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LONG-DISTANCE VAGRANCY OF THE ASIATIC MARBLED MURRELET IN NORTH AMERICA, 1979–1989

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Long-distance vagrancy is common in seabirds, particularly among the petrels of the order Procellariiformes (Bourne 1967). Records of such vagrancy in the Alcidae also are numerous and have involved many species (e.g., Bent 1919, Grinnell 1938, Porsild 1943, Salomonsen 1944, Munyer 1965, Nero 1968, Sealy et al. 1971, Roberson 1980, Pitman et al. 1983). The nominate subspecies of the Marbled Murrelet (*Brachyramphus marmoratus marmoratus*) regularly occurs inland up to 75 km from the Pacific Ocean on the west coast of North America (Carter and Sealy 1986), but these occurrences represent normal use of its inland nesting areas. Long-distance vagrancy in this species was not detected until 1979, but, over the next 10 years, 10 specimens of the Asiatic subspecies (*B. m. perdix*) were taken and three other Marbled Murrelets were observed at widespread localities across North America. Four specimen records have been published (Jehl and Jehl 1981, Mumford 1982, Sealy et al. 1982, Hoffman and Woolfenden 1988). In this paper, we document six other inland occurrences of *B. m. perdix* and examine all records to attempt to explain the occurrence of these Asian birds in North America.

Table 1 Measurements (mm) and Body Mass of Asiatic Marbled Murrelets (*Brachyramphus marmoratus perdix*) from Inland North America, 1979–1986

Record No.	Location	Date found	Body mass (grams)	Exposed culmen	Bill height	Flattened wing	Tarsus	Tail
1	Quebec	Nov 79	285.9	21.9	6.7	148.5	18.5	32.6
2	California[a]	Aug 81	204	22.3	6.4	146.0	17.9	33.4
3	Indiana	Dec 81	303.8	20.3	6.2	138.0	17.3	32.1
4	Colorado	Aug 82	206	19.9	6.8	136.2	17.9	32.4
5	Massachusetts	Sep 82	184.2	21.2	6.5	142.8	18.1	35.0
6	California[a]	Jul 83	—	—	—	139.0	18.8	—
7	California[a]	Aug 83	198.3	19.9	6.4	144.1	16.4	33.0
8	California[a]	Aug 83	—	20.1	—	140.2	—	—
9	Alaska	Aug 83	—	21.4	6.2	139.5	16.6	—
10	Florida	Dec 86	199.4	21.6	6.7	147.3	18.5	37.7

[a]All birds were recovered at Mono Lake, Mono Co.

METHODS

The 10 specimens reported in this paper were examined and measured by Sealy. All but one were referred to the larger subspecies, *B. m. perdix*, because their exposed culmens exceeded 18 mm (Table 1); bills of *B. m. marmoratus* are shorter than this (Sealy et al. 1982). One specimen lacked its head and was identified as *B. m. perdix* on the basis of other measurements (see below). The specimens have been deposited in the following ornithological collections: Denver Museum of Natural History (DMNH); Museum of Vertebrate Zoology, University of California, Berkeley (MVZ); National Museum of Canada, Ottawa (NMC); San Diego Natural History Museum (SDNHM); University of Alaska Museum, Fairbanks (UAM); University of Michigan Museum of Zoology, Ann Arbor (UMMZ); University of South Florida, Tampa (USF); and United States National Museum, Washington, D.C. (USNM). Other details regarding the handling and subspecific identification of the specimens and the examination of comparative material have been given by Sealy et al. (1982).

ANNOTATED LIST OF RECORDS

Definite Records

1. An after-hatching-year (AHY; i.e., adult or subadult but not juvenile) male (NMC 69,845) in nearly complete basic plumage was shot on 11 November 1979 just north of Montreal, Quebec (David and Gosselin 1980, Sealy et al. 1982). It was molting extensively on the body, but its wing molt was nearly complete with the tenth primary only partly sheathed, and all of its secondaries were new.

