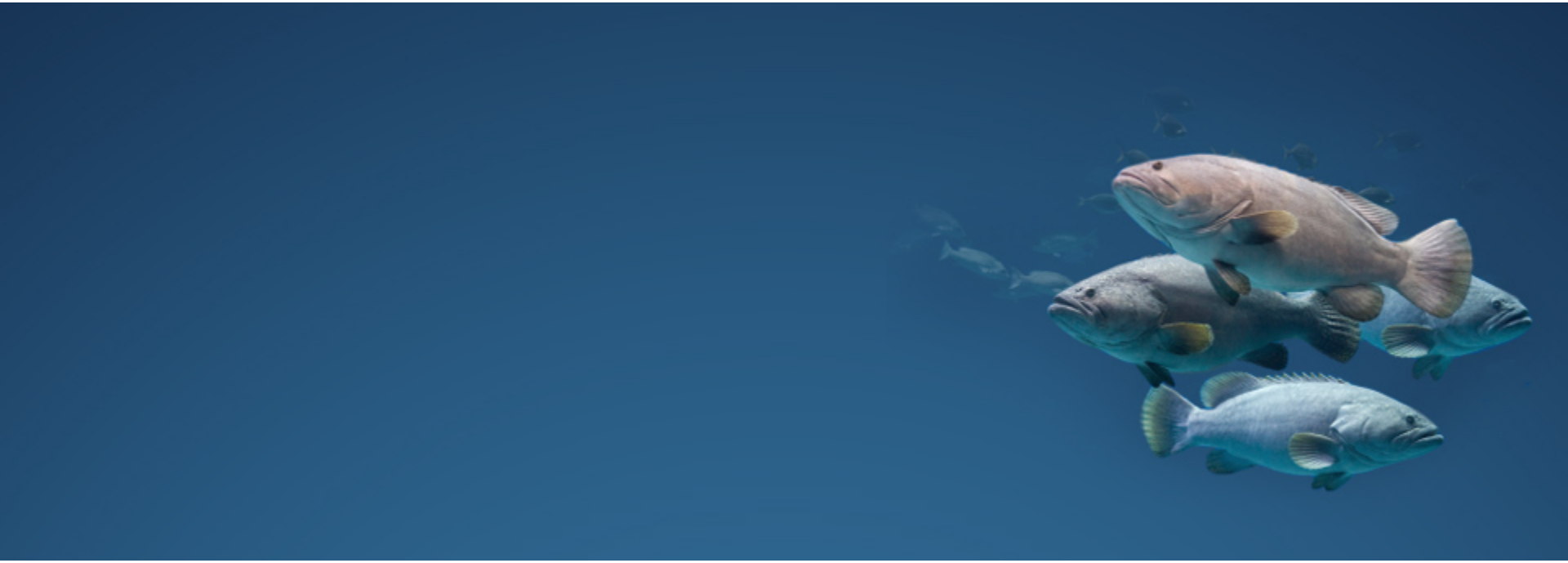
Fish Health

Alex Primus, DVM, PhD
University of Minnesota, College of Veterinary Medicine



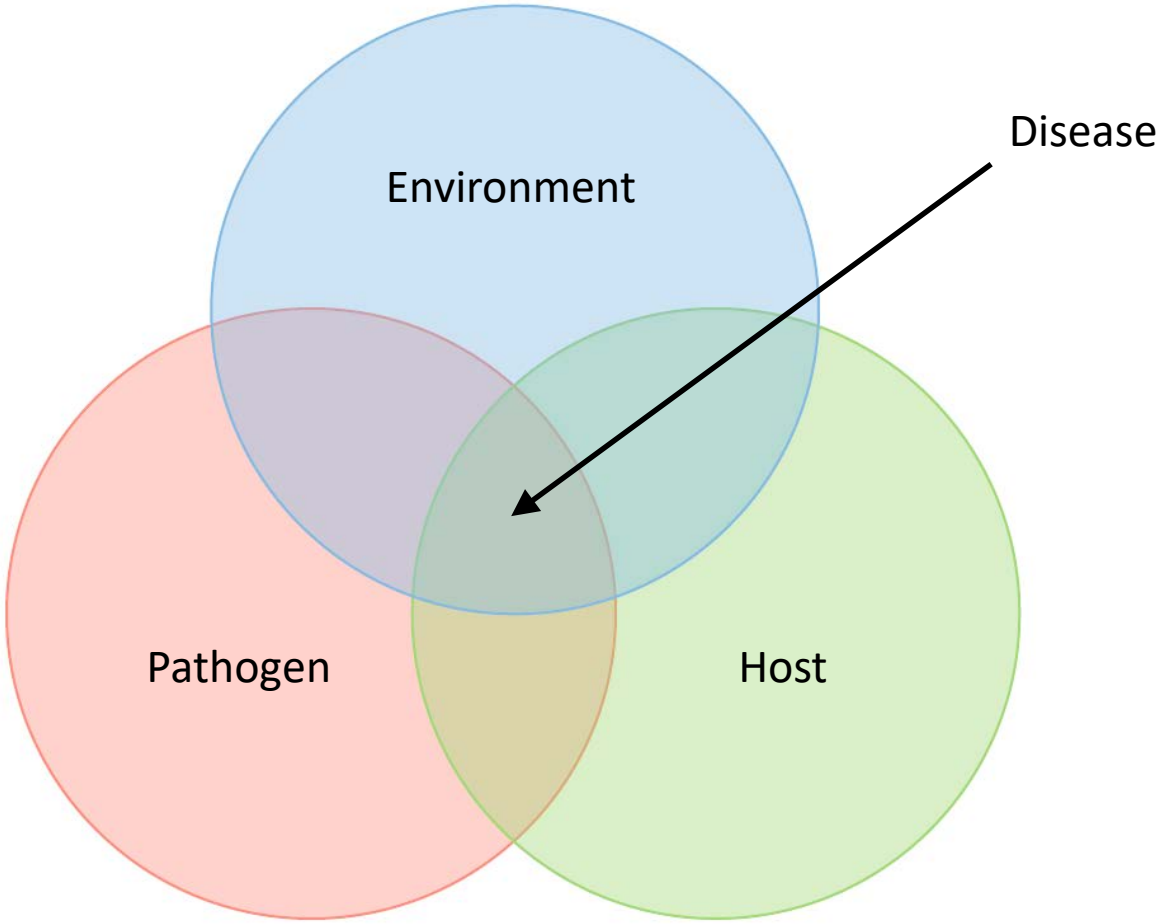
Iowa Aquaculture Conference

November 14th, 2017

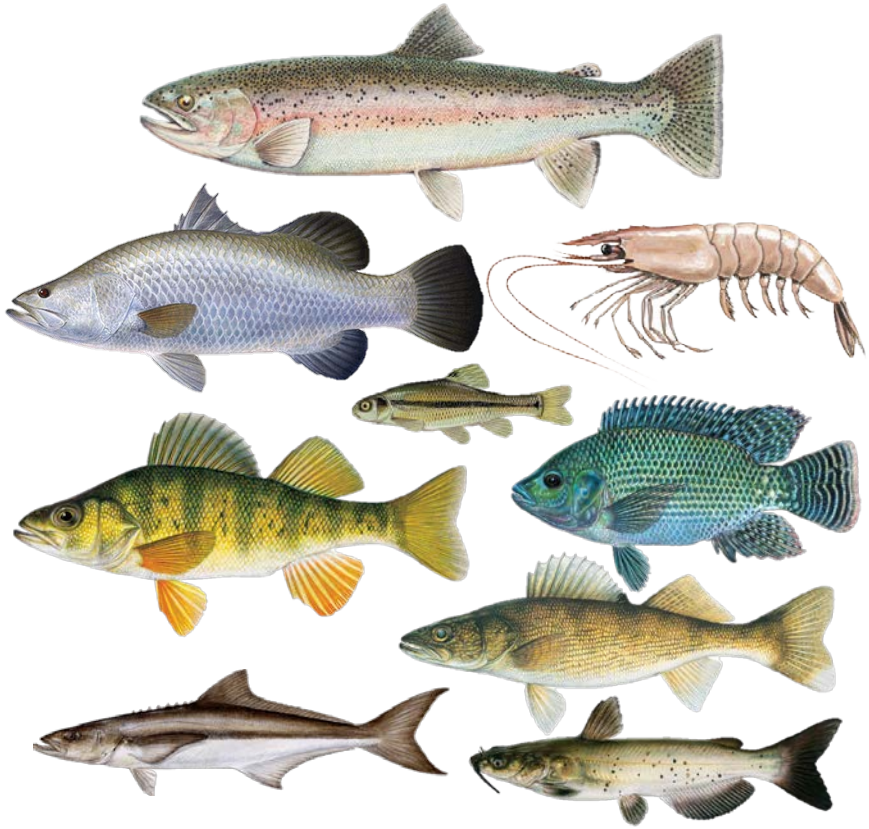
Presentation Overview

- Intro to Fish Health & Disease
- Pillars of Fish Health
- Infectious Disease
- Resources

Manifestation of Disease



Diversity of Species & Systems



Pillars of Fish Health in Aquaculture

- Environment
  - Water Quality / Life Support
- Husbandry
  - QA/QC, Nutrition, Sanitation, ↓ Stress
- Disease Prevention
  - Biosecurity, Health Monitoring, Vaccination
- Disease Management
  - Diagnosis, Treatment & Continuing Prevention

Pillar I: The Environment

- Water Quality
  - Poor Water Quality is The Most Common Source of Fish Health Issues*
