Presentation for the Interested Party Group Meeting
October 30, 2008

Dan L. Wilkinson, Ph.D.,
Project Manager
Chris R. Clark, Principal Investigator

Field Studies

Avian Visual Surveys

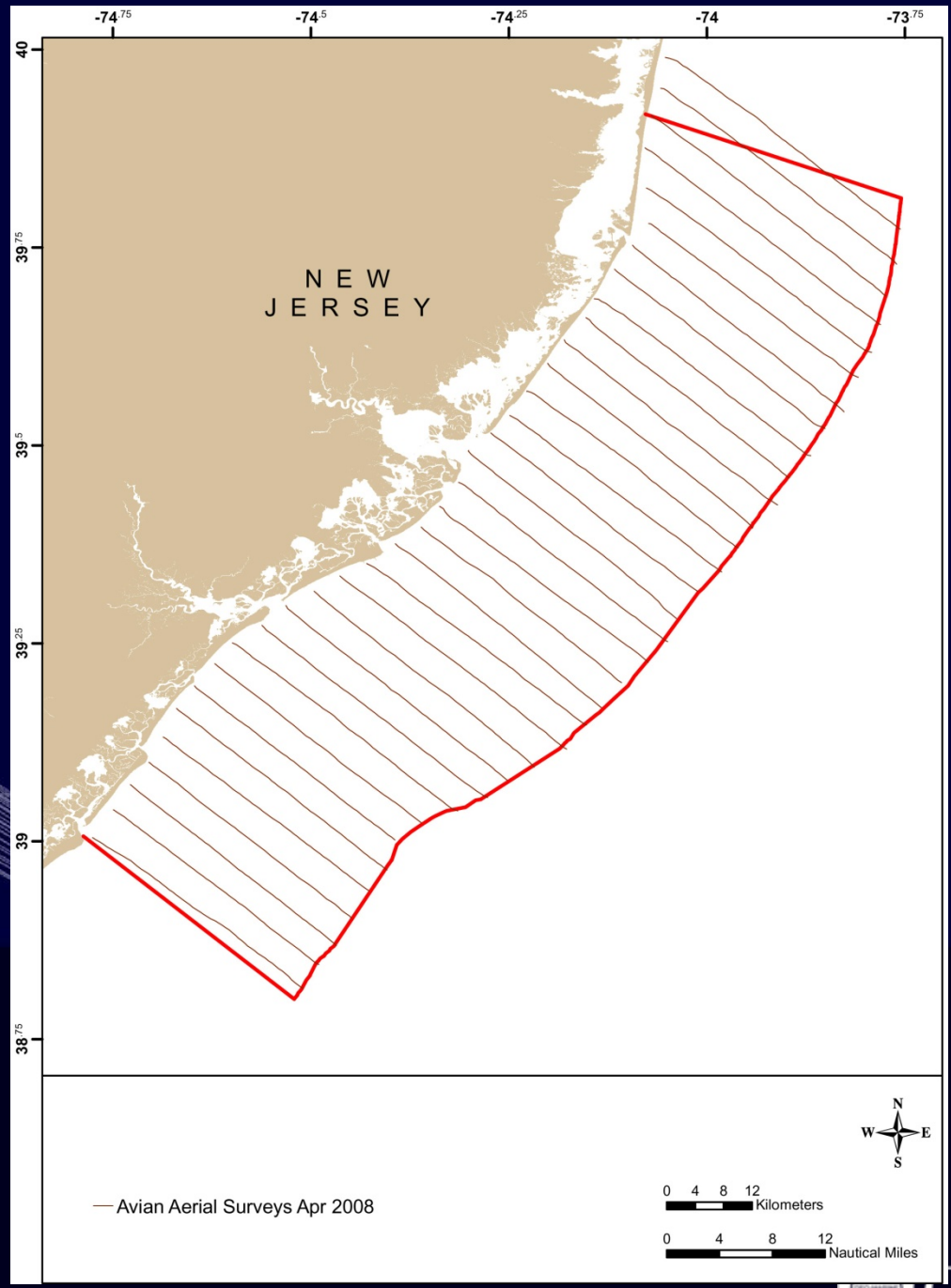
- Aerial
- Small Boat
- Large Boat

Avian Radar Study

- Radar
  - Coastal
  - Marine
- Thermal
- Ground Truthing and Observations

Avian Aerial Survey Track lines

- 16 April 2008
- Transects flown in an alternating pattern at 250 ft [amsl] to provide data on temporal variation
- Total length = 593 NM



Aerial Data

10 Species Identified

- Most abundant species
  - Northern gannet
  - Red-throated loon
  - Common loon

Data Review

- Report submitted to NJDEP
  - Peer Review Group comments
  - Consultation with USFWS

- Conclusions
  - Possible biasing towards larger birds
  - Limited number of surveys compared to other efforts
  - Utilization of resources for other tasks (e.g., radar validation)

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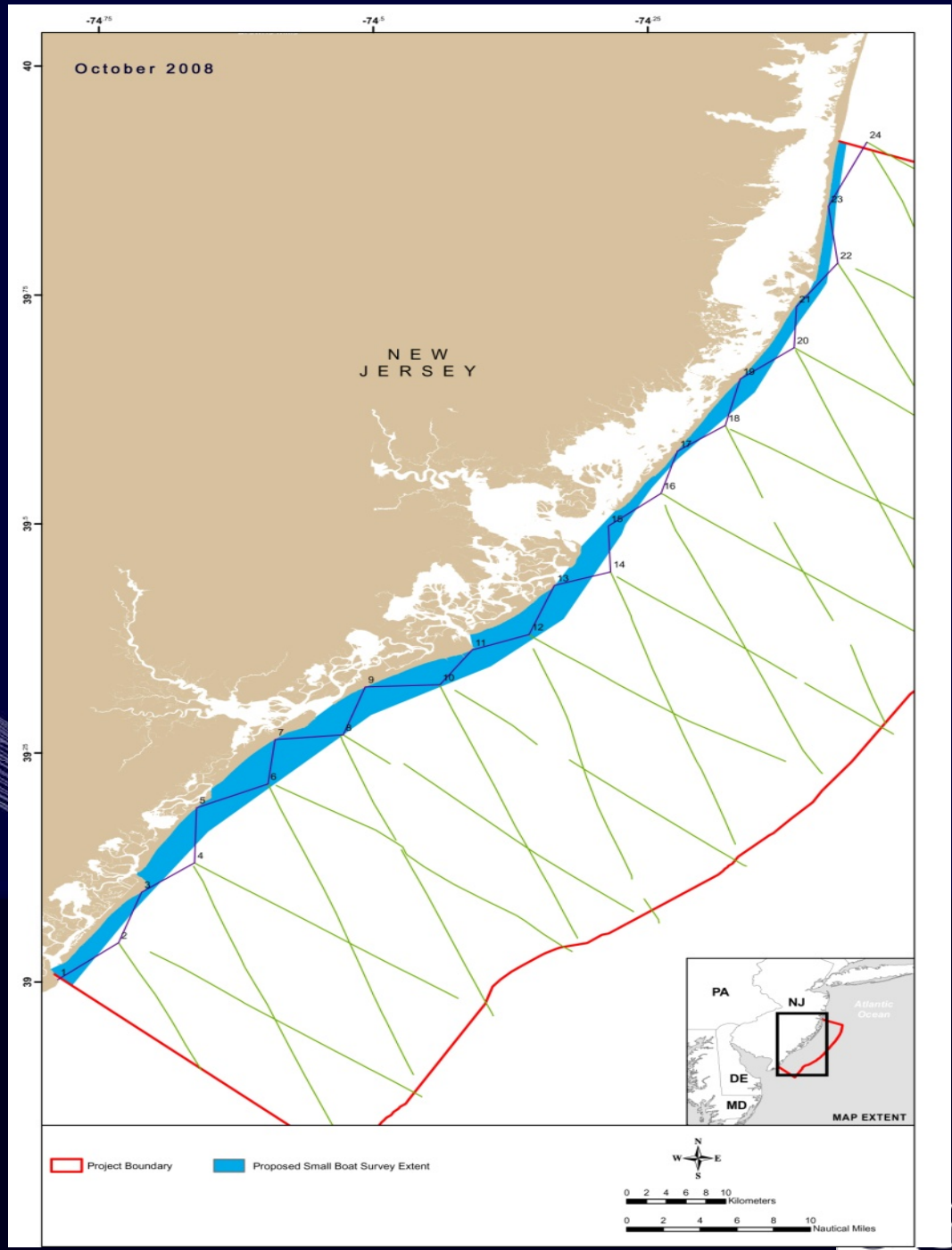
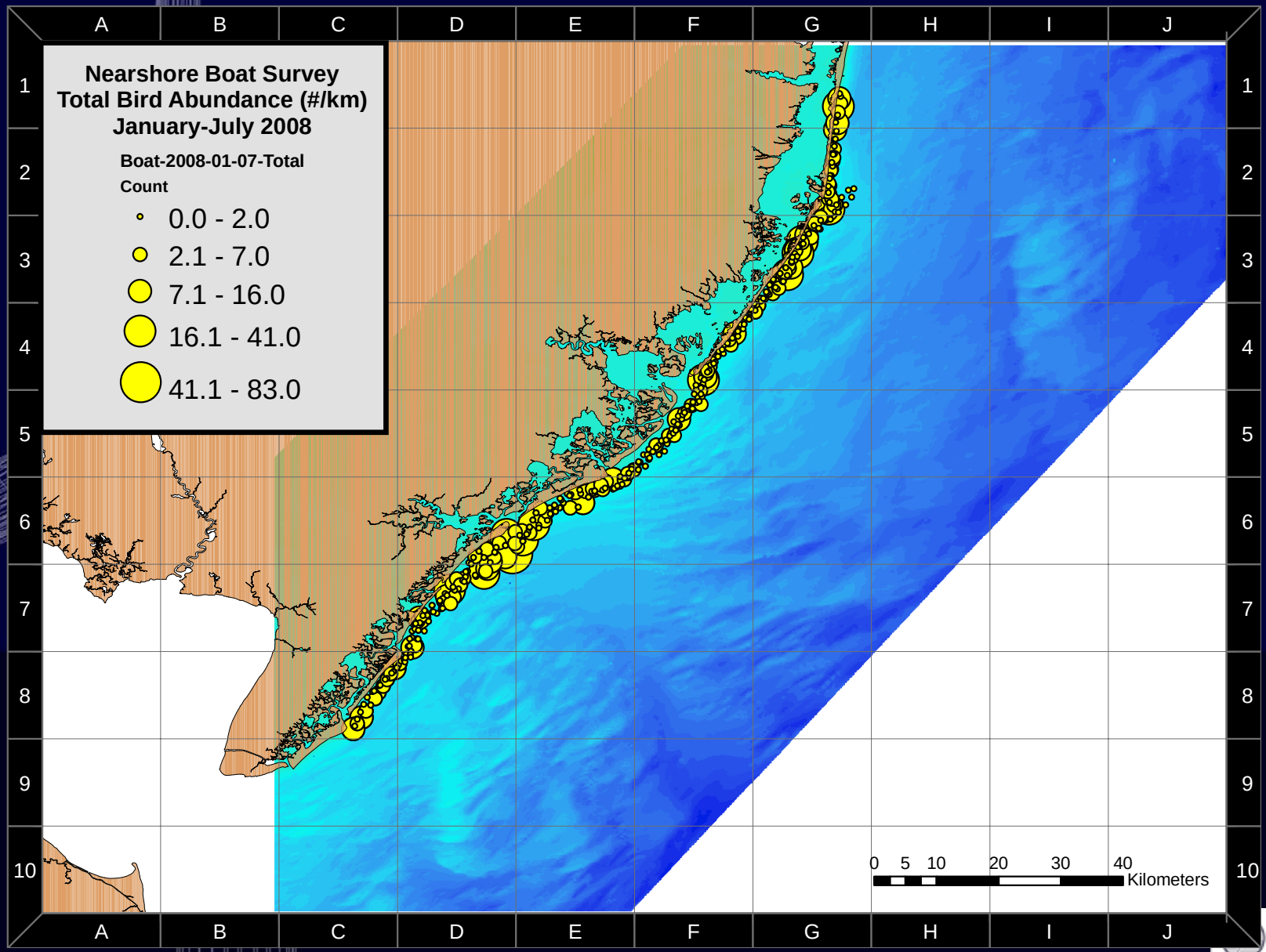
Small Boat Coastal Avian Surveys

- Single saw-tooth design
- Monthly
- Completing large boat data gaps



Small Boat Data

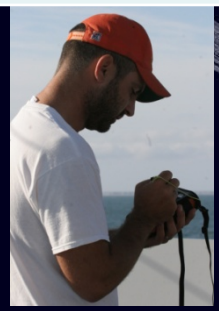


Small Boat Data

	1st Quarter		
	Jan.	Feb.	Mar.
# Species Observed	18	N/A	25
Most Abundant Species	Black scoter (25.45%)	N/A	Herring gull (33.03%)
	Herring gull		Surf scoter
	scaup species		Northern gannet
Total # Birds Observed	4,912	N/A	8,153
*1 state listed avian species (Bald eagle) observed			
Feb. survey cancelled – additional effort in ‘09			

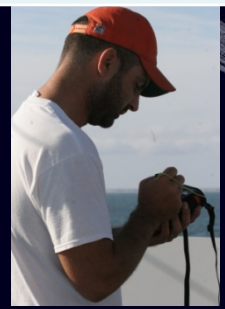
Small Boat Data

	2nd Quarter		
	Apr.	May	Jun.
# Species Observed	24	25	14
Most Abundant Species	Double-crested cormorant (38.60%)	Laughing gull (31.40%)	Laughing gull (50.70%)
	Surf scoter	Herring gull	Great black-backed gull
	Northern gannet	Double-crested cormorant	Common tern
Total # Birds Observed	4,012	1,786	598
* 2 state listed avian species (Osprey and Northern harrier) observed			



