A wireframe model of a wind turbine is centered in the background. The model shows the tower, nacelle, and three blades in a light blue color against a dark blue background. The nacelle and blades are rendered with a grid of lines, giving it a technical, schematic appearance.

**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

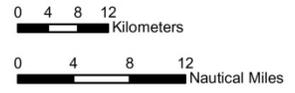
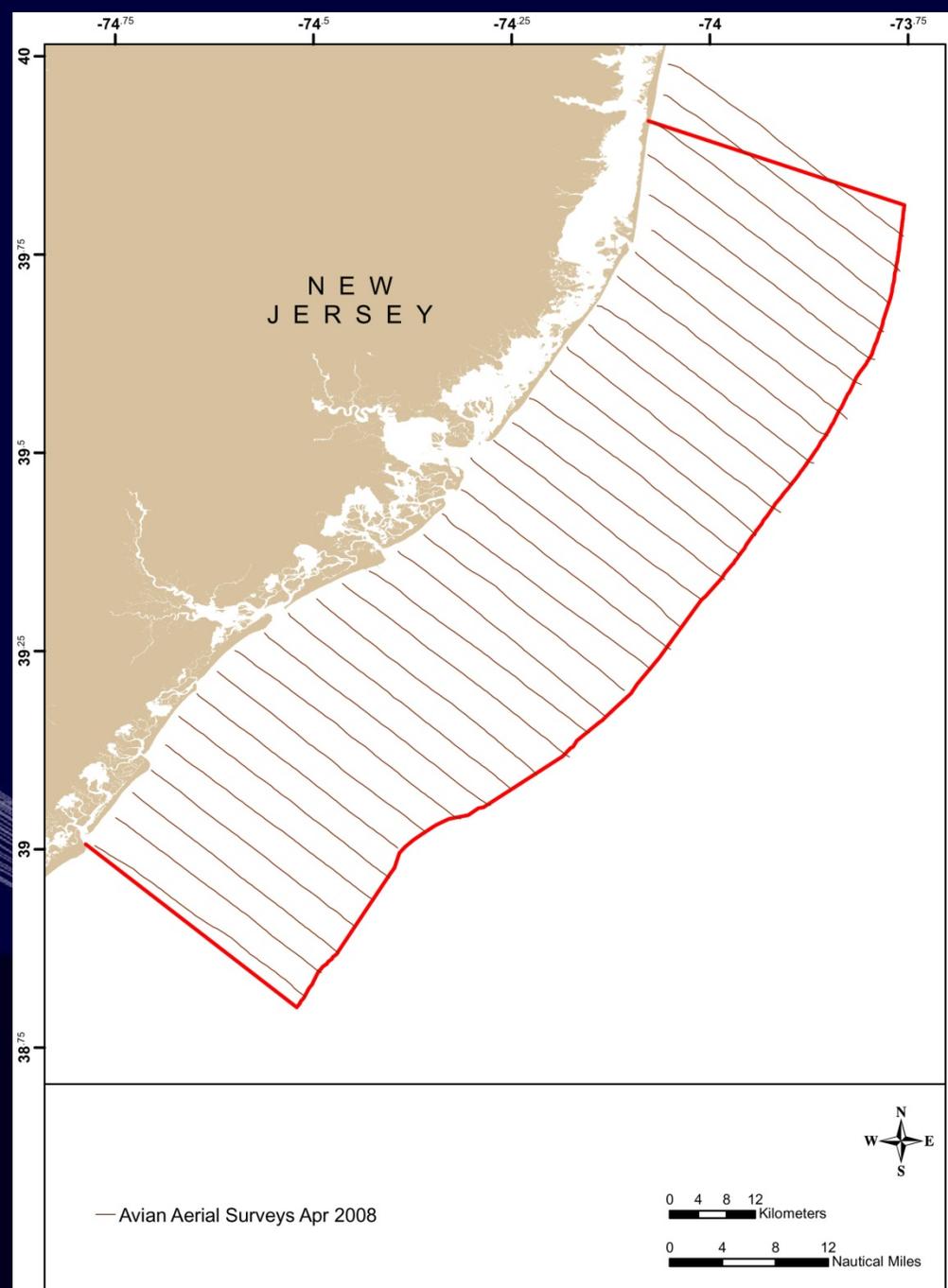
- Aerial
- Small Boat
- Large Boat

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



— Avian Aerial Surveys Apr 2008

Aerial Data

10 Species Identified

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

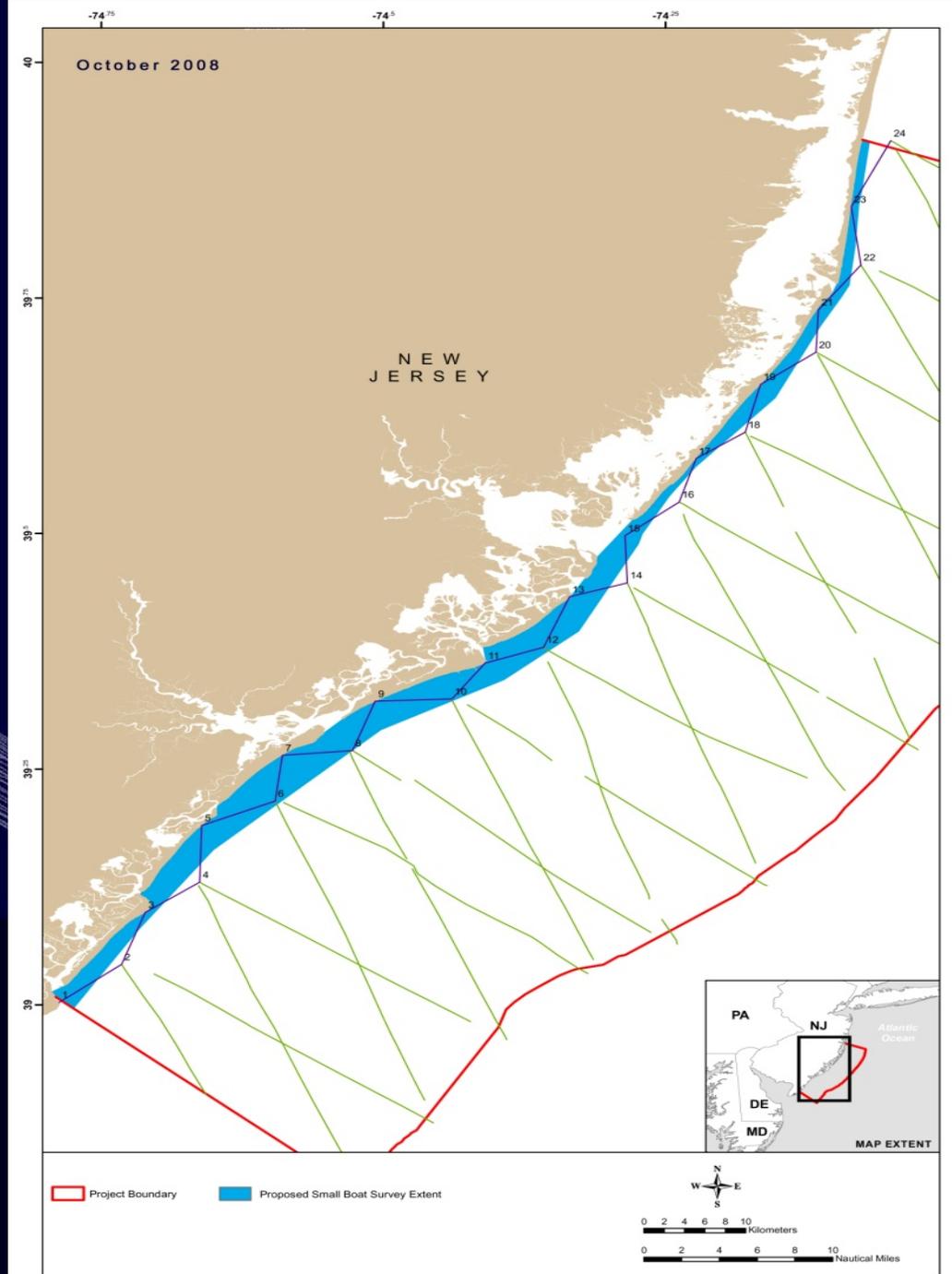
Data Review

- 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)

