

**STATUS AND CONSERVATION OF THE
MARBLED MURRELET IN NORTH AMERICA**

HARRY R. CARTER AND MICHAEL L. MORRISON
Editors



**PROCEEDINGS OF THE
WESTERN FOUNDATION OF VERTEBRATE ZOOLOGY**

VOLUME 5 NUMBER 1 OCTOBER 1992

Publication costs were financed by
**PACIFIC SEABIRD GROUP
THE UNITED STATES FISH AND WILDLIFE SERVICE
THE WESTERN FOUNDATION OF VERTEBRATE ZOOLOGY
WASHINGTON DEPARTMENT OF WILDLIFE
(NONGAME PROGRAM)**

STATUS AND CONSERVATION OF THE MARBLED MURRELET IN NORTH AMERICA

HARRY R. CARTER AND MICHAEL L. MORRISON
Editors

VOLUME 5 NUMBER 1 OCTOBER 1992

Proceedings of a symposium held at the annual meeting of the
Pacific Seabird Group, 16–20 December 1987,
in Pacific Grove, California

WESTERN FOUNDATION OF VERTEBRATE ZOOLOGY

439 CALLE SAN PABLO • (805) 388-9944 • CAMARILLO, CALIFORNIA 93010

BOARD OF DIRECTORS

**ED N. HARRISON, PRESIDENT
GLENN HIATT
DR. ROBERT W. RISEBROUGH**

ADVISORY BOARD

**DR. DEAN AMADON
DR. CRAIG C. BLACK
DR. JAMES F. CLEMENTS
DR. DANIEL M. COHEN
A. S. GLIKBARG
DR. JOSEPH J. HICKEY**

**DR. THOMAS R. HOWELL
DR. JOE T. MARSHALL
DR. ROBERT T. ORR
DR. DAVID F. PARMELEE
THOMAS W. SEFTON
DR. F. GARY STILES**

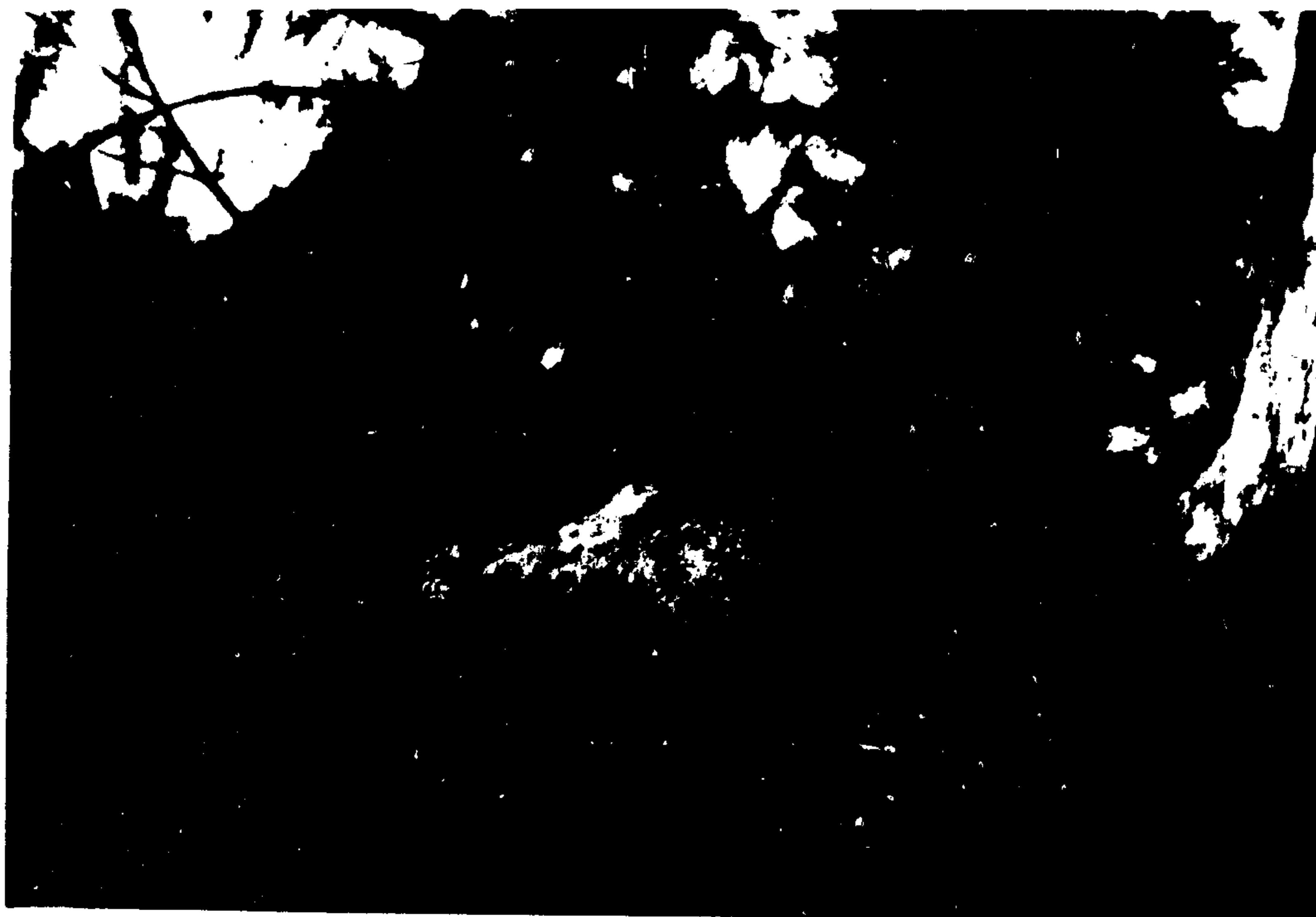
JOHN G. WILLIAMS

**DIRECTOR
LLOYD F. KIFF**

**RESEARCH DIRECTOR
DR. MICHAEL L. MORRISON**

**EDITOR
DR. JAMES W. WILEY**

**A NON-PROFIT CORPORATION DEDICATED TO RESEARCH, PUBLICATION
AND CONSERVATION IN ORNITHOLOGY**



Top: Adult Marbled Murrelet at nest site no. 1 in an old-growth western hemlock (*Tsuga heterophylla*) at Naked Island, Prince William Sound, Alaska, 13 June 1991 (Kuletz, Naslund, Marks, and Cody, unpubl. data). Photo by Nancy Naslund.

