World Organisation for Animal Health

Regional Workshop on Antimicrobial Resistance (AMR) in Aquaculture - English-speaking Africa

13 - 15 August 2025
Harare, Zimbabwe

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innovative approaches to aquatic animal disease treatment with a focus on accessibility in Africa and measures to promote acceptance and use:

Prof. Dr. Refaat El-Gamal

- *Prof. of Fish health and Management.*
- *Director Of Center Laboratory For Aquaculture Research (CLAR) Egypt.*
- *Member of the Egyption Board of the Lakes Protection and Fish Resources Agency.*
- *Director of the African Union Centre of excellence in Egypt*
- *Director, WOAH Collaborating Centre for Fish Health Management in the Middle East.*
- *RegionMember of the Working Group of the African Fisheries Reform Mechanism (AFRM) & (ANAF).*

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Cultured freshwater fishes in Egypt

Common carp

African catfish

Cultured *Oreochromis species*

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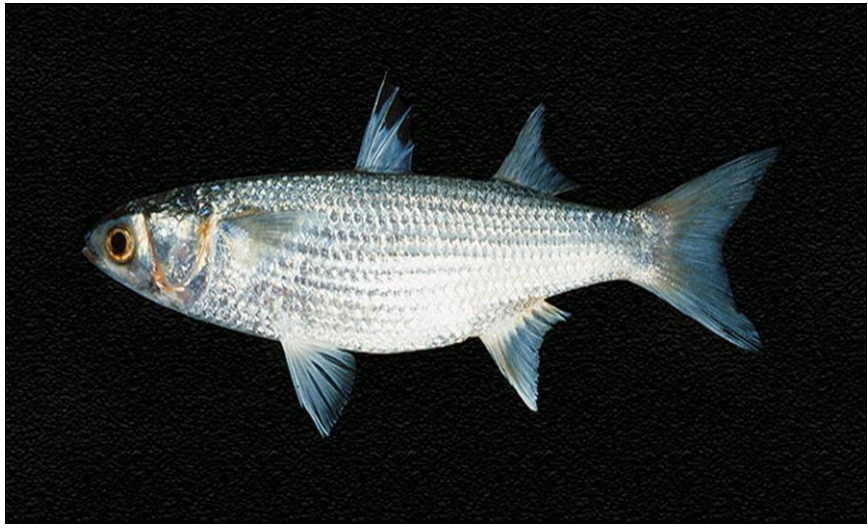
Cultured brackish and marine water fishes in Egypt

Sea bass

Sea bream



***Mugil sp.* (mullet fish)**

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Fish Diseases in Aquaculure

Aims of Studying Fish Diseases

1. Prevention and control of fish disease.
2. Increasing fish production .....How?

- Decreasing fish mortality from diseases.
- Increasing the food conversion rate of cultured fishes.
- Increasing the final body weight of cultured fishes.

3. Production of a safe fish product for human consumption (one Health).
4- Avoid antimicrobial resistance (AMR).

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What is meant by Disease ?

Symptomatologically

- Any abnormal deviation from normal. (Physiological)

Epizootiologically

- An interaction between three main factors:
  - Fish Host.
  - Pathogen (Parasite)
  - Environment

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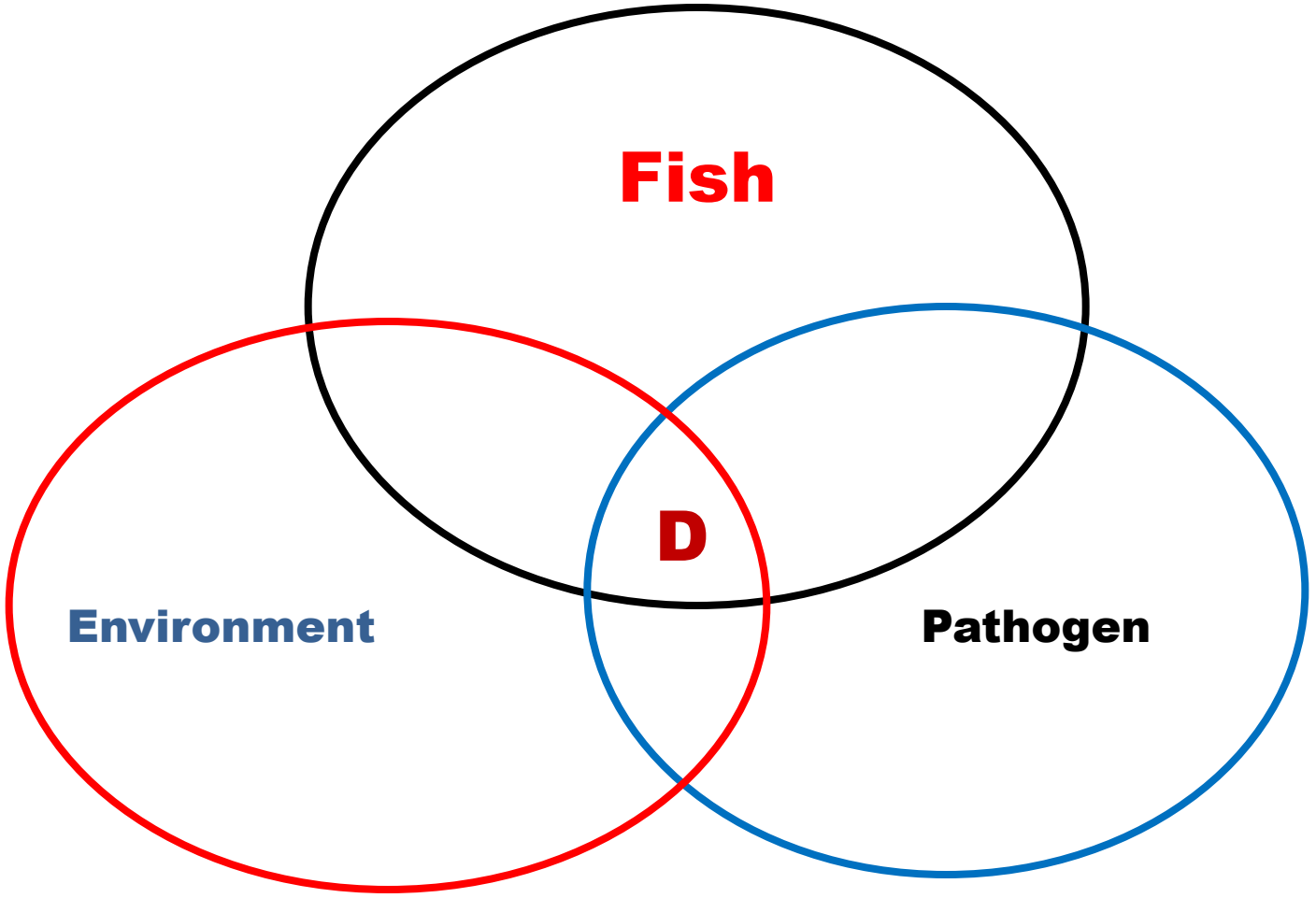

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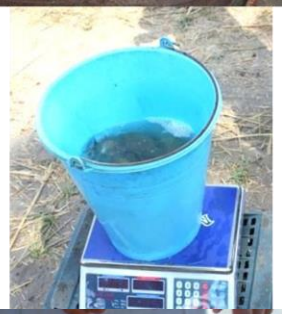
Aquatic Environment

Stress factors



Physical stressors:

- ❑ **Overcrowdness**
- ❑ **Rough handling**
- ❑ **Abnormal sudden change in water temperature.**
- ❑ **Long distance transportation**

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Chemical stressors:

- ❑ **Low dissolved Oxygen**
- ❑ **Abnormal water pH value (normal values 6.8 – 8.3)**
- ❑ **Toxic chemicals (Molluscicides, Herbicides, Algicides,….)**
- ❑ **High organic matters (Fertilizers, Uneaten rations, Excretions)**

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Nutritional Stressors:

1. Starvation
2. Nutritional deficiency
   - ❑Quantity of food
   - ❑Quality of food (Amino acids, Minerals, Vitamins).

Hormonal or Physiological Stressors:

1. Predation. افتراس
2. Spawning
3. Migration.

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Fish Diseases in Aquaculture

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Classification of Fish Diseases

❑ Infectious Diseases

- ❑Bacterial.
- ❑Mycotic.
- ❑Viral.
- ❑Parasitic.

❑ Non-Infectious Diseases

- ❑Nutrional deficiency.
- ❑Environmental pollution and physical disorders.
- ❑Hereditary (Anomalies).

