PARTNERING FOR ALEUTIAN TERN *(ONYCHOPRION ALEUTICUS)* CONSERVATION IN ALASKA: IMPLEMENTING A STATEWIDE COLONY CENSUS PROTOCOL

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Introduction

- Aleutian Tern (*Onychoprion aleuticus;* ALTE) ***population declines > 80% at known colonies*** in Alaska (Renner *et al.* 2015).
- The Pacific Seabird Group's Aleutian Tern Technical Committee developed and implemented projects for ALTE conservation.
- Highest priority = updated population estimate.
- Developed and tested a colony survey framework in Bristol Bay (**Fig. 1**), for statewide implementation in 2023-2025.
- Additional goal = complete understanding of contemporary statewide distribution.

Objectives

Develop methodology to estimate:

- Aleutian Tern colony occupancy
- Aleutian Tern abundance
- Colony detection probabilities from aerial platform

Test scalable methods in a discrete region, with a view toward statewide ALTE census.

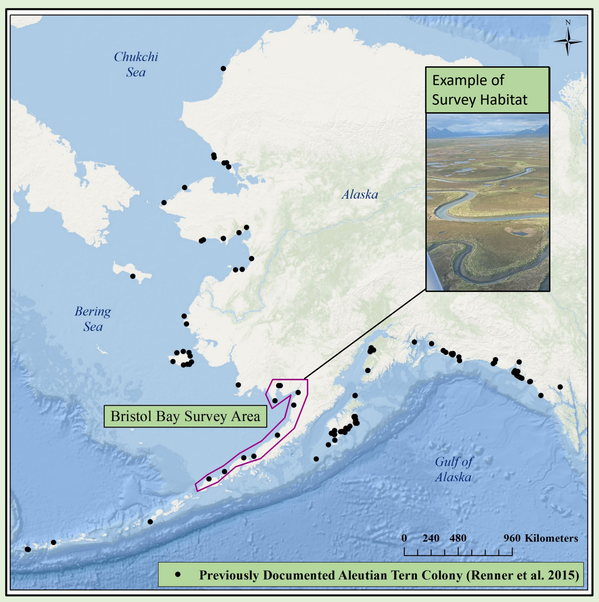


Fig. 1. Historical ALTE colonies (Renner et al. 2015). Bristol Bay study area outlined in purple.

Methods

Two-phase survey methodology (2021 & 2022)

- Phase 1 = Aerial surveys: colony presence, size, species composition (ALTE only; ALTE & Arctic Tern; ARTE)
- Aerial photos used for post-survey species identification
- Colony Size bins = <20, 20-50, 50-100, 100-200, > 200 terns
- Phase 2 = Ground surveys at a sample of colonies: abundance

Sampling frame with two survey strata (2021 & 2022)

- Stratum 1 = Potential ALTE habitat ≤ 1 km of coastline
- Stratum 2 = 1-6 km from coastline
- Approx. same coastline was surveyed in both years (**Fig. 2, Fig. 3**)

Double-observer line transects, distance sampling (2022)

- Flew non-overlapping zig-zags at 500 feet above ground level
- Four independent observers, two on left & two on right
- Estimated independent detection probabilities 0 to 2000m from aircraft: double observer integrated with distance sampling (Buckland *et al.* 2010)