Sealy et al. (1982) reported another specimen of *B. m. perdix* allegedly taken in Montreal, Quebec, on 13 April 1913, but we now consider this collecting locality an error. This specimen was originally reported as an Ancient Murrelet (*Synthliboramphus antiquus*), but without any details (Lewis 1924). Our efforts to track down this specimen, which allegedly was housed in the museum of Laval University, Quebec City, when Lewis (1924) examined it, led us to believe it to be a mounted specimen of *B. m. perdix* in the Musée du Petit Seminaire de Québec (MPSQ 603, Quebec City). However, M. Gosselin (in litt., 4 February 1983) pointed out to Sealy an editorial notice (Huard 1913) in which the alleged Ancient Murrelet from Montreal was originally documented and called "Mergule à gorge noire, Ancient Murrelet." According to Gosselin, the French name means "black-throated Dovekie (*Alle alle*)" suggesting an Ancient Murrelet, especially one taken in April when chins and throats are black even on yearling individuals (Sealy and Carter, unpubl. data). Contrarily, MPSQ 603 has a white throat. Gosselin further pointed out that other specimens of Marbled Murrelets are housed presently in MPSQ, and a mounted specimen of an Ancient Murrelet taken in Japan in 1915 is housed in the Musée du Seminaire de Sherbrooke. Thus, it seems probable that MPSQ 603 was also taken in Japan and not in Quebec.

2. An AHY male in complete alternate plumage (SDNHM 41,544) was found dead on 9 August 1981 on the shore of Mono Lake, Mono Co., California (Jehl and Jehl 1981).

3. An unsexed, AHY bird (USNM 582,506) in basic plumage with wing molt complete but body molt incomplete was found shot on 1 December 1981 on Lake Lemon, Monroe Co., Indiana (Mumford 1982, Peterjohn 1982a,b, Sealy et al. 1982).

4. On 22 August 1982, an AHY male (DMNH 37,691) in alternate plumage was found on a rural road about 8 km from Aspen, Pitkin Co., Colorado, and released on Hallam Lake in Aspen by T. Cardamone. The bird was dead the next day (see Kingery 1983). It lacked subcutaneous fat. Its remiges were old and worn, but the primary and secondary coverts were new, suggesting that the bird was a yearling.

5. An AHY female (ovary granular, 5 × 16 mm) in mostly alternate plumage (USNM 599,498) was taken possibly alive by a domestic cat on 17 September 1982 in swampland near Middleboro, Plymouth Co., Massachusetts (see Forster 1983). The bird was molting lightly on the chin, throat, back, and rump; all but three of its rectrices were gone. Primaries 1–3 were being replaced (still sheathed), primaries 4–6 were missing, and primaries 7–10 were old and extremely worn. The secondaries were worn and old. This is the normal primary molt sequence for Marbled Murrelets during the early stages of wing molt. This individual probably was flightless when found, suggesting that it had been in or near the area of its capture probably for at least one week.

6. On 29 July 1983, E. Strauss and W. D. Shuford found a decomposed, partially mummified, unsexed, and headless AHY murrelet (UMMZ 224,651) in alternate plumage (the remiges were worn) on the shore of Mono Lake, Mono Co., California. We tentatively identified this specimen as *B. m. perdix* by its very large tarsus and large flattened wing length (see Sealy et al. 1982).

7. On 2 August 1983, E. Strauss and M. Kozak found a recently dead AHY male (MVZ 169,134) in alternate plumage, with left testis 2.5 × 11.0 mm, on the shore of Mono Lake, Mono Co., California (see Figure 1). This emaciated individual's stomach was empty and its remiges were worn, but it was not molting.

8. An AHY bird in alternate plumage was found by W. D. Shuford on 6 August 1983 on the shore of Mono Lake, Mono Co., California. Its skull, wings (with worn remiges), and one leg were salvaged from the recently dead, unsexed specimen (UMMZ 224,652).

9. On 27 August 1983, G. S. Lester found a partial carcass of *B. m. perdix* (UAM 5,302) at Railroad Lake (63° 43' N, 148° 55' W) in Denali National Park, Alaska. The unsexed AHY bird was recently dead, in alternate plumage, not molting, and its remiges appeared to be only slightly worn.

