Assessing Rhode Island Sound's Nearshore and Offshore Avian Resource Prior to Potential Alternative Energy Development

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CRMC
COASTAL RESOURCES MANAGEMENT COUNCIL

UNIVERSITY OF
Rhode Island

Tonight's Talk

- Background material on birds and wind farms
- Historical information on spatial distribution and abundance of birds in Ocean SAMP area
- Methods used to assess avian movement ecology for Ocean SAMP
- Present preliminary results of bird use of offshore waters in Rhode Island

Public Perception of Wind Farms and Birds

drowned in a pond in Etowah County. A Tennessee man was missing after he tried to swim

gency management director. Authorities in the northwest Georgia town of Trion

parts of Tennessee, Alabama, North Carolina, Kentucky and Georgia.

This is a tropical air mass over the whole Southeast."

For the past several days,

Contributing: The Associated Press

▸ Full weather, 10A

Bird deaths soar at wind farms

Energy push could wipe out some species

By William M. Welch
USA TODAY

For years, a huge wind farm in California's San Joaquin Valley was slaughtering thousands of birds, including golden eagles, red-tailed hawks and burrowing owls.

The raptors would get sliced up by the blades on the roughly 5,400 turbines in Altamont Pass, or electrocuted by the wind farm's power lines. Scientists, wildlife agencies and turbine experts came together in an attempt to solve the problem. The result?

Protective measures put in place in an effort to reduce deaths by 50% failed. Deaths in fact soared for three of four bird species studied, said the Altamont Pass Wind Resource Area Bird Fatality Study.

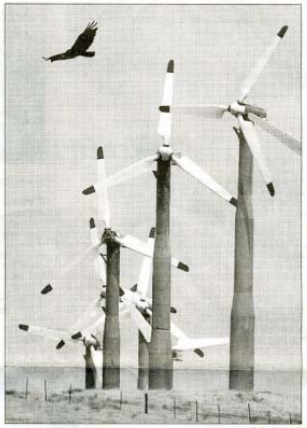
The slaughter at Altamont Pass is being raised by avian scientists who say the drive among environmentalists to rapidly boost U.S. wind farm power 20 times could lead to massive bird losses and even extinctions.

New wind projects "have the potential of killing a lot of migratory birds," said Michael Fry, director of conservation advocacy at the American Bird Conservancy in Washington.

Wind projects are being proposed for the Texas Gulf, the Atlantic Coast, the Great Plains and Upper Midwest. President Obama said in April that he would allow turbines along the Atlantic as one way to help meet a goal by environmentalists and the industry of generating 20% of the nation's electricity through wind by 2030.

Currently about 1% of U.S. power comes from wind, according to the American Wind Energy Association.

"There's concern because of the scale of what we're talking about," said Shawn Smallwood, a Davis, Calif., ecologist and researcher. "Just the sheer numbers of turbines we're talking about — we're going to be killing so many raptors until there are no more raptors, in my opinion."



By Ben Margot, AP

Looking for a big boost: Environmentalists have said they want 20% of the nation's electricity generated through wind by 2030. Currently, about 1% is.

Working on the problem

Interior Secretary Ken Salazar is aware of the problem and says the administration is working with energy companies and wildlife groups to help lessen the deaths.

"I think we will be able to minimize the number of birds being killed, just in terms of sheer numbers," Salazar said. "The fact that some birds will be killed is a reality."

Officials in the wind energy industry say migratory birds and birds of prey, including eagles, are killed each year at some of the nation's biggest wind farms, but they say the concerns are overstated.

Laurie Jodziewicz, manager of siting policy for the American Wind Energy Association, said the industry has taken steps to reduce bird deaths.

"We have hundreds and hundreds of projects all over the country that are not having those impacts," she said, referring to Altamont.

Bird deaths cannot be completely eliminated, she said. "There will be some birds that are killed because they do collide with so many structures," she said.

Salazar said new technology in the design of turbines and more careful placement, such as outside of migratory paths and away from ridgelines, can reduce bird deaths.

Fry says other methods include using radar to detect and shut down turbines when migratory birds approach, building towers higher and with more space between them, and placing them away from areas where raptors hunt for small animals.

"Technology has evolved over the last several decades in significant ways," Salazar said. "We know how to do wind farms in ways that minimize and mitigate the effect on birds and wildlife."

Non-wind utilizes fined heavily

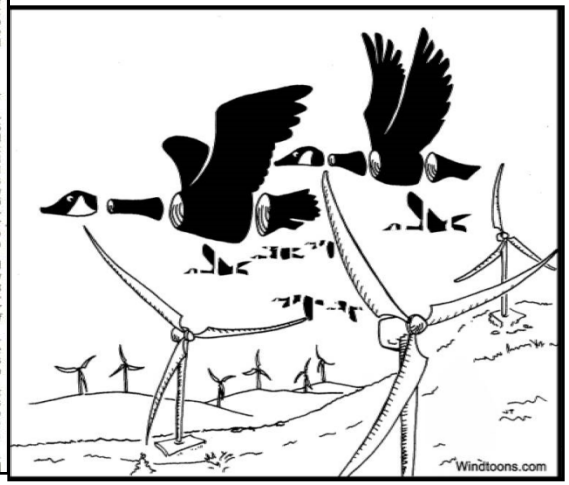
Some see a double standard for wind farms.

ExxonMobil pleaded guilty in federal court in August to the deaths of 85 birds at its operations in several states, according to the Department of Justice. The birds were protected by the Migratory Bird Treaty Act, and Exxon agreed to pay $600,000 in fines and fees. In July, the PacifiCorp utility of Oregon was ordered to pay $10.5 million in fines, restitution and improvements to their equipment after 232 eagles were killed by running into power lines in Wyoming, according to the U.S. Fish and Wildlife Service.

That is far fewer than the estimated 10,000 birds (nearly all protected by the migratory bird law) that are being killed every year at Altamont, according to Robert Bryce, author of *Gusher of Lies: The Dangerous Delusions of "Energy Independence."*

Salazar said he expected his department's Fish and Wildlife Service task force will recommend guidelines for wind farms that are friendlier to birds.

Bird advocates raise doubts about the impact, because the guidelines are voluntary. "It's still entirely up to power companies where to place towers," said Gavin Shire, spokesman for the American Bird Conservancy.



Wind farms blamed for eagle deaths

Cath Harris, *RSPB Press Office*

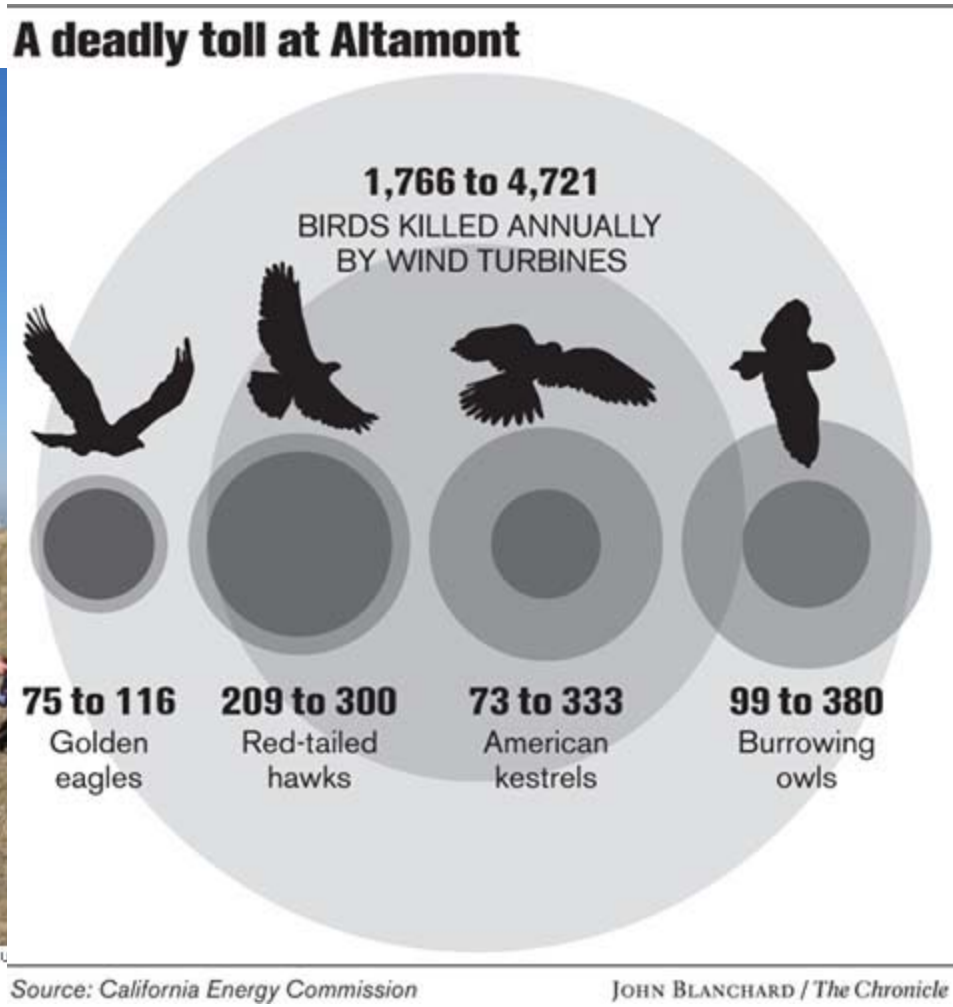
Wind turbines have caused the deaths of four white-tailed eagles in Norway. The discovery of the dead white-tailed eagles, and the failure of almost 30 others to return to nesting sites within the wind farm area on the Smøla islands, has increased fears that wind farms in the UK could have a similar toll on native and migrating wild birds.

Mark Avery, the RSPB's Conservation Director said, 'These findings are shocking, yet may only be the tip of the iceberg. Research on the islands is being stepped up and if more dead birds are found, and even fewer are able to breed, we will be doubly determined to fight wind farm plans that could cause similar destruction in the UK.'

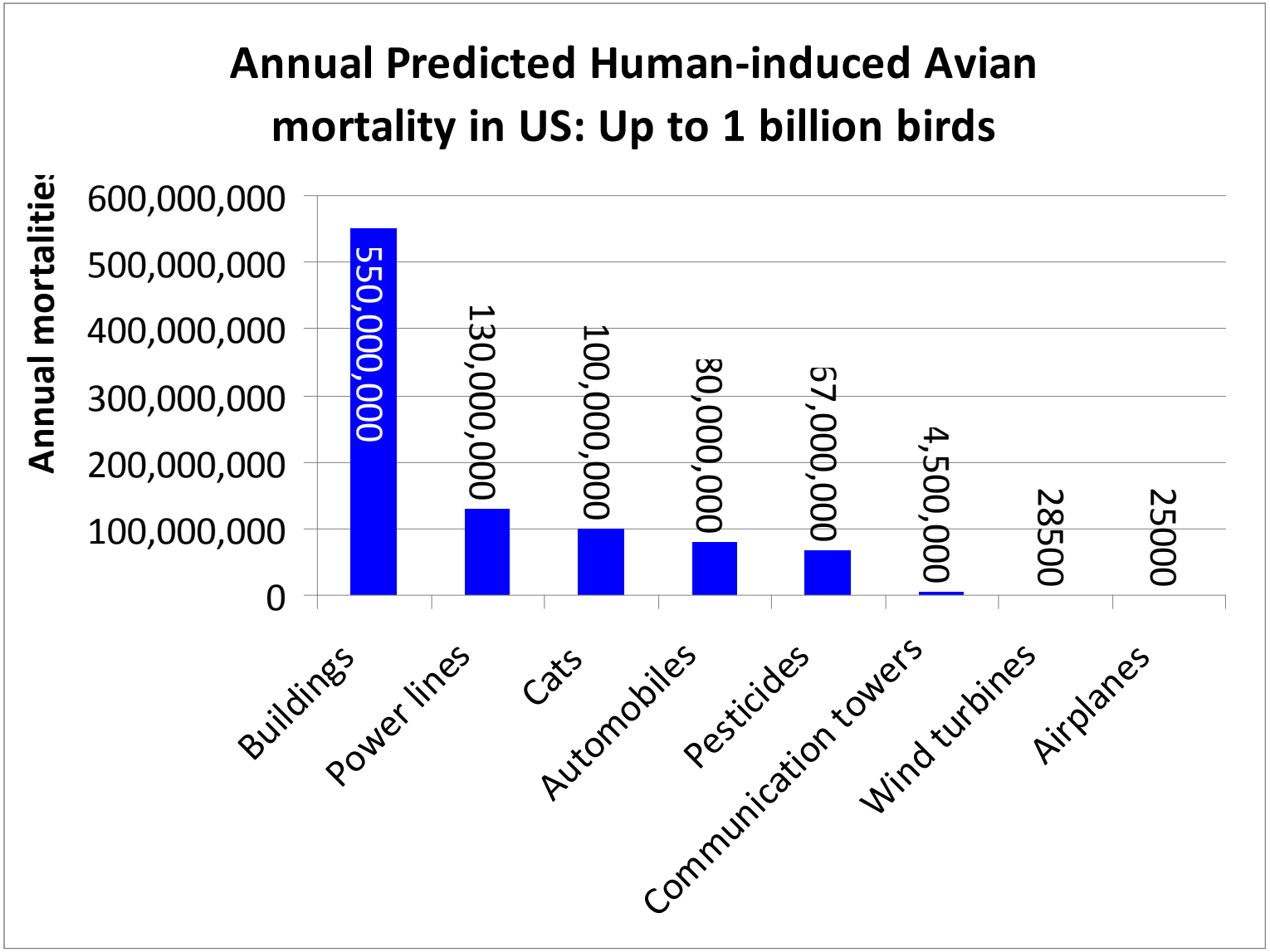
The 68-turbine Smøla wind farm was built between 2001 and 2005. The Norwegian government ignored advice based on an environmental assessment, warning against the development because of the danger it posed to white-tailed eagles. BirdLife International took the case to the Bern Convention but the decision was not overturned.

to monitor the impact of the wind farm, along with the Norwegian Institute
rch and the Norwegian Sea Eagle Project. We are awaiting a decision on the
proposal that could threaten white-tailed and golden eagles in Scotland.

Altamont Pass Wind Resource Area, CA: 5000 wind turbines



Public Perception of Wind Farms and Birds



Erickson et al. 2005. USDA Forest Service Gen. Tech. Rep. PWS-GTR-191

Lots of recent scientific research on birds and offshore wind farms:

Journal of Applied Ecology 2004
41, 724–734

Scaling possible adverse effects of marine wind farms on seabirds: developing and applying a vulnerability index

STEFAN GARTHE* and OMMO HÜPPOP†
**Research and Technology Centre (FTZ), University of Kiel, Hafentörn, D-25761 Büsum, Germany; and †Institute of Avian Research 'Vogelwarte Helgoland', Inselstation Helgoland, PO Box 1220, D-27494 Helgoland, Germany*

Ibis (2006), 148, 129–144

Information needs to support environmental impact assessment of the effects of European marine offshore wind farms on birds

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biology letters
Biol. Lett.
doi:10.1098/rsbl.2005.0336
Published online

Avian collision risk at an offshore wind farm

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floats, resulting in short parts of the trajectories being undetectable by the radar. These parts were reconstructed by drawing a straight line between the points of disappearance and reappearance. This procedure will most probably neither under- nor overestimate the avoidance behaviour, since the vast majority of the disappearing parts of trajectories were situated between the rows of turbines, and not at the rows themselves, where the measurement of distance between the bird flock and the nearest turbine was performed. The decreasing ability to follow bird flocks by radar with increasing distance was not corrected for, since (i) the data for this analysis represent a subsample of the flocks that was large enough for radar detection and (ii) the species under study tend to migrate in relatively large flocks that are easily detected by this radar at the distance of interest. Furthermore, data collection was conducted only in calm winds (less than 10 m s^{-1}) and no-precipitation

Journal of Applied Ecology 2007
44, 516–522

Effects of wind turbines on flight behaviour of wintering common eiders: implications for habitat use and collision risk

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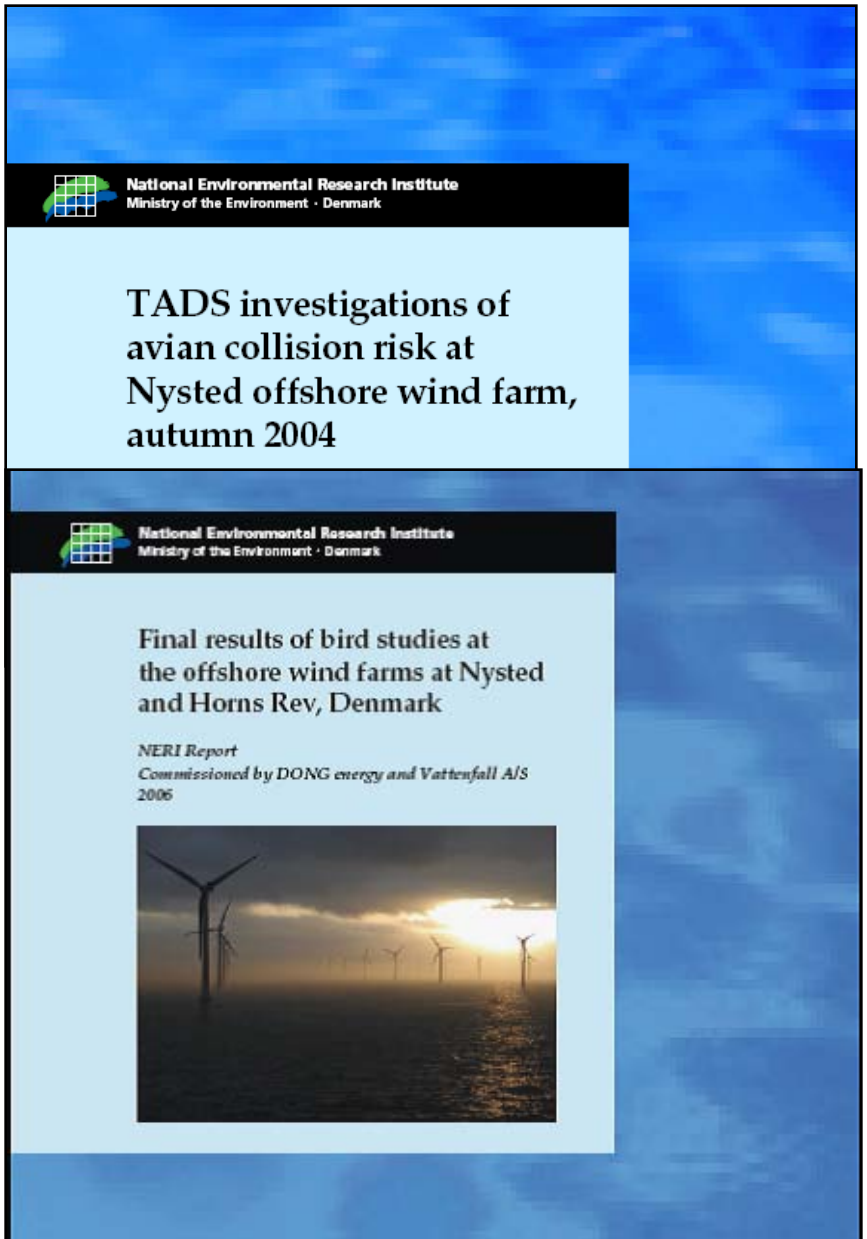
Studies on Nocturnal Flight Paths and Altitudes of Waterbirds in Relation to Wind Turbines: A Review of Current Research in The Netherlands

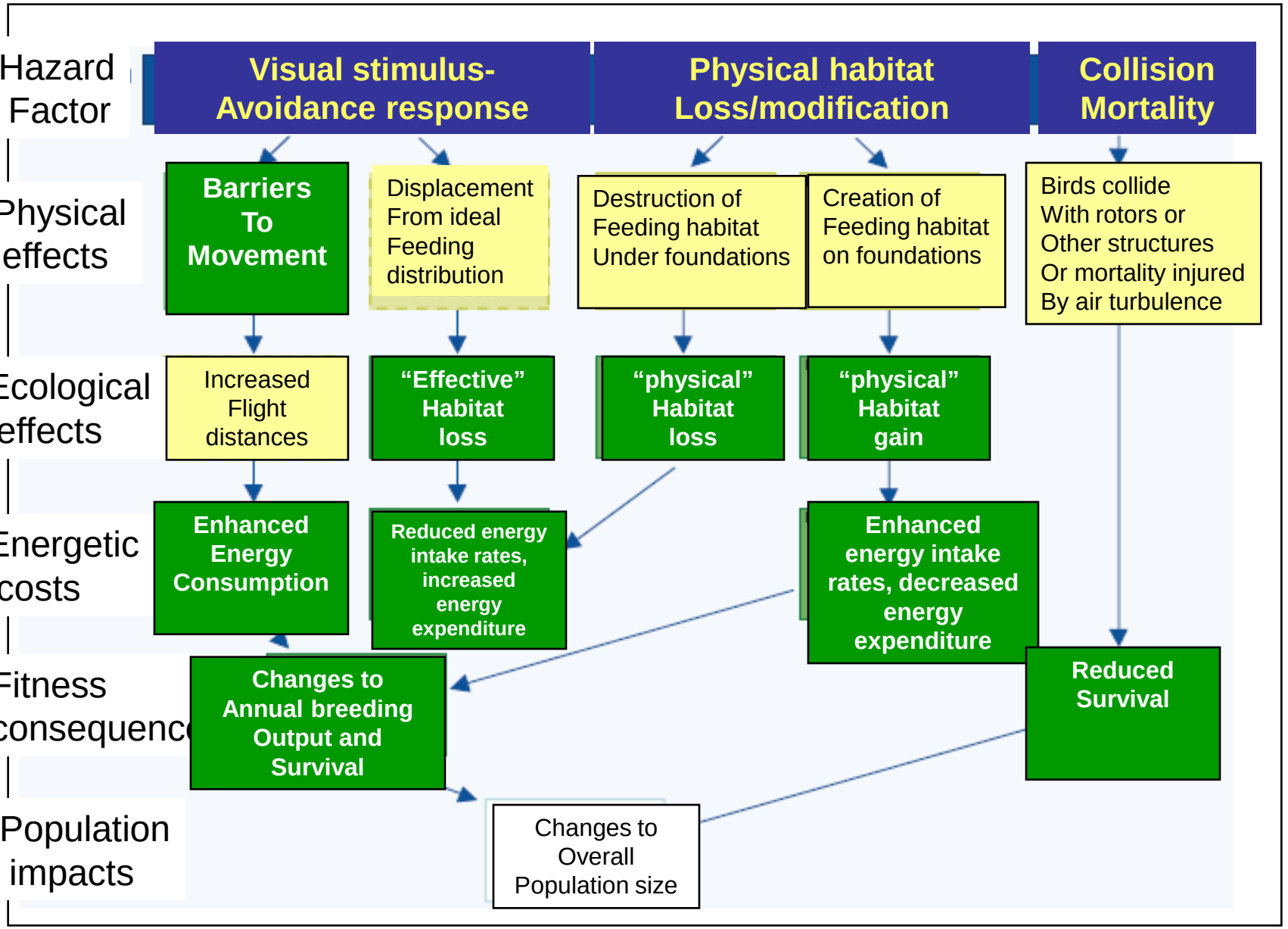
by

Sjoerd Dirksen[1], *Arie L. Spaans*[2] and *Jan van der Winden*[1]
[1] Bureau Waardenburg bv and [2] Alterra

Abstract



Impacts are more complex than just direct mortality from collisions with turbine blades.



