

IDENTIFYING NESTING HABITAT OF KITTLITZ'S MURRELETS *BRACHYRAMPHUS BREVIROSTRIS*: OLD NESTS LEAD TO A NEW BREEDING RECORD

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Kittlitz's Murrelet (*Brachyramphus brevirostris*) is one of the rarest breeding seabirds in the North Pacific and one of the least known in North America. With a patchy distribution in both Alaska and the Russian Far East, the Kittlitz's Murrelet population in Alaska is estimated at 19 578 individuals (range 8 190–36 193; BirdLife International 2012). Owing to its small population size, restricted distribution, and an apparent rapid population decline, the US Fish and Wildlife Service (USFWS) has proposed Kittlitz's Murrelet as a candidate species for listing under the Endangered Species Act (USFWS 2009).

Little is known about the breeding ecology of this species, which makes understanding declines difficult. Unlike most seabirds that breed in coastal colonies, Kittlitz's Murrelets are solitary nesters, and nest sites are generally located on inaccessible mountain slopes, volcanoes or remote islands in the Gulf of Alaska and Aleutian Archipelago (Day *et al.* 1999, Kaler *et al.* 2010). Consequently, little is known about the nesting ecology of this species, including basic information on their nesting habitat preferences and breeding distribution. Prior to 2005, knowledge of the breeding ecology and nesting distribution of Kittlitz's Murrelets was based on a sample of 24 nests discovered between 1913 and 1994 (Day *et al.* 1983, Day 1995, Day *et al.* 1999, Piatt *et al.* 1999). Over 90% of these described nests were reported from mainland Alaska, and only one nest had been described from the Aleutian Islands (Atka Island; Day *et al.* 1983, Gibson and Byrd 2007; Fig. 1).

In the course of a field study of Evermann's Rock Ptarmigan (*Lagopus muta evermanni*; Kaler *et al.* 2010) in 2005/2006, we discovered 12 Kittlitz's Murrelet nests at Agattu Island (52.43°N, 173.60°E) in the western Aleutian Islands (Fig. 1; Kaler *et al.* 2009). Subsequently, we initiated a four-year (2008–2011) breeding ecology study of

Kittlitz's Murrelets at Agattu Island (hereafter, Agattu). In 2009, the second year of the Agattu murrelet study, we revisited all previously discovered nests and noted that several nest sites had increased plant cover compared with the surrounding area. Specifically, nest scrapes where a murrelet chick survived for at least 10–15 days contained dense mosses (*Tetraplodon mnioides*; a coprophilous moss usually found growing on fecal materials and animal remains) and grasses (Poaceae). Kittlitz's Murrelet adults provision their young with marine fishes at the nest scrape during the 24–40 day nestling period (Day *et al.* 1999, Kaler *et al.* 2010). During this period, chicks defecate along the edge of the nest, resulting in a fecal ring around the perimeter of the nest scrape. The nutrient-rich guano facilitates the growth of vegetation in otherwise nutrient-poor soils. The lush mosses and grasses growing at these old nest sites contrast with the otherwise sparsely vegetated mountain slopes and provide an excellent visual cue (Fig. 2).

While searching alpine areas at Agattu for active Kittlitz's Murrelet nests, we used these vegetative cues to locate old or “non-active” Kittlitz's Murrelet nest scrapes, defined as a nest site that had been used in a previous breeding season, but was not monitored during the research period. Non-active nests were confirmed by the presence of egg shell and/or chick remains in the nest scrape. Over three field seasons (2009–2011) we located 74 non-active Kittlitz's Murrelet nests in the mountains at Agattu (unpublished data). Based on observations at Agattu, re-use of a nest site is rare, with <5% (four of 87) of nests re-occupied in subsequent years. Although speculative, because we did not capture and mark adults at nests, Kittlitz's Murrelets appear to exhibit nest area fidelity, and active nests have been discovered ranging from 2 m to 100 m from nests found in previous years (Kaler *et al.* 2010). Thus, searching a



Fig. 1. Islands where Kittlitz's Murrelet nests have been located in the Aleutian Archipelago, Alaska.