Bottom: Adult Marbled Murrelet at the Waddell Creek nest site in an old-growth Douglas-fir (*Pseudotsuga menziesii*) at Big Basin Redwoods State Park, Santa Cruz County, California, 28 June 1989 (Singer et al. 1991; Naslund, unpubl. data). Photo by Robert Burton.

CONTENTS

Introduction	H. R. Carter	1
Distribution, breeding records, and conservation problems of the Marbled Murrelet in Alaska	V. M. Mendenhall	5
Status of the Marbled Murrelet in British Columbia	M. S. Rodway, H. R. Carter, S. G. Sealy, and R. W. Campbell	17
Breeding records, inland distribution, and threats of the Marbled Murrelet in Washington from 1905 to 1987	L. L. Leschner and E. B. Cummins	42
The numbers of Marbled Murrelets in Washington marine waters	S. M. Speich, T. R. Wahl, and D. A. Manuwal	48
The Marbled Murrelet in Oregon, 1899-1987	S. K. Nelson, M. L. C. McAllister, M. A. Stern, D. H. Varoujean, and J. M. Scott	61
Status and conservation of the Marbled Murrelet in California, 1892-1987	H. R. Carter and R. A. Erickson	92
Use of an inland site in northwestern California by Marbled Murrelets	P. W. C. Paton, C. J. Ralph, and R. A. Erickson	109
Techniques for capture and radio tagging of Marbled Murrelets	S. E. Quinlan and J. H. Hughes	117
Marbled Murrelet Bibliography	S. M. Speich (compiler)	122

INTRODUCTION

HARRY R. CARTER

U.S. Fish and Wildlife Service, Northern Prairie Wildlife Research Center
6924 Tremont Road, Dixon, California 95620