    - Can directly result in immediate and significant losses
      - Ex. ↓dO, ↑TGP, ↑NH_3, toxicants, treatment overdoses
    - More commonly, poor WQ results in secondary and/or chronic fish health issues
      - Ex. ↑NO_3^-, ↑TSS, ↑/↓/△ in pH, temp., gH, kH, salinity, trace elements → poor growth, death, opportunistic bacterial infections and/or ectoparasitic infestations
  - Good & Stable WQ is imperative to Fish Health

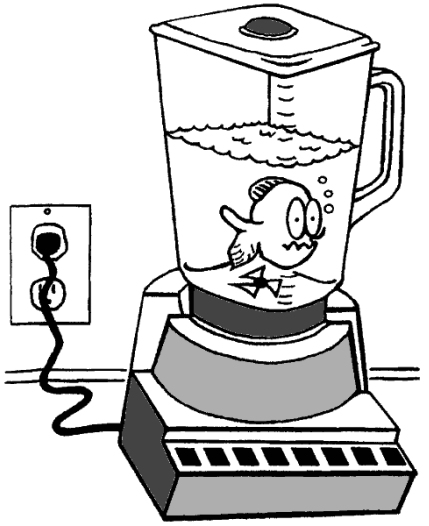
*In my experience in NCR, >50% fish health issues in aquaculture likely due to poor WQ. This likely differs by region, sector, etc., but worth consideration in most cases.

Pillar I: The Environment

- Water Quality (cont.)
  - Keys to Maintaining Good & Stable WQ
    - Know what parameters are most important for your system
    - Have the right equipment/materials (and backups) to maintain these parameters – “Life Support System”
    - Measure these WQ parameters regularly and appropriately
    - Document measurements and adjustments
    - Know how to manage your system/production unit if needed
    - Have a plan for emergencies/disasters that may impact WQ
    - Note: Intensive and RAS systems may require more attention, but these suggestions apply for all systems

Pillar I: The Environment

- Stress can have a significant negative impact on fish health
  - Ensure the rearing environment is safe and species-appropriate
- Factors to consider include:
  - Stocking density
  - Social/behavioral needs
  - Substrate, containment & sharp edges
  - Lighting regimen & excess noise/activity
  - Other environmental risks
    - Sunlight, predators, pathogen vectors, etc.



And you thought there was stress in *your* life !

