

## NOTES

### DIVING TIMES AND BEHAVIOR OF PIGEON GUILLEMOTS AND MARBLED MURRELETS OFF ROSARIO HEAD, WASHINGTON

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Data on the times and frequency of dives by Atlantic alcids have been reviewed by Bradstreet and Brown (1983), who pointed out the need for more such information for this family of birds. Scott (1973) presented data on diving times and depths for marine birds, including the Pigeon Guillemot (*Cepphus columba*), observed along the Oregon coast. Carter and Sealy (1984) found Marbled Murrelets (*Brachyramphus marmoratus*) in fish nets set at depths of 8 to 10 m, while Piatt and Nettleship (1985) recorded Black Guillemots (*Cepphus grylle*) caught in nets at 50 m and diving times for that species of up to 112 seconds in water 35 to 45 m deep. They also suggested that diving ability is directly correlated with body size. Scott (1973) timed maximum dives for Pigeon Guillemots along the Oregon coast at 68.8 seconds, close to the average time I have recorded. Black Guillemots in Lancaster Sound of the Canadian Archipelago, while feeding "horizontally" under ice floes, have remained submerged as long as 146 seconds (Bradstreet 1982). This note presents new information about Pigeon Guillemots and Marbled Murrelets observed from Rosario Head, Deception Pass State Park, south of Anacortes, Washington. Comparative data on diving times, depths, and prey species taken are of value for an understanding of the physiology of diving and differences between species in feeding habits. The numbers of times fish were brought to the surface are also indicated.

For one hour on each of eight days during June and July, 1985, I recorded the diving times and frequency of individuals and pairs of both species and noted their feeding behavior. I made my observations between 1430 and 1530 h ( $n = 6$  days). Other behaviors were noted at various times.

Water depth at this location is approximately 12 meters, and the bottom is rocky with patches of mud or sand. The birds were active within the range of normal vision (30-100 m) beyond the outer limit of a dense kelp bed; however, 7 × 50 binoculars were used for details, and a watch with a second hand was used for timing of dives and periods between dives. Calm seas prevailed during all observation periods, and since only individuals or pairs of birds were present there was no confusion as to which bird was being timed.

Of 50 dives recorded for Pigeon Guillemots, time underwater ranged from 15 to 105 seconds, with a mean of 67 seconds (standard deviation [sd] = ±22.5, standard error [se] = 3.15; see Figure 1). Fish were brought to the surface after 8 of the 50 dives. Although some small fish may have been swallowed below the surface, those brought to the surface were a species of blenny (Stichaeidae), indicating that the birds were foraging on the bottom, as is a well-known habit of the Pigeon Guillemot (Drent 1965). During longer dives, the guillemots covered considerable horizontal distance, and though this distance was difficult to determine, on occasions I estimated it to be as great as 75 meters.

Time spent on the surface between dives averaged 24 seconds ( $n = 31$ ) and ranged between 3 and 175 seconds (sd = ±40.8, se = 7.35; see Figure 2). In two instances