Key Findings

- Waterbirds tend to avoid wind farms in nearshore and offshore waters.

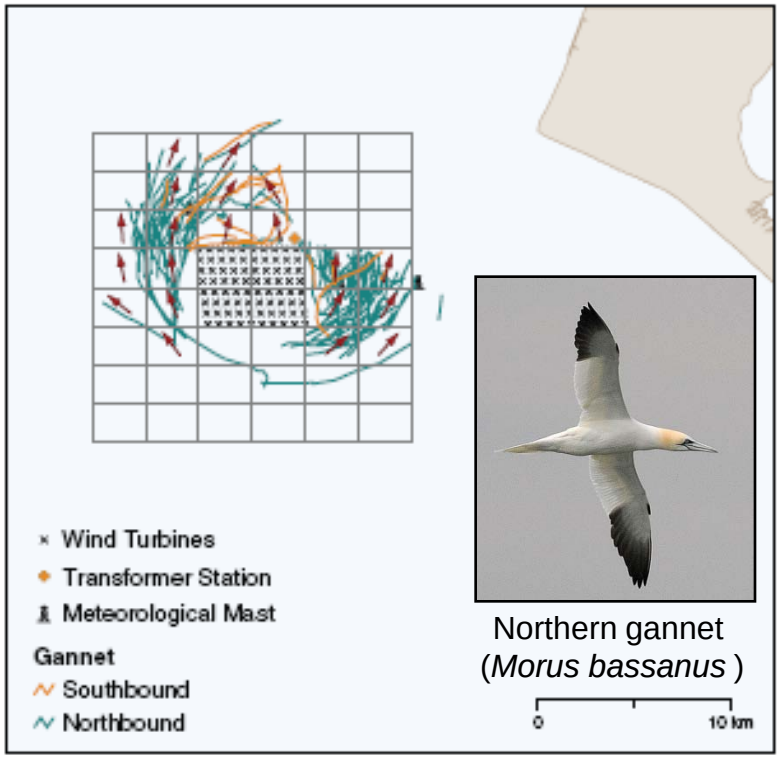
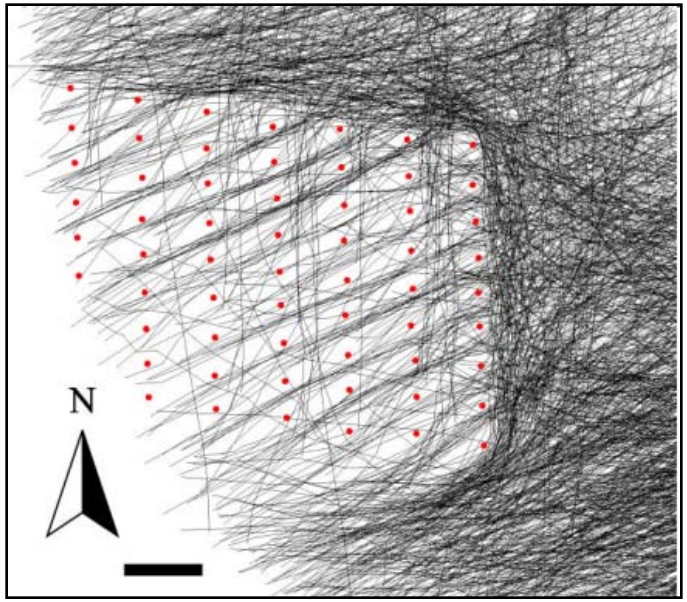
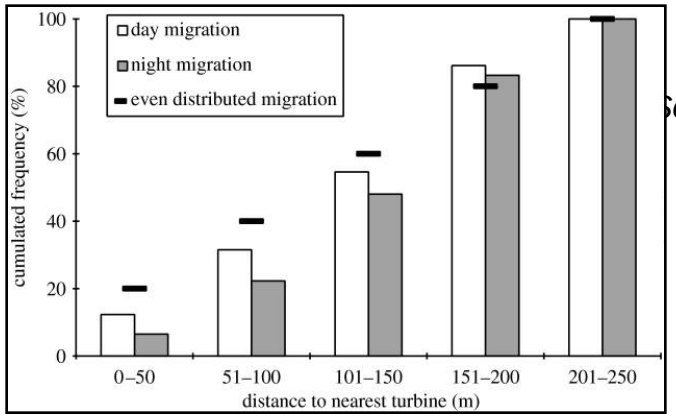


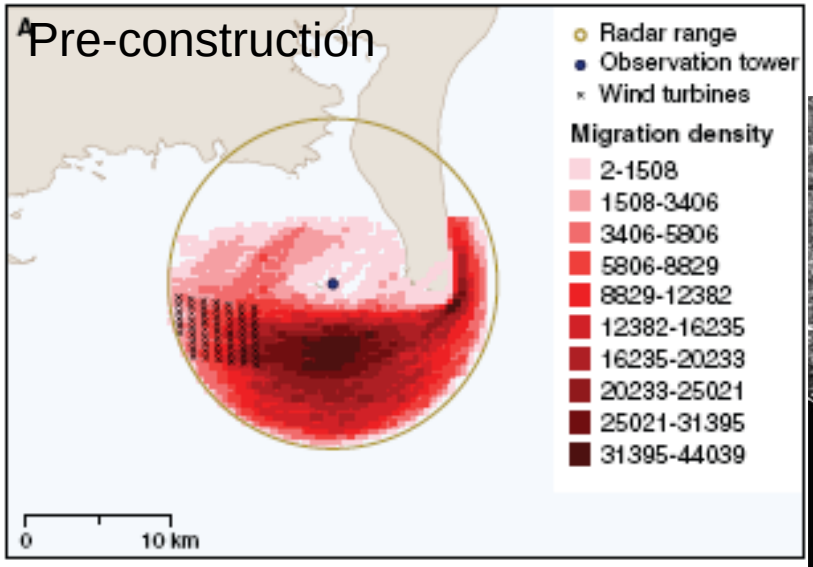
Figure 151. Radar tracks of 126 individuals/flocks of Gannets migrating southwards and northwards at Horns Rev during spring 2003-2005.

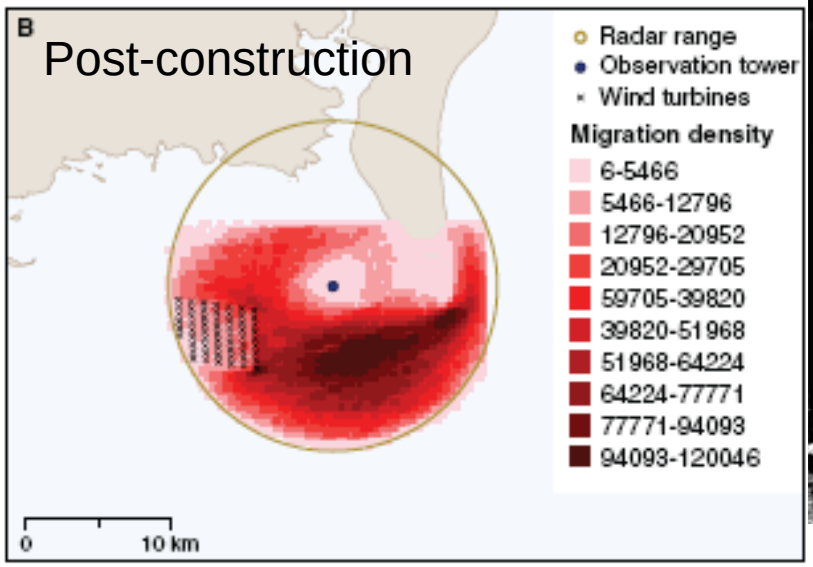


Barnacle goose
(*Branta leucopsis*)

Common eider
(*Somateria mollissima*)







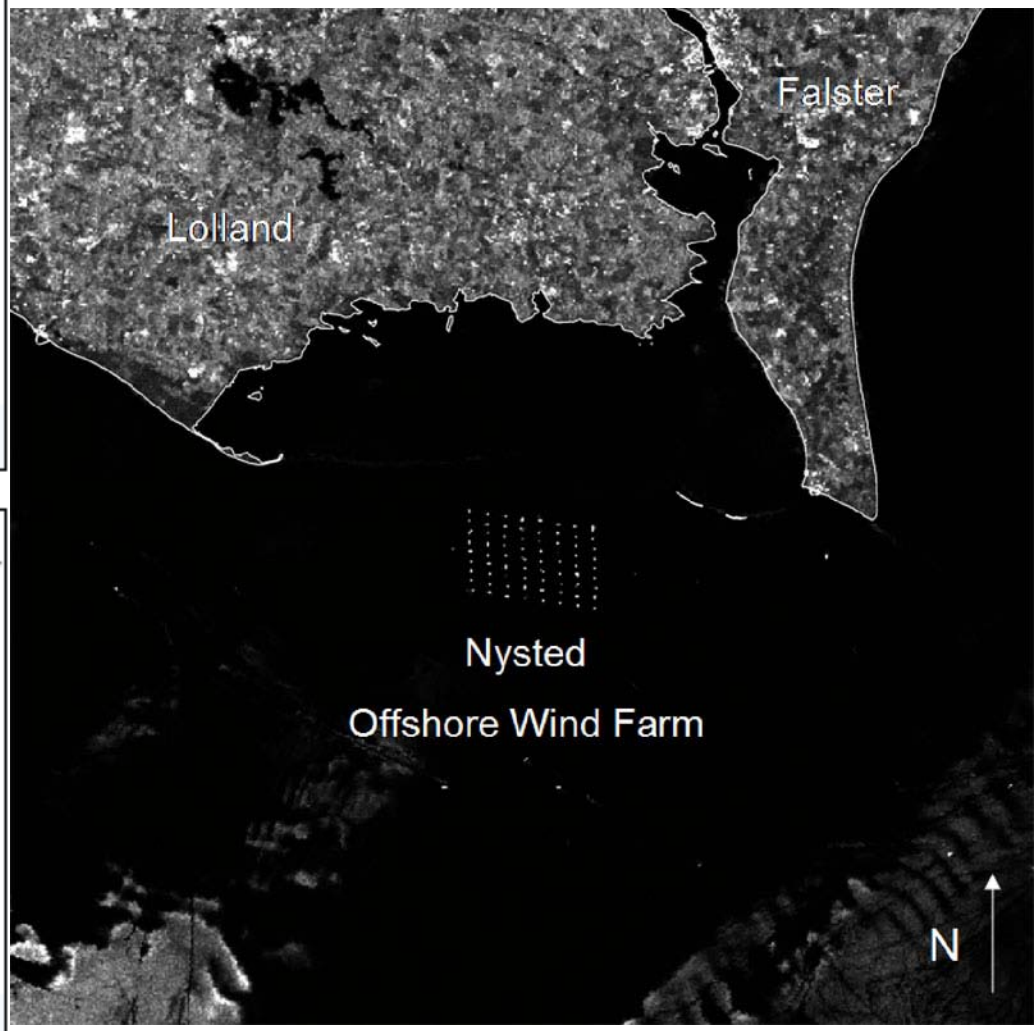


Figure 123. Spatial migration density of waterbird flocks migrating in the study area during autumn. The density is indicated by the total length of tracks in metres within each grid cell. Maps are presented for A) the base-line study (2000-2002) and B) the operational phase (2003-2005).

Key Findings

- Waterbird collisions with wind turbines are rare at offshore wind farms.

Figure 1.2. Thermal camera mounted with a pan/tilt head on the A2 offshore turbine at Nysted wind farm.

Common eider (*Somateria mollissima*)

- At Nysted of 235,000 Common Eider migrating through area in autumn; 41-48 individuals were predicted to collide with turbines.

- An infared camera mounted on a turbine that monitored the turbine blades for 2,4000 hours had no documented Common Eider collisions.

Key Findings

- Wind turbines result in habitat loss in and around the wind farm.

Pre

Post

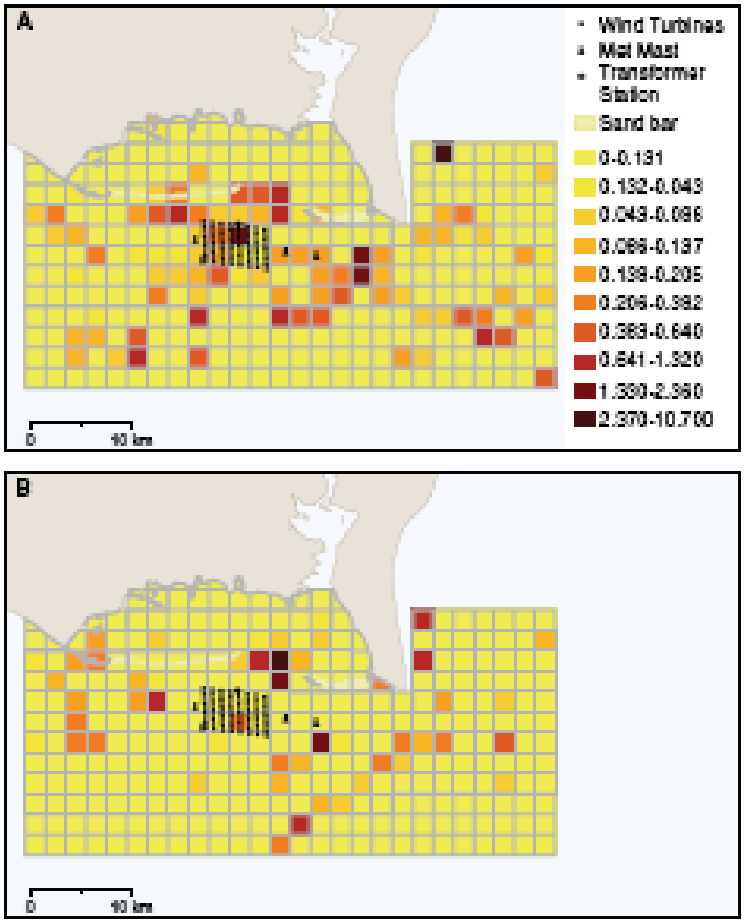


Figure 65. Relative density of Common Scoter in the Nysted study area, based on 16 surveys performed during the pre-construction phase (A) and 15 surveys performed during the post-construction phase (B). Data expressed as number of observed birds per kilometre of flown transect coverage in each 2 x 2 km grid square.

Black scoter (*Melanitta nigra*)

Implications from Recent Research to Ocean SAMP

- Recent research emphasize the importance of a high quality avian assessment prior to any type of nearshore or offshore development.

- If wind farms are placed in areas where avian densities are relatively low (e.g. not important feeding areas or migratory pathways), impacts should be low on avian populations.

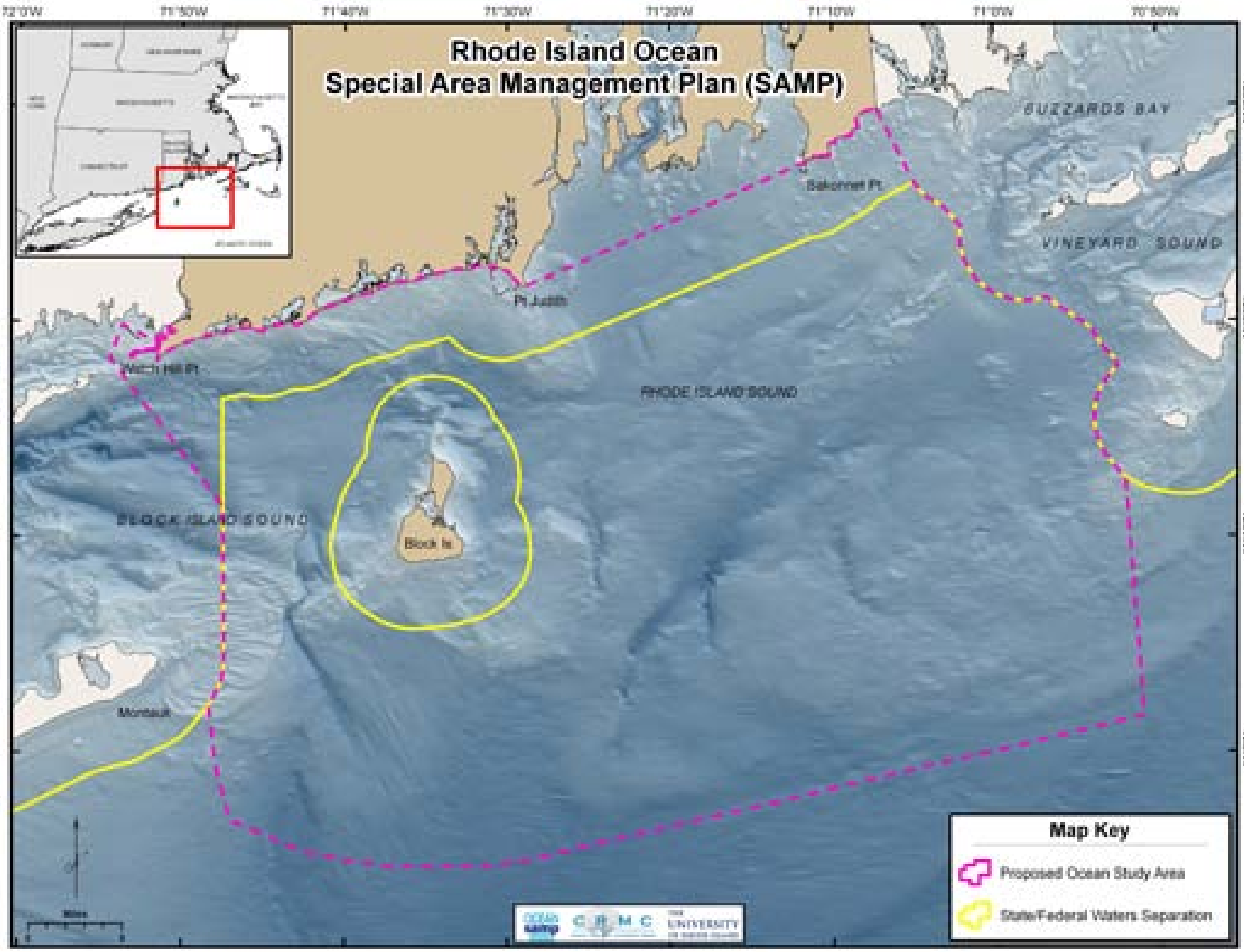
Avian studies for RI Ocean SAMP

- **Goal:** Assess current spatial and temporal patterns of avian abundance and movement ecology within Ocean SAMP study area boundaries

- **Primary Objectives:**
  1) Compile and review historical avian datasets.

  2) Assess temporal variation in avian spatial distribution and abundance of birds in Ocean SAMP study area.