Most of the papers in this volume were presented at a special paper session titled *Status of Marbled Murrelet on the Pacific Coast* held at the annual meeting of the Pacific Seabird Group (PSG) in Pacific Grove, California, 16–20 December 1987. Plans for this session were developed during the first PSG workshop on Marbled Murrelets (*Brachyramphus marmoratus*) organized by Lora Leschner at the annual meeting of PSG in La Paz, Mexico, in December 1986. At the workshop, conservation problems that face Marbled Murrelets were discussed: dwindling nesting habitat due to the long-term and continuing removal of coastal old-growth forests, and mortality in coastal gill-net fisheries and due to oil pollution. These problems had been highlighted earlier for the species in British Columbia in papers presented at a symposium titled *Marine birds: their feeding biology and commercial fisheries relationships* held at the PSG annual meeting in Seattle, Washington, in January 1981 (Carter and Sealy 1984) and at a symposium titled *Status and conservation of the world's seabirds* held by the International Council for Bird Preservation in Cambridge, England, in August 1982 (Sealy and Carter 1984).

Participants of the 1986 PSG workshop identified the need to collate and make available all existing information on the status of Marbled Murrelets and identify conservation problems in each geographic region along the west coast. Thus, papers were solicited from researchers or managers in each coastal state and province. Authors were asked to focus on nesting records, nesting areas, population size, at-sea distribution, inland records, and conservation problems. Other papers pertaining to aspects of the little-known biology of murrelets were also included. The goal was to summarize knowledge on the species up to at least December 1987. The response by authors was remarkable and the need to publish the papers was emphasized after the symposium. The first paper was submitted in August 1988. However, most papers were not submitted until well into 1989 and Rodway et al. (1992) was not added until 1990, after Rodway (1990) was completed. Each paper was reviewed by at least 2

referees, the editors, and 2 other reviewers of the entire volume.

Even though conservation problems were similar between geographic areas, separate papers for Alaska, British Columbia, Washington, Oregon, and California were considered to be the most effective form of presentation:

Mendenhall (1992) used at-sea observations to indicate that the Alaskan population of roughly 250,000 birds (the bulk of the North American population) was centered in southcentral and southeastern parts of the state but extended into Bristol Bay and along the Aleutian Islands. Few inland observations had been made in Alaska but nests had been found on the ground on islands, on the ground or in cavities in subalpine areas, and in old-growth trees. Conservation problems included loss of old-growth forests and mortality in gill nets and from oil pollution (especially the 1989 *Exxon Valdez* oil spill).

Rodway et al. (1992) used an extensive set of at-sea and inland observations to indicate that while murrelets occur throughout most of the British Columbia coast, numbers were highest on the west coast of Vancouver Island. They roughly estimated about 45,000–50,000 birds for the province. They also noted a movement of birds from exposed outer coasts to sheltered inner waters such as the Straits of Georgia in winter. Although no nests had been found (prior to 1990), a multitude of inland records suggested nesting in old-growth forests. Conservation problems included loss of old-growth forests and mortality from gill nets and oil pollution.

Leschner and Cummins (1992) collated the few inland observations of murrelets in Washington from 1905–1987. No nests had been found (prior to 1990), but inland records suggested nesting in old-growth forests. Loss of old-growth forests was the greatest conservation problem in the state although records of oiling had been recorded.

Speich et al. (1992) used at-sea transects and other observations from 1971–1985 to estimate about 5,000 murrelets along the coasts of Washington. Summer and winter populations were centered in northern Puget Sound. Larger numbers in winter may reflect immigration of win-

tering birds from British Columbia. This paper was one of the first attempts to document and quantify the numbers of murrelets over such a large area using largely standardized techniques.

Nelson et al. (1992) used at-sea and inland observations from 1899–1987 to describe a small population of 2000–4000 birds located along the central Oregon coast. No nests had been found (prior to 1988) but a series of inland records suggested nesting in old-growth forests. Loss of old-growth forests was the primary conservation problem in Oregon.

