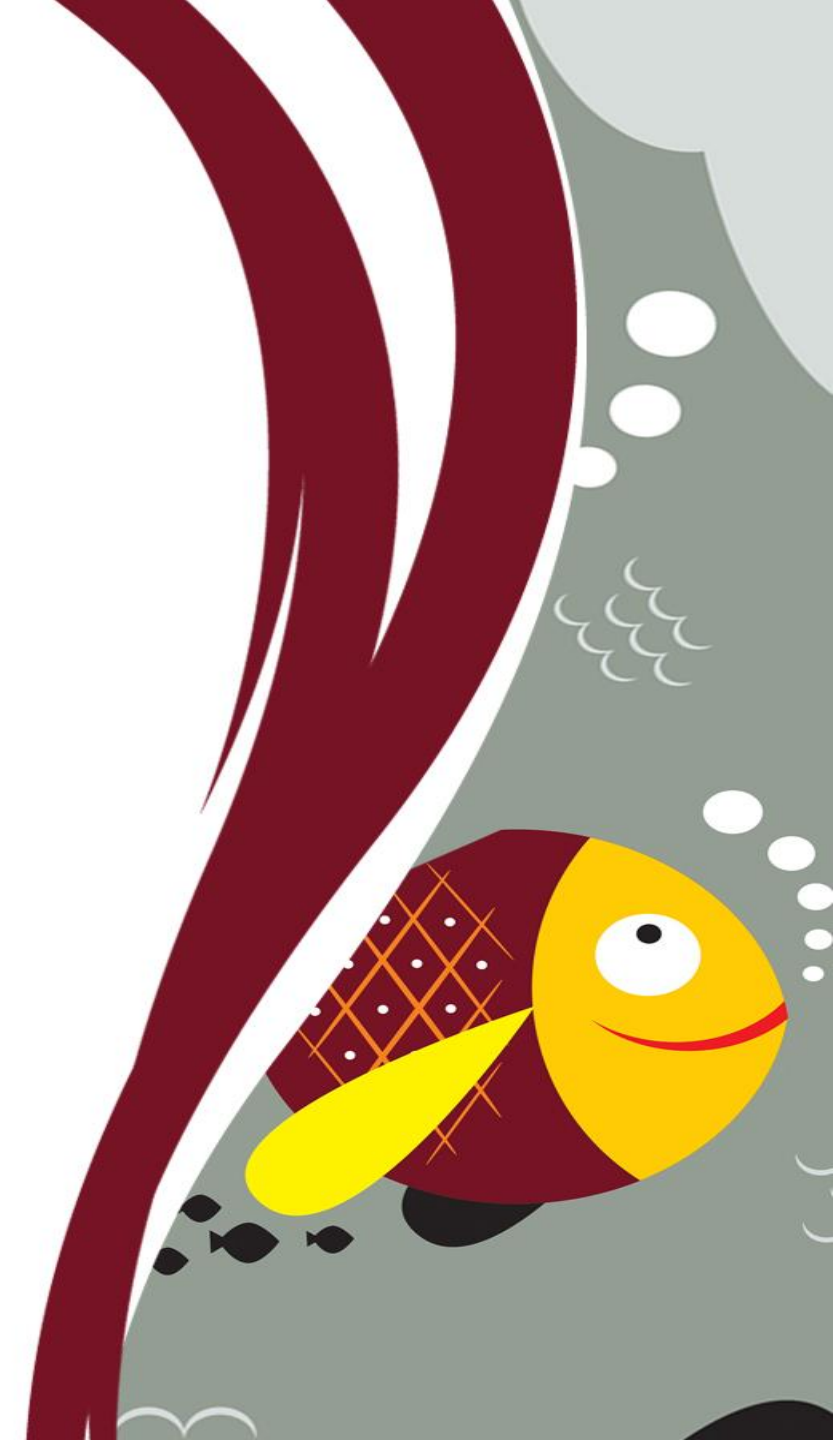
4. Diseased fish can be treated with malachite green at 0.1mg/l for extended periods of time or 0.3mg/l for 12 hours.
5. Transportation of infected fish areas to non-infected areas must be prevented.
6. Increase of water supply help in control of that disease.
7. Stress factors must be avoided.
8. Regulating the feeding rate during warm weather.



