Wilson Bull., 99(2), 1987, pp. 289–291

Fish-holding behavior of Marbled Murrelets.—Prey-holding behavior affects the number and size of prey that can be transported to nestlings on each feeding trip and thus the number of trips required to sustain nestling growth (Orians and Pearson 1979). Marbled Murrelets (*Brachyramphus marmoratus*) carry fish in their bills to feed to their nestlings at nests that may be up to 75 km inland from ocean capture sites (Drent and Guiguet 1961; Sealy 1975a; Carter and Sealy 1983, 1986). During studies of the feeding ecology and at-sea distribution of Marbled Murrelets in Barkley Sound, British Columbia, in 1979, 1980, and 1982 (Carter 1984, Sealy and Carter 1984), we saw hundreds of murrelets holding single fish in one of two ways: *crosswise* in the bill with the fish's head held on one side, the tail on the other, at right angles to the bill, with the tomia clamping the sides of the fish (see Drent and Guiguet 1961, Guiguet 1971); and *lengthwise* in the bill with the head held inside the murrelet's mouth, the tail pointed forward and to one side of the bill, with the tomia clamping the dorso-lateral surfaces of the fish (similar to the way murres [*Uria* spp.] often carry fish [see Nørrevang 1958, Gaston and Nettleship 1981]). Pacific sandlance (*Ammodytes hexapterus*) and small Pacific herring (*Clupea harengus*) weighing 2–10 g were held crosswise by murrelets (estimated from observed lengths [see Carter 1984]). Northern anchovies (*Engraulis mordax*) and herring weighing 10–25 g were held lengthwise. Both methods of holding fish were observed while murrelets were on the water or flying, although prey species were identified mainly while birds were on the water.

Marbled Murrelets capture fish underwater but will manipulate fish in their bills after they surface from a dive. Thus, the methods we observed murrelets using to hold and transport fish to nestlings can be different from the methods that they use to capture fish (see Götmark et al. 1986). On 7 June 1979 at 19:50 h, we collected an adult female Marbled Murrelet that was holding an anchovy lengthwise. The salvaged fish (deposited in the University of Manitoba Zoology Museum, Winnipeg) was 110.5 mm long (standard length) and weighed 12.4 g. Its right side was slashed obliquely at midbody below the dorsal fin and there were 2–3 small slashes behind the gill covers. A puncture 5 mm in diameter and 5–10 mm deep was on the side just behind the dorsal fin; it pointed anteriorly. The tomial slashes indicated that earlier the fish had been held crosswise. The puncture apparently was inflicted by spearing during a posterior attack by the murrelet.

Bédard (1969) pointed out that the rigid, cornified tongues of *Brachyramphus* murrelets permit large prey items to be locked firmly against the rows of sharply-pointed palatal denticles. Such modifications of the tongue and denticles are found only in the other narrow-billed alcid genera, *Cepphus* and *Uria,* which also are usually single-prey loaders (Nørrevang 1958, Drent 1965, Birkhead 1976, Asbirk 1979), although occasionally they carry two prey items (Thoreson and Booth 1958, Gaston and Nettleship 1981). Although Marbled Murrelets have been reported carrying 1–6 fish in their bills at once (Savile 1972, Cody 1973), most observations suggest that they usually transport single fish to their nestlings (Simons 1980, Carter 1984). This may answer Bédard's (1976:182) question: "But if one considers as Cody [1973] does that food transport is the most determinant factor bringing about a deepening of the [alcid] bill, how is it then that the Marbled Murrelet which also carries bundles of fish to its inland nestling . . . has one of the shallowest and certainly one of the most unmodified bills of the entire family . . . ?" While the relationship between bill depth and prey transport is unresolved, the Marbled Murrelet is usually a single-prey loader and should not be used as contrary evidence in the above argument.

Different methods of holding fish probably are related to the ratio of prey size : body size, and the properties involved in the expression of force along the mandibles relative to the

bill's shape and size (Bédard 1969, Lederer 1975). Interestingly, *Cepphus, Uria,* and Marbled Murrelets carry similar-sized prey items, yet *Cepphus* usually hold fish crosswise (although rarely lengthwise [Carter, pers. obs.]), *Uria* characteristically hold fish lengthwise, and Marbled Murrelets commonly hold fish both ways. Larger prey may be too awkward if held crosswise (especially when flying) relative to the murrelet's smaller body size (Bédard 1969). The ability of Marbled Murrelets to carry relatively large fish may reduce the number of feeding trips required and partly account for the fast growth rate of young (Simons 1980, Hirsch et al. 1981) compared to other alcids (Sealy 1973). Prey robbery probably has not forced murrelets to hold fish lengthwise because they nest solitarily, do not feed or nest in association with other seabirds, and visit nests mainly at night (Sealy 1975b, Carter 1984, Sealy and Carter 1984). For Common Murres (*Uria aalge*), however, this may be the main selective factor for their manner of holding prey, as they usually nest and feed in dense groups with other seabirds and transport several food loads during daylight (Birkhead 1976).

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HARRY R. CARTER, *Point Reyes Bird Observatory, 4990 Shoreline Highway, Stinson Beach, California 94970; and* SPENCER G. SEALY, *Dept. Zoology, Univ. Manitoba, Winnipeg, Manitoba R3T 2N2, Canada.* *Received 29 Apr. 1986, accepted 4 Sept. 1986.*

Wilson Bull., 99(2), 1987, pp. 291–292

Gray Kingbird predation on small fish (*Poecilia* sp.) crossing a sandbar.—The Gray Kingbird (*Tyrannus dominicensis*), a common West Indian flycatcher, normally forages on insects and fruit and has occasionally been reported to prey on lizards (Pinchon, Faune des Antilles Françaises: les Oiseaux, Muséum d'Histoire Naturelle, Fort-de-France, Martinique, 1963; Wunderle, Herpetologica 37:104–108, 1981). Its hunting techniques usually involve catching insects on the wing or picking prey off a substrate while flying. To our knowledge, it has not been reported catching fish. On 3 June 1986, at 07:12 (EST), we witnessed repeated predation by at least two kingbirds on *Poecilia* sp. (*Poeciliidae*) at a partially dried freshwater stream near Holetown, Barbados (West Indies). Several hundred of the fish, a close relative of the aquarium black molly, were attempting to swim upstream from a small pool. Water was <2 cm in most parts of the stream, and sandbars almost totally blocked the stream in several places. At the sandbars, fish moved out of water by a series of short flips for distances of up to 50 cm (a similar mode of locomotion has been documented in the related family *Cyprinidontidae*; Seghers, Verh. Inter. Verein. Limnol. 20:2055–2059, 1979). While on land, at least 11 *Poecilia* were caught and eaten by kingbirds. The birds perched on a branch 10 m from the stream and swooped down over the sandbar, occasionally hovering there for a few seconds. The birds were successful on approximately one third of their attacks. Captured fish were consumed when the birds had returned to their perch. On most occasions, the fish were hammered against the branch before being eaten, a technique Gray Kingbirds are