Western Specialty:
Pelagic Cormorant

Photo by © Tom Grey of Stanford, California:
Pelagic Cormorants (*Phalacrocorax pelagicus*)
Pacific Grove, Monterey County, California, 11 January 2009. The Pelagic Cormorant maintains fidelity to a precise nest site year after year, even though the nest itself is washed away in winter storms and even when rock surrounding the site has sloughed off. See in this issue Reuse of Nest Sites by Pelagic Cormorants in North-Central California by Ellen S. Martnsen and Joseph J. Schall.
Volume 45, Number 3, 2014


First Successful Nesting of Swainson’s Hawk in Santa Clara County, California, since the 1800s
Ryan A. Phillips, William G. Bousman, Mike Rogers, Ryan Bourbour, Breanna Martinico, and Michael Mammoser ......................................................... 176

Reuse of Nest Sites by Pelagic Cormorants in Northern California
Ellen S. Martinsen and Joseph J. Schall ........................................... 183

Status of Ospreys Nesting on San Francisco Bay
Anthony J. Brake, Harvey A. Wilson, Robin Leong, and Allen M. Fish .................. 190

First Nesting of the California Gull in New Mexico
William H. Howe and Sartor O. Williams III .................................. 199

Conservation Concerns for Sierra Nevada Birds Associated with High-Severity Fire
Chad T. Hanson ................................................................. 204

Call Types of the Red Crossbill in the San Gabriel, San Bernardino, and San Jacinto Mountains, Southern California
Walter Szeliga, Lance Benner, John Garrett, and Kathi Ellsworth ....................... 213

NOTES

Interspecific Nest Parasitism by Chukar on Greater Sage-Grouse
Michelle L. Fearon and Peter S. Coates ........................................ 224

California Breeding of the Black-throated Magpie-Jay, Including Evidence of Helping
William E. Haas .............................................................. 228

A Rapid Field Assessment of the Rufous Night-Heron Population
of Palau, Micronesia
Alan R. Olsen and Milang Eberdong .......... 231

Book Reviews
Lauren B. Harter and Eugene S. Hunn ....................................... 236

Featured Photo: Occurrence of Amelanistic Marbled Murrelets in Southeast Alaska and Northern British Columbia
Sean E. McAllister and Janet Neilson ........................................ 240

Front cover photo by © Ed MacKerrow, Mountain Horizon Photographs, of Santa Fe, New Mexico: Boreal Owl (Aegolius funereus), near Apache Creek, New Mexico, 29 July 2012. The bird retains chocolate-colored juvenal feathers on the throat and upper breast but is undergoing molt and shows basic plumage elsewhere. First photograph of a juvenile Boreal Owl published from New Mexico, where the species persists at the southern tip of its range in subalpine forests of the San Juan, Jemez, and Sangre de Cristo mountains.


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PERSISTENCE OF THE BOREAL OWL IN NEW MEXICO: 1987–2012

DALE W. STAHLECKER, Eagle Environmental, Inc., 30 Fonda Road, Santa Fe, New Mexico 87508; dale@eagleenvironmental.net

EDWARD P. MacKERROW, New Mexico Consortium, 4200 West Jemez Road, Suite 301, Los Alamos, New Mexico 87544

HIRA A. WALKER, New Mexico Department of Game and Fish, P. O. Box 25112, Santa Fe, New Mexico 87104 (current address: 316 Amherst Drive SE, Albuquerque, New Mexico 87106)

JONATHAN P. BATKIN, 129 West Zia Road, Santa Fe, New Mexico 87505

BERNARD R. FOY, 214 Spruce Street, Santa Fe, New Mexico 87501

ABSTRACT: To better understand the status of the Boreal Owl (*Aegolius funereus*) at the southern extremity of its North American range, we conducted audio playback surveys between late July and mid-October 2012 at seven of the nine northern New Mexico locations where the species had been documented between 1987 and 1993, as well as four additional locations 10–15 km from sites of previous detections. All survey locations were in subalpine conifer forest at elevations >3000 m above sea level. In total, we called in at least 12 individuals (6 adults and 6 juveniles) at or near six of the seven historical locations and at least three adults at two new locations. Of the eight locations with confirmed Boreal Owl detections, two were in the San Juan Mountains, two were in the Jemez Mountains, and four were in the Sangre de Cristo Mountains. Recently fledged owls were seen at both San Juan Mountain sites and photo-documented at one site. Adult owls were photo-documented at six of the seven historical locations confirmed the species’ long-term residency in New Mexico’s three northern mountain ranges. While Boreal Owls have likely been present in New Mexico since the Pleistocene, climate change appears likely to threaten their high-elevation habitat, particularly since more frequent and larger fires are predicted in the future as the forest dries.

INTRODUCTION

Twenty-five years after the Boreal Owl (*Aegolius funereus*) was first photo-documented in New Mexico on 15 April 1987 (Stahlecker and Rawinski 1990), its status in the state remains an enigma. This is not surprising given that there has been no systematic effort to survey the owl’s distribution since
1993 (Stahlecker and Duncan 1996). The species has been reported only occasionally since 1993 (Stahlecker 2010), except in one small area near the Colorado border where birders seek it out by broadcasting recordings. Lack of information on its status over the intervening two decades led the New Mexico Department of Game and Fish (NMDGF) to pursue efforts to remedy this data vacuum and better analyze the species’ status in New Mexico. In autumns of 2009 and 2010, NMDGF biologists surveyed for it by playback at four locations (three historical) and heard Aegolius calls within two of the historical locations (NMDGF 2012). Since the Northern Saw-whet Owl (A. acadicus) is sympatric with the Boreal in northern New Mexico and these observers were inexperienced in distinguishing the vocalizations of the two species, persistence of the Boreal was not confirmed. To augment and expand these survey efforts, in the summer and autumn 2012 we resurveyed seven of the nine historical locations where the Boreal Owl was originally documented between 1987 and 1993 (Stahlecker and Duncan 1996, Stahlecker 2010). This paper summarizes the results of these efforts.

METHODS

Our primary objective was to revisit and resurvey seven of the nine locations where Boreal Owls were detected by Stahlecker and Duncan (1996). A full description of criteria for location selection, localities, and occupancy by Boreal Owls is provided in Stahlecker and Duncan (1996) and will not be revisited here. Of the nine historical sites, we did not revisit lower-elevation locations D and I (Figure 1) in 2012 as they were not likely to be breeding locales (Stahlecker and Duncan 1996). Neither did we visit locations G (Emslie 1981) and K (Howard 1931), sites of archaeological and paleontological records, respectively. In addition to revisiting historical locations for Boreal Owls, we surveyed four new locations, though only the two where we encountered Boreal Owls are plotted in Figure 1. The presence of subalpine conifer forest (Brown et al. 1979), dominated by Engelmann spruce (Picea engelmanni) and subalpine fir (Abies lasiocarpa), was the most important factor in choosing these new survey locations, as the species shows a strong link to spruce and fir throughout its range (Hayward and Hayward 1993). We also purposely chose new survey locations that were at least 5 km distant from historical locations, to provide reasonable certainty that we were outside the home range of owls occupying historical locations.

During late summer/autumn of 2012, we surveyed for Boreal Owls by using the technique described by Palmer and Rawinski (1986), which involves playback of the species’ primary “staccato” song (Bondrup-Nielsen 1984) for ~5-min intervals from stations spaced 200–800 m apart. To confirm locations of breeding in New Mexico, we chose to survey during the postfledging period (July–September) with the intent of encountering identifiable juveniles (Stahlecker 1997). Equally important, the timing of the surveys allowed vehicular access to locations that are covered in snow and impassible in late winter/spring. In the nonbreeding season (July to December), Boreal Owls do not respond to playback with their primary “staccato” song given in the breeding season (Palmer and Rawinski 1987, Macaulay Library 2006), nor did they in New Mexico in 2012. Instead, adult Boreal Owls sometimes
flew in silently (Stahlecker 1997) or responded with “skiew” or “moo-a” calls (Bondrup-Nielson 1984, Hayward and Hayward 1993, Macaulay Library 2006). When Boreal Owls were heard but not seen, we tried playback of both song and calls to entice the owls to remain in close proximity and come into view to facilitate photo-documentation. We conducted a single survey in each area except locations C and H. We completed most surveys during the five nights preceding and including the full moon because moonlight allowed observers to better see silent owls in flight (Palmer and Rawinski 1986). However, we found that surveys at several historical locations were equally successful during nights with little or no moonlight.
RESULTS

We conducted surveys on 18 nights between 28 July and 20 October 2012. In 26.4 hours on 11 nights, we called in at least 12 Boreal Owls (6 adults and 6 juveniles) at or near six historical locations, for a response rate of 0.45 owl/survey-hour. We also searched an additional 34.6 hours on seven nights at four new locations and encountered at least three adult owls at two locations where the species was previously undocumented, for a response rate of 0.09 owl/survey-hour. The combined response rate for 61 hours of surveys was 0.25 owl/survey-hour. Thus we were five times more likely to detect an owl when surveying historical locations (0.45 owl/survey-hour) than when surveying new locations (0.09 owl/survey-hour). Furthermore, in 2012 the response rate at historical locations was ~2.5 times greater than the response rate (0.17 owl/survey-hour) during the original “discovery” surveys from 1987 to 1993 (Stahlecker and Duncan 1996). We attribute higher encounter rates at historical locations to our ability to go directly to these sites rather than have to search new areas, either 25 years ago or in 2012.

Because this study was primarily a resurvey effort, the locations we found owls in 2012 were generally consistent with those from 1987 to 1993, as reported by Stahlecker and Duncan (1996). In 2012, Boreal Owls were again confirmed in the northern and southern portions of the San Juan Mountains (Figure 1, Table 1: locations A and B), the northern and southern portions of the Sangre de Cristo Mountains (locations C, H, and I), and the northeast Jemez Mountains (location F). A single survey in the northwest Jemez Mountains (location E) was unsuccessful. We obtained photographs at all sites where owls were detected except location B. A second survey was needed to call in and photograph an adult owl at location C, and a third visit was necessary to photo-document an owl near location H, though we considered it highly probable that previous vocal responses were of Boreal Owls.

In addition to reconfirming Boreal Owls at six of the seven historical locations, we documented them at two locations distinct enough to be considered new for the species (Figure 1, Table 1). One new location (L) was 4.5 km from location H in the Sangre de Cristo Mountains but in a different drainage. The second location (M) was the first for Sandoval County and was 21 km southwest of location F, in the largest stand of spruce–fir (770 ha) forest within the Valles Caldera National Preserve (Muldavin et al. 2006), and 12 km south of more extensive spruce–fir habitat in the northern Jemez Mountains. The presence of two adults at location M on 28 September 2012 suggests an occupied territory on this isolated mountain (Figure 2).

We saw three juvenile owls (hatched in 2012) on 28 and 29 July at both San Juan Mountain locations, photo-documenting them at location A. The juveniles approached us while giving the “chirp” call that is a shortened staccato song generally given by nestlings and fledglings in response to the adult male’s “food” call (Bondrup-Nielsen 1984). In addition, we initially heard three juvenile owls at location B “chirping” at a distance of 800 m. These birds did not approach upon playback: they instead stayed high in the trees but offered enough glimpses to be identified as juveniles. All juveniles observed were undergoing prebasic molt but retained the “chocolate” breast characteristic of juvenile plumage. While juvenile owls have been seen...
<table>
<thead>
<tr>
<th>Location</th>
<th>Code</th>
<th>Name</th>
<th>Mountain Range</th>
<th>Latitude (N)</th>
<th>Longitude (W)</th>
<th>Elevation (m)</th>
<th>Date</th>
<th>No. of owls seen/heard</th>
</tr>
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<tr>
<td>Historical</td>
<td>A</td>
<td>Apache Creek</td>
<td>San Juan</td>
<td>36° 58’</td>
<td>106° 26’</td>
<td>3300</td>
<td>29 July</td>
<td>3 juveniles seen/heard</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3100</td>
<td>4 Aug</td>
<td>1 adult seen/heard</td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>1 unknown age heard</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 adult seen/heard</td>
</tr>
<tr>
<td>B</td>
<td></td>
<td>Canjilon Mountain</td>
<td>San Juan</td>
<td>36° 36’</td>
<td>106° 20’</td>
<td>3200</td>
<td>30 Jul</td>
<td>3 juveniles heard (1 seen)</td>
</tr>
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</tr>
<tr>
<td>C</td>
<td></td>
<td>Wheeler Peak</td>
<td>Sangre de Cristo</td>
<td>36° 34’</td>
<td>105° 21’</td>
<td>3300</td>
<td>27 Sep</td>
<td>1 adult seen/heard</td>
</tr>
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<td></td>
<td></td>
<td>1 unknown age heard</td>
</tr>
<tr>
<td>E</td>
<td></td>
<td>San Pedro Parks</td>
<td>Jemez</td>
<td>36° 07’</td>
<td>106° 45’</td>
<td>3000</td>
<td>4 Oct</td>
<td>No owls seen or heard</td>
</tr>
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<td></td>
<td>2–3 adults seen</td>
</tr>
<tr>
<td>F</td>
<td></td>
<td>Chicoma Mountain</td>
<td>Jemez</td>
<td>36° 01’</td>
<td>106° 23’</td>
<td>3300</td>
<td>30 Jul</td>
<td>1 unknown age heard</td>
</tr>
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<td>1 unknown age heard</td>
</tr>
<tr>
<td>H</td>
<td></td>
<td>Lake Peak</td>
<td>Sangre de Cristo</td>
<td>35° 47’</td>
<td>105° 46’</td>
<td>3650</td>
<td>1 Aug</td>
<td>1 unknown age heard</td>
</tr>
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<td></td>
<td></td>
<td></td>
<td>1 unknown age heard</td>
</tr>
<tr>
<td>I</td>
<td></td>
<td>Jack’s Creek</td>
<td>Sangre de Cristo</td>
<td>35° 54’</td>
<td>105° 38’</td>
<td>3300</td>
<td>26 Sep</td>
<td>1 adult seen</td>
</tr>
<tr>
<td>New</td>
<td>L</td>
<td>Tesuque Creek</td>
<td>Sangre de Cristo</td>
<td>35° 46’</td>
<td>105° 48’</td>
<td>3050</td>
<td>14 Oct</td>
<td>1–2 adult seen/heard</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>Redondo Peak</td>
<td>Jemez</td>
<td>35° 52’</td>
<td>106° 33’</td>
<td>3400</td>
<td>29 Sep</td>
<td>2 adults seen/heard</td>
</tr>
</tbody>
</table>

a Rounded to the nearest minute.

b New Mexico Department of Game and Fish personnel, led by Walker, also recorded Aegolius here in 2009 or 2010.


d Only detection in 2012 that was not photo-documented.
previously at locations A and I (Stahlecker and Duncan 1996, Stahlecker 1997), the photo on this issue’s front cover is the first published of a juvenile Boreal Owl in New Mexico.

DISCUSSION

The Boreal Owl was added as “threatened” to New Mexico’s list of threatened and endangered species in 1990 because the limited data available at that time suggested a small, sparse, and vulnerable population (NMDGF 2012). However, we believe that the Boreal Owl might not be so much rare in New Mexico as it is difficult to encounter incidentally. In this study, we had little difficulty in refinding this species at historical locations.
by broadcasting its song, even though this was the first systematic survey for the Boreal Owl in New Mexico in two decades. To find Boreal Owls at six of the same locations 20–25 years later suggests that there have been Boreal Owls resident at each site throughout the intervening years. However, such persistence data alone do not clarify the species’ population status and distribution in New Mexico. We recommend long-term systematic surveys, as well as reproductive studies, across the species’ range in New Mexico. Genetic studies showed little variation within the patchily distributed Rocky Mountain subpopulations of the Boreal Owl or between them and the broadly distributed contiguous subpopulations of the boreal forest of northern North America (Koopman et al. 2007); otherwise, population-level monitoring for North America is limited and unpublished. We publish our results in part to stimulate discussion, review, and study of the status and distribution of the Boreal Owl in North America.

The need for such work is particularly relevant as evidence mounts that climate change, at least in the U.S. Southwest, could erode the ranges of alpine and subalpine species such as the Boreal Owl significantly. Williams et al. (2012) combined data on tree-ring growth, climate records, and computer-model projections of future climate trends and predicted that warmer summer temperatures and lower winter precipitation in the 21st century will result in greater evaporation rates and so drying out of the region’s forests. Consequently, these forests will become more susceptible to diseases, infestations such as outbreaks of bark beetles (family Scolytidae), and catastrophic wildfires. Already, we are seeing some evidence of such effects on Boreal Owl habitat in New Mexico. From 2011 to 2013, two wildfires in the Jemez Mountains totaling >700 km² decreased the extent of spruce–fir forest around the southern and eastern portions of the Valles Caldera National Preserve by 34 km². In the same three years, three fires in the southern Sangre de Cristo Mountains burned through 54 km² of spruce–fir habitat. In 2013, one of these fires burned through the Boreal Owl’s historical location at Jack’s Creek. More large fires could decimate Boreal Owl habitat in the three New Mexico mountain ranges the species is known to inhabit.

There is some evidence that climatic and ecological changes are affecting the Boreal Owl already. The species’ use of nest boxes in Scandinavia has been declining in the last few decades, but Hipkiss et al. (2013) found that in Sweden the owls were likely not avoiding old nest boxes. They concluded that the decline in Boreal Owl populations was real and more explainable by concurrent documented declines in prey populations. Field work for Colorado’s second breeding bird atlas from 2007 to 2012 recorded slightly fewer priority (23) and non-priority (24) blocks with Boreal Owls (L. Wickersham in litt.) than did the 1987–95 effort (27 priority and 26 non-priority blocks; Ryder 1998), though this dataset, like ours, is largely distributional rather than numerical.

Meanwhile, a more imminent threat to New Mexico’s Boreal Owl habitat is rapidly approaching from the north. Large outbreaks of spruce bark beetles (Dendroctonus rufipennis) have been documented in Colorado for over a century (Schmid and Frye 1977), but they have accelerated in
the dry years of the early part of the 21st century. From 2010 to 2014 the Rio Grande National Forest of southern Colorado lost 90% of its mature spruce trees, or approximately 200,000 of 240,000 ha (R. Ghormley in litt; Figure 3a). Three fires ignited by lightning in June 2013 intensified as they burned through dead spruce forests; nearly 45,000 ha burned. In August 2014, 25–50% of the spruce trees in the spruce–fir forest at Cumbres Pass on the Colorado/New Mexico border near Apache Creek were dead or dying (Figure 3b). Thus the historical sites for the Boreal Owl in the Rio Grande National Forest and elsewhere in Colorado should be revisited to determine whether the species is still present, and the same will be true of the New Mexico sites if the devastation of mature spruce forests extends into northern New Mexico.

