

Parasitic and fungal diseases in Fish

Numerous types of parasites

- Protozoans
- Trematodes
- Nematodes
- Cestodes
- Crustaceans
- Leeches

Protozoa

- Ciliates
 - Large protozoa up to 2mm in length that have cilia (hair like organelles) covering their body at some point, if not all, of their life cycle
- Flagellates
 - Protozoa equipped with one or more whip-like flagella used for propulsion

Ciliates

- Largest group of protozoa
- Direct life cycle
- Common in pond-reared fish
- Easy to eliminate in aquarium due to controlled conditions
- Easily transmitted through nets, hoses or hands

Ciliates

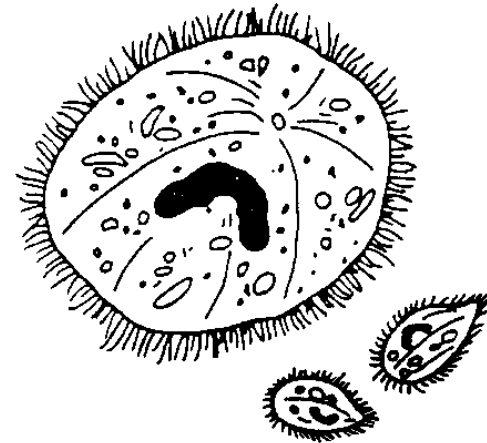
- Symptoms include
 - Skin or gill irritation
 - Rubbing and abnormal breathing
- Species
 - *Ichthyophthirius multifiliis*
 - *Tetrahymena*
 - *Apiosoma*
 - *Epistylis*

Ichthyophthirius multifiliis

- Disease
 - Ich or white spot disease
 - Responsible for majority of fish fatalities
- Symptoms
 - Small lesions on body or fins
 - If gills only then no lesions but a thick mucus

Ichthyophthirius multifiliis cont.

- Identification
 - Horseshoe shaped macronucleus



- Possible misidentification
 - Immature forms may resemble *Tetrahymena*

Ichthyophthirius multifiliis



Ichthyophthirius multifiliis cont.

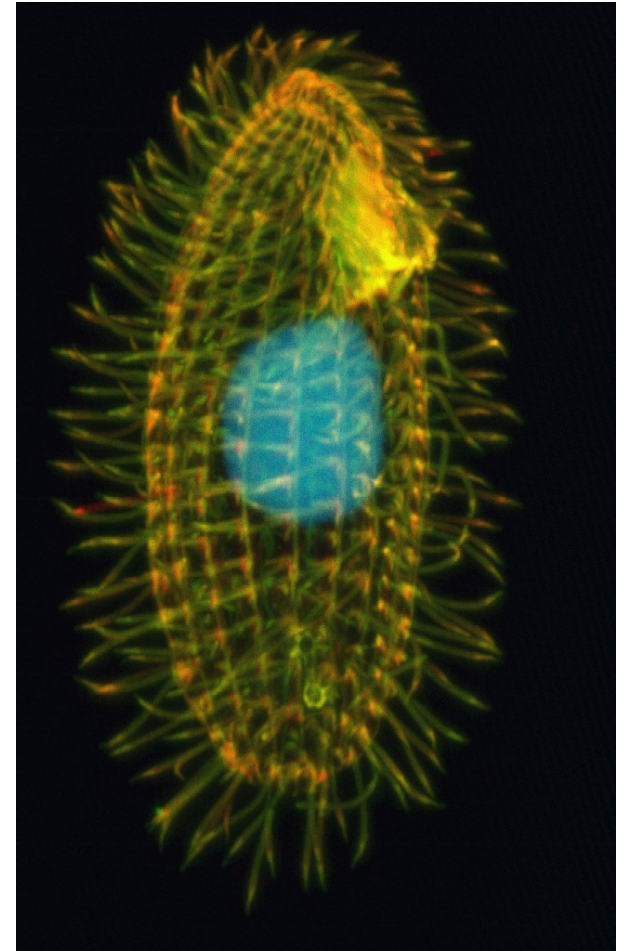
- Life cycle
 - Tomites infect fish $t=0$
 - Dig under scales or gills
 - Mature trophozoites leave fish $t \sim 7$ days
 - Settle and secrete cyst
 - Cysts rapidly divide to produce hundreds of tomites
 - At maturity they leave cysts looking for host
 - Whole cycle = 10 days to 4 weeks

