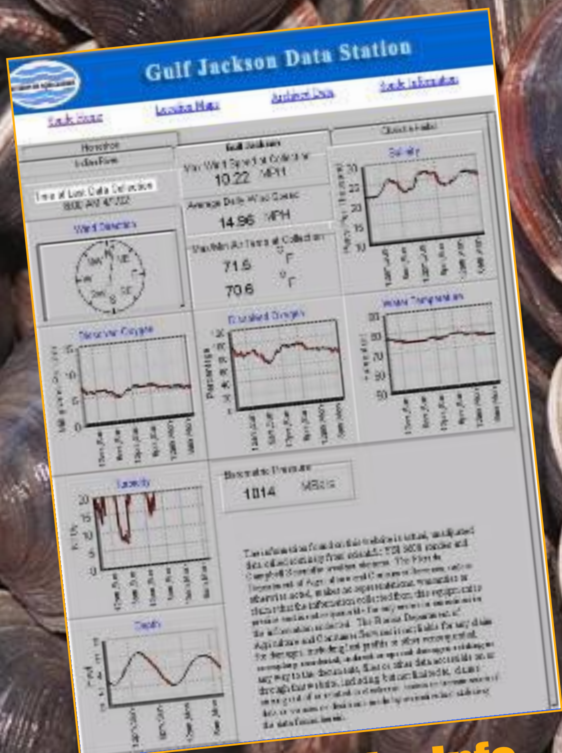
DECISION-SUPPORT TOOLS
for Florida Clam Farmers

Leslie Sturmer
UF IFAS Shellfish Aquaculture Extension
Cedar Key, FL

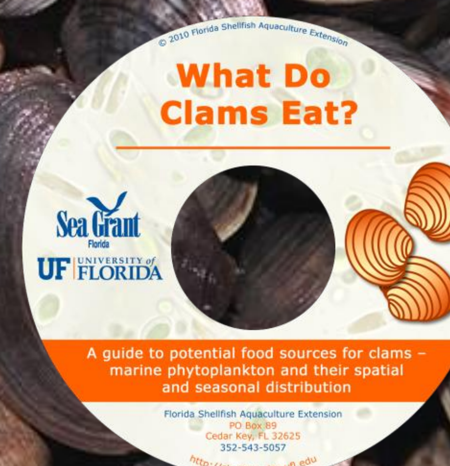
Applied Projects

which allows growers to make informed and timely management decisions



Water Quality Info

Temperature Data Loggers



Water Quality Monitoring

- Collaborative project
  - University of Florida
  - FL Department of Agriculture and Consumer Services
- Partnership with USDA
  - Risk Management Agency
  - Funding renewed for 2010-12
- Allows for continued operation of remote sensing technologies in open-water clam farming

UF UNIVERSITY of FLORIDA IFAS Extension

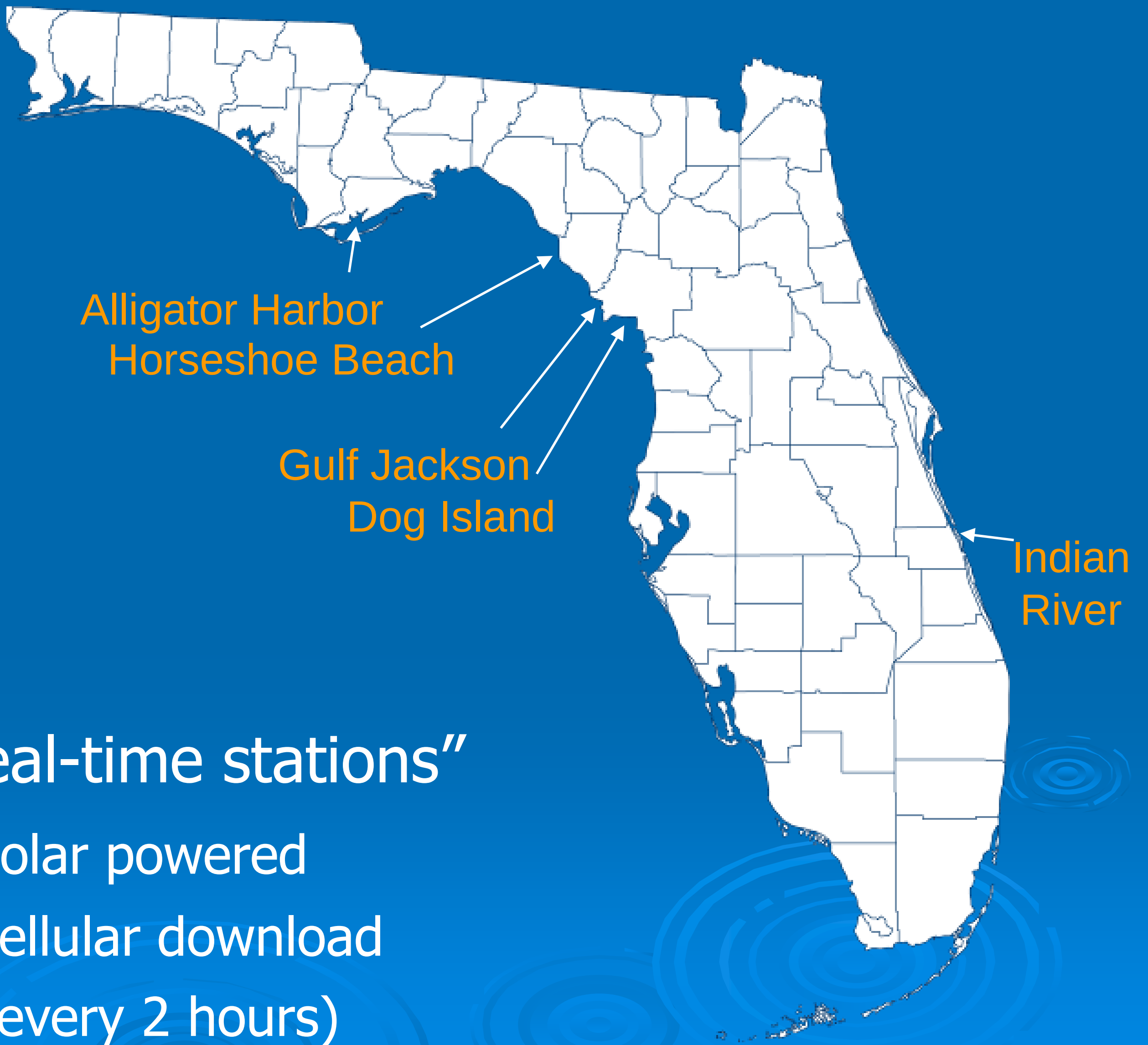
DIVISION OF AQUACULTURE

USDA

Monitoring Equipment

- Campbell Scientific Weather Stations
- YSI, Inc. Sondes 6600
- Continuous recording (every 30 minutes)
  - Water temperature
  - Salinity
  - Dissolved oxygen
  - Turbidity and depth
  - Air temperature
  - Wind speed and direction

Station Locations



- "Real-time stations"
  - Solar powered
  - Cellular download (every 2 hours)

