Minimizing Effects of Wind Development on Bats in the Northeast

Zara Dowling

UMass Offshore Wind IGERT

Residents & Short-distance Migrants

Big Brown Bat
(*Eptesicus fuscus*)

Little Brown Bat
(*Myotis lucifugus*)

Northern Long-eared Bat
(*Myotis septentrionalis*)

Eastern Small-footed Bat
(*Myotis leibii*)

Indiana Bat
(*Myotis sodalis*)

Tri-colored bat
(*Perimyotis subflavus*)

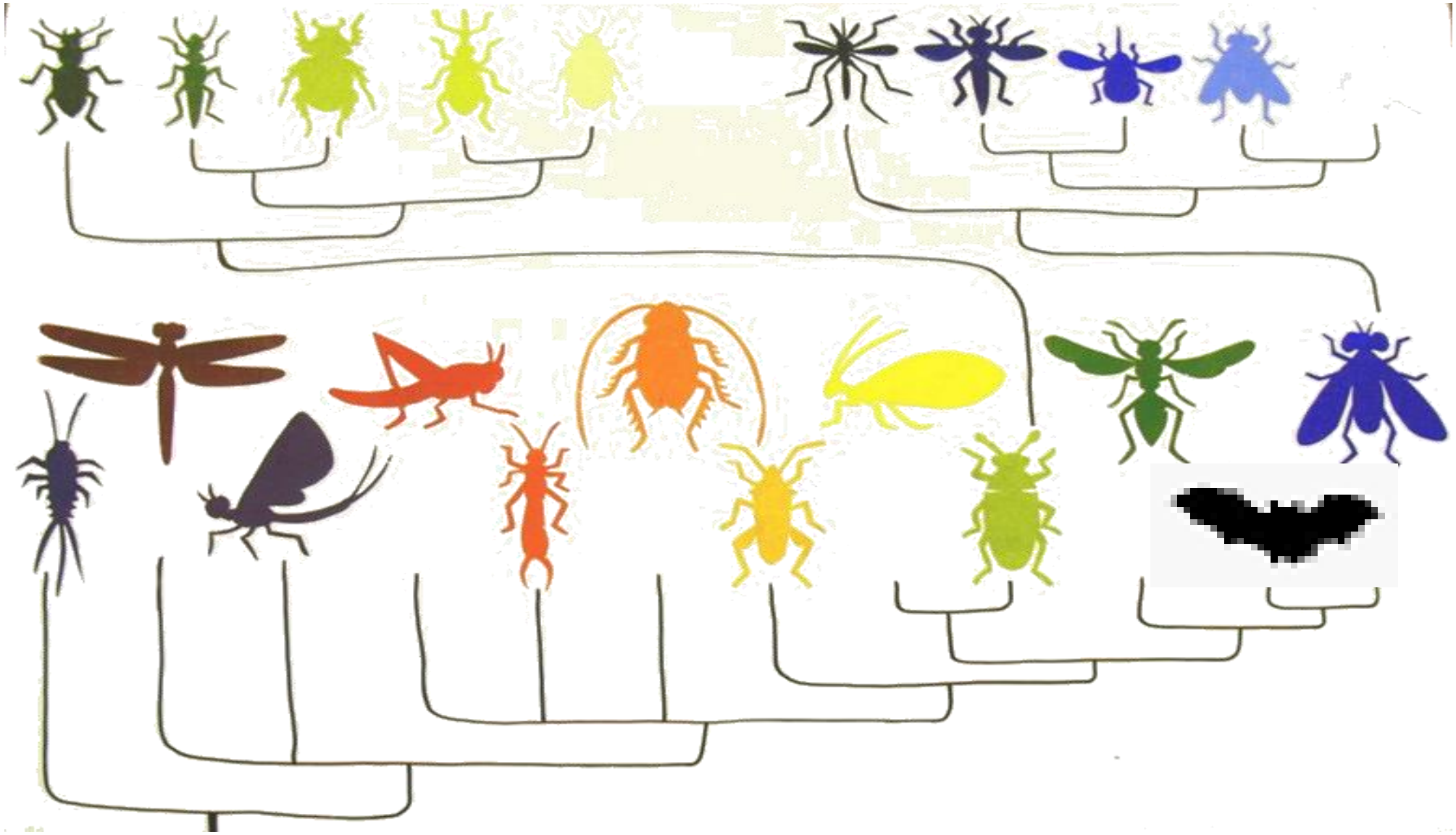
Long-Distance Migratory Bats

Hoary Bat
(*Lasiurus cinereus*)

Eastern Red Bat
(*Lasiurus borealis*)

