

CHARACTERISTICS OF THREE MARBLED MURRELET TREE NESTS, VANCOUVER ISLAND, BRITISH COLUMBIA

KEVIN M. JORDAN¹ AND STEPHANIE K. HUGHES¹

Department of Biology, University of Victoria, P.O. Box 1700,
Victoria, British Columbia, Canada V8W 2Y2

ABSTRACT—Three marbled murrelet tree nests were discovered in the Carmanah-Walbran region on the west coast of Vancouver Island, British Columbia in 1992. All nests were located by climbing trees in an area where murrelets were active and were unoccupied when found. The nests were in Sitka spruce (*Picea sitchensis*) and western hemlock (*Tsuga heterophylla*) trees on large (> 35 cm dbh), moss-covered limbs that appeared accessible by the birds only from below. The nest trees were the largest trees within a 25-m radius and all sites were located in valley-bottom old-growth (> 200 yr) forest. All previously known murrelet nests in British Columbia had been found in Sitka spruce trees.

Marbled murrelets (*Brachyramphus marmoratus*) are associated with the old-growth forest habitat along the Pacific coast of North America, where they nest on branch platforms in large conifers (Quinlan and Hughes 1990, Singer et al. 1991, 1995, Hamer and Nelson 1995a, Kerns and Miller 1995, Manley and Kelson 1995, Naslund et al. 1995). Marbled murrelets have also been found nesting on the ground and in cavities in southcentral and western Alaska (Simons 1980; Johnston and Carter 1985; Mendenhall 1992). In areas where murrelets nest in trees, their nesting habitat is threatened by logging and development. In the United States, the marbled murrelet is listed as a threatened species (U. S. Fish and Wildlife Service 1992) and although it is on the provincial blue-list of endangered species in Canada, only a small portion of murrelet nesting habitat is protected (Rodway 1990).

In 1990 and 1991, forest surveys for marbled murrelets were initiated (Rodway et al. 1991, Manley et al. 1992) and the first 2 tree nests were located (Manley and Kelson 1995). These records were all associated with old-growth forest habitat. Limited information on marbled murrelet nest-site characteristics in Canada has seriously restricted the facilitation of meaningful management decisions for the conservation of this species (Rodway et al.

1992). This paper describes the characteristics of 3 additional murrelet nest sites found in the Carmanah and Walbran valleys of British Columbia in 1992.

METHODS

The Carmanah and Walbran valleys are located on the southwest coast of Vancouver Island, between the communities of Port Renfrew and Bamfield (Fig. 1). The old-growth forests in this area are typical of the coastal western hemlock biogeoclimatic zone (Pojar et al. 1991), and are primarily composed of western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), amabilis fir (*Abies amabilis*), and Sitka spruce (*Picea sitchensis*).

The Carmanah watershed is 6,700 ha and extends 22 km from the headwaters of Carmanah creek to the Pacific Ocean. Approximately 380 ha have been clear cut near the Carmanah headwaters. The 13,000-ha Walbran Valley, directly south of the Carmanah watershed, contains 6,500 ha of pristine forest (Moore 1991) and approximately 6,500 ha of clear-cut areas in the upper valley. Much of this cutting has occurred within the past 10 yr.

We looked for nests in 1992 by observing murrelet behavior and climbing potential nest trees. We concentrated on areas where birds had been observed flying within or below the canopy with survey methods established by Paton et al. (1990). Sixty-seven trees in or near where marbled murrelets landed or circled were climbed after the breeding season, as we believed they were potential nest sites (Singer et al. 1991). Additional trees were selected because they were similar to nest trees previously described (Binford et al. 1975; Quinlan and Hughes 1990; Singer et al. 1991; Manley and Kelson 1995). We searched for

¹ Present address: Box 27062, Victoria, British Columbia, Canada V9B 5S4.

