BREEDING RECORDS, INLAND DISTRIBUTION, AND THREATS OF THE MARBLED MURRELET IN WASHINGTON FROM 1905 TO 1987

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Abstract. We compiled all breeding records and inland sightings of Marbled Murrelets (*Brachyramphus marmoratus*) in Washington from 1905 to 1987 to determine the inland distribution of this species in the state and to evaluate threats to its population. Despite the widespread distribution of this species in coastal waters, there have been no nests, only one egg, three downy young, five fledglings, and eight inland observations of adults documented in the state. Most records were associated with old-growth forests. The harvest of the remaining low elevation old-growth coniferous forest may be the most serious threat to maintaining populations of the Marbled Murrelet in Washington. Other potential threats include mortality from oil spills, entanglement in gill nets, and loss of foraging areas to aquaculture and other marine developments.

Key words: Brachyramphus marmoratus; *breeding records; distribution; forest; Marbled Murrelet; seabird; Washington state.*

INTRODUCTION

The Marbled Murrelet (*Brachyramphus marmoratus*) occurs regularly and is widely distributed along the shorelines of Washington, yet little is known about its breeding status in the state. Nests have been difficult to find because Marbled Murrelets appear to nest solitarily in old-growth coniferous trees (or on the ground in parts of Alaska) along the coast up to 75 km inland and nests are visited by adults mainly at dusk, dawn, and during the night (Simons 1980; Sealy and Carter 1984; Carter and Sealy 1986, 1987). The nests of other seabird species in Washington have been inventoried completely over the last two decades and it has been apparent that Marbled Murrelets do not nest on island colonies with other species (Speich and Wahl 1989).

The intensified harvest of old-growth forests in coastal areas of the Pacific Northwest could pose a serious threat to Marbled Murrelet populations (Sealy and Carter 1984). In this paper, we compiled breeding records and inland sightings of adults and young in Washington from the first record in 1905 to 1987 to describe the inland distribution of the Marbled Murrelet in the state. Information was gathered from the literature, museum records, and interviews of people who found chicks or who observed adults at inland locations.

Breeding Records

Although at one time Marbled Murrelets were thought only to breed north of Washington (Dawson and Bowles 1909), researchers have long assumed that they nested in the state. Adults in breeding plumage and juveniles have been observed along the Washington coast during the breeding season (Bowles 1911, Bent 1919) and they are also abundant in winter (Jewett et al. 1953). In 1978–79, the breeding population in northern Puget Sound was estimated at approximately 2000 birds and the species was considered "widespread" in this area (Wahl et al. 1981). Speich et al. (this volume) estimated a summer (breeding season) population of approximately 4300 to 5000 birds for the state as a whole. These estimates have been projected from at-sea censuses because no confirmed nests have been located (Wahl et al. 1981).

An egg was found by E. Booth on 19 June 1925 in the office of a logging camp near Saxon on the South Fork of the Nooksack River (Anonymous 1927), 24 km inland from Puget Sound (Fig. 1). Booth was told that the egg (described by Kiff [1981]) was found laying on a bed of moss, with no nest apparent. Booth estimated that incubation was one third advanced. Kiff (1981) and Day et al. (1983) classified this record as a ground nest. However, there is not enough information

