North Carolina State University American Oystercatcher Research

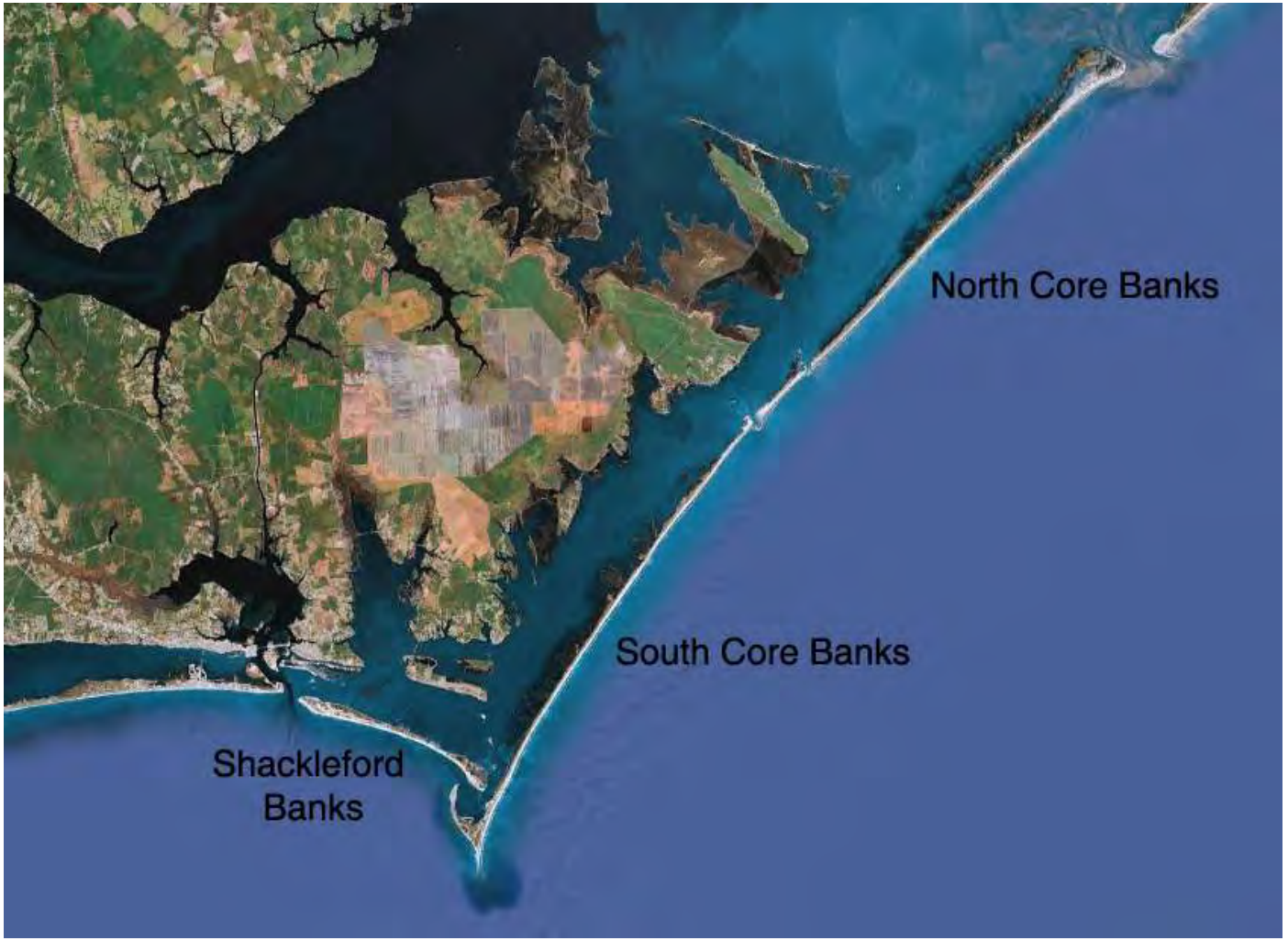
Tracy Borneman, Jessica Stocking, and Ted Simons

AMOY Working Group Meeting
Cedar Key, FL

Nov 2012

Photo: Eli Rose

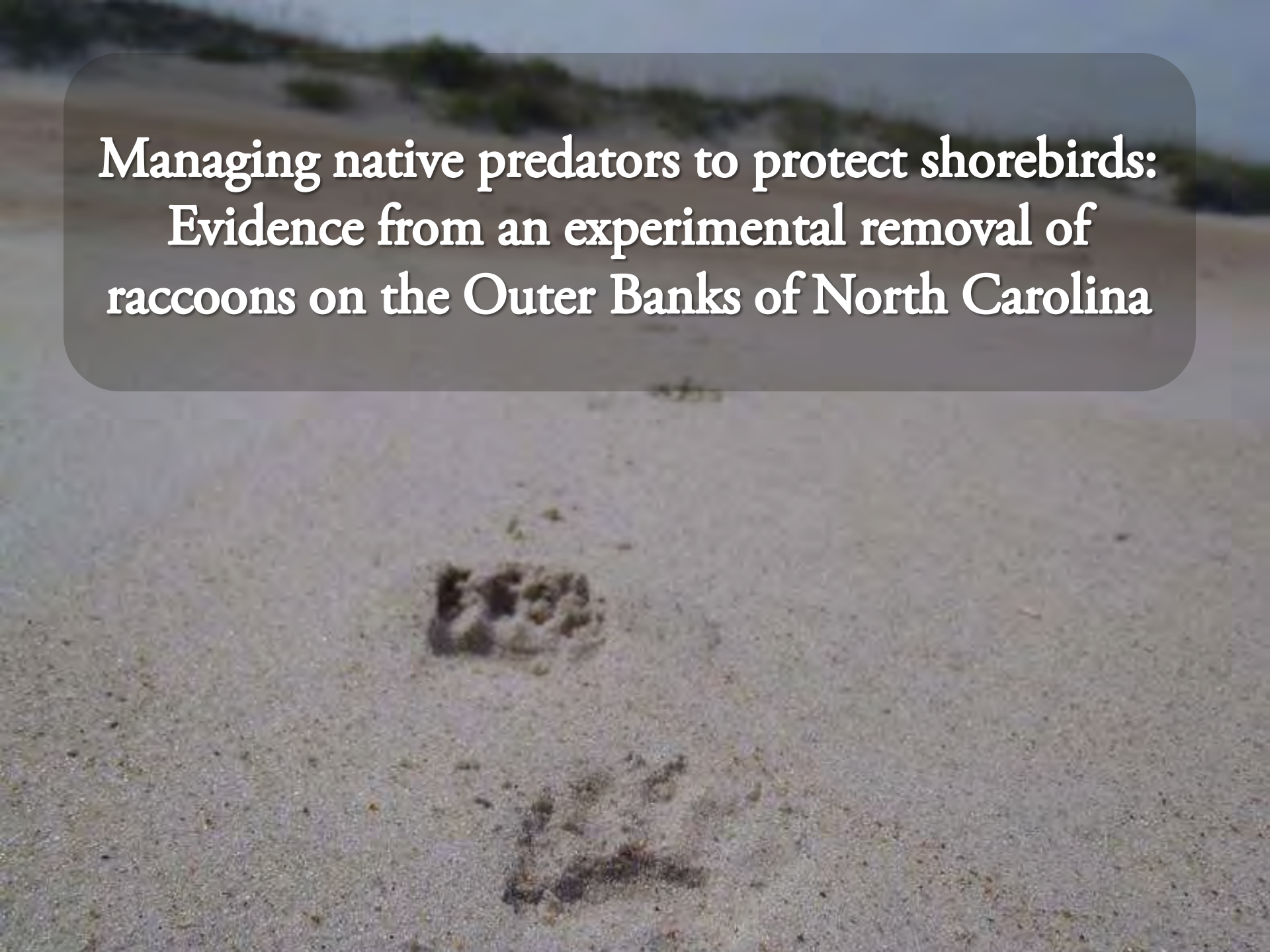
Cape Lookout National Seashore



The effects of predator control and habitat type on American Oystercatcher reproductive success

Jessica J Stocking

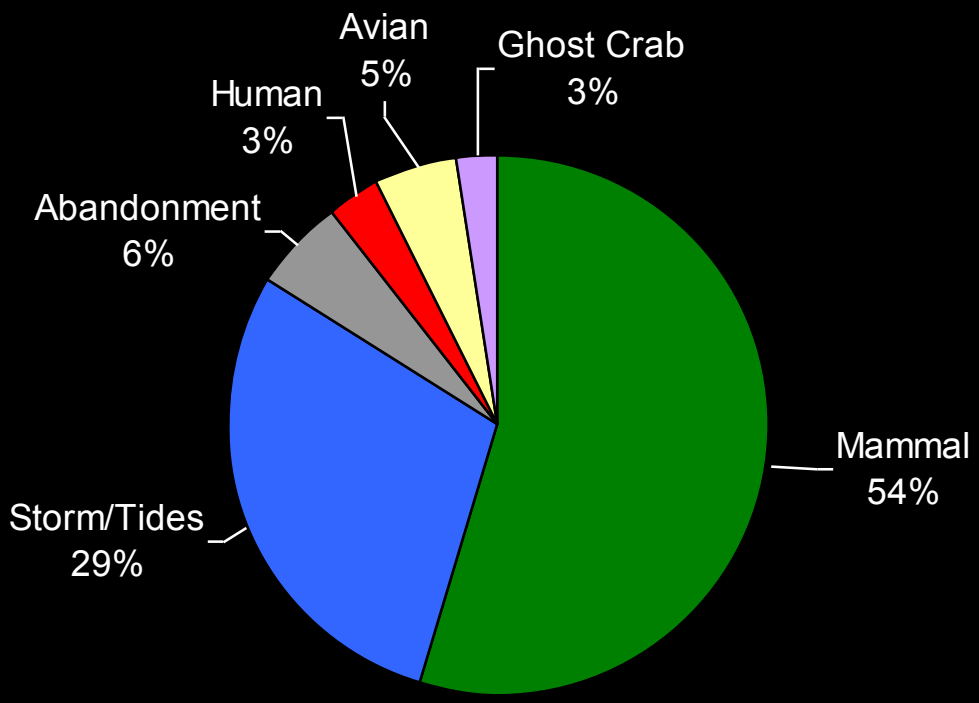
Hello from Alaska!!!