  3) Quantify flight behavior of birds in Ocean SAMP study area


Rhode Island Ocean
Special Area Management Plan (SAMP)
72°0'W
71°50'W
71°40'W
71°30'W
71°20'W
71°10'W
71°0'W
70°50'W
41°30'N
41°20'N
41°10'N
41°0'N
BUZZARDS BAY
VINEYARD SOUND
Sakonnet Pt
Pt Judith
RHODE ISLAND SOUND
BLOCK ISLAND SOUND
Block Is
Montauk
Miles
Map Key
Proposed Ocean Study Area
State/Federal Waters Separation

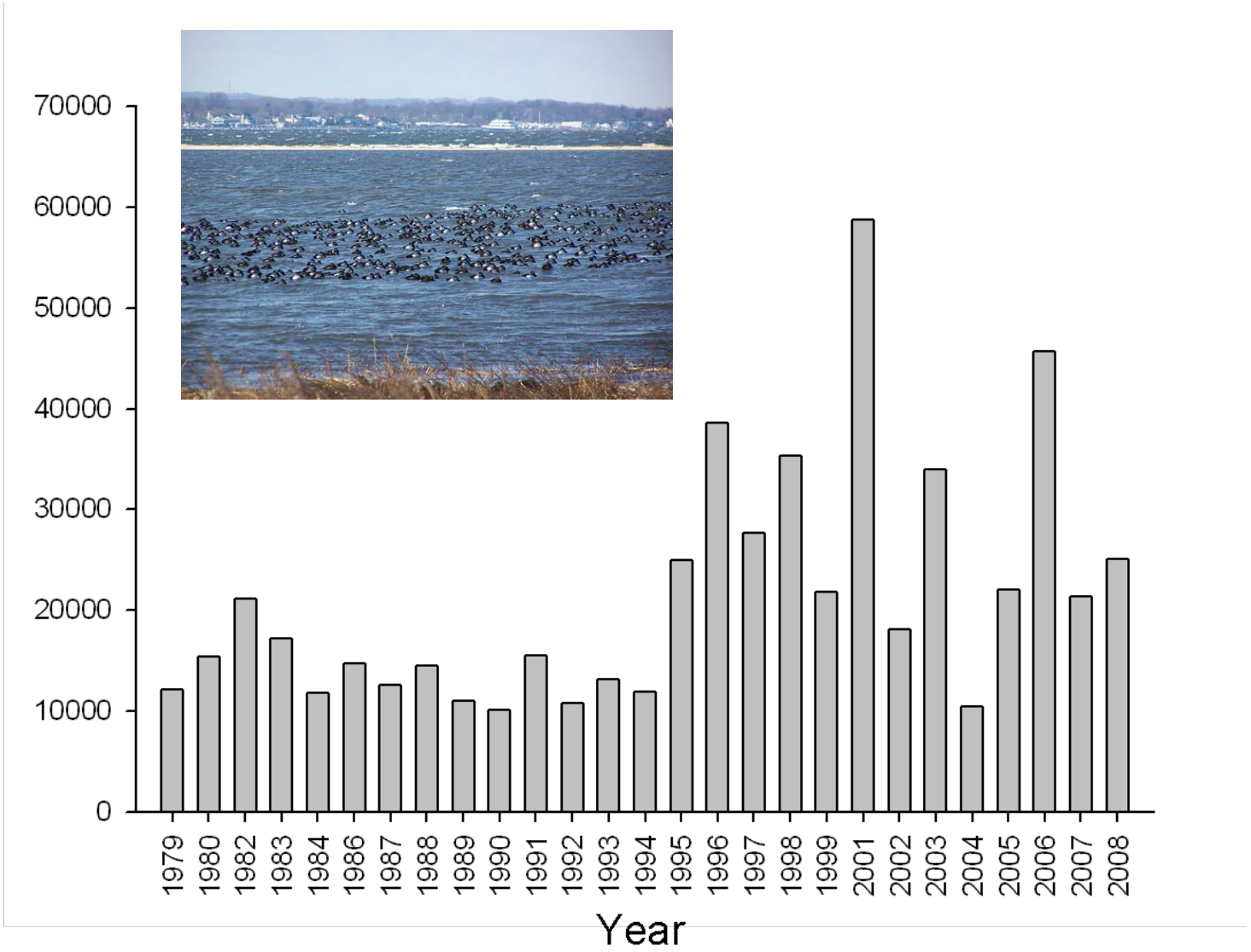
Review of Historical Avian Data

(October 2008 to January 2009)

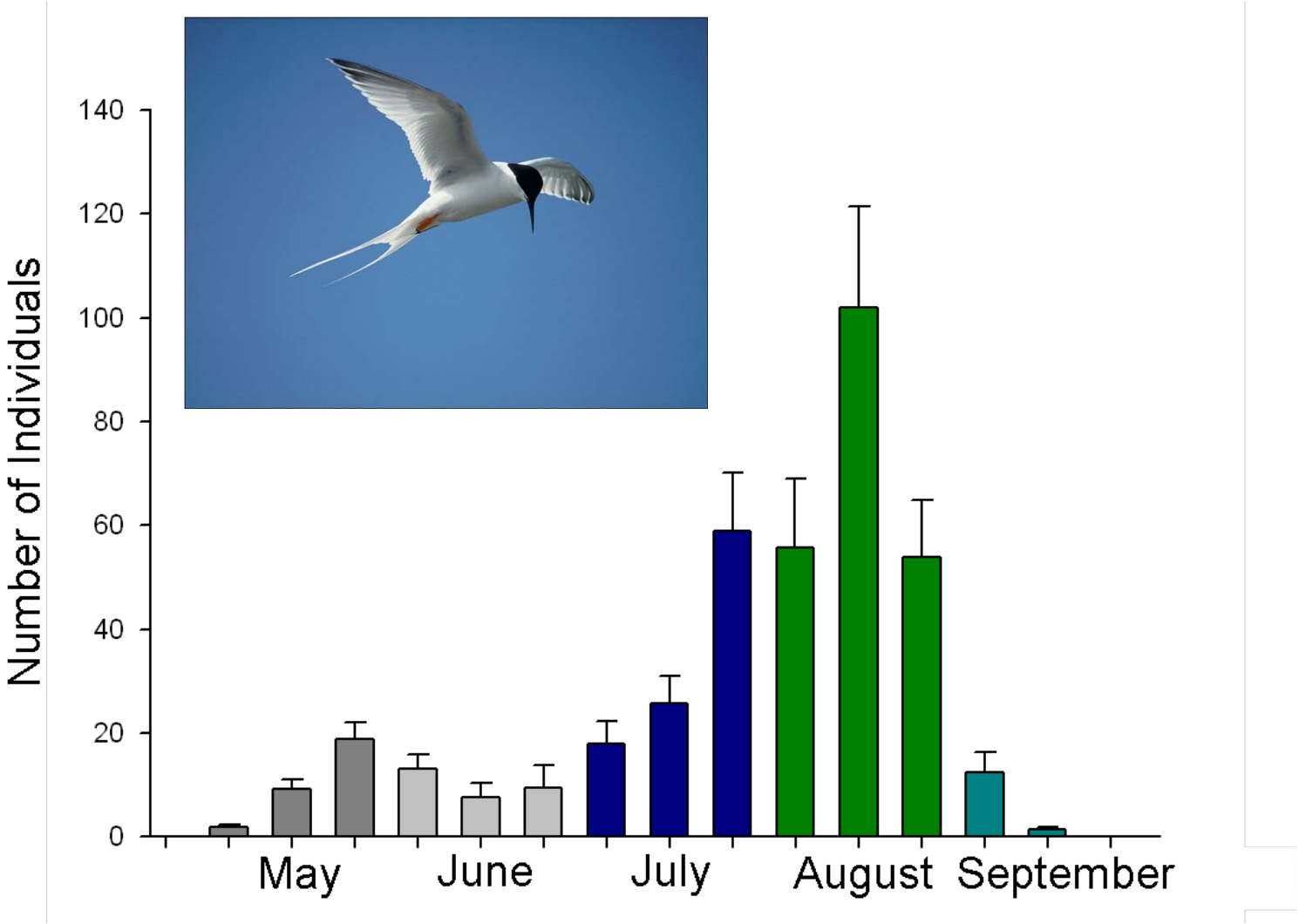
- Phenology, relative abundance and annual variation are well documented for avian species found **nearshore**.

- Little is known about spatial distribution and movement ecology in **offshore** areas.

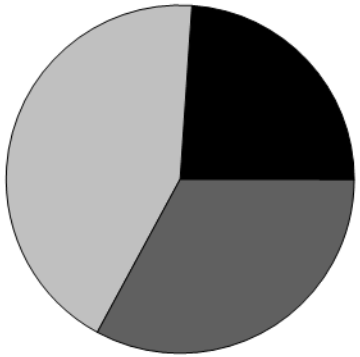
Waterfowl abundance in Narragansett Bay based on DEM mid-winter waterfowl counts



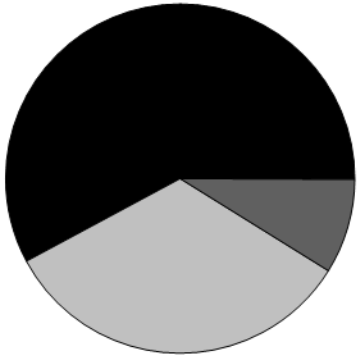
Seasonal variation in number of Roseate Terns detected
At Napatree Spit, RI by C. Raithel (RIDEM – unpubl. data).

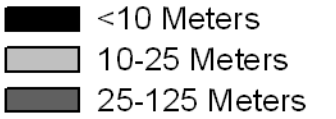


Northern gannet



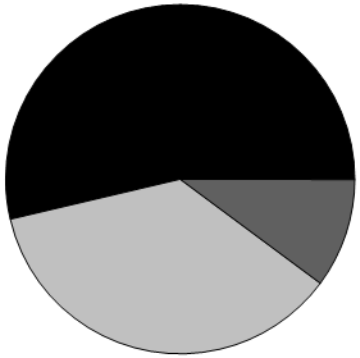
Gull spp.



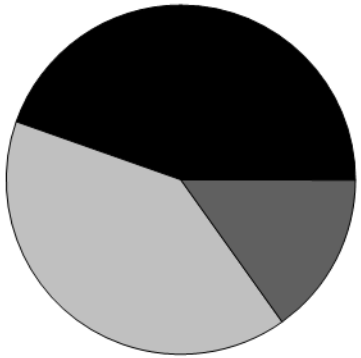


Shorebirds

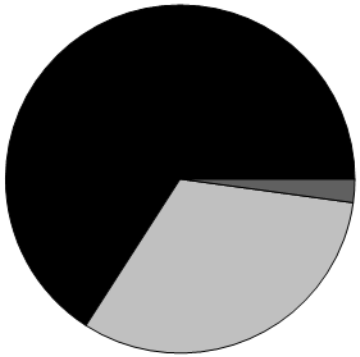
Loon spp.



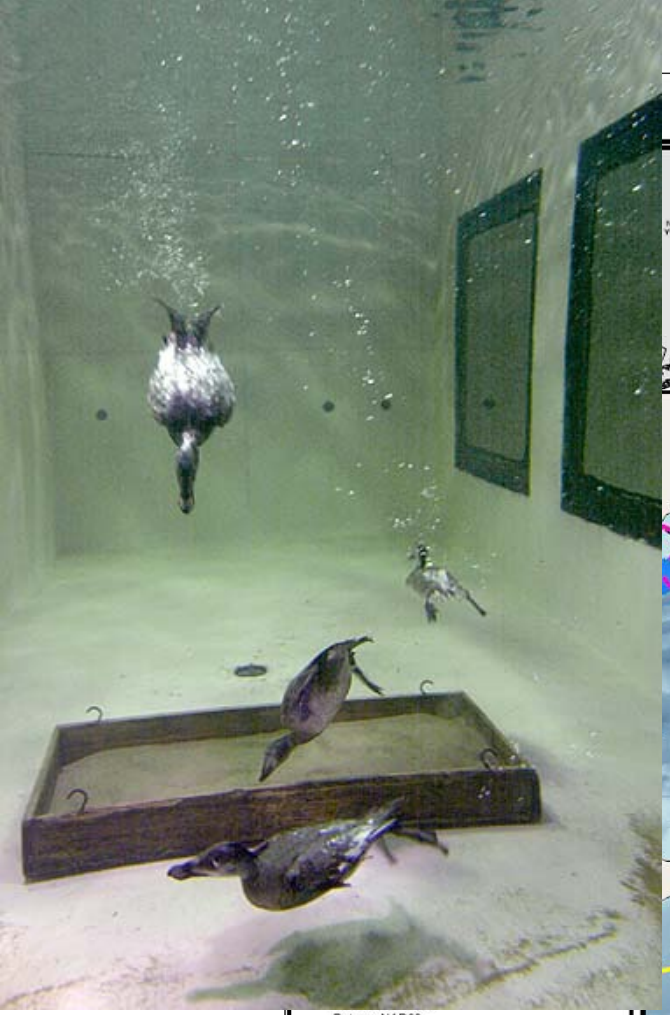
Mergansers

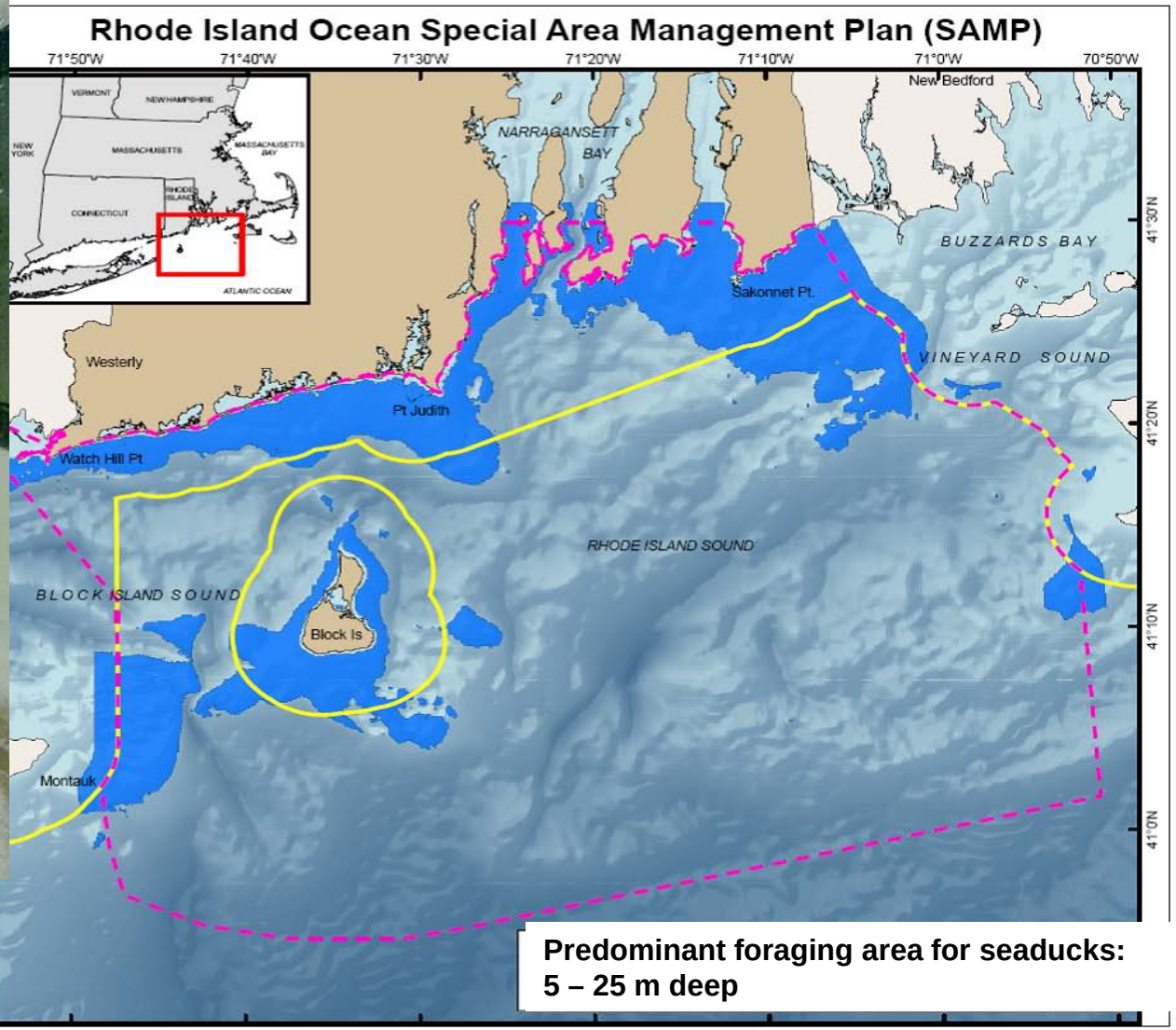


Cormorants



Flight elevations of Waterbirds moving past Pt. Judith in 1998 – 1999 URI unpubl, data





Predominant foraging area for seaducks: 5 – 25 m deep

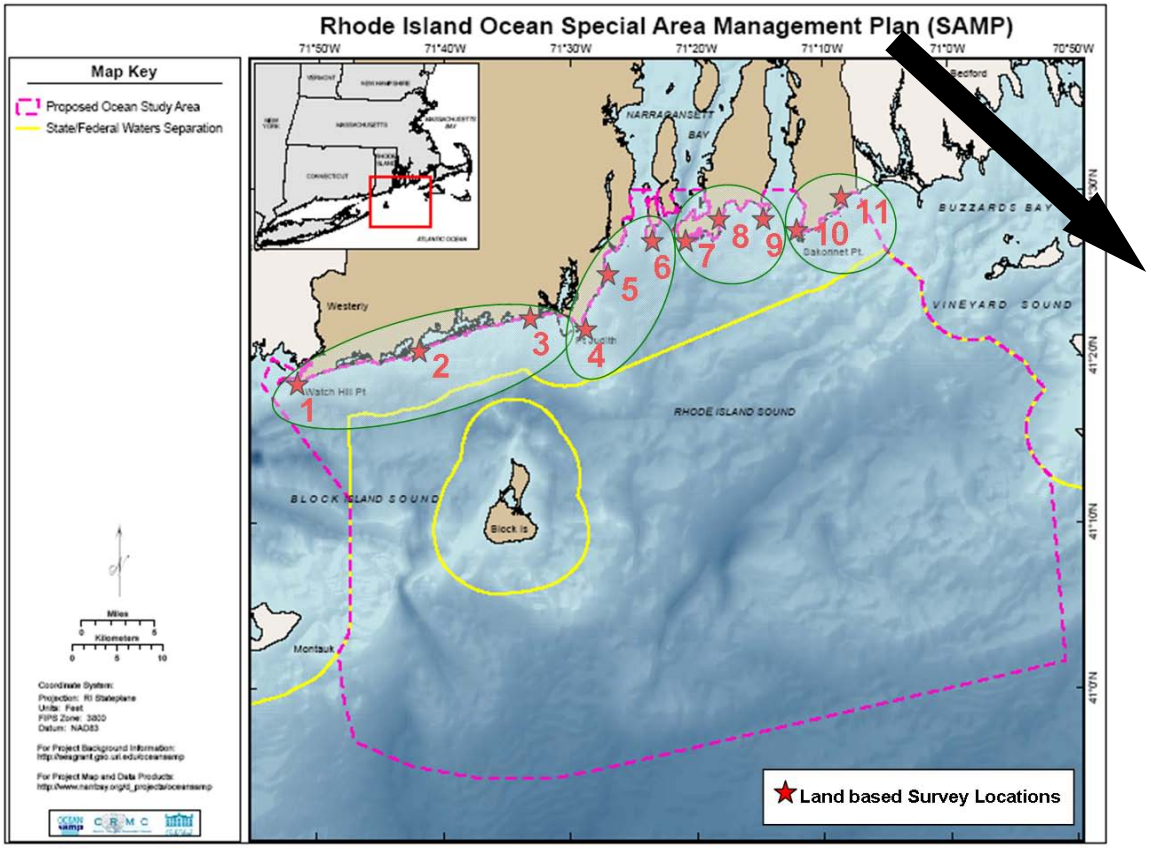
Based on a literature review, most seaducks typically forage in water 5-25 m deep (shown in blue).

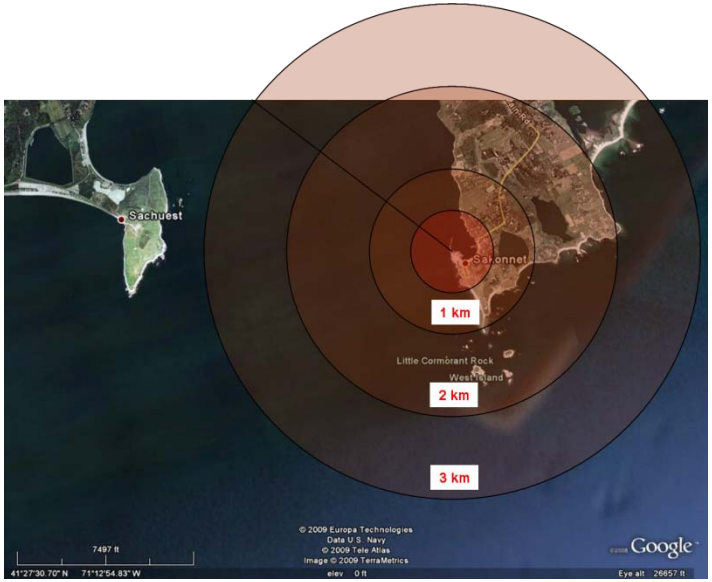
Avian studies for Ocean SAMP conducted by URI scientists

- Land-based point counts
- Boat-based line transects
  - Offshore surveys
  - Roseate Tern surveys of nearshore areas
- Aerial line transects
- Radar studies (conducted by New Jersey Audubon Society)

Land-based Surveys (Jan 2009 – May 2010)

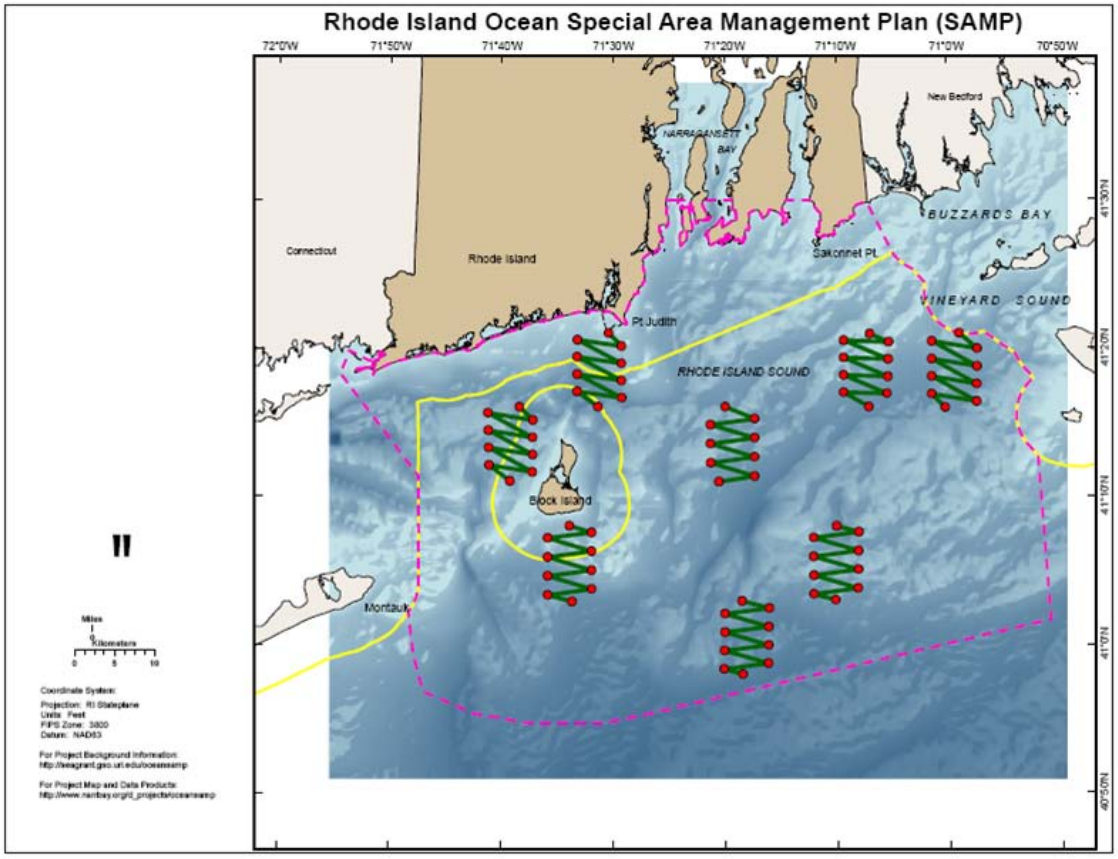
11 sites
- each surveyed 6 times per month
- 1 to 2 hours per survey, to 3 km offshore
- 3 morning and 3 evening surveys per month

