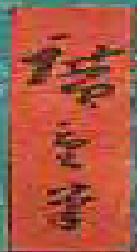


Florida Red Tide Monitoring and Reporting

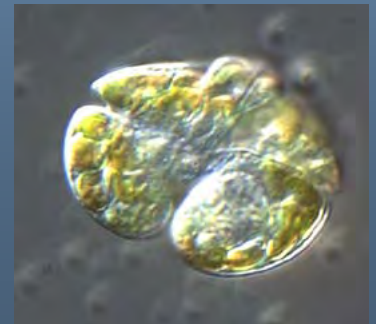
Jay Abbott

Florida Fish and Wildlife Conservation Commission
Fish and Wildlife Research Institute



What is Florida red tide?

- *Karenia brevis* or *K. brevis* (*Gymnodinium breve*, *G. brevis*, *Ptychodiscus brevis*)
- Microscopic plant-like organism (photosynthesizes but also eats)
- Produces chemicals called toxins (brevetoxins)
- Toxins kill fish, sea birds, turtles and marine mammals
- Shellfish accumulate brevetoxins in their tissues
- First documented in FL in 1840's, worst
 - Bloom in 1947-8





Monitoring & Managing *Karenia* Blooms:

The Challenges

- Early detection issues: offshore, large area, low concentrations, at depth,
- Geographical scale of blooms: large km² area, nearshore and offshore
- 3-dimensionality of blooms
- Multiple *Karenia* species (at least 7)
- Monitoring for human and environmental health
- Managing multiple impacts within blooms (coordination, manpower, expertise)
- Bloom Termination
- Public Outreach and education: targeting public and stakeholders for public
 - communication of results
- Weather/hurricanes

FWC/FWRI HAB Monitoring

Goal: To develop a fine tuned state program for monitoring and forecasting of HABs in state waters for the protection of public and environmental health.

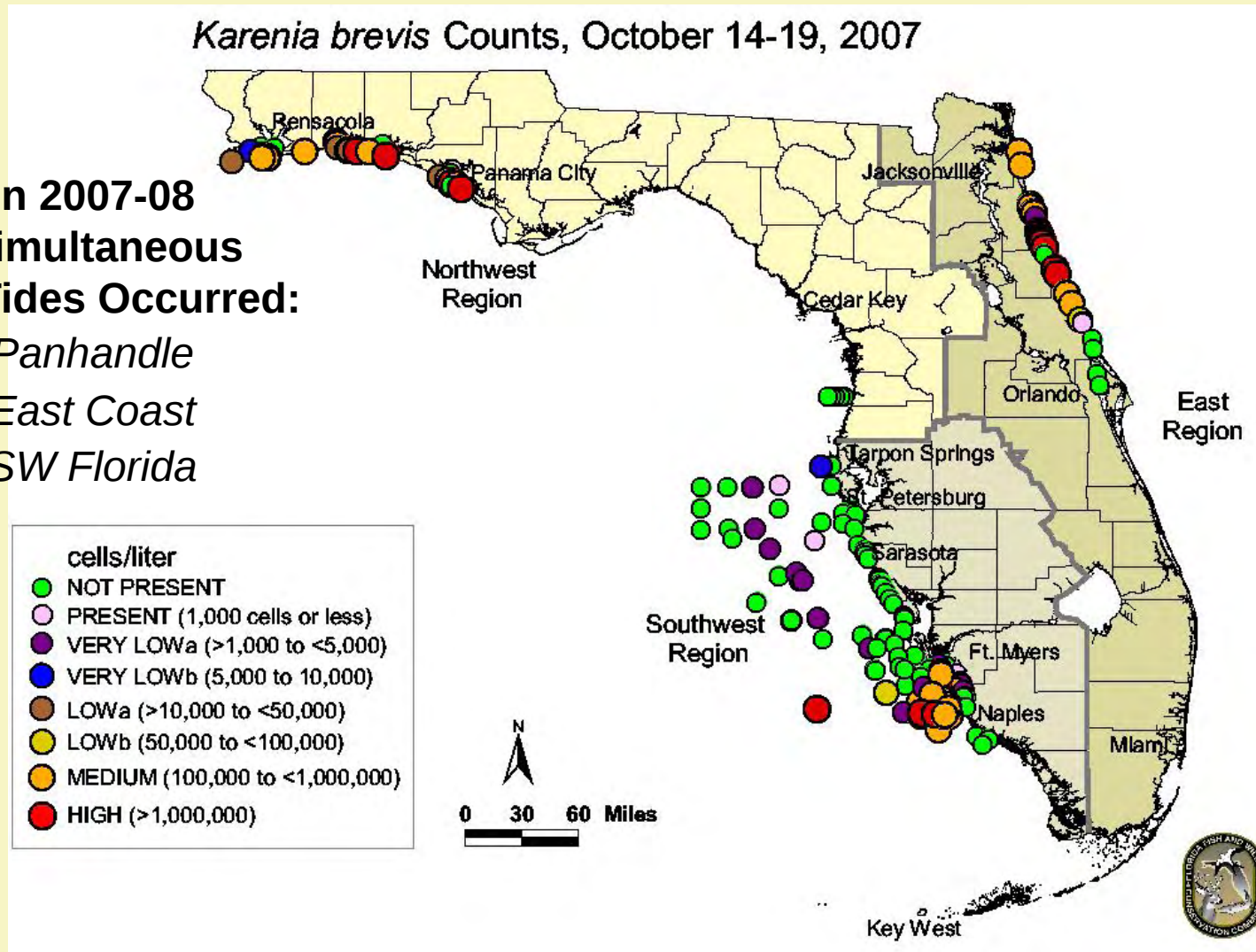
Organization: FWRI coordinates statewide HAB monitoring network consisting of:

- FWRI non-HAB sections,
- Regional FWC labs,
- A volunteer program (charter fisherman, retirees, etc.)
- Contracted institutions (e.g. Mote)
- Other state agencies (e.g. FDACS)
- County agencies
- Collaborators
(universities, fed. agencies)



2007: 3 *Karenia* Blooms in the Eastern Gulf of Mexico

In 2007-08
3 Simultaneous
Red Tides Occurred:
Panhandle
East Coast
SW Florida



Monitoring Methods

Sea



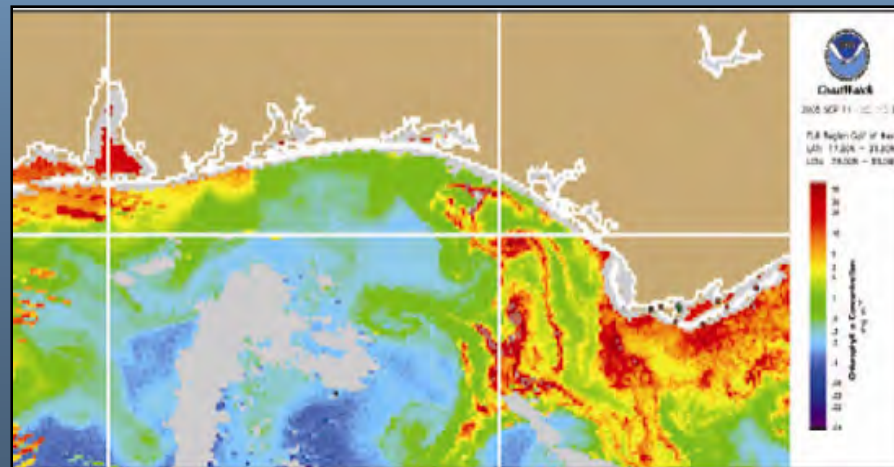
Air



Land



Satellite



Automated

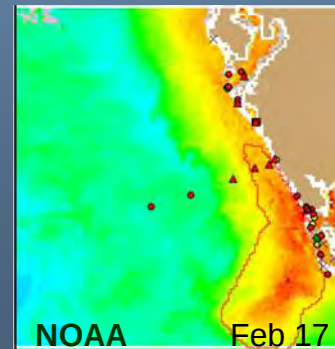
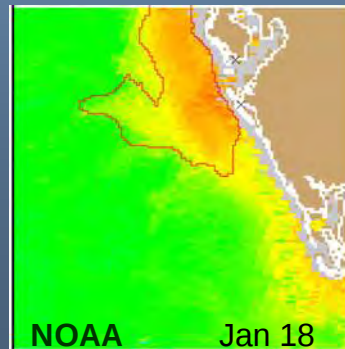
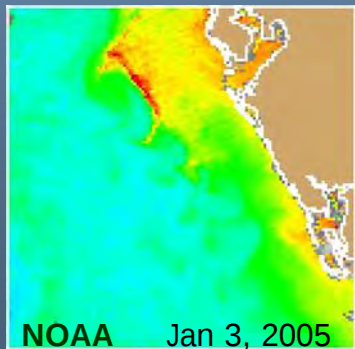


The Physics:

Florida Red Tides: 4 Stages



Initiation → **Growth** → **Maintenance** → **Termination**
Offshore (18-64 km) *Offshore/Nearshore* *Nearshore* **(Transport)**