Uncorrected real-time data posted immediately
www.FloridaAquaculture.com

Wind speed

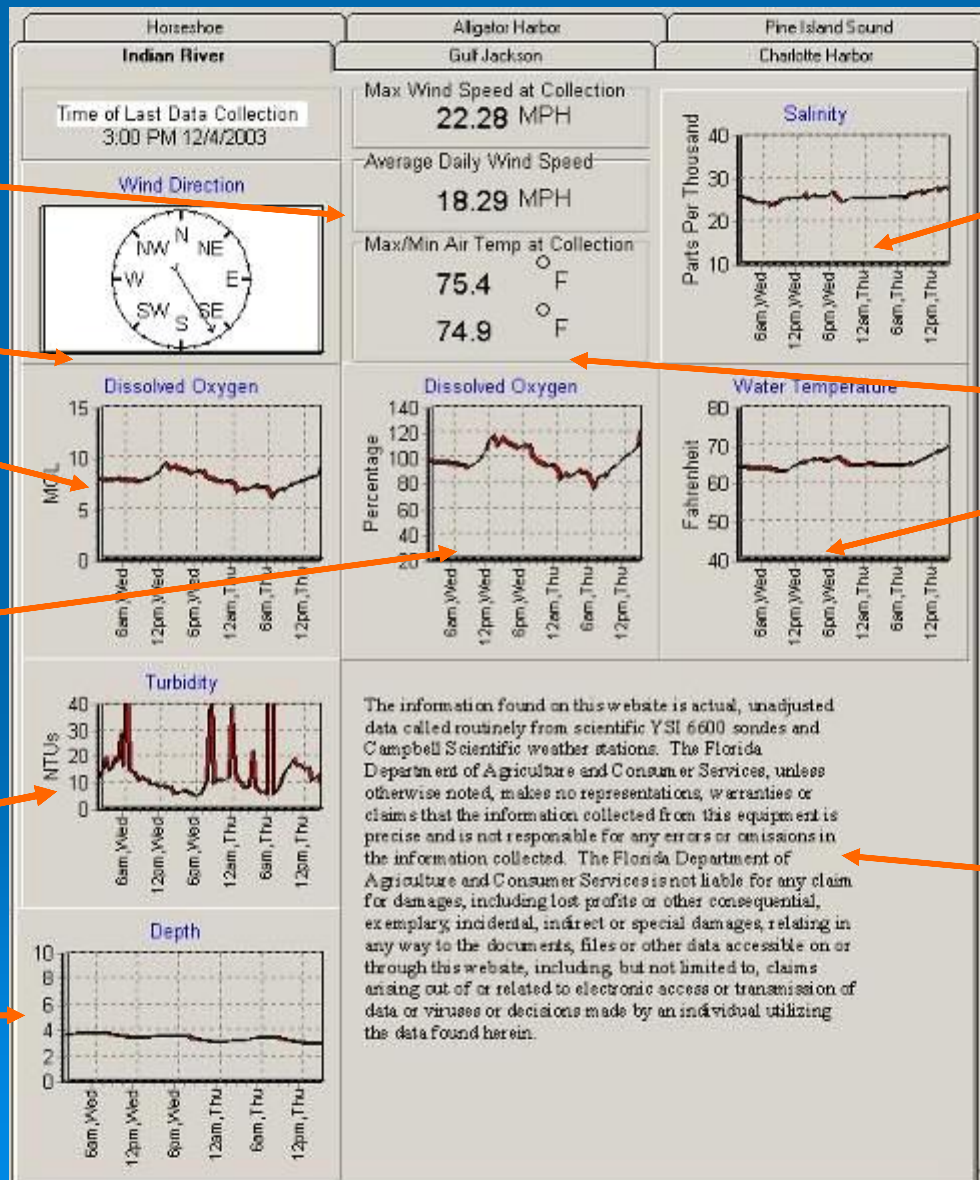
Wind direction

Dissolved O_2 (mg/L)

% Dissolved O_2

Turbidity (NTUs)

Depth (feet)



Salinity (ppt)

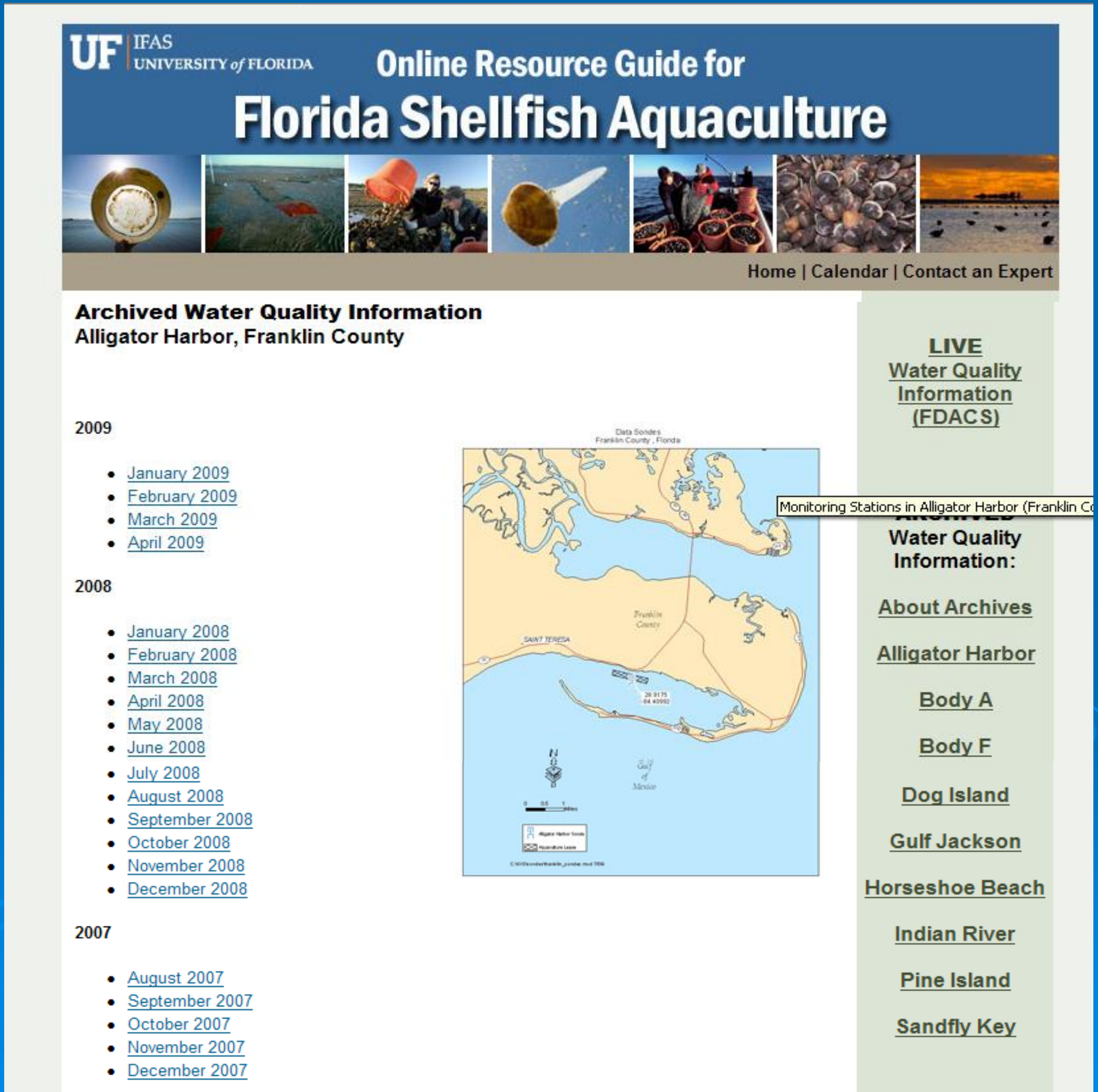
Air temperature

Water temperature (°F)

Disclaimer

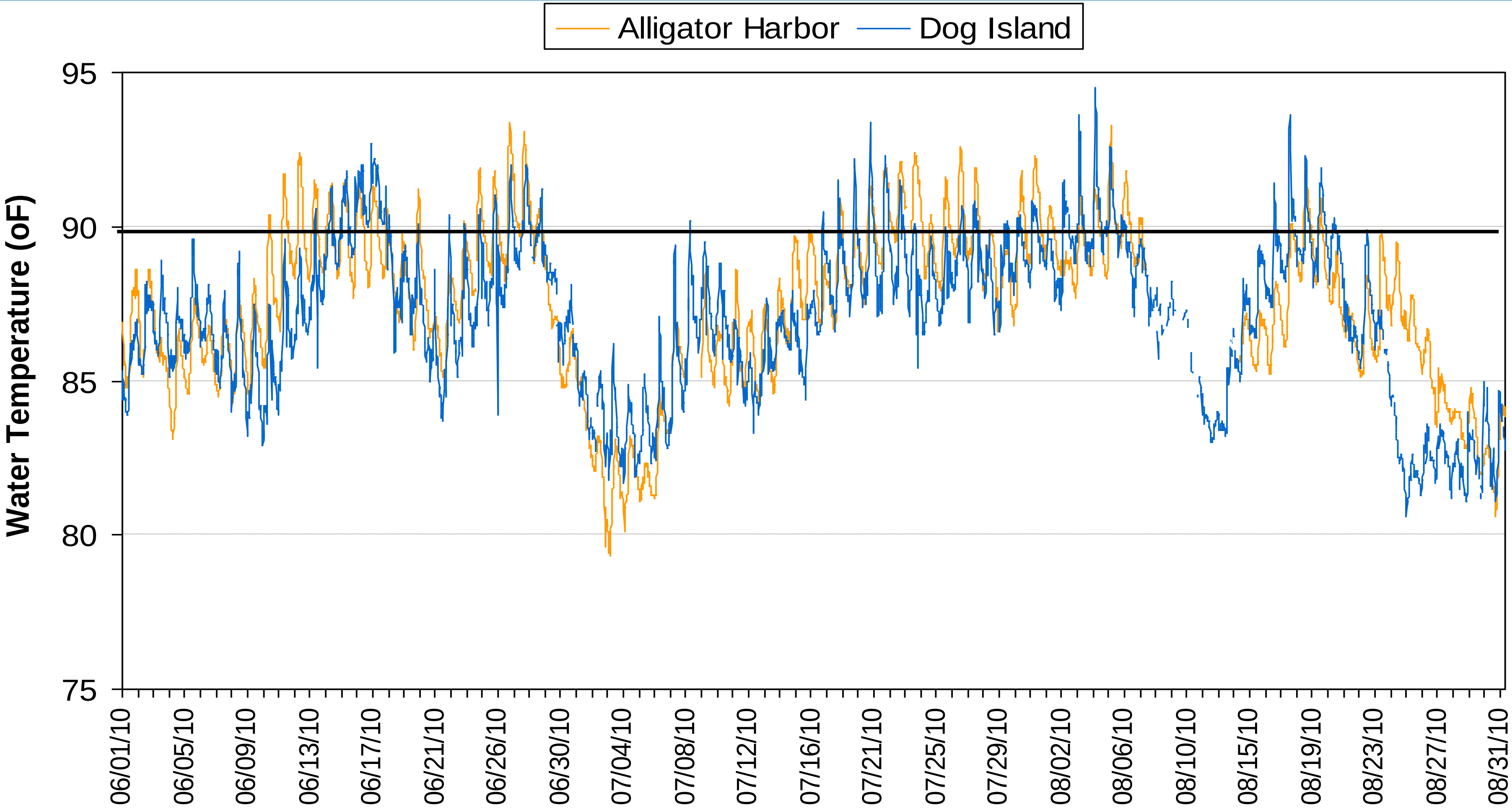
Continuous database archived at http://shellfish.ifas.ufl.edu