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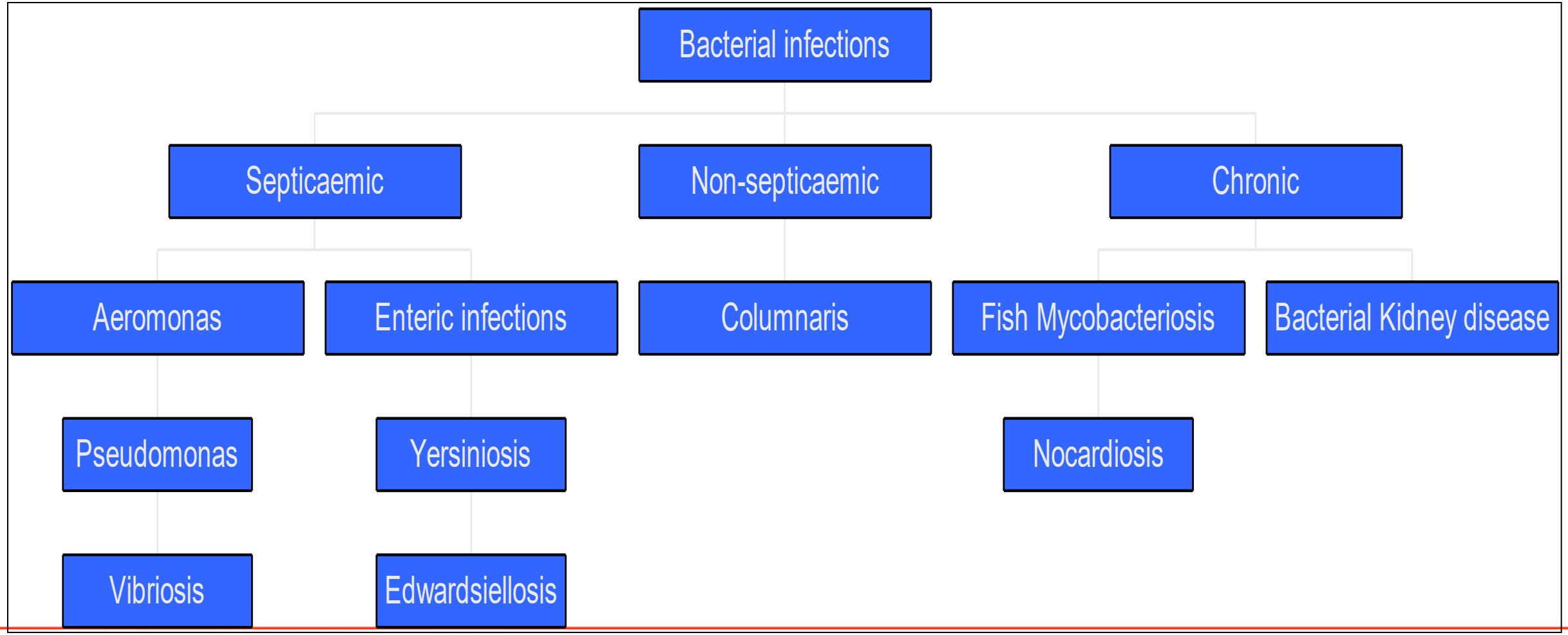
Bacterial diseases in fishes



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Clinical Diagnosis of bacterial infections:

1. Clinical signs and postmortem lesions:

- ❑Skin haemorrhages.
- ❑Exophthalmia.
- ❑Tail and Fin rot.
- ❑Ascitis (Dropsy).
- ❑Skin ulcers.
- ❑Internal haemorrhages.
- ❑Enlarged liver and distended gall bladder.
- ❑ Necrosis and sloughing of gill filaments.

2. Laboratory diagnosis:

- ❑Sampling.
- ❑Isolation and identification of the infectious agent.

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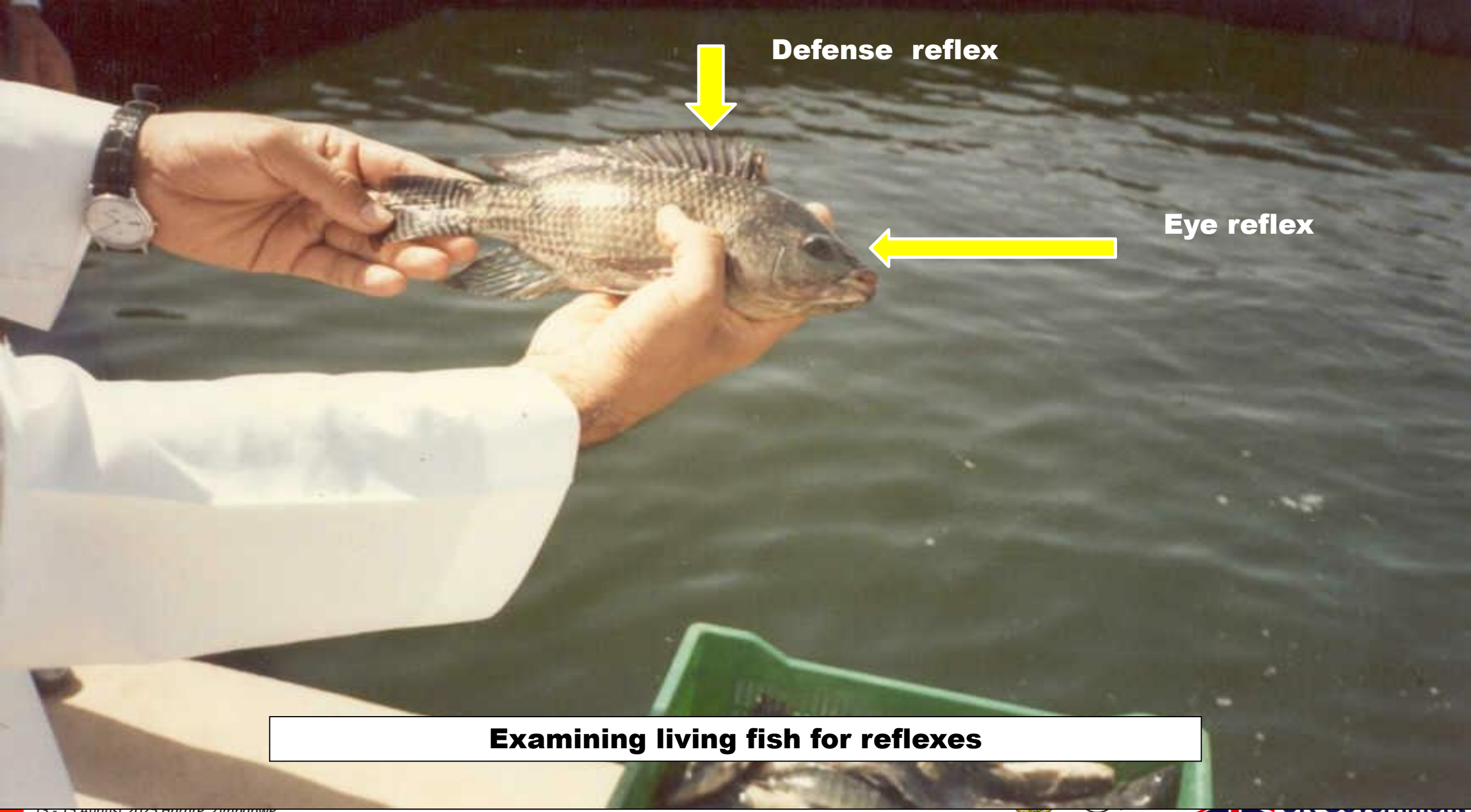
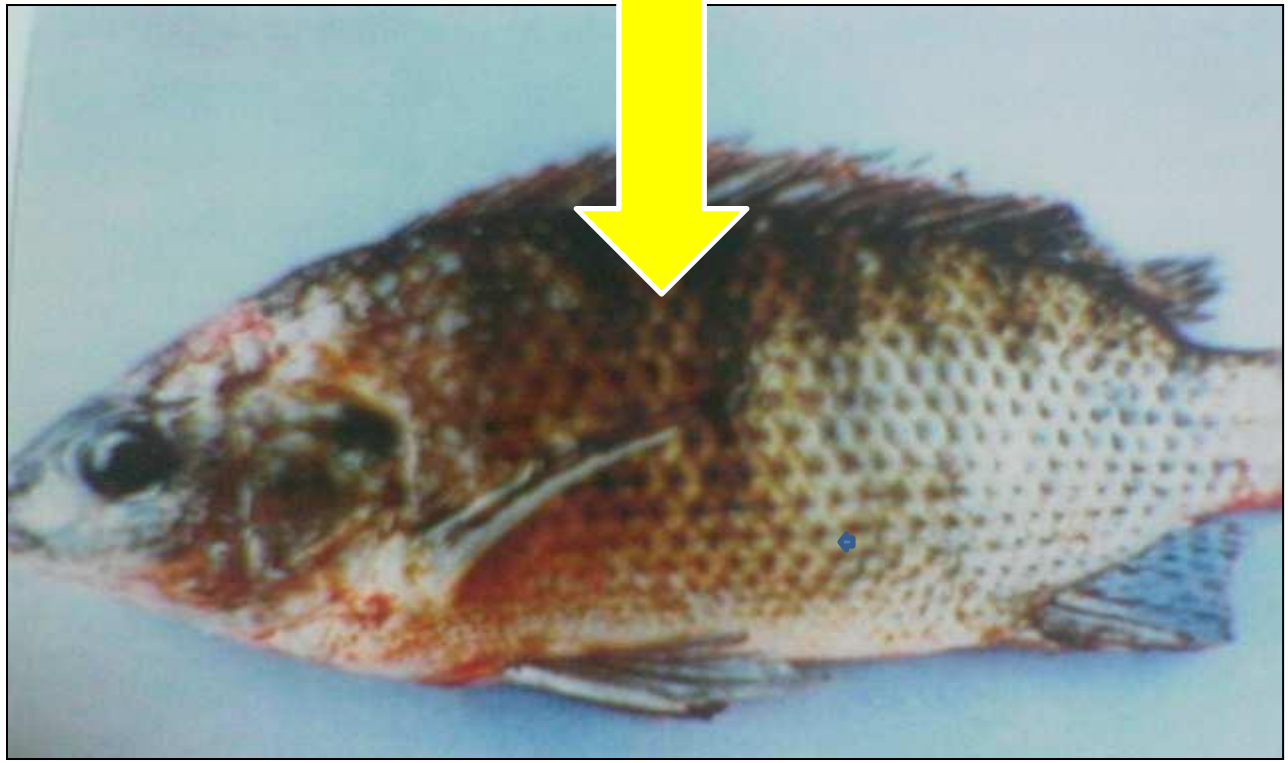