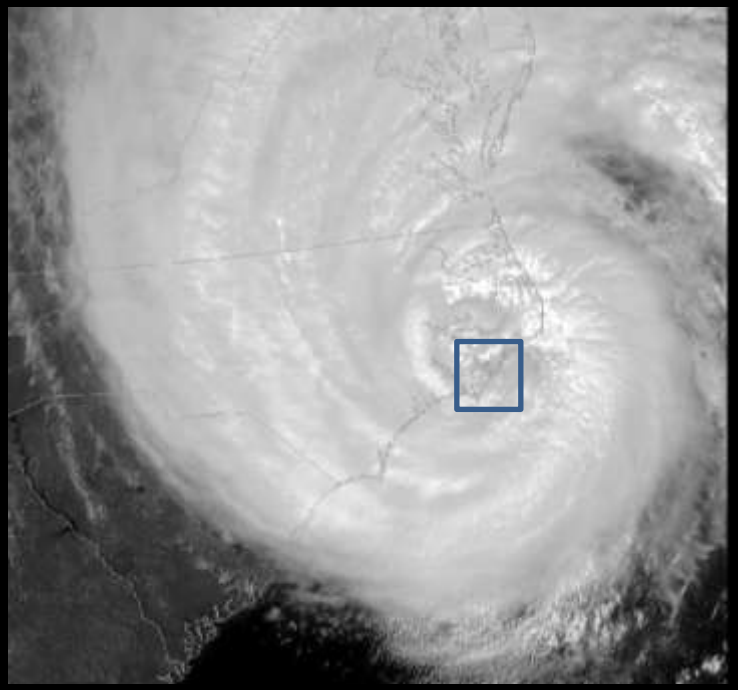


Managing native predators to protect shorebirds: Evidence from an experimental removal of raccoons on the Outer Banks of North Carolina

nest loss and success

Schulte 2012

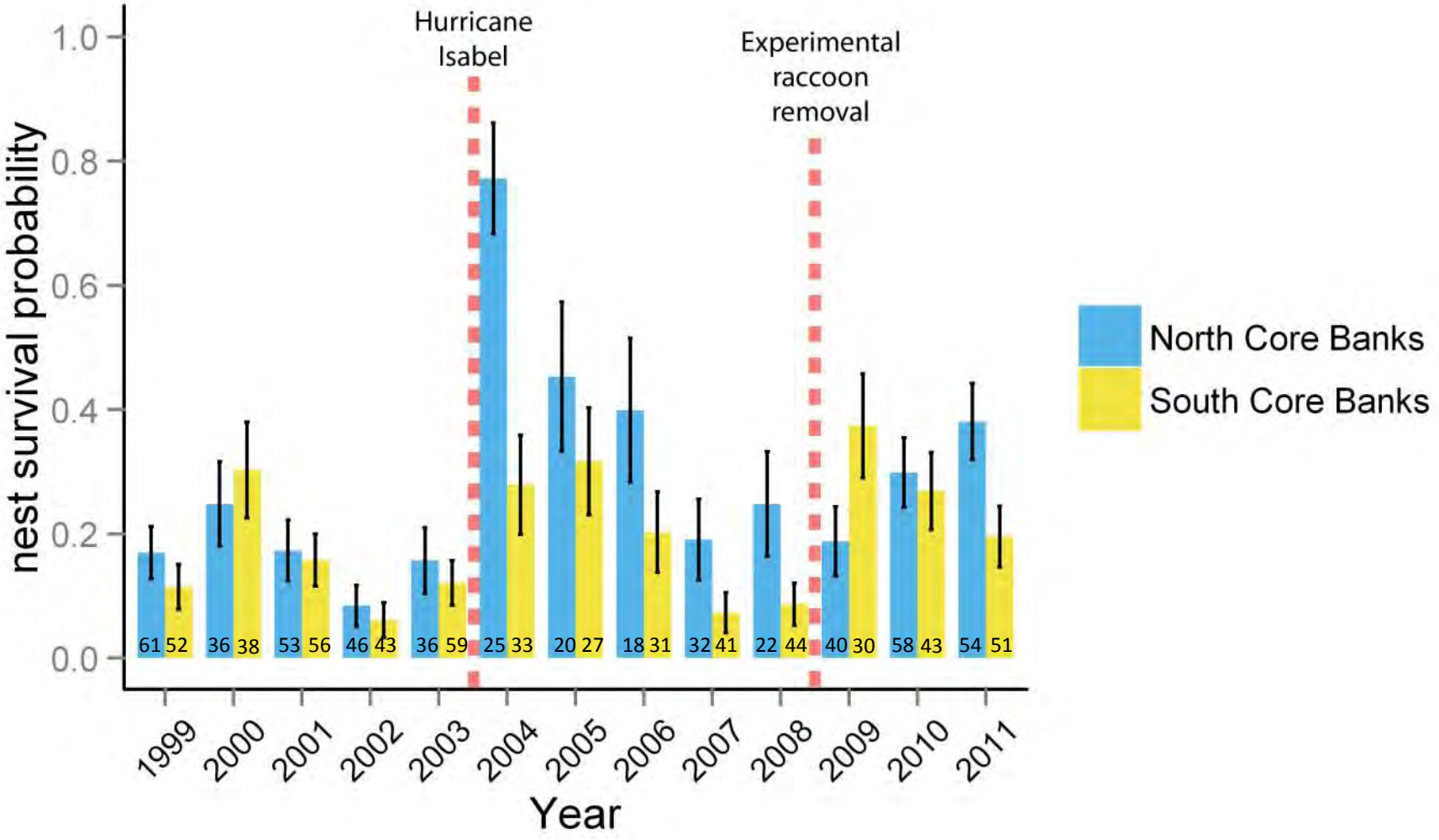




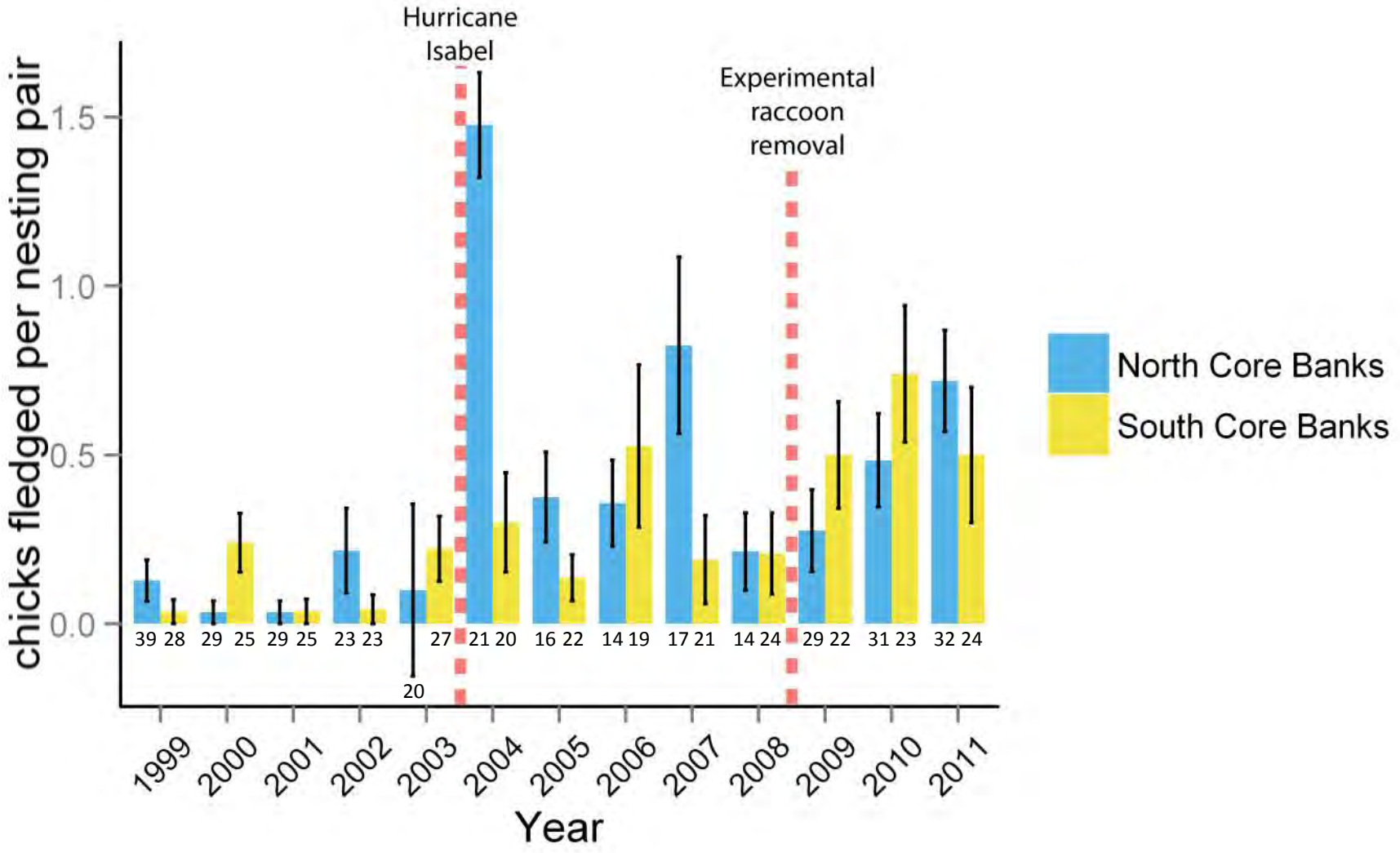
Sampling Period	Marked Caught	Unmarked Caught	Total Caught	Total Marked in Population	Lincoln- Petersen Estimate	SE
5/18-6/30/07	85	112	197	57	136.80	11.61
7/1-8/15/07	150	105	255	94	159.80	8.34
8/16-10/1/07	141	104	245	96	166.81	9.12
10/2-11/17/07	74	91	165	96	214.05	18.36
11/18-2/17/08	26	41	67	96	234.50	35.30
6/21-8/25/08	38	69	107	102	287.21	36.93
				Mean	199.86	22.88