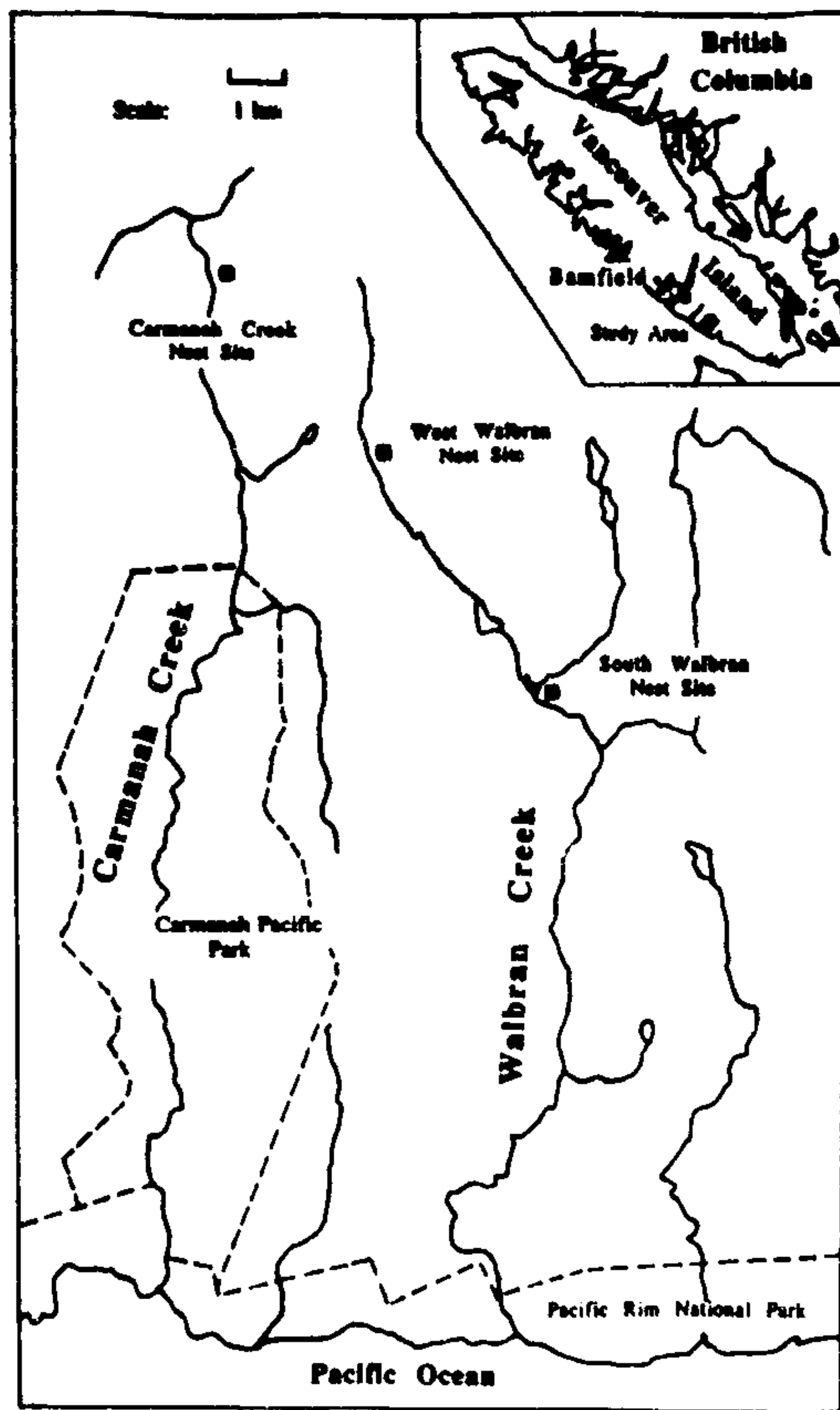


FIGURE 1. Location of study area and 1992 marbled murrelet nests, Vancouver Island, British Columbia.

nests on all limbs focusing within 200 cm of the trunk of the tree. In addition, we searched for nests on the extremities of all limbs while rappelling down from the top of the tree. Nest sites were identified based on 1 or more of the following: the presence of a nest cup, fecal ring, eggshell fragments, feathers, or an obvious landing pad.

All nest sites were photographed before disturbance and photos were deposited with Dr. A. E. Burger at the University of Victoria, Victoria, British Columbia. Samples of the nest contents and surrounding epiphytes were taken and identified using reference material in the University of Victoria herbarium. Eggshell fragments collected were identified by either R. W. Campbell or M. McNall, Royal British Columbia Museum (RBCM) and deposited as voucher specimens (RBCM E2399–E2400). Diagrams of the nest tree, limb, and cup were made. Measurements of the nest tree (height, dbh, crown extension, projection), nest limb (height, length, orientation, diameter), nest cup (distance from trunk, length,

width, depth), and nest limb substrate (species, depth, percent cover) were recorded. Heights of the nest limb and tree were measured by a climber lowering a surveyor's tape to the ground. Tree health or vigor (*i.e.*, excellent, good, poor, declining, dead) was classified according to the criteria outlined by Maser and Trappe (1984).

Characteristics of vegetation surrounding the nest tree were measured in a 25-m radius plot. For each plot, we determined elevation, slope, aspect, distance from nest tree to nearest creek and salt water, and the percentage of canopy closure. The species, number and dbh of all trees and snags > 5 cm in diameter, and the total number of fallen trees for 3 diameter classes (10–50 cm, 51–100, 100+) were also recorded.

RESULTS

We located marbled murrelet nests at 3 locations after climbing 67 trees (Fig. 1): west Walbran (WW; 48°42'05"N, 124°36'40"W, 180 m elevation), south Walbran (SW; 48°40'12"N, 124°35'50"W, 170 m), and upper Carmanah (UC; 48°44'50"N, 124°37'45"W, 300 m). Nest trees were 91 (WW), 20 (SW), and 25 m (UC) from creeks. Straight-line distances from the ocean were 12.6 km (WW, 17.3 km along the creek), 10.2 km (SW, 13.6 km along the creek), and 17.3 km (UC, 19.8 km along the creek).

