Aquatic Animal Diseases

Training Guide

SART Training Media
Aquatic Animal Diseases
Training Guide

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SART Training Media are available for download from the Florida SART Web site <www.flsart.org>.
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About Florida SART

- SART is a multi-agency coordination group.
- SART is made up of over 25 partner agencies (state, federal and non-governmental organizations).
- SART provides preparedness and response resources for Emergency Support Function 17 [(ESF 17) Animal and Agricultural Issues].
- SART statutory authority
  - State Emergency Management Act (Section 252.3569, Florida Statutes)

SART Mission

Empower Floridians through training and resource coordination to enhance all-hazard disaster planning and response for animal and agricultural issues.

SART Goals

- Support the county, regional and state emergency management efforts and incident management teams.
- Identify county resources available for animal and/or agricultural issues.
- Promote the cooperation and exchange of information of interested state, county and civic agencies.
Specific Learning Objectives

At the end of this training module, participants will be able to:

- Identify the difference between an emerging and an endemic disease
- Provide examples and characteristics of emerging aquatic diseases affecting finfish, crustaceans and molluscs
- Provide examples and characteristics of endemic aquatic diseases affecting finfish, crustaceans and molluscs
- Identify key resources available for additional information
Resources

The following are sources of additional information about the subjects mentioned in this introduction.

University of Florida Tropical Aquaculture fact sheets
https://tal.ifas.ufl.edu/extensionoutreach/extension-publications/

USDA Southern Regional Aquaculture Center / Texas A&M and Mississippi State
https://fisheries.tamu.edu/aquaculture/diseases/

Florida Division of Emergency Management
http://www.floridadisaster.org

United States Department of Agriculture (USDA)
http://www.usda.gov

Florida Department of Agriculture and Consumer Services (FDACS)
http://www.doacs.state.fl.us

Florida Division of Aquaculture home page
https://www.freshfromflorida.com/Divisions-Offices/Aquaculture

Aquaculture Best Management Practices manual can be accessed directly at

eXtension Freshwater Aquaculture Community

USDA Animal and Plant Health Inspection Service (APHIS)
http://www.aphis.usda.gov

World Organisation for Animal Health (OIE)
http://www.oie.int

Safety for Fish Farm Workers video on the National Ag Safety Database (NASD), English and Spanish versions available from the following link
http://nasdonline.org/search.php?query=safety+for+fish+farm+workers
Resources, continued

Spawn, Spat, and Sprains book produced by the Alaska Sea Grant College Program. The entire book can be downloaded from the following link
http://www.uaf.edu/seagrant/Pubs_Videos/pubs/AN-17.pdf

University of Florida Institute of Food and Agricultural Sciences Electronic Data Information Source (EDIS) fact sheets for aquaculture, including diseases, can be found at the following links
http://edis.ifas.ufl.edu/DEPARTMENT_VETERINARY_MEDICINE
http://edis.ifas.ufl.edu/DEPARTMENT_FISHERIES_AND_AQUATIC_SCIENCES
Aquatic Animal Diseases

Appendix A: Training Slides

SART Training Media
Aquatic Animal Diseases

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Appendix A: Slides 1-3
Learning Objectives

• Identify the difference between an emerging and an endemic disease
• Provide examples and characteristics of emerging aquatic diseases affecting finfish, crustaceans and molluscs
• Provide examples and characteristics of endemic aquatic diseases affecting finfish, crustaceans and molluscs
• Identify key resources available for additional information

Aquatic Disease Categories

• Emerging
  – Exotic disease with potentially significant impact
  – Not common or not present
• Endemic
  – Common in United States
  – May show regional or seasonal patterns