Carter and Erickson (1992) used at-sea and inland observations from 1892–1987 to describe two small populations in California. The northern California population (about 1400–1700 birds) was located between the Oregon border and Eureka. The central California population (about 200–300 birds) was found between San Francisco and Santa Cruz and represented the southernmost population in North America. One nest was found in an old-growth tree and many inland observations (prior to 1988) indicated nesting in old-growth forests. Conservation problems included loss of old-growth forests and mortality from gill nets and oil pollution.

Paton et al. (1992) used a series of inland observations from 1985–1988 to describe patterns of use of an old-growth forest site in northwestern California. They showed a strong association of murrelet activity with old-growth forest habitat. This study was one of the first to attempt to specifically describe the inland activities and behavior of murrelets.

Quinlan and Hughes (1992) described various techniques used for the capture and radiotagging of murrelets in southeastern Alaska. This was the first, successful study of its kind on murrelets that resulted in the discovery of a radiotagged bird on a nest in an old-growth tree (Quinlan and Hughes 1990).

Speich (1992) compiled citations provided by various researchers to create the first Marbled Murrelet Bibliography. This compilation will aid researchers and others interested in the species to identify and locate past literature which is quite scattered and at times obscure.

Partly as a result of the December 1987 PSG symposium, a large research effort on Marbled Murrelets, both at sea and in coastal forests, has developed throughout its North American range. Almost all research is now coordinated through the PSG Marbled Murrelet Technical Committee (Current Chair, S. Kim Nelson; Past Chair, Lora L. Leschner). Earlier studies involving at-

sea transects and surveys (to examine distribution, population size, and foraging behavior), diet, and telemetry in British Columbia and Alaska (Sealy 1975a, b; Carter 1984; Sealy and Carter 1984; Sanger 1987; Carter and Sealy 1990; Quinlan and Hughes 1990) provided the stepping stones for developing new efforts at sea since 1987.

Not until the early 1980s did researchers come to the realization that it was possible to directly survey for murrelet activity in coastal forests (Eisenhower and Reimchen 1990, Carter and Erickson 1992, Paton et al. 1992, Nelson et al. 1992). Most recent forest-based research has been focused in this direction and survey protocols have been developed (Paton et al. 1990). However, ground-search techniques to find nests in forests also have been successfully developed. Prior to 1987, less than 15 nests of the Marbled Murrelet had been found (Day et al. 1983, Carter and Sealy 1986). Yet, six nests were discovered in old-growth trees in North America in 1989 and 1990 (Singer et al. 1991; Ewins et al., in press) and 13 more nests in old-growth trees have been reported in 1991 (S. K. Nelson, pers. comm.).

Further impetus was given to research in the United States in January 1988 when the National Audubon Society petitioned the U.S. Fish and Wildlife Service to list the Marbled Murrelet as a threatened species in California, Oregon, and Washington (Marshall 1988). In fact, much of the information used in Marshall's report was derived from papers given at the 1987 PSG symposium which are published in this volume. State petitions for listing have also been filed. In addition, several law suits have been filed, attempting to defer logging in old-growth forests where murrelets are known or suspected to nest. In 1990, the Marbled Murrelet was classified as a threatened species in Canada. In 1991, the species was classified as an endangered species by the state of California.

The distribution and nesting habits of the Marbled Murrelet are now much better known than in 1987 and our knowledge continues to change rapidly. To date, new information has strengthened the original assertion that Marbled Murrelets nest only in old-growth forests in most of their North American range (Sealy and Carter 1984, Carter and Sealy 1987), heightening concern for the long-term survival of the species. The 1989 *Exxon Valdez* oil spill, for the first time, brought home the specter of serious mortality from oil pollution in the heart of the world's

population of the species in southern Alaska (Piatt et al. 1990). It is now more important than ever to examine closely the historical information to make available all pertinent knowledge on the distribution and biology of the Marbled Murrelet. Decisions that affect the future of old-growth forests, gill-net fisheries, and oil development and transportation will be made soon, before biologists have conducted most of the research necessary to unfold many of the secrets of this elusive seabird. Gaps in our overall knowledge of Marbled Murrelets and for various geographical areas need to be addressed by interpreting our best available data. The literature and other unpublished observations have served to provide many of the clues needed to develop our original understanding that Marbled Murrelets nest in old-growth forests often far from the coast (reviewed in Sealy and Carter 1984; Carter and Sealy 1986, 1987). Certainly, the several years required to publish this set of papers will not affect the timeless value of this information which has accumulated over the past century. The importance of this volume to murrelet research and conservation is clear.

