

## SMALL BOATS DISTURB FISH-HOLDING MARBLED MURRELETS

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Disturbance of seabirds by people at nesting colonies can reduce reproductive success and alter population demographics (Vermeer and Rankin 1984). In response to disturbance, adult seabirds may increase the incidence of alarm postures and alarm calling (Burger and Gochfeld 1993), increase heart and breathing rates (Culik and others 1990; Wilson and others 1991), reduce attendance of nest sites (Olsson and Gabrielsen 1990; Wilson and others 1991), and completely abandon nests and chicks (Boellstorff and others 1988; Evans and Kampp 1991). Daily or frequent handling of chicks can reduce their growth rates and survival (Harris and Wanless 1984; Pierce and Simons 1986; Piatt and others 1990).

While effects of human disturbance on nesting colonial waterbirds are fairly well described (Carney and Sydeman 1999), we are aware of only 1 study that measured effects of human disturbance of seabirds on the water, such as that caused by vessel traffic. Kuletz (1996) found that the number of marbled

murrelets (*Brachyramphus marmoratus*) at sea was negatively correlated with the number of boats in Kachemak Bay, Alaska, and with both boats and low-flying aircraft in Prince William Sound, Alaska. Presumably, murrelets were moving away from areas with human disturbance. Ecotourism is a rapidly growing industry all over the world, and many seabird colonies are visited regularly by cruise ships, tour boats, and pleasure craft (Chardine and Mendenhall 1998). Therefore, it is worth considering further the possible impacts of vessel disturbance on seabirds as they occupy marine waters in the vicinity of their breeding grounds.

In 1992 and 1993, we studied marbled murrelets in Auke Bay and Fritz Cove, located 20 km NW of Juneau, Alaska (Speckman 1996; Speckman and others 2000; Speckman and others 2003). We counted murrelets daily from early May through mid-August in both years, spanning the period of courtship to chick fledging. Boat surveys were conducted from open skiffs with outboard motors. All skiffs were between 4 and 5 m in length.

In general, marbled murrelets in Auke Bay and Fritz Cove appeared to be habituated to

boat traffic, perhaps more so than murrelets in other parts of Alaska (Kuletz 1996; SGS, pers. obs.). Both motor and sailing vessels comprising a wide range of sizes frequently pass through Auke Bay and Fritz Cove, including 130-m ferries of the Alaska Marine Highway system, commercial fishing vessels, numerous sport fishing charter boats, transient pleasure boats, and hundreds of resident vessels. Of the hundreds of murrelets we encountered with the skiff each day, only a few birds reacted to the moving skiff by flying away; the vast majority merely paddled away, and a few dove briefly before surfacing to paddle away.

However, like a few other alcids (Gaston and Jones 1998), adult murrelets may often be observed on the water with fish in their bills that are being held for later delivery to chicks (Carter and Sealy 1987; Strachan and others 1995). Murrelets that were holding fish for chicks appeared threatened by our skiff when we approached them during surveys. On 8 separate occasions in 1993, murrelets that were holding fish crosswise in their bills, presumably for chicks, swallowed those fish when approached closely by the skiff. Judging from their behavior, birds that swallowed fish did so because of the approaching skiff.

On 1 occasion on 7 June 1993, we slowly approached within 10 m of an adult murrelet holding a fish, in order to identify the fish to species. The murrelet dove twice to evade the boat, and after surfacing for the 3rd time at a distance of 15 to 20 m, it swallowed the fish, a Pacific sand lance (*Ammodytes hexapterus*), head-first. On 28 June 1993, we were surveying murrelets along a transect line and happened to head straight for a murrelet that was holding another Pacific sand lance. We moved forward at a slow, constant speed of <8 km/hr, and when we approached within about 15 m of the murrelet, it promptly swallowed the fish. On the other 6 occasions, fish-holding murrelets swallowed their fish as the skiff approached within 5 to 40 m.

Such disturbance could be detrimental to murrelets in areas where prey are relatively scarce, where birds must fly great distances inland to nesting sites, or where boat traffic is concentrated in waters immediately adjacent to nesting areas.

Marbled murrelets, like other alcids, are not known to hold fish that they themselves intend

to consume at a later time. Birds on the water holding fish are presumed to be parents about to make food deliveries to their chicks (Carter and Sealy 1987; Strachan and others 1995). Indeed, fish-holding behavior is used by biologists to demarcate the timing of the chick-rearing period (Kuletz and Kendall 1998; Speckman and others 2003).

Adult murrelets usually deliver prey to chicks before dawn or after dusk (Naslund and O'Donnell 1995), and adults sitting on the water with prey in their bills are typically waiting for sunset to carry those prey to chicks at nearby inland nest sites. The majority of fish-holding murrelets in Auke Bay were observed during evening hours (Speckman and others 2003). Furthermore, the source of those fish may be quite distant. For example, marbled murrelets that breed in forests adjacent to Auke Bay, and that may stage on waters there in the evening, may travel up to 250 km round trip to get food for chicks (Whitworth and others 2000). Therefore, the loss of prey from boat disturbance can represent a substantial energetic cost to adults if they have to repeat this foraging trip in order to capture another fish for a chick. If it is too late in the evening, then it may be too late to get another prey item for delivery to the chick, and presumably the cost to chicks is even greater than for adults. It is not known whether adult murrelets can make up for these losses. If not, boat disturbance could result in a decrease in food delivery to chicks by adults that forage or nest near busy boating areas.

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