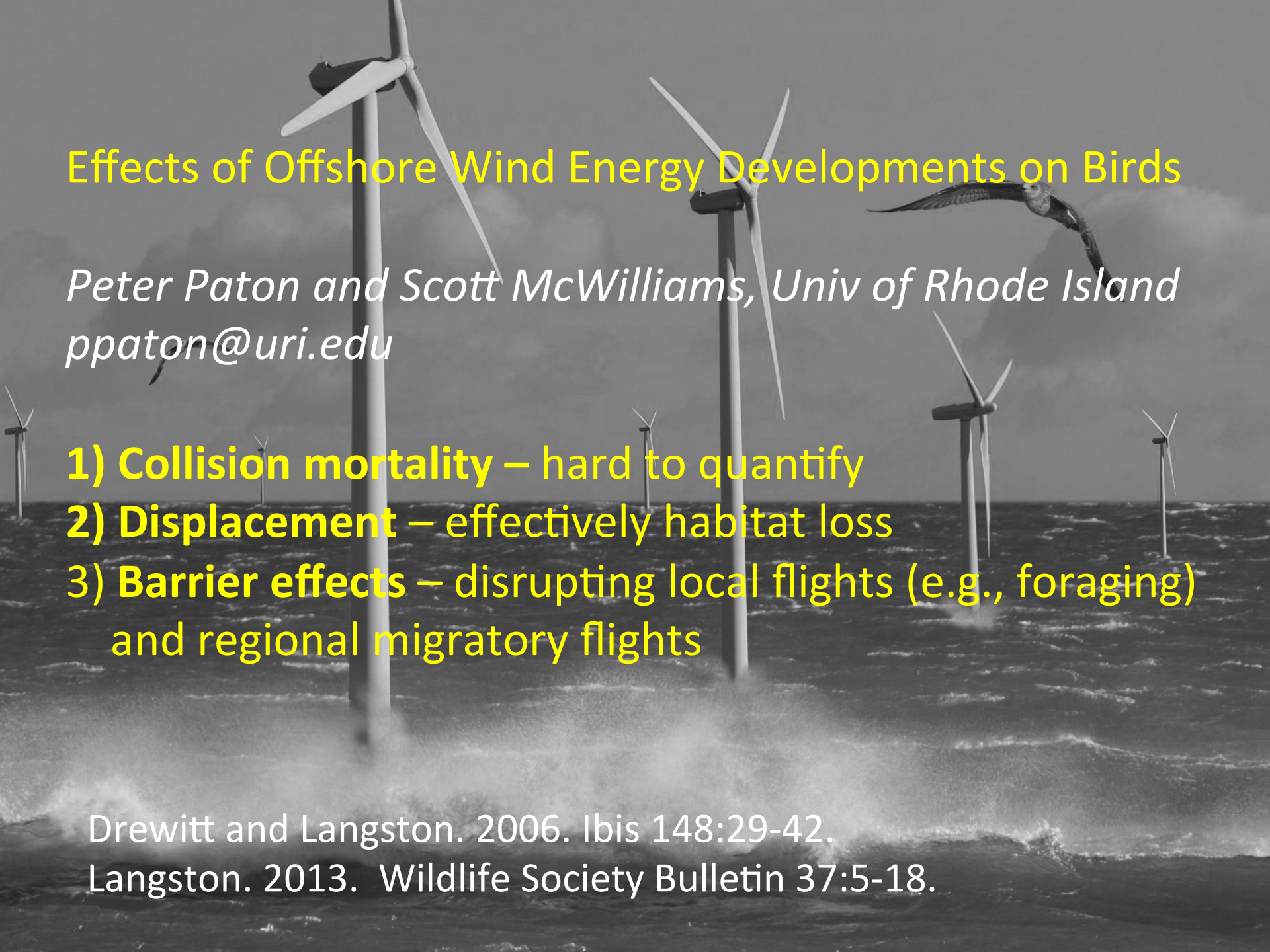


Effects of Offshore Wind Energy Developments on Birds

Peter Paton and Scott McWilliams, Univ of Rhode Island
ppaton@uri.edu

1) **Collision mortality –** hard to quantify
2) **Displacement** – effectively habitat loss
3) **Barrier effects** – disrupting local flights (e.g., foraging) and regional migratory flights

Drewitt and Langston. 2006. Ibis 148:29-42.
Langston. 2013. Wildlife Society Bulletin 37:5-18.

Publi

Estimated bird mortalities at land-based turbines:
5.3 mortalities per turbine per year (3.2-7.3)
44,577 turbines = 234,012 mortalities per year

Loss et al. 2013. Biological Conservation 168:201-209
See also Erickson et al. 2014. PLOSone 107491
Thaxter et al. 2017. Proc. Royal Soc. B 284: 20170829