ACKNOWLEDGMENTS

This study required considerable effort in the field, and we are grateful to the following observers who assisted at least one survey: Melinda Baker, Roger Clark, Alan Cuddy, Tom Egeloff, Wyatt Egeloff, Andrew Fenner, Jerald Friedman, Robert Henriksen, Terrell Johnson, Kent Keahbone, Jared Lujan, Jessica Martin, and Raymond Van Buskirk. We thank the Pueblo de Taos for special permission to travel through its lands to reach U.S. Forest Service lands. Tim Smith updated Figure 1 from his previous effort published 17 years ago. Lynn Wickersham graciously provided Colorado Breeding Bird Atlas II data and assisted with its interpretation. Reviews by Denver Holt and Doug Faulkner and editing by Philip Unitt clarified and improved the submitted manuscript. This project was funded by a Sport Fisheries and Wildlife Federal Aid Grant administered by the New Mexico Department of Game and Fish.

LITERATURE CITED

Figure 3. (a) Nearly complete mortality of mature Engelmann spruce at Wolf Creek Pass, Colorado, 50 km from New Mexico, June 2014. (b) Approximately 50% mortality in a stand of spruce at Cumbres Pass, Colorado, 5 km from New Mexico, August 2014.

Photos by Dale Stahlecker (a) and Mark Blakemore (b)

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FIRST SUCCESSFUL NESTING OF SWAINSON’S HAWK IN SANTA CLARA COUNTY, CALIFORNIA, SINCE THE 1800s

RYAN A. PHILLIPS, De Anza College, Kirsch Center for Environmental Studies Wildlife Science Technician Program, 21250 Stevens Creek Boulevard, Cupertino, California 95014; phillipsryan@fhda.edu

WILLIAM G. BOUSMAN, 321 Arlington Way, Menlo Park, California 94025; barlowi@earthlink.net

MIKE ROGERS, 499 Novato Avenue, Sunnyvale, California 94086

RYAN BOURBOUR and BREANNA MARTINICO, De Anza College, Kirsch Center for Environmental Studies Wildlife Science Technician Program, 21250 Stevens Creek Boulevard, Cupertino, California 95014

MICHAEL MAMMOSER, 121 Winsted Court, San Jose, California 95139

ABSTRACT: We documented successful nesting of a pair of Swainson’s Hawks (Buteo swainsoni) over two consecutive years (2013 and 2014) in Coyote Valley, California, which represents the species’ first nesting in Santa Clara County since 1894 and a range expansion of approximately 60 km from the Central Valley into the species’ historic range. It confirms that there is habitat in Santa Clara County for breeding Swainson’s Hawks, which has implications for conservation. Expansion of this species’ breeding, in recent years, has been documented in other counties within the central and northern Coast Ranges of California, including San Benito, Napa, and Sonoma, suggesting that efforts toward Swainson’s Hawk conservation in California have allowed this species to recolonize some of its historical breeding range, or that Swainson’s Hawk may be adapting to new areas of natural or human-modified habitats.

The historic range of Swainson’s Hawk (Buteo swainsoni) in California spanned the Coast Ranges north to Sonoma County, most of southern California, and much of the eastern side of the Sierra Nevada (Anderson et al. 2007). In 1983, Swainson’s Hawk was listed as a threatened species under the California Endangered Species Act, following a 1979 statewide assessment by Bloom (1980), who estimated 350 breeding pairs throughout the state, a 90% reduction from historic densities, and confirmed extirpation from most of the former range. The listing was justified by the dramatic decline in the population and the loss of breeding habitat. In California currently, Swainson’s Hawk has a restricted breeding range, fragmented into three genetically distinct populations: Central Valley, Modoc Plateau, and Inyo (Hull et al. 2008). An inventory of California Swainson’s Hawks conducted by the California Department of Fish and Game (now Fish and Wildlife) and the University of California, Davis, in 2005 and 2006 yielded an estimated 2081 breeding pairs (averaged over the two years; 94% in the Central Valley, Anderson et al. 2007), corresponding to a 600% increase in 27 years.

Oological collections confirm that the Swainson’s Hawk bred sporadically in Santa Clara County in the late nineteenth century (Bousman 2007a). On 30 April 1889, Henry R. Taylor, an egg collector, collected two eggs (Western Foundation of Vertebrate Zoology 98178) from a nest in “Ferguson’s Swamp,” which Bousman (2007a) presumed to be a swampy area located along Llagas Creek and adjacent to ranch land south of Gilroy in southern
Santa Clara County. The other collected egg set (Museum of of Vertebrate Zoology 5227), dated 21 April 1894, was from a nest located near the Berryessa district or North Valley in San Jose, which is between Coyote Creek and the foothills of the Diablo Range.

More recently, however, Swainson’s Hawk has occurred in Santa Clara County only as a rare transient, with no nesting records since 1894 (Bousman 2007a). There have been two summer records, of an immature on 27 July 2002 and an adult on 9 June 1994 (Bousman 2007a), with the exception of three enigmatic records of nestlings. A nestling with full natal down was found at the Summitpointe Golf Course in the hills of eastern Milpitas on 11 June 1999 and was taken to a rehabilitator. A second nestling, of near fledging age, was found in a pool house in Saratoga on 1 July 2005, and a third nestling was discovered north of Tully Road in San Jose on 17 July 2005 (Rogers et al. 2005, Bousman 2007a). As a result of the unusual and unaccountable circumstances of the recovery of these three nestlings in unsuitable breeding habitat, Bousman (2007a) did not consider them conclusive evidence of Swainson’s Hawks nesting in Santa Clara County.

STUDY AREA AND METHODS

Coyote Valley, in the greater Santa Clara Valley, is located within the central Coast Range in California between south San Jose and Morgan Hill and covers an area of ~33 km² (Phillips et al. 2012). Coyote Valley is the largest contiguous and primarily undeveloped tract of the valley floor remaining in Santa Clara County. It comprises a mosaic of habitat types, including agricultural fields (mostly alfalfa fields), oak savanna, riparian, urban, and the largest freshwater wetland (Laguna Seca) and watershed (Coyote Creek) in the county.

Aided with 8–10 × 40–50 binoculars and spotting scopes with varying magnifications, in 2013 we observed the nest from a distance of 70 m over 14 days from 14 May to 8 August 2013 for a total of 80 hours, all observers pooled. To minimize disturbance we used a thick low coast live oak (Quercus agrifolia) as a blind; it concealed the observers when the birds flew overhead. In 2014, the nest was first checked on 9 April and was observed on 7 days through June.

RESULTS

During April and May 2013, unprecedented numbers of migrant Swainson’s Hawks were recorded in Santa Clara County, in the agricultural fields north of Richmond Avenue in mid-Coyote Valley, with up to 14 individuals observed on 20 May. Of the 14, three were adults, of which two were of the light and one of the dark morph, three were juveniles, of which two were of the light and one was of an intermediate morph, and the others could not be identified to age.

On 13 April 2013, Rogers found an intermediate-morph Swainson’s Hawk, confirmed later to be the male of this pair, soaring low over the nest location, displaying with rodent prey over the Coyote Creek riparian corridor in the Coyote Creek County Park. On 14 May, Bousman located an
intermediate-morph Swainson’s Hawk (later confirmed as the female by her unique plumage) building a nest in the same area where Rogers observed the male display. The nest was built in a western sycamore (*Platanus racemosa*) tree ~22 m high directly above the creek and adjacent to an agricultural field in the mid-Coyote Valley (Figure 1).

On 15 May, we observed the male soaring over the nest site (Figure 2), as well as landing on the nest, where the female was sitting on the nest in an incubation posture. From her apparent incubation for over an hour, we believe the female had either already laid at least one egg or was preparing to lay an egg. From the female’s behavior, we estimate she laid from 15 to 19 May. On the basis of an incubation period of 34–35 days (Woodbridge 1998), we estimate hatching between 18 and 23 June. A single nestling with some down was first observed on 27 June. It evidently fledged (branched) on 7 August, as it was observed in the nest on 6 August and in an adjacent tree ~7 m from the nest on 8 August. This was the last day the juvenile was observed. Thus the nestling period was 45–50 days, which is on the long end of the spectrum reported from other studies, 27–46 days (Woodbridge 1998).

In 2014, we first observed a Swainson’s Hawk in Coyote Valley on 5 April. On 9 April, we checked the nest that was used in 2013 and observed an adult Swainson’s Hawk of the intermediate morph perched ~40 m from the nest,
in which there were fresh cottonwood sprigs. On 22 April, an adult of the intermediate morph, presumably the female, was in an incubation posture on the nest (Figure 3), and the presumed male, an intermediate-morph adult patterned like last year’s male, delivered an unidentified prey item to the female. On 6 June, the nest contained at least one nestling, ~1.5 weeks old. It fledged between 5 and 8 July, during which time the nest fell as a result of high winds. The farthest from the nest we observed this presumed same pair in both 2013 and 2014 was 2.6 km. All observations of their foraging were over agricultural fields, primarily alfalfa, but this was the primary crop in Coyote Valley in 2013 and 2014.

On 30 April 2014, we observed six Swainson’s Hawks over and in the same alfalfa fields adjacent to Richmond Avenue where the 14 individuals had been on 20 May 2013. These six individuals included one adult of the dark morph, one adult of the light morph, one immature of the dark morph, two immatures of the light morph, and one of unknown age and morph. Four of these birds were soaring together in pairs and were displaying (legs extended and soaring wing tip to wing tip) and courting (undulating flights and vocalizations). The same dark-morph pair was observed in the same area on 31 May defending a territory against Red-tailed Hawks (*Buteo jamaicensis*), but we could not locate a nest.

**DISCUSSION**

These records and others suggest that efforts toward Swainson’s Hawk conservation in California have allowed this species to recolonize some of
its historical breeding range, or that it may be adapting to human-modified habitats. Not only did Swainson’s Hawk nest in Santa Clara County in 2013 and 2014, but a pair nested in San Benito County for the first time in 2013 (S. Johnston and D. Shearwater pers. comm.), and a team with the Golden Gate Raptor Observatory monitored eight nesting territories in Napa and Sonoma counties in 2013 (M. Berner and A. Fish pers. comm.). There is a single historical record of Swainson’s Hawk nesting in Sonoma County, at Petaluma, where an egg was collected prior to 1859 (U.S. National Museum of Natural History B01679; Bousman 2007b). In Napa County, where to our knowledge there are no historical records of nesting, nesting Swainson’s Hawks were first noted in 2005, and seven nesting attempts or fledged young have been observed since (M. Berner pers. comm.). The 19th century records from Santa Clara and Napa counties attest to the historic range encompassing the Coast Ranges, but there is no information on the size of the population.

The Swainson’s Hawk is a complete migrant, with the exception of a small population (29 individuals in 1994) in the Sacramento–San Joaquin delta that has wintered since at least 1991 (Herzog 1996), as well as the occasional juvenile that does not migrate farther south. At least 30 wintering individuals were observed in 2014 (C. Briggs pers. comm.). In recent years, wintering Swainson’s Hawks have been observed more frequently, including 27 individuals near Dos Palos in the San Joaquin Valley (unpublished notebooks, North American Birds). The only winter record for Santa Clara County is
of a light-morph juvenile in Coyote Valley, 13 January 2010 (Phillips pers. obs.). Marking or telemetry (e.g., Kochert et al. 2011) might reveal the origins of the recent pioneers in the Coast Ranges and possible connections among them, the birds wintering in the delta, and the main breeding range.

In the Swainson’s Hawk’s primary breeding range in California, 85% of nests are located within riparian forest or remnant riparian forest surrounded by ample and productive foraging habitat, which consists mostly of alfalfa and fallowed agricultural fields (Woodbridge 1998). Coyote Valley could be an ideal location for Swainson’s Hawk to establish a population because of its alfalfa and fallowed agricultural fields, abundant prey (Phillips pers. obs.), and riparian forests along Coyote and Fisher creeks.

Our observations imply establishment of Swainson’s Hawks in Coyote Valley, but further monitoring is warranted. The threat of urban sprawl and land-use changes reducing the riparian forests and agricultural fields in Coyote Valley and other areas in the Coast Ranges may curtail the incipient recolonization, as well as use by the many other species of raptors that breed and winter in Coyote Valley. Effects on this species recognized as threatened should be considered prior to development.

ACKNOWLEDGMENTS

We gratefully acknowledge the land-preservation efforts of the Santa Clara County Parks, which have allowed an extirpated species a chance to return, as well as the park’s authorities’ dedication in reducing disturbance to this nest. Nest monitoring and field efforts by the De Anza College Wildlife Science Technician Program were supported by the Morgan Family Foundation and Dr. Ben and Ruth Hammett and are greatly appreciated. Thank you to the birding community for understanding the need for confidentiality with this sensitive species and respecting the nondisclosure of the nest location. We thank Murray Berner, Chris Briggs, Allen Fish, Stephen Rottenborn, and Debra Shearwater for their information on nesting Swainson’s Hawks in Napa, Sonoma and San Benito counties, as well as advice on aging of these birds from William Clark, Jon Dunn, Chris Briggs and Allen Fish. We appreciate Chris Briggs, Allen Fish, and Stephen Rottenborn for making helpful comments and edits that improved the manuscript.

LITERATURE CITED


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REUSE OF NEST SITES BY PELAGIC CORMORANTS IN NORTHERN CALIFORNIA

ELLEN S. MARTINSEN, Smithsonian Conservation Biology Institute, Center for Conservation and Evolutionary Genetics, National Zoological Park, P. O. Box 37012 MRC5503, Washington, DC 20013-7012; ellensarah.martinsen@gmail.com

JOSEPH J. SCHALL, Department of Biology, University of Vermont, Burlington, Vermont 05405

ABSTRACT: We photographed nests of Pelagic Cormorants (Phalacrocorax pelagicus) on cliff ledges at two colonies in Mendocino and Sonoma counties, California, from 1986 to 1996. In 135 comparisons of the positions of nests in different years, we found that 92% of the nests shifted by <25 cm (approximate diameter of a Pelagic Cormorant nest), and in 24% of comparisons the shift was <5 cm. Some nests were placed within a few centimeters of previous sites for as long as nine years. The rate of reuse of nest sites was high on both small ledges and on large shelves where the nest could have readily been shifted. At sites where substantial rock substrate sloughed off the cliff face in the previous year, nests were placed precisely at former sites. This high rate of nest reuse is striking because many apparently suitable sites on these cliffs remain unused.

Nest-site fidelity, the tendency for birds to return to and reuse a previous nest site, has been noted in many species, both migrants and residents, and among songbirds, waterfowl, seabirds, and birds of prey (Badyaev and Faust 1996). The pervasiveness of nest-site fidelity suggests the behavior has an adaptive significance and increases reproductive success (Greenwood and Harvey 1982). Within a colony, the site fidelity of seabirds nesting on cliffs and slopes is often strong (Aebischer et al. 1995, Fairweather and Coulson 1995). For example, Ollason and Dunnett (1978) found 91% of breeding pairs of the Northern Fulmar (Fulmarus glacialis) to reunite at approximately the same nest site, and Huyvaert and Anderson (2004) detected no measurable shift in placement of Nazca Booby (Sula granti) nests in successive years.

The Pelagic Cormorant (Phalacrocorax pelagicus) is a long-lived seabird that usually nests on ledges on high, steep, inaccessible rocky cliffs facing the sea (Hobson 1997). These nest sites provide protection from predators (Aebischer et al. 1995), although they expose the nest to cold winds, sea mist, and ocean waves, which occasionally destroy active nests (Schall pers. obs.). Siegel-Causey and Hunt (1986) reported that nest sites used persistently over several years are those that are most strongly defended. Here we document reuse of nest sites by Pelagic Cormorants at two breeding colonies in northern California over 10 years. Our goals were to measure differences in nest placement on ledges by year and between the two colonies. We observed that all nests were washed off the cliff ledges during winter storms, so we used photographs to locate the precise previous sites of nests on the basis of the cliffs’ landmarks.

METHODS

In 1986 we selected two colonies for study. The Point Arena colony is located 2 km north of the town of Point Arena, Mendocino County (obser-
vation locations were within 0.32 km north and south along the cliffs from 38.9289° N, 123.7293° W. Since 2004, this section of coast has been included within the Stornetta Public Lands managed by the U.S. Bureau of Land Management. The Sea Ranch colony is 24 km south of the Point Arena study site and 10 km south of the town of Gualala, Sonoma County (observation locations within 0.70 km north and south along the cliffs from 38.7190° N, 123.4646° W). This area has been privately owned as a planned unincorporated community since 1963. At each location, the coast is thrown into a series of convolutions with many narrow inlets that allow an observer to sit on the cliff edge above one cliff face and look into the nests on the opposite face (see satellite photographs of the two locations, Figure 1).

We took color photographs (35-mm slides) of cormorant nests during the early to mid breeding season (May to July) in 1986, 1987, 1988, 1989, 1994, 1995, and 1996. Only active nests (with adult birds attending eggs or hatchlings) are included in the analysis. That is, we excluded nests that had been constructed in April and early May, then abandoned with no eggs laid. We examined the slides by scanning them into digital format for viewing on a flat computer monitor. We compared the nests’ locations by year by the use of landmarks on the cliff face such as overhangs, ledges, distinctively shaped rocks, or clumps of vegetation. We drew lines between the nest and appropriate landmarks and estimated the vertical and horizontal difference in nest placement at each location over different years (see Figure 2). Nests varied in size and shape, so we scored their location from the center top of the forward rim; this point is visible even when the nest contained incubating adults or nestlings. The distance from camera to nest and the camera lens used differed from year to year, so we needed a benchmark in each photograph to determine distance. This we achieved by measuring the wing length of an attending adult in every photograph, using the average chord for the Pelagic Cormorant of 25 cm as the reference scale (Hobson 1997).

We analyzed the data by nonparametric methods in JMP 3.0.2 and Statview 5.0.1, setting the significance level at $P = 0.05$. 

Figure 1. Aerial photographs (from Google Earth, 7 January 2014) of the two study sites, Point Arena (A, centered at 38.9289° N, 123.7293° W) and Sea Ranch (B, centered at 38.7190° N, 123.4646° W).
Over the 10-year period, we made 135 comparisons at 44 nest sites. A nest was not active (egg laid) at each site each year; 57 one-year comparisons were possible. The longest periods observed between placement of nests at a specific site on the cliff ledge were 9 ($n = 60$) and 10 ($n = 1$) years. The distribution of distances between nests at individual sites is shown in Figure 3. We found no significant difference in nest-site reuse over multiple years at the two colonies (an unequal number of observations allowed comparison for an interval of one year only; Point Arena $n = 22$, Sea Ranch $n = 35$, $U$ test, $P = 0.362$). Therefore, we pooled the data for the two colonies for subsequent analysis.