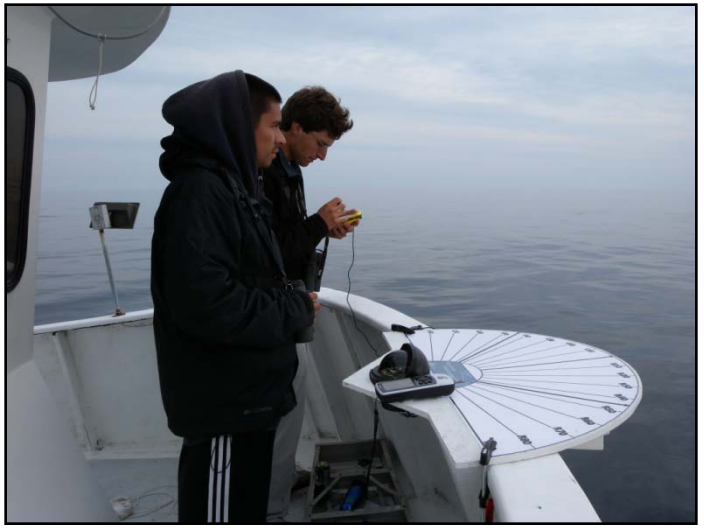




Boat-based Surveys (February 2009 – May 2010)

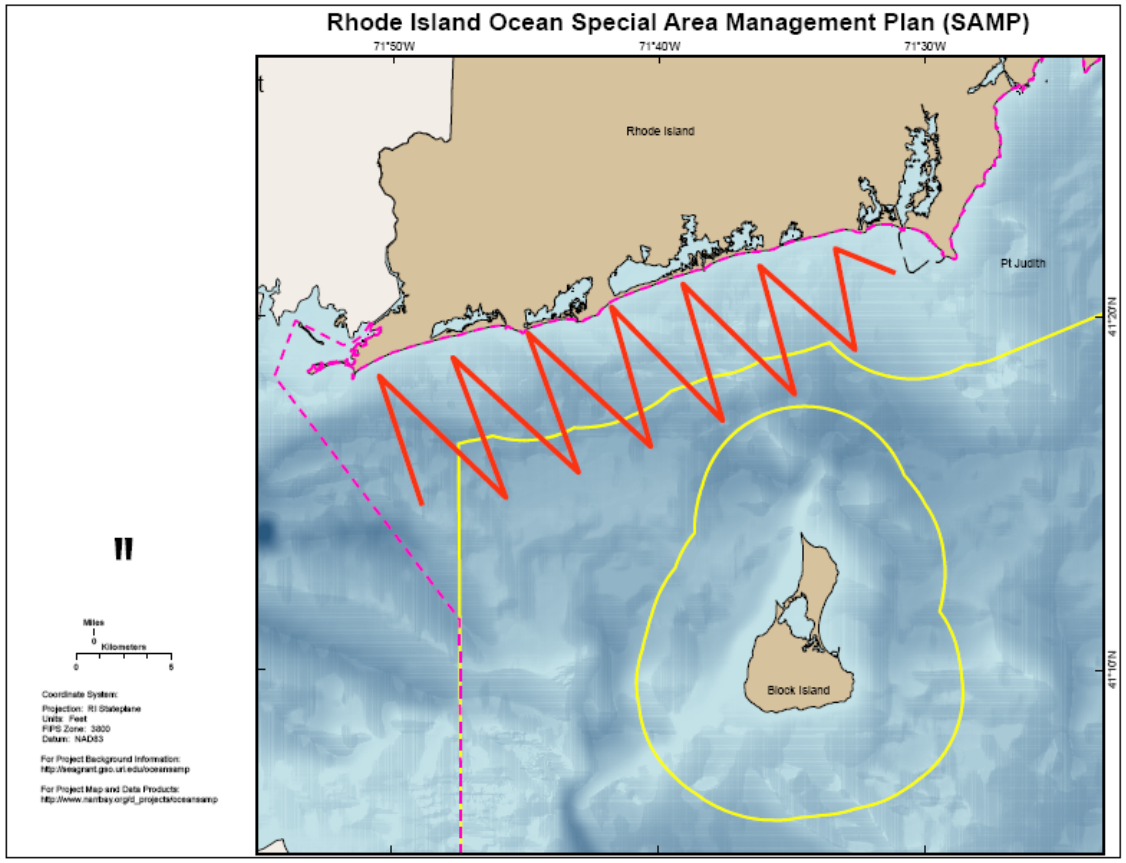
- 8 randomly-located sawtooth line transects to estimate density
- One survey per week conducted on 2 grids
- Each 4 by 5 nm grid gets surveyed once per month





ROST Boat-Based Surveys (August 2009)

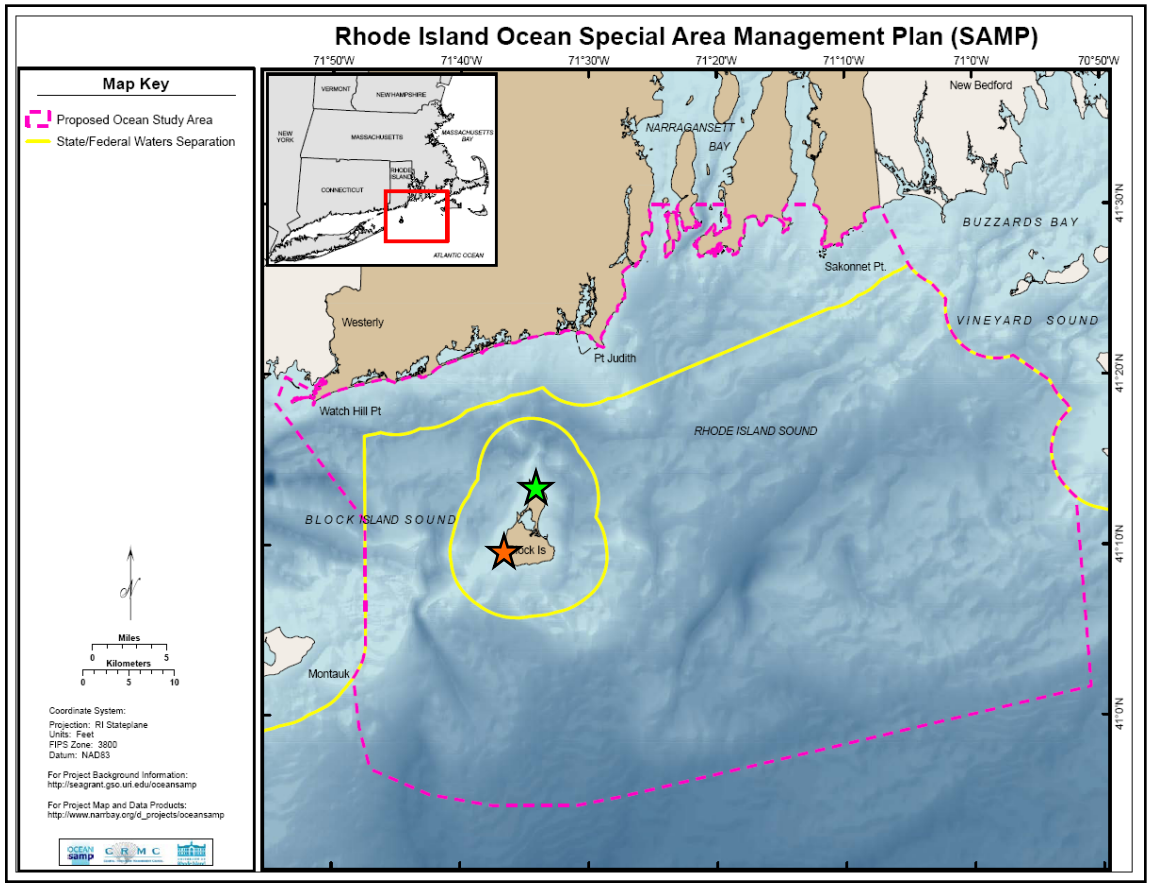
-50 nm of line transects twice per week

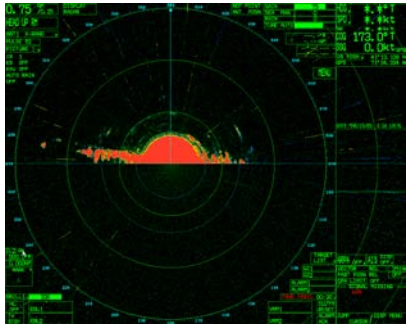


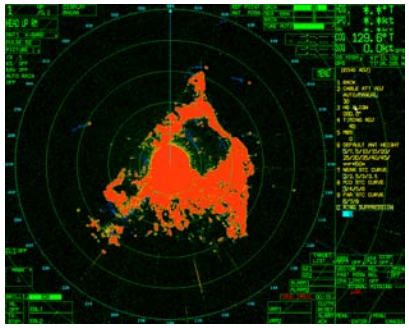
Roseate tern (*Sterna dougalli*)

- Collaboration with USFWS

Radar Surveys (October 2009 – May 2010)



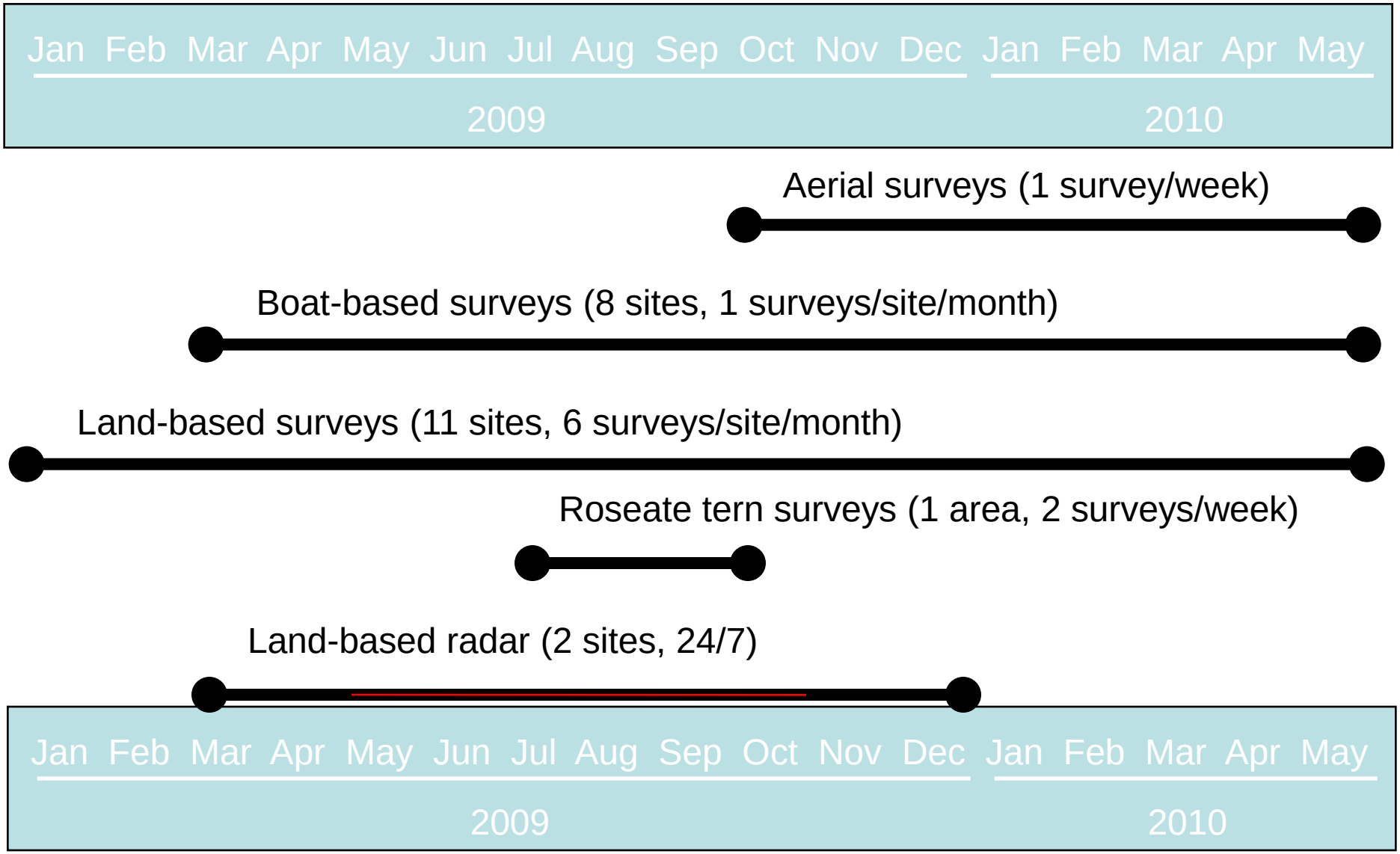




★ March 20th to April 30th
and 1 Nov to December 15th

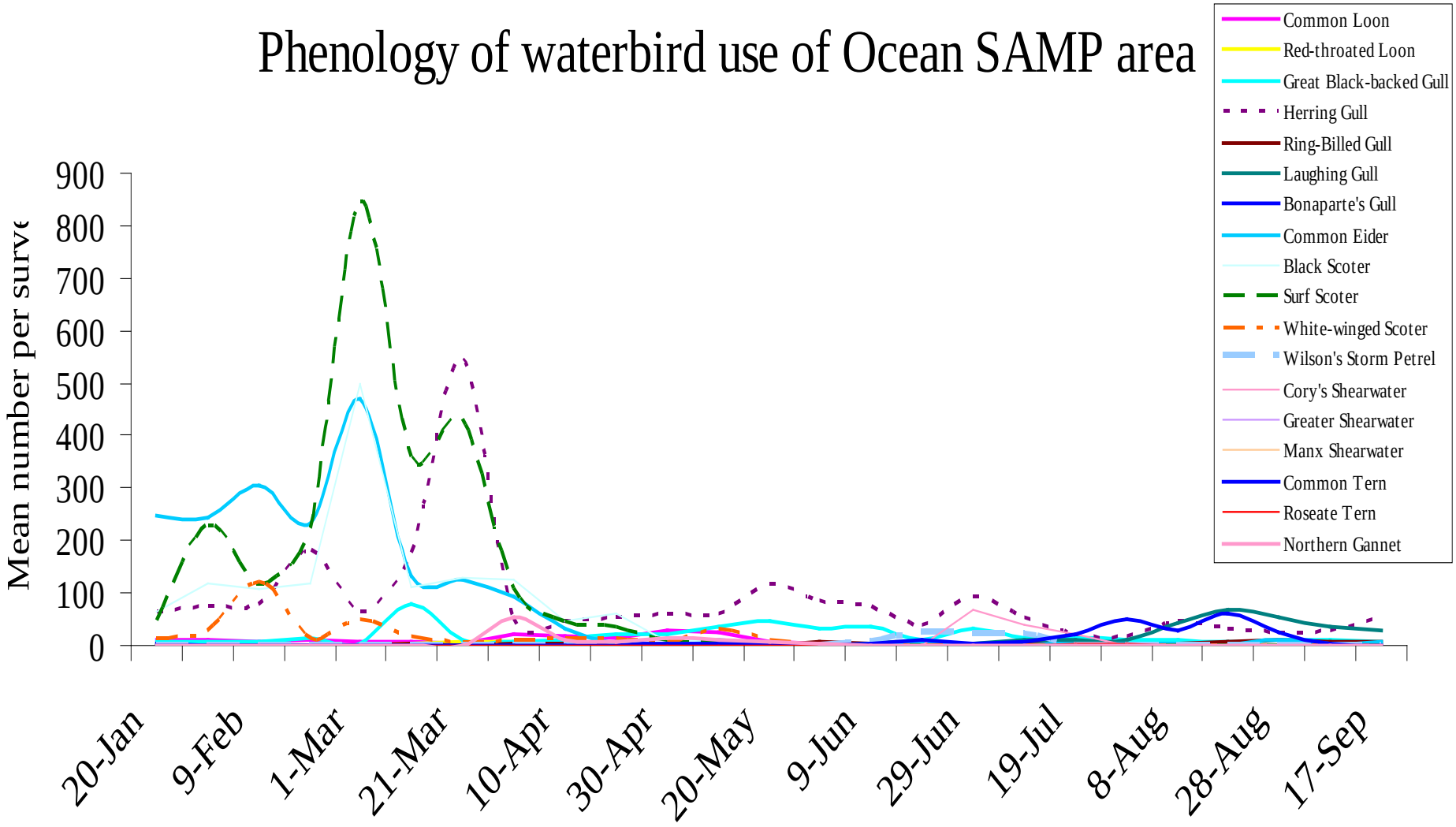
★ 1 May to 1 Nov

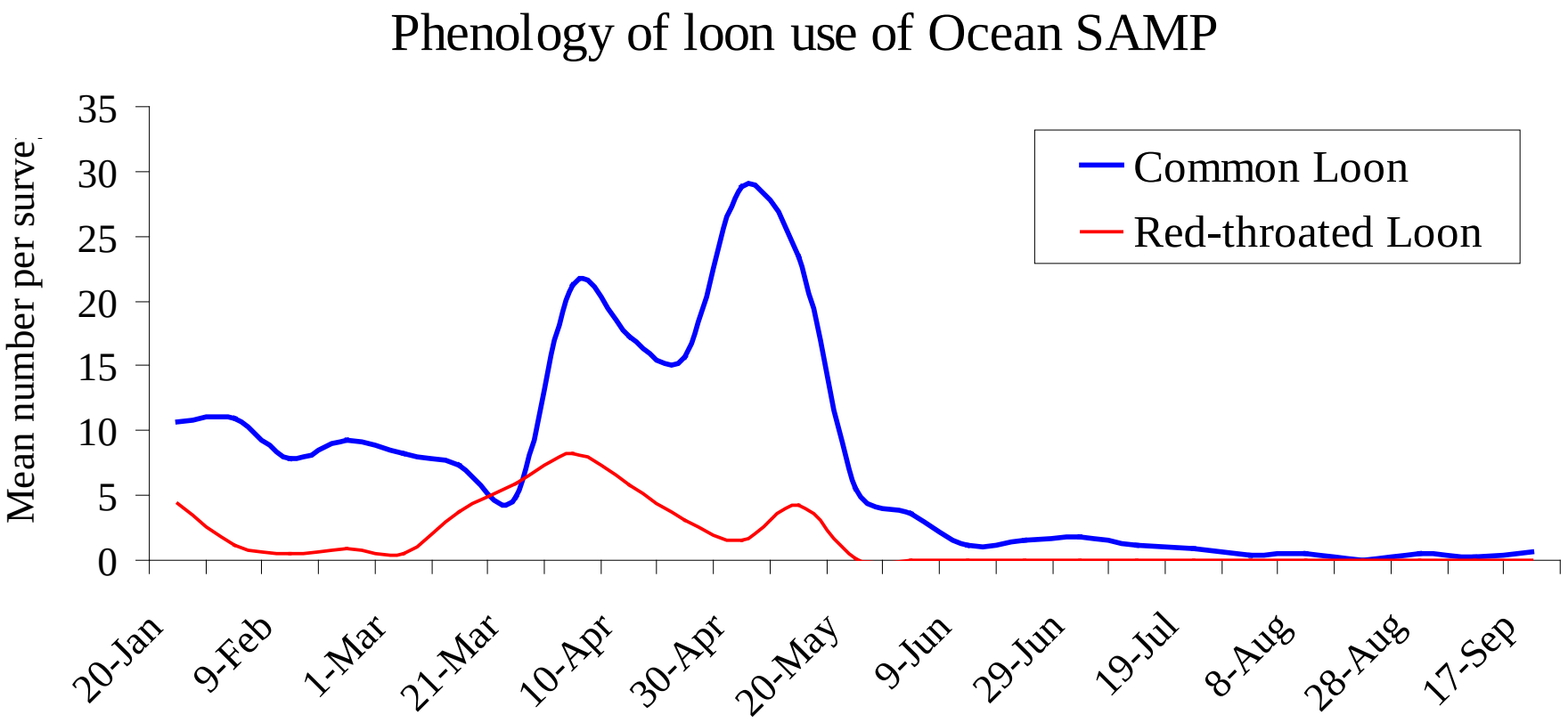
Overview of the RI Ocean SAMP bird surveys

