Linking at-sea foraging behavior and breeding performance of black-legged kittiwakes nesting at colonies in different Bering Sea domains

Rosana Paredes, Ann Harding, Daniel Roby, David Irons, Robert Suryan, Rachael Orben, Heather Renner, Alexander Kitaysky, Kelly Benoit-Bird, and Scott Heppell

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Assumptions

• At-sea distribution of seabirds will reflect predictable prey within commuting distance of breeding colonies

• Reproductive success will reflect the proximity of breeding colonies to predictable prey patches or hot spots
Southeastern Bering Sea Shelf – Pribilofs

Introduction

Hunt et al. 2011; Coyle et al. 2011

- climate
- food web
- forage fish
- top predator
Difference in proximity to Shelf Break

Springer et al. 1996; Byrd et al. 2008
Contrasting top predator population trends

Seabirds

Northern fur seals

Byrd et al. 2008; Lowell Fritz, NMML Alaska Ecosystem Program
LOCATION MATTERS?

Compare at-sea foraging behavior, breeding performance, and diet of black-legged kittiwakes (*Rissa tridactyla*)

1) Spatial comparison – 2009: Pribilofs (shelf) vs. Bogoslof (basin)
   Domain matters?
   Prediction: Basin colony will do better than shelf colonies

2) Temporal comparison – 2008 to 2010: Pribilofs
   Proximity to Shelf Break matters?
   Prediction: St. George will do better than St. Paul
GPS (location) & activity loggers (feeding behavior)

Methods: GPS Tracking

Gipsy-2, Technosmart: 12 g

Mk13 BAS: 1.8 g
Results

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Higher food availability in basin than on shelf

**Stress levels**

- Log10 Baseline CORT (ng/ml)
- St. Paul (shelf) 65
- St. George (shelf) 76
- Bogoslof (basin) 41

*P = 0.004

**Nesting Success**

- Nests w/eggs that fledged chicks
- St. Paul (shelf) n = 358
- St. George (shelf) n = 130
- Bogoslof (basin) n = 102

*P < 0.0001

Spatial comparison results

Breeding performance
**Higher breeding performance in basin than on shelf**

**Feeding frequency**

- St. Paul (shelf): 17 chick feeds per hour
- St. George (shelf): 17 chick feeds per hour
- Bogoslof (basin): 11 chick feeds per hour

*P = 0.002

**Chick survival**

- St. Paul (shelf): 29 nests with chicks that fledged
- St. George (shelf): 14 nests with chicks that fledged
- Bogoslof (basin): 79 nests with chicks that fledged

*P = 0.001

**Spatial comparison results:**

Breeding performance
Contrasting day and night foraging trips at shelf colonies

1. Spatial comparison results: GPS tracking
Conclusions

- Low prey availability near shelf colonies resulted in long-distance foraging trips, low chick feeding rates, low chick survival, and low nest success.

- Long-distance over-night foraging trips compensated for lack of suitable prey on the Shelf during the day.

- Bogoslof kittiwakes (basin) foraged more efficiently than Pribilof kittiwakes (shelf).
Results – Temporal Comparison

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   Domain matters?
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St. George kittiwakes had lower chick survival

Chick Survival

- St. Paul
- St. George

Nests w/chicks that fledged

2008 2009 2010

St. Paul
St. George

*
St. George kittiwakes foraged greater distances from colony

Foraging Distance

Total distance (km)

- St. Paul
- St. George

2008 2009 2010
Kittiwakes adjusted over-night foraging behavior in response to shifts in distribution and availability of age-1 pollock.
Conclusions

- St. George kittiwakes had greater foraging range and lower chick survival than St. Paul kittiwakes, despite proximity to Shelf Break
  - St. George kittiwakes did not consume juvenile pollock

- Low availability of juvenile pollock near St. George resulted in consistent foraging over the basin on lanternfish

- St. Paul kittiwakes switched foraging areas and primary prey in response to changes in availability of juvenile pollock
Take Home messages

- Cold ocean conditions on SE Bering Sea Shelf during 2008-2010 associated with low reproductive success of kittiwakes on Pribilofs
- Pribilof kittiwakes adopted long-distance overnight foraging strategy over Aleutian Basin in response to low food availability on Shelf
- Long-distance foraging associated with low chick provisioning rates, high parental stress, and low chick survival
- Availability of forage fish stocks, especially juvenile pollock, on the Bering Sea shelf near the Pribilofs will play an important role in future kittiwake population trends in the SE Bering Sea
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At-colony and at-sea data collection

- Nesting success, feeding frequency, and chick survival – Observations, monitoring

- Stress levels – blood samples

- Diet composition – regurgitations

- Juvenile pollock availability – acoustic surveys