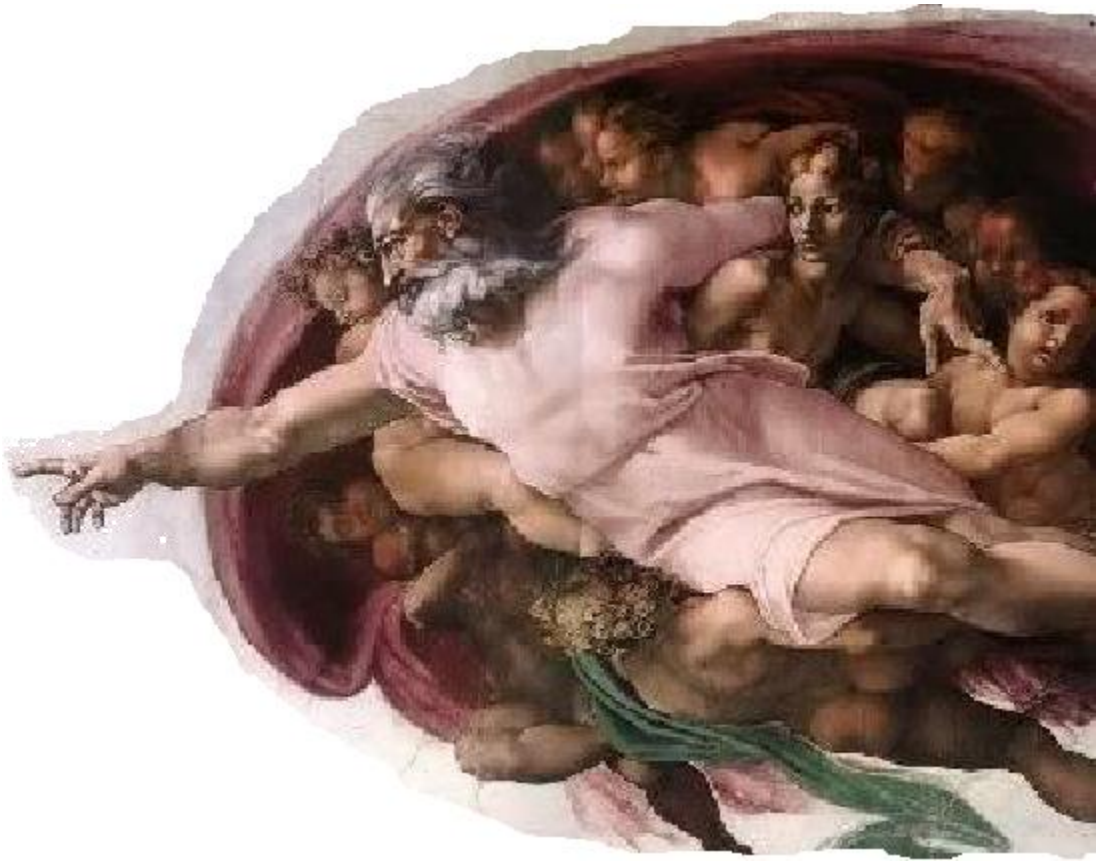
Silver-Haired Bat
(*Lasionycteris noctivagans*)

Background on Bats




BATS AREN'T
BUGS !!

Bats are hard to study…



- Fly, don’t leave any tracks
- Active at night
- Small
- Calls are ultrasonic
- Calls are hard to differentiate
- Hard to tell species apart in flight
- *SCARY and ICKY and probably RABID*
- Roost sites often not obvious
- Hibernate in out-of-the-way places
- Migratory bats roost singly and never congregate

photo © Bat Conservation International

An estimated 600,000 bats were killed by commercial wind power in the U.S. in 2012.