Estimated differences in placement of nests at individual sites ranged from 1 cm (essentially no difference between location of the nest from year to year; a few centimeters of vertical difference could be accounted for by variation in the height of the nest rim) to 43 cm. Vertical shifts in nest placement did not differ from horizontal shifts (Wilcoxon signed-rank test, $P = 0.873$). Only 8% of the measured differences were greater than 25 cm, the length of the Pelagic Cormorant’s wing chord and the approximate diameter of the nest, and 24% were less than 5 cm (Figure 3). In comparisons for one-year intervals only, there was no effect of year on the distance between nest sites (Kruskal–Wallace test, $P = 0.073$); that is, the distance nest sites shifted did not change over the observation period. The number of years between measures over the 10-year period was weakly positively related to distance between placement of the nests (Spearman rank correlation, $r_s = 0.194$; $P = 0.027, n = 133$) (Figure 4), but this correlation vanished if the four greatest shifts were removed from the analysis.

Figure 2. Reuse of nest sites by Pelagic Cormorants after loss of rock substrate at Point Arena. The two pairs of figures show use of the same two nest sites before (1987) and after (1989) loss of surrounding rock substrate.
The cliff ledges were durable through our study, so we could readily find large and small landmarks for locating nest sites with precision. However, at two Point Arena nest sites, a large amount of ledge material (rock and minimal vegetation) fell off during the stormy winter of 1987–1988. We were able to ascertain the location of the original nest sites by using landmarks far from the site and lines drawn between these distant landmarks (Figure 2). Cormorants constructed nests on these two sites, even with very little apparent horizontal area remaining after the loss of cliff material and precisely at the site of the previous nest.

![Figure 3. Shifts in nest sites of Pelagic Cormorants in successive years at two breeding colonies in northern California.](image)

![Figure 4. Number of years between recorded shifts in sites of Pelagic Cormorant nests at two breeding colonies in northern California.](image)

The cliff ledges were durable through our study, so we could readily find large and small landmarks for locating nest sites with precision. However, at two Point Arena nest sites, a large amount of ledge material (rock and minimal vegetation) fell off during the stormy winter of 1987–1988. We were able to ascertain the location of the original nest sites by using landmarks far from the site and lines drawn between these distant landmarks (Figure 2). Cormorants constructed nests on these two sites, even with very little apparent horizontal area remaining after the loss of cliff material and precisely at the site of the previous nest.
DISCUSSION

At two breeding colonies in northern California, Pelagic Cormorants’ rate of reuse of nest sites over a 10-year period was high. Only 8% of comparisons revealed a shift greater than or equal to 25 cm, the approximate diameter of a nest. Therefore, in 92% of comparisons, the nest was placed with at least some overlap with the site occupied in another year. In approximately a quarter of the comparisons, nests shifted 5 cm or less, including some comparisons made eight or nine years apart. This small shift was likely to be within the method’s margin of error, so many nests may have been placed precisely at a previous site. Not all sites were used each year, but even comparisons over more than one year showed very little shift. In some cases, the ledge on the cliff face appeared through a telescope to be equal to or even smaller than the size of a Pelagic Cormorant nest, so precise placement of a nest there year after year is not surprising. However, inspection of the cliff faces with the telescope revealed a great many other similarly sized ledges, including many near the observed nests.

Although we could not assess all factors related to nest-site selection, choice of specific small ledges does not seem to be a result of scarcity of suitable ledges. In many cases the ledge was more of a shelf, and large enough to allow the birds to build a nest at a variety of sites on it, yet even in such places nests were placed at the same site year after year. And, most striking, at sites of substantial rock slides from the cliff face over the winter, changing the cliff’s appearance, birds returned to build nests at precisely the same site seen in previous years. One of these nests was placed at a site that seemed to have little or no horizontal surface but was within a few centimeters of the site used in previous years. It is not known how Pelagic Cormorants find previous nest sites, although memory of landmarks and access as well as position in relation to other nest sites likely are involved. We pinpointed the nest locations by use of sketch maps and photographs, but at places where material had fallen off the cliff ledges during winter storms, extremely detailed study of photographs was required.

Cliff nesting offers the Pelagic Cormorant many advantages including the ability to breed near foraging areas at many points along the mainland coast, as well as on islands (Carter et al. 1984; Siegel-Causey and Hunt 1986). The species’ high fidelity to specific cliffs likely increases an individual’s efficiency in finding food, as the birds are familiar with the distribution of prey nearby (Siegel-Causey and Hunt 1986). Cliffs are also advantageous because they limit the access of avian and mammalian predators. During our study, Common Ravens (Corvus corax) patrolled the two study locations, with 0.3 passes per hour at Point Arena and 0.5 per hour at Sea Ranch, and ravens were observed to take eggs or small nestlings from nests (Cannon 1990).

Although cliff nesting itself has advantages, why are the cormorants so loyal to specific nest sites? A specific site may offer better protection from the elements, including rain from above and sea waves and mist from below, and may be sloped to prevent eggs from rolling into the sea (Lengagne et al. 2004). Small differences, not apparent to the human eye, may also reduce attack by foraging ravens. If specific nest sites are of higher quality, then we may expect the birds to compete for them. Competition among Pelagic
Cormorants for nest sites appears most intense early in the breeding season, especially for sites used over several previous years (Siegel-Causey and Hunt 1986). At our study locations, Cannon (1990) observed numerous attacks by adult cormorants on the nestlings of other birds throughout the nesting season. Cannon also found that early nesters were more successful and used nest sites away from other cormorants.

Studies of cliff-nesting seabirds that share many of the characteristics of the Pelagic Cormorant, including longevity and coloniality, indicate that reuse of nest sites may promote site defense, ensure distance from conspecific nesting pairs, facilitate mate acquisition or retention, and aid in the rapid replacement of a lost mate (Ollason and Dunnett 1988, Boekelheide and Ainley 1989, Pyle et al. 2001, Huyvaert and Anderson 2004). Nest-site reuse may be especially important in cliff-nesting species, in which mate acquisition does not involve choice among a dense group of the species at the colony early in the reproductive season (Vergara et al. 2006), although Pelagic Cormorants can form dense groups at roosts near colonies. Nest-site reuse has been found an efficient way for individuals or pairs to continue breeding at a successful cliff colony in the Common Murre (Uria aalge) and Black-legged Kittiwake (Rissa tridactyla) (Kokko et al. 2004, Naves et al. 2006). Pelagic Cormorants may not breed every year, and they breed in colonies relatively small and scattered in comparison to those of many other seabirds, so returning to the same nest site may be an important means of finding a previous mate (Siegel-Causey and Hunt 1986). In the Black-legged Kittiwake, which also nests on steep rocky sea cliffs, mate retention dropped significantly when nests were located more than 0.3 m from previous sites (Fairweather and Coulson 1995). In birds in general, breeding success increases fidelity to mate and nest site, and in socially monogamous seabirds replacement of a mate has been shown to exact a cost in reproductive fitness (Bried et al. 2003, Ismar et al. 2010).

In our long-term study, we demonstrated great precision in the Pelagic Cormorant’s reuse of nest sites. Unfortunately, as the birds we studied were not marked, we have no information on the identity of individuals returning to nest sites over the years, so we cannot discern whether this reuse of nest sites was caused by individual birds returning to the same site year after year. However, such precision in nest-site reuse does suggest a high rate of nest-site fidelity, which may imply a stable or increasing population. Further study of these two Pelagic Cormorant colonies including banding of adults and chicks would be needed to clarify individuals’ fidelity to nest site and colony as well as the species’ population dynamics. Additional study of these colonies also promises to shed light on the environmental variables most important for nest-site selection.

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Community College permitted us to live near and work at the Point Arena colony. Jim and Linda Riley hosted us at that site and offered substantial logistical assistance.

LITERATURE CITED


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STATUS OF OSPREYS NESTING ON SAN FRANCISCO BAY
ANTHONY J. BRAKE, 1201 Brickyard Way, Richmond, California 94801; tonybrake@sbcglobal.net
HARVEY A. WILSON, 1113 Otis Drive, Alameda, California 94501; harvmon@comcast.net
ROBIN LEONG, 336 Benson Avenue, Vallejo, California 94590
ALLEN M. FISH, Golden Gate Raptor Observatory, Building 1064, Fort Cronkhite, Sausalito, California 94965

ABSTRACT: Historical records from the early 1900s, as well as surveys updated in the late 1980s and more recent information from local breeding bird atlases, indicate that Ospreys rarely nested on San Francisco Bay prior to 2005. In 2013, we surveyed nesting Ospreys baywide and located 26 nesting pairs, 17 of which were successful and fledged 44 young. We also report on findings from previous annual nest surveys of a portion of San Francisco Bay beginning in 1999. These results demonstrate a greater breeding abundance than has previously been recognized. The density of Osprey nests is highest near the north end of San Francisco Bay, but nesting also appears to be expanding southward. Nearly all of the nests observed were built on artificial structures, some of which were inappropriate and required nests to be removed. Over half of unsuccessful pairs experienced significant human disturbance. We recommend that conservation efforts focus on reducing this ratio, and to help do so, we urge erecting nest platforms as part of efforts to deter nesting when it conflicts with human activity.

The Osprey (Pandion haliaetus) is a diurnal, piscivorous raptor that breeds or winters in a variety of habitats on all continents except Antarctica. Upon reaching maturity, the birds typically return close to their natal site to breed. Ospreys do not maintain or defend hunting territories but instead reuse the same nest each year and aggressively defend only the local area around the nest site, called the nesting territory. This results in nesting birds ranging from isolated single pairs to semicolonial groups (Poole 1989, Poole et al. 2002). Historically, Ospreys nested in trees, but with increasing human population and development they now readily nest on artificial structures when available. For example, in Chesapeake Bay, in 1973, 32% of the estimated 1450 Osprey pairs nested in trees, while in 1995 and 1996 only 7% of 3473 pairs nested in trees. The rest nested on artificial structures. In the Willamette River valley of Oregon, in 1976 all of the 13 Osprey nests were in trees, but by 2008, 88% (242 of 275) were on artificial sites, such as nesting platforms, power poles and towers, pilings, cell-phone towers, and bridges (Henny et al. 2010).

Early historical documentation of Ospreys nesting around San Francisco Bay is sparse. Grinnell and Wythe (1927) listed the Osprey as a very rare resident in the bay area. In their compilation of the birds of California, Grinnell and Miller (1944) noted that Ospreys were formerly found along the whole length of California, primarily on rivers and lakes, but had become much less common and were reduced to nesting at only a few sites. Both publications excluded San Francisco Bay as a location for Osprey nesting.

Henny and Anthony (1989) described the population breeding in Califor-
nia as located primarily in northern coastal and mountainous areas. Along the coast, they placed the southern boundary of the breeding population at Kent Lake in Marin County, north of San Francisco Bay. They also reported breeding pairs along the Sacramento River and in the central and southern Sierra Nevada. More recently, breeding pairs have also been reported in Orange County (Kerr 2007) and San Diego County, including on San Diego Bay (Unitt 2004).

Since the surveys by Henny and Anthony, breeding bird atlases have been compiled for the nine San Francisco Bay counties with tidelands. Six of these atlases do not list Osprey as breeding around the tidelands, including those for San Francisco (San Francisco Field Ornithologists 2003), Marin (Shuford 1993), Sonoma (Burridge 1995), Napa (Berner et al. 2003), Santa Clara (Bousman 2007), and San Mateo (Sequoia Audubon 2001) counties. For the three other counties, a nest was reported in Contra Costa County (near Point Pinole) in 1998 (Glover 2009), a pair summered in Alameda County at the mouth of San Lorenzo Creek in 1999 (Richmond et al. 2011), and beginning in 2005, Ospreys nested regularly at Mare Island in Solano County (Berner and Rippey in press).

The largest active Osprey colony located near San Francisco Bay is at Kent Lake, north of the Golden Gate in Marin County (Figure 1). Established in the mid-1960s, the colony reached a peak of 52 occupied nests in 1994 and has since maintained itself but at smaller numbers. All the nests at Kent Lake are in trees, dead or living (Jules Evens pers. comm.).

In this paper we update the status of Osprey nesting on San Francisco Bay on the basis of Leong’s surveys at Mare Island from 1999 to 2013 and from a baywide survey by Brake, Wilson, and volunteers in 2013.

METHODS

Each year from 1999 through 2013, Leong surveyed nests of the Osprey and herons at Mare Island and the Vallejo waterfront (Solano County). Mare Island is the site of a naval shipyard that closed in 1996, but the area has not been extensively redeveloped, so numerous cranes and light poles that provide substrate for Osprey nests persist. These surveys took place between March and late July each year and were done either by car or on foot. The location of active nests was recorded and the behavior of adults and chicks was monitored during multiple visits.

Beginning in mid-summer 2012, Brake and Wilson extended Leong’s work with an exploratory survey of nesting Ospreys throughout San Francisco and San Pablo bays, during which we found 18 nests and counted 30 young.

In 2013, under the auspices of the Golden Gate Raptor Observatory, we initiated a more thorough survey of the bays (Figure 1). Suisun Bay (not shown in Figure 1), east of the Carquinez Strait, is generally considered part of the San Francisco Bay complex, and Ospreys are known to nest there, but only on ships of the Maritime Administration Reserve Fleet. Because the administration actively deters Ospreys from nesting on some of the ships, we excluded Suisun Bay from the study area.

We began nest surveys early in the local breeding season, which is from
Figure 1. Locations of Osprey nests around the San Francisco Bay area in 2013. The three numerals for each location refer to number of territorial pairs, number of laying pairs, and number of successful pairs, respectively. For example, Mare Island had 12 territorial pairs, 12 laying pairs, and 9 successful pairs.
late February to late July. We visited nests found in 2012 as well as searching for new nests. Surveys were limited to within 300 meters of the bay’s shoreline and were conducted on foot or from a car, ferry, or small boat. We solicited additional information on Osprey nesting by posting requests on local Internet birding forums. Each nest was photographed, and its location, substrate, status, number of chicks, and number of young fledged were recorded. We also recorded the behavior of adults and information regarding human disturbance of the nest. All nests were visited numerous times through the season.

We report nesting status and productivity in the terminology of Steenhof and Newton (2007). Two Ospreys occupying a nesting territory were a territorial pair. Territorial pairs that laid eggs were laying pairs. Territorial pairs that fledged at least one young were successful pairs. A nesting territory was occupied if it contained a pair that engaged in courtship or mating behavior, territory-defense behavior, nest building or refurbishing, incubation for long periods, or if eggs or chicks were present. We defined a pair as laying if we observed incubation for long periods or if eggs or chicks were present. We considered chicks fledged when they were 45 days old, which is about 80% of their average age at fledging of 55 days (Poole 1989). We estimated age by visiting nests frequently, usually at least once per week, during the latter part of the incubation and nestling period and noting the date when chick-feeding behavior was first observed and by aging the chicks when they were first visible. We continued regular visits until all of the nestlings had fledged. We report nesting success as both the ratio of successful pairs to territorial pairs and the ratio of successful pairs to laying pairs. We report productivity as the number of chicks fledged both per territorial pair and per laying pair.

RESULTS

Surveys 1999–2013, Mare Island, Vallejo

From 1999 through 2002, one pair of Ospreys nested annually on Mare Island and none nested on the Vallejo waterfront. In 2003, this increased to two pairs on Mare Island, four in 2004, and five in both 2005 and 2006 before dipping to four in 2007. Since then the number of nesting pairs found at Mare Island/Vallejo has increased steadily, rising to 14 in 2013.

Surveys 2013, Baywide

During the 2013 baywide survey, we found 26 territorial pairs (Table 1; Figure 1), which included all 16 pairs found during the exploratory survey in 2012. Of the additional 8 pairs found in 2013, five were in areas thoroughly surveyed in 2012, so we believe they were newly established in 2013 (two pairs at Mare Island and one each at Point Molate, port of Oakland, and San Mateo Bridge). The remaining three pairs were in areas not thoroughly surveyed in 2012, and the structure and appearance of nests suggest these pairs may have been overlooked (Rodeo 1 and 2, Long Wharf).

Of the 26 pairs found, 23 were laying pairs, of which 17 were successful. Of the nine pairs that were not successful, six laying pairs failed and
three pairs did not lay eggs. Nesting success was $17/26 (0.65)$ for territorial pairs and $17/23 (0.74)$ for laying pairs. Laying pairs fledged 44 young for a productivity of 1.7 young per territorial pair and 1.9 young per laying pair.

In our study area, we first observed building or maintenance of nests on 22 February, and the first sign of a pair at a nest on 27 February. Behavior indicating incubation was first observed on March 28. Dates of hatching ranged from 24 April to 21 May. Fledging was first observed on 22 June, and all young had fledged by 30 July.

### Nest Locations and Substrates

All but one of the pairs nested on the east side of the bay (Figure 1). The highest concentration of pairs was at Mare Island/Vallejo, which represented 54% (14/26) of all pairs, 65% (11/17) of all successful pairs, and 33% (3/9) of all unsuccessful pairs. The bay south of Mare Island/Vallejo had 46% (12/26) of all pairs, 35% (6/17) of all successful pairs, and 67% (6/9) of all unsuccessful pairs.

Twenty-five nests (96%) were on artificial structures. Of these, 13 (52%) were on either utility poles or light poles (e.g., Figure 2A) and 6 (24%) were on either active commercial cranes or infrequently moved cranes at a former shipyard (Figure 2B). The remaining six nests (24%) were located on a variety of structures, including a building roof, a ship, and near-shore pilings. One nest at Mare Island was located on a palm tree that had a flattened top.

### DISCUSSION

Available literature indicates that since the early 1900s Ospreys have nested on San Francisco Bay only rarely. Our studies documented a steady increase in nesting pairs, especially at Mare Island/Vallejo since 1999. Our 2013 baywide survey produced 26 nesting pairs, about half of which nested.

