

NOTES ON THE FEEDING BEHAVIOR OF BULLER'S SHEARWATER

TERENCE R. WAHL, Department of Biology, Western Washington University, Bellingham, Washington 98225

Buller's Shearwater (*Puffinus bulleri*) breeds only on Poor Knights Island in northern New Zealand (Jenkins 1974) and migrates north across the tropics to spend its non-breeding season (the boreal summer) in the subarctic Pacific Ocean (Wahl 1985). It is one of the least-known Pacific shearwaters, perhaps because of its restricted breeding range and small population size. Recently it has been increasing in numbers after the elimination of predators on the nesting island (Bartle 1968, Jenkins 1974) and is now seen regularly over much of the North Pacific.

Jenkins (1974) described the feeding behavior of this species as similar to that of surface-feeding ducks: while swimming forward it swings its head from side to side just under the surface of the water. Harper (1983) described two additional feeding techniques, one of which was contact dipping, "precisely that described" by King (1974) for the Wedge-tailed Shearwater, *P. pacificus*: "In contact dipping birds flew close to the surface, wings held back as if to hover, sometimes touching the surface with outstretched feet. Head and neck were plunged down several inches into the water. Forward momentum was regained by vigorous wingbeats and foot paddling. Usually when a fish was caught it was eating without interrupting flight although birds stopped on the surface occasionally, presumably to swallow heavy prey." Harper also states *bulleri* takes prey by surface feeding: "In light airs birds abruptly descend to alight on the water and, with their wings half open, lunge this way and that with their long necks to capture prey." Roberts (1951) reported seeing several birds dive for bait down to about 20 feet, but stated that he had not previously observed this behavior. Harper (1983) reported seeing Buller's Shearwaters plunge briefly below the surface on only 2 of 211 observations of feeding behavior. Bartle (1974) reported that Buller's Shearwaters do not usually follow ships or forage on discards but cited one occasion of "exceptional behavior" when birds fed on fish offal. Wahl and Heinemann (1979) found that, off Washington, this species is not attracted to discards of fishing vessels, whereas Pink-footed (*P. creatopus*), Flesh-footed (*P. carneipes*) and Sooty (*P. griseus*) shearwaters were readily attracted and can be "chummed" to boats. Short-tailed Shearwaters (*P. tenuirostris*) are also attracted to fishing vessels on occasion and can be chummed to boats (pers obs.).

During several extended mid-ocean cruises and over 140 1-day trips off the coast of Washington I saw numbers of Buller's Shearwaters in large and small groups and as single birds. Most groups were resting on the surface. I seldom saw this species trying to obtain food. The feeding behavior I observed was similar to that described by Harper. However, in some cases the foraging flight style was remarkable in being extremely active and erratic to a degree not suggested by previous reports. The following notes may expand the knowledge of this species' behavior:

19 Sep 1976 at 47°07'N, 124°40'W, about 40 km off Copalis Beach, Washington: one bird dove from about 15 cm above the surface, head first with wings partially extended, barely submerged and resurfaced almost immediately without having caught anything obvious.

25 Sep 1976 at about 47°07'N, 125°00'W, about 70 km off Copalis Beach, Washington: one "crashed" on its breast, with wings outspread, in a shallow dive to the surface, plunged its head about 15 cm below the surface and caught something unidentified.

7 Aug 1981 at 47°57'N, 165°17'W, in mid-ocean: one flying bird landed heavily on its breast with wings outspread.

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11 Aug 1981 at 44°01'N, 174°13'E: one flew in tight circles, "flopped" to the surface several times, lightly skimming the surface with its breast and belly, with its head out of the water.

11 Aug 1981 at 44°02'N, 174°46'E: one circled erratically in tight loops and bounced off the water several times.

8 Sep 1985 at 46°52'N, 124°46'W, about 46 km off Westport, Washington: one bird flew in loops and circles, crashing to the surface on its breast, often submerging its head, and quickly taking off again to repeat the operation. I saw the bird persist in this behavior for about 5 minutes. Its course was very erratic, but trended away from the vessel which attempted to close in on it at about 5 kts. I did not get closer than 75 m and could not see if this foraging was successful.

This aerial technique resembles a combination of both methods described by Harper (1983). However, in none of these instances did the bird extend its feet to contact the water before bouncing or "flopping" onto the surface. This technique suggests pursuit of fast-moving near-surface prey such as small fish and might possibly be suitable for catching flying fish, although these observations were outside the range of flying fish. This foraging/feeding technique might be described as "heavy contact surface dipping." The erratic, bouncing chase behavior I observed appeared more active and persistent than previous descriptions. As noted above, I saw just one Buller's Shearwater submerge, and only very briefly, following a "crash" to the surface.

These observations fit the spectrum of feeding behaviors described by Brown et al. (1978) for various species of *Puffinus* and *Calonectris*. These shearwaters range from gliding surface feeders that do not submerge, such as *P. leucomelas*, to agile divers and underwater swimmers like *P. griseus* and some smaller *Puffinus* species. My observations and the literature indicate that in flight Buller's Shearwater is one of the most agile of this group. It is able to turn sharply in light winds and soar easily. It is also one of the least likely to submerge and pursue prey underwater, the diving behavior described by Roberts (1951) being exceptional. Harper (1983) states that Buller's Shearwater weighs about one-half as much as the similarly-sized pursuit-plunging Sooty Shearwater, which indicates anatomical characteristics more suitable for flight than diving behavior.

That Buller's Shearwater has not taken to scavenging discards from fishing operations perhaps is a result of competition with aggressive surface-feeding species like gulls and diving shearwaters (e.g. *P. griseus*).

The frequency with which I have seen the species resting on the surface while other shearwaters were feeding nearby and the few observations of feeding behavior during daylight hours suggest that Buller's Shearwater may be a relatively more nocturnal feeder than other shearwater species. Serventy et al. (1971) list cephalopods, crustacea and small fish as the diet of Buller's Shearwater. Such prey would be most readily available to an aerially adapted, non-diving species during the nocturnal plankton rise. Jenkin's (1974) observations of flocks of *bulleri* feeding in tidal fronts or convergences off northern New Zealand during the nesting season show that the species certainly takes advantage of local prey concentrations during daylight hours, at least in that season.

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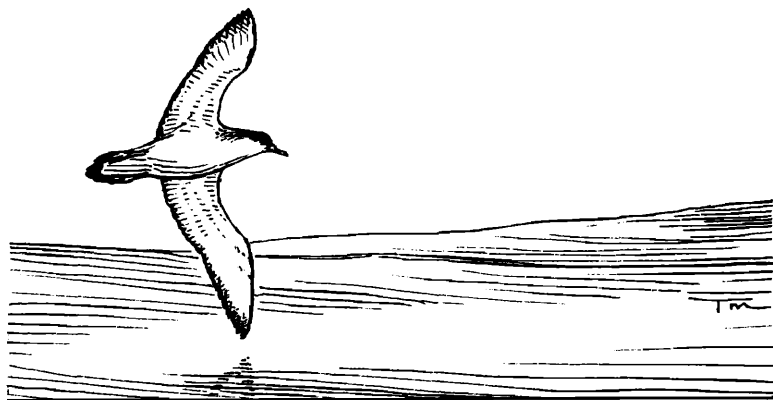
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Sketch by Tim Manolis