

Development of a GIS as a Management Tool to Reduce Sea Turtle Bycatch in U.S. Atlantic Ocean and Gulf of Mexico Fisheries



*A partnership project between NOAA's
National Marine Fisheries Service's Office of Protected Resources and
National Ocean Service's National Centers for Coastal Ocean Science*

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Biogeography Team**



Background

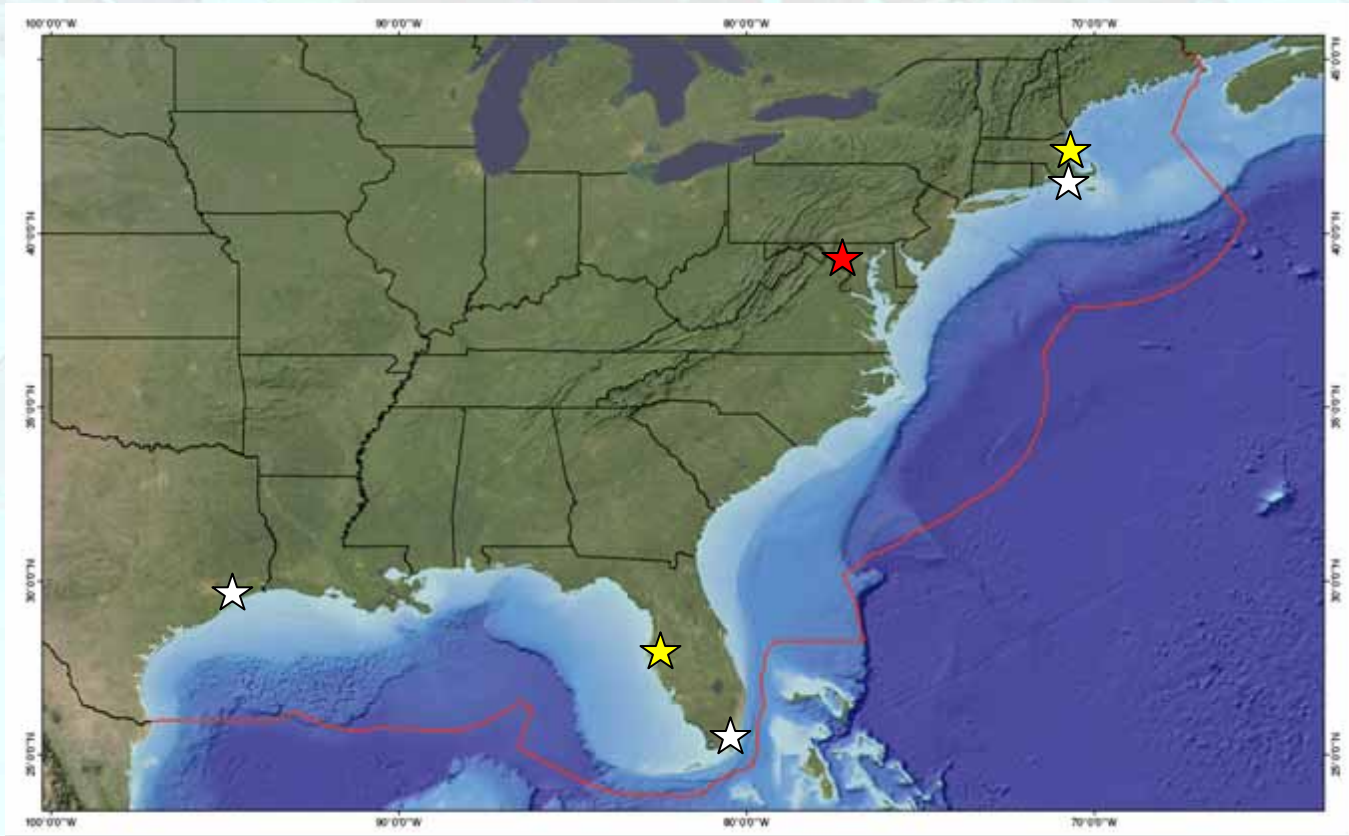
- Six species of sea turtles are found in the U.S.
- All six sea turtles are threatened or endangered
- Commercial fishing is large threat

BYCATCH:
Turtles caught by accident
in fishing gear,
usually thrown back dead or dying



NMFS' Strategy for Sea Turtle Conservation & Recovery in Relation to Atlantic and Gulf of Mexico Fisheries

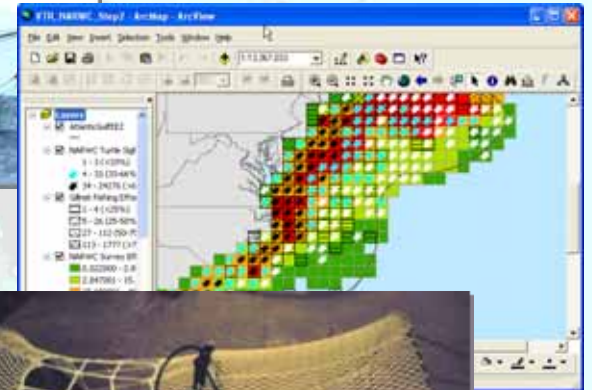
PURPOSE: Evaluate and address bycatch by gear type to reduce sea turtle bycatch



NMFS' Strategy for Sea Turtle Conservation & Recovery in Relation to Atlantic and Gulf of Mexico Fisheries

GOALS:

- ☑ Characterize fisheries
- ☑ Evaluate sea turtle bycatch



RESULTS:

- ☑ Develop and implement measures
- ☑ Recover and protect sea turtles

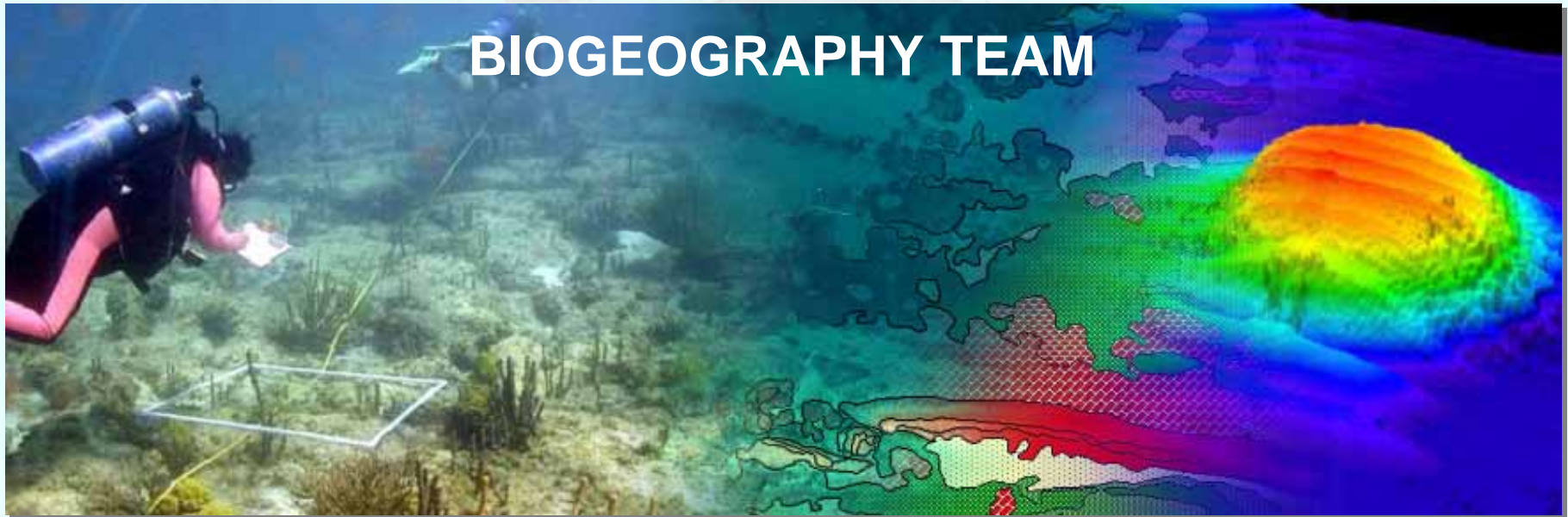




NOAA Partnership – NMFS & NOS



National Centers for Coastal Ocean Science | Center for Coastal Monitoring & Assessment

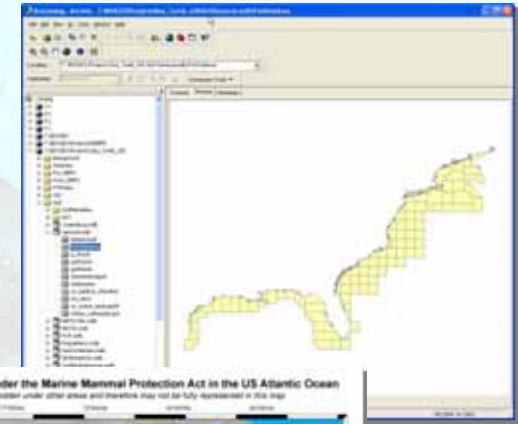


MISSION:

Develop **information** and **analytical capabilities** through research, monitoring, and assessment on the distribution and ecology of marine and estuarine organisms and their associated habitats **for improved ecosystem management.**