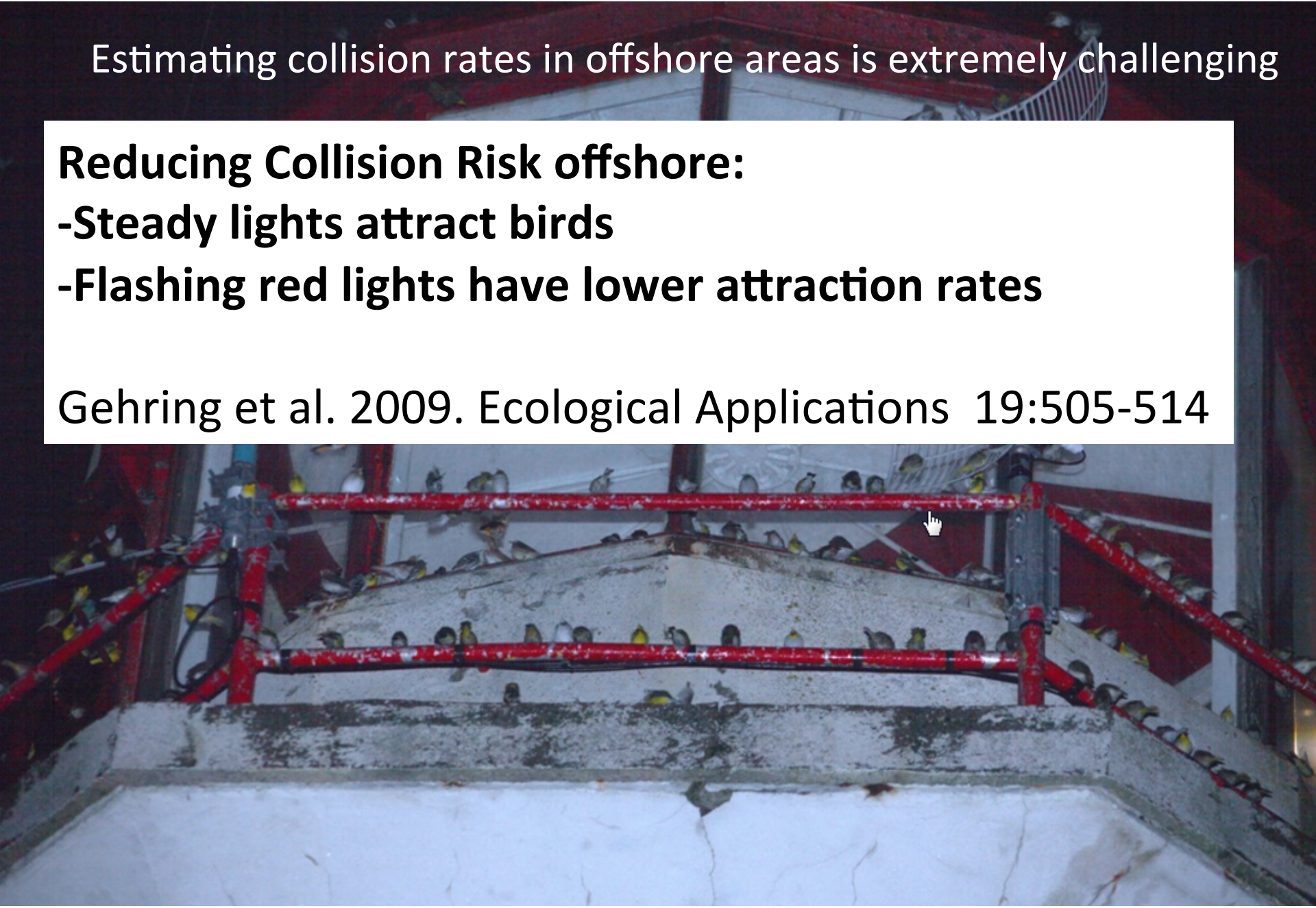
Alameda County / Courtesy to the Chronicle

Alameda County

Estimating collision rates in offshore areas is extremely challenging

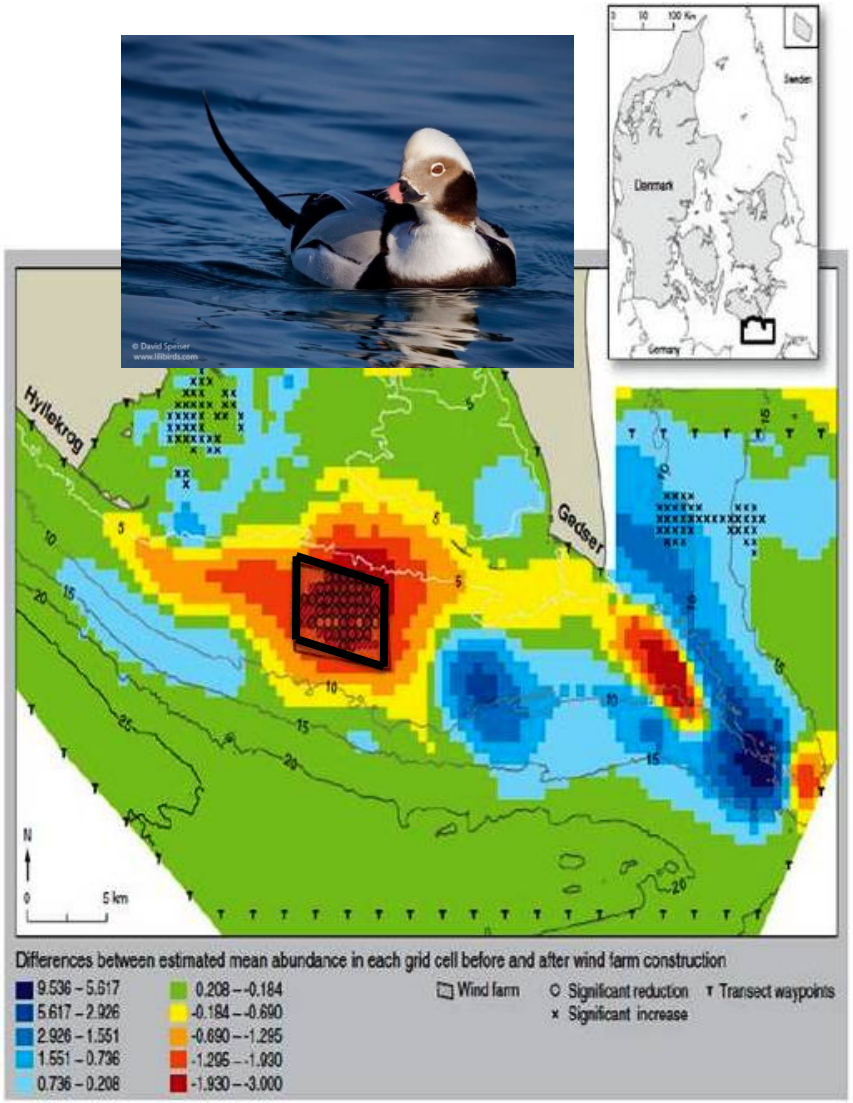
Reducing Collision Risk offshore:
-Steady lights attract birds
-Flashing red lights have lower attraction rates