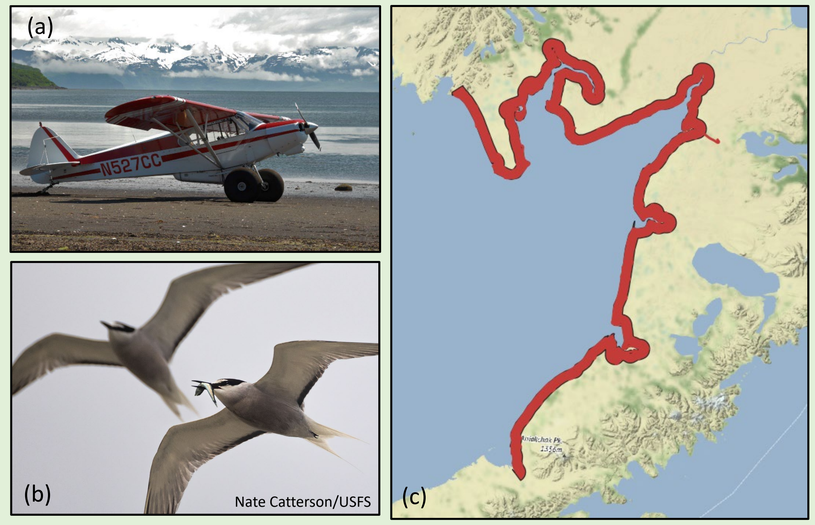


Fig. 2.
a) Survey aircraft included a Cessna 185 in 2022.
b) Ground counts consisted of direct counts of ALTE after a flushing event.
c) Sampling frame, consisting of coastal plains 0 to 6 km inland (red polygon).

Results

2021 (testing two-phase surveys + two-strata methods):

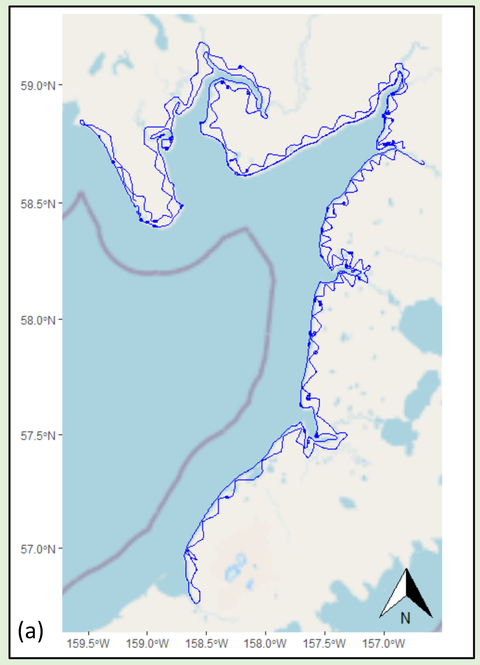
- 49 tern colonies detected, confirmed 10 colonies included ALTE
- Total of 1,485 ALTE estimated in 2,678 km of coastline surveyed
- Density estimated at 55 ALTE per 100 km coastline

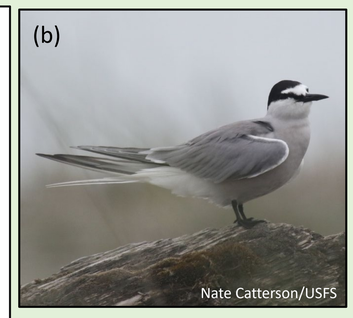
2022 (adding double observer + distance sampling):

- Total of 43 colonies (includes ARTE) estimated in 3,978 km² area
  - 26 colonies estimated as ≤ 20 individuals
  - 9 colonies estimated as 20-100 individuals
- Density estimated at 0.01 colonies/km²
- Detectability rates 0.112-0.512; depended on observer position
- Effective individual strip widths 334 m (pilot) to 1024 (back right)

Next Steps

- Implementation in Southeast Alaska (Glacier Bay to Prince William Sound) in 2023
- Habitat model to refine sampling frame
- Finalizing survey protocol
- Onboarding a Coordinator to oversee field implementation





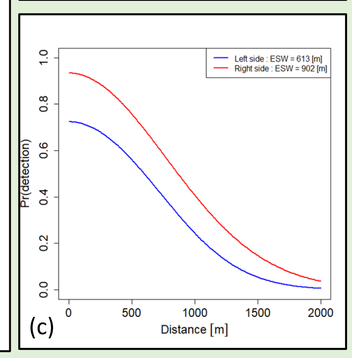


Fig. 3.
a) Double-observer aerial line transect survey design (2022).
b) An Aleutian Tern in Yakutat.
c) Composite distance functions for L&R sides of the aircraft; the curves are $f_r(x) + f_l(x) - f_{rl}(x)$, where $f_i(x)$ are individual distance functions. ESW = effective strip width

Challenges/Lessons Learned

- Low density of ALTE + large spatial extent = difficult to estimate occupancy or colony density
- Abundance estimates need adjustment based on probability of detection; have not yet derived a realistic estimate
- Terns difficult to identify to species from the air, ground colonies difficult to access

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