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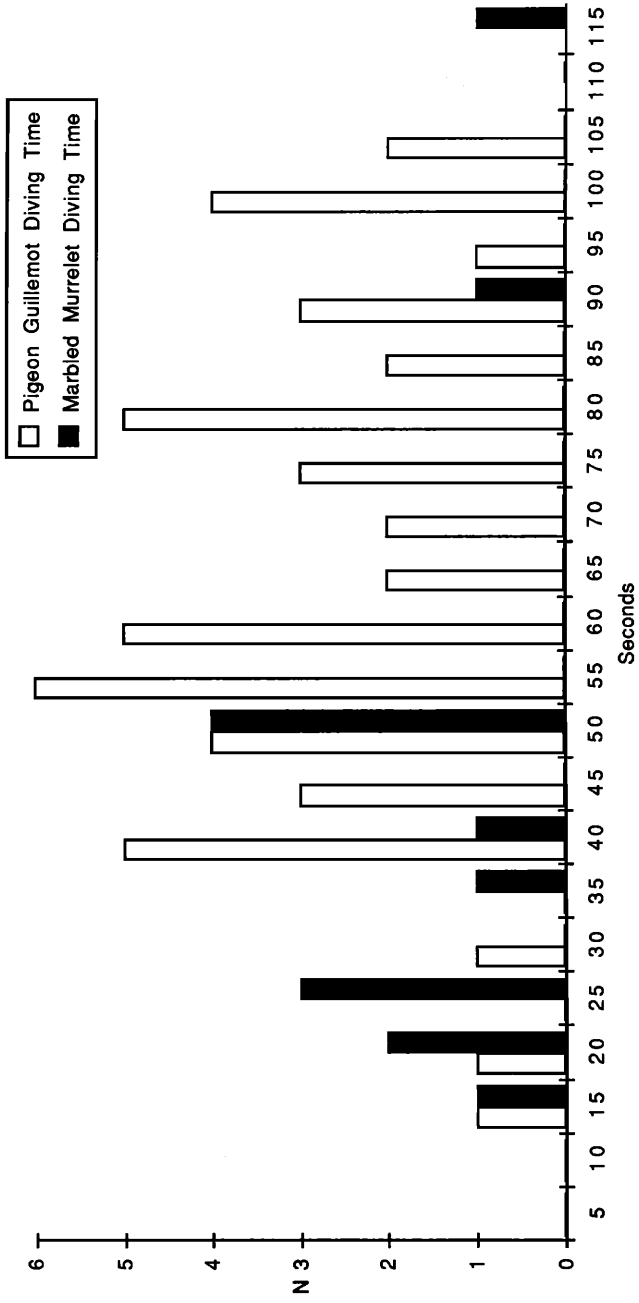


Figure 1. Diving times for Pigeon Guillemots and Marbled Murrelets at Rosario Head, Washington, June and July 1985.

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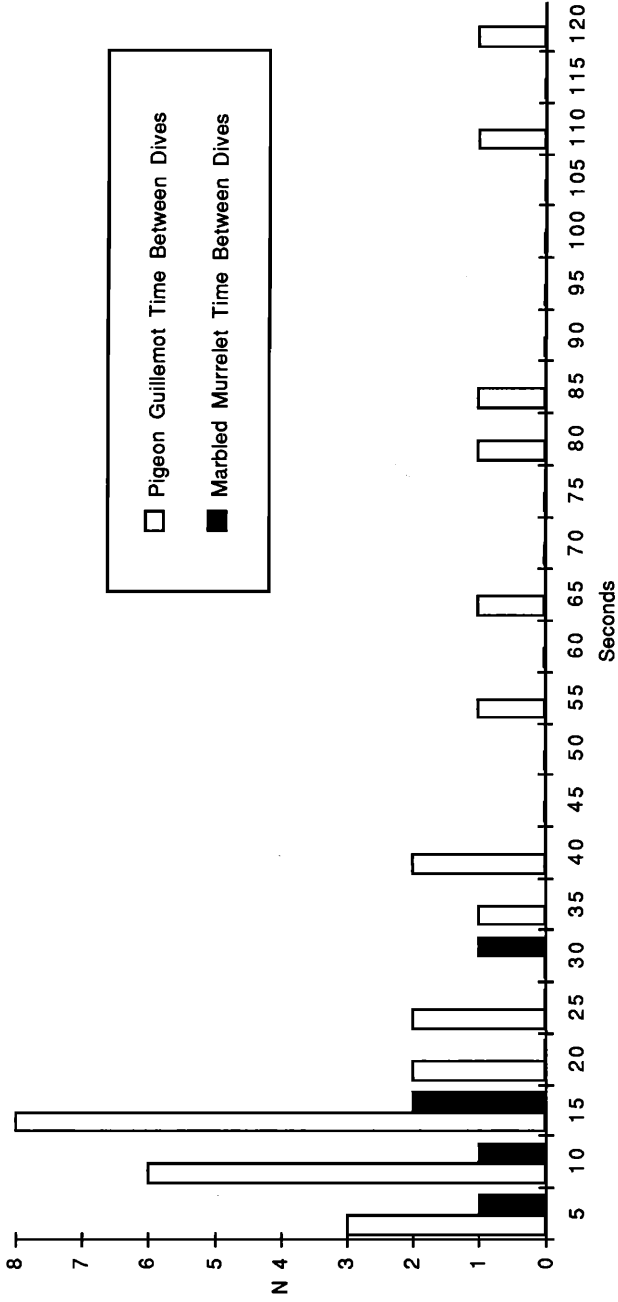


Figure 2. Times between dives for Pigeon Guillemots and Marbled Murrelets, 1985.

