Northwestern Naturalist Volume 76 Number 1, Pages 1–120 Spring 1995

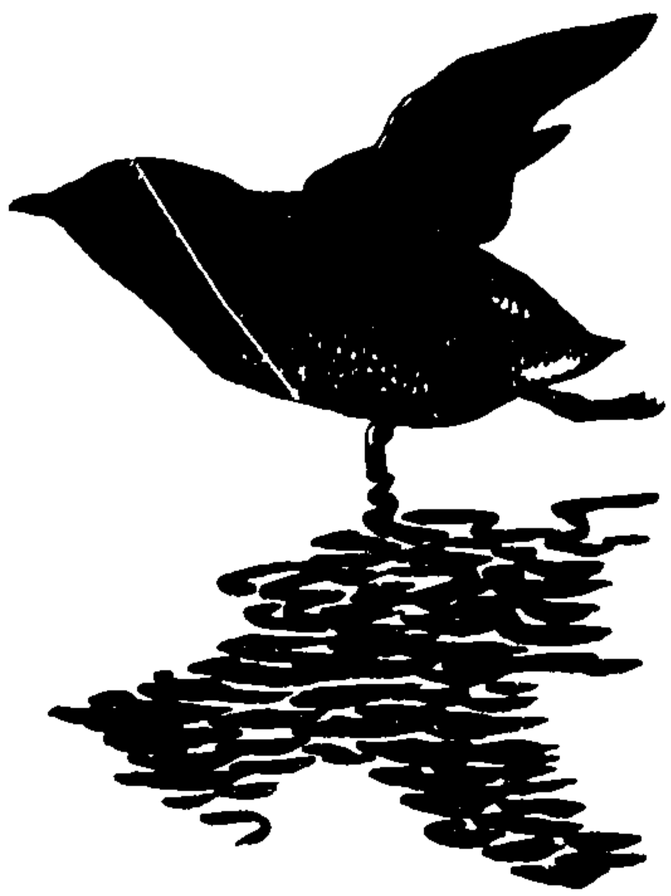
# Northwestern Naturalist

A JOURNAL OF VERTEBRATE BIOLOGY

VOLUME 76 NUMBER ONE SPRING 1995

SYMPOSIUM ISSUE

## BIOLOGY OF THE MARBLED MURRELET: INLAND AND AT SEA



EDITED BY:

S. KIM NELSON AND SPENCER G. SEALY

SPONSORED BY:

**Pacific Seabird Group**

DEDICATED TO THE STUDY AND CONSERVATION OF PACIFIC SEABIRDS AND THEIR ENVIRONMENT

# INTRODUCTION

S. KIM NELSON
*Oregon Cooperative Wildlife Research Unit, 104 Nash Hall, Oregon State University, Corvallis, OR 97331-3803, USA*

SPENCER G. SEALY
*Department of Zoology, University of Manitoba, Winnipeg, Manitoba, Canada R3T 2N2*

The marbled murrelet (*Brachyramphus marmoratus*) is a relatively small and uncommon member of the diving seabird family Alcidae. Although this species was first described by Gmelin in 1789, the first nest was not found in North America until 1959 (Day et al. 1983). Throughout most of their range, marbled murrelets nest in trees within older-aged coniferous forests, perhaps as far as 100 km inland (Hamer and Nelson 1995a). In Alaska, however, some individuals nest on the ground, primarily on rocky or talus slopes near the ocean (Simons 1980, Hir sch et al. 1981). As marbled murrelets are secretive and nest solitarily or in small groups in relatively inaccessible areas (Carter and Sealy 1986, Nelson and Peck 1995), our ability to acquire information on their demography, habitat associations, distribution, and relative abundance has been limited.

The Pacific Seabird Group (PSG) has been interested in the ecology and status of marbled murrelets since the mid-1970's when the first tree nest was discovered in North America (Binford et al. 1975) and Sealy (1974, 1975b) provided the first detailed information on this little-known species. Since then, PSG has taken a leading role in assembling researchers for the purpose of integrating research and sharing information on murrelets. To further this objective, PSG created the Marbled Murrelet Technical Committee (MMTC) in 1986. This committee orchestrated the first symposium on the status and conservation of marbled murrelets in North America, which was held in December, 1987 (Carter and Morrison 1992). The MMTC has also cooperated with government agencies in creating protocols for surveying murrelets in forests (*e.g.*, Paton et al. 1990) and emphasized the necessity of research on this species. These proceedings, from a symposium entitled "Biology of the Marbled Murrelet: Inland and At Sea" held at the annual meeting of the PSG in Seattle, Washington, on 10 February 1993, represent the continued efforts of the MMTC to provide more information on the biology of this threatened seabird.