Hayes 2013

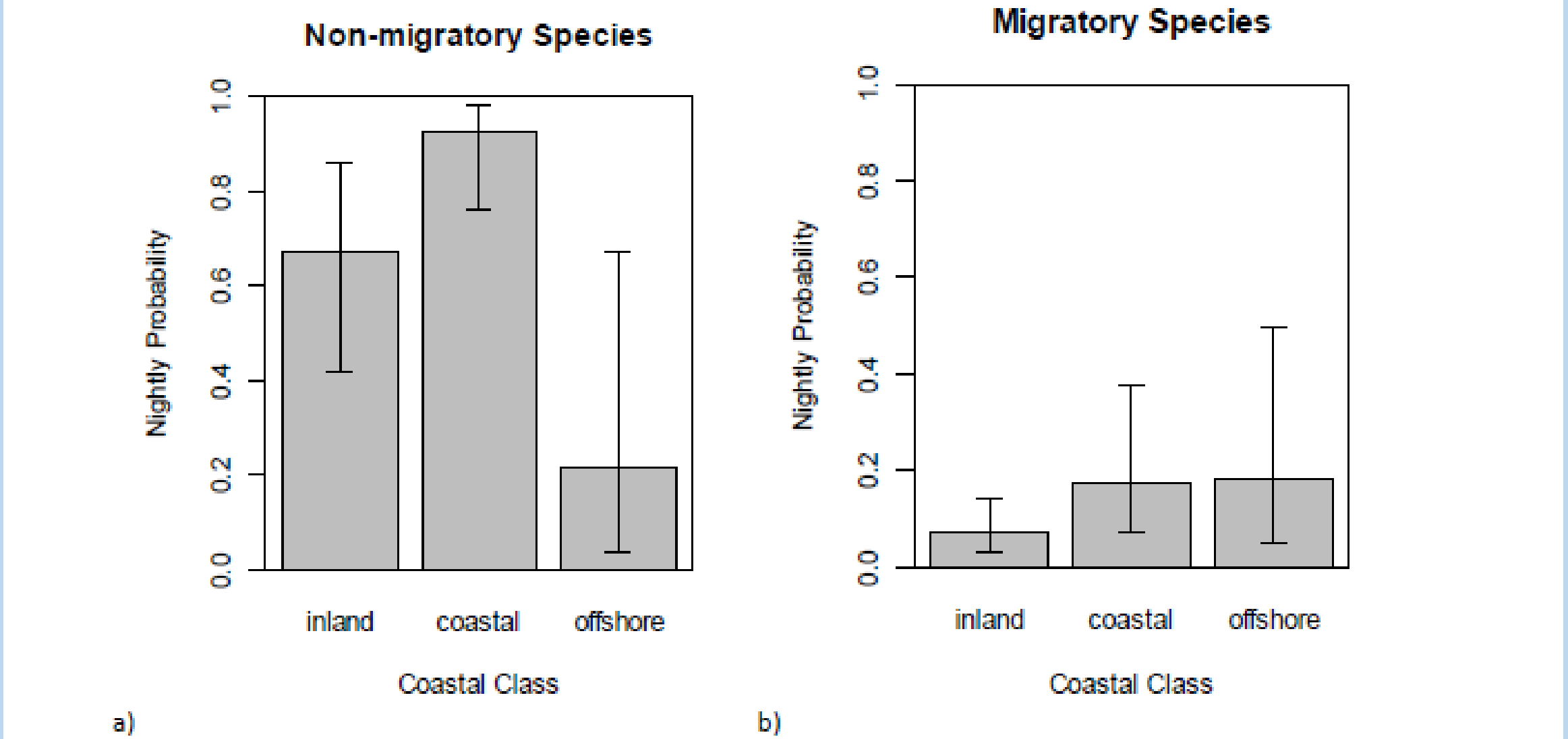
Strategies to Reduce Mortality

1) Deterrents – Devices mounted on wind turbines or on the perimeter of wind facilities to warn bats away from turbines.
2) Curtailment – Stoppage of rotor motion during certain weather conditions/times of year when bat activity and mortality at wind farms is expected to be high.
3) Siting – Location of wind farms away from major bat flyways and habitat.

But bats aren’t in the ocean, right?

flock of “…about a hundred which caught up with and settled on Mr. Cheeseman’s ship…“

-Thomas 1921



Omland et al. 2013

Strategies to Reduce Mortality

1) Deterrents – Is there a device that could function in an offshore environment?

2) Curtailment – When, and under what weather conditions, are bats moving offshore?

3) Siting – Where are bats moving offshore? How far out?