Ich Treatment

- Life cycle is temp dependent
 - So raising the temp increases life cycle to days instead of weeks
- Formalin
- Copper sulfate
- Treat for >3days after last spot gone
- vaccum the floor of tank to get the cysts

Tetrahymena

- Living in organic debris
- Body surface of fish
- Treatment
 - Same as Ich



Apiosoma

- Location
 - Gills, skin, or fins
- shape
 - Vase like
 - Oral cilia
- Treatment
 - formaline, copper sulfata



Apiosoma



Epistylis

- Stalked ciliate very similar to *apiosoma*
- More dangerous than *apiosoma*
 - Greater concern than most due to proteolytic enzymes secreted by the organism
 - The enzyme breaks down proteins in the skin of the fish making the fish susceptible to bacterial infection



Epistylis

- Treatment
 - Salt
 - .02% salt solution for extended period
 - 3% salt dip
 - More than one treatment required

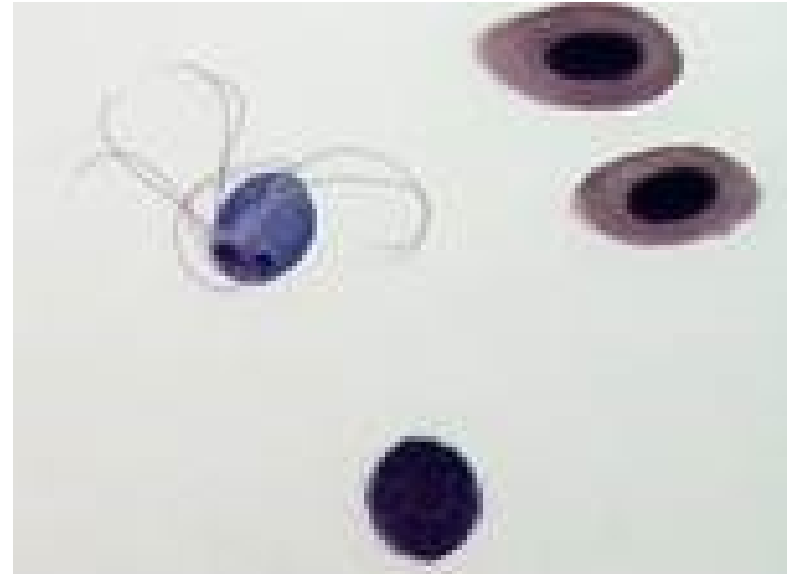


Flagellates

- External and internal
- species
 - *Spironucleus*
 - *Ichthyobodo*
 - *Myxozoa*
 - *Microsporidia*

Spironucleus

- Location
 - Intestinal tract
- Symptoms
 - Extreme weight loss
 - Distended abdomen
 - Yellow mucous build up in intestines