Waldstein 2010

t=-1.975, df=3.68, p=0.1256



t=-4.362, df=3.46, p=0.01654



Before-After-Control-Impact (BACI)

Nest survival probability

	df	Sum Sq	Mean Sq	F value	pr(>F)
BA	1	0.005	0.005	0.433	0.518
CI	1	0.00647	0.00647	0.559	0.463
BA:CI	1	0.03371	0.03371	2.916	0.103
Residuals	20	0.23121	0.01156		

Before-After-Control-Impact (BACI)

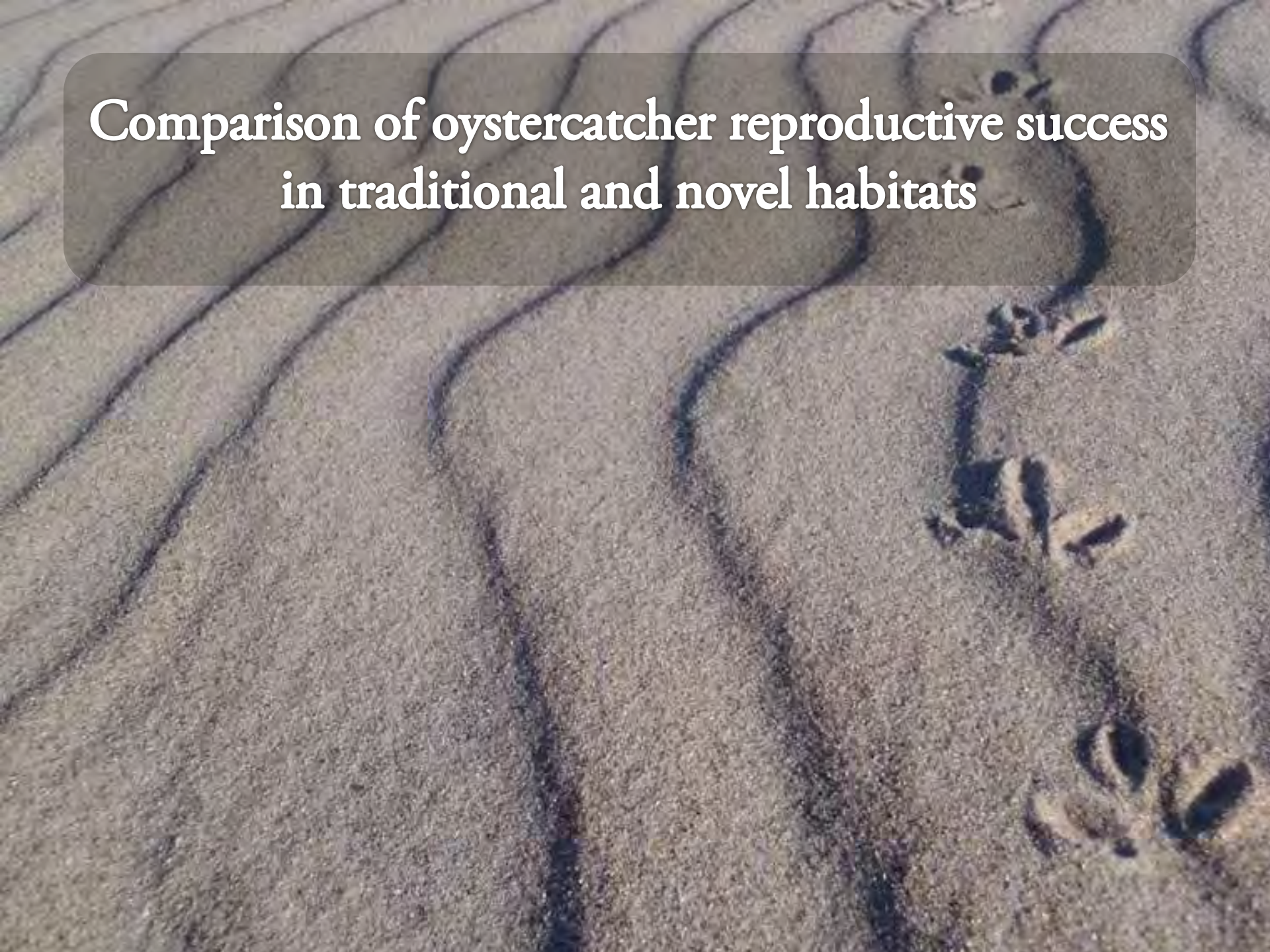
Productivity (chicks fledged per nesting pair)

	df	Sum Sq	Mean Sq	F value	pr(>F)	
BA	1	0.4561	0.4561	11.216	0.0032	**
CI	1	0.0061	0.0061	0.15	0.7022	
BA:CI	1	0.0282	0.0282	0.694	0.4146	
Residuals	20	0.8134	0.0407			

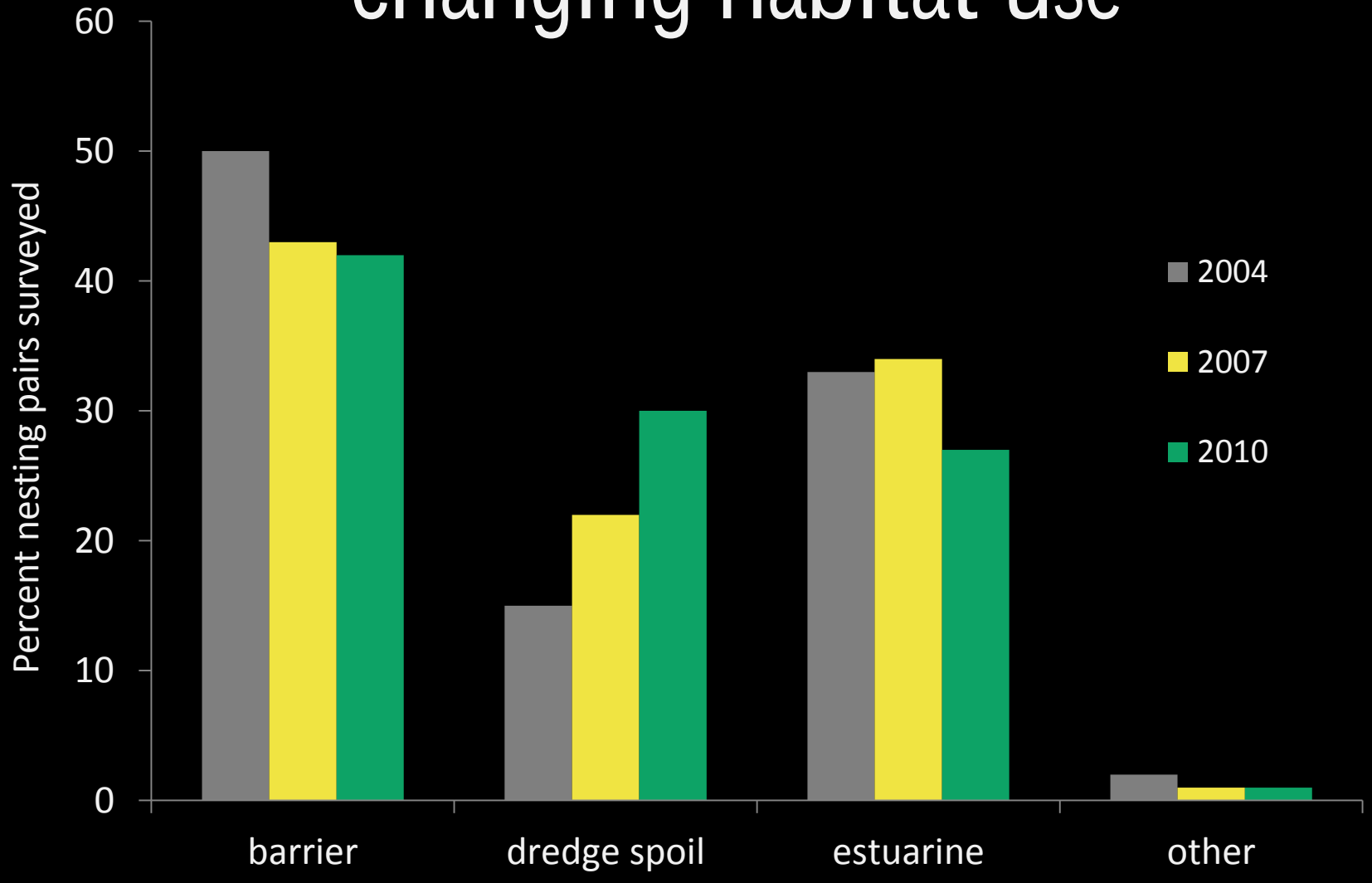
Reasons we might not see a strong AMOY response to raccoon removal:

- Enormous annual variability in reproductive success
- North Core Banks is not a true control
- 50% was not a large enough reduction
- Density-dependent reproduction in raccoon population
- "Problem individuals"
- Competitor release

Comparison of oystercatcher reproductive success in traditional and novel habitats