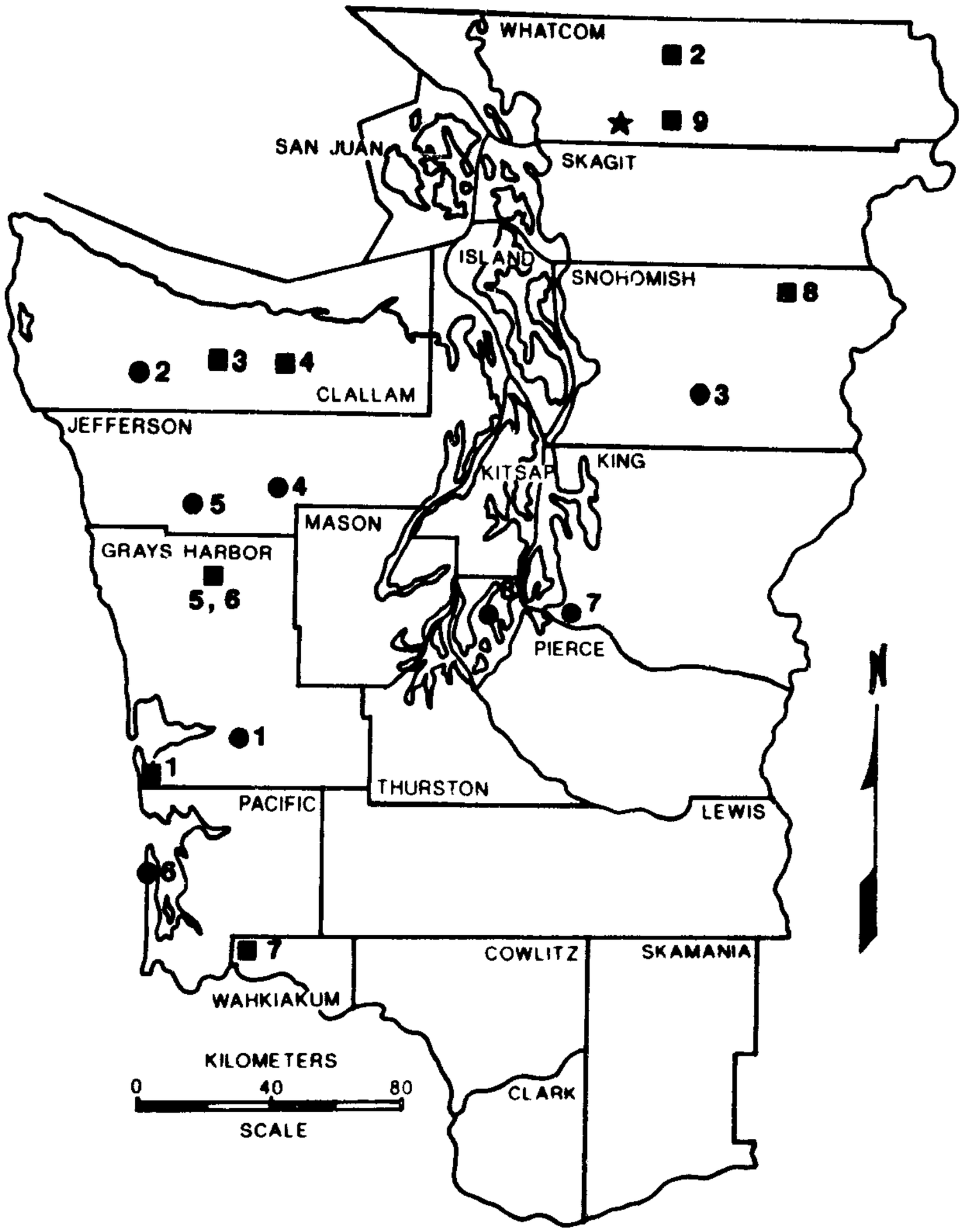

FIG. 1. Inland records of Marbled Murrelets in Washington, 1905–1987. Numbered records refer to observations of chicks (solid circles) and adults (solid squares) mentioned in the text. The star indicates where an egg was discovered (see text).

in the anonymous report to conclude if the egg was dropped by a female as the result of an accident or fell out of a tree (naturally or during timber harvest) rather than actually being in a ground nest.