Pillar II: Husbandry

Just a few points related to health

- QA/QC
  - Protocols, Documentation, Training & Consistency
    - Stability of the system
    - Ability to identify areas of improvement in your system
- Nutrition
  - Use species-specific and age-appropriate feed
    - Different species can have very different requirements
  - Store feed as recommended by the manufacturer
    - Sealed container in cool, dry area off ground
  - Use feeding time to get a good look at your fish

Pillar II: Husbandry

Just a few points related to health

- Sanitation
  - Keep things clean
    - Culture area, equipment, PPE
  - When choosing infrastructure and equipment, select items that are easy to sanitize
  - Regularly remove excess waste/feed from water
  - Use a fallow period if possible
- Minimize Stress

Pillar III: Disease Prevention

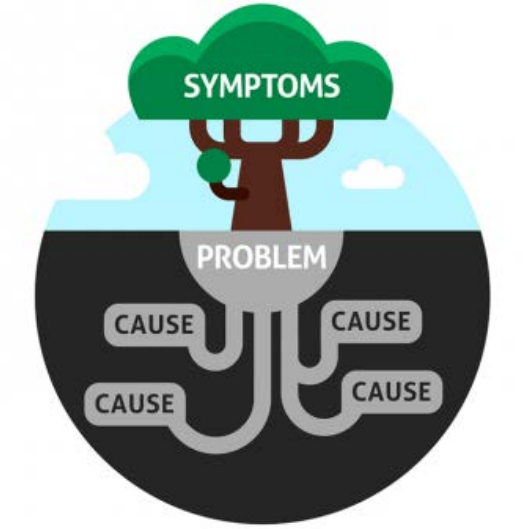
- Biosecurity
  - External barriers – fences, locked doors, signs
  - Regulate all incoming biosecurity risks
    - New stock
      - Fish Health Testing – “SPF-fish”
      - Quarantine, Evaluate & Treat if Necessary
    - Visitors & Equipment
      - Minimize risk of contaminated individuals & equipment
      - Mitigate acceptable risks by decontamination / PPE
  - Isolate populations/stocks
    - Minimize movement of personnel, equipment, stock between production units
    - Mitigate risk of cross-contamination
      - Decontamination of equipment & PPE
      - Traffic flow based on:
        - » “Clean” to “Dirty” areas
        - » High-risk to Low-risk

Pillar III: Disease Prevention

- Health Monitoring
  - Fish Health Log
    - Document Fish Health Information
      - Ex. daily mort's, issues, Dx's, Tx's, etc.
  - Surveillance
    - Active – planned evaluation of healthy fish
      - On Site Testing: Ectoparasites, Necropsy, FHI
      - Dx Lab: Bacteriology, virology & additional options
    - Passive – evaluation of sick or dead fish
      - Above testing +/- NGS & EM
- Vaccination

Pillar IV: Disease Management

- Diagnosis
  - Appropriate Dx (including root cause analysis) important for:
    - ID of appropriate Treatment
    - Knowing your prognosis
    - Modification of Environment, Husbandry & Biosecurity

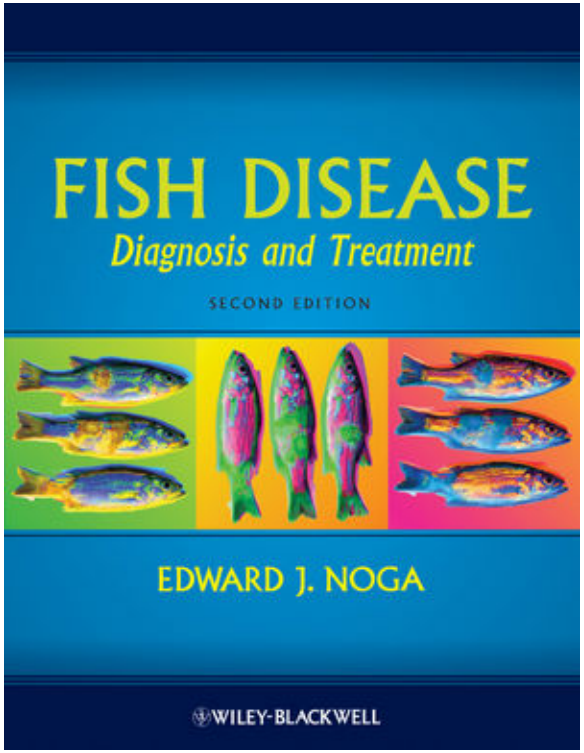


Pillar IV: Disease Management

- Treatment
  - Appropriate for disease and production system
    - Ex. Antibiotics & chemotherapeutants in RAS?
  - Legal
    - Feed-based antibiotics now require vet oversight
  - Should include follow-up and elimination of initiating factors
    - Many bacterial and ectoparasitic issues result from poor water quality, stress, etc.
- Continuing Prevention