- Continuous data base, 2002-10
  - Proofed for sonde errors
  - Archived and electronically posted at website
  - Provided as “farmer friendly” monthly and annual graphs per station location



Continuous water quality database

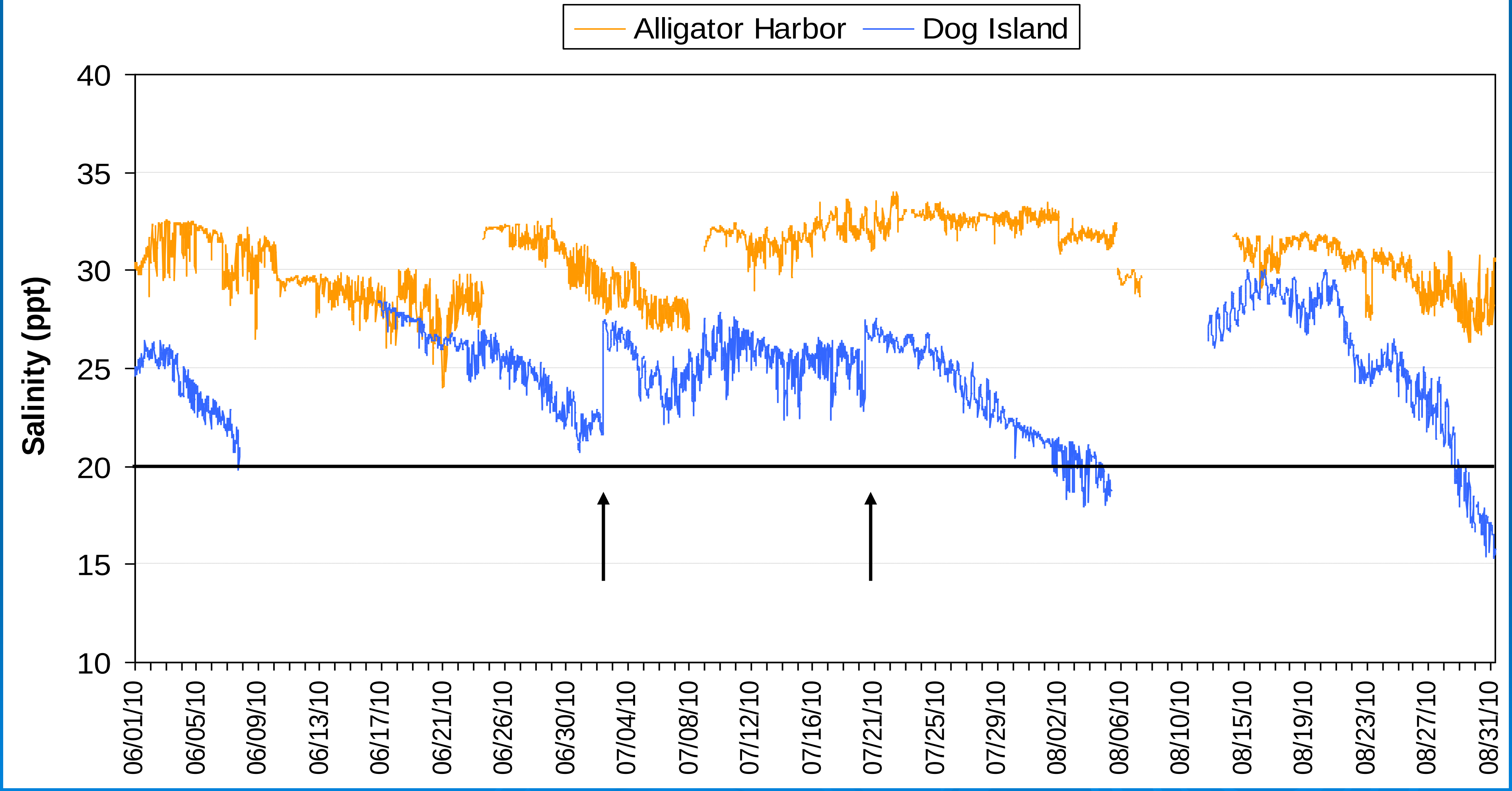
- Long-term data set is being developed
- Details in seasonal and annual variability being revealed



Alligator Harbor (Franklin County) and Dog Island Lease Areas (Levy County)
June - August 2010

Continuous water quality database

- Trends in environmental conditions in relation to clam production emerging

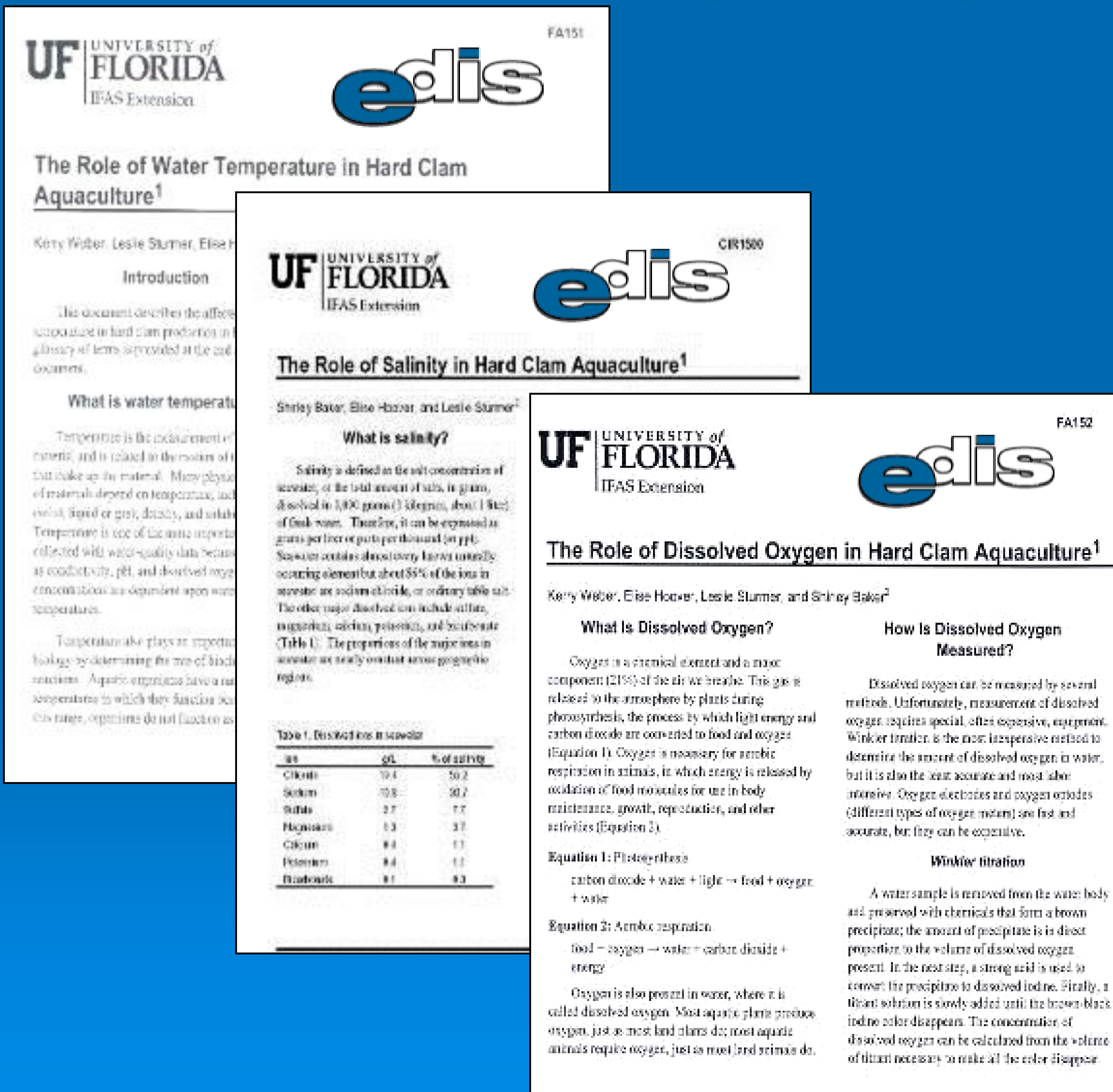


Alligator Harbor (Franklin County) and Dog Island Lease Areas (Levy County)
June - August 2010

