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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Background

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

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.

Development of a GIS to Reduce Sea Turtle Bycatch
Partnership Goals

• 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

Development of a GIS to Reduce Sea Turtle Bycatch
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

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<th>GEARCODE</th>
<th>DAP</th>
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<th>MESH</th>
<th>AREA</th>
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<th>LONG</th>
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<th>TOWHRS</th>
<th>TOWMIN</th>
<th>DEPTH</th>
<th>GEARQTY</th>
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</table>

Development of a GIS to Reduce Sea Turtle Bycatch
Observed Sea Turtle Bycatch

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

<table>
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<tr>
<th>NUM</th>
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<th>YEAR</th>
<th>LAT</th>
<th>LONG</th>
<th>MINDEPTH</th>
<th>MAXDEPTH</th>
<th>SOAKTIME</th>
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Development of a GIS to Reduce Sea Turtle Bycatch
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

Development of a GIS to Reduce Sea Turtle Bycatch
Example Workflow: Select Space and Time

Development of a GIS to Reduce Sea Turtle Bycatch
Example Workflow: Turtle Data

Development of a GIS to Reduce Sea Turtle Bycatch
Example Workflow: Observer Data

Development of a GIS to Reduce Sea Turtle Bycatch
Example Workflow: Fisheries Data
Example Workflow: Regulations

Data Selection

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
- Magnuson-Stevens Act
- Marine Mammal Protection Act
- National Marine Sanctuary Act

Reset this form
Reset all forms

<< Back  Cancel  Next >>
Example Workflow: Oceanography
Example Workflow: Bathymetry

Data Selection

Select bathymetry data to display
- Do not display bathymetry
- Display all bathymetry
- Display selected bathymetry

Minimum depth (m): 0
Maximum depth (m): 0
Display depth (m) in increments of: 0
(multiples of 10)

Reset this form  Reset all forms
Example Workflow: Summary

- **Atlantic and Gulf of Mexico**
- **Jan-Jun of 2000-2004**
- **Points of all observed bycatch for trawl gear**
- **Summarized trawl fishing effort by Federal Waters of each state**
Development of a GIS to Reduce Sea Turtle Bycatch

What about data gaps?

Where are the hotspots?

What regulations are currently in place?

Is it the same across regions?

What about data gaps?
User Considerations

• Need to have some knowledge of data

- Sea turtles
- Observers
- Regulations
- Fisheries
- Ocean conditions
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
- GUI beta version is released
- NMFS is reviewing user manual
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!!
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