

Trout in the Classroom New Participant Workshop

2022



pennsylvania
FISH AND BOAT COMMISSION



Coja Yamashita
Fish Health Unit Leader

PFBC Division of Fish Production Services

- Provide technical services to the hatchery system
- Conduct research related to Aquaculture
- Assist other Bureaus and Divisions as needed

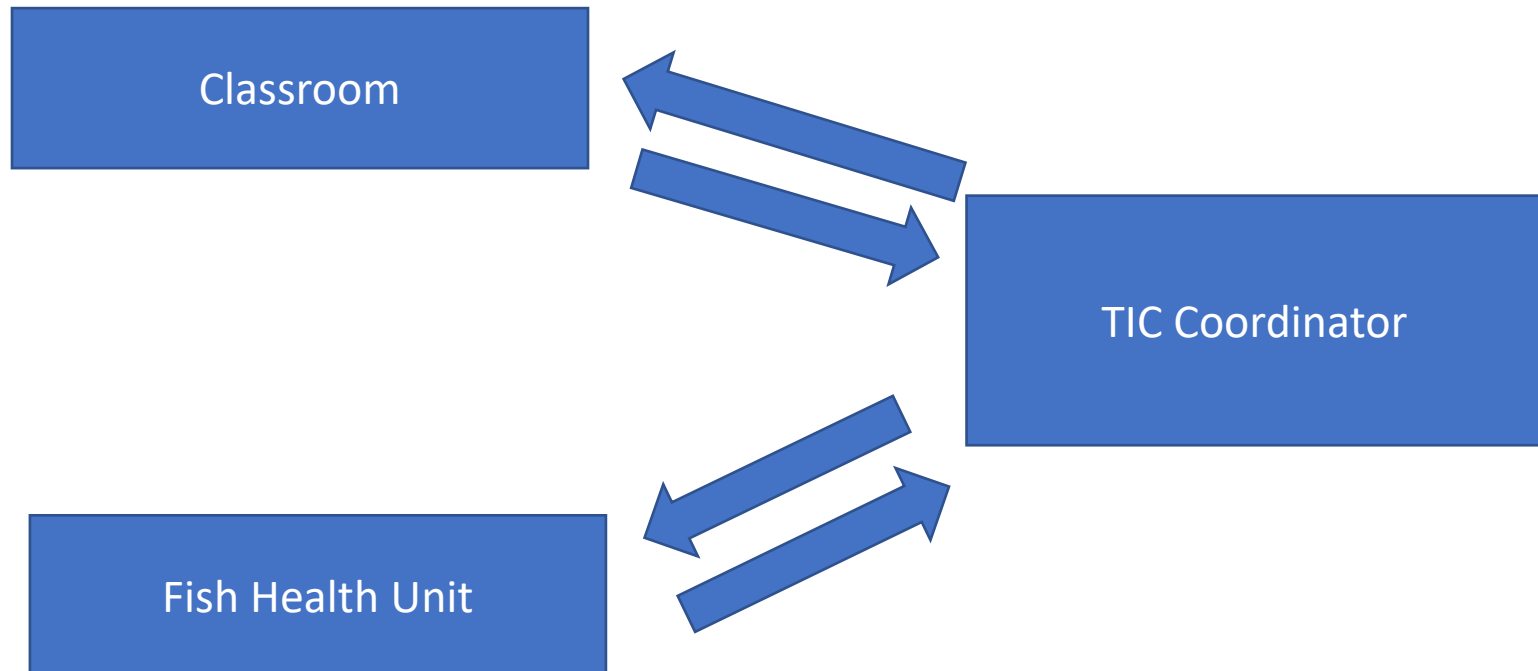


Fish Health Unit

- **Diagnostic** services to the hatchery system
- **Drug and Chemical purchasing / distribution and FDA compliance**
- **Fish Health Monitoring**
 - Annual Hatchery Inspections
- **Monitoring of Wild Brood stocks**
- **Disease prevention programs**
 - Vaccinations
 - Brood treatments
- **Wild fish kill investigation**
- **Instruction/training**



- Fish Health Unit serves as technical advisors for the TIC coordinator.