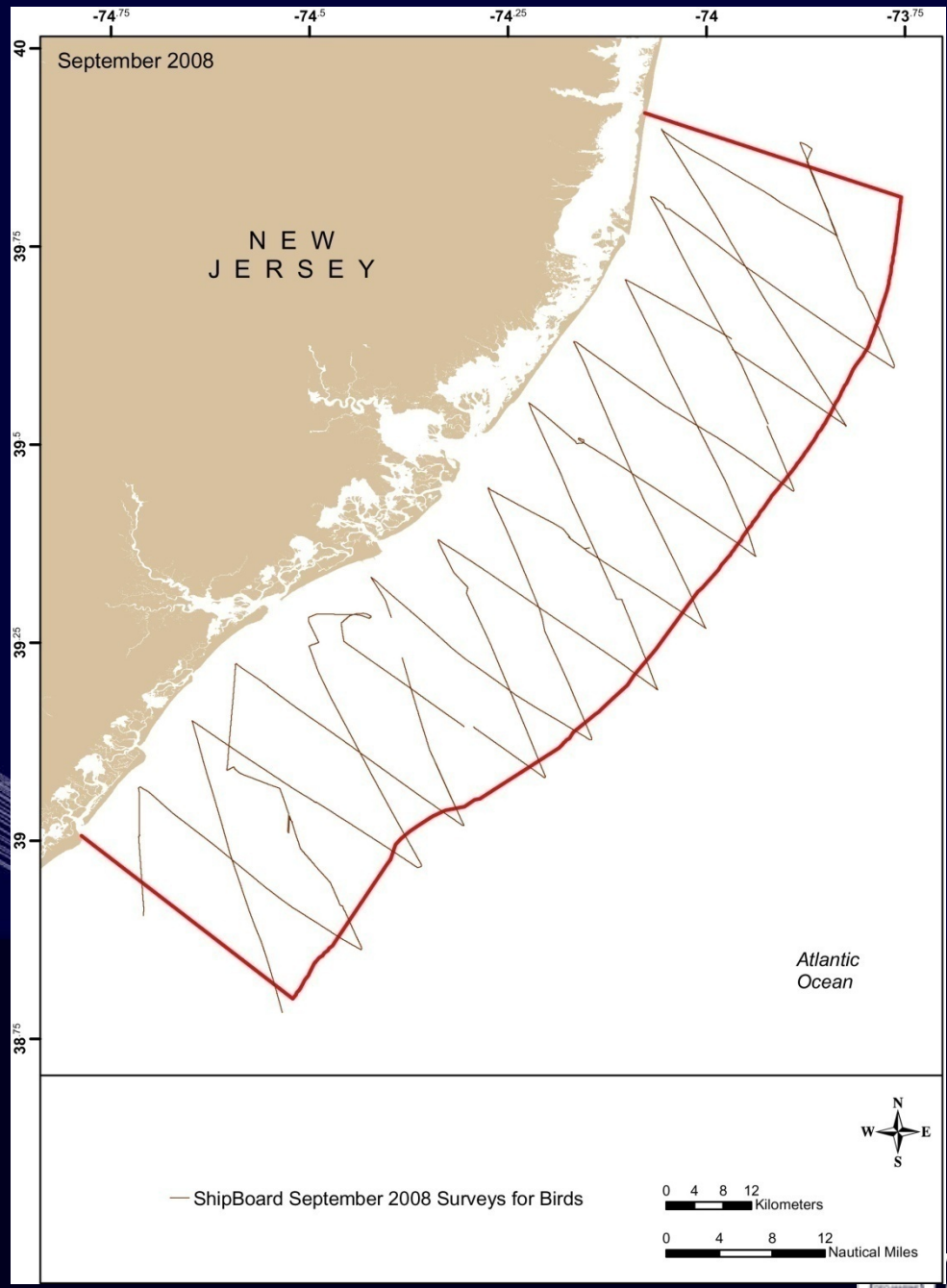
Small Boat Data

	3rd Quarter		
	Jul.	Aug.	Sep.
# Species Observed	11	16	18
Most Abundant Species	Laughing gull (49.60%)	Laughing gull (51.40%)	Laughing gull (17.20%)
	Common tern	Common tern	Great black-backed gull
	Whimbrel	Great black-backed gull and Sanderling (tied)	Double-crested cormorant
Total # Birds Observed	365	1,436	1,006
*1 state listed avian species (Osprey) observed			

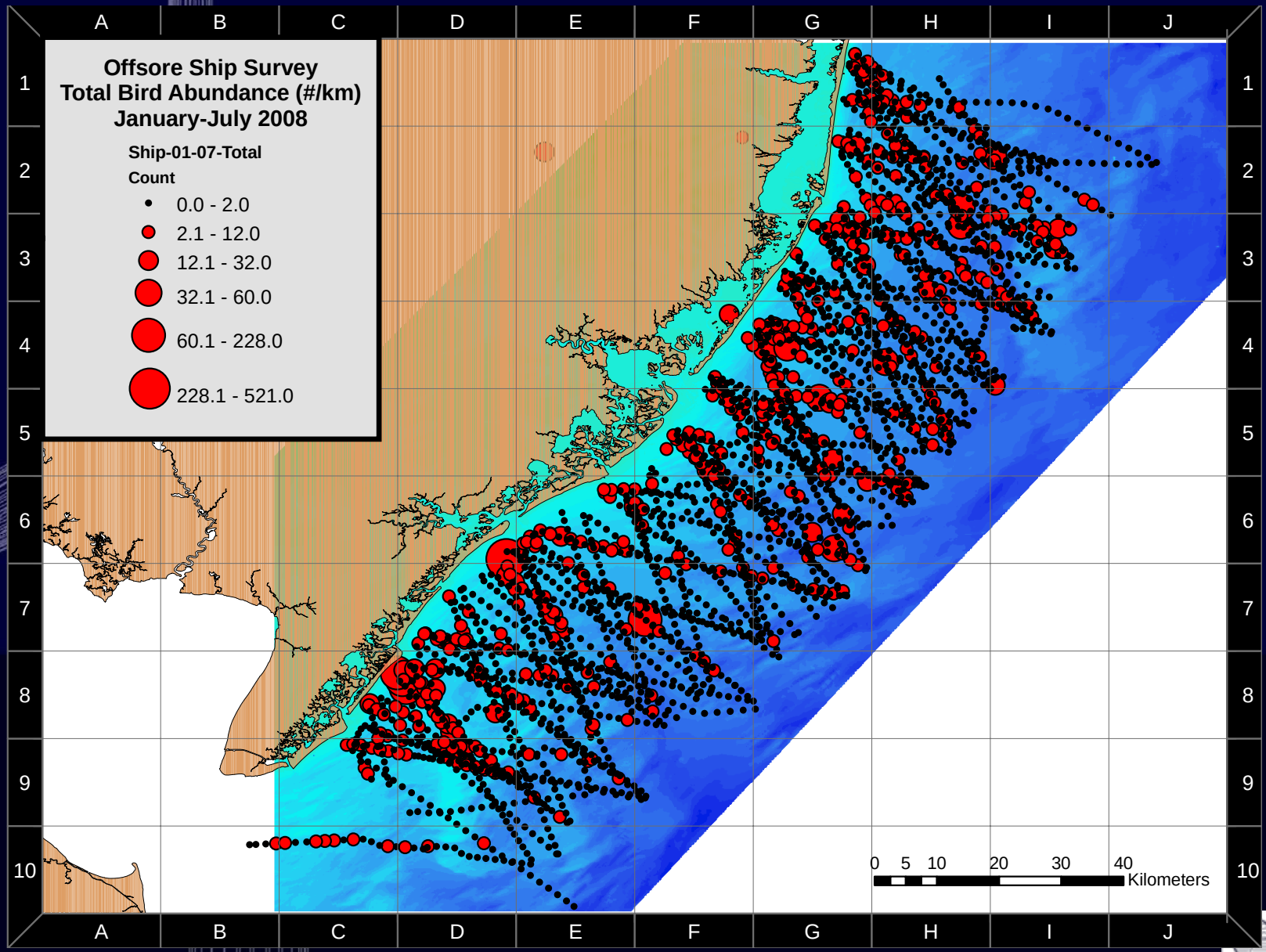


Large Boat Avian Surveys

- Double saw-tooth sample design
- Monthly

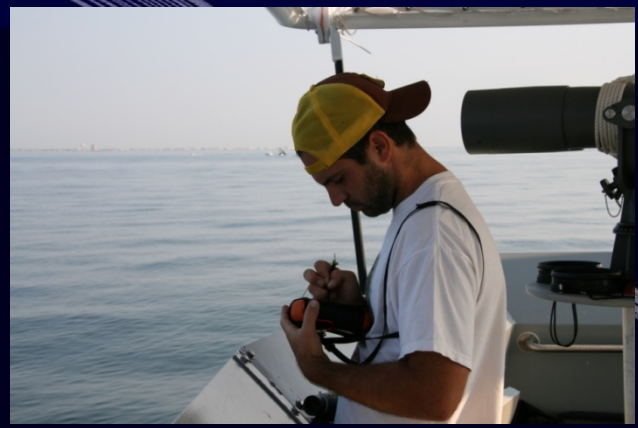


Large Boat Data



Large Boat Data

	1st Quarter		
	Jan.	Feb.	Mar.
# Species Observed	14	11	20
Most Abundant Species	Northern gannet (55.72%)	Limited data (single survey day completed)	Northern gannet (40.32%)
	loons		loons
	sea ducks		sea ducks
Total # Birds Observed	1,592	587	9,265
*no state listed avian species observed			



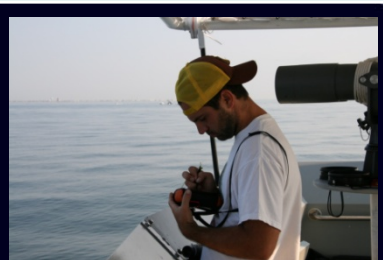
Large Boat Data

	2nd Quarter		
	Apr.	May	Jun.
# Species Observed	38	22	17
Most Abundant Species	Northern gannet (24.05%)	Northern gannet (31.09%)	Wilson's storm-petrel (29.30%)
	scoters (made up 51.39% of total birds)	Double-crested cormorant	Common tern
		Herring gull	Northern gannet
Total # Birds Observed	11,612	2,660	1,367
* 3 state listed avian species (Osprey, Northern harrier, Least tern) observed			

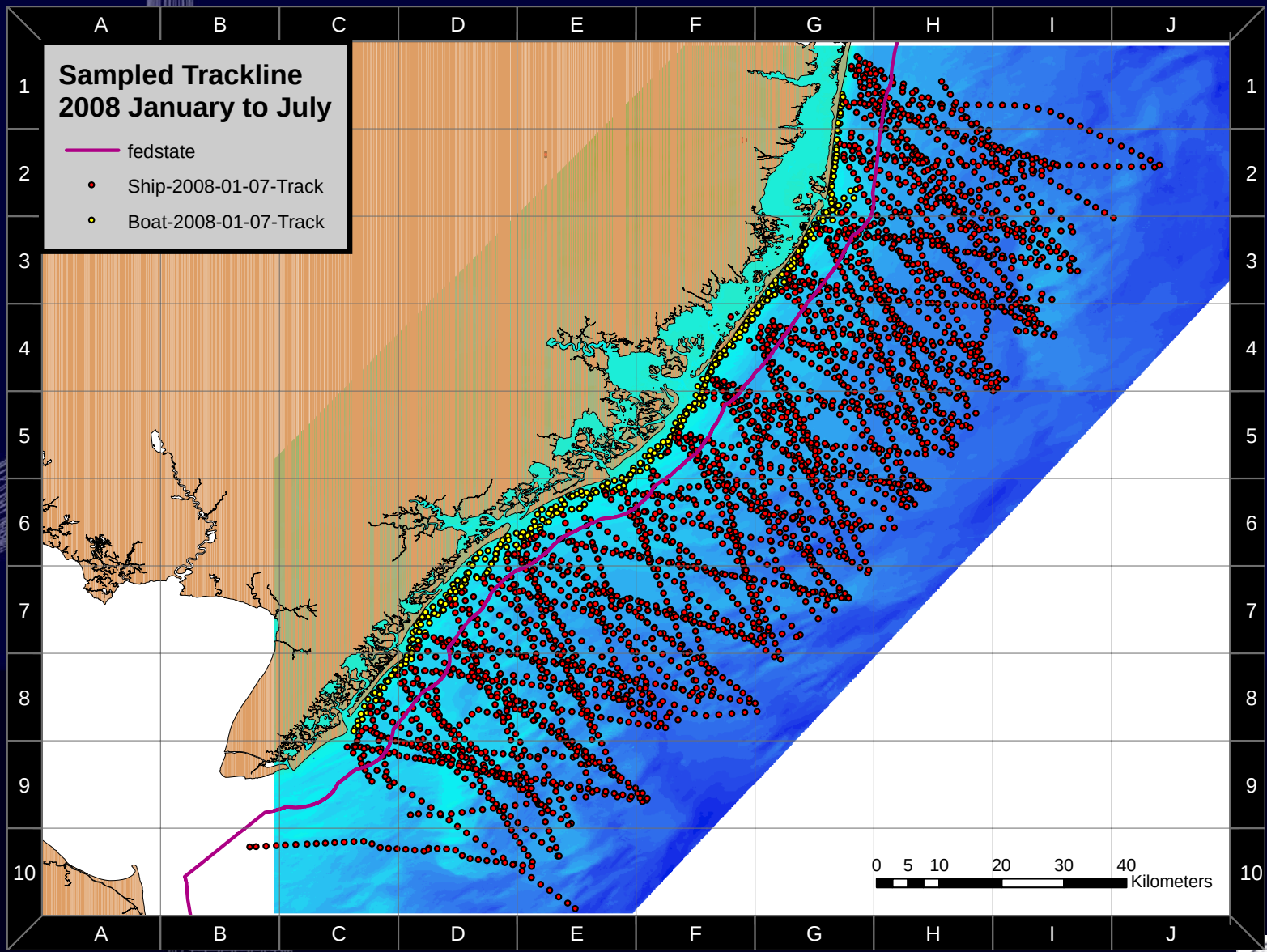
Large Boat Data

	3rd Quarter		
	Jul.	Aug.	Sep.
# Species Observed	16	18	27
Most Abundant Species	Laughing gull (30.90%)	Wilson's storm-petrel (44.40%)	Laughing gull (25.30%)
	Wilson's storm-petrel	Laughing gull	Common tern
	Common tern	Common tern	Great black-backed gull
Total # Birds Observed	1,592	2,819	1,606

