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A time activity budget for American oystercatchers
(*Haematopus palliatus*) and the effect of laughing gulls
on parental behavior

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Introduction

Biparental care

- Has been shown to increase nest and brood survival
- Permits adults to allocate additional time towards incubation and self maintenance
- Complimentary pairs coordinate roles in defense and nest rearing

Parental behavior

- Reproductive success is influenced allocation of time and energy into parental behavior
- Incubation bouts are influenced by temperature, food availability, disturbances
- Activity around the nest influences nest survival
- Foraging behavior is highly influenced by reef exposure
- Brood success is positively related to chick provisioning and chick guarding

Nol 1989; Hazlitt 2001; Palmer *et al.* 2001; McGowan and Simons 2006; Thiabault *et al.* 2010; Collins 2012; Spiegel *et al.* 2012

Research Objectives

1. Quantified parental behavior for the incubation and chick rearing periods during the 2013 and 2014 breeding seasons.
2. Examined whether laughing gulls (*Leucophaeus atricilla*) negatively affected parental behavior.

Methods

- Conducted time activity budgets (TAB) during the 2013 and 2014 breeding seasons
 - Focal observations of pairs during the nesting and chick rearing periods
 - 20 minute periods and observations every 15 seconds
 - 3 time blocks: 8-10:30, 10:30-13:00, 13:00-15:30
 - Attempted to observe both adults simultaneously
 - Identified likely cause for agonistic behaviors: laughing gulls, American oystercatchers, other bird spp., humans, observer
 - Counted gulls that were present in the nesting and feeding territory during the TABs



Methods

Behavioral Categories

1. Self Maintenance
2. Incubation
3. Forage
4. Vigilant
5. Locomotion
6. Agonistic
7. Rest
8. Chick care

Mann-Whitney and Kruskal-Wallis was used to examine differences in frequency of behaviors and several gull variables:

1. Number of gulls
 - Low (0-75, 0-60) and High (76-300, 61-230)
 - Small (0-49, 0)
Medium (50-99, 1-40)
Large (100-300, 41-230)
 - Absent (0) or present (< 0)
2. Absence or presence of nesting gulls