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**Table 1** Pairs of Nesting Ospreys Found During the 2013 Survey of San Francisco Bay

<table>
<thead>
<tr>
<th>Location</th>
<th>Nearest city</th>
<th>Nest substrate&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Territorial pairs</th>
<th>Laying pairs</th>
<th>Successful pairs</th>
<th>Young fledged</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hunters Point</td>
<td>San Francisco</td>
<td>A</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>2</td>
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<tr>
<td>San Mateo</td>
<td>San Mateo</td>
<td>E</td>
<td>1</td>
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<td>0</td>
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<tr>
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<td>Alameda</td>
<td>E</td>
<td>1</td>
<td>1</td>
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</tr>
<tr>
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</tr>
<tr>
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<td>C</td>
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<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Point Molate</td>
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<td>A, B, D</td>
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<td>2</td>
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<tr>
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<tr>
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<td>Rodeo</td>
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<td></td>
<td></td>
<td>26</td>
<td>17</td>
<td>44</td>
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</table>

<sup>a</sup>A, light pole; B, utility pole; C, crane; D, piling; E, other.
at Mare Island/Vallejo and the remainder south of there, predominately along the eastern shore of the bay.

We believe that the concentration of nests at Mare Island/Vallejo and the timing of population growth may be traceable to several factors. Mare Island/Vallejo is at the confluence of the Napa River and Carquinez Strait, both of which add large amounts of fresh water to the bay at various times through the year, resulting in a zone of relatively low salinity (Jassby et al. 1995), which may influence the availability of fish the Osprey prefers (Dege and Brown 2004). In addition, over the last 10 years the turbidity of the water in the bay has diminished (Schoellhamer 2011), and this turbidity is an important determinant of the Osprey’s hunting success (Vana-Miller 1987). Finally, when the Mare Island Naval Shipyard closed in 1996, light poles, cranes, and other structures became available as potential nesting sites, and they host 11 of the 12 nests found there in 2013.

Population Growth

Additional study is needed to quantify the status of the bay’s Osprey population, but several findings suggest the population is growing and expanding geographically. Between 2007 and 2013, the number of nesting pairs at

Figure 2. Osprey nests on artificial structures around San Francisco Bay. (A) Light structure on pier, Mare Island, from which three young fledged. (B) Operating crane on Mare Island where, not surprisingly, the pair failed. (C) Enshrouded nest and PVC deterrence devices installed to prevent use by Ospreys of an existing nest at Point Molate. Note the adult Osprey perched on a deterrence device. (D) Successfully used alternative nest structure installed near the nest shown in (C) with three nearly fledged nestlings.

Photos by Anthony J. Brake
Mare Island/Vallejo grew steadily from four to 14 nests, implying that food supply, availability of nest sites, or other variables have not yet begun to limit population growth at Mare Island/Vallejo. In addition, in 2013, Brake and Wilson found Osprey nests at Point Molate, the port of Oakland, and the San Mateo Bridge that were not present during our exploratory survey in 2012, indicating that the number of nesting pairs south of Mare Island/Vallejo is increasing as well. Finally, in 2013 the number of fledged young per laying pair was 1.9. This compares favorably to the annual productivity range of 1.11 to 2.09 per laying pair at the Kent Lake Osprey colony in Marin County (Figure 1) between 1981 and its peak year of growth in 1994 (J. Evens pers. comm.).

Conservation Issues

Ospreys nesting on the bay strongly preferred artificial structures, entailing the need for nesting on inappropriate structures to be deterred and for shielding of nests from human disturbance. In 2013, these issues affected five of nine unsuccessful pairs (56%). An incubated nest on a working barge-crane at Mare Island, an occupied nest on a power pole at Long Wharf, and an occupied nest on a light pole at the port of Oakland were removed to deter nesting. Significant human disturbance contributed to two additional pairs abandoning their nests: one pair incubating at Mare Island abandoned its nest when the former shipyard crane supporting it was moved, and another nest at Point Molate was abandoned after people began fishing within a few meters of the nest, which was located near eye level. While Ospreys are somewhat tolerant of human disturbance, they are particularly sensitive to abrupt or sporadic disturbance after nesting has begun (Levenson and Koplin 1984, Vana-Miller 1987).

To address these adverse effects on nesting success, we recommend tracking the ratio of nest failures related to disturbance. In 2013, this ratio was needlessly high (56%), and we urge that conservation efforts focus on reducing it to at least 25%, preferably lower. To help accomplish this, we recommend integrating the providing of nest platforms into efforts at deterrence, which typically include only removing nests and installing deterrence devices such as flagging, domed or peaked objects, or flexible plastic pipe structures. Ospreys are unusually persistent, and when their nests are removed birds will frequently try to build one or more new nests at the same or nearby locations, thus prolonging attempts at deterrence. If a platform is erected, however, Ospreys will usually nest on the platform in either the same or the following nesting season (Poole 1989, APLIC 2006). This approach promotes the success of deterrence and enhances the success of the affected pairs. For example, in 2013 at Rodeo, an incubated nest on live electrical wires collapsed. Subsequently, a nest platform was installed on the pole, and the pair used the platform in 2014, rather than attempting to nest on the wires again. In another case, after an attempt at deterring the nest at Point Molate in early 2014 (by covering the previously used nest with black fabric and adding flexible T-shaped devices constructed from PVC pipe; Figure 2C), the pair began building new nests on nearby utility poles, including a pole with live electrical wires. The pair continued building in spite
of continued efforts at deterrence until a platform was installed approximately 400 meters from the existing nest. The pair then quickly occupied the nest platform, adding nest material and commencing incubation (Figure 2D). We hope these results will serve as a model for conservation measures to be used routinely where Osprey nesting may conflict with human activities.

ACKNOWLEDGMENTS

We thank the following people for their enthusiastic help in finding and monitoring Osprey nests: Willie Agnew, Eddie Bartley, Lydia Bird, Michael Carnall (private boat captain), Richard Drechsler, Leora Feeney, Lorinda Ferland, Myrna Hayes, Bruce Holladay, Yvonne McHugh, Wally Neville, and Noreen Weeden. We also thank Chris Briggs, Chris Christopher, Jules Evans, Charles Henny, Yvonne McHugh, and David Quady for guidance and critical reading of the manuscript.

LITERATURE CITED


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FIRST NESTING OF THE CALIFORNIA GULL IN NEW MEXICO

WILLIAM H. HOWE, U.S. Fish and Wildlife Service, Division of Migratory Birds, P. O. Box 1306, Albuquerque, New Mexico 87103; bill_howe@fws.gov

SARTOR O. WILLIAMS III, Division of Birds, Museum of Southwestern Biology, University of New Mexico, Albuquerque, New Mexico 87131-0001

ABSTRACT: The California Gull (Larus californicus) has been expanding its breeding range southward in the western United States, including in the Rocky Mountains, for several decades. In New Mexico, the species was accidental in occurrence until numbers appeared in summer in the mid-1970s. Here we document the first breeding of the California Gull in New Mexico, where a small colony containing four broods was discovered in 2013; this event extends the known breeding range southward in the Rocky Mountains by about 150 km. Nesting will likely continue at least intermittently in New Mexico as water levels in the state’s reservoirs, and the presence of islands suitable for nesting, fluctuate over time.

The California Gull (Larus californicus) breeds largely in the interior of North America from the Northwest Territories and prairie provinces of Canada south into the U.S. locally to California, Nevada, Utah, and, along the Rocky Mountain front from Wyoming into Colorado. Until recently, the southern limits of the breeding range included Mono Lake in California, the Great Salt Lake and Utah Lake regions of Utah, and southern Colorado (Winkler 1996). Exceptionally far south, a small colony was discovered at the Salton Sea in southern California in 1997 (Molina 2000). Here we provide documentation for California Gulls successfully nesting in northern New Mexico at Heron Lake in 2013.

HISTORY OF THE CALIFORNIA GULL IN NEW MEXICO

The California Gull is a relative newcomer to New Mexico, with only two records for the state prior to the mid-1970s: fall 1942 (band recovery near Carlsbad, Eddy County; Woodbury and Knight 1951, Hubbard 1978) and spring 1960 (observation near Española, Rio Arriba County; Audubon Field Notes 14:330, 1960). Its known status radically changed in the mid-1970s, when J. P. Hubbard discovered 31 in July 1975 at Heron Lake (elevation 2188 m), a newly created reservoir adjacent to the San Juan Mountains, Rio Arriba County (American Birds [AB] 29:1016, 1975), followed by 37 seen at Eagle Nest Lake (elevation 2493 m) in the Sangre de Cristo Mountains, Colfax County, in June 1976 (AB 30:987, 1976). The species has since appeared annually at those sites in summer, occasionally in substantial numbers, as well as increasingly at other northern New Mexico locales, including on the Colorado Plateau at Morgan Lake, San Juan County.

By the late 1970s, migrating California Gulls began to occur at large lakes in the lower Rio Grande Valley of New Mexico: in Sierra County at Caballo Lake by November 1978 (AB 33:203, 1979) and Elephant Butte Lake by November 1979 (AB 34:188, 1980). Since then the species has increased in numbers and regularity there as well as to the south in Doña Ana County.
and also in several northwestern counties. It is now regular in small numbers in winter in Sierra and Doña Ana counties and is increasingly regular in the northwest in San Juan County.

In addition, summering birds now regularly linger at the Sierra County reservoirs. Elsewhere in New Mexico, the California Gull is rare and irregular in the middle Rio Grande Valley (where migrants are likely overlooked) and the watersheds of the Canadian and Pecos rivers and is casual elsewhere (e.g., eastern plains, southwestern counties). There are now reports from 27 of New Mexico’s 33 counties (Williams, unpubl. data).

**DISCOVERY OF THE HERON LAKE COLONY**

On 28 June 2013, Howe and Marilyn D. Howe were canoeing Heron Lake, with the intent of circling the largest island in the lake (36.6827° N, 106.7012° W) to investigate the activity of the gulls that were visible from shore over a kilometer away. Ring-billed (*L. delawarensis*) and California gulls had been frequently seen using this island, which is usually small and steep-sided at the water levels normally maintained at the lake. In 2013, following three years of drought, this island was much larger than usual, with long, relatively flat shelves radiating out from the steep center, particularly on the northwest side. It was on this northwestern shelf that the gull activity seemed to be concentrated, and thus a target of the canoe trip.

During our approach to the island from the southwest, 20 or more of what appeared to be California Gulls were visible from a distance. As the northwestern shelf came into view, two large but flightless gull chicks were seen running into the water in response to the approach of the canoe. As we maintained a distance of about 75 m from shore (the distance beyond which the gulls ceased to mob us), a scan from the canoe revealed 26 adult California Gulls plus four different broods of chicks—the two large chicks in the water, another brood of two large chicks with an attendant pair of adults, a younger chick with a single adult in attendance, and a pair of adults with two small chicks. There were also up to five solitary adults on the island in positions suggesting incubation, but we could not accurately count how many might have been incubating. Other adults loitering in this area may or may not have been associated with active nests.

**AGE OF CHICKS AND NESTING CHRONOLOGY**

We estimated the ages of chicks, all of which were photographed, on the basis of visible characteristics as presented by Smith and Diem (1972). We estimate the young California Gulls observed on 28 June 2013 ranged from about 9 to 27 days in age. The youngest chicks (Figure 1), about 9 days of age, appeared as balls of fluff with legs and necks more prominent than in chicks less than a week old but lacked apparent development of pin feathers in the wing or humeral tract, which typically begins around day 11. The next oldest was a single fluffy bird with a single adult; from the fuzzy appearance of its entire front due to down feathers clinging to the tips of the juvendal feathers, plus the lack of juvendal feathers on the crown or front of the head and only a hint of dark gray tuft in the auricular area, that chick
appeared to be in the middle of its third week, or about 17 days old. The oldest chicks were the two on shore with two adults (Figure 2) and the two on the water; these appeared to be roughly the same age of about 27 days, by their feathered heads, traces of down around the neck, and the backs appearing fully feathered or nearly so.

California Gulls typically lay two to three eggs per clutch, at two-day intervals, and full incubation does not begin until completion of the clutch (Winkler 1996). Five studies cited by Winkler (1996) indicated average incubation periods ranging from 23.6 to 26.6 days, with an overall average among those studies of 25.2 days. Presuming an incubation period of about 25 days suggests that the eggs producing the oldest chicks were laid on or about 7 May, and those of the youngest chicks on or about 26 May, with the egg of the intermediate-aged chick laid about 17 May.

DISCUSSION

Conover (1983), analyzing available data from the early 20th century forward, concluded that the California Gull had increased substantially in both range and abundance in western North America. To the north of New Mexico in Colorado, Andrews and Righter (1992) observed that the species had “increased dramatically” since the 1950s, with the first breeding
documented in 1963, regular wintering established by the mid-1970s, and breeding established as far south as southeastern Colorado by 1988. The increases observed in New Mexico since the mid-1970s, including in migrating, wintering, and summering birds, which led to the discovery of nesting reported here, appear to have been a predictable part of this overall increase in range and numbers during the latter half of the 20th century.

Heron Lake began filling in 1971 and was populated by summering California Gulls by 1975. There was no known breeding until 2013, likely because of the absence of a substrate suitable for nests. Under normal operating conditions, the water level of the lake is maintained at about 2188 m. At that level the small, steep-sided island is presumably unsuitable for nesting California Gulls. The lake’s surface elevation on the day of discovery of the colony was 2171 m. Visual estimates from the canoe suggested the elevation of the shelf upon which the gulls were nesting was about 2174 m, increasing gradually toward the interior of the island. Given this, we estimate that this island in Heron Lake would likely be suitable for nesting by California Gulls when the water’s surface elevation ranges between about 2160 m and 2175 m.

Water levels at Heron Lake are likely to continue fluctuating with the climate, and this site’s suitability for breeding gulls should vary over time. Since the dam was constructed in 1971, water levels may have been suitable for nesting in other years, such as in 2004, when the May surface elevation

Figure 2. Adult California Gulls with two chicks estimated to be about 27 days old at Heron Lake, Rio Arriba County, New Mexico, 28 June 2013, representing the oldest of four broods documented there that day.

Photo by William H. Howe
was 2169 m, and possibly in 2003 and 2005, when May surface elevations were 2176 m. In 2003, the water level changed little during the ensuing summer; in 2005, however, the level increased to 2182 m by mid-June, which would likely have flooded any nests. Regardless of year-to-year variability, there now appears to be a population of adult California Gulls in northern New Mexico during late spring and early summer, poised to exploit suitable conditions wherever they may become available.

Breeding at Heron Lake not only marks the first documented nesting by the California Gull in New Mexico, it also extends its known breeding range in the Rocky Mountain region some 150 km to the south, making it second only to the Salton Sea as the southernmost colony known for the species. In addition, this is the only known nesting of any species of gull in New Mexico.

ACKNOWLEDGMENTS

We thank the staff at Heron Lake State Park for providing historical data on water levels at Heron Lake, and Jason Beason for updated information on Colorado breeding sites. We also thank Andrew B. Johnson and David J. Krueper for providing valuable comments on the manuscript.

LITERATURE CITED


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CONSERVATION CONCERNS FOR SIERRA NEVADA BIRDS ASSOCIATED WITH HIGH-SEVERITY FIRE

CHAD T. HANSON, Earth Island Institute, 2150 Allston Way, Suite #460, Berkeley, California 94704; cthanson1@gmail.com

ABSTRACT: Numerous avian species are positively associated with “snag forest” habitat created by patches of high-severity fire, mainly because of the abundance of standing fire-killed trees (snags) and fire-following shrubs. There is now considerably less severe fire than there was historically in the forests of California’s Sierra Nevada, owing to fire suppression. Moreover, under current policies for management of public and private forest, much of the snag forest created by fire is subjected to post-fire logging of snags. Mechanical mastication and herbicide spraying of shrubs, followed by planting of conifers, are also common, and large-scale programs of mechanical thinning seek to prevent creation of this habitat. Thus there is reason for concern for birds associated with snag forest. I synthesized existing research to identify the species positively associated with this habitat and assessed their population trends according to the Breeding Bird Survey. In the Sierra Nevada 24 species are associated with snag forest, and half of these are declining or are too rare for the Breeding Bird Survey to detect any trend. For snag-forest species, there are significantly more declines than increases (all snag-forest species with statistically significant population trends are declining), whereas species of unburned forest manifest no such pattern. These results indicate a need for more managed wildland fire, and for current management policies, both pre- and post-fire, to be revisited, particularly in national forests where most of the post-fire habitat exists.

Recently there has been increased research interest in birds and post-fire environments of conifer forests of the western U.S., including in the Sierra Nevada of California. Numerous bird species have been found to select post-fire habitat created by severe fires (i.e., patches in which most or all trees are killed) (e.g., Hanson and North 2008, Fontaine et al. 2009, Bond et al. 2012, Odion and Hanson 2013, DellaSala et al. 2014). This “snag forest” habitat, also known as “complex early seral forest” (DellaSala et al. 2014), is rich in standing fire-killed trees, or “snags,” used by woodpeckers and secondary cavity-nesters, and has an abundance of fire-following flowering shrubs, which attract flying insects and, in turn, aerial insectivores (Hanson 2007, Fontaine et al. 2009, DellaSala et al. 2014). Biodiversity and wildlife abundance in snag forest is high, particularly among birds, and is comparable to, and often higher than, that found in unburned old forest (Fontaine et al. 2009, Burnett et al. 2012, Swanson et al. 2011, DellaSala et al. 2014).

Since the early 20th century, however, snag forest has become rare in the Sierra Nevada because of fire-suppression policies, resulting in a twofold (Mallek et al. 2013) to fourfold (Odion and Hanson 2013, Hanson and Odion 2014, Odion et al. 2014) decline in severe fire. Moreover, on both public and private lands, when fires do occur, much of the post-fire habitat—especially in severely burned areas—is subjected to intensive post-fire logging, with no restrictions on logging around nest sites for most species, as well as mechanical mastication and herbicide-spraying of shrubs, followed by planting of conifers (USFS 2004). These practices exacerbate the deficit in snag forest caused by fire suppression (Swanson et al. 2011, DellaSala et al. 2014). Furthermore, the U.S. Forest Service is currently proposing
as much as a tenfold increase in large-scale projects of mechanical thinning designed to prevent severe fires in the first place (North 2012). After a fire, logging, reduction/removal of native shrubs, and planting of conifers are the common current practice on private lands and much of national forest lands (USFS 2014a–c). For these reasons, researchers’ concern about conservation of species associated with snag forest is justified.

My objectives in this study were three. First, to synthesize existing data to determine which forest birds native to the Sierra Nevada are positively associated with the habitat conditions created by severe fire and which are associated with unburned forests. Second, to determine the extent to which species in these two habitats are at risk because of either declining populations or rarity. Third, to determine whether declining species are disproportionately represented in one habitat or the other (snag forest or unburned).

METHODS

This paper contains both a synthesis of existing literature on habitat associations of Sierra Nevada bird species with regard to wildland fire and an analysis of population trends in two sets of species: those associated with severe fire and those associated with unburned forest.

