Western Specialty:
Western Screech-Owl

Photo by © Lance Benner of Altadena, California:
Fledgling Western Screech-Owl (Megascops kennisotti)
San Gabriel Mountains, Los Angeles County, California, 6 August 2013
In the Western Screech-Owl, molt from this juvenile plumage into basic
plumage may begin as early as late June and be concluded as late as early
September.
Volume 45, Number 1, 2014

2012 Nevada Bird Records Committee Report  Martin Meyers ..........2
Elevation Ranges of Birds along California’s Pacific Crest Trail
Michael C. McGrann and James H. Thorne ......................18
A Population Census of the Cactus Wren in Ventura County,
California Daniel S. Cooper, Linnea S. Hall,
and Adam J. Searcy ..................................................43
Documentation by Sound Spectrogram of a Cryptic Taxon,
Vireo g. gilvus, in Boulder County, Colorado Ted Floyd ..............57
Foraging Interactions of the Great Egret in Upland Habitats
Cole J. Caldwell ......................................................71
Book Review James R. Tietz ........................................81
Featured Photo: Hypermelanism in an American Pipit
Ken R. Schneider .....................................................84
Thank You to Our Contributors ......................................86

Front cover photo by © Randall Bruce of North Las Vegas, Nevada:
immature Harris’s Hawk (Parabuteo unicinctus), Boulder City, Nevada,
15 January 2012, one of four Harris’s Hawks in the area that winter.
A pair nested the following summer, the first known nesting of Harris’s
Hawk in Nevada.

Back cover “Featured Photo” by © Ken R. Schneider of San Francisco,
California: hypermelanistic American Pipit (Anthus rubescens) at
Menlo Park, California, 8 December 2013. Such excessive melanin
in the plumage is an abnormality much less frequent than abnormal
deficiency of melanin.

Western Birds solicits papers that are both useful to and understandable by amateur
field ornithologists and also contribute significantly to scientific literature. The journal
welcomes contributions from both professionals and amateurs. Appropriate topics in-
clude distribution, migration, status, identification, geographic variation, conservation,
behavior, ecology, population dynamics, habitat requirements, the effects of pollution,
and techniques for censusing, sound recording, and photographing birds in the field.
Papers of general interest will be considered regardless of their geographic origin,
but particularly desired are reports of studies done in or bearing on North America
west of the 100th meridian, including Alaska and Hawaii, northwestern Mexico, and
the northeastern Pacific Ocean.

Send manuscripts to Daniel D. Gibson, P. O. Box 155, Ester, AK 99725; avesalaska@
gmail.com. For matters of style consult the Suggestions to Contributors to Western

Good photographs of rare and unusual birds, unaccompanied by an article but with
caption including species, date, locality and other pertinent information, are wanted
for publication in Western Birds. Submit photos and captions to Photo Editor. Also
needed are black and white pen and ink drawings of western birds. Please send these,
with captions, to Graphics Manager.
2012 NEVADA BIRD RECORDS
COMMITTEE REPORT

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ABSTRACT: This report covers the 99 records reviewed by the Nevada Bird Records Committee in 2012, of which 87 were endorsed. These 99 records cover sightings from 1 June 1954 through 27 August 2012. One species is added to the Nevada list (and to the committee’s review list): the Red-bellied Woodpecker (Melanerpes carolinus). Two species are removed from the review list because of the high number of records or regularity of occurrence. The Nevada state list now stands at 489 species, of which 164 are currently on the review list.

In 2012, the Nevada Bird Records Committee (NBRC) added 108 reports to its database. The committee completed reviews of 99 records during the year. Since the founding of the NBRC in 1994, 888 records have been reviewed, of which 813 have been endorsed.

At its founding in 1994, the committee decided not to review any sightings prior to that year but reversed that decision several years later. Fortunately, founding secretary James Cressman and his wife Marian continued to accumulate documentation for “pre-committee” records. That accumulated documentation has been provided to the current committee, and one of our long-term goals is to organize and review as many of those records as possible. Of the 108 “new” reports received and added to the database in 2012, 13 precede the committee, dating as far back as 1 June 1954.

Of the 99 records reviewed by the committee in 2012, 37 were of birds found during 2012, 45 were of birds found in 2011, 12 preceded the committee’s founding, and the remaining five were of birds found between 13 May 1995 and 22 December 2011. Reviewed records thus extended from 1 June 1954 to 27 August 2012. Of the 87 endorsed records, 71 were supported by photographs. Twelve records failed to gain endorsement. Of those 12, half were supported by photographs.

The NBRC has six voting members and a nonvoting secretary. In 2012, the committee welcomed new member Will Richardson, who joined continuing members John Klicka, Tim Lenz, Carl Lundblad, Dennis Serdehely, and Jeanne Tinsman. The position of secretary continues to be held by Martin.
Meyers. At the close of 2012, John Klicka and Tim Lenz rotated off the committee. They are replaced for 2013 by new member Aaron Ambos and returning member Greg Scyphers, who had rotated off the committee at the end of 2011. In addition, although Dennis Serdehely had reached the limit of his term at the end of 2012, the committee voted to reappoint him to a special two-year extension. This has the desired effect of balancing the terms so that in the future two members’ three-year terms will expire each year.

The NBRC’s website at http://gbbo.org/nbrc contains a statement of purpose, links to a downloadable submission form, the committee’s bylaws, the Nevada state checklist maintained by the NBRC, the state review list, and answers to frequently asked questions. There is a link to a list of all submissions to the NBRC, with each record’s status with respect to endorsement and, if available, a photograph. All previous NBRC reports are available through the website as PDF files. The reports through 2007 (1994–1996, 1997, 1998, 1999, 2000, 2004, 2005, and 2007) appeared in Great Basin Birds, published by the Great Basin Bird Observatory. Beginning with the 2011 report, annual reports appear in Western Birds.

REVISIONS TO THE NEVADA STATE LIST IN 2012

During the period covered by this report, one new species was added to the Nevada list, the Red-bellied Woodpecker (Melanerpes carolinus). This change brought the count of species recorded in Nevada to 489 at the end of 2012.

REVISIONS TO THE NEVADA REVIEW LIST IN 2012

The only species the NBRC added during 2012 to the list of species it reviews was the one new to Nevada, Red-bellied Woodpecker. During 2012, the NBRC removed the Tennessee Warbler (Oreothlypis peregrina) and Swamp Sparrow (Melospiza georgiana) from the review list on the basis of total number of endorsed records, regularity of sightings, status in adjoining states, and the judgment of the members. There are currently 164 species on the Nevada review list, of which seven are exempt from review in some limited geographic area. Six of those seven exemptions are for very localized breeding populations. The seventh, the Broad-winged Hawk, is exempt in the Goshute Mountains, where multiple birds are observed annually in fall migration from a hawkwatch (Smith et al. 2008).

In addition, two subspecies are currently on the review list, the Eurasian Green-winged Teal (Anas crecca crecca) and Mexican Mallard (A. platyrhynchos diazi). Although the committee has reviewed (and endorsed) four records of A. c. crecca, we have not, as yet, reviewed any of the accumulating records for A. p. diazi and have decided to wait until there is more clarity on its issues of taxonomy and identification.

SPECIES ACCOUNTS

For each species, the format is English name, scientific name, and (total number of endorsed records of the species, number of records endorsed in this year’s report). Two asterisks after the total of records signify that the
number of records refers to a restricted review period, usually that the species is no longer on the review list, was placed on the review list as a result of a perceived drop in population, or is exempt from review in some locations. Note that the total number of records for a species is not necessarily the total number of individual birds reported.

After the heading for the species comes each record of that species reviewed in 2012, in this format: NBRC record number, name of each submitter, date or range of documented dates, and location (county in parentheses). If the record involved multiple birds, the number follows the county designation. “(P),” “(V),” or “(A)” following a submitter’s name indicates that he or she provided a photo, video, or audio recording, respectively. Discussion of a particular record follows that record’s data. If there are multiple records of the species, the records are ordered by date of first sighting. Any discussion of the species in general, not specific to a record, concludes the account.

Certain records are noted as “establishing records,” designating the first NBRC-endorsed record of a species. Early in its history, the NBRC adopted an existing checklist (Titus 1996) based on numerous sources that constituted the most reliable information available at the time. All but 28 of the species on the review list now have at least one endorsed record. The committee is pursuing documentation of these 28, and we have had some major success in this quest. However, it will probably be a few years before we conclude that we have exhausted all possibilities. At that time, we will reevaluate the status of those species still without an endorsed record.

BLACK-BELLIED WHISTLING- DUCK *Dendrocygna autumnalis* (4, 1). 2012-042, Marian Cressman (P), James Cressman, 18–31 May 1993, Henderson Bird Viewing Preserve (Clark). One of several examples in this year’s report of our continuing effort to incorporate the wealth of “pre-committee” data into the NBRC’s database.

BRANT *Branta bernicla* (4, 1). 2012-045, Bob Goodman (P), 18 May 1992, Anaho Island, Pyramid Lake (Washoe). While the very limited documentation on this bird was convincing as to species, the single distant photo did not permit determination of the subspecies. The Black Brant (*B. b. nigricans*) is the expected subspecies. The committee also has documentation of a sighting of Brant from Ash Meadows National Wildlife Refuge (NWR) (7 April 1996) that has yet to be reviewed. For perspective, Arizona endorsed two records of the Brant between 2005 and 2009 (Rosenberg 2011), while the Utah Bird Records Committee (www.utahbirds.org/RecCom/RareBirdsIndex.html) lists a total of nine reports (1872 through 31 August 2008), of which it has endorsed three.


2012-062, Michael Todd (P), Randall Michal (P), 11–13 November 2011, Henderson Bird Viewing Preserve (Clark).

2011-093, Edward Sivon (P), Deb Vogt, Randall Michal (P), 13–18 November 2011, Henderson Bird Viewing Preserve (Clark). The committee reviewed records 2012-062 and 2011-093 as a single record but on careful study of photos and written descriptions unanimously decided that they represented two different birds. Two members commented that 2011-093 was an adult female, while one stated that 2012-062 appeared to be an immature female.

RED-THROATED LOON *Gavia stellata* (5, 2). 2011-088, Randall Michal, Babette d’Amours (P), Aaron Ambos (P, Figure 1), 4–14 November 2011, Henderson Bird
Viewing Preserve (Clark), juvenile. The bird was found dead on 14 November but collection was not possible.

2011-094, Debbie van Dooremolen (P), Aaron Ambos (P), 16–25 November 2011, Duck Creek section, Clark County Wetlands Park (Clark), juvenile.

BLUE-FOOTED BOOBY *Sula nebouxii* (2, 1). 2012-060, Bryan Wuerker (P, Figure 2), 21 August 2012, Boulder Canyon (Virgin Basin), Lake Mead National Recreation Area (NRA) (Clark). This bird was well photographed as it swam up to the observer’s boat but was never seen again. The only previous NBRC-endorsed record is of one on 27 August 1971, also at Lake Mead NRA (Meyers 2011).

BROWN PELICAN *Pelecanus occidentalis* (5, 1). 2011-040, NOT ENDORSED. 24 June 2011, Smith Creek Dry Lake (Lander). Although all members considered it very unlikely that the observer misidentified a Brown Pelican, two members considered the documentation insufficient on the record’s first round, and the final vote was 2–4.

2011-075, Andrew Lee (P), Randall Michal (P), Dennis Serdehely, Dave DesMarais (P), 18 September–22 October, 2011, Las Vegas Bay, Lake Mead NRA (Clark).

Las Vegas Bay at Lake Mead has been the location of three of Nevada’s five endorsed records of the Brown Pelican. On 17 July 2004, there were 23 at that location (Meyers 2008). The committee also has on file unreviewed documentation of at least three other occurrences of the Brown Pelican at Lake Mead, in 1971, 1975, and 1992.


2012-057, Bill Henry (P), 27 August 2012, Stillwater NWR (Churchill).

With this species continuing to breed successfully in the Pahranagat Valley (where it is exempt from review), and reports from around the state coming in regularly, the committee is considering removing it from the review list.
MISSISSIPPI KITE *Ictinia mississippiensis* (7, 2). 2011-080, Rick Fridell (P), 21 May 2003, Corn Creek (Clark).

2012-013, Debbie van Dooremolen (P), 16 May 2012, Clark County Wetlands Park (Clark).

Four of the seven endorsed records of this species are for May. There is one record each for June, July, and August.

HARRIS’S HAWK *Parabuteo unicinctus* (7, 2). 2011-014, Brian Day (P), 27 March 2011, Dufurrena Ponds, Sheldon NWR (Humboldt). Although the identification was never in question, this record required two rounds to achieve endorsement, as two members questioned the bird’s origin on the first round. Excellent photos showed a juvenile with no signs of jesses or bands and no obvious feather damage. However, the location is in the extreme northwest corner of Nevada, quite far north for this species. No California record is nearly as far north (Hamilton et. al. 2007). However, there are records from locations in the interior of the U.S. at a latitude similar to that of Sheldon NWR, e.g., Stateline Island, Nebraska (Sharpe et.al. 2001), even slightly farther north. Furthermore, Sheldon NWR is in an extremely remote, very sparsely populated area where an escaped falconer’s bird should be less likely than a natural wanderer. On the second round, it received five votes for endorsement.

2011-105, Maureen J. Kammerer (P), Randall Michal, Babette d’Amours (P), Aaron Ambos (P), Donna Crail-Rugotzke (P), Randall Bruce (P, Figure 3), Rob Lowry (P), Martin Meyers (P), Christina Nycek, 14 December 2011–17 January 2013, Boulder City (Clark), four birds (photographed together on 14 January 2012), two adults and two juveniles. On 10 May 2012, Nycek observed nestlings in a nest she had been following, the first known successful nesting of Harris’s Hawk in Nevada.

2011-106, NOT ENDORSED. 20 December 2011, Las Vegas Wash (Vegas Valley Dr. to E. Rochelle) (Clark). The NBRC considered the documentation of this sighting too brief, although most thought it likely represented one of the birds from Boulder City.


2011-084, Ken Drozd (P), Martin Meyers, 8–9 October 2011, University Farms, Reno (Washoe).

The only American Golden-Plover endorsed by the committee before these two was found on 26 April 1997 (Baepler et.al. 1999). Three records for fall 2012 await review, as do some sightings antedating the committee’s formation.


STILT SANDPIPER *Calidris himantopus* (7**, 2). 2012-012, Andrew Lee (P), Greg Scyphers (P), 15–18 May 2012, Duck Creek area, Clark County Wetlands Park (Clark).

2012-014, Andrew Lee (P), 19 May 2012, Overton WMA (Clark).

This species was previously exempt from review in southern Nevada, defined as Clark, Esmeralda, Lincoln, and Nye counties (Elphick 2001). In September 2009, the committee voted to remove the exemption because of a dearth of reports in the south. Since then, three records from southern Nevada have been endorsed, and three more are still pending review.


HEERMANN’S GULL *Larus heermanni* (10, 2). 2012-051, Hugh Judd (P, Figure 4), 19 May–8 June 1990, Lahontan Reservoir east (Churchill). Truly an amazing record! On 19 May 1990, the late Hugh Judd found an adult Heermann’s Gull sitting on a nest with two eggs at Lahontan Reservoir. Returning on 26 May, he observed an adult California Gull (*L. californicus*) sitting on the nest, with the Heermann’s nearby. On 3 June, Judd and Lynda Booth found both gulls attending one chick. The second egg was not present. On 8 June, the chick was not present, and no sign of it was ever seen after that. The only other known attempts of Heermann’s Gull to nest north of Mexico, apparently unsuccessful, were at Alcatraz Island in San Francisco Bay 1979–1981 and at Shell Beach in San Luis Obispo County, California, in 1980 (Howell et. al. 1983). Hybridization of Heermann’s Gull with any species is previously unreported, except for the mention of this observation by Chisholm and Neel (2002) and Howell and Dunn (2007).

2012-008, Fred Petersen (P, Figure 5), 19 April 2012, Virginia Lake, Reno (Washoe).

Six of Nevada’s Heermann’s Gull records are from spring, four from fall.

LESSER BLACK-BACKED GULL *Larus fuscus* (12, 2). 2012-003, Andrew Lee (P), Aaron Ambos (P), 14–29 January 2012, Las Vegas Bay, Lake Mead NRA (Clark).

2012-004, Andrew Lee (P), 27 January 2012, Las Vegas Bay, Lake Mead NRA (Clark).


BLACK-LEGGED KITTIWAKE *Rissa tridactyla* (5, 2). 2012-033, Tracy Kipke (V), 18 April 2011, private property at Silver Peak (Esmeralda).
2012-023, Anne Pelligrini (P), 30 May 2012, Overton WMA (Clark).
2012-031, William Pratt (P), 8 July 2012, Henderson Bird Viewing Preserve (Clark).

All Nevada records for this species fall between 29 April and 20 July.

POMARINE JAEGER *Stercorarius pomarinus* (2, 1). 2012-046, Bob Goodman (P), 26 June 1993, Lahontan Reservoir east (Churchill). The bird was initially thought to be a Parasitic Jaeger, but the photographs convincingly documented Nevada’s second Pomarine Jaeger.

COMMON GROUND-DOVE *Columbina passerina* (4, 1). 2012-041, John Rogers (P), Sue Rogers, 27 July 2012, Caliente (Lincoln), 2 birds. This species was much more regular in southern Nevada through about the mid-1970s (Alcorn 1988). Multiple photos of 2012-041 permitted the committee to eliminate the similar Ruddy Ground-Dove (*C. talpacoti*) from consideration. While there are only two endorsed records of the Ruddy in Nevada, we have documentation of five additional older records still to review.

BLACK SWIFT *Cypseloides niger* (3, 1). 2012-038, Rick Fridell, 24 May 2012, Corn Creek (Clark). The three endorsed records of the Black Swift for Nevada extend from 27 April to 26 May.