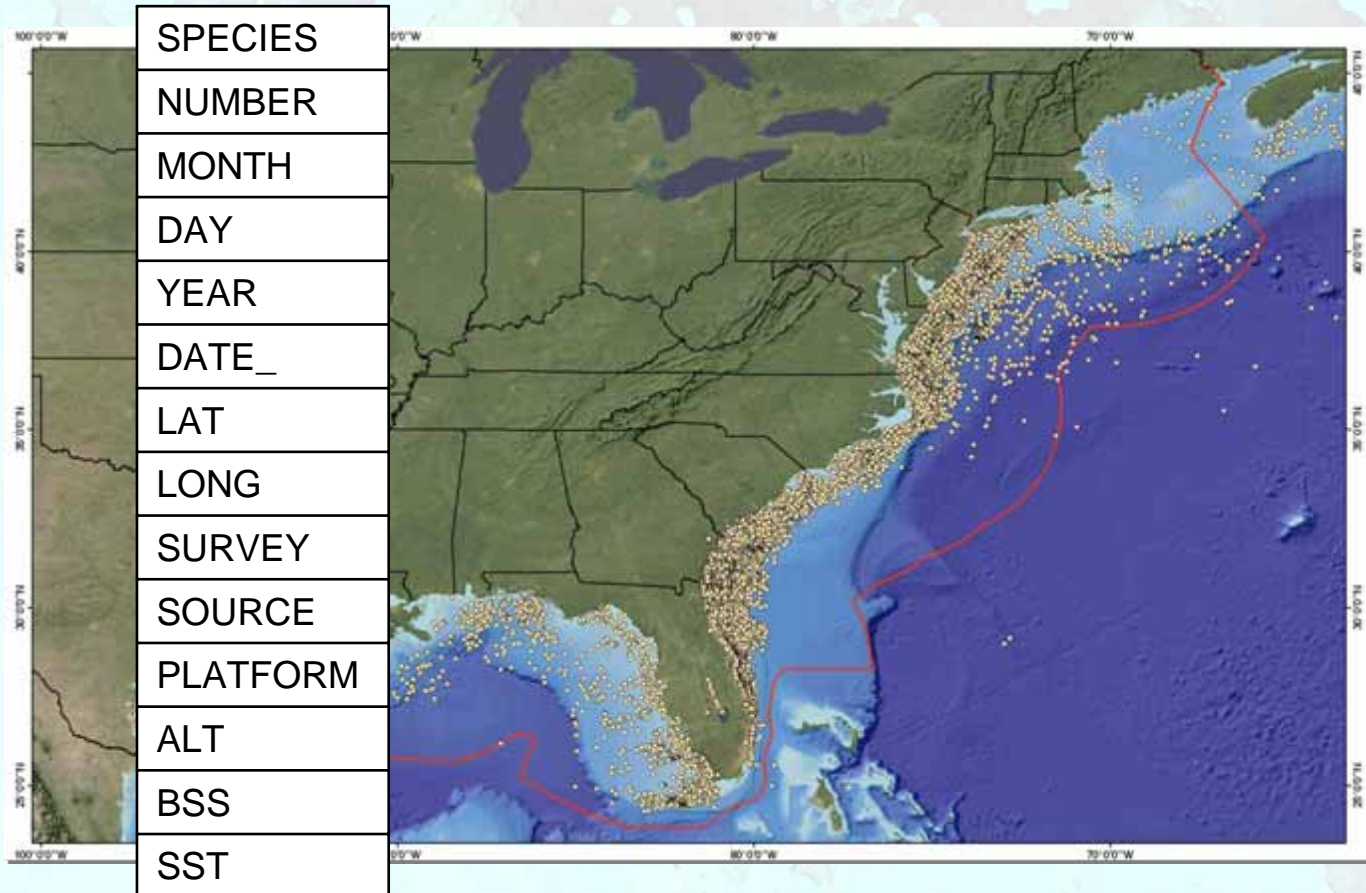
Benefits of a Geographic Information System (GIS)

- Compilation and creation of baseline data
- Assist NMFS with meeting legislative responsibilities
 - Making simple maps
 - In-depth spatial analyses
- Facilitate communication
 - Status of data
 - Data gaps
 - Spatial analysis
 - Data sharing