Common Freshwater Diseases

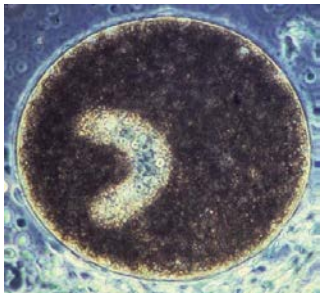
- Parasites
- Bacteria
- Viruses
- Water Molds
- Other

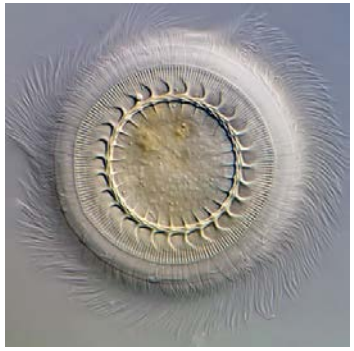


Ectoparasites of FW Fish

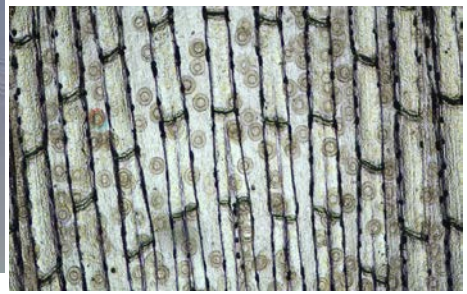
- General notes
  - Inhabit gills, skin, fins
  - Low numbers – asymptomatic
  - High numbers – morbidity & mortality
  - Low → High typically due to:
    - Stress & Poor WQ
  - Symptoms – variable
    - Flashing, gross lesions, respiratory distress
  - Dx: ”Wet-mounts” typically sufficient
  - Tx: Several immersion options (ex. Salt, Formalin, Potassium Permanganate, Copper Sulfate)

“Ich” – White spot

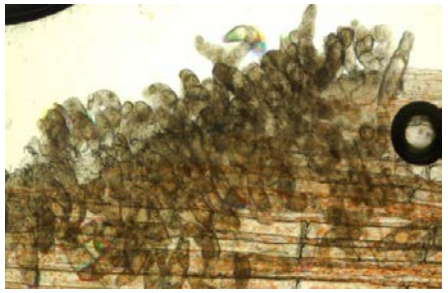




Trichodina

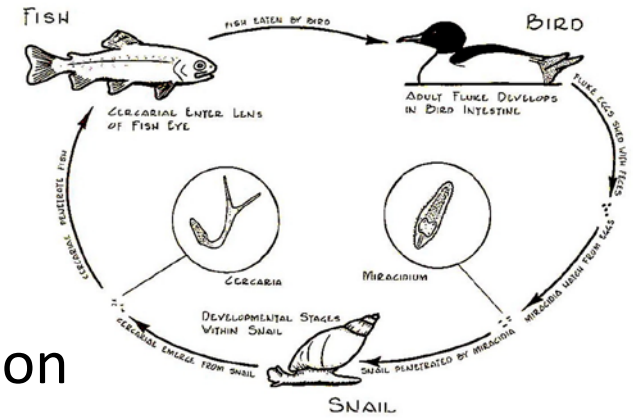


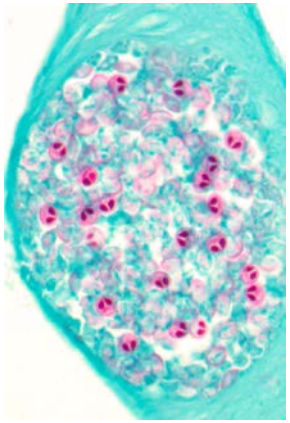
Monogenean

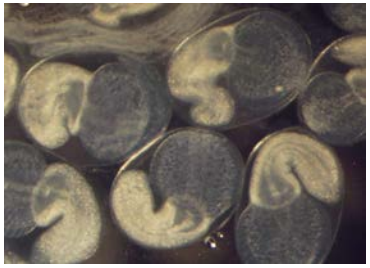


Endoparasites of FW Fish

- General notes
  - Inhabit many tissues
  - Generally asymptomatic
  - Complex life cycles common
    - Snails, arthropods, birds, mammals
  - Includes several types of worms and a few oddballs
  - Dx: Necropsy +
  - Tx: Often not treated, sometimes managed by controlling other hosts