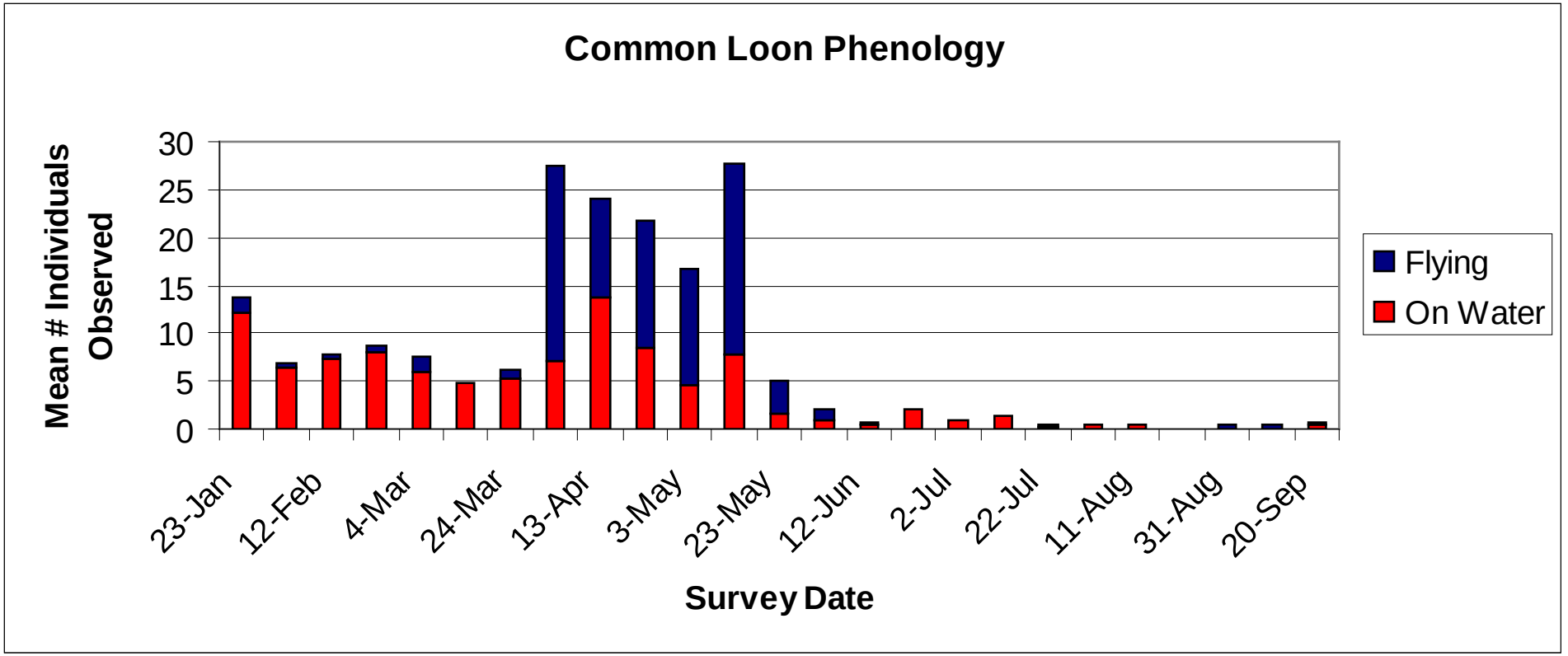


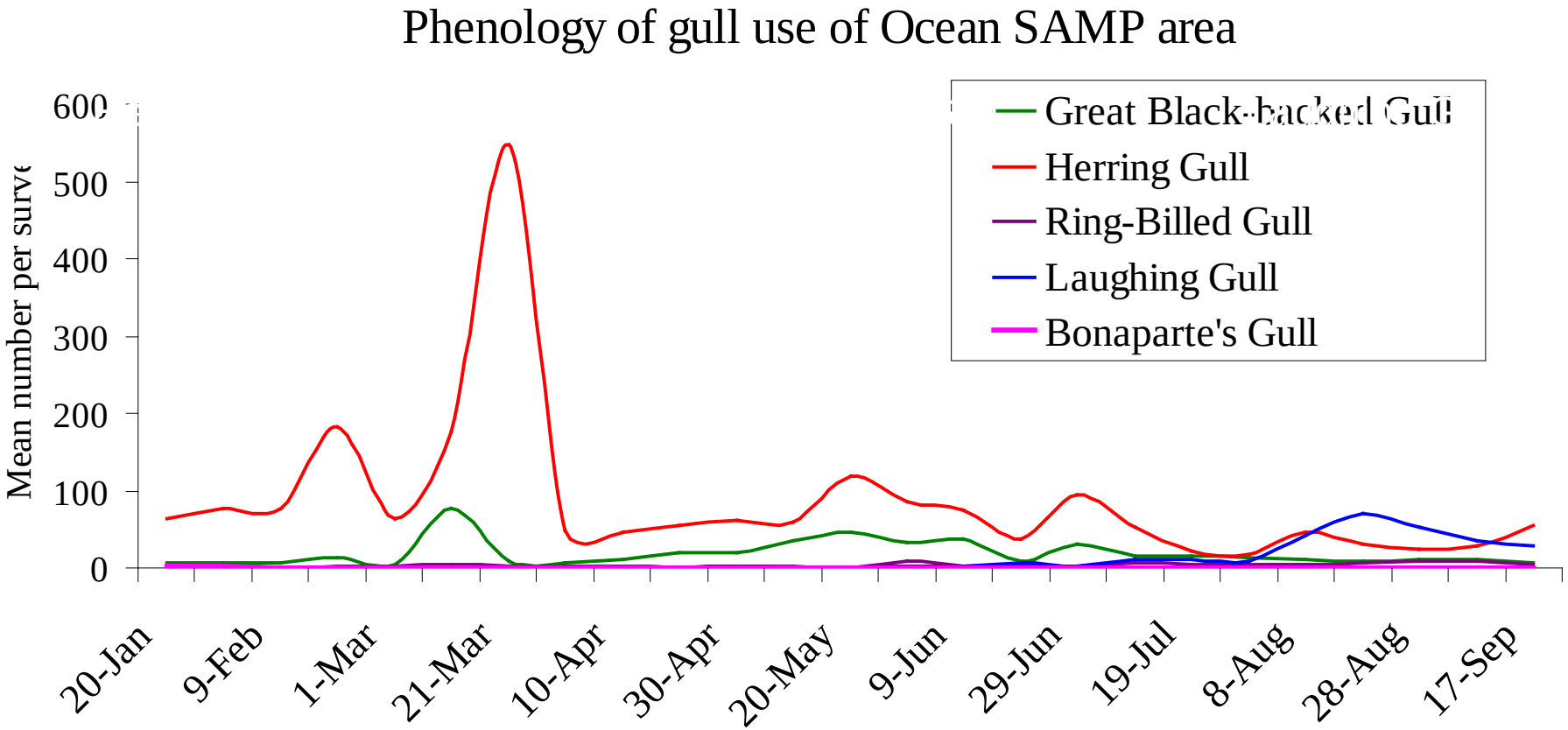
Preliminary Results

Dynamic Nature of Avian Movement Ecology

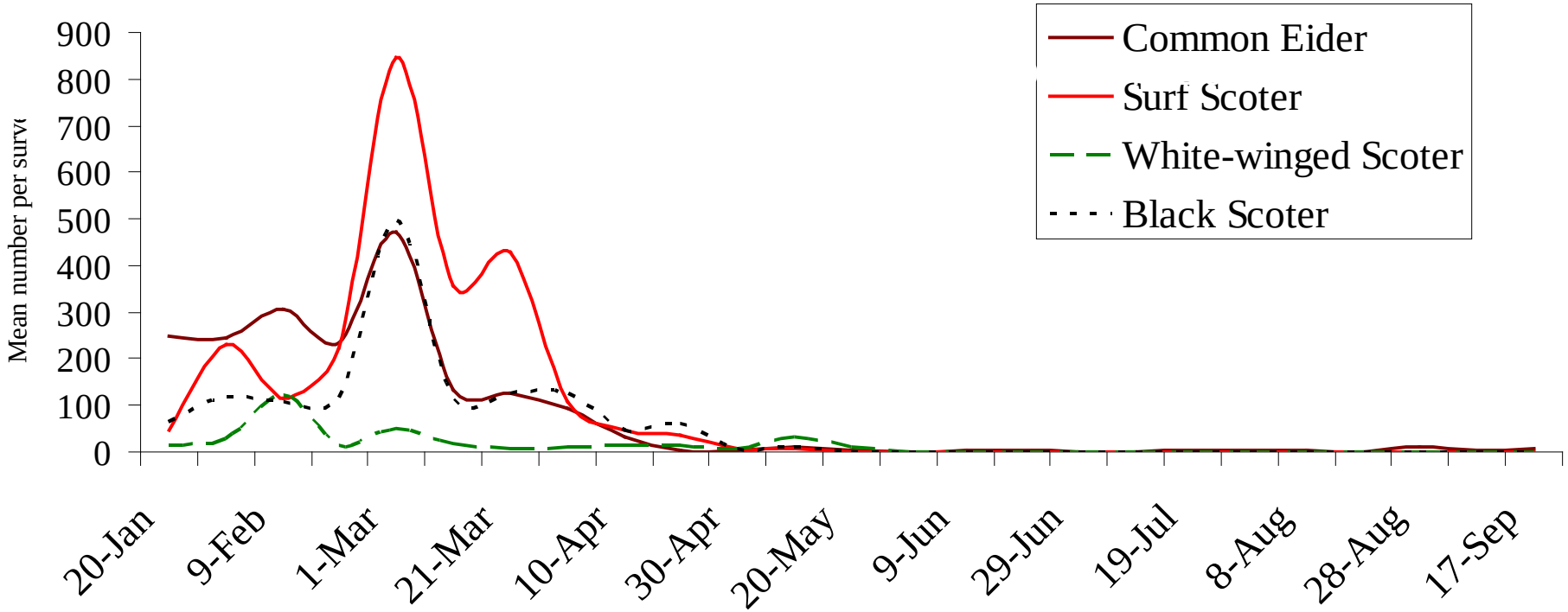

Phenology of waterbird use of Ocean SAMP area
Mean number per surve
900
800
700
600
500
400
300
200
100
0
20-Jan
9-Feb
1-Mar
21-Mar
10-Apr
30-Apr
20-May
9-Jun
29-Jun
19-Jul
8-Aug
28-Aug
17-Sep
Common Loon
Red-throated Loon
Great Black-backed Gull
Herring Gull
Ring-Billed Gull
Laughing Gull
Bonaparte's Gull
Common Eider
Black Scoter
Surf Scoter
White-winged Scoter
Wilson's Storm Petrel
Cory's Shearwater
Greater Shearwater
Manx Shearwater
Common Tern
Roseate Tern
Northern Gannet

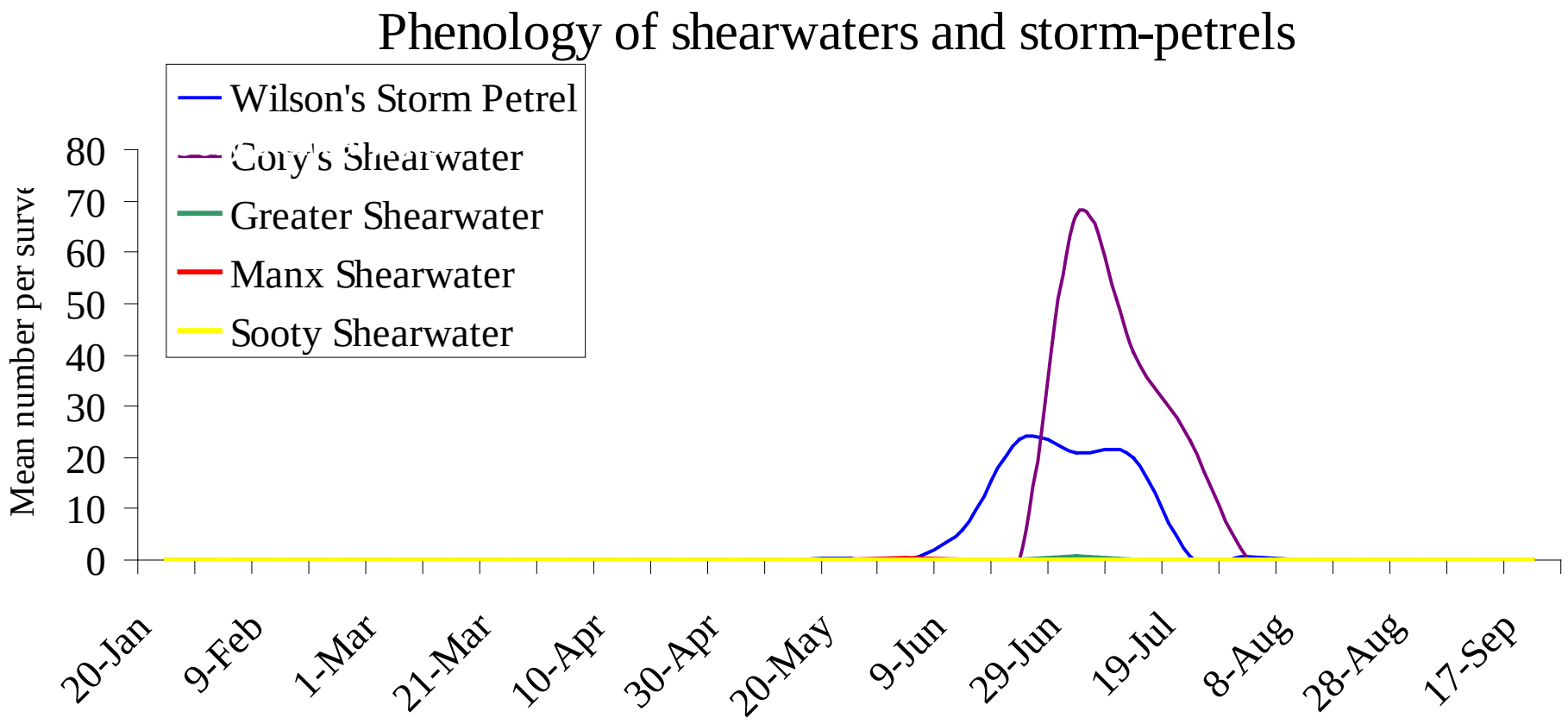

Phenology of loon use of Ocean SAMP
Mean number per surve
35
30
25
20
15
10
5
0
Common Loon
Red-throated Loon
20-Jan
9-Feb
1-Mar
21-Mar
10-Apr
30-Apr
20-May
9-Jun
29-Jun
19-Jul
8-Aug
28-Aug
17-Sep

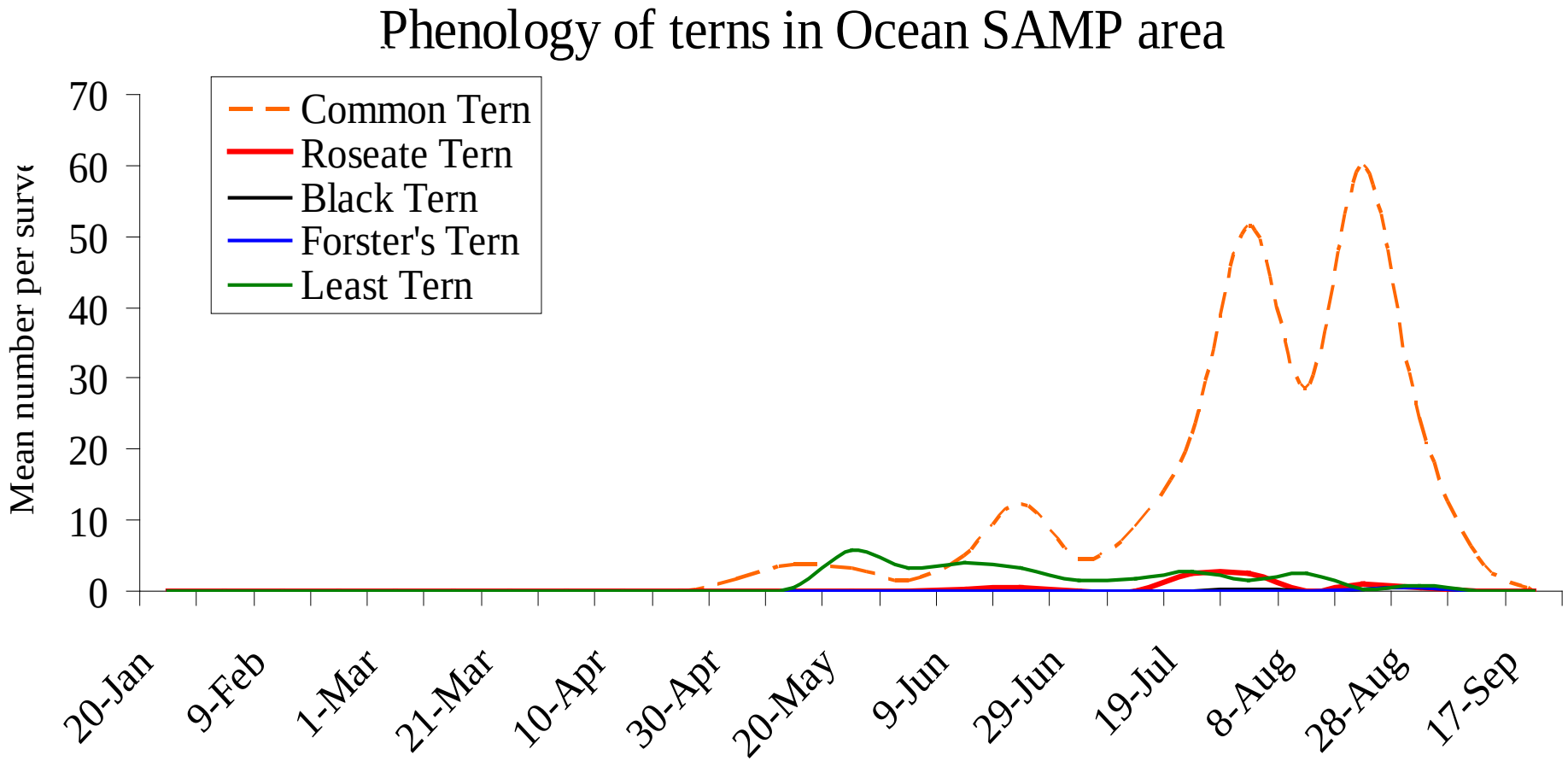

Common Loon Phenology
Mean # Individuals Observed
30
25
20
15
10
5
0
23-Jan
12-Feb
4-Mar
24-Mar
13-Apr
3-May
23-May
12-Jun
2-Jul
22-Jul
11-Aug
31-Aug
20-Sep
Survey Date
Flying
On Water


Phenology of gull use of Ocean SAMP area
Mean number per surve
600
500
400
300
200
100
0
20-Jan
9-Feb
1-Mar
21-Mar
10-Apr
30-Apr
20-May
9-Jun
29-Jun
19-Jul
8-Aug
28-Aug
17-Sep
Great Black-backed Gull
Herring Gull
Ring-Billed Gull
Laughing Gull
Bonaparte's Gull

Phenology of seaduck use of Ocean Samp Area




Phenology of shearwaters and storm-petrels
Wilson's Storm Petrel
Cory's Shearwater
Greater Shearwater
Manx Shearwater
Sooty Shearwater
Mean number per surve
80
70
60
50
40
30
20
10
0
20-Jan
9-Feb
1-Mar
21-Mar
10-Apr
30-Apr
20-May
9-Jun
29-Jun
19-Jul
8-Aug
28-Aug
17-Sep


Phenology of terns in Ocean SAMP area
Mean number per surve
70
60
50
40
30
20
10
0
Common Tern
Roseate Tern
Black Tern
Forster's Tern
Least Tern
20-Jan
9-Feb
1-Mar
21-Mar
10-Apr
30-Apr
20-May
9-Jun
29-Jun
19-Jul
8-Aug
28-Aug
17-Sep

Spatial distribution of seaducks during land-based surveys

Mean number of individuals detected per survey

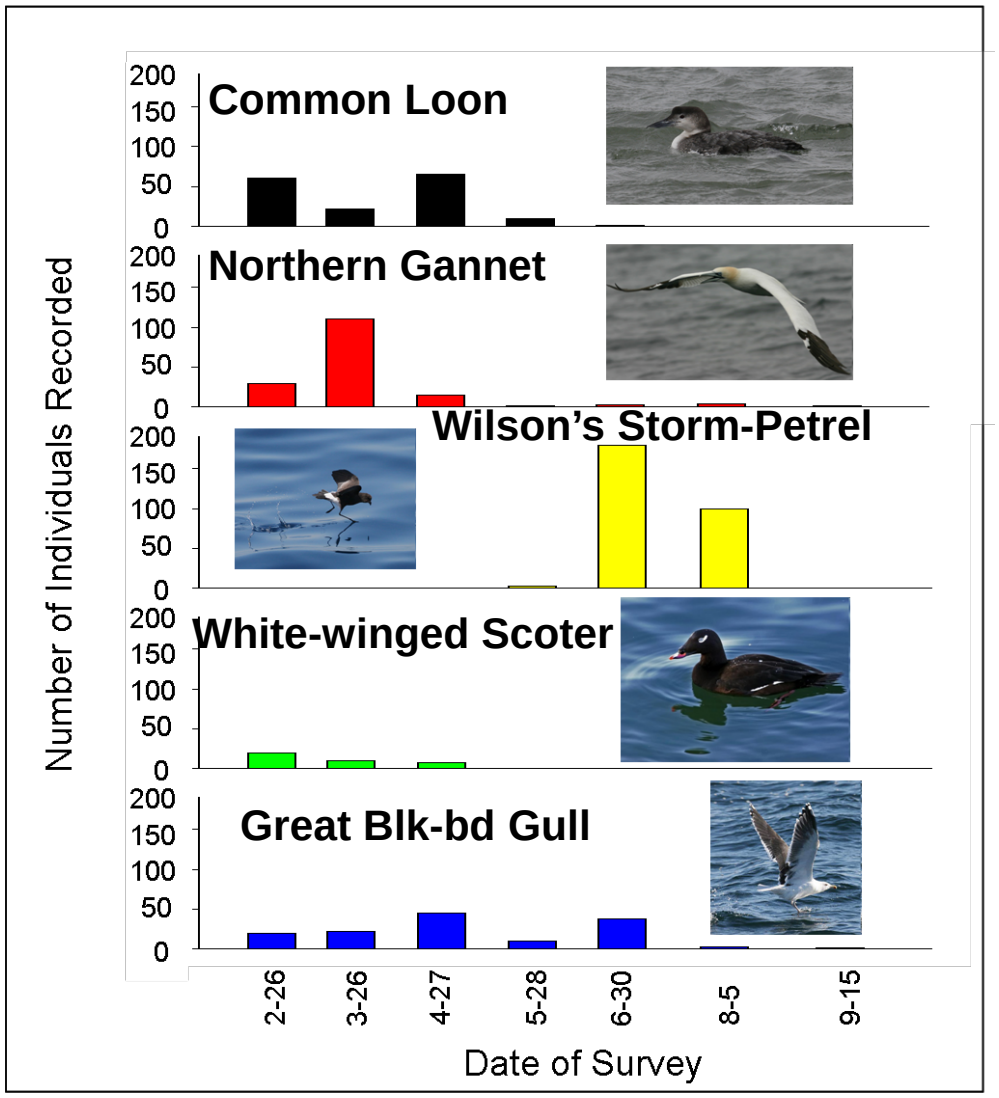
1400
1200
1000
800
600
400
200
0

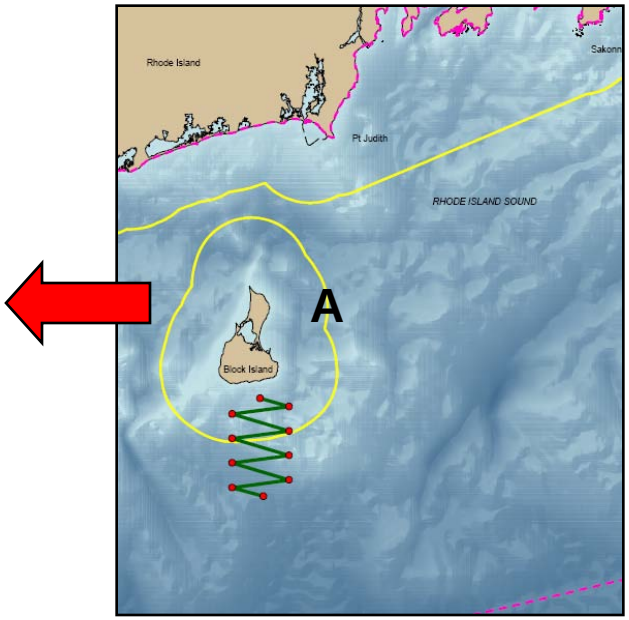
Black Scoter
Surf Scoter
Common Eider

Watch Hill
East Beach
Deep Hole
Pt. Judith
M. Dock
Beavertail
Brenton Pt.
Ruggles
Sachuest
Sakonnet Pt.
Goosewing