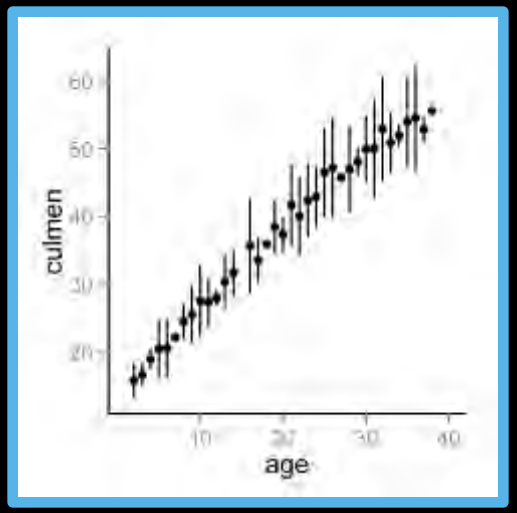


changing habitat use



N.C. Wildlife Resources Commission, unpubl. data


Barrier
Dredge spoil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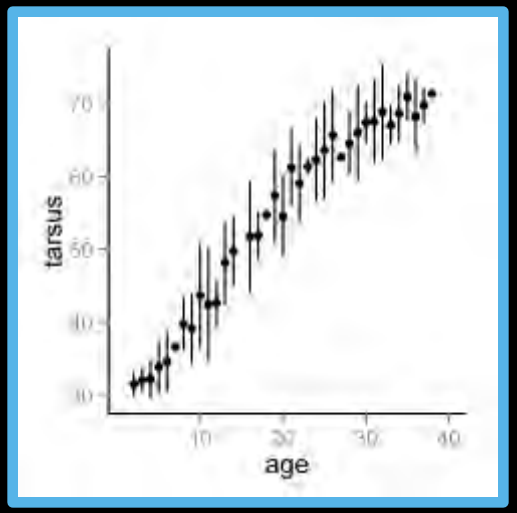
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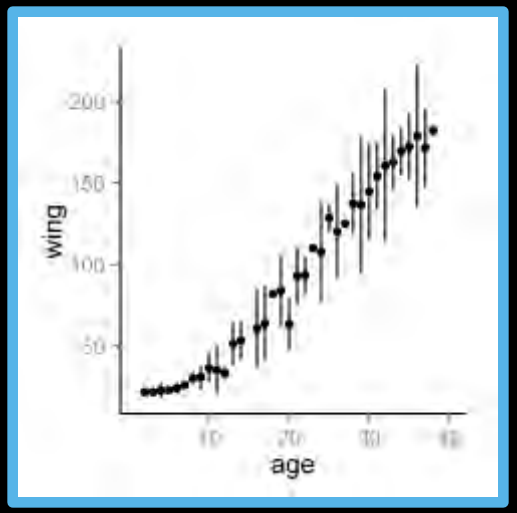
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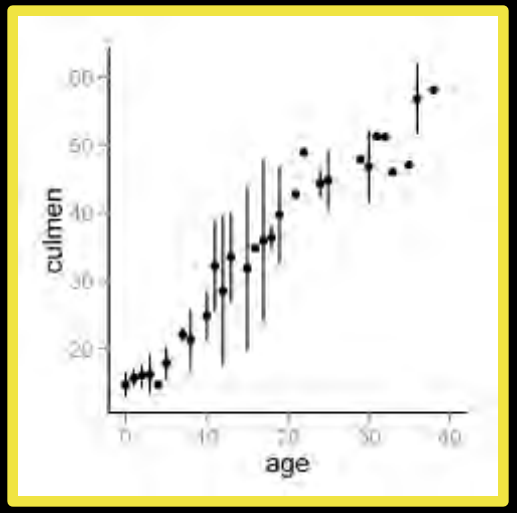
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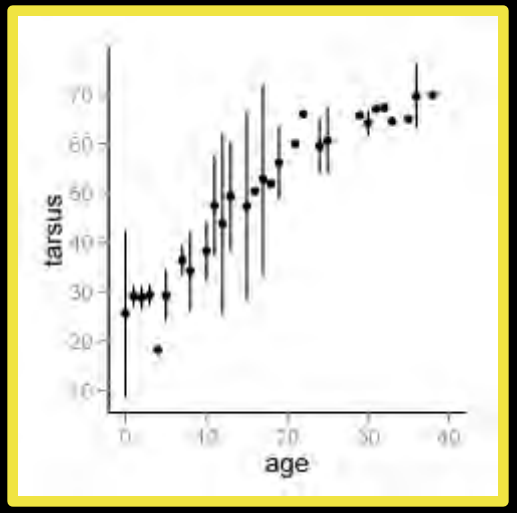
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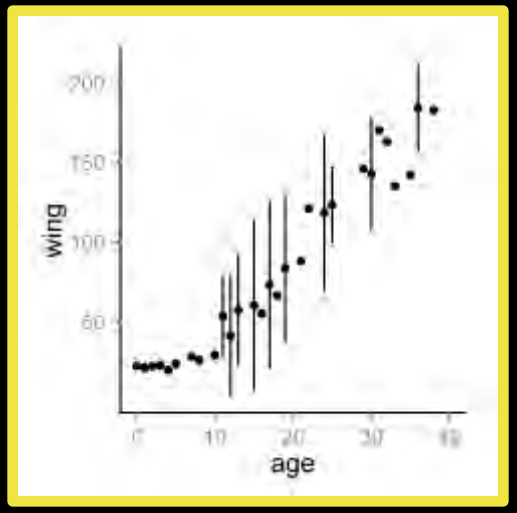
wing
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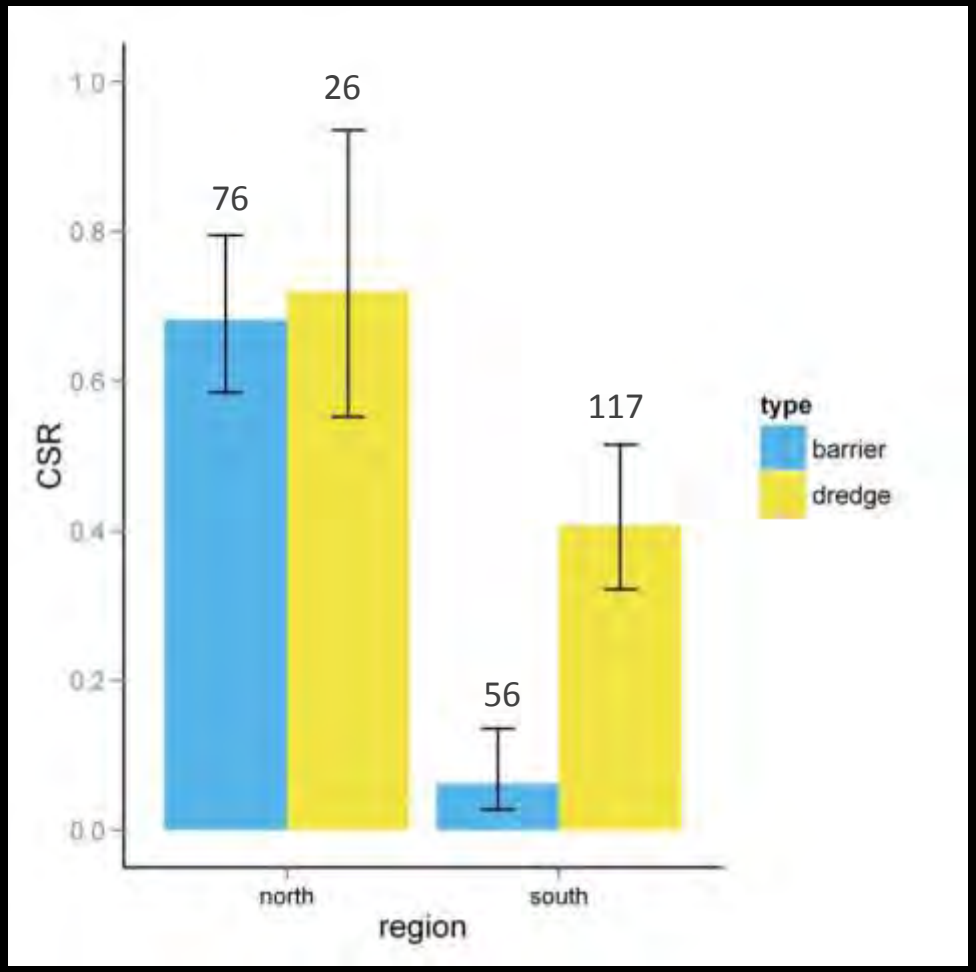
Nest and chick success

2009 - 2011

		nests	chicks	
	n	Nest survival (95% CI)	Fledged / pair (SE)	Fledged / successful nest
barrier	423	0.293 (0.255 - 0.338)	0.519 (0.060)	1.132 (0.076)
dredge	143	0.464 (0.382 – 0.561)	0.505 (0.065)	0.607 (0.059)

barrier island nest

dredge island nest


1.0
0.8
0.6
0.4
0.2
0.0
CSR
76
26
56
117
north
south
region
type
barrier
dredge

Non-traditional habitats: Summary

Trend toward non-traditional sites

Equal chick growth

Higher nest survival in non-traditional sites

Twice as many chicks from successful pairs in barrier sites

Dredge spoil islands may be providing important additional nesting opportunities

Effects of Human Activity on Breeding American Oystercatchers

Tracy Borneman

Background


RESTRICTED
R-5314
PHELPS A MOA
PHELPS C MOA
PHELPS B MOA
STUMPY POINT MOA
PAMLICO B MOA
PAMLICO C MOA
5500 MSL
30'
WARNING
W-110
RESTRICTED
R-5306A
WARNING
W-122
35°
76°
DEFENSE IDENTIFICATION ZONE
WARNING
W-122
5500 MSL
5500 MSL
07
05
18
08
12
04
06
10

Human Activity

Objectives

1) To assess if human activities affect the **behavior** of nesting American Oystercatchers at Cape Lookout National Seashore.
2) To assess if human activities affect the **physiology** of nesting American Oystercatchers at Cape Lookout National Seashore.
3) To assess if human activities affect the **reproductive success** of breeding American Oystercatchers at Cape Lookout National Seashore.

