WESTERN BIRDS

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Western Specialty:
Lawrence's Goldfinch

Photo by © Bob Steele of Inyokern, California:
Lawrence's Goldfinch (*Carduelis lawrencei*)
Ventura County, California, 14 June 2008
Lawrence's Goldfinch feeds heavily on the seeds of native herbs, especially of the family Boraginaceae, that proliferate after wildfire. Thus the goldfinch has benefited, at least in the short term, from the surge in fires sweeping southern California since 2002.

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NOTES

Front cover photo by © Kurt A. Radamaker of Scottsdale, Arizona: Little Bunting (*Emberiza pusilla*), Rancho San José de Castro on the Vizcaíno Peninsula, Baja California Sur, 8 October 2008. See Radamaker and Powell, pp. 55–58, in this issue.

Back cover "Featured Photo" by © Jack C. Daynes of Poway, California: Black-chinned Sparrow (*Spizella atrogularis*), along Boulder Creek Road 5 miles west of Lake Cuyamaca, west slope of Cuyamaca Mountains, San Diego County, California.

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 include 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 North America west of the 100th meridian, including Alaska and Hawaii, northwestern Mexico, and the northeastern Pacific Ocean.

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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.

WESTERN BIRDS

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EGG-TURNING BEHAVIOR AND NEST ATTENTIVENESS OF THE ENDANGERED HAWAIIAN GOOSE ON KAUAI

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ABSTRACT: We used infrared video cameras to obtain the first quantitative measurements of the frequency and details of egg-turning behavior in wild Hawaiian Geese or Nene (*Branta sandvicensis*). We recorded a total of 240 hr of video, of which 53.8% was at night, over 7 days at two nests in Kilauea Point National Wildlife Refuge, Kauai, Hawaii. The mean of the two females' daytime egg-turning frequency (1.15 turns/hr) was similar to the value reported for other waterfowl and identical with that of the Canada Goose (*Branta canadensis*), from which the Nene is thought to be derived. One female turned her eggs less frequently at night, a pattern typical of waterfowl, whereas the other did not. The total number of bouts of egg turning per 24 hr averaged 25.7 for one female and 22.7 for the other. Waterfowl almost always turn their eggs by rotating them solely about the long axis, yet one of these Nene rotated one egg (occasionally two) 180° about the short axis during 21% of egg-turning bouts. We observed a combined total of 65 incubation recesses by the two females, of which 16.8% occurred at night. One of the birds took longer recesses and spent substantially more time away from the nest than the other. As on other Hawaiian islands, the Nene on Kauai tended to take recesses more frequently near dawn and dusk. The two females' nest attentiveness differed during the daytime but not when averaged over 24 hr.

The Hawaiian Goose or Nene (*Branta sandvicensis*), Hawaii's only extant endemic goose, is among the most threatened of waterfowl. It was declared endangered by the U.S. Fish and Wildlife Service in 1967. It currently inhabits the islands of Kauai, Maui, Hawaii, and Molokai but is most abundant on Kauai, the only island lacking the introduced Indian Mongoose (*Herpestes auropunctatus*), a significant predator on adults, goslings, and especially eggs of the Nene (Black and Banko 1994). Despite the Nene's being most numerous on Kauai, our knowledge of its biology derives largely from studies of wild populations on the islands of Hawaii and Maui (Banko 1988, Black et al. 1994, Banko et al. 1999). In this study on Kauai, we examine two aspects of incubation behavior—egg turning and nest attentiveness—in two wild Nene that were habituated to people and draw comparisons with previous studies of the Nene and of the Canada Goose (*Branta canadensis*), from which the Nene is thought to be derived (Banko et al. 1999). For all but a few species of birds, such as the megapodes, turning the eggs during incubation is essential for optimal hatching. To our knowledge, no information exists on the egg-turning behavior of the Nene.

On Hawaii and Maui, Nene inhabit grassy shrublands and sparsely vegetated lava flows (Banko et al. 1999). On Kauai, they inhabit mainly lowland pastures and other modified habitats. On Hawaii and Maui breeding productivity is low because diets are limited by insufficient protein and because introduced mammals destroy many nests (Banko et al. 1999). Productivity is higher on Kauai where nutritious food is readily available in managed grasslands and where predators are fewer (Black and Banko 1994). These differences in the islands' habitat might affect nest attentiveness if on the islands of Hawaii and Maui Nene have to take more frequent or longer incubation recesses to eat sufficient food. We evaluated this possibility by quantifying nest attentiveness and incubation recesses of the Nene on Kauai and comparing our data with those from Hawaii and Maui.

METHODS

We monitored the incubation behavior of two female Nene at Kilauea Point National Wildlife Refuge, Kilauea, Kauai, from 26 December 2007 through 3 January 2008. Both females and their mates were hatched in the wild at the refuge. Nene 1 was tending her first nest of the 2007–2008 breeding season; Nene 2 was tending her second nest. The nests were located approximately 100 m apart and within 10 m of refuge buildings frequented by refuge staff and volunteers. The females were thus habituated to people. Both nests were located on the ground beneath naupaka shrubs (*Scaevola sericea*) within about 2 m of grass lawns (seashore paspalum, *Paspalum vaginatum*), where the two Nene and others often foraged. Each nest contained three eggs.

We monitored incubation by placing an infrared charge-coupled device (CCD) video camera near each nest and continuously recording the video signal with a PVR-330 digital video recorder (Bolide Technology Group, San Dimas, CA) after passing the signal through a SuperCircuits electronic time/date stamp. We analyzed the video records with VirtualDub video software. From the birds' behavior and the day length at our study site, we established daytime as the interval from 06:30 to 18:30 Hawaiian-Aleutian Standard Time (HST), which was 6-8 min longer (depending upon the date) than the period from the onset of morning civil twilight until the end of evening civil twilight.

We typically initiated video recording in the morning between 10:17 and 12:23 HST (5 of 7 days) and consequently undersampled the early morning hours, which is when Nene typically take their first daytime nest recess (Banko et al. 1999). Still, our video records encompassed the transition from nighttime to daytime on 4 of 7 days for Nene 1 and on 3 days of 7 days for Nene 2.

Our video equipment was powered by motorcycle batteries that provided <24 hr of power. Therefore, we obtained 17.7 ± 4.7 (standard deviation) hr (range 7.7–22.9 hr) of continuous video per 24-hr day (n = 7) for Nene 1 and 16.0 ± 3.7 hr (range 11.3–22.7 hr) per 24-hr day (n = 7) for Nene 2. We obtained six rather than seven nighttime video recordings of Nene 1 because a battery failed. We recorded a total of 126.7 hr of video for Nene 1, of which 46.1% was daytime, and 113.0 hr for Nene 2 (46.3% daytime). Thus our records are slightly biased toward nighttime.

We quantified nest attentiveness (percent of time spent on the nest incubating), the frequency of incubation recesses (number of recesses per day), the duration of incubation recesses (minutes off nest per recess and total recess minutes per day), and egg-turning frequency (number of bouts of turning per hour of incubation). We present values as means ± standard deviation and compare means by using two-sample *t*-tests, assuming equal variances and after arcsine-transforming proportions.

RESULTS

Egg Turning

A Nene turns its eggs by standing up, moving backward to the nest's rim, reaching down and hooking the farthest egg with its bill, then drawing the egg backward, thereby rolling it (Figure 1). We videotaped a total of 132 egg-turning bouts by Nene 1, of which 69 (52%) were nighttime bouts, and

Figure 1. The female at nest 1 turning one of her three eggs about its short axis.

105 bouts by Nene 2, of which 43 (41%) were nighttime bouts. Both females avoided turning eggs during rain.

An egg's location within the nest cup relative to the other eggs changed during 7 of 92 bouts (8%, data for both nests combined), as one egg was drawn over another and thereby displaced it. During 42 of 92 bouts (46%) females intentionally manipulated all three eggs. During nine bouts only one egg was manipulated. Yet even when females manipulated only one or two eggs, the unmanipulated eggs usually moved at least slightly. Occasionally we caught glimpses of eggs moving slightly as a female stood to initiate turning. Settling back on the eggs after a turning bout was accompanied by rocking motions and obvious movements of the female's legs as she repositioned herself atop the clutch. It seems likely that these movements also moved the eggs slightly.

The number of minutes that elapsed between a female's return to the nest following an incubation recess and the first time she intentionally turned her eggs did not differ for the two females (t = 0.97, P = 0.34, df = 61) and averaged 26.6 ± 22.3 min (range 2.4–94.4 min). On one occasion, each female departed on a subsequent recess without first turning the eggs. Nene 1 intentionally turned her eggs as soon as she uncovered them after only 5 of 31 recesses (16%); for Nene 2 these numbers were 4 of 30 recesses (13%).

The frequencies of egg turning in daytime were 1.10 and 1.20 turns/hr for Nene 1 and 2, respectively. The nighttime frequency was 1.05 and 0.72 turns/hr for Nene 1 and 2, respectively. Nene 2 turned her eggs more often by day than by night (1.20 versus 0.72 turns/hr), whereas for Nene 1 daytime and nighttime turning frequencies were similar (1.10 versus 1.05 turns/hr). The total number of egg-turning bouts per 24-hr day was 25.7 for Nene 1 and 22.7 for Nene 2.

Incubation Recesses

Before leaving the nest on incubation recess, both females always covered their eggs with a mixture of downy feathers, leaves, and twigs. Nene 1 took significantly longer to cover her eggs than did Nene 2 (58.9 ± 14.3 sec versus 45.2 ± 13.1 sec; t = 3.91, $P < 0.01$, df = 62), but the difference is small and of questionable biological significance.

We observed a total of 31 incubation recesses by Nene 1, of which 9 were taken at night, and 34 recesses by Nene 2, of which 4 were taken at night. Nene 1 averaged 0.38 recesses per hour of daylight video versus 0.57 recesses per hour for Nene 2. Nighttime recesses averaged 0.13/hr for Nene 1 and 0.07/hr for Nene 2. The pooled number of recesses per daylight hour was 4.7 times the number per nighttime hour. Because our Nene took fewer recesses at night, mean nighttime attentiveness exceeded mean daytime attentiveness (97.0 ± 3.1% versus 82.8% ± 7.2%; t = 6.56, P = 0.001, df=16).

Our Nene took recesses throughout the day but tended to favor either dawn or dusk (Figure 2). Nene 2 took significantly more recesses during the first 4 hr after dawn than at other times of day, whereas Nene 1 took more recesses in the last 2 hr before dusk (Figure 3). Overall, the duration of recesses (Figure 2) was not correlated significantly with time of day in either female (Nene 1, r^2 = 0.03; Nene 2, r^2 = 0.00).

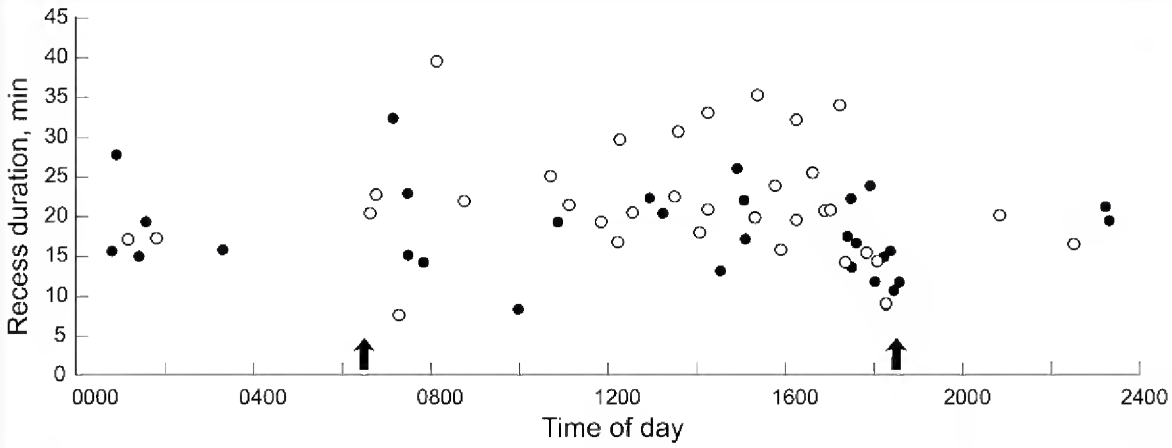

Figure 2. Recess duration versus time of day (HST) for Nene 1 (dots) and Nene 2 (circles) on the island of Kauai. Arrows denote the onset and end of civil twilight.

The duration of daytime recesses ranged from 7.7 to 39.5 min and was significantly longer for Nene 2 (22.4 ± 7.4 min) than for Nene 1 (17.7 ± 5.8 min; $t = 2.41$, $P = 0.02$, df = 50). For both females there was no significant difference between the length of nighttime and daytime recesses (Nene 1, $t = 0.03$, $P = 0.98$; Nene 2, $t = 1.98$, $P = 0.06$).

DISCUSSION

Some species of birds use their feet to turn their eggs (review by Deeming 2002), but in most species, the Nene included, only the bill is used to turn

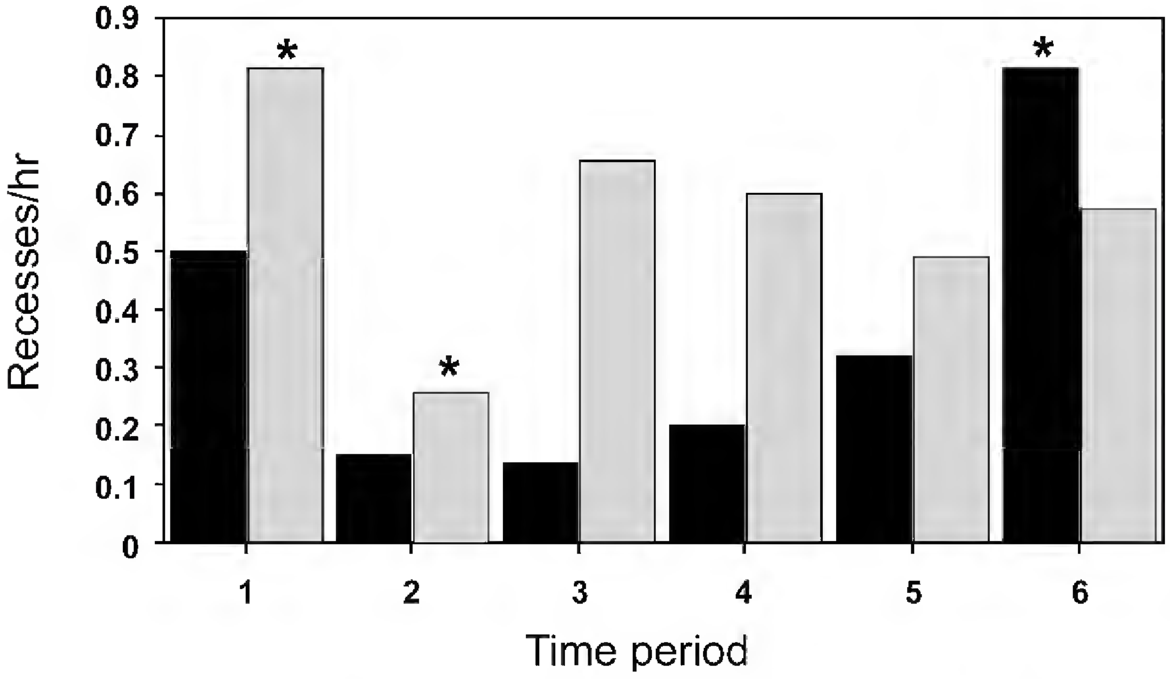

Figure 3. Number of recesses taken per hour of video for the six 2-hr intervals from dawn to dusk (1 = 06:30–08:30, 2 = 08:30–10:30, etc). Black bars denote Nene 1, shaded bars Nene 2. Asterisks denote values lying outside the 95% confidence interval of a given female's mean recess rate.

the eggs intentionally. Birds typically move their eggs by reaching beneath them with the bill and may turn them up to 180° or nudge them only slightly. Eggs may also move when a female changes position on the nest, but these egg movements are generally slight and seem unintentional. By observing natural markings on the eggs, we estimate that Nene typically rotated their eggs about their long axis by a maximum of 90° when turning them. In the Mallard (*Anas platyrhynchos*), the average angle of turn about the long axis when eggs are rolled is 61.2° (Caldwell and Cornwell 1975). Howey et al. (1984) stated that egg rotation in waterfowl is almost always about the long axis. Yet in 21% of bouts we observed, one egg (sometimes two) was rotated 180° about its short axis. Rotation about the short axis may be related to the Nene's relatively small clutch and/or large eggs.

Both females typically prodded the material covering the eggs with their bill a few times before settling on the still-covered eggs after returning to the nest following an incubation recess. The birds removed the material covering the eggs after settling on the nest by scraping backward with their feet while sitting on the nest. Uncovering generally required 2.5–5 min, during which time the females stood two to four times, turned roughly 90°, resettled on the nest, and resumed scraping the eggs'covering away with their feet. While uncovering the eggs, females often adjusted the nest material near their flanks with their bills. Because while being uncovered the eggs were not visible we could not determine if they moved.

The frequency of egg turning in daytime averaged 1.10 turns/hr for Nene 1 and 1.20 turns/hr for Nene 2, values similar to those reported for other waterfowl (Deeming 2002), including the Canada Goose (*Branta canadensis*) (1.2 turns/hr; Kossack 1947), from which the Nene is thought to have evolved (Banko et al. 1999). In three other species of waterfowl, the frequency of turning at night was about half that during the day (Howey et al. 1984). In the birds we observed, the nighttime egg-turning frequency was 95% of the daytime frequency in Nene 1 and 60% in Nene 2.

Incubation Recesses and Nest Attentiveness

Banko (1988) and Black et al. (1994) used time-lapse photography and/or video cameras to monitor incubation rhythms of Nene at Hawaii Volcanoes National Park on the island of Hawaii. In comparing our data with theirs and comparing data for the Nene with those for other geese, caution is warranted because of small sample sizes and differences between first and second nests of the Nene at both locations. At both sites, females spent substantially more total time per day off second nests than they did off first nests as a consequence of taking longer recesses. On Hawaii, they took recesses significantly more frequently (Table 1). On Kauai, the Nene on her first nest took more but shorter recesses than those on Hawaii (Table 1). On Kauai, more frequent but shorter recesses could result in higher average egg temperature and presumably result from foraging sites being nearer to nests on Kauai than at Hawaii Volcanoes National Park.

At Hawaii Volcanoes National Park, Nene took 85% of their incubation recesses during daylight hours, most near dawn or dusk (Black et al. 1994). The birds we observed on Kauai were similar in taking 83% of their incuba-

Table 1 Incubation Recesses of the Nene at Hawaii Volcanoes National Park, Island of Hawaii, and Kilauea Point National Wildlife Refuge, Kauai[a]

	Recess		
	Duration (min)	Number/day	Total time/day (min)
Kauai			
First nest[b]	17.7 ± 5.8	6.1	109.2
Second nest[b]	21.8 ± 7.2	8.2	173.8
Hawaii			
First nests (n = 4)[c]	28.8 ± 5.18	4.0 ± 0.71	112.1 ± 11.4
First nests (n = 5)[d]		3.4 ± 0.81	99.0 ± 25.9
Second nest (n = 1)[c]	18.9	10.7	199.7
Mean of all Nene[e]	24.8	4.4	119
Other geese[f]	19.4 ± 1.3	2.9 ± 2.0	68.5 ± 57.9
Canada Goose[g]	19.0 ± 5.2	3.3 ± 11.4	66.8 ± 40.3

[a] Values are mean ± standard deviation.

[b] Current study.

[c] Nests monitored 1979–1984 (Banko 1988).

[d] Nests monitored during 1991–1993 (Black et al. 1994).

[e] Mean of values above, adjusted for differences in sample size.

[f] Mean of seven species based on 17 studies (Afton and Paulus 1992).

[g] Mean of four races (Afton and Paulus 1992).

tion recesses during daylight but distributed their recesses more uniformly throughout the day (Figure 2). Nene resemble other geese in the duration and number of incubation recesses per day but spent longer away from the nest each day than the average goose, 119 min/day versus an average of 69 min/day for other geese (Table 1). Presumably, warm ambient temperatures in Hawaii permit Nene greater flexibility in their incubation recesses.

In 34 species of waterfowl daytime nest attentiveness ranges from 72.6 to 99.5% (mean 88.1 ± 1.0% standard error; Afton and Paulus 1992). In our Nene, daytime attentiveness averaged 83.3%, well within the range of other waterfowl. Nest attentiveness per 24-hr day averaged 89.9 ± 4.2% for both nests we observed.

Overall, the behavior of our Nene and that of those breeding on Hawaii differed little. Nene spend more time off the nest per day than other geese, which typically breed at higher latitudes (Table 1), but similarities between the Nene and other geese are more striking than the differences.

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LITERATURE CITED

Afton, A. D., and Paulus, S. L. 1992. Incubation and brood care, in Ecology and Management of Breeding Waterfowl (B. D. J. Batt, A. D. Afton, M. G. Anderson, C. D. Ankney, D. H. Johnson, J. A. Kadlec, and G. L. Krapu, eds.), pp. 62–108. Univ. Minn. Press, Minneapolis.

Banko, P. C. 1988. Breeding biology and conservation of the Nene, Hawaiian Goose (*Nesochen sandvicensis*). Ph.D. dissertation, Univ. of Washington, Seattle.

Banko, P. C., Black, J. M., and Banko, W. E. 1999. Hawaiian Goose (*Branta sandvicensis*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 434. Birds N. Am., Philadelphia.

Black, J. M., Prop, J., Hunter, J. M., Woog, F., Marshall, A. P., and Bowler, J. M. 1994. Foraging behavior and energetics of the Hawaiian Goose *Branta sandvicensis*. Wildfowl 45:65–109.

Black, J. M., and Banko, P. C. 1994. Is the Hawaiian Goose saved from extinction?, in Creative Conservation: Interactive Management of Wild and Captive Animals (P. J. S. Olney, G. M. Mace, G. M. and A. T. C. Feistner, eds.), pp. 394–410. Chapman and Hall, London.

Caldwell, P. J., and Cornwell, G. W. 1975. Incubation behavior and temperatures of the Mallard Duck. Auk 92:706–731.

Deeming, D. C. 2002. Patterns and significance of egg turning, in Avian Incubation Behaviour, Environment, and Evolution (D. C. Deeming, ed.), pp. 161–178. Oxford University Press, Oxford, England.

Howey, P., Board, R. G., Davis, D. H., and Kear, J. 1984. The microclimate of the nests of waterfowl. Ibis 126:16–32.

Kossack, C. W. 1947. Incubation temperatures of Canada Geese. J. Wildlife Mgmt. 11:119–26.

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A NEW AND CRYPTIC CALL TYPE OF THE RED CROSSBILL

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ABSTRACT: I describe a new call type (type 10) of the Red Crossbill (*Loxia curvirostra* complex) associated with Sitka Spruce (*Picea sitchensis*) in Humboldt County, California. As with other types of the crossbill's flight calls, the birds using this type of call apparently constitute a subset of the species that is cohesive socially, behaviorally, and morphologically. The patterns of frequency and amplitude modulation of flight calls of type 10 are similar to those of the second half of type 4 but change in frequency more slowly and are given at a higher pitch. The flight calls of type 10 vary among individuals and within an individual's repertoire, perhaps to a greater extent than in other call types. Most type 10 birds gave *toop* calls distinctly different from those of all other call types, but a few were similar to those of types 2 and 4. Likewise, the *chitter* calls of type 10 differed from those of the three call types (2, 3, and 4) found most commonly near type 10. The song repertoires of types 10 and 4 differed as well. Type 10 crossbills are intermediate in size between types 3 and 1. Large numbers of type 10 were resident in Sitka Spruce forests from 2001 to 2010, whereas the few type 4 birds recorded in spruce stands remained only briefly. Morphological and behavioral evidence indicates that type 10 is specialized for foraging on seeds in Sitka Spruce cones.

Groth (1993a) categorized the extensive variation within the Red Crossbill (*Loxia curvirostra*) in North America into eight call types on the basis of differences in vocalizations and morphology. Each call type differs in its flight, excitement ("*toop*"), and alarm calls, but each call type is best recognized from the flight call because it is the most commonly given and most diagnostic vocalization (Groth 1993a). Benkman (1999) subsequently identified a ninth call type. Moreover, evidence is increasing that at least some of these call types represent biological species (Groth 1993a,b, Smith and Benkman 2007, Benkman et al. 2009). Indeed, Benkman et al. (2009) have argued that call type 9 represents a biological species on the basis of high levels of reproductive isolation and morphological and genetic divergence from other sympatric call types.

Two or more types of Red Crossbills often nest in the same area and mate assortatively by flight-call type (Groth 1993b, Edelaar et al. 2004, Smith and Benkman 2007, Summers et al. 2007). In one investigation <1% of the pairs identified consisted of two flight-call types (Smith and Benkman 2007). Flight calls play a role in assortative mating. In trials of mate choice, Snowberg and Benkman (2007) found that females preferred males that had the same type of flight call as their own. Although there often were many type 3 birds nearby during the formation of pair bonds, in my study I detected no pairing of birds using different call types.

Red Crossbills usually learn the flight call of one parent, both parents, or a sibling, imitate it, and continue to use that type of flight call (Groth 1993a, Sewall 2008). Although individuals may, over time, modify the structure of their flight call to a slight extent, the new forms that they produce remain within the range of variation of that type of flight call (Sewall 2008, Keenan and Benkman 2008). Crossbills normally do not change the type of flight call that they use and do not use two or more types of flight calls. There is strong evidence that the type of flight call that an individual uses remains stable over its lifetime (Adkisson 1996, Sewall 2009).

Even though most crossbills eat seeds from the cones of two or more species of conifers, Benkman and colleagues (Benkman 1993, 1999, Benkman and Miller 1996, Parchman and Benkman 2002) found that in North America most call types have evolved a different bill morphology adapted to optimize efficiency of feeding on the cones of a specific "key" conifer species that provides a reliable food source when other conifers have few seeds. Benkman (1993) thought that the Sitka Spruce (*Picea sitchensis*) could represent a key conifer species and predicted that there may be a small form of the Red Crossbill adapted to Sitka Spruce. Here, I present my observations of the vocalizations, morphology, and behavior of Red Crossbills and their occurrence in and use of Sitka Spruce in northwestern California. I describe a new call type, type 10. It appears that Groth (1993a) recorded a few type 10 birds but lumped them with type 4. This new call type differs in morphology and habitat association from other Red Crossbills and may represent a form adapted to Sitka Spruce.

STUDY AREA AND METHODS

I studied Red Crossbills in Sitka Spruce forests in Humboldt and Del Norte counties, California, from 40.56° to 41.70° N and from 124.08° to 124.35° W. Sitka Spruce, the only species of spruce in the study area, occurs on the coastal slope from sea level to an elevation of 400 m in small pure stands fragmented by logging, small mixed stands where it is the dominant species, and as a rather minor component of mixed-conifer forests dominated by Coast Redwood (*Sequoia sempervirens*). As elsewhere, the number of trees is declining with logging and home building, and here it is being replaced with redwood planted in timber holdings. In late November 2001, Red Crossbills invaded Humboldt County, and I found crossbills with a distinctive flight call foraging almost exclusively on Sitka Spruce seed. Red Crossbills with these unusual vocalizations have remained in these Sitka Spruce forests through February 2010. Most of my observations were made at Patrick's Point and Big Lagoon state parks, Humboldt County. Additional observations were made at scattered sites in interior Humboldt County, along the coast of Humboldt County between Ferndale and Big Lagoon, within 8 km south from the mouth of the Klamath River in Del Norte County, along the northern coast of Del Norte County, along the Oregon coast as far north as Coos Bay, in central Oregon around Crater Lake, in northwestern Washington, and in southeastern Arizona. I observed crossbills through 10 × 40 binoculars and a 15–40 × 60 spotting scope from dawn through early afternoon on 1917 days from 1999 to 2009.

I recorded crossbill vocalizations with a Super unidirectional microphone and a Sony TCM-20DV tape recorder and used Cool Edit 2000 to produce and analyze audio spectrograms from the recordings. I recorded songs from numerous individuals that used type 10 calls and catalogued their song repertoire as well as a small sample of different songs from type 4 crossbills.

I also examined a recording of type 4 song on the Cornell Laboratory of Ornithology website at www.animalbehaviorarchive.org (Macaulay Library: catalog number 87926) and spectrograms of a few type 4 songs published by Adkisson (1996).

Over most of its range, Sitka Spruce produces cone crops that can vary greatly from year to year (Harris 1990). I estimated Sitka Spruce cone crops by arbitrarily selecting sample plots of 40 trees that appeared to be representative of the surrounding tract. I then categorized each tree as producing a poor, moderate, or abundant cone crop so that I could make a rough estimate of cone crops to characterize yearly and regional differences.

In June and July 2005, professional banders with more than 10 years of experience at Redwood Sciences Laboratory (U. S. Forest Service) established a banding station in McKinleyville, California, to capture and measure crossbills that used type 10 flight calls. They measured bill length (from the anterior edge of the nares to the tip of the maxilla) bill depth (along a plane perpendicular to the tomia at the anterior edge of the nares), tarsus, wing chord, and body mass of each crossbill captured. Following the method of Benkman (1993), I also made molds of the horny palate of two type 10 crossbills to determine the width of the bill's husking groove. I used a dissecting microscope with a scale in the eyepiece to measure the distances to the nearest 0.01 mm; I rounded off dimensions to the nearest 0.05 mm as did Benkman (1993). I recorded the flight calls of each bird as it was released, but a few did not call and so were not included in the analyses. From their flight calls, I identified 89 measured crossiblls as type 10. Two of type 3 and one of type 4 were also captured, but I did not include them in the analyses.

RESULTS AND DISCUSSION

Vocalizations

I recorded calls from more than 1400 crossbills in Humboldt County. Of these only 5 were type 1, ~185 were type 2, ~450 were type 3, ~165 were type 4, and 21 were type 5 (Figure 1). Types 1–5 were recorded mostly during irruption years (1999, 2004, 2006, and 2008). Additionally, I recorded crossbills of types 2–5 at other sites in the region, two of type 7 crossbills near Crater Lake, Oregon, and one of type 6 in southeastern Arizona. Of the nine crossbill call types previously described in North America (Groth 1993a, Benkman 1999, Benkman et al. 2009), type 8 apparently occurred only on Newfoundland but may now be extinct (Parchman and Benkman 2002), and type 9 is restricted to two small mountain ranges in southern Idaho (Benkman et al. 2009). I have no recordings of these last two call types (see Groth 1993a, Smith and Benkman 2007, Keenan and Benkman 2008, and Benkman et al. 2009 for spectrograms). Groth (1993a) found types 2–5 to be widespread in western North America, although type 3 has a more northern distribution and type 5 occurs more inland. He found type 1 mostly in eastern North America but also in the Pacific Northwest, type 6 in southeastern Arizona (from which it presumably ranges south into Mexico), and type 7 on the east side of the Cascade Mountains and in the northern Rocky Mountains. Beginning in late November 2001, I identified

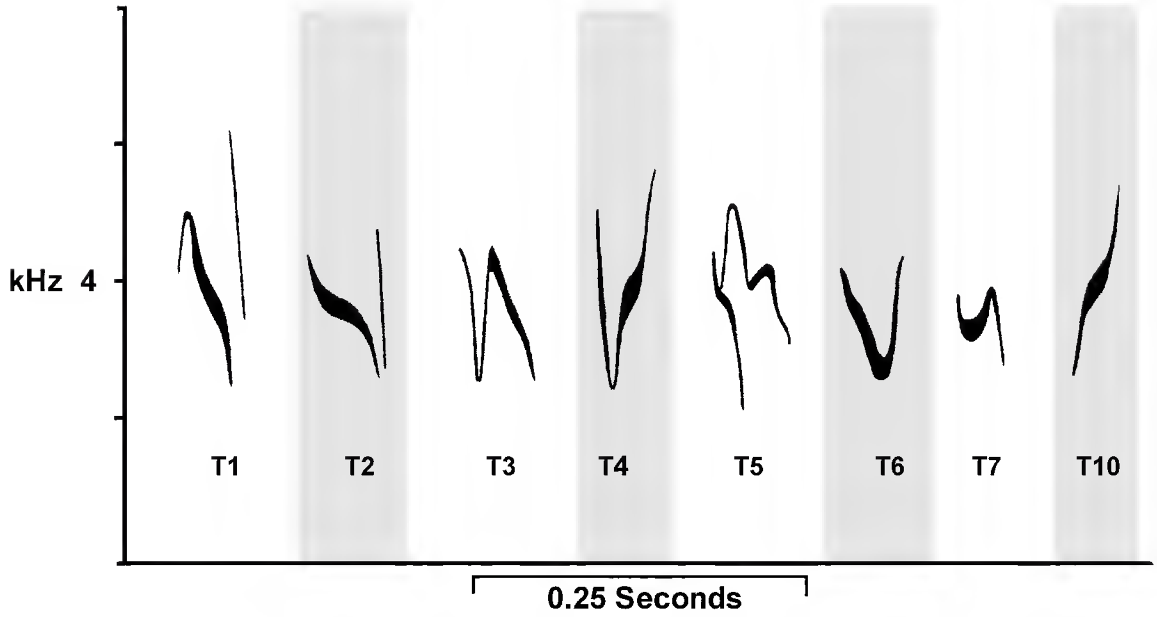

Figure 1. Spectrograms of representative flight calls of eight of the ten types known from North American Red Crossbills. For types 8 and 9, see Groth (1993a) and Keenan and Benkman (2008), respectively.

a new call type from northwestern California (type 10) as crossbills using this call invaded Humboldt County. During observations of flocks at 48 sites from 2002 to 2010 I recorded ~630 type 10 crossbills.

Flight calls. Inspection of Figure 1 reveals that only two known call types resemble type 10: type 6 and type 4 both have components rising in pitch at the end. Type 6 actually sounds nothing like type 10. Most of the energy (amplitude) is imparted in the falling component of the call, and generally there is very little modulation of the final rising portion of the call. Crossbills that use type 6 calls are extremely large and rarely found north of southeastern Arizona. Crossbills that use type 4 calls, however, are abundant and widespread in the western United States, and their calls are closely similar to type 10. Previously, if other observers have detected type 10, they have categorized it as type 4 (Groth 1993a, Thomas P. Hahn pers. comm.), perhaps supposing that the bird had omitted the initial falling component. Figure 2 shows the range of individual variation in the flight calls of type 4 and provides a comparison of the flight calls of type 4 with a representative sample of type 10 flight calls. The most typical flight calls of type 10 are simple in structure (Figure 2: 6–8) and resemble the last half or the rising portion of type 4 flight calls (Figure 2: 1–5). In the field, I often failed to detect the first half of a type 4 flight call unless I recorded and analyzed it. Some type 4 flight calls sounded very similar to some of those of type 10, hence my use of the term "cryptic" to describe the new type of crossbill; refer to the recordings comparing these two flight call types on the website at www.westernfieldornithologists.org/kirwin/ and http://madriverbio.com/wildlife/redcrossbill.

Within type 10, the structure of the flight call varies greatly from individual to individual (Figure 3). The male and female of a mated pair often match the structure of each other's call. This matching usually develops by one bird imitating its mate's call or each bird adjusting its call so that they both con-

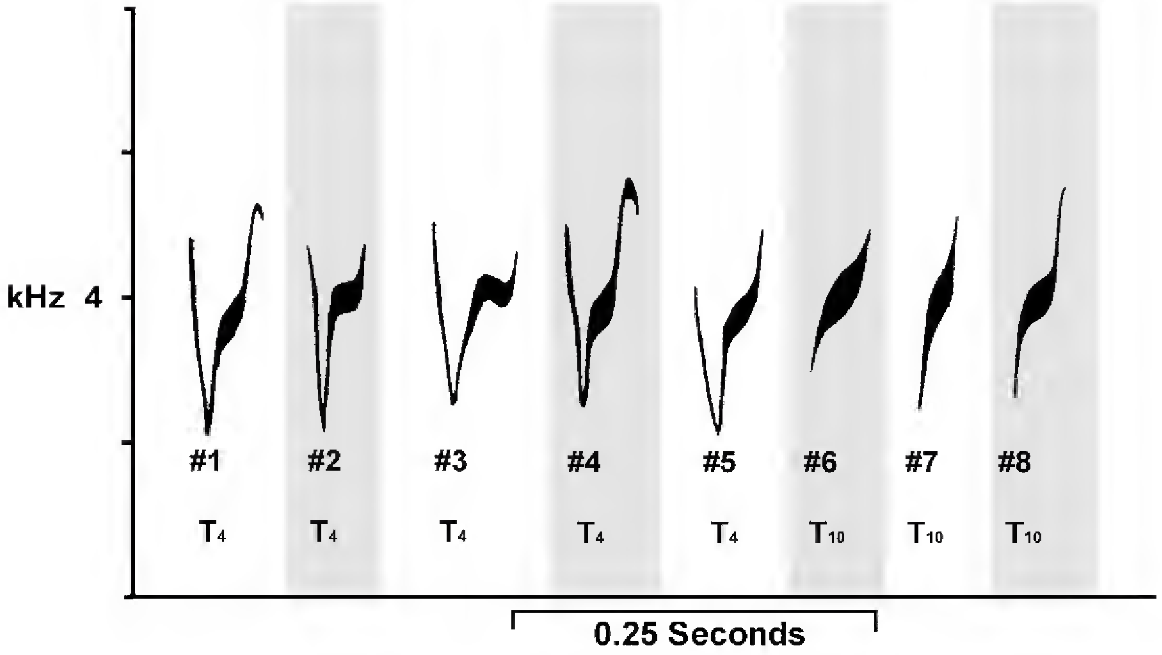

Figure 2. Comparison of the Red Crossbill's flight calls of type 4 and type 10, showing the range in variation of type 4 in western North America. All calls of type 4 begin with a fall in frequency. Most typical of type 4 is trace 5, the most extreme deviation from typical is trace 3. In type 10, the frequency rises at a rate slightly less than that of the rising portion of western Type 4 calls. Type 10 calls are shorter that type 4 and usually given at a slightly higher frequency.

verge on a variant intermediate between the two original forms. (Mundinger 1970, 1979, Groth 1993b, Keenan and Benkman 2008, Sewall 2008). I recorded many mated pairs that were "call matching," and some of these calls are the most complexly modulated calls in Figure 3, indicating that even the calls that differed greatly from the typical form were recognized as flight calls by other birds using type 10.

Some type 10 crossbills used two different forms or variants of type 10 flight calls, but this apparent dimorphism was difficult to quantify or even document conclusively. I had many observations where I thought a bird had changed from one flight call to another, but because other type 10 birds were nearby, I could not always rule out the possibility that I may have recorded two birds sequentially. I recorded only six birds using two variants of the type 10 flight call (Figure 4) when, to my knowledge, they were at least 60 m from any other crossbills. I recorded over 45 individuals that changed from one flight call to a different variant when they were giving a series of calls when I was reasonably certain that only one bird was calling (28 of these can be found in the section on alternate flight calls used by type 10 birds at http://madriverbio.com/wildlife/redcrossbill).This determination was supported by the observation that all of the calls came from the same location and were given at a constant rate. During a bout of calling, an individual usually gives a series of calls with intervals of ~180 msec between calls with only minor variation. This interval can vary by bout of calling or individual. In the recordings, during a series, each bird changed from one flight call to a different variant of type 10 without any deviation in the interval between calls, as would be expected if only one bird was calling. I heard other birds as

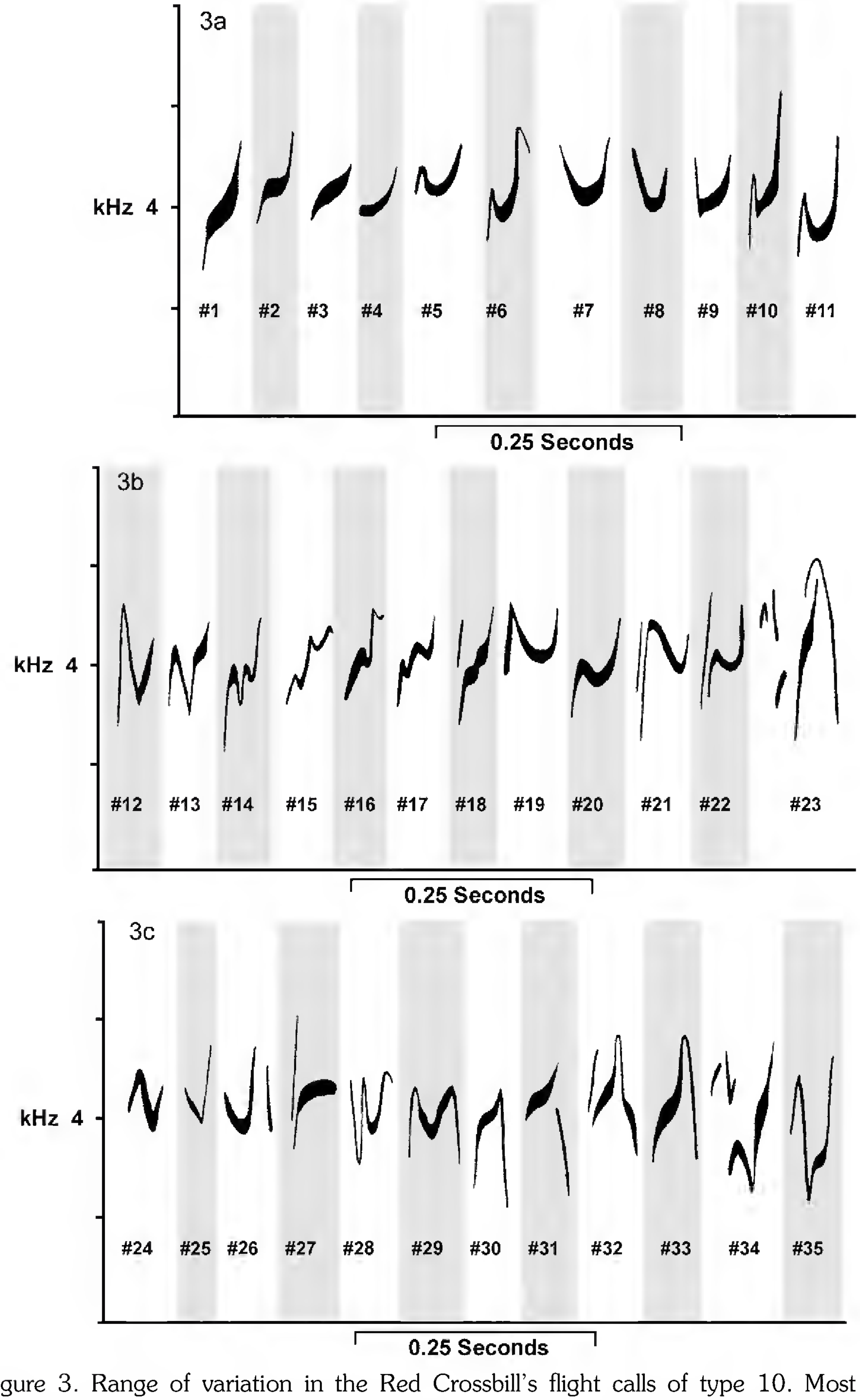

Figure 3. Range of variation in the Red Crossbill's flight calls of type 10. Most individuals' calls are like those represented in traces 1–3, fewer are like those represented in traces 4–6, and fewest are like those represented in traces 7–35. The range of individual variation in crossbills using type 10 calls is greater than in any other type.

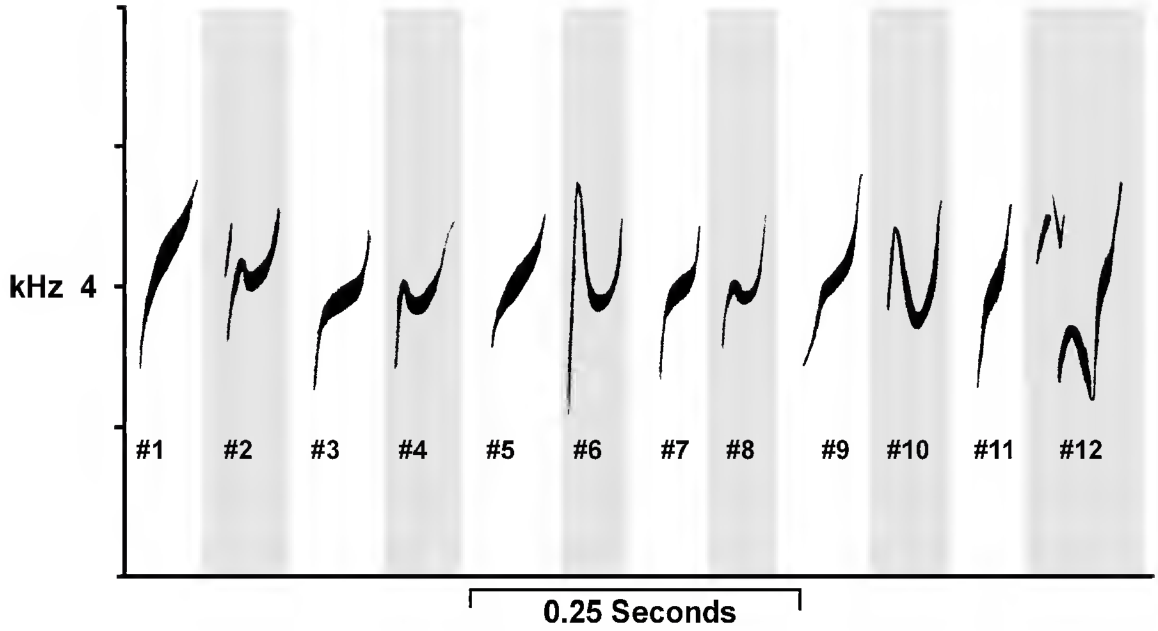

Figure 4. Red Crossbills that used two flight calls of six variants of Type 10 flight calls. In each pair of calls, one (left) has a simple modulation pattern and one (right) has a complexly modulated pattern.

they changed from using one variant of the type 10 flight call to another but did not record them. It seems that many of the crossbills that gave type 10 calls used two variants of the type 10 flight call. In contrast, Groth (1993a) reported that fewer than 10 of 700 crossbills he recorded used two variants of their type of flight call. In type 10, use of a complex call probably enhances recognition of individuals and mates because complex calls differ from individual to individual more than simple calls do.