Ichthyophoniasis

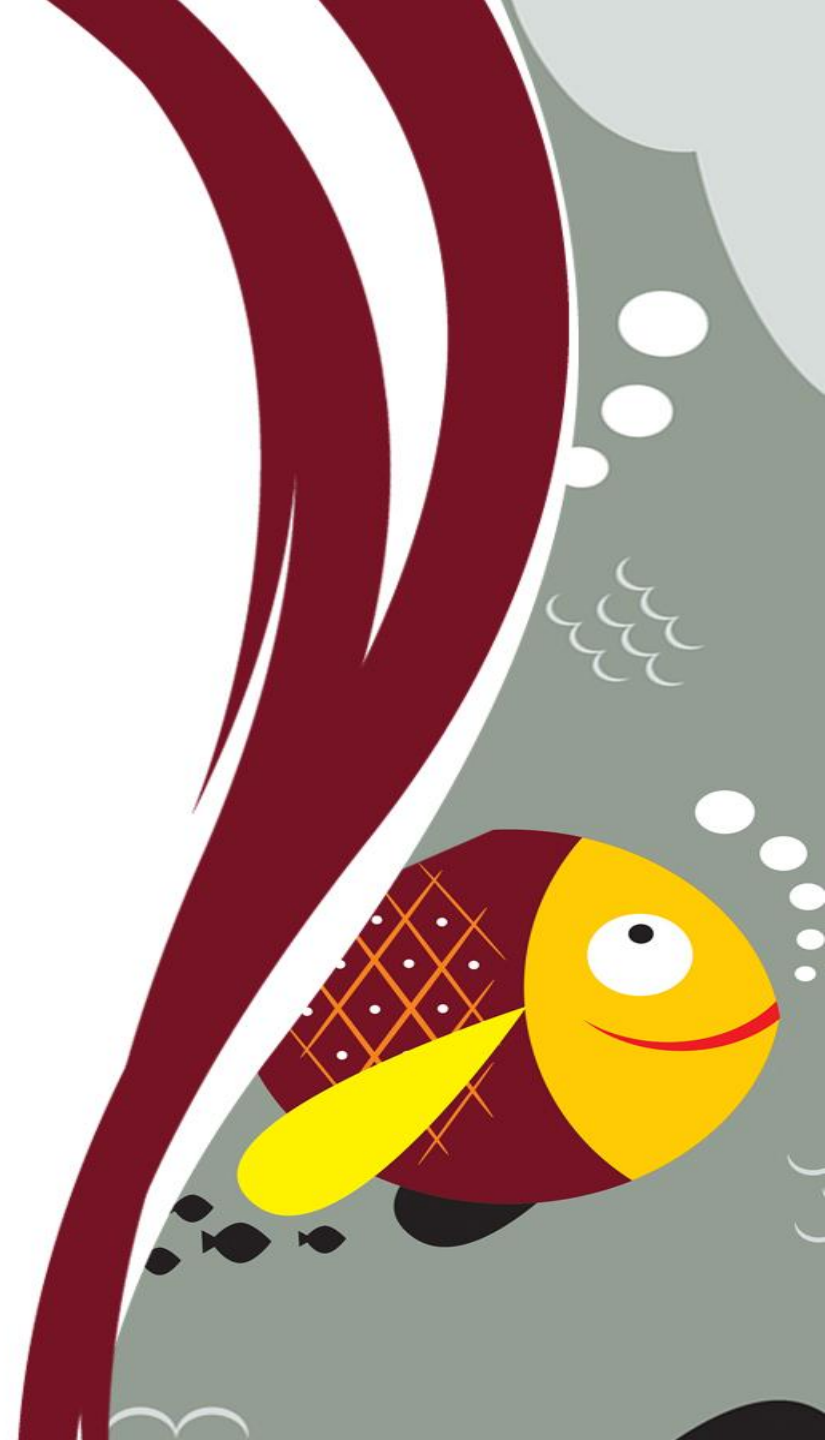
Ichthyophonus hoferi

Salmonid fishes including rainbow trout (*Oncorhynchus mykiss*) and chinook salmon (*O. tshawytscha*), Pacific herring (*Clupea pallasii*), yellowtail (*Seriola quinqueradiata*), etc.



Ichthyophthiriasis

Diseased fish exhibits darkening in color, abdominal distention, exophthalmus, nodules on the internal organs



Ichthyophoniasis

Previously, *Ichthyophonus hoferi* was classified into Zygomycetes (Fungi), but now it is a protozoan.

Binucleate hyphal bodies grow up into thick walled **spherical multinucleate bodies** (20-125 μm in diameter).