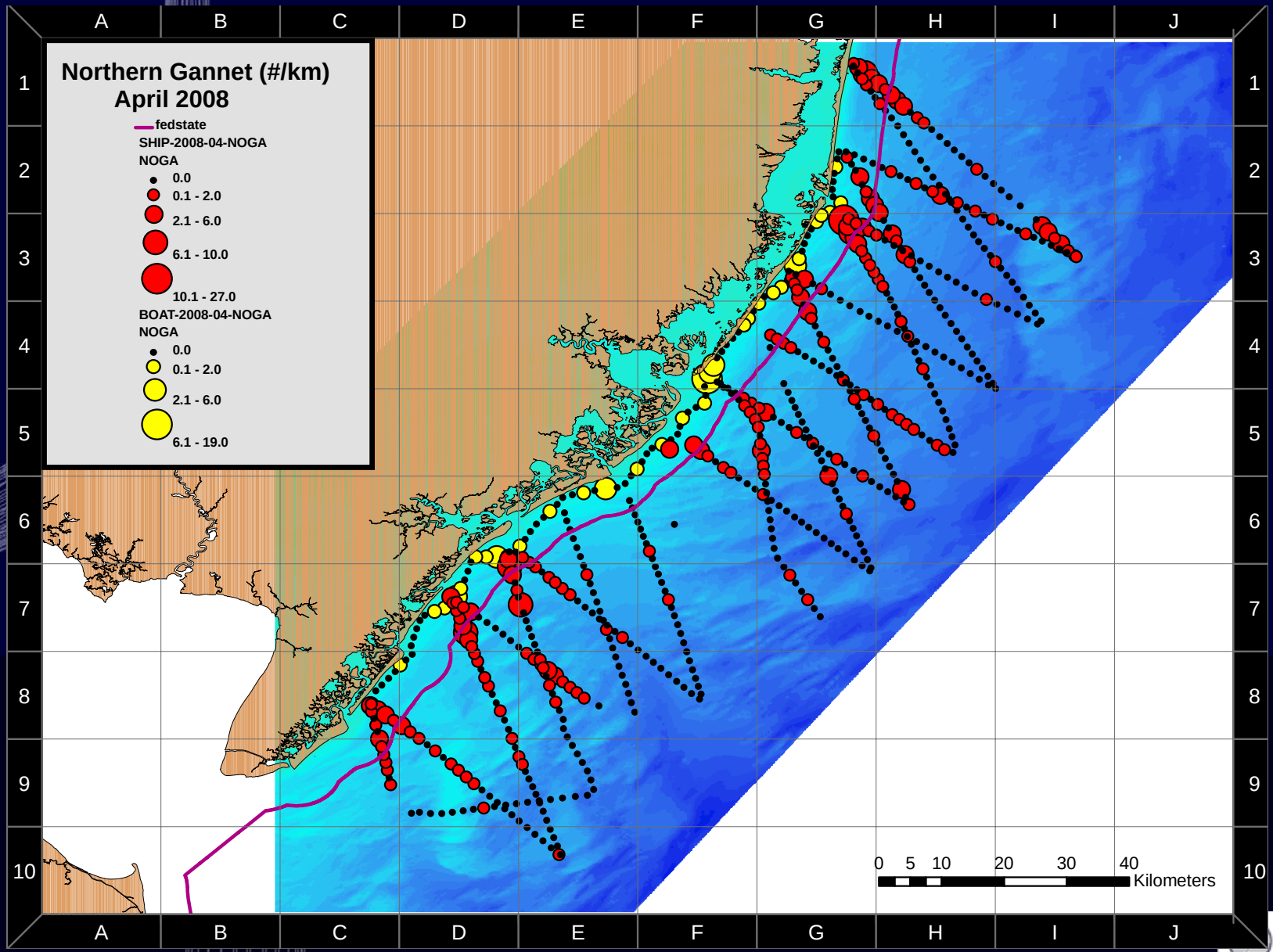
*3 state listed avian species (Osprey, Black-crowned night-heron, Yellow-crowned night-heron) observed



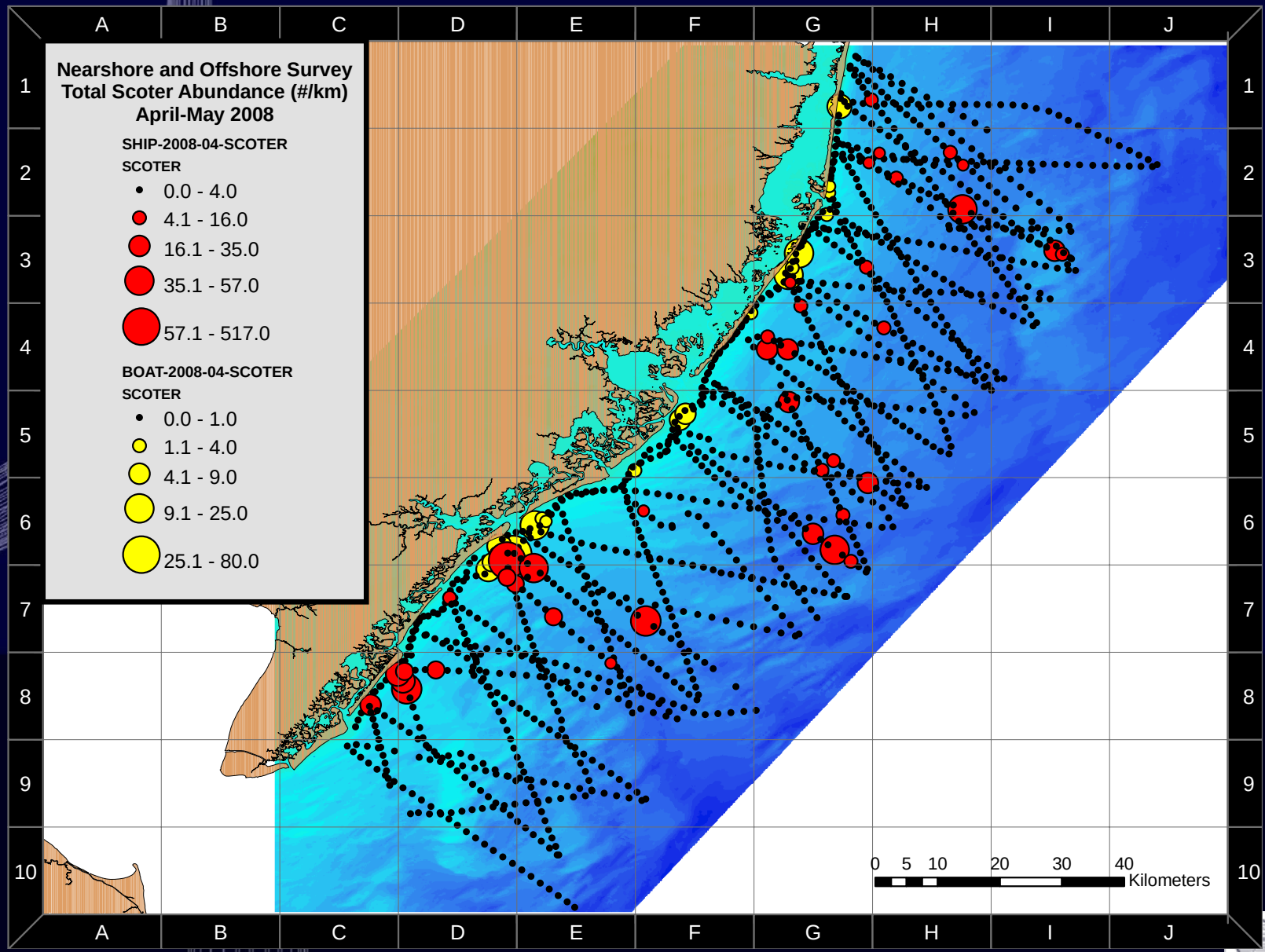
Sampled Trackline



Example – Northern Gannet Abundance

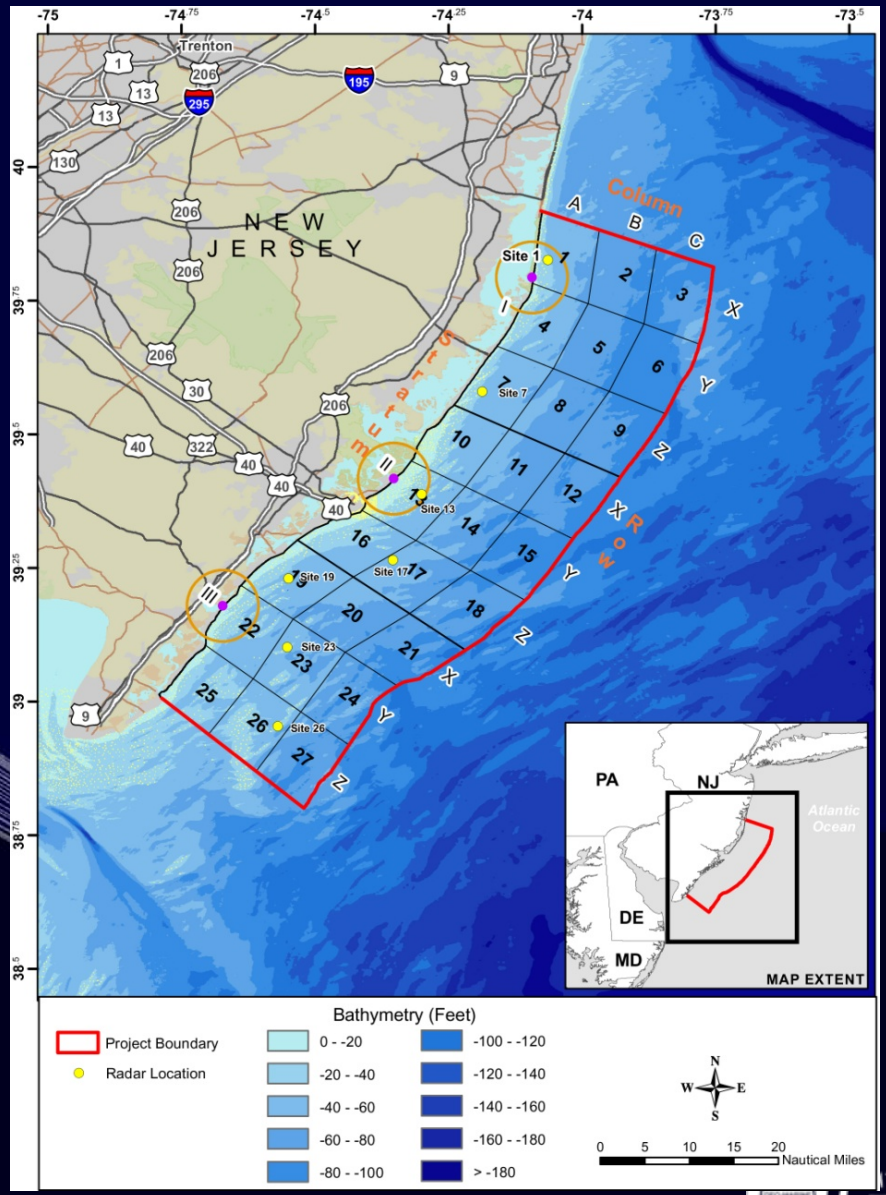


Example – Scoter Abundance



Avian Radar Study - Coastal Onshore

- Onshore locations:
  - Spring ‘08
    - Island Beach State Park; North Brigantine Beach; Corson’s Inlet State Park
  - Fall ‘08
    - Island Beach State Park; North Brigantine Beach; Sea Isle City



Avian Radar Study – Marine Offshore

- Offshore locations:
  - Spring ‘08
    - Planned for 9 offshore locations

      (Grids 1, 7, 13, 17, 19, 23, and 26)
  - Fall ‘08
    - Planned for 5 new offshore locations

      (Grids 23 and 26)

      *Barge accident 10/19/08

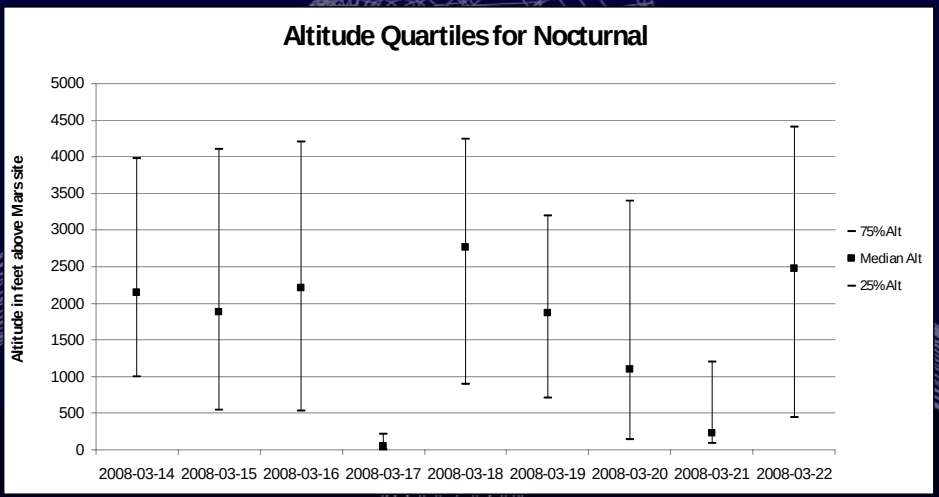
Avian Radar Study – Data

- Data is preliminary and analysis is ongoing:

Site 1 - TracScan® Nocturnal Activity					
Activity in tracks per hour per cubic kilometer.					
Date	Clear	Fog	Mist	Rain	Total
3/14/2008	3.59			4.63	4.49
3/15/2008	7.83			5.56	6.05
3/16/2008	17.35			11.72	14.49
3/17/2008	22.68			0	22.68
3/18/2008	34.17			14.87	24.39
3/19/2008	85.93			42.46	43.19
3/20/2008	70.99			112.14	81.97
3/21/2008	11.82			12.65	11.82
3/22/2008	19.41			22.36	21.54
Mean	28.36			26.48	27.34

Avian Radar Study – Data

- Data is preliminary and analysis is ongoing:



Site 1 - VerCat® Tracks per Hour per Kilometer by Altitude in Relation to Radar					
	Target Type				
Altitude Band	Small	Medium	Large	Flock	Total
Diurnal (1)					
100 feet and below	28.4	121.7	107.0	64.8	321.8
101 -1000 feet	64.7	213.7	141.4	100.7	520.6
1001 - 3000 feet	60.3	188.9	105.2	57.5	411.9
Higher than 3000 feet	83.0	191.4	69.8	54.6	398.8
Subtotal	236.4	715.7	423.4	277.7	1653.2
Nocturnal (2)					
100 feet and below	32.5	107.2	79.4	36.8	255.8
101 -1000 feet	75.7	242.5	148.6	77.8	544.6
1001 - 3000 feet	104.0	332.3	192.1	104.5	732.9
Higher than 3000 feet	177.8	402.5	157.6	127.6	865.4
Subtotal	390.0	1084.5	577.7	346.6	2398.7
Mean	313.4	900.6	500.8	312.2	2026.9

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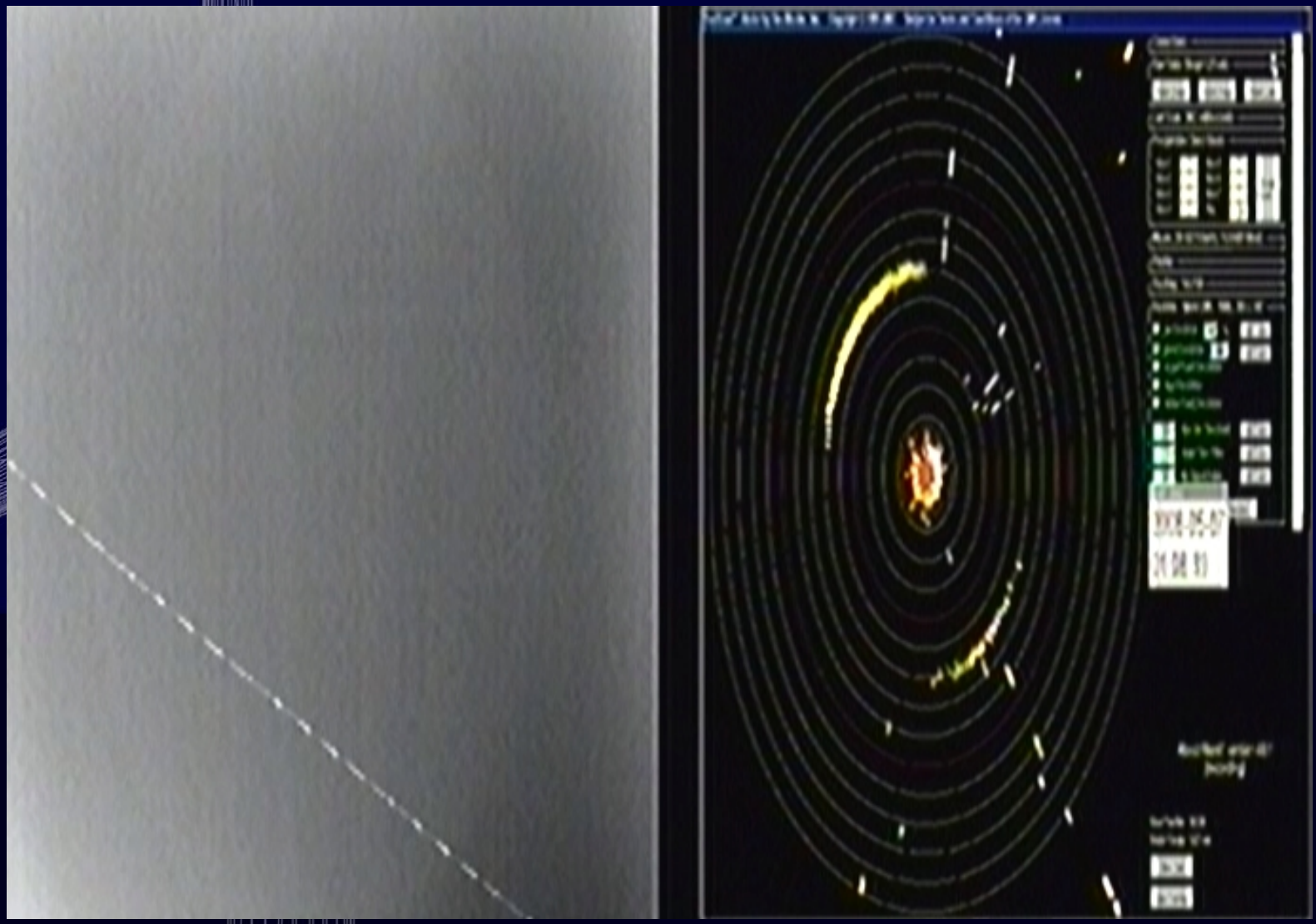
Thermal Imaging/Vertically Pointing Radar

Thermal Imaging/Vertically Pointing Radar

Thermal Imaging/Vertically Pointing Radar



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Ground Truthing and Observations

- Provide Confidence in the Marine Radar Program
- Ground Truthing once per sample location each season
- Recorded Data
  - Targets crossing the transect (vessel bow)
  - Select individual birds and different sized flocks (small, medium, large) of birds
  - Record: observation time, target identity, number, flight direction, estimated distance to bird, and estimated flight altitude

Field Studies and Work Elements

Marine Mammals, Sea Turtles, and Seals Studies

- Aerial
- Large Boat
- Acoustics

Oceanography

Literature Review

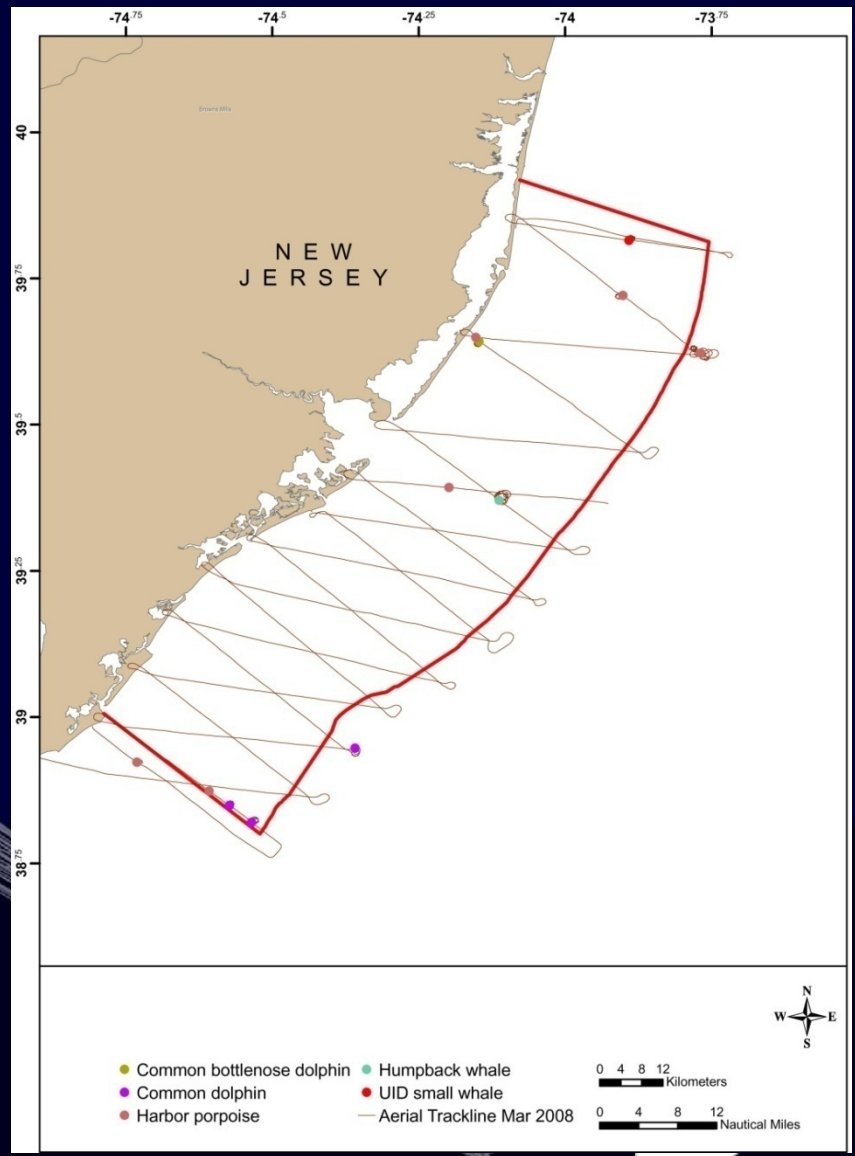
GIS Data Sources

Mapping, Spatial Modeling, Predictive Modeling

Impacts Assessment

Marine Mammal/Turtle Aerial Surveys

- February-May 2008
- February Transects flown along parallel lines
- March-May Transects flown in a saw-toothed pattern
- Aircraft Crash on May 17
- New Safety Protocols and flight requirements
- Flights will Resume in November 2008

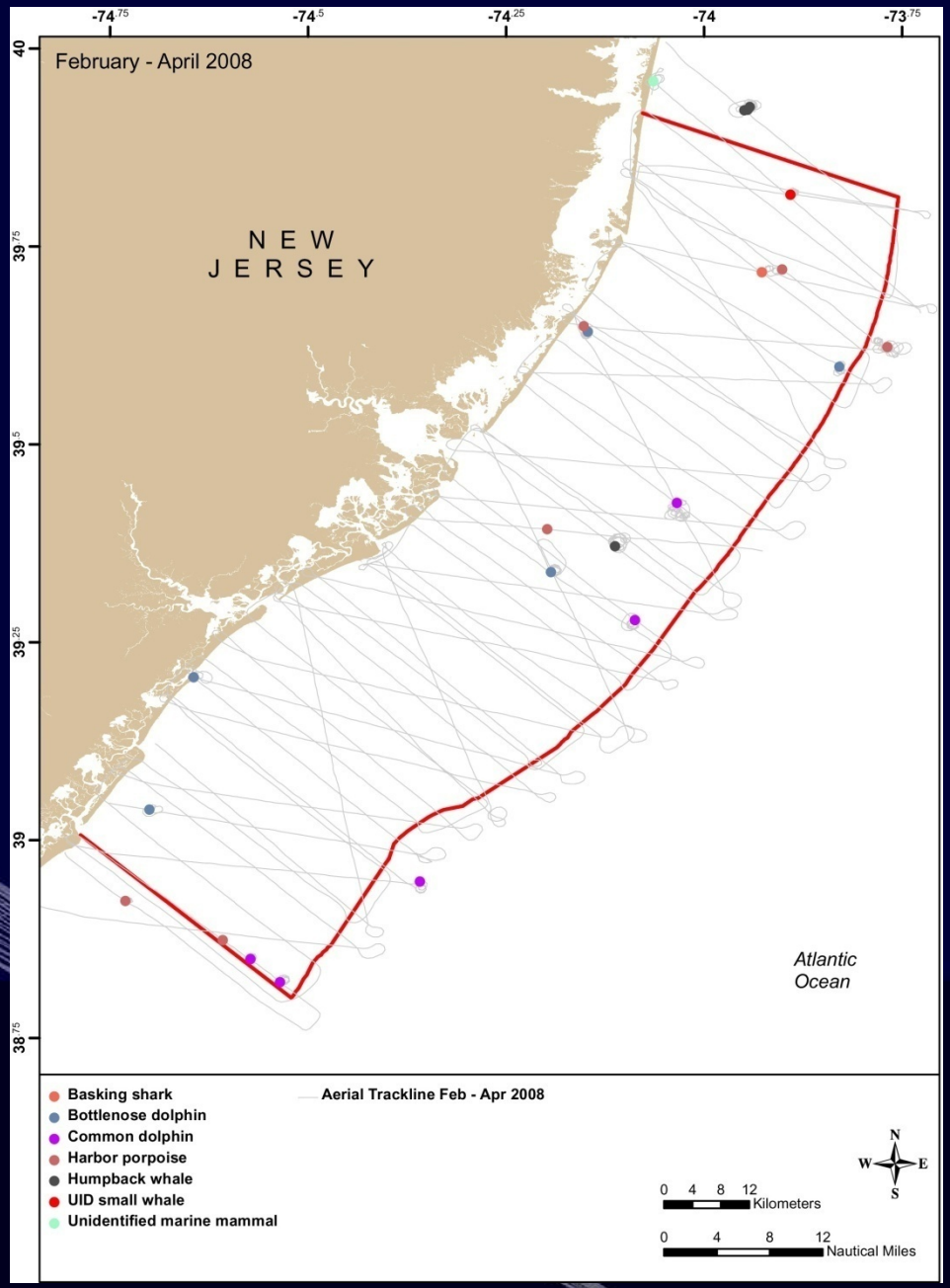


Aerial Data

Total length of transects flown = 1766 NM

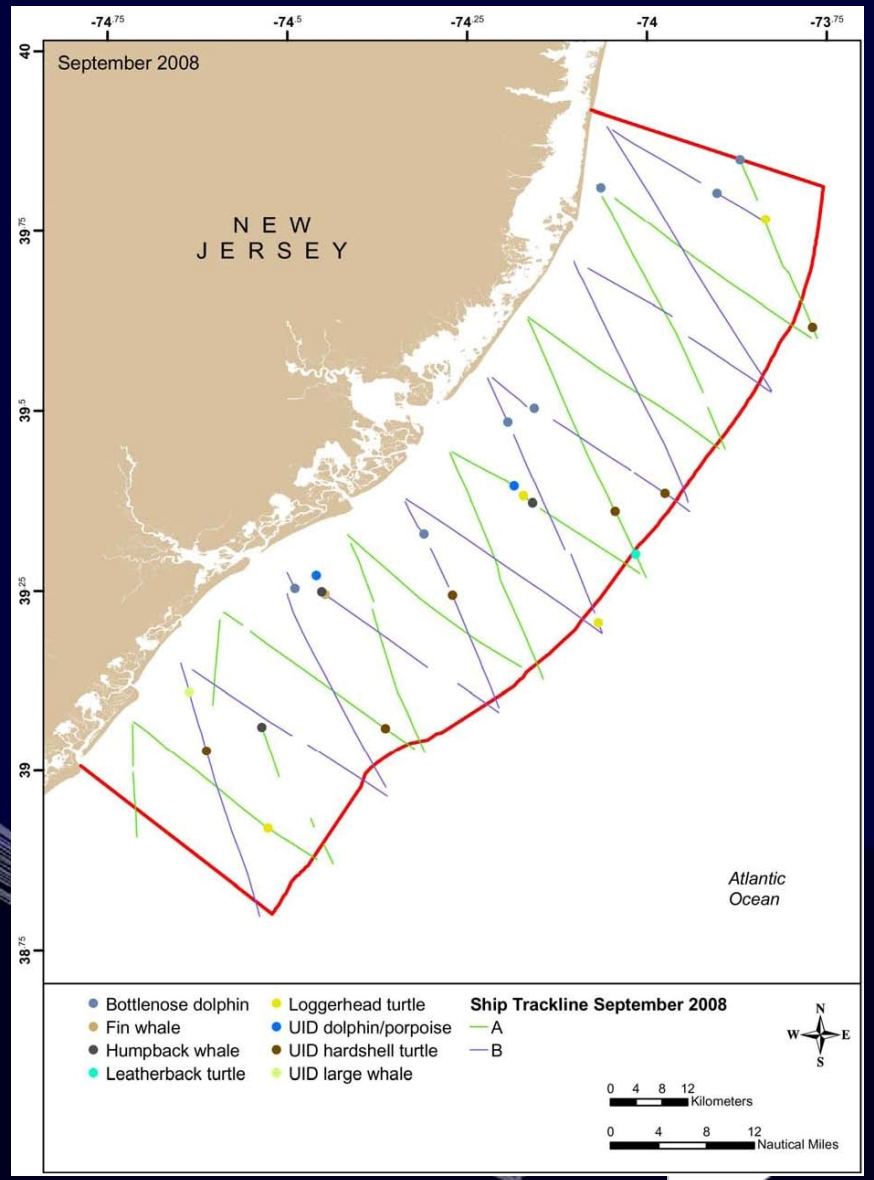
6 Species Identified

- Humpback Whale
- Common dolphin
- Common bottlenose dolphin
- Loggerhead Sea Turtle