Use of two variants of the type 10 flight call also varied within and among individuals. Complexly modulated flight calls seemed to be linked to reproductive behavior. Their use declined following molt in autumn and increased from midwinter through summer with singing and other activities associated with breeding. In the following, the values are for the total number of calls and do not reflect the number of birds calling. In winter (October–March), 83.6% of all flight calls recorded were simple and 16.4% were complex (*n* = 1939), whereas in the spring and summer breeding season (April–September) 58.3% were simple and 41.7% were complex (*n* = 4722). Many anecdotal observations led me to infer that type 10 crossbills tend to use a simple flight call (Figure 3: 1–3) for communicating with other flock members and a more complex flight call (Figure 3: 5–35) for communicating with their mates. Birds engaging in maintenance activities such as foraging tended to use a simple call. On many occasions throughout this study I observed flocks in which several individuals were using complex calls during breaks between bouts of singing or when they were interacting with their mate, but when these flocks were startled, usually by the sudden appearance of a large bird nearby, the entire flock flushed and most, if not all, members of the flock gave simple flight calls (Figure 3: 1–3) or, at most, a slight variation of the simple call (Figure 3: 4). I observed a male on 11 consecutive days as he tended a female on the nest. During this period I recorded 76 flights by the male toward a group of crossbills foraging 70–100 m away and 73 return flights to the nest. He used a simple flight call (Figure 4: 1) on every flight away from the nest, but he used a more complex call (Figure 4: 2) on every return flight to the nest and his mate. Another male, also provisioning a nest, usually used a complex call when flying both to and away from the nest (and mate) and used a simple call only occasionally when moving from the nest to a foraging flock.

To determine if type 10 has been recorded elsewhere, I examined various sources including Groth (1990, 1993a). In figure 15a,b of Groth (1993a), calls of crossbills recorded on the central Oregon coast in Sitka Spruce and Douglas-fir (*Pseudotsuga menziesii*; Groth 1990) appear to be more characteristic of type 10 (no falling component, slope and frequency band similar) than of type 4. There also appear to be type 10 calls in Groth's (1993a) figure 21 from the south shore of Lake Superior. These were included in Groth's range of type 4 calls (compare with the range in Figure 2 above). Because of the similarity of these spectrograms to those of type 10, it seems possible that Groth may have included measurements from some type 10 birds in his set of type 4, which could have affected his morphological characterization of crossbills that used type 4 calls (possibly deflating mean values; see below). I also examined the Red Crossbill flight calls on the compact disc *Flight Calls of Migratory Birds, Eastern North American Landbirds* (www.oldbird.org). In the recordings from Minnesota, there are flight calls of 14 type 4 crossbills in the same frequency band as those that were recorded in western North America, but in all of these the frequency falls more rapidly then rises more slowly than in type 4 in the West. Therefore type 10 rises more slowly than type 4 in the West but more rapidly than those in the small sample from the East. This CD also has recordings of many flight calls given by 17 crossbills (reported as type 4) that have all of the characteristics of type 10 flight calls I recorded in northwestern California. These were recorded in New Jersey, Maryland, and Minnesota. I also examined a recording of one type 10 recorded in northwestern Wisconsin on the *Bird Song Ear Training Guide* CD (www.caculo.com). On the Cornell Laboratory of Ornithology website (www.animalbehaviorarchive.org) there are recordings from Maine of at least nine crossbills giving type 10 calls (catalog number 12985).

Excitement or toop *calls.* Nethersole-Thompson (1975) described *toop* calls given by the Scottish Crossbill (*L. scotica*) associated with anger, alarm, or excitement. Although Groth (1993a) called them "excitement calls," Adkisson (1996) used the terms *toop* and *tooping* to describe these calls. For each call type, it appears that the alarm call and the *toop* call are related because *toops* can be used for alarm and the two calls are similar in structure (see Groth 1993a). Alarm calls are given at a slightly lower frequency. I heard alarm calls seldom and briefly at low amplitude, and I recorded only a few of them. The *toops* of types 2, 4, and 10 differ from each other slightly (Figure 5). *Toops* of types 2 and 4 often have harmonics and rarely include a high-frequency element. I seldom recorded harmonics with type 10 *toops*, and most of these consisted of a low-frequency element given simultaneously with a high-frequency element that overlapped the last portion of the low-frequency element. The structure of the high-frequency element was usually reminiscent of a first harmonic. The low-frequency ele-

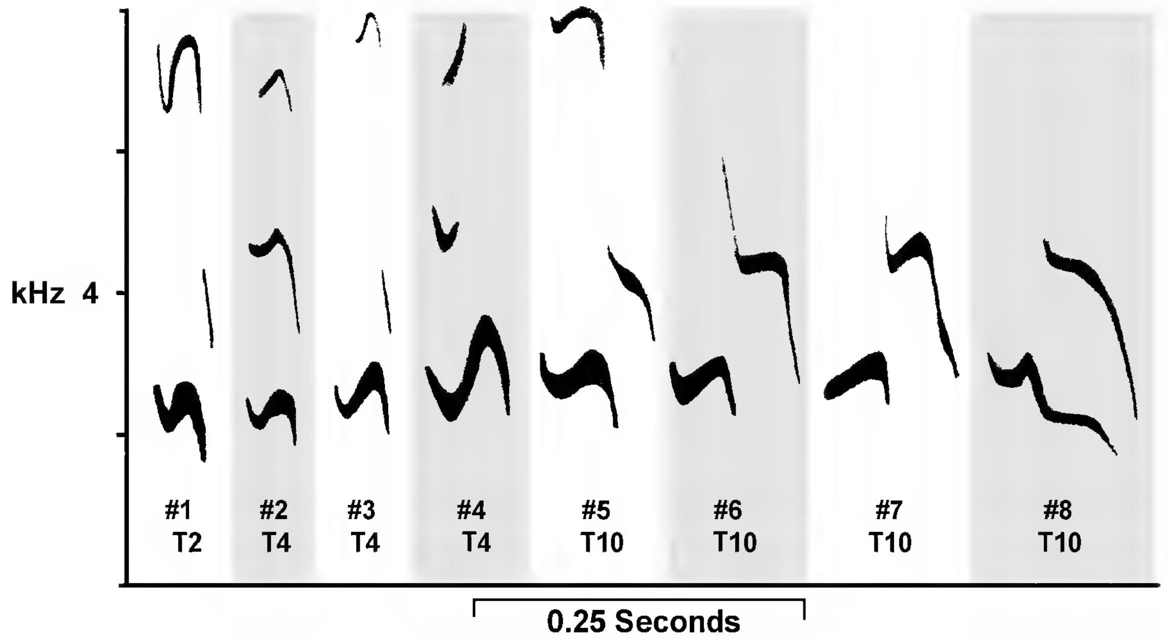

Figure 5. The *toop* or "excitement call" of Red Crossbills that used call types 2, 4, and 10. Type 2 is represented by trace 1, type 4 by traces 2–4, and type 10 by traces 5–8. A few *toops* were so similar that identifying them to one of these three types was difficult. Type 10 crossbills have a strong tendency to include a high-frequency signal that overlies a lower-frequency element (produced simultaneously by the other "voice") and continues long after the low-frequency element has terminated (traces 5–7). Prolonged *toops* (trace 4) are occasionally given by type 4 crossbills. Type 10 birds also use an alternative form of *toop* that is prolonged (trace 8) but is unlike type 4 *toops*.

ment of individual 5 in Figure 5 produced a second harmonic, and the bird added a high-frequency element similar to a type 2 flight call. After the low-frequency element had terminated, type 10 crossbills tended to continue this high-frequency element longer than did birds of any other call type (Figure 5: 5–7). Some type 4 *toops* were unique in structure. They were longer in duration, more modulated, and the bandwidth of their frequency was greater than in the others (Figure 5: 4). I never heard this call from any other type of crossbill. Type 10 crossbills sometimes used a prolonged *toop* that was different in form (Figure 5: 8). It was given occasionally by one or two birds that were in groups *tooping* at Northern Pygmy Owls (*Glaucidium gnoma*) and was also used in the context of reproductive behavior. I recorded it once from a female whose mate immediately responded and copulated with her. Marler (1956) described four "social calls" (analogous to *toop* calls) that Chaffinches (*Fringilla coelebs*) apparently modified from an alarm call. These differ slightly in structure and are used in different contexts. Many Pine Grosbeaks (*Pinicola enucleator*) use two forms of their "location call" (Adkisson 1981), which is analogous to the crossbill's *toop* call.

Chitter *calls*. I recorded *chitter* calls (see Groth 1993a, Robb 2000) from types 2, 3, 4, and 10 (Figure 6). Most *chitter* calls were given by birds as they moved from the tops of trees to bushes next to ponds where they drank. Because their field of view was usually obscured by vegetation, crossbills gave these calls when they seemed to be apprehensive of potential danger. They

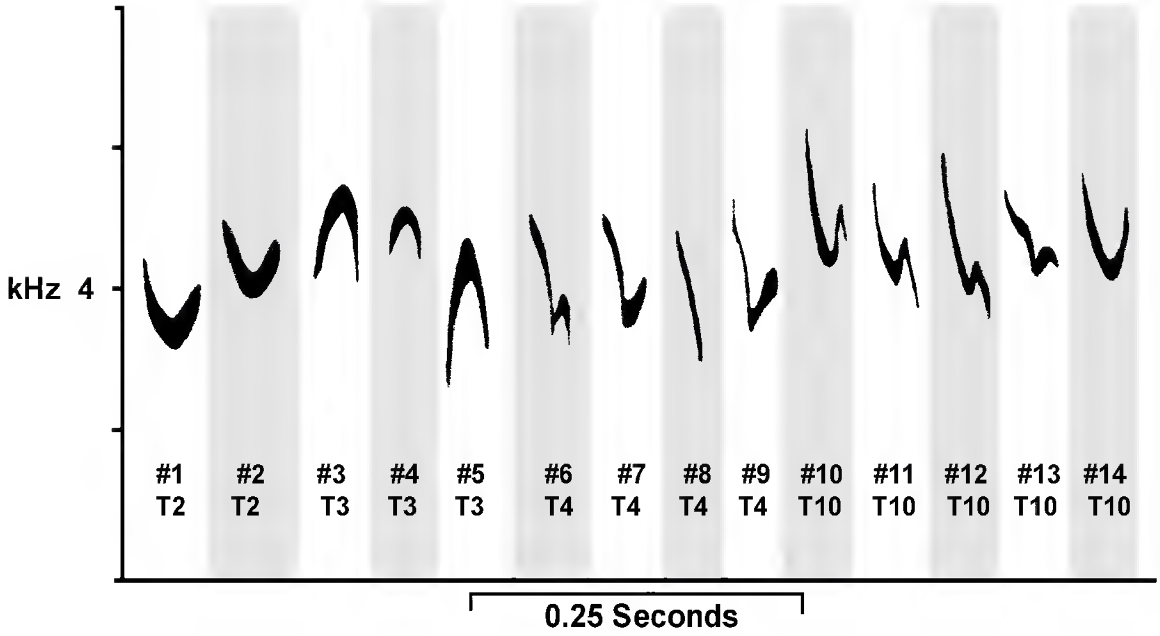

Figure 6. *Chitter* calls of Red Crossbills of type 2 (traces 1–2), type 3 (traces 3–5), type 4 (traces 6–9), and type 10 (traces 10–14). Note in type 4 that the initial long falling portion appears concave, whereas in Type 10 it appears convex. Then type 10 calls rise more rapidly than the corresponding portion of type 4 calls.

scanned rapidly and were skittish or nervous, and they often abandoned the attempt to drink and flew to the top of a tree. I once recorded *chitters* from a bird that was threatened then attacked by another crossbill, and once from a bird that was close to a bird being attacked by a third crossbill. The *chitter* calls of type 10 differ clearly from those of types 2 and 3 (Figure 6). Although the *chitter* calls of types 4 and 10 appear similar, there are consistent differences (Figure 6). In the initial long falling portion of type 4 calls the rate of frequency change slowly increases, whereas in type 10 calls the rate decreases. The type 4 call rises at a constant rate that is lower than the rate in the rising portion of the type 10 *chitter* call. The differences among these four call types suggest that each type may have a *chitter* call that is unique. Robb (2000) identified differences in the *chitter* calls among several types of crossbills in Europe. Flight calls and possibly *toops* that have been modified to varying degrees can be used like *chitters*, as noted also by Groth (1993a) and Robb (2000).

Songs. Most of the elements I examined in the small samples I obtained of type 4 song are very different from anything I recorded from type 10 (not shown). In moderately large samples, these differences are similar to those between the songs of type 2 and type 3 or between either of those and type 10, suggesting (but far from demonstrating) a level of differentiation comparable to that seen between other types. Each type of crossbill may have a large song repertoire. It is not known if any repertoire varies regionally. Almost nothing is known regarding the rate of change (evolution) of a repertoire or the magnitude of the modifications made over time.

I have established a website with recordings of Red Crossbills at http://madriverbio.com/wildlife/redcrossbill. This site has various calls from many call types and useful clues for distinguishing between the calls of these types of crossbills, as well as songs. A subset featuring calls of eight call types and variation within type 10 is at www.westernfieldornithologists.org/kirwin/. These recordings have also been submitted to the Cornell Laboratory of Ornithology for archiving in its Library of Natural Sounds.

Cone Crops and Occurrence of Call Type 10

Along the coast from Ferndale, California, to Coos Bay, Oregon, I identified two patterns of cone production to the north and south of Endert's Beach, 3 km south of Crescent City, Del Norte County. From Endert's Beach south, Sitka Spruce trees produced cones abundantly every year from 1998 through 2009. From Crescent City to Coos Bay (north of Endert's Beach), I estimated the cone crop from 2003 to 2006 to be only ~70% of that south of Endert's Beach. Consequently, Sitka Spruce seed was especially abundant in Humboldt and southern Del Norte counties (south of Endert's Beach), and the high relative humidity near the coast enhanced seed retention in the cones (and see references in Benkman 1993).

The geographic break in cone-production patterns also coincided with an even greater difference in crossbill occurrence. North of Endert's Beach, I did not detect crossbills during surveys along the southern Oregon coast from 2003 to 2006 and near Crescent City from 2001 to 2007. However, I regularly found 48 flocks containing at least 600 type 10 crossbills from Endert's Beach south to Ferndale; most occurred north of Trinidad. Since most spruce trees were on private land, which I did not survey, I suspect that the total population was much greater.

I searched for Sitka Spruce and crossbills in northwestern Washington in August 2005. In the area from Oak Harbor to the Canadian border and inland to the Cascade Mountains I found only a few Sitka Spruce near Puget Sound, 5 km south of the Canadian border at Birch Bay, Washington, and recorded six type 10 crossbills there.

I encountered Red Crossbills regularly in at least fair numbers in Sitka Spruce forests in Humboldt County from 1971 to 1999, suggesting that these spruce trees had produced a good crop in many of the years prior to this study, suggesting that type 10 may have been here in the past.

Flock Sizes and Site Fidelity

I recorded distinctive flight calls at specific sites repeatedly for periods as long as 2 years. At these sites, I did not find much variation in the sizes of the flocks that might indicate movements of flocks or individuals between sites. Only on rare occasions did I see one to three birds venture into the home range of an adjacent flock, but they always returned within 12 minutes. These observations suggest that many individuals (and perhaps major portions of flocks) remained in a limited area for extended periods. From 2002 to 2009, I monitored four flocks almost daily, four others weekly, and 40 less often. I found no evidence of any site being abandoned, even briefly. Each flock apparently resided in its own relatively small discrete home range throughout this period. Here, I give only the counts of the number of birds in each flock during the winter outside of the breeding season of June to August. By focusing on the period outside of breeding I was able to exclude recruitment of fledglings and dispersal of juveniles. In winter, flock sizes of type 10 crossbills averaged 17.7 individuals. Three of the 48 winter flocks held 9–11 birds each, and 45 had 14–21 birds. I surveyed only four areas where there was continuous spruce forest extensive enough to contain two or more flocks. Together these four areas held 11 flocks. Ten of the groups used sites (home ranges) that were roughly circular with diameters that ranged from ~640 to 750 m. The eleventh group, the eastern flock at Patrick's Point, used a site ~350 by ~920 m. For all 11 flocks, the distance between the centers of adjacent home ranges varied from ~780 to 860 m.

Morphological Characteristics

The various call types of North American Red Crossbills differ morphologically. Ranked by size in order from the smallest (type 3) to the largest (type 6) they are 3, 10, 1, 4, 7, 5, 2, 9, 8, and 6. Benkman (1993, 1999, 2003) and Benkman and Miller (1996) found a positive relationship between the mean depth of the bill of the various call types and the pliability of the scales on the cones of each call type's "key" species of conifer. Crossbills with deep bills are more efficient than smaller-billed crossbills at opening the cones of conifers with thick and/or stiff scales. Conversely, smaller-billed crossbills are more efficient on smaller, thinner-scaled cones. Type 3 (♂♂ = 8.19 mm; ♀♀ = 8.10 mm; mean bill depths from Groth 1993a unless noted otherwise) is well adapted for opening the cones of the Western Hemlock (*Tsuga heterophylla*) (Benkman 1993), which has papery scales that are slightly more flexible and smaller than those of Sitka Spruce. Type 1 (♂♂ = 8.80 mm; ♀♀ = 8.72 mm) has been hypothesized to be adapted to the Red Spruce (*P. rubens*) in eastern North America (Parchman et al. 2006; see also Groth 1993a). Type 4 (♂♂ = 9.00 mm; ♀♀ = 8.52 mm) is adapted to Douglas-fir (Benkman 1993). Sitka Spruce cone scales are much more flexible than those of Douglas-fir. By comparison, type 10 crossbills measured in this study (Table 1) are smaller than type 4, and their mean bill depth (♂♂ = 8.55 mm; ♀♀ = 8.37 mm) is intermediate between that of types 1 and 3. The mean values of bill length, tarsal length, and mass for type 10 (Table 1) are also intermediate between those of types 1 and 3 (Tables 2 and 3). The mean wing chord of males and females of type 10 is slightly shorter than that reported for type 3 (Table 3).

Crossbills of type 10 are small, although the male in Figure 7 has a bill that looks proportionately deep. Sean McAllister took this photograph on 9 March 2009, 3 km south of Crescent City. He also recorded the bird's flight call, and I identified it after examining spectrograms.

The groove on the sides of the upper mandible's horny palate is where the bird holds seeds while husking them (Newton 1972, Benkman 1993). The width of this husking groove is adapted to the size of the seeds of each call type's "key species" (Benkman 1993). Like the other morphological characteristics, the widths of the husking grooves of types 1, 3, 4, and 10 overlap. The samples of type 1 (*n* = 1) and type 10 (*n* = 2) are too small to allow for a detailed comparison of the overlap. Benkman predicted that a crossbill adapted to Sitka Spruce should have a husking groove ~1.55 mm wide. The widths of the husking grooves of the two type 10 birds for which I made palate

Table 1 Measurements of Red Crossbills of Call Type 10

	Bill depth at nares (mm)	Bill length from nostril (mm)	Tarsus	Wing chord	Mass
Males					
n	54	54	45	49	53
Minimum	8.0	12.2	14.3	78.0	22.1
Maximum	9.5	15.4	19.8	86.0	34.4
Mean	8.55	14.02	16.72	82.69	27.99
Standard deviation	0.33	0.87	1.09	1.84	2.03
Standard error	0.05	0.12	0.16	0.26	0.28
Females					
n	35	35	29	32	35
Minimum	7.9	10.9	14.6	76.0	23.5
Maximum	9.0	15.2	17.5	86.0	37.2
Mean	8.37	13.45	16.20	81.09	27.44
Standard deviation	0.33	1.14	0.62	2.26	2.34
Standard error	0.06	0.19	0.11	0.40	0.40

molds were 1.50 and 1.55 mm, narrower than the mean value of 1.75 mm for type 4 birds and conforming to Benkman's (1993) prediction.

In addition to bill size and palate structure, the foraging behavior of the type 10 crossbills I observed suggests that they have evolved to exploit Sitka Spruce seeds. Crossbills using type 10 calls spent most of their time in Sitka Spruce, and almost all seeds I saw them eating were of that species. The birds flew only rarely and briefly to conifers other than Sitka Spruce and seldom foraged on them. For example, Shore Pine (*Pinus contorta contorta*) was common at most of my study sites, yet during >10,000 hours of observing type 10 crossbills, I saw only three Shore Pine seeds eaten by them. Red Alder (*Alnus rubra*) was common at all sites, but I saw fewer than 30 Red Alder seeds consumed. After irruptions, type 4 birds spent far less time (<2

Table 2 Measurements of Red Crossbills of Call Type 1[a]

	Bill depth at nares (mm)	Bill length from nostril (mm)	Tarsus	Wing chord	Mass
Males					
n	39	39	39	39	39
Minimum	8.3	13.3	18.0	83.8	25.8
Maximum	9.4	15.7	20.4	95.4	34.5
Mean	8.80	14.49	19.16	89.41	30.49
Standard error	0.041	0.101	0.090	0.374	0.284
Females					
n	33	33	33	33	33
Minimum	8.3	12.9	17.3	82.1	24.5
Maximum	9.2	15.0	20.3	90.3	35.1
Mean	8.72	14.19	18.19	86.50	29.09
Standard error	0.040	0.099	0.103	0.395	0.389

[a] Source: Groth (1993a).

Table 3 Measurements of Red Crossbills of Call Type 3[a]

	Bill depth at nares (mm)	Bill length from nostril (mm)	Tarsus	Wing chord	Mass
Males					
n	28	28	28	28	28
Minimum	7.8	11.7	17.2	81.8	23.8
Maximum	8.7	14.3	19.9	88.5	32.2
Mean	8.19	12.74	18.80	85.88	27.32
Standard error	0.046	0.117	0.127	0.343	0.443
Females					
n	33	33	33	33	33
Minimum	7.7	11.8	17.5	78.0	23.7
Maximum	8.5	13.7	19.4	85.5	29.4
Mean	8.10	12.81	18.47	82.37	26.54
Standard error	0.055	1.127	0.109	0.518	0.469

[a]Source: Groth (1993a).

weeks) at sites with spruce than did any other call type, and many flocks of type 4 crossbills spent the winter and spring at inland sites having Douglas-fir. Conversely, I never heard type 10 in Douglas-fir. The smaller bills of type 3 birds should better enable them to forage in Sitka Spruce. The preference of type 3 crossbills for Sitka Spruce was apparently greater than that of type 4 but less than that of type 10. During four invasions, large numbers of type 3 birds arrived in October, foraged in the spruce, but left in early June the

Figure 7. Male Red Crossbill that used call type 10, 3 km south of Crescent City, California, 9 March 2007. This individual's bill appears deeper than average for its call type.

Photo by Sean McAllister

following year. The relationship between type 10 and species of conifers in the eastern United States is not known.

CONCLUSION

The combination of distinct vocalizations, the difference in average bill depth from other call types with which it occurs (a minimum difference of about 0.2 mm from other call types, similar to the differences between other call types occurring together, e.g., Groth 1993a, Benkman et al. 2009), and the use and apparent specialization of these crossbills on Sitka Spruce, the one conifer in the Northwest that had been predicted to have a call type associated with it (Benkman 1993), all indicate that the crossbills I describe here should be recognized as the tenth North American call type, type 10.

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LITERATURE CITED

Adkisson, C. S. 1981. Geographic variation in vocalizations and evolution of North American Pine Grosbeaks. Condor 83:277–288.

Adkisson, C. S. 1996. Red Crossbill (*Loxia curvirostra*). *In* The Birds of North America, (A. Poole and F. Gill, eds.), no 256. Acad. Nat. Sci., Philadelphia.

Benkman, C. W. 1993. Adaptation to single resources and the evolution of crossbill (*Loxia*) diversity. Ecol. Monogr. 63:305–325.

Benkman, C. W. 1999. The selection mosaic and diversifying coevolution between crossbills and lodgepole pine. Am. Naturalist 153 supplement: 75–91.

Benkman, C. W. 2003. Divergent selection causes the adaptive radiation of crossbills. Evolution 57:1176–1181.

Benkman, C. W., and Miller, R. E. 1996. Morphological evolution in response to fluctuating selection. Evolution 50:2499–2504.

Benkman, C. W., Smith, J. W., Keenan, P. C., Parchman, T. L., and Santisteban L. 2009. A new species of the Red Crossbill (Fringillidae: *Loxia*) from Idaho. Condor 111:169–176.

Edelaar, P. M., Robb, M., van Erde, K., Terpstra, K., Bijlsma, R. and Massen, E. 2004. Zijner meerdere soorten "Gewone" Kruisbek in Nederland? Limosa 77:31–38.

Groth, J. G. 1990. Cryptic species of nomadic birds in the Red Crossbill (*Loxia curvirostra*) complex of North America. Ph.D. dissertation, Univ. Calif., Berkeley.

Groth, J. G. 1993a. Evolutionary differentiation in morphology, vocalizations, and allozymes among nomadic sibling species in the North American Red Crossbill (*Loxia curvirostra*) complex. Univ. Calif. Publ. Zool. 127:1–143.

Groth, J. G. 1993b. Call matching and positive assortative mating in Red Crossbills. Auk 110:398–401.

Harris, A. S. 1990. *Picea sitchensis*, in Silvics of North America: 1. Conifers (R. M. Burns and B. H. Honkala, tech. coords). Agriculture Handbook 654. U.S. Dept. Agric., Forest Service, Washington, D.C.

Keenan, P. C., and Benkman, C. W. 2008. Call imitation and call modification in Red Crossbills. Condor 110:93–101.

Marler, P. 1956. The voice of the Chaffinch and its function as a language. Ibis 98:231–261.

Mundinger, P. C. 1970. Vocal imitation and individual recognition of finch calls. Science 168:480–482.

Mundinger, P. C. 1979. Call learning in the Carduelinae: Ethological and systematic implications. Syst. Zool. 28:270–283.

Nethersole-Thompson, D. 1975. Pine Crossbills. T. & A. D. Poyser, Berkhamsted, England.

Newton, I. 1972. Finches. Collins, London.

Parchman, T. L., and Benkman, C. W. 2002. Diversifying coevolution between crossbills and black spruce on Newfoundland. Evolution 56:1663–1672.

Parchman, T. L., Benkman, C. W., and Britch, S. C. 2006. Patterns of genetic variation in the adaptive radiation of New World crossbills (Aves: *Loxia*). Molec. Ecol. 15:1873–1887.

Robb, M. S. 2000. Introduction to vocalizations of crossbills in north-western Europe. Dutch Birding 22:61–107.

Sewall, K. B. 2008. Age-dependent plasticity of call production and responsiveness in Red Crossbills (*Loxia curvirostra*): Implications for social intermixing and evolution. Ph.D. thesis, University of California, Davis.

Sewall, K. B. 2009. Limited adult vocal learning maintains call dialects but permits pair-distinctive calls in Red Crossbills. Animal Behavior 77:1303–1311.

Smith, J. W., and Benkman, C. W. 2007. A coevolutionary arms race causes ecological speciation in crossbills. Am. Naturalist 169:455–465.

Snowberg, L. K., and Benkman, C. W. 2007. The role of marker traits in the assortative mating within Red Crossbills, *Loxia curvirostra* complex. J. Evol. Biol. 20:1924–1932.

Summers, R. W., Dawson, R. J., and Phillips, R. E. 2007. Assortative mating and patterns of inheritance indicate that the three crossbill taxa in Scotland are species. J. Avian Biol. 38:153–162.

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A REASSESSMENT OF HOMOLOGIES IN THE VOCAL REPERTOIRES OF PHOEBES

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ABSTRACT: During the breeding season, phoebes (*Sayornis*) sing vigorously at dawn with two or three highly stereotyped, probably innate, song types. All song types are combinations of a species-specific introductory note and a terminal phrase. Building on a classic assessment of repertoire structure by W. J. Smith, we recognize three phrase types for the genus (I, II, and III), all of which are used by Say's Phoebe (*S. saya*) but only two of which (I and II) are used by the Black (*S. nigricans*) and another two of which (II and III) are used by the Eastern (*S. phoebe*) Phoebe. A recently discovered hybrid male Black × Eastern used all three phrase types and sang like Say's Phoebe by embedding single type II and III songs in longer strings of type I songs. Thus, what appears to be the primitive sequencing of song types was potentiated through reconstitution of the complete repertoire via hybridization. For future studies, we recommend replacement of Smith's terminology with a simpler scheme recognizing three homologous song types.

As biological lineages diversify via speciation, specific characters (e.g., skeletal organization of the hand) often evolve slowly enough that the equivalent character is recognizable in closely related species and higher taxa. Called "homologues," these characters share "primitive," i.e., unchanged, states that have been inherited from the same character in a common ancestor. Homologies are often recognizable even when the form and function of the character has changed under natural selection (e.g., the hand of a dog and a bird).

In birds, the vocal repertoire is a complex of components, like a somatic organ, in which homologies can be recognized and evolutionary history can be reconstructed. Vocal repertoires are richly structured compilations of simple vocal elements, which may be combined into songs or other stereotyped signals, which may then be combined into singing performances (Smith 1986, 1991). Combination rules assemble the static sounds into signaling behavior (Smith 1977, 1997), just as human syntax assembles words into speech. Like the signals themselves, the rules that govern them are amenable to evolutionary analysis.

W. John Smith, a leading theorist on animal communication (Smith 1977, 1986, 1991), published a series of ground-breaking and now classic studies (Smith 1966, 1969, 1988, Smith and Smith 1992, 1996), both observational and experimental, on the singing behavior of tyrant flycatchers (Tyrannidae). These were significant not only because of Smith's pioneering analysis of the rules used in combining acoustic units into singing performances, thereby illuminating the messages encoded in these performances, but also because they remain among the few studies of the singing behavior of suboscines (suborder Tyranni of order Passeriformes, but see Murphy et al. 2008), which have been thought, on the basis of studies by Kroodsma (Kroodsma 1984, 1985, Kroodsma and Konishi 1991; reviewed by Kroodsma 2005) as well as on morphological grounds (Suthers 2004, Amador et al. 2008), to produce species-specific songs innately.

In his comparative studies of the three phoebes, the Eastern (*Sayornis phoebe*), Black (*S. nigricans*), and Say's (*S. saya*), Smith used the term "regularly repeated vocalization" (RRV) for acoustically distinct sounds that are typically called songs or song types. He gave each distinct song type a numerical designator, so each species had types RR1and RR2. Other sounds received descriptive labels such as "simple vocalization" (SV) and "initially peaked vocalization" (IPV).

Although Smith focused on current utility and did not perform formal analyses of homology, he did compare his results for the three species, writing, "the names assigned to different signals are intended where possible to provide an indication of comparability in form and/or usage between signals of this genus" (Smith 1969:286). Such a naming system implies homology, and Smith himself occasionally used the word "homologue" (e.g., Smith 1970a:77) and the phrase "apparently homologous displays" (e.g., Smith 1970b:105) to describe these vocalizations. Subsequently, the authors of the species accounts in the *Birds of North America* series (Weeks 1994, Wolf 1997, Schukman and Wolf 1998) have referred to RR1, RR2, etc., of the three phoebes as though they were homologues. This assumption, however, remains untested.

One potential problem with Smith's analysis is that he began with a thorough study of the Eastern Phoebe and then generalized his findings to the genus on the basis of rather limited exposure to the two western species. He noted (e.g., Smith 1970b:105) several ways in which the Eastern Phoebe's repertoire is distinctive, but these differences turn out to be autapomorphies (uniquely derived rather than primitive character states) and therefore not suitable as bases for comparison. On the basis of mitochondrial DNA sequences Cicero and Johnson (2002) reported that Say's Phoebe is the basal member of this distinctive three-species clade. On the basis of this finding, as well as our wider experience with the two western species, the abundance of recordings now available for all three species, and the recordings of the first known hybrid in the genus (Pieplow et al. 2008), we assessed homology and repertoire organization in the genus *Sayornis* independently.

Broadly, we wished to determine which, if any, vocal elements (song types) used by *Sayornis* in dawn singing are homologous and whether the syntax revealed by dawn singing is homologous. This broad approach allowed us to evaluate whether Smith's terminology delineates homologues accurately—e.g., whether "RR1" is homologous across species. We limited our investigation to noninteractive broadcast singing, typically delivered around dawn, because patterns of song-type alternation at this time are more likely to reflect species-wide rules rather than the socially mediated modulations seen with daytime singing (e.g., Smith 1969, 1988, Smith and Smith 1992, 1996, Kroodsma 1985).

METHODS

Assessing homology in any suite of characters can be difficult because one cannot be certain whether character states are similar because they are homologous or appear homologous because they are similar. Remane (1956) proposed three criteria for recognizing true homology. As repeated by Brooks and McLennan (1991:7), these are similarity of position in an organ system, special quality, and continuity through intermediate forms. These three criteria are as applicable to behavioral data as they are to morphological data (Brooks and McLennan 1991), especially for innate vocalizations, those that develop normally in the absence of environmental input, such as the vocalizations of the Eastern Phoebe (Kroodsma 1985, Kroodsma and Konishi 1991). We discuss each criterion and its applicability to our study briefly.

Similarity of position in an organ system. Although this criterion was developed to assess morphology, it can also be adapted to the assessment of behavioral systems. The topology of an organ system carries a phylogenetic signal because an organ system is a co-adapted functional complex that is likely to change only under selection. By analogy, behavioral complexes that are essential to fitness are likely to be canalized and thereby consistent. We propose that the syntax of dawn song in phoebes is one such complex and that homologies of dawn-song elements can be inferred from the positions of these elements relative to one another in a singing performance.

Special quality (e.g., commonalities in fine structure or development). In the case of vocalizations, fine structure of sounds is clearly revealed by high-resolution spectrograms and oscillograms, which can indicate the likelihood of similar production mechanisms. The intricacies of avian phonation (reviewed by Suthers 2004) may carry clear phylogenetic signals.

Continuity through intermediate forms. Intermediate forms are provided by the behaviors of hybrids. The recordings of a bird morphologically identifiable as a *nigricans* × *phoebe* hybrid (Pieplow et al. 2008) are very useful in this regard.

We assembled a library of dawn-singing performances, daytime-singing performances, and social interactions from numerous individuals of all three species throughout their U. S. breeding ranges (Appendix). Included in this sample were 68 minutes of recordings of a hybrid Black × Eastern Phoebe (Pieplow et al. 2008). Online material from the Borror Laboratory of Bioacoustics (BLB) and Macaulay Library (ML) public catalogues was played as streaming media with a QuickTime player and rerecorded with WaveDisk software (Engineering Design, Berkeley, CA). We confirmed that compression of streaming media had not resulted in measurable distortion by comparing spectrograms of rerecorded and original source material. McCallum's recordings were recorded in analogue format and digitized at 50,000 points per second with NIDisk software (Engineering Design, Berkeley, CA) with a National Instruments DAQCard 6062E analogue-to-digital acquisition card. Pieplow's recordings were recorded digitally in linear PCM format on a Sony Hi-MD MZ-NH900 minidisc recorder.

To characterize singing performances, we "paged" through continuous recordings of dawn singing spectrographically and logged the start and stop times and the minimum and maximum frequency of each phoebe sound with the on-screen cursor in Signal Sound Analysis Software, Version 4.02.04 (Engineering Design, Berkeley, CA). We displayed 6 sec at a time in a 900-pixel × 400-pixel window, yielding a measurement resolution of

7 msec × 29 Hz. Concurrently, we assigned each sound to one of the song types or call types defined by Smith (1970a). After we had passed through the recordings once, we revisited each identified song, checked its song-type assignment for error, and measured the duration and bandwidth of the introductory note and song phrase from a subset of these (see Results for these distinctions) to assess variability within and among species. We chose this subsample deliberately to capture variation.

We used SAS Version 6 (SAS Institute, Inc., Cary, NC) to manage the resulting data table. We used the Tables option in SAS Proc Freq to calculate transition probabilities to and from each song type for each species and to test these transitions for independence. We prepared histograms of the time intervals separating each song from those immediately preceding and following it with SAS Proc Chart. Summary statistics were calculated with SAS Proc Univariate and Proc Means. Highly skewed (to the right) distributions of intervals between songs were the rule, but these distributions were unimodal. We therefore used the mode (from 0.2-sec bins) to characterize the "typical" interval. We infer that the longer intervals in the tail of the distribution resulted from interruptions or movements by the singers and therefore do not reflect syntactical rules accurately. The mode nicely captures the shorter, limiting intervals that are probably most reflective of singing rules. Intervals lengthen as the day progresses (Smith 1969, 1970a, Kroodsma 1985, 2005; pers. obs.), so we restricted our analyses of dawn-singing syntax to samples recorded within an hour of sunrise.

We used order of homologous song types (Remane's principle 1) to address whether the patterns of combination of the song types indicated homology among entire performances, i.e., whether syntax was homologous.

RESULTS AND DISCUSSION

Descriptions of Repertoire Elements Used in Dawn Singing

We examined 93 recordings from 15 states and measured the start times and stop times of 2248 songs from 27 individuals (Appendix). The seven song types of the genus (Figure 1a, b, c, d, e, i, j) range in duration from 290 to 550 msec (Table 1) and, within a species, occupy the same frequency band. Say's Phoebe songs barely overlap in frequency with the much higher songs of the sympatric Black Phoebe (Table 1), while the Eastern, which is largely allopatric with both Say's and Black, is intermediate.

An arresting characteristic of these seven sounds is that each begins with a species-specific note, which we refer to generically as the "*pip*." In all three species the frequency trend of the *pip* is similar: it is a simple overslur (a rising and then falling trace on the spectrogram). The species, however, differ strongly in the duration and bandwidth of the *pip* (Table 1). Species identity is thus encoded in the acoustic characteristics of this note, and it may exist primarily for the purpose of broadcasting the specific identity of the singer during the dimly lit dawn. The hybrid also uttered a *pip*, which was intermediate in duration but narrower in bandwidth than those of the parental species (Table 1). It had a unique double-peaked frequency contour (Figure 1g, h). The hybrid's *pip* is surprising on two counts: it was poorly stereotyped (see

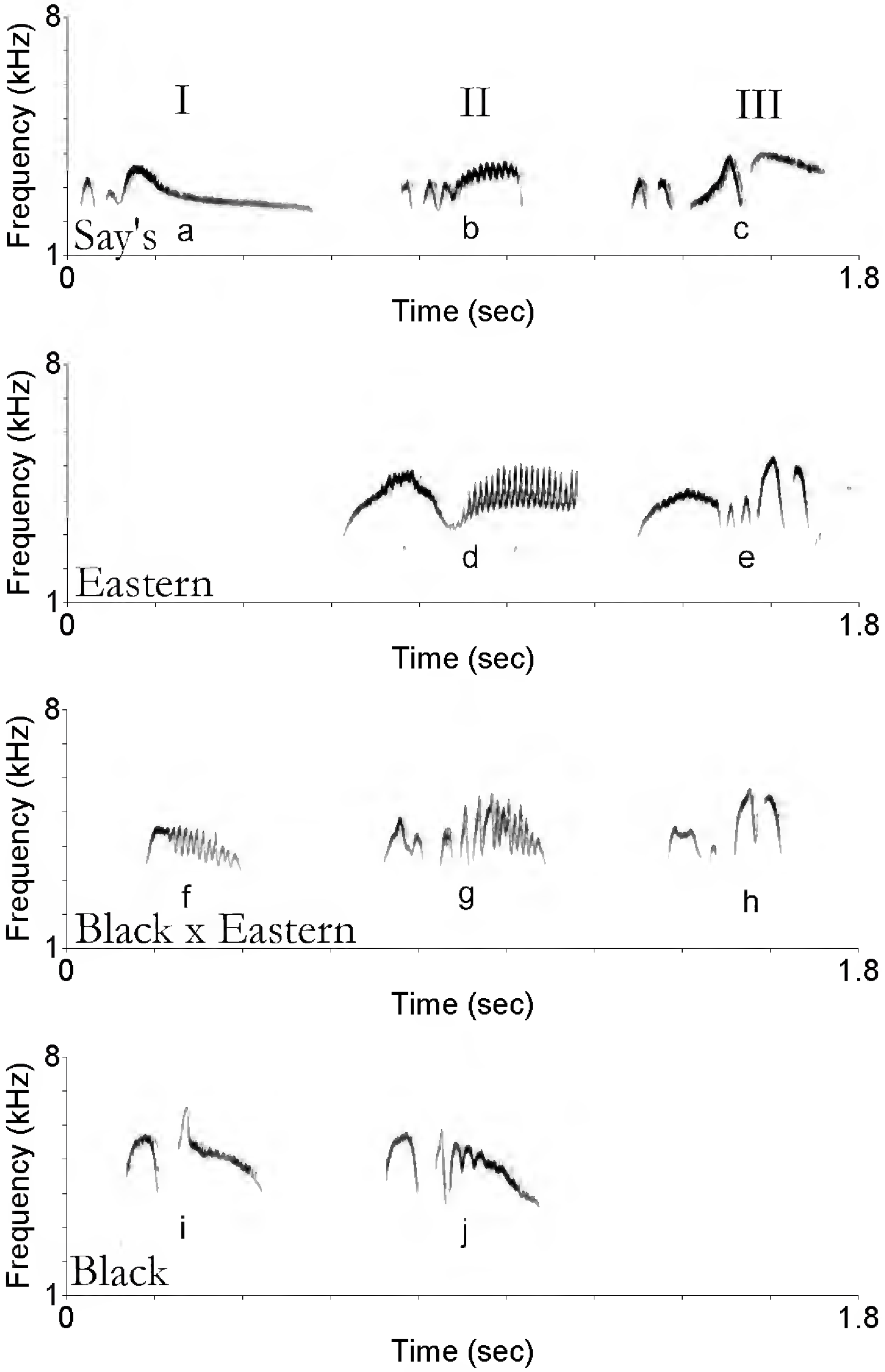

Figure 1. The seven highly stereotyped song types of the phoebes, arranged to show similarity within species horizontally, and similarity within a song type vertically. Say's Phoebe, the basal species in the phylogenetic reconstruction of Cicero and Johnson (2002), is at the top, while a hybrid Black × Eastern Phoebe (Pieplow et al. 2008) is displayed between its parental species. Roman numerals across the top of the figure designate the three song types we propose as homologous (see text).

Table 1 Species-Specific Characters of Introductory *Pip* Notes and Entire Songs[a] of the Three Phoebes and one Hybrid Black × Eastern

		Song type		
Variable[b]	*Pip*[c]	I	II	III
Duration (msec)				
Say's	37 (9), 9.4	551(9), 6.1	279 (9), 21.3	438 (8), 7.4
Eastern	242 (10), 19.1		506 (10), 13.9	461 (11), 13.8
Black	66 (10), 11.4	290 (11), 10.2	336 (10), 8.5	
Hybrid	101 (12), 15.6	207 (10), 27.1	411 (12), 7.0	282 (17), 7.0
Bandwidth (Hz)				
Say's	872 (9), 19.1	1435 (9), 5.4	1571 (9), 9.5	1728 (8), 20.3
Eastern	2153 (10), 9.8		2529 (10), 10.7	2677 (11), 7.3
Black	2003 (10), 16.5	2759 (11), 13.8	2649 (10), 10.6	
Hybrid	1596 (12), 11.3	1835 (10), 13.4	2599 (12), 7.6	2749 (17), 8.5
Maximum frequency (Hz)				
Say's	3314 (9), 6.9	3748 (9), 3.8	3909 (9), 4.8	4090 (8), 8.0
Eastern	5077 (10), 5.1		5444 (10), 5.4	5644 (11), 3.7
Black	5677 (10), 2.7	6271 (11), 6.7	5921 (10), 5.2	
Hybrid	4652 (12), 3.2	4700 (10), 3.7	5570 (12), 2.5	5812 (17), 2.6
Minimum frequency (Hz)				
Say's	2442 (9), 5.7	2317 (9), 4.9	2342 (9) 3.6	2376 (8), 4.5
Eastern	2924 (10), 5.0		3071 (10), 5.5	3147 (11), 7.1
Black	3674 (10), 7.5	3610 (11), 5.6	3301 (10), 5.2	
Hybrid	3056 (12), 5.2	2865 (10), 5.5	2970 (12), 3.5	3063 (17), 4.7

[a] Songs consists of *pip* + intervening notes + main song phrase.

[b] Summary statistics are the mean of means for individual birds, number of individuals measured, and the coefficient of variation (CV) of the individual means. The CV rather than the standard deviation is presented to facilitate comparison. The sample sizes and CVs reported for the hybrid are for individual songs. Sample sizes for individual means are 1–9 songs.

[c] Data on *pips* are from song type II only, but results for *pip* from different song types within each species are highly consistent.

Pieplow et al. 2008 for discussion), and it was completely absent from one of the hybrid's song types (Figure 1f; see below for discussion).

The extent of the *pip* is unambiguous in the Black Phoebe because it is clearly separate from the terminal portion of the song, which we call the "song phrase." In the Eastern the *pip* of song type II is continuous with the song phrase, as seen in Figure 1d, and the *pip* of song type III ends with zero to several frequency modulations that could be considered part of the song phrase. (These chevrons are unattached in Figure 1e, but they are often attached to the introductory note.) For consistency with the Black Phoebe, we defined the end of the Eastern's *pip* as the low-frequency point following the frequency maximum. In Say's the *pip* may be absent or reduplicated (e.g., Figure 1a). We measured the largest *pip* available, whether it was isolated or attached to the main song phrase.

For consistency within and across species, we defined song phrase III as the terminal two notes seen in Figure 1c, 1e, and 1h. These were always present, while small chevron-shaped notes, as seen in Figure 1e and 1h, were variable in number, shape, and presence. In Say's, Black, and the hybrid song phrase II typically began with an accentuated chevron, as in Figure 1, while such a feature was absent from the evenly modulated song phrase II of the Eastern. We included the accentuated chevron in measurements of song phrase II.

Homologies among Song Types

The introductory *pip* note is clearly homologous across the genus by all three of Remane's criteria: position in the finished song type, similarity of frequency trend, and continuity through the intermediacy revealed in the hybrid. This well-supported hypothesis of homology means that the genes that are ultimately responsible for the neurological circuitry that directs the production of these prefixes during singing performances have in all likelihood been inherited from the common ancestor of all three phoebes. This type of introductory note is seen not only in all species of *Sayornis* but also in several pewees (*Contopus*) and in two species of *Empidonax* (McCallum unpubl. data). Use of principle 1 (position) here, within song type, does not invalidate our using it also for homology of syntax in analysis of complete song types.