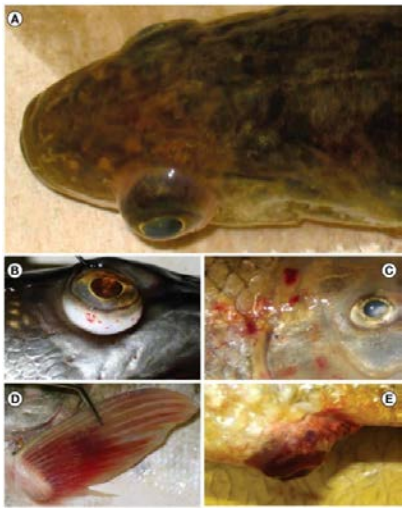






Bacteria & Viruses

- General Notes
  - There are many bacterial and viral diseases of fish
  - Many are species specific, others have a wider host range
  - Many (if not most) are difficult to identify based on clinical signs / gross morphology
  - Common general clinical signs include:
    - Petechial hemorrhage
    - Edema, or “Dropsy”
    - Exophthalmia
    - Ascites
    - Darkening of skin
    - Going off feed



Bacteria & Viruses

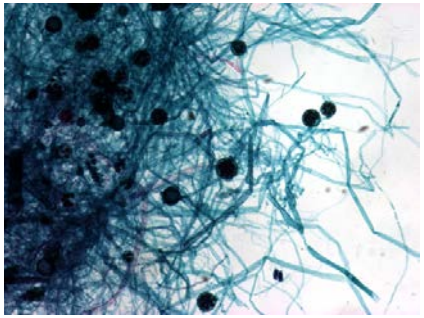
- General notes
  - Many bacteria are opportunists – they would not cause disease if the fish was otherwise healthy
  - Diagnosis is typically based on the following:
    - Bacteria: Aerobic culture of kidney or brain, PCR
    - Viruses: Viral isolation, PCR, electron microscopy
    - …there are exceptions though
  - Prevention is key
    - Biosecurity
    - Vaccination (most are injectable, some immersion)
  - Treatment: Antibiotics for bacterial pathogens (via feed)
    - Challenge: Fish often stop eating when sick

Bacteria & Viruses

- Prevention vs. Treatment: **Prevention is the Key!!!**
  - No treatments for Viruses
  - Subclinical infections (viral or bacterial) would likely compromise:
    - Immune function → increased susceptibility to other pathogens
    - Production efficiency
  - Use of Antibiotics for Bacterial Infections has its downsides (compared to Prevention of Disease)
    - By the time treatment starts, you will probably already have lost fish, possibly a LOT of fish
    - It can be very difficult to get antibiotics into fish
      - Typically in feed, but if fish not eating…
    - There are concerns with antibiotic use
      - Potential for development of resistance
      - Marketing / Added-value in minds of many consumers
      - Environmental contamination / sustainability concerns (particularly with aquaculture)