Reproductive Success

	Breeding Pairs	Nests	Nests Hatched	Chicks Hatched	Nest Survival	Chicks Fledged	Chick Survival	Productivity (Chicks Fledged/Pair)
NCB 2010	31	58	15	30	0.259	15	0.500	0.484
NCB 2011	32	54	18	37	0.333	24	0.649	0.750
NC Summary (1995-2011)	1585	2367	780		0.332	632	0.480	0.399

Reproductive Success

Multiple Logistic Regression – Probability of Successful Hatching

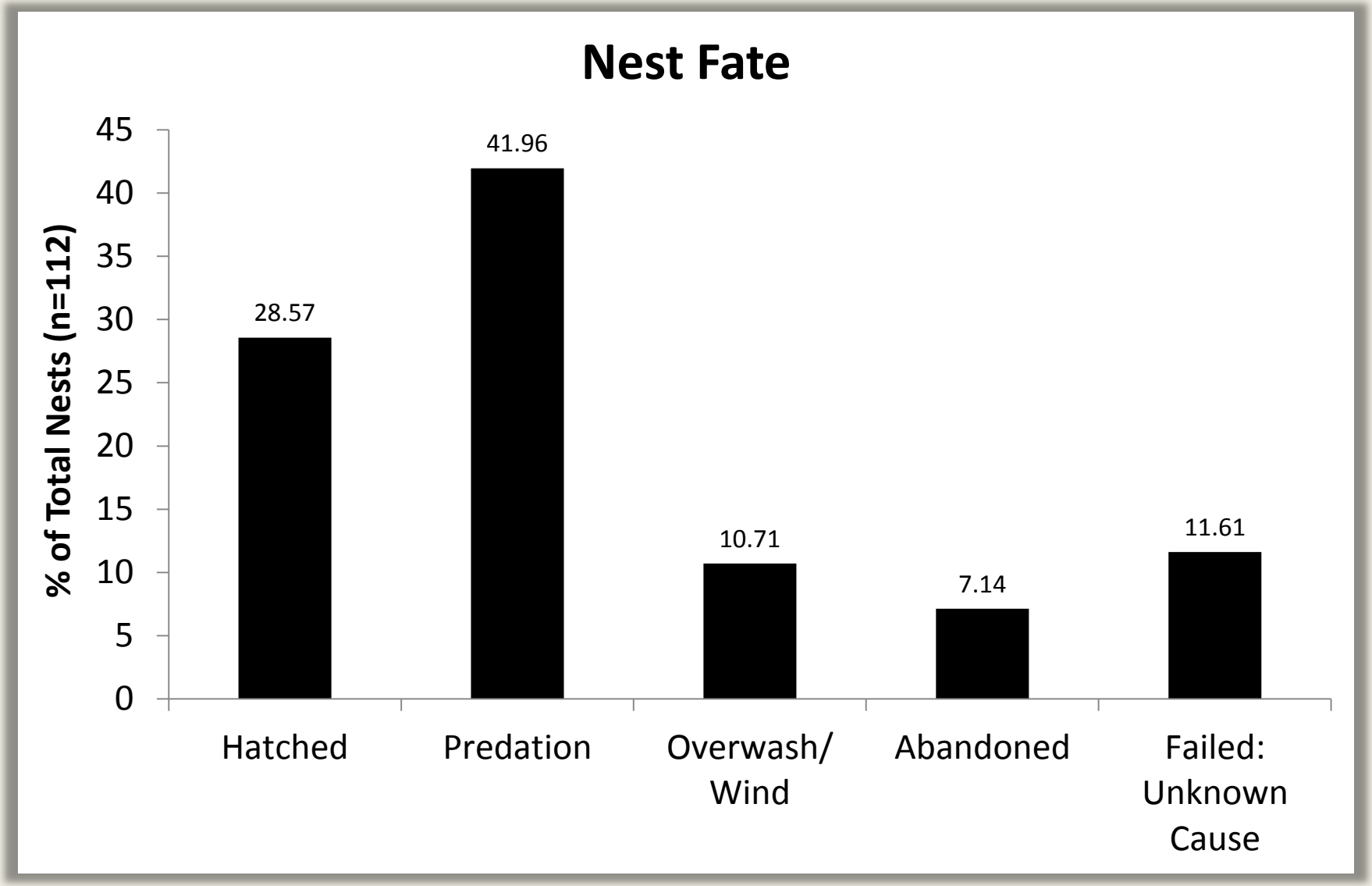
Explanatory Variable	*Estimate (SE)*	*z*	*p-value*
Avg. Daily Aircraft Events	0.076 (0.054)	1.409	0.159
Avg. Daily Vehicle Events	-0.132 (0.062)	-2.116	0.034
Closure Type			
Nest Only	18.144(2164.6)	0.008	0.993
None	-2.468 (1.583)	-1.559	0.119
Partial	-0.173 (1.238)	-0.140	0.889
Ramp-Ramp	0.158 (1.114)	0.142	0.887
Avg. Daily Oystercatcher Departures	0.091 (0.094)	0.971	0.332
Avg. Daily Nest Attendance	0.099 (0.078)	1.277	0.201
Habitat			
Within Dunes	-0.311 (1.304)	-0.239	0.811

Reproductive Success

Logistic Exposure Model – Daily Survival Rate

Explanatory Variable	*Estimate (SE)*	*z*	*p-value*
Avg. Daily Aircraft Events	0.096 (0.046)	2.089	0.037
Avg. Daily Vehicle Events	-0.088 (0.031)	-2.849	0.004
Closure Type			
None	-0.942 (1.352)	-0.697	0.486
Partial	0.333 (1.135)	0.293	0.769
Ramp-Ramp	1.657 (0.966)	1.715	0.086
Avg. Daily Oystercatcher Departures	0.052 (0.093)	0.561	0.575
Avg. Daily Nest Attendance	0.051 (0.069)	0.740	0.459
Habitat			
Within Dunes	-0.738 (1.338)	-0.551	0.581

Reproductive Success

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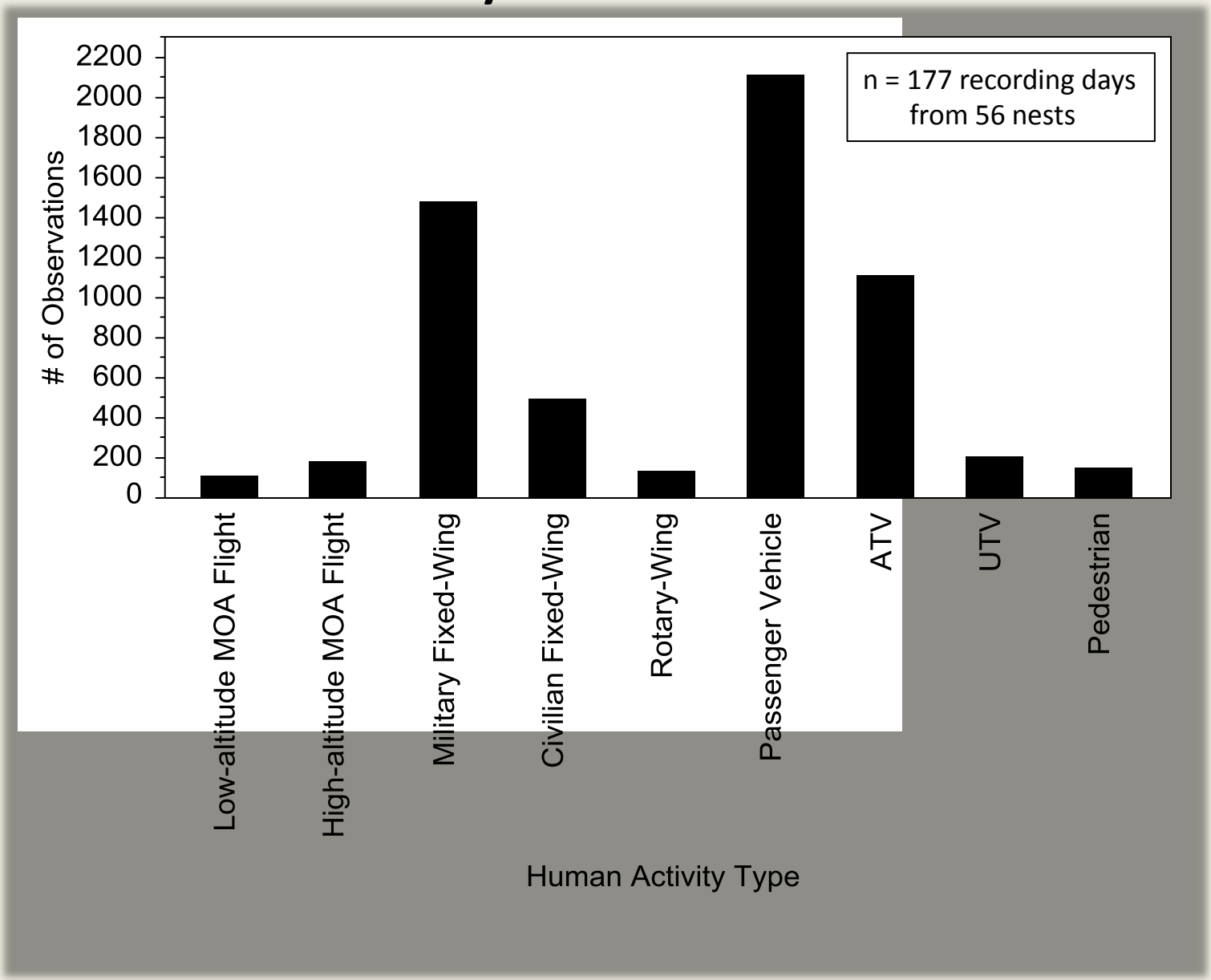
Video and Audio Monitoring