Fig. 2. (a) Example of non-active Kittlitz's Murrelet nest site at Agattu Island, Alaska; (b) bone found among mosses; (c) *Tetraplodon mnioides* moss collected from nest scrape; and (d) Kittlitz's Murrelet egg shell fragments found in nest scrape.

100 m radius area around a non-active nest resulted in the discovery of 13 active nests at Agattu (unpublished data).

To examine the broader application of vegetative cues to identify nesting habitat and to confirm nesting of Kittlitz's Murrelets at other Aleutian islands, we searched for non-active nests at Adak Island (hereafter, Adak; 51.87°N, 176.63°W; Fig. 1). Adak is approximately 1930 km southwest of Anchorage and is part of the Aleutian Islands Unit of the Alaska Maritime National Wildlife Refuge. Adak covers an area of ~750 km² (~39 km × 45 km), the majority of which is characterized by rugged mountains, broad rolling lowlands and modified volcanic cones (Coats 1956). Confirmed nests of Kittlitz's Murrelets have not been reported for Adak; however, Byrd *et al.* (1974) collected a female Kittlitz's Murrelet with a mature egg in its oviduct, implying nesting in the area. In 1993–1995, a focused effort to locate nests of either Kittlitz's or Marbled Murrelets (*B. marmoratus*) at Adak failed even though there were observations of juveniles in waters around Adak in August (Meehan 1996).

Our objectives at Adak were two-fold: (1) confirm the utility of using vegetative cues to locate non-active murrelet nest sites; and (2) use non-active nests to locate active nests. During three summers (28 June–8 July 2010, 1–18 September 2010; 1–8 September 2011; 3–28 June 2012), we focused nest searching efforts in alpine areas (≥200 m above sea level) on the northern half of Adak. Once a potential non-active nest was detected, we confirmed breeding use by carefully excavating the scrape to locate murrelet egg shell fragments or chick remains. Mosses at the nest site were collected using forceps and stored in paper bags for preservation and later identification. Similarly, egg shell fragments and/or feathers were collected in small paper envelopes.

During early July 2010, we discovered two non-active nests within 60 m of each other. A concerted nest searching effort in the area in July and again in September 2010 failed to locate active nests despite the observation of two Kittlitz's Murrelets flying over the area at the time of initial discovery. On 1 September 2011, we revisited the two non-active nest sites found in July 2010 and discovered an abandoned *Brachyramphus* murrelet egg in one of the nest scrapes. Based on the sun-exposed appearance on one side of the egg, we estimated the egg to have been abandoned for at least 2–3 weeks. On 23 June 2012, we revisited the area again and discovered an active nest approximately 80 m from the non-active nest that contained an egg in 2011. The active nest was discovered by flushing an incubating adult Kittlitz's Murrelet.

In total, we located 14 non-active nests during 2010–2012 and provide the first breeding record of Kittlitz's Murrelets nesting at Adak, as well as the third breeding record for the Aleutian Islands. The use of vegetative cues to locate non-active nests provides an effective tool to help delineate the breeding range of Kittlitz's Murrelets and identify nesting habitat for focused studies on reproductive success and nest site selection throughout the Aleutian Archipelago. If the apparent high rate of nest area fidelity observed at Agattu and Adak is a common aspect of murrelet breeding behavior, then locating non-active nests will expedite the process of finding active nests. We recommend using these vegetation cues at other islands in the Aleutian Archipelago, particularly at islands where Kittlitz's Murrelets have been observed foraging in nearshore waters and that have alpine nesting habitat (e.g. Attu, Kiska, Atka, Unalaska and Unimak Islands). Furthermore, the use of the vegetative search cue at non-active nest sites may be applicable in locating breeding habitat of Kittlitz's Murrelets elsewhere throughout its range (e.g. mainland Alaska and Russia).

Information on the breeding ecology of Kittlitz's Murrelets is imperative as the species is a potential candidate for listing as an endangered species (USFWS 2009). At the minimum, the identification of non-active nests would provide evidence of habitat use, contribute to our current knowledge of nest site selection and help to further future long-term monitoring studies.

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