Examining living fish for reflexes



Skin haemorrhage and darkening

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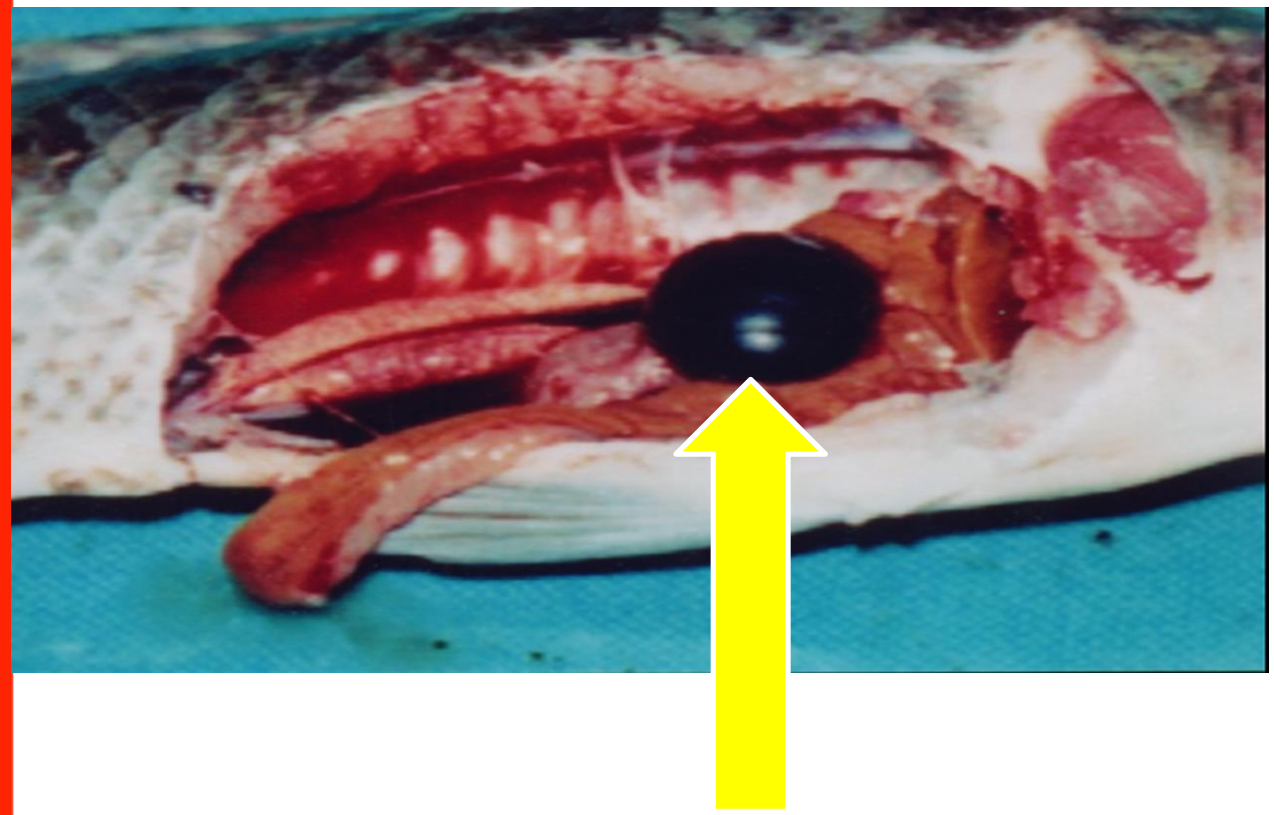
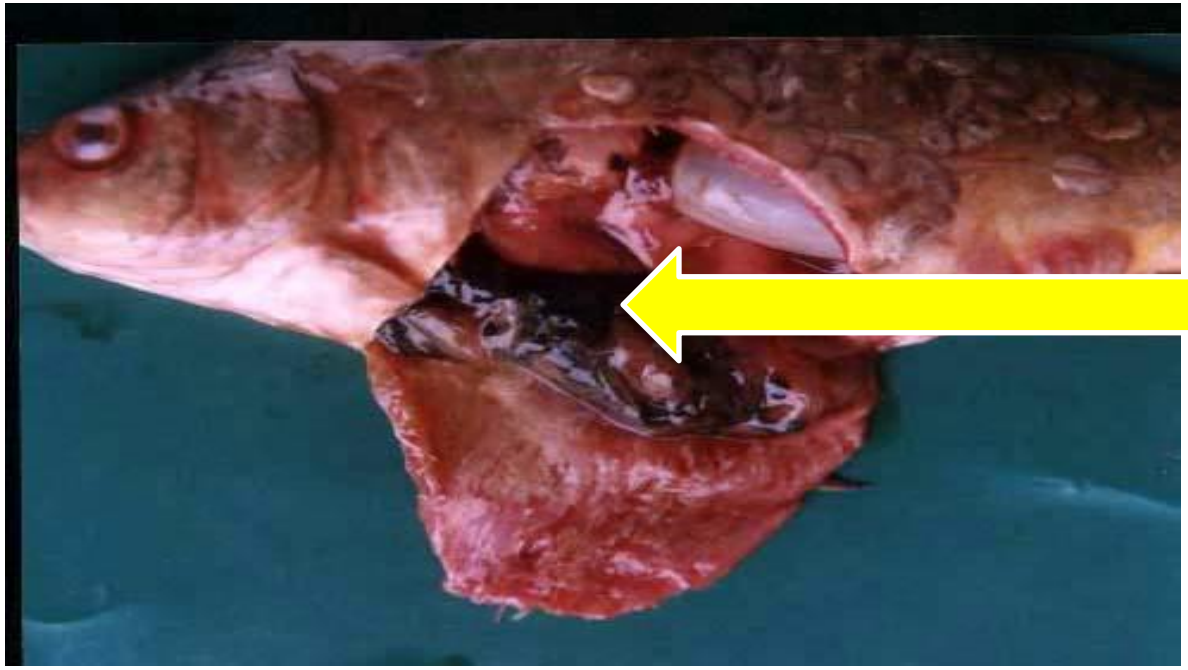


