Workbook

Aquaculture:

Aquatic Animal Diseases

SART Training Media

Aquaculture:

Aquatic Animal Diseases

Workbook

Prepared by: Kathleen Hartman, DVM, PhD
Aquaculture Epidemiologist, USDA-APHIS-Veterinary Services

Denise, Petty, DVM,
Assistant Professor, Large Animal Clinical Sciences,
College of Veterinary Medicine, Univ. of Florida

Charles M. Brown
Coordinator for Infomration/Publication Services
Agricultural and Biological Engineering Dept., Univ. of Florida

Carol J. Lehotla
Associate Professor
Agricultural and Biological Engineering Dept., Univ. of Florida

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Other Aquaculture training units are available. All 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 multiagency coordination group consisting of governmental and private entities dedicated to all-hazard disaster preparedness, planning, response, and recovery for the animal and agriculture sectors in the state of Florida.

SART operates at the local level through county SART organizations.

SART utilizes the skills and resources of many agencies, organizations and individuals with its multiagency coordination group structure.

SART supports the county, regional, and state emergency management efforts and incident management teams.

SART Mission

Empower Floridians through training and resource coordination to enhance all-hazard disaster planning and response for animals and agriculture.

SART Goals

- Promote the active engagement of each county coordinator who is responsible for animal and agricultural issues
- Provide assistance in the development and writing of county ESF-17 plans
- Promote the establishment of a county SART to work as a multiagency coordination group to support emergency management and incident management teams
- Provide training for all SART and animal and agriculture personnel
- Identify county resources available for an emergency or disaster
- Work to comply with the National Incident Management System (NIMS) document

Subject: **Aquaculture may be Florida's least known, important commodity. This unit introduces participants to diseases that can affect aquatic animals in Florida's aquaculture industry.**

Learning Objectives

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

1. State the difference between an emerging and an endemic disease.
2. Provide examples and characteristics of emerging aquatic diseases affecting fish, crustaceans, and molluscs.
3. Provide examples and characteristics of endemic aquatic diseases affecting fish, crustaceans, and molluscs.
4. Identify key resources easily accessible for additional information.

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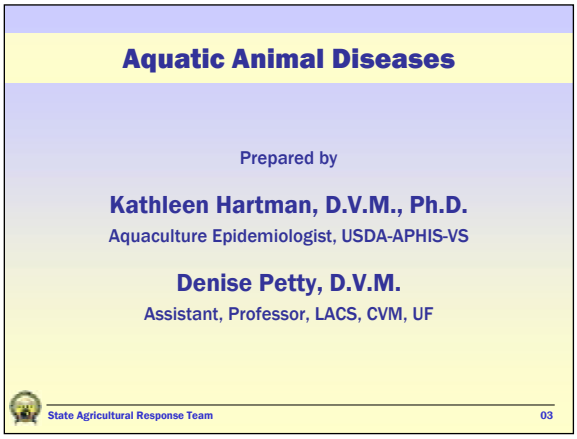
STATE AGRICULTURAL RESPONSE TEAM
S. A. R. T.
FLORIDA


Aquatic Animal Diseases
State Agricultural Response Team
02


Aquatic Animal Diseases
Prepared by
Kathleen Hartman, D.V.M., Ph.D.
Aquaculture Epidemiologist, USDA-APHIS-VS
Denise Petty, D.V.M.
Assistant, Professor, LACS, CVM, UF
State Agricultural Response Team
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Learning Objectives

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

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Aquatic Disease Categories

- **Emerging**
  - Exotic disease with potentially significant impact
  - Exist in finfish, crustaceans, and molluscs
- **Endemic**
  - Common in United States
  - Exist in finfish, crustaceans, and molluscs

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Emerging Diseases for Florida Aquaculture

- **Finfish**
  - Spring Viremia of Carp (SVC)
- **Crustaceans**
  - White Spot Virus
  - Taura Syndrome
  - Yellowhead Virus
- **Molluscs**
  - Bonamiosis (*Bonamia exitiosus, B. ostrea, Mikrocytos roughleyi*)

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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)


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Emerging Diseases


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Finfish

- **"True" fish with fins and permament gills**
  - Term distinguishes true fish from cray*fish*, jelly*fish*, star*fish*, etc.
- **Groups include**
  - Cyprinids (e.g., common grass and bighead carps)
  - Centrarchids (e.g., largemouth and smallmouth bass)
- **Species harvested or in culture include**
  - Common carp (*Cyprinus carpio*)
  - Goldfish (*Carassius auratus*)
  - Largemouth bass (*Micropterus salmoides*)


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Finfish Emerging Disease

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

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Finfish Emerging Disease

Spring Viremia of Carp (SVC)

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*)

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Finfish Emerging Disease

Spring Viremia of Carp (SVC)

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

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Finfish Emerging Disease

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

Finfish Emerging Disease

Spring Viremia of Carp (SVC)

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

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*)

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Crustacean Emerging Disease

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
- Recent outbreak in Kaua'i, HI in April 2004
- Listed disease in the Florida Division of Aquaculture's Best Management Practices (BMP)

White spot disease in giant black tiger shrimp, showing classic white spots

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Crustacean Emerging Disease

Taura Syndrome Virus

- Affects the Pacific White shrimp
  - 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