$P \leq 0.05$ was considered significant

Results

Incubation

Nests(n)= 60

TAB(n)= 249

18,540 behavioral observations



Chick Rearing

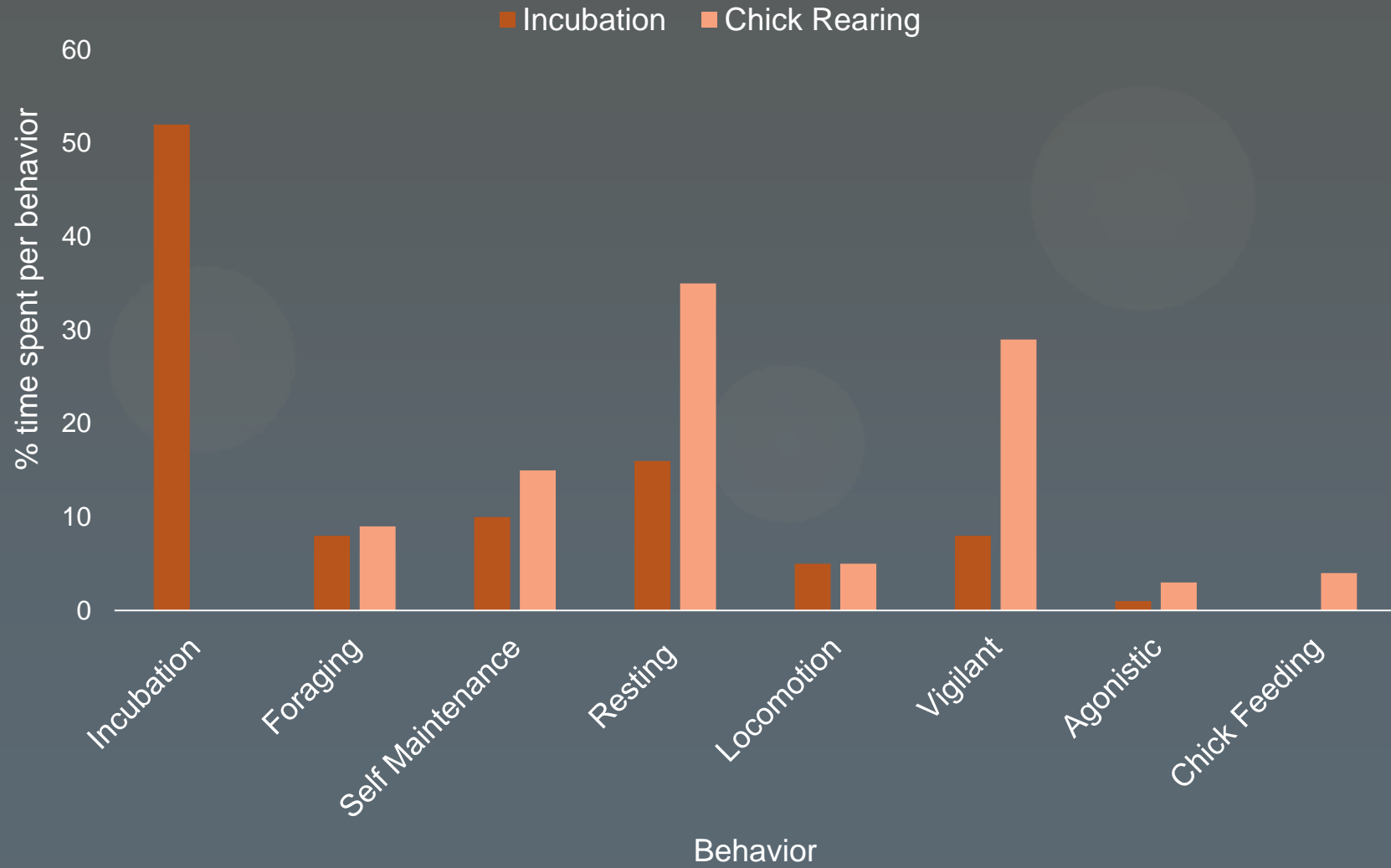
Broods(n)= 38

TAB(n)= 187

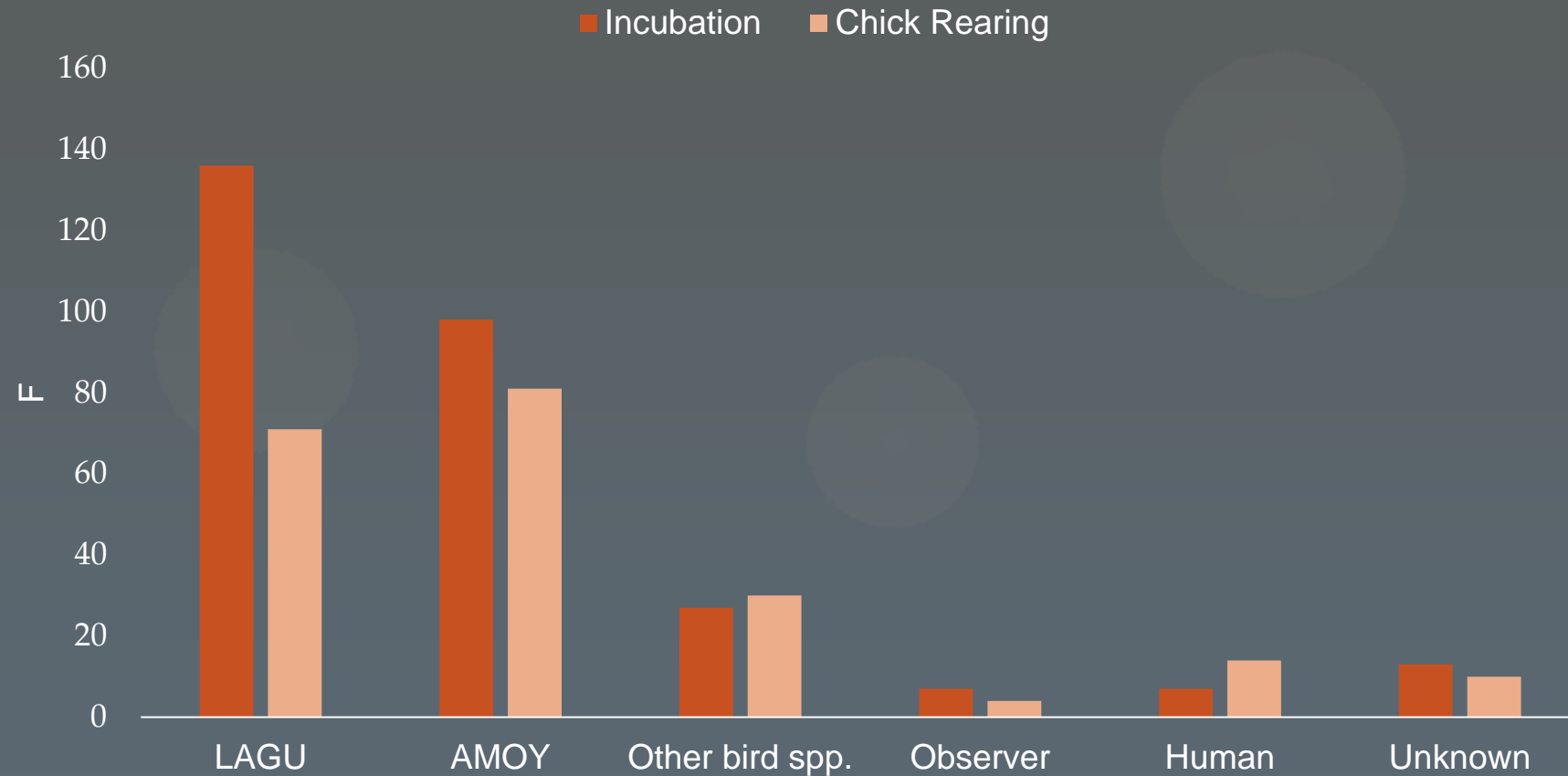
13,976 behavioral observations



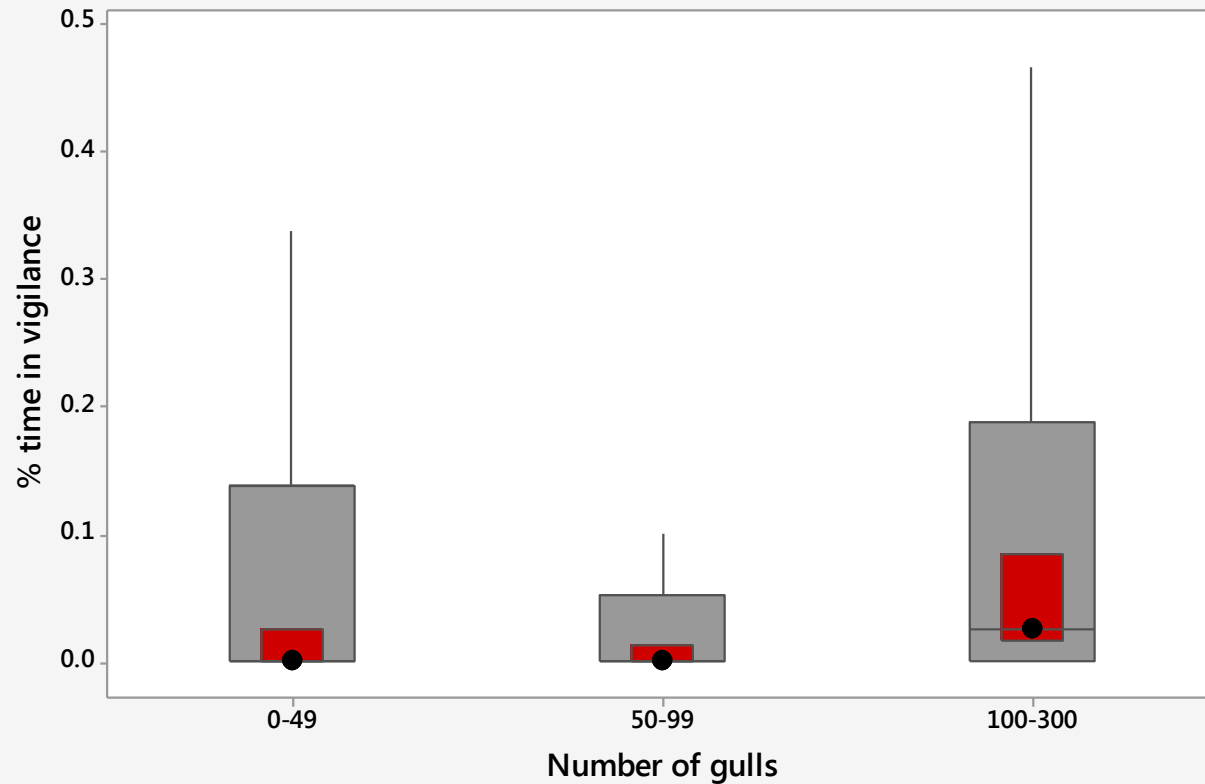
Time Activity Budget



Causes of agonistic behaviors during the incubation and chick rearing periods



Nesting period and number of gulls



- Vigilance increased significantly when there was 100-300 gulls

$$H_2 = 11.11, P = 0.004$$

Nesting period and gulls

- Besides vigilance, gulls did not significantly affect other nest rearing behaviors
- Although not significant, there is evidence of behaviors changing in response to gulls

