

# Long Term Study of Kittlitz's Murrelet Breeding Biology on Kodiak National Wildlife Refuge, Alaska: 2008-14



Robin M. Corcoran<sup>\*1</sup>, Timothy W. Knudson<sup>2</sup>, M. James Lawonn<sup>3</sup>, James R. Lovvorn<sup>2</sup>, John F. Piatt<sup>4</sup>, Ellen W. Lance<sup>5</sup>, Valerie Shearn-Bochsler<sup>6</sup>, and Barbara L. Bodenstein<sup>6</sup>

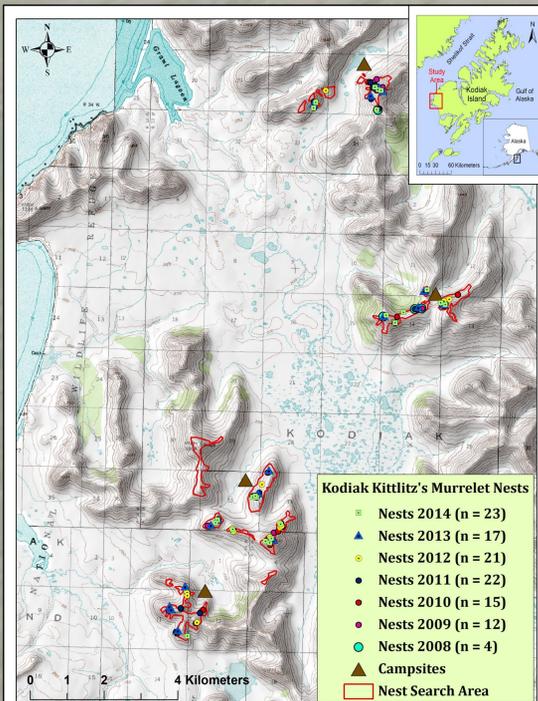
<sup>1</sup>U.S. Fish and Wildlife Service, Kodiak National Wildlife Refuge, 1390 Buskin River Rd., Kodiak, AK, <sup>2</sup>Department of Zoology and Center for Ecology, Southern Illinois University, 1125 Lincoln Drive, MC 6501, Carbondale, IL, <sup>3</sup>U.S. Geological Survey, Oregon Department of Fish and Wildlife, 4907 3<sup>rd</sup> Street, Tillamook OR, <sup>4</sup>U.S. Geological Survey, Alaska Science Center, Anchorage, AK, <sup>5</sup>U.S. Fish and Wildlife Service, Anchorage Fish and Wildlife Field Office, 605 West 4<sup>th</sup> Ave. Rm G61, Anchorage, AK, <sup>6</sup>U.S. Geological Survey, National Wildlife Health Center, 6006 Schroeder Rd., Madison, WI.

## Abstract

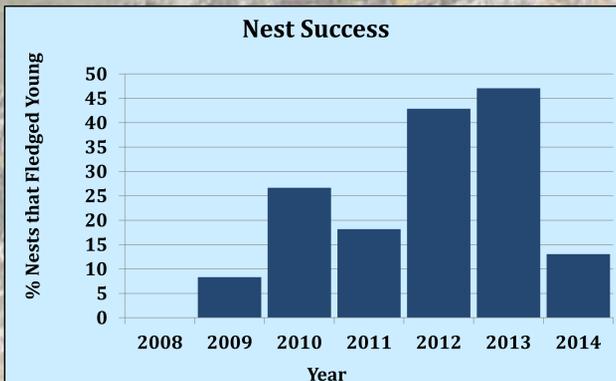
The breeding biology of the Kittlitz's murrelet (*Brachyramphus brevirostris*) is poorly known because this secretive species nests solitarily in remote mountainous terrain. Until 1999, only 19 confirmed nests had been described, and only one nest had been studied from egg laying until fledging. Since 2008, we have studied the breeding biology of the Kittlitz's murrelet at 5-23 nest sites each year (114 nests in total) on southwestern Kodiak Island, where unusual outcroppings of scree and talus slopes at low elevation permit systematic monitoring of a relatively high number of nests. Apparent nest success was low but variable. During the first four years of the study, success averaged 17%, but increased to 45% from 2012-2013, before declining again in 2014 to 13%. Digital cameras placed at nearly all nests recorded incubation patterns, chick feeding rates, prey fed to chicks, fledging, and predation. Nests were visited regularly so that chick growth rates could be measured. Over seven years of field studies, we learned that Kittlitz's murrelets have the fastest growth rate documented for any semi-precocial alcid; birds selected nest sites that were less vegetated, had more gravel sized rocks, and were on steeper slopes compared to available habitat; Pacific sand lance (*Ammodytes hexapterus*) accounted for almost 90% of identified chick meals; most nest failures were due to predation, primarily by red fox (*Vulpes vulpes*); and several chicks that died mysteriously on the nest tested positive for saxitoxin, one of the neurotoxins responsible for paralytic shellfish poisoning.

## Methods

- ❖ Nest Searches conducted late-May to mid-July.
- ❖ Motion-triggered cameras placed on nests to document the behavior of nesting adults, the rate of food delivery/fish species delivered, length of pre-fledge period, and identify nest predators.
- ❖ Chicks measured at regular intervals for growth rate information.
- ❖ Nest site characteristics surveyed and recorded after nests were no longer occupied.