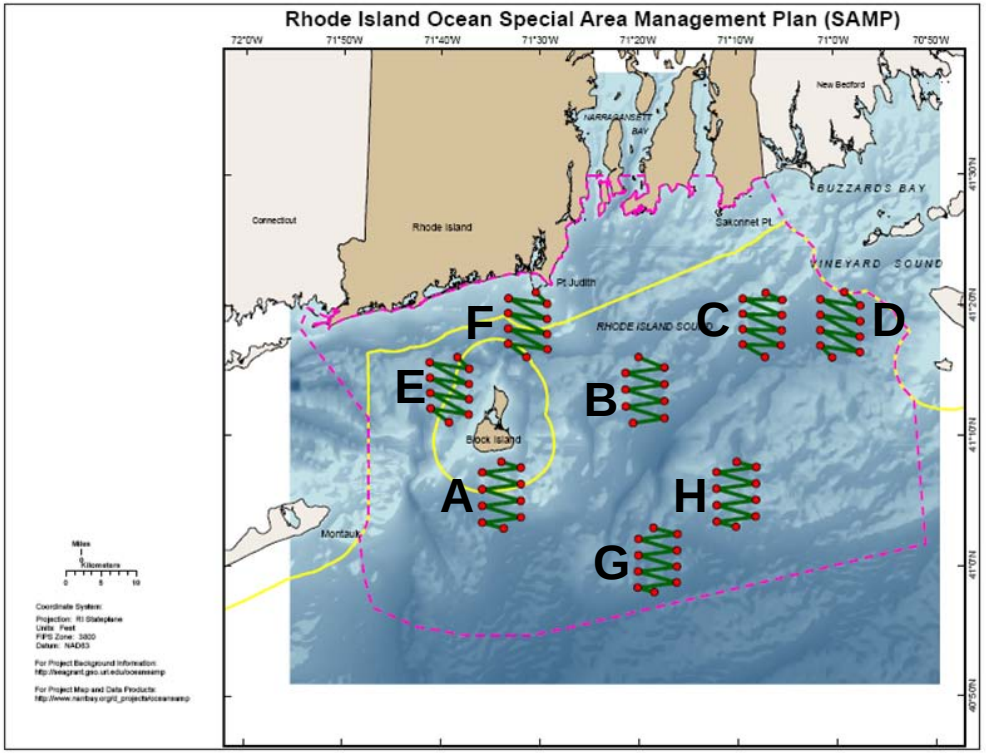
West
East

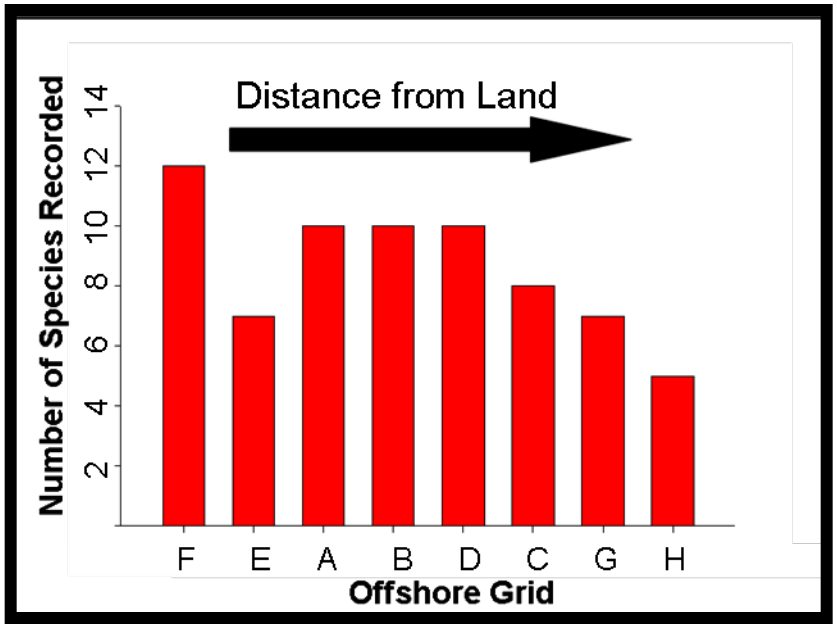
A Dynamic Avian Environment:
Seasonal Variation in Waterbird Species Composition Offshore



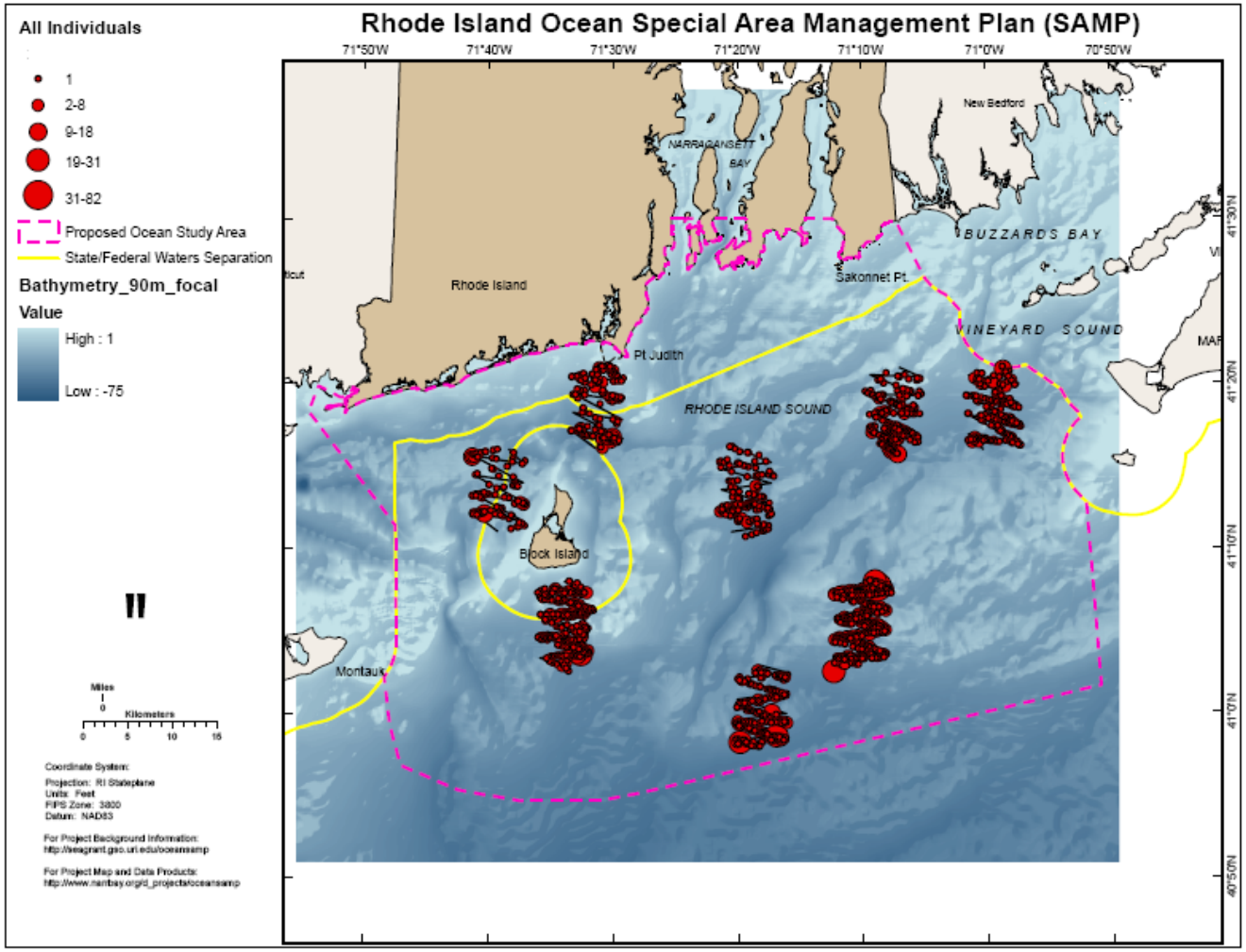


A Dynamic Avian Environment:
Species Richness in Offshore Grids Summer 2009

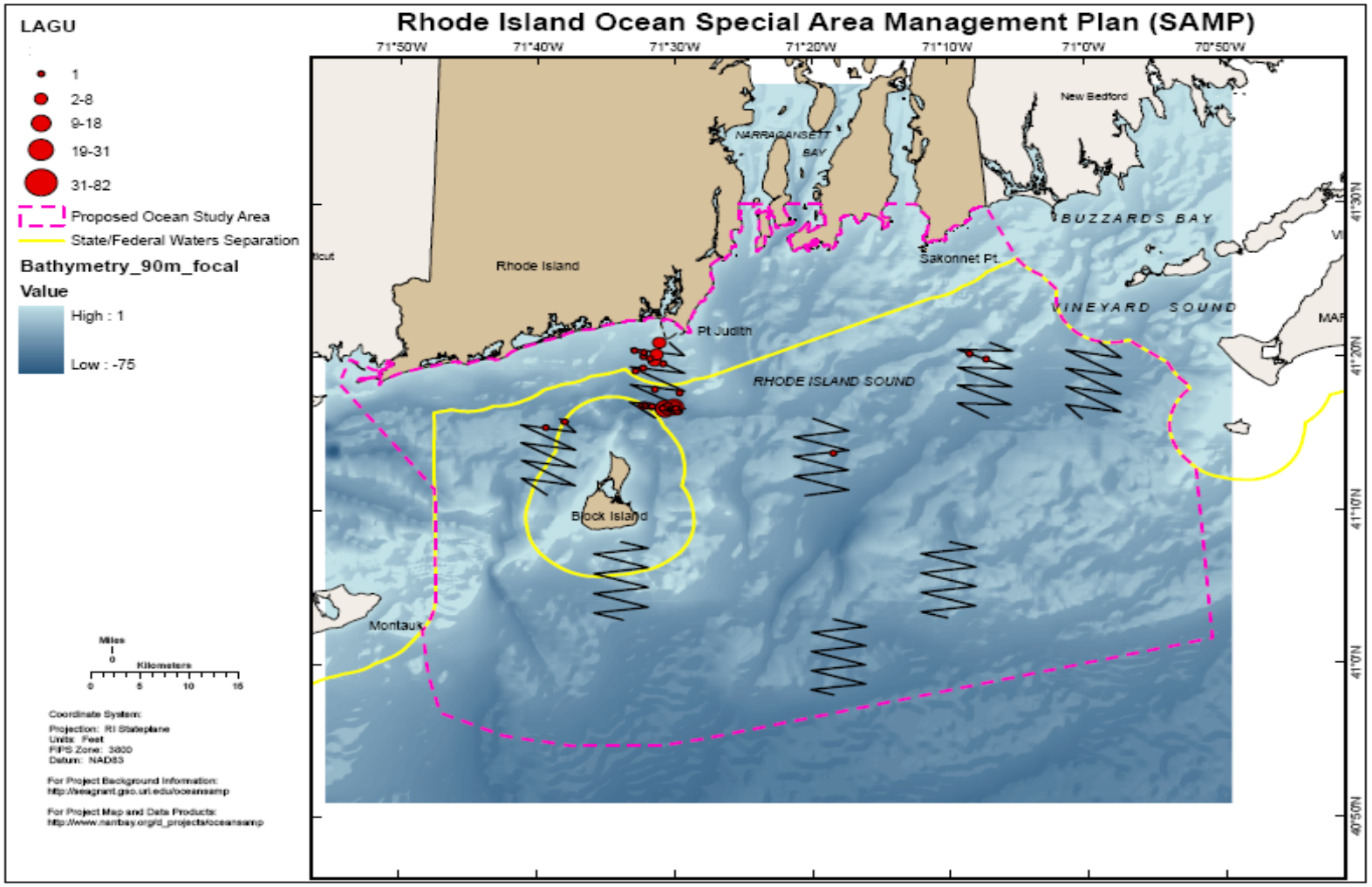




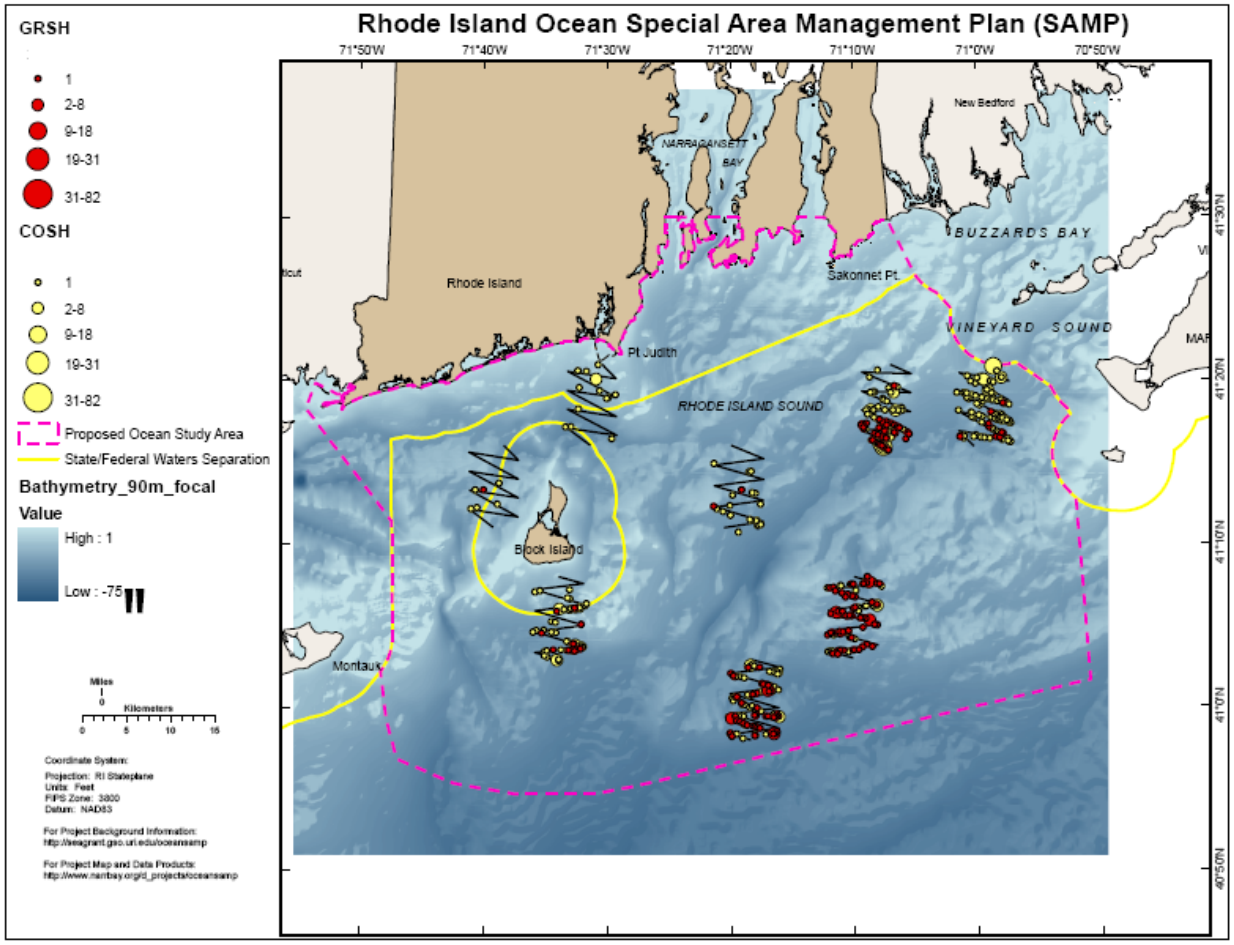
A Dynamic Avian Environment:
Abundance of Waterbirds, Summer 2009



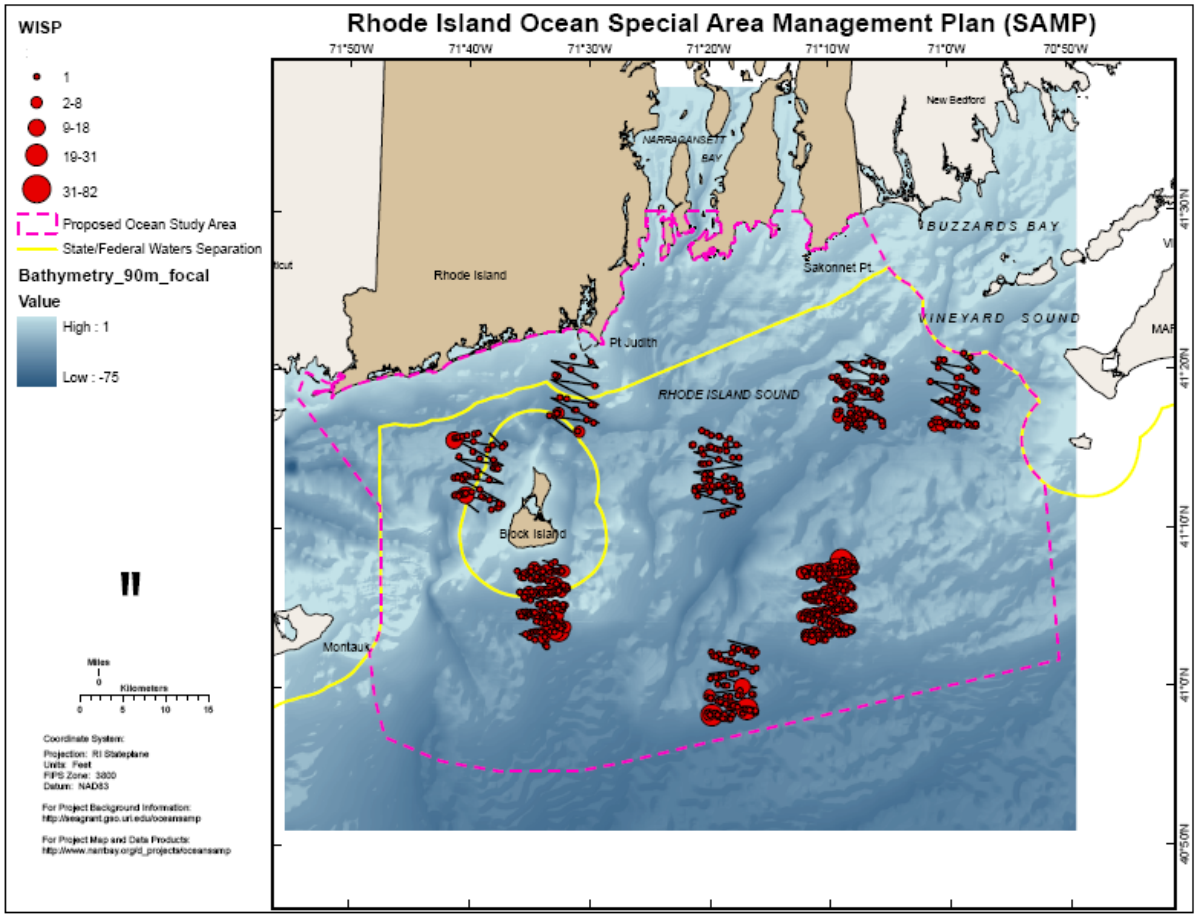
A Dynamic Avian Environment:
Spatial Distribution of Laughing Gulls, Summer 2009