Additional egg-laying information can be derived from examination of ovaries of birds collected at sea (Jewett et al. 1953). A female with a "full-sized" ova was obtained by Brown in Pierce County on 24 May 1914. Cantwell collected two females each containing two developing ova (probably one main ovum and one lesser ovum) and a female with one ovum at the mouth of the Columbia River from 10 to 18 May 1918. He concluded that specimens taken on and after 18 June had already nested because gonads had decreased in size compared to specimens taken earlier in the year. Specimens collected by Jewett in the Strait of Juan de Fuca on 25 May 1937 possessed bare incubation patches for both sexes.

Observations of juvenile birds at sea also are suggestive evidence of nesting. Bowles (1911) reported that immature birds appeared with adults in the vicinity of Fox Island in Puget Sound during June. Cantwell reported adults and young

near the Quillayute Needles on the Pacific coast on 20 July 1916 and Jewett reported juvenile birds near Whidbey Island in Puget Sound on 6 July 1940 (Jewett et al. 1953). A juvenile collected on 3 August 1950 in Davis Bay, Lopez Island (in the San Juan Islands) still had an egg tooth (McMannama 1950). Lewis (1987) and Lewis and Sharp (1987) observed juveniles in the San Juan Islands on 22-23 July 1986 and 6 July 1987. Juveniles have been observed at the south end of Lopez Island in July, 1985 and 1986 and around Cape Flattery in July, 1982 (L. Leschner and E. Cummins, pers. obs.).

Inland Records Of Marbled Murrelets

Although breeding adult and juvenile Marbled Murrelets occur regularly at sea, little firm documentation of nesting has been obtained in Washington since the egg was found by Booth (Anonymous 1927). Sixteen observations of adults ($n = 8$) and hatching-year birds ($n = 8$) at inland sites during the breeding season (April–September) provide further insight into the inland distribution and nesting habitat of this species (Sealy and Carter 1984; Carter and Sealy 1986, 1987). Observation locations are indicated in Figure 1.

Hatching-year birds

1. A downy chick was found on 7 August 1983 on the ground at the edge of a stand of about 8 ha of old-growth western hemlock (*Tsuga heterophylla*) and Douglas-fir (*Pseudotsuga menziesii*) near the town of Aberdeen in Grays Harbor County by D. Covey, and was given to E. Cummins for identification. The site on a steep slope 10 km from the east end of Grays Harbor, and 32 km from the Pacific, was an isolated stand of timber surrounded by clearcuts and young tree plantations. It appeared as an "island" when viewed from an airplane (E. Cummins, pers. obs.). The chick weighed 99g when found alive but died a few days later at the Seattle Aquarium. The dead chick was not prepared as a specimen.

2. A fully-feathered chick with some down on its head was found on 7 July 1982 on the ground along a road through old-growth western hemlock and silver fir (*Abies amabilis*) on Rugged Ridge, Clallam County (K. Hofnagel, pers. comm.). The site was a moderate to steep slope slightly down from the ridge line, 38 km inland from the Pacific. The chick was fed pieces of herring until all down was lost and then it was released in the Quillayute River.

3. A downy chick was found on the ground by loggers in July 1954 or 1955 on a ridge southwest of Spada Lake in the Sultan River basin, Snohomish County (F. Hosea, pers. comm.). The Sultan River Basin is located 40 km inland from Puget Sound and the area was forested with old-growth Douglas-fir before being clear cut in the 1950's. The chick was alive when found but died later. The dead chick was not prepared as a specimen.

4. A fledgling was found on 23 July 1986 on the North Fork of the Quinault River trail, Jefferson County, 55 km from the Pacific and 19 km northeast of Lake Quinault (B. Dalton pers. comm. to B. Moorehead). The site was a riparian area in a valley of deciduous trees within old-growth sitka spruce (*Picea sitchensis*)–western hemlock forest, 1.6 km from the trailhead where the trail descended and crossed the first dry channel of the river. The live chick was left on the trail.