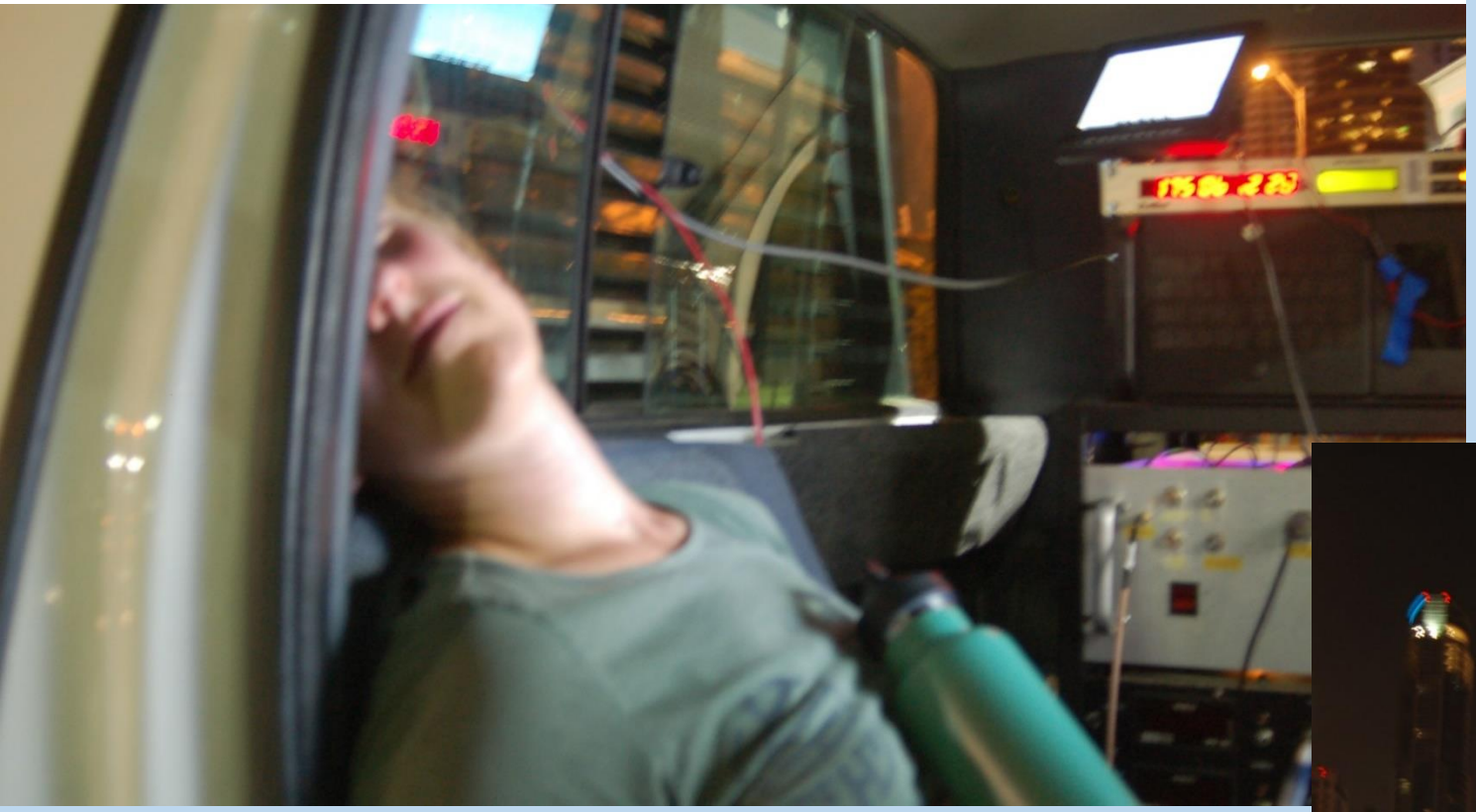
Strategies to Reduce Mortality

1) Deterrents – Is there a device that could function to deter bats in an offshore environment?