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when blennies were brought to the surface and swallowed, the birds remained on the surface for 10 minutes before diving again. These were not included in the average. Some catches, held crosswise in the bill, were transported, probably to feed young in locations beyond my line of sight.

Although individual birds were occasionally seen, Marbled Murrelets were usually paired. Of 14 dives recorded, mean time underwater was 44 seconds with a range of 15 to 115 seconds ( $sd = \pm 14.5$ ,  $se = 4.17$ ; see Figure 1). Of the 14 dives, two were followed by the bird swallowing fish at the surface. In another incident, an individual bird was clearly seen to carry two fish, and in another, three fish. Both birds held these multiple catches crosswise in their bills until they flew with them just at dusk. I followed the birds with binoculars until both were out of sight. Although others have reported Marbled Murrelets with multiple catches (Savile 1972, Cody 1973), Simons (1980) and Carter and Sealy (1987) observed that mostly they transport only single fish.

In addition to the 14 timed dives, on one occasion I noted multiple, quickly repeated, shallow dives by two Marbled Murrelets within an area of one to two square meters. They swirled around just below the surface, each time coming up with a fish which flashed in the sunlight before being swallowed. Apparently, the two birds had located a school of prey just below the surface. Among actively diving birds, times spent on the surface between dives ranged from 5 to 30 seconds with a mean of 15 seconds. ( $n = 5$ ,  $sd = \pm 9.35$ ,  $se = 4.17$ , see Figure 2).

During other times of the day (morning and evening) during the summer months, pairs of murrelets spent 30 to 45 minutes on the surface without feeding. They remained within a few meters of each other, occasionally preening and stretching their wings. When actively diving, they were sometimes seen to become separated by a hundred meters or more, after which they immediately called and paddled toward each other. After reuniting, they momentarily billed, circled each other, stretched their wings, and settled to rest on the surface or dived again. When the pair was together on the surface, one murrelet always remained on the alert with the head held high.

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## LITERATURE CITED

- Bradstreet, M. S. W. 1982. Occurrence, habitat use and behavior of seabirds, marine mammals and arctic cod at the Pond Inlet ice edge. *Arctic* 35:28-40.
- Bradstreet, M. S. W., and Brown, R. G. B. 1985. Feeding ecology of the Atlantic Alcidae, in the Atlantic Alcidae (D. N. Nettleship and T. R. Birkhead, eds.), pp. 263-315. Academic Press, Orlando.
- Cody, M. L. 1973. Coexistence, coevolution and convergent evolution in seabird communities. *Ecology* 54:31-44.
- Carter, H. R., and Sealy, S. G. 1984. Marbled Murrelet mortality due to gill-net fishing in Barkley Sound, B. C., in *Marine Birds: Their Feeding Ecology and Commercial Fisheries Relationships* (D. N. Nettleship, G. A. Sanger, and P. F. Springer, eds.), pp. 212-220. Can. Wildlife Serv. Spec. Publ., Ottawa.
- Carter, H. R., and Sealy, S. G. 1987. Fish-holding behavior of Marbled Murrelets. *Wilson Bull.* 99:289-291.
- Drent, R. H. 1965. Breeding biology of the Pigeon Guillemot *Cephus columba*. *Ardea* 53:99-160.
- Piatt, J. F., and Nettleship, D. N. 1985. Diving depths of four alcids. *Auk* 102:293-297.

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- Savile, D. B. O. 1972. Evidence of tree nesting by the Marbled Murrelet in the Queen Charlotte Islands. *Can. Field- Nat.* 86:389-390.
- Scott, J. M. 1973. Resource allocations in four syntopic species of marine diving birds. Ph.D. Thesis, Oregon State University, Corvallis.
- Simons, T. R. 1980. Discovery of a ground-nesting Marbled Murrelet. *Condor* 82:1-9.

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Pigeon Guillemot and Marbled Murrelet

*Sketch by Narca Moore-Craig*