Marine Mammal and Turtle Ship Surveys

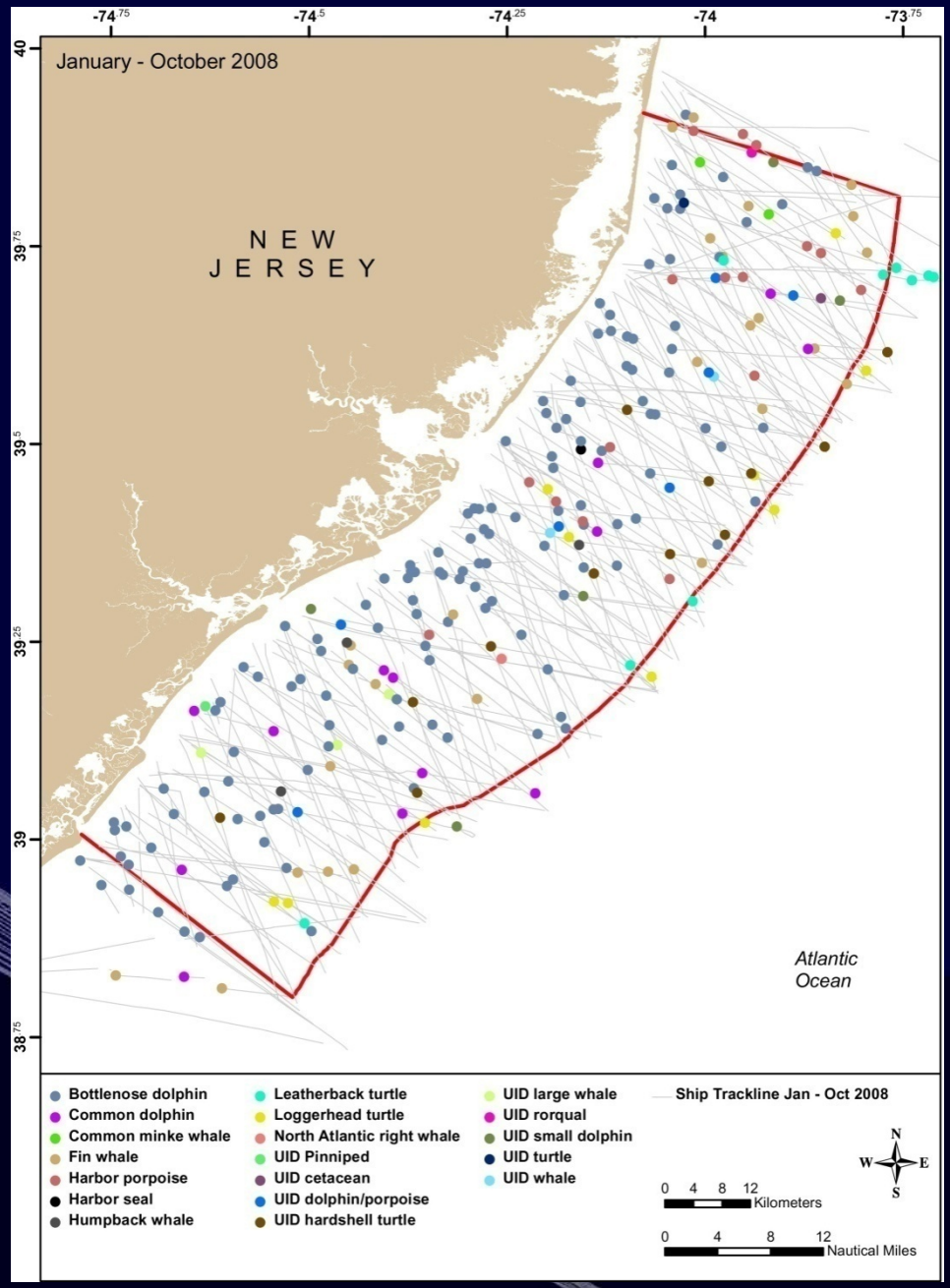
- Transects conducted from Jan-Oct 2008
- 10 Ship Surveys
- Transects conducted along a saw-toothed pattern
- Total length = 3107 NM



Ship Survey Data

- 7 Marine Mammals Identified
- 5 UID Cetaceans or Whales
- 2552 individual animals
- 2 Turtles – 32 animals
- 1 Seal – 3 animals

Species	Total #
Humpback Whale	9
Minke Whale	2
Fin Whale	49
Common Dolphin	266
Harbor Porpoise	38
Bottlenose Dolphin	2186
Harbor seal	3
North Atlantic Right Whale	2
Loggerhead Turtle	22
Leatherback Turtle	10



Activities & Photos conducted under NMFS Permit No. 10014-01

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Activities & Photos conducted under NMFS Permit No. 10014-01

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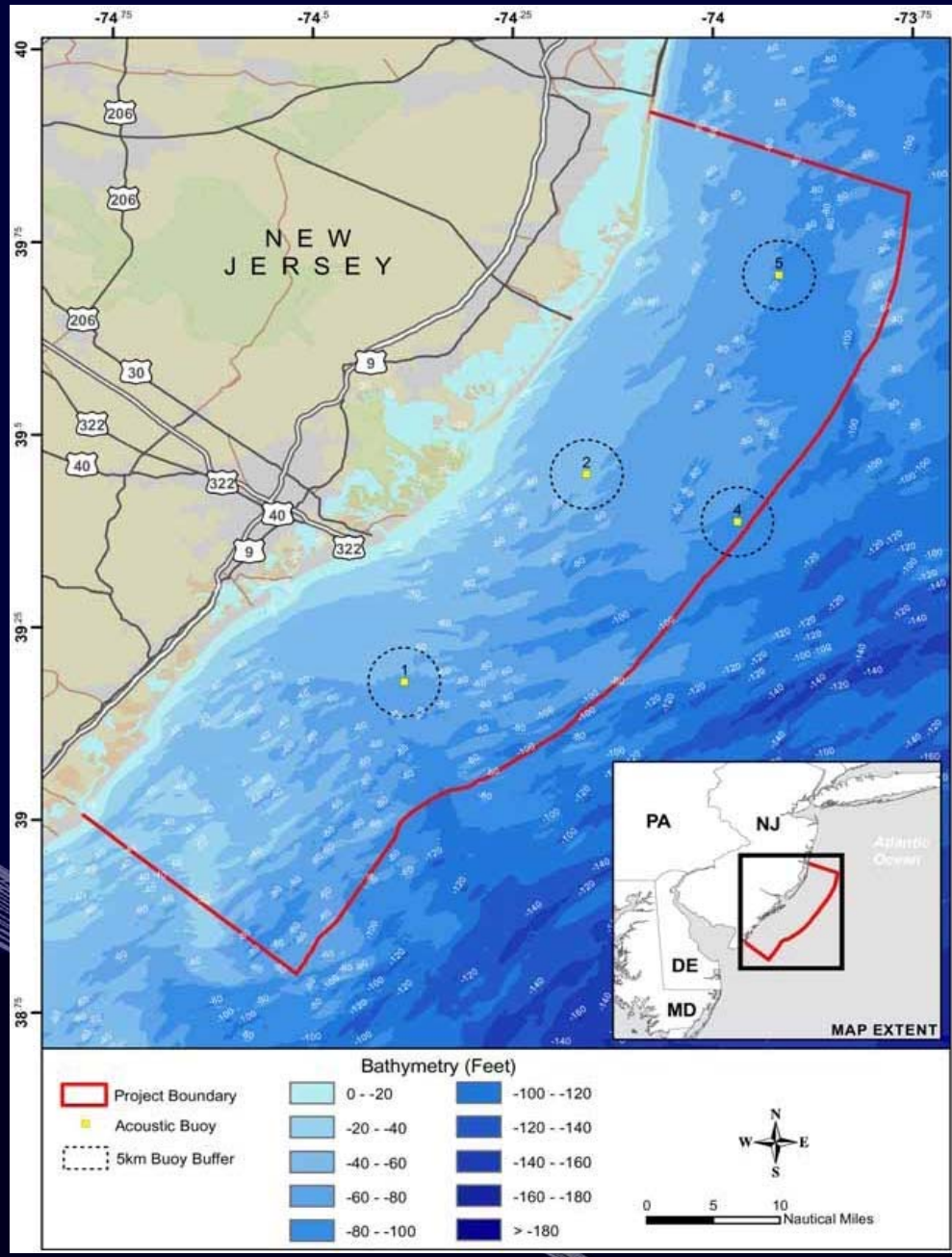
Activities & Photos conducted under NMFS Permit No. 10014-01

Passive Acoustic Survey

- Deploy 5 pop-up buoys
  - 3 months life
  - 0-1000 Hz
  - ~5 km listening range
  - Quantify abundance of marine mammal vocalizations



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Acoustic Surveys

- Marine Autonomous Recording Units (Pop-Ups)
- Deployed March 2008
- 4 Recovered on June 20
- Data Downloaded, Refurbished, and Redeployed on June 24
- 4 Recovered on Sept 17-18
- Data Downloaded, Refurbished, and 5 Redeployed on October 2
- Data Analysis In Progress

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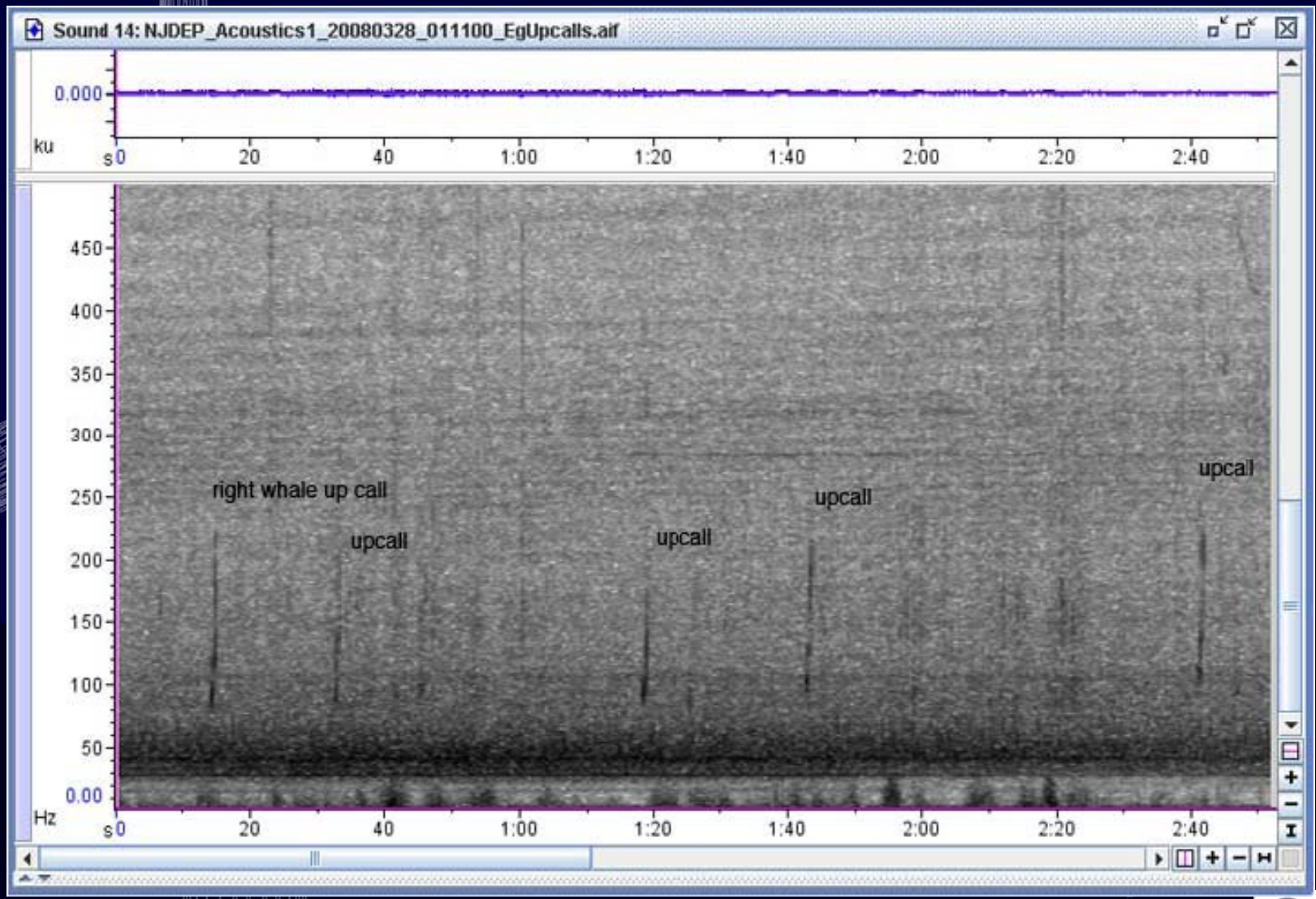
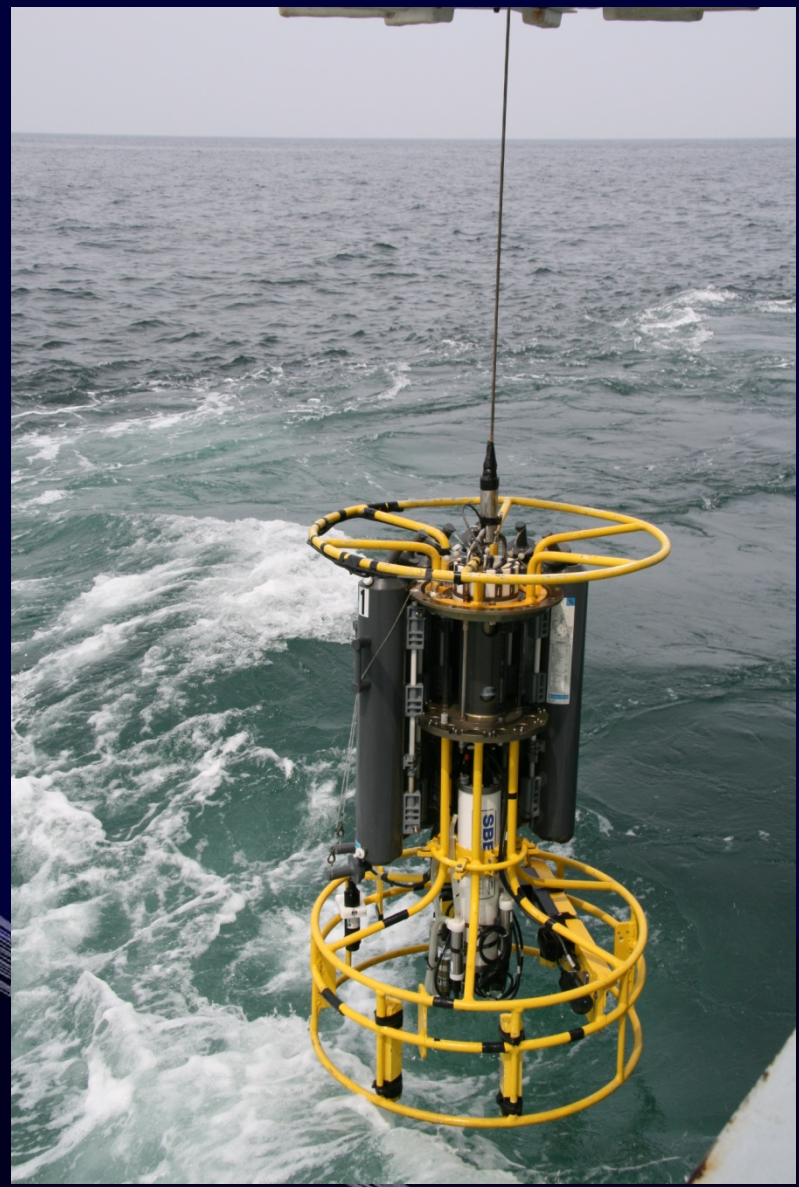
Spectrogram of Five Right Whale Calls