Arnett et al. 2013

Nicholls & Racey 2009

Testing Radar as a Deterrent

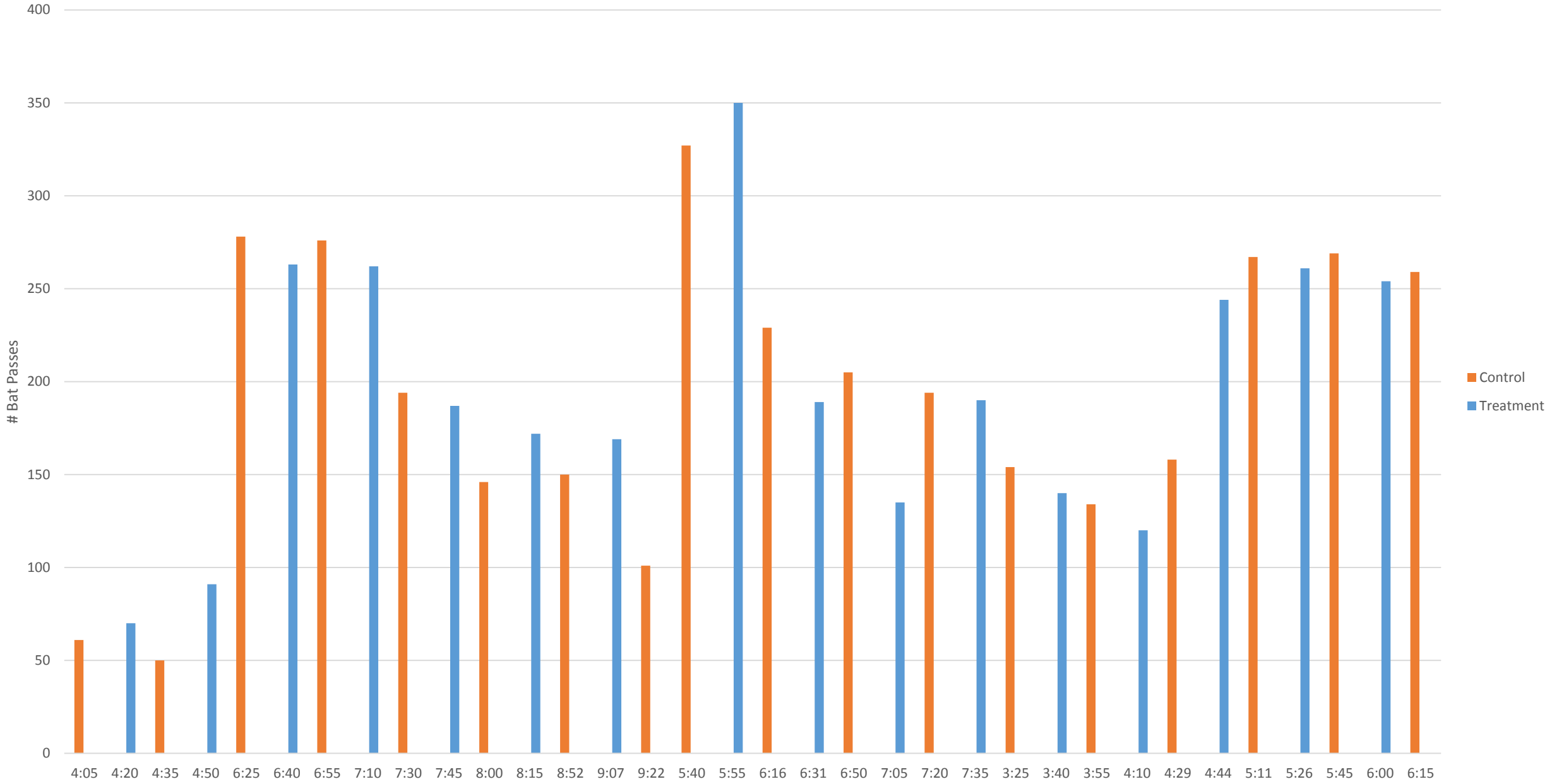


RADAR
- modified Raytheon MK-2 marine radar
- frequency of 9.41 GHz
- peak power up to 25 kW
- pulse width .3 µs,
- pulse repetition frequency of 1 kHz
- 17x17 horn antenna, pencil beam dish antenna

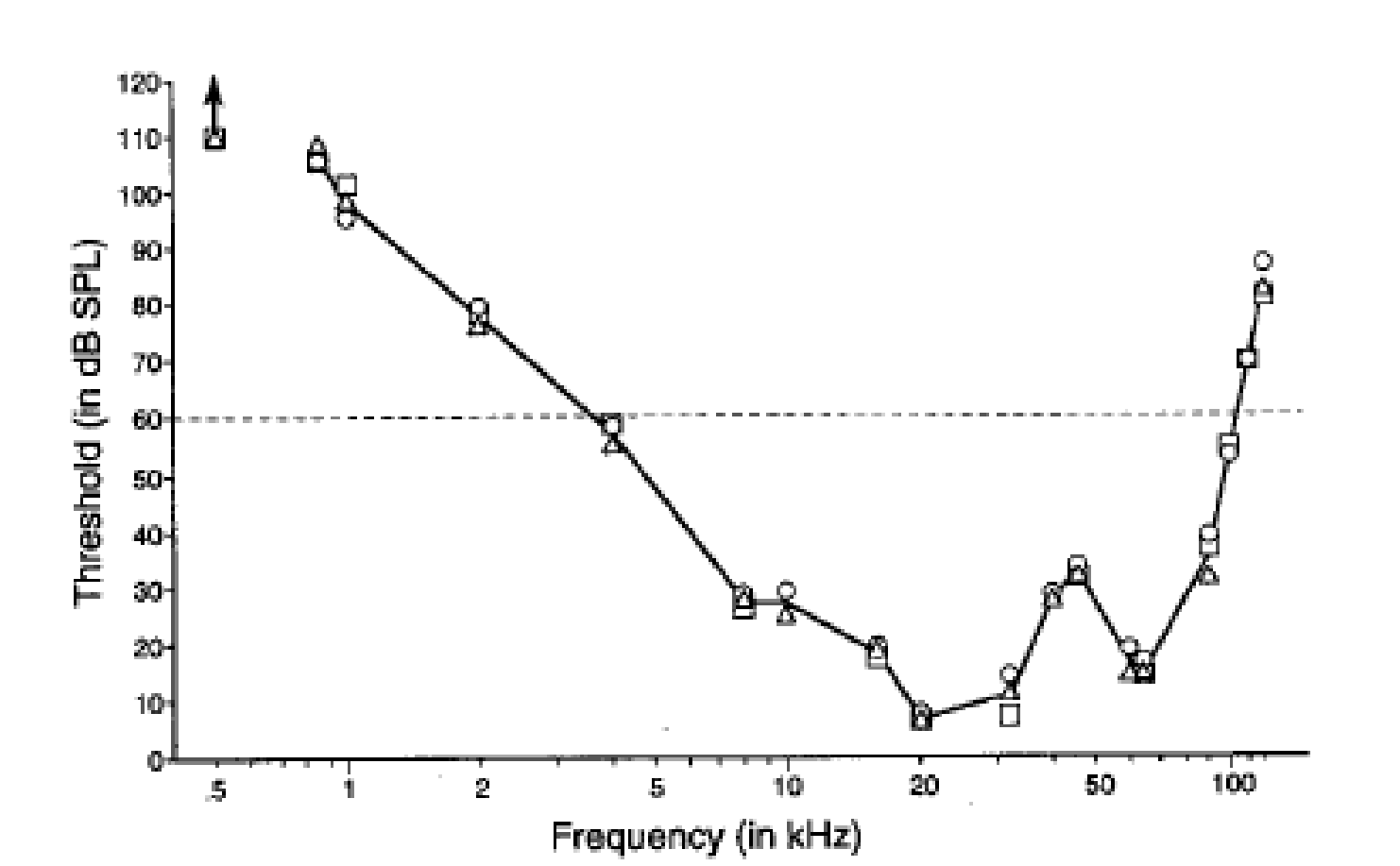
EXPERIMENTAL DETAILS
- fly-way to roost site for Mexican free-tailed bats in Austin, TX
- 15 minutes with radar off, followed by 15 minutes with radar on, repeated
- 4 nights of testing, 16 hours total