Water quality fact sheets

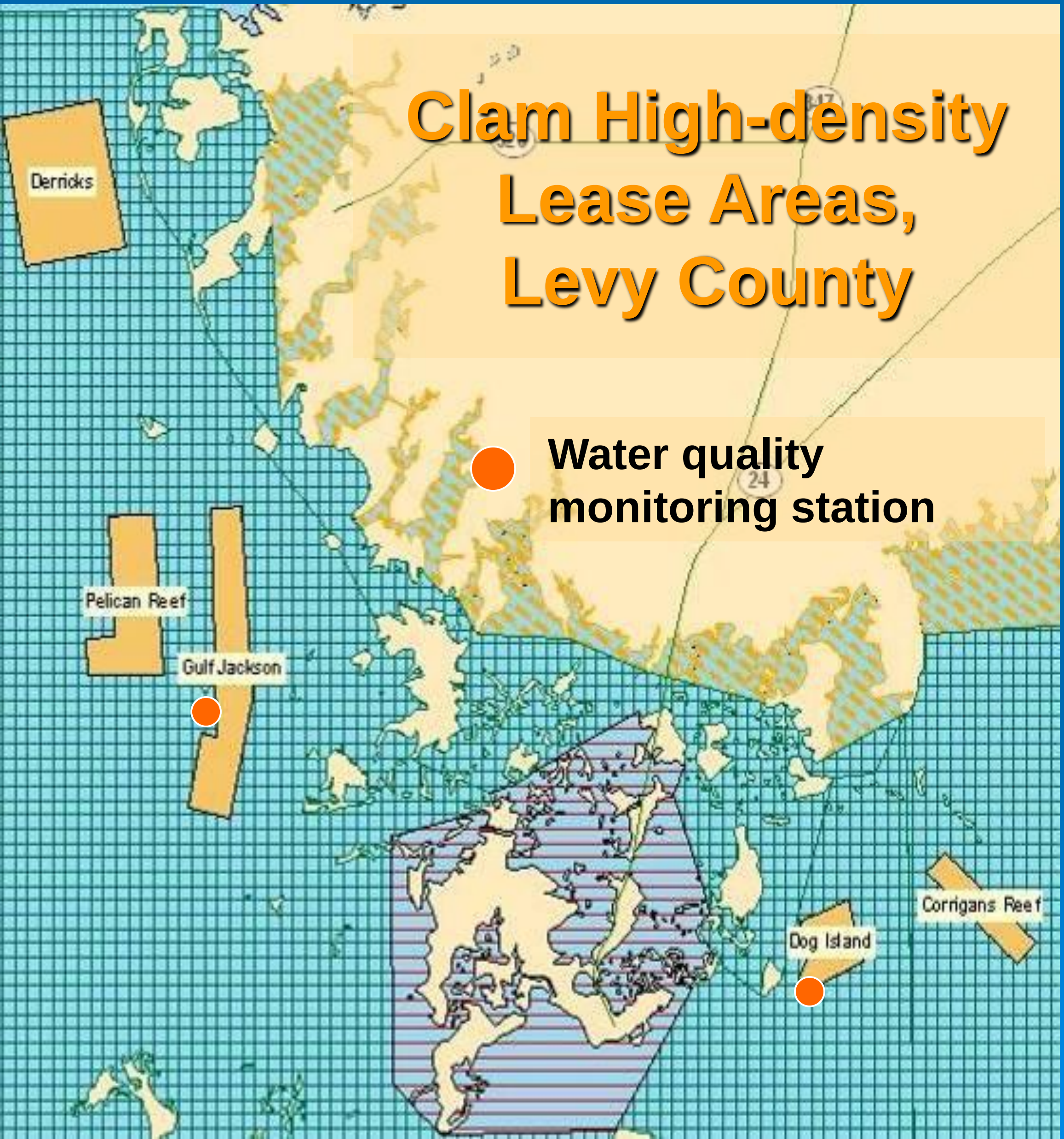
available at website: http://edis.ifas.ufl.edu

FA151, FA152, CIR1500



- How measured
- Why variable
- How affects clam physiology
- What are signs of stress
- How affects clams
- How to manage crop in response to
  - Water temperature
  - Salinity
  - Dissolved oxygen

Water Temperature Monitoring



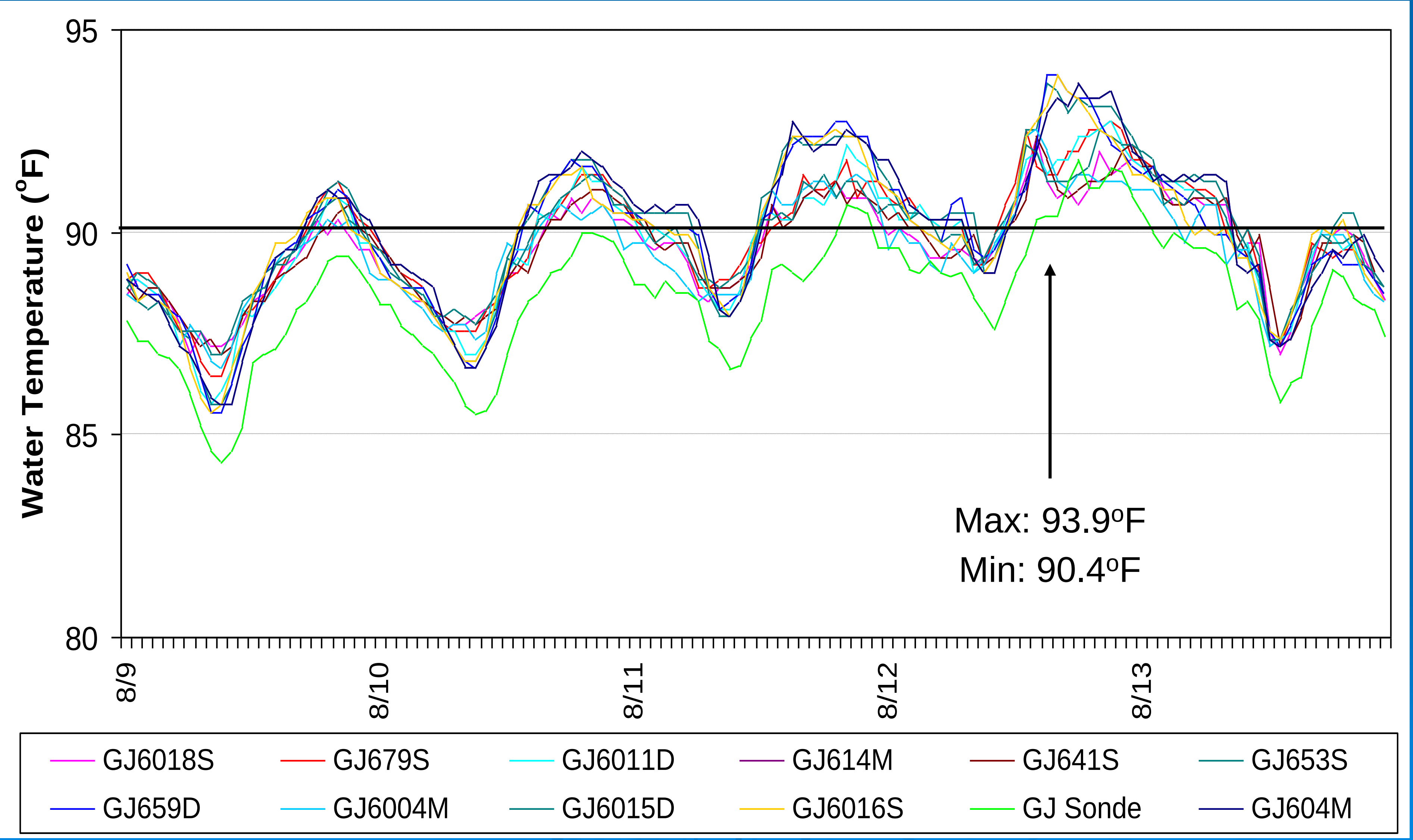
- Need to better understand water temperature during summer months and their affect on clam production
- Inexpensive data loggers distributed to participating growers provides detailed and broad coverage

Water Temperature Monitoring

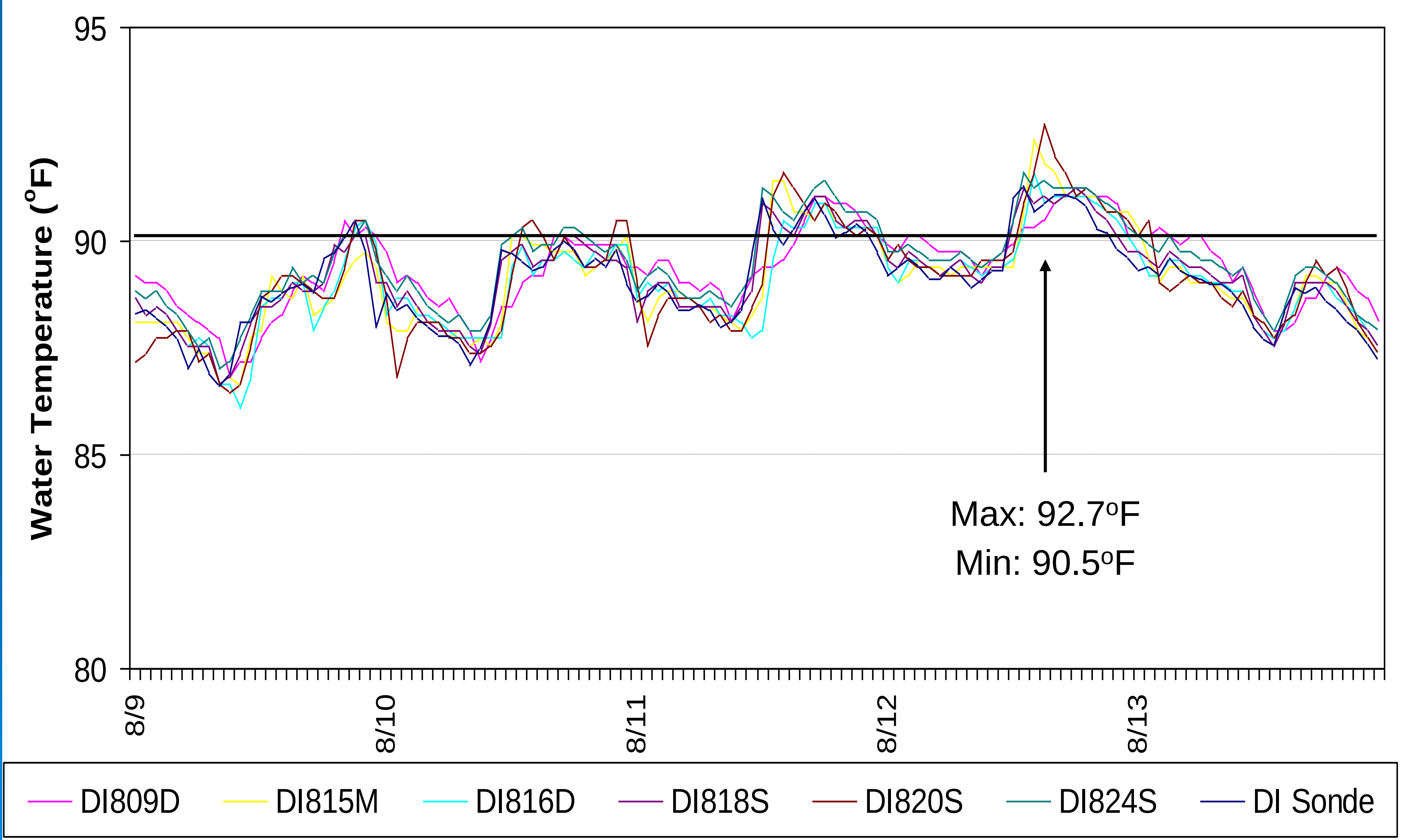
- Deployed by growers inside bags
  - 37 Levy County leases in 2009 - 18% coverage
  - 34 Levy County leases in 2010 - 16% coverage
  - 11 leases in 4 other counties in 2010
- Beginning to adequately describe temperature variability within and among lease areas
  - Water depth
  - Bottom configuration
  - Substrate characteristics
  - Tidal and wind current
  - Other parameters
- Develop site-specific planting and harvesting strategies