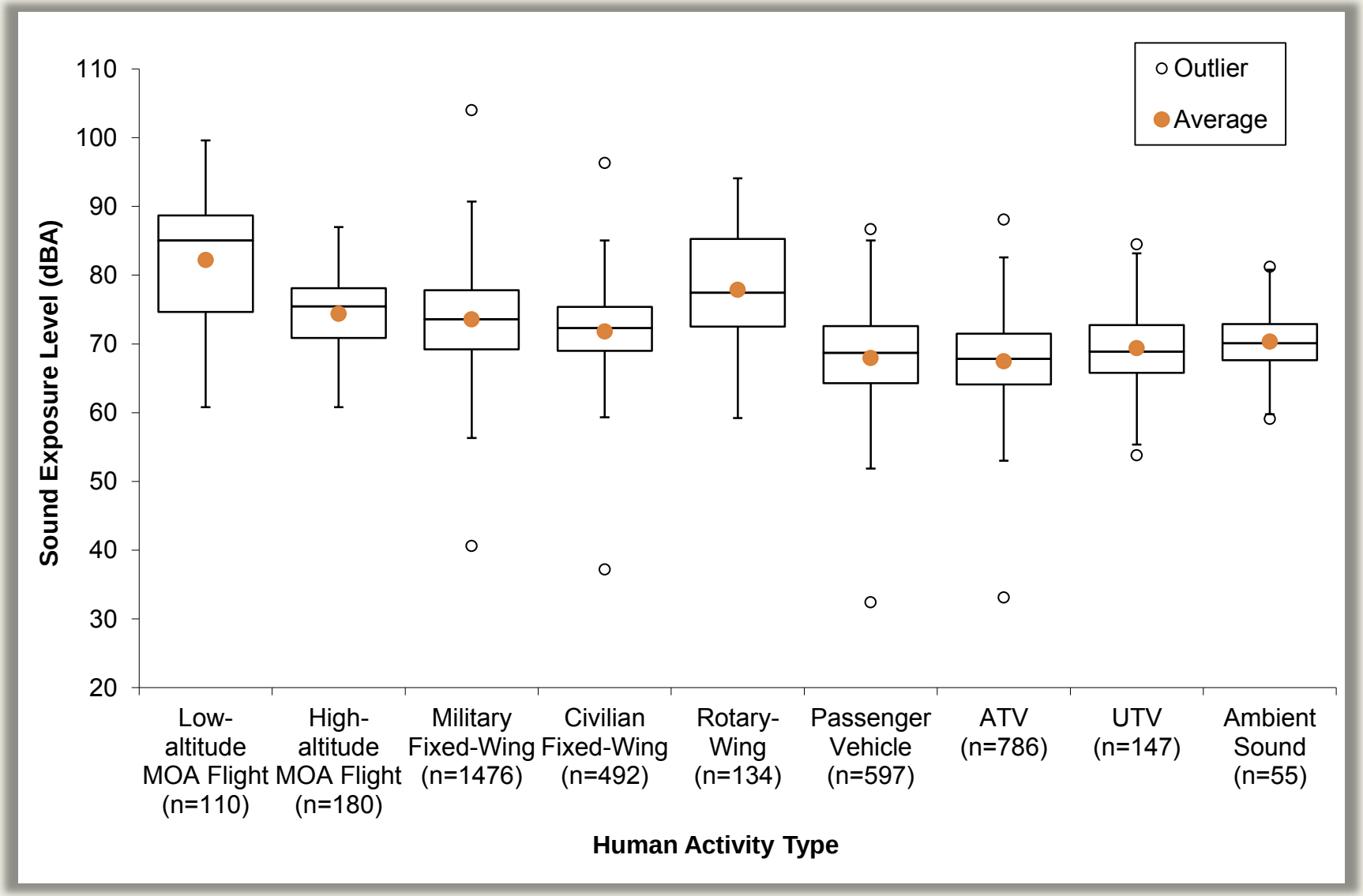
62 nests monitored (55%)
Continual recording 24 hours a day
~ 48,000 hours of recordings