Oceanography

- Surface Mapping System
  - •Date, Time, Water Depth, Long-Lat
  - •Climatic Parameters
    - •Wind speed, Wind direction, Temperature, Relative Humidity
  - •Dynamic Parameters
    - •Water Temperature, Salinity
    - •Fluorometric chlorophyll, CDOM, and PAR
- •Conductivity-Temperature-Depth Profiles
- •Acoustic Doppler Current Profiler



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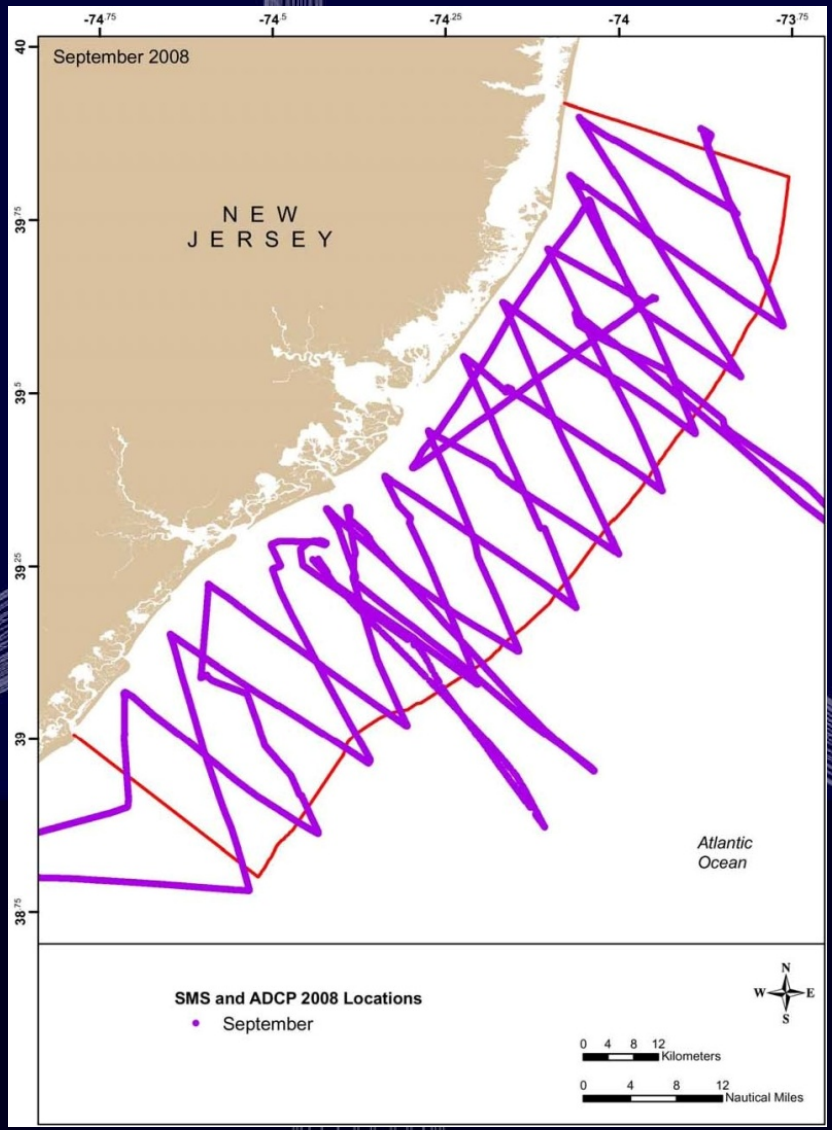
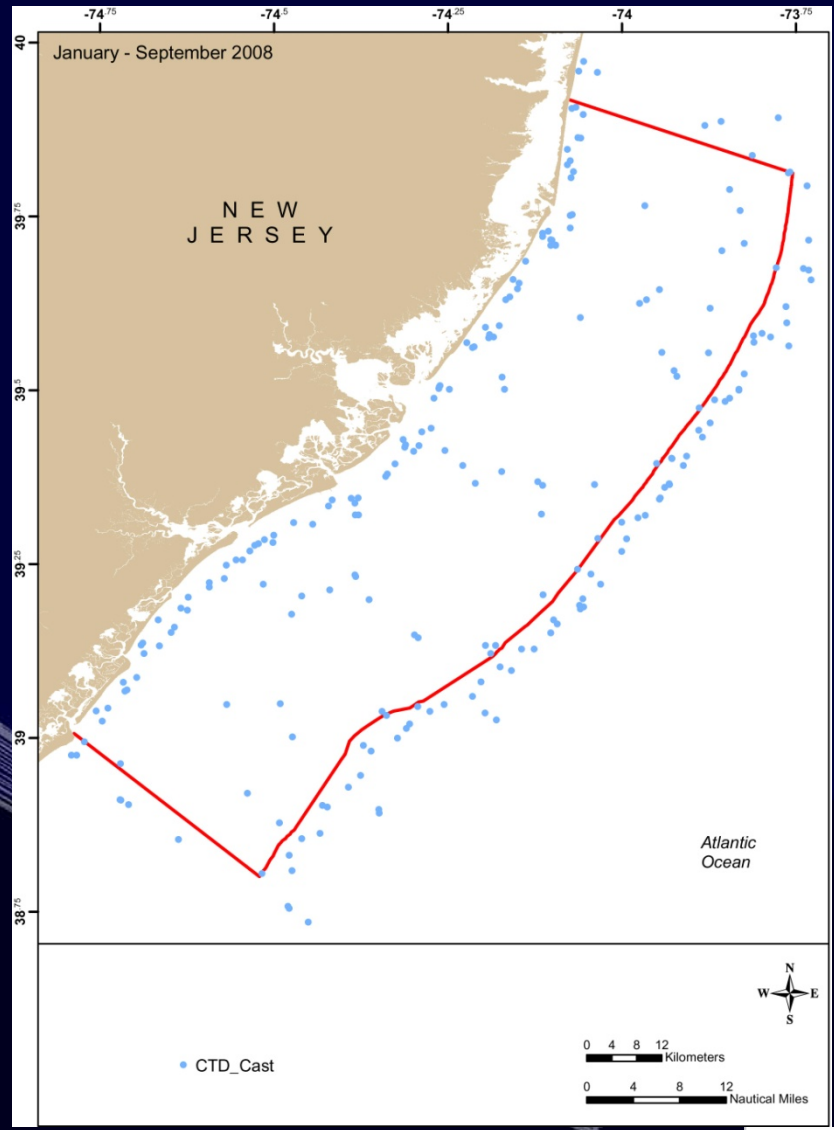
SMS, ACDP, and CTD Sample Sites