- **What causes disease**
- **Common TIC Fish Health Issues**
- **Disease prevention**

Types of Disease

Non- Infectious

Non-Infectious

Environment

+

Host

Infectious

Infectious Disease

Environment

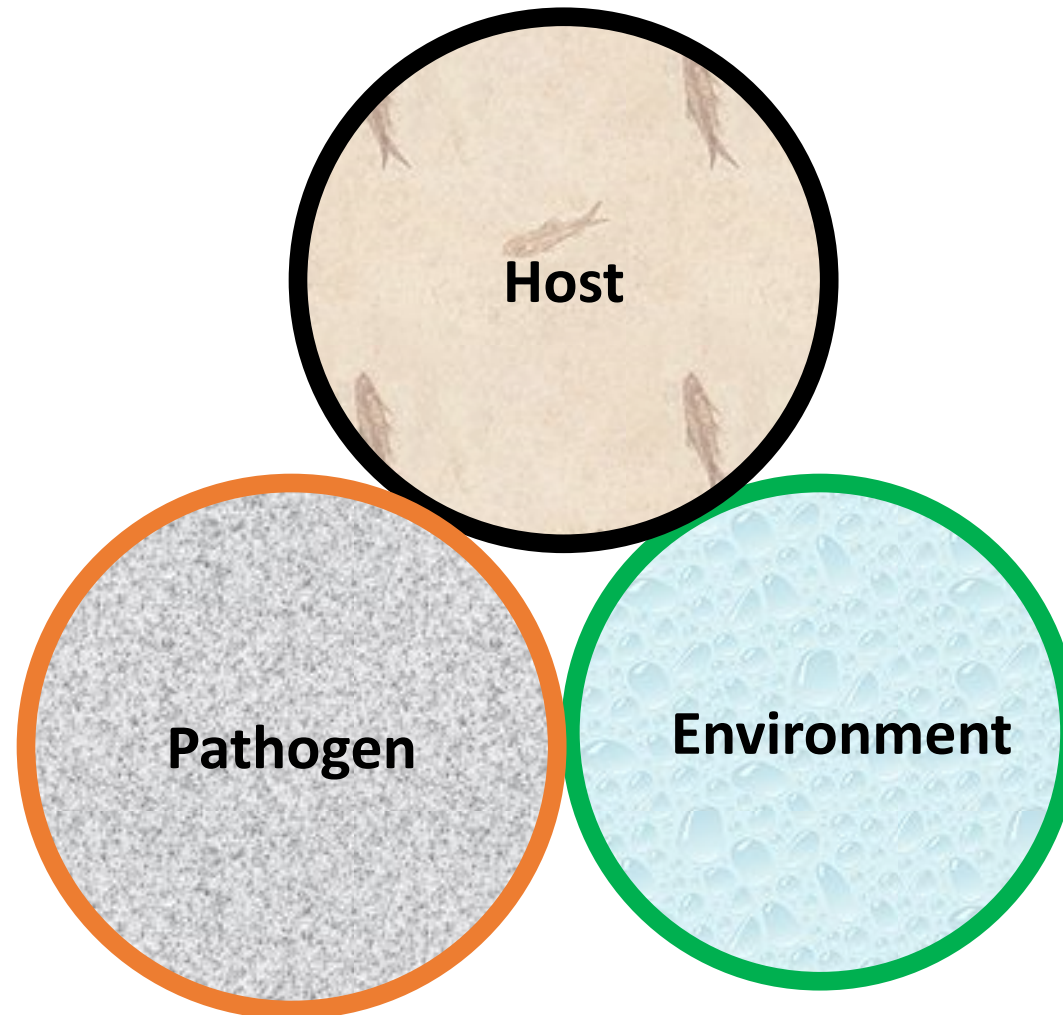
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Host