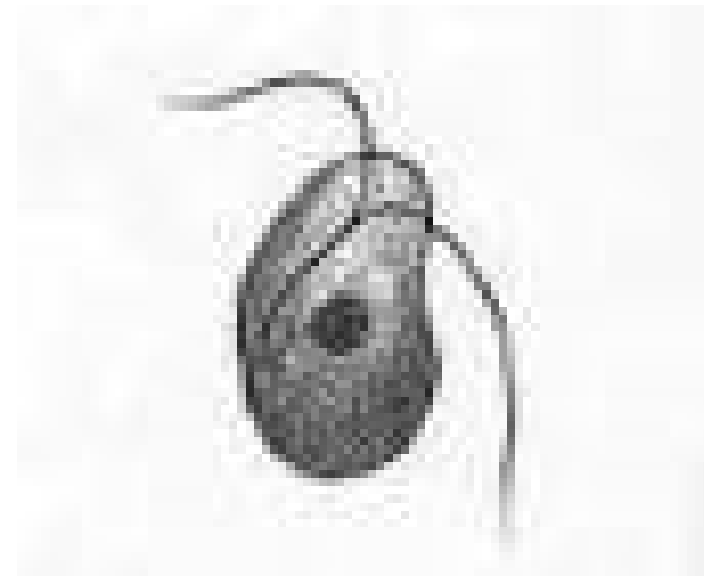


Spirotrichomonas

- Diagnosis
 - Intestinal prep observed at 200-400x
- Treatment
 - Metronidazole bath
 - 5mg/L
 - Every other day for one week

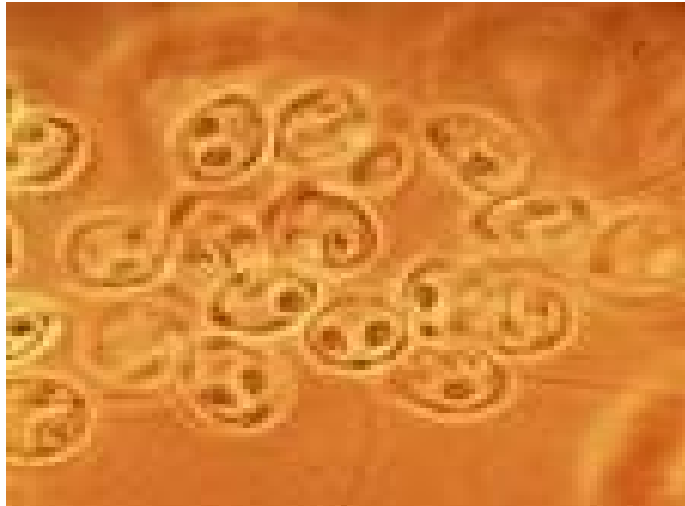
Ichthyobodo

- External Flagellate
- Large amounts of mucus
 - Blue slime disease in catfish
- Location
 - Gills, skin and fins
- Diagnosis
 - Microscopic examination....
- Treatment
- formalin, copper sulfate



Myxozoa

- Widespread in native or pond reared fish
 - Most infections not bad
 - But some may be serious in young fish



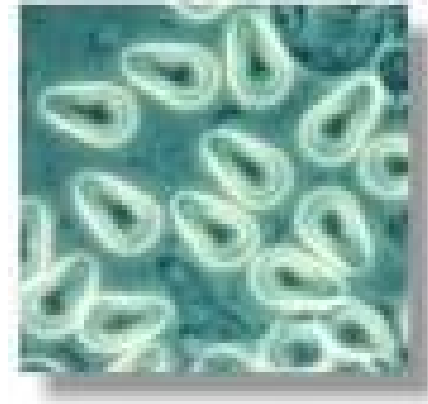
Myxozoa

- Extremely abundant and diverse
- Speciation
 - Based on spore shape and size
- Examination technique
 - Preps of infected area
 - Histologic sections of tissue

Myxozoa

- Symptoms
 - Vary depending on the organ affected
 - Excess mucus productions
 - White or yellowish nodules on target organs
- Treatment
 - No remedies known
 - Spores can survive >1year
 - Disinfection necessary after removal of infected fish