Nearshore
?Grazing
?Virus/Bacteria
?Circulation

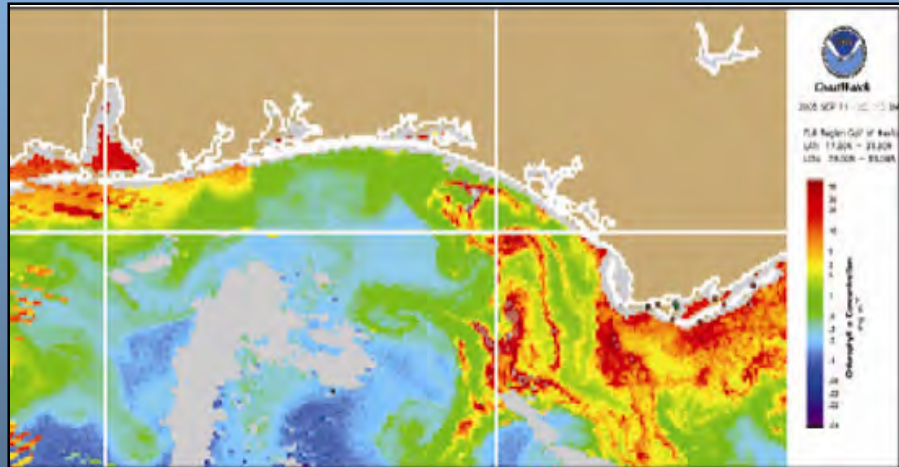
(Steidinger, 1975)

Offshore Initiation

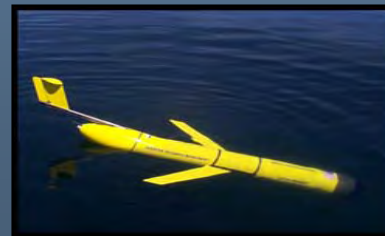
- Early Detection by Volunteer Deep Sea Fishermen and Charter Boat Captains
Fish Kill Hotline 800-636-0511

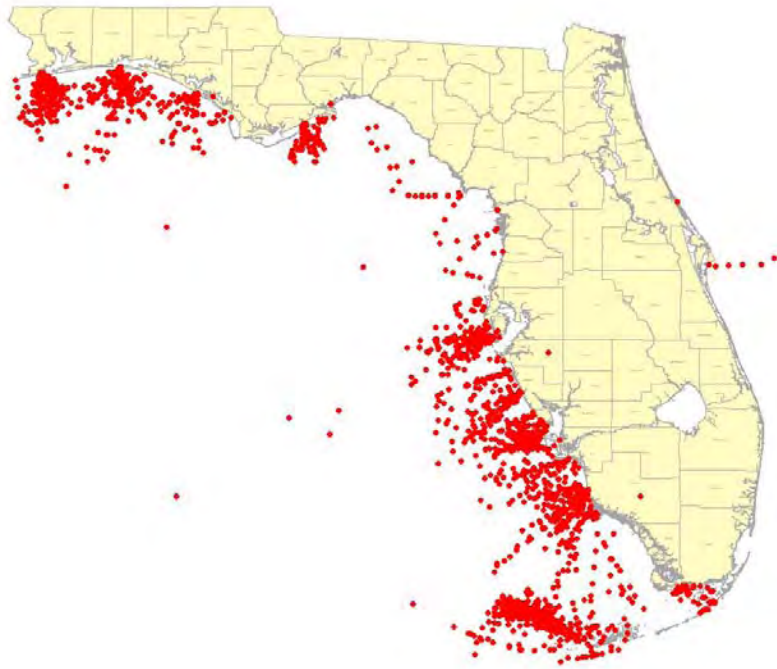


- Satellite Detection of Elevated Chlorophyll Levels



- Automated Detection Technology (Gliders, Buoys, etc.)





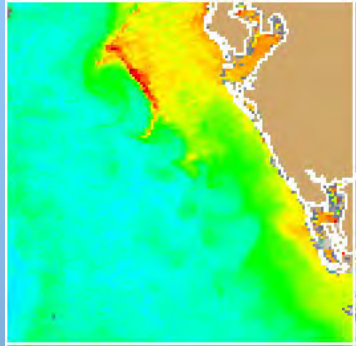
**Samples collected by Volunteers
Since 5/2000. ~3000**



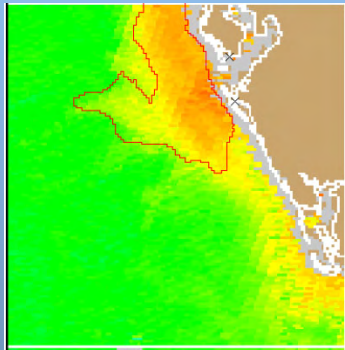
Volunteer Sampling Kit



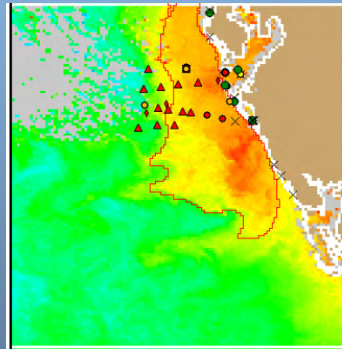
Satellite Detection and Tracking of Blooms