Gehring et al. 2009. Ecological Applications 19:505-514



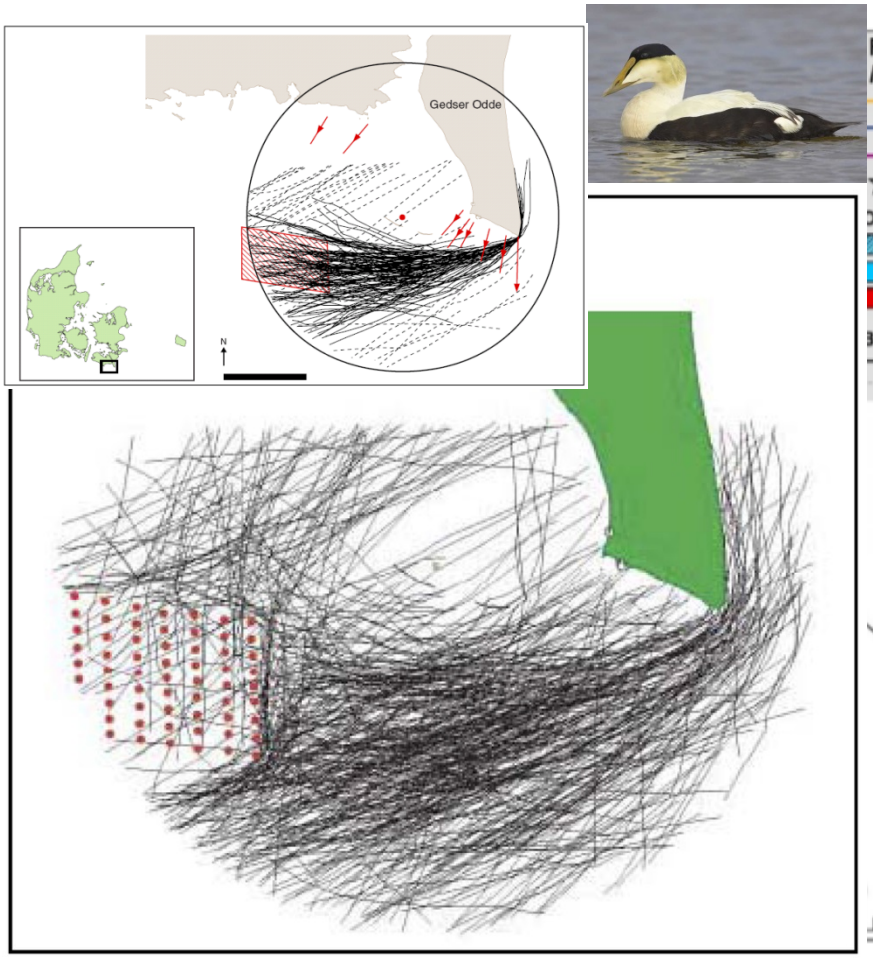
Warbler fallout Machias Seal Island, 24 May 2011: Photo - Ralph Eldridge

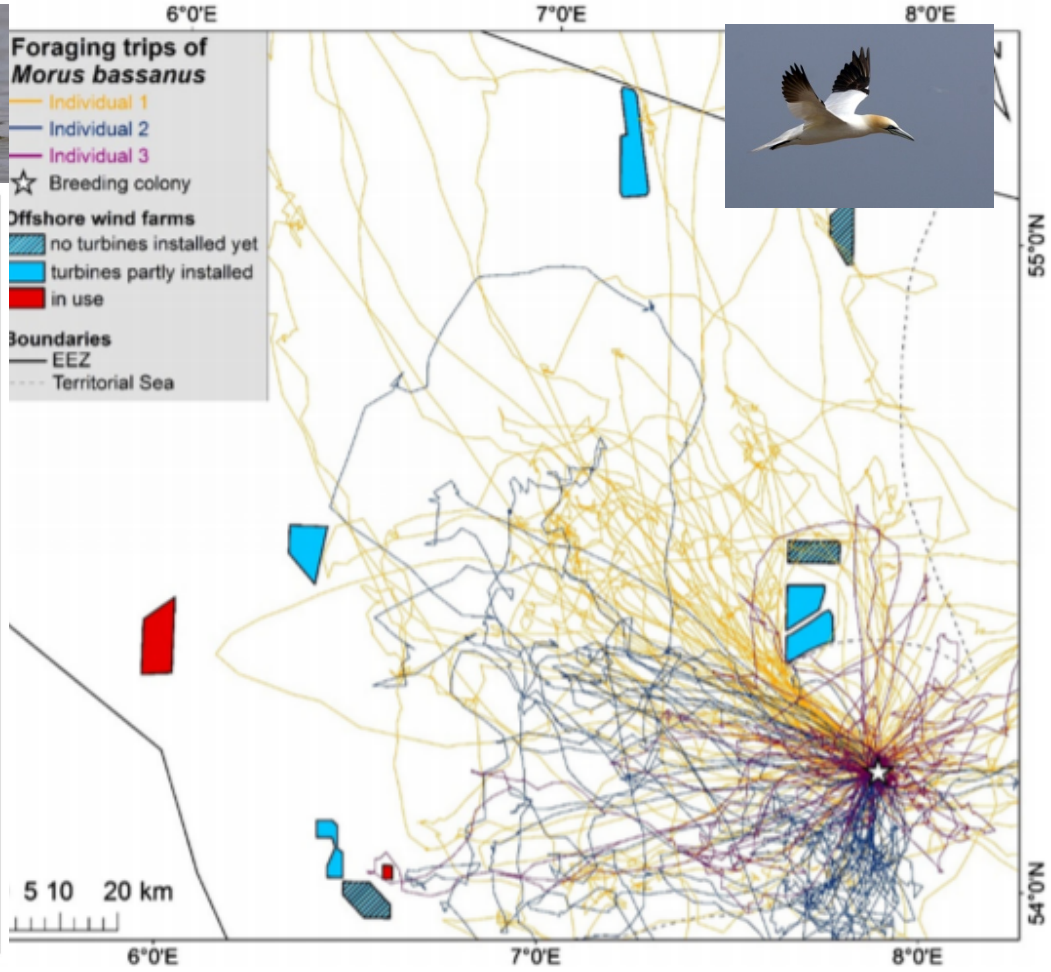
Displacement at Offshore Wind Facilities