The existence and stereotypy of the *pip* reveals that the completed song types are combinations, generated with a rule that prefixes the introductory note to one of several terminal phrase types. Because the finished product is generated by rules, the combining forms may vary independently, and it is possible for the prefix to be inherited from one parent and the terminal phrase type from another. Therefore, in order to determine homology in the phoebes' dawn-song system, we needed to assess it among the seven terminal phrase types rather than among the completed song types. We did that by using Remane's second and third criteria, saving the positional criterion for an assessment of the rules by which song types are combined into singing performances.

Phrase type II. The clearest homology within the seven phrase types is between the highly modulated "buzz" phrases of the Say's (Figure 1b) and of the Eastern (Figure 1d). Both feature a carrier frequency that initially rises and then levels off and is frequency-modulated at a constant rate. Although the note is nearly twice as long and the depth of frequency modulation is roughly twice as great in the Eastern, the rate of modulation in the two species is actually very similar. Overall, the two types differ quantitatively but are qualitatively very similar. These similarities in fine structure abundantly satisfy the "special quality" criterion. We designate song types with this "buzz" phrase song type II. (The choice of designators for the three song types is based on syntactical relations; see below.)

One of the hybrid's phrase types (Figure 1g) provides a link between these periodically modulated "buzzes" and one of the phrase types (Figure 1j) of the Black Phoebe, which is shallowly and irregularly modulated at the outset but "smooth" terminally (Pieplow et al. 2008). The hybrid's version is irregularly modulated at the outset, like the Black parent's, and more regularly modulated terminally, like the Eastern parent's. The hybrid's carrier frequency rises and then falls evenly, which can be interpreted as a pasting together of the initial half of the Eastern parent's and the terminal half of the Black parent's carrier frequencies. Note that the modulation rate and frequency trend are not correlated with regard to parental species and hence are probably inherited independently of each other. These assignments mean that all three species and the hybrid have song type II in their repertoires. Assignment of Figure 1j to song type II rather than to song type I (see below) is supported by the similarity of the semi-attached chevron that always begins this phrase type in the Black and the unattached chevron that begins the hybrid's song type II.

Phrase type III. Although they appear dissimilar at first glance, the "stutter" phrases of Say's (Figure 1c) and the Eastern (Figure 1e) are probably homologous, on the basis of the fine-structure criterion. The last two notes of each have similar frequency trends. The Say's form is an elongated version of the Eastern's form, just as the Eastern's buzz (song phrase II) is an elongated version of the Say's buzz. In other words, as we have seen in both the phrase types and in the introductory *pip* notes, the duration of song elements appears to be rather more labile in this genus than frequency trend. The "stutter" song-phrase of the Eastern Phoebe, which we designate III, is clearly the unadulterated source of one of the hybrid's song phrases (Figure 1h), while the Black apparently lacks song phrase III.

Phrase types I and IPV. Also likely homologues are the two phrase types with an overslurred frequency trend (Fig 1a and 1i). Although the Black's version is typically shorter (Table 1), an abruptly rising, then more gradually falling frequency trend unites them. Bolstering the argument for homology is in all three species' giving a *pip*less note with this frequency trend (Figure 2), designated IPV ("initially peaked vocalization") by Smith (1969, 1970a, b). As noted by Smith (1970a:80), it is highly plausible that Say's and Black simply generate this song type by affixing their species-specific version of *pip* to their species-distinctive IPV. We therefore consider the IPV in these two species the same as the terminal phrase of song type I (Figure 1), i.e., song type I is a "pipped" IPV. The Eastern has lost song type I, i.e., it does not include the combination *pip* + IPV in its singing performances (Smith 1969, 1970a; pers. obs.). The Eastern does retain the IPV as a call (Figure 2b) but uses it rarely (Smith 1969, 1970b; pers. obs.).

It may have been the superficial similarity of the Eastern's IPV (Figure 2b) to Say's song type I (Figure 1a), presented side by side in Smith's (1970a) figure 2, that led him to characterize the latter as an IPV rather than an RRV (i.e., a song type). As we have shown, however, these "pipped IPVs" are not just analogous but homologous to all other sounds used by the phoebes in their singing performances at dawn, in that they are constructed according to the rule "species-specific *pip* + phrase I, II, or III." The appropriate comparison among IPVs appears in Figure 2.

At least in the Black and Say's Phoebes, IPV, unlike the song types, constitutes a spectrum of vocal displays; it could be considered a continuum of variability with modal peaks (e.g., Gardali and Ballard 2000). These modal peaks were classified by Smith (1969, 1970a, b) as subtypes of the IPV—e.g., the "high-tailed" IPV (htIPV) and the "chevron-peaked" IPV (cpIPV)—that tend to be deployed in different behavioral contexts. In the Black Phoebe, the htIPV, without an introductory *pip*, is inserted occasionally in dawn singing performances and is associated with brief pauses (Smith 1970a:80). The cpIPV, on the other hand, occurs with a *pip* during bouts of singing, as the

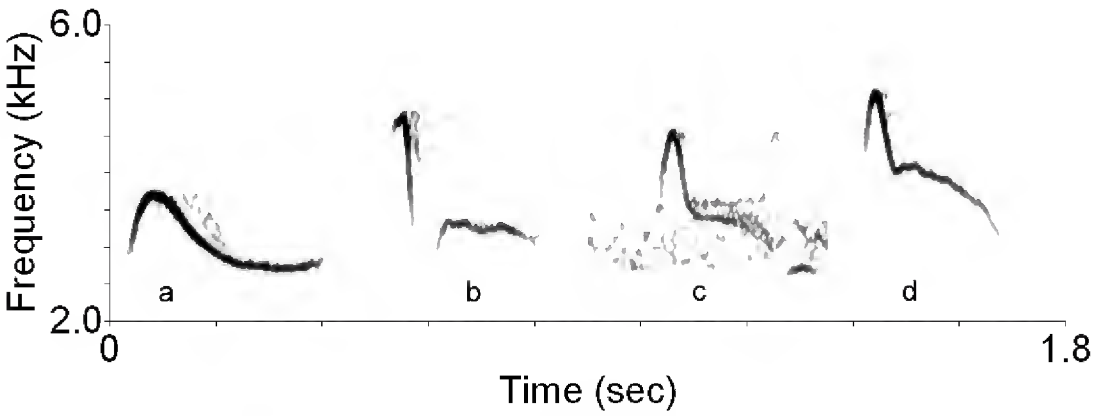

Figure 2. Initially peaked vocalizations (IPV) (Smith 1970a) of (a) Say's, (b) Eastern, (c) the Eastern × Black hybrid (Pieplow et al. 2008), and (d) Black Phoebes. Figure 2d is the "chevron-peak" (cp) variant of Smith. Recordings: (a) Wasco Co., Oregon, by McCallum; (b) Warren Co., Virginia, by McCallum; (c) Larimer Co., Colorado, by Pieplow; (4) Clark Co., Nevada, by Pieplow.

terminal song phrase of song type I, in both the Black and Say's Phoebes. A string of *pip*less IPVs sometimes precedes dawn bouts as well.

In addition, calling Black and Say's Phoebes commonly utter the *pip*less cpIPV after dawn (Smith 1969, 1970b; pers. obs.). These species also give extended performances, i.e., "sing" (Smith 1991), with cpIPV alone (Smith 1970a). We would say, alternatively, that they sing by day with *pip*less song type I, although Say's often retains *pips* in its daytime singing (pers. obs.). These performances are often interrupted for self-maintenance activity, as the Eastern's daytime singing is with RR1 (song type II) (Smith 1970a). Smith (1970a) surmised that in the Say's and Black Phoebes, cpIPV had replaced the RR1 of Eastern in these contexts. Our reconstruction of homology suggests that the reverse is more likely true, i.e., that the Eastern has adopted the pipped song type II (RR1) in contexts reserved for cpIPV (*pip*less song type I) in the other two species. The near loss of IPV in the Eastern, and the absence of an IPV-like song type (i.e., song type I) in its repertoire, exemplify its more derived repertoire (Smith 1970b:86).

The hybrid included in its songs a phrase that, with a few exceptions, lacked a *pip* prefix (Figure 1f), was much shorter than any other song type in *Sayornis*, and had a much smaller bandwidth and lower maximum frequency than the hybrid's other two song types (Table 1). If its frequency-modulated tail were smoothed, the frequency contour of this phrase would most resemble the htIPV of the Black Phoebe (Pieplow et al. 2008), although that call occupies a higher band of the frequency spectrum. The frequency-modulated tail may be an "acoustic overlay" contributed by the Eastern parent. Modulation of both frequency and amplitude of otherwise similar sounds often distinguishes the vocalizations of closely related species (McCallum pers. obs).

Given the homologies we have hypothesized (Figure 1), this third song type should closely resemble the Black's song type I because the Eastern lacks song type I. That is the complementary pattern seen with song type II. An alternative prediction is for the hybrid's song phrase I to resemble its cpIPV, as do song type I of the Black and Say's. Both the absence of a *pip* and the structure of the song-phrase are therefore enigmatic. A third possibility, that this sound is the hybrid's version of htIPV, would solve the previous two problems but produce another: the frequency of use of this sound in dawn bouts (Table 2) does not agree with any of the three species' use of an IPV. We must reserve judgment, therefore, on the exact homology of this sound, but we refer to it operationally as song type I, for the sake of assessing the hybrid's syntax.

The hybrid also produced sounds (Figure 2c) nearly identical to the Black Phoebe's cpIPV (Figure 2d), in typical cpIPV contexts (e.g., in homogeneous strings near the beginning and end of dawn singing). These sounds resemble the Black's cpIPV in shape but are intermediate in frequency between the IPVs of the two parental species (Figure 2). The emergence of an apparently distinct htIPV and cpIPV in the hybrid may support the hypothesis that these different forms of the vocalization have separate evolutionary histories, further underscoring the independent inheritance of many features of a repertoire.

In summary, we hypothesize that Say's has retained the ancestral phoebe's repertoire of three song phrases, and that the Eastern and Black, with two phrase types each, have lost types I and III, respectively. Either the ancestral repertoire of three phrase types has been reconstituted in the hybrid, because the two parental species each contributed a phrase type missing in the other, or the htIPV was inherited from Black and is used in place of phrase type I.

Syntax of Dawn Singing

Dawn singing is highly stereotyped in all three species of *Sayornis* and can be described by simple combination rules applied to two or three highly stereotyped song types (Table 2). Daytime singing is much more variable (Smith 1969, 1970a, b; pers. obs.), as birds communicate at this time of day about, for example, their openness for interaction at close quarters. A daytime singer may give a long string of a single song type, such as RR1 (our song type II) in the Eastern, IPV (*pip*less song type I) in Say's, and cpIPV (also *pip*less song type I) in the Black. Two interacting birds may interleave various call types (Smith 1970b). Vigorous interactions are accompanied, as in most flycatchers, by rapid-fire strings of sounds that include recognizable repertoire elements and others that are not used alone but do have the general acoustic quality of flycatcher sounds (pers. obs.).

Our interest is interspecific comparison, so we focus on the most stereotyped behaviors, which are more likely to carry a phylogenetic signal. We agree with Smith (1969, 1970a, b) that during dawn song the Eastern and Black alternate their two song types in roughly equal measure (Table 2). Smith referred to each species' two song types with identical designators, "RR1" and "RR2." According to our reconstruction of homology, however, RR1 and RR2 in these two species cannot be homologous. RR1 of the Black is our song type I, while RR1 of the Eastern is our song type II. Although the homology of the Black's song type II (Figure 1j) is somewhat conjectural, it would be far-fetched to consider Figure 1d and Figure 1i homologues, given their great similarity to Figure 1b and 1a, respectively. By our terminology, the Eastern sings by alternating song types II and III, the Black by alternating I and II.

Table 2 Syntax of Dawn Singing in Phoebes[a]

Species	Song type	Relative abundance[b]	Following song type	Probability[c]	Modal lag[d]
Say's	I	0.799	I	0.743	1.2
			II	**0.108**	1.2
			III	**0.150**	1.4
	II	0.082	I	**0.982**	1.8
	III	0.119	I	**1.000**	1.2
Eastern	II	0.465	II	0.066	2.6
			III	**0.933**	1.6
	III	0.533	II	**0.812**	1.6
			III	0.187[e]	2.8
Black	I	0.487	I	0.082	2.2
			II	**0.918**	1.2
	II	0.508	I	**0.878**	1.2
			II	0.122	1.0
Hybrid	I	0.564	I	0.389	1.0
			II	0.106	1.0
			III	**0.505**	1.0
	II	0.104	I	**0.783**	2.0
			II	0.050	2.0
			III	0.167	2.1
	III	0.307	I	**0.834**	1.4
			II	**0.126**	1.0
			III	0.04	2.8

[a] Statistics pertain to continuous series of songs only; the very small number of calls inserted in these dawn performances were omitted, as were the transitions to and from them. Final songs were not scored, i.e., there are no transitions to "stop."

[b] Relative abundances of song types pooled over all dawn performances examined for the species. May differ slightly from the species totals obtained from the Appendix because of omission of calls and final songs.

[c] Probability is the relative frequency of the following song type when the preceding song type is the one listed in the song-type column. A following song type is omitted from this table if it has a relative frequency <0.02. Transition probabilities greater than expected by chance are in bold. For each species, the result of a test for independence of the contingency table was highly significant.

[d] Distributions of lag times are highly skewed to the right, with essentially no tail on the left, so the mode seems to capture the minimal "syntactical" lag.

[e] The 0.187 probability of repetition of song type III in the Eastern Phoebe is due almost entirely to a single bird (see Appendix).

In both species the tendency to alternate is highly nonrandom, i.e., they repeat one song type consecutively far less frequently than would be expected if song types were drawn from the repertoire randomly (Table 2). When in these species repetition does occur, the interval between songs is >50% greater than between unlike song types (Table 2). In fact, these intervals are almost great enough to allow insertion of the other song type without breaking the typical cadence when song types are alternated. In the hybrid, this pattern is also true of repetitions of song type III, which are separated by a gap long enough for insertion of song type I. The sole exception to this tendency to pause when repeating is with song type II in the Black, which is repeated slightly more quickly than the alternation of song types. These patterns of tempo suggest that, at least at dawn, syntax is highly conserved, even if communication demands that one song type be emphasized. The restriction of our sample to dawn song is perhaps responsible, also, for our not finding pauses after song type III in the Eastern, as reported by Kroodsma (1985, 2005).

Say's Phoebe, on the other hand, deploys its three song types in unequal proportions (Table 2). Song type I is by far the most frequent, and II is typically but not always least frequent. Song types II and III are so seldom repeated or follow each other (Table 2) that the few exceptions are likely aberrations. Despite the abundance of song type I, repetitions of it are underrepresented, showing again that the phoebes' songs are constructed according to rules. There is a brief pause after each song type II, suggesting that it marks the end of a syntactical subunit.

Like Say's Phoebe, but unlike both parental species, the hybrid Eastern × Black sang with three song types rather than two (Figure 1). One of these song phrases (III) is essentially identical to the Eastern parent's, one (II) is nicely intermediate between the Eastern's and Black's versions, and one (I) is somewhat enigmatic but appears to be part of the song type I–IPV complex (Figure 1). Most of the songs in a dawn performance were of type I (Table 2), and hence, with a reconstituted repertoire of three song types, this bird, a hybrid of the Black and Eastern Phoebes, sang in the manner of the only extant species with three song types, Say's Phoebe.

In summary, the nonrandomness of the song types' order (Table 2) indicates that some form of syntax does exist and directs the assembly of a performance. In dawn song, the consistency of song-type ratios from individual to individual (Appendix) suggests that at least at that time of day the innate species-specific syntax is on display and perhaps is concerned more with communicating fitness (e.g., Murphy et al. 2008) than openness to interaction (e.g., Smith 1969, 1970a, 2008).

As to homology of syntax across species, the predominant [I–II] pattern of the Black, where the brackets enclose minimum repeatable units, seems different from the [II–III] of the Eastern. It may be, however, that rules for combining unit elements can be homologous even when the unit elements are not. The general pattern of dawn singing in both the Eastern and the Black is [AB], where A and B represent the two song types in the species' repertoires. We suggest that they follow an identical, homologous syntax that operates on whatever it "finds" in the repertoire.

The initially surprising behavior of the hybrid supports our interpretation. Like Say's Phoebe, it sang [[I] II [I] III], with the caveat that neither II nor III occurred in every iteration of this pattern. One would expect the bird to have inherited the syntax of one parent or the other, or a blend of the two. That its singing did not meet this expectation does not necessarily mean it inherited the syntax of Say's; it may mean that all three species share a syntax that operates one way, [AB], with a two-song repertoire, and another, [[I] II [I] III], with three songs. In this event the syntax of all three species would be homologous. These combination rules, then, are not predicted by the content of the song types they organize. They are instead higher-order operators that appear to be inherited and neurally organized independently of the acoustic tokens they combine into a performance.

CONCLUSIONS AND RECOMMENDATIONS

Every song type used for dawn singing in *Sayornis* consists of a species-specific prefix and a terminal phrase type that is shared with at least one other species. Thus all song types are homologous in architecture, the prefixes are homologous, and their shared phrase types are homologous as well.

The rules for combining song types into dawn performances appear to be identical in the sister species the Black and the Eastern, even though the repertoire elements combined by this syntax differ partially. Moreover, song type I is not as dominant in the Black, with two song types, as it is in Say's, with three. Say's Phoebe uses three rather than two song types, and, unlike its congeners, does not use them with equal frequency. Rather, types II and III are embedded in a matrix of type I songs. Unequal usage of song types may be "different" syntax or it may not. We emphasize that it is a species-specific characteristic, not a variable result of a varying context of intraspecific communication, as in the daytime singing of the Eastern Phoebe (Smith 1969) and the Eastern Wood-Pewee (Smith 1988). In *Contopus* and *Empidonax* as well, species vary much more in the syntax of dawn singing than do individuals within a species, i.e., these differences are evolved rather than situational. On the usual criterion of reduced uncertainty (entropy) (Shannon 1948, Hailman et al. 1985) as well as the greater number of song types, Say's Phoebe's performances are more complex (contra Wolf 1997) than those of the Eastern and Black.

It is apparent from our independent assessment of homology that the labels (e.g., "RR1") Smith used to indicate "apparently homologous displays" (Smith 1970b:105) need revision. Possibly Smith's RRV phrases are homologues under Remane's first criterion, similarity of position, but we find similarities in special quality and intermediacy more compelling. It is important, in our view, not to assume that Smith's designators encode homology. We recommend instead the usage of our homologue designators I, II, and III in future interspecific comparisons of the singing behavior of the phoebes.

Further comparisons are warranted. We have examined three recordings of Black Phoebes from the eastern slopes of the Andes in Bolivia and northern Argentina. These birds used two song types that do not closely resemble those of Black Phoebes in the United States. One song type resembles type II of the Black × Eastern hybrid (Pieplow et al. 2008); the other, while clearly consistent with other song types of the other phoebes, is unique. The pacing of the South American birds' singing resembles that of the Eastern Phoebe. Like the hybrid's, their *pips* are highly variable. Southern populations clearly deserve more study, as the limited material we have reviewed suggests that southern Andean populations (*S. n. latirostris*) represent a species distinct from *S. n. semiatra* of western North America, as represented by our sample (Appendix). This putative species may not, however, be equivalent to the "*latirostris* group" (American Ornithologists' Union 1998), also known as the "White-winged Phoebe," which comprises also subspecies *S. n. angu-*

stirostris and occurs in South America and central and eastern Panama. The spectrogram presented as Figure 2b by Smith (1970a) is equivalent to one of the two song types sung by southernmost Black Phoebes, but Smith's cited recording location, Cerro Punta, is in westernmost Panama, in the range of subspecies *S. n. amnicola* of the North American *nigricans* group of subspecies (American Ornithologists' Union 1998).

Finally, the hybrid turned out to be very helpful in confirming and clarifying the song-type homologies we hypothesized on the basis of special quality. The significance of even single hybrids to understanding repertoire organization and evolution in an entire genus is underscored by the apparent atavism in the hybrid's arrangement of elements in its dawn performances. This surprising outcome suggests that the syntax of dawn song is contingent on repertoire organization and hence that any phoebe equipped with three song types will sing in the manner of Say's Phoebe, [I] II [I] III. If the Black and Eastern Phoebes continue to hybridize as their ranges expand, following the predictions of Pieplow et al. (2008), more recordings of hybrid phoebes should be sought. Replicate data will not only permit a test of our specific prediction about hybrids' syntax, they may clarify the mode of inheritance of phoebe syntax, which currently appears to be independent of the apparent quantitative inheritance of the acoustic characteristics of the sounds on which that syntax operates.

LITERATURE CITED

Amador, A., Goller, F., and Mindlin, G. B. 2008. Frequency modulation during song in a suboscine does not require vocal muscles. J. Neurophysiol. 99: 2383–2389.

American Ornithologists' Union. 1998. Check-list of North American Birds, 7th edition. Am. Ornithologists' Union, Washington, D.C.

Brooks, D. R., and McLennan, D. A. 1991. Phylogeny, Ecology, and Behavior. Univ. Chicago Press, Chicago.

Cicero, C., and Johnson, N. K. 2002. Phylogeny and character evolution in the *Empidonax* group of tyrant flycatchers (Aves:Tyrannidae): A test of W.E. Lanyon's hypothesis using mtDNA sequences. Molec. Phylogen. and Evol. 22:289–302.

Gardali, T., and Ballard, G. 2000. Warbling Vireo (*Vireo gilvus*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 551. Birds N. Am., Philadelphia.

Hailman, J. P., Ficken, M. S., and Ficken, R. W.. 1985. The "chick-a-dee" calls of *Parus atricapillus*: A recombinant system of animal communication compared with written English. Semiotica 56:191–224.

Kroodsma, D. E. 1984. Songs of the Alder Flycatcher (*Empidonax alnorum*) and Willow Flycatcher (*Empidonax traillii*) are innate. Auk 101:13–24.

Kroodsma, D. E. 1985. Development and use of two song forms by the Eastern Phoebe. Wilson Bull. 97: 21–29.

Kroodsma, D. E. 2005. The Singing Life of Birds. Houghton Mifflin, Boston.

Kroodsma, D. E., and Konishi, M. 1991. A suboscine bird (Eastern Phoebe, *Sayornis phoebe*) develops normal song without auditory feedback. Anim. Behav. 42:477–487.

Murphy, M. T., Sexton, K., Dolan, A. C., and Redmond, L. J. 2008. Dawn song of the Eastern Kingbird: An honest signal of male quality? Anim. Behav. 75:1075–1084.

Pieplow, N. D., Leukering, T., and Coley, E. 2008. An apparent hybrid Black × Eastern Phoebe (*Sayornis nigricans* × *phoebe*) from Colorado. W. Birds 39:209–219.

Remane, A. 1956. Die Grundlagen des natürlichen System der vergleichenden Anatomie und Phylogenetik, 2nd ed. Geest and Portig, Leipzig, Germany.

Schukman, J. M., and Wolf, B. O. 1998. Say's Phoebe (*Sayornis saya*), in The Birds of North America (A. Poole and F. Gill, eds.), no 374. Birds N. Am., Philadelphia.

Shannon, C. E. 1948. A mathematical theory of communication, Bell System Tech. J. 27:379–423, 623–656, as reprinted in C. E. Shannon and W. Weaver. 1949. The Mathematical Theory of Communication. Univ. Ill. Press, Urbana, IL.

Smith, W. J. 1966. Communication and relationships in the genus *Tyrannus*. Publ. Nuttall Ornithol. Club 6:1–250.

Smith, W. J. 1969. Displays of *Sayornis phoebe* (Aves, Tyrannidae). Behaviour 33: 283–322.

Smith, W. J. 1970a. Song-like displays of *Sayornis* species. Behaviour 37:64–84.

Smith, W. J. 1970b. Displays and message assortment in *Sayornis* species. Behaviour 37:85–112.

Smith, W. J. 1977. The Behavior of Communicating. Harvard Univ. Press, Cambridge, MA.

Smith, W. J. 1986. Signaling behavior: Contributions of different repertoires, in Dolphin Cognition and Behavior: A Comparative Approach (R. J. Schusterman, J. A. Thomas, and F. G. Woods, eds.), pp. 315–330. Erlbaum, Hillsdale, NJ.

Smith, W. J. 1988. Patterned daytime singing of the Eastern Wood-Pewee, *Contopus virens*. Anim. Behav. 36:1111–1123.

Smith, W. J. 1991. Singing is based on two markedly different kinds of signaling. J. Theor. Biol 152:241–253.

Smith, W. J., and A. M. Smith. 1992. Behavioral information provided by two song forms of the Eastern Kingbird, *T. tyrannus*. Behaviour 120:90–102.

Smith, W. J., and A. M. Smith. 1996. a. Vocal approaches elicited in playback interactions with Great Crested Flycatchers, *Myiarchus crinitus*. Ethology 102:724–735.

Suthers, R. A. 2004. How birds sing and why it matters, in Nature's Music: The Science of Birdsong (P. Marler and H. Slabberkoorn, eds.), pp. 272–295. Elsevier Academic Press, San Diego.

Weeks, H. P., Jr. 1994. Eastern Phoebe (*Sayornis phoebe*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 94. Acad. Nat. Sci., Philadelphia.

Wolf, B. O. 1997. Black Phoebe (*Sayornis nigricans*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 268. Acad. Nat. Sci., Philadelphia.

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Appendix. Samples Used for Quantitative Analysis of Acoustic Variation and Syntax[a]

Species	Locality	Time	Date	Sample[b]	Song type		
					I[c]	II[c]	III[c]
Black × Eastern							
	Loveland, Larimer Co.,Colorado	08:00	24 Apr 2007	NDP2007-12-01	1	5	4
	Loveland, Larimer Co.,Colorado	08:15	24 Apr 2007	NDP2007-12-03	10	8	15
	Loveland, Larimer Co.,Colorado	05:30	2 May 2007	NDP2007-15-01	169	24	70
	Loveland, Larimer Co.,Colorado	05:15	6 May 2007	NDP2007-16-01	150	23	93
Black							
	Sec. 34, T13N, R13W, McKinley Co., New Mexico	05:00–06:00	11 Jun 2000	DAM0016b	22	24	0
	Sec. 34, T13N, R13W, McKinley Co., New Mexico	05:00–06:00	11 Jun 2000	DAM0016b	31	43	0
	Paradise, Cochise Co., Arizona	06:39	19 Jun 2000	DAM0019a	7	5	0
	Red Bluff, Tehama Co., California	06:20	30 Mar 2008	DAM0808a	40	42	0
	Red Bluff, Tehama Co., California	06:40	30 Mar 2008	DAM0808a	54	73	0
	Lower Table Rock, Jackson Co.,Oregon	05:10	25 Jun 2009	DAM0930a	22	22	0
	Cosumnes Reserve, Sacramento Co., California[d]	10:00	5 Apr 2003	DAMdv0324	7	2	0
	Kern NWR, Kern Co., California	06:14	26 Feb 2004	DAMdv0401	22	20	0
	American Canyon Campground, San Luis Obispo Co.,California	05:54	18 May 1990	ML50171	26	30	0
	Cave Creek Canyon, Cochise Co., Arizona	05:01	26 May 1999	ML109083	37	37	0

(continued)

Appendix (*continued*)

Species	Locality	Time	Date	Sample[b]	Song type		
					I[c]	II[c]	III[c]
	Portal, Cochise Co., Arizona	06:05	23 May 1977	ML20890	31	15	0
Eastern							
	Davidson, Mecklenburg Co., North Carolina	06:25	21 Apr 2007	DAM0704a	0	60	61
	Montreat, Buncombe Co., North Carolina	06:39	28 Apr 2008	DAM0811b	0	8	12
	Montreat, Buncombe Co., North Carolina	06:40	29 Apr 2008	DAM0811b	0	5	6
	Montreat, Buncombe Co., North Carolina	06:41	28 Apr 2008	DAM0811b	0	7	8
	Montreat, Buncombe Co., North Carolina	06:50	30 Apr 2008	DAM0812a	0	26	25
	James Island, Charleston Co., South Carolina[d]	09:43	26 Mar 2003	DAMdv0319	0	37	32
	Nobleboro, Lincoln Co., Maine[d]	10:35	8 Jul 1962	BLB6054	0	11	10
	Lancaster, Fairfield Co.,Ohio[d]	08:21	28 May 1965	BLB7621	0	20	21
	Blendon Township, Franklin Co.,Ohio[d]	07:36	10 May 1975	BLB13454	0	21	20
	Lakewood, Oconto Co., Wisconsin	04:30	4 Jun 1988	BLB16915	0	27	26
	Georgesville, Franklin Co.,Ohio	06:50	21 Apr 1973	BLB12067	0	3	14
	Georgesville, Franklin Co.,Ohio	06:53	21 Apr 1973	BLB12095[e]	0	4	24
	Zaleski, Vinton Co., Ohio	05:47	12 Jun 1987	BLB16657	0	20	21
	Zaleski, Vinton Co., Ohio	05:48	12 Jun 1987	BLB16705[e]	0	7	7

Appendix (*continued*)

Species	Locality	Time	Date	Sample[b]	Song type		
					I[c]	II[c]	III[c]
Say's							
	Sec. 34, T13N, R13W, McKinley Co., New Mexico	05:47	09 Jun 2000	DAM0016b	41	8	9
	Sec. 34, T13N, R13W, McKinley Co., New Mexico	05:00–06:00	11 Jun 2000	DAM0016b	9	1	2
	Sec. 34, T13N, R13W, McKinley Co., New Mexico	05:26	30 Jun 2006	DAMdv0624	85	4	21
	Arizona	—	April	ML61892	13	6	2
	Longlake NWR, Moffit Co., North Dakota	dawn	01 Jun 1988	ML42215	94	10	15
	Malheur NWR, Harney Co.,Oregon	07:00	28 Sep 1994	ML107605	34	2	3
	Eureka, Juab Co.,Utah	06:00	26 Apr 1996	BLB28738	93	1	0
	Taylor Hwy., SE of Fairbanks, Alaska	06:00	11 Jun 1972	ML49907	24	5	1
	Tijuana NWR, San Diego Co., California	05:45	2 May 2002	ML120202	48	16	8
	Sheldon NWR, Humboldt Co., Nevada	05:08	3 Jun 1990	ML50502	131	12	25

[a] Each line represents a different individual except where indicated.

[b] BLB and ML accession numbers, analogue cassette tape numbers from McCallum's personal collection, or digital track numbers from Pieplow's personal collection.

[c] Number of songs of this type measured from this cut. Some long cuts were not completely assayed.

[d] Sample does not represent dawn singing and is not included in Table 2.

[e] Same individual and recording session as in line above.

NOTES

GROUND-NESTING MARBLED MURRELETS IN JUNEAU, ALASKA

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The Marbled Murrelet (*Brachyramphus marmoratus*) ranges from California to the Aleutian Islands, with the center of its abundance in south-central and southeastern Alaska (Piatt and Ford 1993, Nelson 1997). In the conterminous United States, Marbled Murrelets typically nest in old-growth forest on branches in the canopy (Nelson 1997, Piatt et al. 2007). Ground nests of Marbled Murrelets in North America have been known since 1931 (above treeline at 580 m elevation on Chichagof Island in southeastern Alaska), although a ground nest was not well described until 1978 (Carter and Sealy 2005). In British Columbia and Alaska, ground nests occur with increasing frequency to the north and west of the species' distribution. DeGange (1996) reported 34 nests in Alaska, of which 15 were on the ground; in Southeast Alaska alone, two of six nests were on the ground in forested areas.

Less is known, however, about the Marbled Murrelet's ground nests than about its tree nests. Here we describe and provide a photographic record of a ground nest in forest in Juneau, with supplementary information (previously unpublished) about two other ground nests in this area. We briefly discuss the use of ground nests in forested terrain in the Juneau area.

On 30 June 2009, Hocker and Willson discovered a ground nest of the Marbled Murrelet along Eagle Creek on Douglas Island, Juneau (58° 18.335′ N, 134° 28.132′ W). An adult, flushed from the nest, flew rapidly downstream and did not return for at least an hour.

The nest was located on a small mossy ledge close to the top of a nearly vertical cliff adjacent to a waterfall (Figure 1), at an elevation about 127 m. Flight distance to the nearest salt water (at low tide) in Gastineau Channel was about 1400 m and to the nearest deep water, suitable for foraging, was about 6 km. The surrounding vegetation was rainforest of Sitka spruce (*Picea sitchensis*) and western hemlock (*Tsuga heterophylla*), with a few Sitka alders (*Alnus sitchensis*) along the creek and an understory of *Vaccinium* spp., *Menziesia ferruginea*, and devil's club (*Oplopanax horridus*). This area was apparently logged selectively about 100 years ago, as attested by numerous large stumps, and windthrow had also left large snags and fallen logs.

The nest held one egg on June 30 (Figure 1). When we checked the nest again on July 10, no adult was present. Although observers did not approach the nest site closer than about 25 m, the adult may have flushed again. On the other hand, adults are known to leave an egg unattended for several hours (Nelson and Hamer 1997).

On August 3, the nest held a small chick, possibly about 6 days old (S. Kim Nelson pers. comm.). Armstrong photographed the chick at various stages of development until the brown and black down was lost and the nestling, ready to fledge, had black and white juvenal plumage (Figures 2–4). Marbled Murrelet chicks begin to lose their natal down about halfway through the nestling period (27–40 days long), gradually losing the down until a day or two before fledging, when the last of it is shed (Nelson and Hamer 1997).

We observed a daytime feeding of the chick at about 11:45 on 30 August. An adult, with a fish in its bill, was at the nest when we arrived at the lookout spot. It took at least 5 more minutes to transfer the fish to the chick, which appeared to have some

Figure 1. Marbled Murrelet egg in nest near Juneau, Alaska, 30 June 2009, photographed from about 2 m away. The nest was adjacent to a waterfall with northward access for takeoff and landing via the creek's canyon.

Photo by K. M. Hocker

difficulty in swallowing it. It is not unusual for adults delivering food to remain at the nest for some time and for feedings to last several minutes (Nelson and Hamer 1997). Although prey delivery is most common in the twilight hours, daytime feedings also occur (Nelson and Hamer 1997).

The chick fledged sometime between 16:00 on 1 September and 13:00 on 2 September, probably at night, well toward the end of the known nesting season in Alaska (Nelson and Hamer 1997), after an estimated nestling period of about 35 days. Fledglings typically weigh less than adults and have shorter wings; they are independent of their parents after they fledge (Nelson 1997). The deserted nest was surrounded by a characteristic white ring of feces and an accumulation of shed down (Figure 5).

The Marbled Murrelet's nest success appears to be low. One set of estimates is based on nests found by various means, which may include those that were easiest to find. Of 11 nests of known outcome in Alaska, only two (18%) were successful; elsewhere, only 33% of 91 nests were successful (Piatt et al. 2007). However, these values may be underestimates of success, if there is a bias toward nests that are relatively readily accessible to researchers. A study in British Columbia used radiotelemetry to find nests, reducing the potential bias of detection, and reported that 48% of 108 nests were successful (Piatt et al. 2007).

In addition to the nest we describe, two other ground nests of the Marbled Murrelet have been found in forests around Juneau. On 10 May 1999, an adult tended an egg on a cliff ledge near the junction of Nugget and Vista creeks, upstream of

Figure 2. Downy Marbled Murrelet nestling about 23 days old, 20 August 2009. All photos of the nestling were taken through a telescope from a lookout about 25 m away.

Photo by R. H. Armstrong

Figure 3. Marbled Murrelet nestling about 31 days old, 28 August 2009. The chick has shed much of its down.

Photo by R. H. Armstrong

Figure 4. Marbled Murrelet nestling about 35 days old in juvenal plumage and ready to fledge, 1 September 2009.

Photo by R. H. Armstrong

Figure 5. Empty nest of Marbled Murrelet after the chick fledged, with a typical ring of feces on the perimeter and an accumulation of matted, shed down.

Photo by R. H. Armstrong

Mendenhall Lake; this nest was at an elevation of about 320 m, at a distance of 10 km from Auke Bay, the nearest probable foraging area (Gwen Baluss pers. comm.). However, on 30 May, both egg and adult were gone, so the nest apparently failed. The other nest, found on 30 August 2006, was on Shelter Island near Auke Bay, approximately 1 km from the beach, and contained a chick about ready to fledge (Gus van Vliet pers. comm.).

Marbled Murrelets are emblematic of old-growth forest in the conterminous U. S., yet they are sufficiently flexible in their nesting requirements that they nest in treeless areas in the Aleutian Islands. In Southeast Alaska, they nest both in trees and on the ground in well-forested areas. Their use of ground nests in northern Southeast Alaska is probably not related to absence of large conifers, because large spruce and hemlock trees are relatively common. Instead, we suggest that the prevalence of coastal streams with high gradients and associated openings, cliffs, and rocky outcrops in rugged terrain may offer numerous potential nest sites with good access for takeoff and landing, a criterion thought to be important to the Marbled Murrelet (e.g., Nelson and Hamer 1997).

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LITERATURE CITED

Carter, H. R., and Sealy, S. G. 2005. Who solved the mystery of the Marbled Murrelet? Northwestern Naturalist 86:2–11.

DeGange, A. R. 1996. Conservation assessment for the Marbled Murrelet in southeast Alaska. U.S. Dept. Agric. Forest Service Gen. Tech. Rep. PNW-388.

Nelson, S. K. 1997. Marbled Murrelet (*Brachyramphus marmoratus*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 276. Acad. Nat. Sci., Philadelphia.

Nelson, S. K., and Hamer, T. E. 1997. Nesting biology and behavior of the Marbled Murrelet, in Ecology and conservation of the Marbled Murrelet (C. J. Ralph, G. L. Hunt Jr., M. G. Raphael, and J. F. Piatt, eds.), pp. 57–67. U.S. Dept. Agric. Forest Service Gen. Tech. Rep. PSW-152; www.fs.fed.us/psw/publications/documents/gtr-152/.

Piatt, J. F., and Ford R. G. 1993. Distribution and abundance of Marbled Murrelets in Alaska. Condor 95:662–669.

Piatt, J. F., Kuletz, K. J., Burger, A. E., Hatch, S. A., Friesen, V. L., Birt, T. P., Arimitsu, M. L., Drew, G. S., Harding, A. M. A., and Bixler, K. S. 2007. Status review of the Marbled Murrelet (*Brachyramphus marmoratus*) in Alaska and British Columbia: U.S. Geological Survey Open-File Report 2006-1387; http://pubs.usgs.gov/of/2006/1387/pdf/ofr20061387.pdf.

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NOTES

TWO ORIENTAL TURTLE-DOVES (*STREPTOPELIA ORIENTALIS*) REACH CALIFORNIA

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The Oriental Turtle-Dove (*Streptopelia orientalis*), also known as the Rufous Turtle-Dove (e.g., Cramp 1985) or the Eastern Turtle-Dove (Goodwin 1983), is a widespread polytypic Asian species that breeds from the Ural Mountains to the Pacific coast of the Russian Far East, including Sakhalin and the Kuril Islands. It also breeds in Japan (south to the Ryukyu Islands) and on Taiwan. It breeds south to west-central Asia, the Indian subcontinent, Myanmar, and northern Indochina. In the Russian Far East its breeding range extends east to the Sea of Okhotsk and as far north as 64° N in the Lena River valley (Wilson and Korovin 2003). Although the species is resident in parts of its range, it vacates the entire northern portion of the breeding range (e.g., all of Russia) in the fall (Wilson and Korovin 2003). These migratory birds winter mostly within the range of residency farther south. Over large portions of northern, central, and western China, the species is only a passage migrant (see range map in Wilson and Korovin 2003).

We report here on two records from California, both in the late fall and early winter: 29 October 1988 at Furnace Creek Ranch, Death Valley National Park, Inyo County, and 9–31 December 2002 at Bolinas, Marin County (California Bird Records Committee 2007); archived photos and a videotape of the latter bird are stored with the record (2003-036) in the files of the California Bird Records Committee (CBRC) at the Western Foundation of Vertebrate Zoology in Camarillo, California.

The first California record at Furnace Creek Ranch involved a bird initially seen in flight early in the morning. Since the identification was uncertain, a small group (Dunn, N. Bruce Broadbooks, Brian E. Daniels, and Douglas R. Willick) searched for it and found it perched in the central date orchard, eventually getting close views in good light for some 5 minutes. Dunn identified it then as a Rufous or Oriental Turtle-Dove, a species he had seen previously in Japan and Thailand. While it was in view the observers reviewed the identification This discussion included elimination of the smaller and paler European Turtle-Dove (*Streptopelia turtur*), another highly migratory Old World species recorded on three occasions in spring and summer on the east coast of North America (Saint Pierre Island, Massachusetts, and Florida) and more than 200 times from Iceland (Pranty et al. 2008).

We left the bird sitting and went in search of other birders; subsequently, we had only one view of the bird (in flight). At the time observers considered the bird a likely escapee, but ultimately Dunn chose to submit the record to the CBRC. The record circulated for a full four rounds before it was finally rejected in 1993 on identification grounds (Heindel and Garrett 1995). Initially, most committee members, including Dunn, questioned the bird's origin as a vagrant but accepted the identification. Ultimately, three of the ten members accepted the record, four accepted the identification, but questioned the origin, and three members questioned the identification. Those who questioned the identification did so because the descriptions (only Dunn and later Broadbooks and Guy McCaskie submitted details, and McCaskie's views were of the bird in flight only) lacked detail sufficient to substantiate a first state record. With the appearance and acceptance (San Miguel and McGrath 2005) of the Bolinas bird (below), the CBRC chose to re-review the earlier record; it was accepted after one circulation, although one member still questioned the identification, and another questioned the origin (Cole et al. 2006).

California's second Oriental Turtle-Dove was found by Doug Gallagher in his yard in Bolinas on 9 December 2002 (Figure 1). The next day he stopped in Hansen's art

Figure 1. Oriental Turtle-Dove (*Streptopelia orientalis*) at Bolinas, Marin County, California, photographed on 9 or 10 December 2002. Note the stocky shape, the black-and-white neck stripes forming a solid patch, the fringed coverts, the dark gray rump, and the pale gray tail tip. The blackish and rounded covert centers with rufous fringes on most of the wing coverts and on the tertials distinguish the Oriental from the smaller European Turtle-Dove (*S. turtur*) and, in combination with the darker coloration, including a dark blue-gray rump, indicate that this individual is of the eastern *orientalis* group of subspecies rather than one of the more western and southern races (including *meena*). Note also the darker and fresher pale-fringed inner primaries contrasting with the browner and worn older outer primaries, indicating a hatch-year bird.

Photo by Ryan Gallagher

gallery in Bolinas and indicated that he had found an unfamiliar dove. Hansen and Gallagher checked the yard, and after about 15 minutes found the bird sitting on a branch. The bird was facing the observers, and when it turned its face, showing its red eye, Hansen postulated that it could be a White-winged Dove. But then it turned sideways showing the beautiful scaled upperparts, and Hansen recognized it as the same species that Dunn and others had seen in Death Valley over a decade before. Fortunately, Hansen documented the sighting with a video camera as he and Gallagher watched it for 20 to 30 minutes. Because the bird was on private property, only one small group that afternoon was given permission to see it. If it remained, Gallagher was open to letting in groups after 1 January. Those who saw it that afternoon included Peter Pyle and Steve N. G. Howell, both of whom submitted written descriptions (Howell also took and submitted photos), David F. DeSante, W. David Shuford, Richard W. Stallcup, and Lang Stevenson. Although it was occasionally seen after 10 December, it did not remain until January, being last seen on 31 December.

Detailed views of the Bolinas bird by Howell and Pyle revealed two generations of feathers, including the primaries (primaries 7–10 browner and more worn, primaries 1–6 darker and fresh with pale tips). These molt limits indicated that this individual was a hatching-year bird. The bird also had only a half-grown tail, causing some to wonder whether the bird was an escapee from captivity, but alternatively interpreted as evidence of a recent encounter with a predator. CBRC members Luke Cole and Michael M. Rogers investigated the status of the species in captivity (CBRC files); several aviculturists they contacted indicated that the species was now only rarely kept in captivity in the United States, though they thought the Bolinas bird was still likely an escapee. Ironically, despite their conclusions about the Bolinas bird, their statements that it was rarely kept helped allay many of the CBRC's concerns regarding origin. Lewington et al. (1991) reported the species to be kept in captivity in many places in Europe. The record passed 8–2 on the second round, the two negative votes accepting the identification but questioning the origin.

Elsewhere in North America the Oriental Turtle-Dove has been recorded on seven occasions; not surprisingly, five of these records come from western Alaska in late spring and summer. In chronological order these are 23 June–18 July 1984, St. Paul Island, Pribilofs (archived photos at University of Alaska Museum [UAM], Fairbanks; Gibson and Kessel 1992), 20–26 July 1986, in the Bering Sea aboard a ship that was "usually within 50 miles (80 km) of the Pribilofs" (archived photos at UAM; Gibson and Kessel 1992), 20 May–12 June 1989, Attu Island, Aleutians (archived photos at UAM; published color photo in Birding 23:192, 1991; Gibson and Kessel 1992), 10 June to at least 3 July 1995, Unalaska Island, Aleutians (archived photos at UAM; published black-and-white photo in National Audubon Society Field Notes 49:964, 1995; Gibson and Byrd 2007), and 21 May–3 June 1996, Attu Island, Aleutians (archived photos at UAM; Gibson and Byrd 2007). In addition, there are two records from western Canada during the summer: 14–25 August 1992, Tofino, Vancouver Island, British Columbia (Paterson 1992, Campbell et al. 2001:628; color photos published in both sources) and 30 June 2008, Whitehorse, Yukon (North American Birds 62:577, 2009; color photo on page 644).