HOBO® Pendant Temperature Data Logger (2.3 x 1.3 x 0.9 inches)

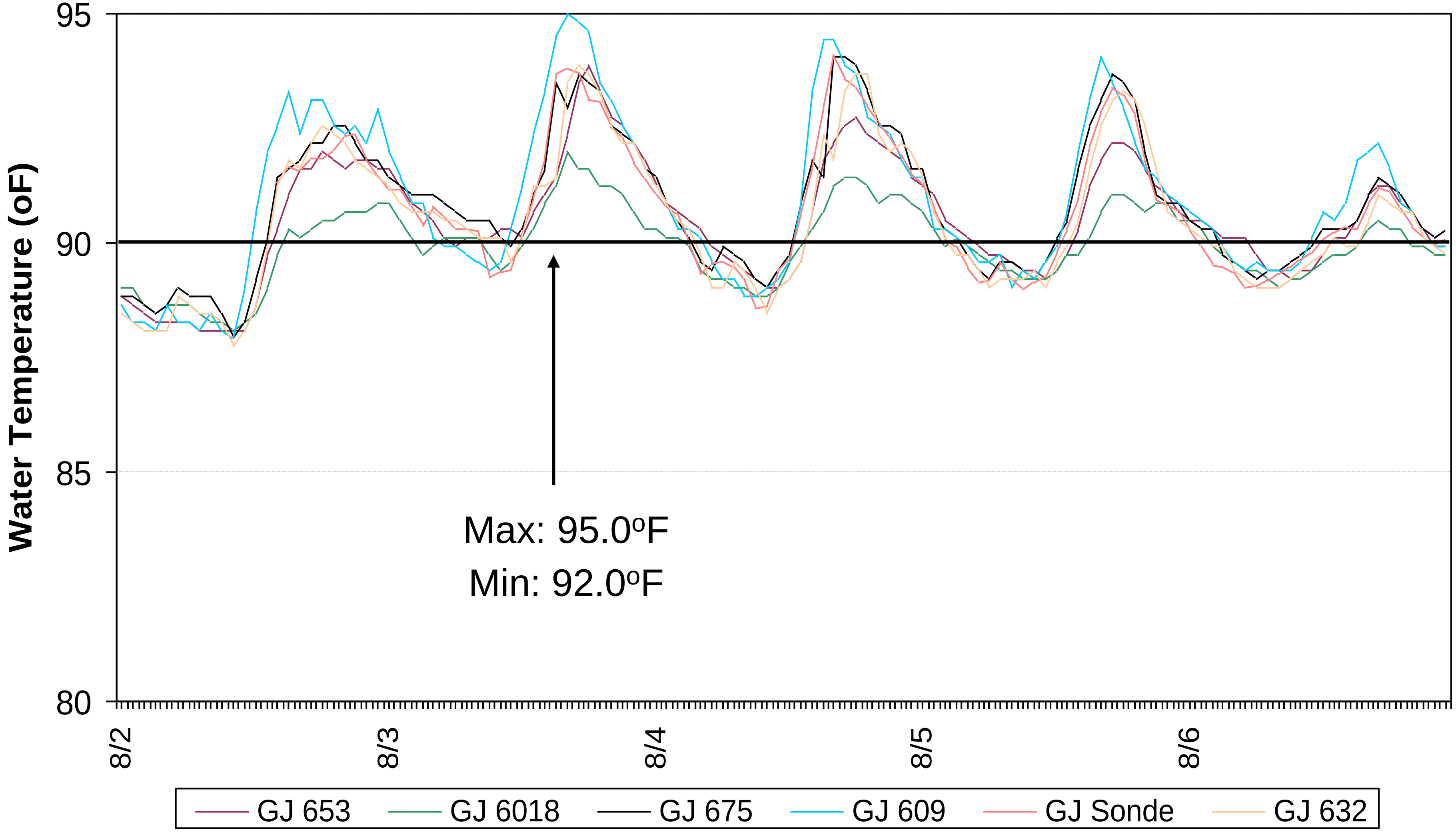
Gulf Jackson, Cedar Key Leases (n=12)
August 9-13, 2009



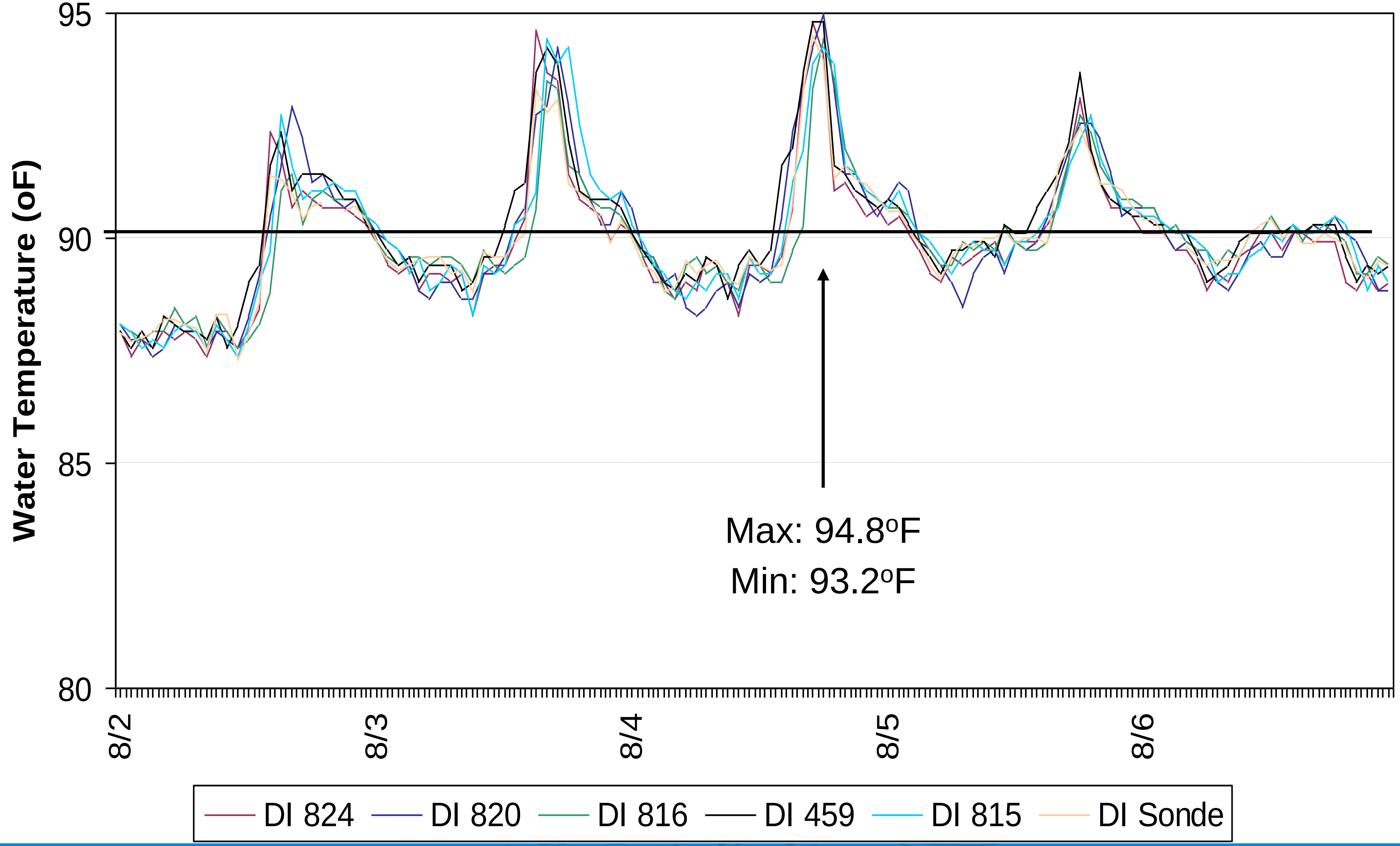
Dog Island, Cedar Key Leases (n=7)
August 9-13, 2009



Gulf Jackson, Cedar Key Leases (n=6)
August 2-6, 2010



Dog Island, Cedar Key Leases (n=6)
August 2-6, 2010



What’s do Clams Eat?