-Petersen et al. 2011

Barrier Effects at Offshore Wind Facilities

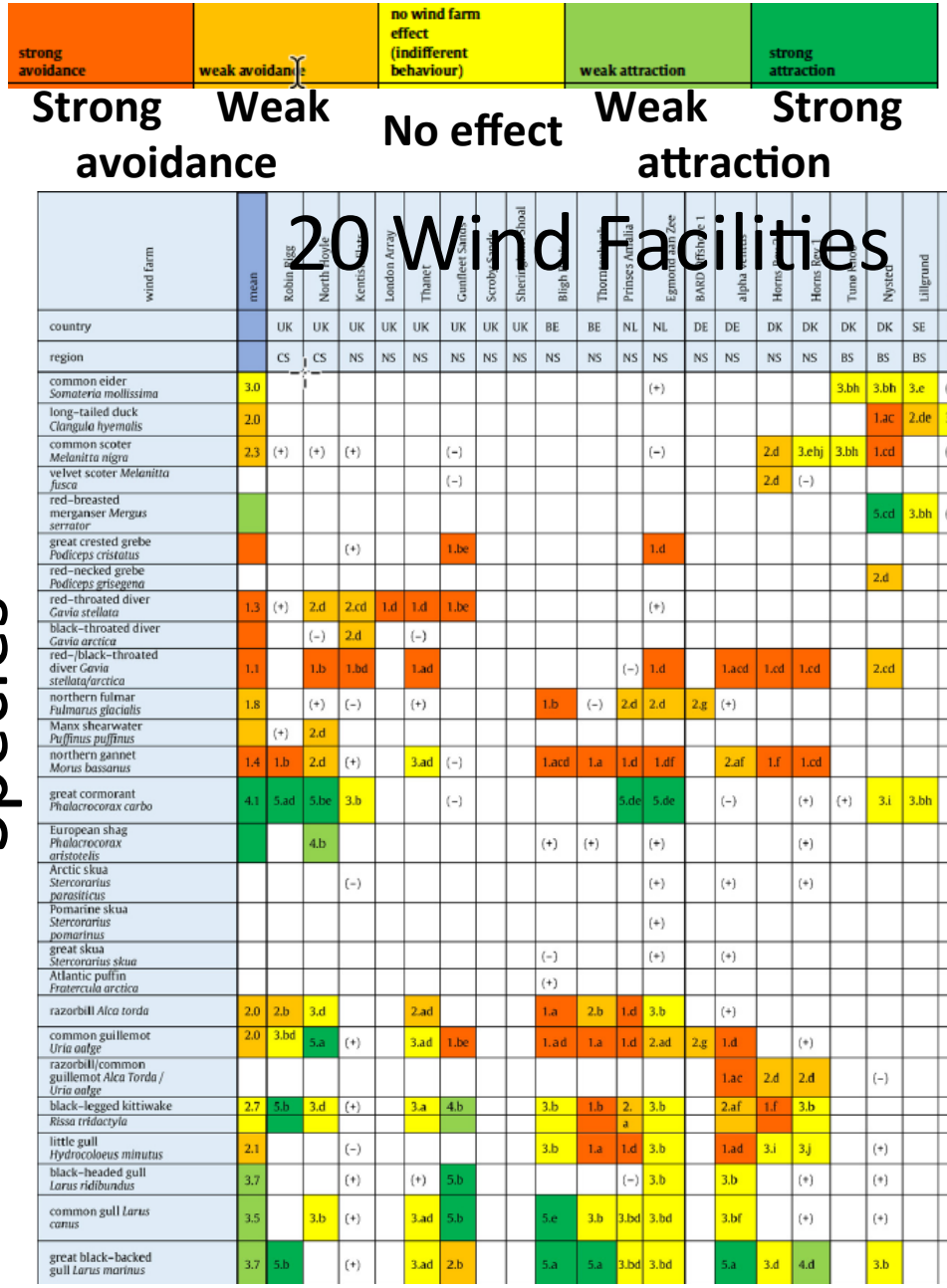




Desholm and Kahlert. 2005.
Biology Letters 1:296-298.

Garthe et al. 2017.
J. Ornithology 158:345-349

Dierschke, Furness and Garthe. 2016. Biological Conservation 202:59-68.



Post-construction surveys of 20 Offshore Wind Facilities in Europe

Distance from shore: 2- 101 km

Started operating: 1995-2013

Water depth: 0 – 37 m (most <20 m)

Number of turbines: 7-175

Dierschke, Furness and Garthe. 2016. Biological Conservation 202:59-68.

