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

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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

Bird deaths soar at wind farms

Energy push could wipe out some species

By William J. Walsh

In 2005, a study entitled "Birds and Wind Energy: A Critical Analysis" was published, examining the risks to birds from wind turbines. The study found that wind turbines could pose a significant threat to bird populations. The study also highlighted the need for better understanding of bird behavior and turbine design to minimize bird deaths.

"There is no doubt that wind turbines can be a significant threat to birds," said one of the study's authors. "However, the concern is not just about bird deaths, but also about the impact on bird populations and ecosystems. We need to develop better technologies and strategies to minimize these risks."
Public Perception of Wind Farms and Birds

Altamont Pass Wind Resource Area, CA: 5000 wind turbines

A deadly toll at Altamont

1,766 to 4,721 birds killed annually by wind turbines

- 75 to 116 Golden eagles
- 209 to 300 Red-tailed hawks
- 73 to 333 American kestrels
- 99 to 380 Burrowing owls

Source: California Energy Commission
Public Perception of Wind Farms and Birds

Annual Predicted Human-induced Avian mortality in US: Up to 1 billion birds

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

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

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

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**Avian collision risk at an offshore wind farm**

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**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

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†Bureau Waardenburg bv and ‡Alterra

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

<table>
<thead>
<tr>
<th>Hazard Factor</th>
<th>Visual stimulus-Avoidance response</th>
<th>Physical habitat Loss/modification</th>
<th>Collision Mortality</th>
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<tbody>
<tr>
<td>Physical effects</td>
<td>Barriers To Movement</td>
<td>Displacement From ideal Feeding distribution</td>
<td>Destruction of Feeding habitat Under foundations</td>
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<td>Ecological effects</td>
<td>Increased Flight distances</td>
<td>“Effective” Habitat loss</td>
<td>“physical” Habitat loss</td>
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<td>Energetic costs</td>
<td>Enhanced Energy Consumption</td>
<td>Reduced energy intake rates, increased energy expenditure</td>
<td>Enhanced energy intake rates, decreased energy expenditure</td>
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<td>Fitness consequences</td>
<td>Changes to Annual breeding Output and Survival</td>
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<td>Population impacts</td>
<td>Changes to Overall Population size</td>
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Birds collide with rotors or other structures or mortality injured by air turbulence.
Key Findings

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

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

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

Common eider (Somateria mollissima)
Key Findings

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

Pre

Post

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.
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).
URI unpubl, data
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

- Collaboration with USFWS
March 20\textsuperscript{th} to April 30\textsuperscript{th} and 1 Nov to December 15\textsuperscript{th}

1 May to 1 Nov
## Overview of the RI Ocean SAMP bird surveys

<table>
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<tr>
<th>Jan</th>
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<td>2009</td>
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- **Land-based surveys (11 sites, 6 surveys/site/month)**
- **Boat-based surveys (8 sites, 1 surveys/site/month)**
- **Aerial surveys (1 survey/week)**
- **Land-based radar (2 sites, 24/7)**
- **Roseate tern surveys (1 area, 2 surveys/week)**
Preliminary Results

Dynamic Nature of Avian Movement Ecology
Phenology of waterbird use of Ocean SAMP area

Mean number per survey

- 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 survey

- Common Loon
- Red-throated Loon
Phenology of gull use of Ocean SAMP area

- Mean number per survey
- Great Black-backed Gull
- Herring Gull
- Ring-Billed Gull
- Laughing Gull
- Bonaparte's Gull
Phenology of seaduck use of Ocean Samp Area

Mean number per survey

- Common Eider
- Surf Scoter
- White-winged Scoter
- Black Scoter
Phenology of shearwaters and storm-petrels

Wilson's Storm Petrel
Cory's Shearwater
Greater Shearwater
Manx Shearwater
Sooty Shearwater
Phenology of terns in Ocean SAMP area

- Common Tern
- Roseate Tern
- Black Tern
- Forster's Tern
- Least Tern

Mean number per survey
Spatial distribution of seaducks during land-based surveys

Mean number of individuals detected per survey

- Black Scoter
- Surf Scoter
- Common Eider

West East

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

- Common Loon
- Northern Gannet
- Wilson’s Storm-Petrel
- White-winged Scoter
- Great Blk-bd Gull

Number of Individuals Recorded

Date of Survey

2-26 3-26 4-27 5-28 6-30 8-5 9-15
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

Federally-listed as endangered

Bird Is, MA
Ram Is, MA
Penikese Is, MA
Faulkner Is, CT
Great Gull Is, NY

30 km – ROST foraging distance
A Dynamic Avian Environment: Spatial Distribution of Roseate Terns

Total # ROSTs observed

Survey Sites (West to East)
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

Flight elevation (m) above ocean surface

<10: 68.8%
10 - 25: 22.6%
25 - 125: 7.3%
125 - 200: 0.9%
>200: 0.1%
- 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

Targets are shown as red/yellow ellipses with blue trails. In this orientation, trails do not represent a target’s true track. Target’s distance above the 90°/270° axis represent altitude above radar level.
Height* of nocturnal avian targets based on radar data on Block Island: Spring migration, 19 March - 30 May

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

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• 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
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
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)