GYRFALCON *Falco rusticolus* (1, 1). 2012-001, Bill Henry (P), Greg Scyphers (P, Figure 6), Meg Andrews, Rose Strickland, 13–16 January 2012, Stillwater NWR (Churchill). Although Titus (1996) listed the Gyrfalcon from Nevada on the basis of unpublished reports, this record is the first documented for the NBRC. Excellent photos and written reports from multiple observers made for a convincing establishing record.

GREATER PEWEE *Contopus pertinax* (1, 0). 2012-017, NOT ENDORSED. 20 May 2012, Henderson Bird Viewing Preserve (Clark). All the committee members agreed that the multiple photos and written description failed to eliminate other more likely, similar species.

LEAST FLYCATCHER *Empidonax minimus* (6, 0). 2012-002, NOT ENDORSED. 22 June 2004, Cottonwood Ranch (Elko). In early 2012, the observer provided the NBRC a paper he had written at the time of the observation that includes (but does not concentrate on) the sighting of a Least Flycatcher. He wrote some additional documentation in 2012, eight years after the sighting, and submitted a video that had some very faint sounds that were, according to the observer, vocalizations of the flycatcher. Even with considerable amplification of the vocalizations, however, most members thought that the video was unsatisfactory as evidence, and four members did not find the written documentation sufficient to endorse the sighting. Two of Nevada’s six endorsed records of the Least Flycatcher are for the breeding season (Santa Rosa Mountains, 13 July 2010, and Ruby Valley, 19 June 2011) and featured a video recording of a singing bird (Meyers 2011, 2012).

WHITE-EYED VIREO *Vireo griseus* (5, 1). 2012-020, Meg Andrews, Andrew
Figure 3. The first documentation of these Harris’s Hawks was on 14 December 2011, although residents of the area in Boulder City related that at least two of the birds had been present well before that date. This photo was taken 14 January 2012. Christina Nycek monitored the birds throughout their stay and reported young in a nest on 10 May 2012, the first confirmed nesting of Harris’s Hawk in Nevada.

Photo by Randall Bruce

Figure 4. (A) Adult Heermann’s Gull that mated with a California Gull at Lahontan Reservoir, Churchill County. The pair laid two eggs, but only one hybrid chick (B) was seen. It disappeared within a few days. This is the first evidence of hybridization of Heermann’s Gull with any other species, far from its normal breeding range in Baja California.

Photos by Hugh Judd
Howe, Andrew Lee (P), Rob Lowry (P), Rose Strickland, Dennis Ghiglieri (P), Randall Michal (P), 26–28 May 2012, Floyd Lamb Park (Clark). All five of Nevada’s endorsed records of the White-eyed Vireo are from late May (18–28 May).


WINTER WREN Troglodytes hiemalis (2, 1). 2011-092, Rick Fridell (P,V), Greg Scyphers (P), Martin Meyers (P, Figure 7, V), Rose Strickland, Dennis Ghiglieri (P), Paul Lehman, 9–26 November 2011, Pahranagat NWR (Lincoln). This very cooperative bird was near at least three Pacific Wrens (T. pacificus), providing excellent opportunities to compare plumage and vocalizations. Submitted documentation included video recordings along with 14 photos and four written descriptions. The bird was found 11 years, to the day, after Nevada’s first endorsed record of the Winter Wren (Meyers 2012).

BROWN THRASHER Toxostoma rufum (12, 1). 2012-027, Fred Welden (P), Greg Scyphers (P), 15–18 June 2012, Miller’s Rest Stop (Esmeralda). This is the third endorsed record of the Brown Thrasher from Miller’s Rest Stop, a well-known migrant trap, and another report from the same location is pending review. The most surprising of these records was from 4 July 2011, as this location rarely holds any
birds beyond the House Sparrow (Passer domesticus) and Rock Pigeon (Columbia livia) during the heat of midsummer.


SNOW BUNTING Plectrophenax nivalis (2, 1). 2011-099, Kerry Ross, 23 October 2011, Mt. Pisgah, Goshute Mts. (Elko). Excellent written description and field sketch resulted in a unanimous vote for endorsement of this bird, which flew past the Goshutes Hawk Watch with a small flock of Gray-crowned Rosy-Finches (Leucosticte tephrocotis).


GOLDEN-WINGED WARBLER Vermivora chrysoptera (4, 1). 2012-053, found by Richard Yank (former American Birds regional editor for Quebec), reported by Michael Patten and Paul Lehman, 27–29 May 1990, Dyer (Esmeralda). For some years, Dyer and Lida (both in Esmeralda County) were on the route of many vagrant-seeking California birders visiting the Death Valley region over the Memorial Day weekend.

BLUE-WINGED WARBLER Vermivora cyanoptera (5, 1). 2012-018, Andrew Lee (P), 24 May 2012, Floyd Lamb Park (Clark). Four of the five records for this species are from spring (17 May to 12 June); the lone fall record is dated 19 September.

PROTHONOTARY WARBLER Protonotaria citrea (14**, 1). 2011-087, Rick Fridell (P), 16 September 2004, Lida (Esmeralda). This species was removed from the review list in September 2009, but the committee continues to review sightings preceding the removal date.


CONNECTICUT WARBLER Oporornis agilis (3, 1). 2011-068, Andrew Lee (P), Chris Ruiz-Gardner (V), Greg Scyphers (P, Figure 8), 3–4 September 2011, Floyd Lamb Park (Clark). While the identification was overwhelmingly supported by the written descriptions and excellent photos, the video of this chunky bird walking around on the ground snatching food from the leaf litter and low branches made the review process more enjoyable than usual.

CAPE MAY WARBLER Setophaga tigrina (4, 1). 2012-043, James Cressman, Marian Cressman (P), 3 October 1992, Corn Creek (Clark).

CERULEAN WARBLER Setophaga cerulea (1, 1). 2012-061, Mrs. E. Boyland (P), 1 June 1954, Boulder Beach, Lake Mead NRA (Clark). This is the establishing record of the Cerulean Warbler for Nevada, based on specimen 2427 at the Barrick Museum of Natural History (University of Nevada Las Vegas). The bird was found dead along the shore of Lake Mead, but the specimen is in reasonably good condition, apparently found fairly soon after its death (G. Scyphers pers. comm.)

2012-015, NOT ENDORSED. 19 May 2012, Corn Creek (Clark). Although the written description included some features that suggested the Cerulean Warbler, the details were insufficient to support the identification of this extreme, and declining, rarity.
Figure 6. Adult Gyrfalcon of the gray morph found by Bill Henry at Stillwater NWR, 15 January 2012.  

*Photo by Greg Scyphers*

Figure 7. Nevada’s second endorsed Winter Wren was extensively photographed and audio and video recorded during its stay in a heavily wooded area at the north end of Pahranagat NWR (photo 11 November 2011). The overall paler color, especially of the throat and breast, helped to distinguish the bird from several Pacific Wrens present in the same area, but the opportunity to compare call notes provided the best identification criterion.  

*Photo by Martin Meyers*
Figure 8. Nevada’s third endorsed Connecticut Warbler at Floyd Lamb Park, Las Vegas, 3–4 September 2011, the first to be documented with video.

*Photo by Greg Scyphers*

Figure 9. Third Bronzed Cowbird documented for Nevada, near Beatty, Nye County, 19 May–21 June 2011. A male, it displayed repeatedly to the many female Brown-headed Cowbirds in the area.

*Photo by Deb Vogt*

CHESTNUT-SIDED WARBLER Setophaga pensylvanica (16**, 1). 2011-071, Diane Wong, 13 September 2011, Pahranagat NWR (Lincoln). Species dropped from the review list 11 days after this sighting.

PALM WARBLER Setophaga palmarum (16**, 1). 2011-073, Fred Petersen (P), 16 September 2011, Miller’s Rest Stop (Esmeralda). Species removed from the review list eight days after this sighting.

YELLOW-THROATED WARBLER Setophaga dominica (5, 1). 2011-035, Martin Meyers (P), 11 June 2011, Dyer (Esmeralda). Of the five previously endorsed records, three are from spring (22 April 1977, 18 May 2003, and 11 June 2011), one is from fall (24 October 1979), and one is from midwinter (2–8 January 2011.)

PRAIRIE WARBLER Setophaga discolor (7, 2). 2012-050, John Brack, 16 May 1993, Lida (Esmeralda).

2011-072, Fred Petersen (P), 13 September 2011, Dyer (Esmeralda). Birders who frequent the California coast in fall, where this species occurs annually, might be surprised at its extreme scarcity in Nevada. However, the bird is also casual in the interior of California. “The great majority of California records involve fall vagrants along the coast” (Hamilton et. al. 2007), and Utah has only three endorsed records (www.utahbirds.org/RecCom/RareBirdsIndex.html).

BLACK-THROATED GREEN WARBLER Setophaga virens (3, 1). 2012-032, Greg Scyphers (P), 22 October 2011, Pahranagat NWR (Lincoln). All three NBRC- endorsed records are from fall, between 30 September and 6 November.

CANADA WARBLER Cardellina canadensis (4, 1). 2012-047, John Brack, 8 September 1993, Dyer (Esmeralda). Three of the four NBRC-endorsed records are from September, the fourth being a spring record (30 May 2009). In California, roughly 90% of the 250+ records are from the fall, and of those, “coastal records strongly predominate” (Hamilton et al. 2007). Utah has only one endorsed record (www.utahbirds.org/RecCom/RareBirdsIndex.html).

PAINTED REDSTART Myioborus pictus (7, 2). 2011-025, Carolyn Titus, Dennis Ghiglieri (P), 7 May 2011, Corn Creek (Clark).

2012-028, John C. Ruckdeschel, 16 June 2012, Summerlin (Las Vegas) (Clark).


2012-011, Andrew Lee (P), 12 May 2012, Floyd Lamb Park (Clark).

2012-019, Andrew Lee (P), 24 May 2012, Floyd Lamb Park (Clark).


2012-035, Greg Scyphers (P), 20 May 2012, Corn Creek (Clark).

2012-055, NOT ENDORSED. 17 August 2012, Ruby Mountains (Elko). Species removed from the review list, 7 December 2012.

HEPATIC TANAGER Piranga flava (1, 0). 2011-034, NOT ENDORSED. 7 June 2011, Henderson Bird Viewing Preserve (Clark). Video of this bird was insufficiently clear to identify the Hepatic Tanager. Several members and some outside experts thought the voice recording in the video to match the Summer Tanager better than the Hepatic.

2012-024, NOT ENDORSED. 5 May 2012, Spring Mountain Ranch State Park (Clark), 2 birds. The documentation made a stronger case for the Summer Tanager (expected at that location) than for the Hepatic.
2012-026, NOT ENDORSED. 5 May 2012, Corn Creek (Clark). Although the written documentation suggested the Hepatic Tanager, the accompanying photograph, taken in deep shade, did not provide enough additional support for the record to receive endorsement.

Nevada still has only one endorsed record of the Hepatic Tanager, one photographed at the famed migrant trap Miller’s Rest Stop on 29 September 2002 (Cochran 2006). Though Austin and Bradley (1971) described the Hepatic Tanager as a “summer resident,” and Alcorn (1988), on the basis of notes of C. S. Lawson, called it an “uncommon to rare breeding species,” it went totally unrecorded during field work for the Nevada breeding bird atlas (Floyd et. al. 2007). The committee has documentation for four old records yet to be reviewed.


2011-095, Paul Lehman (P), 26 November 2011, Coyote Springs (Lincoln).

With the exception of one in May, all of Nevada’s seven endorsed records of the Scarlet Tanager are for fall.

NORTHERN CARDINAL *Cardinalis cardinalis* (2, 0). 2011-089, NOT ENDORSED. 22 December 2010, Shantytown, Ruby Lake NWR (Elko). None of the committee members questioned the identification, as photographs clearly established the bird’s identity as a male Northern Cardinal and ruled out the similar Pyrrhuloxia (*C. sinuatus*), for which there is one NBRC-endorsed record. Two committee members voted not to endorse this record because of concerns about the bird’s possibly being an escapee. Although the location is remote and sparsely populated, it is far from any known wild population. If the documentation had been sufficient to identify the subspecies, that might have influenced some members. Five (of six) votes are needed for endorsement. A record receiving four votes for endorsement on the first round is circulated for a second round. If there is no change in the vote totals (or a change away from endorsement), the record is considered complete and not endorsed.


2011-110, Greg Scyphers (P), 11 September 2011, Dyer (Esmeralda). Endorsed records of this species are evenly divided between spring and fall.

DICKCISSEL *Spiza americana* (5, 2). 2011-023, Andrew Lee (P), 22 April 2011, Floyd Lamb Park (Clark).


2011-114, Rob Lowry (P), 29 December 2011, Riverview Park (Carson City).

BRONZED COWBIRD *Molothrus aeneus* (3, 1). 2012-016, Laura Cunningham (P), Darlene Feener (P), Rob Lowry (P), Deb Vogt (P; Figure 9), Dennis Serdehely, Martin Meyers (P), 19 May–21 June 2012, Parker Ranch (private) (Nye). This very cooperative male displayed to surrounding Brown-headed Cowbirds (*M. ater*) for over a month, providing opportunities for many Nevada birders to observe and photograph it. Thanks to Laura Cunningham for providing birders with access to the property while the bird was present.

ORCHARD ORIOLE *Icterus spurius* (8, 1). 2011-074, NOT ENDORSED. 17 September 2011, Floyd Lamb Park (Clark). This record was supported by five photographs and considerable written detail. However, two members thought that such critical identification features as bill length/shape and tail length were somewhat ambiguous, failing to eliminate a female or juvenile Hooded Oriole (*I. cucullatus*) completely. Juvenile Hooded Orioles are a source of confusion in late summer and early fall.
2012-029, Randall Michal, 19 June 2012, Henderson Bird Viewing Preserve (Clark). A written description of a male Orchard Oriole received unanimous support.

COMMON REDPOLL \emph{Acanthis flammea} (4, 2). 2011-104, Jesse Swift (P), 8 December 2011, Apex (Clark).

2012-006, Dennis Serdehely, Greg Scyphers (P), 10 January 2012, Fernley (Lyon).

These two records in winter 2011–2012 were the first of the Common Redpoll in Nevada since December 2003. They turned out to be a mere hint of things to come, as the winter of 2012–2013 brought eight submitted records documenting 35 individual birds (pending review). Similar invasions were noted in neighboring states as well.

CORRIGENDA

Corrections to 2011 Annual Report: Thayer’s Gull (\emph{Larus thayeri}, 2011-007): date range should be 8–19 February 2011. Arctic Tern (\emph{Sterna paradisaea}, 2010-084): date range should be 11–14 October 1990. Prairie Warbler (\emph{Setophaga discolor}, 2010-064): date range should be 31 October–6 November 2010. Lark Bunting (\emph{Calamospiza melanocorys}, 2011-077): date range should be 17–18 September 2011. Lawrence’s Goldfinch (\emph{Spinus lawrencei}, 2010-048) date range should be 5–19 September 2010. The statement, “There are currently 167 species on the Nevada review list” should be “There are currently 165 full species on the Nevada review list, plus two subspecies.”

ADDENDUM

To 2011 Annual Report: Worm-eating Warbler (\emph{Helmitheros vermivorum}, 2011-010): date range is expanded to 26 September–8 October 2010 because of the committee’s decision to consider the sighting on 8 October (Rick Fridell, Pahranagat NWR) to represent persistence of the individual initially reported 26 September.

ACKNOWLEDGMENTS

The NBRC thanks everyone who contributed to the accounts contained in this report. All submissions, photos, advice, comments, and opinions are greatly appreciated. We apologize to anyone who may have been overlooked. Some of the contributors on this list are no longer with us, but their contributions are no less appreciated.


Jon Dunn, Paul Lehman, Greg Scyphers, Dennis Serdehely, Jeanne Tinsman, Philip Unitt, and Will Richardson reviewed the report and provided helpful suggestions. Special thanks to Western Field Ornithologists and Great Basin Bird Observatory for their support and encouragement.
LITERATURE CITED


Accepted 14 August 2013
ABSTRACT: Climate change is predicted to affect the ranges of montane birds differently, depending on their ecological adaptations to regional conditions. Detailed regional data on species’ distributions from a systematic survey are crucial for tracking these range shifts and for guiding conservation decisions. We systematically completed 3578 point counts along a 2736-km mega-transect by following the Pacific Crest Trail (PCT) from 2 April to 8 September 2006. On this basis, we describe the elevation ranges of 74 common bird species and their habitats along the PCT by five segments: southern California, southern and northern Sierra Nevada, southern Cascade Range, and Klamath Mountains. We also identify potential sampling bias caused from seasonal variation in the detectability of birds by region. This assessment of bird distributions over a wide range can permit future efforts to gauge the responses of large numbers of common birds to land use and climate change.

California is a state with great topographic relief, dominated by mountain ranges oriented largely north–south, and supports a rich avifauna. The elevational ranges of montane species are determined by many factors, including past and present climate, topography, biological interactions, habitat distribution, and patterns of human disturbance (Lee et al. 2004, Ruggiero and Hawkins 2008, Tingley et al. 2009). Many of these factors vary across California’s distinctive mountain regions, so many birds’ ranges are determined by intrinsic regional conditions.

Data over the past 100 years show that birds of the California cordillera are particularly sensitive to climate changes (Tingley et al. 2009). Depending on their climate niche, many species have moved upslope or downslope in response to changes in temperature and precipitation, and this response may vary in neighboring regions (Tingley et al. 2012). By the end of the 21st century, the average annual temperature throughout California is expected to increase by 2 to 5 °C (Snyder et al. 2002, Cayan et al. 2012). Additionally, although there is less agreement among climate modelers about the direction of change in precipitation (IPCC 2007), rain is expected to be more frequent than snow, resulting in a reduced snowpack, especially in the Sierra Nevada (Hayhoe et al. 2004, Cayan et al. 2012). This reduction is expected to change vegetation structure and plant-species composition profoundly, a change already underway (Thorne et al. 2008, Dolanc et al. 2013). Hayhoe et al. (2004) predicted a conversion of 50 to 90% of subalpine and alpine habitats by the year 2099.