Microsporidia



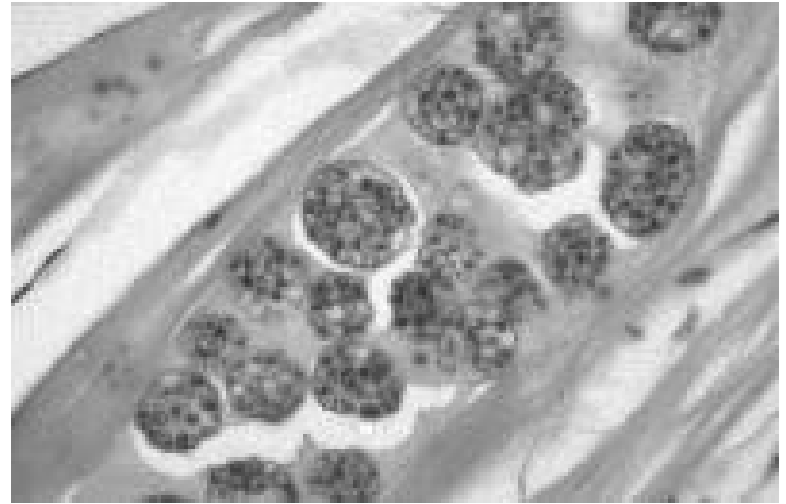
- Intracellular parasites
 - Require host tissue for reproduction
- Mode of transmission
 - Ingesting spores from infected fish or food
- Symptoms
 - Small tumors in various tissues
 - Enlargement of hosts cells cause tumor like masses

Microsporidia

- Clinical signs
 - Dependent on tissue infected
 - from no lesions to dead
 - In Serious cases, cysts enlarge to a point that organs no longer function correctly

Microsporidia

- Infections caused
 - *Pleistophora*
 - Infects skeletal muscle
 - Cysts are observed
- Treatments
 - None available
 - Spores tough
 - Can survive long periods
 - Most environmental conditions it can handle
 - Flushing of infected fish
 - Disinfect the environment



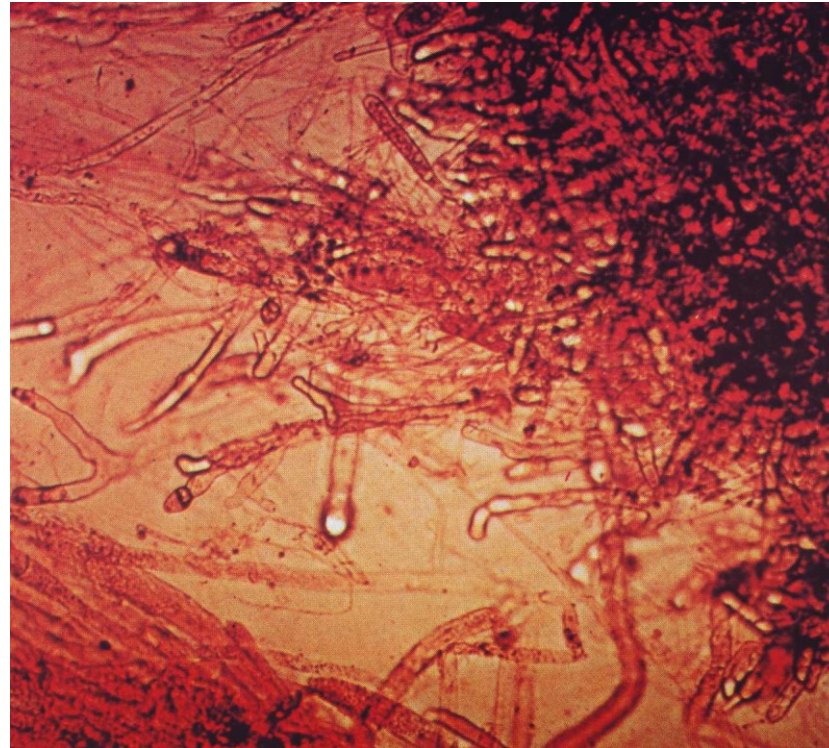
Class Oomycetes

- They produce a motile biflagellate spore (easy dispersal)
- Also produce a thick-walled zoospore by the fusion of two gametes
- usually identified as **hyphae**