Although the Alaska and Canadian records are from late spring and summer, the two California records are for late fall and early winter, matching the timing of occurrences in Fennoscandia and northwestern Europe (Lewington et al. 1991). Some of the records from Sweden involve birds returning for multiple winters. Near the northern end of the breeding range in the Urals and western Siberia, fall migration of the subspecies *meena* and *orientalis* begins during the last third of August and peaks in mid-September, and a few stragglers occur as late as early October (Wilson and Korovin 2003). Farther south in Hong Kong, where the species does not breed and where there are only a few summer records, fall arrival of *orientalis*, the only recorded subspecies, is not until the last week of October, with most birds arriving after the second week of November (Carey et al. 2001). Carey et al. (2001) termed the Oriental Turtle-Dove a common passage migrant and winter visitor with maximum counts in excess of 700 birds.

The Oriental Turtle-Dove looks like no other North American dove or pigeon. It is illustrated in at least one North American field guide (Dunn and Alderfer 2006) and in many European and Asian guides. Within the Old World the most similar species is the European Turtle-Dove; the identification of these two species is thoroughly covered by Lewington et al. (1991), Hirschfeld (1992), Cottridge and Vinicombe (1996), Harris et al. (1996), Beaman and Madge (1998), and Gibbs et al. (2001). Briefly, the European Turtle-Dove is distinctly smaller and paler and has more pointed, less rounded, dark centers to the wing coverts and scapulars with broader rufous fringes. The Oriental Turtle-Dove is 25–75% heavier, giving it a bulkier look in the field, accentuated by its shorter tail and proportionately shorter, more rounded wings (Cottridge and Vinicombe 1996).

The Oriental Turtle-Dove is strongly polytypic. Five (Peters 1937, Vaurie 1965) or six (Goodwin 1983, del Hoyo et al. 1997, Gibbs et al. 2001, Dickinson 2003) subspecies are generally recognized, the difference being that more recent treatments (cited above) recognize *erythrocephala*. There is a closely allied eastern group of subspecies that consists of *orientalis* in most of the range, breeding west in Russia to about 87° E and south and east to Mongolia, Yunnan, and northern Indochina, *stimpsoni* from the Ryukyu Islands, and *ori* from Taiwan. The latter two races are both very similar to nominate *orientalis*, and their validity has been questioned (Gibbs et al. 2001). To the west and south are three races, *meena* from western Siberia to northern Pakistan and central Nepal, *agricola* from the eastern Himalayan region of northeastern India to Myanmar, and *erythrocephala* of peninsular India. Two of the races, western *meena* and eastern *orientalis*, both breed quite far north and are highly migratory. Both have strayed well to the west, especially to Fennoscandia, but also to northwestern Europe, including the Faeroe Islands, where one apparently wintered (Dutch Birding 28:172, 2006), southern Europe, the Balkans, and the Middle East (Lewington et al. 1991, Shirihai 1996). Wilson and Korovin (2003) suggested that because of morphological and vocal differences these two groups (*meena* and *orientalis*) might be separate species and that further detailed studies, including DNA analysis, are warranted. Rasmussen and Anderton (2005) described the vocalizations and indicate that the Himalayan birds (*meena* and *agricola*) all sound very similar and are quite different from recordings of the nominate race made in Japan. Eastern *orientalis* intergrades with *meena* in central Siberia between Achinsk and the Ob River and with *agricola* from northwestern Yunnan and northern Myanmar west through the foothills and lower mountains of the Himalayas to Sikkim (Vaurie 1965), although Rassmussen and Anderton (2005) listed *orientalis* as only a vagrant to India. Wilson and Korovin (2003) found *orientalis* in the Novokuznetsk district of the Kemerovo region (about 87° E, western Siberia) and *meena* from the Urals to be closely similar in habitat selection for breeding and in the timing of their migrations.

Distinguishing *meena* from nominate *orientalis* is reasonably straightforward given decent views. Lewington et al. (1991), Hirschfeld (1992), Cottridge and Vinicombe (1996), Harris et al. (1996), Beaman and Madge (1998), Gibbs et al. (2001), and Wilson and Korovin (2003) provided details on their identification. The latter is slightly larger and bulkier and is overall darker and richer in coloration with a browner crown and back and broader and redder fringes to the blacker-centered scapulars and inner wing coverts; it has a bluish-gray, not brownish, rump. Most references (e.g., Vaurie 1965, Goodwin 1983, Cramp 1985, Hirschfeld 1992, Cottridge and Vinicombe 1996, Harris et al. 1996, Gibbs et al. 2001, Wilson and Korovin 2003) have emphasized tail-tip color as a key feature distinguishing the eastern races of the Oriental Turtle-Dove from the more westerly and Indo-Himalayan subspecies, but that difference has been questioned by Leader (2004, illustrated with color photos of spread tails), who indicated from his experience with nominate *orientalis* in Hong Kong and northeastern China that tail-tip color, as in *meena*, varies from white to dull gray and thus can be used only as a supporting character. He concluded that other characters, such as those detailed by Hirschfeld (1992) and Harris et al. (1996), especially size and structure, are much more useful.

Of the nine North American records of the Oriental Turtle-Dove to date, eight have been documented with photographs. The characters of all the birds are consistent with the eastern group of races, and parts of the description of the Death Valley bird also indicate that it was likely a member of the eastern group. Within the eastern group of races—given that the nominate race is widespread and northern populations are highly migratory while the other two are resident on the Ryukyu Islands and Taiwan—it seems highly likely that all North American records pertain to the nominate race, but to date there is no specimen to confirm this.

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are grateful. We also thank Brian E. Daniels for sharing his memory concerning the sighting of the Furnace Creek bird. We also thank the members of the California Bird Records Committee for their comments, many based on the members' own thorough research.

LITERATURE CITED

Beaman, M., and Madge, S. 1998. The Handbook of Bird Identification. Princeton University Press, Princeton, NJ.

California Bird Records Committee (R. A. Hamilton, M. A. Patten, and R. A. Erickson, eds). 2007. Rare Birds of California. W. Field Ornithol., Camarillo, CA.

Campbell, R. W., Dawe, N. K., McTaggart-Cowan, I., Cooper, J. M., Kaiser, G. W., Stewart, A. C., and McNall, M. C. E. 2001. The Birds of British Columbia, Vol. 4. Univ. Br. Columbia Press, Vancouver, BC.

Carey, G. J., Chalmers, M. L., Diskin, D. A., Kennerley, D. A., Leader, P. R., Leven, P. J., Lewthwaite, M. R., Melville, R. W., Turnbull, D. S., and Young, L. 2001. The Avifauna of Hong Kong. Hong Kong Bird Watching Society, Hong Kong.

Cole, L. W., Nelson, K. N., and Sterling, J. 2006. The 30th report of the California Bird Records Committee: 2004 records. W. Birds 37:65–105.

Cottridge, D., and Vinicombe, K. 1996. Rare Birds in Britan & Ireland, A Photographic Record. HarperCollins, London.

Cramp, S. (ed.). 1985. The Birds of the Western Palearctic, Vol. 4. Oxford Univ. Press, Oxford, England.

Del Hoyo, J., Elliott, A., and Sargatal, J. (eds.). 1997. Handbook of the Birds of the World, Vol. 4. Sandgrouse to Cuckoos. Lynx Edicions, Barcelona.

Dickinson, E.C. (ed.) 2003. The Howard & Moore Complete Checklist of the Birds of the World, 3rd edition. Princeton Univ. Press, Princeton, NJ.

Dunn, J. L., and Alderfer, J. 2006. Field Guide to the Birds of North America, 5th edition. Natl. Geogr. Soc., Washington, DC.

Gibbs, D., Barnes, E., and Cox, J. 2001. Pigeons and Doves. Yale Univ. Press, New Haven, CT.

Gibson, D. D., and Byrd, G. V. 2007. Birds of the Aleutian Islands, Alaska. Nuttall Ornithol. Club and American Ornithol. Union Series in Ornithology 1.

Gibson, D. D., and Kessel, B. 1992. Seventy-four new avian taxa documented in Alaska 1976–1991. Condor 94:454–467.

Goodwin, D. 1983. Pigeons and Doves of the World, 3rd edition. British Museum (Natural History), London.

Harris, A., Shirihai, H., and Christie, D. 1996. The Macmillan Birder's Guide to European and Middle Eastern Birds. Macmillan, London.

Heindel, M. T., and Garrett, K. L. 1995. Sixteenth annual report of the California Bird Records Committee. W. Birds 26:1–33.

Hirschfeld, E. 1992. Identification of Rufous Turtle Dove. Birding World 5:52–57.

Leader, P. 2004. Tail pattern of Oriental Turtle Dove. Br. Birds 97:98–100.

Lewington, I., Alström, P., and Colston, P. 1991. Rare Birds of Britain and Europe. HarperCollins, London.

Paterson, A. 1992. An extraordinary backyard. Birders Journal 1:339–342.

Peters, J. L. 1937. Check-list of Birds of the World, Vol. III. Harvard Univ. Press, Cambridge, MA.

Pranty, B., Dunn, J. L., Heinl, S. C., Kratter, A. W., Lehman, P. E., Lockwood, M. W., Mactavish, B., and Zimmer, K. J. 2008. ABA Checklist: Birds of the Continental United States and Canada, 7th edition. Am. Birding Assoc., Colorado Springs, CO.

Rasmussen, P. C., and Anderton, J.C. 2005. Birds of South Asia. The Ripley Guide. Vol. 2. Smithsonian Institution, Washington, D.C.

San Miguel, M., and McGrath, T. 2005. Report of the California Bird Records Committee: 2003 records. W. Birds 36:78–113.

Shirihai, H. 1996. The Birds of Israel. Academic Press, London.

Vaurie, C. 1965. The Birds of the Palearctic Fauna. Non-Passeriformes. H. F. and G. Witherby, London.

Wilson, M. G., and Korovin, V.A. 2003. Oriental Turtle Dove breeding in the Western Palearctic. Br. Birds 96:234–241.

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A LITTLE BUNTING REACHES BAJA CALIFORNIA SUR

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At midday on 8 October 2008, we discovered a Little Bunting (*Emberiza pusilla*) at Rancho San José de Castro on the Vizcaíno Peninsula, Baja California Sur (cover photo, Figure 1). This sighting represents the first record of this Old World species from Mexico and only the third for North America south of Alaska.

Rancho San José de Castro is located at 27° 32′ 20.83″ N, 114° 28′ 24.29″ W, approximately 3 km toward Bahía Asunción south of the main road from Ejido Vizcaíno to Bahía Tortugas. The ranch consists of a few small structures and dwellings, a small livestock pen, a natural spring and a pond about 50 m wide, an orchard, and several large trees and plantings. It is one of several small ranches that dot the immense, xeric landscape of the Vizcaíno Peninsula, a rugged and barren promontory jutting far out into the Pacific Ocean about midway down the Baja California Peninsula, south and west of Guerrero Negro. Its proximity to the ocean, isolation, and barren landscape, with only a few remote ranches and fishing villages, make it an ideal location for finding migrants and vagrants (Howell et al. 2001). Ever since the discovery of Mexico's first Arctic Warbler (*Phylloscopus borealis*) there (Pyle and Howell (1993), it has been birded nearly annually, producing a number of noteworthy sightings (1991–2000 results summarized by Erickson and Howell 2001).

On 8 October 2008 we arrived around noon and shortly thereafter discovered a small emberizid about the size of a Chipping Sparrow (*Spizella passerina*) foraging on the ground at the livestock pen. Because of its bold chestnut cheeks and small ear covert spot (a field mark characteristic of some Old World buntings), Radamaker suspected the Little Bunting, but seconds later the bird disappeared from view behind the livestock pen. After several tension-filled minutes, Powell relocated the bird some meters from its original location along the shore of the pond, but the bird abruptly disappeared again. After 15 minutes, we relocated it several meters away in the orchard.

This time the bird stayed in the general area, but, frustratingly, it kept mostly hidden in some tall dense clumps of Bermuda grass (*Cynodon dactylon*), betraying itself with only teasing glimpses and slight movements of grass. We waited several long minutes, and eventually it came into the open, where Radamaker was able to photograph it at close range. We studied it for about an hour, taking note of the field marks: bold chestnut face outlined at the rear and below with black, obvious white eye ring, pale spot on the ear coverts, buffy central crown stripe, broad supercilium, strong white malar stripe, fine black streaking on the breast and flanks, and, in flight, conspicuous white outer tail feathers. We compared these field marks directly to the descriptions and plates in several field guides (WBSJ 1982, Jonsson 1993, and Svensson et al. 1999)—Old World references we brought along in hopes they would be needed! The combination of the bird's small size, distinct pale eye ring, and chestnut face eliminated confusion with other similar looking Old World buntings, such as the Rustic (*E. rustica*) and Reed (*E. schoeniclus*) buntings. The bird likely was an immature on the basis of the shape of the rectrices and condition of the primary coverts (P. Pyle pers. comm.), grayish back, pale and indistinct lateral crown stripes and supercilium, and the dense black streaking on the breast (Cramp and Perrins 1994). For a thorough treatment of the identification of and age criteria for the Little Bunting see Wallace (1980), Bradshaw (1991), and Cramp and Perrins (1994).

Figure 1. Little Bunting at Rancho San José de Castro, Vizcaíno Peninsula, Baja California Sur, 8 October 2008.

Photo by Kurt Radamaker

Because of the bird's erratic movements and flighty behavior when initially seen, followed by its settling down and staying in one place, allowing close approach until we walked away from it, we surmise the bird had arrived recently, probably that morning. Furthermore, the location had been checked for birds three days earlier on 5 October 2008 by R. A. Erickson, M. J. Billings, and P. A. Gaede, who did not see the bunting (Erickson pers. comm.).

Other migratory birds at Rancho San José de Castro that day were one Long-billed Dowitcher (*Limnodromus scolopaceus*), one Red-naped Sapsucker (*Sphyrapicus nuchalis*), one Hermit Thrush (*Catharus guttatus*), two Yellow-rumped Warblers (*Dendroica coronata*), and one vagrant from eastern North America, a Blackburnian Warbler (*Dendroica fusca*). However, earlier that morning at the nearby coastal town of Bahía Asunción, we observed a noteworthy 17 species of warbler, indicating an influx of migrants.

The Little Bunting breeds across the far northern part of Eurasia from the Russian Far East to northern Scandinavia. Southward migration begins in mid-August, with the majority of birds leaving the breeding grounds by mid-September and arriving on the wintering grounds mostly in October (Cramp and Perrins 1994). The winter range extends from China to eastern Nepal and northeastern India. The Little Bunting is a vagrant to most European and Middle Eastern countries (Byers et al. 1995) and is a regular migrant and winter visitor to Japan (Brazil 1991). The first documented occurrence in North America was of one found 6 September 1970 on a U.S. Coast Guard icebreaker operating in the Chukchi Sea 150 miles off Icy Cape, Alaska (Watson et al. 1974). The Little Bunting is now casual during fall in western Alaska, with 13 reports of 26 individuals (ABA 2008). With the advent in the late 1990s of regular fall coverage of western Alaska, the Little Bunting has been found from 25 August to 3 October in most years at Gambell, St. Lawrence Island (P. Lehman pers. comm.), with a high of 10 individuals in 2007 (Tobish 2007). In contrast, there is only one spring record for Alaska and North America, of one bird photographed at Gambell 2–4 June 2008 (P. Lehman in litt.). The only previous North American records south of Alaska are of single Little Buntings photographed at Point Loma, San Diego County, California, 21–24 October 1991 (McCaskie 1993) and at Southeast Farallon Island, San Francisco County, California, 27–28 September 2002 (Hamilton et al. 2007).

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LITERATURE CITED

American Birding Association (ABA). 2008. ABA Checklist: Birds of the Continental United States and Canada, 7th ed. Am. Birding Assoc., Colorado Springs, CO.

Bradshaw, C. 1991. Identification of Little and Rustic Buntings. Birding World 4:30–13.

Brazil, M. A. 1991. The Birds of Japan. Smithsonian Inst. Press, Washington, D.C.

Byers, C., Curson, J., and Olsson, U. 1995. Sparrows and Buntings: A Guide to the Sparrows and Buntings of North America and the World. Houghton Mifflin, Boston.

Cramp, S., and Perrins, C. M. (eds.) 1994. Handbook of the Birds of Europe, the Middle East and North Africa: The Birds of the Western Palearctic. Vol. IX: Buntings and New World Warblers. Oxford Univ. Press, Oxford, England.

Erickson, R. A., and Howell, S. N. G. (eds.). 2007. Birds of the Baja California Peninsula: Status, Distribution, and Taxonomy. Am. Birding Assoc. Monogr. Field Ornithol. 3.

Hamilton, R. A., Patten, M. A., and Erickson, R. A. (eds.). 2007. Rare Birds of California. W. Field Ornithol., Camarillo, CA.

Howell, S. N. G., Erickson, R. A., Hamilton, R. A., and Patten, M. A. 2001. An annotated checklist of the birds of Baja California and Baja California Sur, in Birds of the Baja California Peninsula: Status, Distribution, and Taxonomy (R. A. Erickson and S. N. G. Howell, eds.), pp. 171–203. Am. Birding Assoc. Monogr. Field Ornithol. 3.

Jonsson, L. 1993. Birds of Europe with North Africa and the Middle East. Princeton Univ. Press, Princeton, NJ.

McCaskie, G. 1993. A Little Bunting reaches California. W. Birds: 24:95–97

Svensson, L., Mullarney, K., Zetterström, D., and Grant, P. J. 1999. Collins Bird Guide. Harper Collins, London.

Pyle, P., and Howell, S. N. G. 1993. An Arctic Warbler in Baja California, Mexico. W. Birds 24:53–56

Tobish, T. 2007. Fall migration: Alaska. North American Birds 62:129–135

Wallace, D. I. M. 1980. Distinguishing Little and Reed Buntings, in Frontiers of Bird Identification (J. T. R. Sharrock, ed.), pp. 236–244. MacMillan, London.

Watson, G. E., Angle, J. P., and Browning, M. R. 1974. First North American record of Little Bunting in eastern Chukchi Sea. Auk 91:417.

Wild Bird Society of Japan (WBSJ). 1982. A Field Guide to the Birds of Japan. Wild Bird Soc. Japan, Tokyo.

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Little Bunting

Sketch by George C. West

BOOK REVIEWS

Avian Invasions: The Ecology & Evolution of Exotic Birds, by Tim M. Blackburn, Julie L. Lockwood, and Phillip Cassey. 2009. Oxford University Press. 305 pages, numerous figures and tables. Paperback, $55.00. ISBN 978-0-19-923255-0.

Over the past 20 years, there has been an explosion of interest in the ecology and evolutionary biology of introduced species, particularly birds. The aim of *Avian Invasions: The Ecology & Evolution of Exotic Birds* is to summarize the current state of knowledge of birds introduced outside their native range. Given the large number of papers that have been published on this topic during the past few decades, this goal is ambitious.

As the cover states, the target audience is "professional avian biologists and ornithologists, invasion ecologists, and graduate students of ecology, evolution and conservation." *Avian Invasions* is essentially a short textbook on the biology of non-native birds that focuses on identifying areas of agreement (and disagreement) in papers published in this field over the past few decades. Unlike Long's 1981 *Introduced Birds of the World*, *Avian Invasions* does not provide a catalog of introductions around the globe. Instead, it describes our current state of knowledge on the patterns and processes of avian introduction, establishment, and (for some species) range expansions. It cites numerous studies of established exotics in the Hawaiian Islands, for example, but offers little detailed information on introduced birds on the mainland of western North America.

The book is divided into ten chapters. The first briefly introduces the topic of exotic birds and explains why studying non-native species is of interest. The second discusses patterns of transport and release of exotic birds and discusses in some detail the role of acclimatization societies in introducing and establishing them. Chapter 3 discusses how sporadic events such as unusually high mortality caused by an unusually cold winter may interact with the number of individuals introduced and the number of repeated introductions to help explain why some introductions succeed while others fail. Chapter 4 examines which traits of a species affect the success of establishment, while Chapter 5 examines whether traits of a locality can help predict that success. Chapter 6 discusses mathematical models of spread. Chapter 7 looks at patterns of species richness and diversity in space and considers whether islands are more easily invaded than the mainland and whether biotic resistance may limit an invasion's success. Chapter 8 addresses the extent of genetic diversity in introduced species, while Chapter 9 focuses on evidence for microevolution in introduced populations. The final chapter summarizes the highlights of each of the nine preceding chapters and suggests that a coherent picture of the biology of avian invasions is beginning to emerge.

Overall, the book does a nice job of discussing numerous studies of avian ecology and summarizing areas of agreement. In particular, I was impressed that the authors reiterated multiple times that the number of individuals introduced into an area (what they term "propagule pressure") needs to be controlled for when other factors that may influence the introduction's success are examined. I also liked how they broke invasion ecology into four stages: (1) transport, (2) introduction, (3) establishment, and (4) spread. This framework is useful for several reasons, not least because it helps identify characters that may influence an invasion's success at each stage. The authors also do a good job of describing potential avenues of research for other investigators at each stage.

The authors are to be commended for mentioning important papers and concepts without going into too much detail in each chapter. I found Chapter 6 a bit weak, however, as it contains only a cursory overview of some of the more recent advances in mathematical modeling of range expansions (for example, hierarchical Bayesian models receive only a sentence in this chapter).

Each chapter is methodical and well researched, although the prose is generally a bit dry. Nonetheless, I found a few sections that elicited a smile. For example, in the concluding chapter the authors wrote, "In other words, the study of the early invasion stages is ecologically boring and nearly impossible to obtain funds to explore from basic science initiatives that value experimental scientific approaches." While this may be a bit of an overstatement, there is a substantial body of literature on the variables that influence an introduction's success.

Overall, this book does a good job of summarizing areas of agreement, disagreement and avenues of potential research on introduced birds. It will be a valuable reference for anyone who is interested in studying the ecology of avian invasions.

Chris Butler

Birds of the US–Mexico Borderlands: Distribution, Ecology, and Conservation, by Janet Ruth, Tim Brush, and David Krueper, editors. 2008. 165 pages, over 60 black-and-white photos, tables, maps and figures. Three color maps and figures. Paperback, $20.00. ISBN 978-0-943610-84-9. Order through http://cooper.org.

Birds of the US–Mexico Borderlands: Distribution, Ecology, and Conservation is the latest *Studies in Avian Biology* from the Cooper Ornithological Society. This volume is an assemblage of the papers presented at the North American Ornithological Conference held in Veracruz, Mexico, on October 2006. It is organized into four sections of two to four papers addressing the topics of changes in distribution and abundance, population trends and ecology of riparian and wetland birds, population trends and ecology of grassland birds, and new technological applications and bird-conservation planning.

The preface provides an excellent overview of the geography, human population statistics, and bird and other biotic communities of the borderlands region. The section includes two maps of the region, one general and the other in color, of the biotic communities. The preface also lists the species recognized as being of concern in the region. It also clarifies one important question: what defines the "borderlands region"? The inevitably arbitrary definition is anything within 325 km (202 miles) of the US–Mexico border. The selection includes all of the habitats typifying this region.

The first two papers in the first section describe the recent shifts in the breeding status of the avifauna of the lower Rio Grande Valley and Big Bend National Park, respectively. Surveys in the lower Rio Grande Valley by Timothy Brush from 2003 to 2007 revealed that populations of 19 breeding species have increased whereas 9 species have declined, ceased breeding, or have been extirpated. The paper on Big Bend National Park presents similar results for an additional 30 species found there. The third paper is a more complete overview of the bird life of northern Sonora, and the last documents the long-term declines, along with the recent increase, of breeding Royal Terns along the Pacific coast of southern California and Baja California.

In the second section, addressing riparian and wetland species, two of the papers are somewhat general analyses of avian habitat use and interactions, one of wintering birds in riparian habitat of Sonora, and the other of all species using riparian habitat along the lower Colorado River, site of some of the region's worst man-made environmental disasters though also some recent limited regeneration of native riparian vegetation. The third is a more detailed analysis of trends in the population of the Yuma Clapper Rail (*Rallus longirostris yumanensis*) along the Colorado River, and another paper looks at how granivorous birds such as sparrows are exploiting seeds during the winter in the deserts of southwestern New Mexico. The final paper in this section reports the results of surveys in New Mexico and Arizona of the Arizona

Grasshopper Sparrow (*Ammodramus savannarum ammolegus*), a subspecies listed as endangered in New Mexico.

The study reported in the first of the two papers in the final section takes advantage of the recent technological advances in surveillance of weather by radar, using data from weather stations to monitor the direction, speed, and altitude of spring and fall migrants and inferring routes of passerines migrating over the borderlands region. The last paper provides a comprehensive conservation plan for the Chihuahuan Desert Ecoregion, which extends from Guanajuato in the south to New Mexico in the north and includes the enigmatic and threatened Worthen's Sparrow.

The paper on the status of the birds of the lower Rio Grande valley will be of interest to readers in the ABA area: it presents updates on the current status of a number of Mexican species that barely make it over the border in this region, including recent colonists such as the Ferruginous Pygmy-Owl, Tamaulipas Crow, and Mangrove Yellow Warbler. On a more serious note, the paper on Big Bend National Park documents the recent and precipitous decline of park's population of the Montezuma Quail, the causes of which are unknown. Along the Colorado River, sporadic floods and inflows of fresh water have allowed for the recovery of some native riparian vegetation, and Hinojosa-Huerta et al. demonstrate that certain vulnerable riparian bird species have been able to recolonize this habitat, providing some hope for this severely threatened ecosystem.

Although the two sections on specific habitats cover what are arguably the region's most threatened habitats, grasslands, wetlands, and riparian, the borderlands encompass many other habitats, some also threatened. The partiality to certain habitats is no fault of the authors but instead highlights the work yet to be done on the other endangered species and habitats of the borderlands region. It is in fact this incredible variation in habitats of the borderlands region that is highlighted in figure 2 of the preface, and along with the species of concern also listed in the preface, illustrates the damage that has been inflicted on the habitats of this area.

Being a detailed examination a few selected topics, this publication is directed to an audience narrower than the general birder. But for those with an interest in conservation and ecology, or who are looking to do research in this region so changed by human activity, its baseline data on birds' status, distribution, and ecology are an essential resource. With any luck this publication will provide a greater incentive to protect this unique region.

Oscar Johnson

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FEATURED PHOTO

BLACK-CHINNED SPARROW: NOTES ON BREEDING BEHAVIOR AND NESTING ECOLOGY IN SAN DIEGO COUNTY, CALIFORNIA

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Although the Black-chinned Sparrow (*Spizella atrogularis*) is fairly widespread in the Southwest and locally abundant, it is one of the least studied passerines in North America (Tenney 1997). This is perhaps due to its preference for large tracts of undisturbed chaparral or successional scrub in remote and rugged terrain. Over much of its range its population density tends to be low and its occurrence is erratic. The main breeding populations are in southern to central California, Arizona, New Mexico, southern Nevada and Utah, southwestern Texas, and Mexico. Occasional irruptions are reported north as far as Oregon (Gilligan et al. 1994). The Black-chinned Sparrow is a partial migrant, with the distribution shifting southward during winter and into desert scrub mostly in northern to central mainland Mexico and Baja California Sur. As far as known, all populations breeding in the U.S. are migratory, and only a few birds winter in southern Arizona, southern New Mexico, and southwestern Texas. In southern California it is very rare as a winter visitor and as a migrant away from nesting habitat (Unitt 2004). Results of the North American Breeding Bird Survey suggest a national trend of overall decrease in Black-chinned Sparrow abundance of –5.4% per year 1966–2007 ($P = 0.001$), but many regions of its range are not adequately covered (Sauer et al. 2008).

The individual featured on this issue's back cover was at 900 m elevation on the west slope of the Cuyamaca Mountains, San Diego County, California, in successional chaparral five years after the Cedar Fire of October 2003. It is a singing adult male with substantial black around a pinkish bill and unstreaked gray breast. Females have no black around the bill or only a small amount, making the Black-chinned Sparrow the *Spizella* with the strongest sexual dimorphism. Juveniles have no black around the bill and are lightly streaked on the breast. The Black-chinned Sparrow was one of the most numerous birds in the successional chaparral in this area along Boulder Creek Road, with up to 45 in a day counted in 2007 along two survey routes totaling 5 km (P. Unitt pers. comm.).

I targeted this species as part of a study of distributional change and nesting ecology along an elevational gradient in the Laguna Mountains, San Diego County. Here I present descriptive findings on its breeding behavior and nesting ecology.

METHODS

My study took place along the desert slope of the Laguna Mountains (Figure 1), within an elevation range of 190–1852 m. The habitat was mostly chaparral but included Sonoran desert scrub at lower elevations and montane scrub mixed with coniferous forest at upper elevations. The chaparral varied from very open with scattered shrubs on the desert edge to nearly impenetrable in canyons and at higher elevations. It included one area burned in the Pines Fire of July–August 2002. From 2006 to 2008, 26 plots, each 1200 m × 200 m, were surveyed weekly throughout the nesting season. Numerous people helped with field work (see acknowledgments). We observed pairs for evidence of nesting activity from vantage points that were

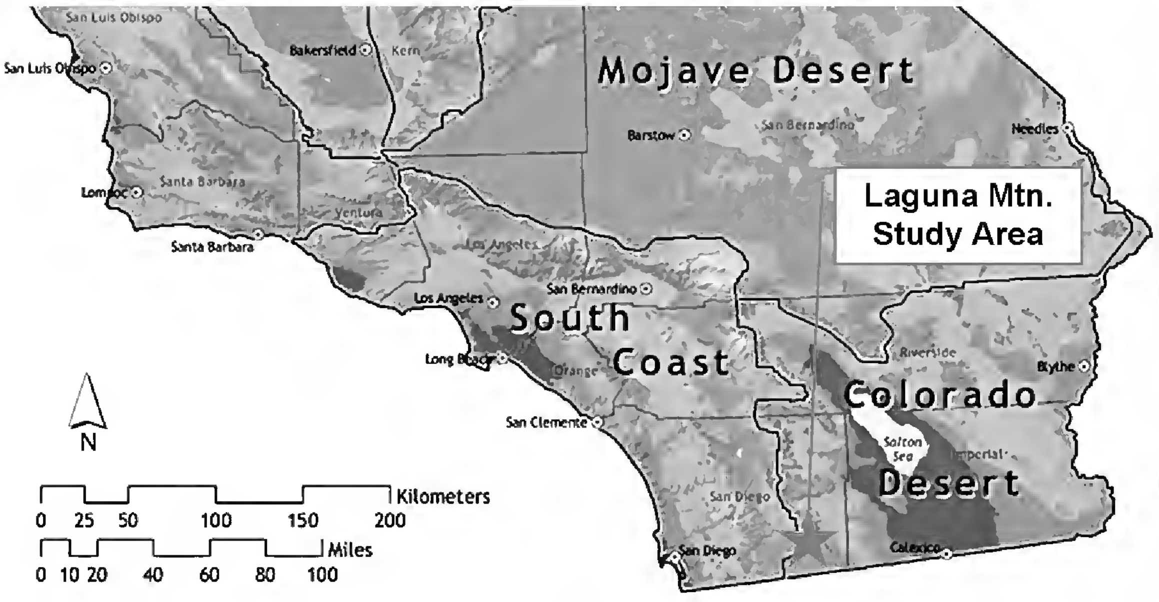

Figure 1. Location of Laguna Mountain study area in southern California.

Map source: California Department of Fish and Game Wildlife Diversity Project 2005

unlikely to cause disturbance and avoided approaching nests during construction or egg laying. Nest checks were as brief and unobtrusive as possible, typically at intervals of 3–8 days. We returned after the breeding season was completed to measure nests and vegetation.

Arrival and Territory Establishment

In this study area, Black-chinned Sparrows were found within an elevation range of 896–1852 m. Most birds arrived by mid-April. Males were often seen singing continuously or nearly continuously without a female partner. Once paired, males continued to sing nearly continuously but alternated between singing and following the female or assisting with nesting. Males often sang from exposed perches but were also observed singing while foraging, preening, and carrying nest material or food. Counter-singing of neighboring males was often synchronized, with neighbors singing in alternation or rotation. Aggressive chasing of one male by another was common. Territory size and density were highly variable. The highest density I estimated was 37 singing males per 40 hectares, substantially greater than the highest density previously reported in southern California of 21 birds per 40 hectares (Weathers 1983). In areas of denser population, however, there seemed to be a surplus of males and more frequent chasing, so territory size was difficult to estimate. In areas of low population density, pairs occurred singly without neighbors, and paired males sang from perches over areas of at least 2 hectares.

Nest Placement and Construction

Nests were found within an elevation range of 1213–1816 m (n = 64). Nests were placed in various shrubs and subshrubs, often in patches that were structurally heterogeneous or in post-fire succession (Figures 2, 3). Nests were placed most commonly in chamise, *Adenostoma fasciculatum* (n = 26), big sagebrush, *Artemisia tridentata* (n = 16), and California buckwheat, *Eriogonum fasciculatum* (n = 8). Other plants supporting nests included manzanita (*Arctostaphylos glandulosa*), scrub oak (*Quercus* spp.), mountain mahogany (*Cercocarpus betuloides*), desert ceanothus (*Ceanothus greggii*), holly-leaf cherry (*Prunus ilicifolia*), and redberry (*Rhamnus ilicifolia*). Nests

Figure 2. Examples of Black-chinned Sparrow nests: (A) nest with eggs placed in big sagebrush; (B) adult feeding nestlings in a nest placed in California buckwheat.

Photos by Joe Barth (A) and Anthony Mercieca (B)

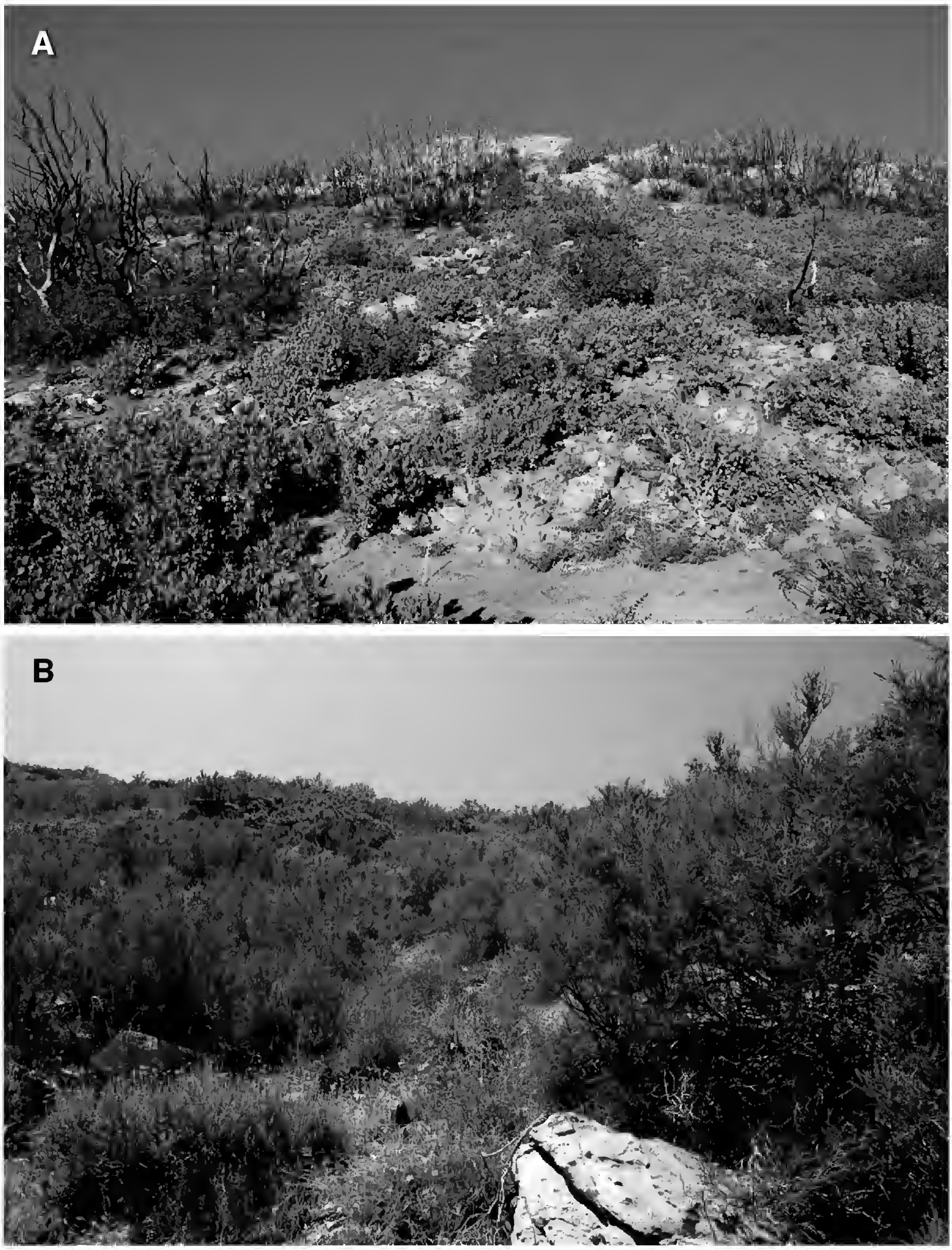

Figure 3. Examples of habitat of Black-chinned Sparrow nests: (A) Chaparral in post-fire succession, dominated by manzanita and scrub oak (elevation 1650 m); (B) heterogeneous patch of chaparral dominated by chamise and California buckwheat (elevation 1350 m).

Photos by Lori Hargrove

tended to be placed toward the middle of shrubs, mostly well concealed, at an average nest height of 44.9 cm (range 20.1–87.6 cm, standard deviation [SD] 15.3 cm, n = 62). Nest dimensions were as follows: outer height 5.8 cm (range 3.6–8.0 cm, SD 1.0 cm, n = 46), outer diameter 8.1 cm (range 7.0–10.0 cm, SD 0.8 cm, n = 46), inner depth 3.3 cm (range 2.0–5.0 cm, SD 0.8 cm, n = 43), and inner diameter 4.7 cm (range 3.5–6.0 cm, SD 0.5 cm, *n* = 43). Average nest height was somewhat lower and nest dimensions were smaller than previously reported for southern California by Tenney (1997) on the basis of data in the Western Foundation of Vertebrate Zoology (WFVZ). Nests were simple cups, often constructed of grasses, yucca fibers, herbaceous stems, shredded bark, and occasionally a few small twigs or leaves, and were often lined with finer material. Some nests were built of yucca fibers exclusively. There was no evidence of re-use of nests or nest sites.

Nesting Dates

On the basis of estimated dates of laying, most nests were initiated from the second week of May through the third week of June (87%, *n* = 62). The earliest nest was found on 3 May with nestlings that appeared to be at least one week old, and an adult was seen feeding a young fledgling near the nest on 11 May. The eggs in this nest were evidently laid near 16 April, before all birds had arrived. Nest building continued through the end of June. The latest nest building was noted on 26 June, eggs on 3 July. The nestlings of this late nest hatched probably on 13 or 14 July but did not fledge successfully. These records are close to previously reported egg dates ranging from 23 April to 7 July for California (*n* = 91; Newman 1968). I estimated incubation periods at 13–14 days and nestling periods at 11–13 days, which are slightly longer than the only published record of 12 days for incubation period and 10 days for nestling period (Wheelock 1904).

Clutch Size and Nest Success

Where it could be determined with certainty, average clutch size was 3.2 (range 2–4, SD 0.6, *n* = 25). This is similar to the previously reported mean clutch size of 3.4 for southern California (range 2–4, SD 0.6, *n* = 36, WFVZ data in Tenney 1997). Sixteen of 55 nests fledged young, for an apparent nest-success rate of 29% (*n* = 55). Since many nests failed early, biasing estimates of nest success when not all nests are found early, the true nest success rate is likely much lower. Expressed by the exposure method (Mayfield 1961), the daily survival rate was 0.89, meaning that a nest had an 89% chance of surviving from day *i* to day *i* +1, and if the total exposure period was 24 days, then nest success was 5.9%. The only previously reported estimate of nest success was a somewhat higher daily survival rate of 0.94 and an apparent success rate of 39% in southern California (*n* = 31, USDA Forest Service 1997). Nest failures were due mostly to depredation of eggs and nestlings. Suspected nest predators included Western Scrub-Jays (*Aphelocoma californica*), ants, snakes, lizards, and rodents. Western Scrub-Jays were often scolded and seen in the vicinity of depredated nests. On three occasions freshly hatched chicks were found covered with ants. Snakes, lizards, and rodents were seen near nests, and rodent scat was found in a few depredated nests. Though Brown-headed Cowbirds (*Molothrus ater*) were present in the study area, no nests were found parasitized, but parasitism rates for all species in this study area were low. We observed four nests where a single egg failed to hatch and two nests that were abandoned at the egg stage for unknown reasons. Birds were frequently observed building a new nest near a recently failed nest. In at least two instances we observed pairs that were feeding fledglings while they were building a second nest (26 June 2006 and 15 June 2008). Both second nests failed (nestling and egg stages, respectively), but this is the first evidence of Black-chinned Sparrows attempting multiple broods.

Nestlings and Fledglings

Nestlings were pink and bare when first hatched or occasionally had a few small patches of dark gray down. They often begged quietly but called more loudly as they neared fledging. Fledglings were often seen up to two weeks within 50 m of the nest. Compared to adults, fledglings had short tails, yellow gapes, faintly streaked breasts, paler gray heads, and darker bills. They often called conspicuously while following parents and begged while being fed.

Adult Attendance

It appeared that females did all incubation and brooding and most nest building. On two occasions females were observed incubating a single egg, with a final clutch size of three eggs observed at a later date. Males often assisted with nest building, fed females on or near the nest, and participated equally in feeding nestlings and fledglings and removing fecal sacs. During nest building and incubation males often engaged in "escort" behavior, following females and perching near the nest as the female entered or exited the nest area. This puts the male in a position to guard females from other intruding males and possibly to provide vigilance and distraction for nest predators. On a few occasions females gave calls from the nest when the male was near. Very few behavioral data have been published on this species, but these observations are consistent with previous notes that females appear to do all incubation and brooding while males assist with feeding young (Tenney 1997). Incubation before the clutch is complete, mate guarding, and this degree of male assistance have not been previously reported.

ACKNOWLEDGMENTS

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LITERATURE CITED

Gilligan, J., Smith, M., Rogers, D., and Contreras, A. 1994. Birds of Oregon: Status and Distribution. Cinclus Publ., McMinnville, OR.

Mayfield, H. F. 1961. Nesting success calculated from exposure. Wilson Bulletin 73:255–261.

Newman, J. D. 1968. Black-chinned Sparrow (*Spizella atrogularis*), in Life histories of North America cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies (A. C. Bent and O. L. Austin, Jr., eds.). U.S. Natl. Mus. Bull. 237 (part 2):1241–1248.

Sauer, J. R., Hines, J. E., and Fallon, J. 2008. The North American Breeding Bird Survey, Results and Analysis 1966–2007. Version 5.15.2008. USGS Patuxent Wildlife Research Center, Laurel, MD.

Tenney, C. R. 1997. Black-chinned Sparrow (*Spizella atrogularis*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 270. Acad. Nat. Sci., Philadelphia.

Unitt, P. 2004. San Diego County bird atlas. San Diego Soc. Nat. Hist. Proc. 39.

USDA Forest Service. 1997. Characteristics of bird communities in young and old-age chaparral in southern San Diego County. Cleveland National Forest, 10845 Rancho Bernardo Road, San Diego, CA 92127.

Weathers, W. W. 1983. Birds of Southern California's Deep Canyon. Univ. of California Press, Berkeley.

Wheelock, I. G. 1904. Birds of California. A. C. McClurg and Co., Chicago.

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The California Bird Records Committee of Western Field Ornithologists revised its 10-column Field List of California Birds in July 2009. The new list covers 641 species, plus 6 species on the supplemental list. Please send orders to WFO, c/o Robbie Fischer, Treasurer, 1359 Solano Drive, Pacifica, CA 94044. Price for 9 or fewer, $2.75 each, for 10 or more, $2.50 each, which includes tax and shipping. Order online at http://checklist.westernfieldornithologists.org.

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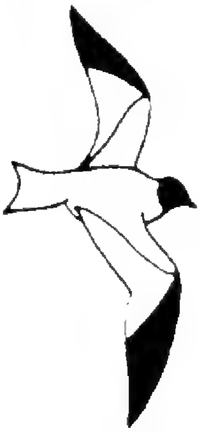
Photo by © Gary Woods of Fresno, California:
Ruff (*Philomachus pugnax*)
Madera County, California, 18 May 2009
This adult male was found by the photographer at the city of Madera's wastewater-treatment plant, the same location where he had found a juvenile in the fall of 2006. Might this have been the same individual? The bottom photo shows it aggressively advancing on a nearby Black-necked Stilt, which quickly retreated in alarm.



WESTERN BIRDS

Vol. 41, No. 2, 2010

Western Specialty:
Large-billed Savannah Sparrow

Photo by © Dennis Ancinec of Carlsbad, California:
Large-billed Savannah Sparrow (*Passerculus sandwichensis rostratus*)
San Diego County, California, 10 December 2009
The migration and history of the Large-billed Sparrow are among the most interesting of any bird of western North America. Known to nest only around the head of the Gulf of California, the subspecies ranges northwest in fall and winter to the coast of southern California. The population collapsed in the 1950s, after dams diverted the water of the Colorado River away from the delta, then recovered to some extent beginning in the mid-1980s, after the floods of 1983 returned some water to the delta.

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NOTES

Front cover photo by © John Sterling of Woodland, California: White-chinned Petrel (*Procellaria aequinoctialis*), off Half Moon Bay, San Mateo County, California, 18 October 2009, evidently constituting the first record of this species for California and the North Pacific Ocean; as this issue goes to press still under consideration by the California Bird Records Committee.

Back cover "Featured Photos" by © Stephen Fettig of Los Alamos, New Mexico: (top) female Gray-crowned Rosy-Finch, (*Leucosticte tephrocotis*), in the Sandia Mountains of north-central New Mexico, 23 March 2008; (bottom) female Black Rosy-Finch (*Leucosticte atrata*), (left) and female Gray-crowned Rosy-Finch (right) in the Sandia Mountains, 11 January 2009.

Western Birds solicits papers that are both useful to and understandable by amateur field ornithologists and also contribute significantly to scientific literature. 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 Kathy Molina, Section of Ornithology, Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007; kmolina@nhm.org. For matters of style consult the Suggestions to Contributors to *Western Birds* (at www.westernfieldornithologists.org/docs/journal_guidelines.doc).