In addition to climate change, change in human land use can shape the patterns of species’ distributions on mountains (Lee et al. 2004, Nogues-Bravo et al. 2008). On the California cordillera, habitat alteration has played a significant role in reducing species richness, particularly at the lower elevations (Forister et al. 2010). As California’s population expands
from 37.3 million (2010) to a projected 59.3 million in 2050 (Sanstad et al. 2009), continued development of housing, roads, and resources will likely further stress montane birds (Strasser and Heath 2013) already coping with climate change.

These disturbances increase the need for systematically recorded data on bird distributions to inform management (Tingley and Beissinger 2009). As yet, few studies have documented the occurrence of birds in remote mountainous regions systematically (Siegel et al. 2011, 2012). We recorded birds by point counts and assessed habitat along a single, continuous mega-transect and documented their elevational ranges and habitats by five adjoining segments of the Pacific Crest National Scenic Trail (PCT).

METHODS

Study Area

The PCT extends along mountain ranges from Mexico to Canada, traversing California, Oregon, and Washington. It is a recreational and scenic trail reserved for hiking and equestrian use that crosses remote areas. We hiked the California portion of the PCT (2736 km), which served as a mega-transect for a survey of birds every 10 minutes walked. This route spanned nine degrees in latitude (32.58° N to 42.00° N) and elevations from 365 m (San Gorgonio Pass in southern California) to 4020 m (Forester Pass in the southern Sierra Nevada). Varying locally with elevation, precipitation generally increases from south to north along the PCT. The Transverse and Peninsular Ranges of southern California receive the least amount of precipitation, where annual precipitation ranges from 15 to 102 cm. In the Klamath Mountains of northwestern California, annual precipitation ranges from 46 to 305 cm (Miles and Goudey 1997). We used topographic, climatic, and biogeographic features to divide this PCT mega-transect into five segments: southern California mountains ("SoCa"), southern Sierra Nevada ("SoSN"), northern Sierra Nevada ("NoSN"), southern Cascade Range ("Casc"), and Klamath Mountains ("Klam") (Figure 1). With some modification, this delineation agrees with boundaries of natural regions defined by Schoenherr (1992), Small (1994), and Miles and Goudey (1997). The wide range of habitats along the PCT is due to the trail’s elevation as well as the mountains’ topography. The extent of the elevation gradient sampled differed for each region, so our transect should not be considered representative of the entire range of elevations but only of the habitats along the PCT.

Data Recording

Stopping at 10-minute intervals while walking along the PCT, McGrann counted birds for 5 minutes within a radius of 50 m, estimated visually, and avoided counting any bird that may have been recorded at a previous plot. The distance between plots, ~500–700 m, depending on terrain, was greater than the 250-m minimum recommended by Ralph et al. (1995), reducing the potential for duplicate counts of individuals. We excluded from analysis all birds observed beyond 50 m and those flying above the vegetation canopy, apparently not foraging, displaying, or behaving in a way that
suggested use of the habitat below. By visual assessment, Amy McGrann classified the habitat in each plot according to the scheme of the California Wildlife Habitat Relationship System (CWHR; www.dfg.ca.gov/biogeodata/cwhr/wildlife_habitats.asp). Additionally, we recorded the time, date, and geographic coordinates of each point count. We did not count in inclement weather, and on one occasion a snow storm forced the observers off the PCT, resulting in a gap of approximately 15–20 km along the transect in southern California. Otherwise, our mega-transect was complete in a single field season, yielding 3578 plots along the PCT in California.
ELEVATIONAL RANGES OF BIRDS ALONG THE PACIFIC CREST TRAIL

Timing of Surveys

To maximize our data, we followed the recommendations for point counts of Ralph et al. (1995) except for time of day and season. Instead of being restricted to the morning, surveys extended from dawn to dusk. As birds’ singing generally declines in the late morning and afternoon, our counting through the day may introduce a source of bias. However, the influence of any such bias on our calculations of species’ distributions by region should be minimal because the proportion of counts before 10:30 in each region was similar (SoCa: 30%, SoSN: 31%, NoSN: 31%, Casc: 30%, and Klam: 32%). Furthermore, seasonal variation in vocalizing may have influenced the detectability of species in different regions because we did not restrict counts to the breeding season but instead continued them from 2 April to 8 September. To complete surveys when the PCT was mostly free of snow, we surveyed each region separately: SoCa (2 April–27 May), SoSN (29 May–20 June), NoSN (8 August–8 September), Casc (26 June–20 July), and Klam (20 July–4 August). By reviewing Small (1994) and www.ebird.org, we assessed whether each species’ observed distribution along the PCT represented its summer range, or may have been significantly reduced by cryptic post-breeding behaviors, may have represented primarily latitudinal or elevational migrants, or may have represented primarily birds in their winter ranges.

Data Analysis

We used the spatial analyst extension in ArcGIS (version 10, Environmental Systems Research Institute, Redlands, CA) to extract elevation from the National Elevation Dataset (resolution 10 m; U. S. Geological Survey, http://ned.usgs.gov) for each GPS-recorded survey point.

We calculated birds’ elevational distribution in each region by methods similar to those of Siegel et al. (2011, 2012). The basis was data from 1126 plots in SoCa (mean elevation of point counts 1495 m, range 363–3195 m), 486 in SoSN (mean 2286 m, range 1164–3661 m), 877 in NoSN (mean 2735 m, range 1904–3662 m), 687 in Casc (mean 1584 m, range 662–2312 m), and 402 in Klam (mean 1771 m, range 428–2331 m).

Next, we categorized each species detected at least 20 times in at least one region as detected or not detected at each plot in that region. We then calculated summary statistics to describe the elevations at which the species was detected in each of the five regions, including the mean elevation of detection as well as the range encompassing 95% of the detections (lowest and highest 2.5% of detections excluded), calculated with the quantile function (Hyndman and Fan 1996) in R version 2.15.1.

Using the “beanplot” package in R (Kampstra 2008), we graphed the distributions of survey plots with and without detections for common species (at least 20 detections in at least one region) to ensure a sample large enough for a beanplot to be built (Siegel et al. 2011, 2012). Beanplots employ a density trace and depict a species’ distribution along an elevational gradient. The density trace illustrates the relative difference in the density of detections or non-detections along the elevation gradient. The width of the density trace (the x axis) is determined by the sample size, the spread
ELEVATIONAL RANGES OF BIRDS ALONG THE PACIFIC CREST TRAIL

of data points along the gradient, and a bandwidth parameter, whose value we determined by the method of Sheather and Jones (1991). The asymmetrical beanplots display the distribution of plots with detections next to the distribution of plots without detections. The differing shapes of the density traces on either side of the beanplot’s y axis are not complementary and thus do not represent the ratio of detections to non-detections. Rather, they represent the proportion of detection or non-detections with respect to entire distribution of locations (of detection or non-detection pooled) along the elevation gradient (Siegel et al. 2011).

We employed an identical procedure to illustrate the distributions of the habitats noted at each plot. Again, the only habitats analyzed are those recorded at least 20 times in one region.

RESULTS

Bird Distributions

Many California birds commonly move upslope after breeding (Grinnell 1908, Siegel et al. 2011). We made no attempt to locate nests and could not verify whether birds detected on point counts were local breeders. Thus our results should be interpreted as birds’ summer ranges rather than strictly breeding ranges. Figure 2 depicts the densities of detection and non-detection by elevation for each species meeting our criterion of 20 plots with detections in at least one region. Seventy-four species met this criterion, including 69 in SoCa, 65 in SoSN, 47 in NoSN, 59 in Casc, and 49 in Klam (see Table 1 for mean elevations and ranges). The observed distributions of 12 species may have been influenced by the timing of the survey, detections of migrants, or detections of birds still in their winter ranges (Figure 2). These species excluded, 30 species occurred in all regions, and of these 30 species, the elevational means of 24 (80%) were higher across all three southern regions (SoCa, SoSN, NoSN) than in either of the two northern regions (Casc and Klam). In part, these differences are due to regional variation in the elevations sampled and may also reflect the distributions of forest habitats optimal for these birds (see Habitat Distributions below).

The ranges of several lower-elevation species lay primarily below the mean elevation of all point counts along the PCT (1954 m), while several higher-elevation species occurred primarily above this elevation. These included eight low-elevation species detected only in the two most southern regions (SoCa and SoSN): the California Quail, Costa’s Hummingbird, California Thrasher, California Towhee, Black-chinned Sparrow, Lark Sparrow, Black-throated Sparrow, and Bell’s Sparrow (see Figure 2 for scientific names); their ranges tended to correspond with distributions of desert scrub and chaparral (Figure 3). Additionally, we detected the Horned Lark only in SoCa at low elevations, in association with annual grassland—none in the Sierra Nevada along the PCT, perhaps reflecting the species’ negative trend in Sierra Nevada according to data from the Breeding Bird Survey over 45 years (Sauer et al. 2012). Bewick’s Wren and Wrentit, common in chaparral in SoCA, were also confined to lower elevations but occurred across a wider latitudinal range along the PCT, being noted in regions SoCa, SoSN,
and Casc. The ranges of the Acorn Woodpecker and Oak Titmouse, also restricted to lower elevations in these regions, corresponded with montane hardwood–conifer and montane hardwood habitats. Three species were restricted to high elevations; the range of Clark’s Nutcracker corresponded with subalpine conifers, particularly in SoCa, and the Gray-crowned Rosy-Finch and American Pipit (*Anthus rubescens alticola*) were confined almost entirely to the alpine dwarf-shrub and barren habitats at the highest elevations of regions SoSN and NoSN. The American Pipit was detected on just 14 plots so is not included in Figure 2.

Habitat Distributions

Twenty-one CWHR habitats met our criterion of occurring on 20 survey plots in at least one region (Figure 3). The xeric grass and shrub habitats (annual grassland, desert scrub, chamise–redshank chaparral, mixed chaparral, and sagebrush) occurred most frequently below 1954 m (the mean elevation of all points) in the two southernmost regions (SoCa and SoSN), whereas woodland and more mesic habitats (montane hardwood, montane hardwood–conifer, and Douglas-fir) occurred more frequently below 1954 m in the two northernmost regions (Casc and Klam). Montane riparian forest was frequent along streams and at springs below 1954 m in the SoCa region and sporadic elsewhere along the PCT. Where the PCT traversed drier and east-facing slopes, frequent woodland habitats were juniper, pinyon–juniper, and Joshua tree. At middle to upper elevations of all five regions, montane chaparral and several forest habitats were common (Jeffrey pine, mixed conifer, white fir, red fir, lodgepole pine, and subalpine conifer); their mean elevations in the two northernmost regions were lower than in the three southernmost regions. The alpine dwarf-shrub and barren (i.e., devoid of vegetation) habitats were found only at the highest elevations along the PCT, predominantly in regions SoSN and NoSN, to a lesser extent in Klam.

DISCUSSION

Systematic surveys of California’s mountains, including Grinnell’s historic transects (e.g., Grinnell 1908, Grinnell and Storer 1924) and the recent efforts of Siegel et al. (2011, 2012), have proven invaluable to avian ecology and conservation. Our mega-transect represents the first systematic survey of bird diversity along the entire PCT in California. In the five regions we defined, species’ distributions differed notably. Furthermore, certain species had narrow elevational ranges at both extremes of the gradient. Elevational range is an important predictor of montane species’ risk of extinction (Sekercioglu et al. 2008, La Sorte and Jetz 2010). Low-elevation species with limited ranges may be more susceptible to land-use change (Lee et al. 2004, Forister et al. 2010) but may have an opportunity to disperse to higher elevations in response to climate change. Of particular conservation concern are species confined to high elevations, generally much smaller in extent than low-elevation zones (McCain 2007). Species restricted to these areas may have limited opportunities to disperse laterally to neighboring alpine habitats (La Sorte and Jetz 2010). Because of their narrow and isolated ranges, two
Figure 2. The elevational distribution of plots with and without detections of 74 species detected on at least 20 plots along the Pacific Crest Trail. Dark gray regions to the left of the center line represent density traces of detections; light gray regions to the right of the center line represent density traces of points without detections. Black horizontal lines show mean elevations of points where a species was detected.
(left of center) and not detected (right of center). The dashed line indicates the mean elevation of all points, all five regions pooled. An asterisk after a species’ English name indicates that at least one form of seasonal detection bias may have influenced the range observed; see text for details. See Figure 1 for definitions and dates of survey of the five segments of the trail.
Figure 2 (continued).
Figure 2 (continued).
ELEVATIONAL RANGES OF BIRDS ALONG THE PACIFIC CREST TRAIL

Figure 2 (continued).

Rock Wren
*Sialia mexicana*

Bewick’s Wren
*Thryomanes bewickii*

House Wren
*Troglodytes aedon*

Golden-crowned Kinglet
*Regulus satrapa*

Ruby-crowned Kinglet*
*Regulus calendula*

Wrentit
*Chamaea fasciata*

Western Bluebird
*Sialia mexicana*

Townsend’s Solitaire
*Myadestes townsendi*
ELEVATIONAL RANGES OF BIRDS ALONG THE PACIFIC CREST TRAIL

Figure 2 (continued).
ELEVATIONAL RANGES OF BIRDS ALONG THE PACIFIC CREST TRAIL

Figure 2 (continued).
ELEVATIONAL RANGES OF BIRDS ALONG THE PACIFIC CREST TRAIL

Figure 2 (continued).
ELEVATIONAL RANGES OF BIRDS ALONG THE PACIFIC CREST TRAIL

Figure 2 (continued).
high-elevation specialists, the American Pipit and Gray-crowned Rosy-Finch in the Sierra Nevada, may be especially at risk of extirpation. The pipit may have vanished from the Sierra Nevada in the past, about 5000–2900 years ago, as a result of warming of the climate that dried its mesic tundra habitat. It recolonized the Sierra Nevada only recently, perhaps about 45 years ago (Miller and Green 1987)

Detections of Migrants

Some species’ distributions, in certain regions, were likely influenced heavily by detections of migrants (Figure 2). Surveys in SoCa were completed early in the season, and many or all of the Hermit Thrushes and Nashville, Black-throated Gray, Townsend’s, and Hermit warblers seen were likely spring migrants. Furthermore, the Northern Flicker, Ruby-crowned Kinglet, Yellow-rumped Warbler, and White-crowned Sparrow all have complex patterns of seasonal movement within California (Small 1994); detections of these species, especially at low elevations in SoCa, could be of either wintering individuals or migrants. The White-crowned Sparrows in SoCa were likely of subspecies gambelii and had not yet departed for their breeding range in Alaska and Canada, while the high-elevation detections of this species in the Sierra Nevada were of subspecies oriantha on their breeding territories (Small 1994). Rufous Hummingbirds were detected at low elevations in SoCa, as they were migrating north, and at high elevations in regions NoSN, Casc, and Klam, as they were migrating south. Orange-crowned Warblers were detected mostly at upper elevations in regions NoSN, Casc, and Klam, largely reflecting upslope movements after breeding. Surveys of NoSN and Klam were completed rather late in the season, and because of more cryptic behavior after breeding, the number of detections of the White-headed Woodpecker appeared to be relatively low, given the amount of suitable habitat available. The number of plots with detections of the Ruby-crowned Kinglet was particularly low in NoSN (3 plots) and Casc (1 plot). In addition, we detected no Horned Larks in either Sierra Nevada region, perhaps reflecting the long-term, negative trend for these two species. Both
Table 1  Elevational Distributions of the 74 Species Most Frequently Detected<sup>a</sup> on Point Counts by 5 Regions of the Pacific Crest Trail, 2006

<table>
<thead>
<tr>
<th>Species</th>
<th>Region&lt;sup&gt;b&lt;/sup&gt;</th>
<th>SoCa</th>
<th>SoSN</th>
<th>NoSN</th>
<th>Casc</th>
<th>Klam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mountain Quail</td>
<td></td>
<td>76</td>
<td>26</td>
<td>4</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
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<td>White-throated Swift</td>
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<td>Northern Flicker</td>
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<td>87</td>
<td>372</td>
<td>192</td>
<td>133</td>
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</tbody>
</table>

<sup>a</sup> Species detected on point counts.

<sup>b</sup> Regions: SoCa = Southern California, SoSN = Southern Sierra Nevada, NoSN = Northern Sierra Nevada, Casc = Cascade Range, Klam = Klamath Range.
<table>
<thead>
<tr>
<th>Species</th>
<th>SoCa</th>
<th>SoSN</th>
<th>NoSN</th>
<th>Casc</th>
<th>Klam</th>
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</thead>
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<tr>
<td>Oak Titmouse</td>
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SoCA: the southern California (2 April–27 May), SoSN: southern Sierra Nevada (29 May–20 June), NoSN: northern Sierra Nevada (8 August–8 September), Casc: southern Cascade Range (26 June–20 July), and Klam: Klamath Mountains (20 July–4 August).

See Figure 2 for scientific names.

Numbers of point count stations at which we detected the species in each region.

Range encompassing 95% of the detections.
were once numerous throughout Sierra Nevada according to the Breeding Bird Survey and the Grinnell Resurvey Project (Moritz 2007, Sauer et al. 2012, Beedy and Pandolfino 2013).

Conclusion

The stereotypic perception of the PCT is of a scenic route along rugged mountain ridgelines. While this is true in some places, the PCT is a trail of extremes, and the route actually crosses a wide range of landscapes, including desert, plateaus, broad valleys, and deep canyons. Habitats range from sparsely vegetated deserts scrub to dense forests. Over the decades the trail took to construct, the planners and field crews who scouted out the route considered many factors in addition to scenic value (Schirrin et al. 2003), including property ownership, water access, proximity to human development, and topography. Furthermore, the trail was often built on gentle grades to facilitate equestrian use, and some sections follow contours or ascend through river valleys to mountain passes. For this reason, a significant proportion of our count points were not only along riparian corridors but also in a diversity of upland habitats. The ownership of lands crossed by the PCT is also diverse, including private lands, state and federal parks, national forests, and wilderness areas. Similarly, the range of human land uses, including recreation, housing, logging, and energy production, is also wide.