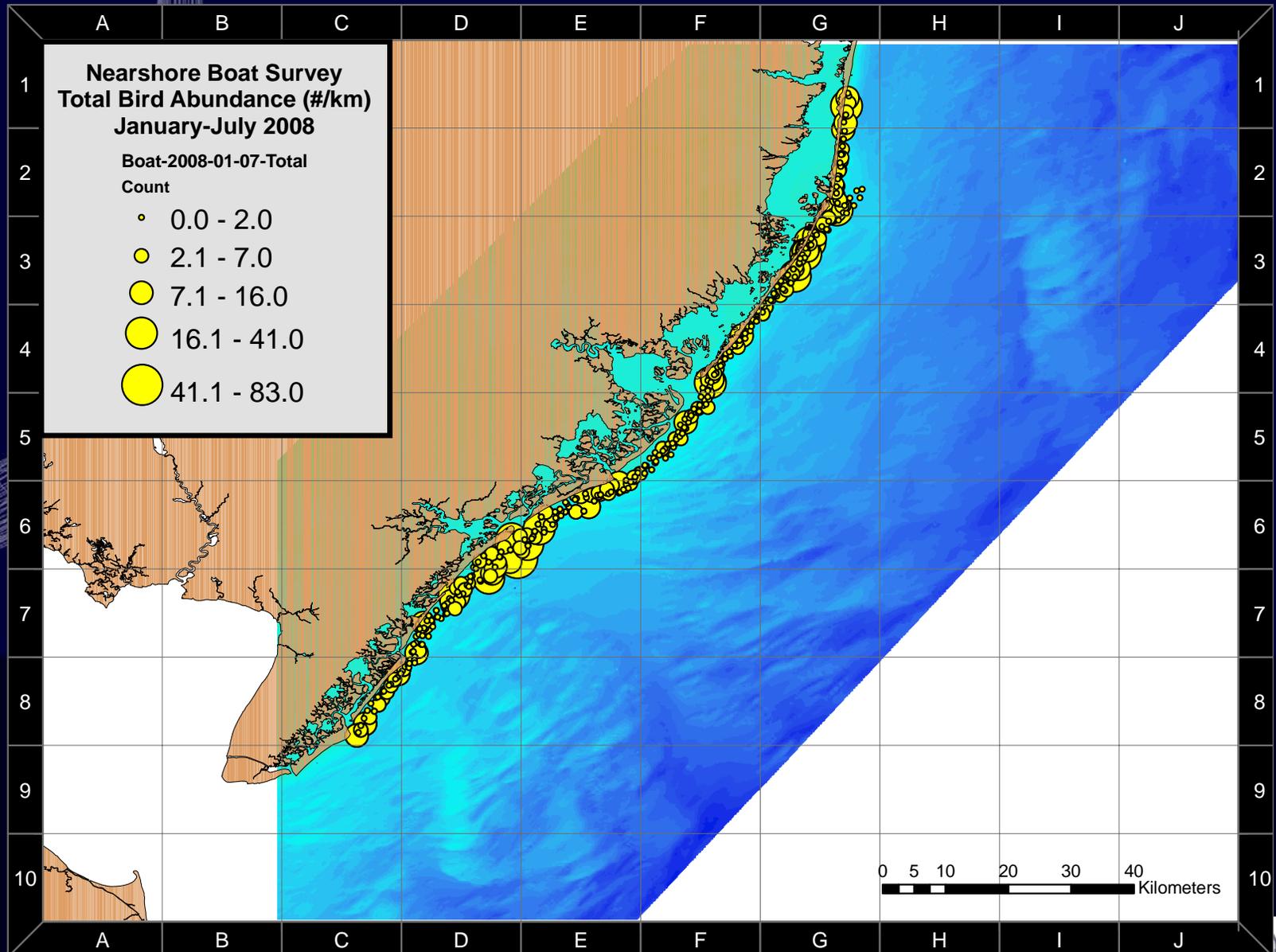


Small Boat Coastal Avian Surveys

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



Small Boat Data



Small Boat Data

	1 st 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

	2 nd 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

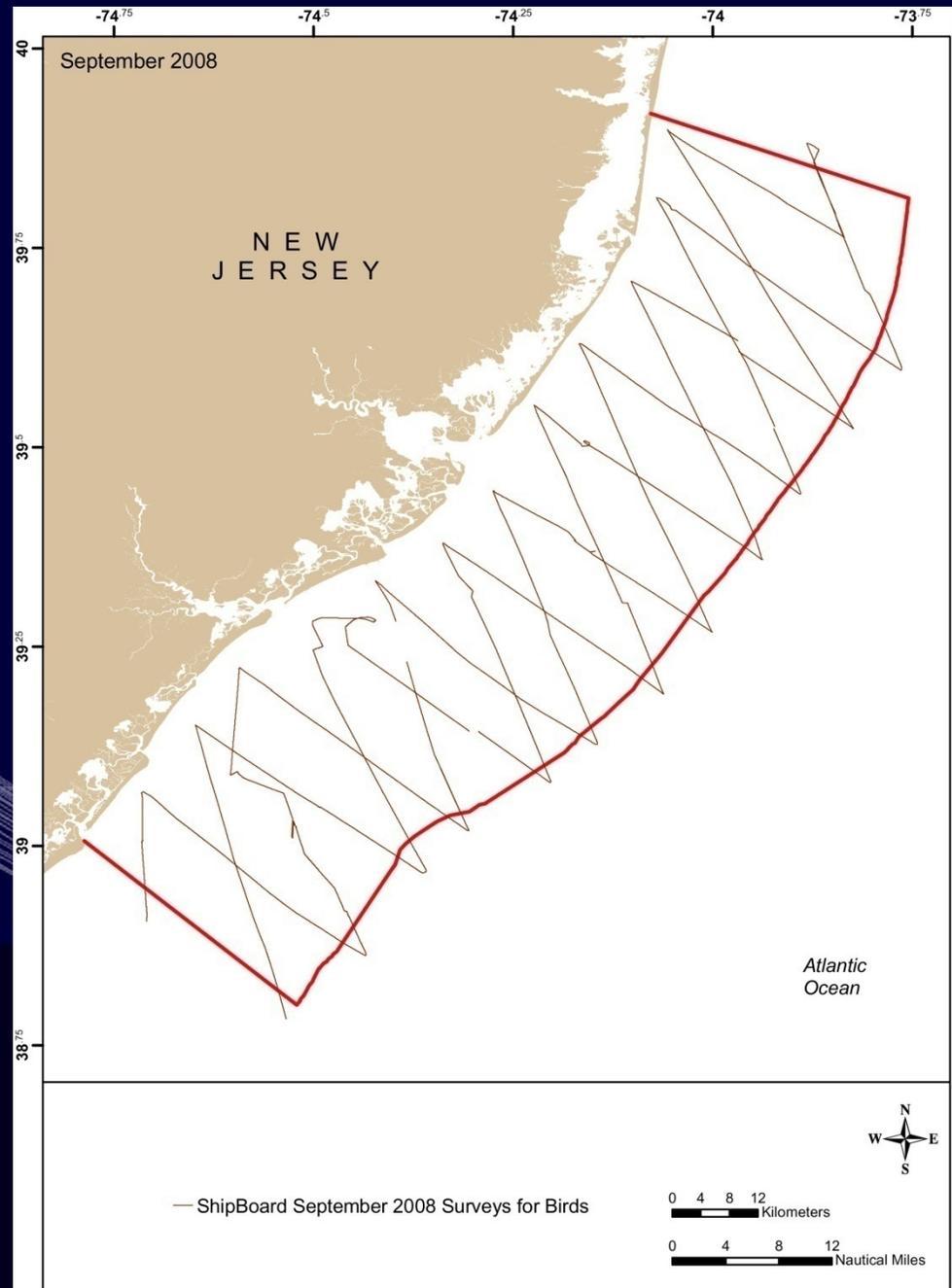
	3 rd Quarter		
	Jul.	Aug.	Sep.
# Species Observed	11	16	18
Most Abundant Species	Laughing gull (49.60%)	Laughing gull (51.40%)	Laughing gull (17.20%)
	Common tern	Common tern	Great black-backed gull
	Whimbrel	Great black-backed gull and Sanderling (tied)	Double-crested cormorant
Total # Birds Observed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