+

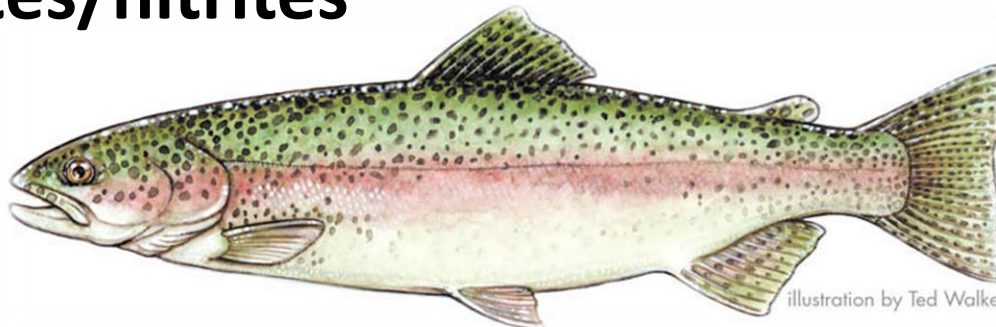
Pathogen

What causes a disease event



Rainbow Trout

- Native to Western US
- Highly Susceptible to Bacterial Coldwater disease (Bacterial Pathogen)
- Highly susceptible to **Whirling Disease** (Parasite)
- Suspectable to low **pH**, and high **nitrates/nitrites**



Environment

- Directly responsible for significant mortality (Non-Infectious Disease)
- Act as a stressor making fish more susceptible to Infectious Disease
- Pathogens are also affected both negatively and positively by the environment.
- In a closed system the environmental conditions can be easily monitored and manipulated.



Water Quality

Water Quality usually plays a role in both infectious and non-infectious disease

- There are specific ranges within each parameter that fish/organism/parasite can survive and or thrive
- High or Low ends of each range can cause chronic stress
 - Effect growth rate
 - Cause immune system suppression increasing susceptibility and response to infectious disease
- Rapid changes in any Water Quality parameter (Temp, pH,) can cause stress and mortality.
 - Fish should be tempered when changing water

Water Quality is often a major component in the “perfect storm” that leads to major mortality events.

Nutrition

Poor nutrition can act as a stressor, making fish more susceptible to other environmental conditions or infectious diseases.

- **Food Size**

- Need to feed to the smallest fish in the tank.

- **Nutritional requirements**

- Specific feeding rates (ex - 3% Biomass)
- Protein, fat, Fiber

- **Storage**

- Feed can become rancid or moldy
- Food should be stored in cool/dry/dark conditions
- Do not use old feed, start fish off on new feed each year.



Physical Environment

- **Current**
 - Fit Fish = Healthy fish
 - Disperse Food/Nutrients/Toxins/Dissolved Oxygen
 - Make sure current is not creating dead spots
- **Cover/shade/structure**
 - Provides a more natural environment
 - Lack of structure can increase stress
- **High Traffic Areas**
 - Fish will react to movement



Mechanical (Pumps, Filters, Air stones, lights, Chillers)

Usually act as a stressor but can also cause mortality

- Noise / Vibration
 - Avoid direct contact of equipment with tank
- Electricity
- Light – (intensity, frequency and duration)
 - Avoid turning on lights suddenly
 - Use Dimmer switches and timers
 - Leave blinds open
- Impact –(Blunt Force Trauma)



Population Density

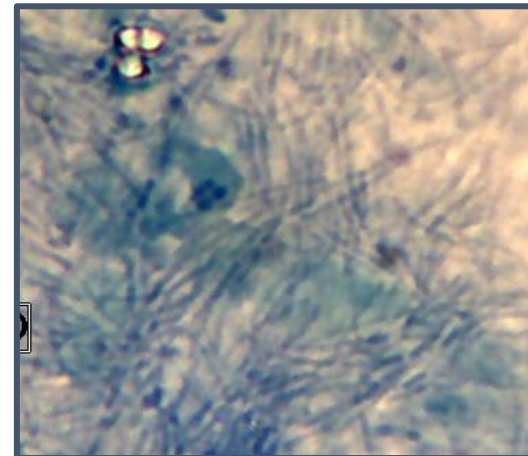
- Fish Compete for resources
 - O₂, Food, Space
- As fish grow, they will require more resources
 - Produce more waste leading to a decrease in water quality, adding stress and compromising their immune system.
- Physical Contact (Confrontational and accidental)
 - Leads abrasions providing an entry for pathogens.
- Monitor water quality



Remove fish if there are too many in the tank, releasing a couple earlier is better than losing them all to disease