Enlarged liver and distended gall bladder



Internal haemorrhage

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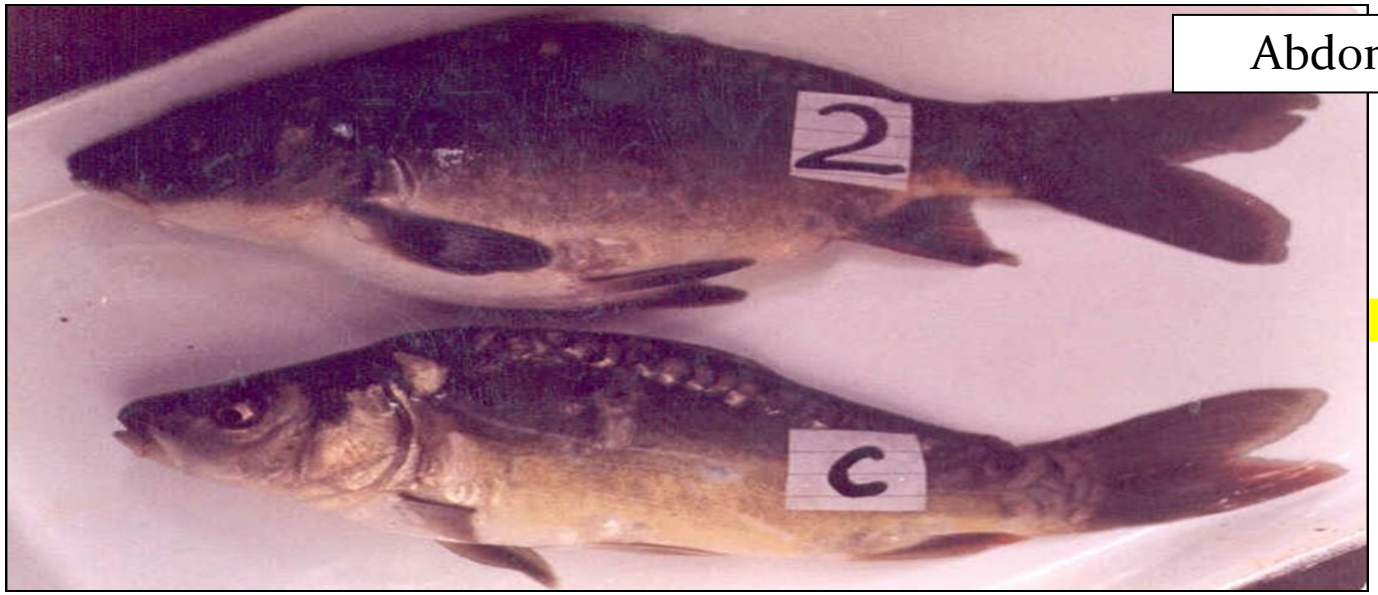
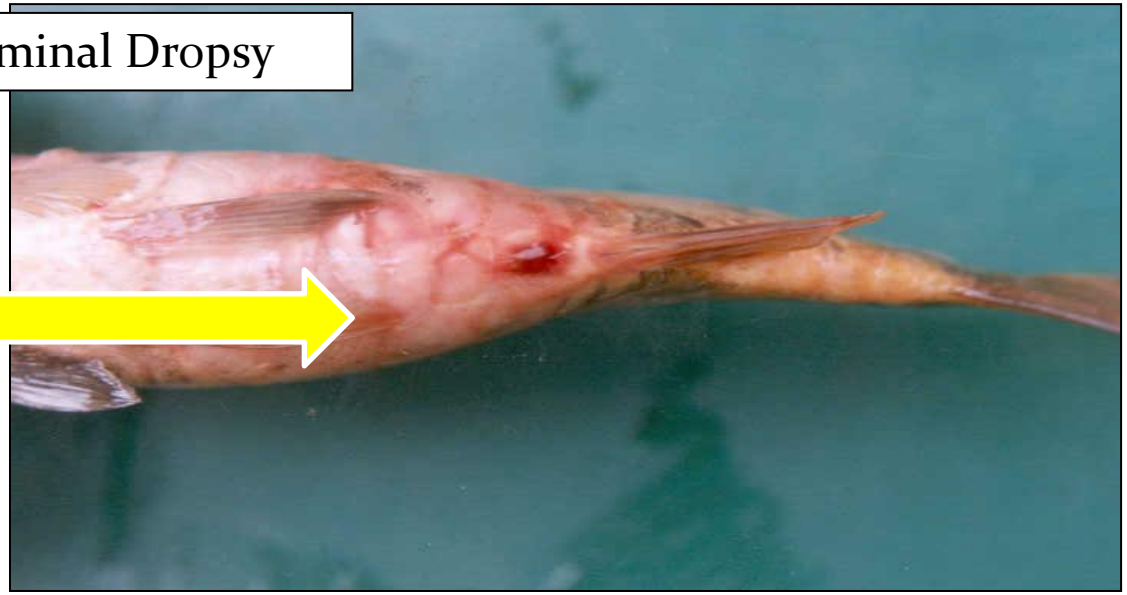


Abdominal Dropsy



Abdominal ascitis

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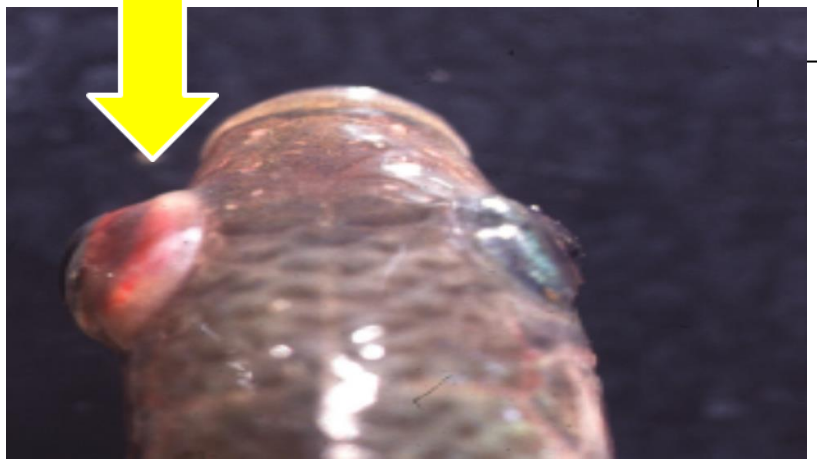
Bilateral Exophthalmia

Unilateral Exophthalmia



Haemorrhagic Exophthalmia

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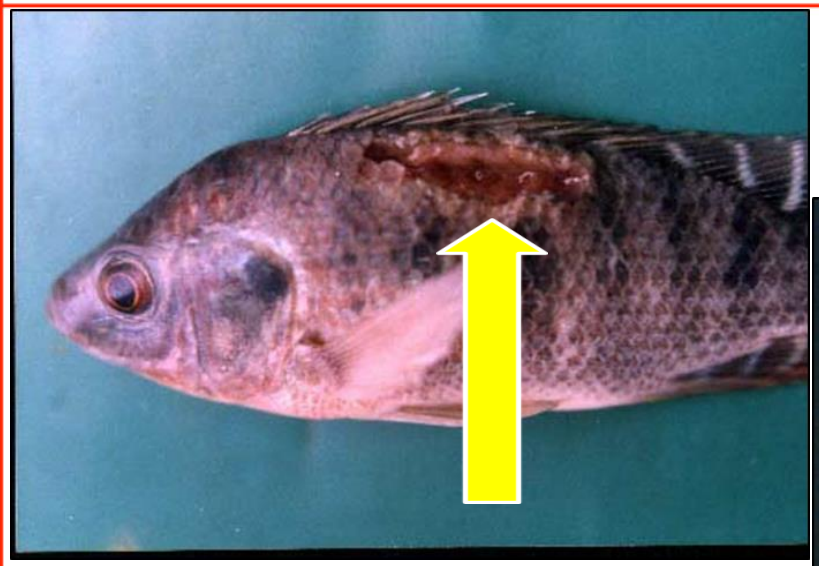
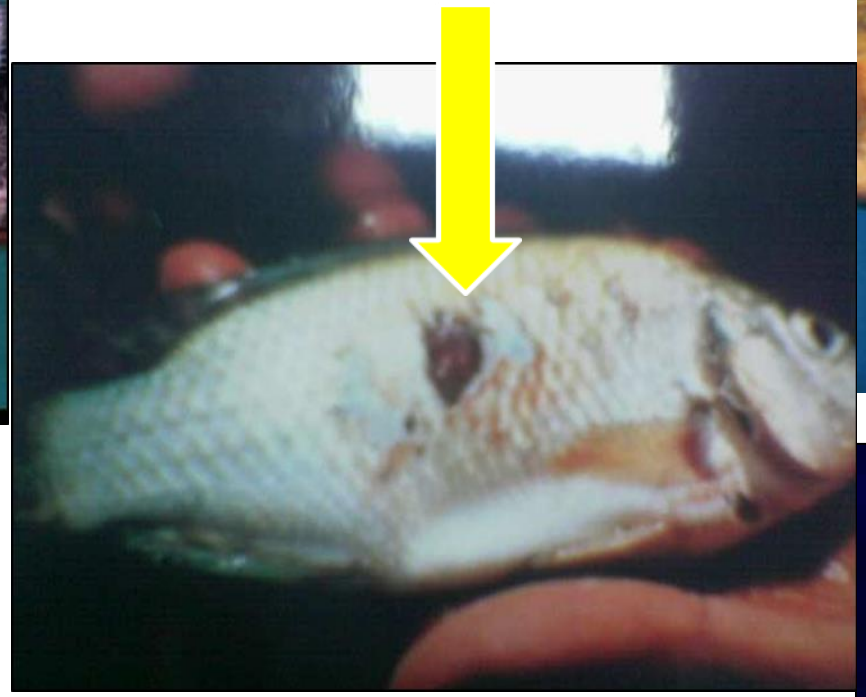
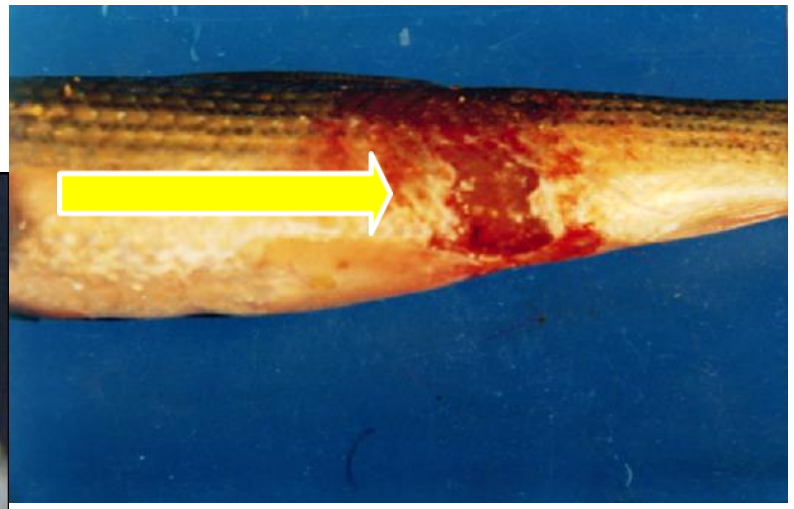
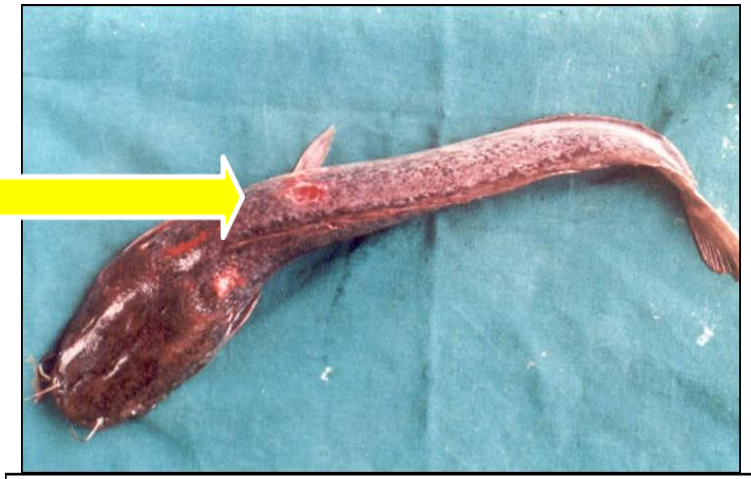
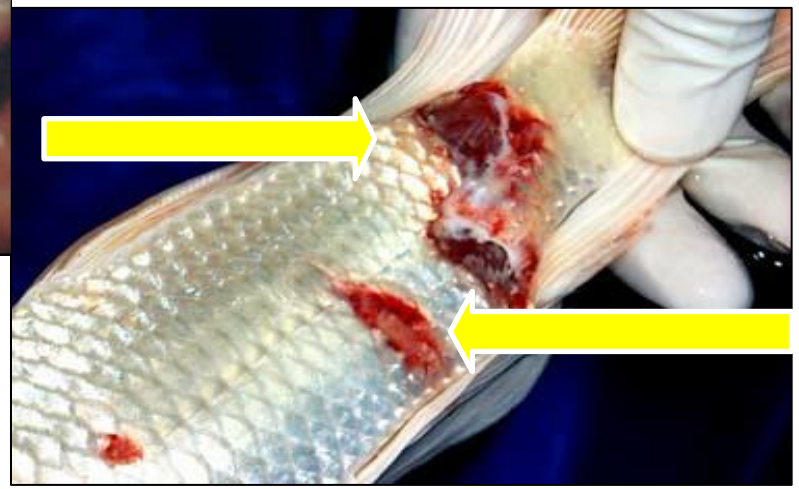