*1 state listed avian species (Osprey) observed

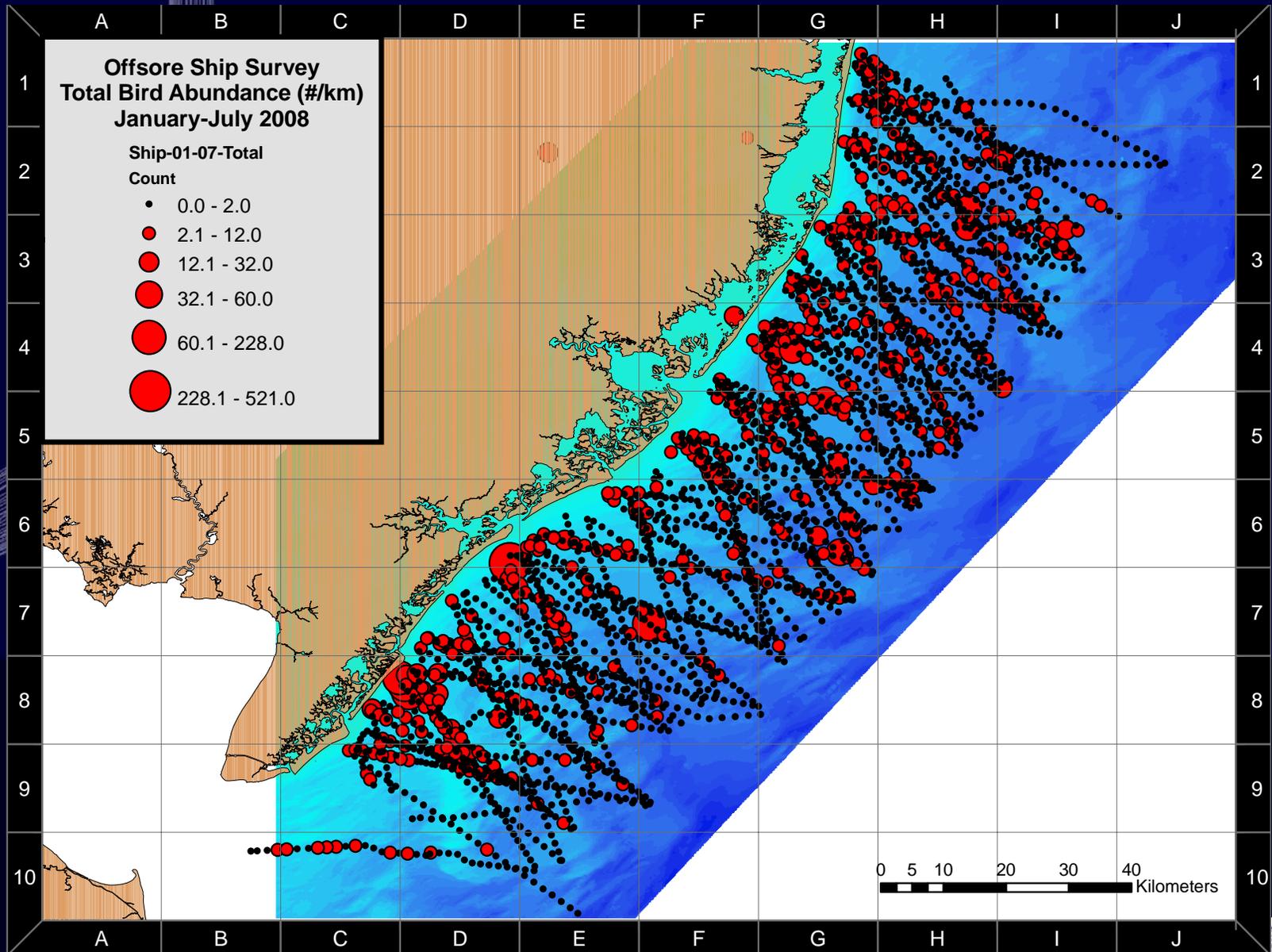


Large Boat Avian Surveys

- Double saw-tooth sample design
- Monthly



Large Boat Data



Large Boat Data

	1 st 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

	2 nd 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



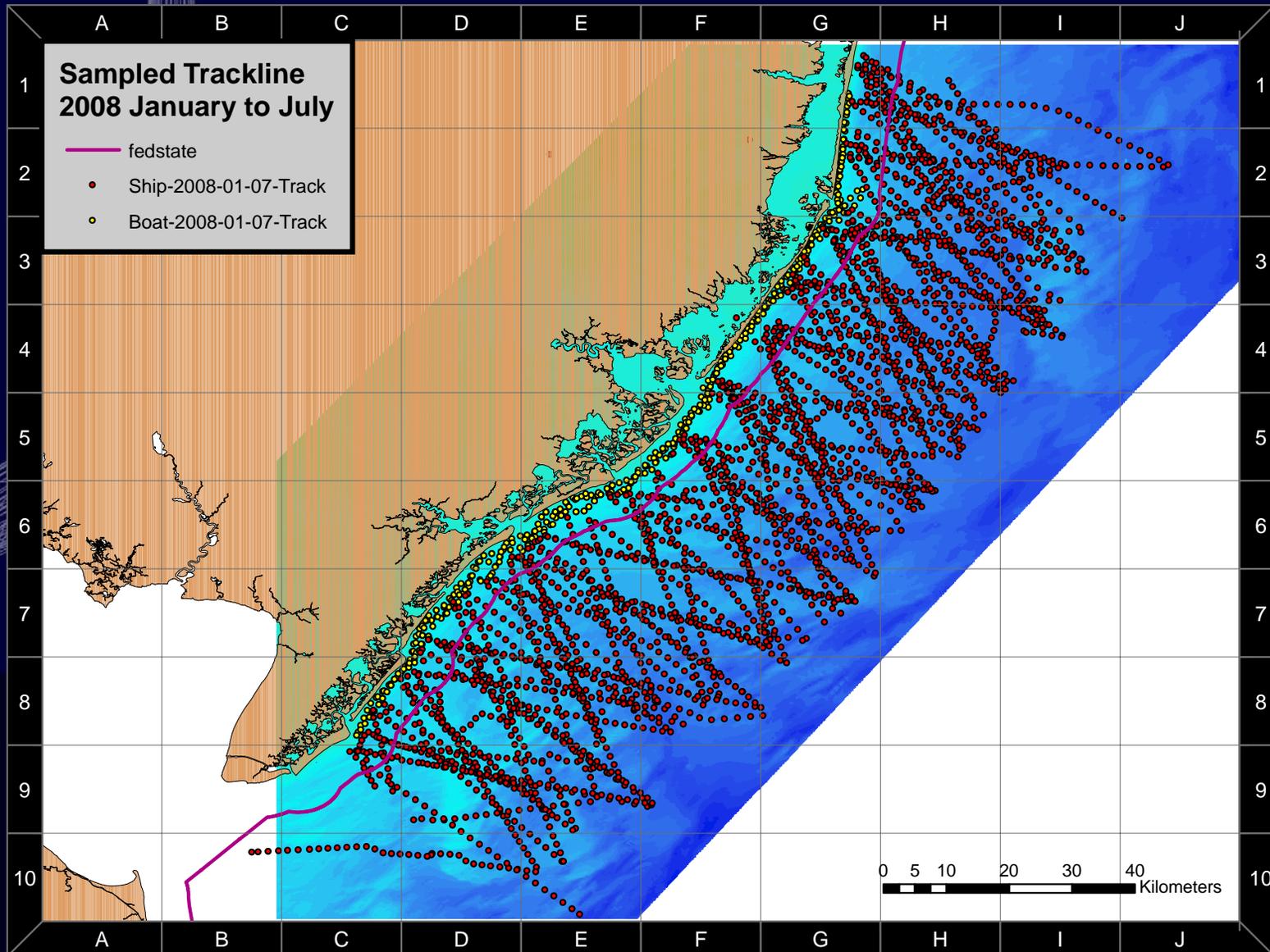
Large Boat Data

	3 rd 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

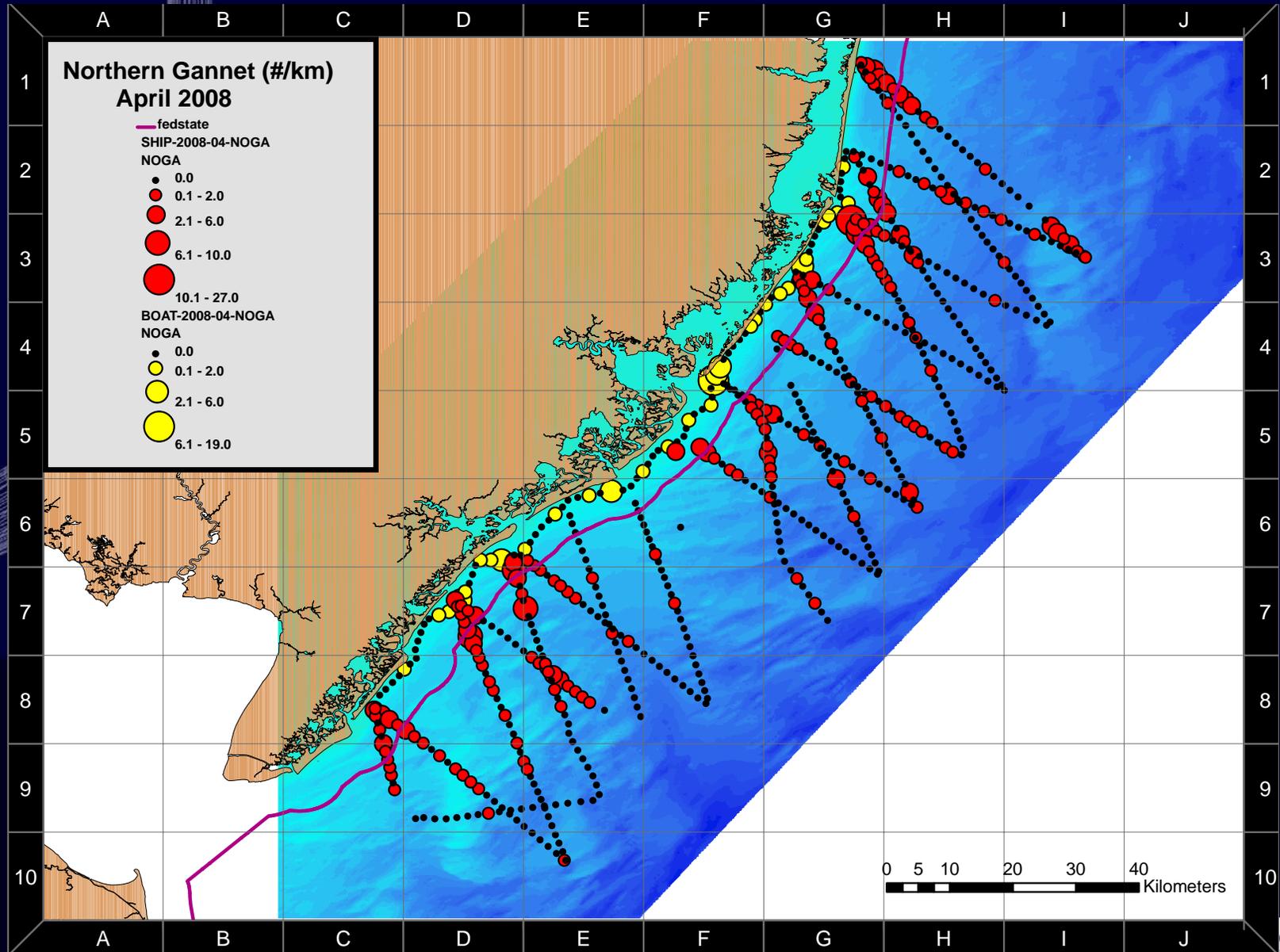
*3 state listed avian species (Osprey, Black-crowned night-heron, Yellow-crowned night-heron) observed