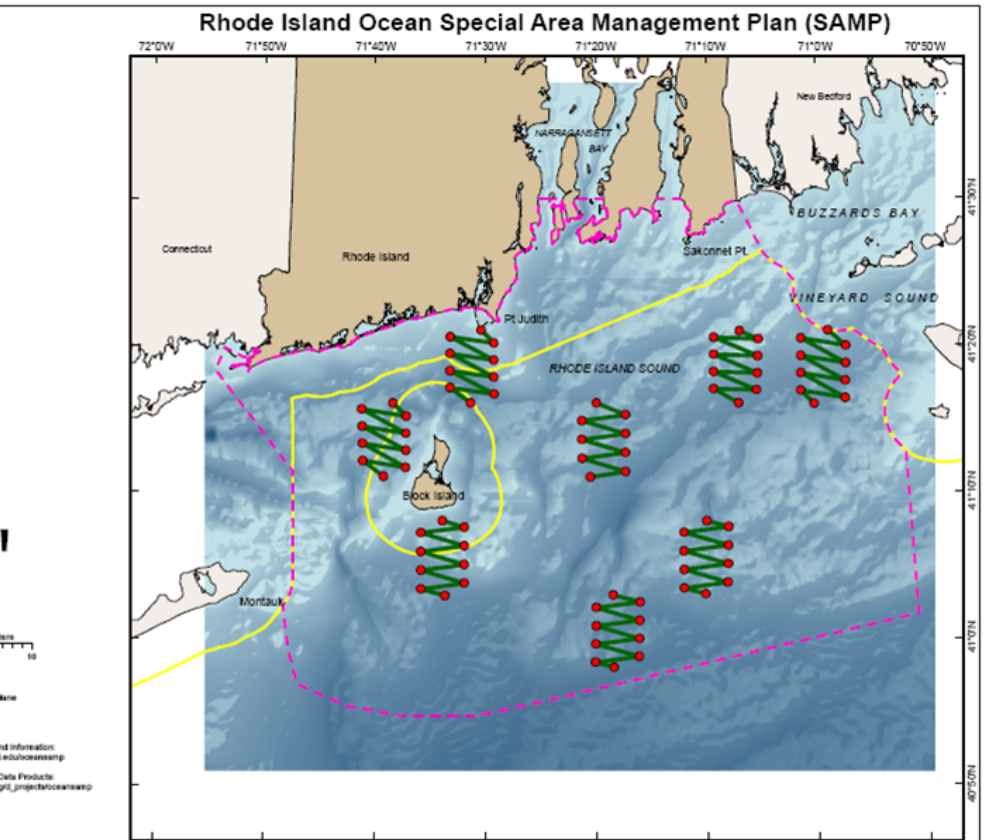

Richard Crossley/VIREO

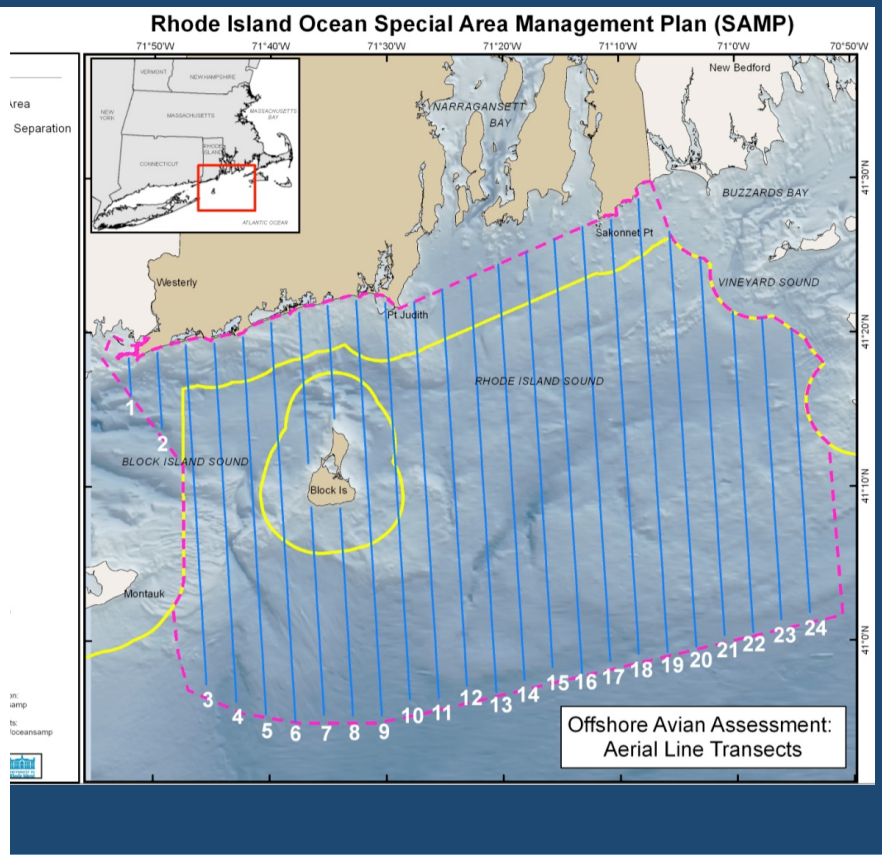
Species	
Red-throated Loon	**Strong Avoidance**
Northen Gannet	
Northern Fulmar	
Long-tailed Duck	**Weak Avoidance**
Manx Shearwater	
Razorbill	
Common Murre	
Sandwich Tern	
Black Scoter	
Common/Arctic Tern	**Indifferent Behavior**
Black-legged Kittiwake	
Common Eider	
Lesser Black-backed Gull	**Weak Attraction**
Herring Gull	
Black-headed Gull	
Great Black-backed Gull	
Red-breasted Merganser	**Strong Attraction**
European Shag (cormorant)	
Great Cormorant	

To quantify avian abundance and distribution for Rhode Island Ocean Special Area Management Plan (SAMP):

Ship-based Line Transects
8 grids – 2 surveyed per week
Feb 2009-May 2010

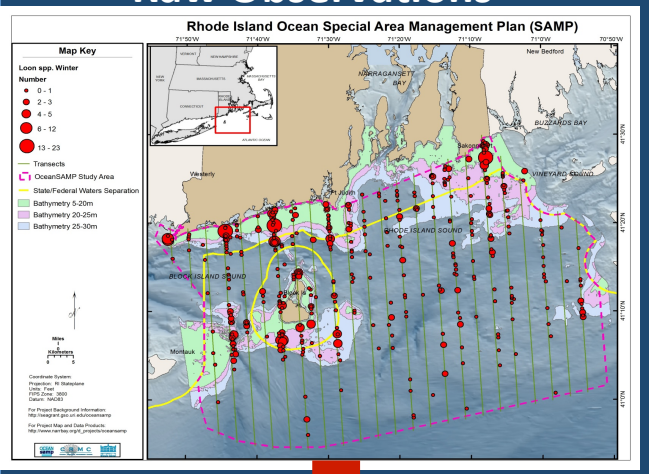
Aerial Line Transects
41 flights 3X month
Oct 2010- July 2012
24 transects – 2.5 km apart