10. An AHY female in essentially complete basic plumage was found dead on a beach on Honeymoon Island, Pinellas Co., Florida, on 27 December 1986 (Ogden 1987, Hoffman and Woolfenden 1988). It was emaciated and had died recently.

Probable Records

We presume that these birds belonged to the Asiatic subspecies, *B. m. perdix*, from the vast distance of these records from the Pacific Ocean. Not one specimen of the nominate subspecies *B. m. marmoratus* has been secured more than 75 km inland (Carter and Sealy 1986).

11. An unaged and presumably basic-plumaged Marbled Murrelet was observed alive at Lake Michigan between Long Beach and Michigan City, Indiana, on 2 December 1984 (Peterjohn 1985).

12. An AHY Marbled Murrelet in alternate plumage was observed alive on the Atlantic Ocean off Little Codroy River, Newfoundland, on 15 July 1989 (MacTavish 1989).

13. One Marbled Murrelet was observed alive at Cypress Lake, Saskatchewan, on 22 October 1989 (Koes and Taylor 1990).

EXPLANATION FOR VAGRANCY

Attempts to explain long-distance vagrancy such as that exhibited by murrelets are speculative. Most explanations link vagrancy to meteorological events, often unsuccessfully (Elkins 1983). Nevertheless, weather patterns have been invoked to explain several recent records of birds, many of Siberian origin, in North America and the Atlantic Ocean (e.g., Evens and LeValley 1981, Amos and Wingate 1983, Pyle et al. 1983, Wingate 1983).

Figure 1. Male Asiatic Marbled Murrelet (MVZ 169,134) found on 2 August 1983 on shore of Mono Lake, Mono Co., California.

The regular occurrences of Ancient Murrelets inland in North America since the 1880s have been associated with storms that moved inland from the Gulf of Alaska, mainly in late fall (Munyer 1965, Verbeek 1966, Sealy and Carter 1980). Similarly, long-distance vagrancy, including inland occurrences, of Dovekies has been associated with storms (Sprunt 1938) that moved inland from the Atlantic Ocean (Murphy and Vogt 1933, Snyder 1953). Considering inland records of vagrant petrels, tropicbirds, frigatebirds, and terns, Wingate and Watson (1974) suggested that seabirds "may occasionally soar to great heights and get blown far inland over continents, especially in overcast or stormy conditions." Nevertheless, these authors did not obtain a simple meteorological explanation of a record of the Pacific subspecies of the White Tern (*Gygis alba candida*) in Bermuda.

The 13 records of Asiatic Marbled Murrelets in North America fall into two periods, late July through early September and late October through December. The first period coincides with the early post-breeding period (Kuzyakin 1963, Sealy 1974, Sealy et al. 1982) when many birds are probably dispersing before becoming flightless during the prebasic molt (Sealy 1975, Carter 1984). Marbled Murrelets in Asia generally breed in regions that experience more severe winters than do murrelets in North America and tend to migrate south (Sealy et al. 1982). Vagrancy from July to September would account for the presence of birds in alternate plumage in Alaska, California, Colorado, and Newfoundland, as well as the Massachusetts individual that presumably started molting after it arrived in North America. However, some Marbled Murrelets molt at breeding areas before moving later in the fall (Carter 1984). Late fall birds (Quebec, Indiana, Florida, Saskatchewan) probably molted in Asia, shortly before their long journey. In fact, the Quebec and Indiana birds had not quite completed molting when recovered in North America.

Eastward trans-Pacific vagrancy may be tied to anomalous weather conditions at the time of southward migrations of Marbled Murrelets in Asia. Since 1976, the Aleutian–Gulf of Alaska Low pressure system has intensified during winter and was especially strong during the 1982–1983 El Niño–Southern Oscillation (Namias and Cayan 1984, Rasmusson 1984, McLain et al. 1985). This is part of the development of the Pacific–North American weather pattern in which the Aleutian–Gulf of Alaska Low pressure system extends from the western Bering Sea over western Alaska to much of the eastern North Pacific Ocean above the Tropic of Cancer (see Figure 2). These conditions favor strong westerly winds and associated storms that could carry individual murrelets to North America from their breeding range in Kamchatka and the Sea of Okhotsk (as summarized by Sealy et al. 1982).