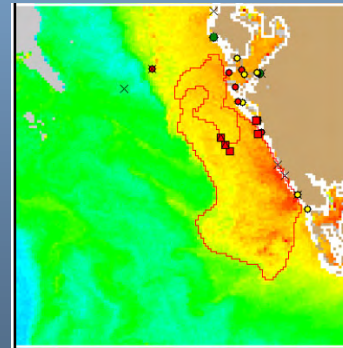
Jan. 9, 2005



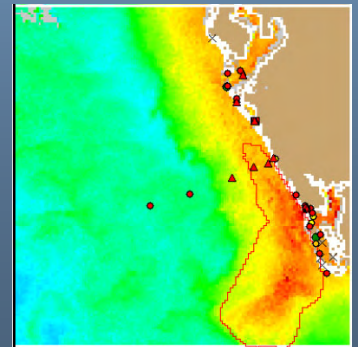
Jan. 18, 2005



Jan. 27, 2005



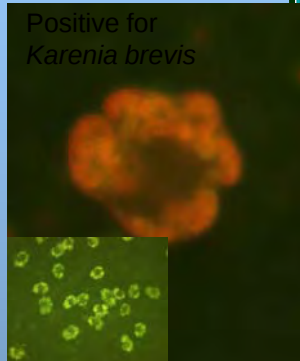
Feb. 10, 2005



Feb. 17, 2005

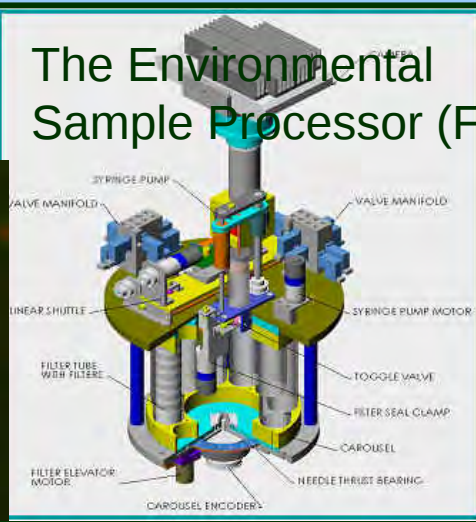
New Platform Technologies

Genetic Signal

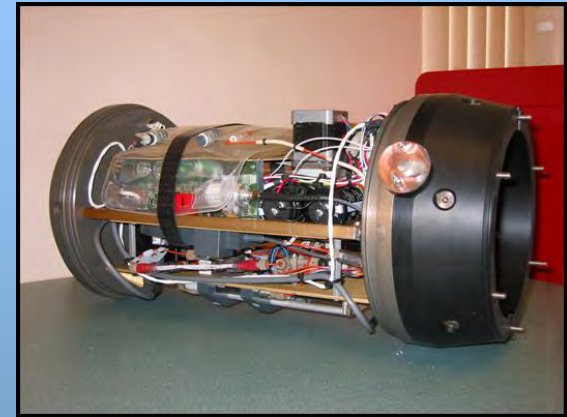


Karenia Molecular Probes (FWRI)

The Environmental Sample Processor (ES-P)



Optical Signal



BreveBuster (Mote)

Monitoring Buoys (USF)



BSOP (USF & FWRI)
(Bottom Sampling Ocean Profiler)

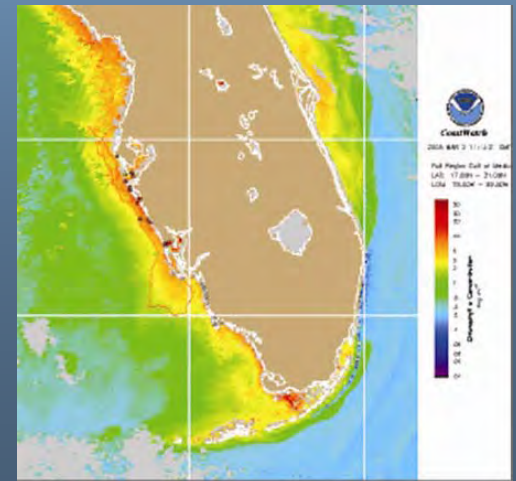


Gliders (Mote)



Growth Stage

- Aerial Overflights
- Research Cruises
- Begin nearshore sampling and Shellfish Monitoring
- Continued Satellite Monitoring



Monitoring Florida Shellfish

NSP (Neurotoxic shellfish poisoning)

- Shellfish harvesting areas monitored by DOACS.
- Harvesting areas are closed when *K. brevis* counts reach **5,000 cells/L** or higher.
- Areas re-open when counts have dissipated and shellfish tested by mouse bioassay are less than **20 MU/100g**.