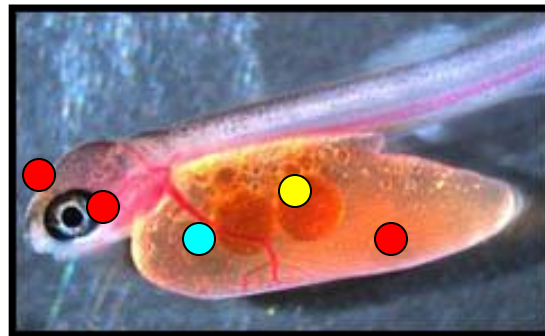
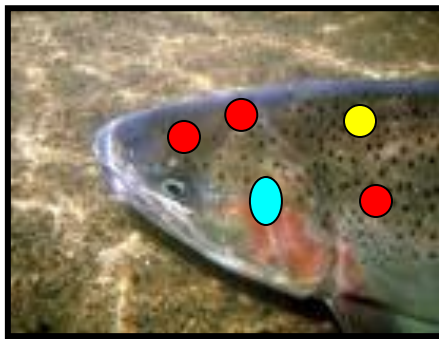
Pathogens

- Parasites
- Bacteria
- Viruses



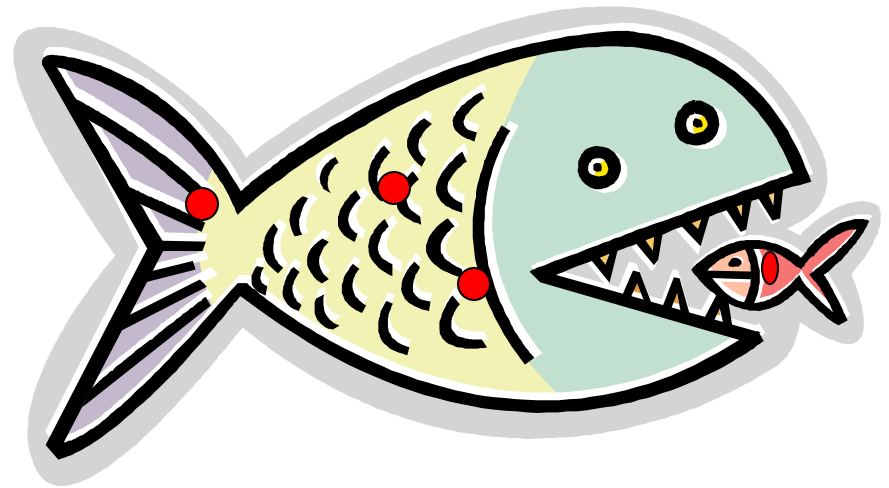
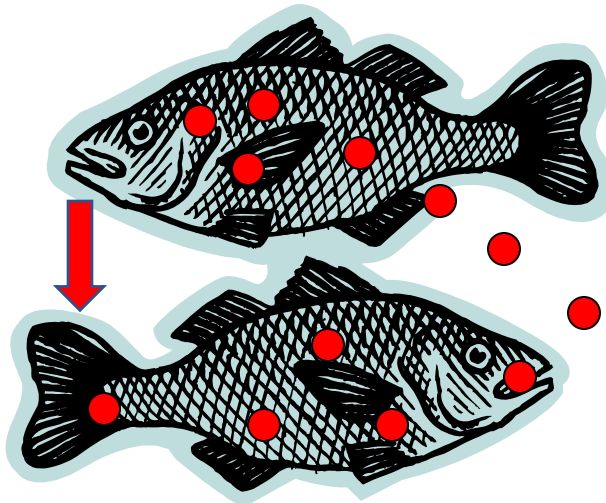
Vertical Transmission

Carried in the egg or on milt during spawning, certain viral and bacterial pathogens can be spread from brood fish to their progeny



Horizontal Transmission

Carried in water or by direct contact, viral and bacterial pathogens can be spread from fish to fish, through bodily fluids, physical contact and eating other fish