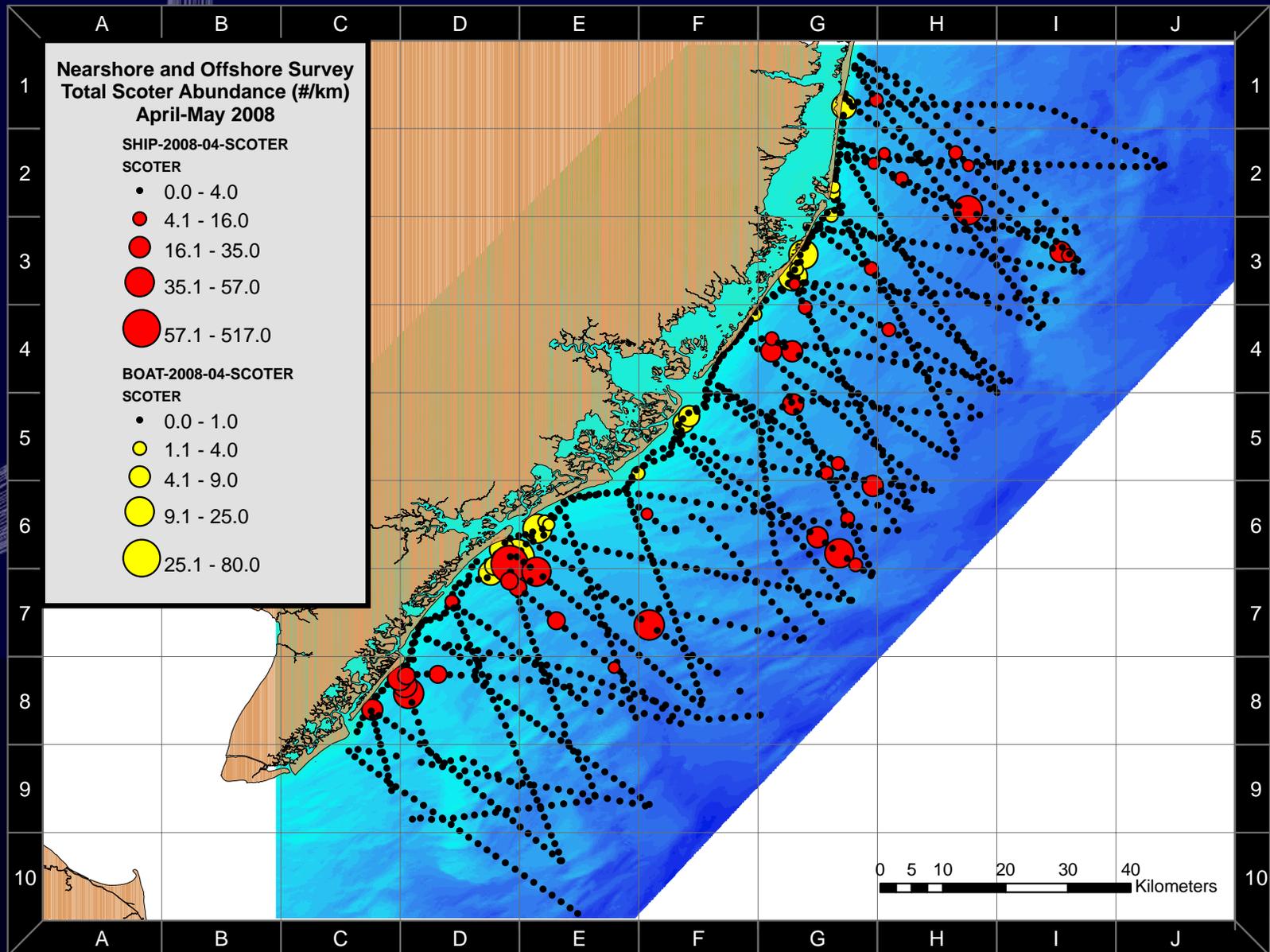
Sampled Trackline



Example – Northern Gannet Abundance

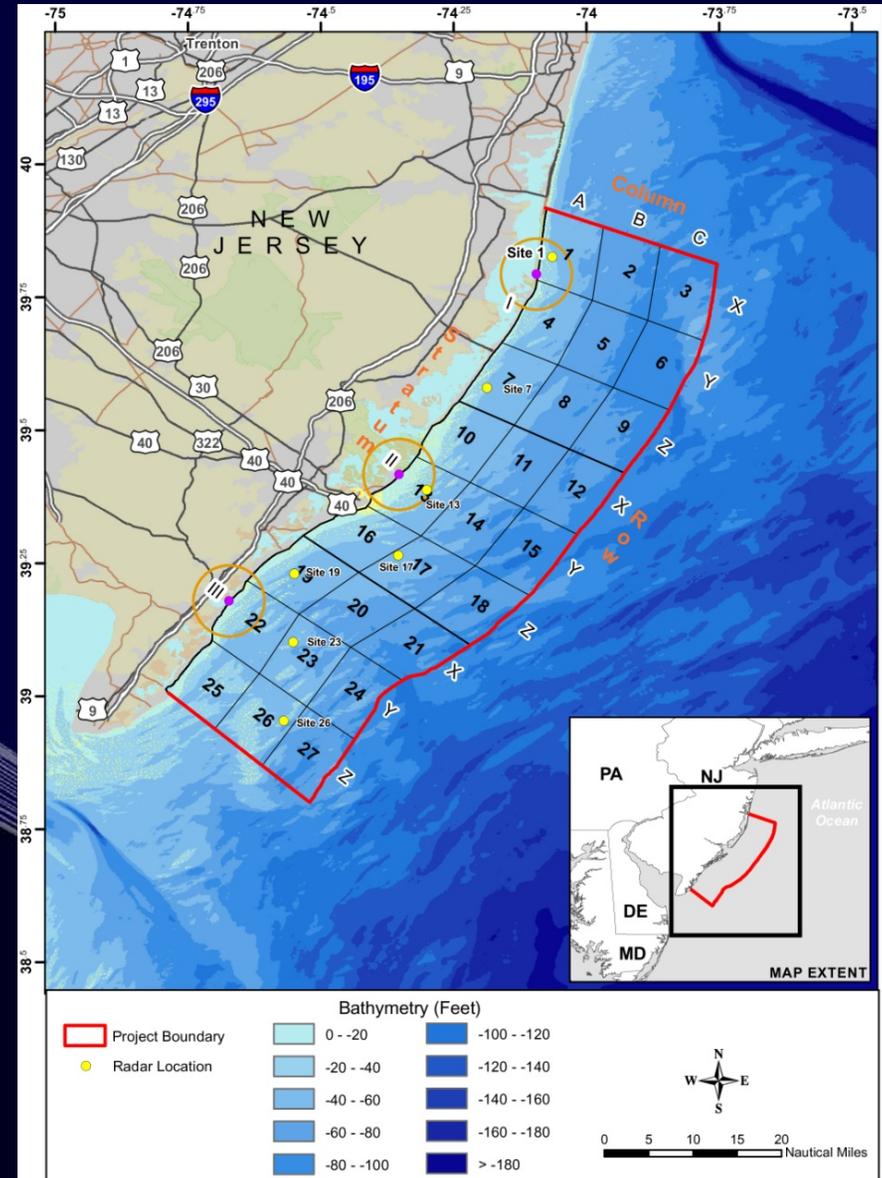


Example – Scoter Abundance



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

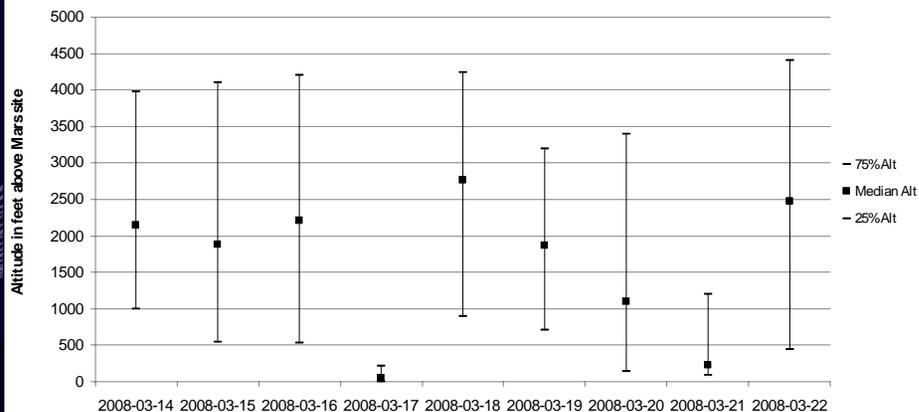
- Offshore locations:
 - Spring '08
 - Planned for 9 offshore locations
(Grids 1, 7, 13, 17, 19, 23, and 26)
 - Fall '08
 - Planned for 5 new offshore locations
(Grids 23 and 26)
 - *Barge accident
10/19/08



Avian Radar Study – Data

- Data is preliminary and analysis is ongoing:

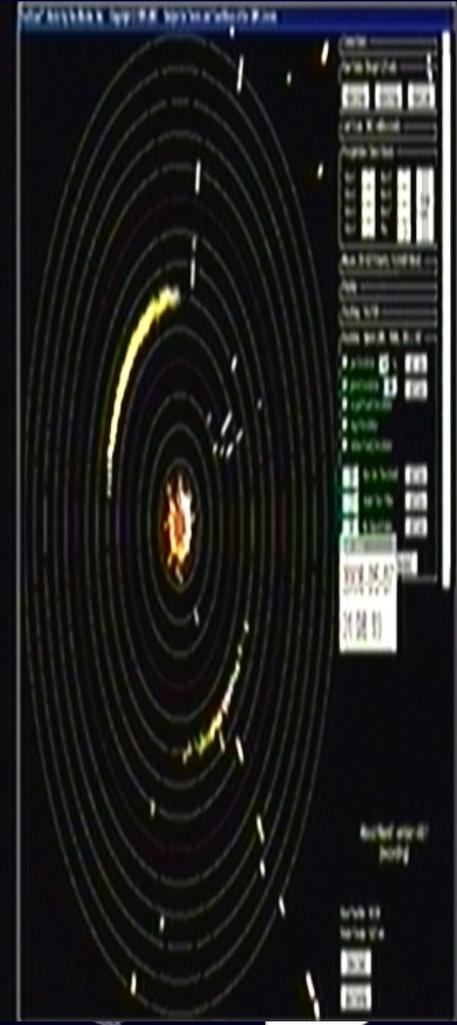
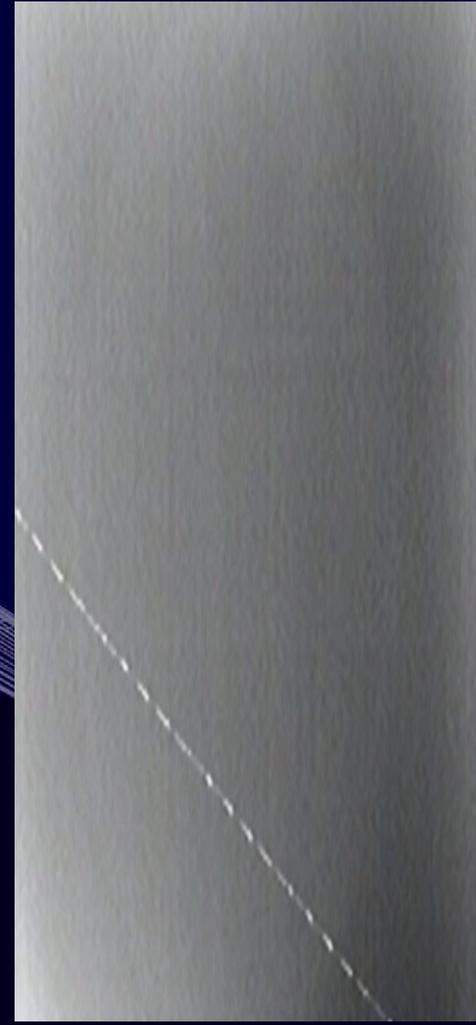
Altitude Quartiles for Nocturnal



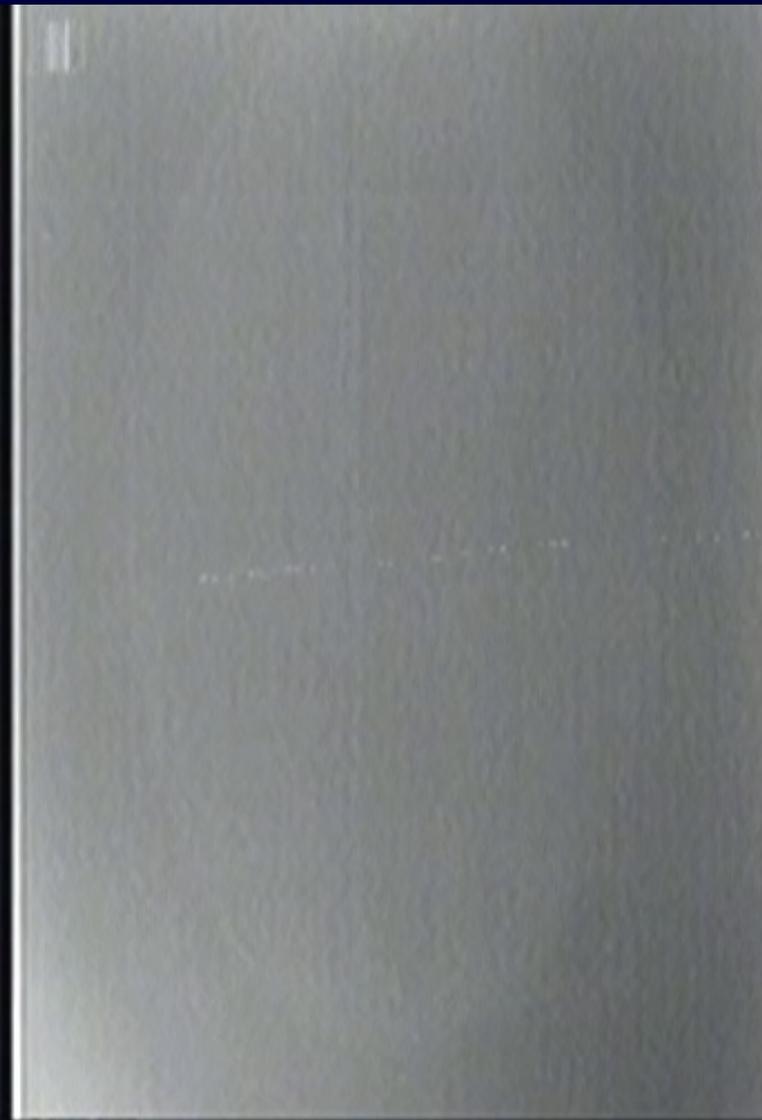
Site 1 - VerCat® Tracks per Hour per Kilometer by Altitude in Relation to Radar

Altitude Band	Target Type				
	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