Since the publication of the proceedings of the last symposium on marbled murrelets (Carter and Morrison 1992), much needed information on murrelet habitat associations, abundance and distribution at sea, and nest-site characteristics has been amassed. In addition, techniques for surveying and monitoring murrelets have been developed and refined.

Information on marbled murrelet habitat associations previously was based on historical and anecdotal information such as the presence of birds flying below the forest canopy or the discovery of eggshells and chicks on the ground (Carter and Morrison 1992). More specific information on forest structure and habitat attributes important to murrelets is now available. Papers in this volume by Dillingham et al., Kuletz et al., and Marks et al. summarize data on murrelet habitat associations from intensive surveys in a variety of forest types in Alaska and Oregon. Results from these studies indicate that murrelets are associated with forests that contain large conifer trees, moss and an abundance of nesting platforms. In addition, murrelet distribution may be limited in areas without suitable branch structure and where stand microclimate (*i.e.*, temperature) prevents bryophyte formation. This information on murrelet habitat associations will help management planning, for example, in the development of Habitat Conservation Plans.

Before 1989, fewer than 15 murrelet tree and ground nests had been found (Day et al. 1983, Carter and Sealy 1986), yet today, more than 65

tree and 18 ground nests have been located in North America (Singer et al. 1991; Hamer and Nelson 1995a; K. J. Kuletz, pers. comm.; see below). The characteristics of 24 of these tree nests from Alaska, British Columbia and California are presented here in papers by Jordan and Hughes, Kerns and Miller, Manley and Kelson, Naslund et al., and Singer et al. Results from these studies indicate that murrelets nest in the largest and tallest conifer trees in the forest, including old-growth (>200 cm dbh south of Alaska; >30 cm dbh in Alaska) Sitka spruce (*Picea sitchensis*), western hemlock (*Tsuga heterophylla*), mountain hemlock (*T. mertensiana*) and coast redwood (*Sequoia sempervirens*) trees. Nest limbs are large moss-covered platforms that are protected by foliage from the tree crown. Canopy cover in the area immediately surrounding the nest tree is often low, which permits access to nest platforms. However, many nests were unsuccessful, therefore conclusions about quality of nest-site characteristics need further study. Data on nest-tree and nest-site characteristics should help land managers to identify suitable nesting habitat, even in areas where no nests have been located.

Limited information was available before 1991 on the behavior of adult and nestling murrelets at nests; nesting behavior has been summarized at only 4 murrelet nests in North America (Simons 1980, Hirsch et al. 1981, Singer et al. 1991). In this volume, intensive studies by Nelson and Peck in Oregon and Singer et al. in California present detailed information on murrelet behavior at 12 nests. These studies reveal that murrelets use consistent, below-canopy flight paths when flying to and from their nests at dawn and dusk, and that activity at nests is affected by weather patterns (occurs later on cloudy compared to clear days). Nestlings are fed up to 5 times daily and were observed fledging alone at dusk. In addition, visits to the nest by adults are usually unelaborate and quiet; this secretive behavior may help to limit predation, although nest predation frequencies were high in these studies. Murrelets re-used 3 nest trees in successive years indicating some level of site fidelity. The information on murrelet behavior at or near nests, and activity patterns in nesting stands will aid in the modification of future survey protocols and in development of methods for locating additional tree nests.