Parasites

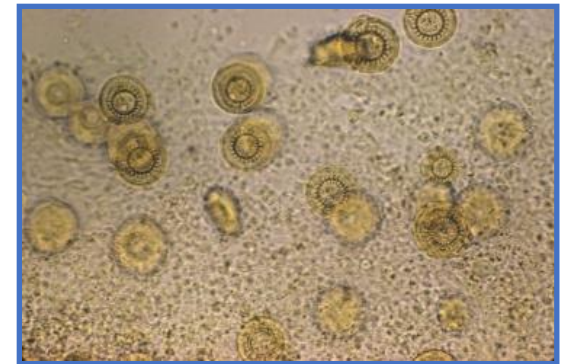
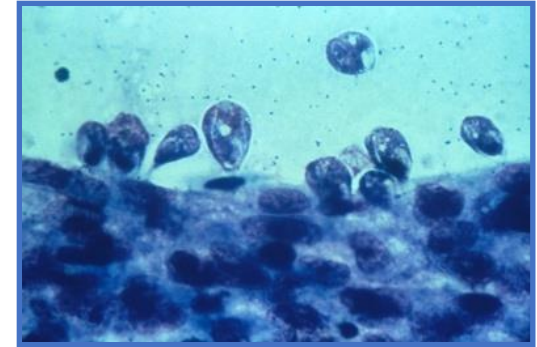
- Protozoans, Trematodes, Myxozoans, Fungus
- Usually transmitted horizontally.
- Most parasites do not cause mortality in low numbers but can act as stressors, responsible for high mortality when found in high numbers.
- Greater affect on smaller fish.
- Some parasites have complex life cycles involving several host.
- Presence of high numbers of parasites is usually an indicator of poor water quality or stressed fish.



Parasites

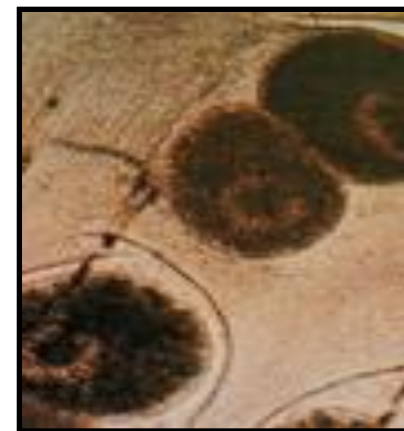
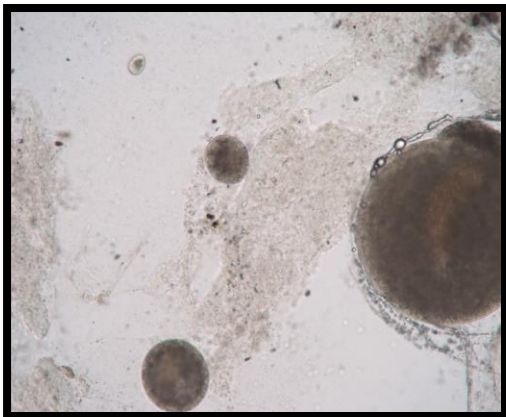
- Usually diagnosed using a microscope
- Fish will flash or rub on the bottom
- If parasite is on the gills fish will sometimes cough or have flared gills
- Frayed fins are sometimes observed.

Most TIC systems should not be affected by parasites.



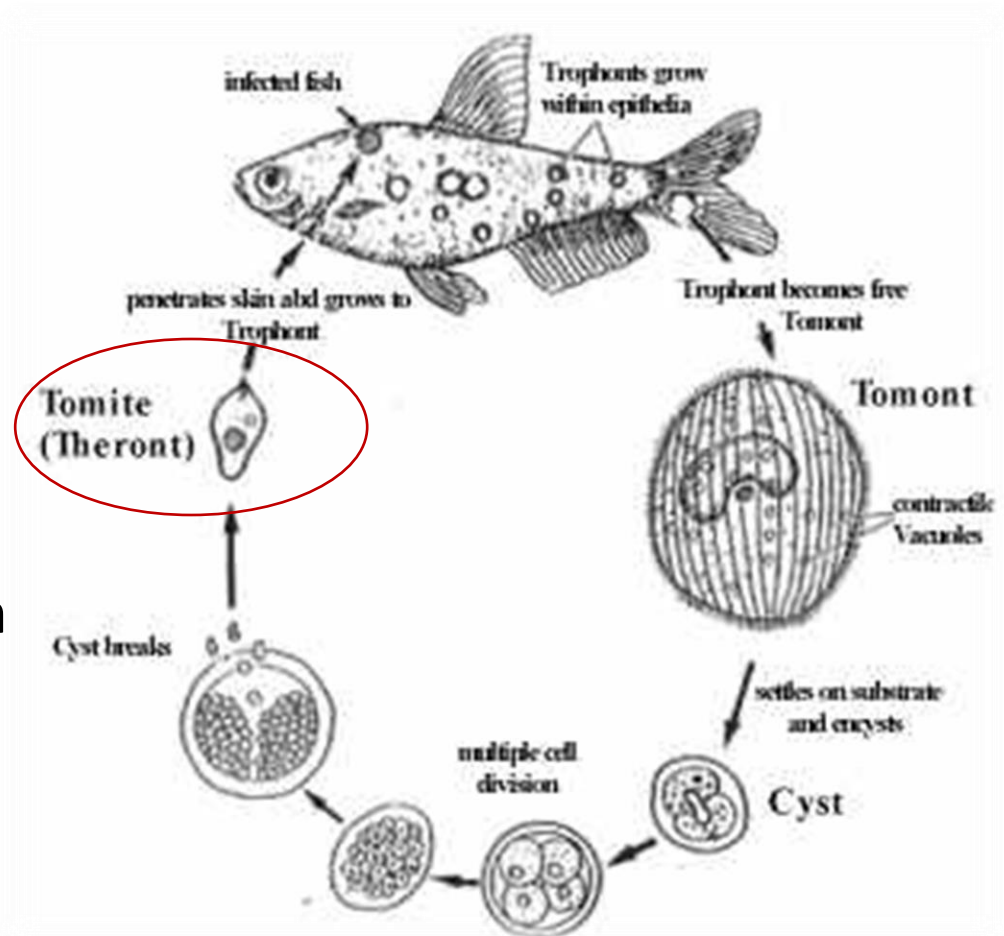
Ichthyophthirius Multifilis (Ich)