WESTERN BIRDS

Volume 41, Number 2, 2010

NOTEWORTHY BIRD OBSERVATIONS FROM THE CAROLINE AND MARSHALL ISLANDS 1988–2009, INCLUDING FIVE NEW RECORDS FOR MICRONESIA

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ABSTRACT: We evaluate previously unpublished or semi-published reports of 61 migratory, 3 resident, and 1 failed introduced species or subspecies of birds in Micronesia from a variety of sources. These include first (or first confirmed) Micronesian records of the Glossy Ibis (*Plegadis falcinellus*), American Whimbrel (*Numenius phaeopus hudsonicus*), Brown Hawk-Owl (*Ninox scutulata*), Oriental Reed Warbler (*Acrocephalus orientalis*), and Scaly Thrush (*Zoothera dauma*); second regional reports of the Red-necked Phalarope (*Phalaropus lobatus*), Rufous Hawk-Cuckoo (*Hierococcyx hyperythrus*), Eurasian Hoopoe (*Upupa epops*), and White-throated

Needletail (*Hirundapus caudacutus*); and many firsts for major islands, island groups, and islands within groups including 13 first (or first confirmed) and 7 second records for Yap, 11 first and 8 second records for Palau, 7 firsts for Pohnpei, 1 for Kosrae, 1 for Kwajalein, and a second for Majuro. We report several occurrences as first for their season and other significant bird observations that help to establish patterns in the region. We question published sight records of the Asian House Martin (*Delichon dasypus*).

Because Micronesia (Figure 1) falls outside the scope of surrounding list-keeping nongovernmental organizations such as the American Ornithologists' Union (AOU), the Royal Australasian Ornithologists' Union, and the Oriental Bird Club, summarizing of its avifauna has fallen haphazardly to authors of varying affiliations (Baker 1951, Owen 1977a, Pyle and Engbring 1985, Pratt et al. 1987, Engbring 1988, Wiles 2005). Their work has been aided by a long tradition of occasional omnibus compilations of bird reports such as Engbring and Owen (1981), Pratt and Bruner (1981), Pyle and Engbring (1987), Wiles et al. (1987, 1993, 2000, 2004), and VanderWerf et al. (2006), to which this paper is a contribution. We understand that authors of such compilations serve as a *de facto* checklist committee, and we have evaluated all records thoroughly. For this summary, we have restricted our geographic coverage to the Caroline Islands (Republic of Palau and the Federated States of Micronesia) and the Marshall Islands but have contributed several records to a compilation for the Mariana Islands to be published elsewhere. We cover records known to us through October 2009.

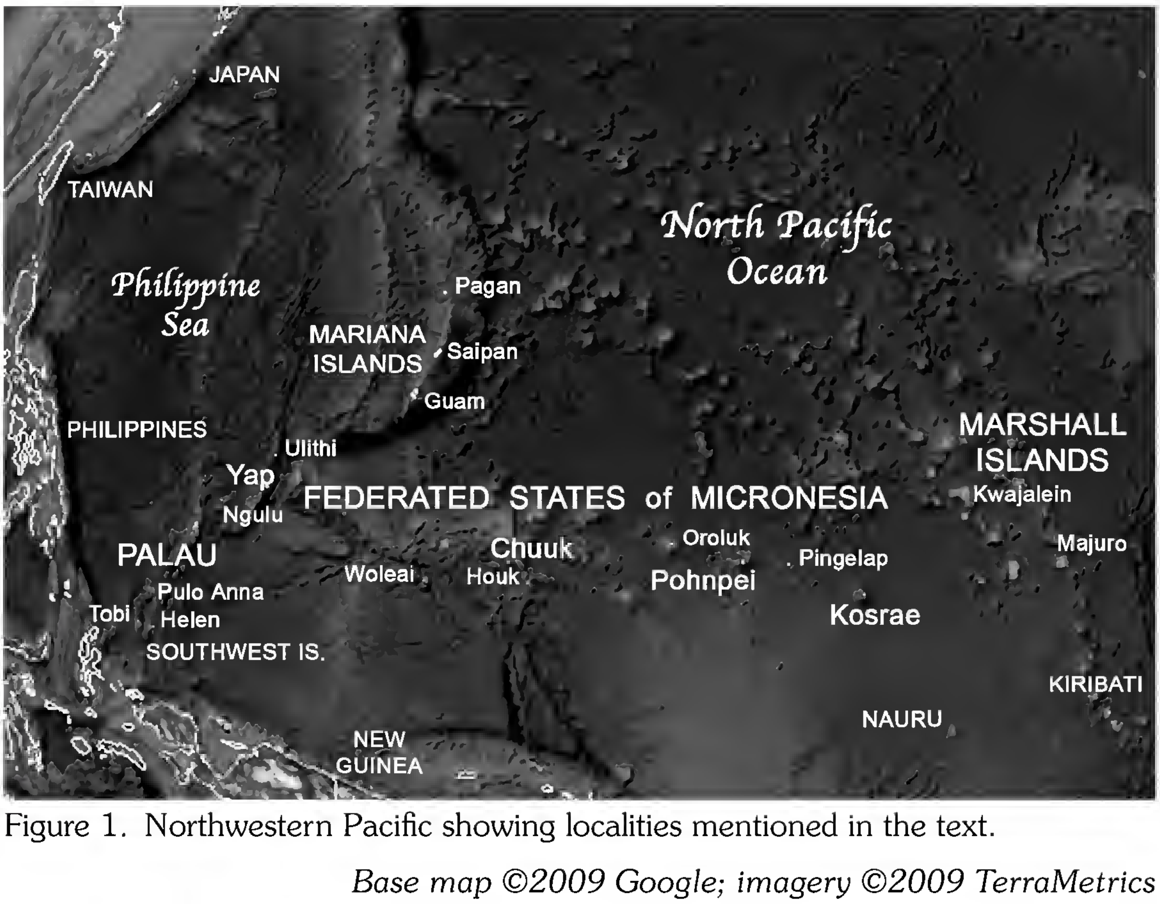

Figure 1. Northwestern Pacific showing localities mentioned in the text.

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SOURCES AND METHODS

In February 2003, Pratt escorted a private birding group that included Stuart Keith, Gaye Fugate, J. Anthony Keith, and Iola Price (hereafter 2003 Pratt party) that visited all the high islands of Micronesia. Wiles et al. (2004) published their noteworthy records except those from Yap, which we include here. Pratt also led a research expedition in April 2007 under the auspices of the North Carolina State Museum of Natural Sciences, with participants Pisano, Douglas Chapman, Michael L. P. Retter, W. Michael Ord, Daphne Gemmill, William M. Mueller, and Romney Bathurst (hereafter 2007 Pratt party). They visited Pohnpei (3–7 Apr), Palau (7–12 Apr), and Yap (12–15 Apr). In June 2007 and June 2008, Pratt and Pisano studied skins of difficult-to-identify species seen on the expedition at the National Museum of Natural History (Smithsonian Institution) in Washington, DC. As senior author of the primary field guide to the region (Pratt et al. 1987), Pratt frequently receives unsolicited bird reports from visitors to Micronesia, sometimes long after the fact. We include several such records dating back as much as two decades. Increasingly, international birders are posting trip reports on the Internet. These may include new distributional records of which the list-makers are apparently unaware. Such unedited and non-peer-reviewed reports do not qualify as publication in the traditional sense and require the same scrutiny as other sightings. Pratt reviewed all such reports from the region and, where necessary, contacted the observers for corroborating details of significant sightings as well as permission to publish them. Copies of relevant correspondence are available from him.

Over several decades, Falanruw has accumulated many unpublished reports and specimens of unusual birds seen on Yap, including a few whose documentation was almost lost in the destruction of the Yap Institute of Natural Science building by termites or damaged or destroyed by Typhoon Sudal in April 2004. Some documentation was contained in now obsolete media from which we have retrieved what we could. Wildlife photographer Etpison has lived in Palau since 1985 and focused primarily on birds 2004–2008. Pratt and Etpison's (2008) semi-popular book provides additional photographs of many of the birds discussed in this report. Following Pratt's discovery of the possible records, Etpison obtained the original photos (and permission to publish them) of two "mystery birds" photographed in November 2004 by the Helen Reef Resource Management Project, under the management of Wayne Andrew. No further information on these birds is available. Buden has investigated the avifaunas of numerous poorly known atolls in the region and contributes several previously unpublished records from outlying atolls in Chuuk State to this compilation. He visited Ngulu Atoll in Yap State 12 Jul–10 Aug 2008 and noted three land birds new to this nearly uninhabited and ornithologically unexplored island. The remaining authors are present or former wildlife and conservation workers (Ketebengang, Olsen, Gupta, Vice, Wiles, Yalap) or birders on brief visits to the region (Klauber 2–23 Apr 2004; Herter Sep 1991 and Feb 1992; Clement Mar 2008). Gupta worked for several years with the Palau Conservation Society (PCS) on BirdLife International's Important Bird Area project (Holm et al. 2008), which yielded several observations reported here.

Nomenclature follows the *AOU Check-list* and its supplements (American Ornithologists' Union 1998, Banks et al. 2006, 2007, 2008, Chesser et al. 2009) or Gill and Wright (2006) for species not covered by the AOU. Opinions on the validity or accuracy of older published records are Pratt's. Most of the photographs were cropped from their originals, and some were brightened (as noted in captions) with Adobe PhotoShop cs, version 8.0, but no colors were altered, and no changes were made that affect identifications.

SPECIES ACCOUNTS

For brevity in the text, compass directions are given as capital letters (N = north, etc.), adjectival directions given as lower case (e. = eastern, c. = central, etc.), and plumages are specified as ad. (adult), or juv. (juvenile).

Eurasian Wigeon (*Anas penelope*). Flock of four, including one male in alternate plumage, on the main reservoir on Yap 25 Feb 2003 (Pratt party) represents the third report from the island. The second was in 2001 after hiatus of nearly 80 years (Wiles et al. 2004).

Green-winged Teal. (*Anas crecca*). Observers in w. Micronesia usually assume all Green-winged Teal to be the Eurasian subspecies *A. c. crecca* rather than American *A. c. carolinensis* (Pratt et al. 1987), but only alternate-plumaged males are identifiable in the field (Beaman and Madge 1998, Brazil 2009). Both forms visit the Hawaiian Is. (Pyle 2002), and *carolinensis* has reached the Marshalls (Baker 1951). Etpison photographed a lone male *A. c. crecca* in full alternate plumage (Pratt and Etpison 2008:187) on the small pond beside the old airport runway 8 Feb 2008, establishing the first unequivocal record for Yap.

Northern Shoveler (*Anas clypeata*). May be an annual visitor to Yap, but only two specific records, both from the Colonia reservoir in Feb, have been published previously (Wiles et al. 2000). Clement saw two female-plumaged Northern Shovelers on the old airport pond in Ruul Municipality 15 Mar 2008. T. Mark (pers. comm.) and T. Alfonso saw a female at the intermittent pond near the old airport 16 Oct 2008 for the first fall record.

Northern Pintail (*Anas acuta*). One of the most frequent wintering ducks in w. Micronesia (Pratt et al. 1987), but Yap's only published record is from Feb 1988 (Wiles et al. 2000). The 2003 Pratt party saw ~15 pintails on the Colonia reservoir 23–24 Feb 2003, and T. Alfonso (pers. comm.) reports small numbers present every year. Most birds seen on Yap are female-plumaged, but Etpison photographed three males in alternate plumage 8 Feb 2008. On 2 Feb 2009 John Gilardi observed two females in a wetland on Woleai Atoll, Yap State, a first for that remote island. Buden saw two males and a female on a saline lake on Houk (= Pulask) I., Chuuk State, 28 Dec 2003, the first report for that island and only the second for Chuuk State (Pyle and Engbring 1987).

Garganey (*Anas querquedula*). The 2003 Pratt party observed one alternate-plumaged male and three female-plumaged Garganey on the Colonia reservoir, Yap, 24 Feb. This first record for Yap fills a distributional gap between scattered records from the Marianas (Wiles et al. 2004) and a single sighting at Palau (Engbring and Owen 1981).

Common Pochard/Redhead (*Aythya ferina/A. americana*). While surveying shorebirds for avian influenza on the reef flats at the n. end of Peleliu, Palau, 9 Feb 2007, Ketebengang and Shelley Kremer observed a flock of six diving ducks on the ocean that Kremer, familiar with only North American waterfowl, initially identified as Redheads. Kremer made no notes at the time, but, following Vice's suggestion that the birds were more likely Common Pochards, the sighting was published as such without comment (Hawai'i–Pacific Islands Working Group on Avian Influenza Surveillance 2008: table 7). Neither of these species has been reported previously from Palau, and while the pochard is more likely (two records from the Marianas; Wiles 2005), the Redhead has straggled to South Korea and Japan (Brazil 2009) and is a rare visitor to the Hawaiian Is. (Pyle 2002). Consequently, this sighting is equivocal and only the Redhead/Common Pochard species pair can be accepted for Palau.

Wedge-tailed Shearwater (*Puffinus pacificus*). In Nov 2004, a party with the Helen Reef Resource Management Project captured and photographed (Figure 2) a dark-morph Wedge-tailed Shearwater on Helen I. for the second, and first documented, Palau record. The only previous record is of a dark-morph bird seen near Koror, May 1978 (Pyle and Engbring 1987).

Black-crowned Night Heron (*Nycticorax nycticorax*). Historically only a vagrant in extreme w. Micronesia, with scattered records of adults for Palau (Baker 1951) and Yap (Wiles et al. 2000). Now seen annually at the Koror landfill, Palau (Etpison). First juvenile for Palau reported by VanderWerf et al. (2006). Etpison photographed another at the Malakal sewer pond Oct 2007 (Pratt and Etpison 2008:162). The Yap Institute of Natural Science has a mounted specimen in first basic plumage taken on Yap, other details lost (Falanruw).

Striated Heron (*Butorides striatus*). Cathy McFadden reported a Striated Heron at the Malakal sewer pond Jan–Feb 2005 (www.surfbirds.com/trip_report.php?id=626), possibly same individual photographed later that year by VanderWerf et al. (2006) for the second published Palau record. However, these sightings postdate repeated observations by the Pratt party of an adult Striated Heron feeding in the boat channel adjacent to the Palau Aquarium during the third week of Feb 2003.

Figure 2. Wedge-tailed Shearwater (*Puffinus pacificus*) captured on Helen Reef atoll, Palau, by the Helen Reef Resource Management Project party, Nov 2004.

Photo by Conservation Officer Homar

Unidentified pond heron (*Ardeola* sp.). On 12 Dec 2008 Ketebengang photographed a small heron (Figure 3a, b) feeding in grass beside the garbage dump in Koror, Palau. On 19 Dec 2008 Olsen relocated the bird at the same place (Fig. 3c). It is clearly a pond heron in nearly complete basic plumage but with a few dark feathers remaining in the neck from the previous alternate plumage. The Chinese Pond Heron (*A. bacchus*) has a chestnut neck in alternate plumage, breeds in ne. China, migrates as far south as Borneo (Brazil 2009), and has turned up at least once on Guam (Wiles et al. 1993). The Javan Pond Heron (*A. speciosa*) has an orange-buff neck tinged chestnut at the base and is mostly nonmigratory but recently expanded its range to Mindanao in the Philippines (Kennedy et al. 2002). Both could reach Palau, but the Chinese is more likely. Many authorities consider the two indistinguishable in the field in basic plumage, but Robson (2000) suggested that noticeably dusky tips to the outer primaries might be diagnostic for the Chinese Pond Heron, and the Palau bird clearly shows them (Figure 3c, arrow). Unfortunately, the bird was last seen in February 2009 (Ketebengang) before it acquired the next alternate plumage. Pratt believes some traces of chestnut (Figure 3b, arrow) are too high on the neck for a Javan, which, combined with dusky primary tips and likelihood, suggests strongly that this bird is *A. bacchus*. Others (Vice, Wiles, Ben King, and Phillip D. Round) who viewed the photos considered the bird's identity equivocal. Perhaps eventually this bird can be identified for certain, but for now only *Ardeola* sp. can be placed on the Palau list.

Gray Heron (*Ardea cinerea*). C. McFadden (www.surfbirds.com/trip_report.php?id=626) saw a juvenile on a basketball court in the village of Ngardmau on Babeldaob in Jan or Feb 2005. The first confirmed Palau record is of an adult photographed on Peleliu Apr 2005 (VanderWerf et al. 2006). Other recent sightings: one ad., Malakal sewage pond, 30 Oct 2006 (Etpison); one juv. on reef flats near Palau Aquarium, Koror, May 2007 (Etpison); one ad., Lake Ngardok, Babeldaob, 19 Aug 2007 (Olsen and Milang Eberdong), the earliest fall date for Micronesia; and two birds in second basic plumage (Pratt and Etpison 2008:163), Malakal sewer pond, 12 Jan 2008 (Etpison). The first Gray Heron seen on Yap was in Feb 1991 (Wiles et al. 2000), the second in Nov 2001 (Wiles et al. 2004). Pratt party saw a single ad. at Colonia reservoir on 23 Feb 2003.

Purple Heron? (*Ardea purpurea*). On 18 Mar 2008, Ketebengang and S. Kremer saw a large dark heron unknown to them at Ngatpang aquaculture ponds, Babeldaob, Palau. They photographed it (Figure 3d) through Canon Stabilizer binoculars with a Sony Cybershot digital camera. The photo shows a dark heron with coloration and proportions unlike those of the Pacific Reef Heron (*Egretta sacra*) or Rufous Night Heron (*Nycticorax caledonicus*), the only dark herons resident at Palau. Brownish dark areas, with lighter, more reddish brown feather edges on the wing coverts, a buffy white foreneck and throat with a diffuse dark stripe separating them from the reddish brown of the sides of the neck, an indistinctly dark crown and feathering around the eye, a buffy or grayish white belly, a dark yellow bill with a dark tip, pale yellow legs with indistinct darker markings, and bright a yellow iris are all consistent with a late juv. Purple Heron (Beaman and Madge 1998, Brazil 2009) and inconsistent with features of any other large heron. Nevertheless, some observers familiar with the Purple Heron believe the bird depicted in Figure 3d fits the Purple Heron poorly and could represent an aberrant individual of another species or a hybrid. Or it might be stained. Purple Herons breed in e. Asia, including the Philippines, with n. populations migratory (Brazil 2009). There is no previous record of the Purple Heron for Palau or Micronesia.

Great Egret (*Ardea alba*). The first Great Egret for Yap was noted in Feb 1991 (Wiles et al. 2000). Pratt's party saw three on the extensive tidal flats in Gilman Municipality at the s. tip of the island on 13 Apr 2007 for a second island record, and the third sighting for Yap was by T. Mark and T. Alfonso (pers. comm.) of one at an intermittent pond near the old airport 16 Oct 2008. Palau's first Great Egret was on Peleliu in Mar 2000 (Wiles et al. 2004), its second on the same island May 2005 (VanderWerf et al. 2006). Etpison found five individuals, the first in Palau north of Peleliu, among a huge gathering of egrets at the sewer pond on Malakal during Nov 2006 (photo Pratt and Etpison 2008:172).

Little Egret (*Egretta garzetta*). Engbring (1988) considered the Little Egret an uncommon migrant at Palau, but today substantial numbers occur every year (Pratt and Etpison 2008:172). Etpison counted 46 white egrets, mostly Little Egrets, at the Malakal sewer pond in Nov 2006 with the aforementioned five Great Egrets and a few Cattle (*Bubulcus ibis*) and Intermediate (*Mesophoyx intermedia*) egrets. The 2007 Pratt party noted 20 Little Egrets feeding on tidal flats at Ngatpang, Babeldaob, on 9 Apr. Yap's first Little Egret was seen by Pratt and Bruner (1981) in Aug 1978 but was overlooked by Wiles et al. (2000). This summer date remains anomalous. Subsequent published reports are for Feb 1991 and Mar 1993 (Wiles et al. 2000) and Nov 2001 (Wiles et al. 2004). The 2003 Pratt party saw one at the Colonia reservoir 23–24 Feb, and the 2007 Pratt party saw two departing a roost shared with Cattle Egrets near the reservoir on 13 Apr. A few Little Egrets probably now reach Yap every year.

Glossy Ibis (*Plegadis falcinellus*). On 17 June 2009, after two weeks of reports from taro farmers of an all-dark egret-sized bird at several localities on Babeldaob, Angelina S. Olsen spotted such a bird in a taro patch in Ngerkebesang, Arakabesan I., Palau. Alan Olsen photographed it (Figure 3e, f) at 14:30 and watched it for 5 minutes before it flew out of sight into the far end of the taro patch. The photos show clearly the long down-curved bill, glossy olive-green body plumage, and chestnut-brown neck and head of a *Plegadis* ibis in first alternate plumage, as well as the brown iris and dark gray facial skin bordered above and below by pale blue that distinguish this species from the very similar White-faced Ibis (*P. chihi*), a regular nonbreeding visitor in low numbers to the Hawaiian Is. (Pyle 2002). This is the first record for the Glossy Ibis in Micronesia and the oceanic tropical Pacific (a juvenile *Plegadis* collected in Fiji was not identified to species; Pratt et al. 1987). The Glossy Ibis has a patchy cosmopolitan distribution that includes the Philippines, E. Indies (Kennedy et al. 2000), and Australia, where it is irregularly migratory and irruptive (Pizzey and Knight 1997) north into New Guinea from March to October (Beehler et al. 1986). The ibis on Palau was more likely a migratory overshoot from Australia than a straggler from nearer but more sedentary populations.

Unidentified cormorant (*Phalacrocorax* sp.). The 2003 Pratt party saw and photographed (Figure 3g) a large cormorant at the reservoir near Colonia, Yap, early on the mornings of 23 and 24 February. It resembled a Great Cormorant (*P. carbo*), a species found once before at this locality (Wiles et al. 1987), but lacked the characteristic white border to the orange gular pouch (Brazil 2008, Orta 1992) and instead showed more orange in the area. The bird's heavy-necked proportions and lack of orange in the lores suggest that it was not a Double-crested Cormorant (*P. auritus*), the only all-black cormorant with such an extensive orange gular pouch (Orta 1992). John Gilardi saw another all-dark cormorant flying inside the lagoon at Woleai Atoll, Yap, on 2 Feb 2009 but was unable to distinguish any further identifying marks. All-dark cormorants, including a Great on Pagan in the Mariana Is. (Glass et al. 1990), a Little Black (*P. sulcirostris*) on Pulo Anna in Palau's Southwest Is. (Wiles et al. 2004), and an unidentified bird on Guam (Wiles et al. 1993), are very rare in Micronesia and tantalizingly difficult to identify to species.

Osprey (*Pandion haliaetus*). Adam Welz (pers. comm.) saw an Osprey twice at the north end of Maap I., Yap, in late 2002 (exact date not recorded). Only two previous records have been published for Yap, one in 1991 (Wiles et al. 2000) and another in 2003 (Clements 2003).

Figure 3. (a, b) Pond-heron (*Ardeola* sp.) at Koror landfill, Palau, 12 Dec 2008; arrow indicates trace of previous alternate plumage; (c) same, 19 Dec 2008; arrow indicates dusky primary tips; (d) probable juv. Purple Heron (*Ardea purpurea*) at Ngatpang aquaculture ponds, Babeldaob, Palau, 18 Mar 2008 (brightened +26 in Adobe PhotoShop); (e) Glossy Ibis (*Plegadis falcinellus*) on Arakabesan I., Palau, 17 Jun 2009; (f) same, close-up of head showing facial details; (g) cormorant (*Phalacrocorax* sp.) in flight, showing extensive orange gular pouch with rounded posterior margin, Colonia reservoir, Ruul District, Yap, 24 Feb 2003 (digital enlargement from original 35-mm Kodachrome 200 transparency).

Photos by Heather Ketebangang (a, b, d), Alan Olsen (c, e, f) and H. Douglas Pratt (g)


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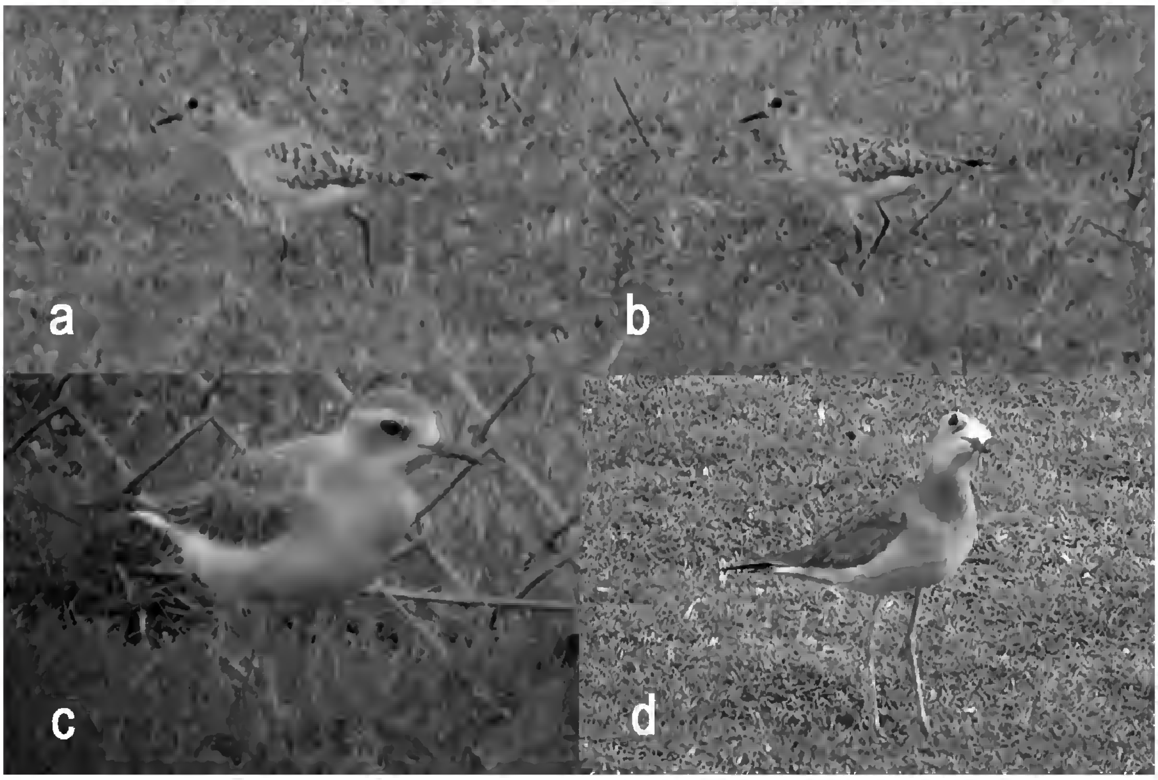

Figure 5. (a, b) Two views of a Black-bellied Plover (*Pluvialis squatarola*) at Kolonia, Pohnpei, 6 Apr 2007; (c) juvenile Oriental Plover (*Charadrius veredus*), Meyuns, Arakabesan, Palau, 30 Sep 2009; (d) adult Oriental Plover, Belau International Airport, Babeldaob, Palau, 27 Oct 2009

Photos by Daphne Gemmill (a, b) and Heather Ketebengang (c, d)

Figure 6. Common Snipe mist-netted at Koror landfill, Palau, 17 Nov 2008 showing prominent white trailing edge of secondaries.

Photo by Jeff Flores

Figure 4. (a–c) Nearly ad. Gray-faced Buzzard (*Butastur indicus*) captured on Yap, Mar 2003; (d–f) immature captured on Kayangel Atoll, Palau, Nov 2004.

Photos by Sam Falanruw (a), Marjorie Falanruw (b, c), and Miriam Watts (d–f)


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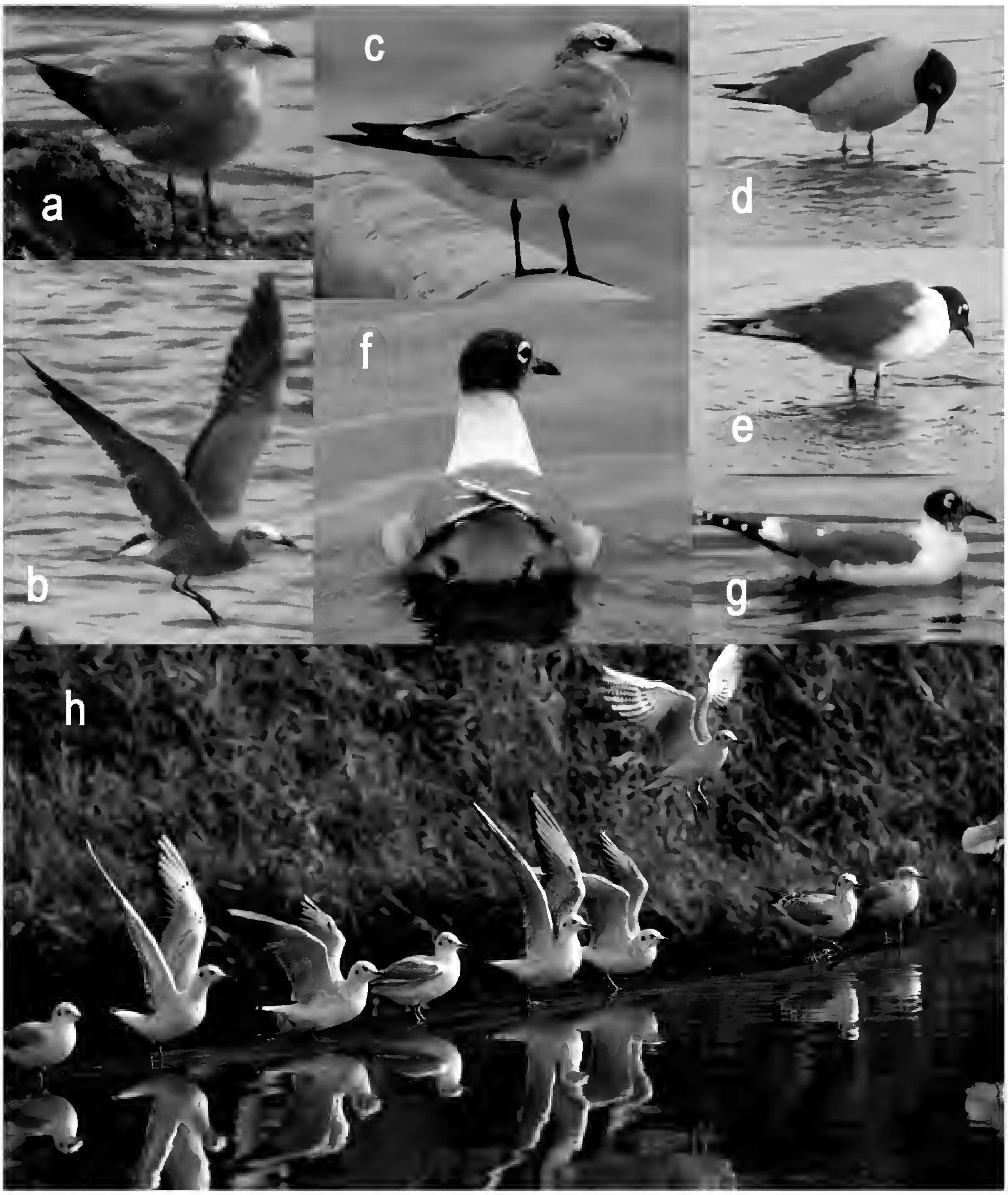

Figure 8. Gulls: (a, b) Laughing Gull (*Leucophaeus atricilla*), Pohnpei, 4 Apr 2007; (c) Laughing Gull, Kosrae, 4 Jan 2008; (d, e) Franklin's Gull (*L. pipixcan*) near airport, Majuro, Marshall Is., 19 May 2009; (f, g) Franklin's Gull, Kitti District, Pohnpei, 5 Jul 2009; (h) part of large assemblage of Black-headed Gulls (*Chroicocephalus ridibundus*) at Malakal sewer ponds, Palau, late winter 2008.

Photos by Paul Pisano (a, b), Carlos Cianchini (c), Glenn McKinlay (d–g), and Mandy T. Etpison (h)

Figure 7. (a) Green Sandpiper (*Tringa ochropus*) at Malakal sewer pond, Palau, Oct 2006, (b) at same locality, Sep 2007; (c) Curlew Sandpiper (*Calidris ferruginea*) molting into alternate plumage (right) with alternate-plumaged Black-tailed Godwit (*Limosa limosa*) at Malakal sewer pond, Palau, 20 May 2008; (d) Ruff (*Philomachus pugnax*), Colonia, Yap, 23 Sep 2000; (e) Ruff, Ulithi Atoll, 25 Sep 2000; (f) Red-necked Phalarope (*Phalaropus lobatus*) in Palau's Rock Islands, 10 Oct 2006; (g) Oriental Pratincole (*Glareola maldivarum*) at Koror Airport, Babeldaob, Palau, spring 2008; (h) same, mist-netted bird showing rufous underwing characteristic of species.

Photos by Mandy T. Etpison (a–c, f), Paula Sullivan (d, e), and Heather Ketebengang (g, h)

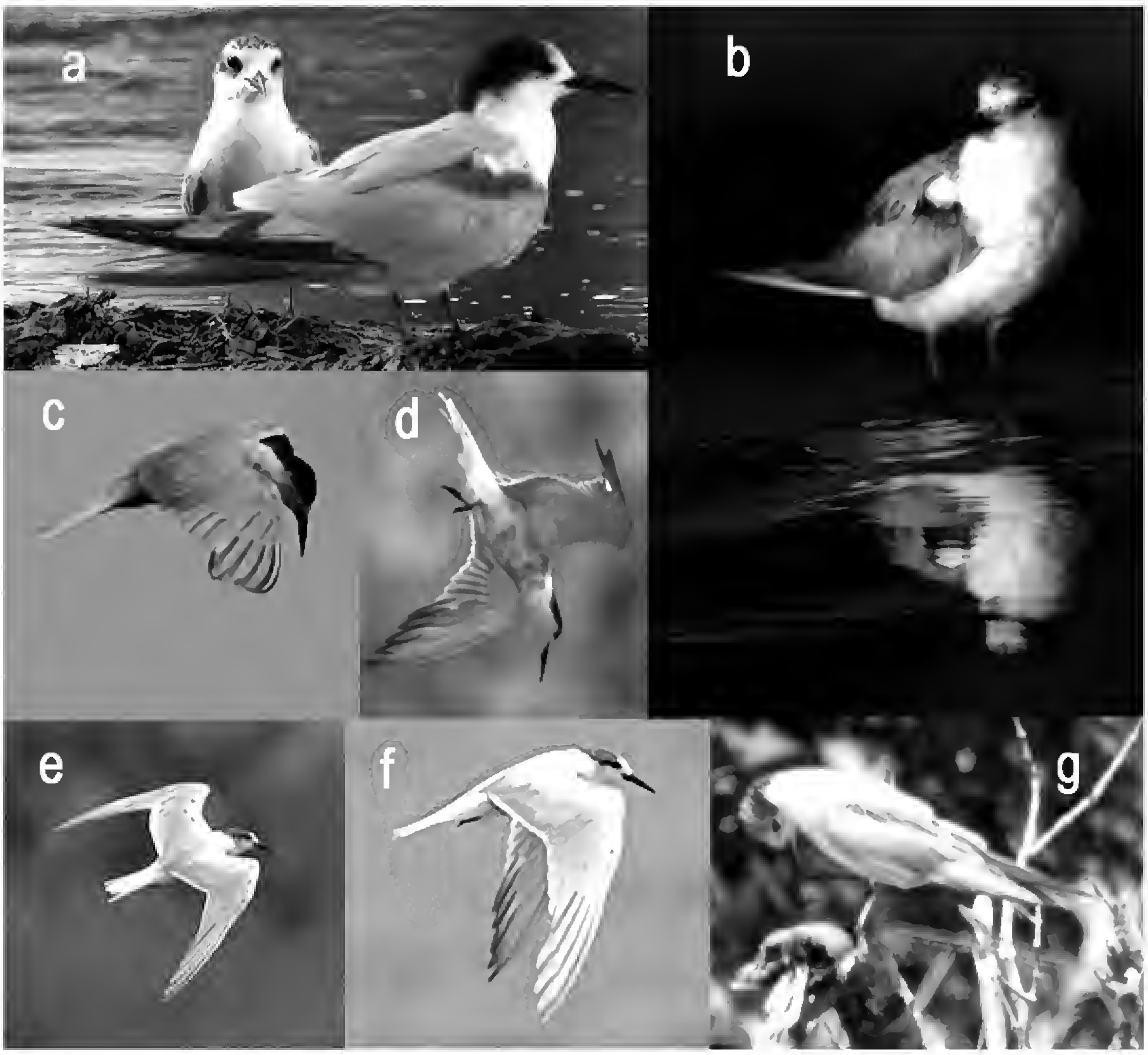

Figure 9. Terns: (a) Common Tern (*Sterna hirundo*) at the Malakal sewer pond, Palau, Oct 2006; (b) same, Sep 2007; (c, d) same species, Pohnpei, Apr 2007; (e, f) Whiskered Terns (*Chlidonias hybrida*) (possibly same bird) flying near causeway between Kolonia and airport, Pohnpei, 7 Apr 2007; (g) Whiskered Tern ad. in basic plumage, 9 Apr 2007, Lake Ngardok, Babeldaob, Palau.

Photos by Mandy T. Etpison (a, b), H. Douglas Pratt (c–f), and Paul Pisano (g)

Gray-faced Buzzard (*Butastur indicus*). Approximately a week after passage of Typhoon Miteg, 4 Mar 2003, Yap's first Gray-faced Buzzard was caught by children and brought to Falanruw (Figure 4a, b; Pratt and Etpison 2008:49, bottom). The bird was quite battered, with an injured eye, drooping wing, and damaged tail. Falanruw and State Forester Pius Liyagel rehabilitated it and liberated it in June. It returned briefly to the release site, and a local pilot saw it over the airport, before it disappeared from the island.

During a visit to Kayangel Atoll, Palau, from 9 to 12 Nov 2004, a PCS party saw three unfamiliar hawks, which local residents said had been present for some time. Yalap suggested capturing one without injuring it, and, after the PCS group departed, one hawk was shot but not seriously wounded, kept caged for a short time, photographed (Figure 4d–f), and released. It shows the white eyebrow, bold mesial line on the throat, streaked and spotted underwing coverts, and three dark bands in the tail characteristic of the species (Ferguson-Lees and Christie 2001, Robson 2000). The Chinese Sparrowhawk (*Accipiter gularis*), more frequently seen at Palau, lacks the eyebrow, has four bands in the tail and unmarked underwings, and is much smaller.

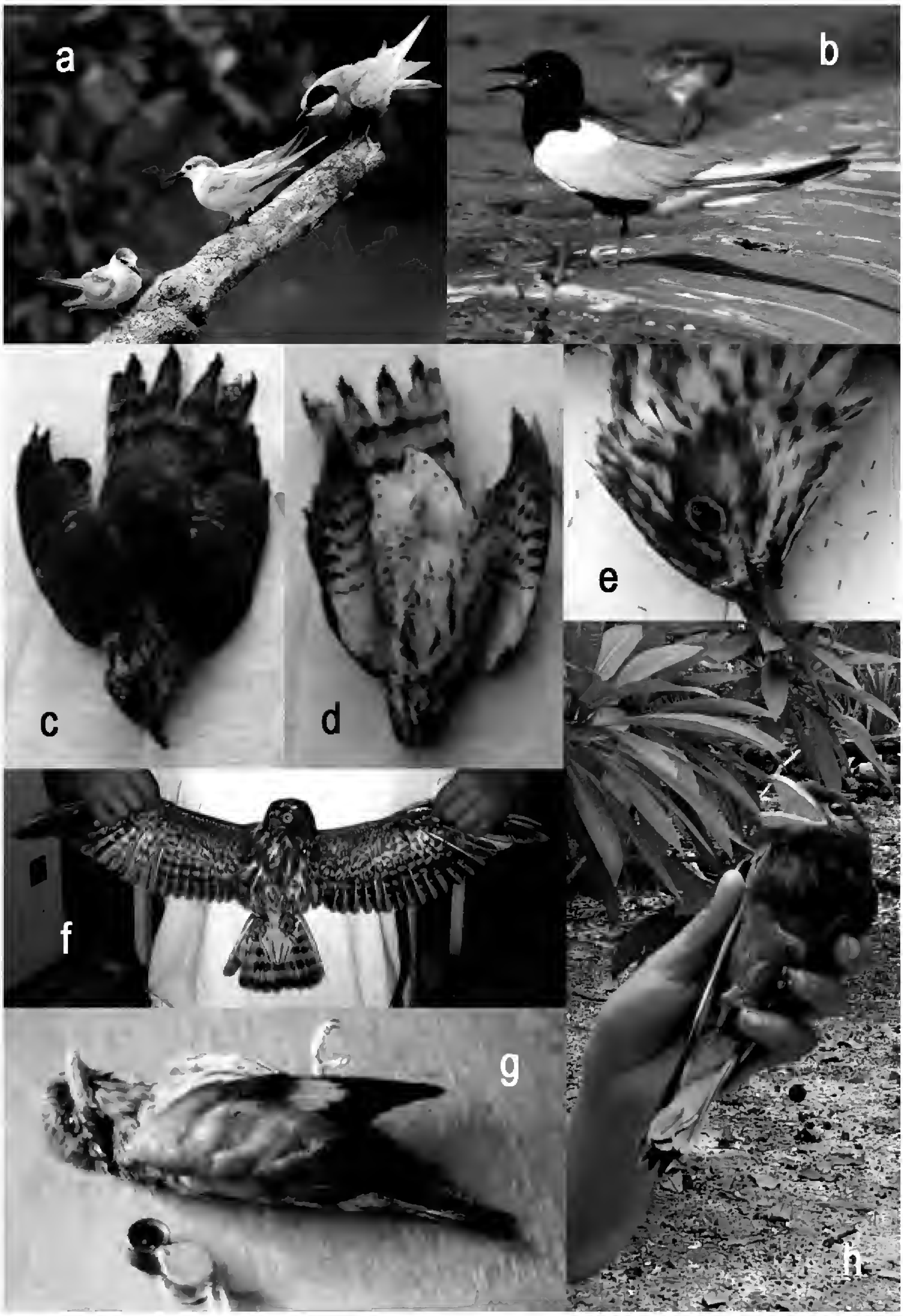

Figure 10. (a) Three ages of Whiskered Terns, Lake Ngardok, Palau, 14 Dec 2005: upper, ad. alternate; middle, ad. basic; lower, first basic (browner nape, trace of dark carpal bar); (b) White-winged Tern (*C. leucopterus*) in alternate plumage, Malakal, Palau, May 2008; (c–e) Rufous Hawk-Cuckoo (*Hierococcyx hyperythrus*) carcass, Yap, late 1996, video stills by Brent McCraven; (f) Brown Hawk-Owl (*Ninox scutulata*) captured on Helen Atoll by Helen Reef Resource Management Project, Nov 2004; (g) Oriental Dollarbird (*Eurystomus orientalis*) killed at Gitam, Yap, Nov 1988; (h) injured Oriental Dollarbird, Ngulu Atoll, Yap, 3 Aug 2008.

Photos by Thomas Dove (a), Mandy T. Etpison (b, f),, Marjorie Falanruw (c–e, g), Conservation Officer Homar (f), and Donald W. Buden (h)

This is the second report of the Gray-faced Buzzard for Palau, the first with photodocumentation (Wiles et al. 2004), and the first for Kayangel.

Peregrine Falcon (*Falco peregrinus*). While observing a flock of shorebirds that included Pacific Golden Plovers (*Pluvialis fulva*), Ruddy Turnstones (*Arenaria interpres*), Little Ringed Plovers (*Charadrius dubius*), and Little Curlews (*Numenius minutus*; see below) at the south end of the airport on Peleliu on 13 Apr 2004, Klauber watched a Peregrine Falcon attack and flush all the birds but fail to catch any. This is the first Peregrine Falcon reported on Peleliu and the third for Palau. The second was captured on the Koror–Babeldaob bridge in 2001 (Wiles et al. 2004), and the first was a century and a quarter earlier (Finsch 1875) at an unknown locality.

Eurasian Coot (*Fulica atra*). The 2003 Pratt party saw a single Eurasian Coot on the reservoir south of Colonia, Yap, early in the morning on 23 Feb 2003. The bird was standing in the edge of shallow water at the north end of the reservoir among a group of shorebirds, ducks, and crakes. It had all-black body plumage and a prominent white bill and frontal shield, with a point of black feathering between the shield and the bill, diagnostic for this species as compared to other n. hemisphere coots (Pratt et al. 1987). The coot was not seen again on subsequent visits to the reservoir over the next four days. The Eurasian Coot is a rare and erratic winter visitor to the Mariana Is. (Wiles et al. 2004), but this is the first reported on Yap.

Black-winged Stilt (*Himantopus himantopus*). First recorded as a vagrant at Palau in 1978 (Engbring and Owen 1981), and not again until 2002 (VanderWerf et al. 2006), the Black-winged Stilt now winters at Palau annually in small groups. Recent observations include one on a brackish pond, Ngeriungs I., Kayangel Atoll, 11 Nov 2004 (Gupta and PCS party), one at the milkfish pond on Peleliu, 25 Jan 2005 (same observers), nine at the Malakal sewer pond, winter 2006–07 (Etpison), and six at the Ngatpang aquaculture ponds, Babeldaob, 9 April 2007 (Pratt party).

Yap's first Black-winged Stilt sighting was in 1986 (Wiles et al. 1987), followed by several in 2002 (Clements 2003; reported erroneously as the Pied Stilt, *H. leucocephalus*). Three at the Colonia reservoir, 13 Apr 2007 (Pratt party), and three at the old Yap airport pond in Ruul Municipality,15 Mar 2008 (Clement, Barry Cooper, and Gail Mackiernan), suggest the Black-winged Stilt has also become an annual visitor to Yap.

Black-bellied Plover (*Pluvialis squatarola*). On 6 Apr 2007, Pratt's party found a Black-bellied Plover (Figure 5a, b) among a small group of Pacific Golden Plovers on an athletic field near downtown Kolonia, Pohnpei. This bird is the second recorded for the main island of Pohnpei, and the first in spring for Pohnpei State. Buden (1995, 1999a) reported Black-bellied Plovers in December on the outlying islands of Pingelap and Oroluk, and G. Dutson saw one on the main island in Oct 2001 (Wiles et al. 2004).