- Pictorial guide assists clam farmers in identifying
  - Potential food sources
  - Spatial and seasonal distribution of food
  - Whether food is good (nutritious) or bad (noxious or harmful) for clams
- Focuses on 2 regions of FL
  - Suwannee Sound
  - Indian River
- Data collected from prior UF phytoplankton studies
  - US EPA, USDA
  - FL Water Management Districts

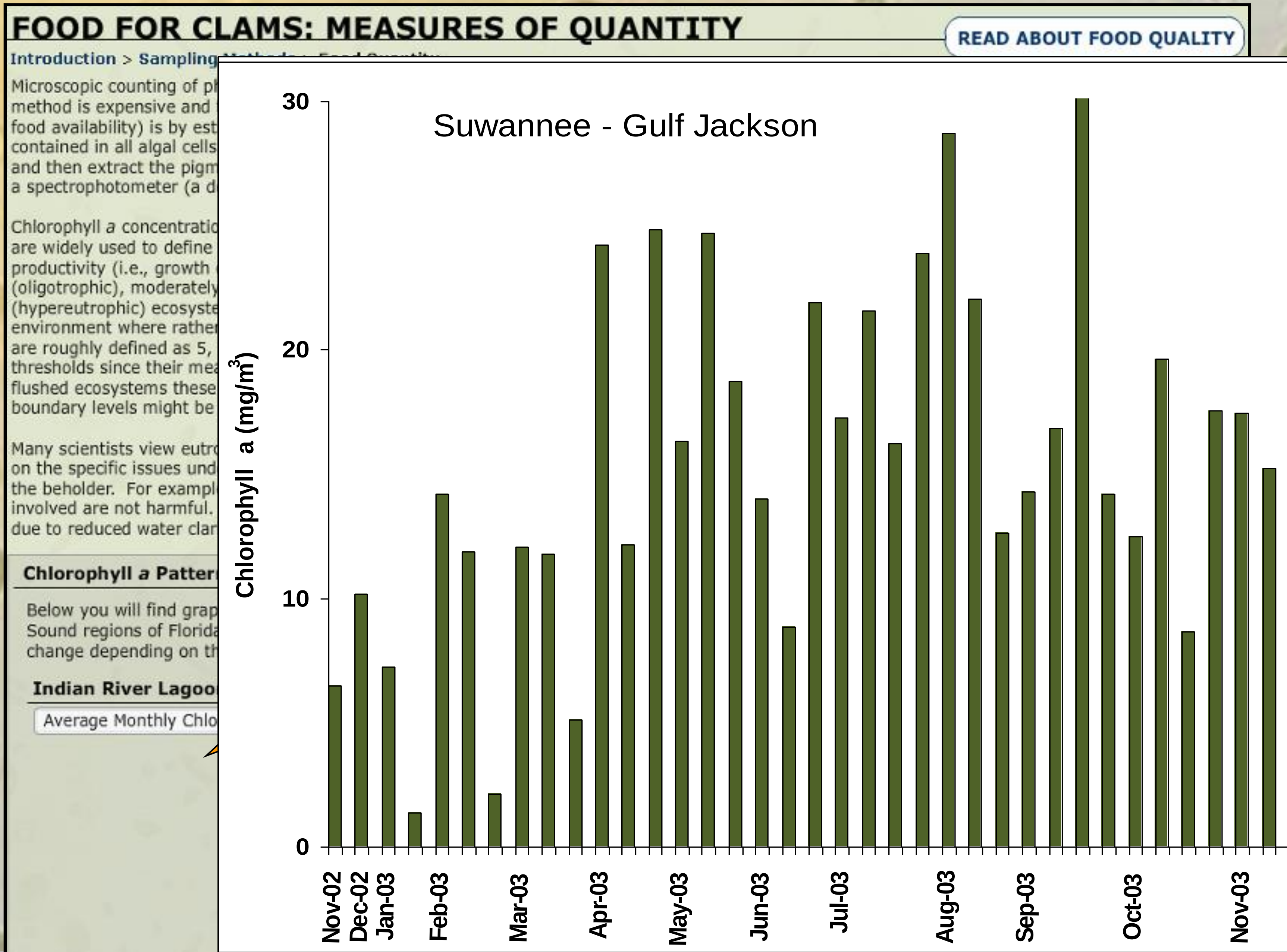
<u>Project Team</u>:

– Ed Phlips, Nikki Dix, Shirley Baker
  UF SFRC Fisheries and Aquatic Sciences

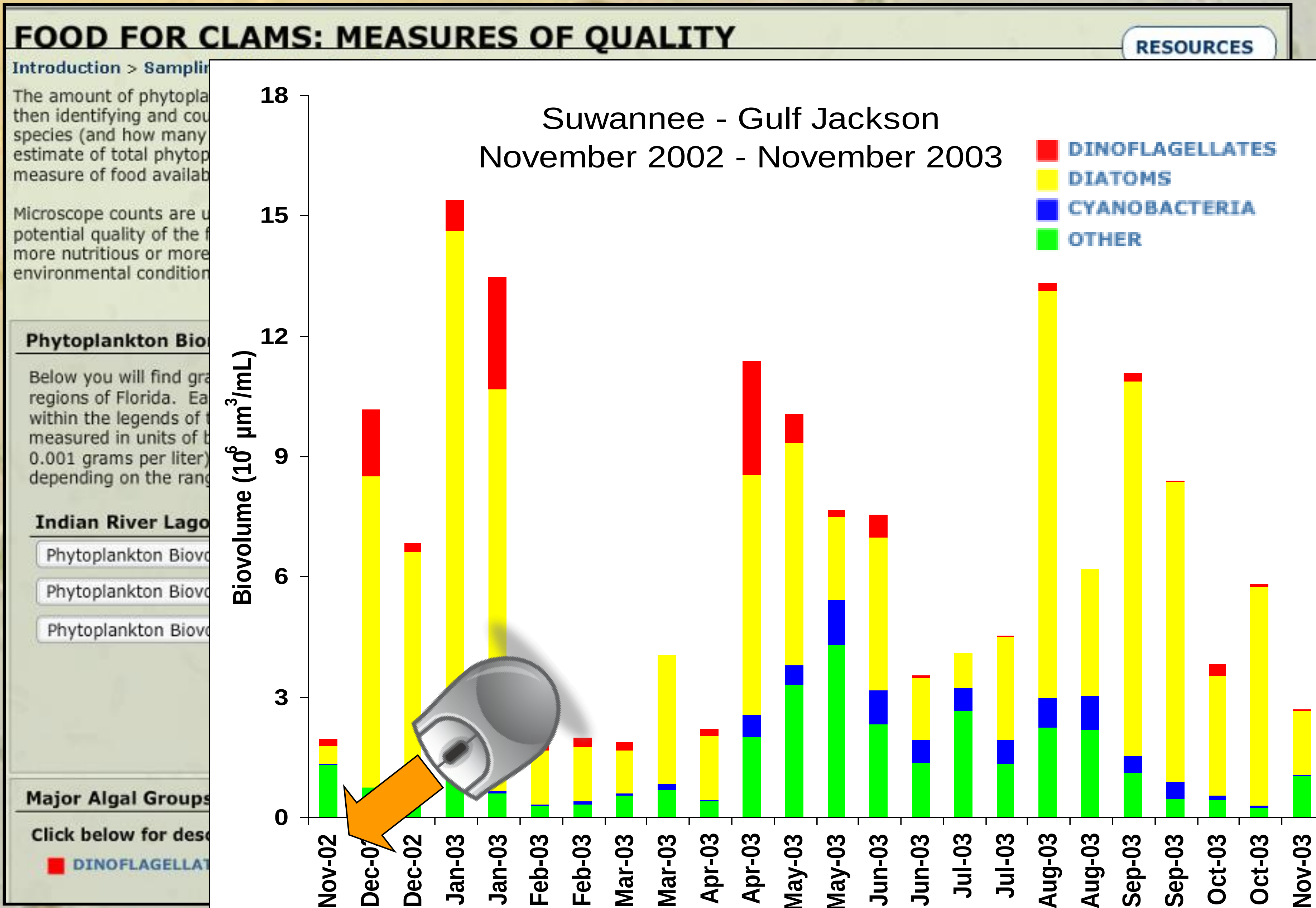
– Leslie Sturmer, UF Cooperative Extension

– Kevin Hulen, UF Biological Sciences

Quantity of Clam Food



Quality of Clam Food

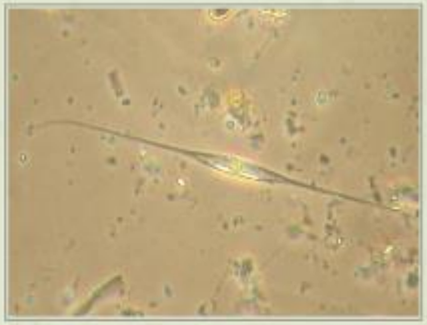


Algal Group Pages

ALGAL GROUP: **DIATOMS**

Introduction > Sampling Methods > Food Quantity > Food Quality > Diatoms

(5 – 200 µm cell size)



Diatoms are among the most common and widely distributed microscopic marine algae. They are the dominant algal group in most of Florida's coastal waters and can form major blooms. They have cell walls composed of silica. In other words, diatoms live in glass houses, which often take on beautiful shapes. Diatoms have traditionally been classified based on their shape and size. Circular, centric diatoms (such as ***Paralia sulcata***) have radial symmetry and live mostly in the water column, while oblong, pennate diatoms (such as ***Nitzschia* spp.**) exhibit lateral symmetry. Some pennate diatoms are planktonic (i.e., live in the water column), but many reside on the seafloor or attached to surfaces, except when water turbulence stirs them up into the water column.