- Major mortality in PFBC and world-wide
- Horizontal transmission
- Largest protozoan fish pathogen
 - Adults can be seen with the naked eye
- Adult fish will often jump and flash when infestation occurs



Ich

- Complex life cycle
- The Tomite or theront is most susceptible to treatment
- One tomont can = 10,000 tomites
- Length of cycle depends on temperature
 - 3-6 days @ 77° F
 - 10 days @ 59° F
 - 30+ days @ 50° F

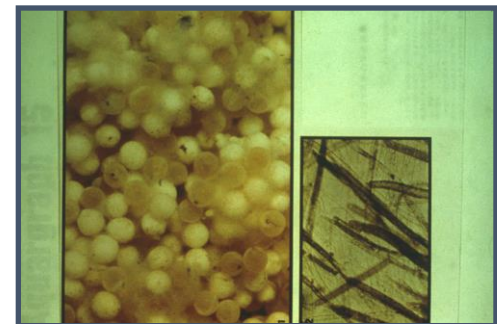
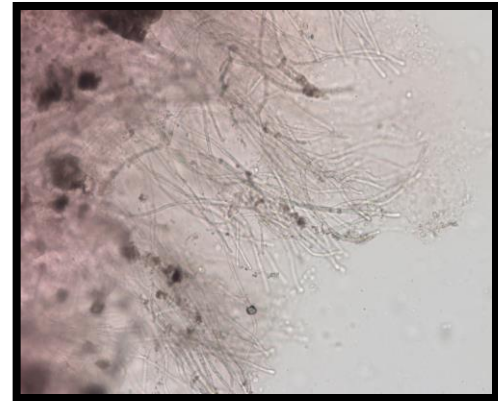