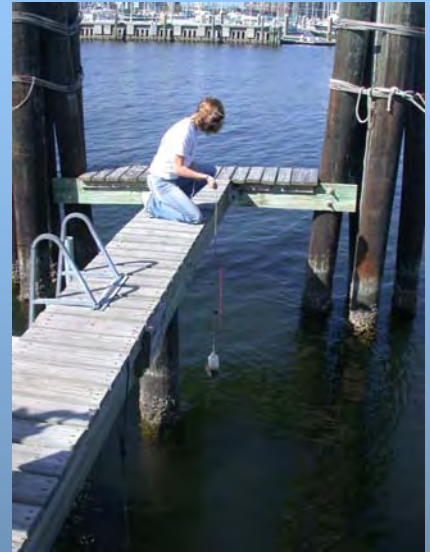
Maintenance Stage

- Increased Nearshore Sampling and Shellfish Monitoring
- Continued Satellite Tracking and Research Cruises

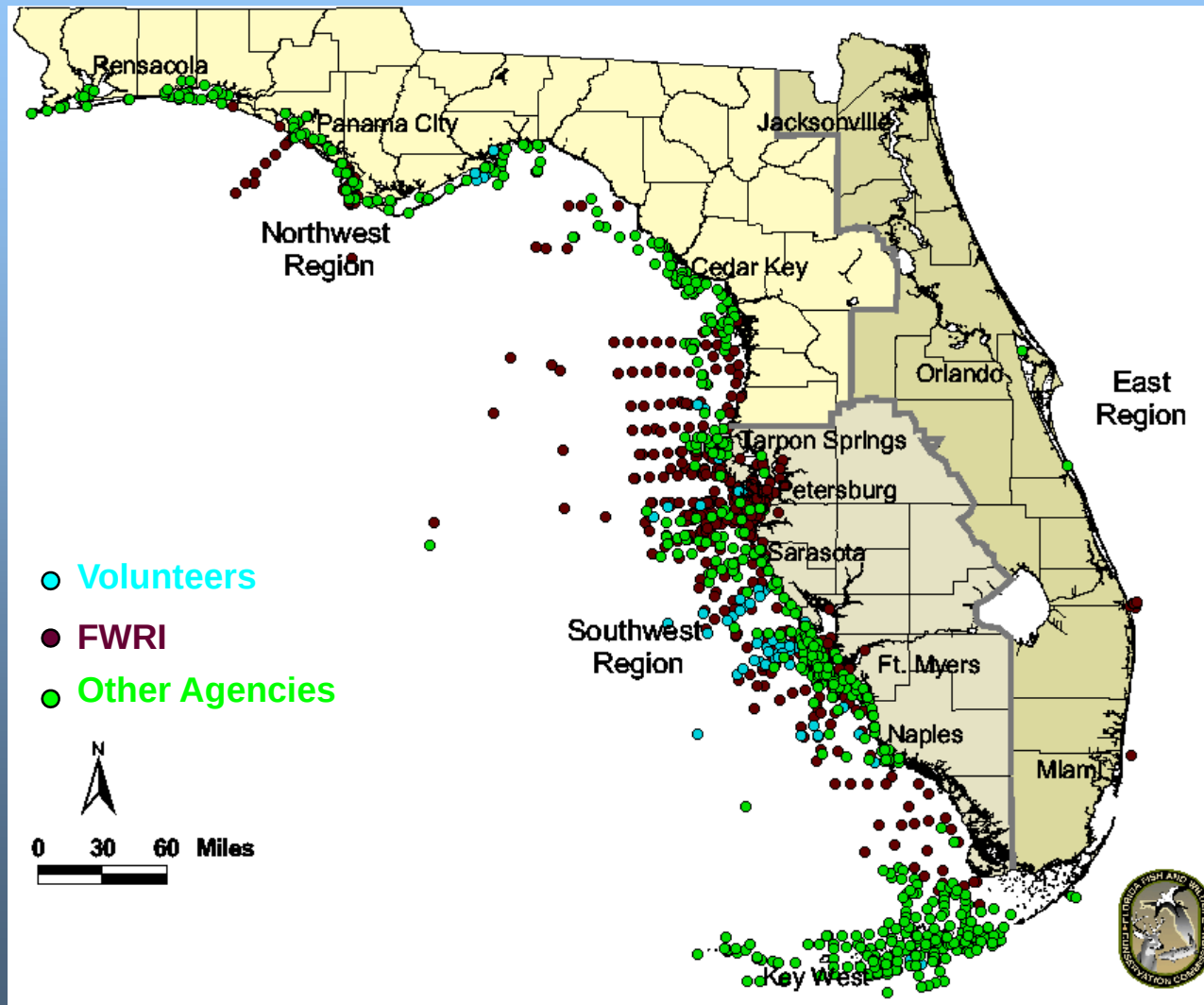


Termination

- Continued Nearshore Sampling
- Continued Monitoring of Shellfish until Meat is Determined Safe



Total Number Water Samples Collected & Counted for Red Tide in 2005



How are water samples analyzed for Red Tide?