Greater Sand Plover (*Charadrius leschenaultii*). Although this species has been long reported as a winter resident (Baker 1951, Pratt et al. 1987, Pratt and Etpison 2008) in Micronesia, actual records reveal it to be mainly, if not entirely, a passage migrant. Recent reports on Yap include three on 7 Aug 1989 (locality not noted; H. L. Jones, field notes), one on 23 Sep 2000 (Paula Sullivan), and two molting into alternate plumage 15 Apr 2007 (Pratt party). But Pratt's parties found none in Feb 1988 and 1991, early Mar 1993, or Feb 2003. At Palau, where the species is a regular spring and fall migrant, Vice captured individuals in 2008 on 27 Mar and 18 Nov, and in 2009 on 24 Feb and 2 Apr. His Feb record and one from Pohnpei (Wiles et al. 2000) are the only possibly winter records published, and both could well be of early spring migrants.

Oriental Plover (*Charadrius veredus*). In Micronesia known only from several sight records in the 1970s from Palau's Southwest Islands (Merir and Helen) and Angaur, all between 10 and 21 Oct (Engbring and Owen 1981; Angaur records mistakenly attributed to Peleliu by Pratt and Etpison 2008). On the basis of geographic probability these reports have been assumed to represent *C. veredus* rather than the very similar Caspian Plover (*C. asiaticus*). On 30 Sep 2009 Ketebengang, with Sarah Sugiyama, photographed a single juvenile Oriental Plover (Figure 5c) at the softball field in Meyuns, Arakabesan I., and saw two more at the same locality 15 Oct, the first to be reported from the main islands of Palau. They found and photographed (Figure 5d) another at the international airport, Babeldaob, on 27 Oct. The photographs show bright straw-yellow legs with a slight orange tint (would be dusky in *C. asiaticus*) and the more diffuse breast band characteristic of *C. veredus* (Brazil 2009). The absence of reports from Palau during the 1980s and 1990s probably reflects both the lack of observers and the narrow interval for potential sightings. This species is possibly a rare but regular migrant in Palau in October.

Common Snipe (*Gallinago gallinago*). On 24 Feb 2003 the Pratt party closely observed a snipe feeding along the shore of the small pond adjacent to the abandoned airport runway in Ruul Municipality, Yap. The bird was in strong morning light at ~25 m and viewed through binoculars and a spotting scope. It was richly colored, apparently in fresh plumage, without any extreme tail projection beyond the wing tips. In two short, hopping flights, the bird revealed a bold white trailing edge to the secondaries, diagnostic for the Common Snipe (Pratt et al. 1987, Message and Taylor 2005) and establishing a first record for Yap. Swinhoe's Snipe, a regular visitor to w. Micronesia (Wiles 2005), lacks the prominent trailing edge. The very similar Wilson's Snipe (*G. delicata*) of N. America has the pale edge to the secondaries less obvious (Message and Taylor 2005; Pratt pers. obs.) than that of the bird on Yap. Vice captured Palau's first Common Snipe at the Koror landfill on 17 Nov 2008 (Figure 6). The bird clearly shows the prominent white trailing edge to the secondaries.

Latham's Snipe (*Gallinago hardwickii*). Shortly after the Common Snipe sighting (above) on Yap, Pratt independently observed a second snipe on the far side of the same pond. The bird was considerably larger with very worn plumage that, except in the scapulars, showed little of the rich dorsal patterning typical of snipes. The tail extended well beyond the folded wing tips. When flushed, the bird flew rapidly with comparatively heavy wing beats directly toward the observer, so details of wing feathers were not visible. All of these features suggest Latham's Snipe (Hayman et al. 1986:394, Message and Taylor 2005, Brazil 2009) but are insufficient to establish an unequivocal first record for Yap. A report of Latham's Snipe on Rota (Mariana Is.), with a similar level of detail, is also considered hypothetical (Stinson et al. 1991). The only certain record for Micronesia remains a specimen from the Marshall Is. (Amerson 1969), although Vice recently photographed a bird in the hand on Guam that is likely this species (details to be published elsewhere).

Bar-tailed Godwit (*Limosa lapponica*). H. L. Jones (field notes) saw a Bar-tailed Godwit at Bechyal, n. Maap I., Yap, 7 Aug 1989. His sighting predates by 13 years the first published record (Clements 2003). The third, and only spring, record is of a bird radio-tagged (Z5) in New Zealand in early 2007 and tracked to Yap, where it remained for a month before flying to Okinawa (Battley et al. 2008). Coincidentally, Etpison photographed (Pratt and Etpison 2008:207) a number-tagged Bar-tailed Godwit in Ngiwal State on Babeldaob, Palau, in early Nov 2007. This male had been banded and leg-flagged at Chongming Dongtan, near the mouth of the Yangtze River, China, on 13 May 2007 (Zhijun Ma, pers. comm. to PCS and others, 7 Nov 2007).

Little Curlew (*Numenius minutus*). The only Palau sighting since the 1970s (Engbring 1983b, Owen 1977a) is of two birds at the north end of airport on Peleliu,13 Apr 2004 (Klauber), a first for that island.

(American) Whimbrel (*Numenius phaeopus hudsonicus*). Although all Micronesian records of the Whimbrel identified to subspecies had proven to represent *N. p. variegatus*, Wiles (2005) presciently stated that the N. American form *N. p. hudsonicus* "could reach Micronesia, especially the Marshalls." On 3 Apr 2007, from the window of a commercial passenger jet, Pratt saw a *hudsonicus* among several Whimbrels flushed from grassy areas adjacent to the runway on Kwajalein Atoll, Marshall Is. The bird lacked any trace of the white "slash" that extends up the rump and lower back of *N. p. variegatus* (Message and Taylor 2005, Brazil 2009), and it lacked the characteristic peach color seen on the posterior of the similar Bristle-thighed Curlew (*N. tahitiensis*; Pratt et al. 1987). Subsequently, "at least one" American Whimbrel was adequately described from a high-tide roost in mangroves on Pohnpei in Dec 2008 (Derek Scott, www.birdquest.co.uk/tripreports.cfm?trip=667). The American Whimbrel regularly visits Hawaii and has strayed to Japan (Brazil 2009), but these are first reports from Micronesia.

Far Eastern Curlew (*Numenius madagascariensis*). This species seems to be decreasing, both in Micronesia and elsewhere (Close and Newman 1984, Wiles et al. 2000, Reid and Park 2003), so all sightings in Micronesia are now important. H. L. Jones (field notes) saw one on Peleliu, Palau, 4 Aug 1989, and the Pratt party saw and photographed (Pratt and Etpison 2008:206) another on 11 Apr 2007 near the Ngiwal State building and monument on the east coast of Babeldaob for the only recent reports from Palau, where the Far Eastern Curlew was formerly believed to be a regular passage migrant (Baker 1951). Buden found one on the beach near the airstrip on Houk I., Chuuk State, on 28 Dec 2003 for the first report from Houk and the third from Chuuk State (Pyle and Engbring 1987, Wiles et al. 2004).

Lesser Yellowlegs (*Tringa flavipes*). Among the species reported from shorebird surveys 6–9 Feb 2007 at the Ngatpang aquaculture ponds on Babeldaob, Palau (Hawai'i–Pacific Islands Working Group on Avian Influenza Surveillance 2008:Table 7), is a Lesser Yellowlegs. Lead biologist S. Kremer (pers. comm., 4 Jun 2009) is familiar with the species but did not realize the significance of the sighting, a possible first record for Palau, at the time. She identified the bird by its very bright yellow legs and size appropriate for this species rather than the Greater Yellowlegs (*T. melanoleuca*) but made no detailed notes. Other species present at the time that can have yellow or yellowish legs include the Common Greenshank (*T. nebularia*), Wood Sandpiper (*T. glareola*), Marsh Sandpiper (*T. stagnatilis*), and Gray-tailed Tattler (*T. brevipes*), but none approached

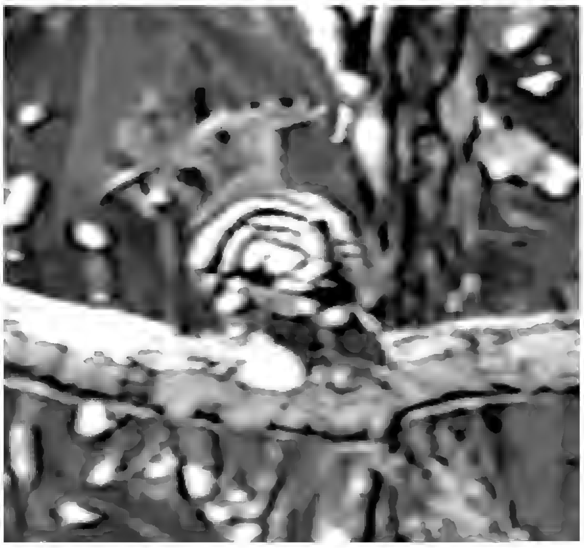

Figure 11. Eurasian Hoopoe (*Upupa epops*), Yap, Oct 1995; video still by Brent McCraven.

Photo by Marjorie Falanruw

Figure 12. Oriental Reed Warbler (*Acrocephalus orientalis*): (a–c) Malakal sewer pond, Palau, 11 Apr 2007; (d) Ruul District, Yap, 8 Feb 2008.

Photos by Paul Pisano (a–c) and Mandy T. Etpison (d)

the bright yellow color of this individual. Nevertheless, the reported details are insufficient for a positive identification, and this species must be regarded as hypothetical for Palau. The Lesser Yellowlegs breeds in N. America and winters in S. America but has a strong tendency for long-distance vagrancy. It is regular in Hawaii (Pyle 2002) and has reached Australia, New Zealand, Hong Kong, French Polynesia (Tibbitts and Moskoff 1999), and Kwajalein in the Marshall Is. (Clapp and Schipper 1990).

Common Redshank (*Tringa totanus*). Despite Clements's (2003) statement that this species "is an uncommon winter visitor to Yap," the only published record is of two birds seen 3 Aug 1978 (Pratt and Bruner 1981). The Pratt party and T. Alfonso observed several individuals on tidal flats at the s. end of the main island of Yap on 23 and 24 Feb 2003.

Green Sandpiper (*Tringa ochropus*). Etpison photographed three Green Sandpipers (Pratt and Etpison 2008:199; Figure 7a), long regarded as hypothetical for Palau (Owen 1977), at the sewage pond on Malakal in Oct 2006. The birds segregated themselves from a much larger number of Wood Sandpipers (*T. glareola*). The photographs show many of the distinctive features that distinguish the Green Sandpiper from the similar and more common Wood Sandpiper (Message and Taylor 2005), including darker overall plumage, much reduced pale flecking on the back, a shorter eyestripe less prominent behind the eye, darker greenish legs, and fewer and broader dark bars across the white tail feathers. All birds were juveniles, as indicated by their brownish color and barring extending to the sides of the rump. The birds remained at the site into December. In Sep 2007, Etpison again found a Green Sandpiper at the same locality (Figure 7b) for the second confirmed Palau record.

Common Sandpiper (*Actitis hypoleucos*). Wiles (2005) considered all records of this species from Kosrae and Pohnpei hypothetical because none had detail sufficient to eliminate the Spotted Sandpiper (*A. macularius*) of N. America, which reaches Hawaii (Pyle 2002) and strayed once to the Marshalls (Amerson 1969). The 2007 Pratt party confirmed that the several birds they saw on Pohnpei in April were Common Sandpipers by the long projection of the tail beyond the folded wing tips (Pratt et al. 1987, Message and Taylor 2005).

Great Knot (*Calidris tenuirostris*). Klauber saw a Great Knot in nearly full alternate plumage roosting with Greater Sand Plovers on a temporary coral causeway off the s. end of Babeldaob, Palau, on 16 Apr 2004. The only previous Palau record is of flocks of 15–20 birds at Peleliu in Sep 1945 (Baker 1951). Klauber's sighting is first report of a Great Knot in alternate plumage in Micronesia.

Red Knot (*Calidris canutus*). Clement and B. Cooper observed a Red Knot at a distance of ~150 m in good light through binoculars and a telescope 15 Mar 2008 in Colonia, Yap, taking detailed notes of the bird's basic plumage. This is the first Red Knot reported on Yap and only the fourth for Micronesia, the previous ones being two from Guam and one from Palau (Owen 1977b, Wiles et al. 2004), including records for both spring and fall.

Curlew Sandpiper (*Calidris ferruginea*). Although Engbring (1988) considered this species an uncommon passage migrant at Palau, published records are few, with two from Peleliu, in September (Baker 1951) and April (VanderWerf et al. 2006), and another from Helen Reef (Engbring 1983a; no details). Klauber saw a Curlew Sandpiper at a small pond north of the airport on Peleliu 13 Apr 2004 and another among a group of birds foraging on the lawn of the new national capitol at Melekeok, Babeldaob, 18 Apr 2004. Etpison found a bird approaching full alternate plumage at the sewer pond on Malakal on 20 May 2008 (Figure 7c), and Vice captured one in Apr 2009 at Ngatpang, Babeldaob. Elsewhere in Micronesia, Yap (Pyle and Engbring 1987) and Guam (Wiles et al. 1987) have one record each.

Ruff (*Philomachus pugnax*). The first published records of this species from Yap State are those of Wiles et al. (1987), who reported one near the Yap airport and another at Ulithi Atoll, both in early Mar 1986. P. Sullivan photographed a Ruff (Figure 7d) in the center of Colonia on 23 Sep 2000 and another at Ulithi Atoll (Figure 7e) on 25 Sep 2000. Each photo establishes a second record for the Ruff for each island and the first fall records for Yap State. The Ruff is a regular passage migrant at Palau May–June and September–October (Owen 1977a, VanderWerf et al. 2006, Etpison pers. obs.). Etpison's observation of a Ruff at the Ngatpang aquaculture ponds on Babeldaob on 15 Feb 2007 suggests that a few overwinter.

Red-necked Phalarope (*Phalaropus lobatus*). Although this arctic breeder winters at sea just south of Micronesia (Piersma et al. 1996) and surely must pass through the region during migration, only a single actual record exists, of one in alternate plumage on Tinian 29 May 1999 (Wiles et al. 2000). Etpison found the first for Palau, a bird in basic plumage swimming in the open lagoon among the Rock Is. on 10 Oct 2006 (Figure 7f; Pratt and Etpison 2008:254). Local fishermen (*fide* Shallum Etpison), who regularly venture 32–80 km outside the reef to troll for marlin, often see similar birds but could not recall specific dates other than Sep 2006. They notice the bird "because it floats in the middle of nowhere and swims around in circles like it's drunk." On 6 Nov 2006, Etpison saw another Red-necked Phalarope on the ocean outside the main reef between Peleliu and Angaur.

Oriental Pratincole (*Glareola maldivarum*). Engbring (1988) considered this species an annual migrant to Palau, but subsequent observations suggest that it is less regular there. Pratt, whose visits have been mostly in February, has never seen one there, nor has Etpison in her work from 2004 through 2009, but in 2008, Ketebengang saw one bird at the Palau airport on her monthly survey in January, then 39 in February, 45 in March, and three in April. A few individuals remained through the ensuing months (Figure 7g, h) until she found none on 28 Aug. The February and March counts represent by far the largest groups of pratincoles ever reported in Micronesia and contrast strikingly with the many years in which none have been present during the same months.

Laughing Gull (*Leucophaeus atricilla*). Pisano, accompanied by Chapman and Retter, digiscoped an apparent first-summer Laughing Gull (Figure 8a, b) along the causeway connecting the commercial port and Kolonia, Pohnpei, on 4 Apr 2007 for the first Pohnpei record. The gull was not present on subsequent visits to the locality. On 4 Jan 2008, Carlos Cianchini photographed a winter ad. Laughing Gull (Figure 8c), a first for Kosrae, perched on a swimming platform next to the causeway that connects Lelu I. with the main island. The bird remained through February and was seen twice at Okat Harbor on the west side of the island (C. Cianchini pers. comm.).

Franklin's Gull (*Leucophaeus pipixcan*). Early in the morning on 19 May 2009, Glenn McKinlay photographed a Franklin's Gull in full alternate plumage (Figure 8d, e) at the west end of the airport on Majuro, Marshall Is. He did not find the gull on subsequent visits to the site through 21 May. The only previous record for Majuro

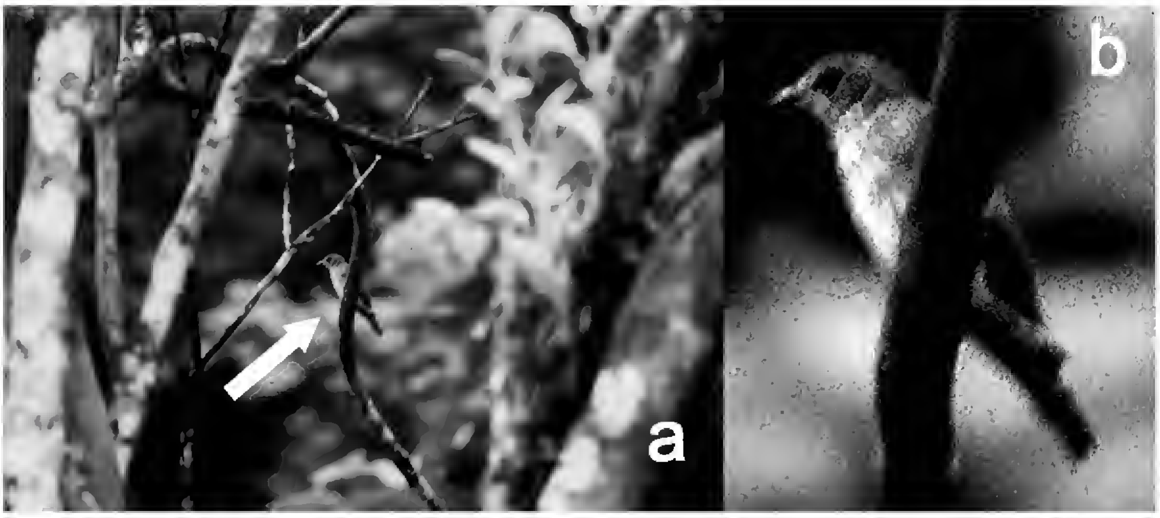

Figure 13. (a) Gray-streaked Flycatcher (*Muscicapa griseisticta*), Fanif District, Yap, 26 Sep 1991; (b) same image enlarged and processed with Adobe PhotoShop by H. D. Pratt.

Photo by Dale Herter

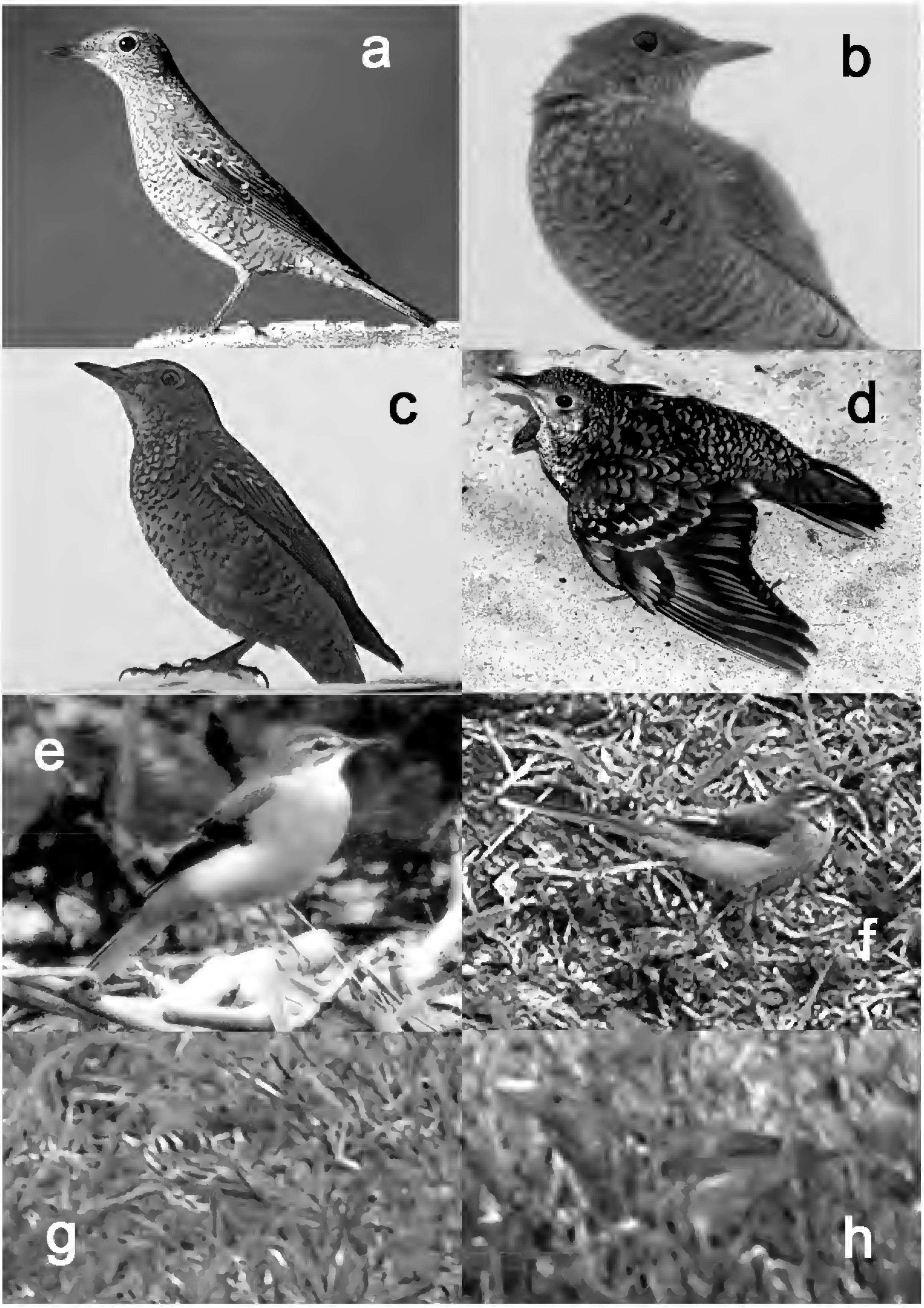

Figure 14. (a) Blue Rock Thrush (*Monticola solitarius*), female, Koror, Palau, 12 Nov 2006, (b) female, Arakabesang I., Palau, 22 Oct 2009, (c) juvenile male with incoming definitive feathers, Koror, Palau, 25 Oct 2009 (shadow levels adjusted in Adobe PhotoShop by Pratt); (d) Scaly Thrush (*Zoothera dauma*), Neco I., Palau, Jan 2006; (e) Gray Wagtail (*Motacilla cinerea*), female, Malakal sewer pond, Palau, 11 Apr 2007 and (f) male, same locality and date; (g, h) Red-throated Pipit (*Anthus cervinus*), Peleliu, Palau, Apr 2004.

Photos by Mandy T. Etpison (a), Alan Olsen (b, c), H. Douglas Pratt (e–f), and David Klauber (g, h) and the Marshalls is that of Anderson (1978) in Jun 1976. McKinlay photographed another Franklin's Gull (Figure 8f, g), molting from basic to alternate plumage, in the lagoon 500–800 m NW of Nahlap, Kitti District, Pohnpei, 5 July 2009 just before 18:00. It is the first Franklin's Gull reported for that island and the second for the Carolines; the first was at Chuuk in August 1983 (Pyle and Engbring 1987). McKinlay sent his photographs via Buden to Pratt who, assisted by Steve N. G. Howell, made the identifications on basis of the large eye crescents, relatively small bill, rounded head, and large amount of white in the primary tips.

Black-headed Gull (*Chroicocephalus ridibundus*). Although the first published sighting of this species for Yap was in 1993 (Wiles et al. 2000), the first known occurrence on the island is of two winter-plumaged birds observed by Herter near the Manta Ray Bay Hotel on 20 Feb 1992. Pratt's 2003 party saw another bird from the mainland across from O'Keefe's I. At Palau, the Black-headed Gull (Figure 8h) has been regarded as a regular winter resident in small numbers (Pratt et al. 1987, Engbring 1988), but because so few reports have been published since the 1980s, VanderWerf et al. (2006), who had sightings of what may have been only a single individual in Apr 2005, questioned whether that status still held. Filling some of the gap are previously unpublished sightings by Pratt's tour groups in Feb 1991, 1993, and 2003. Etpison sees Black-headed Gulls every year, and in the spring, groups of up to 25 birds often congregate in a vacant lot adjacent to NECO Marine Dive Shop and at the nearby Dolphins Pacific facility on Malakal. Dolphins Pacific employees reported as many as 20 birds at a time stealing fish intended for dolphin food for "several months" in 2007–08 but did not see any in 2008–09 (Etpison). Apparently numbers fluctuate widely from year to year, and many birds may be spring migrants rather than winter residents. Most of them depart by April, which might explain the paucity of sightings by VanderWerf et al. (2006) and the lack of sightings by the 2007 Pratt party.

Common Tern (*Sterna hirundo*). A Common Tern (Figure 9a; misidentified as a Whiskered Tern in Pratt and Etpison 2008:233), one of three present at the Malakal sewer pond in late Oct 2006, provides only the second confirmed record for Palau since the 19th century. Another Common Tern at the same locality in Sep 2007 (Figure 9b) suggests the species is probably annual at Palau. On Pohnpei, the 2007 Pratt party observed the first since several individuals wintered there in 1978–79 (Engbring and Owen 1981). A single Common Tern, first seen and identified while perched, was later flying (Figure 9c) and plunge-diving (Figure 9d) just east of the causeway connecting the main island and the airport on 6 Apr. To date, all Micronesian Common Terns have apparently been the black-billed *S. hirundo longipennis*.

Whiskered Tern (*Chlidonias hybrida*). The 2007 Pratt party saw three or four Whiskered Terns on several occasions from 4 to 7 Apr around the commercial port on Pohnpei (Figure 9e, f). All apparently adults in basic plumage, they constitute a first record for Pohnpei. Since 2006, especially in the fall, Etpison has noted increasing numbers of Whiskered Terns at Palau. At least a few birds remain until April each year. Other recent unpublished reports are of three birds, Lake Ngardok, Babeldaob, 14 Dec 2005 (T. Dove pers. comm.), one at same locality (Figure 9g) 9 Apr 2007 (Pratt party), and three near the Koror landfill 7–9 Apr 2007 (Pratt party). Except for the first, of one collected July 1976 (Clapp and Laybourne 1983), Yap records extend from October to April. Recent sightings at the old airport pond, Ruul Municipality, include three in basic plumage 13 Apr 2007 (Pratt party), one 15 Mar 2008 (Clement), and another 16 Oct 2008 (T. Alfonso and T. Mark pers. comm.). All plumage stages have now been observed in Micronesia (Figure 10a).

White-winged Tern (*Chlidonias leucopterus*). From the airport terminal on Pohnpei 7 Apr 2007 the Pratt party saw a tern perched on the runway several hundred meters away. It was observed through glass windows with binoculars and a telescope and showed very pale upperparts, an obvious round black auricular spot, and smudgy markings across the hindcrown. When it flew, it showed a pure white rump and shallowly forked tail, with no dark color in the outermost web. The wing pattern was very similar to that of several Whiskered Terns seen at the same time. The distinctive head pattern is characteristic of the White-winged Tern in basic plumage (Brazil 2009). This sighting constitutes the first record for Pohnpei.

The White-winged Tern is a regular spring and fall passage migrant at Palau (Pratt et al. 1987, Engbring 1988). Most birds observed are in some stage of molt between the juvenal, basic, and alternate plumages (VanderWerf et al. 2006, Pratt and Etpison 2008:232). On 11 May 2008 after two weeks of stormy weather with strong southwesterly winds, a large number of White-winged Terns in resplendent alternate plumage (Figure 10b) appeared at Palau. They foraged mostly among the Rock Is. north to Malakal, in groups of up to nine individuals, and, because of their unusual plumage, were even noticed by Palauans with little interest in birds. On Babeldaob, Olsen and Mark Bezner saw several at Lake Ngardok on 10 May, and Olsen saw several on the Compact Road at Ngatpang, 24 May. The terns lingered at Palau until the third week of June, the latest date ever for this species in Micronesia.

Rock Pigeon (*Columba livia*). Domestic pigeons have been reported on many Micronesian islands but, except in the Marianas, have not become established (Wiles 2005). An incipient population on Pohnpei was the object of efforts at extermination in 2007 and 2008 by the Pohnpei Invasive Species Task Force, whose efforts succeeded in eliminating the birds from the island except for a domestic flock of ~20 maintained by a family in U District (K. Englberger pers. comm., 17 Sep 2009). T. Alfonso found a lone pigeon at the ESA Hotel, Colonia, Yap, 2 Sep 2007 (*fide* Falanruw). It bore colored leg bands, blue with numeral 50 over white on the left leg and one blue band on the right. The bird remained for ~2 weeks and disappeared. The cargo ship *Haneburg* was in port when the bird was first seen, and other ships had called on 22 and 30 Aug.

Rufous Hawk-Cuckoo (*Hierococcyx hyperythrus*). This species, also called the Northern Hawk-Cuckoo, has been known in Micronesia only from a single ad. specimen in the Yale Peabody Museum (YPM 12390), collected by P. J. R. Hill on Babeldaob, Palau, in Feb 1950 (Ripley 1951; Wiles 2005). The species was once considered a subspecies of Hodgson's (or Horsfield's) Hawk-Cuckoo (*H. fugax*), now divided into several species (King 2002). It is the only migratory member of that group and breeds in temperate ne. Asia and migrates apparently to Borneo and surrounding areas, although the details are poorly known (Payne 2005). In late 1996 (exact details not recorded), following either Typhoon Dale (Nov) or Fern (Dec), Falanruw found a hawk-cuckoo (Figure 10c–e) with damaged tail feathers dead on the road in Fanif Municipality, Yap. She made a video of it before preparing it as a specimen that was later destroyed by insects. Although the heavily streaked head, including the crown and nape, does not match exactly any published illustration or description we can find, Robert B. Payne (pers. comm.) believes the bird to be a juv. *H. hyperythrus*. Bradley Livezey and Stephen P. Rogers (Carnegie Museum of Natural History) reached the same conclusion by comparing stills from the video to a small number of specimens, and Livezey (pers. comm.) believes the bird to be "very recently fledged without all the flight feathers yet grown out." Paul Sweet compared still outtakes with specimens in the American Museum of Natural History and noted that all the juv. *H. hyperythrus* in that collection differ in being solidly dark on the top of the head. Whatever this bird's plumage represents, it constitutes the first record of a hawk-cuckoo for Yap and only the second of *H. hyperythrus* for Micronesia.

Brown Hawk-Owl (*Ninox scutulata*). For decades on hypothetical list for Micronesia (Pratt et al. 1987, Wiles 2005) on the basis of two unsubstantiated reports from

Helen Atoll in Palau's Southwest Is.,1978–1979. Those sightings failed to rule out "several other *Ninox* spp. that reside on nearby islands with which the [Brown Hawk-Owl] could conceivably be confused" (Engbring 1983b). In Nov 2004, the Helen Reef Resource Management Project party captured and photographed a Brown Hawk-Owl (Figure 10f, Pratt and Etpison 2008:157) on Helen Atoll to confirm the species' occurrence on that island and add it unequivocally to the Micronesia list.

Short-eared Owl (*Asio flammeus*). Clements (2003:41) said this species is "the only owl...reported from Yap, but the records need documentation." We know of no certain published records for Yap, but Pyle and Engbring (1987) found an owl pellet (specimen at Yap Institute of Natural Science) in the open savanna of Gagil-Tomil and tentatively identified it as that of a Short-eared Owl. John Fanoway caught one of several owls at the Yap airport at ~21:00 in Jun or Jul 1991 (exact date not recorded). Sam Falanruw made a video of it, viewed later by M. Falanruw, who was off the island at the time. Unfortunately, the images were later damaged in a typhoon, but from memory, M. Falanruw identified the bird as a Short-eared Owl. T. Alfonso and Martin Faimau also saw the bird and, after viewing photos of several possible owls, agree with the identification. The Short-eared Owl is the one most likely to turn up on Yap (Pyle and Engbring 1987), and we consider this bird sufficiently documented now to confirm the species for the island. Migratory Short-eared Owls turn up occasionally throughout Micronesia (Spennemann 2004, Wiles 2005).

White-throated Needletail (*Hirundapus caudacutus*). Klauber saw four black-and-white birds with swiftlike shape and powerful flight soaring over Bloody Nose Ridge, Peleliu, Palau, 13 Apr 2004. They were much larger than nearby Palau Swiftlets (*Aerodramus pelewensis*) and lacked the prominent white rump of the White-breasted Woodswallow (*Artamus leucohrynchus*), resident in n. Palau. They showed white throats, but the tails were short, not long and forked as in the Fork-tailed Swift (*Apus pacificus*), the only other large white-throated swift previously known from Micronesia (Wiles 2005). The features he saw are all consistent with the White-throated Needletail and are not shared by any other potential species (Chantler and Driessens 1995). The only previous record for Micronesia is of one on Guam, Nov 1997 (Wiles et al. 2000). Klauber's sighting is the first for any migratory swift at Palau.

Oriental Dollarbird (*Eurystomus orientalis*). H. L. Jones (field notes) observed an Oriental Dollarbird on Ngcheangel Islet of Kayangel Atoll, n. Palau, 2 Aug 1989, an island first. Gupta and R. Leidich reported the first dollarbird for Peleliu in Dec 2003, the only Micronesian record during the n. winter. Engbring (1983a) incorrectly stated that *E. o. pacificus* is the only migratory subspecies, and this observation suggests that one of the field-identifiable e. Asian forms (Fry et al. 1992) may also visit Palau occasionally.

A second specimen of the Oriental Dollarbird for Yap was brought dead (Figure 10g) to Falanruw in Sep or Oct 1988 (specimen later destroyed by insects). Buden saw a dollarbird on Ngulu Atoll, Yap State, almost every day 13 Jul–3 Aug 2008, a first for that island. On 3 Aug an islander brought him an Oriental Dollarbird with a broken wing (Figure 10h). The bird died the next day and was not preserved.

Eurasian Hoopoe (*Upupa epops*). On 25 or 26 Oct 1995, Falanruw and M. Faimau found a Eurasian Hoopoe near the Department of Education and the Catholic Mission in Colonia, Yap. In Falanruw's video, all identifying features of this very distinctive bird are clearly evident (Figure 11). This is the first record of a hoopoe for Yap and only the second for Micronesia; the first was on Saipan Aug 1988 (Stinson et al. 1991).

Brown Shrike (*Lanius cristatus*). Until recently, the Brown Shrike was known in Micronesia only on the remote island of Tobi in Palau's Southwest Is., where an ad. and immature were present 15 Nov 1977, followed by a single bird 21 May 1979

(Engbring and Owen 1981). On 19 Apr 2003, J. Hunter saw a Brown Shrike on s. Peleliu (Wiles et al. 2004, pers. comm.). On 23 May 2003, T. Mark (pers. comm.) saw probably the same individual in the same general area. The bird had a black mask, white supercilium, and uniformly brownish-gray cap and upperparts, which eliminate from consideration both the Tiger Shrike (*L. tigrinus*) and Bull-headed Shrike (*L. bucephalus*), the other e. Asian brown-backed shrikes likely to reach Micronesia (Brazil 2009). These sightings are the first for the main Palau Is. and the third for Micronesia (if both observers saw the same bird in 2003).

Barn Swallow (*Hirundo rustica*). A common nonbreeding visitor, with a few remaining all year, on the main islands of Palau (Pratt and Etpison 2008) and Yap (Clements 2003), but it has not been reported from Yap's outlying atolls. Falanruw saw several on Gileop Islet, Ulithi Atoll, in Aug 2007. Buden saw one bird, flying back and forth along the beach, on Ngulu Atoll on 25 Jul 2008. By the end of the month, six or seven birds were present, and by the time he departed on 10 Aug, dozens of swallows were hawking insects over the island.

Unidentified house martin (*Delichon* sp.). Engbring and Owen's (1981) two identifications, based primarily on geographic probability, of single Asian House Martins (*D. dasypus*) from Koror, Palau, have long been accepted uncritically (Pratt et al. 1987, Wiles 2005, Pratt and Etpison 2008), but the observers themselves considered the Asian and Common (*D. urbicum*) house martins indistinguishable in the field. Details of the sightings do not eliminate the Common House Martin, which breeds in far e. Siberia, winters to se. Asia (Robson 2000, Brazil 2009), and is only slightly less likely to stray to Palau. Fer-Jan de Vries (www.camacdonald.com/birding/tripreports/TripReports.html) reported a sighting between 22 Dec 1994 and 4 Jan 1995 on Angaur, Palau. Like the first, this report lacks details essential for distinguishing the two species of house martins, which are difficult but not impossible to identify in the field (Brazil 2009). Thus, the occurrence of the Asian House Martin in Micronesia must be considered hypothetical.

Common Myna (*Acridotheres tristis*). Fortunately, Common Mynas are not yet established anywhere in Micronesia, although they were present for several years on Kwajalein in the Marshall Is. (Wiles 2005). In Sep 1988, shortly after a ship had been in port, seven Common Mynas appeared in Colonia, Yap. They were identified by Falanruw and C. Frieberg, who were familiar with the species elsewhere. Local citizens T. Alfonso, M. Faimau, and P. Liyagel took the responsibility of killing them all because of the bird's reputation for invasiveness on other Pacific islands.

Oriental Reed Warbler (*Acrocephalus orientalis*). This species has long languished on the hypothetical list for Micronesia because sight records from Palau (Pyle and Engbring 1987) and Yap (Wiles et al. 2000) did not completely exclude other possible similar species.

The first confirmation of this species at Palau is a series of photographs (Figure 12a–c), digiscoped by Pisano, of one of two individuals at the Malakal sewer pond on 11 Apr 2007. The photos reveal a clear pale supercilium, flaring behind the eye; a dark eye line extending well behind the eye; faint grayish streaks on the sides of the breast; obvious pale tips and diffuse darker subterminal area on the rectrices (this feature particularly obvious in flight, Pratt); tawny tinges to lower flanks; a very slight rufous tinge to the rump; primaries evenly spaced, showing seven or eight beyond the tertials; a squarish, slightly graduated tail; and a nearly straight lower mandible, pale throughout its length. The bird is intermediate in several features between the two color figures of the Oriental Reed Warbler in Robson (2000: plate 82) and is clearly not a Thick-billed Warbler (*A. aedon*), whose facial features are quite different (Brazil 2009), or a Clamorous Reed Warbler (*A. stentoreus*), which lacks the breast streaks and the pale-tipped tail (Robson 2000). Pratt and Pisano's close comparison of the photographs with large series of skins of all three candidate species at the U.S. National Museum found the Palau bird's bill to be too thin for the Thick-billed Warbler and too thick for the Clamorous Reed Warbler, with plumage characters matching those of Oriental Reed Warbler.

On 8 Feb 2008, Etpison, with T. Alfonso, photographed an Oriental Reed Warbler (Figure 12d) at a small pond near the old airport runway, Ruul Municipality, Yap. The photograph shows all of the identifying features mentioned above. The bird gave the harsh chattering calls characteristic of large *Acrocephalus* warblers but did not sing. The locality is only a short distance from the spot where Pratt and others saw and heard a similar bird, not positively identified to species, in Feb 1991 (Wiles et al. 2000). This photograph establishes the first unequivocal record of the Oriental Reed Warbler for Yap.

Gray-streaked Flycatcher (*Muscicapa griseisticta*). Herter saw and photographed a Gray-streaked Flycatcher (Figure 13) in the n. part of Fanif Municipality, Yap, on 26 Sep 1991, for a first island record. The clear streaking on the sides of the breast is not as evident in the photo as it was at the time of the observation. This feature helps to distinguish this species from similar ones that might stray to Yap, such as the Dark-sided Flycatcher (*M. sibirica*) and Asian Brown Flycatcher (*M. daurica*) (Brazil 2009).

Blue Rock Thrush (*Monticola solitarius*). The Blue Rock Thrush is a rare winter visitor to Palau, with only three previous reports, one prior to 1932, and more recently in 1979 and 1988 (Wiles et al. 2000). The latter two were of ad. males of the chestnut-bellied form *M. s. philippensis*. Etpison noted a female-plumaged bird in Nov 1993, and it or similar birds have turned up along her driveway on Koror every 2–3 years since. She found one there on 12 Nov 2006 and again on its roost in a coral cave on 9 Apr with the 2007 Pratt party (Figure 14a, Pratt and Etpison 2008:157). Olsen saw a female (Figure 14b) on 22 Oct 2009 near the Palau National Hospital in Meyuns, Arakabesang I., and a juvenile male beginning its molt into definitive plumage (Figure 14c) on 25 Oct 2009 on Koror.

Scaly Thrush (*Zoothera dauma*). Following a heavy storm in Jan 2006 (exact date not recorded), Etpison found an apparently exhausted Scaly Thrush (Figure 14d; Pratt and Etpison 2008:157) on the beach at Neco I. (between Ngeruktabel and Mercherchar in the Rock Is.), Palau, for the first Micronesian record. The bird appeared uninjured but did not fly when approached and could be picked up. It was released unharmed. From the photographs, the bird appears to belong to the subspecies *Z. d. aurea*, which breeds across Siberia, winters south to the Philippines, and has a wide pattern of vagrancy (Clement 2001).

Eurasian Tree Sparrow (*Passer montanus*). How this species, which breeds naturally in e. Asia, Japan, and Taiwan, reached Micronesia is shrouded in mystery. Baker (1951) was apparently unaware of it, and the first solid report was of several pairs on Guam (Marshall 1957). By 1976, it had spread, aided or otherwise, to all the larger islands in the Marianas (Pratt et al. 1979). It has been established around the military base on Kwajalein in the Marshalls since at least 1964 (Amerson 1969, Pratt et al. 1987). It reached Yap in the late 1970s or early 1980s and was established in small numbers at the public market and around Chamorro Bay in the town of Colonia and at the communications center of the old airport by 1984 (Pyle and Engbring 1987, Engbring et al. 1990). The populations remained small and localized through mid-1994 (Wiles pers. obs.); Engbring et al. (1990) estimated <10 birds at the airport and 25–50 in Colonia. Following this period of latency, the population increased dramatically, and Pratt's 2003 party found the species ubiquitous in rural areas throughout the main islands with a population likely in the thousands.

At Palau, Eurasian Tree Sparrows first appeared in the village of Kloulklubed on Peleliu in 2000 (Wiles et al. 2004), and that population has expanded rapidly

(VanderWerf et al. 2006). In 2005, a small population (~30 birds) was reported in the industrial/harbor area of Malakal (VanderWerf et al. 2006). That population remained stable through 2007 (Pratt and Etpison 2008) but more than tripled to over 100 birds and spread to nearby downtown Koror by early 2008 (Etpison). On 13 Oct 2009, Olsen and Milang Eberdong discovered an apparently isolated colony of at least 10 birds around the Ngiwal State office building in Ngiwal, Babeldaob. Office personnel had not noticed them previously, and their origin is unknown.

On Pohnpei, this species was unknown until the 2007 Pratt party discovered several Eurasian Tree Sparrows in the commercial harbor area of Dekehtik I. and along the causeway to the town of Kolonia. Later that year, several observers saw sparrows at three locations in Kolonia, including >20 at the Dekehtik locality in November (Englberger 2008). The Pohnpei Invasive Species Task Force targeted the sparrows in 2007 and 2008. Initially, numbers were reduced to ~20 (K. Englberger pers. comm. 28 Sep 2008), but further reduction proved difficult, and by Sep 2009 the sparrows had increased in numbers and were "spreading fast" (K. Englberger pers. comm. 17 Sep 2009).

We know of no evidence that anyone purposely introduced the Eurasian Tree Sparrow to Micronesia, and its preference for urban habitats, where it often nests in man-made structures, makes it a good candidate for inadvertent transport in planes or ships. In every case in Micronesia, the birds have appeared first in developed areas, usually near a seaport or airport, and only spread later to rural areas, even though they seem well adapted to those less urbanized habitats. The seemingly inexorable spread of the Eurasian Tree Sparrow in Micronesia suggests that control measures might be futile because new colonists could arrive on any ship or plane from e. Asia or other islands in Micronesia. Will Chuuk and Kosrae be next?

Blue-faced Parrot-Finch (*Erythrura trichroa pelewensis*). Until recently, Palau's endemic subspecies of the Blue-faced Parrot-Finch was unknown from the s. island of Peleliu (Engbring 1988), but Wiles et al. (2004) reported two sightings there Feb–Mar 2000, and VanderWerf et al. (2006) found it at two localities on the island. Other recent sightings include two at Bloody Nose Ridge lookout, 20 Apr 2003 (J. Hunter pers. comm.), and one a short distance south of Kloulklubed,12 Apr 2004 (Klauber).

Gray Wagtail (*Motacilla cinerea*). This species was first reported in Palau in Oct 1978, when two or three were seen on Koror (Engbring and Owen 1981), then not again until VanderWerf et al. (2006) found one at the sewer pond on Malakal, Apr–May 2005. Pratt, Pisano, and Ord saw and photographed a male (Figure 14e) and a female (Figure 14f; Pratt and Etpison 2008:156) at the same locality on 11 Apr 2007 for a third record.

Red-throated Pipit (*Anthus cervinus*). Engbring and Owen (1981) saw three alternate-plumaged Red-throated Pipits at the Koror landfill 25–26 Mar 1979 for the first Palau record. Klauber found Red-throated Pipits at two localities in Palau in Apr 2004, a bird photographed poorly (Figure 14g, h) at the south end of the airport on Peleliu on 13 Apr, and another seen on the lawn of the new capitol building at Melekeok, Babeldaob, on 18 Apr. The birds at both localities had the dull reddish throat characteristic of the alternate plumage (Brazil 2009). Klauber's sightings are the first for their respective islands, the second and third for Palau, and the third and fourth for Micronesia, one having been seen at Ulithi Atoll, Yap State, in Mar 1986 (Wiles et al. 1987).

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LITERATURE CITED

Amerson, A. B., Jr. 1969. Ornithology of the Marshall and Gilbert Islands. Atoll Res. Bull. 127.

Anderson, D. A. 1978. A Franklin's Gull from the Marshall Islands. Micronesica 14: 361–362.