First, I synthesized existing studies that have investigated the relationships between severe fire and birds native to the Sierra Nevada to identify those species that tend to select snag forest during the breeding season. Four published, peer-reviewed studies addressing this question, Raphael and White (1984), Raphael et al. (1987), Hanson and North (2008), and Fontaine et al. (2009), are the basis for my categorization.

Raphael and White (1984) and Raphael et al. (1987) compared use of unburned forest and severely burned forest by various species in the northern Sierra Nevada. The former used a cluster analysis with a threshold of 0.75 for overlap in selection of nesting habitat. The latter evaluated species’ habitat associations in a severely burned area versus an adjacent unburned forest by using frequencies of detection in surveys during three intervals, 6–8, 15–19, and 21–25 years after the fire. Raphael et al. (1987) did not include a statistical analysis, so I characterized species as being associated with severe fire or unburned forest if, during the breeding season, they were at least twice as abundant in one forest type than in the other. Hanson and North (2008), using point counts, investigated the relationship between three woodpecker species and fire severity in the Sierra Nevada in terms of foraging-habitat selection in three burned areas at 2 to 4 years after the fire. Fontaine et al. (2009) used point counts to evaluate differences in birds’ use of unburned versus severely burned forest of two ages in southwestern Oregon. Though their study was not in the Sierra Nevada, it was useful in identifying the habitat association of a few of the rarer Sierra Nevada species for which the Sierra Nevada studies had too few (or no) detections for habitat selection to be assessed effectively. From Hanson and North (2008) and Fontaine et al. (2009) I categorized a species as associated with severe fire or unburned forest if the studies reported a statistically significant association with such habitat (at \( \alpha = 0.05 \)).

In some cases the literature identifies a species as being associated
with severe fire only in the early years after the fire (e.g., Black-backed Woodpecker, Hairy Woodpecker, and Dark-eyed Junco [scientific names in Table 1]) but not in older burns, or vice versa (e.g., Orange-crowned Warbler, MacGillivray’s Warbler). I have included both categories in the list of species associated with severe fire.

I restricted the list to species whose California breeding ranges lie primarily or exclusively in the montane and foothill forests of the Sierra Nevada, not extending to other nearby ecosystems such as the Central Valley to the west or the desert to the east. For this selection I used range maps from field guides to birds of western North America in general and northern California in particular (Fix and Bezener 2000, Peterson 2010).

Once the list of bird species associated with severely burned areas was determined, I used population-trend data (1966–2012) for the Sierra Nevada region from the Breeding Bird Survey (BBS) (http://www.mbr-pwrc.usgs.gov/cgi-bin/atlasa12.pl?S15&2&12) as the basis for which species are declining or increasing or are too rare for BBS data to reveal trends with confidence. I categorized a declining species as being at risk only if the long-term trend (1966–2012) was statistically significant, as coded by red at the BBS website (http://www.mbr-pwrc.usgs.gov/bbs/trend_info10.html).

I characterized species with serious data deficiencies due to rarity (coded by a red dot in BBS data: http://www.mbr-pwrc.usgs.gov/bbs/credhm09.html)—those with so little data that no trend could be estimated—as being at risk because of the inherent vulnerability of small populations (Traill et al. 2007).

Second, I used these sources to also identify the Sierra Nevada birds most strongly associated with the opposite end of the spectrum: unburned forest. To identify species at risk within this group, I used the BBS data as described above for snag-forest species.

To base the assessment on sets of species with a clear contrast, I excluded from the analysis species that were significantly associated neither with snag forest nor with unburned forest, for example, those species for which habitat associations are not yet well understood or which are more associated with intermediate levels of fire severity.

I used a chi-squared test for goodness of fit (Rosner 2000) to determine whether the proportions of increasing and declining species—those with statistically significant BBS trends—differed from the expectation under the null hypothesis of an equal proportion of increasing and decreasing species.

RESULTS

I identified 24 forest birds native to Sierra Nevada that are associated with severely burned areas (Table 1). Of these 24 species, 10 have a population trend in the Sierra Nevada with a statistically significant decline, and six of these are also experiencing significant population declines across the United States as a whole (Table 1). Data for an additional two species are insufficient for a trend to be estimated (Table 1). Of the remaining species, most have downward trends, but these are not statistically significant. All of the snag-forest species with statistically significant population trends are in decline.

I identified 17 forest birds associated with unburned forests (Table 2). Of
**Table 1** Birds Associated with Severely Burned Areas in the Sierra Nevada and Their Population Trends

<table>
<thead>
<tr>
<th>Nesting guild and species</th>
<th>Studies indicating habitat association</th>
<th>BBS trend, 1966–2012a</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Canopy</strong></td>
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</tr>
<tr>
<td>Calliope Hummingbird <em>Selasphorus calliope</em></td>
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<td>Olive-sided Flycatcher <em>Contopus cooperi</em></td>
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<td>−3.71b</td>
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<td>Western Wood-Pewee <em>Contopus sordidulus</em></td>
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<td>−1.68</td>
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<tr>
<td>Warbling Vireo <em>Vireo gilvus</em></td>
<td>Fontaine et al. 2009</td>
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</tr>
<tr>
<td>Purple Finch <em>Haemorhous purpureus</em></td>
<td>Fontaine et al. 2009</td>
<td>−2.14b</td>
</tr>
<tr>
<td><strong>Shrub and ground</strong></td>
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<tr>
<td>Mountain Quail <em>Oreortyx pictus</em></td>
<td>Fontaine et al. 2009</td>
<td></td>
</tr>
<tr>
<td>Common Nighthawk <em>Chordeiles minor</em></td>
<td>Raphael et al. 1987</td>
<td></td>
</tr>
<tr>
<td>Dusky Flycatcher <em>Empidonax oberholseri</em></td>
<td>Fontaine et al. 2009</td>
<td></td>
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<td>Wrentit <em>Chamaea fasciata</em></td>
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<td>−1.98</td>
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<td>Orange-crowned Warbler <em>Oreothlypis celata</em></td>
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<td>Green-tailed Towhee <em>Pipilo chlorurus</em></td>
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<td>−2.85</td>
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<tr>
<td>White-crowned Sparrow <em>Zonotrichia leucophrys</em></td>
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<td>Dark-eyed Junco <em>Junco hyemalis</em></td>
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<td>−1.12b</td>
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<td>Lewis’s Woodpecker <em>Melanerpes lewis</em></td>
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<td>Hairy Woodpecker <em>Picoides villosus</em></td>
<td>Raphael et al. 1987</td>
<td></td>
</tr>
<tr>
<td>Black-backed Woodpecker <em>Picoides arcticus</em></td>
<td>Raphael et al. 1987</td>
<td>NAc</td>
</tr>
<tr>
<td>Pygmy Nuthatch <em>Sitta pygmaea</em></td>
<td>Raphael and White 1984</td>
<td>−2.93</td>
</tr>
<tr>
<td>Mountain Bluebird <em>Sialia currucoides</em></td>
<td>Raphael et al. 1987</td>
<td></td>
</tr>
</tbody>
</table>

---

aPercent change per year in Sierra Nevada. Only statistically significant trends are shown.


cDetections during the BBS, at both the regional and national scales, too few for any trend to be estimated, and there are major deficiencies in the data (BBS red dot category).
these 17, two have experienced a statistically significant decline in the Sierra Nevada, three have experienced an increase, and three are too rare for their trend to be determined (Table 2).

Among snag-forest species associated with severely burned areas, the ratio of declining species to increasing species was significantly greater

Table 2  Birds Associated with Unburned Forest in the Sierra Nevada and Their Population Trends

<table>
<thead>
<tr>
<th>Nesting guild and species</th>
<th>Studies indicating habitat association</th>
<th>BBS trend, 1966–2012a</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Canopy</strong></td>
<td></td>
<td></td>
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<tr>
<td>Pacific-slope Flycatcher <em>Empidonax difficilis</em></td>
<td>Fontaine et al. 2009</td>
<td></td>
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<tr>
<td>Hutton’s Vireo <em>Vireo huttoni</em></td>
<td>Fontaine et al. 2009</td>
<td>+5.33</td>
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<tr>
<td>Steller’s Jay <em>Cyanocitta stelleri</em></td>
<td>Raphael et al. 1987</td>
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<tr>
<td>Brown Creeper <em>Certhia americana</em></td>
<td>Raphael and White 1984</td>
<td></td>
</tr>
<tr>
<td>Golden-crowned Kinglet <em>Regulus satrapa</em></td>
<td>Raphael et al. 1987</td>
<td></td>
</tr>
<tr>
<td>Black-throated Gray Warbler <em>Setophaga nigrescens</em></td>
<td>Fontaine et al. 2009</td>
<td>−1.61b</td>
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<tr>
<td>Hermit Warbler <em>Setophaga occidentalis</em></td>
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<td>Raphael et al. 1987</td>
<td>+1.21</td>
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<tr>
<td>Red Crossbill <em>Loxia curvirostra</em></td>
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<td>NAc</td>
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<tr>
<td>Evening Grosbeak <em>Coccothraustes vespertinus</em></td>
<td>Raphael et al. 1987</td>
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<tr>
<td><strong>Shrub and ground</strong></td>
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<td></td>
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<td>Hermit Thrush <em>Catharus guttatus</em></td>
<td>Raphael et al. 1987</td>
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<tr>
<td>Wilson’s Warbler <em>Cardellina pusilla</em></td>
<td>Fontaine et al. 2009</td>
<td>−4.71b</td>
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<tr>
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<tr>
<td>Williamson’s Sapsucker <em>Sphyrapicus thyroideus</em></td>
<td>Raphael and White 1984</td>
<td>+3.14</td>
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<tr>
<td>Red-breasted Sapsucker <em>Sphyrapicus ruber</em></td>
<td>Raphael and White 1984</td>
<td></td>
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<tr>
<td>Chestnut-backed Chickadee <em>Poecile rufescens</em></td>
<td>Fontaine et al. 2009</td>
<td>NAc</td>
</tr>
<tr>
<td>Red-breasted Nuthatch <em>Sitta canadensis</em></td>
<td>Raphael and White 1984</td>
<td></td>
</tr>
<tr>
<td>Pacific Wren <em>Troglodytes pacificus</em></td>
<td>Fontaine et al. 2009</td>
<td></td>
</tr>
</tbody>
</table>

aPercent change per year in Sierra Nevada. Only statistically significant trends are shown.
cDetections during the BBS, at both the regional and national scales, too few for any trend to be estimated, and there are major deficiencies in the data (BBS red dot category).
than expected, contradicting the null hypothesis ($\chi^2 = 10.0, P = 0.002$). The observed numbers of increasing and decreasing snag-forest species were zero and ten, respectively, whereas the expected values for both were five. The number of species of unburned forest with statistically significant population trends was insufficient for this analysis, but there were more increasing species than decreasing species. Thus, while it cannot be said that significantly more species of unburned forest are increasing rather than decreasing, the possibility that more of these species are decreasing than increasing can be ruled out.

**DISCUSSION**

These results imply that about half of the Sierra Nevada bird species associated with severe fire are at risk, including some nesting in the canopy, in shrubs, and in cavities. BBS data also suggest that most of these are experiencing population decline nationally as well (Table 1). Moreover, all of the Sierra Nevada snag-forest species with statistically significant population trends are declining, a pattern not evident for the species of unburned forest.

Stephens et al. (2012) analyzed the effects of mechanical forest thinning intended to inhibit fires, but they did not include the effects of such fire reduction on species associated with habitat created by severe fire. They suggested that such projects have “few unintended consequences” (p. 558). However, the substantial number of bird species that select severely burned areas, and the pattern of declines among these species, indicate that the effects on snag-forest associates from management designed to reduce fire cannot be so easily dismissed.

White et al. (2013) suggested that mechanical thinning could be used to create “open” forests, with which many species are aligned. However, White et al. did not distinguish between open conditions created by intensive mechanical thinning, which is designed to minimize snags and reduce shrubs, versus open conditions created by natural disturbance, which contain an abundance of snags and patches of chaparral. For this reason, White et al. (2013) categorized species such as the Olive-sided Flycatcher and Black-backed Woodpecker, which are associated with severe fire, as associated with “open” forest rather than burned habitat. However, logging creates an ecological trap for the former (Robertson and Hutto 2007), and, once the forest is burned, severely degrades it for the latter by reducing the density of snags (Hutto 2008). This underscores the need for the rather specific nature of burned habitat, and the species associated with it, to be recognized (DellaSala et al. 2014).

The species associated with fire-following shrubs may be particularly vulnerable, as this group contains the largest number of species at risk. The threats to these species—as well as to other species associated with snag forest—from current policies for forest/fire management are compounded by a lack of protection during nesting season. Much of the post-fire logging and pre-fire mechanical thinning is ground-based, and heavy machinery crushes shrub patches, potentially affecting nesting birds, since there are currently no restrictions to prevent this (USFS 2004). The U.S. Forest Service’s conservation strategy for the Black-backed Woodpecker, which is the agency’s chosen “management indicator species” for snag forest, strongly
recommends no logging in the nesting season, to protect not only Black-backed Woodpecker chicks as snags are felled, but also the many other birds of Black-backed Woodpecker habitat (Bond et al. 2012). However, although many studies of birds and burned habitat have been published over the last decade, the Forest Service has not incorporated this recommendation into its plan governing Sierra Nevada national forests (USFS 2004, USFS 2014a-c).

Additional harm to species associated with post-fire shrub habitat is caused by planting of conifers, intended to short-circuit the chaparral stage of natural post-fire succession and substantially reduce the extent and duration of shrub cover. This suppression of shrubs is exacerbated by post-fire logging often being promoted as a means of generating revenue to fund artificial planting of conifers (USFS 2004). Thus current post-fire management practices represent a threat to species that nest in or under shrubs, like the Orange-crowned Warbler, which is associated with intermediate stages of succession of severely burned forest in the Pacific states and the northern Rockies (Hutto 1995, Fontaine et al. 2009) and which is declining in the Sierra Nevada.

While my results highlight conservation concern for snag-forest species, they do not suggest that there are no threats to any species in unburned forest in the Sierra Nevada, particularly those of specialized habitat within unburned forest. For example, one of the declining species of unburned forest, Wilson’s Warbler, is associated with dense thickets of riparian shrubs and small trees, and livestock grazing has been identified as a substantial threat in this regard (Beedy and Pandolfino 2013). Also, dense, old conifer forest is disproportionately affected by intensive mechanical thinning, which under current management tends to remove most of the trees, many of which are mature and old (USFS 2004). The California Spotted Owl (Strix occidentalis occidentalis), which the Forest Service considers sensitive, tends to avoid such thinned areas (Gallagher 2010). Dense, old forest adjacent to unmanaged burned patches offers conditions optimal for this species, since the owls prefer the former for nesting and roosting, the latter for foraging (Bond et al. 2009). Under current management (USFS 2004), these conditions are being targeted by mechanical thinning of dense old forest and by post-fire logging (DellaSala et al. 2014), which tends to reduce occupancy (Lee et al. 2012). The California Spotted Owl is now experiencing a population decline, except in unmanaged forests protected on national park lands (Conner et al. 2013, Tempel and Gutiérrez 2013, Tempel 2014).

Thus a reevaluation of current policies for forest and fire management (i.e., fire suppression, forest thinning for fuel reduction, post-fire logging, shrub eradication, and conifer planting) is warranted, especially on federal public lands where most of the current and potential habitat for these species occurs. Furthermore, increased use of managed wildland fire, particularly in remote areas, to restore fire of mixed severity to these forests, would benefit many species.

ACKNOWLEDGMENTS

Thanks are due to all of the authors of the cited studies regarding snag-forest habitat for their intellectual curiosity about this unique forest type, and for their countless hours of field work in difficult terrain. I also thank the peer reviewers and Western Birds’ editorial staff for numerous helpful suggestions that improved the manuscript.
CONSERVATION CONCERNS FOR SIERRA NEVADA BIRDS

LITERATURE CITED


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Accepted 21 August 2014
CALL TYPES OF THE RED CROSSBILL IN THE SAN GABRIEL, SAN BERNARDINO, AND SAN JACINTO MOUNTAINS, SOUTHERN CALIFORNIA

WALTER SZEŁIGA, 2614 Millstone Loop, Ellensburg, Washington 98926; walter.szeliiga@gmail.com
LANCE BENNER, 2257 Country Club Drive, Altadena, California 91001
JOHN GARRETT, 711 S. Mentor Ave., Pasadena, California 91106
KATHI ELLSWORTH, 448 Shadyglen Lane, San Dimas, California 91773

ABSTRACT: The Red Crossbill (Loxia curvirostra) is notable for its extensive morphological and vocal variation, which may represent a complex of incipient and cryptic species differing by flight call. To date, at least 10 distinct flight-call groups have been identified in North America. To our knowledge, however, the flight calls of the Red Crossbills of southern California have not been studied. To begin to address this deficit, we recorded Red Crossbill flight calls at 17 locations in and near the Transverse and northern Peninsular ranges from January 2011 through April 2014. These crossbills were associated with multiple species of conifers, including Jeffrey Pine, Sugar Pine, White Fir, and ornamental plantings of non-native Aleppo Pine, at elevations from 380 to 2700 m. Analysis of sonograms of these flight calls reveals primarily type 2 of Groth’s (1993) classification system but also migrants of type 3 in the Mojave Desert.

The nomadic Red Crossbill (Loxia curvirostra) is found throughout the coniferous forests of North America and is notable for its large irruptions, which are modulated primarily by the waxing and waning of cone crops (Dickerman 1987, Knox, 1992, Benkman, 1993). The Red Crossbill is further distinguished by its complex morphological and vocal variation (Groth 1993, Smith and Benkman 2007), characteristics that may help create or reinforce reproductively isolated populations. Although often difficult to discern under field conditions, these vocal variations, particularly in flight calls, may be used to assign individual crossbills to groups that may represent incipient or cryptic species. The physical differences, primarily in body and bill size, by which the various subspecies have been defined are not obvious under field conditions (Groth 1993).

In southern California, the occurrence of the Red Crossbill has been documented in the literature since the end of the 19th century (Daggett 1899, Grinnell and Miller 1944). Much work on the variation of the Red Crossbill has been done since the publication of the most recent regional survey (Garrett and Dunn 1981), yet no study, to our knowledge, has categorized the Red Crossbills of southern California by flight calls. To address this deficit, we audio-recorded the species in the San Gabriel (Kern and Los Angeles counties), San Bernardino (San Bernardino County), and San Jacinto mountains (Riverside County) from January 2011 to April 2014. Here, we describe the results of the analysis of these audio recordings.