Samples Collected & shipped w/i 24 hr:
FWRI, Volunteers

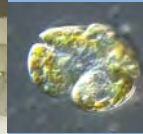


Positive for
K. brevis

Molecular Probes
(Experimental)



Sample
examination &
count w/i 12 hr



Sample data entry

HAB Historical Database - [HAB Data Entry]

File Edit View Help

Sample Demographics
Date (MM/DD/YYYY): 12/02/2004 HAB_ID: HABW04003-001
Time (HH:MM -GMT): 12:59
Agency: FWS
Station: Cedar Beach
Location: [blank]
Latitude: 26.5301 Longitude: -81.8453

Program Data
Program: Routine Red Tide Monitoring
Cruise ID: [blank] Vessel: [blank]

Sample Type	Instrument	Depth (m)	Temp (°C)	Salinity (ppt)	Diss. O ₂ (mg/L)	pH	Fluorescence	Turbidity	Conductivity (µS/cm)	P.A.H.	Chlorophyll	Notes
Water Surface	Manual	0		36.00								

Registration Data

Organism	Count/Depth (1m)	Description	Grade
Karenia brevis	0		
Chaetoceros sp.	14000		
Skeletonema sp.	44000		
Tetraselmis sp.	1300		
Nannocula sp.	3670		

Water Quality Data

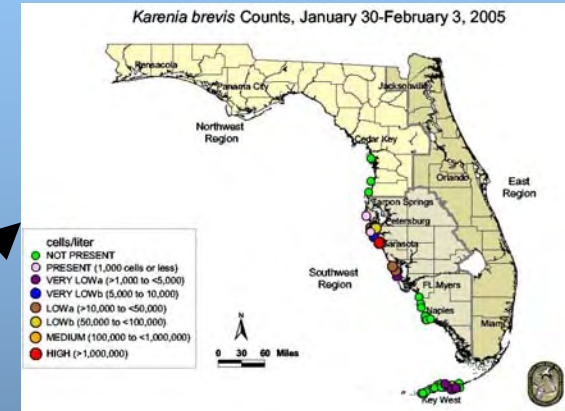
Parameter	Value	Message
Temperature (°C)	26.5	
Salinity (ppt)	36.0	
Dissolved Oxygen (mg/L)	6.5	
pH	8.2	
Fluorescence	1000	
Turbidity	0.5	
Conductivity (µS/cm)	50000	
P.A.H.	0.0	
Chlorophyll	0.0	

Comments:
Monthly Analysis

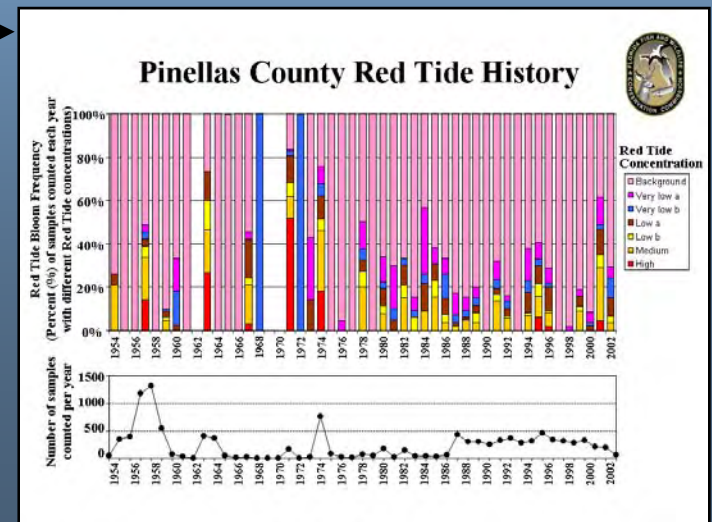
Sample Data

Florida has one of longest
Red Tide monitoring data
sets in the US & the world
(1953-current)

Weekly web, e-mail Status Reports



Data Analyses



HAB Reporting

Weekly maps and tables based on *Karenia brevis* cell counts

Additional HAB species, discolored water and fish kills noted if present

Reports distributed via email to HAB community, coastal managers and general public subscribers

Reports also available on FWRI web site

<http://research.MYFWC.com/> and by telephone at (866) 300-9399

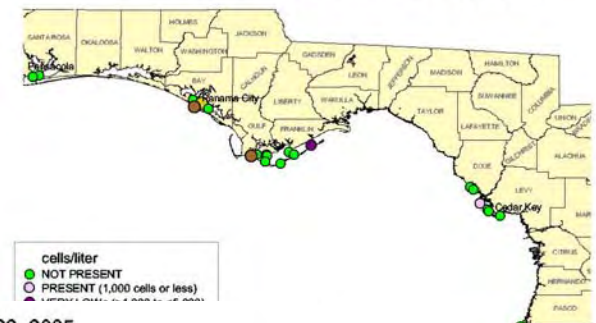
*** RED TIDE STATUS *** Florida Northwest Coast *** September 23, 2005 ***