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Crustacean Emerging Disease

Taura Syndrome Virus

- 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

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Crustacean Emerging Disease

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**

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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 virginica*)
  - Pacific oyster (*Crassostrea gigas*)
  - Flat oyster (*Ostrea equestris*)
  - Hard clams (*Mercenaria mercenaria*)

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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

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Mollusc Emerging Disease

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

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Mollusc Emerging Disease

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 document

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Endemic Diseases

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Finfish Endemic Disease

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
- **Not reportable to OIE**

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Finfish Endemic Disease

Koi Herpesvirus (KHV)

Operculum removed to show gill with patchy white tips

Severe gill necrosis and discoloring

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Finfish Endemic Disease

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

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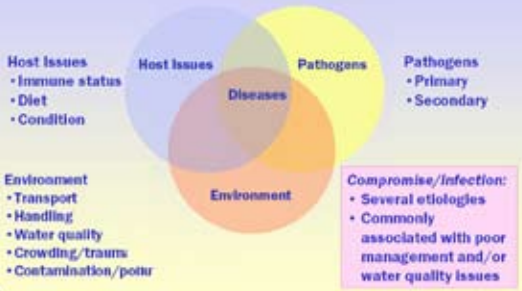
Finfish Endemic Disease

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

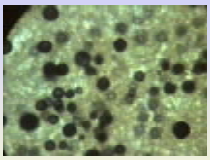
Finfish: Other Diseases



Mollusc Endemic Disease

Perkinsosis

- Also called “dermo” disease
- Caused by *Perkinsus marinus, P. olseni/atlanticus*
- 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



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Mollusc Endemic Disease

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

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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

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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
  - *Erysipelothrix* – parasite, "fish rose"
  - Vibriosis – bacterial infection, especially risky for those with liver disease
  - *Edwardsiella tarda* – bacteria
  - Improper cooking practices can pass on infection

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Key Resources

- USDA-APHIS fact sheets for various animal diseases
  http://www.aphis.usda.gov/lpa/pubs/fsheet_faq_notice/fsfaqnot_animalhealth.html
- APHIS's Center for Emerging Issues (CEI) has various worksheets available on animal health and diseases of concern
  http://www.aphis.usda.gov/vs/ceah/cei/worksheets.htm
- Aquatext.com -- a free, online aquaculture dictionary
  http://www.pisces-aqua.co.uk/aquatext/dicframe.htm

Key Resources

- 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

Key Resources

- Florida Division of Aquaculture home page
  http://www.floridaaquaculture.com
- *Aquaculture Best Management Practices* manual can be accessed directly at
  http://www.floridaaquaculture.com/BAD/BMP%20Rule%20-%20Manual%206-9-04.pdf
- Aquaculture Network Information Center
  http://aquanic.org

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Key Resources

- 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://www.cdc.gov/nasd/videos/v001401-v001500/v001433.html

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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
  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

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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

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Resources

- USDA-APHIS fact sheets for various animal diseases, including aquatic animals. Web site: <http://www.aphis.usda.gov/lpa/pubs/fsheet_faq_notice/fsfaqnot_animalhealth.html>
- APHIS's Center for Emerging Issues (CEI) has various worksheets available on animal health and diseases of concern as well. Web site: <http://www.aphis.usda.gov/vs/ceah/cei/worksheets.htm>
- Aquatext.com is an on-line aquaculture dictionary. Web site: <http://www.aquatext.com>
- Florida Department of Community Affairs, Division of Emergency Management . Web site: <http://www.floridadisaster.org>
- United States Department of Agriculture (USDA). Web site: <http://www.usda.gov>
- Florida Department of Agriculture and Consumer Services (FDACS). Web site: <http://www.doacs.state.fl.us>
- FDACS Division of Aquaculture. Web site: <http://www.floridaaquaculture.com>
- The Division of Aquaculture's Best Management Practices Manual can be accessed at: <http://www.floridaaquaculture.com/BAD/BMP%20Rule%20-%20Manual%206-9-04.pdf>
- Aquaculture Network Information Center. Web site: <http://aquanic.org>
- USDA Animal and Plant Health Inspection Service (USDA-APHIS). Web site: <http://www.aphis.usda.gov>
- World Organisation for Animal Health (OIE). Web site: <http://www.oie.int>
- Safety for Fish Farm Workers video on the National Ag Safety Database (NASD), English and Spanish versions. <http://www.cdc.gov/nasd/videos/v001401-v001500/v001433.html>
- *Spawn, Spat, and Sprains,* produced by the Alaska Sea Grant College Program, describes the dangers faced by shellfish farmers and salmon hatchery workers at the aquaculture worksite. It also tells how to reduce the chance of injury. Chapters include physical and chemical hazards, proper lifting techniques, airplane and boat safety, basic first aid, electrical hazards, fire fighting, cold water survival, and coping with bears. The entire book can be downloaded from: <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 and diseases can be found at <http://edis.ifas.ufl.edu/DEPARTMENT_VETERINARY_MEDICINE> and <http://edis.ifas.ufl.edu/DEPARTMENT_FISHERIES_AND_AQUATIC_SCIENCES>.