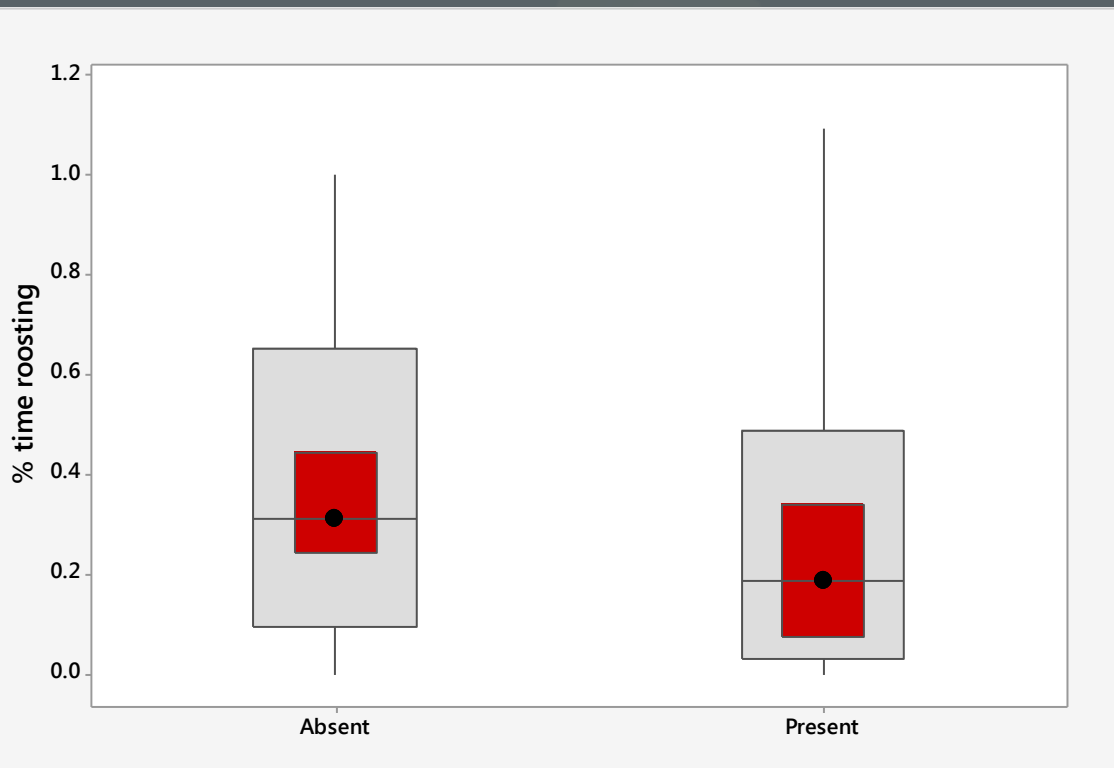
	Gulls A or P		# of gulls		Gulls nesting	
	No	Yes	Low (0-75)	High (76-300)	No	Yes
Incubation	93.7	95	95.6	92.5	96.8	90
Self Maintenance	10.6	11.7	12.5	10	11.7	10
Roosting	11.8	19.4	15	17.5	17.7	17.5