Saprolegniasis

- Four Orders, but most significant fish pathogens are within Family Saprolegniaceae
- It is typically external, affecting skin and gills, sometimes eggs

Saprolegniasis: hyphae



Saprolegniasis

- the adult form is a mass of filaments known as hyphae
- the mass is called a mycelium (looks like cotton in the water)
- hyphae are unique in that they are non-septate (no divisions)
- the asexual biflagellated zoospores are thought to initiate most infections

Saprolegniasis

- ubiquitous, most surface fresh waters, limited to no greater than 2.8 ppt salinity.
- Can live on dead or live matter, affect only fish which have been compromised in some way:
 1. suppression of immune system (unfavorable temps)
 2. injury to skin (trauma)
 3. spawning or precocious sexual maturity (thickened epithelium = more mucus)
 4. no seasonal (temperature) restrictions to infections with eggs

Saprolegniasis

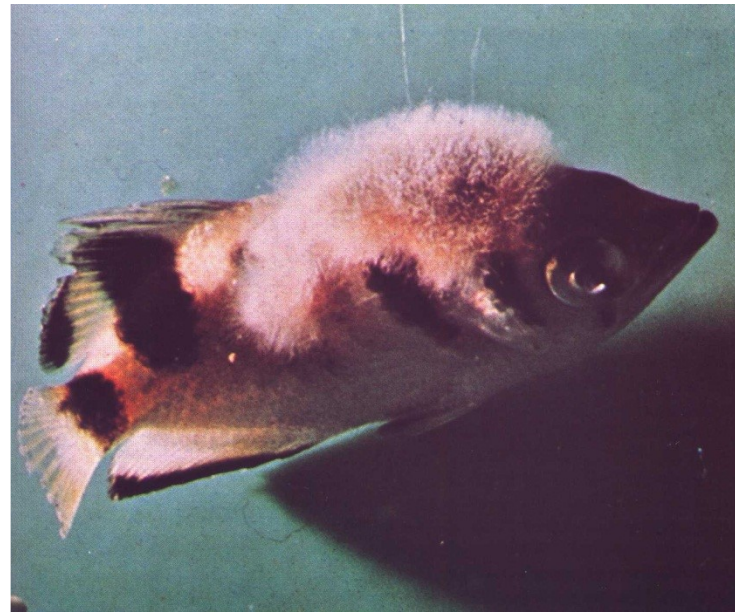
- **Signs**
- gray-white lesions on skin
- lesions start small and circular: spread
- can damage internal organs
- All fish susceptible
- Unfertilized eggs can be attacked by hyphae (water hardening)

Saprolegniasis

Treatment:

- Malachite green-topical (not approved)
- Bath: 1-2 mg malachite/litre (30 - 60 min.)
- Formalin: Bath: 0.15 to 0.25 mls/litre (60 min.)
approved but as effective
- Salt bath
- Potassium Permanganate
- Chloramine T
- Methylene blue
- Acetic acid (as a dip at 5% up to 1 minute)