Nesting Environment

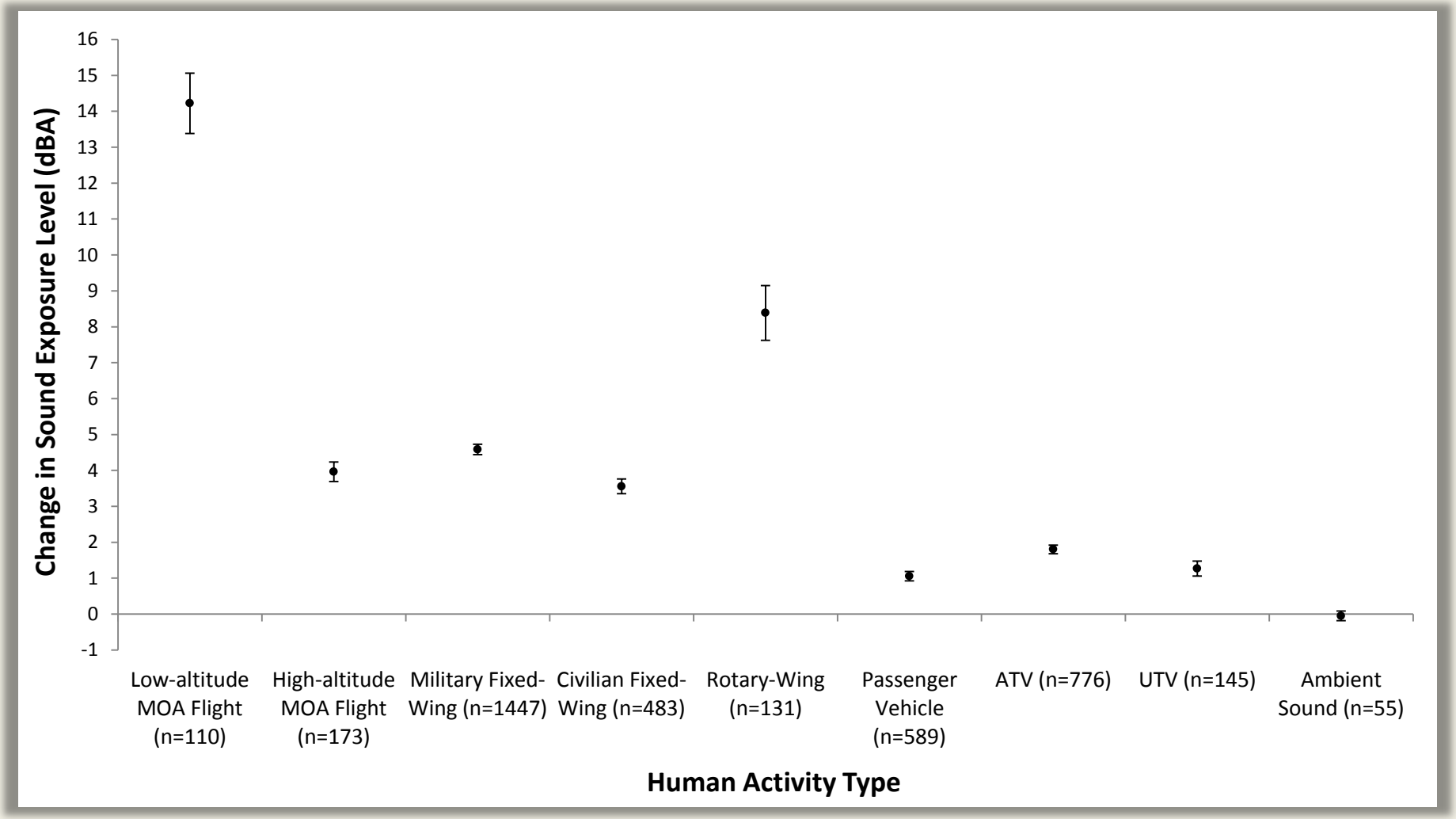
Human Activity Observed Around Nests



Sound Levels

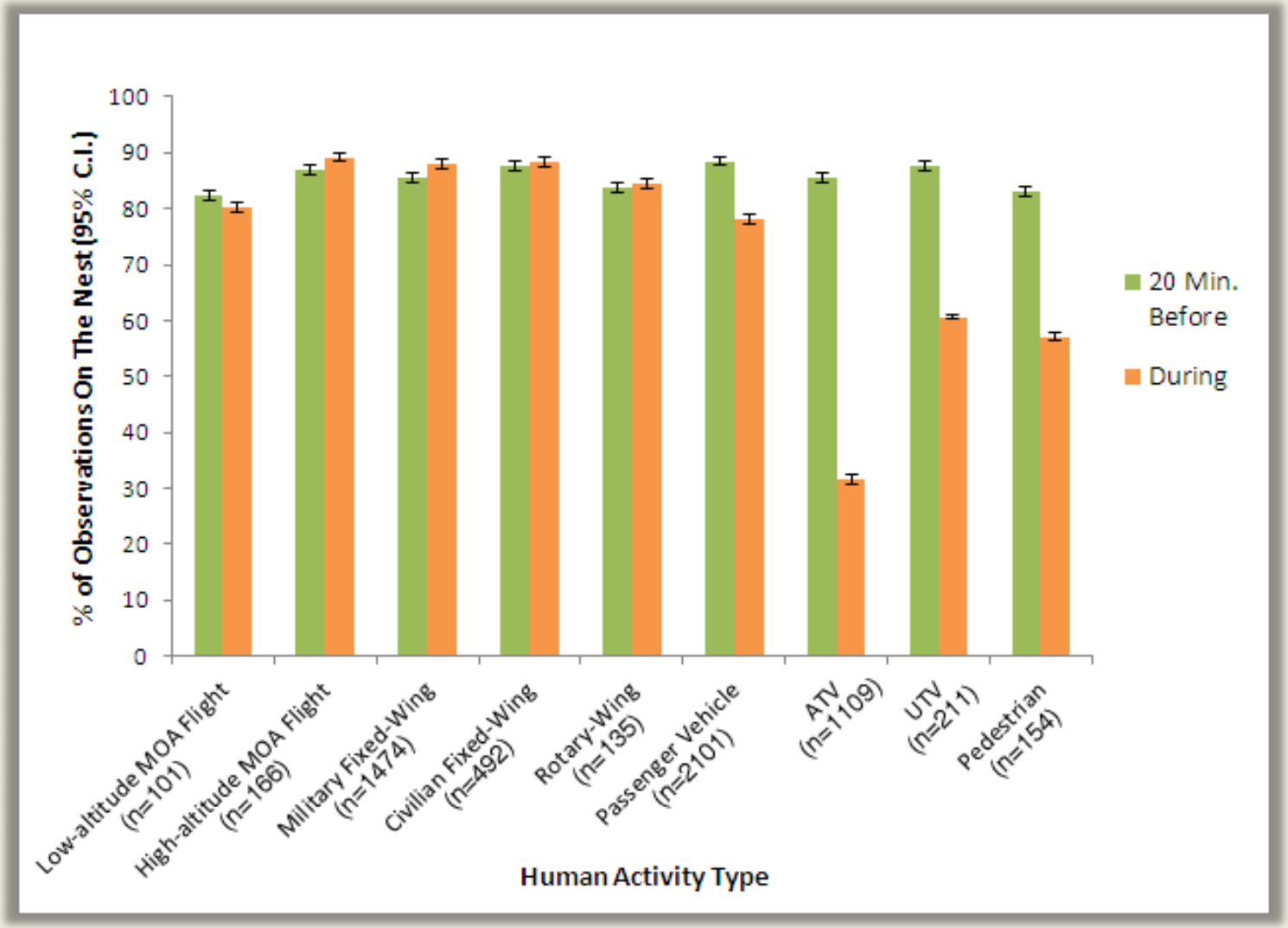


Sound Levels



Behavioral Response

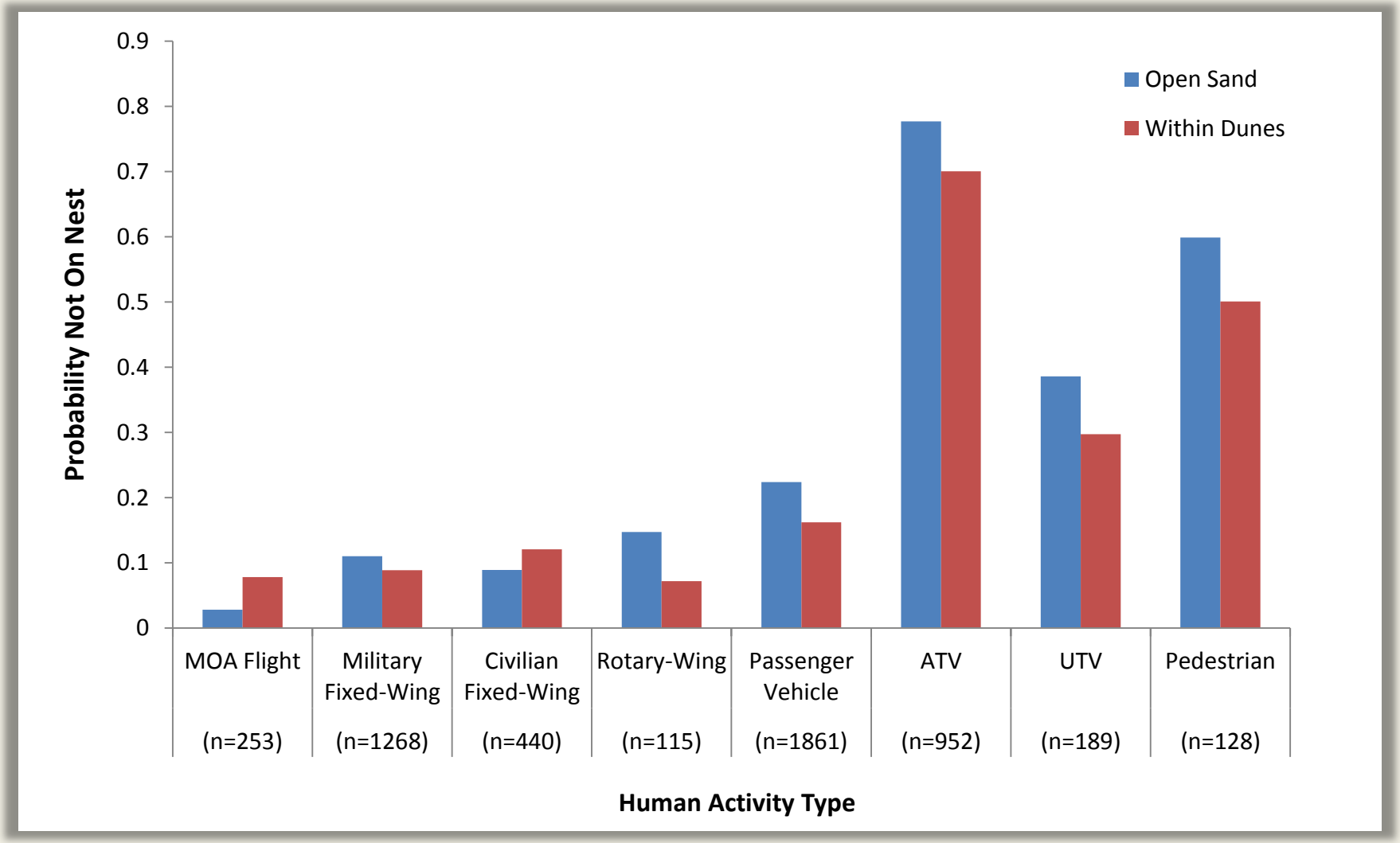
Behavior of American Oystercatchers Before and During Human Activity