While this mechanism for and timing of long-distance vagrancy may explain how Asiatic Marbled Murrelets arrived in North America, it does not explain fully why they were recorded only between 1979 and 1986. El Niño or other conditions that promote vagrancy may have prevailed earlier in the year than at other times in the past century and coincided with the southerly post-breeding dispersal of murrelets in Asia. Between April and August 1982, atmospheric anomalies at the equator in the western Pacific

began abruptly and were especially pronounced during the atypical 1982–1983 El Niño and probably were connected to weather anomalies farther north at this time (Philander 1983, Rasmusson and Wallace 1983, Harrison and Cane 1984, Rasmusson 1984). Between July and September 1982, two murrelets were found in North America. Typically, El Niño begins earlier in the year and in the eastern Pacific. The 1982–1983 El Niño began to decay in the western Pacific by May 1983 but was prolonged in the eastern Pacific, not ending until October 1983. But in July and August 1983, four more murrelets were found in North America. It appears that six *B. m. perdix* found in North America were temporally linked to this single El Niño. Changes in seabird distributions were also noted elsewhere in the Pacific during this El Niño; for instance, warm-water species moved farther

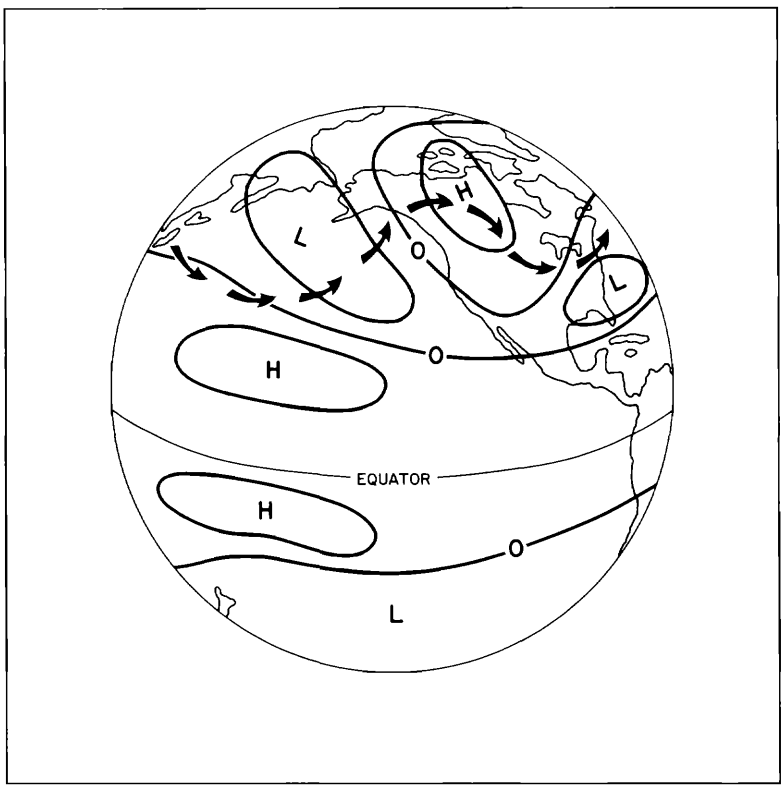

Figure 2. Anomalous pressure pattern in the upper troposphere during El Niño–Southern Oscillation conditions. Arrows indicate how streamlines for airflow in the upper atmosphere are affected. Anomalies in the upper troposphere reflect surface pressure anomalies (from Philander 1983).

north while cool-water species were less abundant in California waters and more abundant in central subarctic waters (Ainley et al. 1988).