Emerging Diseases for Florida Aquaculture

• Finfish
  – Spring Viremia of Carp (SVC)
  – Tilapia Lake Virus (TiLV)
• Crustaceans
  – White Spot Virus
  – Taura Syndrome
  – Yellowhead Virus
  – Early Mortality Syndrome
• Molluscs
  – Bonamiosis (*Bonamia exitiosa*, *B. ostrea*, *Mikrocytos roughleyi*)
**Endemic Diseases for Florida Aquaculture**

- **Finfish**
  - Koi Herpesvirus (KHV)
  - Largemouth Bass Virus (LMBV)
  - Other parasitic, fungal and bacterial diseases

- **Molluscs**
  - Perkinsosis
  - Multinucleate Sphere X (MSX)

**Emerging Diseases**

**Finfish**

- “True” fish with fins and permanent gills
  - Term distinguishes true fish from crayfish, jellyfish, starfish, etc.

- **Groups include**
  - Cyprinids (e.g., common grass and bighead carps)
  - Centrarchids (e.g., largemouth and smallmouth bass)
  - Cichlidae (e.g., tilapia)

- **Species harvested or in culture include**
  - Common carp (Cyprinus carpio), Goldfish (Carassius auratus)
  - Tilapia (Nile Oreochromis niloticus or Blue (O. aureus))
  - Largemouth bass (Micropterus salmoides)
Spring Viremia of Carp (SVC)

- OIE notifiable disease
- Caused by a virus
- First official U.S. report in spring 2002
  - Farmed koi in NC, VA
  - Wild carp in WI
  - Recent outbreaks in WA, MO
- Major industry concern
- Can cause mortalities up to 70% in younger fish

General Facts
- One of several Rhabdoviruses that cause diseases in fish
- Distribution – Reported in Europe, Middle East, Russia, North and South America, Asia
- Species affected – Koi/Common carp, Grass carp, Bighead carp, Silver carp, Crucian carp, goldfish (C. auratus)

Disease Risk Factors
- Water temperature very important – 54-68°F (12-28°C)
- Fish age, other stressors, temperature fluctuation and immune status are also factors
- Transmitted through gills, feces, fish lice, birds, equipment, water and mud
Spring Viremia of Carp (SVC)

**Treatment**
- No treatment available
- Virus infective in mud for up to 42 days

**Depopulate infected fish, then disinfect tank/pond**

**Disinfection agents/techniques**
- Gamma/UV radiation
- Chlorination at 500 ppm for 10 minutes
- pH less than 4.0 or greater than 10.0
- Heating to 140°F (60°C) for 15 minutes

**Prevention**
- Buy from SVC-free source
- Quarantine/Biosecurity
  - Keep shipments separate
  - Keep species separate (e.g., koi separate from goldfish)
  - Refrain from Japanese-style shows where fish are commingled
- Reputation of fish supplier
- Among finfish, only SVC-affected species require USDA-APHIS import permit and inspection at time of import

**Crustaceans**

- Invertebrates characterized by a hard outer shell and jointed appendages and bodies
- Two major classes
  - Malacostracans (i.e., crab, shrimp, lobster)
  - Entomostracans (i.e., fairy shrimp, water fleas, barnacles)
- Species harvested or in culture include
  - Pacific White shrimp (*Litopenaeus vannamei*)
  - Blue shrimp (*Litopenaeus stylirostris*)
  - Giant Tiger shrimp (*Penaeus monodon*)
White Spot Disease

- Baculovirus affecting mostly juvenile Pacific White shrimp with high mortality
- Distribution
  - Asia, North, Central and South America
  - Native Florida shrimp may harbor similar virus
- Outbreak in Kaua‘i, HI in April 2004
- Listed disease in the Florida Division of Aquaculture’s Best Management Practices (BMP)

Taura Syndrome Virus

- Affects the Pacific White shrimp; all cultured species susceptible
  - Affects post-larval, juvenile, sub-adult life stages
    - Mortality rate for these life stages 40 to 90%
    - Survivors may become carrier for life
- Distribution
  - Asia, Central, South and North America
  - Infected Central and South American shrimp introduced disease into Asia
  - Outbreaks in Texas and South Carolina in late 1990s