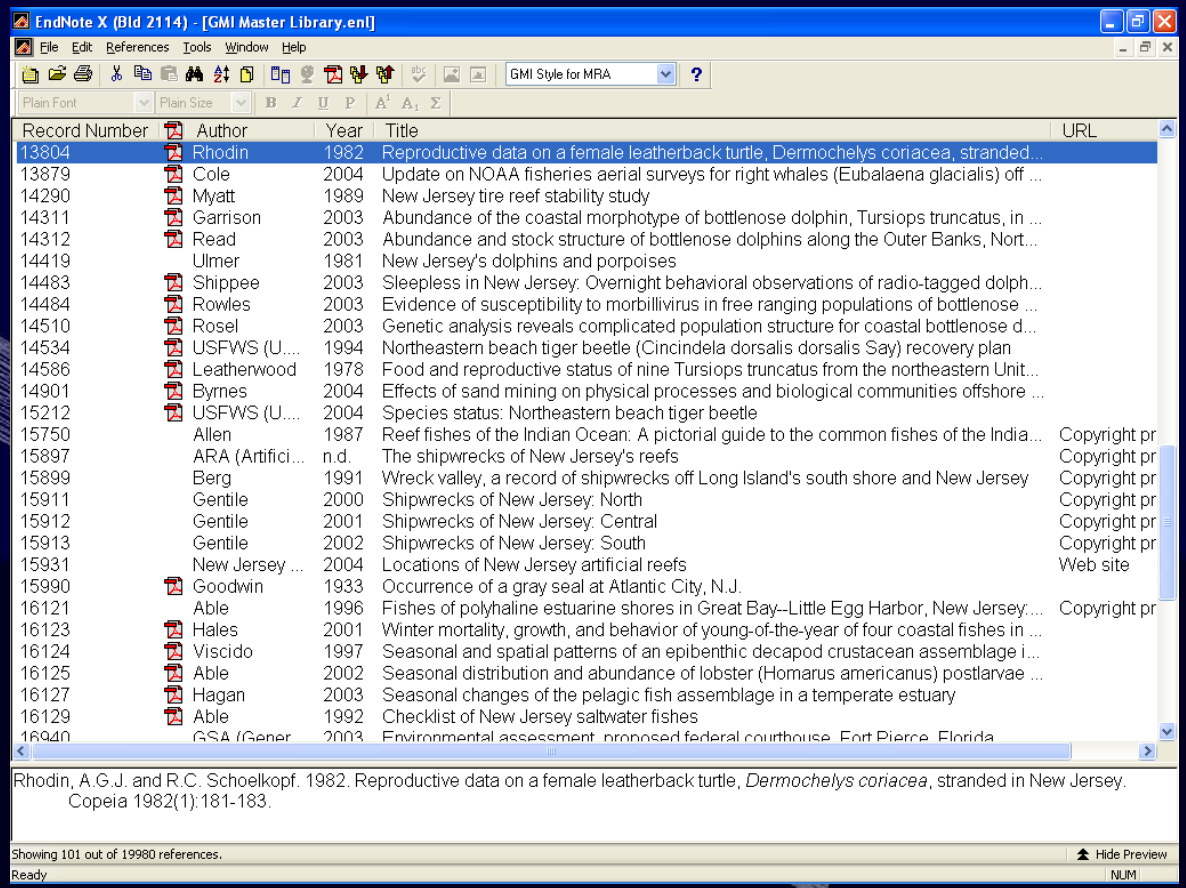


Literature Review

Collected, Reviewed, Keyworded and Catalogued 454 References

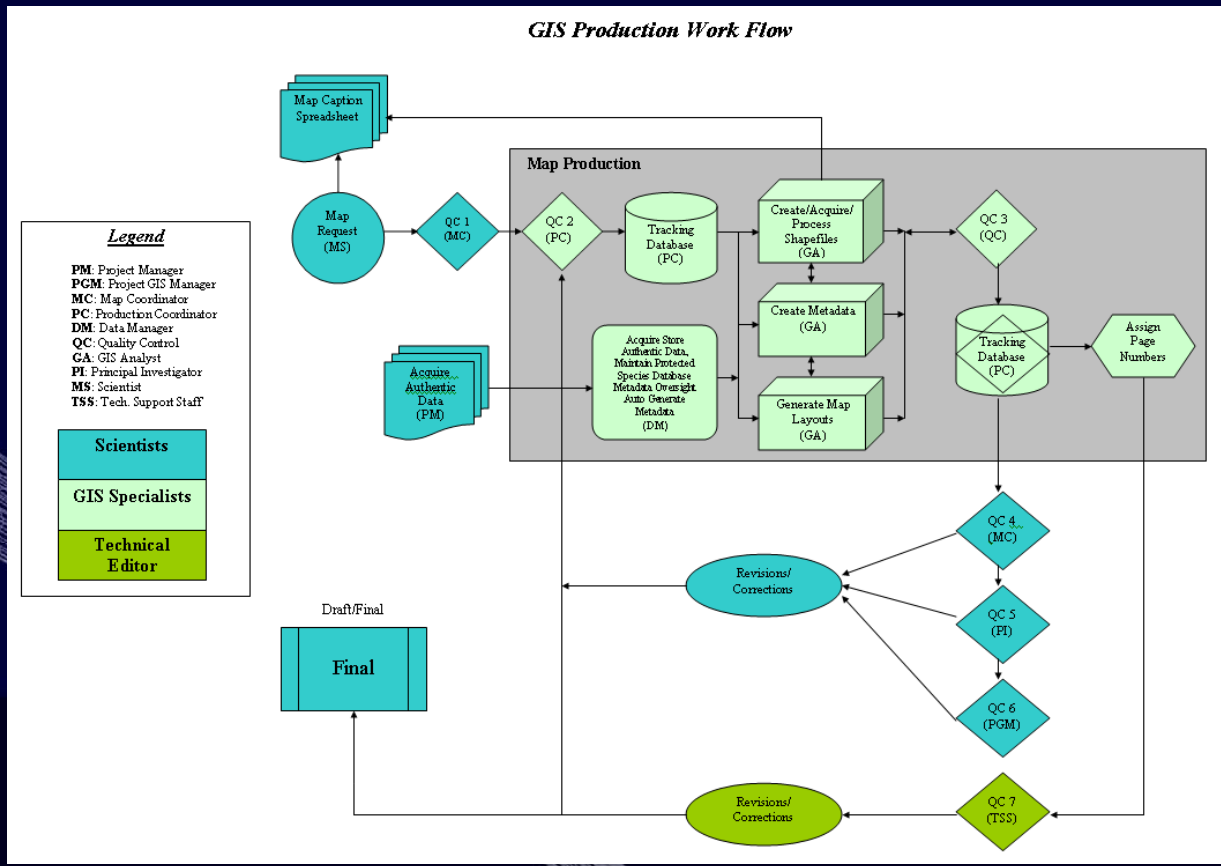
Electronically scanned and catalogued using EndNote software

Categories	# References
Fishes	146
Marine Birds	35
Marine Mammals	133
Offshore Wind Farms	89
Sea Turtles	51



GIS Digital Data Layers from Multi-Source Data Banks

- MMS – 9
- National Atlas - 1
- NOAA – 5
- USFWS – 5
- NJDEP – 52
- NJDOT – 1
- NJHWPPC - 12
- USGS – 5
- 93 Data Source Layers

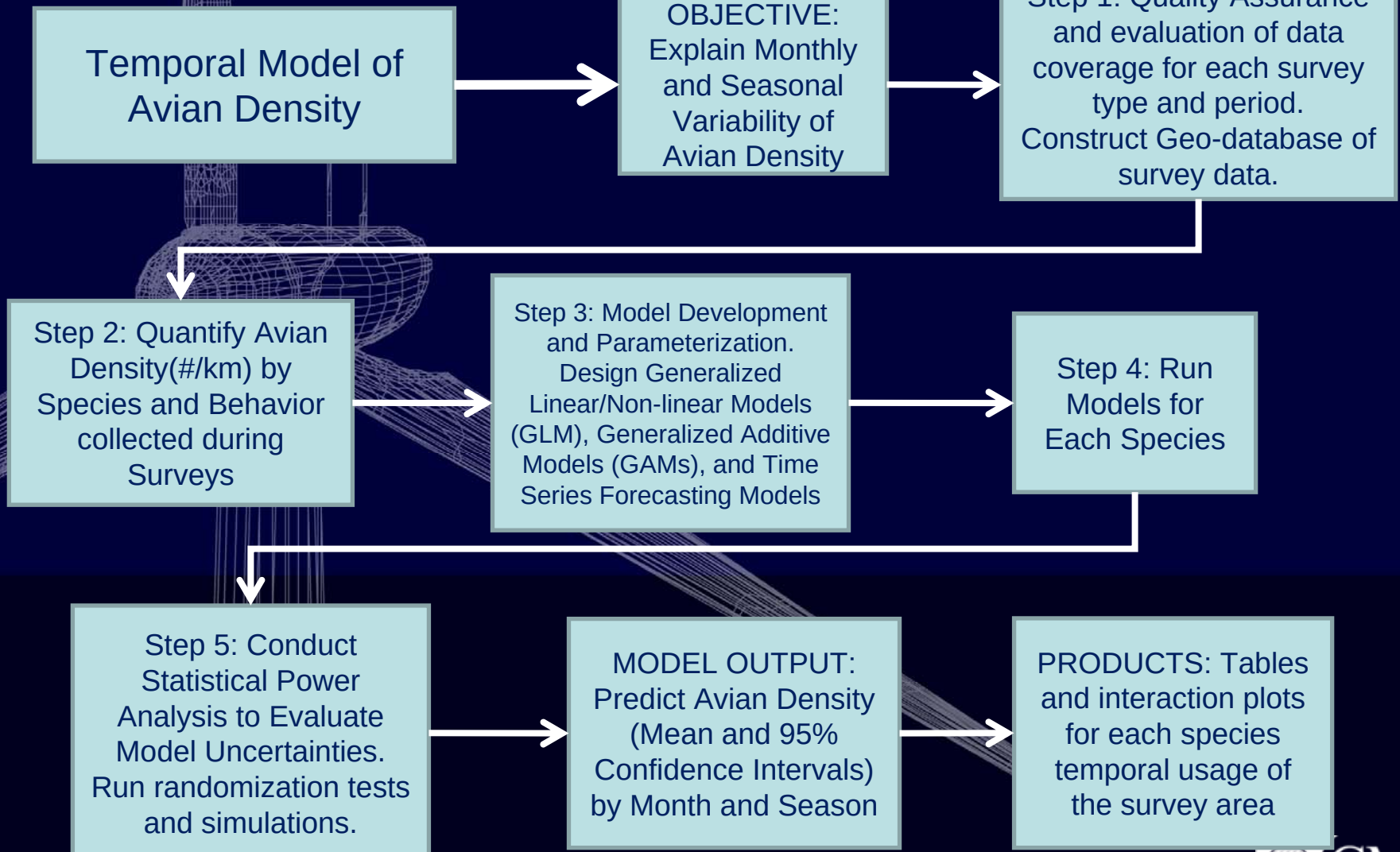


GIS QA/QC PROCEDURES

Mapping, Spatial Modeling, Predictive Modeling

- ***Density Estimates – Cetaceans and Sea Turtles***
  - ***–Aerial and Shipboard***
  - ***–Distance Methodology (***CREEM, University of St. Andrew's, UK)
  - ***–DSM (Density Surface Models) for each species by season using Generalized Additive Modeling with covariates***
  - ***–Covariates***
    - ***dynamic = SST, salinity, chlorophyll***
    - ***static= bottom depth, bottom slope, distance from shore, and lat-lon***
- ***Density Estimates – Birds***
  - ***–Temporal Model for Density/Distribution***
  - ***–Spatial Model for Density/Distribution***

Estimating and Predicting Seabird Density-Distribution: Temporal Model



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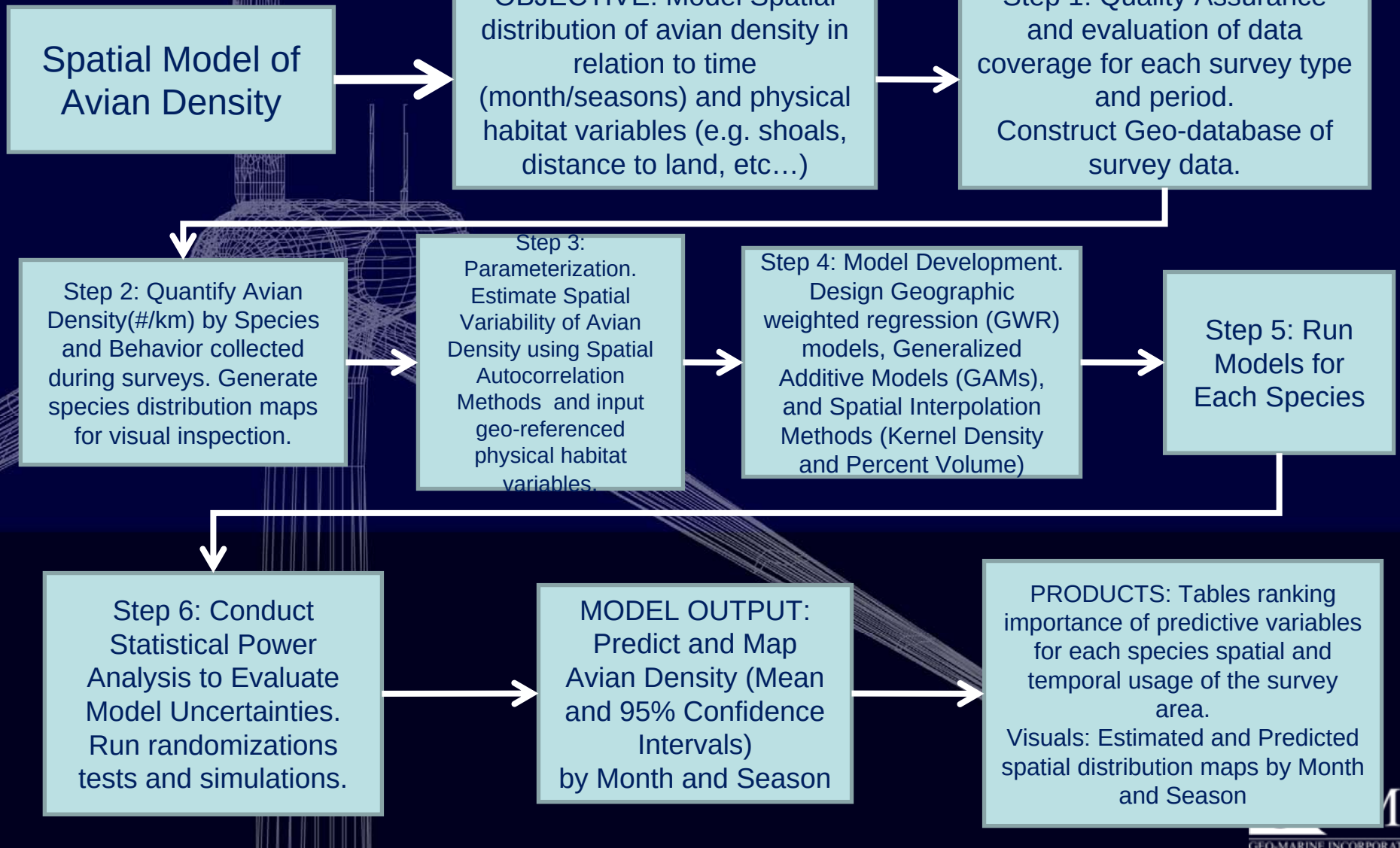
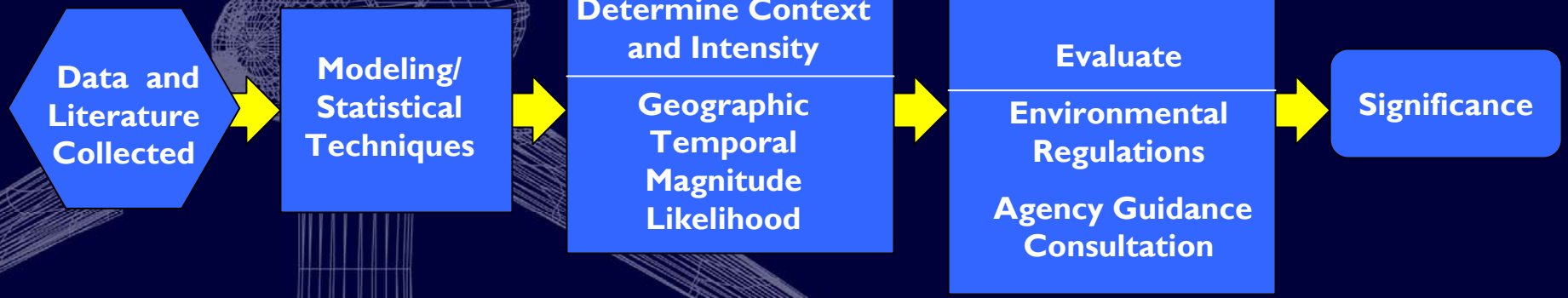
Estimating and Predicting Seabird Density – Distribution: Spatial Model