Habitat alteration on the cordillera will likely continue as California’s human population continues to grow, but the extent and magnitude of land-use change will vary with local policies (Beardsley et al. 2009). Furthermore, climate change will affect species’ distributions on the California cordillera differently depending on regional conditions and a species’ climate niche (Tingley et al. 2012). Thus region-specific knowledge of montane birds’ distributions is needed to inform prudent conservation decisions. This mega-transect may serve as a benchmark for future assessments of shifts in species’ ranges in response to changes in climate and land use.

ACKNOWLEDGMENTS

This study was funded in part by a Selma Herr endowment grant from the Department of Wildlife, Fish, and Conservation Biology at the University of California, Davis. We are grateful to the Herr family for their financial support. Bob Gill, Amy McGrann, L. Jay Roberts, Rodney Siegel, and Sarah Stock provided useful comments on earlier versions of the manuscript. James Saracco assisted with writing R code for the production of the beanplot figures. We are grateful to Michael McGrann’s wife, Amy McGrann, who also walked every step of the mega-transect, for her assistance in categorizing the habitat along the PCT. The field component of this study could not have been accomplished without the aid and support of many individuals. We thank the Pacific Crest Trail Association for tirelessly maintaining and promoting the PCT.

LITERATURE CITED

Figure 3. The elevational distribution of plots with and without 21 habitat types defined by the California Wildlife Habitat Relationships System and recorded on at least 20 plots along the Pacific Crest Trail. Dark gray regions to the left of the center line represent density traces of points with the habitat; light gray regions to the right of the center line represent density traces of points without the habitat.
center line represent density traces of points without the habitat. Black horizontal lines show mean elevations of points with the habitat (left of center) and without it (right of center). The dashed line indicates the mean elevation of all points, all five regions pooled. See Figure 1 for definitions and dates of survey of the five segments of the trail.
Figure 3 (continued).


ELEVATIONAL RANGES OF BIRDS ALONG THE PACIFIC CREST TRAIL


ELEVATIONAL RANGES OF BIRDS ALONG THE PACIFIC CREST TRAIL


Accepted 6 October 2013

Gray-crowned Rosy-Finch

Sketch by George C. West
ABSTRACT: The Cactus Wren (Campylorhynchus brunneicapillus) is a polytypic species widespread in the southwestern U.S. and northern Mexico. Though closer in plumage characteristics to the desert subspecies anthonyi, populations resident in coastal sage scrub on the coastal slope of Ventura County and Los Angeles County occupy an ecological niche more similar to that of the more southerly subspecies sandiegensis. Because of fragmentation of habitat associated with urbanization, the populations on southern California’s coastal slope are almost entirely isolated from those of the deserts, and apparently from each other. They are declining precipitously for reasons not entirely understood but certainly related to loss, fragmentation, and degradation of suitable habitat. In 2012, we organized a volunteer effort to map the entire population in Ventura County and found 111 active, accessible territories with at least one adult or a fresh nest. Additional areas to which we did not have access could raise this total number to 166 territories county-wide. While historically the species occurred somewhat more widely in the eastern portion of the county, all active territories now appear to be restricted to a narrow band of cactus-rich scrub at the far western edge of the Santa Monica Mountains and Simi Hills, from Point Mugu northeast through Thousand Oaks to the west side of Simi Valley, roughly tracking the distribution of large patches of prickly-pear (Opuntia spp.) and coast cholla (Cylindropuntia prolifera).

During spring 2012, the California Department of Fish and Game (CDFG, now California Department of Fish and Wildlife) contracted with us to organize a volunteer-based survey to develop a baseline estimate of the number and distribution of the Cactus Wren (Campylorhynchus brunneicapillus) in Ventura County (Cooper and Hall 2012). The effort was modeled after similar recent surveys for the species elsewhere in coastal southern California (Mitrovich and Hamilton 2007, Cooper et al. 2012). Here we present an updated distribution map and population estimate of the wren, along with a historical overview of the species’ range and former status in Ventura County.

All known populations of the Cactus Wren in Ventura County may be considered the “coastal Cactus Wren;” interior populations extending west from the Mojave Desert occur (or recently occurred) near Gorman, Los Angeles County (www.ebird.org), but these noncoastal birds are not known to extend into neighboring Ventura County. As recently summarized by Hamilton et al. (2011), coastal Cactus Wrens are confined to extensive stands of mature prickly-pear (Opuntia spp.) or cholla (Cylindropuntia spp.) cactus in cismontane southern California and adjacent Baja California, Mexico, occur mainly below 600 m elevation, are extremely sedentary, and are now largely isolated from desert populations. The San Diego Cactus Wren (Campylorhynchos brunneicapillus sandiegensis) is considered a California bird species of special concern (Unitt 2008), affording it some measure of protection under the California Environmental Quality Act (CEQA). Although not all coastal
populations are attributable to *sandiegensis*, as discussed by Cooper et al. (2012), many land managers and regulatory agencies in the region nonetheless treat all coastal Cactus Wrens as having special status under CEQA. Today, the coastal Cactus Wren is essentially confined to sites dominated by mature, native coastal sage scrub near large tracts of open space; while the species may persist in small habitat patches within suburban development near these open spaces, it is highly prone to extirpation from such areas and unlikely to recolonize them quickly once extirpated (see Soulé et al. 1988 and Crooks et al. 2001; pers. obs.). Reflecting concern about the conservation of these populations, the coastal Cactus Wren has been proposed for listing under the Endangered Species Act (USFWS 1994) and has been identified as a focal species in local and regional conservation and management plans.

METHODS

Study Area

Ventura County is located in coastal southern California, just north and west of Los Angeles County. Development is concentrated in the southern half of the county; the rugged canyons and ridges of the San Rafael Mountains dominate the northern portion. The Santa Monica Mountains, a range of coastal hills rarely exceeding an elevation of 900 m, enter the county from the southeast, terminating at the Oxnard Plain near Point Mugu. The Santa Clara River bisects the county from east to west and is separated from the southern portion of the county by several ranges of hills, including the Santa Susana Mountains. Agriculture is still a major land use in the county; row crops occupy large areas of the Santa Clara River valley and Oxnard Plain in the south, while orchards (especially avocado and citrus) cover the low hills across the middle of the county.

We searched for Cactus Wren habitat by using Google Earth to locate suitable vegetation, identifiable from the distinct signature of large cactus patches in recent (>2005) aerial photographs (i.e., pale green, roughly circular areas within coastal sage scrub and chaparral, typically on south-facing slopes). We reviewed the literature to establish where Cactus Wrens had been observed or collected in Ventura County in the past, drawing from more recent sources such as www.ebird.org, as well as records of nests and specimens from museums (Table 1). Ultimately, we divided the study area into six subregions and selected 28 moderately to highly experienced birders to serve as observers (Table 1). We encouraged volunteers to form their own survey groups and coordinate visits, and we sent each volunteer aerial photographs (as JPEG files) of potentially suitable cactus patches, with instructions to print out these maps and check for access points prior to surveys.

Survey Methods

Survey methods followed Cooper et al. (2012), which were adapted from those developed for Cactus Wren surveys in the Nature Reserve of Orange County (Mitrovich and Hamilton 2007); however, we quickly realized that the cactus scrub in Ventura County presented unique challenges not anticipated from past experience. In some areas, such as north of the Conejo Grade
into the Hill Canyon area, cactus was simply too extensive to be viewed or mapped from the ground, so here our first priority became having volunteers cover enough ground on foot or bicycle to intersect a wren territory (as suggested by a calling bird). By contrast, in other areas such as near Moorpark, wren habitat was highly fragmented and sometimes impossible to access, often hidden within gated residential areas where access was difficult to obtain. Ultimately, the priority shifted mid-season from careful mapping of the boundaries of suitable cactus patches to simply searching for birds and nests throughout the study area, mapping patches only in the vicinity of detections of the species as we went. On both public and private properties we surveyed potential habitat from trails, roads, utility rights-of-way, and “neighborhood trails” used by dog-walkers.

We mapped large, contiguous areas of cactus scrub (“polygons”) only if they were found to hold either wrens or nests (of any age). We further divided polygons into multiple (occupied) “sites;” in general, each site represented a single wren territory, and a group of sites constituted a polygon (occasionally, a polygon had just a single site, particularly if it was small or isolated). Volunteers categorized each site on the basis of the extent and height of its cactus, and used colored pens to outline areas of cactus scrub directly on aerial photos. Volunteers also recorded up to four dominant shrub species within each site. We considered initial mapping to be “round one” of a minimum of three total visits to be made in April, May, and June, with visits spaced at least two weeks apart. All Cactus Wrens observed or heard, and all nests found during the first visit, were recorded directly on aerial photos and noted on data sheets; surveyors also recorded whether nests appeared

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<td>1906</td>
<td>WFVZ 64130/74537</td>
</tr>
</tbody>
</table>

*a SDNHM, San Diego Natural History Museum; USNM, U. S. National Museum of Natural History; UWBM, University of Washington Burke Museum; WFVZ, Western Foundation of Vertebrate Zoology.
to be old or fresh. In subsequent visits, surveyors mapped only the locations of birds and nests where they had not been detected on prior visits (see Cooper et al. 2012 for further discussion of methods).

We did not ask our volunteers to assess and map the extent of cactus in areas where nests or birds were not observed during initial mapping, but we encouraged participants to visit all accessible habitat in their subregions whenever possible during the survey, to ensure that any new territories established later in the spring were detected. We encouraged volunteers to conduct surveys with at least one other partner, and we recommended that all visits be done during the morning, although this was not always possible. However, we found wrens to be active throughout the day, foraging and calling frequently (pers. obs.). Broadcast recordings were not used during the survey, since a CDFG collecting permit would have been necessary for all volunteers; instead, volunteers relied on “pishing” and visual scans of cactus habitat. We encouraged volunteers to record incidental observations of the California Gnatcatcher (Polioptila californica), which shares habitat with the Cactus Wren in the region, as well as sightings of potential predators such as Cooper’s Hawk (Accipiter cooperii). We gave clear instructions for not disturbing gnatcatchers or wrens during observations.

In our population estimate, we considered “active territories” to be sites where we found at least one adult and at least one nest of any condition or age. “Probable territories” were sites where we found either an adult but no nest, or a fresh or recent nest but no adult. “Possible territories” were sites where we found only a nest that appeared either old or of unknown age. We based our estimate of the number of territories in areas to which we could not gain access on the apparent extent of cactus as observed in aerial imagery for each subarea and on the number of territories found in similar habitat elsewhere in the region.

RESULTS

2012 Survey

Including a handful of incidental sightings, we and our volunteers detected 69 active Cactus Wren territories (adult birds and nests), 35 probable territories with adults but no nests of any kind, 7 probable territories with freshly built nests but no adults, and 6 possible territories with no adults but with at least one nest that appeared to be old or of unknown age, for a total of 117 potential territories. Of these, we considered 111 as likely active in 2012, excluding the 6 sites with no birds and only old/unknown nests. In addition to these documented sites, we estimated an additional 55 potential territories elsewhere in the county on lands that were inaccessible to our surveys, either because of exclusion from private property or because of steep terrain (Table 2). This latter number should be seen as very preliminary; we did not attempt to map habitat within these inaccessible areas but only estimated a rough number based on our findings in apparently similar (in aerial photos) habitat in the area.

Figure 1 shows the locations of adult Cactus Wrens or their nests in Ventura County found during the survey (solid circles), locations of seemingly suitable habitat in which we found no birds despite multiple visits (open
circles), locations we failed to gain access to but that appeared suitable (question marks), and locations where birds were known historically but where we found no evidence of current occupation (×). For a variety of reasons (including private-property concerns), we intentionally do not show the exact locations of territories, or areas where we searched for additional birds, but these can be found in our original report to the California Department of Fish and Wildlife (Cooper and Hall 2012). From information provided by our volunteers as well as from incidental sightings forwarded to us, the entire population of the Cactus Wren in Ventura County appears to be restricted to a narrow band of mostly volcanic soils with strong coastal influence from the western edge of Simi Valley (near Tierra Rejada Rd.), southwest through the western edge of the city of Thousand Oaks, and southwest along the western flank of the Santa Monica Mountains to the coast near Point Mugu. The entire area does not exceed 240 km².

Cactus Wrens were found widely on both public and private lands. On the basis of available maps (COSCA 2008), of the 111 active territories, 44 were on public lands, and 22 were on lands whose ownership we could not determine but that were otherwise accessible, mainly near the campus of California State University Channel Islands. The largest concentration we confirmed on known private lands was in the Hill Canyon ranchland near the Conejo Grade north of state route 101 (west of Thousand Oaks/Newbury Park), which we had permission to survey; however, it is possible that other large concentrations exist, particularly at the southeastern edge of the Oxnard Plain and north of Thousand Oaks, where fairly extensive cactus scrub was visible on private ranchland but inaccessible to us.

On the basis of our survey, the largest aggregations of wren territories lie in three main areas. From north to south, they are

<table>
<thead>
<tr>
<th>Region and subregion</th>
<th>Nearest cities</th>
<th>Documented</th>
<th>Estimated (additional)</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Santa Clara River valley</td>
<td>Santa Paula</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Upper</td>
<td>Fillmore</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Moorpark</td>
<td>Moorpark, Simi Valley</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>&quot;Moorpark Grasslands&quot; (north of state route 118)</td>
<td>Moorpark, Simi Valley</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Tierra Rejada/Las Posas Hills (south of state route 118)</td>
<td>Moorpark, Simi Valley</td>
<td>15</td>
<td>15</td>
<td>30</td>
</tr>
<tr>
<td>Thousand Oaks</td>
<td>Thousand Oaks</td>
<td>26</td>
<td>10</td>
<td>36</td>
</tr>
<tr>
<td>Mountclef Ridge/Wildwood Park</td>
<td>Newbury Park, Camarillo</td>
<td>40</td>
<td>10</td>
<td>50</td>
</tr>
<tr>
<td>Hill Canyon/Camarillo Springs (north of S.R. 101)</td>
<td>Camarillo</td>
<td>30</td>
<td>20</td>
<td>50</td>
</tr>
<tr>
<td>Oxnard Plain (including Point Mugu)</td>
<td></td>
<td>111</td>
<td>55</td>
<td>166</td>
</tr>
<tr>
<td>CSU Channel Islands and vicinity (south of state 101)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2  Active Cactus Wren Territories in Ventura County, 2012
Mountclef Ridge/Wildwood Park on the northwestern edge of Thousand Oaks,
The Hill Canyon area along the Conejo Grade west of Thousand Oaks/Newbury Park, and
Near California State University Channel Islands at the edge of the Oxnard Plain southeast of Camarillo.

Countywide, all active territories were found within 5 km of these three main areas, with the exception of a small number of pairs in the eastern
Tierra Rejada valley area at the border of Simi Valley and Moorpark and a single pair just north of Point Mugu. We should note that even these “outliers” were within 5 km of other occupied territories; they were just more distant from the three main concentrations. Additional surveys on private property between known territories (especially at the eastern edge of the Oxnard Plain and in the Moorpark area) may show that no pair is more than about 2 km from any other pair in the county.

Although a majority of territories were in extensive blocks of open space, such as in the Hill Canyon area, numerous isolated subpopulations were in habitat surrounded by agriculture (especially on the southeastern Oxnard Plain) or in undeveloped patches within residential development (especially in Thousand Oaks and Moorpark). Several of these isolated subpopulations included fewer than five pairs, and at least one (at Monte Vista Nature Park in Moorpark) apparently consisted of a single pair in about 2 hectares of open space surrounded by residential development. However, even this site was within 1 km of other pairs just to the east, at Miller Park, also in Moorpark.

Past Distribution

We located historical records of wrens from an area wider than the current known range in Ventura County—perhaps twice its current extent, if one considers the amount of alluvial scrub and other suitable habitat in the pre-agricultural Santa Clara River valley. The distribution continued to contract through the late 1900s, when the last Santa Clara River valley subpopulation was last detected; birds occurred along the Santa Clara River valley until the early 1980s, apparently isolated from subpopulations elsewhere in the county. Paul Lehman (in litt. to D. Guthrie, 1988) wrote, “we used to get one or two every year on the Sespe Christmas (Bird) Count…in an isolated hillside patch of prickly pear just east of the town of Piru on the road to Lake Piru. It was last gotten in 1981–1982.” One hundred years prior, Evermann (1886:86–87, 185), writing about the “village of Santa Paula” described the area:

“Along the river are small, isolated groves of cottonwoods and willows, with here and there an occasional sycamore. Scattered irregularly over the valley in its narrow portion are clumps of live-oaks, which are still more numerous in the cañons and on the adjacent foothills. Further up the sides of the mountains are dense growths of chaparral. At many places in the valley are large patches of prickly pear (Opuntia tuna), where the Cactus Wren, Mockingbird, Roadrunner, etc., are most numerous.”

Evermann (ibid.) termed the Cactus Wren “a common summer resident where cacti are abundant” in Ventura County, but by the early 1900s, it was apparently already in decline in the Santa Clara River valley. Willett (1933:126) considered it “apparently much less plentiful in that section at present time, as land has been largely cleared for agricultural purposes.” Interestingly, Willett [ibid.: “S. B. Peyton (MS)”] mentioned “at least two pairs still nesting near Sespe,” and a 1922 specimen from “Sespe” (University of Washington Burke Museum specimen 27262, also attributable to Peyton) suggests that the area mentioned by Lehman decades later may have been the same long-occupied locale noted by early ornithologists. Unfortunately, this site no longer supports any large stands of cactus, apparently because of frequent fire (D. S. Cooper, pers. obs.).
We found no evidence (historical or recent) to suggest that Cactus Wrens ever occurred farther downstream along the Santa Clara River than Santa Paula (nor in the Ventura River drainage to the northwest). During our 2012 survey, the most promising area of habitat remaining along the Santa Clara River, cactus patches in Harmon Canyon north of Saticoy (a tributary of the Santa Clara River), were surveyed for the Cactus Wren on several days without success (D. Blankenship, CDFW, pers. comm.). Otherwise, so little cactus scrub habitat remains along the river and its tributaries that we could not locate a suitable area to include in the survey.