Distributional Summary

Red Crossbills inhabit coniferous forest throughout North America. In California, they are widespread in the northern half of the state, with breed-
Figure 1. Locations of Red Crossbill recordings discussed in this paper. Letters refer to locations keyed in Table 1. Contour interval 1200 m. (a) Southern and Baja California. Dashed box shows region of detail. (b) Detail of sites of Red Crossbill recordings in the San Gabriel Mountains.
CALL TYPES OF THE RED CROSSBILL IN SOUTHERN CALIFORNIA

ing populations in the southern Cascade Range, northern Coast Ranges, Klamath Mountains, Modoc Plateau, and the Sierra Nevada (Adkisson 1996). In southern California, the occurrence of Red Crossbill is erratic, with most records from the mountains of the Transverse and Peninsular ranges, supplemented with exceptional records, both toward the coast and in the desert, primarily in ornamental plantings, during irruption years (Garrett and Dunn 1981, Unitt 2004).

In the Transverse Ranges, nesting has been recorded on Mt. Pinos (elevation ~2600 m), Ventura County, but is still only suspected elsewhere despite an abundance of apparently suitable habitat (K. L. Garrett pers. comm. 2011). Farther south, potential breeding has been observed on only one occasion, in coastal ornamental plantings in San Diego County (Unitt 2004).

The morphological variation in the Red Crossbill has led to various classification schemes over the past century (Griscom 1937, Monson and Phillips 1981, Payne 1987, Groth 1993). However, most of the recent work has focused on variations in flight calls, which in North America have been grouped into 10 types (Groth 1993, Benkman et al. 2009, Irwin 2010). Birds of each call-type differ in bill structure, and these differences influence their ability to feed on cones of various sizes (Benkman 1993, Benkman et al. 2010). These differences in bill structure are thought to cause each call-type to preferentially forage on and associate with specific conifers. This preferential foraging may be especially apparent during periods of food scarcity (Benkman 1993). During failures of cone crops of a call-type’s key conifer, crossbills may irrupt in search of other seed sources.

Observations

In southern California Red Crossbills are sporadically reported to ornithological mailing lists and to the online database at http://www.ebird.org. We drew upon both of these sources in choosing locations to search for Red Crossbills. Garrett’s observations near Big Pines, San Gabriel Mountains, provided the impetus for beginning our search on nearby Table Mountain.

We recorded the birds with a Sennheiser ME66 shotgun microphone connected to a Marantz PMD 670 digital recorder sampling at 44 kHz and a Sennheiser MKE-400 short shotgun microphone connected to an Olympus LS-10. One exception is the recording made on 25 June, which was extracted from a video taken with a Canon A720 IS digital camera. Table 1 lists our observations and recordings. We are aware of one additional recording from the Peninsular ranges, made by Richard Webster on 24 September 2010, in the Sierra San Pedro Mártir of Baja California, Mexico (XC71803, accessible at http://www.xeno-canto.org/71803).

Our observations in the mountains were made mostly above 2000 m elevation in mixed-conifer forests (Minnich 2007). In addition, we observed crossbills in subalpine forests on Throop Peak and at Bluff Lake as well as in ornamental plantings of Aleppo Pine (Pinus halepensis) in the Mojave Desert. Mixed-conifer forests in the Transverse and Peninsular ranges consist primarily of Jeffrey Pine (P. jeffreyi), Sugar Pine (P. lambertiana), and White Fir (Abies concolor), infrequently of Ponderosa Pine (P. ponderosa), while subalpine forests at high elevations consist of Lodgepole Pine (P. contorta subsp. murrayana) and Limber Pine (P. flexilis).
## Table 1  Recordings of Flight Calls of the Red Crossbill from Southern California and Northern Baja California

<table>
<thead>
<tr>
<th>Location</th>
<th>Map key</th>
<th>Elevation (m)</th>
<th>Coordinates</th>
<th>Forest type</th>
<th>Date</th>
<th>Call type(s)</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>Kern County</td>
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<tr>
<td>Frazier Mountain</td>
<td>l</td>
<td>2322</td>
<td>34.792° N, 118.954° W</td>
<td>Jeffrey Pine</td>
<td>12 May 2013</td>
<td>2</td>
<td>XC133514</td>
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<td>Los Angeles County: Mojave Desert</td>
<td></td>
<td></td>
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<tr>
<td>Pearblossom Park, Pearblossom</td>
<td>d</td>
<td>950</td>
<td>34.502° N, 117.911° W</td>
<td>Aleppo Pine (ornamental)</td>
<td>5 Mar 2011</td>
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<td></td>
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<tr>
<td></td>
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<td></td>
<td></td>
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<td>4 Nov 2012</td>
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<td>10 Nov 2012</td>
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<td>Holiday Lake, Neenach</td>
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<td>879</td>
<td>34.800° N, 118.576° W</td>
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<td>k</td>
<td>710</td>
<td>34.742° N, 118.200° W</td>
<td>Aleppo Pine (ornamental)</td>
<td>2 Mar 2013</td>
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<td>Table Mountain, Big Pines</td>
<td>b</td>
<td>2200</td>
<td>34.386° N, 117.687° W</td>
<td>Ponderosa/Jeffery Pine</td>
<td>8 Jan 2011</td>
<td>2</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>15 Jan 2011</td>
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<td>24 Apr 2011</td>
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<td>Angeles Crest Hwy., Mile 60.7</td>
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<td>3 Jun 2011</td>
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<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td>15 Jun 2011</td>
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<td>Throop Peak</td>
<td>h</td>
<td>2700</td>
<td>34.353° N, 117.800° W</td>
<td>Lodgepole Pine</td>
<td>19 Jun 2011</td>
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<td>Mt. Waterman</td>
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<td>2117</td>
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<td>2</td>
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<td>1610</td>
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<td>XC165047</td>
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<td>Bluff Lake, Big Bear Lake</td>
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<td>34.221° N, 116.969° W</td>
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<td>c</td>
<td>2600</td>
<td>33.813° N, 116.639° W</td>
<td>Sugar Pine</td>
<td>23–24 Jan 2011</td>
<td>2</td>
<td>XC124421</td>
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<td>Baja California: Sierra San Pedro Mártir</td>
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<td>National Observatory</td>
<td>a</td>
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<td>31.014° N, 115.463° W</td>
<td>Jeffrey Pine, Sugar Pine, White Fir</td>
<td>24 Sep 2010</td>
<td>2</td>
<td>XC71803c</td>
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</table>

*aSee Figure 1.*

*bRecording available at www.xeno-canto.org or specimen.*

*cRecording by Richard E. Webster. All others by Benner.*
Flocks of Red Crossbills ranged in size from as few as two adults to in excess of 30 individuals, including adults and juveniles. One juvenile, from a flock of call-type 2, was killed by striking a window at the Mt. Waterman ski area on 25 June 2011 and is deposited as a specimen in the Natural History Museum of Los Angeles County (LACM 115904).

We observed crossbills feeding on seeds of Sugar Pine (once, Mt. San Jacinto), Jeffrey Pine (Angeles Crest Highway, Mt. Waterman Ski Area, Table Mountain), Lodgepole Pine (Throop Peak, Bluff Lake), and Aleppo Pine (Holiday Lake, Apollo Park, Pearblossom Park), as well as visiting a feeder (Grassy Hollow). On many occasions, we saw individuals perching, but not feeding, in White Fir. We also noted birds taking grit at Mt. Waterman and gleaning insects from branch tips on Mt. San Jacinto. In addition, we observed adults feeding juveniles on at least two occasions (25 June 2011 and 14 September 2013). Because of the species’ nomadism, however, this behavior does not necessarily indicate breeding in the immediate area.

Analysis and Discussion

Identification of crossbill calls from audio recordings requires analysis of the calls’ time-frequency content. Figures 2 and 3 show spectrograms of representative flight calls. Groth (1993) provided sample spectrograms and written descriptions of the eight flight-call categories he defined.

Of these eight, four (types 1, 2, 3, and 5) are dominated by a downward modulation in frequency over time, similar to the recordings shown in Figures 2 and 3. The frequency modulation of flight calls of type 1 is rapidly upward followed by rapidly downward. Flight calls of type 2 have a downward frequency modulation interrupted by a hesitation (Figure 2). Flight calls of call-type 3 feature a zigzag modulation in frequency, so that the trace resembles a lower case “n” stretched horizontally (Figure 3). Flight calls of type 5 have two parallel frequency components, both with an overall downward frequency modulation.

In comparison with those presented by Groth (1993) and one of type 2 from New York (Figure 2D), spectrograms of most of our recordings resemble call-type 2. In addition, Webster’s recording from the Sierra San Pedro Mártir, 24 September 2010, is most similar to call type 2. However, comparison with Groth (1993) and examples of type 3 from Washington and New York (Figures 3B and C) shows that some flight calls recorded at Pearblossom Park during November 2012 (Figure 3A) are most similar to that type.

Our record of call-type 3 is notable. Crossbills of call-type 3 are considered specialists on Western Hemlock (*Tsuga heterophylla*) and occur primarily in the Pacific Northwest and, during irruptions, locally in the Eastern Hemlock (*T. canadensis*) forests of the north-central U.S. and Canada (Benkman 1993, Groth, 1993). Although call-type 3 is plentiful in the Coast Ranges of northern California, there appear to be few records south of the San Francisco Bay area or elsewhere in the southwestern U.S. The occurrence of call-type 3 in the Mojave Desert during the winter of 2012–2013 coincided with a broad irruption of that call-type throughout the western U.S. (M. Young pers. comm.). One record of call-type 3 from the Pinaleno Mountains of southern Arizona during an irruption in the
Figure 2. Comparison of type 2 flight calls. (A) Recorded on 23 January 2011 at Mt. San Jacinto, San Jacinto Mountains, (B) recorded on 8 January 2011 at Table Mountain, San Gabriel Mountains, (C) recorded on 5 March 2011 at Pearblossom Park, Los Angeles Co., (D) recorded in Cayuga County, New York (M. Young; Macaulay Library of Natural Sounds [LNS] 161296). Digitization artifacts from file compression are apparent in A, B, and C.

Figure 3. Comparison of call type 3 flight calls. (A) Recorded on 4 November 2012 at Pearblossom, Los Angeles Co., (B) recorded on 3 September 2011 at Tucquala Meadows, Kittitas Co., Washington, (C) recorded in Pharsalia, Chenango Co., New York (M. Young; LNS 136592)
CALL TYPES OF THE RED CROSSBILL IN SOUTHERN CALIFORNIA

summer of 1986 (Groth 1993), however, hints at prior far-ranging irruptions. Crossbills making call-type 3 correspond with the smallest North American subspecies, *minor*, of which *sitkensis* is a synonym (Monson and Phillips 1981, Groth 1993). This subspecies has been reported from southern California previously on the basis of measurements of two small specimens from Pasadena collected on 26 December 1898 and of one small specimen from Riverside collected 17 January 1909 (Daggett 1899, Willett 1933, Grinnell and Miller 1944). So long ago, of course, these specimens’ vocalizations were not reported.

The habitat requirements inferred from Benkman (1993) suggest that the mountains of southern California could support resident populations of crossbills of up to four call-types (Figure 4). The preponderance of mixed-conifer forest throughout the Transverse and Peninsular ranges (Figure 4a and Minnich 2007) suggests that birds of call-type 2, a Ponderosa Pine specialist, should be the most abundant, as we confirmed.

Crossbills of call-type 4, specializing on Douglas-fir (*Pseudotsuga menziesii*), occur throughout the Pacific Northwest. In southern California, Douglas-fir is replaced by the endemic Bigcone Douglas-fir (*P. macrocarpa*) (Burns and Honkala 1990). Although the massive cones of Bigcone Douglas-fir appear to provide ideal forage for Red Crossbills, the late age at which the trees bear cones and smaller size of their cone-crop size in comparison with *P. menziesii* (Burns and Honkala 1990), combined with the absence of large, continuous stands (Minnich 2007), suggest that Bigcone Douglas-fir may not provide enough nourishment to support a resident population of the Red Crossbill. However, crossbills of call-type 4 could occur in Bigcone Douglas-fir during irruption years (Figure 4b).

The presence of small yet continuous stands of subalpine forest, containing primarily Sierra Lodgepole Pine (*P. contorta* subsp. *murrayana*), scattered about the Transverse and Peninsular ranges (Minnich 2007), suggests that small populations of call-type 5, a specialist on the Rocky Mountain subspecies of the Lodgepole Pine (*P. contorta* subsp. *latifolia*), are possible (Figure 4c). However, differences in serotiny between *latifolia* and *murrayana* should lead to an increase in competition for seed from other, nonspecialized consumers, reducing the likelihood of a resident type-5 population in southern California (Critchfield 1980, Benkman, 1999).

Finally, call-type 6, equivalent to the Mexican Crossbill (*L. c. stricklandi*), is presumed to occur in the southern Peninsular Ranges of the Mexican state of Baja California and may disperse northward toward the international border, just as it does in Arizona (Monson and Phillips 1981). Although we are not aware of any audio recordings of call-type 6 from the Sierra Juárez and Sierra San Pedro Mártir of Baja California, the presence of a single specimen of *L. c. stricklandi* collected at Campo, San Diego County (Unitt 2004, San Diego Natural History Museum 873), coupled with reports of *L. c. stricklandi* from Santa Cruz Island (Howell 1917, Dickey and van Rossum 1923) suggests that call-type 6 may, at least, be considered accidental. Additional recordings and new specimens from Baja California are needed to assess the status of call-types 2 and 6 there.
CONCLUSIONS

We have obtained recordings of the Red Crossbill from the San Gabriel, San Bernardino, and San Jacinto Mountains and surrounding desert valleys demonstrating the occurrence of individuals of call-types 2 and 3. While
CALL TYPES OF THE RED CROSSBILL IN SOUTHERN CALIFORNIA

call-type 2 is expected on the basis of habitat and wide range elsewhere in western North America, call-type 3 is notable, possibly representing vagrancy from the Pacific Northwest. Furthermore, the presence of Red Crossbills of call-type 2 in the mountains of southern California continuously from 2011 to 2014 suggests they are resident. The recordings we obtained in southern California cover a little over three years, and continued observation may demonstrate the occurrence of other call-types, especially during irruption years. Diagnostic recordings are often obtainable with readily available technology, such as cell phones, and we encourage bird watchers to continue collecting data.

ACKNOWLEDGMENTS

We thank Nathan Pieplow, Matthew Young, Kimball Garrett, and Larry Allen for fruitful discussion.

LITERATURE CITED

CALL TYPES OF THE RED CROSSBILL IN SOUTHERN CALIFORNIA


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Red Crossbill

Photo by Lance Benner
NOTES

INTERSPECIFIC NEST PARASITISM BY CHUKAR ON GREATER SAGE-GROUSE

MICHELLE L. FEARON and PETER S. COATES, U.S. Geological Survey, Western Ecological Research Center, 800 Business Park Drive, Dixon, California 95620; mfearon@usgs.gov

Nest parasitism occurs when a female bird lays eggs in the nest of another and the host incubates the eggs and may provide some form of parental care for the offspring (Lyon and Eadie 1991). Precocial birds (e.g., Galliformes and Anseriformes) are typically facultative nest parasites of both their own and other species (Lyon and Eadie 1991). This behavior increases a female's reproductive success when she parasitizes other nests while simultaneously raising her own offspring. Both interspecific and conspecific nest parasitism have been well documented in several families of the order Galliformes, particularly the Phasianidae (Lyon and Eadie 1991, Geffen and Yom-Tov 2001, Krakauer and Kimball 2009). The Chukar (Alectoris chukar) has been widely introduced as a game bird to western North America from Eurasia and is now well established within the Great Basin from northeastern California east to Utah and north to Idaho and Oregon (Christensen 1996). Over much of this range the Chukar occurs with other phasianids, including the native Greater Sage-Grouse (Centrocercus urophasianus), within sagebrush (Artemisia spp.) steppe (Christensen 1996, Schroeder et al. 1999, Connelly et al. 2000). Chukar typically exploit a broader range of habitats than do sage-grouse, but both species use the same species of sagebrush and other shrubs for nesting cover (Christensen 1996, Schroeder et al. 1999). Chukar are known to parasitize nests of other individuals of their own species (Geffen and Yom-Tov 2001), but we are unaware of reported evidence that Chukar may parasitize nests of sage-grouse. Here we describe a case of a Chukar parasitizing a sage-grouse nest in the sagebrush steppe of western Nevada.

We observed this parasitism during a large-scale study aimed at evaluating spatio-temporal variation in the sage-grouse's demographics. The study area is in the Virginia Mountains (40° 3' N, 119° 50' W) approximately 65 km north of Reno, where the sage-grouse population is small and isolated (Coates et al. 2011). Although Chukar occupy the site, their population is scattered and their numbers are relatively small (Coates pers. obs.). The habitat is high-desert sagebrush steppe altered by exurban development, encroachment of conifers and invasive annual grasses, and multiple human land uses, including livestock grazing and recreation. Land ownership is a mix of private and public, the latter administered by the U.S. Bureau of Land Management.

On 5 May 2011, while we were using radio-telemetry (Millspaugh and Marzluff 2001) to monitor nesting sage-grouse equipped with necklace-style VHF transmitters (Advanced Telemetry Systems, Isanti, MN), we incidentally flushed an incubating sage-grouse and observed two Chukar eggs and eight sage-grouse eggs. We distinguished the remains of the Chukar eggs by their morphology, and David J. Delehanty (Idaho State University) later confirmed our identification. After discovering the parasitized nest, to evaluate the effect of the parasitism we deployed a camouflaged miniature video camera at the nest site (Figure 1a). The device recorded continuously. On 3 June, this nest contained two Chukar eggs and the eggshells of eight hatched sage-grouse eggs (Figure 1b). One of the Chukar eggs was partially hatched, but the chick did not survive; the other egg was fertile and appeared to be in the later stages of incubation, but failed to begin hatching (Figure 1c). We collected the eggs for confirmation of the species.

Although species of the family Phasianidae have been reported to parasitize...
nests of others (Lyon and Eadie 1991, Krakauer and Kimball 2009), and the sage-grouse has been documented as a conspecific nest parasite (Bird et al. 2012), our observations represent the first evidence of the Chukar parasitizing sage-grouse nests. Both species construct similar nests by scraping a shallow depression in the ground under vegetation that provides cover (Mackie and Buechner 1963, Connelly et al. 2000). These shared characteristics present opportunities for parasitism by other Galliformes or other ground-nesting precocial birds (Krakauer and Kimball 2009). Furthermore, the Chukar and sage-grouse nest concurrently, usually from early April to early July (Mackie and Buechner 1963, Schroeder et al. 1999), which enhances the opportunity for parasitism.