American Ornithologists' Union. 1998. Check-list of North American Birds, 7th edition Am. Ornithol. Union, Washington, DC.

Baker, R. H. 1951. The avifauna of Micronesia, its origin, evolution, and distribution. University of Kansas Publications, Museum of Natural History 3:1–359.

Banks, R. C., Cicero, C., Dunn, J. L., Kratter, A. W., Rasmussen, P. C., Remsen, J. V., Jr., Rising, J. D., and Stotz, D. F. 2006. Forty-seventh supplement to the American Ornithologists' Union *Check-list of North American birds*. Auk 123:926–936.

Banks, R. C., Cicero, C., Dunn, J. L., Kratter, A. W., Rasmussen, P. C., Remsen, J. V., Jr., Rising, J. D., and Stotz, D. F. 2007. Forty-eighth supplement to the American Ornithologists' Union *Check-list of North American birds*. Auk 124:1109–1115.

Banks, R. C., Chesser, R. T., Cicero, C., Dunn, J. L., Kratter, A. W., Lovette, I. J., Rasmussen, P. C., Remsen, J. V., Jr., Rising, J. D., Stotz, D. F., and Winker, K. 2008. Forty-ninth supplement to the American Ornithologists' Union *Check-list of North American Birds*. Auk 125:758–768.

Battley, P., Gill, B., and Warnock, N. 2008. Satellite-tagged godwits: The continuing journey. Southern Bird 33:9, 12.

Beaman, M., and Madge, S. 1998. The Handbook of Bird Identification for Europe and the Western Palearctic. Princeton Univ. Press, Princeton, NJ.

Beehler, B. M., Pratt, T. K., and Zimmerman, D. A. 1986. Birds of New Guinea. Princeton Univ. Press, Princeton, NJ.

Brazil, M. A. 2009. Birds of East Asia: China, Taiwan, Korea, Japan, and Russia. Princeton Univ. Press, Princeton, NJ.

Buden, D. W. 1995. Reptiles, birds, and mammals of Mokil and Pingelap atolls, eastern Caroline Islands. Micronesica 28:9–23.

Buden, D. W. 1999. Reptiles, birds, and mammals of Oroluk Atoll, eastern Caroline Islands. Micronesica 31:280–300.

Chantler, P., and Driessens, G. 1995. Swifts: A Guide to the Swifts and Treeswifts of the World. Yale Univ. Press, New Haven, CT.

Chesser, R. T., Banks, R. C., Barker, F. K., Cicero, C., Dunn, J. L., Kratter, A. W., Lovette, I. J., Rasmussen, P. C., Remsen, J. V., Jr., Rising, J. D., Stotz, D. F., and K. Winker. 2009. Fiftieth supplement to the American Ornithologists' Union *Check-list of North American Birds*. Auk 126:705–714.

Clapp, R. B., and Laybourne, R. C. 1983. First record of the Whiskered Tern from the tropical Pacific. 'Elepaio 43:69–70.

Clapp, R. B., and Schipper, W. L. 1990. New records of birds for Kwajalein Atoll, Marshall Islands. 'Elepaio 43:69–70.

Clapp, R. B., Laybourne, R. C., and Pyle, R. L. 1983. Status of the Common Tern (*Sterna hirundo*) in the tropical Pacific, with a note on records of the Black-naped Tern (*Sterna sumatrana*) in Hawaii. 'Elepaio 43:97–100.

Clement, P. 2001. Thrushes. Princeton Univ. Press, Princeton, NJ.

Clements, J. F. 2003. A Field Guide to the Birds of Yap Island. Ibis Publ. Co., Vista, CA.

Close, D., and Newman, O. M. G. 1984. The decline of the Eastern Curlew in south-eastern Australia. Emu 84:38–40.

Engbring, J. 1983a. Avifauna of the southwest islands of Palau. Atoll Res. Bull. 267.

Engbring, J. 1983b. First Ponape record of a Dollarbird, with a summary of the species' occurrence in Micronesia. 'Elepaio 44: 35–36.

Engbring, J. 1988. Field Guide to the Birds of Palau. Conservation Office, Koror, Palau.

Engbring, J., and Owen, R. P. 1981. New bird records for Micronesia. Micronesica 17:186–192.

Engbring, J., Ramsey, F. L., and Wildman, V. J. 1990. Micronesian Forest Bird Surveys, the Federated States: Pohnpei, Kosrae, Chuuk, and Yap. U.S. Fish and Wildlife Service, Honolulu.

Englberger, K. 2008. Sparrows are new intruders in Pohnpei. Kaselehlie Press, 9 Jan 2008.

Ferguson-Lees, J., and Christie, D. A. 2001. Raptors of the World. Houghton Mifflin, Boston.

Finsch, O. 1875. Zur ornithologie der Südsee-Inseln. 1. Die Vögel der Palau-Gruppe. J. Mus. Godeffroy 8:133–183.

Fry, C. H., Fry, K., and Harris, A. 1992. Kingfishers, Bee-eaters and Rollers. Princeton Univ. Press, Princeton NJ.

Gill. F., and Wright, M. 2006. Birds of the World: Recommended English Names. Princeton Univ. Press, Princeton, NJ.

Glass, P. O., Reichel, J. D., Lemke, T. O., Clapp, R. B., Wiles, G. J., Aldan, D. T., and Pratt, T. K. 1990. New migrant and vagrant bird records for the Mariana Islands, 1978–1988. Micronesica 23:67–89.

Hawai'i–Pacific Islands Working Group on Avian Influenza Surveillance. 2008. Avian Influenza Surveillance Project Report for Hawai'i and the U.S.-Affiliated Pacific Islands 2006–2007. U. S. Fish and Wildlife Service, Pacific Islands Office, Honolulu.

Hayman, P., Marchant, J., and Prater, T. 1986. Shorebirds: An Identification Guide to the Waders of the World. Houghton Mifflin, Boston.

Holm, T., Isechal, A. L., Matthews, E., and Gupta, A. 2008. Important Bird Areas in Palau: Protecting Palau's Natural Heritage. Palau Conservation Soc., Koror, Palau.

Kennedy, R. S., Gonzales, P. C., Dickinson, E. C., Miranda, H. C., Jr., and Fisher, T. H. 2000. A Guide to the Birds of the Philippines. Oxford Univ. Press, Oxford, England.

King, B. 2002. The *Hierococcyx fugax*, Horsfield's Hawk-Cuckoo complex. Bull. Br. Ornithol. Club 122:74–80.

Marshall, J. T., Jr. 1949. The endemic avifauna of Saipan, Tinian, Guam, and Palau. Condor 51:200–221.

Marshall, J. T., Jr. 1957. Atolls visited during the first year of the Pacific Islands Rat Ecology Project. Atoll Res. Bull. 56:1–11.

Message, S., and Taylor, D. 2005. Shorebirds of North America, Europe, and Asia. Princeton Univ. Press, Princeton, NJ.

Orta, J. 1992. Family Phalacrocoracidae (cormorants), in Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks (J. del Hoyo, A. Elliott, and J. Sargatal, eds.), pp. 326–353. Lynx Edicions, Barcelona.

Owen, R. P. 1977a. New bird records for Micronesia and major island groups in Micronesia. Micronesica 13:57–63.

Owen, R. P. 1977b. A checklist of the birds of Micronesia. Micronesica 13:65–81.

Payne, R. B. 2005. The Cuckoos. Oxford Univ. Press, Oxford, England.

Piersma, T., van Gils, J., and Wiersma, P. 1996. Family Scolopacidae (sandpipers, snipes and phalaropes), in Handbook of the Birds of the World, Vol. 3: Hoatzin to Auks (J. del Hoyo, A. Elliott, and J. Sargatal, eds.), pp. 444–533. Lynx Edicions, Barcelona.

Pizzey, G., and F. Knight. 1997. The Graham Pizzey and Frank Knight Field Guide to the Birds of Australia. Angus and Robertson, Sydney.

Pratt, H. D., and Bruner, P. L. 1981. Noteworthy records of nonbreeding birds in Micronesia. Micronesica 17:195–198.

Pratt, H. D., and Etpison, M. T. 2008. The Birds and Bats of Palau. Mutual Publ., Honolulu.

Pratt, H. D., Berrett, D. G., and Bruner, P. L. 1977. Ornithological observations on Yap, western Caroline Islands. Micronesica 13:49–56.

Pratt, H. D., Bruner, P. L., and Berrett, D. G. 1979. America's unknown avifauna: the birds of the Mariana Islands. Am. Birds 33:227–235.

Pratt, H. D., Bruner, P. L., and Berrett, D. G. 1987. A Field Guide to the Birds of Hawaii and the Tropical Pacific. Princeton Univ. Press, Princeton, NJ.

Pyle, R. L. 2002. Checklist of the birds of Hawaii—2002. ‘Elepaio 62:137–148.

Pyle, P., and Engbring, J. 1985. Checklist of the birds of Micronesia. ‘Elepaio 46:57–68.

Pyle, P., and Engbring, J. 1987. New bird records and migrant observations from Micronesia, 1977–1984. ‘Elepaio 47: 11–16.

Reid, T., and Park, P. 2003. Continuing decline of Eastern Curlew, *Numenius madagascariensis*, in Tasmania. Emu 103:279–283.

Ripley, S. D. 1951. Migrants and introduced species in the Palau Archipelago. Condor 53:299–300.

Robson, C. 2000. A Guide to the Birds of Southeast Asia. Princeton Univ. Press, Princeton, NJ.

Spennemann, D. H. R. 2004. The occurrence of owls in the Marshall Islands. Notornis 51:147–151.

Stinson, D. W., Reichel, J. D., Craig, R. J., and Aldan, D. T. 1991. New and unusual bird records from the Northern Mariana Islands, 1988–1990. Micronesica 24:261–271.

Tibbitts, T. L., and W. Moskoff. 1999. Lesser Yellowlegs (*Tringa flavipes*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 427. Birds of North America, Inc., Philadelphia.

VanderWerf, E. A., Wiles, G. J., Marshall, A. P., and Knecht, M. 2006. Observations of migrants and other birds in Palau, Apr–May 2005, including the first Micronesian record of a Richard’s Pipit. Micronesica 39:11–29.

Wiles, G. J. 2005. A checklist of the birds and mammals of Micronesia. Micronesica 38:141–189.

Wiles, G. J., Beck, R. E., Jr., Avenengo, C. M., Conry, P. J., and Savidge, J. A. 1987. New bird records for Guam, Yap, Saipan and Tinian. ‘Elepaio 47: 37–41.

Wiles, G. J., Beck, R. E., Jr., Aguon, C. F., and Orcutt, K. D. 1993. Recent bird records for the southern Mariana Islands, with notes on a colony of Black Noddies on Cocos Island, Guam. Micronesica 26:199–215.

Wiles, G. J., Worthington, D. J., Beck, R. E., Jr., Pratt, H. D., Aguon, C. F., and Pyle, R. L. 2000. Noteworthy bird records for Micronesia, with a summary of raptor sightings in the Mariana Islands, 1988–1999. Micronesica 32:257–284.

Wiles, G. J., Johnson, N. C., de Cruz, J. B., Dutson, G., Camacho, V. A., Kepler, A. K., Vice, D. S., Garrett, K. L., Kessler, C. C., and Pratt, H. D. 2004. New and noteworthy bird records from Micronesia, 1986–2003. Micronesica 37:69–96.

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Micronesia's two most widespread endemic birds: above, the Micronesian Myzomela (*Myzomela rubratra*), male (left) and female (right); below, the Micronesian Starling (*Aplonis opaca*), juvenile (left) and adult (right).

Grayscale image from color paintings by H. Douglas Pratt

OCCUPANCY OF HABITATS BY MEXICAN SPOTTED OWLS IN RELATION TO EXPLOSIVE NOISE AND RECREATIONAL ACCESS AT LOS ALAMOS NATIONAL LABORATORY

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ABSTRACT: We examined 15 years of presence/absence data on the Mexican Spotted Owl (*Strix occidentalis lucida*) at Los Alamos National Laboratory in seven areas managed as Spotted Owl habitat and affected by two types of anthropogenic disturbances: human recreation and relatively frequent but brief impulse noises caused by explosives. On the basis of the percent of years each area was occupied (the occupancy rate), the type of disturbance had an apparent effect on habitat occupancy. The rate of occupancy of Spotted Owl habitat within 2.4 km of firing sites with restricted access was 31% while in habitat >2.4 km from firing sites in which recreational access was allowed it was 7%. These results suggest that the Spotted Owl's use of habitat at Los Alamos is not adversely affected by noise generated during explosives tests but may be adversely affected by recreational access.

The Los Alamos National Laboratory is a laboratory for national security operated for the Department of Energy's National Nuclear Security Administration. The steep-walled canyons of the Jemez Mountains within the laboratory's boundaries provide nesting habitat for the Mexican Spotted Owl (*Strix occidentalis lucida*). Under the Endangered Species Act, the U.S. Fish and Wildlife Service listed the subspecies as threatened in 1993 (USFWS 1993) and published a recovery plan for it in 1995 (USDI 1995). In the Jemez Mountains, Spotted Owls prefer to nest on cliff faces in canyons (J. A. Johnson and T. H. Johnson unpubl. data).

The effects of noise, especially noise alone without an accompanying physical or visual disturbance, on the Spotted Owl's habitat selection is not well understood. Many anthropogenic disturbances have been shown to affect birds of prey (Fyfe and Olendorff 1976). Delaney et al. (1999) examined the effects of helicopter noise on the Mexican Spotted Owl and found that the owls did not respond by flushing when helicopters were >105 m away. Johnson and Reynolds (2002) examined the effects of the noise of low-flying jet aircraft on the Mexican Spotted Owl and found that the owl's responses to low-flying F-16 jets did not exceed responses to natural events. Swarthout and Steidl (2001) examined behavioral responses of the Mexican Spotted Owl at varying distances to hikers and concluded that owls altered their behavior in the presence of a hiker at distances of up to 55 m. Further study (Swarthout and Steidl 2003) showed that high rates of hikers passing quickly near nests may be detrimental to the owls.

Part of the laboratory's operations includes detonation of a variety of explosives at fixed firing sites on the ground. Some of the Mexican Spotted Owl habitat within the laboratory is near active firing sites. Public access to these areas is prohibited, and work-related access is strictly limited. Other Spotted Owl habitat at the laboratory is not affected by explosives, but pedestrian access is allowed within it, and the public as well as the laboratory's workforce uses it frequently. The purpose of this study was to compare rates of Spotted Owl occupancy at Los Alamos National Laboratory in areas near firing sites, subject to relatively frequent impulse noise from explosives, to that in areas not affected by testing of explosives but used for recreation.

STUDY AREA

Los Alamos National Laboratory and the associated towns of Los Alamos and White Rock are located in Los Alamos County, north-central New Mexico, approximately 100 km north-northeast of Albuquerque and 40 km northwest of Santa Fe. The 10,240-ha laboratory is situated on the Pajarito Plateau on the eastern flanks of the Jemez Mountains. Large portions of the site are relatively undisturbed by people because of access restrictions. Adjacent landowners include the U.S. Forest Service, the National Park Service, the county of Los Alamos, and the San Ildefonso Pueblo.

There are seven segments of canyons within the laboratory that are protected as Spotted Owl habitat. This habitat was initially identified as suitable through modeling of topography, elevation, and cover type in 1998. Hathcock and Haarmann (2008) developed a refined vegetation-based model of suitable habitat for the Jemez Mountains, and the boundaries of the habitat within the laboratory were redrawn in 2005 on the basis of a version of this model.

Los Alamos National Laboratory is more heavily developed than many areas typically considered Mexican Spotted Owl habitat. Approximately 12,000 people work on the site each day, and 18,000 people live in Los Alamos and White Rock. Some areas of the laboratory can be visited by the public on foot or by bike (but not by vehicle); in other areas public access is prohibited.

A large fraction of the 10,240 ha (more than one-third of the land area) forms safety buffers for the testing of explosives. The frequency of explosions at Los Alamos varies from 700 to 1200 experimental firings ("shots") annually. Some "shots" are contained, some are in open air, and the quantities and types of explosive materials vary. Access to the areas of the tests and associated safety buffers is highly restricted—there is no public access and limited access for workers.

Levels of noise resulting from detonation of explosives were measured in March of 1995 as part of the environmental impact statement for the Dual-Axis Radiographic Hydrodynamic Test Facility (DOE 1995). These measurements recorded the peak overpressure levels of 137 dB on a mesa directly above and 1180 m from a site occupied by Spotted Owls (DOE 1995). Peak overpressure measured in dB and noise levels measured in dB(A), scaled to the level of human hearing, are comparable because the A-scale weighting at 20 Hz is about –50 dB (ANSI 1971). This means that the A-scale noise levels at the site of the owls were above 80 dB(A), double the normal level of background noise in this vicinity, which averages 40 dB(A) (LANL 2000).

METHODS

All of the Spotted Owl habitat identified within the laboratory is surveyed annually, with up to four surveys per year between late March and 31 August in each segment of canyon containing habitat. Surveys are halted if Spotted Owls are found; otherwise, they are continued until four surveys are completed. The surveys follow the required protocols established by the USFWS (2003) and are performed under permit by the laboratory's biologists.

Using ArcMap version 9.2 (ESRI, Redlands, CA), we identified which of the Spotted Owl habitats that either (1) were within 2.4 km of firing sites and disallowed recreational access or (2) were greater than 2.4 km from firing sites and allowed recreational access. The data are too sparse for statistical testing, so our inferences on whether habitat occupancy was related to the proximity of firing sites or public access are based on general descriptive statistics.

RESULTS

Of the seven areas of Spotted Owl habitat at Los Alamos National Laboratory, one has been occupied continuously since surveys began in 1995 through 2009. Two additional locations have been occupied intermittently from 2004 to 2009.

Four of the seven areas were within 2.4 km of the nearest firing site, and recreational access to them is not allowed. The other three areas were more than 2.4 km from the firing sites and is accessible for recreation to the public and/or the laboratory's workforce.

The 15 years of survey data pooled, the annual rate of occupancy of areas within 2.4 km of firing sites with no recreational access was 31%. In areas >2.4 km from firing sites with recreational access, the rate of occupancy was 7%.

DISCUSSION

Our results suggest that the Spotted Owl occupancy in areas of Los Alamos National Laboratory exposed to frequent impulse noise from explosions has not been affected negatively. In 1997, 69% of all territories in the Jemez Mountains were surveyed with 67% of those being occupied (T. H. Johnson unpubl. data preceding 1998). Compared to that in the surrounding Jemez Mountains, fecundity of the Spotted Owl in areas where explosives are tested at Los Alamos has been high, further suggesting that the owls are not adversely affected by the noise generated by tests of explosives tests at the current frequency. This inference corresponds with that of Ellis et al. (1991), who reported that noise from low-flying jet aircraft and sonic booms were never associated with reproductive failure of the various species of raptors they studied. Palmer et al. (2003) documented subtle effects of overflying jets on the parental behavior of the Peregrine Falcon (*Falco peregrinus*), but they found no evidence that the falcons' pattern of nest attendance differed by exposure to such overflights.

On the other hand, our data do suggest that recreational access had a negative effect on the Spotted Owl's habitat. At Los Alamos, we have not found the owls occupying any part of a canyon that contains an access road in its bottom, either within or outside of the buffer area for tests of explosives. Our inferences, however, are based on the assumption that the seven areas of habitat considered suitable for the Spotted Owl are of equal quality and have an equal chance of being occupied. Furthermore, though extending over 15 years, our data are based on only two nesting pairs and one single owl, whose site tenacity may have inhibited them from shifting from site to site or outside the laboratory's boundary altogether.

The patterns we are seeing at Los Alamos indicate that noise from explosives testing has not been a deterrent in the Spotted Owl's nest-site selection but that disturbance in other forms, such as from vehicles driving along roads or persons walking through a nesting area, might be a deterrent. It is likely that the restrictions of access associated with firing sites have made the habitats within the buffer more desirable to the Spotted Owl than habitats in areas with more human disturbance.

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LITERATURE CITED

American National Standards Institute (ANSI). 1971. American National Standards Specification for Sound Level Meters. ANSI-S1.4-1971. Am. Natl. Standards Assocs., New York.

Delaney, D. K., Grubb, T. G., Beier, P., Pater, L. L., and Reiser, M. H. 1999. Effects of helicopter noise on nesting Mexican Spotted Owls. J. Wildlife Mgmt. 63:60–76.

Department of Energy (DOE). 1995. Dual-axis radiographic hydrodynamic test facility: Final environmental impact statement. United States Department of Energy, Albuquerque Operations Office and Los Alamos Area Office. DOE/EIS-0228 (www.globalsecurity.org/wmd/library/report/enviro/eis-0228/index.html).

Ellis, D. H., Ellis, C. H., and Mindell, D. P. 1991. Raptor responses to low-level jet aircraft and sonic booms. Environmental Pollution 74:53–83.

Fyfe, R. W., and Olendorff, R. R. 1976. Minimizing the dangers of studies to raptors and other sensitive species. Can. Wildlife Service Occ. Paper 23.

Hathcock, C. D., and Haarmann, T. K. 2008. Development of a predictive model for habitat of the Mexican Spotted Owl in northern New Mexico. Southwestern Naturalist 53:34–38.

Johnson, C. L., and Reynolds, R. T. 2002. Responses of Mexican Spotted Owls to low-flying military jet aircraft. USDA Forest Service Research Note RMRS-RN-12 (order from the U.S. Forest Service at www.treesearch.fs.fed.us).

Los Alamos National Laboratory (LANL). 2000. Temporal and spatial variation in background noise levels at Los Alamos National Laboratory. Los Alamos National Laboratory Report LA-13684-MS.

Palmer, A. G., Nordmeyer, D. L., and D. D. Roby. 2003. Effects of jet aircraft overflights on parental care of Peregrine Falcons. Wildlife Soc. Bull. 31:499–509.

Swarthout, E. C. H., and Steidl, R. J. 2003. Experimental effects of hiking on breeding Mexican Spotted Owls. Cons. Biol. 17:307–315.

Swarthout, E. C. H., and Steidl, R. J. 2001. Flush responses of Mexican Spotted Owls to recreationists. J. Wildlife Mgmt. 65:312–317.

U.S. Department of the Interior (USDI). 1995. Recovery plan for the Mexican Spotted Owl, vol. 1. U.S. Fish and Wildlife Service report, Albuquerque, NM.

U.S. Fish and Wildlife Service (USFWS). 1993. Endangered and threatened wildlife and plants: Final rule to list the Mexican Spotted Owl as a threatened species. Federal Register 58(14).

U.S. Fish and Wildlife Service (USFWS). 2003. Mexican Spotted Owl survey protocol. U.S. Fish and Wildlife Service, Albuquerque, NM.

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NOTES

A BROWN HAWK-OWL (*NINOX SCUTULATA*) FROM KISKA ISLAND, ALEUTIAN ISLANDS, ALASKA

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On 1 August 2008 Bond found the carcass of an unidentified owl at Sirius Point, Kiska Island, in the Rat Island group of the Aleutian Islands, Alaska (52° 08′ N, 177° 36′ E, Figure 1), in Glen Larry canyon between two lava flows. Within that canyon, dead birds (mostly auklets, *Aethia* spp.) had been found frequently in a low area, possibly because of CO or CO_2 gas seeping from the more recent lava flow. The owl carcass was photographed in camp (Figures 2 and 3), but it was in poor condition and was not preserved. Some time later, upon returning from the field, Jones examined the photographs and identified the carcass as that of a Brown Hawk-Owl (*Ninox scutulata*).

The owl was generally chocolate brown above, with white scapular patches, underparts white but heavily streaked with brown slightly lighter than that of the back, the tail with distinct bars of light and dark brown, and less distinct barring on the primaries and secondaries. The underside of the wing was mostly light, with the outer primaries showing fewer and smaller light patches than the secondaries. The legs were feathered; the toes were almost bare but with a hairy appearance and dark rose in color. The bill was blackish with a paler culmen. Overall, the owl lacked a distinct facial disk and ear tufts and measured approximately 30 cm in length. This distinctive specimen fit the description of only one species, *Ninox scutulata* (Ali and Ripley 1983, Meyer de Schauensee 1984, del Hoyo et al. 1999, König et al. 1999)

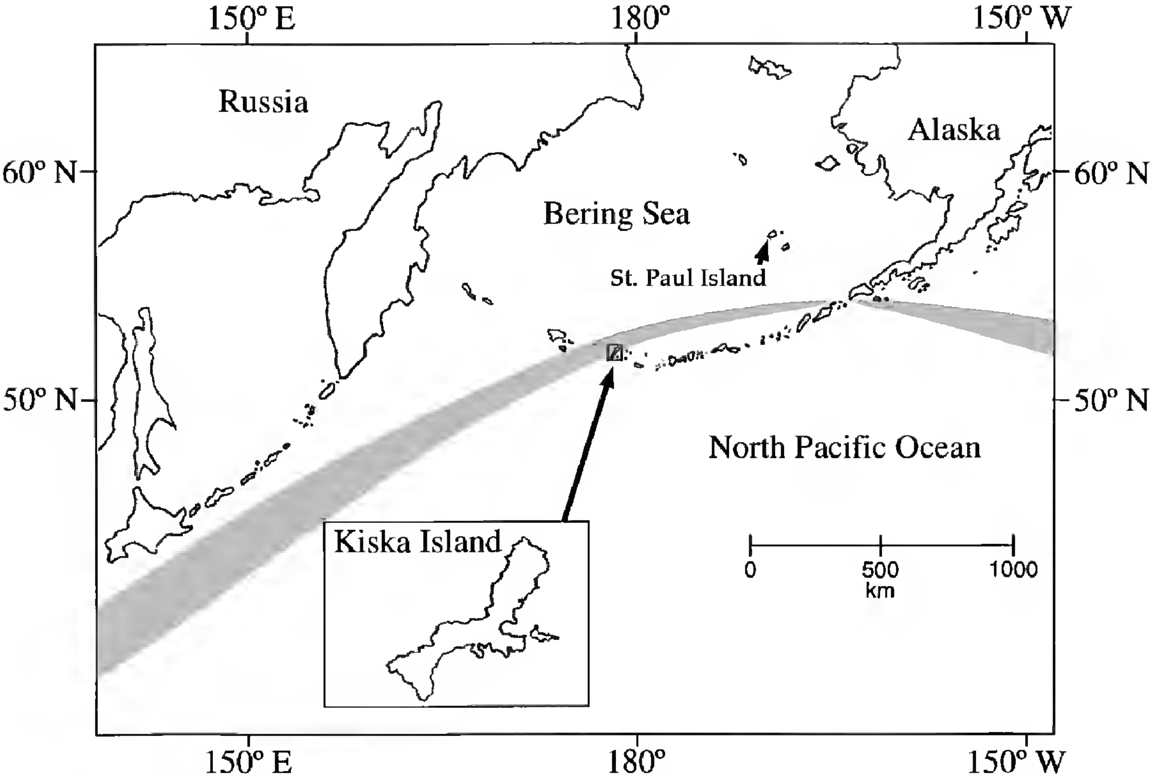

Figure 1. Locations of Kiska and St. Paul islands and the northern great circle shipping route (gray shading) between major ports in Asia and North America.

Figure 2. Ventral view of the Brown Hawk Owl (*Ninox scutulata*) from Kiska Island. Note the streaked breast and barring on the underside of the tail.

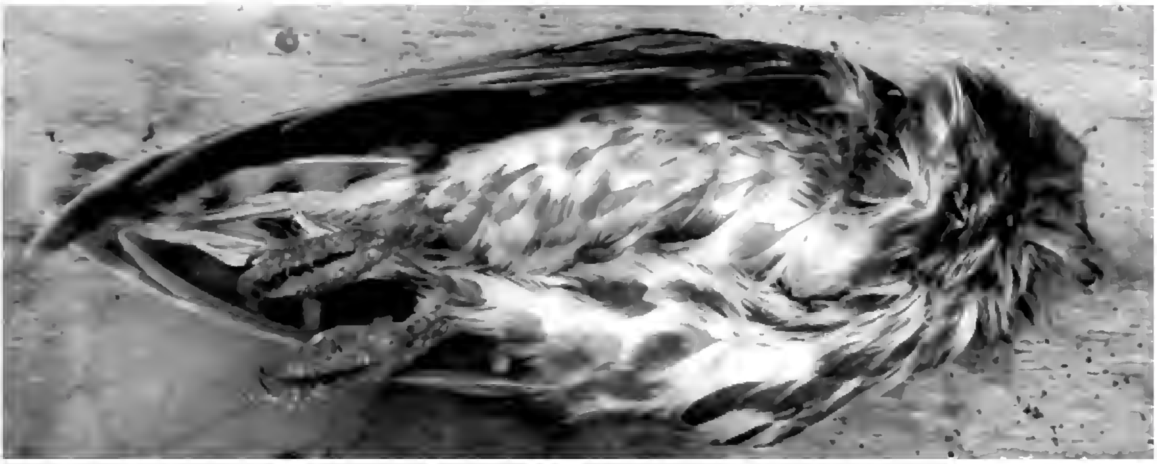

Figure 3. Ventral view of the Brown Hawk Owl (*Ninox scutulata*) from Kiska Island. The rosy feet, and lack of facial disk are evident.

This is the second record of the Brown Hawk-Owl for Alaska and North America, the first being 27 August–3 September 2007 on St. Paul Island, in the Pribilof Islands (Yerger and Mohlmann 2007). Among Old World birds that have reached Alaska, other Asiatic owls include the Boreal Owl of the Russian Far East (*Aegolius funereus magnus*), recorded in 1911 at St. Paul (Evermann 1913), the Oriental Scops-Owl (*Otus sunia japonicus*), recorded in the 1970s at Buldir and Amchitka islands in the Aleutian chain (Gibson and Byrd 2007), and (probably) the Long-eared Owl (*Asio otus*, subspecies unknown), photographed in 2006 aboard a ship in the northern Bering Sea (Gibson et al. 2008). Finally, the Short-eared Owls (*Asio flammeus flammeus*) that occur annually in the western Aleutians are thought to be migrants from Asia (Gibson and Byrd 2007).

It is impossible to determine when the Brown Hawk-Owl arrived at Kiska, but from its state of decomposition it had probably been dead for at least several weeks. If the owl arrived during summer 2008, winds predominantly from the south-southeast would not have been particularly helpful in pushing it in the direction of Kiska. A ship-assisted arrival at Kiska cannot be ruled out as the island is near the western Aleutian crossing of the northern great circle route through the North Pacific (Figure 1). In 2007, winds at St. Paul were predominantly from the west or southwest, which would have aided that owl in flight.

The Brown Hawk-Owl has the broadest geographic distribution of any species of the tribe Ninoxini and is a long-distance migrant, ranging from Siberia and China to Indonesia and the Philippines (del Hoyo et al. 1999). Subspecies *japonica* breeds throughout Japan and in Korea and winters south to the Malay Peninsula, Philippines, Greater Sunda Islands, and Sulawesi (Ornithological Society of Japan 2000). On the basis of that range, it is the subspecies most likely to occur in North America.

Various authorities treat the taxonomy of this species or species complex in a variety of ways. Eleven subspecies have been recognized, but there is consensus that the taxonomy merits revision (del Hoyo et al. 1999, King 2002). The subspecies *N. s. japonica* and *N. s. totogo* have been segregated as *Ninox japonica* or the Northern Boobook (King 2002), the remaining eight to 10 other subspecies constituting *N. scutulata*, the Brown Hawk-Owl (Clements 2007). Other authors (e.g., Gill et al. 2008) maintain one species that includes all of these subspecies. The definition of these two groups is based on vocalizations and differences in wing/tail ratios, but when the birds are not vocalizing, identification in the field is difficult (Ali and Ripley 1983, King 2002). Identification to subspecies from photographs is not necessarily possible (B. King pers. comm.).

On the basis of range, subspecies *japonica*, which breeds in Japan and Siberia and is the most common owl in Japan (Yamashina 1982, Ornithological Society of Japan 2000), is the most likely to occur in North America; the other subspecies breed in India and southeast Asia (Ali and Ripley 1983, Clements 2007).

We thank Ben King for confirming our identification and for valuable discussion on the identification of subspecies. The captain and crew of the M/V *Tiĝlax̂*, research-support vessel of the Alaska Maritime National Wildlife Refuge, provided transportation to Kiska Island and other logistical support. Steven C. Heinl, G. Vernon Byrd, and Daniel D. Gibson provided valuable comments on previous drafts of the manuscript. Additional photographs can be found at www.mun.ca/serg/brownhawkowl.html.

LITERATURE CITED

Ali, S., and Ripley, S. D. 1983. Handbook of the Birds of India and Pakistan, compact edition. Oxford University Press, Oxford, England.

Clements, J. F. 2007. The Clements Checklist of Birds of the World, 6th edition. Comstock, Cornell Univ. Press, Ithaca, NY.

Del Hoyo, J., Elliott, A., and Sargatal, J. 1999. Handbook of the Birds of the World, vol. 5: Barn Owls to Hummingbirds. Lynx Edicions, Barcelona.

Evermann, B. W. 1913. Eighteen species of birds new to the Pribilof Islands, including four new to North America. Auk 30:15–18.

Gibson, D. D., and Byrd, G. V. 2007. Birds of the Aleutian Islands, Alaska. Nuttall Ornithol. Club and Am. Ornithol. Union Series in Ornithology 1.

Gibson, D. D., Heinl, S. C., and Tobish, T. G., Jr. 2008. Report of the Alaska Checklist Committee, 2003–2007. W. Birds 39:189–201.

Gill, F. B., Wright, M., and Donsker, D. 2008. IOC world bird names (version 1.6), www.worldbirdnames.org.

King, B. 2002. Species limits in the Brown Boobook *Ninox scutulata* complex. Bull. Br. Ornithol. Club 122:250–257.

König, C., Weick, F., and Becking, J.-H. 1999. Owls: A Guide to the Owls of the World. Pica Press, Sussex, England.

Meyer de Schauensee, R. 1984. The Birds of China. Smithsonian Inst. Press, Washington, DC.

Ornithological Society of Japan. 2000. Check-List of Japanese Birds, 6th revised edition. Ornithol. Soc. Japan, Tokyo.

Yamashina, Y. 1982. Birds in Japan. Shubin Int. Co., Tokyo.

Yerger, J. C., and Mohlmann, J. D. 2007. First North American record of Brown Hawk Owl (*Ninox scutulata*) on Saint Paul Island, Alaska. N. Am. Birds 62:2–6.

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LADDER-BACKED WOODPECKERS NEST IN CISMONTANE SAN BERNARDINO COUNTY, CALIFORNIA

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The Ladder-backed Woodpecker (*Picoides scalaris*) is an uncommon resident of arid regions from California east to Texas and south to Nicaragua (Short 1971, AOU 1998). Although in Baja California the Ladder-backed Woodpecker occurs along the northwest coast at least as far as north as La Bufadora, 15–20 km southwest of Ensenada (Erickson and Howell 2001), its California distribution is transmontane (i.e., inland of the Transverse and Peninsular ranges), extending north to the desert slopes of the southern Sierra Nevada (Garrett and Dunn 1981). Cismontane (coastal slope) breeding has recently been documented in Miller Valley in southeastern San Diego County and from Dameron Valley of north-central San Diego County to Aguanga in adjacent Riverside County; these small valleys support many elements of desert biota (Unitt 2004). Occupied habitats in California typically include desert slopes vegetated with Joshua Tree (*Yucca brevifolia*) or Desert Agave (*Agave deserti*), desert washes and arroyos, riparian oases, and occasionally pinyon–juniper woodland. Ladder-backed Woodpeckers nest in both the live and dead wood of a variety of trees, includ-

Figure 1. Alluvial-fan sage scrub (late pioneer to intermediate stage) used by Ladder-backed Woodpeckers in the Santa Ana Wash.

Photo by Karen Carter

ing cottonwoods (*Populus* spp.) and willows (*Salix* spp.), in the trunks of the Joshua Tree, or in the dead flowering stalks of other species of yucca or agave (Grinnell and Miller 1944, Lowther 2001, Unitt 2004, McKernan unpubl. data).

We present details of successful nesting of the Ladder-backed Woodpecker at a cismontane site along the Santa Ana River near Redlands, San Bernardino County, California. We also briefly discuss other sightings of this species in this drainage as well as in nearby Cajon Creek.

On 18 May 2000, Willick found an active nest of a Ladder-backed Woodpecker in the stalk of a Chaparral Yucca (*Hesperoyucca whipplei*) at which a female was observed making several visits to feed very advanced nestlings. The nest was on the north side of the main active channel of the Santa Ana River wash, approximately 1 km northeast of the Redlands Municipal Airport runway. The height of the nest cavity was not measured, but Willick noted that the cavity was above eye level and therefore ≥2 m above ground. More specific details regarding the nest site were not recorded. Although no male was seen in the area when the nest was found, Willick had observed a male approximately 0.5 km north of the nest on 19 April. This observation represents the first report of nesting by this species in the cismontane portion of San Bernardino County. On 29 May 2000, McKernan observed two fledgling Ladder-backed Woodpeckers and an adult female near the site.

Beginning in the fall of 1999, prior to the discovery of the nest, House had sporadically observed single Ladder-backed Woodpeckers in the Santa Ana wash. On 22 April 2000 we collected an adult male approximately 2 km northeast of the Redlands Municipal Airport (San Bernardino County Museum 56105). The specimen's enlarged testes suggested nesting. House observed adult male and female Ladder-backed Woodpeckers, as well as juveniles, on several occasions during summer 2000 in the riparian corridor and adjacent alluvial-fan sage scrub near Greenspot Road, approximately 1.5 km east of where the specimen was collected. The presence of an adult male in August 2000 suggests that more than one pair was in the area, since the bird collected in April was also an adult male. Although Nuttall's Woodpeckers (*P. nuttallii*) were also present and presumably breeding along the Santa Ana River at Greenspot Road, the plumage of the specimen showed no evidence of hybridization.

During the same period, House also noted Ladder-backed Woodpeckers at two locations along Cajon Creek (a tributary of the Santa Ana River), near Devore. The Cajon Creek sites also support alluvial-fan sage scrub. The first sighting was of two birds approximately 1 km north of Glen Helen Regional Park in Devore, on 28 and 29 October 1999. Approximately 4 km upstream of the 1999 sighting and approximately 2 km northwest of the intersection of interstate highways 15 and 215, two birds were present from 29 February to 2 March 2000. Since the Cajon Creek locations are over 30 km northwest of the Santa Ana River site, we assume that these sightings involved different individuals. It is unknown if the birds nested at either Cajon Creek location. A sighting of a possible Ladder-backed Woodpecker at Glen Helen Regional Park in January 1997 by Dave Goodward (C. McGaugh, pers. comm.) suggests the species was present in the area even earlier. Ladder-backed Woodpeckers were still present in both Cajon Creek, and along the Santa Ana River throughout 2001. The sighting of a male in Devore in February 2003 (C. McGaugh, pers comm.) and a male near the confluence of the Santa Ana River and Mill Creek on 10 October 2007 (J. Dunn pers. comm.) suggests a continued presence in both areas.

The Ladder-backed Woodpeckers in cismontane San Bernardino County were found in alluvial-fan sage scrub, a plant community unique to southern California and now limited to isolated remnants as a result of urbanization and flood-control projects. Alluvial-fan sage scrub supports a distinctive combination of plants of both chaparral and coastal sage scrub (Smith 1980) and of both coastal and desert affinities. The dominant shrubs at the Santa Ana River locale included Brittlebush (*Encelia farinosa*), Eastern Mojave Buckwheat (*Eriogonum fasciculatum* var. *foliolosum*), California Broomsage (*Lepidospartum squamatum*), Chaparral Yucca, Coastal Pricklypear (*Opuntia littoralis*), and California Cholla (*Cylindropuntia californica*). A narrow corridor of riparian woodland dominated by Goodding's Willow (*Salix gooddingii*), Coyotebrush (*Baccharis pilularis*), and Fremont Cottonwood (*Populus fremontii*) is present along an unnamed drainage near the confluence of the river and Mill Creek.

Older cismontane records of the Ladder-backed Woodpecker are from Riverside County, near Riverside, where one was collected in April 1895 (Heller 1901), and near Valle Vista in the San Jacinto Valley (six or seven birds, 29 August–5 September 1908) (Grinnell and Swarth 1913). More recent sightings have been west of San Gorgonio Pass in San Timoteo Canyon, Riverside County (22 August 1979; Garrett and Dunn 1981), Santa Clara River in Acton, Los Angeles County (24 February 1998; M. C. Long, pers. comm.) and in the Tijuana River valley, San Diego County (9 October 1974; Garrett and Dunn 1981). The Valle Vista records apparently represented a resident population (Unitt pers. comm.), but the other records likely represent wanderers. Searches of the last remnant of alluvial-fan scrub along the San Jacinto River on the northeast margin of Valle Vista on 13 February 2008 by Lori Hargrove and Philip Unitt, on 9 August 2008 by Kenneth L. Weaver, and 8–10 September 2008 by Unitt (pers. comm.) did not reveal any Ladder-backed Woodpeckers, so that population is likely extirpated.

In California, the Ladder-backed Woodpecker and Nuttall's Woodpecker are almost completely allopatric (Short 1971). In some areas of southern California they breed within a few kilometers of each other, and they are sympatric in the Walker Pass area of Kern County, in Morongo Valley, San Bernardino County (Short 1971), locally on the desert slope of San Diego County (Unitt 2004), and in the Antelope Valley (westernmost Mojave Desert), where the latter species has expanded its range into ranchyards (Los Angeles County Breeding Bird Atlas data, Los Angeles Audubon Society). Although the differing habitat preferences result in spatial isolation in some areas where the species' ranges overlap, hybridization occurs regularly in Walker Pass and Morongo Valley (Short 1971).

On the basis of exhaustive ornithological investigations of this locality and other reaches of the Santa Ana River before 1997, we consider the occurrence of the Ladder-backed Woodpecker in the Santa Ana River Wash a recent colonization. The San Bernardino County Museum had surveyed the birds of this area annually from 1982 and 1994 without finding the Ladder-backed Woodpecker. Furthermore, the location is within the circle of the Redlands Christmas Bird Count, which has been conducted since 1962 (E. A. Cardiff pers. comm.). Although the degree of spatial and temporal overlap in habitat use by the Ladder-backed and Nuttall's Woodpeckers in these areas is unknown, both species were observed using the same riparian areas at least some of the time. The presence of Ladder-backed Woodpeckers along the Santa Ana River and Cajon Creek over a period of several years, along with successful nesting, suggests the possibility of a new (at least temporary) area of sympatry with Nuttall's and presumably Downy (*P. pubescens*) Woodpeckers. Observers visiting these areas should be aware of the potential presence of all three species, as well as possible hybrids. Future documentation of Ladder-backed Woodpeckers or possible hybrids in these areas will be invaluable in determining the degree of sympatry and hybridization that may be occurring in southern California.

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LITERATURE CITED

American Ornithologists' Union. 1998. Check-list of North American Birds. 7th ed. Am. Ornithol. Union, Washington, D.C.

Erickson, R. A., and Howell, S. N. G. (eds.). 2001. Birds of the Baja California Peninsula: Status, Distribution, and Taxonomy. Am. Birding Assoc. Monogr. Field Ornithol. 3.

Garrett, K., and Dunn, J. 1981. Birds of Southern California: Status and Distribution. Los Angeles Audubon Soc., Los Angeles.

Grinnell, J., and Miller, A. H. 1944. The distribution of the birds of California. Pac. Coast Avifauna 27.

Grinnell, J., and Swarth, H. S. 1913. An account of the birds and mammals of the San Jacinto area of southern California. Univ. Calif. Publ. Zool. 10:197–406.

Hanes, T. L., Friesen, R. D., and Keane, K. 1989. Alluvial scrub vegetation in coastal southern California. USDA Forest Service Gen. Tech. Rep. PSW-110.

Heller, E. 1901. Notes on some little-known birds of southern California. Condor 3:100.

Lowther, P. E. 2001. Ladder-backed Woodpecker (*Picoides scalaris*), in the Birds of North America, (A. Poole and F. Gill, eds.), no. 565. Birds N. Am., Philadelphia.

Short, L. L. 1971. Systematics and behavior of some North American woodpeckers, genus *Picoides* (Aves). Bull. Am. Mus. Nat. Hist. 145:1–118.

Smith, R. L. 1980. Alluvial scrub vegetation of the San Gabriel River floodplain, California. Madroño 27:126–138.

Unitt, P. 2004. San Diego County bird atlas. Proc. San Diego Soc. Nat. Hist. 39.

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MOUNTAIN BLUEBIRD NESTING IN AN ARROYO BANK IN NORTHERN NEW MEXICO

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The breeding range of the Mountain Bluebird (*Sialia currucoides*) extends from central Alaska along the eastern slopes of the coast ranges to northwestern California, the San Bernardino Mountains of southern California, and the Davis Mountains of western Texas (Power and Lombardo 1996). Breeding Mountain Bluebirds typically occupy open woodland or edge habitat with exposed perches and fairly sparse ground cover (Pinkowski 1979). They are attracted to burned areas, particularly those with dead trees and/or snags (McClelland et al. 1979, Hutto et al. 1992).

In northern Arizona, Mountain Bluebirds occupy clearcut stands of ponderosa pine (*Pinus ponderosa*) but not stands less heavily cut (Szaro atnd Balda 1986). A secondary cavity nester, the Mountain Bluebird typically uses cavities in trees and now often nest boxes. Hutto et al. (1992) emphasized the importance of snags for cavity nesters. The female selects the cavity, and both members of the pair build a loose cup nest with stems, grass, and twigs, lined with softer materials. Both parents feed the young, which fledge within two to three weeks of hatching (Power and Lombardo 1996).

If Mountain Bluebirds cannot locate a traditional tree cavity, they may nest in holes in cliffs or dirt banks or in old swallow nests (Bent 1949). Rowley (1939) found a Mountain Bluebird nest in a niche on the side of a cliff well above timberline in Mono County, California. Similarly, Haecker (1948) found a Mountain Bluebird nest under construction in a building on the summit of Pike's Peak, Colorado, above 14,000 feet elevation. Other sites of nontraditional Mountain Bluebird nests include old nests of other birds. For instance, Calder (1970) found a Mountain Bluebird nesting in a previously used American Dipper (*Cinclus mexicanus*) nest on the underside of a bridge.