PRESENT STATUS: A Florida red tide is still present in northwest Florida, but concentrations of *Karenia brevis*, the Florida red tide organism, appear to have decreased at several locations. Concentrations in St. Andrew Bay (Bay County) remained low; concentrations in Apalachicola Bay (Franklin County) are lower than last week but still above background at some sites. Bloom concentrations of *K. brevis* were found offshore of St. Andrew Bay at the end of last week and offshore of Apalachicola Bay, Dixie County, and Levy County this week. Commercial shellfish harvesting continues to be affected. Check with the Florida Department of Agriculture and Consumer Services, Division of Aquaculture for the most up-to-date information regarding shellfish area closures. Fish kills and some respiratory irritation were reported in bay and offshore areas of Bay, Franklin, Wakulla, Dixie, and Levy counties.

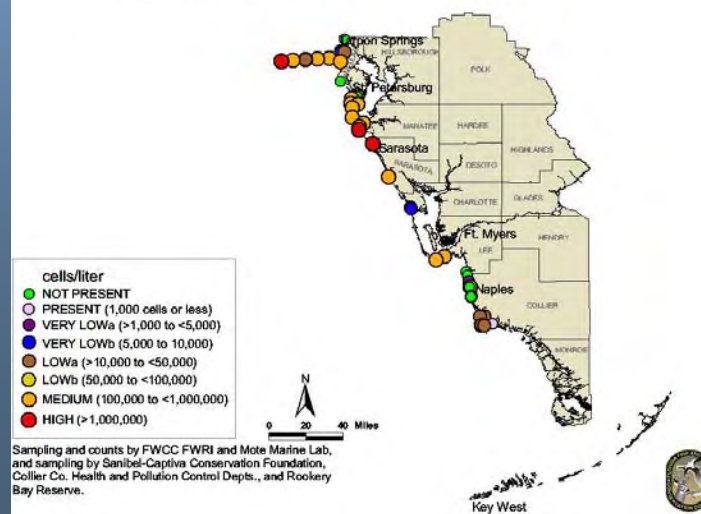
Bloom Boundary West (alongshore): Bay County
Bloom Boundary East (alongshore): Levy County

Date Collected	Karenia brevis Concentrations/Observations		Site Location* (West to East)	Collector or Agency		
	Alongshore (<1 mi)	Offshore				
Escambia - Santa Rosa Counties						
	no recent samples					
Okaloosa - Walton Counties						
	no recent samples					
Bay County						
09/21	not present	--	Panama City at Highway Bridge	FDACS		
09/21	LOWa + Karenia spp.	--	St. Andrew State Park	FDACS		
09/21	LOWb + Karenia spp.	--	Panama City marina	FDACS		
09/21	not present	--	Panama City at DuPont Bridge	FDACS		
09/16**	--	VERY LOWb to MEDIUM (S), not present to LOWa (B)	St. Andrew Bay, 3 to 35 mi SW of (14)	FWRI		
Gulf County						
	samples collected but could not be analyzed					
Franklin County						
09/19	LOWa + Karenia spp.	--	Indian Pass	FDACS		
09/19	--	VERY LOWa to VERY LOWb + Karenia spp.	Indian Pass, 1 to 3 mi off (2)	FDACS		
09/19	not present + Karenia spp.	--	Picklesville bar, St. Vincent Sound	FDACS		
09/19	not present	--	Cabbage Top in the Miles	FDACS		
09/19	not present	--	Green Point, SW of West Pass, mouth	FDACS		
09/19	not present	--	West Pass, 1 to 3 mi off (2)	FDACS		
09/19	--	VERY LOWb to LOWa + Karenia spp.	Sikes Cut, mouth	FDACS		
09/19	not present	--	Apalachicola Bay, Cat Point bar	FDACS		
09/19	not present	--	Apalachicola Bay, Marker 24	FDACS		
09/19	VERY LOWa + Karenia spp.	--	East Pass, mouth	FDACS		
Wakulla County						
	no recent samples					
Jefferson County						
	no recent samples					