Behavioral Response

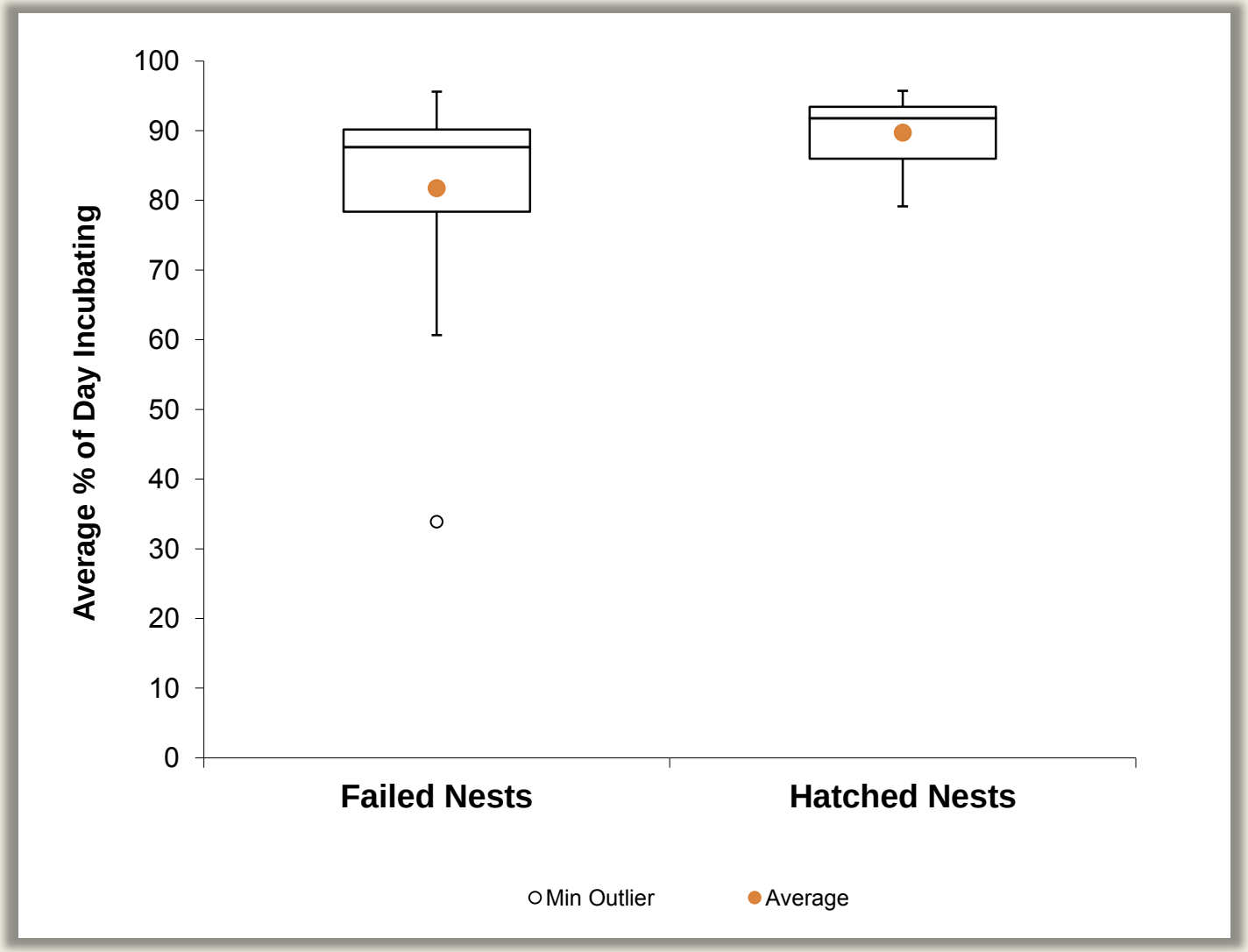
Behavioral Response

Probability American Oystercatchers Are Not On Their Nests During Human Activity



Behavioral Response

Daily Nest Attendance

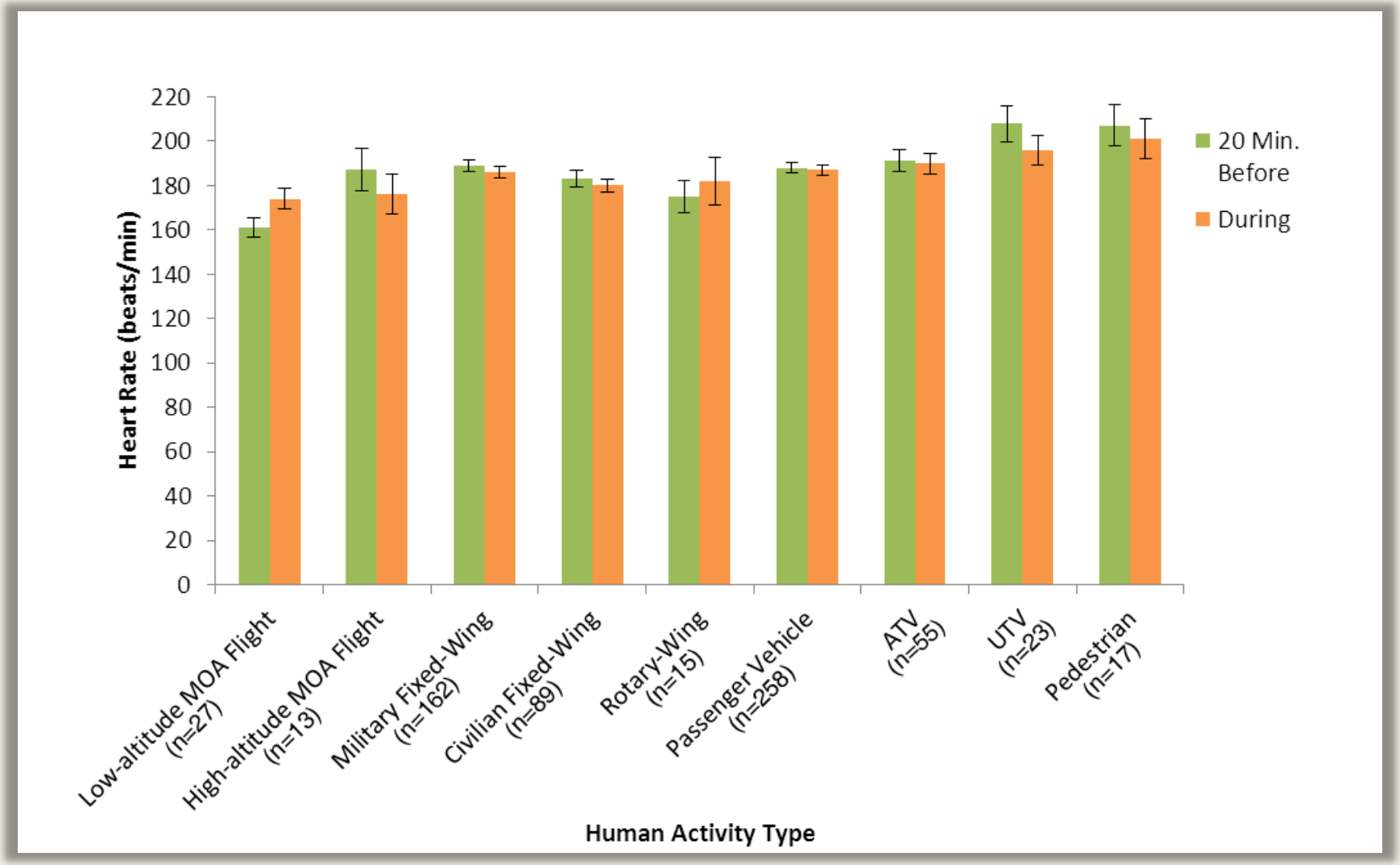


Heart Rate Monitoring

42 nests monitored (38% of nests)
Continual recording 24 hours a day
~ 12,000 hours of recordings

Physiological Response

Heart Rate of American Oystercatchers Before and During Human Activity



Physiological Response

Covariates:

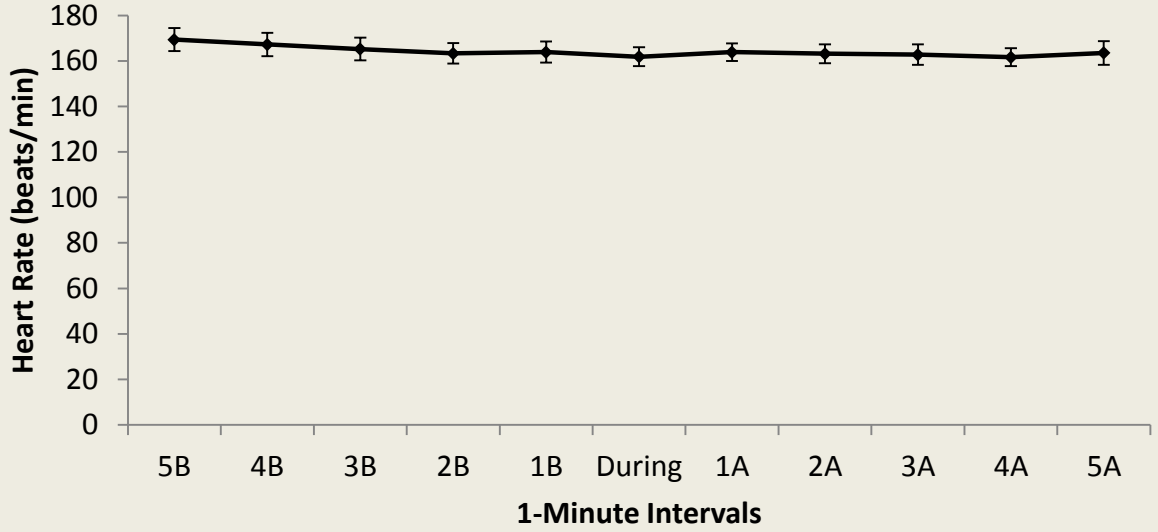
- Nesting habitat – open sand vs. within dunes
- # of human activity events per day
- # of days oystercatchers had been incubating
- Altitude of MOA flights – low vs. high

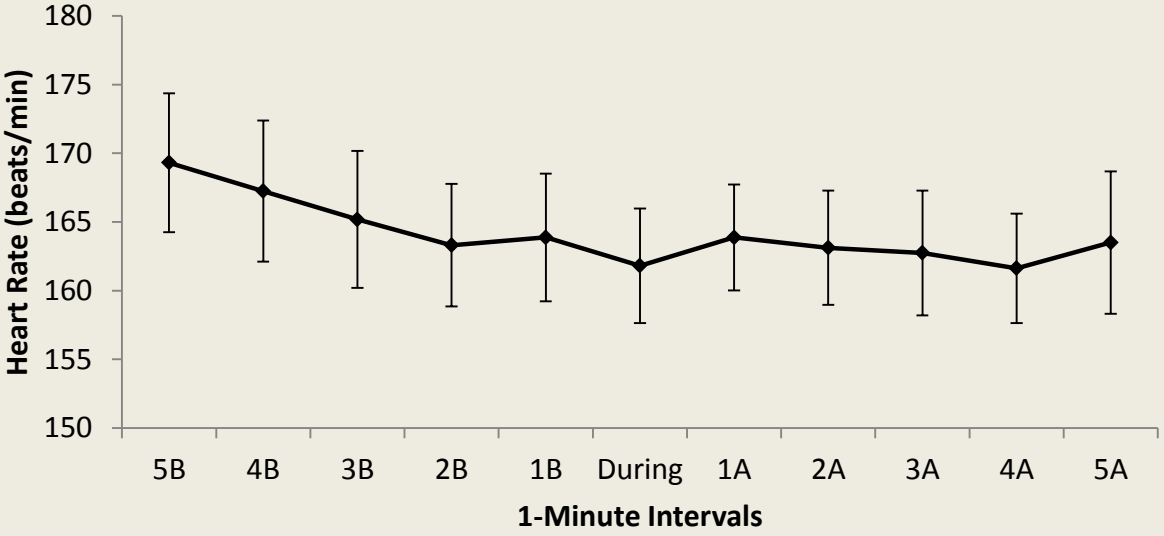
Results:

- Only altitude of MOA flights affected heart rate

Physiological Response

Average AMOY heart rate over a 10-minute interval centered during low-altitude MOA flights





Conclusions - Behavior

- Aircraft, particularly high-speed low-altitude MOA flights, temporarily increased sound levels at Cape Lookout National Seashore significantly more than other human activity
- No effect of aircraft on nesting behavior of American Oystercatchers
- Behavioral responses to off-road vehicles and pedestrians
- Aircraft potentially a smaller perceived threat than off-road vehicles and pedestrians

Conclusions – Physiology

- Heart rate response to high-speed low-altitude MOA flights was ambiguous and inconclusive

- No other human activity affected heart rate

Conclusions – Reproductive Success

- Rotary-wing aircraft may have decreased nest attendance, which was correlated with hatching success
- The average number of off-road vehicles per day was negatively correlated to hatching success and daily survival rate
- Average number of aircraft flyovers per day was positively correlated to daily survival rate
- Reproductive success was high in study breeding seasons
- From additional research banding birds, we saw no indication of nesting territory abandonment
- Demographic effects through the hatching stage of breeding are unlikely under current levels of human activity.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