Population sizes of marbled murrelets have been estimated from at-sea surveys and anecdotal sightings throughout the range (Sealy and Carter 1984, Carter and Erickson 1992, Mendenhall 1992, Nelson et al. 1992, Rodway et al. 1992, Piatt and Ford 1993, Speich et al. 1992). However, estimates of murrelet abundance from many areas were based on limited surveys or they lacked information on population distribution, status, habitat associations, or population demography. In this volume, Kelson et al. and Strong present estimates of murrelet populations from detailed surveys off the west coast of Vancouver Island and Oregon, respectively. Strong suggests that murrelets are more numerous off Oregon than previously estimated (not a population increase, but better survey data), whereas Kelson et al., comparing their estimates to those of Sealy and Carter (1984), suggest that murrelet numbers had declined by 40% over a 10-yr period in Clayoquot Sound, British Columbia. Anderson and Beissinger summarize preliminary information on ratios of adults to juveniles in Auke Bay, southeast Alaska. They suggest that juveniles, although uncommon in their study, use marine habitat differently than adults; juveniles were located closer to shore than adults. Rodway et al. demonstrate the variability in abundance of murrelets at sea over the breeding season in 2 inlets in the Queen Charlotte Islands, British Columbia, and suggest that murrelets in this area may travel long distances to feed, thus their distribution at sea may not reflect or parallel the distribution of their nesting sites.

Marbled murrelets are difficult to study. Researchers continually look for ways to facilitate and improve techniques for studying their biology. New or refined methods for monitoring or capturing murrelets are presented here. Burns et al. tested 2 mist-net systems for capturing murrelets in shallow and deep water in British Columbia. Using both techniques, murrelets were successfully captured over the water. Hamer et al. used X-band radar to monitor murrelet flight in coastal and inland sites in California. They demonstrate that radar may prove useful for monitoring the speed and direction of murrelet flight patterns and behavior at inland sites during the day or night. Using boats to survey murrelets in coastal forests of Prince William Sound, Alaska, Marks et al. found that murrelets were detected as success-

fully in boat-based surveys as with the traditional land-based surveys. These new and refined techniques should be useful in designing and implementing future research projects.

After many years of searching in vain for nests of marbled murrelets along the coast of British Columbia, Guiguet (1956) described them as the "enigma of the Pacific". In the 1990's, marbled murrelets finally are beginning to reveal some of their secrets. Nevertheless, efforts to understand this elusive seabird have only just begun; perhaps now more than ever before, information about their nesting ecology, life history and population viability are needed to implement conservation and management strategies in a timely manner. The marbled murrelet was recently Federally listed as a threatened species in Washington, Oregon and California (U.S. Fish and Wildlife Service 1992), endangered by the State of California (California Fish and Game Commission 1992), and threatened by the State of Washington (Washington Administrative Code 232-12-011; 1993), the Province of British Columbia (Rodway 1990), and the State of Oregon (Oregon Administrative Rule 635-100-125; 1995). The almost range-wide listing of the marbled murrelet exemplifies the importance of accurate, complete information on this seabird.

## ACKNOWLEDGMENTS

We appreciate the assistance, cooperation and support of many people and organizations in preparing this symposium and publishing the proceedings. We thank the authors of each paper for contributing to the symposium, and their patience throughout the editing and publication process. We sincerely appreciate the guidance and support from S. Corn, editor of *Northwestern Naturalist*, and for his patience while the manuscripts were being completed. We are grateful to P. Sekora, former Chair of PSG, and H. Carter for their support and encouragement in the development and implementation of this symposium. Thanks also to the 1993 and 1994 PSG Executive Councils, and the Marbled Murrelet Technical Committee for substantial help throughout the process, and to G. Divoky and J. Piatt, former Chairs of PSG, for helping to secure funding. Financial and logistical support for this symposium were provided by the Pacific Seabird Group, U.S. Fish and Wildlife Service, National Biological Service, Oregon State University, U.S. Forest Service (Siskiyou National Forest), and the Pacific Lumber Company. Finally, each paper was reviewed by at least 3 referees, the editor of *Northwestern Naturalist*, and us. We thank the following reviewers for helping to assure that the papers in these proceedings are of high quality: S.Beissinger, T. Birkhead, K. Briggs, M. de L. Brooke, R. Brown, A. Burger, G. Byrd, R. Day, T. Hamer, M. Harris, K. Hobson, J. Hughes, M. Huff, G. Hunt, Jr., P. James, R. Jarvis, G. Kaiser, K. Kuletz, R. Mannan, D. Manuwal, V. Mendenhall, S. Miller, M. Myres, P. Paton, C. Pennycuick, D. Perry, J. Piatt, S. Quinlan, M. Raphael, T. Reimchen, M. Rodway, G. Sanger, J. Scott, S. Singer, D. Schneider, N. Verbeek, T. Wahl, T. Williams, and M. Willson.