Risk factors
- Seagulls feeding on infected/dead shrimp may carry virus pond to pond, farm to farm
- Listed disease in the Florida Division of Aquaculture’s BMP
### Yellow Head Virus

- Affects juvenile Giant Tiger shrimp
  - High mortality in early and late juvenile life stages
- Afflicted shrimp show signs of gross yellowing of the cephalothorax
- Distribution
  - Asia
  - Americas – Possible, however not yet documented
- Listed disease in the Florida Division of Aquaculture’s BMP

### IHHNV

- Infectious Hypodermal and Hematopoietic Necrosis Virus
- Affects Blue shrimp (L. stylirostris) – up to 90% mortality
- White leg shrimp (L. vannamei) less affected
  - Resistant lines have been developed
  - Affected shrimp exhibit bent rostrum and broken antennae
- Distribution
  - SE Asia
  - Americas – Pacific Coast (NW Mexico to Chile)

### Molluscs

- Invertebrate animals with soft unsegmented bodies, a muscular foot and a body enclosed in a mantle
- Groups include
  - Cephalopods (e.g., squid, octopus)
  - Gastropods (e.g., abalone)
  - Bivalves (e.g., clams, mussels, oysters)
- Species harvested or in culture include
  - Eastern oyster (Crassostrea virgíñica)
  - Pacific oyster (Crassostrea gigas)
  - Flat oyster (Ostrea equestris)
  - Hard clams (Mercenaria mercenaria)
**Mollusc Emerging Disease**

**Bonamiosis**

- Caused by *Bonamia ostrea* (Northern hemisphere), a protozoan parasite
- Affects flat oysters
  - 2 new species affect the Asian oyster (*Crassostrea ariakensis*) and Flat oysters
  - Most infected oysters appear normal
- Distribution
  - France, Ireland, Italy, the Netherlands, Spain, the United Kingdom (excluding Scotland), and the United States (CA, ME and WA)
  - Confirmed cases in VA and NC in 2003 and 2004

**Seaside Organism Disease (SSO)**

- Caused by the protist, *Haplosporidium costale*
- Affects the Eastern oyster
- Seasonal, complex life cycle ending in final sporulation killing the host
- Distribution on east coast of United States and Canada (from Virginia to Nova Scotia) in water with a salinity over 25 ppt
  - Outbreaks in Canada in 2003

**Quahog Parasite X (QPX)**

- Net slime mold in phylum, Labyrinthulomycota
- Affects Hard clams
- Can be found from Virginia’s east coast to Canada
  - Recent outbreaks in Massachusetts
- Clams entering Florida must be QPX free
- Listed disease in the Florida Division of Aquaculture’s BMP
Endemic Diseases

Koi Herpesvirus (KHV)

- Highly contagious
  - Transmitted from infected fish, water and/or mud
  - Water temperature important 64 - 81°F (17 - 27°C)
- High mortalities
  - 80 to 100% mortality (higher in younger fish)
  - Can occur as soon as 24 to 48 hours after signs of disease onset
- Not transmissible to humans
- Affects koi and common carp
- Worldwide distribution
  - Reported in Europe, United States and Asia
- Reportable to OIE

Operculum removed to show gill with patchy white tips
Severe gill necrosis and discoloring

Appendix A: Slides 25-27
Koi Herpesvirus (KHV)

**Treatment**
- None – Virus can live in water for up to four hours
- Depopulation, then disinfect
- Disinfection techniques
  - Chlorine at 200 ppm for one hour
  - Quaternary ammonium compounds at 500 ppm for one hour (for nets)

**Prevention**
- Quarantine/Biosecurity
  - Keep shipments separate
  - Keep species separate
  - Avoid Japanese-style shows where fish are commingled
  - Reputation of fish supplier

Largemouth Bass Virus (LMBV)