175:06:28:16.6


175:06:28:05.2


400
350
300
250
200
150
100
50
0
Bat Passes
4:05
4:20
4:35
4:50
6:25
6:40
6:55
7:10
7:30
7:45
8:00
8:15
8:52
9:07
9:22
5:40
5:55
6:16
6:31
6:50
7:05
7:20
7:35
3:25
3:40
3:55
4:10
4:29
4:44
5:11
5:26
5:45
6:00
6:15
Control
Treatment

Microwave Auditory Phenomenon?



Obrist & Wenstrup 1998

In a head the size of a bat's, predicted fundamental frequencies would fall within the range of 88.5-117 kHz, assuming an unconstrained surface, and 126.5-166.5 kHz, assuming a constrained surface. The true values are expected to fall between these ranges (based on Lin 1977).

Other Mechanisms?

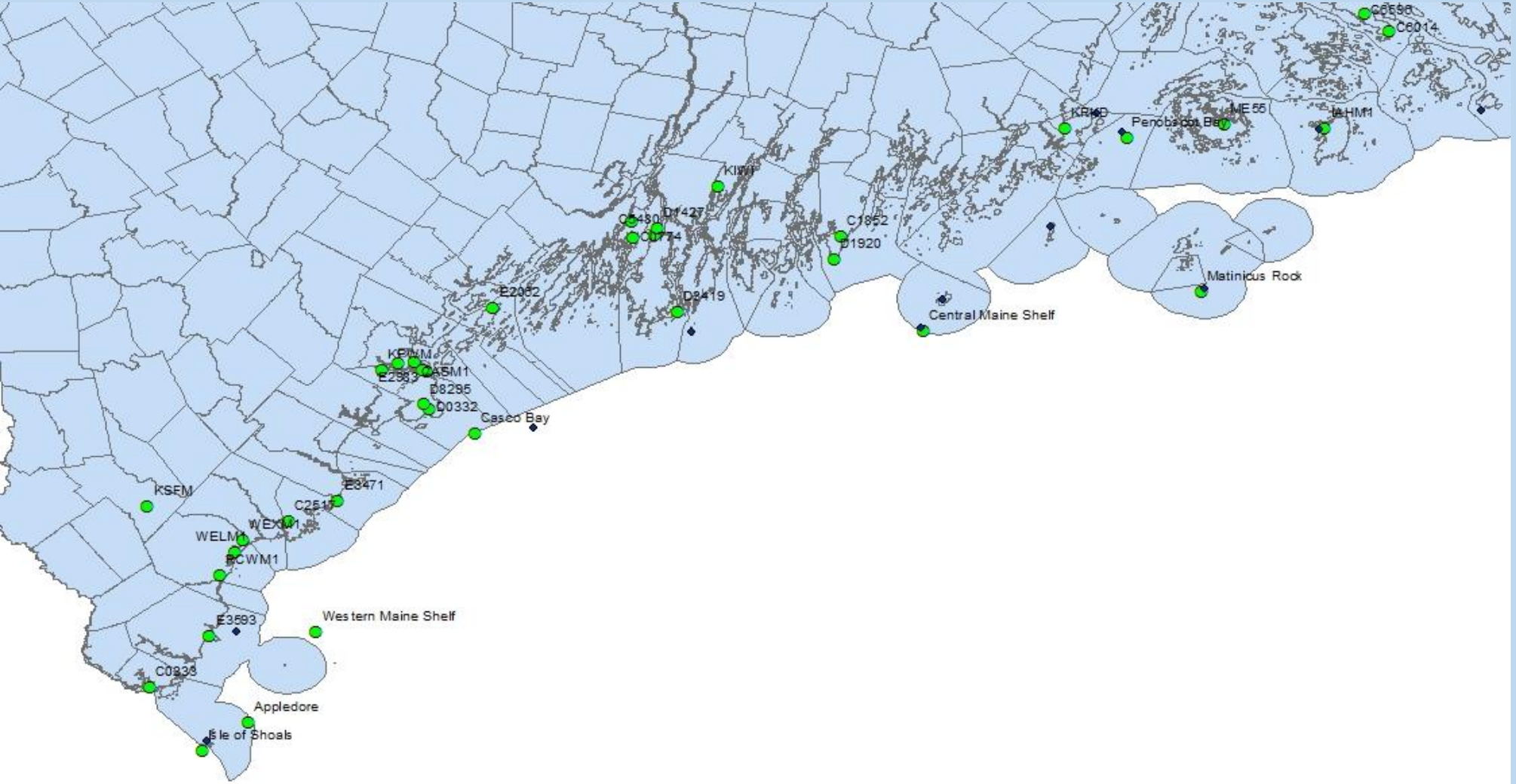
Thermal heating

Hotspots

Magnetic effects

Strategies to Reduce Mortality

2) Curtailment – When, and under what weather conditions, are bats moving offshore?