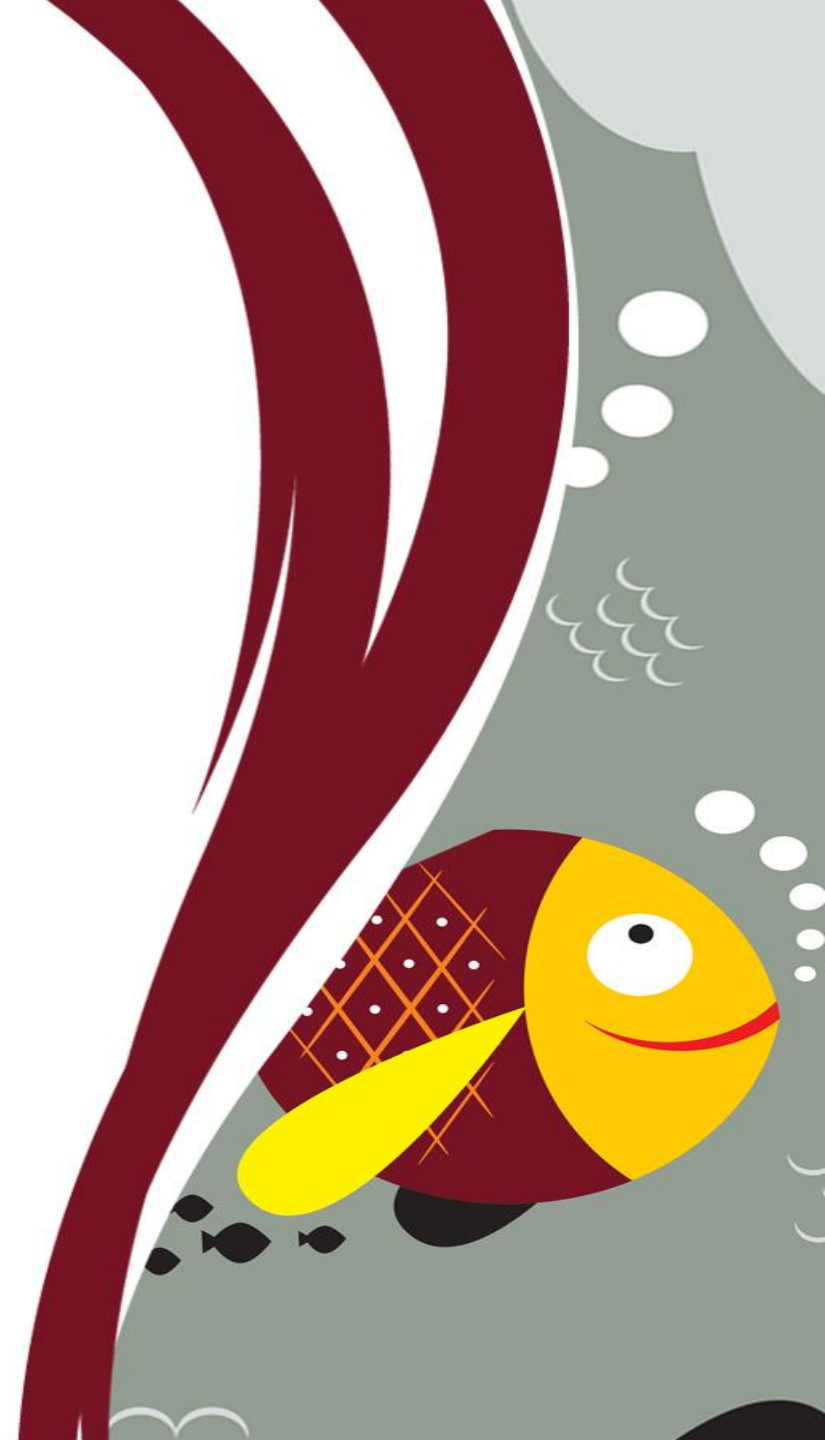
The multinucleate spherical bodies *extend* the hyphal bodies and **produce spores**.

Fish become infected by ingesting the multinucleate spherical bodies, which germinate and penetrate in the **gastric mucosa**.



Ichthyophoniasis

Diseased fish shows abdominal distention caused by accumulation of ascitic fluid and enlargement of the kidney. **White small nodules are formed in the visceral organs. Granulomatous inflammation is observed in the focus.**



References

Andrew E. Goodwin. Branchiomycosis. <https://units.fisheries.org/fhs/wp-content/uploads/sites/30/2017/08/4.2.1-Branchiomycosis-2014.pdf>