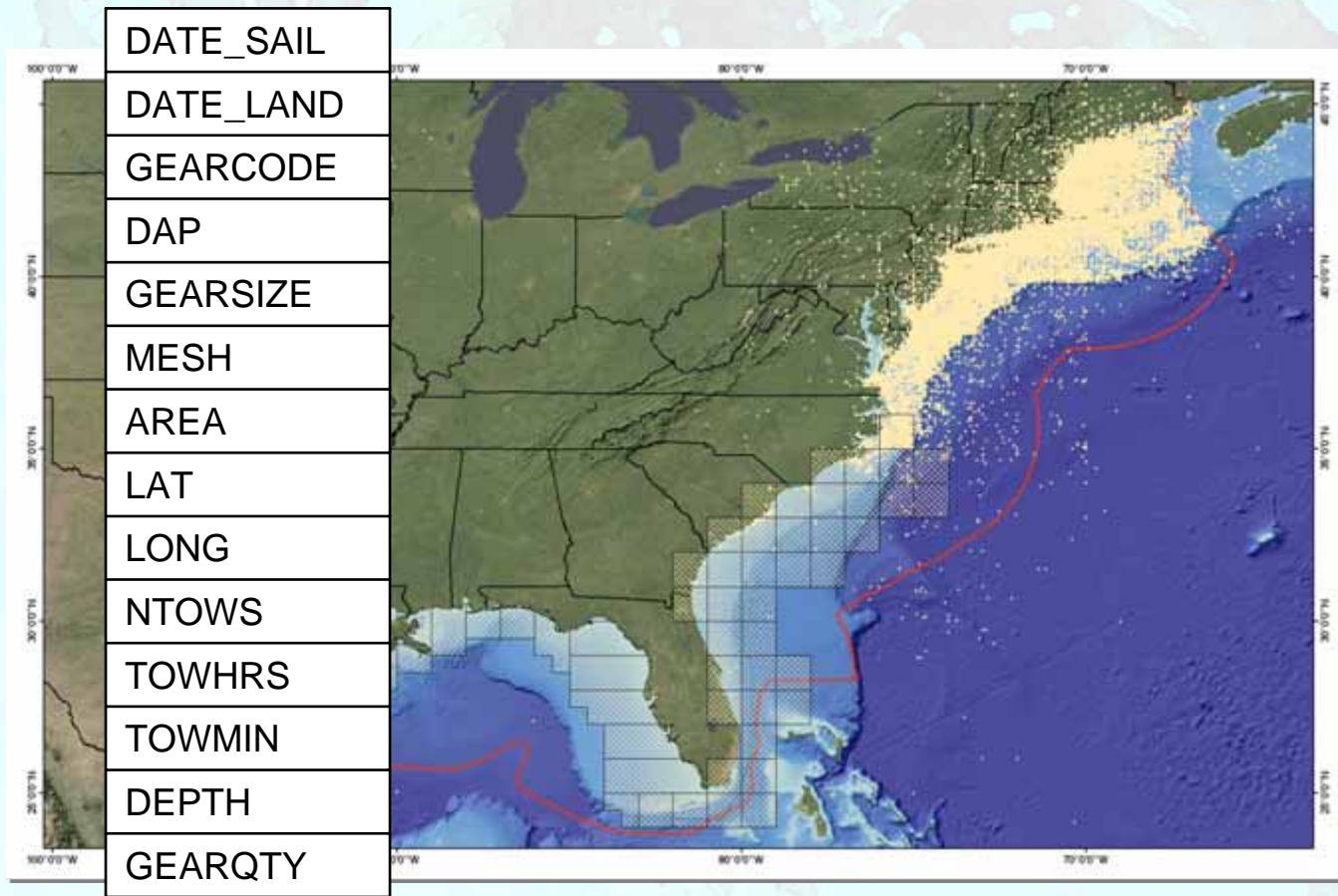
Sea Turtle Distribution

- 78 aerial and shipboard surveys
- Over 90,000 records of sea turtle sightings



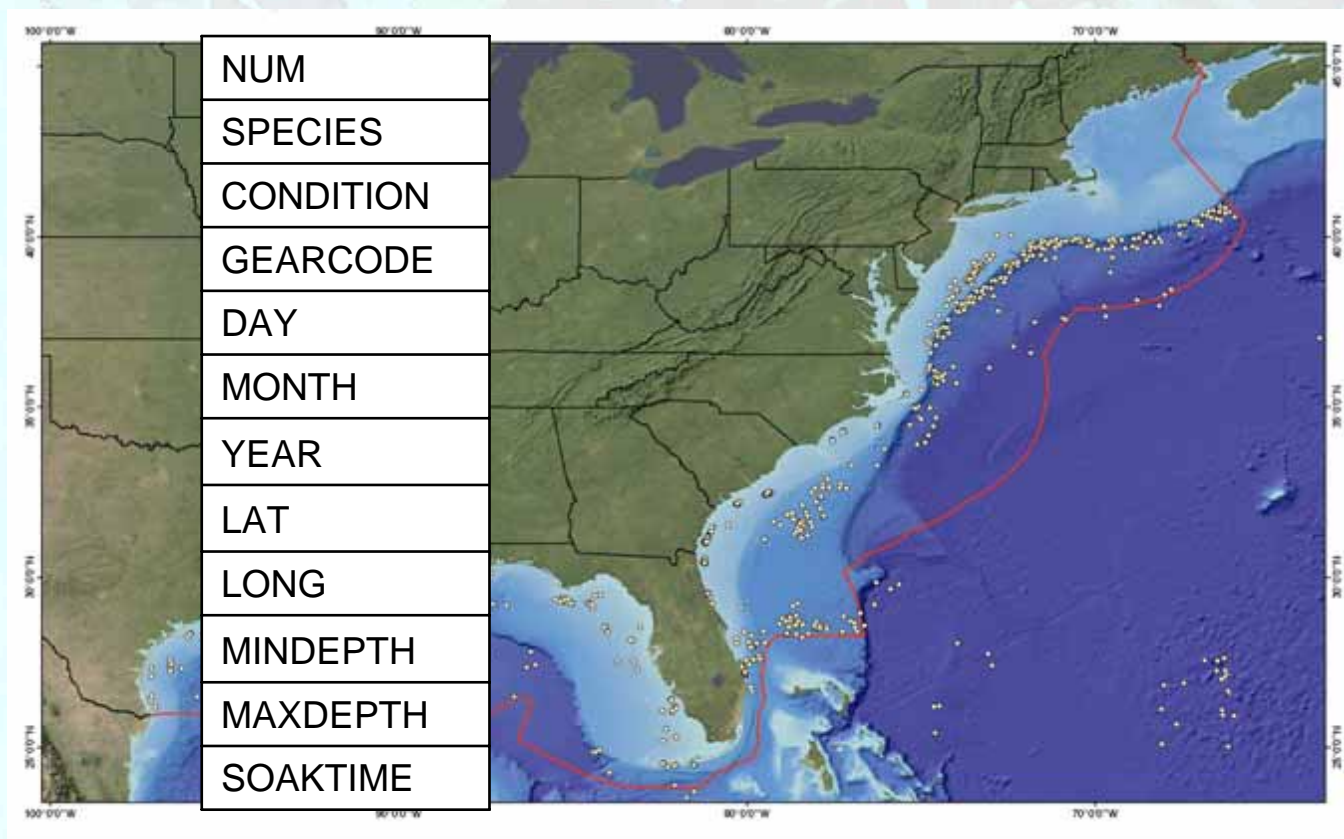
Commercial Fishing Activity

- Northeast and southeast fisheries logbooks
- Over 1.5 million fisheries records