Ichthyophthirius Multifilis



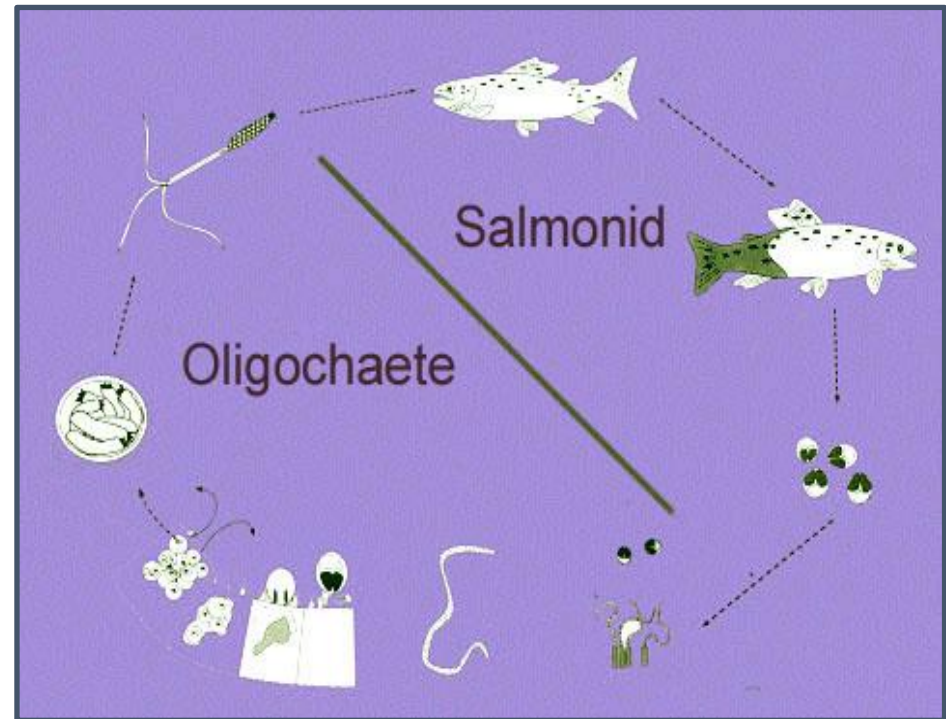
Fungus

- Indicator of **stressed** fish
- Indicator of **poor environment**
- Horizontal transmission
- Chronic mortality in adults
- High mortality in fry and eggs



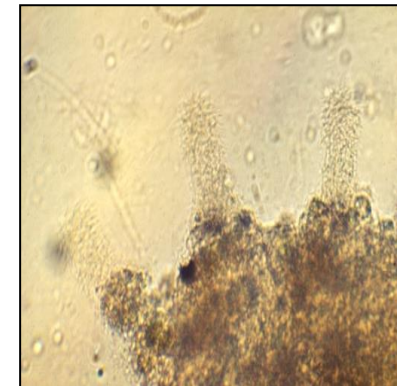
Whirling Disease

- Whirling Disease is a Myxozoans parasite that primarily infects Rainbow trout in the first four months of life.
- Big issue in Western US (Rainbow Trout)
- Needs a worm for a host / the worm needs soil to live in.
- PFBC eliminated earthen raceways removing the worm's habitat thus controlling the disease.



Bacterial Pathogens

- Outbreaks usually occur when immune system is compromised
- Bacteria have the potential to cause massive mortality events
- Can be transmitted both horizontally and vertically
- Most can be treated using antibiotics, but they can also develop antibiotic resistance



Viral Pathogens

- Very hard to diagnose and to treat
- Mortality and outbreaks of disease usually occurs when fish are stressed
- Transmitted both vertically and horizontally



What Can TIC Participants do to Prevent Diseases?

1. Reduce Environmental Stressors
2. Have a Biosecurity plan in place.

Biosecurity

Strict control over anything that may act as a vector transporting pathogens into your tank

- **Fish**
 - Start with disease free fish or fish with a known disease history
 - Avoid introducing new fish to your system
- **Water**
 - Use chemically treated or UV filtered water
- **Equipment**
 - Disinfect all equipment. If there are several tanks use separate equipment for each tank
- **Staff**
 - Ensure staff is educated in the Biosecurity protocols

Why is it important to be observant for signs of disease?

- Mortality events can be prevented if disease is treated early
- Sick fish and dead fish have higher pathogen loads
- Disease will often spread through out the tank if not treated
- It may take a long time to diagnose the disease
- It may not be that difficult to treat (ex Environmental Problems)

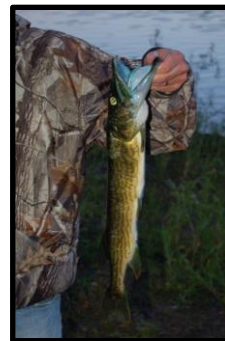
Indicators of Disease

- Fish behavior, appearance, mortality, and growth rate may be species and or environment dependent.
- Know what is NORMAL for your fish and environment
- Maintaining documentation of NORMAL fish behavior as it relates to the species life stage and environment is crucial in identifying when disease may be present in a population

Fish Appearance

Disease diagnosis should not be made on appearance alone, often clinical signs are very similar or the same for multiple disease

It is important to know what is **NORMAL** for your fish



Fish Appearance

- Color-Light, Dark, Molted
 - Fish will often change color when sick or stressed.
 - Color change is sometimes a sign of a specific disease or condition
- Eye Condition –Cataracts,
 - Nutritional
 - Genetic
- Missing
 - Over crowding
 - Not being fed enough