Strategies to Reduce Mortality

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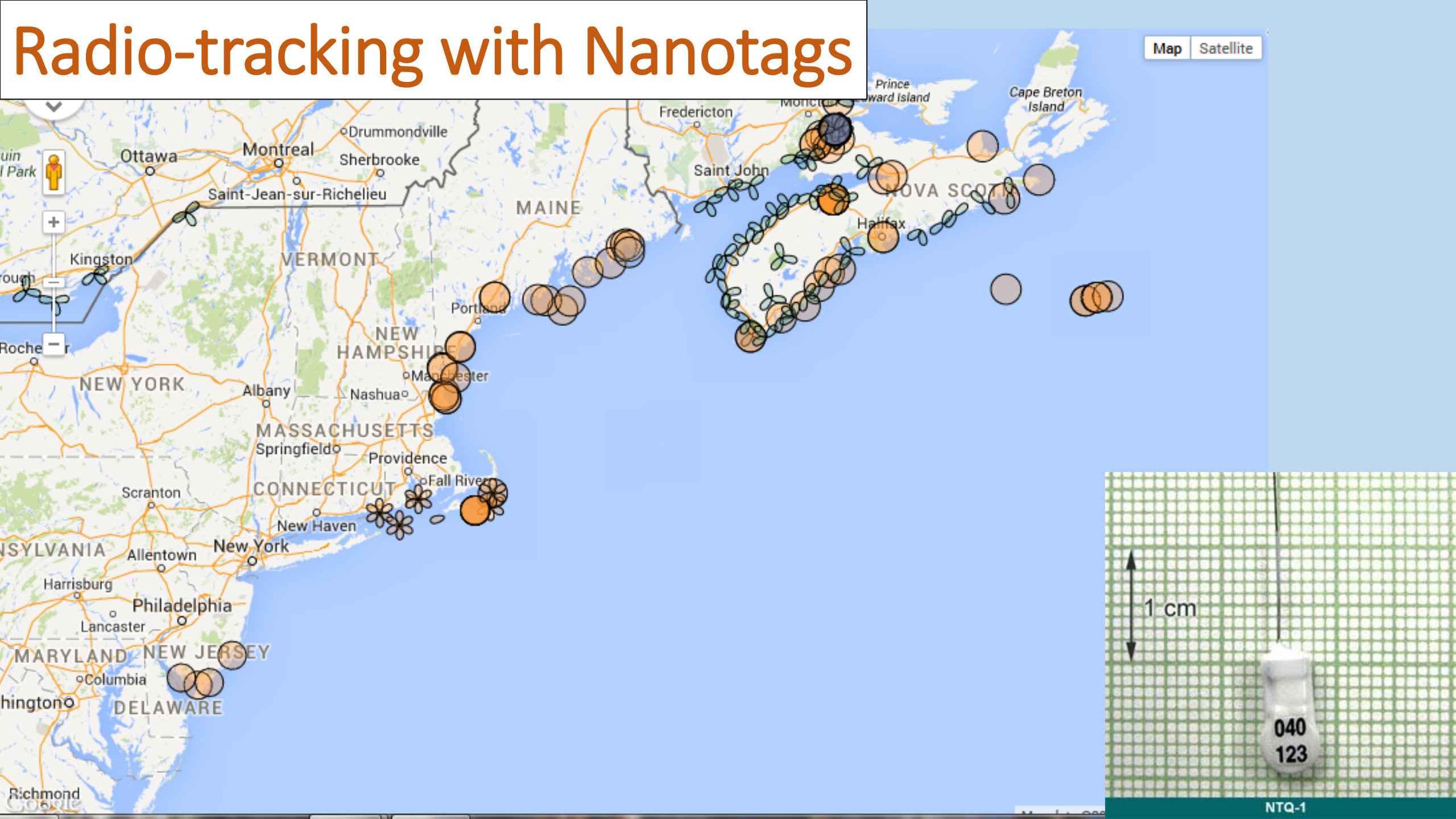
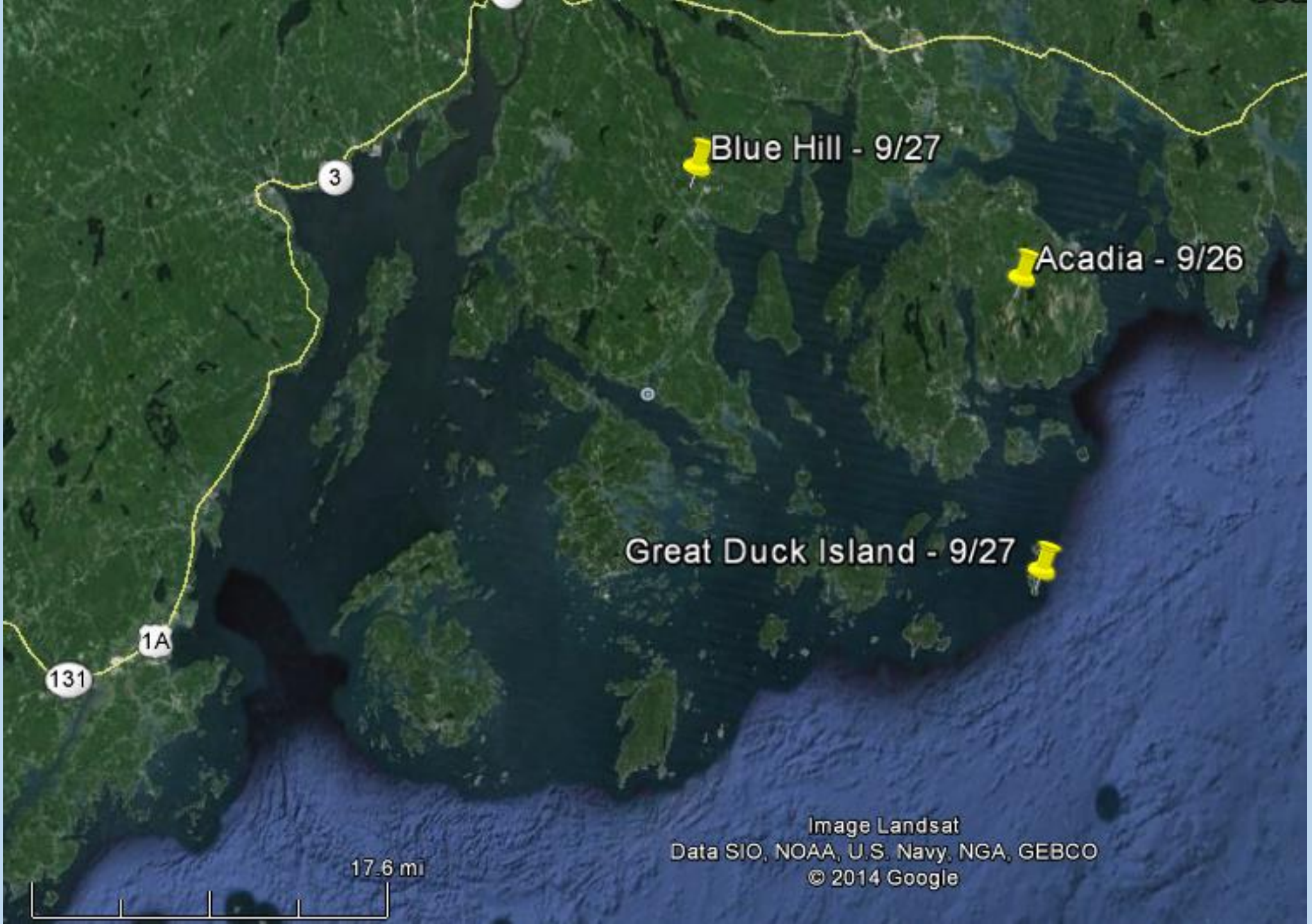
Radio-tracking with Nanotags




La Pocatière
Edmundston
Dickey
Grand Falls
20
Quebec
Presque Isle
2
St-Georges
Baxter State Park
Houlton
95
Millinocket
Lac-Megantic
MAINE
Stratton
Dover-Foxcroft
St Stephen
Skowhegan
Bangor
Machias
Rumford
Waterville
Ellsworth
Belfast
Blue Hill Bay
Auburn
Rockland
Acadia National Park
Brunswick
Portland
Biddeford
Dover
Portsmouth
Manchester


Seal Cove - 9/12
Acadia - 9/5
Nelson - 9/29
Napatree - 10/5
Data SIO, NOAA, U.S. Navy, NGA, GEBCO


Blue Hill - 9/27
Acadia - 9/26
Great Duck Island - 9/27
3
1A
131
17.6 mi
Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
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