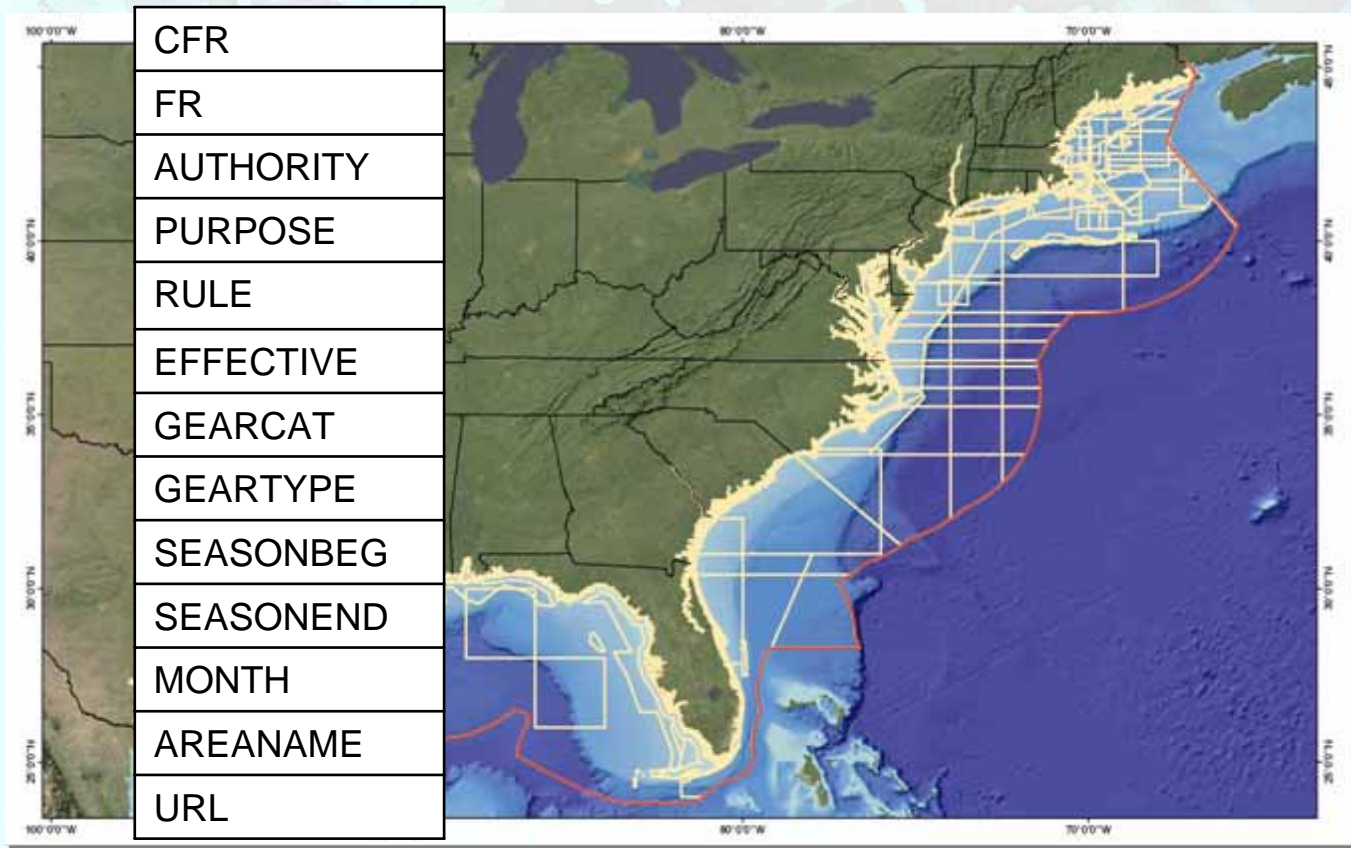
Observed Sea Turtle Bycatch

- Individual northeast and southeast observer programs
- Over 2,000 bycatch records