While the impetus for this volume evolved from a great idea at a round table discussion, few anticipated the work and length of time required to see it through to publication. The completion of this project would not have been possible without the extensive final editing efforts of Michael L. Morrison nor without the encouragement, assistance, and prodding of Spencer G. Sealy and Steven M. Speich. The entire series of papers were much improved by the overall reviews of David N. Nettleship and Spencer G. Sealy. Finally, I thank the authors and reviewers of each paper for contributing to this symposium and for their patience throughout the publication process. Financial support for this proceedings was received from the Western Foundation of Vertebrate Zoology, Pacific Seabird Group, U.S. Fish and Wildlife Service, and Washington Department of Wildlife.

LITERATURE CITED

- Carter, H. R. 1984. At-sea biology of the Marbled Murrelet (*Brachyramphus marmoratus*) in Barkley Sound, British Columbia. Master of Science Thesis, University of Manitoba, Winnipeg, Manitoba.
- Carter, H. R., and R. A. Erickson. 1992. Status and conservation of the Marbled Murrelet in California, 1892-1987. In H. R. Carter and M. L. Morrison (editors). Status and conservation of the Marbled Murrelet in North America. Proceedings of the Western Foundation of Vertebrate Zoology 5:92-108.
- Carter, H. R., and S. G. Sealy. 1984. Marbled Murrelet mortality due to gill-net fishing in Barkley Sound, British Columbia. Pages 212-220 in D. N. Nettleship, G. A. Sanger, and P. F. Springer (editors). Marine birds: their feeding ecology and commercial fisheries relationships. Canadian Wildlife Service Special Publication.
- Carter, H. R., and S. G. Sealy. 1986. Year-round use of coastal lakes by Marbled Murrelets. Condor 88: 473-477.
- Carter, H. R., and S. G. Sealy. 1987. Inland records of downy young and fledgling Marbled Murrelets. Murrelet 68:58-63.
- Carter, H. R., and S. G. Sealy. 1990. Daily foraging behavior of Marbled Murrelets. Pages 93-102 in S. G. Sealy (editor). Auks at sea. Studies in Avian Biology No. 14.
- Day, R. H., K. L. Oakley, and D. R. Barnard. 1983. Nest sites and eggs of Kittlitz's and Marbled murrelets. Condor 85:265-273.
- Eisenhower, A. E., and T. E. Reimchen. 1990. Inland flight patterns of Marbled Murrelets, *Brachyramphus marmoratus*, on the Queen Charlotte Islands, British Columbia. Canadian Field-Naturalist 104: 439-444.
- Ewins, P. J., H. R. Carter, and Y. Shibaev. In press. The status, distribution and ecology of inshore fish-feeding alcids (*Cepphus guillemots* and *Brachyramphus murrelets*) in the North Pacific. In K. Vermeer (editor). Status, ecology and conservation of marine birds in the North Pacific. Canadian Wildlife Service Special Publication.
- Leschner, L. L., and E. B. Cummins. 1992. Breeding records, inland distribution and threats of the Marbled Murrelet in Washington from 1905 to 1987. In H. R. Carter and M. L. Morrison (editors). Status and conservation of the Marbled Murrelet in North America. Proceedings of the Western Foundation of Vertebrate Zoology 5:42-47.
- Marshall, D. B. 1988. Status of the Marbled Murrelet in North America: with special emphasis on populations in California, Oregon, and Washington. United States Department of Interior, Fish and Wildlife Service, Biological Report 88(30).
- Mendenhall, V. M. 1992. Distribution, breeding records and conservation problems of the Marbled Murrelet in Alaska. In H. R. Carter and M. L. Morrison (editors). Status and conservation of the Marbled Murrelet in North America. Proceedings of the Western Foundation of Vertebrate Zoology 5:5-16.
- Nelson, S. K., M. L. C. McAllister, M. A. Stern, D. H. Varoujean and J. M. Scott. 1992. The Marbled Murrelet in Oregon, 1899-1987. In H. R. Carter and M. L. Morrison (editors). Status and conservation of the Marbled Murrelet in North America. Proceedings of the Western Foundation of Vertebrate Zoology 5:61-91.
- Paton, P. W. C., C. J. Ralph, H. R. Carter, and S. K. Nelson. 1990. Surveying Marbled Murrelets at inland forested sites: a guide. United States Forest Service, Pacific Southwest Research Station, Arcata, California.
- Paton, P. W. C., C. J. Ralph and R. A. Erickson. 1992. Use of an inland site in northwestern California by Marbled Murrelets. In H. R. Carter and M. L. Morrison (editors). Status and conservation of the Marbled Murrelet in North America. Proceedings of the