**Figure 1.** Location of study area and nest locations of Kittlitz's Murrelets on Kodiak Island, AK.

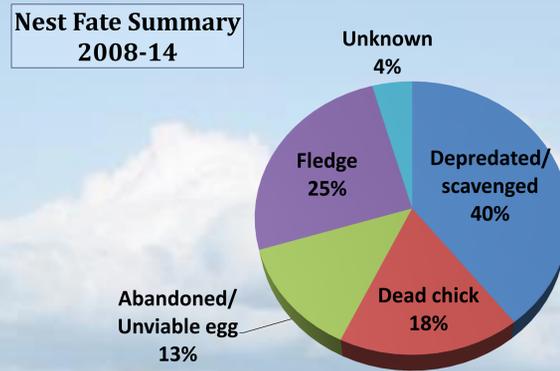


**Figure 2.** Apparent nest success by year of Kittlitz's Murrelets on Kodiak Island, AK, 2008-14.

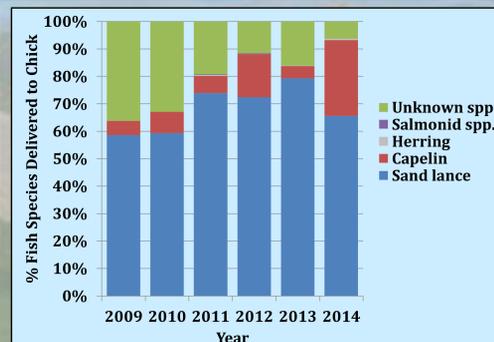
## Results



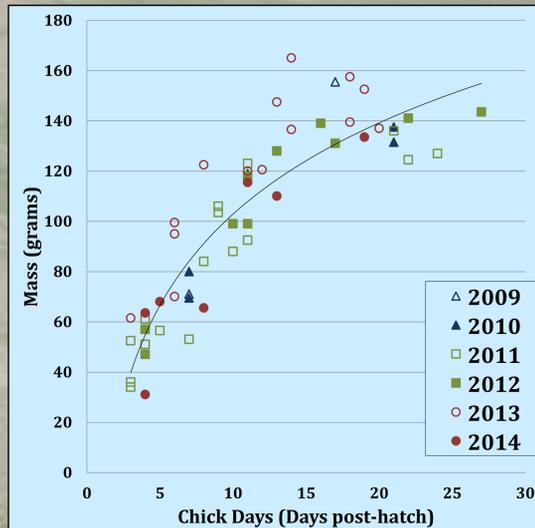
## Results



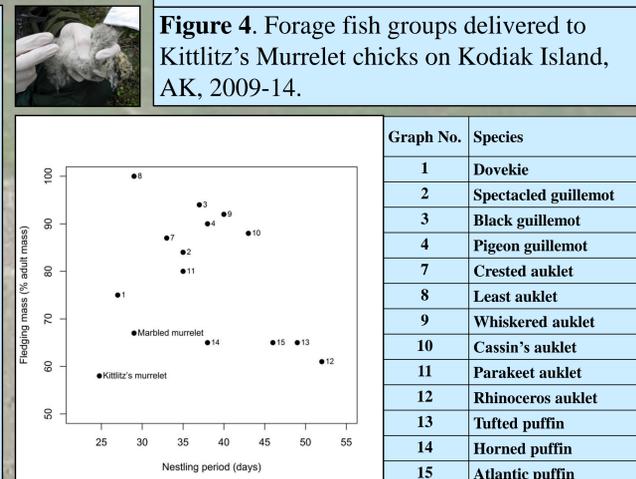
**Figure 3.** Nest fate summary of 114 Kittlitz's Murrelets nests monitored on Kodiak Island, AK, 2008-14.



**Figure 4.** Forage fish groups delivered to Kittlitz's Murrelet chicks on Kodiak Island, AK, 2009-14.



**Figure 5.** Body mass of Kittlitz's Murrelet chicks as a function of age on Kodiak Island, 2009-14.



**Figure 6.** Average fledging mass (% of adult mass) as a function of mean nesting period (days) for 15 species of semi-precocial Alcids (Kittlitz's Murrelet data from this study; other species from Ydenberg 1989).

## Summary – Kittlitz's Murrelet Breeding Biology on Kodiak

- ❖ Overall nest survival was low but quite variable between years.
- ❖ The main reason for low nest survival was high nest predation rates, mainly by red fox.
- ❖ Perhaps to reduce the period of exposure to predation, these murrelets have the fastest chick growth rates of any Alcid species. However, this strategy mandates that chicks be fed exceptionally high numbers or quality of fish.
- ❖ In the years of our study, sand lance were by far the most frequent forage fish fed to chicks. However, chick growth rates appeared to vary substantially between seasons owing to annual differences in energy content of sand lance. We are currently assessing the possible importance of long-term trends in energy content of forage fish to population trends of murrelets.
- ❖ Saxitoxin, one of the toxins responsible for paralytic shellfish poisoning, most likely transmitted through sand lance, was a significant source of chick mortality in some years.
- ❖ We have also characterized nesting habitat including ground cover type, distance to nearest ridge, elevation, slope, aspect, and size of adjacent rocks, as a means of defining high-quality nesting habitat.

### Acknowledgements

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