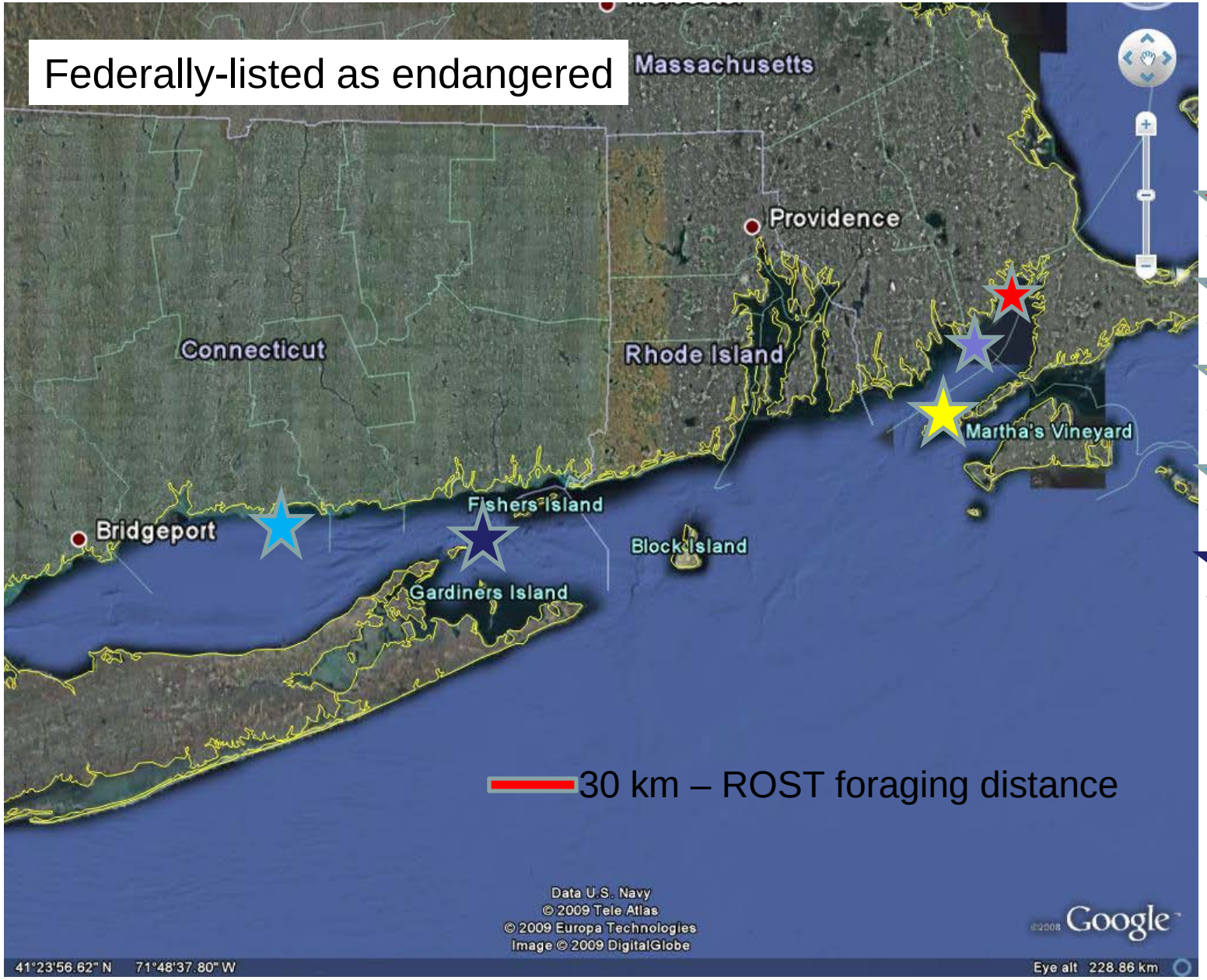
A Dynamic Avian Environment:
Spatial Distribution of Greater and Cory's Shearwaters, Summer 2009



A Dynamic Avian Environment:
Spatial Distribution of Wilson's Storm-Petrels, Summer 2009



Roseate Tern Nesting Colonies in CT and MA



Bird Is, MA

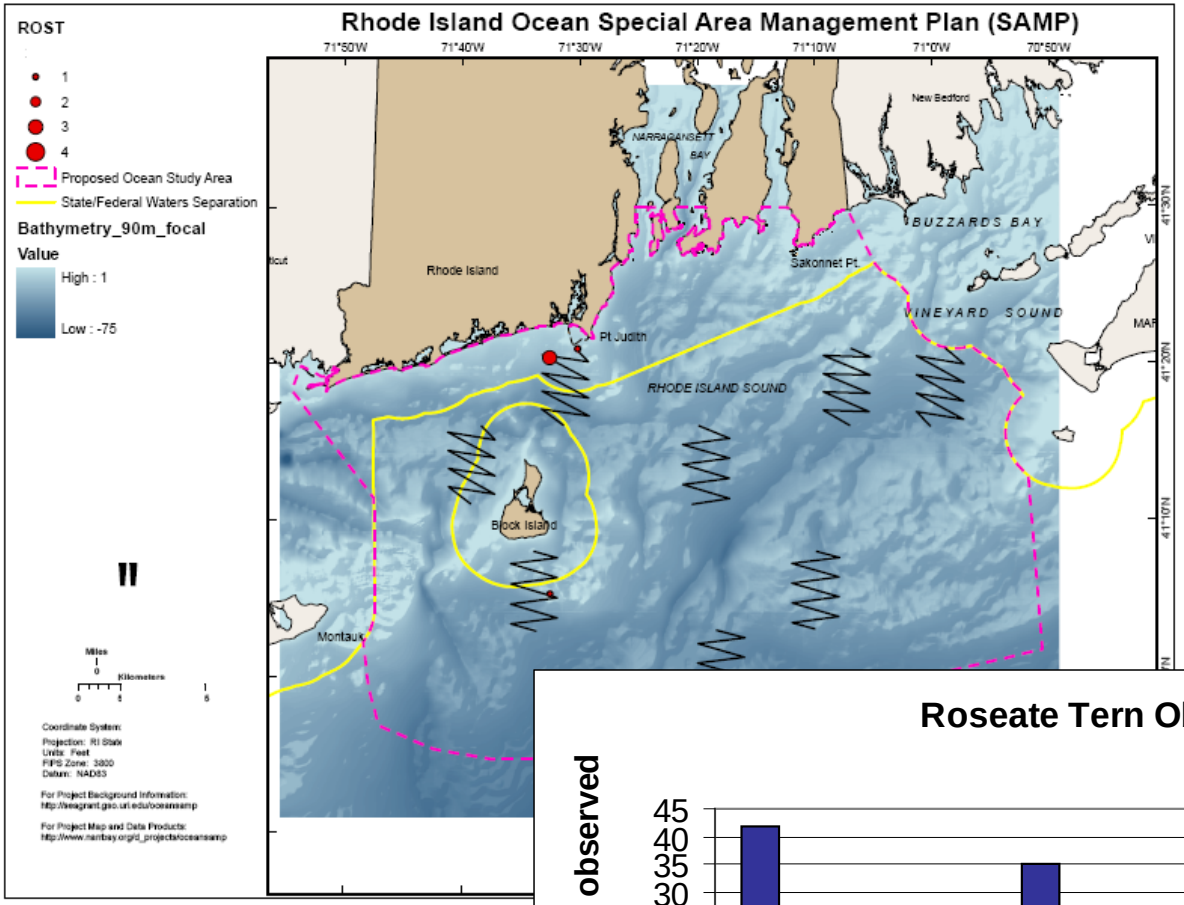
Ram Is, MA

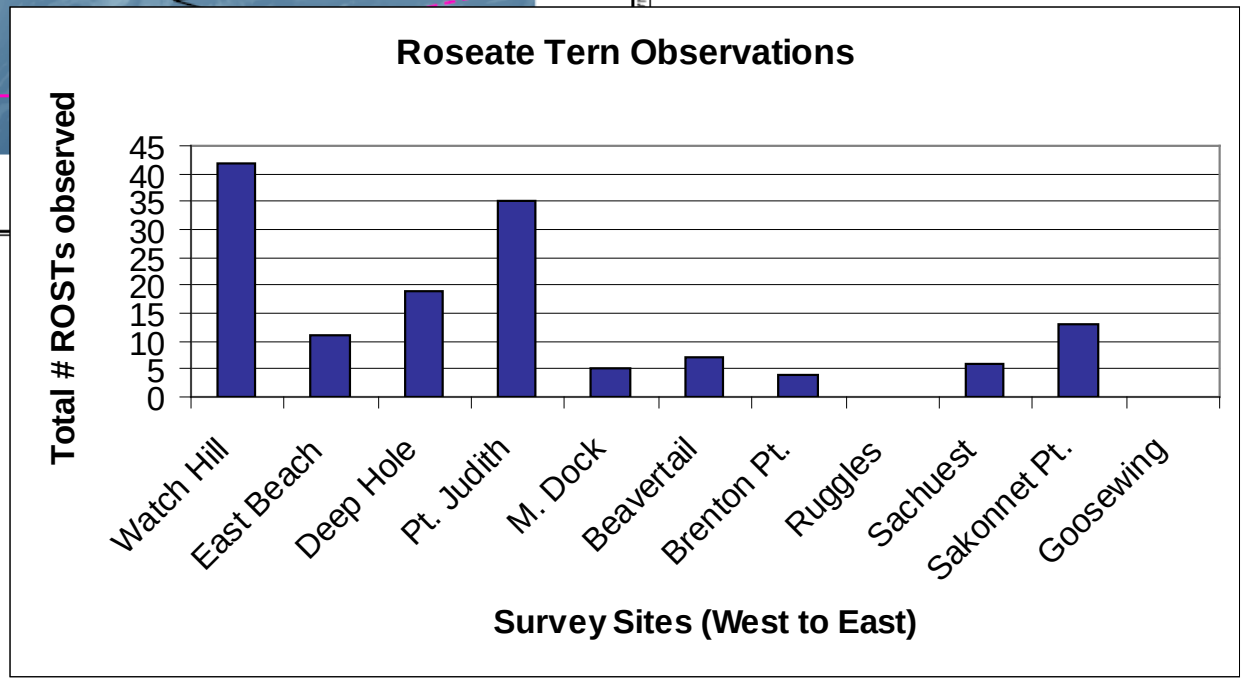
Penikese Is, MA

Faulkner Is, CT

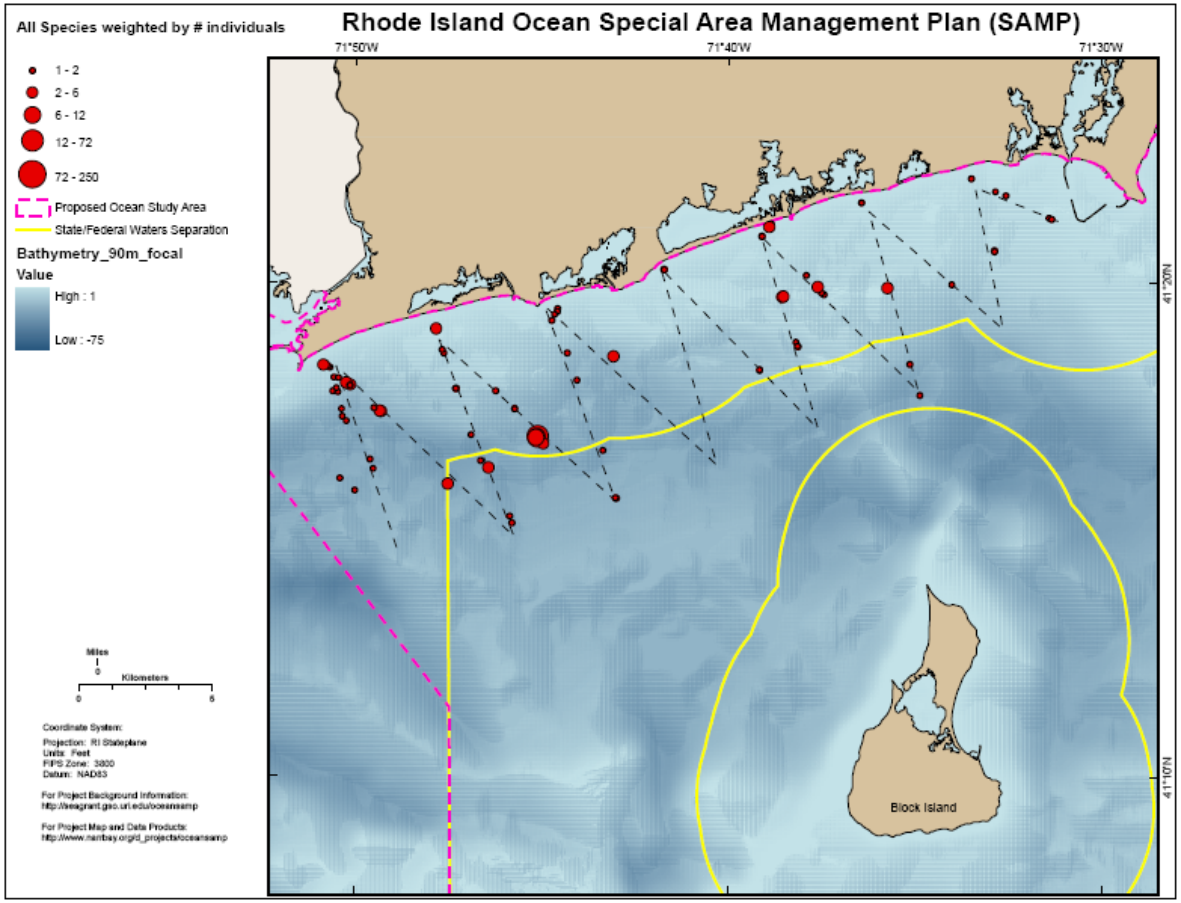
Great Gull Is, NY

A Dynamic Avian Environment: Spatial Distribution of Roseate Terns

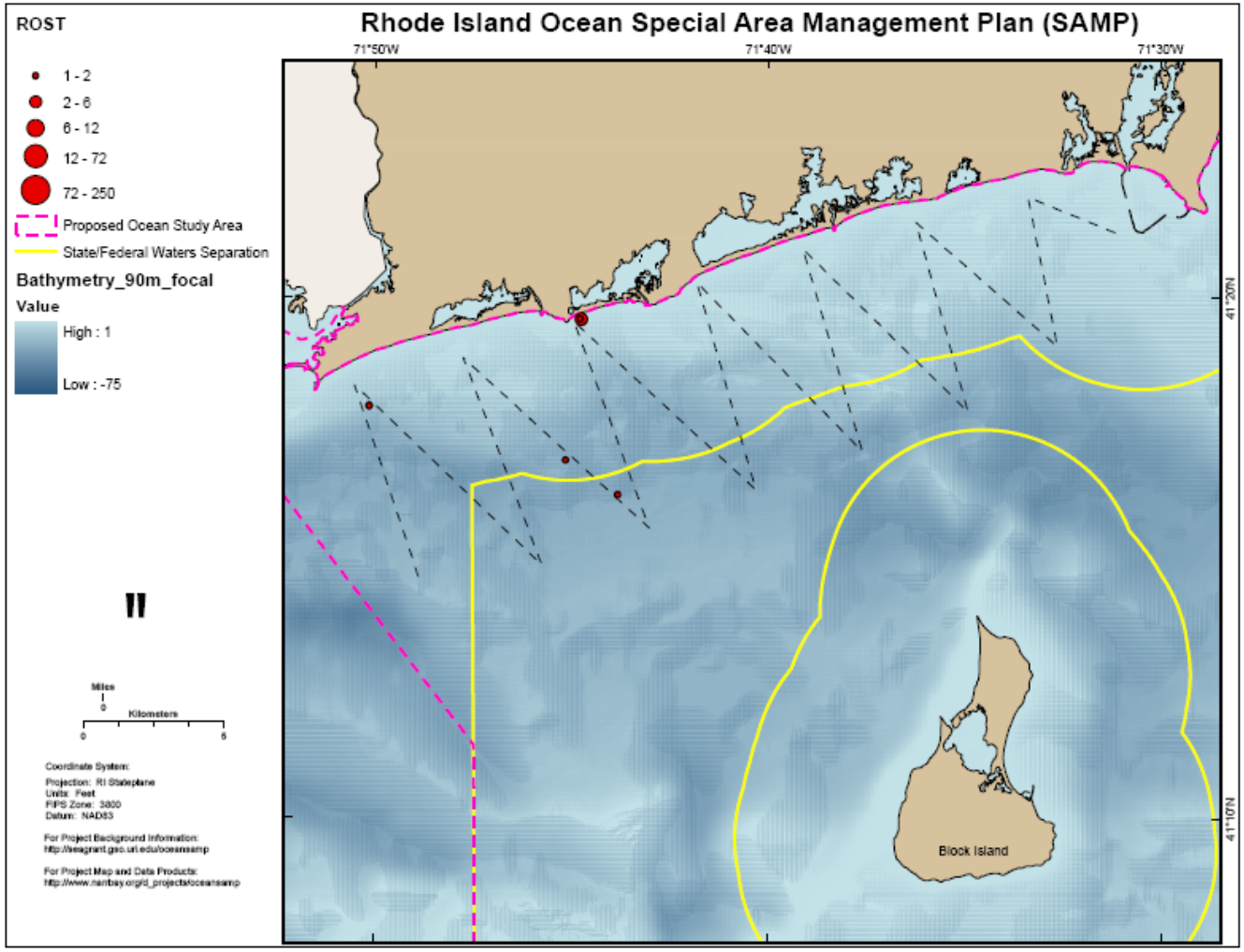


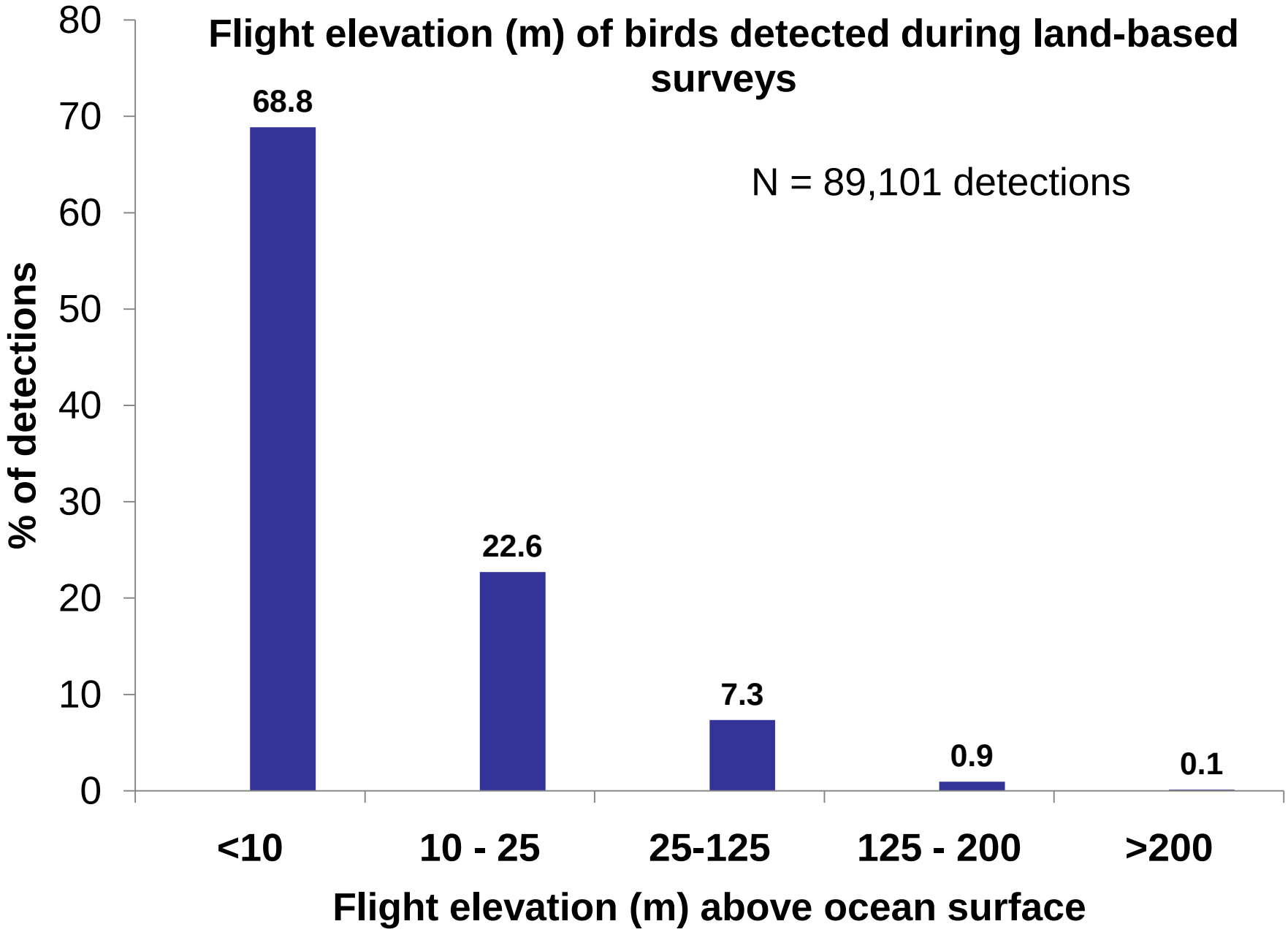


A Dynamic Avian Environment:
Spatial Distribution of Tern Species August 2009



A Dynamic Avian Environment:
Spatial Distribution of Roseate Terns during August 2009