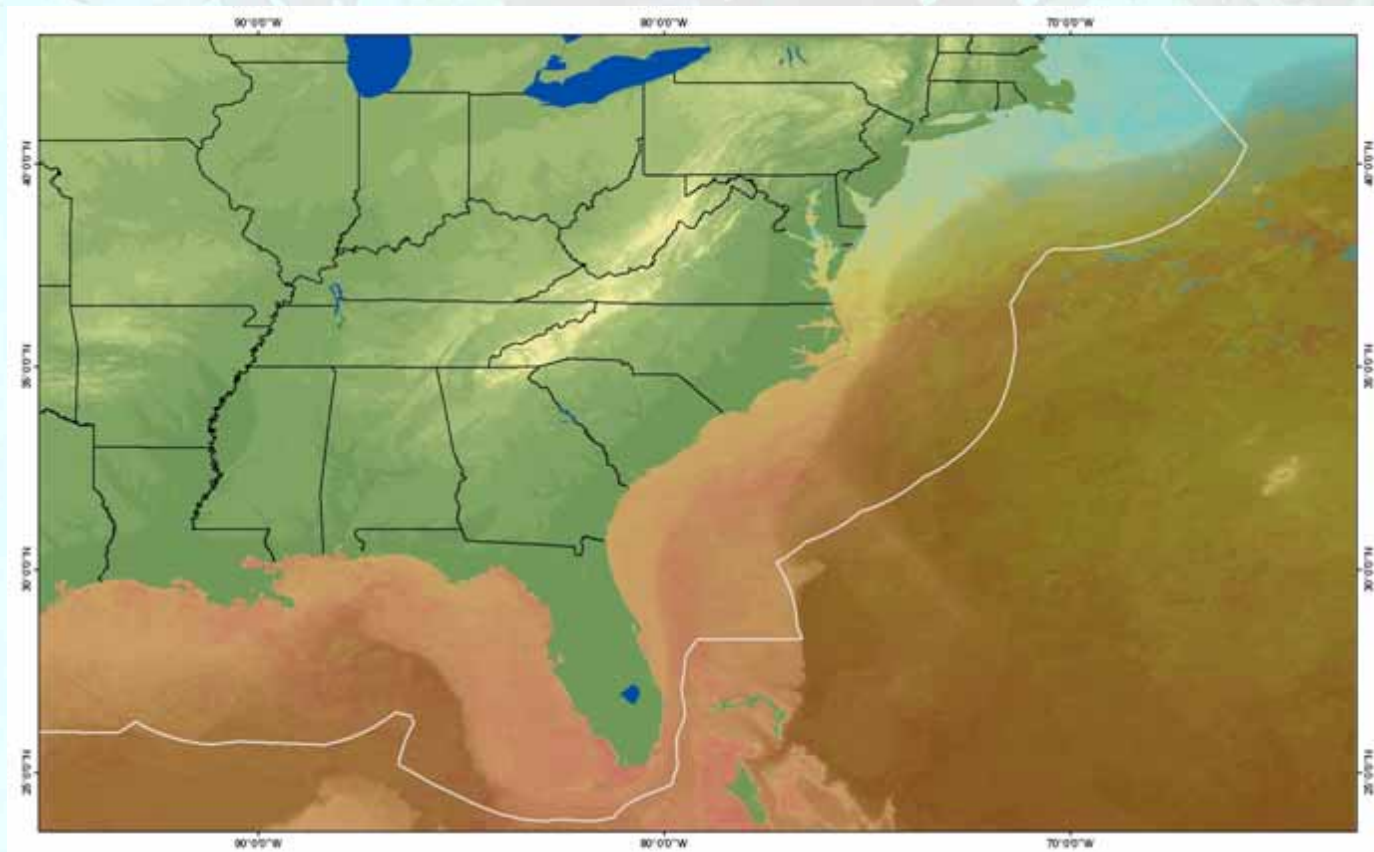
Federal and State Regulations

- ESA, MSFCMA, MMPA, NMSA
- 132 unique marine managed areas records; 92 areas



Oceanographic Conditions

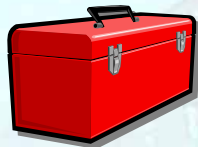
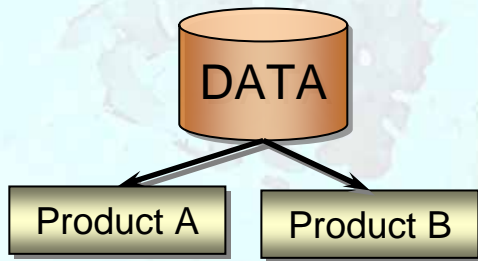
- Sea surface temperature
- Ocean color (chlorophyll *a* concentration)
- Bathymetry



A LOT OF DATA!!!

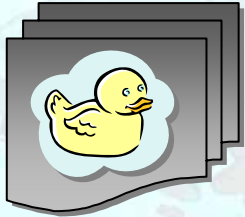


Accessing and Integrating Data

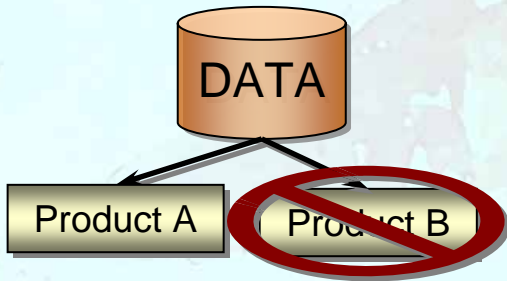


- Design and develop graphical user interface (GUI)
 - Assist with data access
 - Enable user with limited GIS experience
- Provide tools for geoprocessing and analysis
 - Summarize data
 - Standard calculations

Accessing and Integrating Data

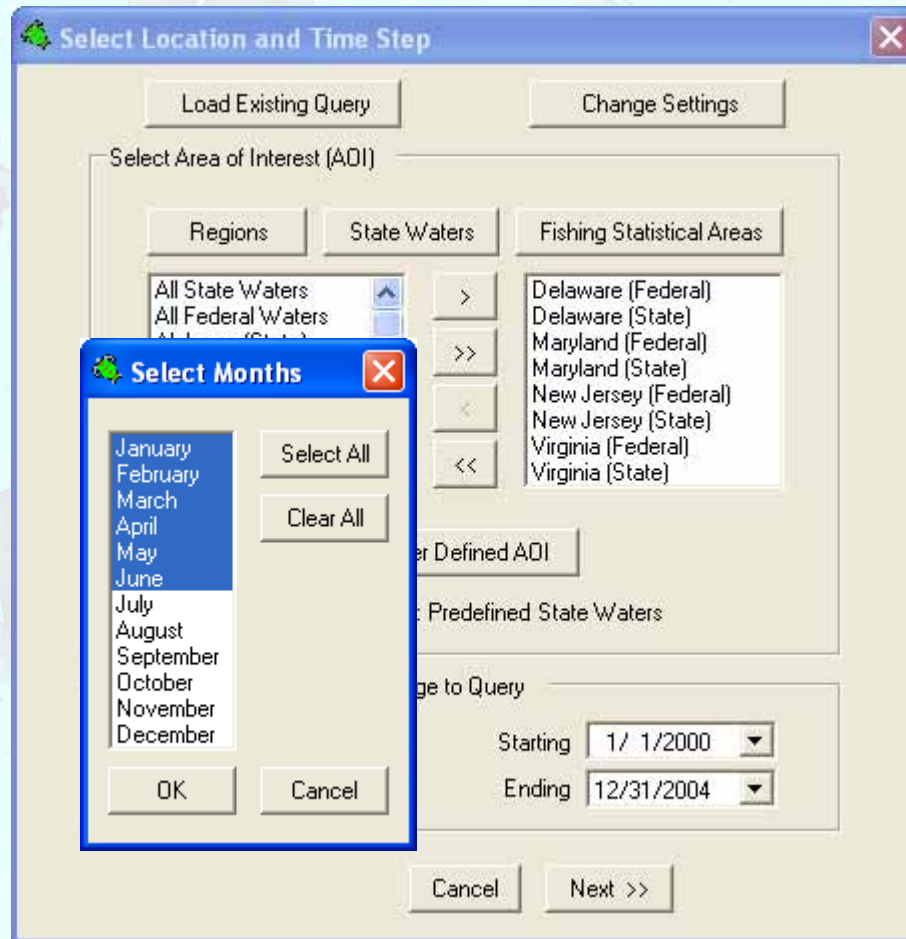


- Provide metadata and user manual
 - Include caveats of data
 - Discuss appropriate uses and limitations