- Western Foundation of Vertebrate Zoology 5:109-116.
- Piatt, J. F., C. J. Lensink, M. Butler, M. Kendziorek, and D. Nysewander. 1990. Immediate impact of the *Exxon Valdez* oil spill on marine birds. *Auk* 107: 387-397.
- Quinlan, S. E., and J. H. Hughes. 1990. Location and description of a Marbled Murrelet tree nest site in Alaska. *Condor* 92:1068-1073.
- Quinlan, S. E., and J. H. Hughes. 1992. Techniques for capture and radio tagging of Marbled Murrelets. In H. R. Carter and M. L. Morrison (editors). Status and conservation of the Marbled Murrelet in North America. Proceedings of the Western Foundation of Vertebrate Zoology 5:117-121.
- Rodway, M. S. 1990. Status report on the Marbled Murrelet, *Brachyramphus marmoratus*, in Canada. Unpublished report, MacMillan Bloedel Limited and British Columbia Ministry of Environment, Victoria, British Columbia.
- Rodway, M. S., H. R. Carter, S. G. Sealy and R. W. Campbell. 1992. Status of the Marbled Murrelet in British Columbia. In H. R. Carter and M. L. Morrison (editors). Status and conservation of the Marbled Murrelet in North America. Proceedings of the Western Foundation of Vertebrate Zoology 5:17-41.
- Sanger, G. A. 1987. Winter diets of Common Murres and Marbled Murrelets in Kachemak Bay, Alaska. *Condor* 89:426-430.
- Sealy, S. G. 1975a. Aspects of the breeding biology of the Marbled Murrelet in British Columbia. *Bird-banding* 46:141-154.
- Sealy, S. G. 1975b. Feeding ecology of Ancient and Marbled Murrelets near Langara Island, British Columbia. *Canadian Journal of Zoology* 53:418-433.
- Sealy, S. G., and H. R. Carter. 1984. At-sea distribution and nesting habitat of the Marbled Murrelet in British Columbia: problems in the conservation of a solitarily-nesting seabird. Pages 737-756 in J. P. Croxall, P. G. H. Evans, and R. Schreiber (editors). Status and conservation of the world's seabirds. International Council of Bird Preservation Technical Publication No. 2.
- Singer, S. W., N. L. Naslund, S. A. Singer, and C. J. Ralph. 1991. Discovery and observations of two tree nests of the Marbled Murrelet. *Condor* 93:330-339.
- Speich, S. M. (compiler). 1992. Marbled Murrelet Bibliography. In H. R. Carter and M. L. Morrison (editors). Status and conservation of the Marbled Murrelet in North America. Proceedings of the Western Foundation of Vertebrate Zoology 5:122-133.
- Speich, S. M., T. R. Wahl, and D. A. Manuwal. 1992. The numbers of Marbled Murrelets in Washington marine waters. In H. R. Carter and M. L. Morrison (editors). Status and conservation of the Marbled Murrelet in North America. Proceedings of the Western Foundation of Vertebrate Zoology 5:48-60.