Thermal Imaging/Vertically Pointing Radar



Thermal Imaging/Vertically Pointing Radar



Thermal Imaging/Vertically Pointing Radar



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

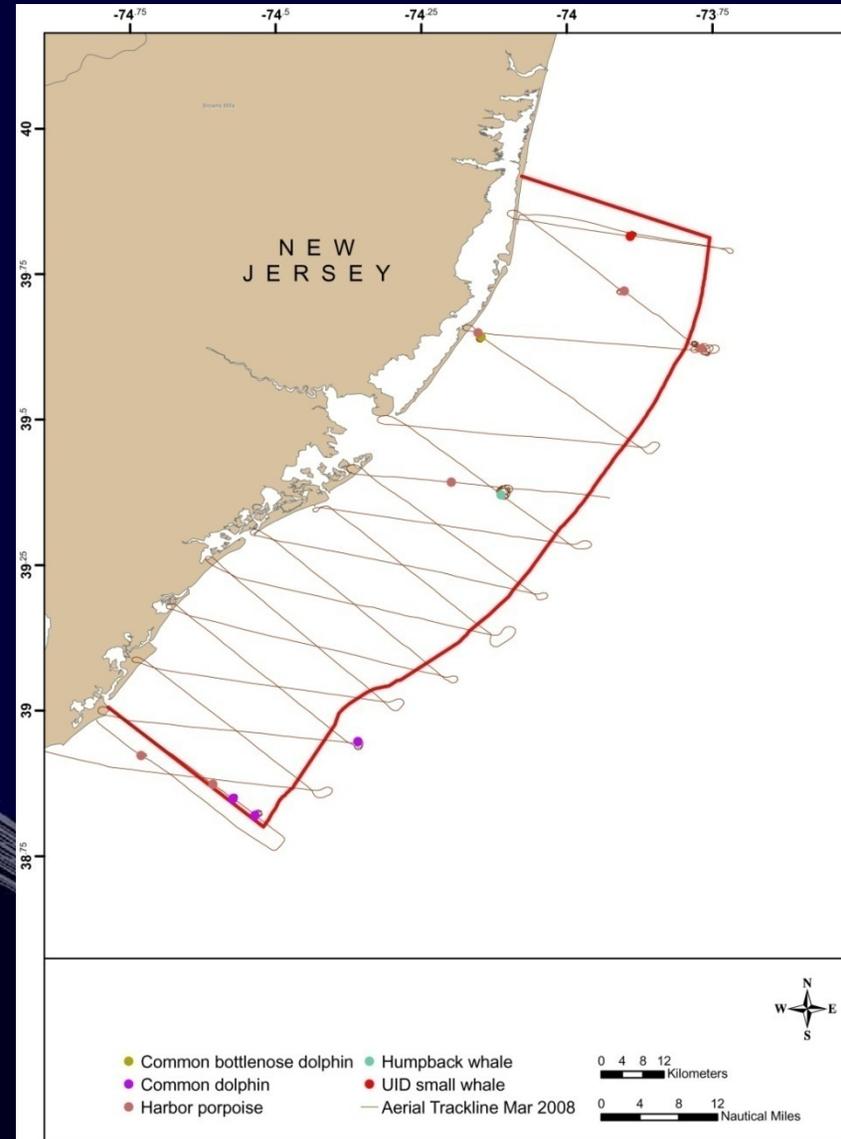
GIS Data Sources

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

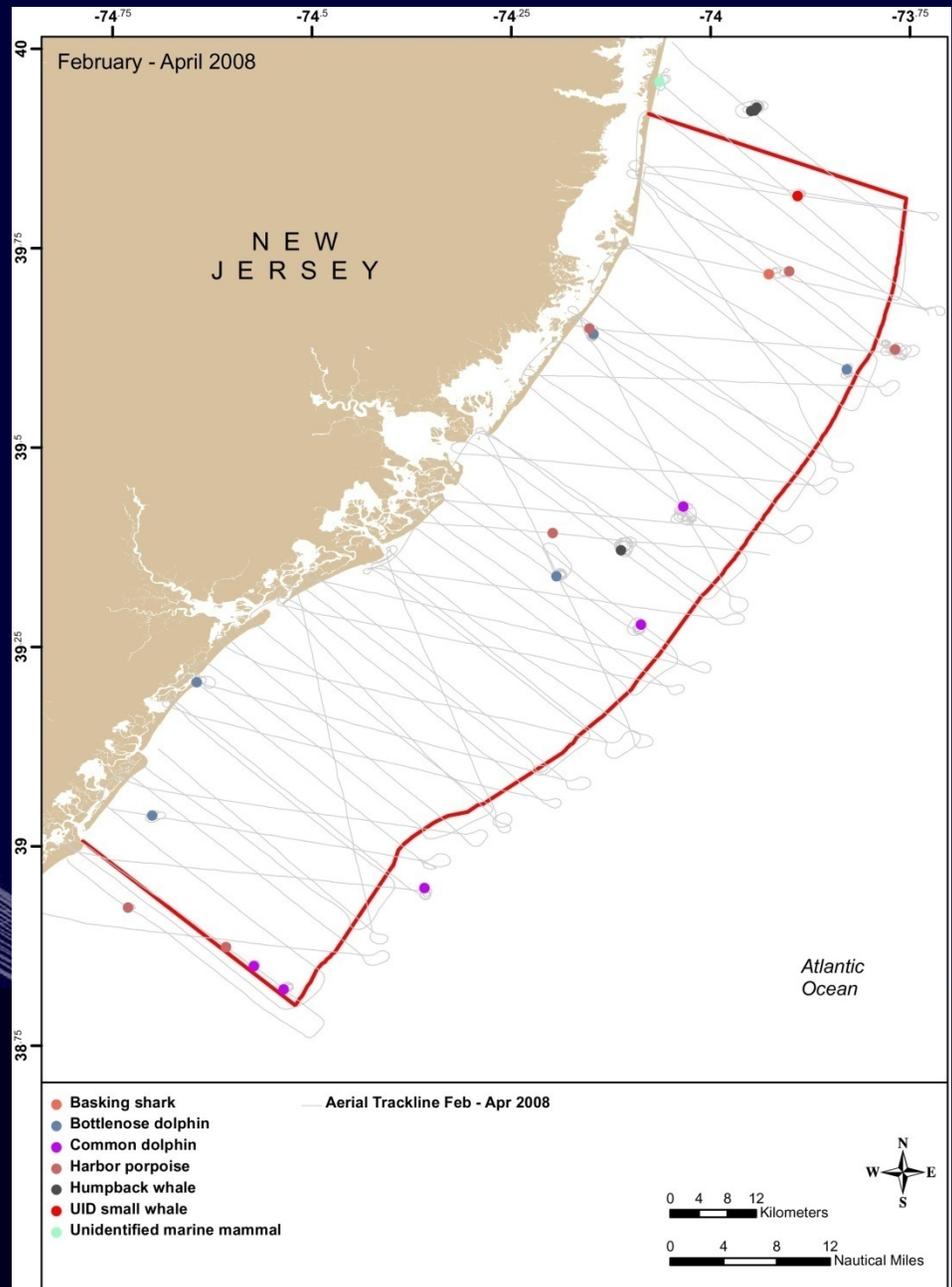


Aerial Data

Total length of transects
flown = 1766 NM

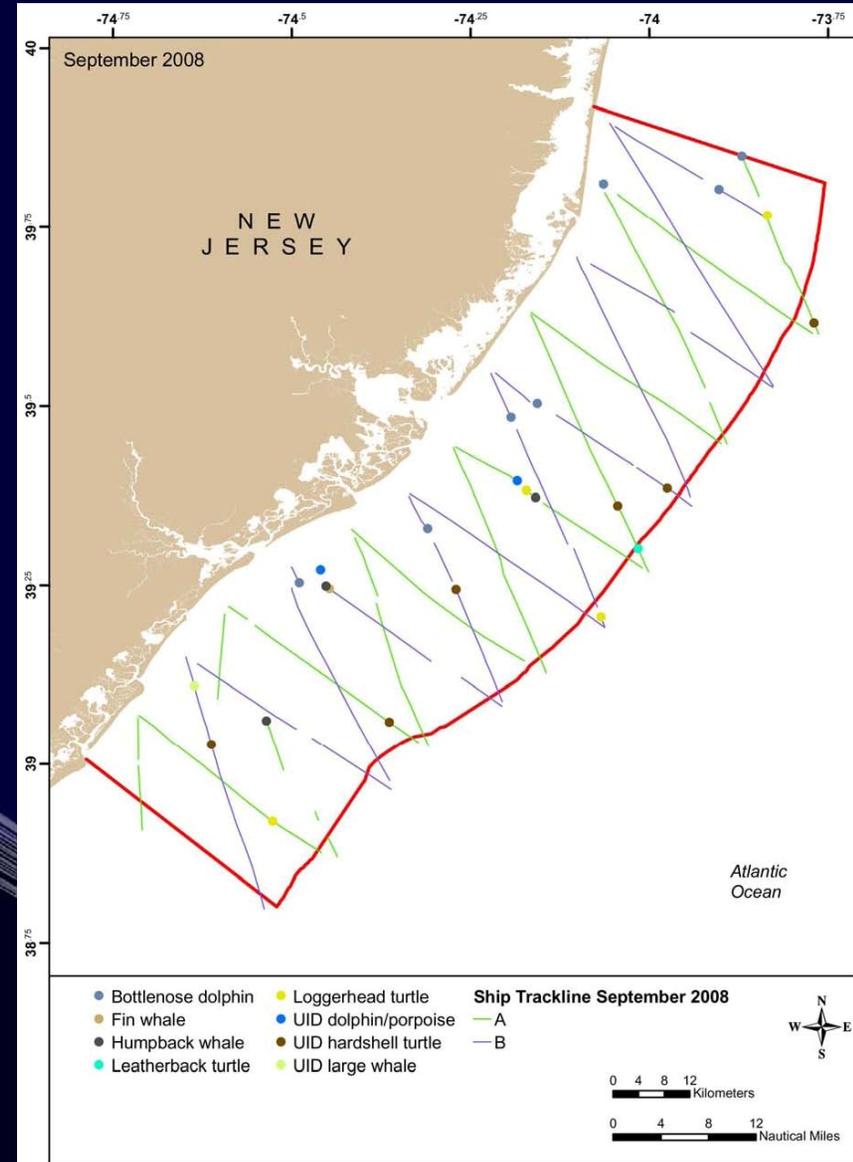
6 Species Identified

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



Marine Mammal and Turtle Ship Surveys

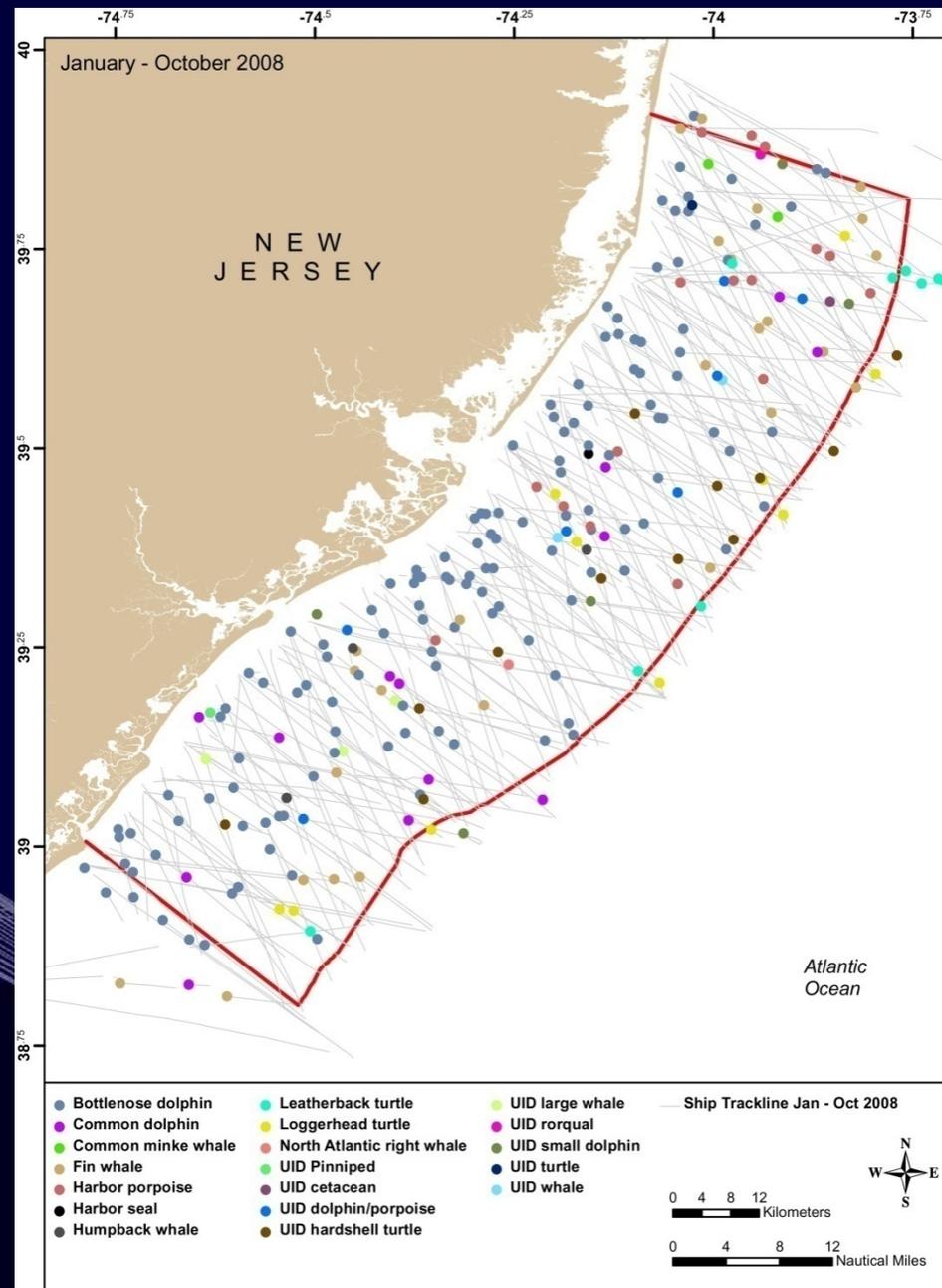
- Transects conducted from Jan-Oct 2008
- 10 Ship Surveys
- Transects conducted along a saw-toothed pattern
- Total length = 3107 NM