* Values are median % time spent per behavior

Chick rearing and nesting gulls

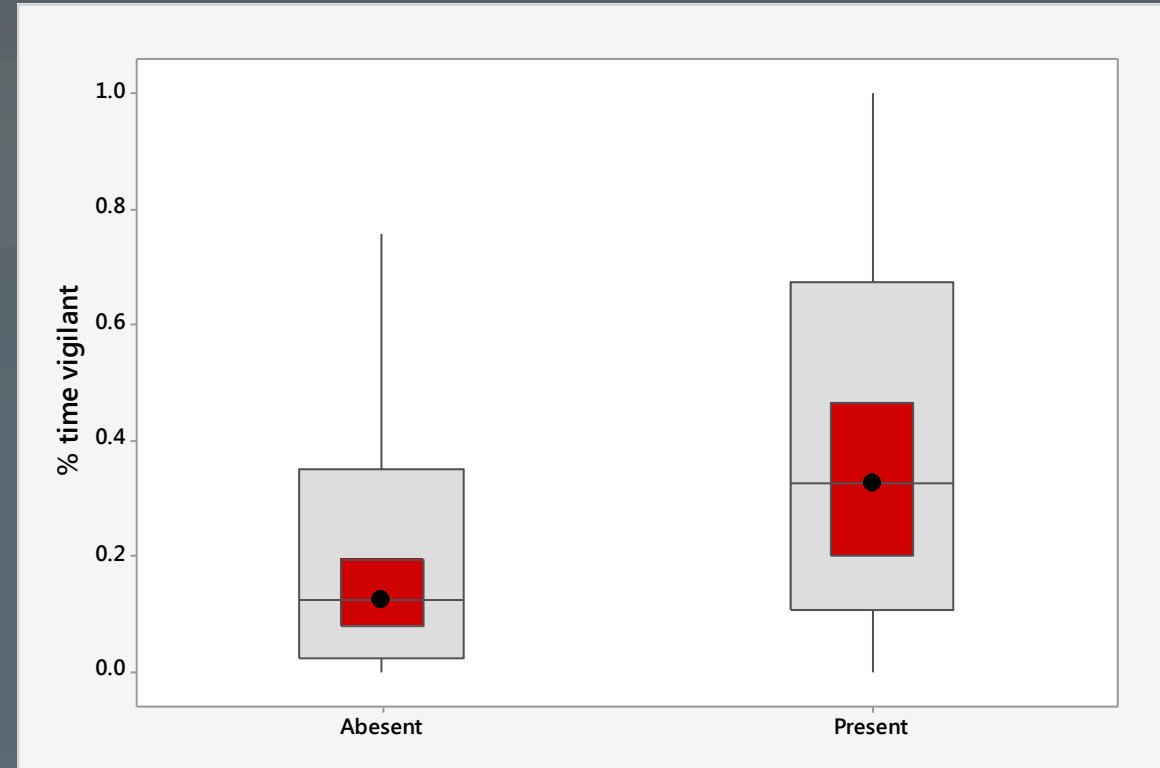
- Roosting increased significantly when nesting gulls were absent