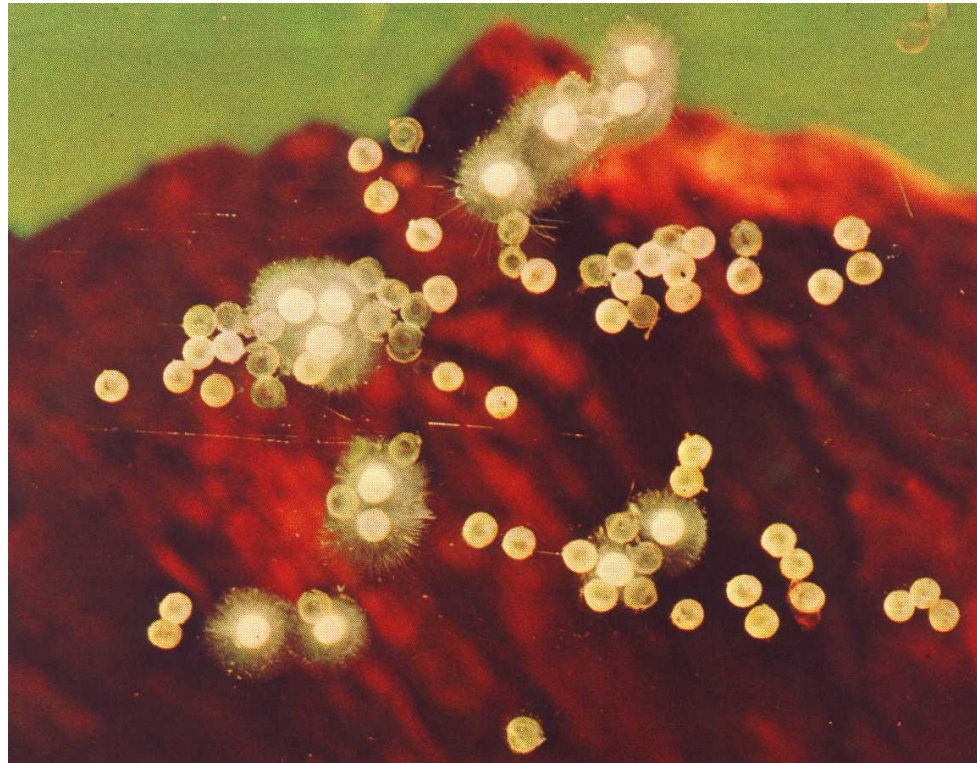
Saprolegniasis



Saprolegniasis



Saprolegniasis



Fish eggs with Saprolegniasis

Branchiomycosis

- This disease is commonly referred to as “gill rot”
- due to massive necrosis of gills
- *Branchiomycosis sp.* fungus invades gill blood vessels
- either *B. sanguinis* (only in gill blood vessels); carp, goldfish
- *B. demigrans* (grows from blood vessels to tissue); bass, pike, striped bass