Diatoms store food in the form of lipids (fats), which makes them nutritious food for clams. Lipid concentrations in diatoms can be very high, up to 70% of dry weight, which helps decrease their rate of sinking. In fact, some species of diatoms have been studied for their ability to produce nutritionally beneficial lipids, such as omega-3-fatty acids, for human consumption as a means of lowering bad cholesterol. Other ways diatoms maintain their position in the water column include the increase of surface area through the production of **spines** or formation of **colonies.** In seawater, diatoms can increase their buoyancy by exchanging heavy ions with lighter ions in the surrounding water.

Species with long, rigid spines can cause physical harm to the gills of fish and may be difficult for clams to filter. A few species of pennate diatoms (e.g., some species of ***Pseudo-nitzschia* spp.**) have been known to produce the neurotoxin demoic acid, which is associated with Amnesiac Shellfish Poisoning (ASP). ASP can affect human and aquatic animal health, although confirmed cases of ASP have not yet been reported along the peninsular coast of Florida.

Common Species

Below you will find a list of example species. When you click on a species in the list, you will find a biographical sketch with information about what the species looks like, where and how often we found it in our study (see **Sampling Methods** for sampling dates and locations), and the potential "good" and "bad" effects on clams. Most species have the potential to **harm** clams if they form dense blooms; however, the "good" and "bad" categories on this page refer to the acceptability of individual cells as food items.

***Amphiprora* cf.** **Found in:** Indian River and Suwannee Sound
Site(s): Sebastian:DE,GJ,PI,HB,PR

Bellerochea horologicalis **Found in:** Suwannee Sound
Site(s): DE,GJ,PI,HB,PR

Cerataulina pelagica **Found in:** Indian River and Suw
Site(s): Sebastian:DE,GJ,PI,HB,PR

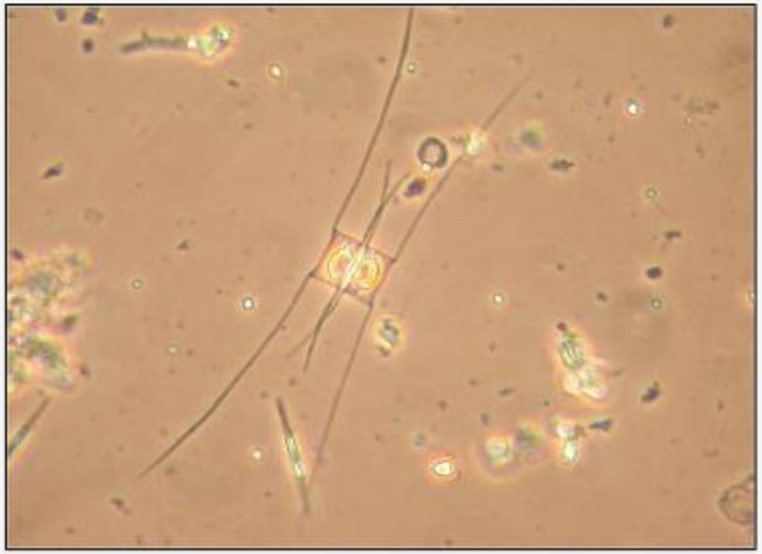
***Chaetoceros* spp.** **Found in:** Indian River and S nee Sound
Site(s): Sebastian:DE,GJ,PI,HB,PR,SR

Dactyliosolen fragilissimus **Found in:** Indian River and Suwannee Sound
Site(s): Sebastian:DE,GJ,PI,HB,PR

Algal Species Pages

ALGAL GROUP: **DIATOMS**
BIOGRAPHICAL SKETCH: ***Chaetoceros* spp.**

cl



Description

Cylindrical cells (appear rectangular), 4-84 μm wide, single or chains, spines (setae) at corners.

Where we found it

Indian River
Suwannee Sound - Gulf Jackson, Pine Island, Horseshoe Beach, Pelican Reef, Suwannee River

Frequency of occurrence

Indian River - 34% in 116 samples taken
Suwannee Sound - 44% in 120 samples taken

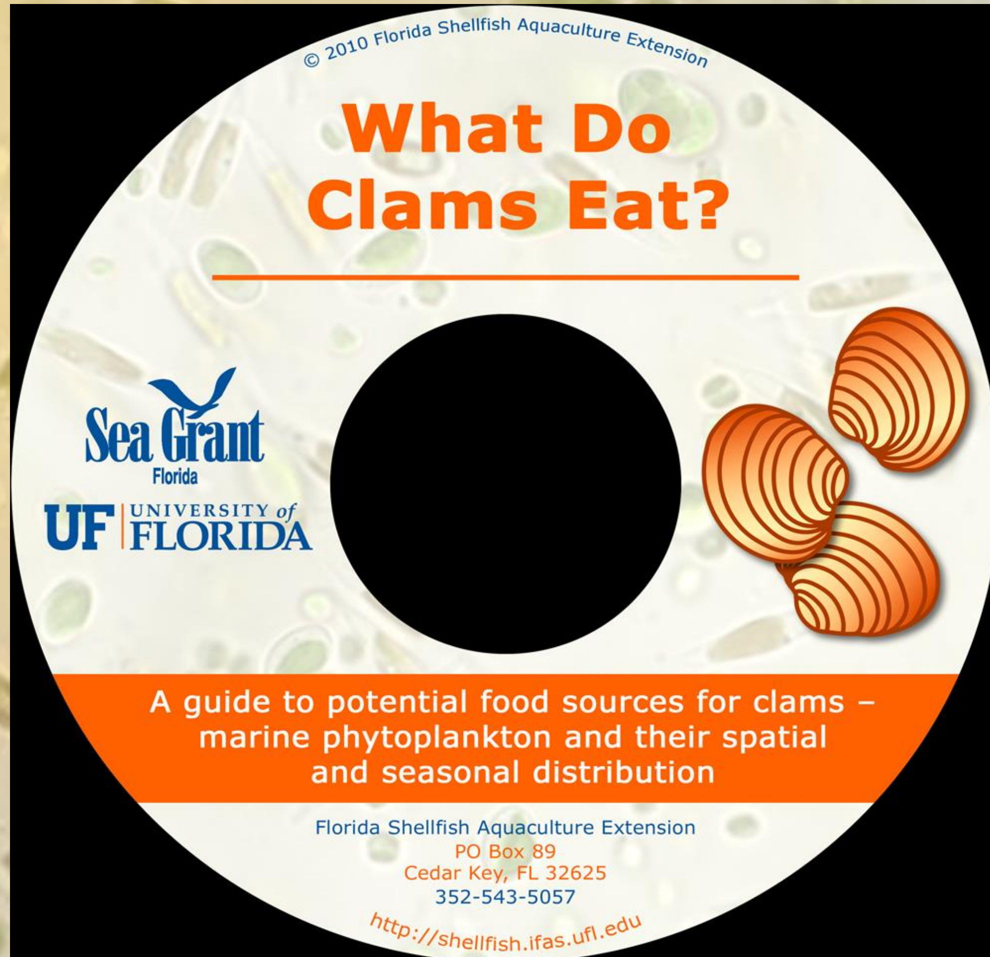
What are effects on clams?

GOOD BAD

Why is it good? Acceptable food item for clams.
Why is it bad? Some species have long silica spines that can damage bivalve gills.

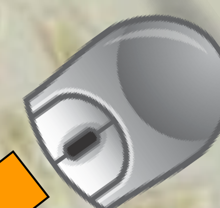
Ecological considerations

A major bloom-former. Blooms can occur any time of year, but are most common in fall and spring. Resting spores are common.



Available as a CD-ROM and web-based linked to

http://shellfish.ifas.ufl.edu



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Online Resource Guide for Florida Shellfish Aquaculture

Sea Grant Florida

THE INDUSTRY
GETTING STARTED
PUBLICATIONS
NEWSLETTERS
SUPPLIERS
PROJECTS
EXTENSION
CALENDAR
FIND AN EXPERT
JOBS

Welcome to the Online Resource Guide for Florida Shellfish Aquaculture in Florida, a completely updated and redesigned website which replaces the Florida Shellfish Aquaculture Extension site. This site provides, through the University of Florida/IFAS's Shellfish Aquaculture Extension Program (SAEP), information about clam farming and related activities for the general public, growers, and others involved in shellfish. This includes updates on research and extension projects, current supplier lists, and state and national publications, such as the SAEP's newsletter, *The Bivalve Bulletin*. Additional resources will be added over time, including pertinent ones from the former Florida Shellfish Aquaculture Extension website.

The mission of the extension program is to support and enhance environmentally and economically-sustainable shellfish aquaculture in Florida. The industry produces over 150 million hard clams annually while providing hundreds of jobs in rural coastal communities. The program addresses the needs of the industry through integration of applied research projects with outreach and educational efforts.