- Train NMFS' Strategy Team
 - Effectively manipulate data layers
 - Emphasize information in metadata

Example Workflow: Select Space and Time



Example Workflow: Turtle Data

Data Selection

Turtles |
 Observer |
 Fishery |
 Regulation |
 Surface Oceanography |
 Bathymetry

Turtle Sightings

- Caretta caretta
- Chelonia mydas
- Dermochelys coriacea
- Eretmochelys imbricata
- Lepidochelys kempii
- Unidentified

Survey Platform: All ▾

Latin Name

Common Name

Display turtles as:

Presence

Summarized by:

Sightings ▾

Sum ▾

Display effort as separate layer

Reset this form
Reset all forms

<< Back
Cancel
Next >>

Example Workflow: Observer Data

Data Selection

Turtles | Observer* | Fishery* | Regulation | Surface Oceanography | Bathymetry

Select observed fishing gear

Dredge
Gillnet
Longline
Trawl

Load selected fishery gear
Load selected regulation gear

Display effort as

Event
 Summarized by:

Event
Count

Display bycatch as

Event
 Summarized by:

Event
Count

Reset this form Reset all forms

<< Back Cancel Next >>

Example Workflow: Fisheries Data

Data Selection

Turtles |
 Observer* |
 Fishery* |
 Regulation |
 Surface Oceanography |
 Bathymetry

Select observed fishing gear

- Gillnet
- Handline
- Longline
- Pot and trap
- Seine
- Tub Trawl
- Trawl

Load selected observer gear

Load selected regulation gear

Display effort as

Event

Summarized by:

DAP

Sum

- Count
- Sum
- Average
- Minimum
- Maximum
- Standard Deviation
- Variance

Reset this form

Reset all forms

<< Back

Cancel

Next >>

Example Workflow: Regulations

Data Selection

Turtles | Observer | Fishery | Regulation | Surface Oceanography | Bathymetry

Select regulation gear

- Dredge
- Fixed net
- Gillnet
- Longline
- Pot and trap
- Seine
- Trawl

Load selected observer gear

Load selected fishery gear

Select authority

- Endangered Species Act
- Maguson-Stevens Act
- Marine Mammal Protection Act
- National Marine Sanctuary Act

Reset this form Reset all forms

<< Back Cancel Next >>

Example Workflow: Oceanography

Data Selection

Turtles | Observer | Fishery | Regulation | **Surface Oceanography** | Bathymetry

Select SST to display

- Jan 1998
- Feb 1998
- Mar 1998
- Apr 1998
- May 1998
- Jun 1998
- Jul 1998

Select time period

Select specific months

Select specific years

Display quality grid

Reset this form Reset all forms

<< Back Cancel Next >>

Example Workflow: Bathymetry

Data Selection

Turtles | Observer | Fishery | Regulation | Surface Oceanography | **Bathymetry**

Select bathymetry data to display

Do not display bathymetry
 Display all bathymetry
 Display selected bathymetry

Minimum depth (m):
 Display depth (m) in increments of (multiples of 10)

Maximum depth (m):

Example Workflow: Summary

The image shows a screenshot of a software interface titled "Query Summary". The dialog box has a blue header and a light beige body. Inside, there is a text area with the following content: "Area of Interest: Predefined Fishing Statistical Area" and "Selected features: All FSAs". Below this, there are two more lines of text: "Display observer effort as points" and "Display observer bycatch as points". At the bottom of the dialog, there are three buttons: "<< Back", "Cancel", and "Process". A yellow callout box with a drop shadow is overlaid on the right side of the dialog, containing a bulleted list of query parameters.

Query Summary

Area of Interest: Predefined Fishing Statistical Area

Selected features:
All FSAs

- Atlantic and Gulf of Mexico
- Jan-Jun of 2000-2004
- Points of all observed bycatch for trawl gear
- **Summarized** trawl fishing effort by fishing statistical area