Parasitic chicks of species with incubation periods shorter than those of the host species are often more successful (Slagsvold 1998), largely because the difference in timing allows parasitic chicks to hatch first and subsequently outcompete the host’s chicks. Ground-nesting species may depart from their nests soon after hatching of the first few eggs, and unhatched eggs are often left behind (Westemeier et al. 1998). Among other Galliformes, for example, Greater Prairie-Chicken (Tympanuchus cupido) nests parasitized by the non-native Ring-necked Pheasant (Phasianus colchicus) are more likely to be abandoned than unparasitized nests because pheasant eggs hatch earlier (Westemeier et al. 1998). Although the incubation period of the Chukar (24 days; Mackie and Buechner 1963, Christensen 1996) is shorter than that of the sage-grouse (28 days; Schroeder et al. 1999, Taylor et al. 2012), at the nest we observed the parasite did not gain this advantage. The Chukar appeared to lay its eggs up to 5 days after the sage-grouse’s clutch was complete, as indicated

Figure 1. Images recorded by the miniature camera at the Greater Sage-Grouse nest parasitized by the Chukar in the Virginia Mountains, northwestern Nevada. Arrows identify the Chukar eggs: (A) Hen leaving for an incubation recess on 30 May 2011; (B) partially hatched sage-grouse clutch with two Chukar eggs remaining (one is hidden from view under a sage-grouse eggshell); (C) a partially hatched Chukar egg. Images B and C were recorded on 3 June 2011.
by the partially hatched Chukar chick. Therefore, the Chukar eggs may have been incubated insufficiently. Alternatively, the Chukar eggs could have been laid while the sage-grouse was laying but the development of the smaller Chukar eggs was slower than that of the sage-grouse eggs because transfer of heat from hen to egg was reduced. Although this instance of nest parasitism by the Chukar failed to produce viable offspring, if Chukar are able to parasitize sage-grouse nests during laying and hatch before the sage-grouse eggs, the female sage-grouse may abandon her clutch. Bird et al. (2012) reported that in Alberta sage-grouse successfully hatched 42.3% of parasitic eggs deposited by conspecifics.

Our observation should be of interest to wildlife conservationists and managers, as the Chukar is a non-native species whose range overlaps that of the sage-grouse in the Great Basin. Although this observation represents the single clear occurrence of parasitism by the Chukar among 91 sage-grouse nests monitored over 4 years, other occurrences were possible. Furthermore, the parasitism was observed in an area in which Chukar were relatively few. Research into the prevalence of parasitism by the Chukar and its effects on the sage-grouse’s nest survival and recruitment rates, particularly in areas where sage-grouse populations overlap areas where the Chukar’s population density is moderate to high, might prove beneficial.

We thank Zachary B. Lockyer and Jonathan Dudko for their help in the field, as well as Mike L. Casazza and David J. Delehanty for collaboration on the project from which this observation arose. Financial support was provided by the Nevada Department of Wildlife, U.S. Bureau of Land Management, and U.S. Fish and Wildlife Service. Any use of trade, product, or firm names in this publication is for descriptive purposes only and does not imply endorsement by the U.S. government.

LITERATURE CITED


NOTES


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In San Diego County, California, anecdotal records of free-ranging Black-throated Magpie-Jays (*Calocitta collei*) date back to the 1970s in the vicinity of the Solana Beach neighborhood of Eden Gardens (M. U. Evans pers. comm.). Of several locales within the county where the species has persisted, the oldest is the Tijuana River valley, where it has been documented continuously since ~1992 (G. McCaskie pers. comm.). These long-tailed corvids are endemic to the Pacific slope of mainland Mexico and reside in deciduous open woodlands and arid scrub forests between sea level and 1200 meters elevation. Their occurrence in San Diego County can almost certainly be attributed to the pet trade in adjacent northwestern Baja California (see Hamilton 2001) and escapees from aviaries north of the U.S.–Mexico border. Primary areas of their local occurrence and where I documented breeding include the Tijuana River valley as well as the Sweetwater River in the vicinity of the Plaza Bonita mall in the community of Bonita (Haas 2004). Magpie-jays seen in Jamul (e.g., 15 June 2000, M. U. Evans) were probably escapees from a local aviary. The origin of their occurrence on Point loma (e.g., 17 May 1999, P. A. Ginsburg; 1 May 2000, S. E. Smith; 12 September 2004, K. Goldman) and within Mission Trails Regional Park and nearby residential communities (e.g., 20 April 2013, M. Beeve; 21 April 2013, B. Mulrooney) is less clear. They may have been escapees from local aviaries or individuals dispersing from Bonita or the Tijuana River valley.

Between April and July of 2000, during unrelated field studies in Goat Canyon just north of the international border at the eastern edge of Border Field State Park, I regularly observed two to three adult magpie-jays. These garrulous birds were easily found during virtually every visit to my study site of >12 hectares. On 20 April, when I was in a stand of tall, sparsely leaved arroyo willows (*Salix lasiolepis*), a pair of adult magpie-jays scolded me. Their close approach and persistent scolding suggested the presence of a nearby nest or young. As I worked my way through the willow thicket, the two jays followed me and continued to scold. I subsequently entered an area with a partially open canopy and found a third adult sitting atop a bulky nest of loosely assembled sticks (Figure 1). The nest had been built in the upper crotch of one of the taller willows approximately 5 meters above the ground. As I neared the nest tree, the sitting adult departed. Hoping to determine the status of the nest (presence of eggs, nestlings, etc.), I found a nearby area from which to observe. Within 15 minutes two adults returned to the vicinity of the nest. Although my position was fairly well concealed, both magpie-jays approached me, did not visit the nest, but instead re-initiated scolding, at which time I departed.

I returned to my study site eight days later (28 April) to once again find an adult atop the nest. I did not approach the nest closely, but once again took refuge, this time under a dense arch of giant reed (*Arundo donax*). A second adult approached the nest, fed the sitting adult, and was quickly forced aside by a third adult that likewise fed the sitting bird. I saw no other feeding behaviors during one hour of observation, the sitting bird did not depart the nest, and I consequently assumed that the sitting bird was brooding.

I continued to monitor the nest through May, returning on 22 May to find the nest occupied by two nestlings. One nestling was considerably larger than the other. I estimated that it must have hatched two or more days prior to its sibling. The larger bird’s tail was already becoming elongate, and its posture and plumage (e.g., pin
feathers not obvious, crown fully feathered with few down feathers) suggested to me that fledging was imminent. I observed no feeding behaviors at this time. Because the adults remained away from the nest for more than 30 minutes, I departed.

On 2 June I returned to my study site but first checked the magpie-jay nest and found no evidence of occupancy. After resuming my field work I spotted two juvenile magpie-jays at the top of a large gum tree (Eucalyptus sp.); they were easily distinguished from three nearby adults by their extensively white underparts. I subsequently observed each of the three adults feeding the fledglings. These events represent the first documentation of not only successful breeding of the Black-throated Magpie-Jay in San Diego County but also of cooperative breeding.

In an intensive study of four breeding groups of Black-throated Magpie-Jays in Sonora, Mexico, from 1980 to 1982, Winterstein (1985) reported numerous examples of helping including courtship feeding as well as helping behavior at the nest. Helpers, ranging from one to seven per group, “participated in all aspects of the reproductive effort except copulation and incubation” (p. ix). Although the breeding females were responsible for the majority of nest construction, helpers were also involved. Helpers also were the primary feeders of females on nests. Helping behavior has also been documented in the closely related White-throated Magpie-Jay (C. formosa; e.g., Langen and Vehrencamp 1999), with helpers similarly providing disproportional feedings to female breeders and occasionally acting as the primary care-providers of fledglings.

My San Diego County observations document courtship feeding, helping at the nest, and fledgling support within the species’ introduced range. These behaviors are not unexpected in view of the pervasive level of helping reported by Winterstein as well as the species’ close relationship with the cooperatively breeding White-throated Magpie-Jay. The benefits of cooperative breeding in corvids as well as theories on its evolution are widely addressed in the ornithological literature (e.g., Brown 1974, Emlen 1978, Ekman and Ericson 2006).

I initially documented the Black-throated Magpie-Jay’s nesting season in San Diego County as extending from March to July (Haas 2004). Within its natural range the species may breed from as early as November to July of the following year (Howell and Webb 1995), this extended period incorporating two periods of seasonal rains. My San Diego County records corresponded with the region’s single, often limited, rainy season. However, while continuing to study the small population in the Tijuana River valley over several succeeding years, I discovered on 12 November 2005 a trio of magpie-jays building a nest. This event, which followed a season of above-average rainfall in 2004–2005, marked the return of a family group to Goat Canyon in the vicinity of previously documented late winter–early spring nests that were constructed in 2000, 2001, and 2002. The November nest, however, was abandoned prior to egg deposition.

Since 2005, I have found successful nesting of the Black-throated Magpie-Jay only in 2009 (both of two nests found in the Tijuana River valley were successful), 2011 (two of three nests found in the Tijuana River valley were successful, as was one nest along the Sweetwater River in Bonita), and 2012, which was the year of the magpie-jay’s most successful breeding since I began monitoring the species in 2000 (three of three nests found in the Tijuana River valley and one of two nests found in Bonita were successful). All of these nestings took place during the locally more traditional late winter–early spring avian breeding season. Given that “family group” is the appropriate descriptor of the magpie-jay’s breeding system, and despite reports of their occurrence at an increasing number of localities within San Diego County, the number of family groups (of annually variable size) has remained fairly constant over the past 15 years. Typically two but as many as three family groups have occupied the Tijuana River valley during this period, and one family group (although I found two family groups in 2012) has occupied the Sweetwater River–Bonita area. Recent observations along the San Diego River in Mission Trails Regional Park may portend
the species' colonization of a new locale. Although the habitat there is ideal for breeding, the species' persistence will be dictated more likely by the availability of forage (especially fruits, nuts, and large invertebrates) in adjacent residential neighborhoods.

LITERATURE CITED


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A RAPID FIELD ASSESSMENT OF THE RUFOUS NIGHT-HERON POPULATION OF PALAU, MICRONESIA

ALAN R. OLSEN and MILANG EBERDONG, Belau National Museum, P. O. Box 666, Koror, Palau 96940 or P. O. Box 10232 Koror, Palau 96940; kerallang@yahoo.com

A medium-sized (58 cm) cinnamon-brown heron with a black crown and nape, Nycticorax caledonicus pelewensis is a nonmigratory subspecies of the Rufous Night-Heron that occurs only in the Palau and Chuuk islands of Micronesia (Pratt et al. 1987, Wiles 2005, Pratt and Etpison 2008). Its natural habitat is coastal wetland with mangroves for roosting and tidal flats for feeding grounds (Engbring 1988). The Rufous Night-Heron was selected as the flagship coastal species for Palau’s National Program for Monitoring Forest and Coastal Birds because it is a prominent feature of Palau’s coastal avifauna and, as a conspicuous territorial predator with a varied diet, it has practical value as an indicator of the biological richness of Palau’s coastal wetlands (Olsen and Eberdong 2012). In order to fully incorporate the Rufous Night-Heron into the national monitoring program, we needed a baseline population estimate for the Palau subpopulation. When we reviewed the reports of previous surveys of Micronesia’s birds (Engbring et al. 1990, Engbring 1992, VanderWerf 2007) we found that the reports mentioned sightings of Rufous Night-Herons but did not provide a population estimate. Waterbird Population Estimates (Wetlands International 2014) hazarded a “best guess” population estimate of “1–10,000” for the subspecies. The chief obstacles to establishing a more precise population estimate for the subspecies are the lack of a well-defined breeding season and the lack of centralized roosting or nesting colonies where the birds can be conveniently counted. Although Rufous Night-Herons are generally considered to be crepuscular or nocturnal creatures (Hancock 1999, Brazil 2009), we observed that, in Palau, they are routinely attracted to their coastal feeding grounds during daytime low tides. So we took the approach of a rapid field assessment of Palau’s Rufous Night-Heron population by counting the birds at low tide on their daytime feeding grounds as they stand on the tidal flats waiting for prey.

Taking advantage of a four-day sequence of exceptionally low (~6 cm to ~21 cm) afternoon tides from 4 through 7 June 2012, we counted Rufous Night-Herons on their feeding grounds in a study area that encompasses the coastal wetlands of Babeldaob Island and of the smaller islands of Koror, Ngerkebesang, and Malakal (known collectively as the Koror Complex) immediately south of Babeldaob. Together, the four islands account for 80% (376 km²) of Palau’s land mass and 92% (4200 ha) of Palau’s mangroves (Colin 2009). The remaining 8% of Palau’s mangroves is scattered among small, remote islands in the lagoon south of the study area. In order to complete the assessment during the four-day tide sequence, we selected four representative assessment localities within the study area, using the extent of mangroves to express our coverage of Rufous Night-Heron habitat in the study area. The four assessment localities and their estimated coverage by mangrove in hectares are in eastern Babeldaob (500 ha), western Babeldaob (600 ha), northern Babeldaob (500 ha), and southern Babeldaob/Koror Island Complex (500 ha). The greater extent of mangrove represented at western Babeldaob resulted from the inclusion of Ngermeduu Bay, an estuary that is lined with mangrove forest. In combination, the four localities encompass 2100 ha of mangroves, representing half of the Rufous Night-Heron habitat in the study area. En route to or from each assessment locality, we visited inland sites where Rufous Night-Herons are known to congregate to see how many remained at these sites at low tide.

Over the four-day period, we completed 46 counts of Rufous Night-Herons from
separate vantage points at the coastal assessment localities and at inland sites where Rufous Night-Herons reportedly congregate. For each count, we recorded the number of Rufous Night-Herons, time of day, geographic coordinates, temperature, cloud cover, and wind condition. We conducted our coastal counts from vantage points that offered neighboring panoramic views of the tidal flats and mangroves, using landmarks to avoid overlapping counts and following the daily progressions of low tide from north to south. We conducted 22 coastal counts from separate shoreline vantage points (beach, bluff, bridge, causeway, or pier) as follows: eastern Babebdaob (4 June 2012, 8 counts), northern Babebdaob (6 June 2012, 6 counts), southern Babebdaob/Koror Island Complex (7 June 2012, 8 counts). The number of shoreline counts per assessment locality depended on the distribution of suitable vantage points and landmarks. We made 18 coastal counts from a boat traveling along the remote coast of the western Babebdaob assessment locality (5 June 2012), which is not accessible by a land route. These offshore counts required many tightly spaced offshore vantage points to avoid overlap from drift each time we stopped the boat to count birds. The six inland sites that we assessed en route to or from the coastal counts included a fish farm in western Babebdaob, a landfill in eastern Babebdaob, and two landfills, a fish farm and a sewage-treatment plant in the southern Babebdaob/Koror Complex. Figure 1 maps the approximate locations of the vantage points in each assessment locality. In three instances, pairs of vantage points for adjacent sites (e.g., a pier and a landfill) were too close together to register as separate points on the scale of the map.

We tallied a four-day cumulative total of 552 Rufous Night-Herons: 514 (93.1%) adult birds and 38 (6.9%) immature birds, with an average of 12 birds per count (range 0–50 birds per count). The time of day ranged from 12:45 to 16:00; temperature from 26.2°C to 35.5°C; cloud cover from 5% to 100%; wind calm to gentle breeze (Beaufort Scale 0 to 3); visibility unlimited. Table 1 summarizes our cumulative counts for each coastal assessment locality and for the inland sites. All of the Rufous Night-Herons that we encountered during the assessment were on exposed meadows of sea grass except for three adults at the Koror municipal landfill, an inland site that reportedly attracts up to 50 Rufous Night-Herons at high tide (Pratt et al. 1980). Rufous Night-Herons were absent from the other five inland sites. No Rufous Night-Herons were seen in the mangrove areas of the assessment localities, and none were seen on the tidal flats of Ngermeduu Bay, which is rich in mangroves but devoid of sea-grass meadows because of sedimentation from the three rivers that empty into the bay. Our results are consistent with previous anecdotal reports that Palau’s Rufous Night-Herons normally roost in coastal mangroves until low tide, when they fly to their feeding grounds on nearby tidal flats (Marshall 1949, Baker 1951, Pratt et al. 1980, Pratt and Etpison 2008, Olsen and Eberdong 2009).

On the basis of the results of our rapid field assessment of half of the study area and several inland sites, we conclude that the Rufous Night-Herons that we encountered during the low-tide sequence of the four-day assessment period represent half of the

<table>
<thead>
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<th>Assessment Locality</th>
<th>No. Adults</th>
<th>No. Immatures</th>
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</table>
Rufous Night-Herons in the study area. We estimate that Palau harbors a population of no more than 1200 Rufous Night-Herons—roughly twice the four-day cumulative total from our field assessment plus an 8% adjustment to account for the birds in the southern lagoon, which was not included in the study area. It is noteworthy that the Rufous Night-Herons on the exposed tidal flats were attracted to sea-grass meadows exclusively (Figure 2). Palau’s sea-grass meadows face continuing threats from sedimentation due to economic development and from rising sea level and other effects of climate change (Colin 2009). The Rufous Night-Heron should prove useful as an indicator species for managers of coastal ecosystems where sea-grass meadows occur. We recommend a companion assessment of the Rufous Night-Heron subpopulation...
in the Chuuk islands to combine with our results as a starting point for future population studies of the subspecies.

We gratefully acknowledge the support we received from the Belau National Museum and the National Program for Monitoring Forest and Coastal Birds, as well as the Palau Conservation Society and the Marisla Foundation through the Global Greengrants Fund. Hon. Wilson Ongos, governor of the state of Ngaremlengui, arranged boat transportation for the offshore counts. We thank Mark O’Brien of BirdLife International for guidance, reviewers Kimball L. Garrett and Daniel D. Gibson for their valuable comments, Mike Aulerio of The Nature Conservancy for the map of the study area, and our student birdwatchers: Angelica Olsen, Aurora Olsen, and Murako Belibe.

LITERATURE CITED

Engbring, J., Ramsay, F. L., and Wildman, V. J. 1990. Micronesian forest bird surveys, the Federated States: Pohnpei, Kosrae, Chuuk and Yap. U.S. Fish and Wildlife Service, 300 Ala Moana Blvd., Rm. 3-122, P. O. Box 50088, Honolulu, HI 96850.


VanderWerf, E. A. 2007. 2005 bird surveys in the Republic of Palau. U.S. Fish and Wildlife Service, 300 Ala Moana Blvd., Rm. 3-122, P. O. Box 50088, Honolulu, HI 96850.


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BOOK REVIEWS


Familiarity with bird vocalizations is an integral part of birding, identification, and understanding behavior. Thus a good sound library is critical for anyone with a strong interest in birds. A suite of CDs, websites, and apps is available to satisfy this need, each with varying geographic coverage, number of vocalizations per species, quality, and overlap in sound libraries. The Cornell Guide to Bird Sounds: Master Set for North America (Master Set) stands apart from other sound libraries in its massive scope, with 4938 recordings of 735 species. Recordings are meant to represent the vocal and nonvocal repertoire of each species, as well as geographic variation and dialects.