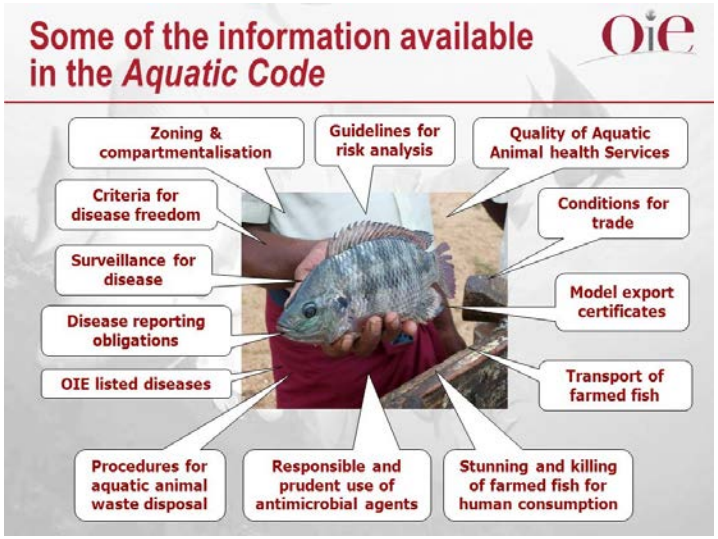
Water molds

- Saprolegneosis (Oomycete infection)
  - Caused by one of several saprophytic / pathogenic species of water molds (but only in freshwater)
    - Often called “fungal infections”, but not true fungus
    - Ubiquitous in freshwater and soil
    - Form spores that are highly impervious to treatments
  - Disease itself results from hyphal growth on skin or gills
    - Appears fluffy like cotton underwater
    - Often appears following acute stress, drop in temperature, transport, etc.
    - Damages skin or gills which results in 2° infection or osmoregulatory dysfunction
    - Very difficult to treat once established
  - Because it is saprophytic, will start growing on fish that die in water – can be diagnostic “red herring”

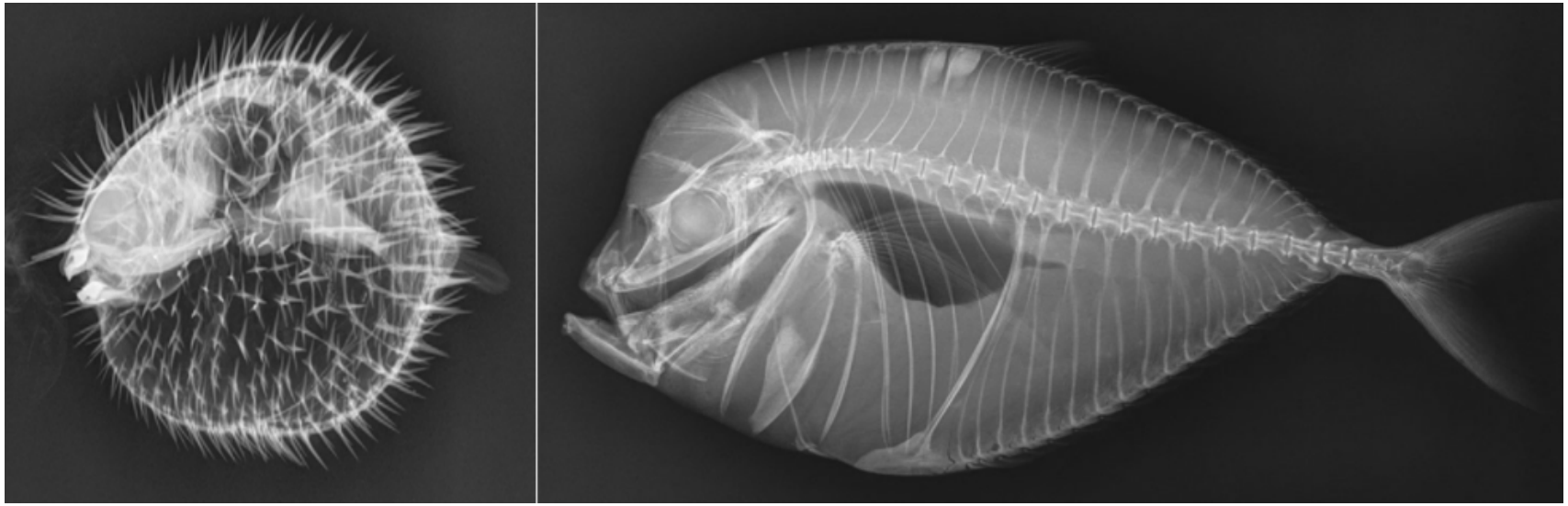


Fish Health Resources

- Books
  - Ex. “Fish Disease: Diagnosis and Treatment”
- Websites
  - OIE Aquatic Code
  - FAO - Aquaculture
  - AFS – Fish Health Section
  - Regional Sites – NCRAC, SRAC
  - The Fish Site
- People
  - American Association of Fish Veterinarians
  - Aquaculture extension specialists
  - Diagnostic Labs – public and private



Questions



Radiographs by Dr. Shane Boylan, South Carolina Aquarium