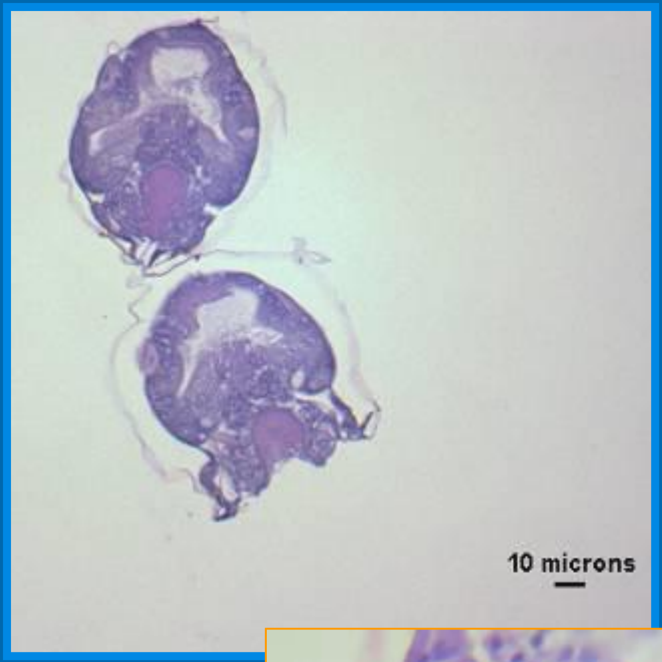
What's going on in 2011?

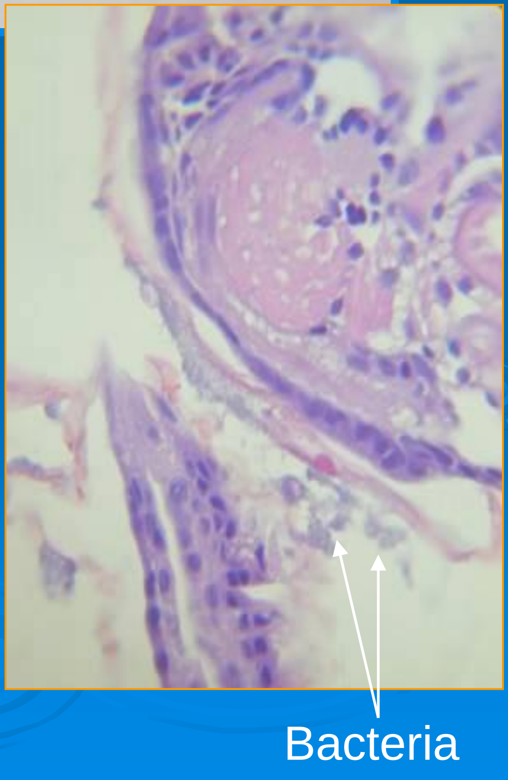
- Growers reports from 2010 will be sent soon
- RETURN LOGGERS!
- More data loggers to be deployed by growers at leases throughout the state
- Clam health and diagnostic testing

Dr. Denise Petty, DVM

Diagnostic Testing

- Testing includes:
  - Water quality parameter analysis
  - Bacterial cultures of algal stocks, water, and larvae
  - Histology of larvae and adult stocks
  - Identification of phytoplankton (Susan Badylak or Mary Cichra)



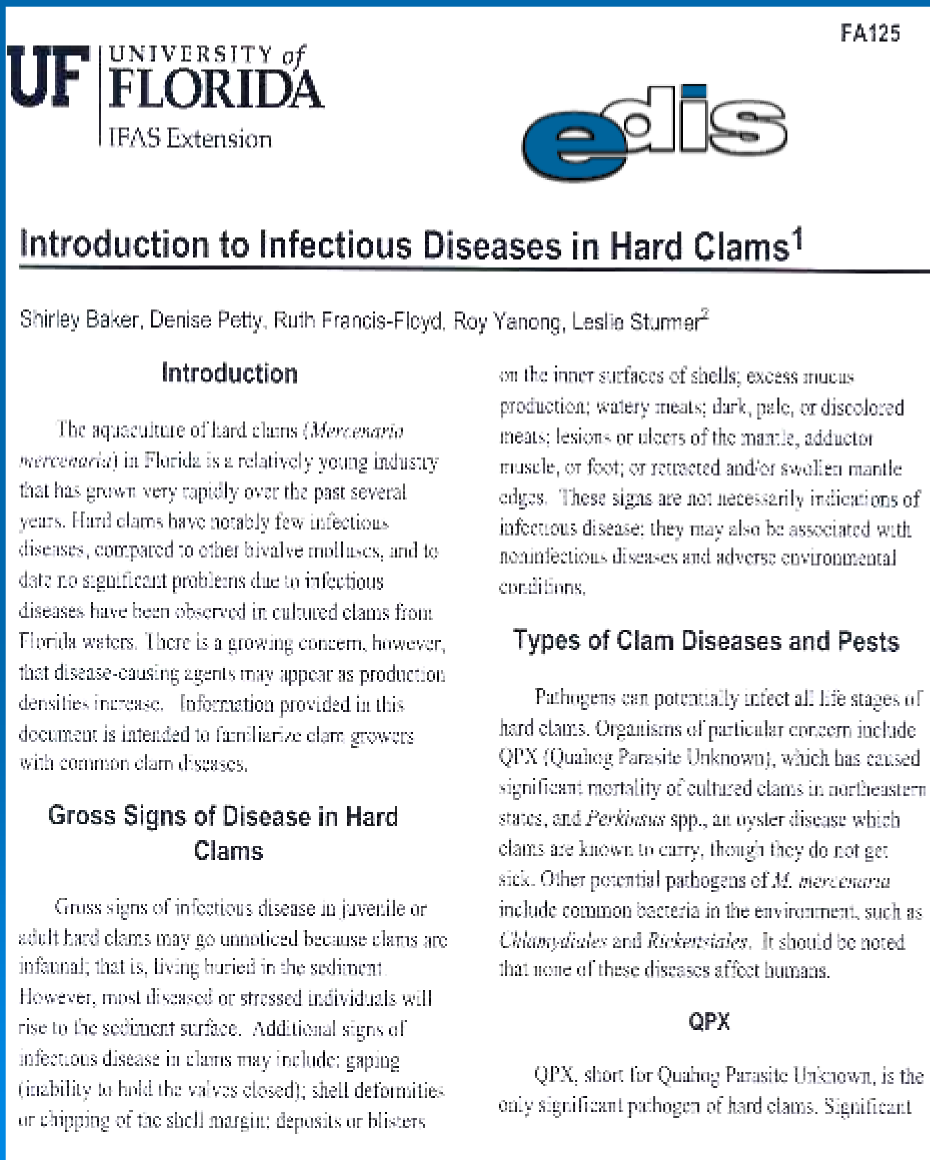


Act quickly when mortalities occur!

- Animals should be collected for diagnostic testing as soon as mortality is observed. Timing is critical!
  - The primary problem may resolve before a sample of animals is collected. Often, these animals are the survivors and tests will be negative.
  - Many larvae are required to run a variety of tests; be generous.

Clam health fact sheet

available at http://edis.ifas.ufl.edu, FA125


FA125

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IFAS Extension

edis

Introduction to Infectious Diseases in Hard Clams[1]

Shirley Baker, Denise Petty, Ruth Francis-Floyd, Roy Yanong, Leslie Sturmer[2]

Introduction

The aquaculture of hard clams (*Mercenaria mercenaria*) in Florida is a relatively young industry that has grown very rapidly over the past several years. Hard clams have notably few infectious diseases, compared to other bivalve molluscs, and to date no significant problems due to infectious diseases have been observed in cultured clams from Florida waters. There is a growing concern, however, that disease-causing agents may appear as production densities increase. Information provided in this document is intended to familiarize clam growers with common clam diseases.

Gross Signs of Disease in Hard Clams

Gross signs of infectious disease in juvenile or adult hard clams may go unnoticed because clams are infaunal; that is, living buried in the sediment. However, most diseased or stressed individuals will rise to the sediment surface. Additional signs of infectious disease in clams may include: gaping (inability to hold the valves closed); shell deformities or chipping of the shell margin; deposits or blisters on the inner surfaces of shells; excess mucus production; watery meats; dark, pale, or discolored meats; lesions or ulcers of the mantle, adductor muscle, or foot; or retracted and/or swollen mantle edges. These signs are not necessarily indications of infectious disease: they may also be associated with noninfectious diseases and adverse environmental conditions.

Types of Clam Diseases and Pests

Pathogens can potentially infect all life stages of hard clams. Organisms of particular concern include QPX (Quahog Parasite Unknown), which has caused significant mortality of cultured clams in northeastern states, and *Perkinsus* spp., an oyster disease which clams are known to carry, though they do not get sick. Other potential pathogens of *M. mercenaria* include common bacteria in the environment, such as *Chlamydiales* and *Rickettsiales*. It should be noted that none of these diseases affect humans.

QPX

QPX, short for Quahog Parasite Unknown, is the only significant pathogen of hard clams. Significant

- Gross signs of disease in clams
- Types of clam diseases and pests
  - QPX, a"slime-net" protist
  - *Perkinsus* spp. (Dermo)
  - Chlamydiales
  - Rickettsiales
  - Pest metazoans
  - Granulomas
- Significance in Florida

Thank You!

For further information,
contact Leslie Sturmer
at **LNST@ufl.edu**
or visit the website:
http://shellfish.ifas.ufl.edu