Another large area from which the Cactus Wren has been extirpated recently is the “Moorpark Grasslands,” a region of formerly cactus-rich coastal scrub and oak savanna at the southwestern edge of the Santa Susana Mountains between Moorpark and Simi Valley, just north of state route 118. Prior to devastating wildfires in the early 2000s that converted the scrub to annual grassland and eliminated essentially all mature cactus here, this area apparently supported a fairly large population of Cactus Wrens, with up to eight birds recorded by Mike San Miguel during surveys in November 2001 (www.ebird.org). In the western part of this area north of Moorpark, the birds occurred in Happy Camp Canyon at least through the late 1990s (www.ebird.org; D. Pereksta, Bureau of Ocean Energy Management, pers. comm.). Today, cactus patches in this area are small, isolated, and not robust (i.e., pads appear desiccated, and many patches are invaded with weeds).

Several early specimens and nest records refer to “Simi” or “Simi Valley.” Since this is such a large area, it is not possible to determine where the records might have originated. A population remains at the extreme western edge of Simi Valley, including the vicinity of Tierra Rejada Park and on the Reagan Foundation property (on opposite sides of Tierra Rejada Rd., C. Dellith, USFWS, pers. comm.; pers. obs.), and a small population of Cactus Wren was apparently resident southeast of here in the vicinity of Azure Hills Dr. on the south side of Simi Valley until about the year 2000, after which time birds were no longer seen (M. Campbell pers. comm.). Some robust cactus habitat remains here, including at least one patch strongly dominated by cholla, as well as in the Wood Ranch area to the west, although the latter has public access blocked by gated communities and could not be surveyed. However, this area is at the far eastern edge of the known range in the county, and in two visits to the Azure Hills Dr. area we found no birds and no nests in 2012, so the species is probably no longer present east of Madera Rd. in Simi Valley, which likely marks the current northeastern edge of its local range.

The southeastern edge of the range appears to lie just west of Newbury Park, but a single Cactus Wren was observed at Rancho Sierra Vista/Satwiwa, a National Park Service property within the western Santa Monica Mountains south of Newbury Park (Figure 1), in May of 1987 and 1988 (www.ebird.org, K. L. Garrett; J. Nash, in litt. to D. Guthrie, 1988). Whether it represented a vagrant, a pioneering individual, or the last remnant of a historical population is not known, but this record is as far east as we could find evidence of the species in the Santa Monica Mountains proper. The area still has patches of cactus scrub (pers. obs.), and it is possible that future visits will reveal a very small number of birds here.
Cactus Wren Habitat in Ventura County: Vegetation and Soils

Because vegetation data were not collected uniformly (volunteers varied in ability to identify plants and to assess percent cover), and because we recorded vegetation data only at sites that had either wrens or nests, we cannot analyze the Cactus Wren's habitat selection in Ventura County at this time. However, we can assess broad trends in breeding-habitat use that add to our understanding of the needs of this species. For example, at the 101 sites for which we have some vegetation data, prickly pear was present at all, and coast cholla was noted at 42. “Type I cactus scrub” (i.e., the category of tallest, most extensive cactus) was noted at 88 sites. As for other plant species, lemonadeberry (*Rhus integrifolia*) was at 85 sites, blue elderberry (*Sambucus mexicana*) at 68 sites. Shrub species most often cited as either the first or second most dominant species (after cacti) were California buckwheat (*Eriogonum fasciculatum*), California sagebrush (*Artemisia californica*), black sage (*Salvia mellifera*), and ashy-leaf buckwheat (*E. cinereum*). While just one of the active sites found during the survey was within view of the ocean (near Point Mugu), nearly all sites were within the zone of coastal breezes coming up the canyons of Calleguas Creek and Arroyo Simi, and most, but not all, were on slopes with southern exposures.

The rocky “Conejo Volcanics” soil type that is dominant within the distribution of the Cactus Wren in Ventura County deserves comment, as it likely contributes to the presence of cactus and, therefore, the Cactus Wren. This substrate occurs throughout the western Santa Monica Mountains from near Calabasas (Los Angeles Co.) south and west to Point Mugu and thence north-east to the Moorpark–Simi Valley area via Mountcief Ridge (which terminates just south of Simi Valley, near state route 23 and Olsen Rd.) (National Park Service 2007). Inland (east) and coastward (south) of this zone of volcanic soils, the soil type shifts to the sandstones and shales found widely in the Santa Susana Mountains and Simi Hills, or the elevation increases, and both the wren and extensive cactus are absent. Elsewhere, volcanic soil is replaced by fine alluvium in several “interior coastal” valleys in the area, including the Conejo Valley, which includes much of the flatter areas of Thousand Oaks and Newbury Park. While now intensively developed, these alluvial soils would have supported oak savanna or, locally, oak woodland unsuitable for the Cactus Wren. At a slightly greater elevation (most of the Cactus Wren territories located in 2012 were below 300 m), coastal sage scrub is replaced with chaparral, and cacti become rare. Therefore, the vegetation supporting the Cactus Wren in Ventura County appears to be dependent on both soil type and elevation, and perhaps numerous other interrelated factors, such as proximity to the coast and aspect of slope.

Historically, Cactus Wrens were found in two distinct habitat types in Ventura County. In addition to cactus-dominated scrub on south-facing slopes, they inhabited alluvial sage scrub, which they use heavily where it remains in neighboring Los Angeles County (Cooper et al. 2012) and southwestern San Bernardino County (e.g., Santa Ana River wash, pers. obs.). In Ventura County, this habitat occurred along the Santa Clara River, Arroyo Simi, and in Happy Camp Canyon as well, where relict occurrences persist. However, alluvial scrub is now largely gone from the county, at least
in areas near known Cactus Wren populations, so the species is largely dependent on a relatively narrow band of “upland” coastal scrub, underlain by Conejo Volcanics.

California Gnatcatcher

Though not a target of this survey, the California Gnatcatcher (designated as threatened by the USFWS) was detected incidentally by volunteers at 14 Cactus Wren sites, mostly in the eastern part of Mountclef Ridge near Moorpark Rd. Other observations came from near Tierra Rejada Rd. on the border of Simi Valley and Moorpark (C. Dellith, USFWS, pers. comm.), the eastern slope of the Conejo Grade west of Newbury Park, and from the vicinity of California State University Channel Islands. However, neither the species nor its preferred habitat (which often lacks cactus) was the focus of our study. On the basis of historical specimens and recent sightings (WFVZ, www.ebird.org), the distribution of the California Gnatcatcher in Ventura County appears to be virtually identical to what we now know is that of the Cactus Wren. Similarly, it is essentially absent from areas historically occupied by both species, such as the Santa Clara River valley.

DISCUSSION

Unlike that in many parts of coastal southern California (e.g., the Palos Verdes Peninsula in Los Angeles County), most of the open space in this portion of Ventura County is at least tenuously connected, even if across a busy road, to other open space. So, currently, ecological connectivity between subpopulations around Ventura County appears to be relatively good (though future development may change that). However, at a larger scale, the Ventura County population as a whole is very isolated, separated by a distance of roughly 45 km from the nearest population in Los Angeles County (at Big Tujunga Wash in the northeastern San Fernando Valley) and roughly 70 km from the nearest population with more than 10 pairs, located south along the coast on the Palos Verdes Peninsula. Little cactus scrub—almost none of it suitable for Cactus Wrens—is found in the intervening areas between the Ventura County populations and those in Los Angeles County.

As discussed by Cooper et al. (2012), prior to the 2009 census in Los Angeles County, the northern range of the coastal Cactus Wren was imperfectly known and therefore poorly represented in the published literature, often depicted as contiguous with populations in the Los Angeles Basin (Garrett and Dunn 1981). Although the population in Ventura County was likely contiguous with that in Los Angeles County along the upper Santa Clara River, this population was apparently itself isolated, both from others in Ventura County and from the nearest Los Angeles County population in the San Fernando Valley, cut off from both by the Santa Susana Mountains. In any event, the Santa Clara River population is now apparently extirpated, and so Ventura County wrens appear to be even more geographically isolated from interior birds than they were historically.

The question of how the Cactus Wren, largely a desert species, came to occur in coastal Ventura County involves several possible scenarios. While Atwood and Lerman (2007) did not detect vocal differences among coastal
populations of the species, Barr et al. (2013), in multiple genetic analyses, found that in the genes analyzed Ventura County birds were more similar to other northerly populations from across the Los Angeles Basin into southwestern San Bernardino County (including the Palos Verdes Peninsula on the coast) than they were to those in Orange County and San Diego County south. Further analysis of genetic substructures identified three distinct clusters within this northernmost population: birds in Ventura County, those in Diamond Bar/Chino Hills, and the remainder of the Los Angeles/San Bernardino County populations. Cactus Wrens could have spread coastward from the western Mojave Desert down the Santa Clara River into the Oxnard Plain, and then back northeast toward the Santa Monica Mountains and Simi Hills via the Calleguas Creek watershed, where they persist today. They could also have arrived from the San Fernando Valley, perhaps over Santa Susana Pass into Simi Valley, or along the northern base of the Santa Monica Mountains into the Conejo Valley. Or, wrens could have dispersed north along the coast from the Palos Verdes Peninsula along the southern face of the Santa Monica Mountains and northwest to Point Mugu, with extirpation over time eliminating them from the intervening areas.

Today, large areas of cactus-rich coastal scrub are limited in these intervening areas on the Ventura/Los Angeles County border (which are dominated by chaparral or are completely urbanized); however, cactus is found along the southern face of the Santa Monica Mountains, from Point Mugu east to near Arroyo Sequit just inside Los Angeles County. Although this cactus is relatively short in stature and becomes increasingly patchy east of Arroyo Sequit, it may still allow for occasional dispersal of wrens. However, despite regular coverage of this area by birders for decades (including Big Sycamore Canyon and Leo Carrillo State Park), the Cactus Wren has never been confirmed (e.g., by photograph or voice recording) along this stretch of coast (fide K. L. Garrett), nor east of here into Malibu (Cooper et al. 2012).

With a few exceptions, such as on the immediate coast east of Pt. Mugu where cactus, but not the Cactus Wren, is present, the wren’s distribution in Ventura County closely tracks the distribution of the largest patches of mature cactus within large, unfragmented blocks of open space. Although we did not compare the sizes of patches of cactus with and without wrens quantitatively, we encountered very few occupied sites in patches located in smaller areas of open space (<5 ha) that were entirely surrounded by development or that were farther than about 1 km from another active territory, a pattern similar to that seen elsewhere in the region (e.g., Cooper et al. 2012). However, we did note that patches of cactus in habitat fragments were often occupied by wrens if close enough to the main population clusters (e.g., in the Wildwood Park, Hill Canyon, and adjacent areas). Away from these areas, the Cactus Wren apparently reaches both a natural distributional limit, with tall cactus scrub becoming scarce at higher elevations and with greater distance from coastal breezes, as well as an anthropogenic limit implying that wrens are unable to persist in small fragments of habitat isolated by development. Where these two factors coincided, such as at isolated interior sites (as in the north Moorpark area), Cactus Wrens were predictably absent.

The Cactus Wren faces a variety of threats in Ventura County. Development, including wholesale clearing of cactus-rich scrub for agricultural,
residential, and commercial use, continues each year, even despite downturns in the economy. Aggressive clearing for fire control is also a potential threat; we noted occupied Cactus Wren habitat near several areas where all vegetation had been cleared (to dirt) along “fuel modification zones” around development and below power lines. In contrast to Los Angeles County and most of Orange County, in Ventura County agriculture is adjacent to many occupied Cactus Wren territories, and we observed numerous examples in Ventura County where a hillside might support robust, native cactus scrub and wrens on one side, and a hard line where an orchard began and extended across the remainder of the slope.

Even if cactus patches are maintained and preserved, the deleterious effects on the Cactus Wren of both isolation and proximity to the urban edge are likely to increase if development continues without providing corridors of open space with suitable habitat between these patches (Preston and Kamada 2012). Encouragingly, we noted several cases where birds were maintaining adjacent territories split by fairly busy roads (e.g., along Moorpark Road south of Tierra Rejada Rd.) or adjacent to yards and houses (as near Wildwood Canyon Park). But we also noted fairly large patches of cactus scrub that appeared to be too far from the main concentration of territories to support the wrens (as near Azure Hills Dr. on the southwestern edge of Simi Valley). Thus conservation of habitat patches would probably be most effective near existing large populations of birds, as south of Moorpark and to the north and west of Thousand Oaks.

Notably, we found that a single entity, the Conejo Open Space Conservation Authority (COSCA), manages nearly 40% of the known Cactus Wren territories in Ventura County, mainly near Thousand Oaks (44 active territories in 2012). This proportion would have been somewhat lower had we been able to access private lands, but it still is a remarkable number, and there is no other similar public entity with anything close to that degree of representation in the county. It is likely that a similar proportion of California Gnatcatcher territories also lie on COSCA lands.

Several potential improvements to our survey, and to future surveys, involve the management and training of volunteers. We recommend that similar volunteer-based projects not require volunteers to map cactus patches, but that such mapping be completed in advance where possible, as it proved beyond the ability of most of our volunteers (and so was never completed). And, we recommend that volunteers use a checklist of conspicuous indicator species of plants, rather than trying to identify the dominant scrub species and their relative cover, since plant identification was not a skill of many volunteers. This problem particularly affected sites lacking easy access and having to be observed from a long distance away, through binoculars. Thus the utility of the data on vegetation structure and composition is limited. Ultimately, we concluded that too much of the volunteers’ time was devoted to locating both promising habitat and determining access points (which could also have been done in advance), and this detracted from the total time spent actually surveying and mapping locations of birds and nests. Thus our plan of having each volunteer commit to three survey days stretched into many more days for several participants, since so much time was spent navigating various neighborhoods and open spaces. Finally, we would not recommend
that observers survey in groups, but rather in pairs, or even individually if
their skill level is sufficient; it became difficult to coordinate multiple persons’
schedules. These “lessons learned” could be incorporated into guidelines for
future surveys, particularly those relying heavily on volunteers.

As ours was the first attempt to map the range of the Cactus Wren in
Ventura County, the dearth of information on such variables as nesting suc-
cess or dispersal should not detract from the value of a baseline distributional
map, which will allow for future calculations of population fluctuation. Our
finding that around 40% of the known territories are reasonably secure on
protected open space (mainly COSCA lands), and agencies charged with rec-
ommending and enforcing mitigation for development being more aware of
the wren’s conservation needs than they were just a decade ago, should help
conserv this important population. However, there is no legal prohibition
against a landowner’s removing habitat suitable for the Cactus Wren (or any
protected species) on his or her private land in Ventura County, and cactus
scrub continues to be lost away from parkland, potentially affecting more
than half the known territories. So, while a Ventura County population of
the Cactus Wren could persist for many years, its boundaries could continue
to contract as pockets of habitat and their birds are lost in this piecemeal
fashion. How small an isolated population can become and remain viable
remains an open question; that in Big Tujunga Wash in Los Angeles County
was down to just seven pairs in 2009, and that in the Baldwin Hills, never
more than around 5–10 pairs, vanished, apparently permanently, by the
mid-1990s (Cooper et al. 2012).

Fire presents another, probably more immediate threat; Preston and
Kamada (2012) documented declines of >80% in reserves in south Orange
County after major wildfires in the past 20 years. On the morning of 2
May 2013 (after the end of our survey), the devastating Springs Fire burned
more than 9700 hectares at the far southwestern edge of the Santa Monica
Mountains, including most of the Cactus Wren habitat south of state route
101 (http://cdfdata.fire.ca.gov/incidents/incidents_details_info?incident_
id=780). An estimated 24 territories were affected, or 22% of the known
population in Ventura County (per K. Miner, CDFW). We hope to investigate
the actual effect of this fire and to assess the Cactus Wren’s recovery within
the area burned.

ACKNOWLEDGMENTS

We thank Dan Blankenship, Mary Ann Campbell, Bonnie Clarfield-Bylin, Linda
Dye, Linda Easter, Adele Fergusson, Kitty Frallic, Alexis Frangis, Jennifer Gold,
Carolyn Greene, Howard Higley, Linda Easter, Mark Holmgren, Jim Jennings, Dexter
Kelly, Lindsey Kufa-Christie, Carol and William Langford, Larry Marcus, Heather
Medvitz, David Pereksta, Allen Saute, Don Schroeder, Mike Sos, Eric Waian, Amy
Worrell, Jackie Worden, Michael Zarky, and Francesca Zern for their time spent
searching for Cactus Wrens. This project would not have been possible without their
help. Permission to search for birds on various properties was provided by Shelly
Austin and Kristin Foord of the Conejo Open Space Conservation Agency, the city
of Thousand Oaks, and Conejo Recreation and Parks District, by California State
University Channel Islands, and by Jody and Larry Neill, LeRoy Goldberg and Mike
Simmons, and other private landowners. Karen Miner and Dan Blankenship, of the
A POPULATION CENSUS OF THE CACTUS WREN IN VENTURA COUNTY

California Department of Fish and Wildlife, provided monetary and logistical support of the project, and the Western Foundation of Vertebrate Zoology provided logistical and personnel support. An early draft of the manuscript was greatly improved by perceptive comments from Lori Hargrove and Jonathan Atwood.

LITERATURE CITED


Accepted 26 September 2013
DOCUMENTATION BY SOUND SPECTROGRAM OF A CRYPTIC TAXON, VIREO G. GILVUS, IN BOULDER COUNTY, COLORADO

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ABSTRACT: During June and July 2011, I audio-recorded eight Warbling Vireos (Vireo gilvus) at widely scattered sites in eastern Boulder County, Colorado, immediately east of the steep foothills of the Rocky Mountains. All eight sang songs like those of the eastern subspecies, V. g. gilvus; immediately to the west, in the steep foothills of the Rocky Mountains, Warbling Vireos sing songs like those of the western subspecies, V. g. swainsonii. The results of these observations suggest both the presence of nominate gilvus farther west in Colorado than previously documented and a sharp demarcation between the breeding ranges of swainsonii and gilvus.