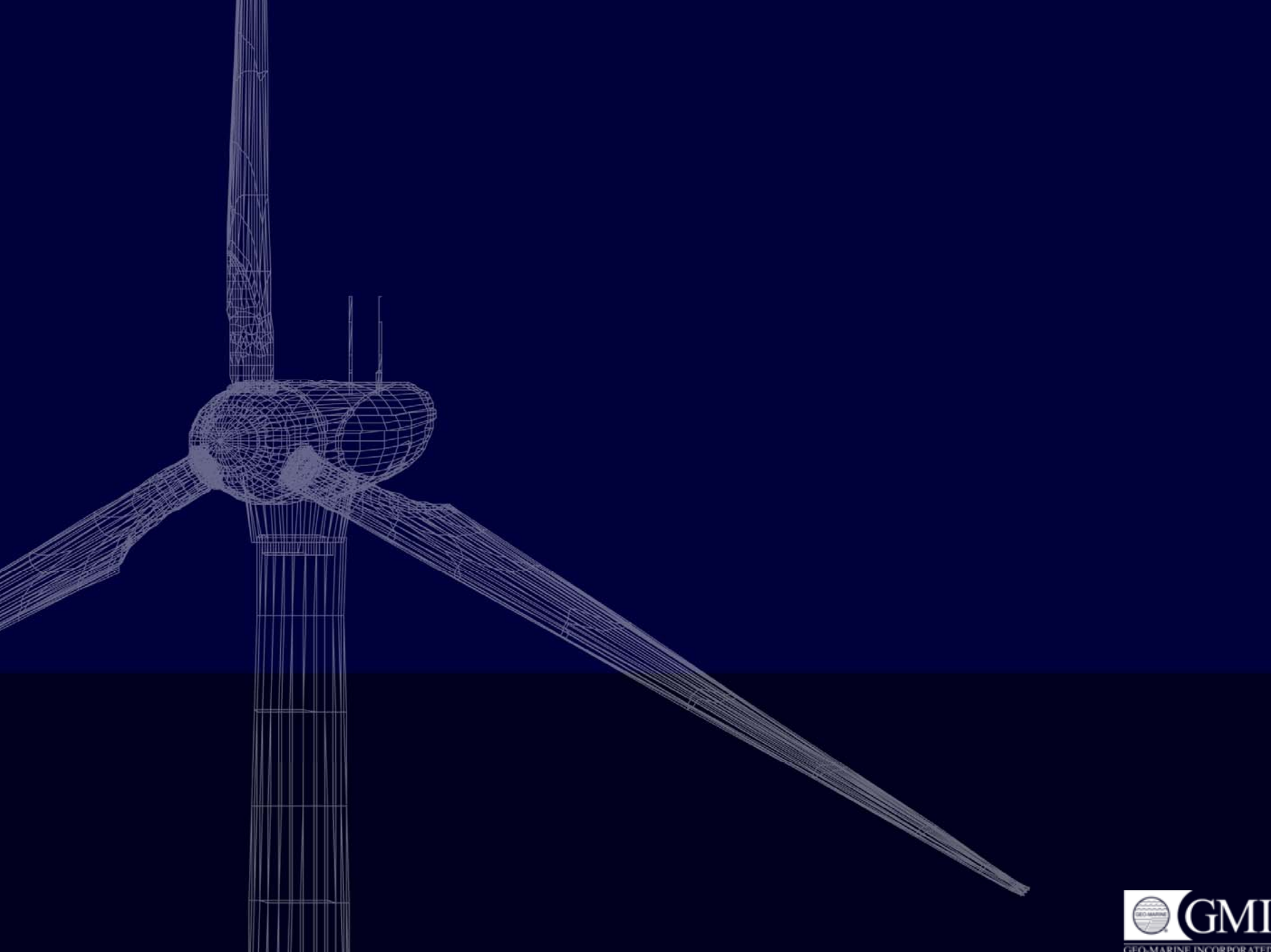
Environmental Impact Analysis Process

- Data Gathering
- Ensure a thorough understanding of wind farm construction and operational activities
- Define the potential impacts
- Assess impacts
- Coordinate and consult with regulators
- Determine biologically significant sites within the study area

Impacts Assessment



A Few Members of the Geo-Marine Marine Mammal and Bird Survey Team



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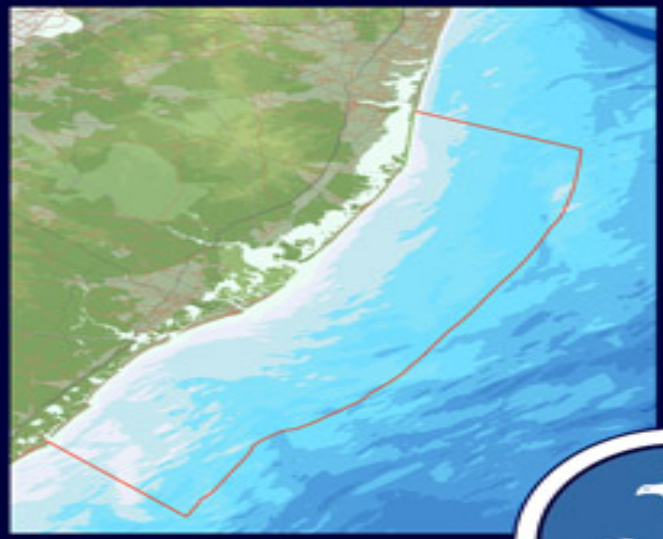
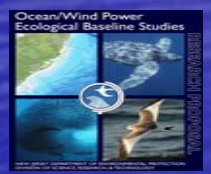
Ocean/Wind Power Ecological Baseline Studies

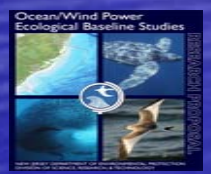


NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF SCIENCE, RESEARCH, & TECHNOLOGY



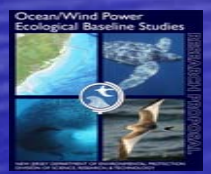
Ocean / Wind Power Ecological Baseline Studies

Gary A. Buchanan, Ph.D.
Project Manager
Bureau of Natural Resources Science
Division of Science, Research & Technology
NJDEP



Interested Party Group (IPG)

- Organizations that have an interest in offshore power (e.g., environmental, natural resource or development standpoint)
- DEP outreach
  - Provide updates on the project's progress and results



STATE OF NEW JERSEY

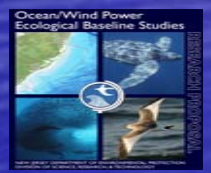
Blue Ribbon Panel on Development of Wind Turbine Facilities in Coastal Waters

FINAL REPORT

TO

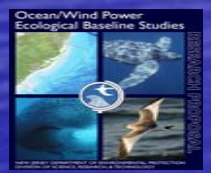
GOVERNOR JON S. CORZINE

APRIL 2006



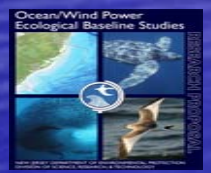
Background

- New Jersey's Blue Ribbon Panel on Development of Wind Turbine Facilities in Coastal Waters
- Recommendations
  - Natural Resources
  - Economics, Tourism
  - Ocean Uses



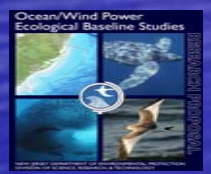
Project Objectives

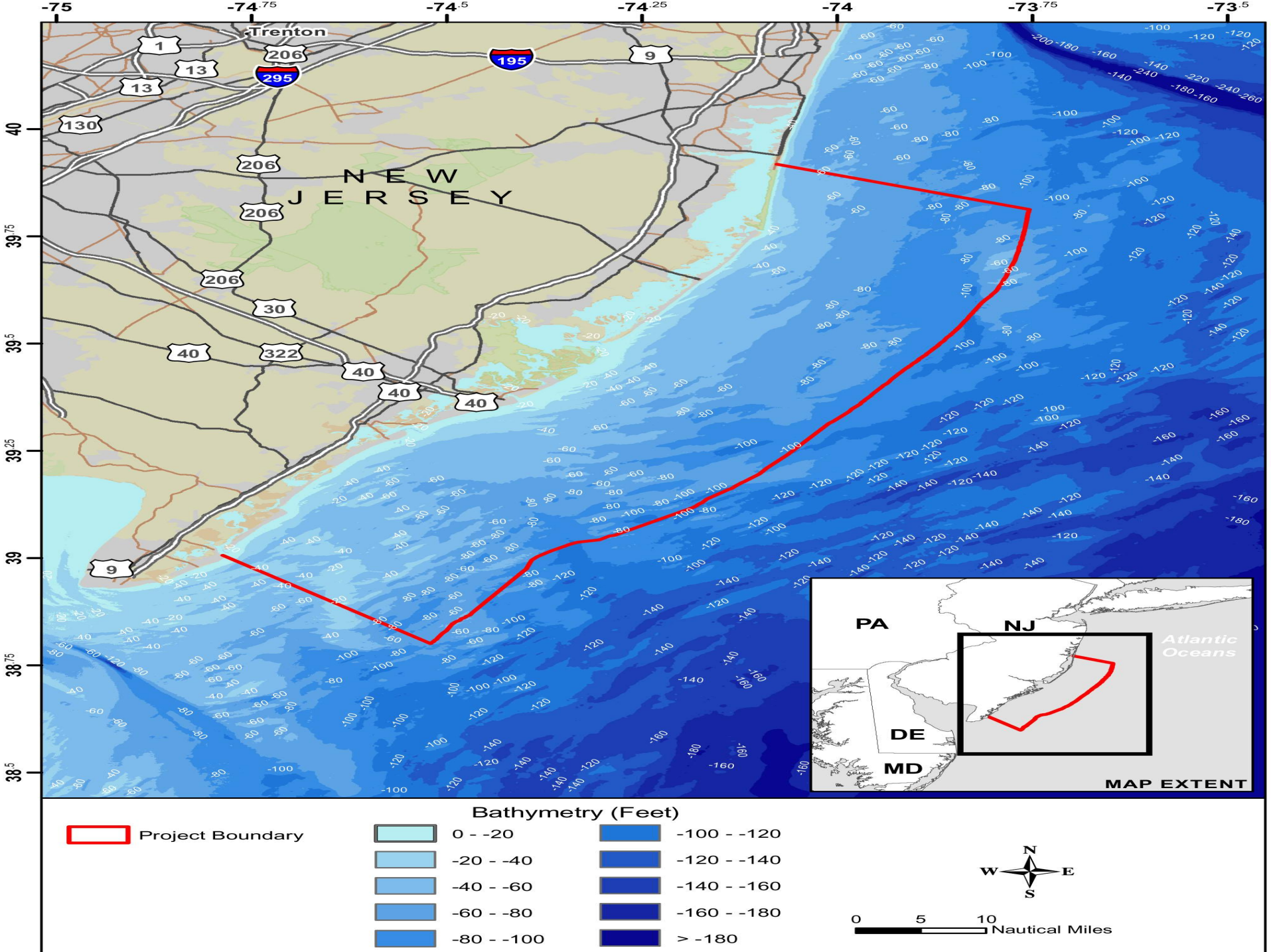
- Address Natural Resource portion of Blue Ribbon Panel Recommendation No. 4:
  - "Baseline data should be collected regarding the distribution, abundance, and migratory patterns of avian species, fish, marine mammals and turtles in the offshore area where development may be feasible."



Project Design

- Blue Ribbon Panel
- European Studies
- Technical Review Committee
  - USFWS, NMFS, MMS, NJDEP
  - North American Methods

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Project Boundary
Bathymetry (Feet)
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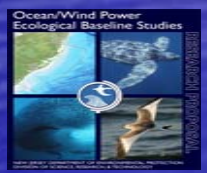
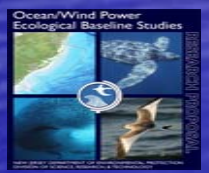
Specific Objectives

- In the Study Area, what are the abundance, distribution, and utilization of:
  - Bird Species (flight behavior)
  - Marine Mammals
  - Sea Turtles



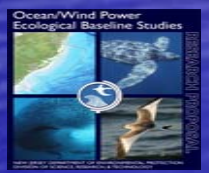
Specific Objectives

- What are the abundance, utilization, and distribution of other marine biota (e.g., fish, shellfish) in the Study Area?
- What is the distribution of other existing natural resources, including, but not limited to, shoals, sand borrow areas, artificial reef sites, and other pre-existing resources in the Study Area?



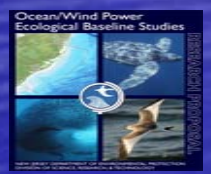
Specific Objectives

- Using predictive modeling, mapping, and environmental assessment methodologies what portions of the study area are more or less suitable for wind/alternative energy power facilities based on potential ecological/environmental impacts?



Field Studies

- Three Primary Surveys:
  - Avian
  - Marine Mammal
  - Sea Turtle
- Supporting Studies:
  - Oceanographic

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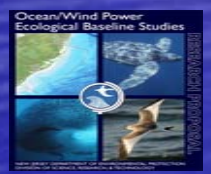
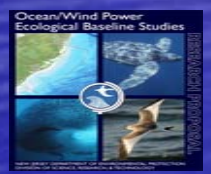
Other Studies

- Literature Review
- Data Compilation (digital and historical)
- Model Development
- Impact Assessment
- GIS
- Reporting



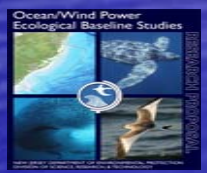
Budget

- $4.9 million
- Baseline Surveys: >80% of budget
- Remaining Budget:
  - Literature Review/Data Compilation
  - Predictive Modeling
  - Impact Assessment
  - Reporting



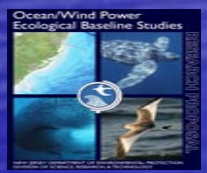
Overall Process

- Technical Review Committee – State & Federal Agencies
- Peer Review Group – Independent Review
- Interested Party Group



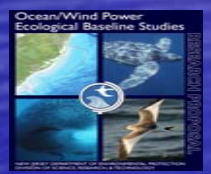
Challenges/Issues

- Weather – Visual surveys need to be conducted under good conditions
- Vessels – Limitations on operation (e.g., storms, availability)
- Aerial Surveys
- Radar Lift Boat – damaged Oct. 19



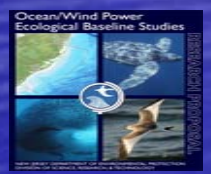
Schedule

- 18-month study
- Field Work: 1/2008 – 6/2009
- Interim Report – January (Feb) 2009
- Draft Final Report – September 2009
- Final Report – December 2009



Status

- 10 months of surveys (56%) complete
- Literature Review ongoing
- Data compilation and analysis continuing
- Interim Report



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Related Sites

Blue Ribbon Panel on Development of Wind Turbine Facilities in Coastal Waters

The New Jersey Department of Environmental Protection (NJDEP), Division of Science, Research & Technology (DSRT) issued a Solicitation for Research Proposals (SRP) in order to address the need for baseline ecological/natural resource data as recommended by the State of New Jersey Blue Ribbon Panel on Development of Wind Turbine Facilities in Coastal Waters.

The objective of this study is to conduct baseline studies in waters off New Jersey's coast to determine the current distribution and usage of this area by ecological resources. The scope of work includes the collection of data on the distribution, abundance and migratory patterns of avian, marine mammal, sea turtle and other species in the study area over an 18-month period.

- Agenda - Interested Party Group Meeting, November 9, 2007
- Response to Bidders Questions (May 11, 2007)
- Addendum (May 11, 2007)
- Solicitation of Proposal - Ocean/Wind Power Ecological Baseline Studies (April 19, 2007)

For more information regarding this project, please contact Gary A. Buchanan, Ph.D., Bureau of Natural Resources Science Division of Science, Research & Technology, NJDEP.

http://www.nj.gov/dep/dsr/ocean-wind/