5. A fledgling was found on a road by Matheny Creek in Jefferson County on 17 July 1981 (E. Lunberg, pers. comm.). Cummins examined photos of the chick and confirmed the identification. Cummins visited the site which was located in a stand of old-growth Douglas-fir–western hemlock–silver fir 29 km inland from the Pacific and 11 km northwest of Lake Quinault. The road parallels a creek in a narrow steep valley. Much of the immediate vicinity had been logged. The chick was released in Grays Harbor 2–3 days after capture.

6. A fledgling was caught by a dog near Loomis Creek, Ocean Park, Pacific County in the summer of 1979 (R. Widrig, pers. comm. to U. Wilson). The site was in a dense, brushy area of second-growth conifers surrounding freshwater sloughs behind sand dunes 1 km from the ocean. When captured, the bird appeared healthy and active. It was released into nearby Willipa Bay on the same day that it was found.

7. A fledgling with down on its head was found in a backyard 0.8 km from Puget Sound in Federal Way, King County on 7 August 1974 (T. Bock, pers. comm.). T. Bock presumed that the bird flew to the site as there was only a few trees in the relatively small yard. It was taken to a wildlife rehabilitator but died 3 days after capture (UWMZ #28571).

8. Colby (1972) found a fledgling on a tidal mudflat in a small lagoon near North Rosedale,

Pierce County on 24 July 1971. The bird had a prominent egg tooth that persisted for two weeks but no down. The chick died after 3 weeks in captivity (UPSM #28571).

Inland observations of adults

1. A bird with a brood patch was road-killed less than 1 km from the ocean on the highway between Westport and Grayland, Grays Harbor County, on 2 July 1935 (Balmer 1935). The specimen was not preserved in a museum.

2. Dawson heard Marbled Murrelets flying seaward at dawn on 11 May 1905 at Glacier on the North Fork of the Nooksack River, Whatcom County, approximately 45 km from salt water (Dawson and Bowles 1909). This is one of the earliest known records of Marbled Murrelets at an inland locality.

3. Adults were heard daily at dusk and dawn between Blackwood Creek and Mink Lake Drainage near the Soleduck Ranger Station, Clallam County, 11 June to 25 August 1979 and 1980 (M. McAllister, pers. comm.). The ranger station is 21 km from the Strait of Juan de Fuca.

4. Adults were heard at dawn and dusk from 1 June to 25 August 1979 and 1980 at Observation Point where Boulder Creek enters Lake Mills, Clallam County (M. McAllister, pers. comm.). Boulder Creek is 18 km from the Strait of Juan de Fuca.

5. Three adults were observed flying over Quinault Lake, Grays Harbor County, on 18 July 1964 (Boggs and Boggs 1964, Carter and Sealy 1986). The east end of Lake Quinault is 38 km from the Pacific Ocean.

6. S. Speich (pers. comm.) observed 42 Marbled Murrelets on 12 May 1984 from 1215 to 1530 PDT. The birds were diving and feeding 300–1000 feet offshore where the Quinault River enters the lake at its east end. This is one of the highest numbers of birds ever reported at a lake. Dawson and Bowles (1909) reported murrelets on Lake Washington in "winter." The importance of lakes to murrelets is unknown. However, lakes may provide access to tree-nesting habitat, provide a supplementary food source that may allow nesting farther inland, or may be used as an intermediate staging area (Carter and Sealy 1986).

7. Adults were heard in the summer of 1987 in Hendrickson Canyon, Wahkiakum County flying over a remnant stand of old-growth between 0500 and 0730 PDT (J. Atkinson, pers. comm.). This stand is surrounded by second-growth forest and plantations, 10 km from the mouth of the Columbia River and 23 km to the Pacific.

8. Larrison and Sonnenberg (1968) observed Marbled Murrelets flying up the Suiattle and Stillaguamish River valleys in the "late afternoon." Little data are available to further substantiate this observation. The confluence of the Suiattle River with the Sauk River is 64 km from Puget Sound.