The polytypic Warbling Vireo (Vireo gilvus) is common across much of its extensive North American breeding range. Species limits are uncertain (AOU 1998), but the general consensus is that two groupings are represented: a monotypic eastern gilvus group and a polytypic western swainsonii group. The eastern and western populations—the Eastern Warbling-Vireo and Western Warbling-Vireo, respectively—are recognized by some authorities (e.g., Pyle 1997, Gardali and Ballard 2000) as subspecies groups, whereas others (e.g., Sibley and Monroe 1990, Phillips 1991) have treated them as separate species. Of particular interest is a recent study from Alberta (Lovell 2011) employing molecular, morphometric, and acoustic methods to test hypotheses about species limits within the warbling-vireo complex.

The Eastern and Western warbling-vireos are exemplary “cryptic taxa.” They are literally cryptic, drab and small, moving about slowly in dense foliage in treetops, where they are hard to study closely. Moreover, morphological differences between the two groups (summarized by Pyle 1997, Gardali and Ballard 2000) are relatively slight: Eastern Warbling-Vireos are proportionately larger-billed, larger overall, and brighter (less gray, more olive–yellow) than Western Warbling-Vireos. Unsurprisingly, the limits of the ranges of the Eastern and Western warbling-vireos have not been precisely established in the literature. According to the AOU (1998), Eastern Warbling-Vireos range west in the central Great Plains to eastern Nebraska, Kansas, and southeastern Colorado, whereas Western Warbling-Vireos occur east to southwestern South Dakota, central Wyoming, and western Nebraska.


The specimen record tells a similar story. The Denver Museum of Nature and Science (DMNS) houses 80 Colorado specimens of the Warbling Vireo (sensu lato), four of which have been identified at some point as
V. g. gilvus. Of those four, however, A. R. Phillips reassigned three to V. g. swainsonii. Thus only one of the 80 Colorado specimens in the DMNS collection is currently attributed to V. g. gilvus. It is certainly possible that additional Colorado specimens of V. g. gilvus are represented—but as yet undetected—in the DMNS collection. Greater resolution of the Warbling Vireo’s status in Colorado would be achieved by examining specimens in other collections as well.

Although weakly differentiated morphologically (see Lovell 2011), Eastern and Western warbling-vireos are well separated in other respects, including habitat (Fisher and Acorn 1998, Lovell 2011), genetics (Murray et al. 1994), molt schedule (Voelker and Rohwer 1998), and song (summarized by Gardali and Ballard 2000, Sibley 2000). Differences in song may be described as follows: (1) the song of the Western Warbling-Vireo is burrier or “less musical” overall than the relatively clear and “musical” song of the Eastern Warbling-Vireo; (2) the song of the Western Warbling-Vireo often has a break at the beginning, and the overall phrasing is choppier than that of the Eastern Warbling-Vireo; (3) the lowest-frequency phrases in the Western Warbling-Vireo’s song average slightly higher-pitched than the analogous phrases in the Eastern Warbling-Vireo’s song; and (4) the song of the Eastern Warbling-Vireo tends to end with a squeaky and relatively high-pitched note (“squirt!”), whereas the Western Warbling-Vireo’s song often ends on a buzzy and/or relatively low-pitched note. I have provided a tutorial comparing audio recordings and sound spectrograms of the songs of presumed Western and Eastern warbling-vireos in Boulder County, Colorado, at http://tinyurl.com/Floyd-Warbling-Vireos (Floyd 2010a).

It has been remarked by many writers (e.g., W. M. Tyler in Bent 1950) that warbling-vireos are as easy to hear as they are hard to see. Thus audio recordings of warbling-vireos might serve as a useful proxy for occurrence data based on photographic or specimen records. In particular, differences in song—if spectrographically diagnosable and verifiably correlated with geographic variation in morphology—could provide a means for better resolution of the range limits of the two groups. Additionally, spectrographic analysis of song in the contact zone, assuming a contact zone exists, could be useful for determining taxonomic limits within the warbling-vireo complex.

Boulder County, Colorado, provides an especially propitious venue for studying variation and contact between populations in the warbling-vireo complex. From west to east, the county drops an impressive 2700 m. The transition between “eastern” and “western” landscapes is abrupt and dramatic, with typical “eastern” and “western” bird communities occurring within a few kilometers of one another.

METHODS

Applying the method of convenience sampling (see McCormack and Hill 1997), I searched for and attempted to make audio recordings of presumed Eastern Warbling-Vireos in Boulder County. I made the recordings depicted in Figures 1 and 2 with a “flower pot mic” (see Evans 2005), and those depicted in Figures 3–9 with an Olympus VN-8100PC recorder (see Floyd 2012b). I analyzed the songs on the basis of sound spectrograms generated
RESULTS

Field Observations from and Sound Recordings Obtained in the Lowlands of Boulder County, Colorado

In June and July of 2011, I made the following observations in the lowlands of eastern Boulder County.

At Walden Ponds on the afternoon of 9 June 2011, I saw a warbling-vireo that, on the basis of visual characters, I tentatively identified as an Eastern Warbling-Vireo. Within a minute of the initial detection, the bird began to sing; its song sounded to me like that of the Eastern Warbling-Vireo. I returned to the site on the morning of 11 June 2011 and obtained audio recordings of two warbling-vireos, one of which sounded typical of the Eastern Warbling-Vireo.
Warbling-Vireo, the other atypical. Sound spectrograms of the apparently atypical songs show a mix of slightly aberrant (Figure 1a) and typical (Figure 1b) Eastern Warbling-Vireo song-types. M. O’Brien and N. Pieplow (pers. comm.) identified the songs as those of the Eastern Warbling-Vireo, despite my equivocation when I heard the bird in the field. Sound spectrograms of the other bird’s songs (Figures 2a, b) are typical of the Eastern Warbling-Vireo, consistent with my impressions from the field.

At White Rocks on the morning of 19 June 2011, I heard two warbling-vireos whose songs seemed a perfect match for the Eastern Warbling-Vireo. I returned to the site on the morning of 22 June and obtained an audio recording of what I assume was the first bird I had heard on 19 June (on both mornings, a bird was singing from the same perch). Sound spectrograms of this bird’s song (Figures 3a, b) are consistent with the song of the Eastern Warbling-Vireo. I did not obtain audio recordings of the other warbling-vireo I had heard there on 19 June.

Near Greenlee Preserve on the morning of 21 June 2011, I heard a warbling-vireo whose song sounded typical of the Eastern Warbling-Vireo. I briefly heard what I presumed to be the same bird on the morning of 23 June. I did not hear the bird again after that date, despite repeated visits to the site, and I did not obtain an audio recording of it.
At Pella Crossing on the morning of 25 June 2011, I heard and recorded two warbling-vireos. In the field, the song of the first bird sounded typical of the Eastern; I thought the second bird was an Eastern Warbling-Vireo, too, although I judged its song to be less typical than that of the first bird. Sound spectrograms of the first bird’s song (Figures 4a, b) are consistent with the song of the Eastern Warbling-Vireo. Sound spectrograms of the second bird’s songs reveal some that are typical of Eastern Warbling-Vireo (Figure 5a) as well as others that are less typical but probably within the eastern subspecies’ range of variation (Figure 5b).

Along South Boulder Creek on the morning of 26 June 2011, I recorded two warbling-vireos. My experiences with these two birds were analogous with my experiences the morning before at Pella Crossing. The first bird I heard along South Boulder Creek sounded typical of the Eastern Warbling-Vireo, and sound spectrograms of that bird’s songs (Figures 6a, b) are consistent with it. The second bird sounded more problematic in the field, but sound spectrograms of that bird’s songs reveal that my assessments in the field may have been affected by substantial noise from the nearby creek. Spectrographically, this bird’s songs are either typical of (Figure 7a) or only somewhat aberrant for (Figure 7b) the Eastern Warbling-Vireo.

Figure 3. Songs of a warbling-vireo recorded at 40.0465° N, 105.1446° W at White Rocks, near Boulder Creek, Boulder County, Colorado, 22 June 2011. Both songs are typical of the Eastern Warbling-Vireo. (a) Includes calls of a Red-winged Blackbird (whistled down-slip beginning at around 0.20 sec) and an Eastern Kingbird (Tyrannus tyrannus; buzzy notes at around 0.80 sec and 2.75 sec); (b) includes song of a Western Wood-Pewee (Contopus sordidulus), extending from around 0.35 to 0.85 sec.
Along Coal Creek on the morning of 2 July 2011, I recorded a warbling-vireo which sounded to me like an Eastern. Sound spectrograms of its songs (Figures 8a, b) confirm that they are consistent with the Eastern Warbling-Vireo.

The locations of these presumed Eastern Warbling-Vireos (ten birds heard, of which I obtained audio recordings of eight) are shown in Figure 10. Note that all ten were in riparian habitat just east of the steep foothills of the Rocky Mountains. Nine birds were along or within 500 m of creeks, and one was in wooded habitat near the edge of a lake. Four of the ten birds were along or near Boulder Creek; two were along or near South Boulder Creek; two were along or near St. Vrain Creek; and two were in the Coal Creek drainage (including the one at Greenlee Preserve). Thus I documented two or more apparent Eastern Warbling-Vireos within all four of the primary drainages of Boulder County.

Field Observations in the Mountains of Boulder and Teller Counties, Colorado

For comparative purposes, I recorded a presumed Western Warbling-Vireo in spruce–fir habitat at an elevation of 2750 m in mountainous Teller County on the morning of 28 June 2011. In the field, the bird sounded like
a Western Warbling-Vireo. Sound spectrograms of its songs (Figures 9a, b) confirm that they are consistent with that form.

On various occasions during June and July 2011, in Boulder County’s mountains and steep foothills I heard or saw warbling-vireos that I assumed were Western. Their songs were indistinguishable to my ears from those of the individual from Teller County (Figures 9a, b); if seen well enough, they looked like Western Warbling-Vireos (per Pyle 1997). In Boulder County, the boundary between the eastern lowlands (consisting of grasslands and broadleaf riparian woodland) and western foothills (consisting of pine, spruce, and fir forests) is abrupt and dramatic; see Figure 10. The Boulder County landscape thus differs from that described by Lovell (2011), who studied Eastern and Western warbling-vireos across a more gradual ecotone from aspen parkland (favored by the Eastern) to mixed conifer woodlands (preferred by the Western).

In late May and early June 2012 (i.e., nearly one year following the detections reported above), I audio-recorded several Western Warbling-Vireo songs in the mountains and foothills of western Boulder County (Floyd 2012a–c), as well as additional Eastern Warbling-Vireo songs in the lowlands.
just east of the Boulder County foothills (Floyd 2012a–c). These very anecdotal detections in 2012 further support an abrupt demarcation between the two subspecies’ ranges at the interface of the central Rocky Mountains and southern Great Plains.

**DISCUSSION**

My observations confirm the widespread occurrence in the lowlands of Boulder County, Colorado, of birds that sound like Eastern Warbling-Vireos. In the middle latitudes of the continental United States, the western limits of the range of the Eastern Warbling-Vireo have been characterized only imprecisely (e.g., Bailey and Niedrach 1965, AOU 1998); nevertheless, the prevailing published consensus has been that Eastern Warbling-Vireos, if present at all in Colorado, are limited to the southeastern part of the state (Bailey and Niedrach 1965; see Barrett 1998; cf. DMNS data). More recently, an emerging online “gray literature”—consisting, in the present case, of data submitted to eBird.org, xeno-canto.org, and groups.google.com/forum/#!forum/cobirds—has pointed to the occurrence of Eastern Warbling-Vireos across the eastern tier of Colorado counties and west spar-
Figure 7. Songs of a warbling-vireo recorded at 39.9784° N, 105.2224° W in the South Boulder Creek Management Area, near South Boulder Creek, Boulder County, Colorado, 26 June 2011. In both examples, excessive background noise (broadband “splattering,” heaviest at low frequencies) is the sound of South Boulder Creek; the bird was singing from a perch just above the creek. (a) Although obscured somewhat by creek noise, the song appears to be typical of an Eastern Warbling-Vireo. (b) The song may be atypically short for an Eastern Warbling-Vireo, but background noise may obscure the beginning of the bird’s song. In other respects, however, the song is typical of the Eastern Warbling-Vireo, consisting of sweet, continuous phrasing with a relatively low-pitched baseline and a high-pitched and ascending terminal note.

In any event, the occurrence of at least ten presumed Eastern Warbling-Vireos, eight of which I audio-recorded, is without precedent in the lowlands immediately east of the Rocky Mountains in northern Colorado. Their presence in Boulder County raises an ontological question: are they “really” Eastern Warbling-Vireos, or are they birds that merely sound like Eastern Warbling-Vireos? Either outcome would have bearing on our understanding of geographic variation and taxonomic limits in the warbling-vireo complex.

The typical songs of warbling-vireos from well within their described ranges are distinct. Thus an Eastern Warbling-Vireo in New Jersey sounds different from a Western Warbling-Vireo in Nevada. In regions of contact, however, one must be wary of two complications. First, because vireos are oscines and develop their songs in part through learning, a “good” Western Warbling-Vireo might learn the “wrong” song, i.e., that of an Eastern Warbling-Vireo singing nearby; conversely, an Eastern might sing the song of a Western. Second, there might be intermediate song types, just as one might expect
intermediate morphologies in zones of overlap; in this regard, it is worth noting that geographic variation in song phrases in the Solitary Vireo complex (*Vireo solitarius sensu lato*) appears to be clinal (James 1981). Unpublished field observations and playback experiments from Choteau, Teton County, Montana, suggest the local warbling-vireo population may be intermediate with regard to song type (D. A. Sibley, pers. comm.) In a zone of overlap zone in Alberta, however, Lovell (2011) detected no intermediate song types.

Regardless, the songs of warbling-vireos are complex and variable (Howes-Jones 1985). It might be expected that a variant or atypical song of an otherwise “normal” Western Warbling-Vireo approaches or overlaps that of the Eastern Warbling-Vireo, and vice versa.

Better understanding of the Eastern and Western warbling-vireos in or near the contact zone will require specimen-based studies. On the one hand, my study establishes the occurrence near the foothills of the Rocky Mountains of birds that sound like Eastern Warbling-Vireos. On the other, its results cannot be taken as proof that such birds “really” are Eastern Warbling-Vireos. Audio recordings alone are inadequate, in most instances, for establishing taxonomic limits in birds; evidence adduced only from audio recordings may appear persuasive, but such “proof” is based on circular reasoning. A recent and relevant case study involves the question of the taxonomic status of the “South Hills Crossbill” (*Loxia sinesciuris* Benkman), rejected as a full species by the AOU (2009) in part because audio recordings purported to refer to
the taxon were not convincingly matched to specimens, i.e., vouchers of verifiable identity.

In Boulder County and elsewhere in Colorado, high-quality digital photographs of audio-recorded birds might help to clarify the range limits of the Western and Eastern warbling-vireos. Specimens and mist-netted birds would be better, however, as the relatively slight morphological differences between these cryptic taxa are difficult to quantify from digital photographs. Moreover, specimens of audio-recorded birds would provide genetic data that digital photographs cannot; of particular value would be nuclear DNA for determining the extent of introgression, if any, in the contact zone. The recent monograph by Lovell (2011) affirms the importance of specimen-based research for acoustic studies aimed at resolving species limits within the warbling-vireo complex.

Figure 9. Songs of a warbling-vireo recorded at 38.9268° N, 105.1005° W in spruce–fir forest in Woodland Park, Teller County, Colorado, 28 June 2011. Both songs are typical of the Western Warbling-Vireo, differing in various ways from the songs of the Eastern Warbling-Vireo. In both examples, note the break after the first phrase in the song, followed by irregular phrases with a baseline frequency slightly higher pitched than that of the Eastern Warbling-Vireo; note further that both songs peter out at the end, ending on a low-pitched note, the opposite of the high-pitched and emphatic terminal note of the Eastern Warbling-Vireo. The effect on a human listener is of a burry tone quality and a “relaxed” quality to the phrasing; also, the absence of an emphatic terminal note (“squirt!”) is characteristic. (a) The song of a Dark-eyed Junco (Junco hyemalis) runs to about 0.75 sec; the sounds at about 2.35 and 2.65 sec are of a wooden screen door being shut. (b) The song of a Dark-eyed Junco runs to about 0.95 sec.
Another unresolved matter is the status in Boulder County prior to 2011 of birds that sound like Eastern Warbling-Vireos. My field notes indicate no such occurrences prior to 2011. Likewise, Boulder-based natural-sounds expert N. Pieplow (pers. comm.) is unaware of occurrences prior to 2011. The summer of 2011 brought numerous “Midwestern” breeders to Boulder County; Cassin’s Sparrows (Peucaea cassinii) were widespread, multiple Red-headed Woodpeckers (Melanerpes erythrocephalus) were reported, and, most notably, Eastern Phoebes (Sayornis phoebe) bred or were suspected of breeding at several locations (Such and Such 2012). Perhaps the occurrence in 2011 of presumed Eastern Warbling-Vireos was linked to the broader arrival of such “Midwestern” bird species in an unusual breeding season. However, Eastern Warbling-Vireos might have been present in previous summers but simply undetected as such.

An obvious next step is to continue to monitor the status of presumed Eastern Warbling-Vireos in Boulder County and elsewhere along the eastern foothills of the southern Rocky Mountains. Such monitoring would benefit from a two-pronged approach, involving both audio recording and capture. In this scenario, individual birds would first be recorded and then collected or captured for measurements, photos, and blood-sampling; next, sound
spectrograms would be matched to individuals that could be identified by plumage, measurements, and genes. Such a sampling design is essential for avoiding the trap of circular reasoning that an Eastern Warbling-Vireo song can come only from an Eastern Warbling-Vireo.

Such an approach will also permit determination of the extent of inter-breeding, if it exists, in the contact zone. That finding, in turn, would substantially advance our understanding of taxonomic limits within the warbling-vireo complex. It would also answer the question of whether song can reliably be used to identify warbling-vireos in field studies such as breeding bird atlases, point-count surveys, and the Breeding Bird Survey.