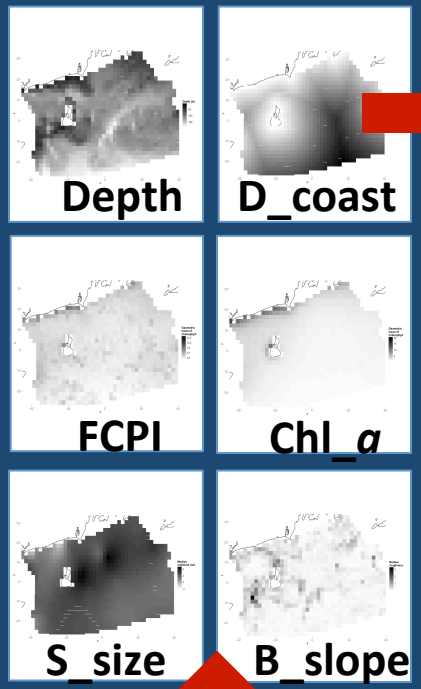


Density Surface Modeling

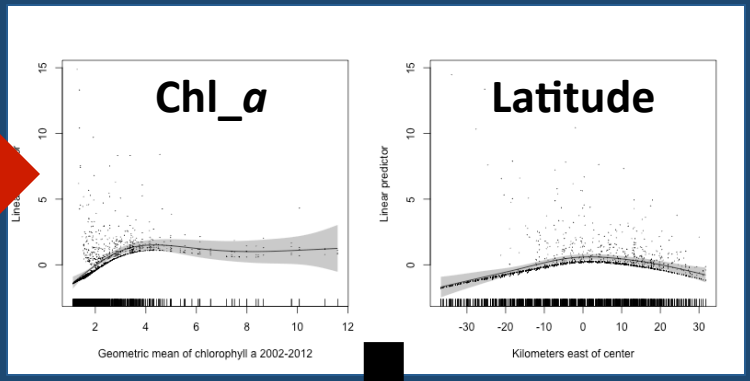
Raw Observations

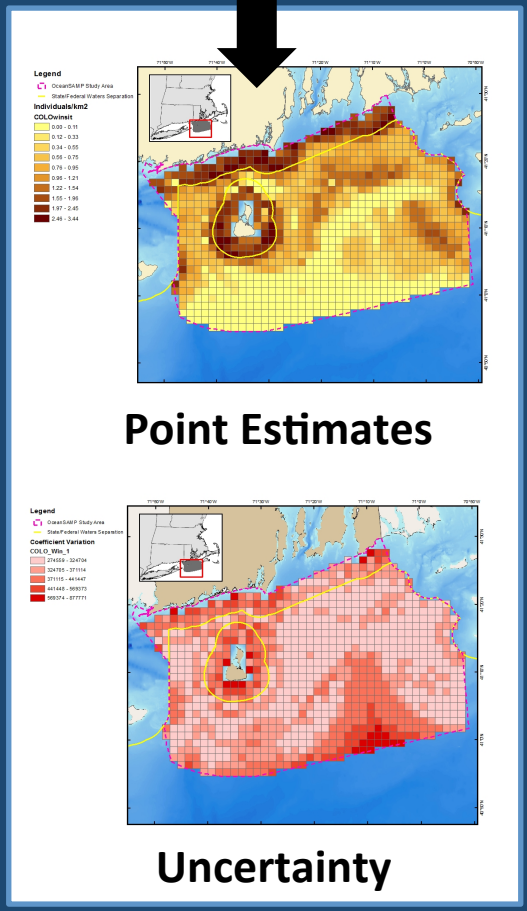


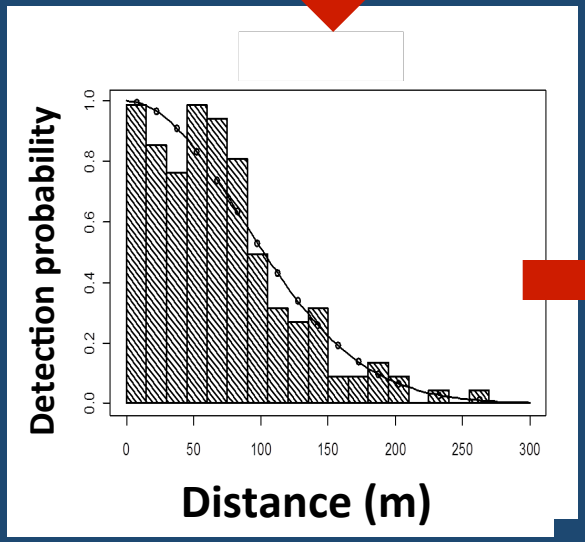
Environmental Covariates

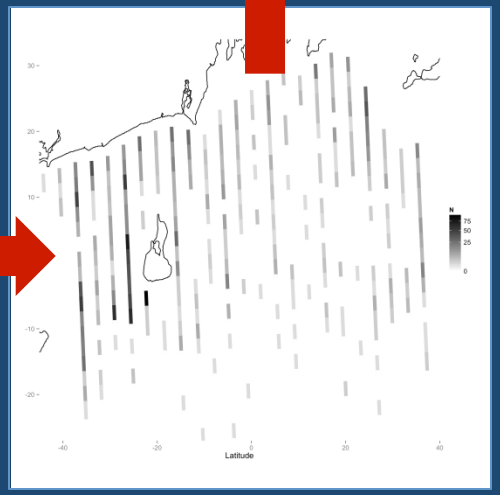


Generalized Additive Model



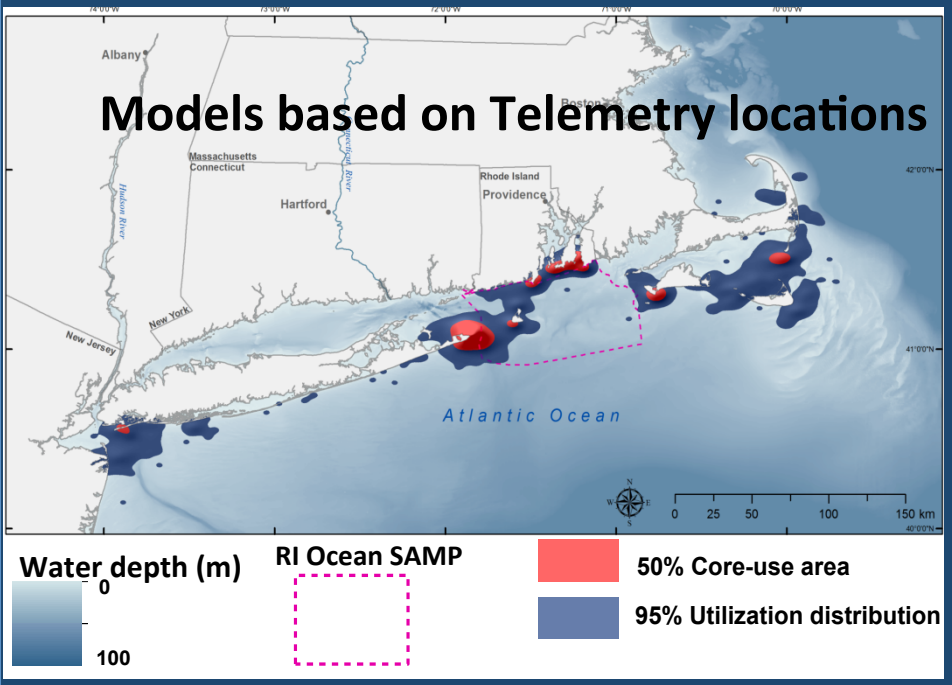


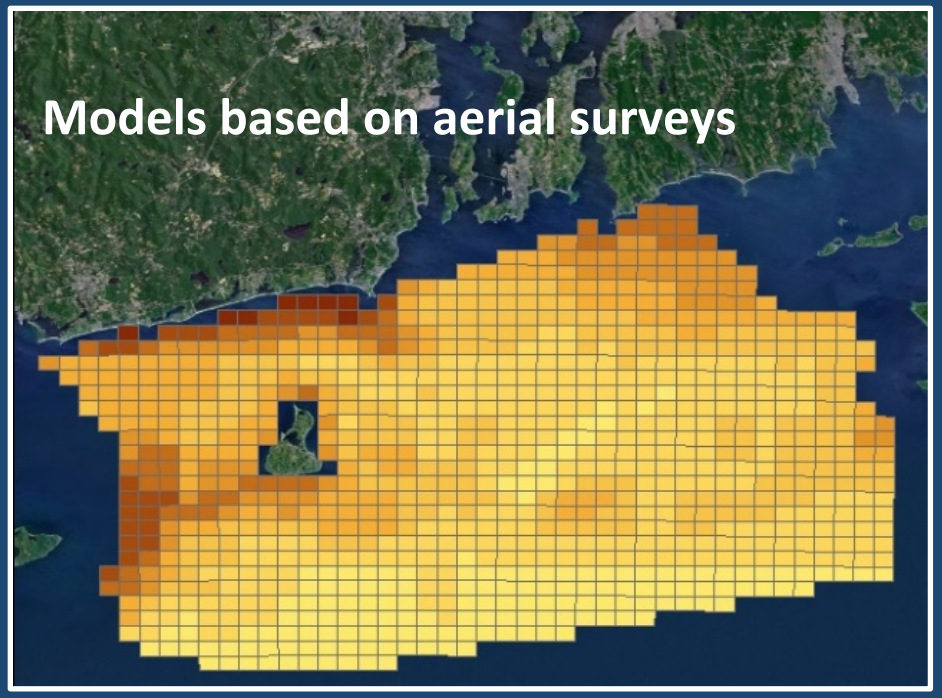




Segments

Black Scoter Distribution





RI Ocean SAMP:

No offshore wind turbines in waters **< 20 m deep** to minimize displacement of seaducks, loons and other species from foraging sites

Loring et al. 2014. JWM 78:645-656

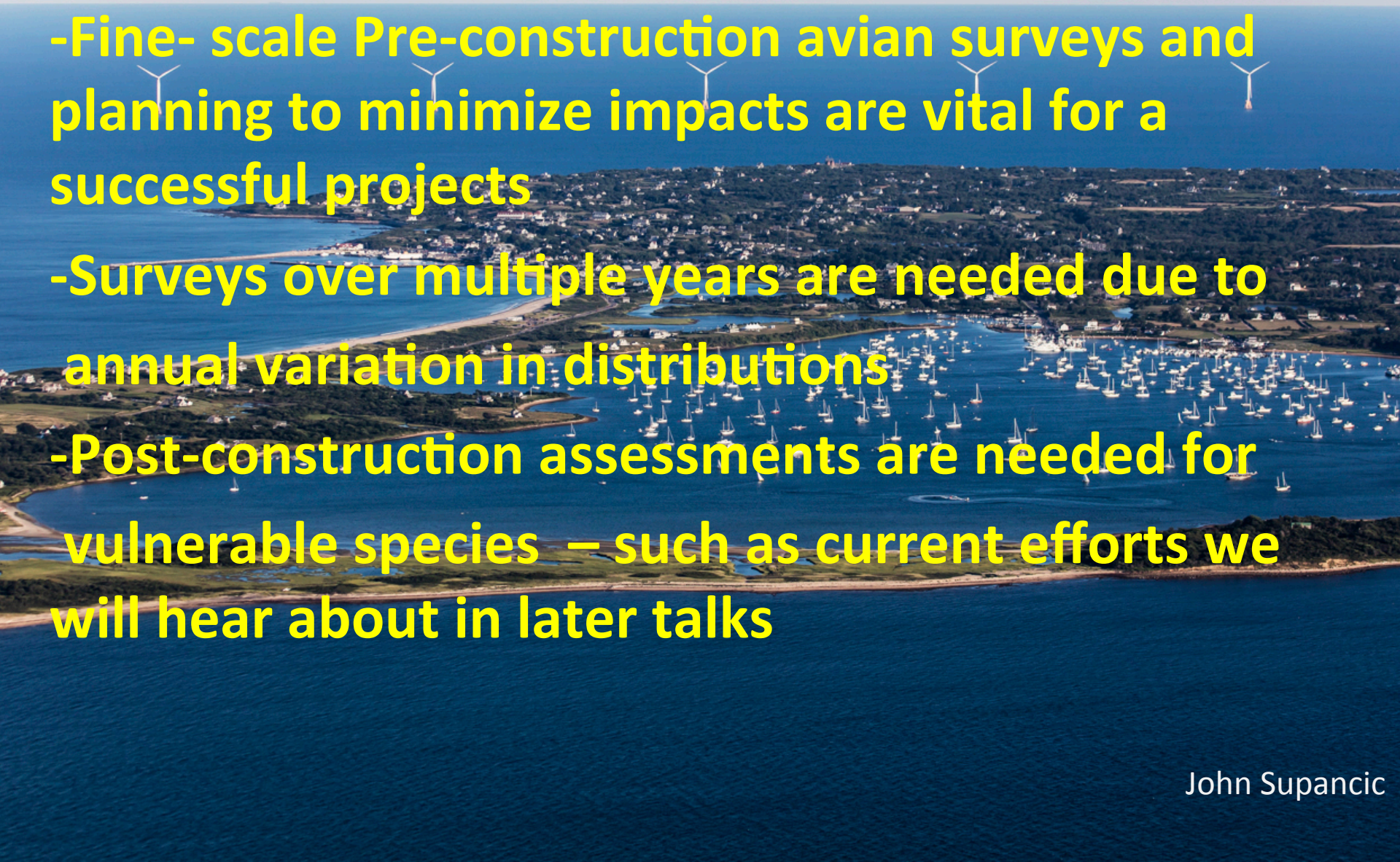
Flanders et al. 2015. MEPS 533: 277-290.

Important take home messages

-Fine- scale Pre-construction avian surveys and planning to minimize impacts are vital for a successful projects

-Surveys over multiple years are needed due to annual variation in distributions

-Post-construction assessments are needed for vulnerable species – such as current efforts we will hear about in later talks



John Supancic

URI Avian Publications

Beuth et al. 2016. Validating the deuterium dilution method to measure body composition of common eider. Wildl. Soc. Bull. 40:456-463

Beuth et al. 2016. Body composition dynamics of common eider during winter: An application of the deuterium dilution method. Wildl. Soc. Bull. 40:464-469

Beuth et al. 2017. Habitat use and movements of common eiders wintering in southern New England. J. of Wildl. Management 8: 1276-1286.

Flanders et al. 2015. Using a community occupancy model to identify key seabird areas in southern New England. Mar Ecol Prog Ser. 533:277-290.

Loring et al. 2013. Densities of wintering scoters in relations to benthic prey assemblages in a North Atlantic Estuary. Waterbirds: 36: 36:144-155.

Loring et al. 2014. Habitat use and selection of black scoters in southern New England and siting of offshore wind energy facilities. J Wildl. Management 78: 645-656.

Shumchenia et al. 2012. An adaptive framework for selecting environmental monitoring protocols to support ocean renewable energy development. Sci. World J. 2012:450685.

Smith et al. 2015. Using land-based surveys to assess sea duck abundance and behavior in nearshore waters of southern New England. Waterbirds 38:252-259.

Winiarski et al. 2013. Spatially explicit model of wintering common loons: conservation implications. Mar Ecol Prog Ser 492:273-283

Winiarski et al. 2014. A spatial conservation prioritization approach for protecting marine birds given proposed offshore wind energy development. Biol Con 169:79-88

Winiarski et al. 2014. Integrating aerial and ship surveys of marine birds. Condor 116:149-161.

Study Partners and Collaborators

Photo Courtesy Andreas Trepte, www.photo-natur.de

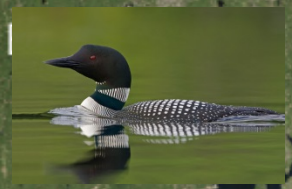
Common Eider

Predicted occupancy prob.