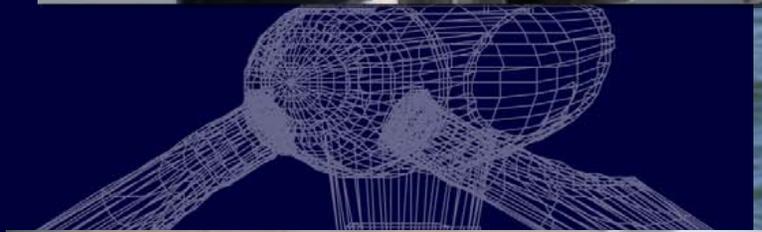


Ship Survey Data

- 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

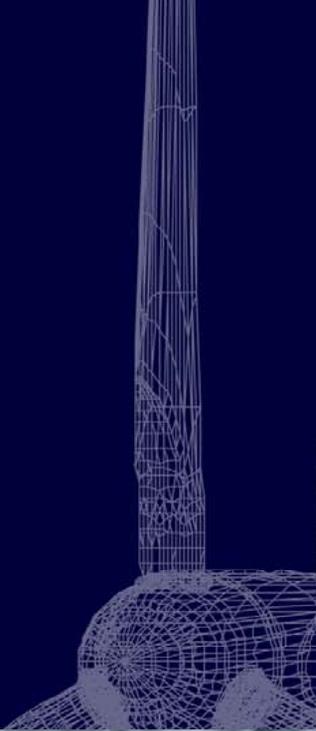




Activities & Photos conducted under NMFS Permit No. 10014-01



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

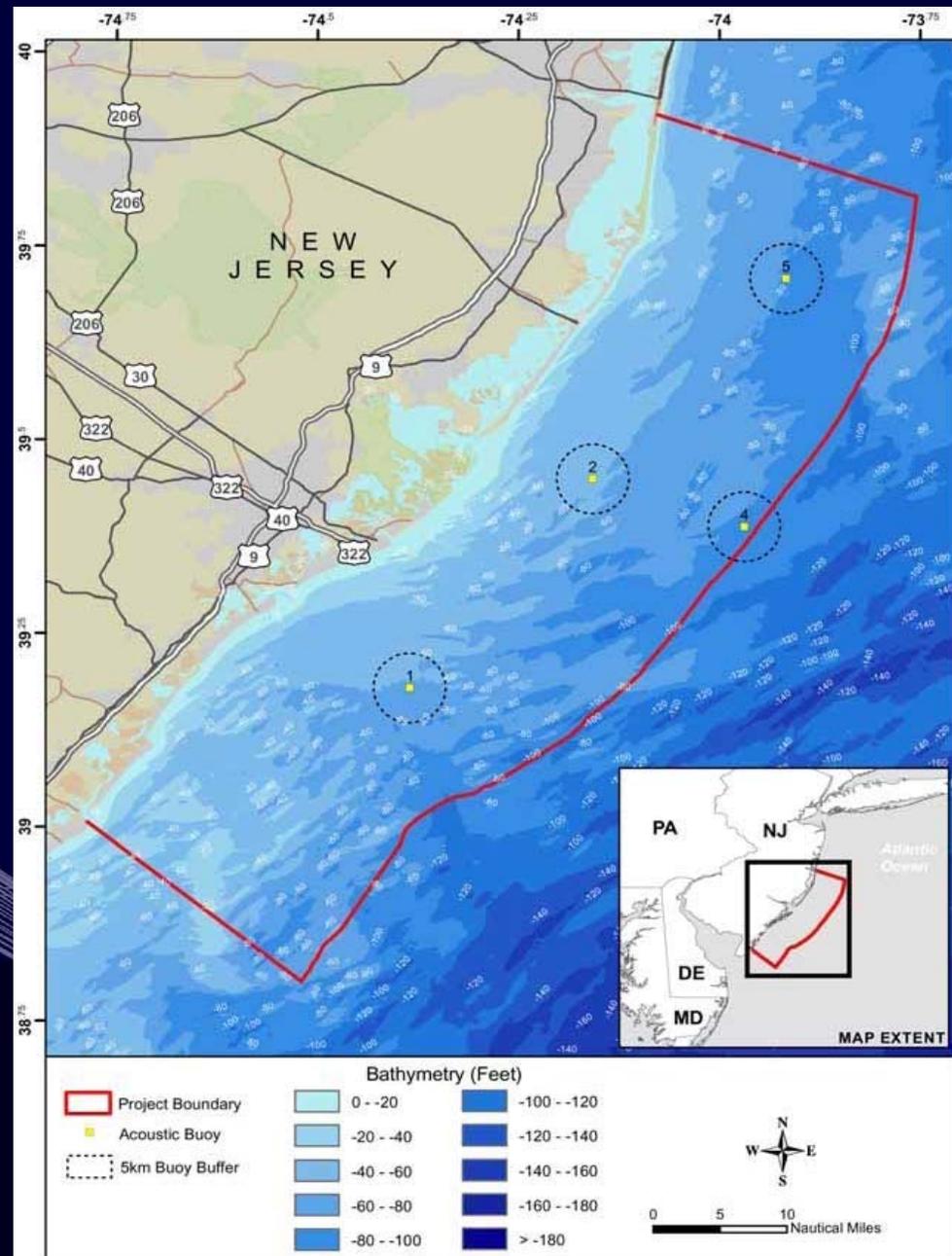


Activities & Photos conducted under NMFS Permit No. 10014-01



Passive Acoustic Survey

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

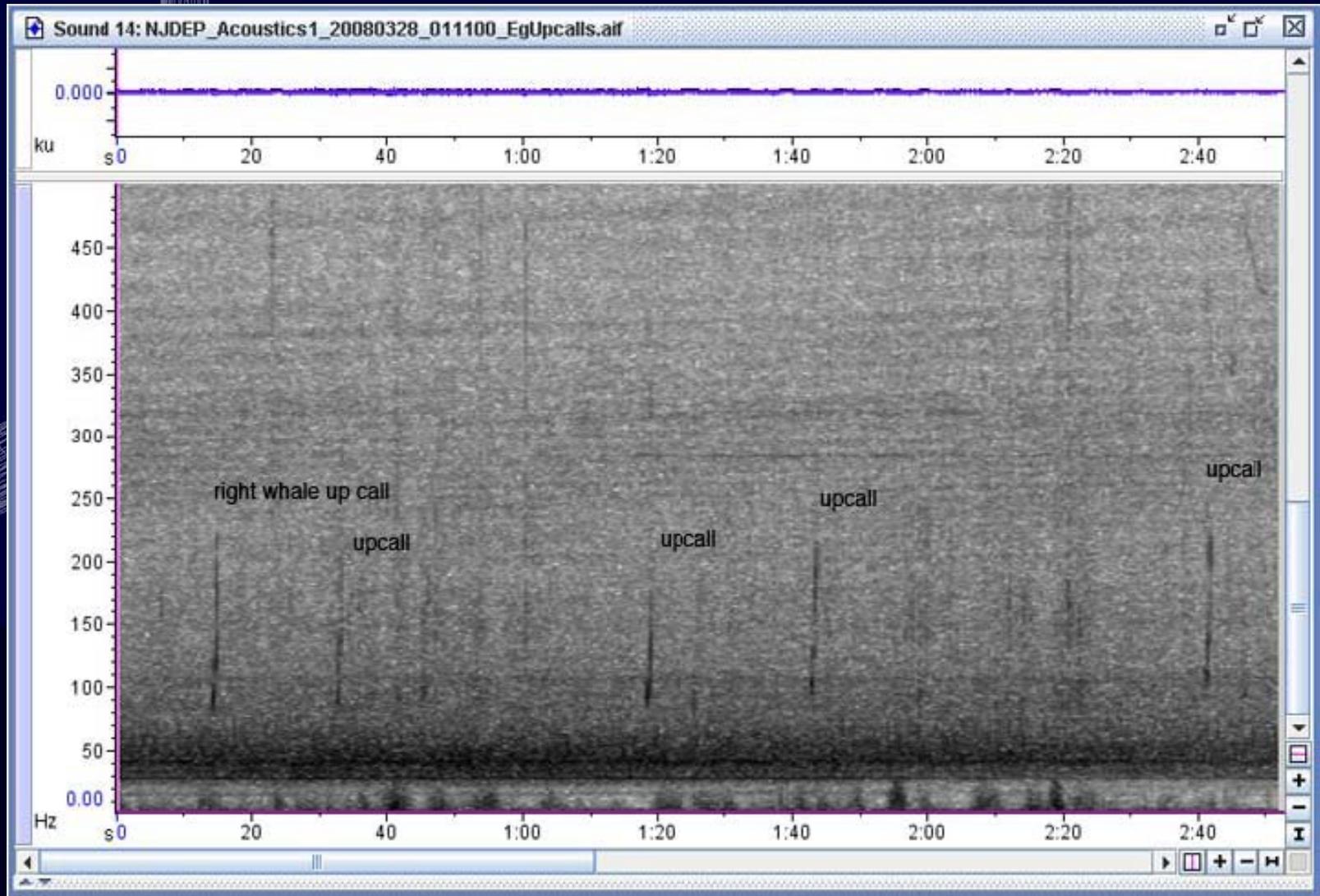


Acoustic Surveys

- 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

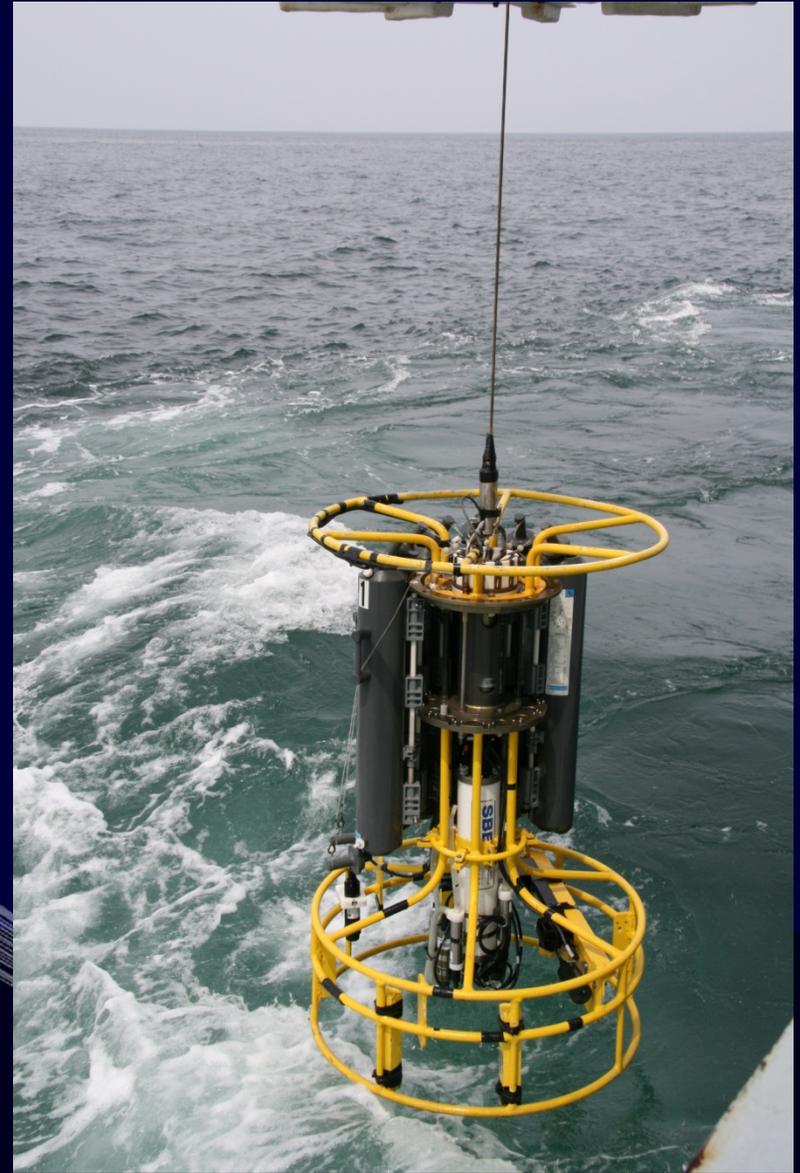


Spectrogram of Five Right Whale Calls

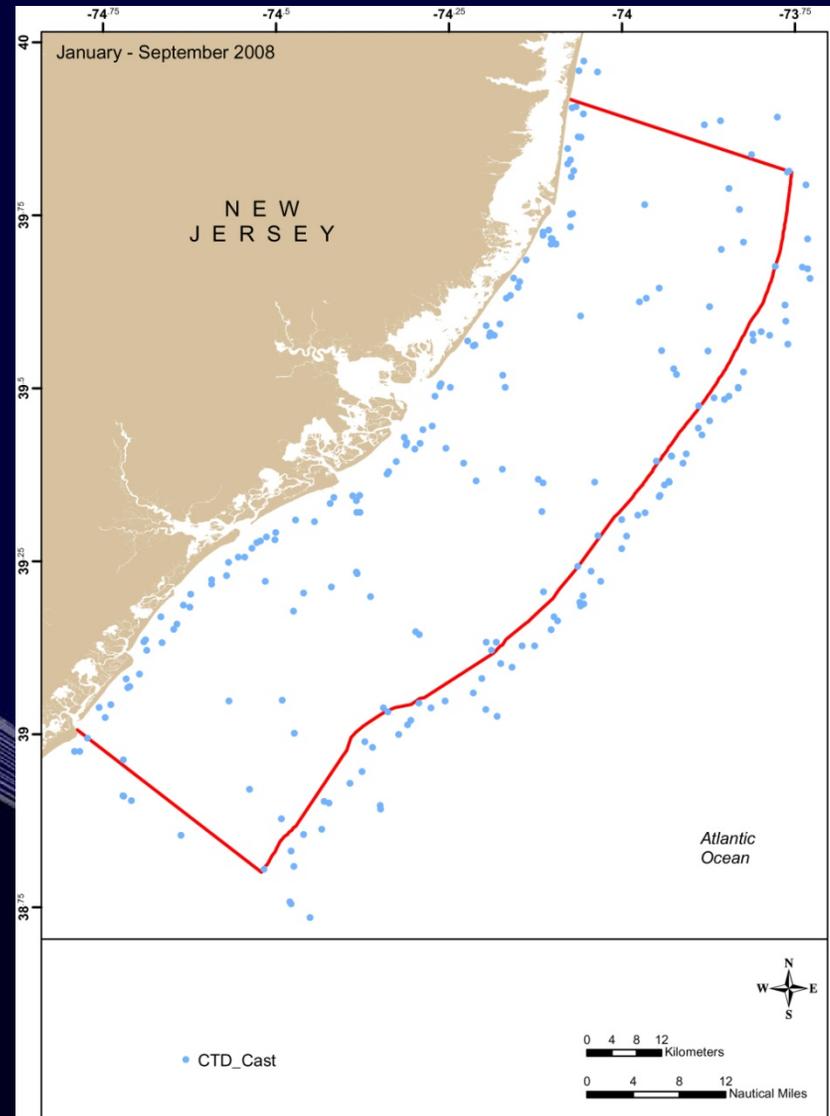
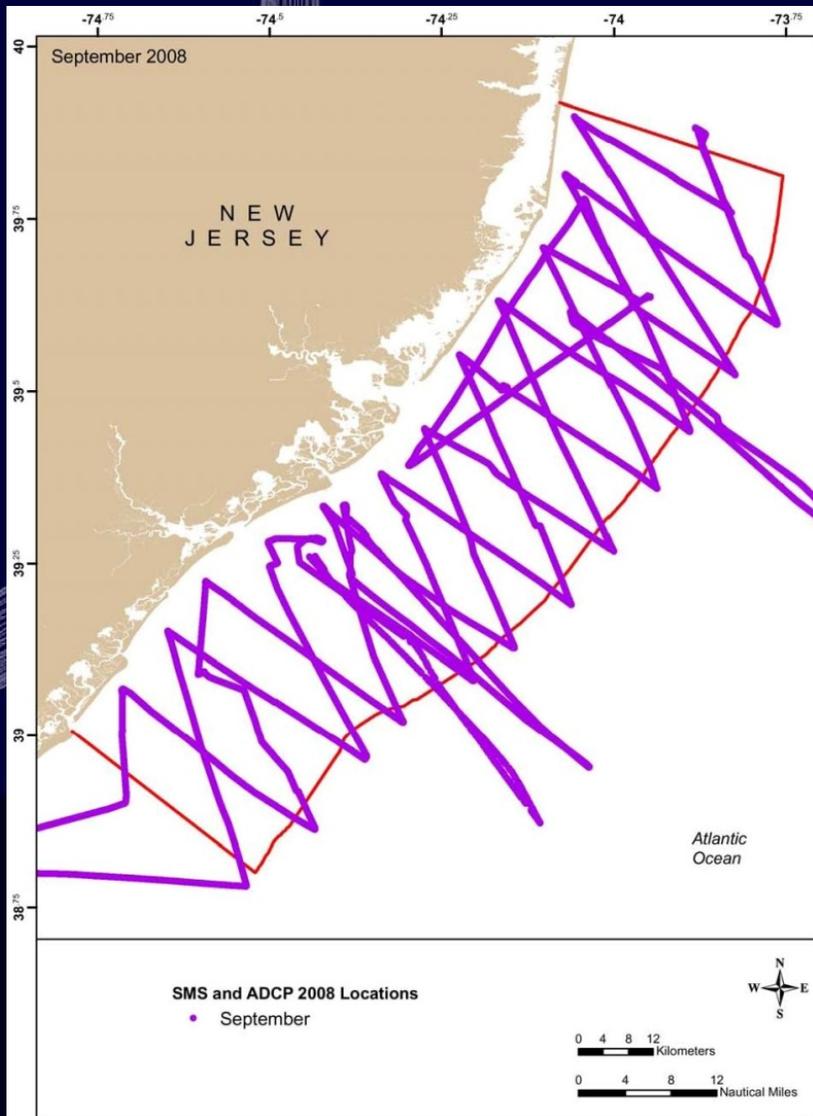


Oceanography

- 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



SMS, ADCP, 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

Record Number	Author	Year	Title	URL
13804	Rhodin	1982	Reproductive data on a female leatherback turtle, <i>Dermochelys coriacea</i> , stranded...	
13879	Cole	2004	Update on NOAA fisheries aerial surveys for right whales (<i>Eubalaena glacialis</i>) off ...	
14290	Myatt	1989	New Jersey tire reef stability study	
14311	Garrison	2003	Abundance of the coastal morphotype of bottlenose dolphin, <i>Tursiops truncatus</i> , in ...	
14312	Read	2003	Abundance and stock structure of bottlenose dolphins along the Outer Banks, Nort...	
14419	Ulmer	1981	New Jersey's dolphins and porpoises	
14483	Shippee	2003	Sleepless in New Jersey: Overnight behavioral observations of radio-tagged dolph...	
14484	Rowles	2003	Evidence of susceptibility to morbillivirus in free ranging populations of bottlenose ...	
14510	Rosel	2003	Genetic analysis reveals complicated population structure for coastal bottlenose d...	