ACKNOWLEDGMENTS

I thank Jon L. Dunn, Kimball L. Garrett, Daniel D. Gibson, Scott F. Lovell, Van Remsen, David A. Sibley, and Philip Unitt for their helpful comments on an earlier draft of this paper, and I thank Michael O'Brien and Nathan Pieplow for help with analysis of the sound spectrograms. Jeff Stephenson, Zoology Collections Manager with the Department of Zoology at the Denver Museum of Nature and Science (DMNS), kindly granted me access to specimens of warbling-vireos in his care. I am especially grateful to Nathan Pieplow for creating Figures 1–9, and to Kei Sochi for creating Figure 10.

LITERATURE CITED


Accepted 17 July 2013
ABSTRACT: Great Egrets (Ardea alba) foraging in grassy uplands near Arcata, California, used multiple strategies, foraging solitarily or in groups and commensally or noncommensally, in any of the four possible combinations. Egrets foraging commensally with cattle apparently benefited from the association on eight of the 21 observed occasions. Solitary foragers tended to use microhabitats along ditches and fences and were generally less active, made fewer errors, and captured larger prey than did group and commensal foragers. But group foragers, commensal and noncommensal foragers combined, captured more prey. Tidal fluctuations, prey types, and habitat structures likely modified foraging behaviors. There was no clear difference in rate of food intake, handling time, or foraging success by foraging strategy: a higher rate of capture of small prey by egrets foraging in groups compensated for the lower rate of capture of larger prey by solitary birds.

The Great Egret (Ardea alba) is commonly associated with wetlands but also forages in uplands, occasionally commensally with grazing mammals (Caldwell 1956, Kushlan 1978b, Herring and Herring 2007) and in aggregations with others of its species (Kushlan 1978a, Wiggins 1991). In northern California’s Humboldt Bay, Great Egrets nest colonially on islands within the bay and often fly to the nearby mainland to feed (Ives 1972). Humboldt Bay was historically surrounded by freshwater marshes, but 95% of these were diked and drained for agriculture in the late 1800s and early 1900s (Long and Ralph 2001). These agricultural areas contain rich sources of food for foraging egrets (Schlorff 1978). Given that food is a limiting factor for predatory birds (Lack 1946) and that individuals may vary in their ability to exploit resources (Reid et al. 2003), different behaviors may return better results in different habitats (Kushlan 1972, 1976, Maccarone and Brzorad 2007). The Great Egret’s feeding behavior, aggression, and sociality may be expressed and interact differently in different habitats (Kushlan and Hancock 2005). Interspecific and intraspecific interactions may contribute to the Great Egret’s various feeding behaviors (Kushlan 1976).

The goal of my study was to compare the Great Egret’s behaviors and success when foraging in groups of various sizes and commensally or noncommensally in upland habitats. I aimed to identify functions of the Great Egret’s social system and how various habitats contribute to the species’ ecology.

METHODS

Study Area

My study took place in an area of ~2415 ha in the Arcata Bottoms (40.9° N, 124.1° W) north of Humboldt Bay, Humboldt Co., California, from 25 January to 27 March 2010. The upland landscape consists of pastures for dairy and beef cattle (Monroe 1973). The fields (n = 92) vary in size, shape,
and composition and are separated by roads, ditches, fences. They are vegetated with ryegrass (*Lolium perenne*), dandelion (*Taraxacum officinale*), plantain (*Plantago lanceolata*), velvet grass (*Holcus lanatus*), Kentucky bluegrass (*Poa pratensis*), meadow fescue (*Festuca arundinacea*), bentgrass (*Agrostis* spp.), clover (*Trifolium* spp.), and buttercup (*Ranunculus repens*) (Black et al. 2003). The Arcata area receives 1000–1300 mm of rainfall annually, mainly in winter and spring, and it may be foggy year round. Temperatures seldom dip below −1° C in winter and rarely climb above 21° C in summer. Tidal sloughs connected to Humboldt Bay wind through the study area and are used for irrigation. Consequently, some upland areas had characteristics of wetlands, being variably saturated and supporting mainly hydrophytic plants. As my study focused on the egret’s use of uplands, I excluded observations in wetlands.

**Foraging Behaviors and Interactions**

For this study I defined “foraging” as an egret standing, pacing, or probing with its head and bill down. “Feeding” was a successful strike, capture, and swallowing of prey. I defined foraging strategies as “solitary” (individual > 10 m from another Great Egret or other species) or “grouped” (individual ≤ 10 m from another Great Egret or other species). I categorized the size of a group as 2–15, 16–30, or ≥31 egrets and identified foraging as commensal or noncommensal. Egrets foraging both noncommensally and commensally could be feeding either solitarily or in groups. “Commensal foraging” consists of one species inadvertently displacing potential food items, making them available to an “attendant” species, thus aiding the attendant’s foraging while receiving no benefits and paying no cost (Wiens 1989). I identified commensal foraging of a Great Egret by its following, in the same direction, at a similar pace, and at a distance < 2 m, another animal such as a grazing cow.

After selecting a specific egret (“focal animal sampling,” Altmann 1974) for observation, I recorded its foraging behavior for 20 minutes or until it left the habitat. During these observations, through a spotting scope, I recorded the number of birds present, capture tactics (e.g., neck wobble, stand and wait, bill clapping, fast/slow walk; see Krebs 1974, Kushlan 1976, Kelly et al. 2003), prey type, prey size (in relation to the bill; Bayer 1985), steps, “errors” (drops, a strike at an item other than prey, or an unsuccessful strike), time spent handling prey, probes (moving debris with the bill without striking), strikes, and captures. I also noted interference with foraging such as conspecific aggression when another bird was < 5 m from a foraging egret or when another individual flew into a field with a solitary egret. “Aggression” consisted of an egret raising its feathers, chasing another bird, attempting kleptoparasitism, or engaging in combat, displacing the other bird. I excluded the time such a bird was in flight from the observation time. “Relocations” consisted of a bird moving from one location to another within the same field and continuing foraging. Before and after sampling I recorded the presence of other animals and sources of disturbance (e.g., loud noise, motor vehicles, or human interference) that noticeably altered an egret’s behavior.

To randomize sampling, I randomized observations by time of day, spread observations among the various agricultural habitats, observed foraging birds
at randomly selected sites within a habitat, and chose only one bird per site for focal observation, limited to birds close enough for me to identify their food, generally <100 m. I ensured that timed observations were independent and avoided repeated sampling of individuals and groups by moving to a different location for each observation. In cases where my arrival disturbed a foraging egret noticeably, I allowed it 1–20 minutes to adjust. If weather such as high wind, fog, heat distortion, or rain impaired the accuracy of an observation, I terminated it. For each 20-min observation, I recorded the time, tide (as flood or ebb and as low or high), wind speed, wind direction, percent cloud cover, and precipitation (http://www.noaa.gov/wx.html).

Diet

Possible prey items, which I assumed to be similar across the habitats sampled, included earthworms, the Northern Red-legged Frog (*Rana aurora*), Pacific Treefrog (*Pseudacris regilla*), and voles (*Microtus* spp.). I left an item unidentified if it was captured and ingested in <1 sec. From the size of an item, I estimated its biomass on the basis of Siegfried (1969), Ricklefs (1974), and Schlörrf (1978), and from these estimates I calculated intake rates (g/min), total energy content (kcal/g wet mass), and total energy content per individual (kcal). With reference to the average exposed culmen of 12 specimens of the Great Egret at Humboldt State University (109.1 mm, sexes combined), I categorized prey as small (≤1/4 bill length or ≤27 mm), medium (1/4–3/4 bill length or 28–81 mm), or large (>3/4 bill length or ≥82 mm).

Habitat Characteristics

The habitats surveyed varied in vegetation height, providing prey with a varying degree of cover. Adapting the method of Burger and Gochfeld (1993), I categorized the height of vegetation in comparison to the length of a foraging bird's tarsus (mean 148.2 mm, sexes combined; Herring et al. 2008) as short (<1/3 tarsal length or <50 mm), medium (1/3–2/3 tarsal length or 50–75 mm) and tall (≥2/3 tarsal length or >75 mm).

Statistical Analysis

I expressed the rates of strikes, errors, captures, pace, and probes per minute over a 20-min observation period and capture success as the number of successful captures divided by the total number of strikes. Using SAS, version 9.1.3, I calculated Pearson correlation coefficients between total time foraging, strike rates, probe rates, error rates, capture rates, and capture success to test correlation strengths. I defined highly correlated measures as those with the absolute value of $r > 0.40$ and $P < 0.0001$. To estimate the effect of foraging strategies (commensal or not, group or solitary, and interaction), I ran a multivariate analysis of covariance on correlated measures and analysis of covariance on uncorrelated measures, with observation time and flock size as covariables. I estimated least-squares means and standard errors (SE) for these comparisons and in all analyses set the threshold of significance at $\alpha = 0.01$. 

73
RESULTS

Foraging Behaviors and Success

I observed foraging egrets in 123 sessions over the 52 days of sampling, totaling 2069 min. The average length of an observation was 16.82 min (SE = 0.50), range 2–20 min. Groups contained up to 80 birds. I observed solitary noncommensal egrets (n = 50) for a total of 826.37 min (16.53 ± 0.89) and group-foraging noncommensal egrets (n = 44) for a total of 723.26 min (16.44 ± 0.89). For egrets foraging commensally these times were 143.00 min (15.89 ± 1.88) for solitary egrets (n = 9) and 376.31 min (18.82 ± 0.86) for group-foraging egrets (n = 20). Egrets foraged in association with solitary cows and herds of up to 84. Of the 29 instances of commensal foraging, 21 were with cattle, four were with gulls, and four were with Aleutian Cackling Geese (Branta hutchinsii leucopareia). Commensal foragers received apparent rewards on eight occasions of foraging with cattle (38%), one occasion with gulls (25%), and on three occasions with Aleutian Cackling Geese (75%).

During the 123 observations, I noted 18 instances of aggression between egrets foraging noncommensally (15%). Of these, 7 involved groups, 11, solitary birds. Among egrets foraging commensally, I noted conspecific aggression on only two occasions, once from a solitary bird and once in a flock of 12 birds. Conspecific aggression included chases on foot (16 instances), flight chases (one instance), and attempted kleptoparasitism (one instance). Flights and relocations were observed a total of 114 times. Egrets foraging in groups, whether they were foraging commensally (0.16 times per minute, ±0.09 SE) or noncommensally (0.16 ± 0.06), relocated more often than did solitary egrets (0.07 ± 0.13 and 0.06 ± 0.06, respectively). But the difference was not statistically significant.

Table 1 summarizes measures of foraging effort and success. Pearson correlations confirmed strong associations among strike rate, pace rate, error

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<thead>
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<th>Metric</th>
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<th>Commensal</th>
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<tr>
<td>n</td>
<td>50</td>
<td>44</td>
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<tr>
<td>Total time foraging (min)</td>
<td>48.0 ± 8.0</td>
<td>51.1 ± 8.5</td>
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<td>Strike rate (per min)</td>
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<td>5.30 ± 1.88</td>
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<td>Probe rate (per min)</td>
<td>0.01 ± 0.39</td>
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<td>Pace rate (per min)</td>
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<tr>
<td>Error rate (per min)</td>
<td>0.04 ± 0.11</td>
<td>0.28 ± 0.12</td>
</tr>
<tr>
<td>Capture rate (per min)</td>
<td>0.24 ± 1.68</td>
<td>5.02 ± 1.77</td>
</tr>
<tr>
<td>Relocation rate (per min)</td>
<td>0.06 ± 0.06</td>
<td>0.16 ± 0.06</td>
</tr>
<tr>
<td>Intake rate (g/min)</td>
<td>0.87 ± 0.12</td>
<td>0.55 ± 0.13</td>
</tr>
<tr>
<td>Handling time (sec)</td>
<td>22.3 ± 4.6</td>
<td>6.8 ± 4.9</td>
</tr>
<tr>
<td>Foraging success (%)</td>
<td>94 ± 2</td>
<td>96 ± 2</td>
</tr>
</tbody>
</table>

Values are least-square means ± standard error.
rate, and capture rate (all values >0.9). Correlations of these measures with relocation rate, handling time, prey-intake rates, capture success, and total time foraging were weaker to none. Wilks’ lambda (Λ) from multivariate analysis of covariance indicated no overall difference between commensal and noncommensal foraging (Λ = 0.97, F = 0.71, P = 0.62) and none between solitary and group foraging (Λ = 0.97, F = 0.63, P = 0.68). In addition, there was no interaction between whether or not foraging was commensal and whether or not it was in a group (Λ = 0.98, F = 0.37, P = 0.87). The covariates of flock size (Λ = 0.89, F = 2.83, P = 0.02) and observation time (Λ = 0.92, F = 2.02, P = 0.08) were not significant. Furthermore, there was no difference by strategy in rates of error (P = 0.27), strike (P = 0.22), probe (P = 0.22), or capture (P = 0.22). Neither was there any difference by strategy in relocation rate (F_{1,117} = 1.0, P = 0.32), capture success (F_{1,117} = 1.24, P = 0.30), or total time foraging (F_{1,117} = 0.06, P = 0.80). For egrets in flocks, flock size had no effect on capture success (F_{3,114} = 1.15, P = 0.14). Mean success by three categories of flock size was 95.5 ± 1.9% for 2–15 birds, 87.4 ± 3.4% for 16–30 birds, and 90.6 ± 5.3% for 31–84 birds.

The capture rate of grouped foragers was 10 to 20x the rate of solitary foragers, a significant difference (multivariate analysis of variance, P = 0.005). Yet the intake rate (g/min) differed by a factor of less than 2, and among noncommensal foragers the intake rate of solitary foragers was greater even though their capture rate was only 5% that of the grouped foragers. So the few voles caught by the solitary foragers more than made up for all the earthworms and frogs caught by the grouped foragers.

Diet

By number of prey items, the diet of solitary commensal foragers consisted 54% of invertebrates (mainly earthworms), 11% of frogs, 1.5% of voles, and 34% unidentified. The diet of Great Egrets foraging commensally in a group was 55% invertebrates, 7% frogs, 0% voles, and 38% unidentified. Of egrets foraging noncommensally, the diet of those in flocks was 61% invertebrates, 7% frogs, 0.1% voles, and 33% unidentified, while that of solitary foragers was 33% frogs, 25% earthworms, 4% voles, and 38% unidentified. The voles, up to 10 cm long and 28 g in weight, were rich sources of energy. I noted 13 captured by solitary foragers but only one by group foragers (Table 2). Both strategies combined, group foragers captured more total prey (F_{1,118} = 21.99, P < 0.001) (Table 2). Solitary and grouped foragers did not differ in mean time handling prey (P = 0.94) or mean intake rate (P = 0.76).

Habitat Characteristics

Usage of vegetation heights differed by foraging strategy (χ^2_6 = 19.48, P = 0.003). Solitary foragers used taller vegetation more frequently (40/50 instances or 80%) than did group foragers (20/44 instances or 45%). Solitary egrets feeding commensally were mainly in tall vegetation (7/9 instances or 78%), whereas groups feeding commensally used vegetation heights nearly evenly (50% short, 45% tall). The difference between commensal and noncommensal foragers in use of upland habitat by tide level was nearly

FORAGING INTERACTIONS OF THE GREAT EGRET IN UPLAND HABITATS
significant ($\chi^2 = 10.03$, $P = 0.018$). Commensal foragers used upland areas more often at low tide (total of 17/29 instances or 59%, grouped and solitary foragers combined), while noncommensal foragers tended to prefer high tide (total of 67/94 instances or 71%, grouped and solitary foragers combined). Over the study, foraging egrets were associated with characteristics of wetland habitat 22% of the time.

**DISCUSSION**

While foraging, Great Egrets often gathered into groups of various sizes, and they arrived and departed feeding sites more or less simultaneously. Krebs (1974) proposed that birds nesting colonially may follow one another to discover food sources. Birds may also be attracted to feeding areas by seeing another feeding (Poysa 1992). The egrets I studied likely exploited these strategies. Interactions such as competition and aggression that arise during foraging in a group likely make group foraging more costly (Goss-Custard and Durell 1987). Of the egrets I observed, group foragers did suffer a greater rate of striking errors, which were possibly the result of increased competition. But group foraging also enhances the mean rate of food intake (Beauchamp 1998) by decreasing the time each individual must devote to vigilance (Sullivan 1984), enabling herding of mobile prey (Swynnerton 1915), and allowing imitation of behaviors of other individuals.
(Krebs 1973, Morse 1978). Because of the large number of unidentified prey, I did not evaluate the data on energy intake. Therefore, my results may not reflect differences in how the birds managed their time or achieved energy balance. But I found no detectable differences in mean intake rate by foraging strategy, possibly because food was abundant in the habitats I surveyed. Beauchamp (1998) proposed that the rate of food intake increases when resources are more concentrated in space and that food dispersal may influence group size. Gawlik (2002) suggested that Great Egrets typically remain at a site until they deplete the prey. So the birds I observed likely switched tactics as needed to increase intake rates and success.

Solitary egrets foraging along fence rows and ditches defended their space more than did group foragers. Thus solitary foragers suffered costs from displacement and aggression. Prey are likely larger, more concentrated, or more available along fence rows and ditches than in the open fields in which groups foraged. As a result, egrets could defend these areas, precluding groups from forming. Attempts to capture large prey occasionally entailed the increased effort of capture in flight, by diving, by fast running, extended handling times, and long periods of stalking or waiting. On average, birds that were less active (i.e., solitary foragers) took prey larger than that taken by group and commensal foragers, possibly because of the lack of competition.

