

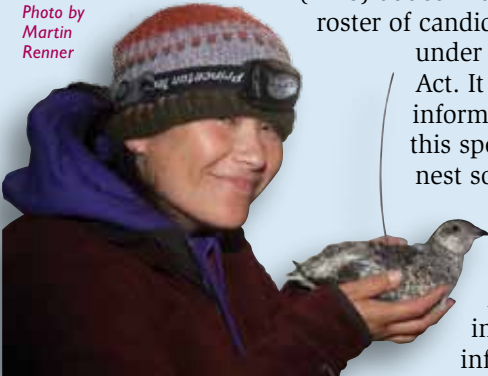


Big Returns from a Small Package: Tracking Kittlitz's Murrelet with the 5.5g Solar Powered PTT

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Kittlitz's Murrelet (*Brachyramphus brevirostris*) is a small (220-260g) member of the Auk family of diving seabirds, and is one of the rarest and least-studied seabirds in the North Pacific. It is generally found in glaciated regions of Alaska and its natural history reflects adaptation to life in glacially influenced habitats. Populations appear to have declined during the past 20 years, and so the U.S. Fish and Wildlife Service (FWS) added Kittlitz's Murrelet to its roster of candidate species for listing under the Endangered Species Act. It is difficult to gather information on the biology of this species. Adults generally nest solitarily, inland within 30 km of the coast, and at high elevations (up to 2000 m). Kittlitz's Murrelets tend to forage in coastal fjords heavily influenced by glacial rivers. The winter range of the species is poorly known. There are occasional winter sightings in coastal and shelf waters of the northern Gulf of Alaska and Bering Sea. Lack of knowledge about the wintering grounds remains a critical data gap because we essentially have no information about factors influencing populations for 2/3rds of the year.

Photo by Martin Renner



Mayumi Arimitsu prepares to release a Kittlitz's Murrelet with a 5.5g PTT attached.

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By late 2007, MTI had developed a 5.5g version of their solar-powered PTT. Fantastic! A unit small enough to be carried by a murrelet! In 2008, MTI sent us a prototype model to test on a Marbled Murrelet (*B. marmoratus*), a close relative to the Kittlitz's Murrelet. With the help of USDA Forest Service biologists Marty Raphael and Tom Bloxton in Washington, we captured a Marbled Murrelet in Puget Sound by stalking it at night from a small boat, and capturing it with a dip-net. We attached the PTT using a subcutaneous anchor and subsequent visual observations of this murrelet wearing the PTT provided confidence that it was not detrimental to the well-being of the bird.

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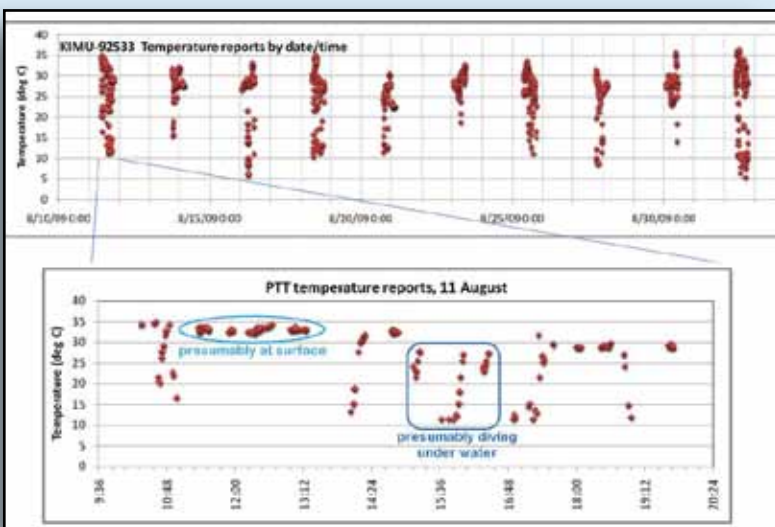
examined performance under different light and temperature regimes, and tested for submersion to depths to 40 m. In addition to reporting location, these PTTs also report temperature and battery voltage. Thus far the PTTs have performed well under the extreme conditions under which they must operate. For example, riding on the backs of murrelets, the PTTs routinely reach temperatures of 30-35° C, but may plummet to temperatures of < 5° C when birds dive in ice-filled seawater found in glacial fjords to depths of about 30 m (and pressure of 45 psi).



Post-breeding season (August-October) migration of two Kittlitz's Murrelets from the NE Gulf of Alaska about 1000 km westward to the Alaska Peninsula and Bering Sea.

Preliminary results from tagging have been exciting. For example, birds tagged during the breeding season in glacial fjords of the northeastern Gulf of Alaska (Icy Bay) and Prince William Sound migrated in late summer to the southwest corner of Cook Inlet, which is also strongly influenced by large glacial rivers that flow into the head of the inlet. From there they moved in a southwesterly direction along the coast of the Alaska Peninsula, apparently staging at selected bays, many of which have large glacial rivers that feed into them. Some of our tagged birds crossed over the Alaska Peninsula into the Bering Sea, where they may reside during winter. All of our tags stopped transmitting in early fall, presumably because they fell off during migration and molt. In the future, we plan on deploying PTTs from more locations including the Aleutians and Bering Sea, and we may try to catch birds after fall molt to gain further insights into winter migration patterns.

In addition to location data, we are obtaining interesting data on diving behavior. Kittlitz's Murrelets forage by "flying underwater" and capturing schooling fish. Temperature data collected during each reporting cycle (generally 10 hr on a 10/48 on/off cycle) revealed dramatic changes in temperature that we believe corresponds to when they are resting at the surface (warmer, steady temperatures) or diving (colder, variable temperatures). Kittlitz's Murrelets need to obtain more than half their body mass in prey every day, and the PTT temperature profiles are consistent with frequent diving activity. Presumed diving is highest during the day and virtually absent at night. We are beginning to contrast foraging activity patterns among birds, areas, and seasons to see how these factors may influence foraging behavior. It is possible that temperature data may provide a proxy for food availability, and enhance our understanding of how food supplies may affect choice of foraging habitat, migration routes, and breeding success.



Temperature data recorded by a 5.5g PTT attached to a Kittlitz's Murrelet. Upper graph shows averaged temperature reports on each satellite pass during each 10 hr reporting cycle (10 hr on/48 hr off). Bottom graph shows temperatures recorded on individual messages received on each satellite pass throughout one 10 hr cycle.

Following a few modifications in attachment design, we deployed 18 PTTs in 2009 and 2010 on Kittlitz's Murrelets in several locations with the help of colleagues Marc Romano (FWS), Ellen Lance (FWS) and Josh Adams (USGS). We tested a variety of attachment methods (single-prong and double-prong subcutaneous anchors; four-channel sutures). We