African Clarias fish with skin ulcers



Skin ulceration

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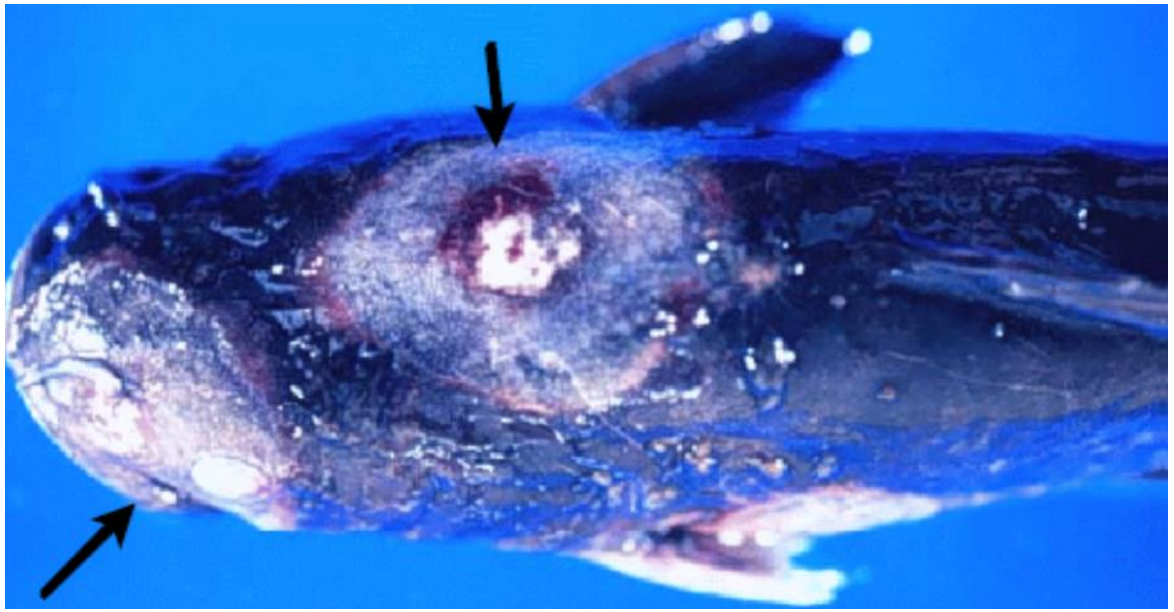
Entric Red Mouth disease caused by *Yersinia ruckeri*



Hole in the Head (Edwarsiellosis in Catfish)

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Surfacing of fish as a sign of asphyxia

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Necrosis of gill filaments in Columnaris disease

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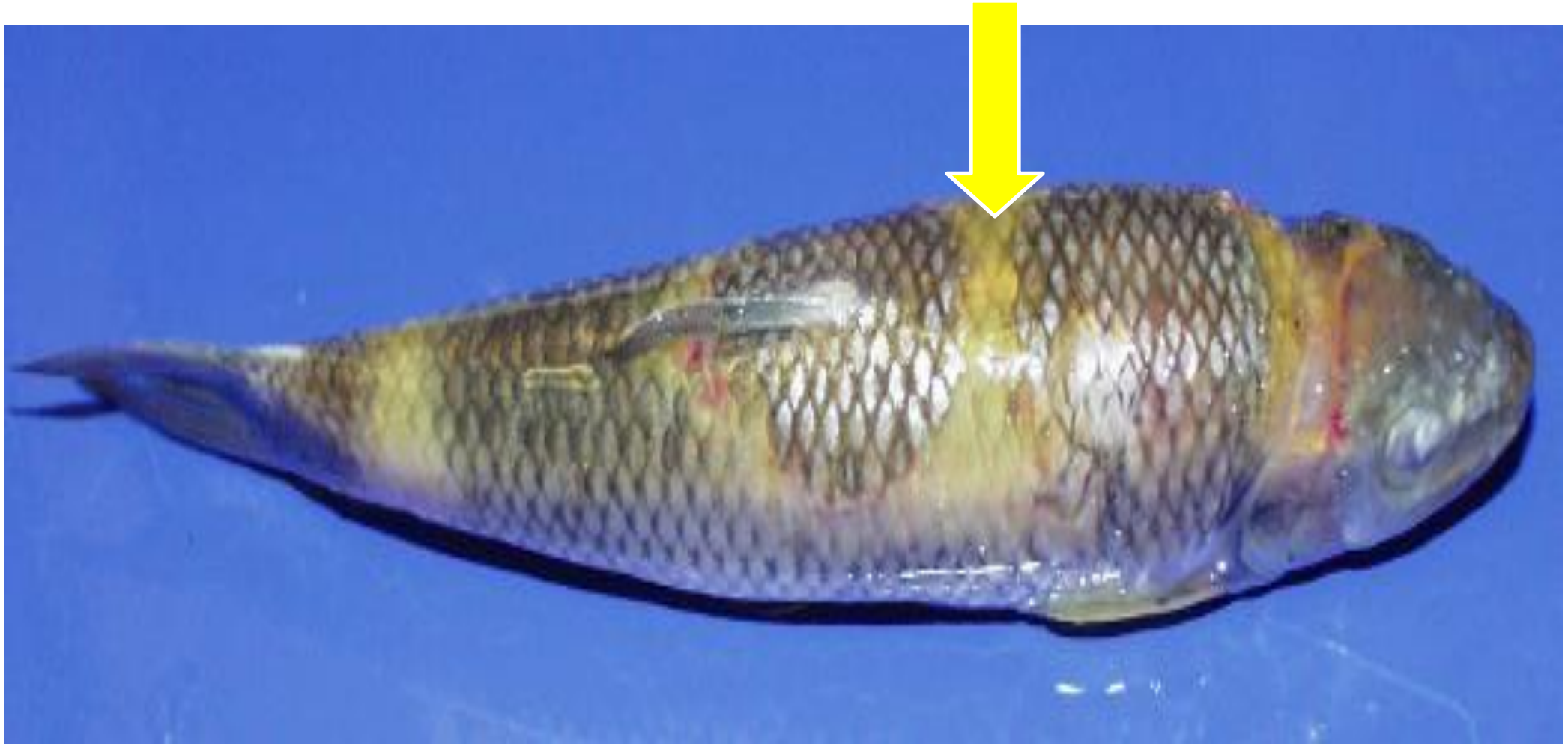