Nest-Tree Characteristics

The 2 Walbran nests were in large Sitka spruce trees (296 cm dbh, 70 m tall [WW]; 370 cm dbh, 79.4 m tall [SW]). The Upper Carmanah nest was in a western hemlock tree (214 cm dbh, 55.7 m tall). Nest trees at WW and UC had broken tops; the tree at SW had an intact but dead top. Each nest tree had many dead primary limbs and was declining in vigor.

The nest limbs were 30.8 (WW), 32.1 (SW), and 39.5 m (UC) above ground within the lower third of the tree crown. Nests were on large (37.0, 39.4, 36.0 cm diameter at WW, SW, and UC, respectively), long (7.0, 9.7, 6.6 m) limbs that were heavily covered with the mosses *Antitrichia curtipendula*, *Dicranum fuscescens* and *Isothecium myosuroides*. Nest limbs were oriented southward at WW and UC and eastward at SW. All 3 limbs were oriented towards a creek. We found evidence of "landing pads" in nest trees at SW and UC. All nests were simple shallow depressions in deep mossy pads on primary, horizontal (± 5 degrees) branches. Nests were 14.5 (WW), 195.0 (SW), and 34.5 cm (UC) from the trunk. Nest dimensions were 12.5-cm

long \times 8.0-cm wide \times 3.5-cm deep (WW), 11.5 \times 8.7 \times 4.2 cm (SW), and 9.0 \times 8.7 \times 2.7 cm (UC). There was no indication of any material being added to the nest structure. Cover from overhanging vegetation was 70% (WW), 85% (SW), and 95% (UC), suggesting that nests were probably accessed by the murrelets from below.

Eggshell fragments were present at SW and UC, but only UC had a fecal ring. This brownish nest depression at SW contained a layer of yellowing spruce needles, although there was no evidence that they were placed there by the bird. Immediately surrounding the SW nest cup was a ring of small licorice ferns (*Polypodium glycyrrhizia*) 3–5 cm high and taller (20+ cm) licorice ferns were growing 7–10 cm from the edge of the nest cup.

The west Walbran nest site, which had no eggshell fragments or fecal ring, was identified based upon our observations of documented nest sites after 1–2 yr of weathering. At this site, there was an obvious ovoid depression in the moss pad that was brown in color. The rim of this depression was raised 1 cm above the moss pad and was noted as looking "burnt" or brown tinged in color. A ring of licorice ferns (4–7 cm high) grew around the depression. Several licorice ferns were also noted growing within the depression. The brownish tinge to the moss, the presence of the licorice ferns, the open access from below and other characteristics led us to believe that this was a previously used nest site.

Nest-site Characteristics

The nest trees were located in valley-bottom old-growth forests. The canopy trees within the 25-m plots included Sitka spruce, western hemlock, amabilis fir, western red cedar, and red alder (*Alnus rubra*). Density of live trees was 290/ha at WW, 345/ha at SW, and 530/ha at UC. Snag density was 45/ha at WW, 80/ha at SW, and 35/ha at UC. The dominant species by cover value were amabilis fir (75.6% at WW and 72.9% at UC) or western hemlock (68.3% at SW and 51.2% at UC). Mean dbh of live trees was 55.7 (WW), 36.7 (SW), and 26.0 cm (UC). There were 20 (WW), 77 (SW), and 70 (UC) fallen trees on each plot. Canopy closure was 40% at WW and SW, and 60% at UC. The nest tree was the largest of all the living trees in each plot and emerged above the canopy. Despite this, the

nests were located below the height of the surrounding trees.

DISCUSSION

Most marbled murrelet tree nests in southern Alaska and the Pacific Northwest have been situated on thick moss mats high above ground in large old-growth trees that are declining in vigor. The nests described in this paper were similar in characteristics to those previously reported (Quinlan and Hughes 1990, Singer et al. 1991, 1994, Hamer and Nelson 1995a, Manley and Kelson 1995). Within British Columbia, however, we reported on the first marbled murrelet nest in a western hemlock.

The Carmanah Valley nest had a large ring of feces around the rim. Adults are not known to defecate on the nest rim (Nelson and Hamer 1995a), and Singer et al. (1991) noted that the voiding action of the chick produced a ring around the nest rim. The amount of feces found suggested that the chick must have been present for at least several weeks.

Murrelets probably used the opening in the forest provided by the creeks as "flyways" to access the nests (Manley et al. 1992, Nelson and Peck 1995, Singer et al. 1995). In addition to providing easy access for the adult bird, this open area beneath the nest limb may have enabled the birds to accelerate immediately after leaving the nest. Campbell et al. (1990) noted that similar to other alcid species, marbled murrelets require height and access to be able to leave the nest limb safely and accelerate to leave the nest site.

Very little is known about nesting density or the breeding success rate of this species. A. E. Burger (unpubl. data) stated that the Carmanah-Walbran watersheds provide excellent nesting habitat and that on a provincial basis these watersheds represent one of the largest breeding aggregations of marbled murrelets in British Columbia. The discovery of these nest sites is further evidence that the lowland old-growth forests on the southwest coast of Vancouver Island are important nesting areas for marbled murrelets.

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