This set is essentially a compilation of the most representative recordings available in the Macaulay Library of Natural Sound, an enormous archive of recordings accumulated since 1929. The library was recently digitized and is available online in a searchable format (http://macaulaylibrary.org), but wading through all the available recordings can be cumbersome. Many are not labeled with vocalization type, or are not labeled correctly (especially song vs. call), some are very long clips with a variety of sounds, and quality varies. The Master Set excels at making this enormous resource more user-friendly for someone wishing to learn a bird’s vocalizations, look up a mystery sound, or even learn a little about the function of a certain call. Another benefit of the Master Set is its portability. Once the set has been downloaded to a computer, the files can be organized to suit the user’s needs, displayed in a computer media player such as iTunes or Windows Media Player, or downloaded onto a mobile device.

For birders who want a smaller but still robust sound library with fewer examples of uncommon vocalizations and regional dialects, the Cornell Guide to Bird Sounds is also available in an Essential Set for North America, with nearly as many species as the Master Set but about a third of the recordings and a much smaller size at 812 MB.

The Master Set comes as a downloadable 4.71-GB .zip file, organized into three folders arranged in alphabetical order by species. Each file name includes the species, location (two-letter state or province code or three-letter country code), and a description of the song or call type. A “track number” orders the set taxonomically, so it is easy to sort the entire set into taxonomic order (following Clements version 6.7; http://www.birds.cornell.edu/clementschecklist/download/). A “Comments” field includes a suite of additional information, including scientific name, location, date, recordist, and the Macaulay Library catalog number. Also included is a photo of each species, which pops up when the track is played, a nice touch. A booklet included with the download has a good deal of background information, including resources, credits, and a handy “How to Use” section. It also includes contact information for users to send in feedback (see below).

One aspect of the Master Set that sets it apart from other audio guides is its focus on highlighting geographic variation. Not only is every recording labeled with location, but many species are split into field-identifiable “groups” with representative recordings of each. Clearly a great deal of effort went into selecting not only the most distinctive variations but many more subtle differences as well. Each “call type” of the Red Crossbill and the Evening Grosbeak is included, as well as each “group” of the White-crowned Sparrow, and I was delighted to hear the distinctive Martha’s Vineyard song type of the Black-capped Chickadee. There are a variety of clips for widespread and variable species such as the White-breasted Nuthatch, Bewick’s Wren, and Dark-eyed Junco, although the Red-backed Junco (Junco hyemalis dorsalis) is not represented. Many vagrants to North America are also included. Most of these are represented by only one or two recordings, although a few have a variety of sounds given. For example, there are four clips of song and one of call of the Golden-crowned...
Warbler, and several of the Fork-tailed Flycatcher, including the dawn song.

For such an enormous undertaking, it is perhaps to be expected that the Master Set suffers from a lack of consistency, many missing vocalization types, and containing a few errors. In general, species that are widespread, well studied, or highly variable are well represented in this set. For example, there are 20 clips each of the Common Raven and of the Great Gray Owl, and 23 of the Ruby-crowned Kinglet. On the other hand, there are only three tracks of the Pinyon Jay, which has a large and varied repertoire. The Song Sparrow is well represented in song, with an array of examples from different populations, but only two call types are given. The Master Set booklet claims that it represents “the full vocal repertoire” of many regular North American breeding species, but this claim is not met for many others. One of the most glaring examples for me is in the towhees, for which each species has several examples of songs but only one clip of the typical contact call. For the three “brown” towhees with which I am most familiar (Abert’s, California, and Canyon), this set should include high-pitched “seet” calls, aggression, alarm, and begging calls, and especially the distinctive “squeal duet.” Clips of the Anna’s and Black-chinned hummingbirds do not include the dive displays. Although the Master Set does include most species likely to be encountered in North America, a few regular North American species are not represented. The Pink-footed Shearwater, one of the most vocal North American seabirds away from its breeding islands, is one example. A few species with limited ranges, such as the Red-faced Cormorant, are also absent from this set. Given the size and scope of this work, I found relatively very few errors. These included a prominent song of a Rufous-winged Sparrow included in a recording of a family of Verdins, and the typical daytime song of the Ash-throated Flycatcher is labeled as a “possible dawn song.” The assembly call of the Gambel’s Quail is labeled “song,” and the male’s advertisement calls are simply labeled “call.” whereas equivalent vocalizations of the California Quail are labeled and ordered correctly.

To the developers’ credit, the booklet notes that this is a work in progress, and contact information is given for those who wish to send in additional recordings, comments, suggestions, or corrections. It is also noted that those who purchase the Master Set will be notified when additions or corrections are available.

The strength of the Master Set is not as a compendium of the entire vocal repertoire of North American birds but as a thorough, well-organized collection of the most representative recordings available in the Macaulay Library of Natural Sounds. This is by far the most extensive portable sound library available today. It will be useful to advanced birders as well as to researchers for a wide array of purposes, and is extremely interesting and informative to simply browse. I enjoyed stumbling upon recordings of human mimicry by the European Starling and the American Crow, the advertising hoot of a Barred × Spotted Owl hybrid, and even recordings of the Bachman’s Warbler, Ivory-billed Woodpecker and Dusky Seaside Sparrow. The Master Set is a treasure trove of sounds that can only improve with further additions and input from the ornithological community, making available the sounds of the bird world that can improve our understanding of the birds around us.

Lauren B. Harter


This slim volume is a valuable contribution to our understanding of the historic occurrence of the California Condor from California north of San Francisco Bay to southern Canada. It is perhaps not widely recognized that the condor was at one
time a conspicuous element of the Pacific Northwest’s avifauna. We may associate condors with the open, semi-arid mountain ranges of southern California, their last redoubt, rather than with the dense coastal forest habitats to the north. However, the authors compile a carefully scrutinized and apparently exhaustive list of 81 reports from the Pacific Northwest dating from Lewis and Clark’s first observation while they descended the Columbia River gorge on 28 October 1805 to a 1925 report from Siskiyou County, California. Dave DeSante’s sighting of a single condor soaring over the Stanford University campus in March of 1971 falls a bit south of the region covered by this study (J. Nisbet, *Visible Bones*, Sasquatch Books, Seattle, 2003, pp. 55–58).

The established facts with regard to the condor’s occurrence in this northern portion of its historic range are of more than academic interest. From a low point of just 22 in the early 1980s, through prodigious efforts by recovery teams, there are today over 400 living condors, including over 200 that have been reintroduced into the wild from several captive-breeding programs. These free-flying condors have been released in southern and central California, northeastern Arizona, and northern Baja California. Several pairs have successfully fledged young in the wild. However, these populations are carefully monitored and managed, provisioned, and periodically captured for lead detoxification, which is a serious continuing threat to the success of these reintroductions. The aggressive management required offends the sensibility of some passionate observers. If ultimately successful, however, these efforts may be appreciated as atonement for our prior sins.

If the condor was once a well-established permanent resident of the Pacific Northwest, future reintroductions along our rugged and sparsely populated coast might well be successful. The historical evidence the authors compile here supports that supposition. Though they found no firm proof of nesting within the Pacific Northwest, they address the controversy with respect to whether condors were permanent residents or just seasonal visitors to the region, a key consideration for any attempt at reintroductions here.

The first Euroamerican explorers and naturalists to visit these regions, notably, Meriwether Lewis and William Clark, Alexander Henry, David Thompson, David Douglas, William Fraser Tolmie, John Kirk Townsend, and Titian Ramsey Peale, reported observing condors frequently at various seasons and in substantial numbers along the lower Columbia, the Willamette, Umpqua, Rogue, Klamath, and Sacramento rivers, even north to the lower Fraser and east of the Cascades on the Columbia. By the 1850s, however, the condor was judged rare and declining in these northern regions.

The authors evaluate several competing explanations for this early and precipitous decline. They make a compelling case that the primary threat to the condor at this time was the widespread use of poisoned bait to protect livestock raised at the early fur-trading posts and missions. For example, John McLoughlin, chief factor for the Hudson’s Bay Company outpost at Fort Vancouver on the lower Columbia, ordered strychnine for that purpose as early as 1839 (pp. 79–80). Ironically, lead poisoning from lead shot remains a potent threat to the survival of condors reintroduced in recent years.

The Oregon Zoo initiated breeding condors in 2003. In 2007 the Yurok Tribe on the Smith River in northwesternmost California voted to support a study of the feasibility of reintroducing condors within their traditional territory. Perhaps condor recovery will be more effective in the Pacific Northwest than elsewhere given that the threat of poisoning could be much reduced here.

The authors take note of the ethnographic and linguistic evidence of Native American observers. Though they left no written accounts that meet contemporary scholarly standards of evidence, it is clear that Native peoples throughout the Pacific Northwest (and beyond, to the high Plains east of the northern Rockies) were well acquainted with the California Condor, as Brian Sharp has meticulously documented (“The California Condor in Northwestern North America,” *Western Birds* 43:54-89, 2012).
2012). The authors are critical of some of Sharp’s claims, but are in agreement on the fundamentals. They effectively dismiss the facile equation of the condor with the mythical thunderbird, noting that thunderbird legends have a much wider distribution that scarcely overlaps that of the known Anthropocene range of the California Condor. They also dismiss as most unlikely that Native communities might have contributed significantly to the rapid decline of the condor in the mid-1800s (pp. 98–99). They note that Native people coexisted with the condor throughout the West for millennia and that they suffered massive population declines as a result of introduced diseases and hostility from settlers at the very time the condor population was plummeting.

If one day soon we may marvel at the sight of this “beautifull Buzzard of the colum-bia” (Meriwether Lewis, 3 January 1806, in Gary E. Moulton, ed., The Journals of the Lewis & Clark Expedition, vol. 6, p. 162) at home along the rugged Northwest coast, the authors’ meticulous research will be amply rewarded.

Eugene S. Hunn
FEATURED PHOTO

OCCURRENCE OF AMELANISTIC MARBLED MURRELETS IN SOUTHEAST ALASKA AND NORTHERN BRITISH COLUMBIA

SEAN E. McALLISTER, 417 Second Street, Suite 201, Eureka, California 95501
JANET NEILSON, Glacier Bay National Park & Preserve, P.O. Box 140, Gustavus, Alaska 99826

Authors’ note: Although the terminology commonly used to describe abnormal pigmentation in birds (e.g., albinism, leucism) is generally understood, confusion and disagreements over the exact definitions of such terms can be problematic, and may result in misrepresentations of the actual source of associated abnormalities (van Grouw 2006, Davis 2007). Therefore, in this paper we use the more general term “amelanistic” to refer to birds that lack melanin, either partially or completely, when the cause is not known.

On 5 July 2009, McAllister was part of a team surveying by boat for Marbled (Brachyramphus marmoratus) and Kittlitz’s (B. brevirostris) Murrelets in Glacier Bay, southeast Alaska. In calm and clear conditions, toward the end of a survey transect at North Sandy Cove (58.7° N, 135.9° W), he saw in the distance a small, bright white object on the water. His initial impression was that it was Styrofoam or other debris, but closer inspection revealed it to be a lone live bird the size and shape of a Marbled Murrelet (see this issue’s back cover). Although largely white, the bird had a dark eye, ruddy brown bill, and pale brown pigmentation in some feathers of the back and wings, indicating the bird was partially amelanistic. In addition, the bird also appeared to have a slightly malformed bill, with the tip of the maxilla curving beyond and below the tip of the mandible. The possibility of a stray Long-billed Murrelet (B. perdix) could not be fully dismissed, but McAllister’s impression of the overall size of the bird and the relative length and depth of the bill was more consistent with a Marbled Murrelet.

After sharing photos of this striking bird and discussing it with several murrelet experts, it became apparent that amelanism in murrelets was largely unrecorded. However, seven years earlier, in August 2002, Neilson photographed a small all-white alcid (Figure 1) near Leland Island in Glacier Bay (58.6° N, 135.9° W), within 10 km of the bird seen in 2009. Observed with two Marbled Murrelets also in view, the bird resembled a murrelet in appearance and behavior. However, the low quality of the image, scanned from a black and white negative, precludes positive identification. In particular, the bill of the bird appears too large and conical for a Marbled Murrelet, being more typical perhaps of a juvenile Rhinoceros Auklet (Cerorhinca monocerata), but a Rhinoceros Auklet should have appeared larger in comparison to the nearby Marbled Murrelets, and the eye appears disproportionately large for that species.

Notwithstanding, Neilson photographed another white alcid (Figure 2), which we consider is definitely a Marbled Murrelet from its overall shape and proportions of the eye and bill, at the mouth of Idaho Inlet (58.2° N, 136.3° W), approximately 25 km southwest of the mouth of Glacier Bay, in June 2012. The photo shows a dark eye, dark bill, and all white plumage except for a blackish lining on the tip of the outer primary and at least one of the tertials.

S. G. Sealy and H. R. Carter also informed us of a specimen of an apparently totally amelanistic Marbled Murrelet that they had examined at the Royal British Columbia Museum (RBCM 6023) in Victoria (Figure 3). The bird was collected by M. Lohbrunner in August 1936 near Price Island on the northern mainland coast of British Columbia.
Figure 1. Unidentified amelanistic alcid (possibly a Marbled Murrelet) in Glacier Bay, Alaska, 19 August 2002.

Photo by Janet Neilson

Figure 2. Partially amelanistic Marbled Murrelet at the mouth of Idaho Inlet, southeast Alaska, 19 June 2012.

Photo by Janet Neilson
(52.4° N, 128.7° W), and its identity was confirmed by measurements. No obvious pigment was evident in any of the feathers, and the bare parts (bill and feet) appeared yellow to flesh colored (not dark). It is possible, however, that the pale appearance of the bare parts resulted from age-related foxing of the specimen rather than a lack of melanin in the bare parts of the living bird.

Gross’s (1965) compilation of 54 bird families for which albinism had been reported, included 7 species of the family Alcidae: the Razorbill (*Alca torda*), Common Murre (*Uria aalge*), Thick-billed Murre (*Uria lomvia*), Dovkie (*Alle alle*), Black Guillemot (*Cepphus grylle*), Pigeon Guillemot (*C. columba*), and Atlantic Puffin (*Fratercula arctica*). Sealy (1969) reported an additional three species, the Parakeet Auklet (*Aethia psittacula*), least Auklet (*A. pusilla*), and Crested Auklet (*A. cristatella*). An Internet search for unpublished alcid observations produced a recent (January 2009) photo from an undisclosed location of an amelanistic Rhinoceros Auklet and a brief account of a reportedly well-seen, but unphotographed, all-white Kittlitz’s Murrelet off the east side of Kodiak Island in September 2002 (J. Allen, fide G. van Vliet). Those, along with our examples of the Marbled Murrelet, bring the total number of alcid species in which amelanism is known to 13 of the total 25, including the extinct Great Auk (*Pinguinus impennis*).

In the Marbled Murrelet, the body plumage is molted twice per year, during prealternate molt in late winter to spring and prebasic molt in late summer to early fall, while the remiges are molted once per year during the complete prebasic molt (Carter and Stein 1995). Prior to the prebasic molt in mid to late summer, some individuals’ body plumage and primaries are heavily worn and faded (at times, only the rachis remains on the distal part of the outer primaries), but they still appear light brown when viewed from a relatively close distance (H. R. Carter pers. comm.). Whitish, lighter colored, or basic plumaged murrelets during the breeding season have been reported throughout the breeding range, without photographs or careful descriptions and often from a distance (Carter and Stein 1995; H.R. Carter pers. comm.). Such observations may include second-year birds in incomplete or delayed alternate plumage (Pyle 2008), birds in faded alternate plumage, juveniles with lighter brown coloration, or amelanistic adults with less white than those depicted in this paper. Strikingly white individuals like these have never been recorded south of northern British Columbia or north of southeast Alaska.

The pattern of dark markings on the left wing (in both the primaries and tertials) appears similar in the 2002 and the 2012 photos, although the poor quality of the 2002 photo makes it difficult to discern pigmentation from shadow or artifact. Slight differences in the appearance of the dark markings in all of the photos could be affected somewhat by molt, feather wear, and/or artifact. Photographic artifact may have also contributed to the appearance of a massive bill in the 2002 photo of the 2002 bird. But any two of these three photos of live birds may be of the same individual, suggesting that amelanistic murrelets may survive for many years with-
out the cryptic alternate plumage that Carter and Stein (1995) and Nelson (1997) thought to be vital for successful breeding. But although the Marbled Murrelet nests in trees in the southern part of its range from British Columbia to California, it nests on the ground in the treeless northwestern part of its range at Kodiak Island, on the Alaska Peninsula, and in the Aleutian Islands. In northern southeast Alaska, where these amelanistic birds were observed, Marbled Murrelets nest both in trees and on the ground (DeGange 1996). As much as 50% of one population studied near Port Snettisham, in southeast Alaska, was found to nest on the ground at higher elevations above the tree line (Nelson et al. 2009, Barbaree 2011). Of all of Marbled Murrelet nests known in Alaska, 45–50% have been found on the ground (Nelson et al. unpubl. data), or in a few cases in rock cavities (e.g., Johnson and Carter 1985). These habitats can retain significant amounts of snow/ice through the nesting season. Largely white amelanistic individuals without the typical cryptic plumage may be able to breed successfully in these habitats. However, any adaptive value of amelanism for the Marbled Murrelet and other alcids is unlikely.

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LITERATURE CITED


Western Specialty:

Pelagic Cormorant

Photo by © Tom Grey of Stanford, California:
Pelagic Cormorants (*Phalacrocorax pelagicus*) Pacific Grove, Monterey County, California, 11 January 2009. The Pelagic Cormorant maintains fidelity to a precise nest site year after year, even though the nest itself is washed away in winter storms and even when rock surrounding the site has sloughed off. See in this issue Reuse of Nest Sites by Pelagic Cormorants in North-Central California by Ellen S. Martnsen and Joseph J. Schall.

1

Photo by © Thomas A. Blackman of San Diego, California:

Black-throated Magpie-Jay (*Calocitta colliei*) Tijuana River valley, San Diego County, California, 4 September 2012. A small population of the Black-throated Magpie-Jay, native to northwestern mainland Mexico, has been nesting in southwestern San Diego County, California, since the 1990s. Even where the population consists of only two or three families and so is unrestrained by competition, the birds nest cooperatively. See in this issue California Breeding of the Black-throated Magpie-Jay, Including Evidence of Helping, by William E. Haas.