Saddle back lesion in columnaris disease

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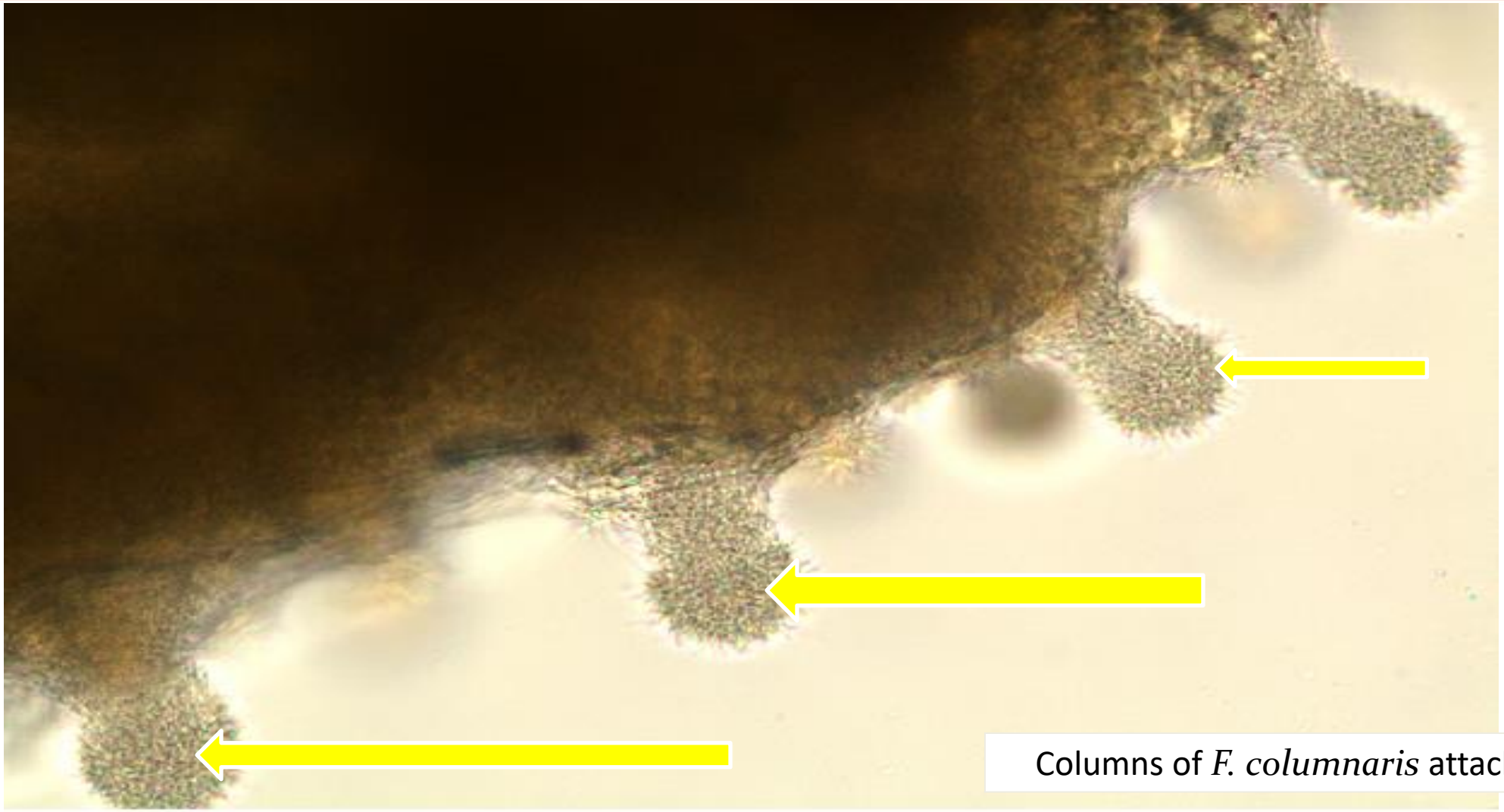

Columns of *F. columnaris* attached to fish gills

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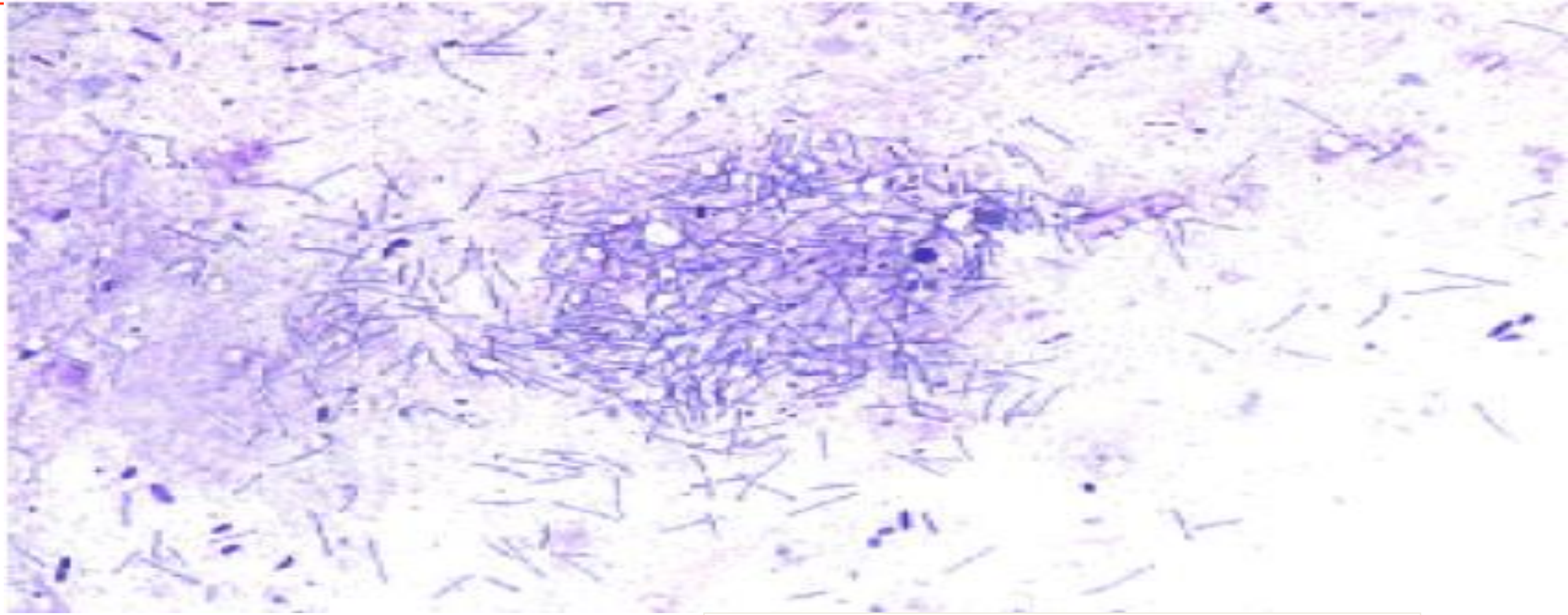

Stained filamentus *F. columnaris*

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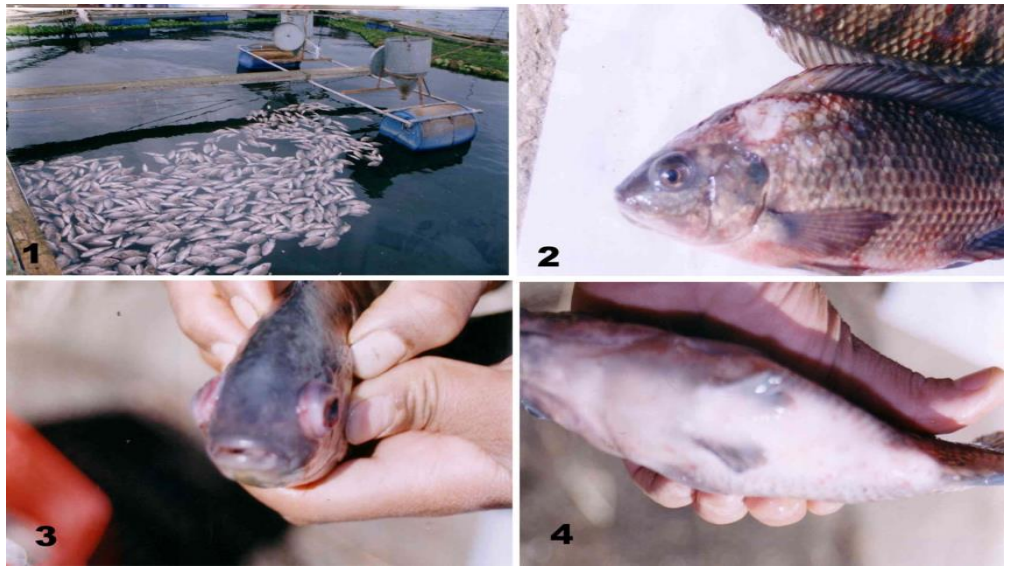
- *Aeromonas septicemia*