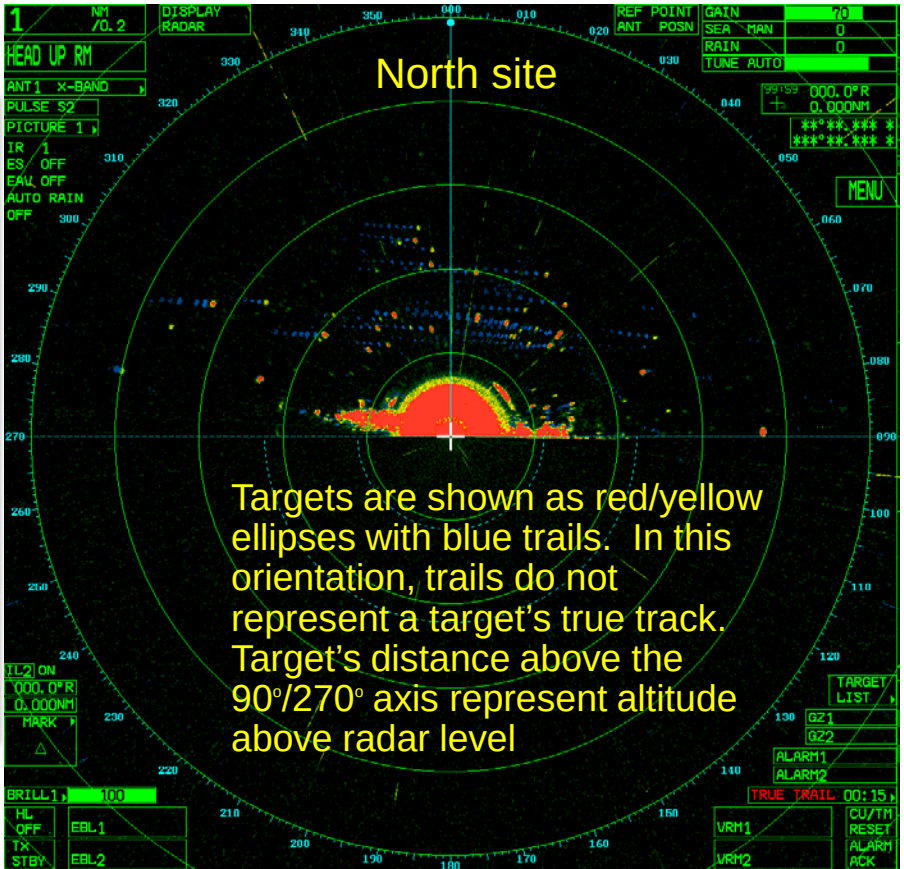


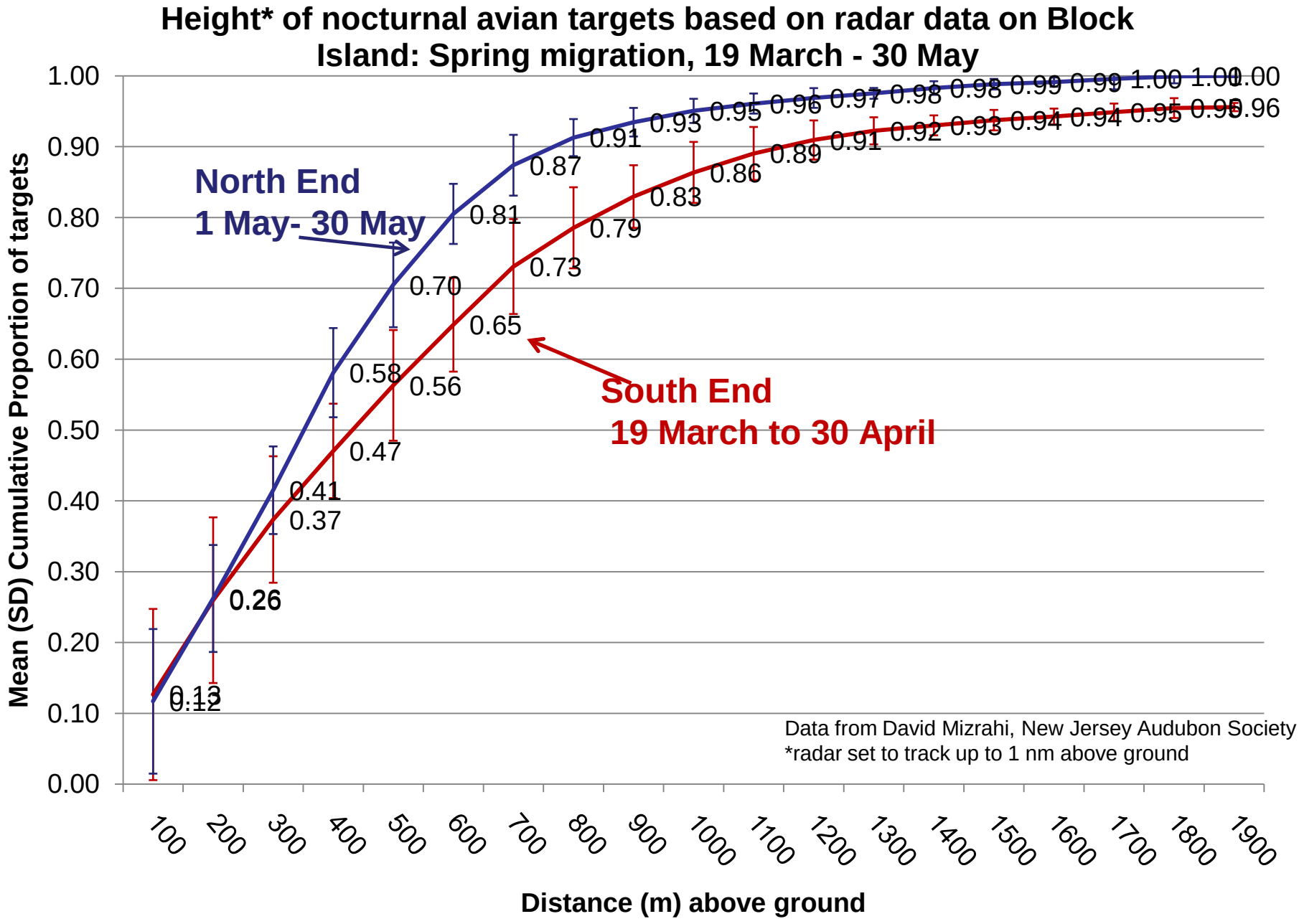

Flight elevation (m) of birds detected during land-based surveys
N = 89,101 detections
% of detections
80
70
60
50
40
30
20
10
0
68.8
22.6
7.3
0.9
0.1
<10
10 - 25
25-125
125 - 200
>200
Flight elevation (m) above ocean surface

-Two Furuno 25 kW X-band (3 cm wavelength)

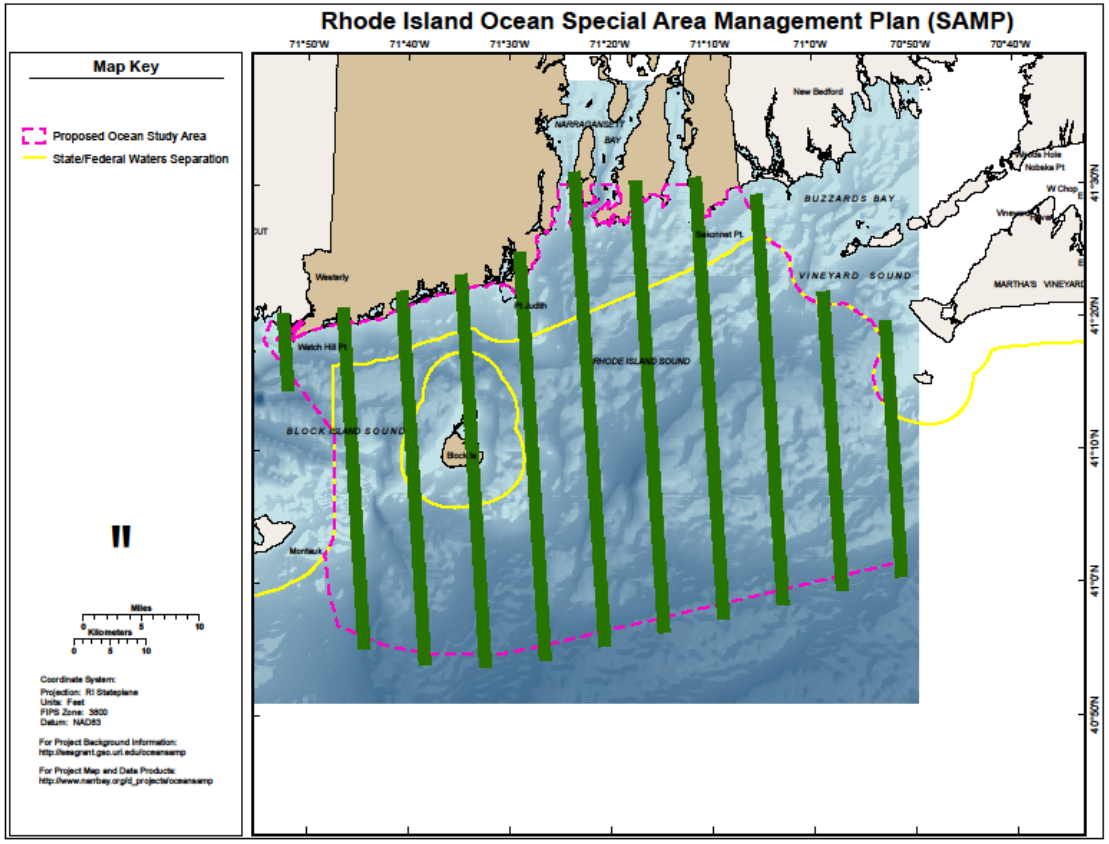
-Units operate simultaneously collect data in the “vertical” and “horizontal” planes

-Five successive radar sweeps captured every 10 min, 24 hours/day, 7 days/week



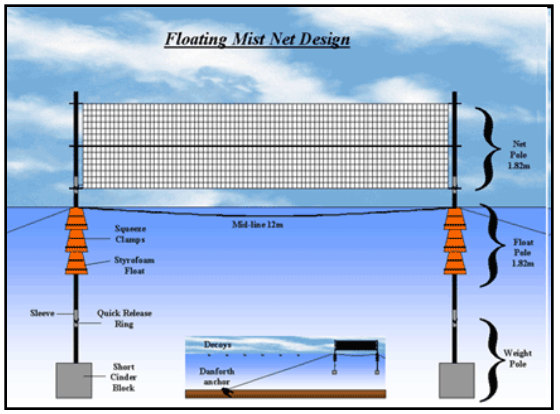

Height* of nocturnal avian targets based on radar data on Block Island: Spring migration, 19 March - 30 May
Mean (SD) Cumulative Proportion of targets
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
North End
1 May- 30 May
South End
19 March to 30 April
0.12
0.13
0.26
0.37
0.41
0.47
0.56
0.58
0.65
0.70
0.73
0.79
0.81
0.83
0.86
0.87
0.89
0.91
0.91
0.92
0.93
0.93
0.94
0.94
0.95
0.95
0.96
0.96
0.97
0.98
0.98
0.99
0.99
1.00
1.00
1.00
100
200
300
400
500
600
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
1800
1900
Distance (m) above ground
Data from David Mizrahi, New Jersey Audubon Society
*radar set to track up to 1 nm above ground

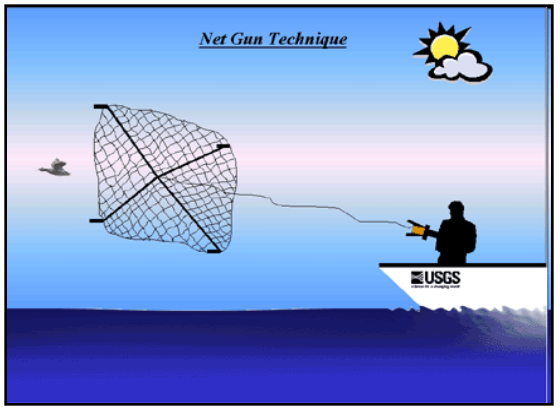
- Aerial Surveys (October 2009 – May 2010)

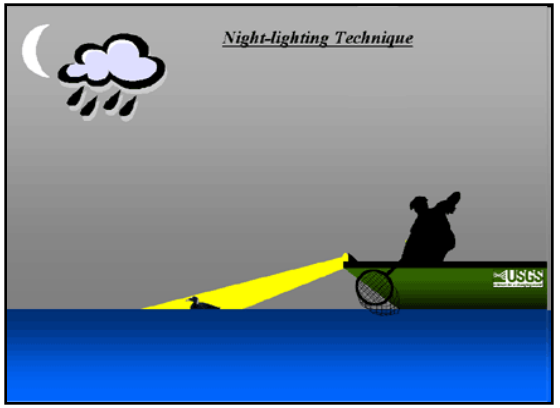


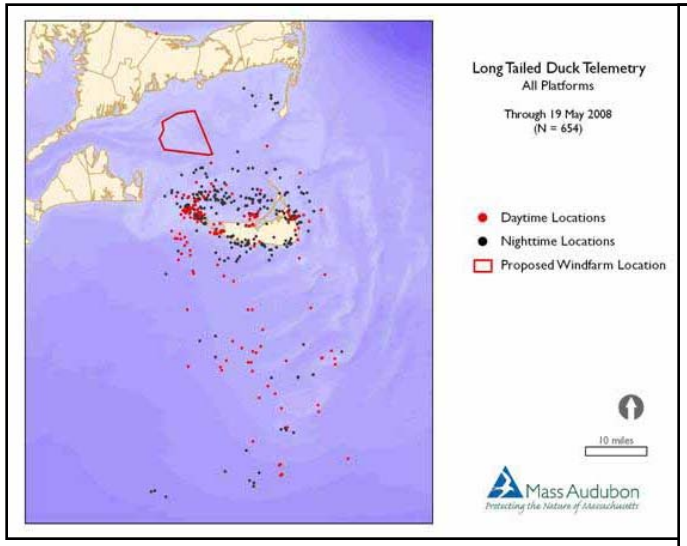
Future Work

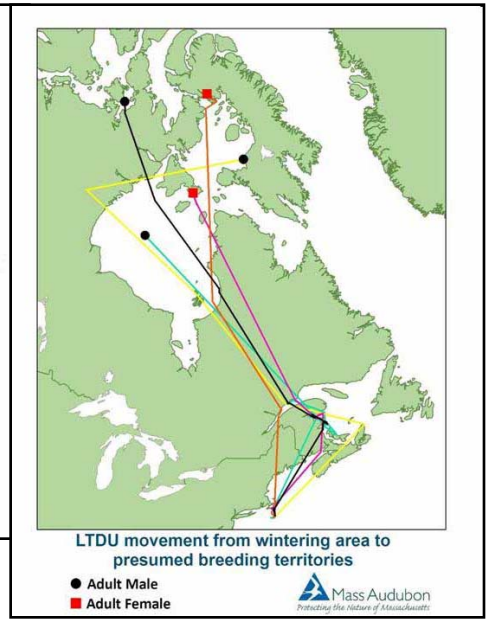
- Sea Duck Satellite Telemetry (January 2010)
- Collaboration with RIDEM











Local movements of LTDU

Final Report - 2010

- Phenology of waterbird migration in study area based on land-based counts

- Spatial distribution and abundance (density) and phenology of waterbirds in offshore waters based on boat-based and aerial transects

- Movement ecology of birds based on land-based point counts and radar studies (e.g., flight elevation, flight direction, timing of movements)

Acknowledgments


Wilson's Storm-Petrel

Access to historical datasets

•Chris Raithel, RI DEM
•Jay Osenkowski, RI DEM
•Rick McKinney, EPA
•Suzanne Paton, USFWS RI Refuge Complex

Assistance with boat surveys

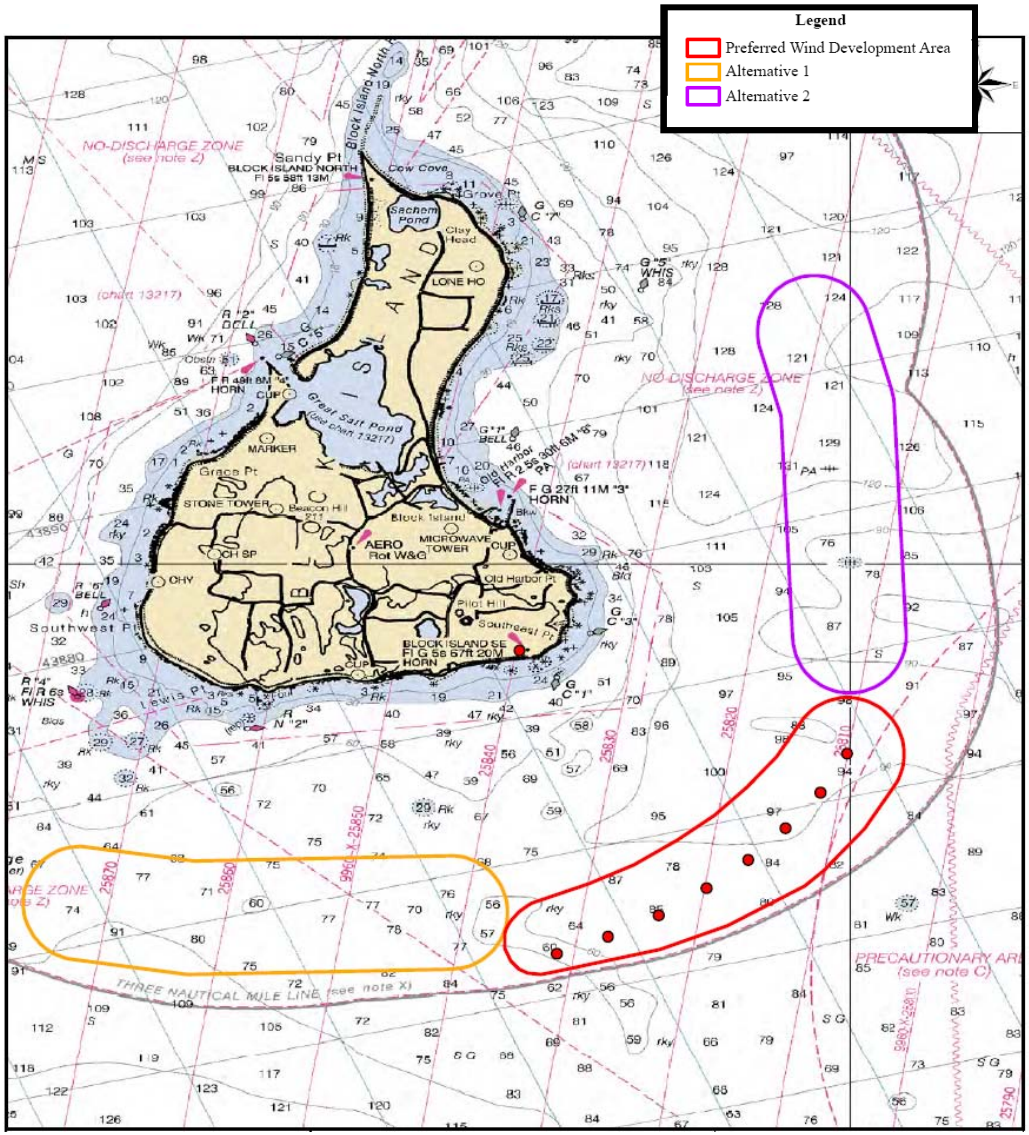
Sharon Marino and Tom Halavik, USFWS Coastal Program

Optics

•Swarovksi Optik


Common Loon

Deepwater Study Area



Deepwater Wind Surveys Conducted To Date

Spring 2009

- MERLIN Radar ground-truthing
- On-shore and off-shore point count surveys
- Initial bat acoustic survey (2 x AR-125 detectors)

Summer 2009

Avian

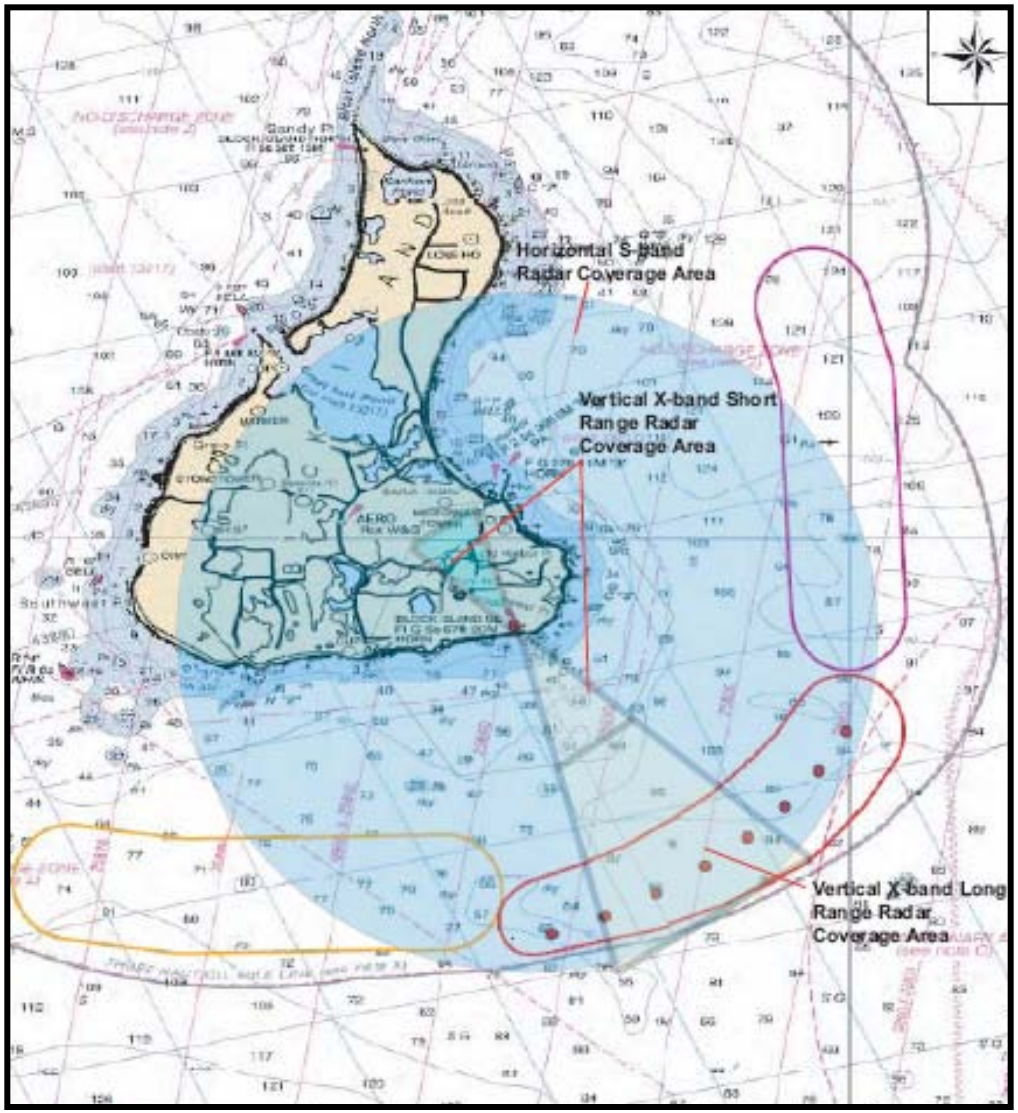
- MERLIN and VESPER radar
- Off-shore boat based avian surveys
- On-shore tern, shorebird, RTE and general migration surveys
- High Definition aerial videography
- Raptor migration surveys
- Avian acoustic monitoring

Bat

- Off-shore active bat surveys
- On-shore and off-shore passive bat monitoring
- On-shore active roost and activity surveys

TETRA TECH, INC.

MERLIN Radar Coverage Conceptualization



Deepwater Ongoing Survey Update: Summer 2009

- **Avian Surveys Conducted To Date:**
  - MERLIN and VESPER Radar
  - VESPER Radar ground truthing
  - Boat-based Avian Surveys (8 transects)
  - On Shore Point Counts (10 points, surveyed >8 times)
  - High Definition Aerial Video (2 test flights and 1 full scale flight in August)
  - Raptor Migration Surveys (5 conducted to date, 10 planned)
  - Avian Acoustics (4 monitoring locations)
- **Bat Surveys Conducted To Date:**
  - MERLIN and VESPER Radar
  - Boat Based Bat Surveys (4 transects)
  - Full spectrum on-shore passive detectors (4 detectors)
  - Remote off-shore buoy mounted detectors
  - On Shore Roost Surveys (4 Survey nights)