Branchiomycosis



Branchiomycosis

- **Signs:** sudden on-set, rapid course, high mortality (within two days sometimes), overall mort's = 30-50%
- usually when temps above 20°C
- High organic loads, algae, high temps, high density
- **transmission:** horizontal from other necrotic gills (spores)

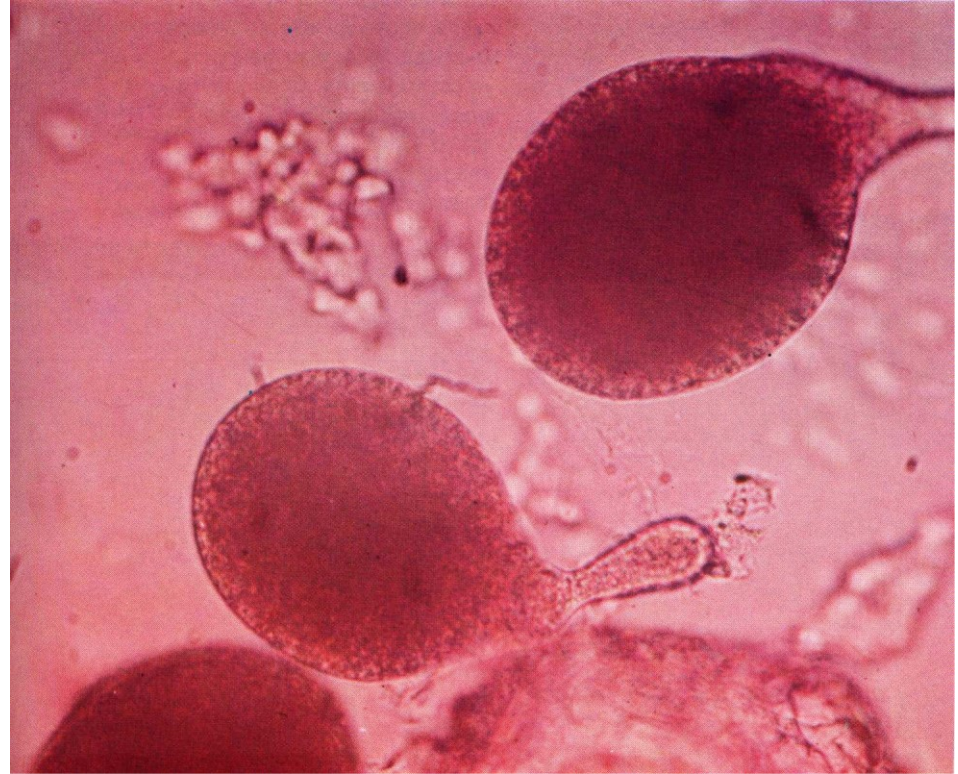
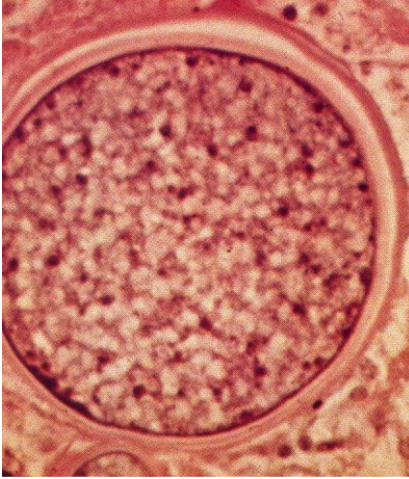
Branchiomycosis