- Iridovirus frequently present in healthy largemouth bass
  - Bass test positive, but show no clinical signs of infection
  - No LMBV-infected fish in Florida

Factors in Disease Development

- **Host Issues**
  - Immune status
  - Diet
  - Condition

- **Environment**
  - Transport
  - Handling
  - Water quality
  - Crowding/trauma
  - Contamination/pollution

- **Compromise/Infection**
  - Several etiologies
  - Commonly associated with poor management and/or water quality issues

Appendix A: Slides 28-30
Perkinsosis

- Also called “dermo” disease
- Caused by Perkinsus marinus and P. olseni
- Complex life cycle; all stages appear to be infective
- Affects Crassostrea virginica, C. gigas
  - Could infect other bivalves
- Distribution – U.S. East coast (ME to FL) and Gulf of Mexico
- Listed disease in the Florida Division of Aquaculture’s BMP

Multinucleate Sphere X (MSX)

- Caused by protist, Haplosporidium nelsoni
  - Does not survive low salinities
- Affects Crassostrea virginica, Crassostrea gigas
  - Oysters are aberrant hosts
- Distribution
  - East coast of North America, California, France, Korea and Japan
- Listed disease in the Florida Division of Aquaculture’s BMP

Things to Remember...

- Carriers and vectors
  - Survivors of viral diseases may be life-long carriers
  - Vectors can include fish, birds, parasites, equipment and personnel (i.e., YOU!)
- Viral diseases do not have treatments
- Make biosecurity/quarantine a habit
  - Personnel and equipment may be sources of disease and/or modes of transmission
  - Prevention is the best treatment in many cases
Things to Remember...

Zoonotic potential
- People with compromised immune systems are most susceptible
- Examples:
  - Atypical mycobacteriosis – bacterial infection
  - Streptococcus iniae – food handlers infected from handling live fish
  - Vibriosis – bacterial infection, especially risky for those with liver disease
  - Improper cooking practices can pass on infection

Key Resources

- University of Florida Tropical Aquaculture fact sheets
  https://tal.ifas.ufl.edu/extensionoutreach/extension-publications/
- USDA Southern Regional Aquaculture Center / Texas A&M and Mississippi State
  https://fisheries.tamu.edu/aquaculture/diseases/
- Florida Department of Community Affairs, Division of Emergency Management
  http://www.floridadisaster.org
- United States Department of Agriculture (USDA)
  http://www.usda.gov
- Florida Department of Agriculture and Consumer Services (FDACS)
  http://www.doacs.state.fl.us

Appendix A: Slides 34-36
**Key Resources**

- Florida Division of Aquaculture home page
  [https://www.freshfromflorida.com/Divisions-Offices/Aquaculture](https://www.freshfromflorida.com/Divisions-Offices/Aquaculture)

- Aquaculture Best Management Practices manual can be accessed directly at

- eXtension Freshwater Aquaculture Community

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**Key Resources**

- USDA Animal and Plant Health Inspection Service (APHIS)

- World Organisation for Animal Health (OIE)
  [http://www.oie.int](http://www.oie.int)

- Safety for Fish Farm Workers video on the National Ag Safety Database (NASD), English and Spanish versions available from the following link:

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**Key Resources**

- Spawn, Spat, and Sprains book produced by the Alaska Sea Grant College Program. The entire book can be downloaded from the following link
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  [http://edis.ifas.ufl.edu/DEPARTMENT_FISHERIES_AND_AQUATIC_SCIENCES](http://edis.ifas.ufl.edu/DEPARTMENT_FISHERIES_AND_AQUATIC_SCIENCES)
Summary

• Identified the two categories of diseases in Florida
• Provided examples and characteristics of emerging diseases affecting finfish, crustaceans and molluscs
• Provided examples and characteristics of endemic diseases affecting finfish and molluscs
• Listed key resources available for additional information on aquatic animal health and disease

Thank You!