

# ALEUTIAN TERN *ONYCHOPRION ALEUTICUS* COLONY ABANDONMENT IN RESPONSE TO BALD EAGLE *HALIAEETUS LEUCOCEPHALUS* NEST PREDATION

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## SUMMARY

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On 09 June 2016 we witnessed an attack by an adult Bald Eagle *Haliaeetus leucocephalus* on one of the largest Aleutian Tern *Onychoprion aleuticus* colonies in the Kodiak Archipelago, Alaska; it resulted in complete colony abandonment. The Bald Eagle was accompanied by Black-billed Magpies *Pica hudsonia*, which scavenged nests destroyed by the eagle and appeared to depredate several nests. Based on nesting chronology determined from earlier surveys and on searches for nest contents remaining after the attack, we concluded that eggs were the primary target. We believe this is the first report of Bald Eagle predation on tern eggs leading to complete colony abandonment. Colony abandonment by Aleutian Terns mid-season has been reported previously, but causes of abandonment have not been identified.

**Key words:** Aleutian Tern, Bald Eagle, colony abandonment, *Haliaeetus leucocephalus*, Alaska, *Onychoprion aleuticus*

## INTRODUCTION

Recent trend analysis of Aleutian Terns *Onychoprion aleuticus* at colonies in Alaska suggests that the population of this poorly known seabird has declined by almost 93% over the past three decades (Renner *et al.* 2015). Research and monitoring are challenging because the species is widely distributed in remote regions of coastal Alaska, exhibits frequent shifts in colony locations from year to year, and breeds in a variety of habitats (North 2013). In addition to weak colony site fidelity, mid-season abandonment for unknown reasons has been documented at tern colonies in the Yakutat Bay in southeastern Alaska (Pyare *et al.* 2013). Because causes of past abandonment are largely unknown and the decline in the Alaskan population is dramatic, observations identifying specific abandonment triggers are an important precursor to determining meaningful management actions.

Predation is a leading cause of disturbance for many species of nesting terns (Burger & Gochfeld 1994, Sudmann *et al.* 1994, Gochfeld & Burger 1996, Becker & Ludwigs 2004, Cabot & Nisbet 2013, Nisbet *et al.* 2013). Direct effects of predators on terns include adult mortality and nest destruction; indirect effects include colony disturbance. Studies of Aleutian Tern colonies at Kodiak Island in the 1970s indicated that predation by river otters *Lontra canadensis*, short-tailed weasels *Mustela erminea*, gulls, and corvids was a leading cause of nest failure (Baird 1983). In 1994 two Aleutian Terns, an adult and a nestling, were found dead on an island in the Sitkalidak Strait (Kodiak Island), apparently killed by a river otter (Duffy 1995). In general, however, information is sparse on predation on Aleutian Tern adults and nests.

## STUDY AREA AND METHODS

Seabird colony records between the 1970s and 2017 indicate at least 23 sites in the Kodiak Archipelago that have a history of Aleutian Tern nesting (Stephensen *et al.* 2002, Tengeres & Corcoran 2018). At all sites, Aleutian Terns nest in association with Arctic Terns *Sterna paradisaea*. Since 2010, only two to three predominantly Aleutian Tern colonies numbering over 100 individuals were active in the archipelago (Tengeres & Corcoran 2018). These large colonies were on northeastern Kodiak Island and were accessible to the City of Kodiak road system. Tern colonies on the road system were located at the heads of bays adjacent to major salmon-spawning rivers and not on offshore islands, which was more typical of the smaller colonies in the archipelago. Since 2012, one of the largest of these accessible colonies was on land owned by the State of Alaska along the Pasagshak River, at the head of Pasagshak Bay (57°28'22"N, 152°28'10"W). This site was part of a larger parcel of land that had a long-term lease for cattle grazing; however, while the colony was active in 2016, cattle were in the pasture to the north and did not have access to the tern nesting area. The grazed habitat was generally sparsely vegetated and was dominated by *Sphagnum* moss, bluejoint grass *Calamagrostis canadensis*, cottongrass *Eriophorum* spp., and several species of forbs including Nootka lupine *Lupinus nootkatensis*, wild iris *Iris setosa*, and northern yarrow *Achillea borealis*.

Due to declining populations along the Gulf of Alaska coast, Aleutian and Arctic Tern colonies in the Kodiak Archipelago became a priority for monitoring by the US Fish and Wildlife Service in 2001 (Stephensen *et al.* 2002, 2003). Monitoring

consisted of counting adult terns in June at known colonies and searching for new nesting locations. In recent years (2015–2017), monitoring expanded to include multiple within-season counts of adult and hatch-year terns at colonies, as well as recording nesting activity using digital game cameras at a small number of Aleutian Tern nests (Tengeres & Corcoran 2018).