0.00 - 0.10	0.501 - 0.60
0.101 - 0.20	0.601 - 0.70
0.201 - 0.30	0.701 - 0.80
0.301 - 0.40	0.801 - 0.90
0.401 - 0.50	0.901 - 0.99

N

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community



Common Loon

Predicted occupancy prob.

0.00 - 0.10	0.501 - 0.60
0.101 - 0.20	0.601 - 0.70
0.201 - 0.30	0.701 - 0.80
0.301 - 0.40	0.801 - 0.90
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N

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Northern Gannet

Predicted occupancy prob.

0.00 - 0.10	0.501 - 0.60
0.101 - 0.20	0.601 - 0.70
0.201 - 0.30	0.701 - 0.80
0.301 - 0.40	0.801 - 0.90
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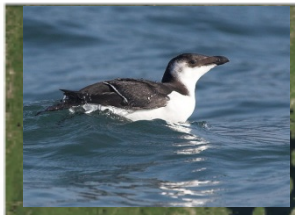

Razorbill

Predicted occupancy prob.

0.00 - 0.10	0.501 - 0.60
0.101 - 0.20	0.601 - 0.70
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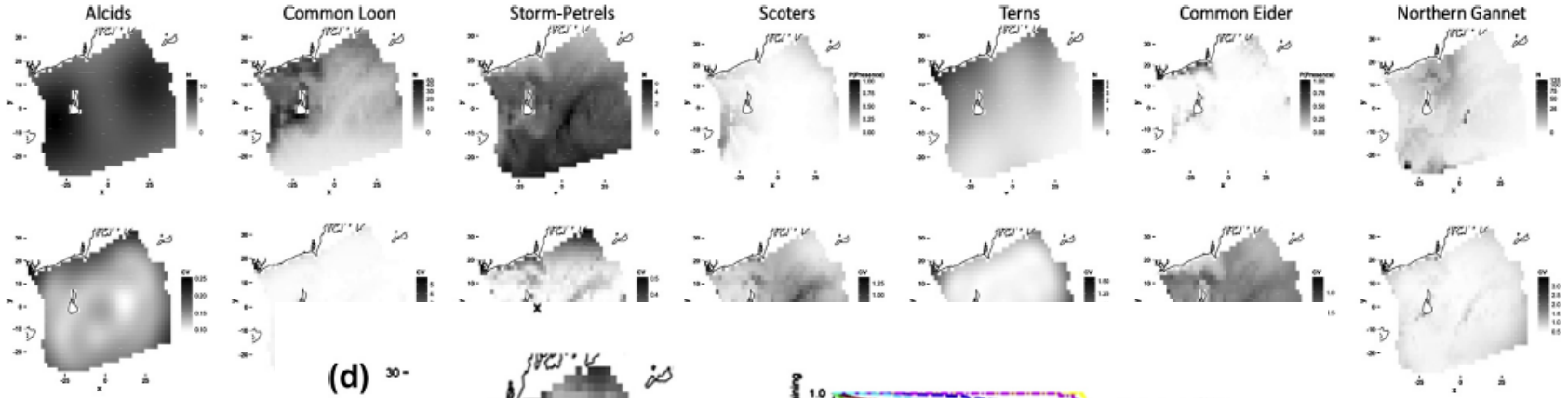
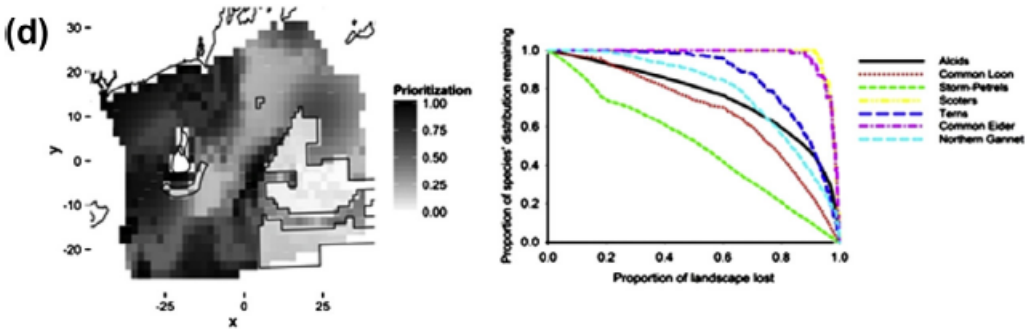
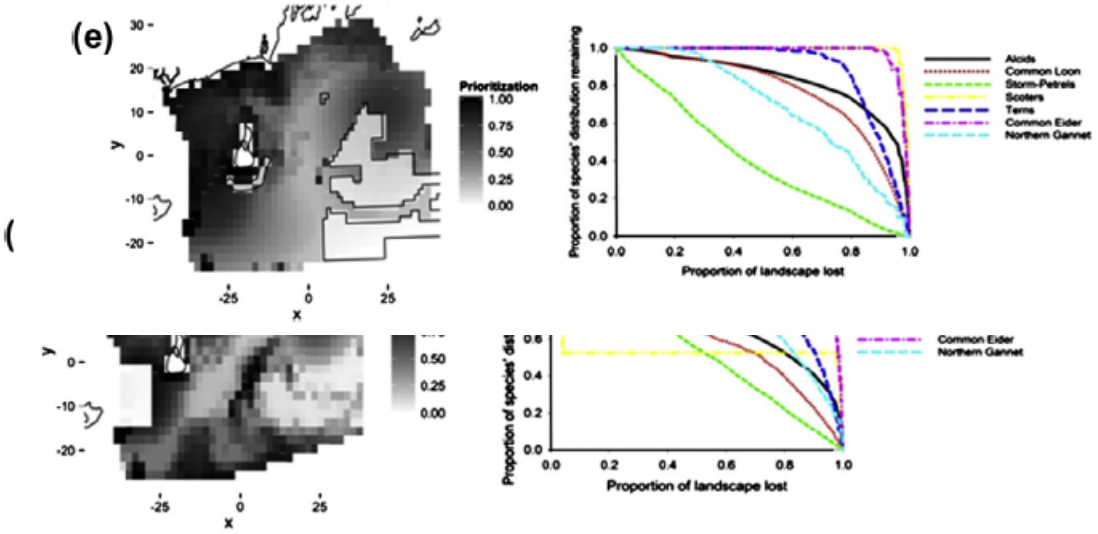


Fig. 2. Density surface models o ed during aerial surveys off the coast of Rhode Island. Top panel ence. Bottom panels are model uncertainty (coefficient of variati





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M. Macor