14534	USFWS (U...	1994	Northeastern beach tiger beetle (<i>Cincindela dorsalis dorsalis</i> Say) recovery plan	
14586	Leatherwood	1978	Food and reproductive status of nine <i>Tursiops truncatus</i> from the northeastern Unit...	
14901	Byrnes	2004	Effects of sand mining on physical processes and biological communities offshore ...	
15212	USFWS (U...	2004	Species status: Northeastern beach tiger beetle	
15750	Allen	1987	Reef fishes of the Indian Ocean: A pictorial guide to the common fishes of the India...	Copyright pr
15897	ARA (Artifici...	n.d.	The shipwrecks of New Jersey's reefs	Copyright pr
15899	Berg	1991	Wreck valley, a record of shipwrecks off Long Island's south shore and New Jersey	Copyright pr
15911	Gentile	2000	Shipwrecks of New Jersey: North	Copyright pr
15912	Gentile	2001	Shipwrecks of New Jersey: Central	Copyright pr
15913	Gentile	2002	Shipwrecks of New Jersey: South	Copyright pr
15931	New Jersey ...	2004	Locations of New Jersey artificial reefs	Web site
15990	Goodwin	1933	Occurrence of a gray seal at Atlantic City, N.J.	
16121	Able	1996	Fishes of polyhaline estuarine shores in Great Bay--Little Egg Harbor, New Jersey...	Copyright pr
16123	Hales	2001	Winter mortality, growth, and behavior of young-of-the-year of four coastal fishes in ...	
16124	Viscido	1997	Seasonal and spatial patterns of an epibenthic decapod crustacean assemblage i...	
16125	Able	2002	Seasonal distribution and abundance of lobster (<i>Homarus americanus</i>) postlarvae ...	
16127	Hagan	2003	Seasonal changes of the pelagic fish assemblage in a temperate estuary	
16129	Able	1992	Checklist of New Jersey saltwater fishes	
16940	GSA (Gener...	2003	Environmental assessment, proposed federal courthouse, Fort Pierce, Florida	

Rhodin, A.G. J. and R.C. Schoelkopf. 1982. Reproductive data on a female leatherback turtle, *Dermochelys coriacea*, stranded in New Jersey. *Copeia* 1982(1):181-183.