By displacing prey and disturbing the substrate, cattle made prey more available to egrets following them. Though published reports of Great Egrets foraging commensally with mammals are few (Dean and MacDonald 1981, Ruggiero and Eves 1998, Herring and Herring 2007), this behavior may increase foraging success (Kushlan 1978b), as it does for the Cattle Egret (Bubulcus ibis) (Heatwole 1965, Dinsmore 1973 and Grubb 1976). Burger and Gochfield (1982) found that in the Cattle Egret selectiveness for a mammal (“host”) and availability of prey are positively correlated; the egret forages in the way that maximizes efficiency. In my study I could not ascertain selectiveness for a host. The assumption that prey captured by commensal foragers was a direct “reward” of associating with other birds or cattle may not be fully justified. Rather, solitary egrets foraging noncommensally may have been trying to discourage the competition from another bird. In contrast, when feeding primarily with grazing cattle, a solitary egret would have no added competitive pressure and thus receive unrestricted benefit from cattle flushing prey.

Behavioral plasticity may have improved foraging success. The Great Egrets I studied often modified their behavior as they shifted among microhabitats differing in prey and vegetation height. Characteristics of a wetland and level of the tide contribute to plasticity of foraging (Erwin et al. 2006). Although the risk of predation may have influenced the egrets’ foraging behavior, that risk was presumably low across the study area. Despite different behaviors used to capture prey, the rate of success of all strategies was similar (Table 1). Two different strategies, solitary foraging that occasionally yielded a few large prey and grouped foraging that frequently yielded many small prey, gave similar returns, and the egrets had the behavioral plasticity to pursue either.

Great Egrets often behaved socially, competing, interacting aggressively or territorially, forming groups, and arriving and departing feeding sites at the
same general time. Sexual, age, genetic, and environmental differences may all contribute to the Great Egret’s diversity of behaviors (Lott 1984). Since I had no data on the egrets’ sexes, ages, or genetics, these factors likely biased the results. Lott (1984) proposed several possible sources of such variation: experience (including learning during a critical period), imitation, culture, classical conditioning, demography, niche breadth, environmental stability, social system, psychological complexity, and hormones. The observed behavioral variation could be caused by frequency-dependent selection or selection for an adaptive plasticity that permits individuals to adjust their behavior in response to abiotic variables (Lott 1984). Given my results, I hypothesize that the Great Egret’s social system varies intraspecifically. Such variation could be adaptive (Eisenberg 1966), relevant to attempt to manage or predict changes in a species’ social system.

ACKNOWLEDGMENTS

I respectfully acknowledge Susan E. Spruill, Jon Runge, David Kitchen, and Jeff M. Black for statistical advice and their overall assistance. I thank Garth Herring and Dale E. Gawlik for sharing their morphometric data. I thank Jim Gammonley and John P. Kelly for their helpful editorial comments.

LITERATURE CITED


FORAGING INTERACTIONS OF THE GREAT EGRET IN UPLAND HABITATS


Accepted 27 August 2013

Great Egret

Sketch by Narca Moore-Craig
BOOK REVIEWS


The Sierra Nevada’s varied habitats of forest, chaparral, and alpine meadows, combined with its splendid mountainous scenery, have made this range a favored destination for tourists and bird watchers. For over a century, professional ornithologists and amateur field naturalists have studied the rich avifauna of this region, but until now a comprehensive guide to the full expanse of the Sierra Nevada did not exist. In 1977, David Gaines wrote the Birds of the Yosemite Sierra: A Distributional Survey, which covered both the western and eastern slopes of the Sierra Nevada but was limited to the area around Yosemite—it was updated in 1988 as Birds of Yosemite and the East Slope. Published in 1985, Discovering Sierra Birds, by Edward Beedy and Stephen Granholm, covered the western slope only and focused on Yosemite, Kings Canyon, and Sequoia national parks. The need for a book covering the entire Sierra Nevada, with additional information on natural history, population status, and conservation, was expressed by the late Steve Medley, former president of the Yosemite Association, in 1998. And now, after 15 years of devoted labor, the Birds of the Sierra Nevada: Their Natural History, Status, and Distribution has been completed. It includes many passages from Discovering Sierra Birds, but with so much additional information and entirely new illustrations, it is much more than just an update.

The physical boundaries of the Sierra Nevada are somewhat ambiguous as steep mountains transition to rolling foothills and foothills gradually flatten to plains. The authors’ approach to this issue was to include all the ecological communities directly influenced by the Sierras and to use unambiguous boundaries, such as highways and elevation contours, when feasible. Using this system, the authors recognized 442 species that have been documented within the region at least once. Of these, they considered 276 species sufficiently common to warrant full accounts in the main section of the book, and covered the status and occurrence of the remaining 166 rare species briefly in an appendix. In comparison, Discovering Sierra Birds has accounts for 191 species and a list of 103 rare species.

Several well-written introductory chapters precede the main species accounts and are worth reading to gain a fuller appreciation of the Sierra’s biotic diversity and status. The chapter on Ecological Zones and Bird Habitats describes seven distinct zones, with major habitat types defined within each zone; the authors then use these habitat types and zones within each species account to describe distributional patterns. Seven “special habitats,” such as riparian forest, are also characterized and their importance to birds described. Overall, these zones accurately portray the Sierra landscape. However, in the section on Mountain Chaparral, there is no mention of chaparral in mesic areas, which is an important habitat type in the southern Sierra but apparently not present in the north (Ryan Burnett pers. comm.). This habitat is frequently composed of cherry, willow, and whitethorn and may constitute a dense shrub layer in the understory of coniferous forest or in north-facing openings. This habitat provides important nesting habitat not only for several shrub-dwelling species, such as the Dusky Flycatcher, Fox Sparrow, and MacGillivray’s, Yellow, and Wilson’s warblers, it is also the habitat in which these species appear to reach their highest densities.

The chapter Recent Trends in Bird Populations and Ranges is a nice addition that provides analyses of data from Breeding Bird Surveys (BBS) and Christmas Bird
Counts (CBC). A few surprising results stood out, such as positive population trends for the Dusky Flycatcher and Warbling Vireo and negative trends for the Mountain Chickadee, Purple Finch, and Cassin’s Finch. While the analyses are rather cursory, they provide readers with a long-term historical perspective and a better understanding of population trends. The sections on Range Expansions and Contractions also rely on BBS and CBC data but were seemingly supplemented by anecdotal observations. In the future, observations from eBird should play a larger role in documenting changes in bird distribution. The next chapter asks the reader several Unanswered Questions about the range and status of 18 species, which will hopefully motivate amateur and professional ornithologists to seek out these species and to enter their sightings into eBird, to publish their findings in peer-reviewed journals, or to post them to an Internet site dedicated to the birds of the Sierra Nevada. The final introductory chapter addresses Bird Conservation in the Sierra by reviewing historical human activities like market hunting and mining as well as contemporary issues such as fire suppression, dams, pollution, housing development, and climate change.

The bulk of this book consists of Family and Species Accounts. The family accounts precede the species accounts for each family and within a few paragraphs provide the reader with the distinctive features of the family’s anatomy and behavior. The species accounts contain sections on the Origin of Names, Natural History, Status and Distribution on the West Side and East Side, and Trends and Conservation Status. I found the Origin of Names section particularly enlightening, as it provides a historical context for some of the lesser-known people who have had birds named after them, such as Robert Williamson who was so honored with a beautiful sapsucker. A military engineer and Civil War veteran, Robert Williamson just happened to be a leader on a survey party to Oregon when the first male of this species was collected. I also enjoyed learning the English translations of the scientific names from the various contemporary and antiquated European languages, fascinating details that have certainly improved my memory of many of these birds’ scientific names.

The Natural History section is full of interesting anecdotes, many of which are from the authors’ collective personal experiences in the Sierra with others supplemented from the scientific literature. This section includes a wealth of information on behavior, vocalizations, foraging, habitat selection, courtship, nesting, and seasonal patterns. One of the more intriguing behaviors I learned about is the communal food sharing by the Cedar Waxwing and Mountain Chickadee. The only detractor in this section is some inconsistency in the amount of material presented for different taxa. For example, all the woodpecker accounts have extensive details about each species’ life history, yet for some other species such as swifts information is scant. Regrettably, the spectacular courtship fall of the White-throated Swift is not even mentioned. The Status and Distribution section provides general information about elevational limits and the ecological zones within which the species is expected to occur. This section is further refined by dividing the Sierra Nevada along its crest into the west and east sides. Because of the ecological differences between the two sides, this distinction is critical, as birds often occur at different elevations and occupy different habitats on each slope. Within these subdivisions the authors provide more precise location details for localized species. The complex distribution patterns of several sparrows that have multiple subspecies within the region are well described. For instance, the thorough treatment of the Sage Sparrow’s subspecies was rather prescient considering its subsequent split into the Sagebrush and Bell’s sparrows. For a few other species, as discussed in the introductory section on Unanswered Questions, the exact range limits are still being determined. For the two subspecies of the White-breasted Nuthatch that occur in the Sierra Nevada, the authors considered the ranges and habitats to be “non-overlapping,” but since both subspecies occur in the vicinity of Shaver Lake where I live, perhaps it would be better if their ranges were described as mostly non-overlapping. I was also curious that there was no mention of upslope dispersal
of the House Wren; in the Sierra, this species seems to be uncommon at mid to high elevations during May and June but then becomes abundant during July and August.

For most species with significant positive or negative population trends, or for species listed by federal or state agencies as endangered, threatened, or of concern, a Trends and Conservation section details the species’ changing population status and provides information about the perceived threats or enhancements that may be influencing this change. In general, I believe this section will prove valuable as another resource to land managers in the Sierra, as it helps to elucidate many current conservation issues and covers species in addition to those in California Bird Species of Special Concern (W. D. Shuford and T. Gardali, 2008, WFO Studies of Western Birds 1). However, I was a bit dissatisfied that no attempt was made to quantify the magnitude of the population changes from the Breeding Bird Survey or Christmas Bird Count data. In addition, this section was absent from some accounts that probably should have contained it. For example, although the chapter Recent Trends reports that populations of the Mountain Chickadee, Purple Finch, and Cassin’s Finch are declining, there is no mention of these declines in the accounts. I also question a few of the conclusions in this section, such as why the recovery of the Bald Eagle in the Sierra was considered limited and whether this species actually nested historically throughout the Sierra. In the Natural History section it states that Bald Eagles “require sizeable bodies of water,” but where did large bodies of water occur in the Sierra before reservoirs? Prior to the dam-every-river era we live in now, there were only a few large bodies of water in the Sierra that could have sustained Bald Eagles. Historically, most natural lakes in the Sierra Nevada were relatively small and at high elevations. Typically these lakes have sparse or no forest surrounding them, are frozen during spring when eagles start nesting, and had no fish. Only Lake Tahoe and Eagle Lake come to mind as natural lakes that would have been large enough and had suitable nesting habitat. For the Osprey, though, whose requirement for nesting are similar to those of the Bald Eagle, the authors stated that the creation of reservoirs increased its population and range in the Sierra. The reason for a discrepancy between these two accounts is unclear.

The illustrations in Birds of the Sierra Nevada easily surpass those in most other books on the regional status and distribution of birds. Although Birds of the Sierra Nevada is not meant to be a guide to identification, the beautifully realistic illustrations do more than just capture the essence of the species; in most instances, field observations should easily match those in the book. For all species, an illustration of the adult is provided, with a second or third illustration included for significant plumage differences by sex or age. For species frequently seen in flight, such as raptors and swallows, another illustration depicts the bird in this pose. My favorite illustrations in the book are of the woodpeckers. In particular, the exquisite detail and accuracy of the Lewis’s and Acorn woodpeckers are so realistic that they appear to fly right off the page. There are, however, a few species with minor flaws of proportion, such as the small diameter of the eye on the Canyon Wren and the thin depth of the bill on the Northern Rough-winged Swallow. But overall the illustrations present a delightful visual complement to the text while also providing an instructional tool for readers not already familiar with some of the species covered.

For anyone with an interest in the birds of the Sierra Nevada, whether you live in these mountains, are studying birds anywhere in the range, or are just visiting for a few days, I strongly recommend this book, as it will not only help you find the birds you are looking for, it will give you a much fuller appreciation of the feathered mountaineers of the Sierra. Despite the few minor issues mentioned in this review, I found Birds of the Sierra Nevada to be a superb book on the birds in this region that should become a standard for other natural history guides for many years to come.

James R. Tietz
Point Blue Conservation Science
On 1 December 2013, I observed an unusual pipit in a flock of American Pipits (*Anthus rubescens*) at Bedwell Bayfront Park in Menlo Park, San Mateo County, California. The bird appeared structurally similar to the other pipits in the flock, but its plumage was much darker overall (see this issue’s back cover). The whitish to buff areas on the face, underparts, and tips of the median and greater wing coverts of a normally pigmented pipit were replaced by dark brown. The legs and bill were also darker than the corresponding bare parts of the nearby pipits. The bird did show what appeared to be normal pale edges on the tertials, but brief glimpses of the rectrices failed to reveal the expected white in the outer tail feathers. I observed this individual again at the same location on 8 December 2013 and obtained several photographs. Although I initially considered the possibility of a vagrant pipit species, the structural characteristics and other field marks identify the bird as an aberrantly colored American Pipit, the only species of pipit expected in the area. In particular, the essentially concolorous upperparts and underparts of this bird rule out even dark pipit species such as the Rock Pipit (*Anthus petrosus*), which still have a contrastingly lighter breast and belly.

Melanin pigments in feathers and other tissues are responsible for most of the black, gray, brown, buff, and chestnut colors that we perceive in birds (McGraw 2006). Melanins are complex and incompletely characterized organic polymers derived from the amino acid tyrosine. Melanins can be divided into eumelanin, responsible for blackish coloration, and phaeomelanin, responsible for reddish brown coloration. Hypermelanism (sometimes simply called melanism) has been defined as “abnormally high melanin concentrations in the plumage, skin, eyes, or all three areas” (Davis 2007). Although chemical analysis of this bird’s feathers would be required for the nature of the plumage aberration to be characterized definitively, the diffuse increase in both dark gray and brown in the feathers and bare parts suggests that concentrations of both eumelanin and phaeomelanin were elevated in this hypermelanistic pipit. The cause of such hypermelanism in is unclear, but recent molecular studies have shown that mutations in the melanocortin-1 receptor gene (MC1R) are responsible for the dark morphs of several species, including the Snow Goose (*Chen caerulescens*) and Parasitic Jaeger (*Stercorarius parasiticus*) (Mundy 2005). Although the increase in melanin concentration in hypermelanistic birds is abnormal by definition, the mechanism responsible for the increase may be the same as that for normal dark morphs.

In birds, hypermelanism appears to be substantially less common than the abnormal lack of pigment (variously called leucism, amelanism, or albinism) (Sage 1963, 1964, Gross 1965). I am not aware of any recent summary of hypermelanism in birds. In an older review on the subject involving birds in the British Isles, Sage (1964) noted instances of “melanism” in two species of wagtail, which are in the same family (Motacillidae) as the pipits. I am unaware of published records of hypermelanism in North American motacillids or of published cases of melanism in *Anthus* pipits in general (Gross 1965, Deane 1876, 1879, 1880).

The presence of a molt limit (two generations of feathers) in the greater coverts, with the inner three replaced, indicates that the bird was in its first year. Little is known about either the survival of aberrantly plumaged birds or fidelity to wintering sites in this species (Hendricks and Verbeek 2012). It will therefore be of some interest if this “marked” individual returns to this location the following winter.

I thank Jeff Davis, Peter Pyle, and Paul Hendricks for their comments on the images.
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Please join us for the 39th annual conference of Western Field Ornithologists in San Diego, California, 8–12 October 2014, at the Marriott Courtyard hotel at Liberty Station. This is a beautiful location on the San Diego Harbor, less than a mile from the San Diego airport.

This year the science sessions will feature a symposium on avifaunal change in western North America with papers to be published subsequently as a new volume of WFO’s monograph series Studies of Western Birds.

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There will be workshops on field identification of warblers (Jon Dunn and Kimball Garrett), vireos (Peter Pyle), sparrows (Homer Hansen), molt (Peter Pyle), specimen preparation (Phil Unitt), and bird sound identification (Nathan Pieplow). The Saturday evening banquet will feature a celebration of the rich 44-year history of WFO. Ed Harper and Nathan Pieplow will again offer their ever-popular sessions on bird identification by sight and sound. In addition to our regular reception Friday evening at the hotel, we are offering a pre-conference reception Wednesday evening at the magnificent San Diego Natural History Museum.

Registration for the conference will open in mid-June with the exact date to be announced via a future WFO News e-mail. If you are NOT currently on our electronic mailing list, please send a message to erpfromca@aol.com, include your full name and city and state of residence, and we’ll put you on.

We look forward to seeing you in San Diego!
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*Rare Birds of California*, the California Bird Records Committee’s opus devoted to documenting the birds rare to California, was originally published in 2007 by Western Field Ornithologists (edited by Robert A. Hamilton, Michael A. Patten, and Richard A. Erickson). The book is now out of print and no longer available from WFO on paper.

This format fulfills the 2009 commitment of the WFO Board to make the book available digitally as a benefit to our membership and to the ornithology community in general, and to continue to acknowledge the efforts of the CBRC and the hundreds of volunteers and donors who made the original volume possible. Funds from WFO’s Mike San Miguel publications fund were used to reformat the book and make it available in this format from both the Western Field Ornithologists website, westernfieldornithologists.org, and the CBRC’s website, californiabirds.org.

Western Field Ornithologists is very proud of this accomplishment and we hope you enjoy the result. We wish to acknowledge the contributions of the *Rare Birds of California*’s editors, the CBRC, and, more recently, the efforts of Tim Brittain, in bringing this book to you in a digital format.

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Published 31 March 2014

ISSN 0045-3897
The fall of 2013 brought the largest invasion of the Blue-footed Booby north of the Mexican border yet recorded. Over 100 individuals were counted around the Salton Sea, and at least that number were seen along the California coast, where very few had been recorded previously. The northernmost was found as far north as the north end of Vancouver Island in British Columbia.
hypermelanistic American Pipit (Anthus rubescens) at Menlo Park, California, 8 December 2013. Such excessive melanin in the plumage is an abnormality much less frequent than abnormal deficiency of melanin.