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- Ps. Septicemia

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Vibriosis

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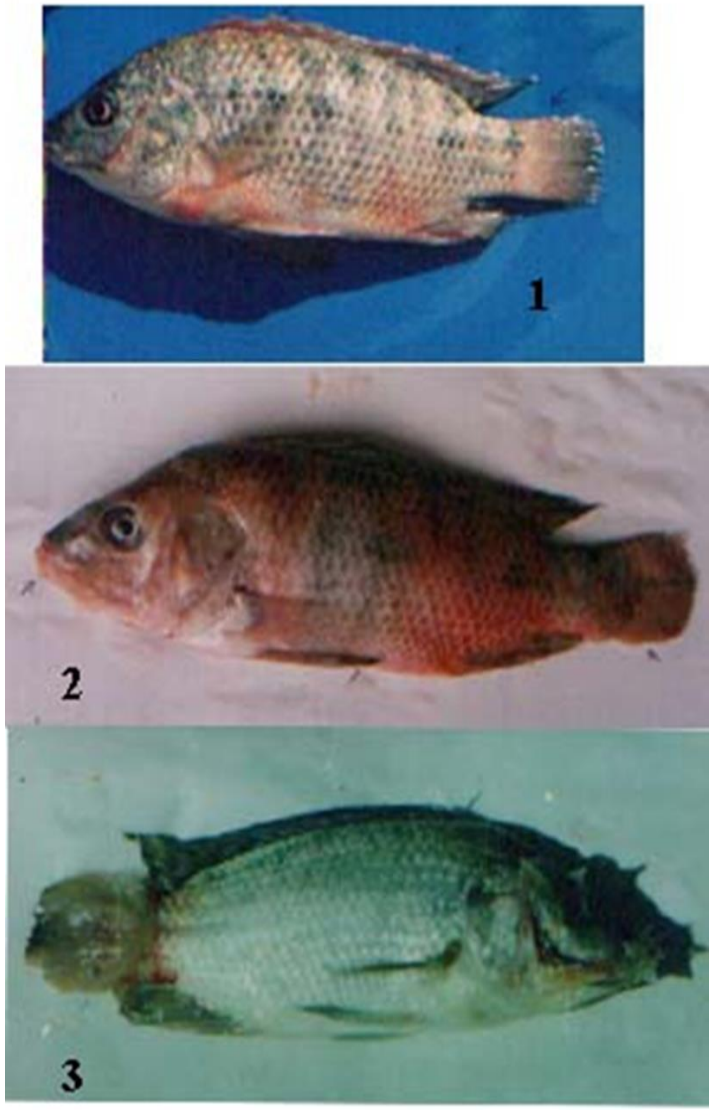
Mycotic diseases

External Mycosis

- ❑ **Saprolegniosis**
- ❑ **Branchiomycosis**

Systemic Mycosis

- ❑ **Ichthyophonosis**



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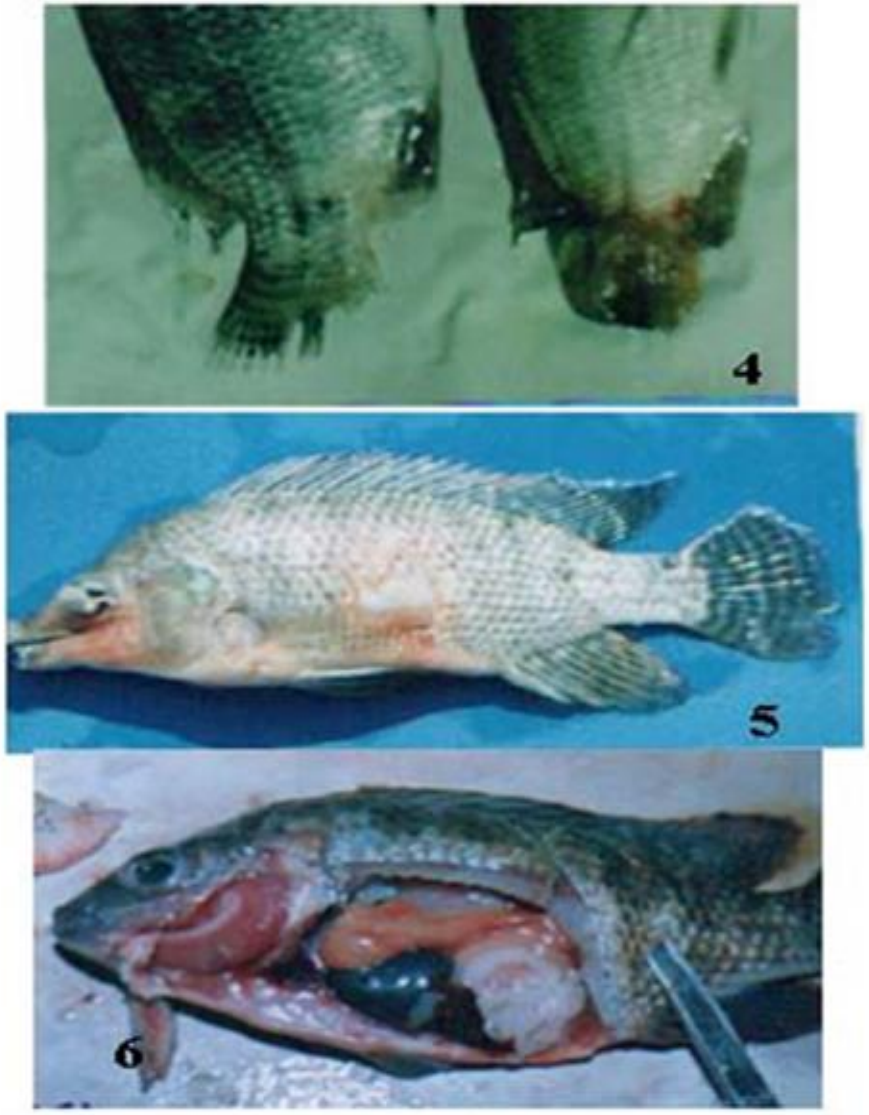

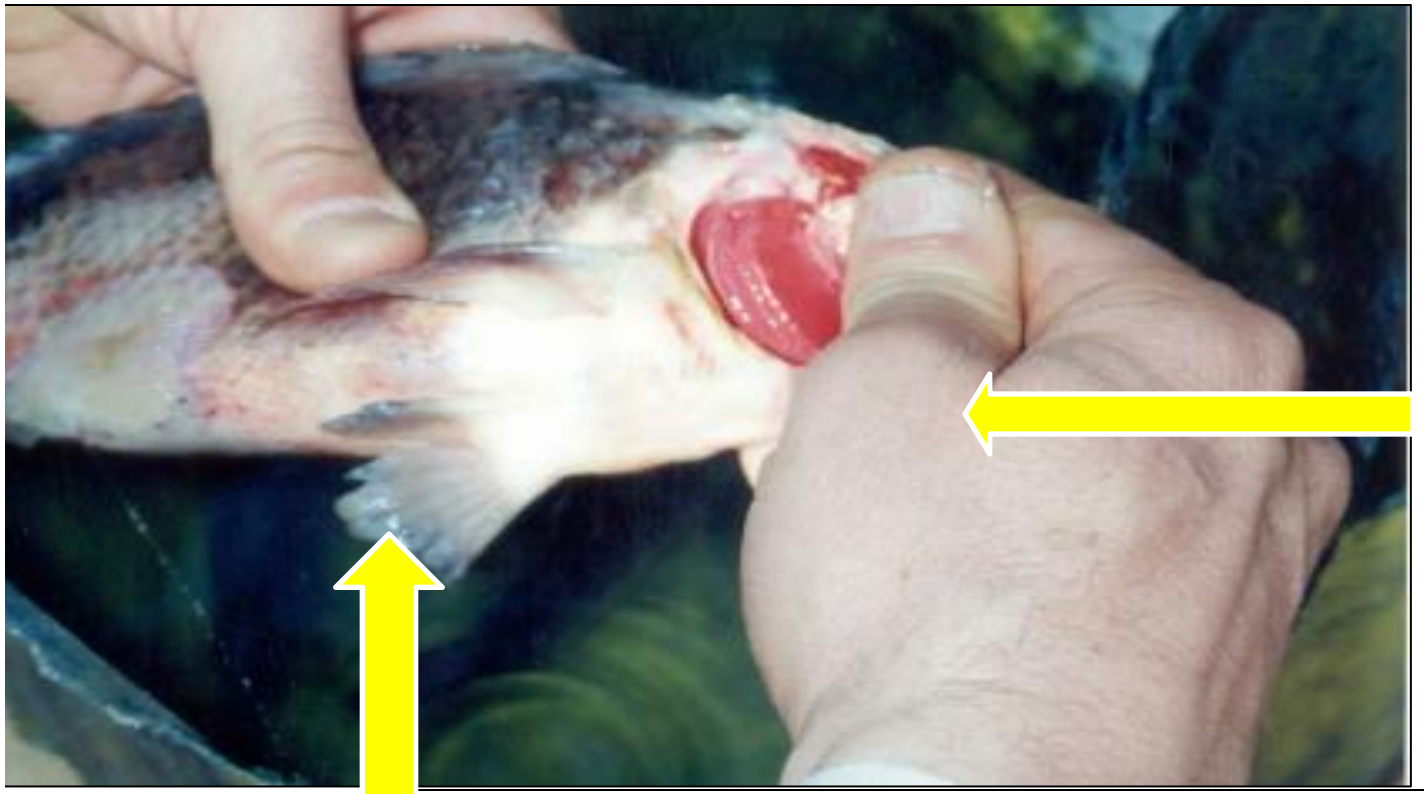

Saprolegniosis on Tilapia

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How Prevention andControl of Fish diseases in infected fish farms