Display observer effort as points

Display observer bycatch as points

Save Query

<< Back Cancel Process

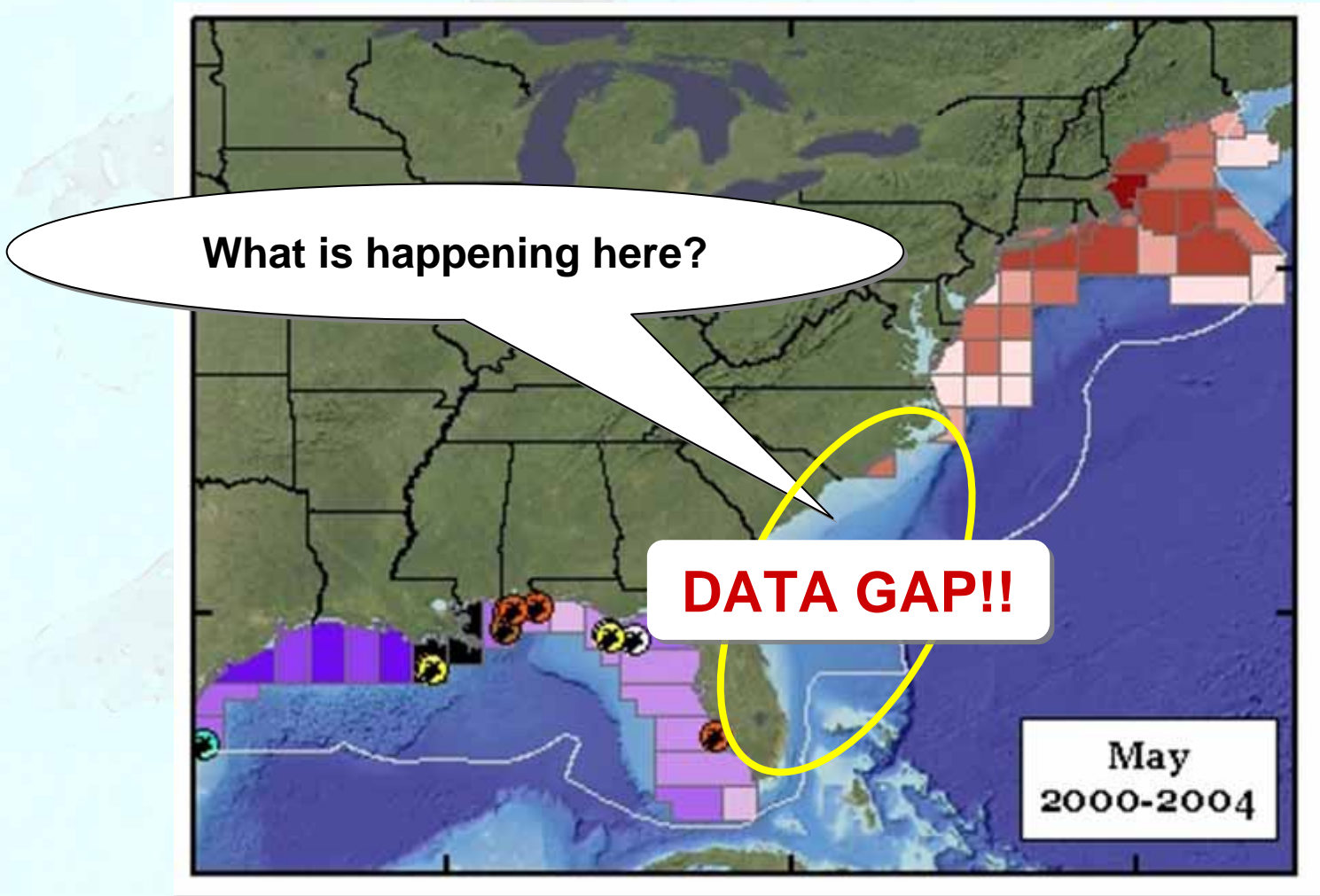
Where are the hotspots?

Is it the same across regions?

What regulations are currently in place?

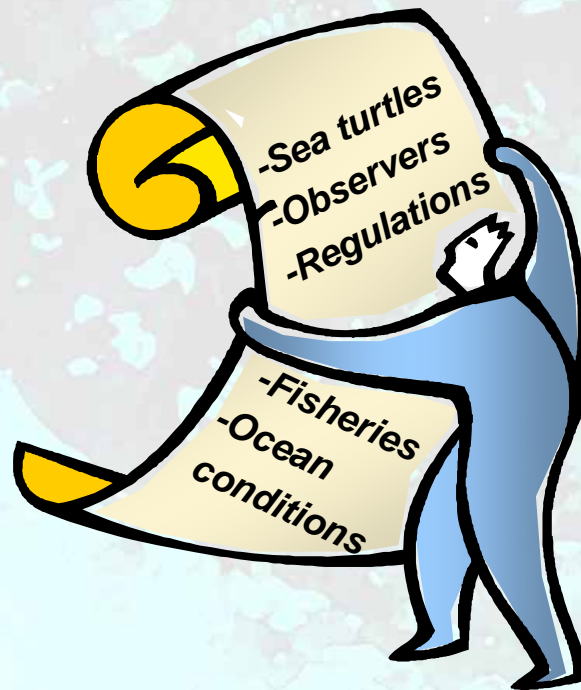
If needed, where is the best place for a new regulated area?





User Considerations

- Need to have some knowledge of data



User Considerations

- Need to have some knowledge of data
- GIS products are a snapshot of the data



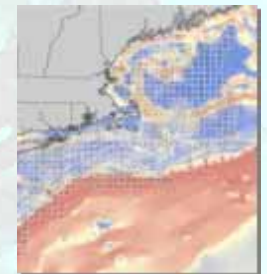
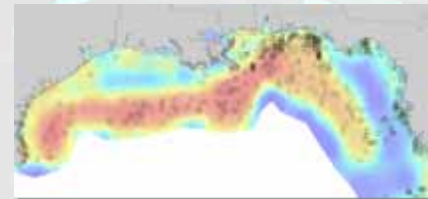
Progress Report – Where are we now?

- Preparing final report
- Programming the GUI
- Preparing documents for users



Future Direction of the GIS

- Keep it dynamic
- Additional datasets
 - Sea turtle tracking data
 - Sea turtle stranding data
 - Recreational fishing activity
 - Benthic habitat
 - Oceanic fronts
- Model for predictions
- Continue communication



Collaboration is the key to success!!

A diver in a wetsuit and scuba gear is underwater, holding a sea turtle. The scene is set in clear blue water with a sandy seabed visible at the bottom. The diver is positioned on the right side of the frame, reaching out towards the center where the sea turtle is held. The overall tone is serene and focused on marine conservation.

For more information:

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<http://www.nmfs.noaa.gov/pr/species/turtles/strategy>