$U = 4875.5, P = 0.013$

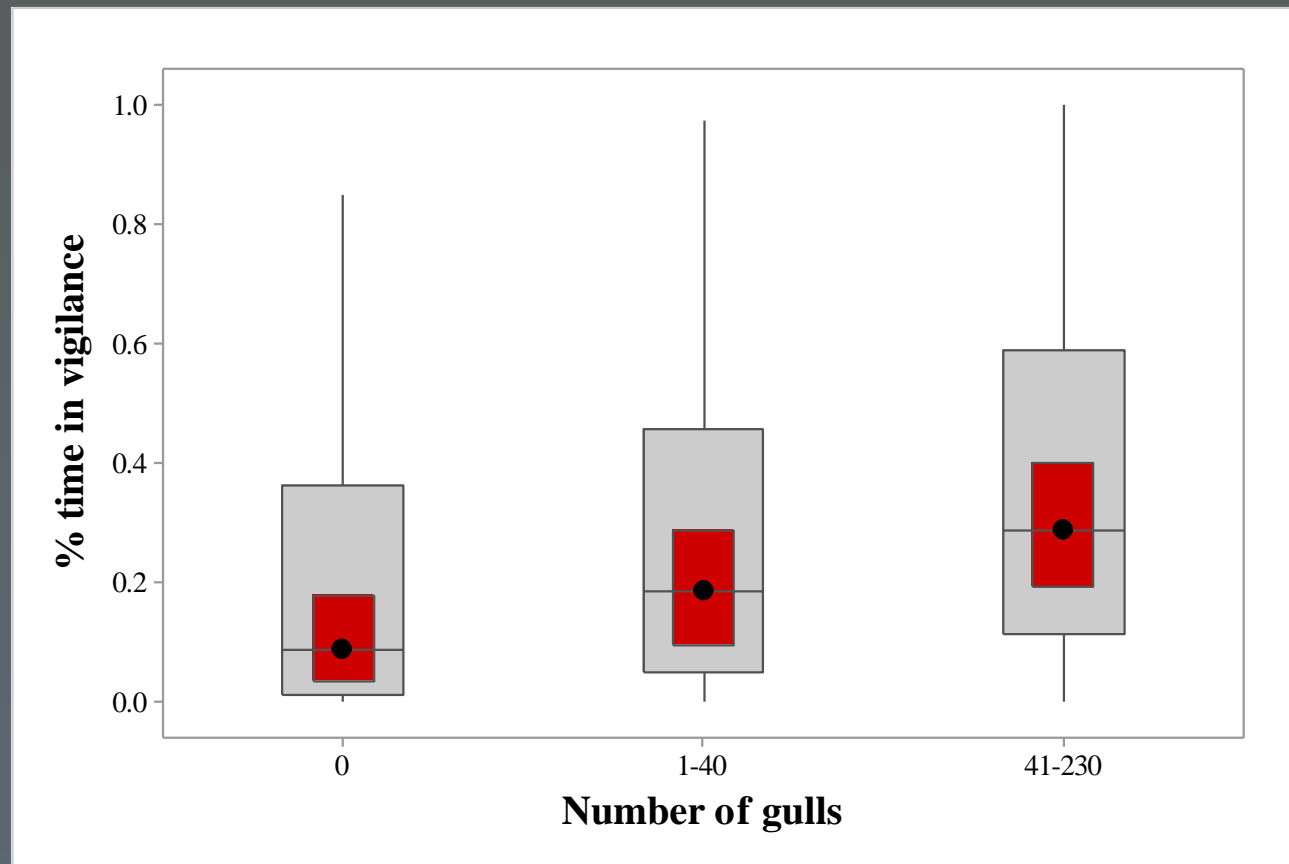


- Vigilance increased significantly when nesting gulls were present

$U = 10601.5, P = 0.000$



Chick rearing and number of gulls



- Vigilance significantly increased as the number of gulls increased

$H_2 = 11.11$, $P = 0.004$

Discussion: Nest rearing



- As expected, pairs spent most of their time incubating
 - Consistent with other studies and characteristic of biparental care
 - Incubation bouts are influenced by foraging opportunities and disturbances
 - Nest departures were due to mate switching, human disturbance and nest defense
- Resting and self maintenance behaviors occurred most often following incubation
 - While incubating, oystercatchers were vigilant 38% of the time and roosted only 7% of the time
 - When adults were relieved from incubating, typically began roosting or preening
- Laughing gulls elicited the 50% of agonistic behaviors
 - My study and other studies have documented gull species as opportunistic predators of shorebird eggs and young

Discussion: Nest rearing and laughing gulls

- I found that most behaviors were not significantly influenced by nesting gulls or the number of gulls
- Why did parental vigilance only significantly increased when there was ≥ 100 gulls?
 - I predict that oystercatchers nesting near large nesting colonies are allocating time differently and a density dependent threshold may exist
- Incubation decreased in the presence of nesting gulls and as gulls increased
 - Gulls were the main disturbance and oystercatchers typically flushed to attack gulls
- Roosting increased when more gulls were present
 - Indicative of a stressful environment
 - Reduce nest site activity

Discussion: Chick rearing

- As expected, adults spent most of their time in vigilant behaviors
 - Consistent with other studies
 - Either one or both adults would exhibit vigilance while standing or laying near a chick, presumable chick guarding
- Surprisingly, foraging and chick care behaviors only accounted for 13% of observations.
- Agonistic behaviors increased from 1% (nest rearing) to 3%
 - Young chicks (< 2 weeks old) are more vulnerable to predation



Discussion: Chick rearing and laughing gulls

- Vigilance was positively related to the number of gulls and when nesting gulls were present
 - Adults decide to allocate behaviors differently in response to gulls
- Roosting increased significantly in the absence of nesting gulls
 - Chick rearing is an energetically demanding time and adults were able to allocate more time towards individual fitness
- It appears gulls influence parental behavior more during the chick rearing period.
 - More costly to lose a chick
 - Pairs typically do not attempt to reneest after chick loss



Research considerations

Behaviors may have been underestimated for several reasons:

1. Foraging ecology—observations were not conducted at dawn or dusk; did not include tide levels and feeding area in analysis; observation times were not dependent on reef exposure
2. Nocturnal behaviors not represented—underestimated incubation, foraging, and roosting behaviors
3. I did not consider the sex or age of oystercatchers

Conclusions

- As predicted, American oystercatchers are allocating time disproportionately among behaviors in response to laughing gulls
- Laughing gulls are the main disturbance and threat to eggs and young chicks
- Additionally, my thesis determined that laughing gulls negatively affected daily nest and brood survival and chick body condition.
 - I suggest laughing gulls are decreasing reproductive success and recommend implementing management strategies that reduce laughing gulls on American oystercatcher nesting sites.

Questions or Comments?