Showing 101 out of 19980 references. Hide Preview

Ready NUM

GIS Digital Data Layers from Multi-Source Data Banks

MMS – 9

National Atlas - 1

NOAA – 5

USFWS – 5

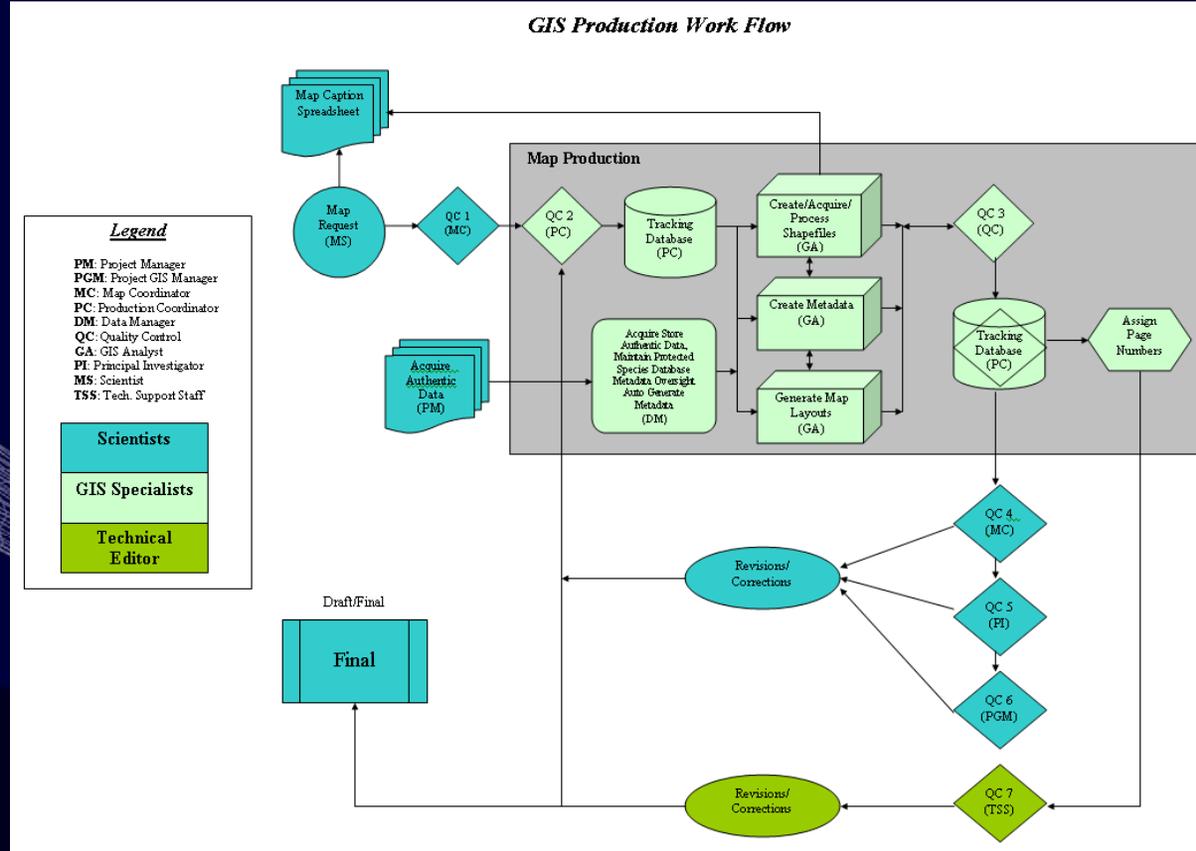
NJDEP – 52

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**

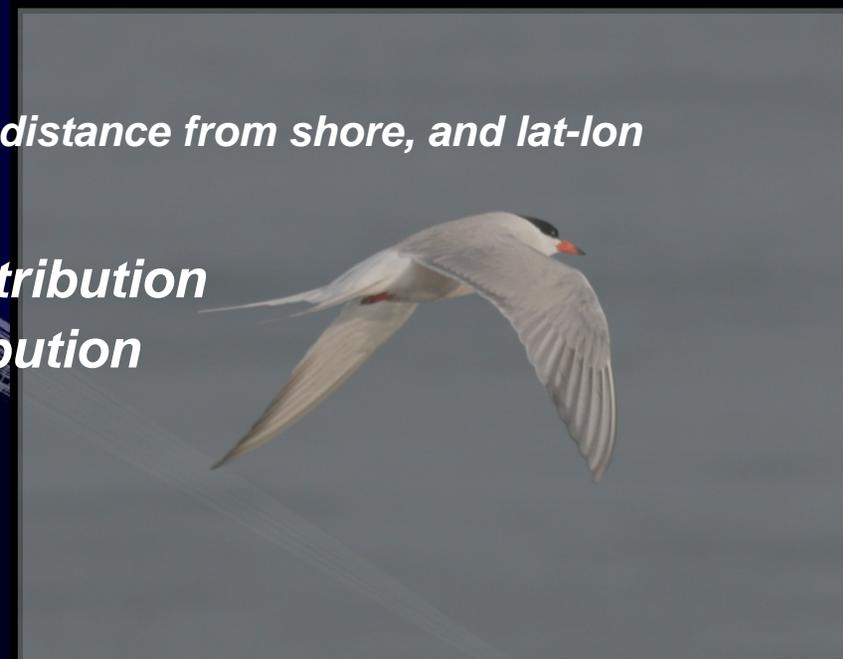
- *dynamic = SST, salinity, chlorophyll*

- *static = bottom depth, bottom slope, distance from shore, and lat-lon*

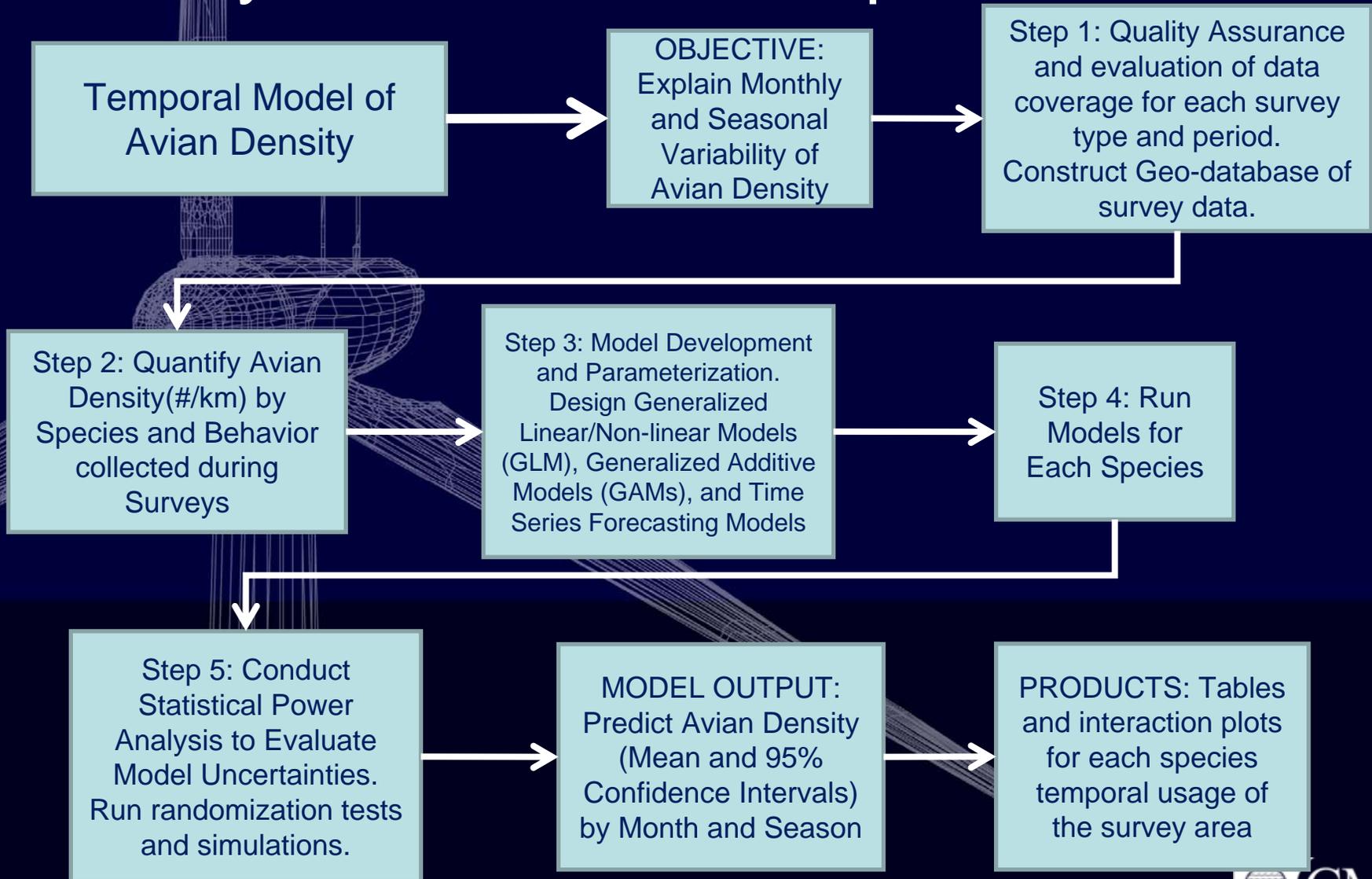
- **Density Estimates – Birds**

- *Temporal Model for Density/Distribution*

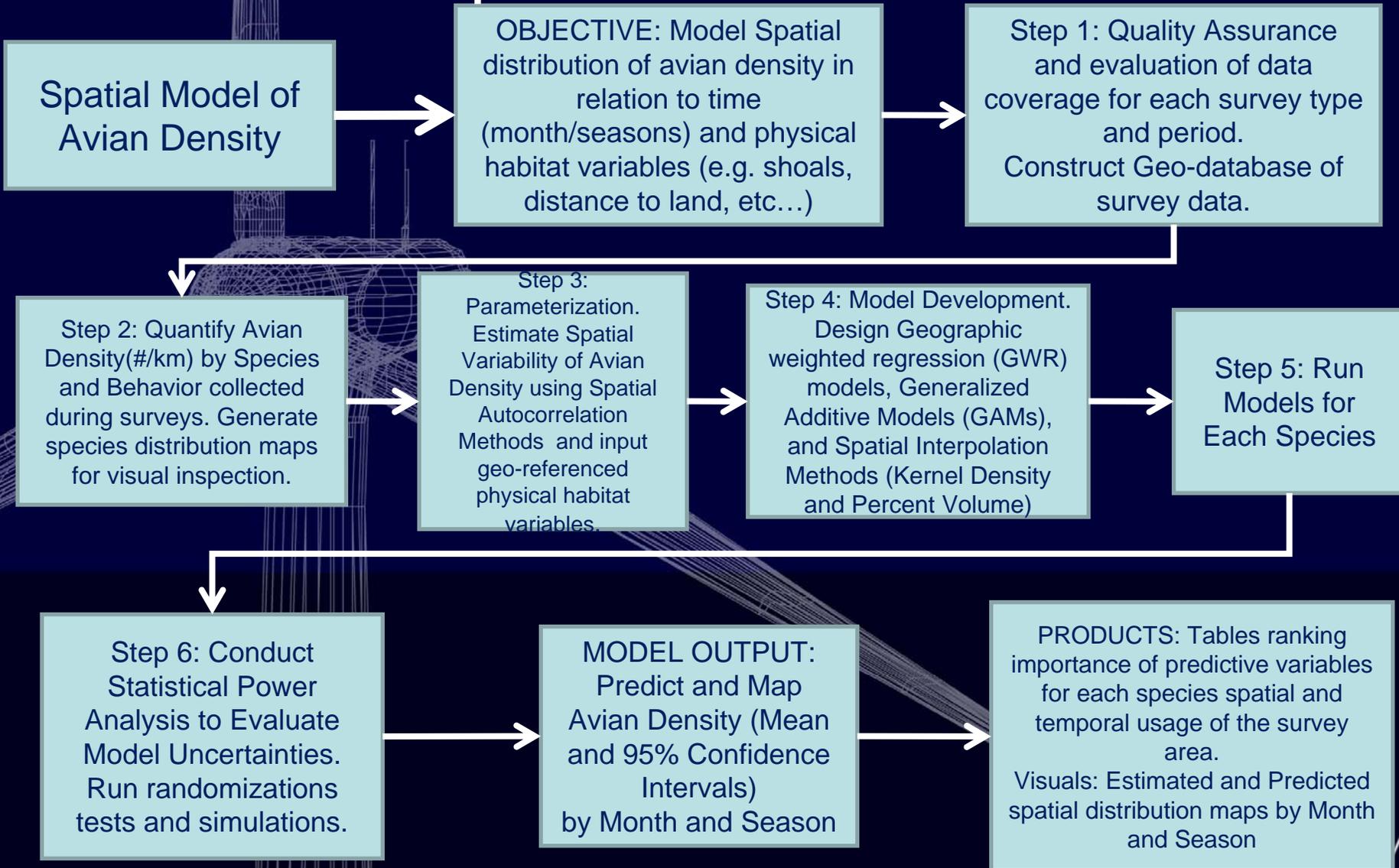
- *Spatial Model for Density/Distribution*



Estimating and Predicting Seabird Density-Distribution: Temporal Model



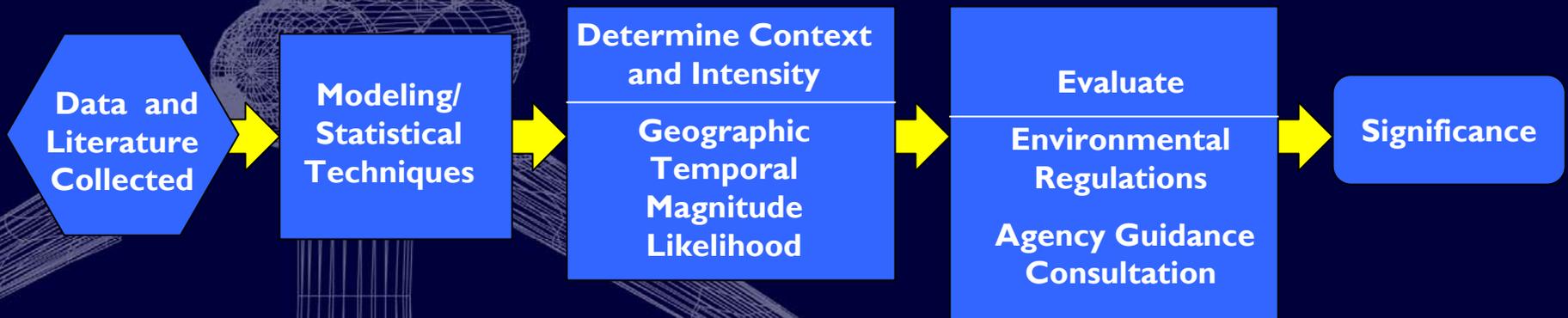
Estimating and Predicting Seabird Density – Distribution: Spatial Model



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



R/V HUGH R. SHARP