- **In infected earthen ponds:**
  - **Drainage**
  - **Dryness**
  - **Disinfection using quick lime**
- **In infected concrete or fiberglass tanks:**
  - **Drainage**
  - **Disinfection with strong antiseptics**

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- It is important to ensure that the pond is free of snails, weeds, and aquatic plants, which provide a haven for pathogens.
- The ponds should be as safe as possible from birds, rodents, and frogs to prevent the transmission of diseases. This can be achieved by using nets to impede or prevent their movement.
- The pond floor should be exposed to sunlight for appropriate and sufficient periods between incubation or rearing cycles to eliminate pathogens.
- If the pond floor does not dry completely, quicklime, should be used in areas where water collects to eliminate pathogens.

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Second: Water:

- The water source must be constant and in appropriate quantities throughout the year.
- away from various sources of pollution, and of high quality and characteristics.
- Suitable, highly efficient filters should be installed for the water to pass through before it enters the hatchery or farm.
- Conduct periodic and regular analyses of the physical and chemical specifications of the water and maintain records of these.

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Third: Broodstock and Fry:

- proper handling of broodstock and fry within hatcheries and farms.

- Selecting broodstock free from disease with good specifications and weights, paying attention to their nutrition and avoiding exposure to various stressors to obtain quality and quantity of broodstock.

- Paying attention to the health aspects of hatcheries, particularly egg incubation units and larval care containers.

- Paying attention to the initial feeding of broodstock in terms of quantity, quality, and size appropriate to the type and size of broodstock.

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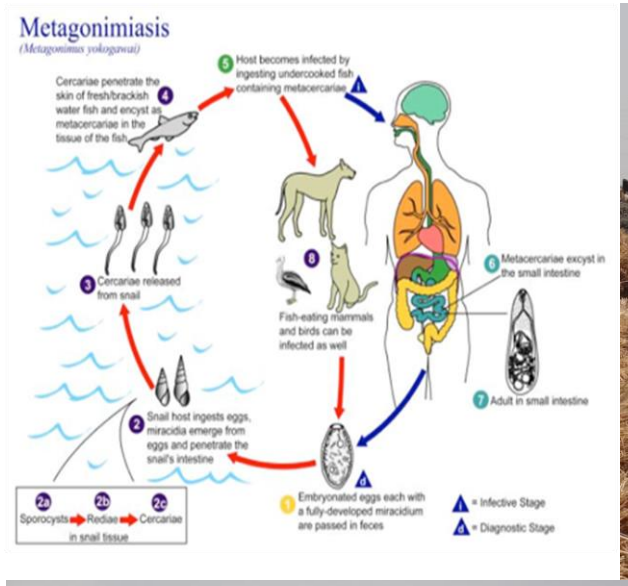
Intermediate hosts:

- Intermediate hosts, such as snails, crustaceans, and leeches, are eliminated. Using some chemical.



Aquatic birds:

- One of the important environmental impacts of fish diseases is that most larval-infected fish play an intermediate role in transmitting certain diseases to fish-eating aquatic birds, which are the final hosts for most internal parasites.

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Treatment of Fish Diseases

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During treatment:

- Keep the fish under constant observation.

- Monitor oxygen levels.

There are basics to follow during treatment:

* Know the fish (species, size, age, density, natural color, etc.).

* Know the water (temperature, oxygen level, ammonia, etc.).

* Know the medication (expiry date, concentration, dosage, source, storage, etc.).

- Know the disease (diagnosis, severity, etc.).

After treatment:

- Record the treatment results and their effects for future reference.

- Consider the medication withdrawal period, especially if the fish are of marketable size.

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Chemicals used to treat fish

Potassium permanganate:

- Used to combat bacteria and external parasites (costa, trichodina, chelodendronella, girdactyl worms, and crustacean parasites).
- Applied at a concentration of 2 parts per million (ppm). Non-specific treatment.
- A concentration above 2 ppm is toxic if the water is low in organic matter.
- If the water color changes from red to yellowish-brown in less than 12 hours, this indicates that the chemical has broken down and is no longer effective. In this case, 2 ppm should be added.
- Kills algae, which reduces oxygen. Therefore, it is recommended to use aeration after using it to treat the aquarium.
- If used by immersion, use 20 mg/L for 20 seconds.

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Sodium Chloride (Table Salt):

- Used to treat external parasites in broodstock at a concentration of 30,000 parts per million (30 ppm).
- Dip the fish in a quick immersion for 15 seconds before placing them in the tank.
- Used to treat external parasites (apestyl, trichodonia worms, dactylogres, and gyrus dactyls) at a concentration of 10,000–30,000 ppm for 30 minutes or when the fish show signs of stress.
- Used to treat external parasites at a concentration of 1,000–2,000 (0.1–0.2% ppm) in transport tanks as an indefinite treatment.
- Used for fish stressed by transport or fishing at a concentration of 200–500 ppm as an indefinite treatment.

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- Formalin

Used to control	concentration and duration of treatment
External parasites: Protozoa, Costoia or Odenum, White spot disease : Trichodina, Apistils, Scavidina	15-25 ppm as a non-specific treatment
Glaustela clinodiniella Worms: Gyrodactylus and Psylloidescus	125-250 ppm for one hour as a long-term treatment
Fungal-infected eggs	250 ppm for one hour as a long-term treatment

- Eggs should not be treated with formalin within 24 hours of hatching
- because formalin concentrates within the eggshell during the developmental stage and leads to mortality

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Copper sulfate

It is used to treat the following parasites:

- Trichodonia,
- Trichophora,
- Chlodniella,
- Scaphoidia gelstella,
- and possibly other parasites.

✓It is used to treat fungi.

✓It is used as a snail repellent.

✓Do not use when alkalinity is less than 20 parts per million.

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1. Innovative Approaches to Treatment

a. Probiotics and Immunostimulants

- **Use of probiotics** (e.g., *Bacillus spp.*, *Lactobacillus spp.*) to enhance gut health and immunity in fish and shrimp.
- **Natural immunostimulants** like beta-glucans, herbal extracts (e.g., *Moringa oleifera*), and algal products that boost resistance to pathogens.

b. Phage Therapy

- Bacteriophages are viruses that target specific bacterial pathogens without harming the host or beneficial microbes.
- Particularly promising for controlling antibiotic-resistant *Aeromonas* and *Vibrio* infections.

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c. Nanotechnology

- Nano-encapsulation of drugs, vaccines, and nutrients for targeted delivery, improving efficacy and reducing waste.
- Silver nanoparticles, for instance, have shown antimicrobial activity against common aquatic pathogens.

d. Vaccination Strategies

- Oral and immersion vaccines for viral and bacterial diseases such as infectious pancreatic necrosis (IPN) and streptococcus disease.

e. Digital Disease Monitoring

- AI-powered mobile apps for disease recognition and reporting.
- Use of sensors in fish farms to monitor water quality and early signs of disease.

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2. Accessibility in Africa

a. Decentralized Aquatic Health Centers

- Community-based diagnostics and treatment hubs to reduce reliance on distant, central laboratories.
- Training local personnel in basic microbial diagnostics.

b. Open-source Knowledge Platforms

- Translation of fish health manuals and treatment protocols into local languages.
- Mobile-friendly platforms to disseminate best practices and disease alerts.

c. Low-cost Treatment Alternatives

- Research into indigenous herbs and naturally occurring compounds with antimicrobial properties.
- Locally produced probiotics and fermented feeds as affordable alternatives to synthetic medicines.

d. Microfinancing and Cooperative Models

- Financing mechanisms to help small-scale fish farmers access health services, diagnostic kits, and preventive care.
- Aquaculture cooperatives can pool resources to afford shared veterinary support.

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3. Measures to Promote Acceptance and Use

a. Farmer Education and Training

- Community workshops on the benefits, safety, and use of modern treatments.
- Demonstration farms showcasing improved yields and survival rates through proper disease management.

b. Cultural and Behavioral Integration

- Align new methods with traditional practices and beliefs to reduce resistance.
- Engage community leaders and respected fishers in promotion campaigns.

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c. Government and Policy Support

- Subsidies or tax breaks for vaccine and diagnostic tool producers.
- Inclusion of aquatic health in national veterinary services and aquaculture development plans.

d. Public-Private Partnerships

- Collaboration between government, NGOs, and private companies to distribute innovative tools and treatments.
- Involvement of local pharmaceutical manufacturers to produce affordable therapeutics.

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