- **Signs**
- disease course so fast that fish are dead before any signs, become sluggish
- later: necrotic patches on gills (much clubbing, fusion of lamellae)
- hyperplasia of gill epithelium, fusion of lamellae, massive necrosis
- **Control:** treatment ineffective due to rapid on-set; strict hygiene, remove dead fish, don't overfeed, fertilize, crowd

Ichthyophoniasis (Zygomycotina)

- caused by *Ichthyophonus hoferi*
- thick, fungus-like resting spores
- found in most cold water marine fish populations
- disease transmitted orally
- it is an obligate fish pathogen.
- life history varies from host to host

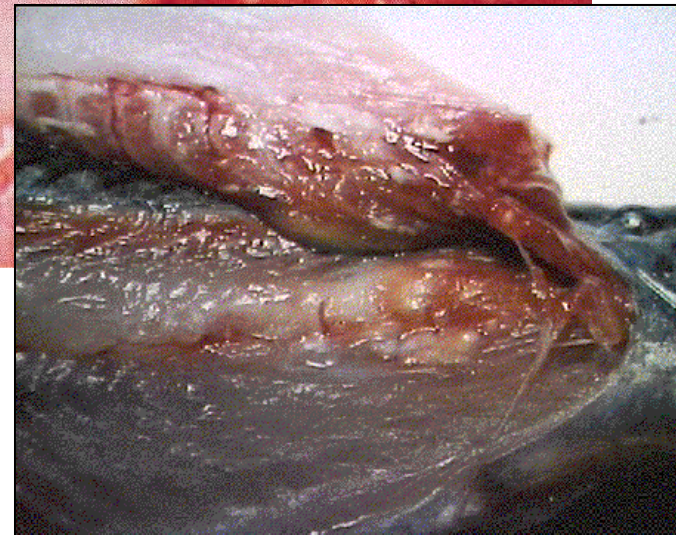
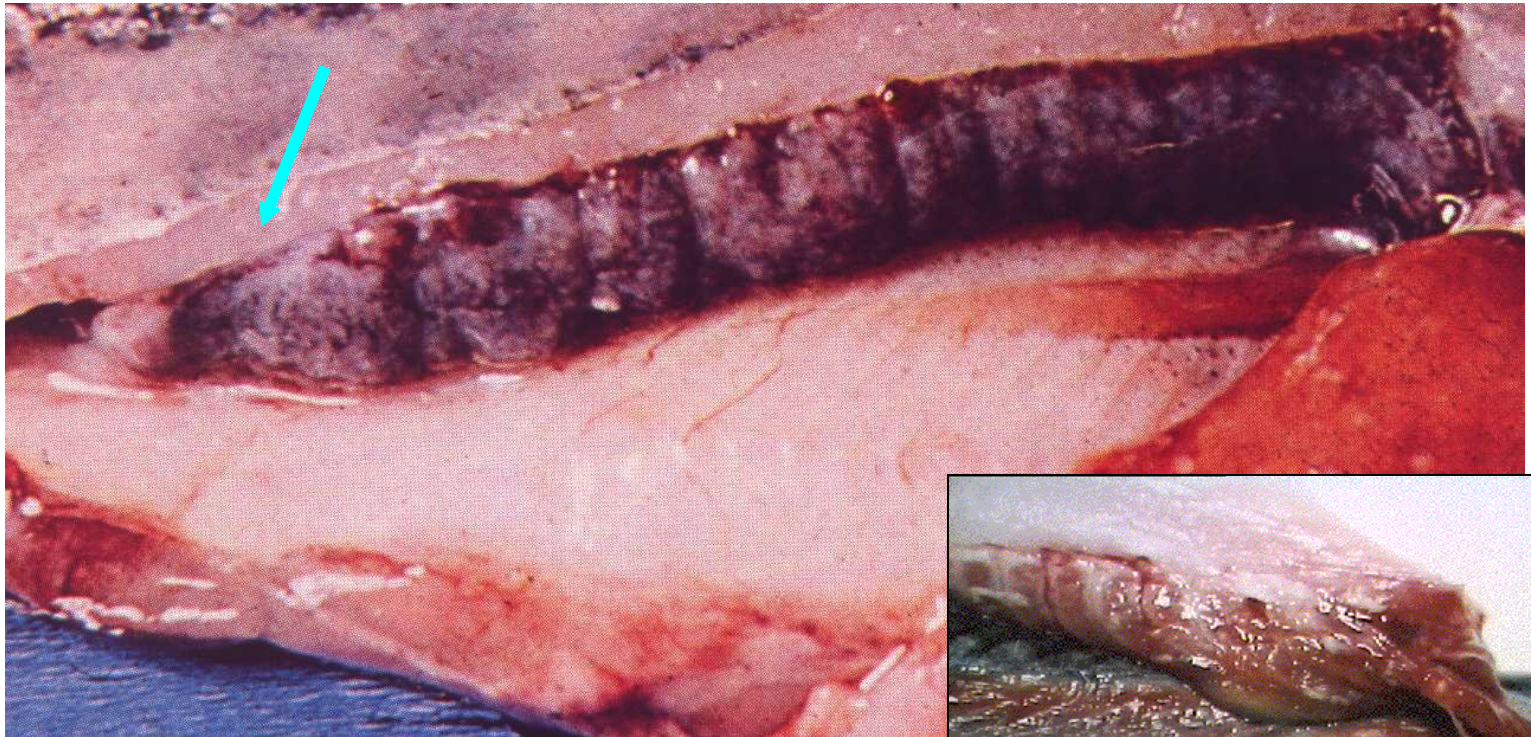
Ichthyophthiriasis



Ichthyophonus

- Life cycle complicated: produces large number of endospores and resting spores in most internal organs
- **Signs:** hyphae are not visible externally
- gray-white lesions of organ, organ atrophy
- **Control:** disease transmitted orally
- Don't feed infected fish to fish (feeding raw marine fish meal to hatchery fish)

Ichthyophthiriasis



Aspergillo mycosis

- Ubiquitous, involved in decay
- By products of degradation of feeds = aflatoxicosis
- mortalities of at least 20% of stock
- **Signs:** abdominal distension, darkening of color, lethargy
- hyphae in liver, spleen, kidney, intestine, swim bladder