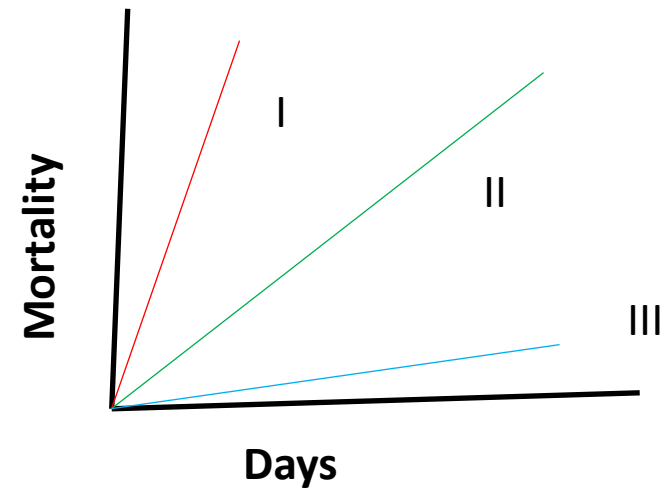
Fish Appearance

- Visible parasites
 - Ich
 - Fungus
- Emaciated
 - Pinheads, hammerheads
 - Size variation
- Fin wear
 - Overcrowding
 - Parasites/bacterial infection



Mortality

- **When mortality occurs**
 - After Feeding - Low Dissolved Oxygen, Bad feed.
 - After Cleaning- Low Dissolved Oxygen
 - After tank has not been cleaned for several days
- **What size fish**
 - Only larger fish -Sign of low dissolved oxygen.
 - Only smaller fish – Possibly Parasites
 - Not being fed enough
- **Appearance of dead fish**
 - Flared Gills / arched back – Dissolved oxygen
 - Covered in Fungus
- **Rate of mortality** can be an indicator of pathogen type or environmental condition.



Fish Behavior

- Loss of appetite
 - Gill Parasites or organic material on the gills
 - Bad feed/Nutritional
- Position in the Tank
 - surface – Low DO, Gill Parasites
 - At the influent – Low DO, Temperature, Gill Parasites
- Lethargy or listlessness
 - Bacterial disease, virus, Nutritional.
- Flashing or Rubbing on the bottom
 - Parasites
- Inverted swimming (Bloated)
 - Swim bladder, or nutritional issues.



What to do if you observe signs of disease?

- Act now!!
- Reduce Stress
 - Ensure the water flow, oxygen, nitrogen, and water temperature are at acceptable levels
- Document conditions and results



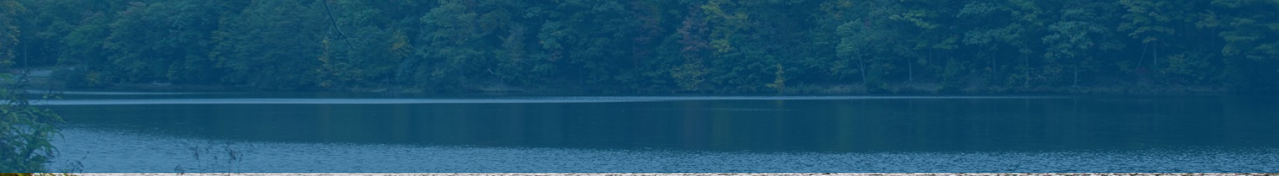
Treating disease

- TIC trout have the potential to be consumed as a result they are regulated by the FDA.
- Can only be treated with chemicals and drugs approved by the FDA for food fish.
- Consult TIC coordinator prior to treatments other than salt.
- Usually the simplest thing,
- Try to reduce environmental stressors first
- Remember fish need FOOD, O₂, Water to survive
- Determine what changed prior to mortality (document daily activities)
 - lapses in biosecurity
 - New stressors

Summary

- Some fish will die
- Know what is normal for your fish
- Fish Mortality is usually the result of a combination of factors creating the “perfect storm”
- Good biosecurity is essential in preventing disease
- Documentation of environmental and fish condition is key to diagnosing disease
- Take pictures/video of your sick fish

An ounce of prevention is worth a pound of solution



Questions?