Karenia brevis Counts, September 19-21, 2005

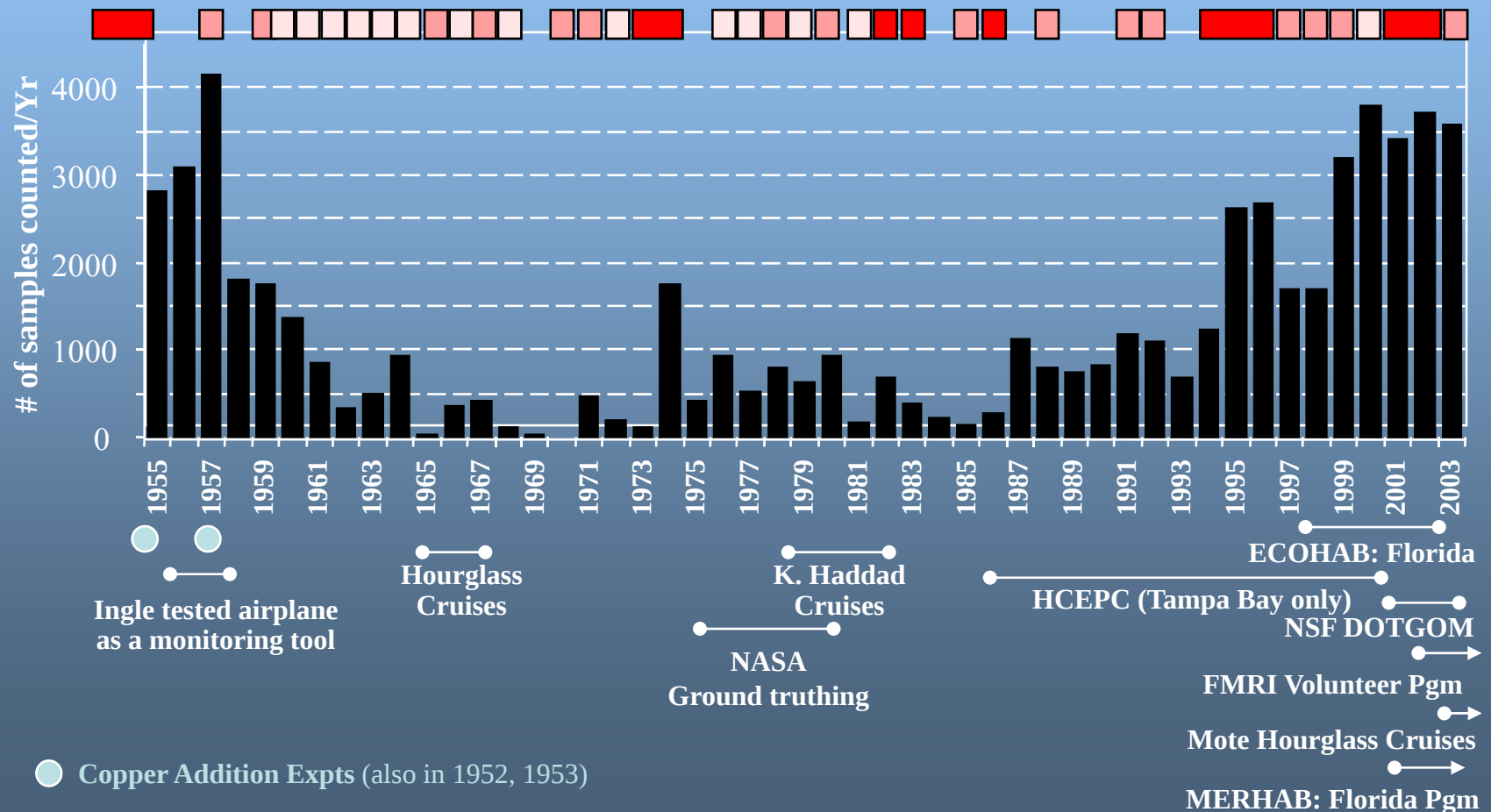
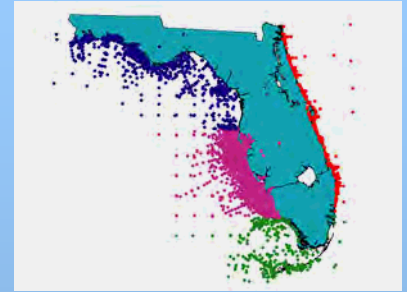
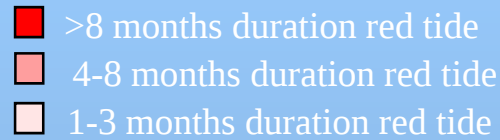


Karenia brevis Counts, September 19-22, 2005



Sampling and counts by FWCC FWRI and Mote Marine Lab, and sampling by Sanibel-Captiva Conservation Foundation, Collier Co. Health and Pollution Control Depts., and Rookery Bay Reserve.

Historical Florida Red Tide Sampling Effort (1954-2004)



Red Tide Control and Mitigation Grant Program

"control and mitigation": projects or efforts that are designed to minimize the size, intensity, or duration of *Karenia brevis* blooms or reduce the environmental, economic, social, or public health impacts of future red tides in Florida.

- State funded program
- ~\$1,000,000 dispersed annually
- 12 projects funded 2007-2009
 - 2 Socioeconomic
 - 3 Human Health Research
 - 4 Bloom Control
 - 3 Outreach

Program and Project details are available at:

<http://research.myfwc.com>, RTCM@MyFWC.com

Red Tide Status Reports

<http://research.MYFWC.com/>

Red Tide Status Toll Free Number

1-800-300-9399

jay.abbott@MYFWC.com