9. Murrelets were heard on 29 July 1984 flying near Bell Creek north of its confluence with the South Fork Nooksack River, 43 km from Puget Sound (W. Weber, pers. comm.). Weber estimated that in the 30 minutes before sunrise he heard a total of 30 Marbled Murrelets calling as they flew west and southwest. Weber estimated from the vocalizations that the birds were flying 60 to 200 meters above the ground.

Threats To Marbled Murrelets

Like most seabirds, Marbled Murrelets have a low reproductive rate (Sealy 1974, Kiff 1981, Day et al. 1983). In addition, this species is one of the few alcids whose known and suspected nesting habitat is not protected by federal refuge designation (Sealy and Carter 1984).

Forestry developments

The importance of forests to Marbled Murrelets in Washington is demonstrated by the number of chicks found in the forest. Five of the eight hatching year birds including all of the downy chicks (records 1, 2, 3) were found in or on the edge of old-growth forests. The predominant forest types were Douglas-fir, western hemlock–silver fir, sitka spruce–hemlock and mixed Douglas-fir–hemlock–silver fir.

The harvest of the remaining low elevation old-growth forest nesting habitat is the greatest threat to the Marbled Murrelet in Washington. There is so little known about the inland distribution and nesting habitat requirements of the Marbled Murrelet in Washington that sufficient nesting habitat may not be provided by the old-growth habitat conservation areas for indicator species like the Spotted Owl (*Strix occidentalis*). Much research is needed to identify the distribution and habitat requirements of Marbled Murrelets in old-growth forests in Washington. It is essential to assess if the present old-growth conservation areas are sufficient to preserve any murrelet nesting habitat.

It is relatively well documented that actual old-

growth nesting habitat has been removed by logging and is being encroached upon in the state. Timber harvest has occurred in or around four of the five old-growth sites where chicks were found. The Aberdeen site (record 1) was managed by private industry and the area was clearcut in 1987. The U.S. Forest Service managed the land where records 2 and 5 occurred and timber harvest has occurred around the sites. The Sultan River Basin (record 3) chick was found by loggers during logging of the area. Ownership of the Sultan Basin location is unknown but most old-growth was clearcut in the 1950's and 1960's. The North Fork of the Quinault River site (record 4) is the only protected location, located within Olympic National Park. It is intriguing that several chicks were found adjacent to or during logging activities. Although we could presume their old-growth nest trees may have been logged, it may also be that the small remaining patches of old-growth do not provide adequate nesting habitat for successful nesting to occur. Further examination of old-growth patches is needed to search for murrelet nests and to document murrelet activities.

Fisheries developments

Marbled Murrelet entanglement in gill nets has been identified as a problem in some areas of British Columbia, Alaska, and California (Carter and Sealy 1984, Sealy and Carter 1984, Carter and Erickson 1988). They estimated that 7.8% of the potential fall population in the area was killed by gill nets in 1980. Gill net fishing is widespread in Puget Sound, but bird mortalities have not yet been monitored.

Mariculture structures (including salmon net pens, nori farms, and mussel rafts) in protected bays of northern Puget Sound have removed some nearshore foraging habitat both directly and indirectly. The effects of mariculture on Marbled Murrelets in Washington has not been investigated.

Pollution

Oil pollution is a significant threat to Marbled Murrelets (Wahl et al. 1981). However, few records of oiling are known in the state. Marbled Murrelets have been reported as oiled in Washington during the *Seagate* oil spill in 1956 (Richardson 1956) and during the *Arco Anchorage* oil spill in 1985 (E. Cummins, pers. obs.). Offshore oil development has been proposed along the Washington coast which could lead to greater numbers of oiled murrelets in the future. Other marine pollutants also may impact Marbled Murrelets as they have affected other seabirds in Puget Sound (Fry et al. 1987).

In summary, little is known about the inland distribution and breeding of the Marbled Murrelet in Washington. Given the multitude of threats to the species on land and at sea that could result in local extirpation, a major research effort is needed to obtain sufficient knowledge to plan for a viable population in the future.

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