Upon reaching North America, the birds could be carried inland by continued wind and storms, especially at higher elevations [see Vickery (1980) for records of hurricane-driven Sooty (*S. fuscata*) and Bridled (*S. anaethetus*) terns as far north as Maine and New Hampshire, respectively]. Once birds are inland, winds can swing them onto a northwest to southeast diagonal across northern North America from British Columbia to below the Great Lakes and then to the northeast at mid-continent (see Figure 2). This occurs as a continuation of the Pacific–North American weather pattern, driven by a high-pressure ridge over western Canada and a low-pressure ridge over the southeastern United States. Many records roughly fall on this general path. Similarly, inland occurrences of vagrant Ancient Murrelets also follow this pattern (Sealy and Carter 1980). During the fall of 1982, the continued movement of westerly winds and associated storms from the North Pacific and across the continent were especially evident and may have accounted for the Colorado and Massachusetts occurrences. Similar but less understood conditions in late fall, possibly in relation to changes in the Aleutian–Gulf of Alaska Low pressure system since 1976, may account for the far-inland birds in Quebec and Indiana in 1979 and 1981, respectively, and may be related to oceanic conditions that could have prompted more southerly movements of Marbled and Ancient murrelets along the west coast of North America during the winter of 1979–1980 (Garrett and Dunn 1981). McCaskie (1980) noted that the southernmost previous records of Marbled Murrelets were in 1886, 1910, and 1958. Each of these years corresponded to strong-to-moderate El Niño conditions in 1884–1887, 1911, and 1957–1959, respectively (Rasmusson 1984). The December 1986 Florida bird may have been associated with a weak El Niño earlier that year.

In conclusion, we believe that anamolous weather patterns since 1976, especially El Niño and changes in the Aleutian–Gulf of Alaska Low pressure system, provide a tentative explanation for long-distance vagrancy in the Asiatic Marbled Murrelet. Our examination of storm tracks associated with each vagrant's occurrence did not provide any more direct support for this explanation. Strong individual storm tracks rarely travel the entire distance from eastern Asia to western North America, let alone across North America (e.g., Wilson 1984). We presume that storm-driven vagrants could travel along several storm-track routes, modified by varying amounts of self propulsion.

SUMMARY

Ten specimens of the Asiatic Marbled Murrelet (*Brachyramphus marmoratus perdix*) and three other observations of probable Asiatic Marbled Murrelets were obtained at widely scattered locations across North America between 1979 and 1989. These occurrences were linked to anomalous weather patterns related to El Niño and the Aleutian–Gulf of Alaska Low pressure system, especially during the July 1982 to August 1983 El Niño period, for which there are six records for North America.

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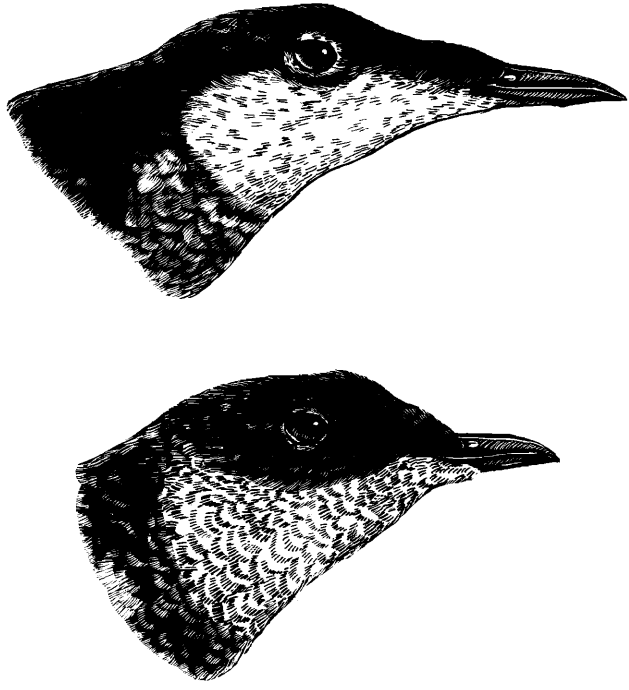

Two subspecies of the Marbled Murrelet (*Brachyramphus marmoratus*). Upper, Asiatic race, *B. m. perdix* (9 August 1981, Mono Lake, Mono County, California, San Diego Natural History Museum 41544). Lower, North American race, *B. m. marmoratus* (26 August 1933, Depoe Bay, Lincoln County, Oregon, SDNHM 21791). Note the difference in size and shape of the bill.

Sketch by Callie Mack