During colony visits in 2016, flying terns were counted at regular 30-minute intervals with the high count for the day recorded, following the protocols of Bibby *et al.* (2000) for surveying tern colonies of less than 200 pairs. Visits typically lasted 30–90 minutes and were conducted between 10h00 and 16h00. Most surveys were conducted along the periphery of the colony, as the terns typically flushed in response to avian predators (gulls, corvids, eagles) flying nearby or during dreading events. We flushed birds on colony surveys only when we searched for nests. Due to patchy vegetation and dispersed nesting, tern nests were located opportunistically by watching adults return to incubate and recording a GPS position.

## RESULTS AND DISCUSSION

We surveyed the tern colony adjacent to the Pasagshak River three times prior to the Bald Eagle *Haliaeetus leucocephalus* attack. The first visit on 18 May 2016 documented two Aleutian Terns and no Arctic Terns. The second visit on 02 June 2016 documented a high count of 146 Aleutian Terns flying over the nesting habitat; the high count for Arctic Terns was 4. During the second survey, two observers documented five Aleutian Tern nests situated on top of small mossy mounds, close to the road access point at the south end of the colony. Two of the five nests contained two eggs each, while the remaining three nests each contained one egg. We did not enter the area on the northeast side of the field, which appeared to have the highest activity level, with many Aleutian Terns landing in the vegetation to settle on nests. Arctic Tern activity was concentrated at a wetland on the northwest side of the field, and we did not enter this area either. Counts were also conducted during a third brief visit on 07 June 2016 to the south end of Lake Rose Tead, across the Pasagshak River from the colony. This count did not include a full survey, but it did document an estimated 175 Aleutian Terns and 20 Arctic Terns in the air at one time.

On 09 June 2016 at approximately 18h00, one of us (S.S.) photographed an adult Bald Eagle flying into the colony, landing at nests, and eating eggs. It is possible that recently hatched chicks may also have been eaten. The eagle flew from nest to nest and was followed by several Black-billed Magpies *Pica hudsonia* that scavenged eggs in the eagle's wake. The magpies also appeared to depredate nests abandoned by the mobbing terns. Approximately 25 Aleutian Tern adults pursued and dive-bombed the eagle as it depredated multiple nests. Four days later, on 13 June 2016, we observed the colony from an access road on its southern edge and did not see any terns over the nesting habitat. We scanned the colony via spotting scope on 14 June 2016 and observed a single Aleutian Tern repeatedly diving on a small alder bush that held a Northwestern Crow *Corvus caurinus*. We visited the colony on 15 June 2016 and observed two Aleutian Terns flying along the Pasagshak River, but they remained only briefly before returning south towards the bay. During that visit, we searched the northeast side of the colony, where the densest concentration of Aleutian Terns had been seen in previous surveys. Here, we located 6 depredated/scavenged eggs in 5 separate nests and collected 15 intact eggs from 13 additional nests. The colony was

clearly visible to residents of the small community of Pasagshak, which contains several homes situated along the southern edge of the colony, less than 400 meters from the nests. Based on daily observations by Pasagshak residents and two colony visits by researchers (22 June and 03 July 2016), there was no evidence of terns re-nesting at this site after the eagle attack.

Examples of terns completely abandoning colonies in response to predators are rarely reported, but anecdotal observations indicate that such events may be more common than we realize. The number of small tern colonies (primarily Common Terns *Sterna hirundo* and Arctic Terns) on Sable Island, Nova Scotia, has been declining since 1998; gull predation of eggs and young was implicated in low rates of breeding success and complete abandonment at some of the smaller colonies (Taylor *et al.* 2001, Ronconi *et al.* 2016). In another example, predation by American mink *Neovison vison* caused complete abandonment of a Caspian Tern *Hydroprogne caspia* colony on an island in the Columbia River in southeastern Washington (Antolos *et al.* 2004).

Sea eagles *Haliaeetus* spp. have been widely implicated in local declines in surface-nesting seabirds (Hipfner *et al.* 2012). Sea eagles impact seabirds both directly (through predation and disturbance) and indirectly (by facilitating other predators of seabird nests, mainly gulls and corvids). Due to decreases in both contamination and persecution, Bald Eagle populations increased dramatically during the late twentieth century, and there is evidence that this recovery has contributed to seabird declines in some regions (Parrish *et al.* 2001, Kildaw *et al.* 2005, Hayward *et al.* 2010). On Kodiak Island the number of active Bald Eagle nests increased by a factor of 3.4 from 1963 to 2002 (Zwiefelhofer 2007), concurrent with Aleutian and Arctic Tern declines in the region (Stephensen *et al.* 2002, 2003). Bald Eagles are generalist nearshore marine predators that readily shift diets in response to changing environmental conditions (Buehler 2000, Anthony *et al.* 2008). Bald Eagle populations could continue to increase as a result of warmer winters increasing survival, particularly at northern latitudes. Even if eagle populations have stabilized, changes in fisheries (particularly reduced salmon returns to spawning streams) could lead to higher rates of predation by eagles on secondary prey like seabirds and waterfowl (Elliott *et al.* 2011). Additional monitoring at tern colonies might identify Bald Eagle predation as a contributor to tern population declines in this region.

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