We found no documented reports of the Western (*Sialia mexicana*) or Eastern (*S. sialis*) bluebirds nesting in cliffs or banks. Like the Mountain Bluebird, however, the Western has been reported using old mud nests of the Cliff Swallow (*Petrochelidon pyrrhonota*; Sims 1983). For all three species of bluebirds, it is commonly cited that they use cliff crevices (Oberholser 1974, Sims 1983); however, there is little documentation of these nests in the literature.

On 19 May 2007 we found a Mountain Bluebird nesting in a hole in the bank of an arroyo (Figure 1) in Nambé, New Mexico (35° 55′ 00″ N, 105° 59′ 20″ W, elevation 1867 m). The surrounding habitat included One-seed Juniper (*Juniperus monosperma*), Silver Sagebrush (*Artemisia cana*), and sparse Narrowleaf Cottonwood (*Populus angustifolia*). The soils were primarily Carjo soils (Nyhan et al. 1978). The embankment containing the nest edged an arroyo seasonally flooded two to three times per year. The bank was approximately 6 m high with the hole containing the nest 1.2 m from the top of the bank. There were no observable trails to this entrance; the only access appeared to be by flight. However, the hole was likely made by Rock Squirrels (*Spermophilus variegatus*) burrowing into the top of the bluff from above and excavating to the edge, either as ventilation or for escape.

The tunnel led to a junction with a side channel that curved to the right. It was within this side channel, approximately 51 cm into the bank, that the nest was built. The nest was composed primarily of grass, and when it was discovered it contained five one-day-old nestlings. We banded the nestlings with U.S. Fish and Wildlife Service bands at age 14 days, and all five fledged by day 20. The adults did not lay a second clutch at this site. Two pairs of the Western Bluebird nested in nest boxes within 137 m of the Mountain Bluebird nest and fledged two sets of nestlings each.

Our observation represents one of the most recent records for bank nesting by bluebirds. The banks of this arroyo contained hundreds of similar holes, many occupied by the Rock Squirrel, Desert Cottontail (*Sylvilagus audubonii*), Spotted Ground Squirrel (*Spermophilus spilosoma*), Bullsnake (*Pituophis melanoleucus*), Western Rattlesnake (*Crotalus viridis*), and Coachwhip (*Masticophis flagellum*). We also found Rock Wrens (*Salpinctes obsoletus*) nesting in bank holes in the area.

Most studies of diversity of birds of cliffs, higher and more defined structures than arroyo banks, have found greater diversity at the base of the cliff where shrubs are taller (Reitan 1986, Ward and Anderson 1988, Camp and Knight 1998). Both the Western and Mountain bluebirds use cliffs for foraging but not for nesting (William et al. 2000). The suitability of cliff or bank faces as habitat for bluebird nesting depends on both scale and soil. However, for birds selecting shorter, less stable arroyo banks, the likely explanation for their use is the limited availability of other suitable nest sites in the area. Although suitable traditional sites for bluebird nests, such as previously excavated cavities in cottonwoods, exist in the Nambé area, they are few compared to the abundance of holes in arroyo banks.

We thank Charles Hathcock and Stephen Fettig for comments on an earlier version of this paper.

LITERATURE CITED

Bent, A. C. 1949. Life histories of North American thrushes, kinglets, and their allies. U.S. Natl. Mus. Bull. 196.

Calder, W. A. 1970. Use of a Dipper nest by Mountain Bluebird. Condor 72:498.

Camp, R. J., and Knight, R. L. 1998. Rock climbing and cliff bird communities at Joshua Tree National Park, California. Wildlife Soc. Bull. 26:892–898.

Haecker, F. W. 1948. A nesting study of the Mountain Bluebird in Wyoming. Condor 50:216–219.

Hutto, R. L., Hejl, S. J., Preston, C. R., and Finch, D. M. 1992. Effects of silvicultural treatments on forest birds in the Rocky Mountains: Implications and management recommendations, in Status and management of neotropical migratory birds (D. M. Finch, ed.). U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station Gen. Tech. Rep. RM-229.

McClelland, B., Frissell, S. S., Fischer, W. C., and Halvorson, C. H. 1979. Habitat management for hole-nesting birds in forests of western larch and Douglas-fir. J. Forestry (August), pp. 480–483.

Nyhan, J. W., Hacker, L. W., Calhoun, T. E., and Young, D. L. 1978. Soil survey of Los Alamos County, New Mexico. LA-6779-MS. Los Alamos National Laboratory Report, Los Alamos, NM.

Oberholser, H. C. 1974. The Bird Life of Texas, vol. 2. Univ. of Texas Press, Austin.

Pinkowski, B. C. 1979. Foraging ecology and habitat utilization in the genus *Sialia*, in The Role of Insectivorous Birds in Forest Ecosystems (J. G. Dickson, R. N. Connor, R. R. Fleet, J. C. Kroll, and J. A. Jackson, eds.), pp. 165–190. Academic Press, New York.

Power, H. W., and Lombardo, M. P. 1996. Mountain Bluebird (*Sialia currucoides*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 222. Acad. Nat. Sci., Philadelphia.

Reitan, O. 1986. Breeding bird fauna and bird communities in Norwegian cliffs. Fauna (Blindern) 39:18–23.

Figure 1. Male Mountain Bluebird with food item for nestlings at nest-hole entrance.

Photo by L.K. Marsh

Rowley, J. S. 1939. Breeding birds of Mono County, California. Condor 41:247–254.

Sims, M. D. 1983. Breeding success and nest site characteristics of the Western Bluebird on Parrett Mountain. M.S. thesis, Portland State University, Portland, OR.

Szaro, R. C., and Balda, R. P. 1986. Relationships among weather, habitat structure, and ponderosa pine forest birds. J, Wildlife Mgmt. 50:253-260.

Ward, J. P., and Anderson, S. H. 1988. Influences of cliffs on wildlife communities in southcentral Wyoming. J. Wildlife Mgmt. 52:673–678.

William, D., Larson, U. M., and Kelly, P. E. 2000. Cliff Ecology: Pattern and Process in Cliff Ecosystems. Cambridge University Press, Cambridge, England.

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BOOK REVIEWS

The Birds of the Hawaiian Islands: Occurrence, History, Distribution, and Status, by Robert L. Pyle and Peter Pyle. B. P. Bishop Museum, Honolulu. Version 1 (31 December 2009); http://hbs.bishopmuseum.org/birds/rlp-monograph.

The Birds of the Hawaiian Islands is the magnum opus of Robert L. Pyle, the grand old man of Hawaiian birding, who passed away in 2007 at the age of 84. The monograph was started with the assistance of his family and finished by his son Peter Pyle, also a well-known birder and ornithologist. In keeping with Bob's generous spirit and his boundless encouragement of Hawaiian birding and conservation (which touched me personally when I was still in high school), the Pyles decided to publish this monograph online to maximize its availability and utility. It will also be available as a DVD from Bishop Museum Press.

The Birds of the Hawaiian Islands is essentially a very detailed checklist, an encyclopedic compendium of all historically known birds of Hawai'i: native breeding species, migrants, accidental, introduced (both successful and non-established) and hypothetical. With the exception of the extinct species known only from fossil and subfossil remains (though some are mentioned in conjunction with the main accounts), if it had feathers, it's in here. Species accounts, as downloadable pdf files, cover the history (e.g., notable collections and number of specimens), historical occurrence, and current status and distribution of each species.

Many species are also illustrated by the Hawaii Rare Bird Documentary Photograph File of Bishop Museum, with links to full-sized pictures. These illustrate principally migrants and vagrants rather than endemic species, although there are a few notable exceptions, such as the poignant photographs of the now extinct Kaua'i 'O'o and 'O'u. As many of the photographs are primarily documentary (of birds both live in the field and collected specimens), they vary in quality, but some are gorgeous. More photographs of native birds are expected to be added, which will be a welcome addition.

Additional features include analyses and graphs of long-term population trends from Christmas Bird Counts, an exhaustive and fascinating compendium of synonymies, an extensive list of literature, and a list of relevant links. The CBC data are an especially useful resource—I found some species' trends to be quite disturbing.

I found the species accounts to be highly detailed, interesting, informative, readable, and accurate. Although I consider myself well read in the old literature and the history of Hawaiian birds, I learned something from nearly every account. The authors have tackled the problem of sightings of rare birds (particularly difficult with species on the brink of extinction, which rarely get photographed) with both vigor and rigor. I may disagree with some of their decisions on which observations to accept, mostly in the period between the end of major collecting at the turn of the 20th century and about 1950 (e.g., with the O'ahu 'Akialoa), but by and large I think they made the right conclusions, particularly with many recent "sightings," few of which seem to be replicable.

I found only one major error: the authors state that the Maui 'Alauahio "gradually disappeared from the crater and more accessible areas (other than upper Kipahulu Valley) of Haleakala National Park during the 1960s–1970s." However, Hosmer Grove, location of the national park's campground and picnic area near its headquarters, still has a thriving population of the Maui 'Alauahio, while upper Kipahulu Valley is accessible only by a rugged two-day hike, and permission to enter this fragile area is granted only to scientific researchers.

Inevitably, some typographical errors have crept into the monograph (e.g., 'Oma'o incorrectly spelled Oma'o or even O'mao, and a few place names are misspelled). I found rather more typos than in most books, but these should be easy to correct, given the monograph's electronic format.

The Birds of the Hawaiian Islands is an invaluable resource for anyone interested in the Hawaiian avifauna. It is a great complement to the field guides that may pique the reader's interest to learn more. I highly recommend visiting the website and exploring it at one's leisure. The online publication is, in my opinion, ideal for this work. It will only improve even more as further photographs and new research are added in the future—Version 2 is expected between 2011 and 2013. Until then, Version 1 is to remain unchanged (except for corrections) so that it can be cited in the same way as printed scientific literature.

My only disappointment is that Bob did not live to see this project completed; I am sure he would have been pleased by the end result.

A Photographic Guide to the Birds of Hawai'i: the Main Islands and Offshore Waters, by Jim Denny. 2010. University of Hawai'i Press. 222 pages, over 200 color photographs. Softback, $19.99. ISBN 978-0-8248-3383-1.

Hawaii is high on most birdwatchers' lists of places to visit. Birders come both for the spectacular radiation of its endemic land birds—in particular, the Hawaiian honeycreepers, for which it is justly famous—and for its wide assortment of tropical seabirds and introduced species from around the world. Beyond exciting birds, the Aloha State offers abundant scenic and cultural attractions that nonbirding family members will enjoy.

The goal of *A Photographic Guide to the Birds of Hawai'i* is to illustrate the species an observer is at all likely to encounter in the main islands. Along with the resident and migrant species, the book also includes accidental species only rarely encountered in Hawai'i. It does not include species believed to be extinct, vagrants that have shown up only once or twice, nor species found only in the northwestern Hawaiian Islands, most of which are restricted to authorized researchers (although limited and expensive ecotourism has returned to Midway Atoll).

As implied by the title, the heart of the book is the pictures. Nearly all species are illustrated with large photographs by two of Hawai'i's premier avian photographers, Jim Denny and Jack Jeffrey, while excellent pictures by other photographers cover the few remaining species. There isn't a dud in the entire book; I found the frontispiece of an 'I'iwi in a flowering mamane to be an especially exquisite composition. In addition, there are pictures of habitat and good birding locales.

The species are separated into urban, country, forest, wetland and seabirds, a system that works well. Each species is given a full page, with large easy-to-read type that older eyes will appreciate. All the Hawaiian birds and place names are spelled with the proper orthography, with macrons and glottal stops, which I appreciate, but which may at first look odd to visitors. The engaging text is colloquial rather than technical, and descriptions are brief and to the point rather than tediously detailed. Background information on behavior and habits is given, as well as local lore and good places to look for each species. I learned a few new tidbits along the way—I will leave it to the reader to find out which species is "the BVD bird"!

The book begins with a short but comprehensive introduction to the Hawaiian avifauna and its woeful history. Following the species accounts there is a comprehensive checklist and an extensive list of suggested birding localities; I could not think of any important omissions.

No book is perfect, and I found a few places where I think this work could have been improved. Although most similar species are placed on facing pages, some are not, despite being compared to each other in the text, such as the Greater and Lesser Scaups and Pectoral and Sharp-tailed Sandpipers. For some accounts, I would have liked more discussion of the birds. The book mentions how, in Hawaiian mythology, the moorhen brought fire to mankind, but leaves out how it scorched its forehead in the process, giving it the red shield (*'alae 'ula*) that distinguishes it from the coot. For some of the migrants, the text is so brief that there is a large gap between it and the picture. For example, for the Tufted Duck, there is twice as much empty space as text. Perhaps more pictures could have filled that in. Most species are illustrated by a single photograph; while these are generally adequate for identification, I think the book could have benefited from showing more plumages. It also resurrects the century-old name *'Akakane* for the Hawai'i 'Akepa, though it is used by few, if any, birders or researchers. An amusing typo calls the Puaiohi "illusive" rather than "elusive," although a few species not covered may deserve the former description. But these are minor quibbles. As a whole, the book does an admirable job of presenting each species. Factual errors are very few—one is an incorrect conversion of 2500 miles to 5025 kilometers (should be 4025) in the introduction.

This book tries to fill the niche between the Hawai'i Audubon Society's *Hawaii's Birds* and Pratt, Bruner, and Berrett's *Field Guide to the Birds of Hawaii and the Tropical Pacific.* Each has its own strength. In the case of *A Photographic Guide to the Birds of Hawai'i*, comprehensive scope is combined with easy-to-read, interesting text and large portraits. While the others may be more detailed, this is the book I pulled out when a colleague asked me about birds seen during a recent conference in Hawai'i.

A Photographic Guide to the Birds of Hawai'i is an accessible book that is perhaps aimed more to the recreational birder who wants to identify what he or she sees rather than to hard-core listers. The latter will find the traditional field guides to be indispensible, but even serious birders will get much utility here. Nonbirding spouses and friends will also enjoy this beautiful book—and might even get converted.

Jaan Lepson

FEATURED PHOTO

DIFFERENCES BETWEEN THE WINTER PLUMAGES OF THE BLACK AND GRAY-CROWNED ROSY-FINCHES IN NEW MEXICO

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Many observers find the identification of rosy-finches (*Leucosticte* spp.) difficult, in part because the birds' high-elevation and remote breeding habitats provide few opportunities for comparison of the three North American species. In winter, distinguishing the rosy-finches in mixed flocks can be a further challenge because the birds' seemingly restless nature often permits only brief views of individuals. Here we address differences between the wide-ranging interior form of the Gray-crowned Rosy-Finch (*L tephrocotis tephrocotis*) and the Black Rosy-Finch (*L. atrata*), which can be difficult to distinguish because both typically have broad silver-gray superciliary stripes and hind crowns. The Brown-capped Rosy-Finch (*L. australis*) and the Gray-crowned can also be confused when the former shows some silver-gray above and behind the eyes, but that is a subject for another paper.

The Gray-crowned Rosy-Finch is easily divided into the gray-cheeked subspecies and the brown-cheeked subspecies (MacDougall-Shackleton et al. 2000). The gray-cheeked subspecies breed in the Pribilof (*L. t. umbrina*) and Aleutian Islands (*L. t. griseonucha*) and in the mountains from south-central Alaska and southwestern Yukon south to Mount Shasta, California (*L. t. littoralis*) (MacDougall-Shackleton et al. 2000). The brown-cheeked or interior forms breed above tree line primarily in rocky habitats of the intermountain West, including the Wallowa Mountains of Oregon, the Sierra Nevada of California, and the Brooks Range of northern Alaska (MacDougall-Shackleton et al. 2000, Kessel and Gibson 1978). The Black Rosy-Finch is monotypic and breeds in areas of cliffs and rock slides above tree line from central Idaho and Montana to northeastern Nevada and southern Utah (Johnson 2002). The Gray-crowned and the Black Rosy-Finches join mixed flocks wintering from the east sides of the southern Cascade Range and Sierra Nevada east to southwestern Montana, western Wyoming, and Colorado (French 1959a, b, King and Wales 1964, Johnson 2002). The monotypic Brown-capped Rosy-Finch joins these mixed winter flocks only in Colorado and New Mexico (French 1959a, Bailey 1928, Johnson et al. 2000, Williams 2000-2007, Truan and Percival 2001, Wood et al. 2005).

At the crest of the Sandia Mountains above 3250 m (10,670 ft) east of Albuquerque, New Mexico, we have banded over 2000 wintering rosy-finches from January 2004 through December 2009. The project is an attempt to study winter site fidelity, annual variation in flock composition, and variations in winter plumages.

We recaptured and photographed an adult (fourth-year) male Black Rosy-Finch on 16 March 2008 (this issue's inside back cover, upper photo), originally banded on 22 January 2006. In 2006, we aged it as a first-winter bird in formative plumage (Pyle 2008) on the basis of a retained juvenile uppertail covert, little or no pink in the edging of the greater coverts, and outer primary coverts with relatively narrow pink edging (Pyle 1997). For species identification, note that the back and scapular feathers are black or nearly black with white or pale buff edges. In a closer look, the broad core of each back feather along its rachis is mostly black. Toward the edge of each feather, the vane is only somewhat less black than near the rachis. The outermost edges of many feathers (not just at the tips) are nearly white to cream color with some light brown or buff. The buff-colored feather edges contribute a slight brown cast to the upper back. Also, in the upper back of the photographed bird (inside back cover, upper), the feather edges are starting to show signs of wear and have a ragged or uneven look. The white or silvery edges to the nape, auricular, cheek, and posterior scapular feathers give a gray cast to those areas. For sex identification, note the mostly pink lesser and median wing coverts, wide pink edging on most of the greater coverts, and pink edging on all primary coverts, characteristic of the adult male Black Rosy-Finch; females of that species show less extensive pink (Fettig 2009). The bird's identification as a male was also supported by pink in the underwing coverts (not visible in the photographs printed here). All the primaries have pink edges as do a few outermost secondaries.

On 9 March 2008 we recaptured and photographed an adult female Black Rosy-Finch (inside back cover, lower) originally banded on 25 November 2007. For species identification, note that the back and scapular feathers have relatively dark to nearly black centers, similar to the centers of the back feathers of the photographed male (inside back cover, upper). The outer portions of the webs of each feather, however, are rather brown not black, with pale brown to buff edges. These colors should be contrasted with the black of the background in the photos as well as the black in the throat of the female Black Rosy-Finch. This same relatively brownish color of back feathers was pictured by Fettig (2009). The female Black Rosy-Finch (inside back cover, lower) also shows pale brown edging on the auriculars and cheek feathers. On the female Black Rosy-Finch these auriculars and cheek feathers are typically browner and less black then the same feathers on the male. For sex identification, note that the lesser and median coverts are more orange and white with less pink that on the male in the upper photo. In adult (after-second-year) female Black Rosy-Finches such as the one illustrated in the lower photo, the lesser and median coverts can be pale pink to salmon colored with substantial amounts of white (Fettig 2009). The middle greater coverts have wide white edging, and a few outer greater coverts have some orange to pink color, overall markedly less pink than in the photographed male (inside back cover, upper). Note that the edging on the female's primary coverts is more orange than the male's. All primaries are edged in pale orange to pink, but in the photographed female only the outer two or three secondaries are edged in orange to pink.

On 23 March 2008 we banded and photographed an adult (after-second-year) female Gray-crowned Rosy-Finch (this issue's outside back cover, upper photo). For species identification, note the back and scapular feathers are a light cinnamon-like brown with much less black color than the same feathers of the adult (after-second-year) female Black Rosy-Finch (inside back cover, lower). The Gray-crowned's back feathers are dark or nearly black only narrowly along the rachis with most of each feather away from the rachis being brown and specifically much closer to a cinnamon-brown color than to anything near black (outside back cover, upper), and distinctly browner than in either male or female Black Rosy-Finches. For sex identification, note the lesser and median coverts have broad orange to pink tips. The greater coverts have wide white edging with some orange to pink color. All the primary coverts have orange to pink edges. All the primaries are edged thinly in orange to pink, but only the outer two secondaries are edged in orange to pink. Adult (after-second-year) male Gray-crowned Rosy-Finches typically have little if any orange and more extensive pink in the coverts and along the edges of the primaries and secondaries, compared to adult females.

There are three brown-cheeked subspecies of the Gray-crowned Rosy-Finch, all with brown auriculars. The bird in the upper photo on this issue's back cover is a Cassin's Gray-crowned Rosy-Finch (*L. t. tephrocotis*), which MacDougall-Shackleton et al. (2000) described as having "bright" brown upperparts with minimal or no dusky feather centers. This form is known to winter from British Columbia south through northeastern California and as far south as New Mexico. Miller (1939) reported the underparts of the Wallowa Gray-crowned Rosy-Finch (*L. t. wallowa*) to be duller and more sooty than those of nominate *tephrocotis*, with the streaks on the back darker and broader with feather margins distinctly less yellow and red-brown, giving the back a distinctly more neutral brown appearance. The Wallowa form breeds in northeastern Oregon and winters south to central eastern California and western Nevada. The Sierra Nevada Gray-crowned Rosy-Finch (*L. t. dawsoni*) is resident in the Sierra Nevada and White Mountains of California. MacDougall-Shackleton et al. (2000) describes its upperparts as tawnier with feather centers narrower and paler than in the Wallowa form.

In our experience in New Mexico in winter, the male Black Rosy-Finch and the Gray-crowned Rosy-Finch are not difficult to distinguish when the observer has a good view because of the brown auriculars, cheeks, and backs of the latter. What seems to confuse some observers is how gray or somewhat dark brown female Black Rosy-Finches can appear, especially in early winter when many of the back feathers have fresh white edges, leading misidentifications of female Black Rosy-Finches as the Gray-crowned Rosy-Finch. Female Black Rosy-Finches (outside back cover, lower photo, left side) typically have dark gray to nearly black backs and breasts with white edging on many feathers that is most prominent in fall and early winter. Some of their upper-back feathers have distinct brown edges (outside back cover, lower photo, left side). Subspecies *tephrocotis* of the Gray-crowned Rosy-Finch (outside back cover, lower photo, right side) typically has a light slightly reddish brown (more or less cinnamon) color to the back and breast not found in the female Black Rosy-Finch. This slightly-reddish brown of the Gray-crowned Rosy-Finch is much lighter brown than the dark gray-brown of the female Black Rosy-Finch. In our experience, this color difference makes the two species readily distinguishable. We are aware of the reported mixing of characters of interior Gray-crowned and Black Rosy-Finches breeding in the mountains of Idaho and Montana (French 1959a, Johnson 2002), so we are vigilant for such individuals. Observers should be cautious about assigning ages to rosy-finches on the basis of pink in the plumage, unless the bird is viewed at very close range with experience. The pink changes with wear, its intensity increases with feather wear and exposure to the sun, though the shade does not change (French 1959b).

We will be forever thankful for the energy and enthusiasm that the late Ryan Beaulieu gave to the start-up of our rosy-finch-banding project. Without Ryan's involvement, the project might never have happened. We thank Carol Davis, Mary Ristow, Bill Talbot, Jim Place, Laurel Ladwig, Amber West, Laura West, Lee Hopwood, Terrence Hodapp, Gail Owings, Bruce Panowski, Cole Wolf, and Chuck Hathcock, who have volunteered many hours with our study. Special thanks go to Richard E. Johnson for very helpful suggestions on an earlier version of this paper. We thank Lee Hopwood for donating all of the seed used for this project and thank the Central New Mexico Audubon Society for contributing funds.

LITERATURE CITED

Bailey, F. M. 1928. Birds of New Mexico. N. M. Dept. Game and Fish, Santa Fe.

Fettig, S. M. 2009. Understanding plumage variation in the Black Rosy-Finch. Birding 41:54–60.

French, N. R. 1959a. Distribution and migration of Black Rosy Finch. Condor 61:18–29.

French, N. R. 1959b. Life history of the Black Rosy Finch. Auk 76:159–180.

Johnson, R. E. 2002. Black Rosy-Finch (*Leucosticte atrata*), in the Birds of North America (A. Poole and F. Gill, eds.), no. 678. Birds N. Am., Inc., Philadelphia.

King, J. R., and Wales, E. E., Jr. 1964. Observations on migration, ecology, and population flux of wintering rosy finches. Condor 66:24–31.

Kessel, B., and Gibson, D. D. 1978. Status and distribution of Alaska birds. Studies in Avian Biology 1.

Johnson, R. E., Hendricks, P., Pattie, D. L., and Hunter, K. B. 2000. Brown-capped Rosy-Finch (*Leucosticte australis*), in the Birds of North America (A. Poole and F. Gill, eds.), no. 536. Birds N. Am., Inc., Philadelphia.

MacDougall-Shackleton, S. A., Johnson, R. E., and Hahn, T. P. 2000. Gray-crowned Rosy-Finch (*Leucosticte tephrocotis*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 559. Birds N. Am., Inc., Philadelphia.

Miller, A. H. 1939. The breeding leucostictes of the Wallowa Mountains, Oregon. Condor 41:34–35.

Pyle, P. 1997. Identification Guide to North American Birds, part 1. Columbidae to Ploceidae. Slate Creek Press. Bolinas, CA.

Pyle, P. 2008. Identification Guide to North American Birds, part II. Anatidae to Alcidae. Slate Creek Press, Point Reyes Station, CA.

Truan, V. A., and Percival, B. K. 2001. Mountain West. N. Am. Birds 55:200–202.

Williams, S. O. 2000. New Mexico. N. Am. Birds 54:209–211.

Williams, S. O. 2001. New Mexico. N. Am. Birds 55:209–212.

Williams, S. O. 2002. New Mexico. N. Am. Birds 56:207–209.

Williams, S. O. 2003. New Mexico. N. Am. Birds 57:235–237.

Williams, S. O. 2004. New Mexico. N. Am. Birds 58:262–264.

Williams, S. O. 2005. New Mexico. N. Am. Birds 59:302–305.

Williams, S. O. 2006. New Mexico. N. Am. Birds 60:265–268.

Williams, S. O. 2007. New Mexico. N. Am. Birds 61:304–307.

Wood, C. L., Leukering, T., and Schmoker, B. 2005. Colorado and Wyoming. N. Am. Birds 59:296–299.

35th Annual Meeting of Western Field Ornithologists Palm Desert, Coachella Valley, California

The 35th Annual Meeting of Western Field Ornithologists will take place at the Embassy Suites Hotel, 747000 Highway 111, Palm Desert, CA 92260, 760-340-6600, embassysuites1@hilton.com. The dates are Wednesday to Monday, 13–17 October. Registration for the meeting is now online at www.westernfieldornithologists.org. You must be registered to attend all sessions, field trips, and social activities.

- An informal no-host reception on Wednesday, October 13 for early arrivals.
- Welcoming reception on Thursday 14 October, hosted by Western Field Ornithologists Board of Directors.
- Dr. Cameron Barrows**,** University of California, Riverside, will open the science portion of our annual meeting on Friday, 15 October, introducing us to the Coachella Valley region from his perspective of many years of research in the region.
- Scientific presentations Friday and Saturday, 15–16 October.
- Experts' visual and sound-identification panels Friday and Saturday, 15–16 October.
- Workshops:
  - *Bird-skin preparation*: Demonstrated by Bob Dickerman (New Mexico), Dan Gibson (Alaska), Kathy Molina, Kimball Garrett, and Philip Unitt (California), among the top museum-based ornithologists in the West.
  - *Describing bird sounds*: Led by Sylvia Gallagher (California), recordist, educator, and expert on bird calls and songs who has developed unique techniques for learning to identify bird sounds in the field.
  - *Data mining*: The second in WFO's series of workshops on research and publishing, led by expert "miner" Ed Pandolfino, who will share his insights and techniques for mining published data and applying it for use in publications and oral presentations.
  - *Recording bird sounds in the field*: Bird-sounds expert, recordist, and sound scientist Nathan Pieplow will take us into the field for training in how to record.
  - *Fall sparrows of California*: Jon Dunn will lead a workshop in sparrow identification covering species and subspecies, plumages, and distribution.
- Dr. Douglas Altshuler, University of California, Riverside, will speak on Friday evening, 15 October at the Desert Museum on his groundbreaking research into the flight of mammals, birds, and insects. Coffee and light dessert will follow.
- On Saturday evening 16 October Paul Lehman, noted expert in bird distribution, vagrancy, weather, and migration and current chair of the California Bird Record Committee, will guide us through 35 years of migrants and vagrants to California.
- Designed by Kurt Leuschner of College of the Desert, field trips will be offered for full days on Wednesday, Thursday, and Sunday, 13, 14, and 17 October, morning on Friday and Saturday, 15 and 16 October. Most trips are limited to 12 participants plus leaders and, to keep costs of registration low, they will be driven by car pools. Let Kurt know if you can drive, kleuschner@collegeofthedesert.edu. See www.westernfieldornithologists.org/docs/2010/WFO_Conference_2010_Details.pdf for the list of trips and leaders.
- An informal goodbye reception at the end of the day on Sunday, 17 October, hosted by WFO president and vice president, Cat Waters and Dan Gibson.
- Fundraising field trip to the Colorado River Delta, Sonora and Baja California, Mexico, 17–19 October with Osvel Hinojosa-Huerta, member of the boards of directors of WFO and Pronatura and expert on bird ecology in these endangered wetlands. Limited to 12 people and 3 leaders, this trip will venture into areas of Sonora and Baja California not normally open to the casual birder and tourist. You must register for the meeting and be a WFO member to participate.

Registration is online at www.westernfieldornithologists.org. Register now to assure your place in the exceptional workshops, field trips, and social activities!

Cuba Bird Survey
led by Jon Dunn and William Suarez
26 October–6 November 2010

Western Field Ornithologists is endorsing a program to Cuba coordinated by the Caribbean Conservation Trust, based in Connecticut. This is the third program since 2006 on which WFO has collaborated with the Caribbean Conservation Trust. Along with WFO leader Jon Dunn, our team will include Dr. William Suarez, paleo-ornithologist with the National Museum of Natural History in Havana, a bilingual Cuban tour leader, and local naturalists. This team will guide you through parts of Cuba rarely visited by outsiders.

Our program begins and ends in Havana, to which a pre-trip and post-trip extension for up to 2 days and nights are available as an option. The pre-trip option provides a visit to the home and private ornithological collection of Orlando Garrido, Cuba's pre-eminent living naturalist and co-author of the Field Guide to the Birds of Cuba. A post-trip extension option for 1 additional day and night in Havana is available with the pre-trip extension as a requisite.

The itinerary will take you to Cuba's best birding habitats located in beautiful national parks, diverse biosphere reserves, and unique natural areas. We will meet with local scientists and naturalists who work in research and conservation. In addition to birding, we will learn about the ecology and history of regions we visit. Finally, we can expect some degree of indulgence in the richness of Cuban music, dance, art, architecture, and history.

Our itinerary provides opportunities to see many of Cuba's 30 endemic and potential endemic species, as described at www.westernfieldornithologists.org/docs/2010/WFOCuba2010Program.pdf. This trip will also focus on the many migrants that arrive in Cuba during the fall.

On the Guanahacabibes Peninsula at the far western tip of the island, one of the last wild places remaining in the Caribbean, our destinations include Guanahacabibes National Park and a UNESCO-administered biosphere reserve that covers more than 125,000 acres and provides habitat to 47% of all Cuba's 192 species of birds and 44% of its endemics. A major corridor of migration, this peninsula was Cuba's first significant area protected after the revolution of 1959. The **Bee Hummingbird** and **Blue-headed Quail Dove** are primary targets here. Also in western Cuba, we will visit the Sierra de los Organos, the magical karst landscape of *mogotes*—towering flat-topped monoliths of limestone—habitat of the **Cuban Solitaire**.

We will explore the wetlands of the Zapata Peninsula, Cuba's richest bird habitat, and coastal forest around the historic Bay of Pigs. Birds to be seen here include the **Zapata Wren**, **Zapata Sparrow**, **Fernandina's Flicker**, **Bare-legged Owl**, **Tawny-shouldered** and **Red-shouldered blackbirds**, **Stygian Owl**, **Cuban Parrot**, **Gray-fronted**, **Key West**, and **Ruddy quail-doves**, **Greater Flamingo**, **Wood Stork**, **Roseate Spoonbill**, **White Ibis**, and a great variety of wading birds.

Camaguey Province is our easternmost destination. The city of Camaguey provides the base for our efforts to track down species endemic to eastern Cuba, the **Cuban Parakeet**, **Cuban Palm Crow**, **Giant Kingbird**, **Cuban Gnatcatcher**, and **Oriente Warbler** among them. In addition to its proximity to excellent birding destinations, Camaguey offers a unique and authentic Cuban experience often overlooked by tourists.

Other species of interest that we will have opportunities to see throughout the program include the **Cuban Crow**, **Cuban Emerald**, **Cuban Bullfinch**, **Great Lizard-Cuckoo**, **La Sagra's Flycatcher**, **Loggerhead Kingbird**, **Zenaida Dove**, **White-crowned Pigeon**, **Greater Antillean Nightjar**, and numerous others.

Registration information, costs, and a complete description of the trip can be found at www.westernfieldornithologists.org/docs/2010/WFOCuba2010Program.pdf.

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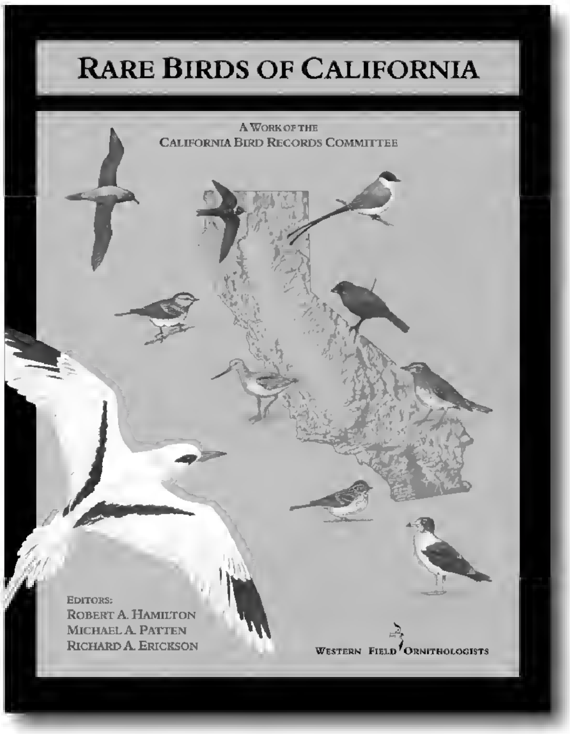

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A WORK OF THE
CALIFORNIA BIRD RECORDS COMMITTEE

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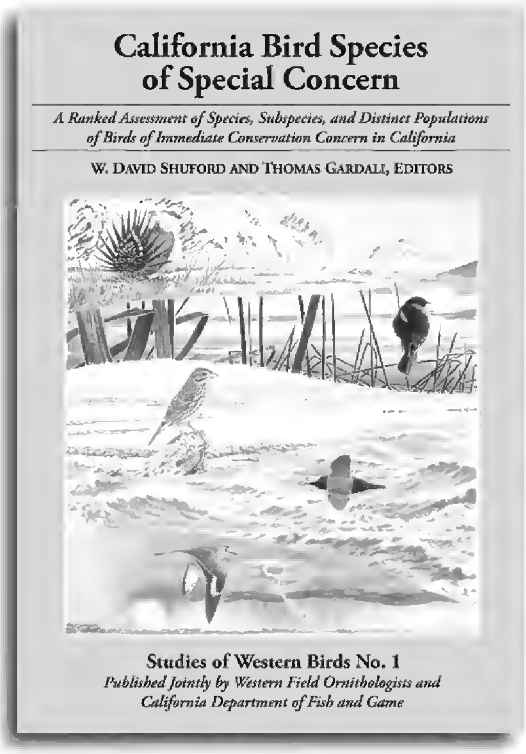

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WESTERN BIRDS

Quarterly Journal of Western Field Ornithologists

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The California Bird Records Committee of Western Field Ornithologists revised its 10-column Field List of California Birds in July 2009. The new list covers 641 species, plus 6 species on the supplemental list. Please send orders to WFO, c/o Robbie Fischer, Treasurer, 1359 Solano Drive, Pacifica, CA 94044. Price for 9 or fewer, $2.75 each, for 10 or more, $2.50 each, which includes tax and shipping. Order online at http://checklist.westernfieldornithologists.org.

Published June 30, 2010 ISSN 0045-3897

Fourth-year male Black Rosy-Finch (*Leucosticte atrata*) originally banded in its first winter and recaptured on 16 March 2008 in the Sandia Mountains of north-central New Mexico. Note the black on the bird's back and compare it to the black of the background and crown and to the birds below and in the upper photo on the back cover.

Adult (after-second-year) female Black Rosy-Finch recaptured on 9 March 2008 in Sandia Mountains of north-central New Mexico. Note the dark back feathers with buff or brown edges and the darkest feathers around the neck, blackest on the throat. Compare the brown of the back to the black background and the black of the crown. In early winter, female Black Rosy-Finches in formative (first-winter) plumage can be very silver-gray on the upperparts before wear removes most of the pale feathers edges; see lower photo on the back cover.

Photos by © Stephen Fettig

WESTERN BIRDS

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Western Specialty:
Pacific Wren

Photo by © Peter LaTourrette of Los Altos, California:
Pacific Wren (*Troglodytes pacificus*)
Burleigh Murray Park, San Mateo County, California, 17 March 2007.
In 2010, the American Ornithologists' Union Committee on Classification and Nomenclature for North and Middle America reclassified populations of the Winter Wren in western North America as the Pacific Wren (*Troglodytes pacificus*) and those in eastern North America as the Winter Wren (*T. hiemalis*), both as species different from the Eurasian Wren (*T. troglodytes*). The decision was made on the basis of differences in voice and genetics, even at the point of contact at Tumbler Ridge, northeastern British Columbia (see Toews, D. P. L., and Irwin, D. E. 2008. Cryptic speciation in a holarctic passerine revealed by genetic and bioacoustic analyses. Molecular Ecology 17:2691–2705). Within the Pacific Wren, there are several divergent subspecies, some large, on the islands of Alaska, and further variation, still poorly understood, in the species' mainland range (see Rea, A. M., in A. R. Phillips' *Known Birds of North and Middle America*, part 1, 1986).

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NOTES

Front cover photo by © Mark Scheel of Sierra Madre, California: Hudsonian Godwits (*Limosa haemastica*), Edwards Air Force Base, Los Angeles County, California, 15 May 2010.

Back cover "Featured Photo" by © Nancy Bell of Livermore, Colorado: Xanthochroistic male Cassin's Finch (*Carpodacus cassinii*) near Livermore, Larimer County, Colorado, 26 March 2009, in which yellow-orange has replaced the normal red.

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 include 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 Kathy Molina, Section of Ornithology, Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007. For matters of style consult the Suggestions to Contributors to *Western Birds* (at www.westernfieldornithologists.org/docs/journal_guidelines.doc).

WESTERN BIRDS

Volume 41, Number 3, 2010

THE 34TH REPORT OF THE CALIFORNIA BIRD RECORDS COMMITTEE: 2008 RECORDS

This report is dedicated to the memory of former committee members Laurence C. Binford (member 1970–1978, 1980–1985), Luke W. Cole (member 2002–2004), and Mike San Miguel (member 1996–1998, 2002–2004).

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ABSTRACT: The California Bird Records Committee reached decisions on 233 records involving 76 species, one species pair, and one hybrid combination evaluated during 2008, endorsing 200 of them. New to California was the Bluethroat (*Luscinia svecica*), bringing California's bird list to 641 species, ten of which are non-native. A potential first state record of a Yellow-headed Caracara (*Milvago chimachima*) was not accepted on grounds of questionable natural occurrence, and potential first state records of the Great Black-backed Gull (*Larus marinus*) and Oriental Greenfinch (*Chloris sinica*) were not accepted on grounds of identification.

This 34th report of the California Bird Records Committee (hereafter the CBRC or the committee) discusses the evaluation of 233 records of 76 species, one species pair, and one hybrid combination. Although most records pertain to birds found in 2008, the period covered by this report spans the years from 1967 through 2008. The committee accepted 200 of the 233 records involving 209 individuals of 67 species, one species pair, and one hybrid, for an acceptance rate of 86%. Nineteen of the accepted records involved determinations of whether a bird was the same as another reported earlier in the year or in a previous year, and another involved a date extension. Twenty-nine records of 20 species were not accepted because of insufficient documentation or because descriptions were inconsistent with known identification criteria. Four additional records of two species were not accepted because of questions concerning the birds' natural occurrence. Counties best represented by accepted records were San Diego (22 records), Imperial (20), Humboldt (17), Mendocino (17), Los Angeles (14), San Francisco (13, 11 of which were from or near Southeast Farallon I.), Monterey (13), Orange (11), Santa Barbara (10), San Bernardino (9), Kern (8), Riverside (7), Inyo (7), Ventura (7), San Luis Obispo (6), and San Mateo (6). In addition to the Bluethroat, highlights of this report include California's second Black-tailed Gull (*Larus crassirostris*), third Bridled Tern (*Onychoprion anaethetus*), fourth Cave Swallow (*Petrochelidon fulva*), fourth hybrid Blue-winged × Golden-winged Warbler (*Vermivora cyanoptera* × *V. chrysoptera*), and first record of a returning Dusky-capped Flycatcher (*Myiarchus tuberculifer*). In addition, species recorded in unusually high numbers in 2008 included the Mottled Petrel (*Pterodroma inexpectata*) with 20, the Lesser Black-backed Gull (*Larus fuscus*) with 14, the Worm-eating Warbler (*Helmitheros vermivorum*) with 13, and Sprague's Pipit (*Anthus spragueii*) with 9. Records of the Mottled Petrel and Sprague's Pipit are reviewed only through 2008.

Currently, the committee is considering the validity of potential first state records of the White-chinned Petrel (*Procellaria aequinoctialis*) and Yellow-breasted Bunting (*Emberiza aureola*). With the addition of one new state record described in this report, California's list stands at 641 species, ten of which are non-native and two of which have been extirpated within historical times. An additional species that has declined to the brink of extirpation within the past two decades, the Elf Owl (*Micrathene whitneyi*), was added to the review list at the January 2010 meeting.

The acceptance rate of 86% was above the average of 80.2% for all CBRC records combined and continues a recent trend toward higher than average acceptance rates. For example, the average annual acceptance rate between 2006 and 2008 was 84.8%, whereas the average between 1996 and 1998 was 73.5%. One cause for this trend may be the increasing use of digital photography to support records that otherwise might have been documented only with written descriptions. The total records reviewed is above the committee's average of 218.9 records per report over its first 33 reports but well below the more recent three-year average of 263.7.

The list of species reviewed by the committee is posted at the CBRC web site at www.californiabirds.org. This site also includes the California state list, the committee's bylaws, a reporting form for the direct e-mail submission of records to the CBRC, the addresses of current committee members, and a photo gallery of recent submissions, including some pertaining to records published in this report. Additional information about the CBRC, the Western Field Ornithologists (WFO), and its journal, *Western Birds* can be found at the WFO home page at www.westernfieldornithologists.org.

All documentation reviewed by the CBRC, including copies of descriptions, photographs, videotapes, sketches, audio recordings, and committee comments on records submitted, is archived at the Western Foundation of Vertebrate Zoology, 439 Calle San Pablo, Camarillo, California 93012, and are available for public review. The CBRC solicits and encourages observers to submit documentation for all species on the review list, as well as for species unrecorded in California. Documentation should be sent to Guy McCaskie, CBRC Secretary, P. O. Box 275, Imperial Beach, CA 91933-0275 (e-mail: secretary@californiabirds.org).

NEWS AND FORMAT

Committee News. The committee's voting membership after the January 2010 annual meeting consisted of Paul E. Lehman (chair), Daniel S. Singer (vice-chair), David M. Compton, Jon L. Dunn, Kimball Garrett, Oscar Johnson, Joseph Morlan, Brian Sullivan, and James R. Tietz. Guy McCaskie continued in his role as nonvoting secretary. Additional committee members who voted on many of the records in this report include Alvaro Jaramillo, Kristie N. Nelson, James E. Pike, Peter Pyle, and Scott B. Terrill.

As noted by Shuford (2006) and Iliff et al. (2007), *California Birds/Western Birds* is now available online via SORA, the Searchable Ornithological Research Archives (http://elibrary.unm.edu/sora), and all previously published CBRC reports through 2006 can be accessed through that site. Annual reports published from 1999 through 2009 also are available through the CBRC website at www.californiabirds.org.

Format and Abbreviations. As in other recent CBRC reports, records are generally listed chronologically by first date of occurrence and/or geographically, from north to south. Included with each record is the location, county abbreviation (see below), and date span. The date span usually follows that published in *North American Birds* (hereafter *N. Am. Birds*; formerly *American Birds* and *Field Notes*); if the CBRC accepts a date span that differs from a published source, the differing dates are italicized. Initials of the observer(s) responsible for finding and/or identifying the bird(s)—if known and if they supplied supportive documentation—are followed by a semicolon, then the initials, in alphabetized order by surname, of additional observers submitting supportive documentation, then the CBRC record number consisting of the year of submission and a chronological number assigned by the secretary. All records are sight records unless otherwise indicated: a dagger (†) following an observer's initials indicates the observer supplied a supportive photograph, (‡) indicates the observer supplied a video, (§) indicates a voice recording, (S) indicates a sketch, and (#) indicates a specimen record, which is followed by the acronym (see below) of the institution housing the specimen and that institution's specimen catalog number. An asterisk (*) prior to a species' name indicates that the species is no longer on the CBRC's review list.

In this report, the first number in parentheses after the species' name is the number of *individual birds* accepted by the CBRC through this report, not the number of accepted *records*; the number of individual birds may be higher than the number of records, as historically the committee has treated groups of individuals appearing together with a single record number (e.g., a flock of Common Redpolls, *Acanthis flammea*). The second number is the number of new individuals accepted in this report (because this number excludes records thought to pertain to returning individuals treated in previous reports, it may be zero). Two asterisks (**) after the species' total indicate that the number of accepted records refers only to a restricted review period or includes records accepted for statistical purposes only; see Roberson (1986) for more information.

When individual birds return to a location after a lengthy or seasonal absence, each occurrence is reviewed under a separate record number, and committee members indicate whether or not they believe the bird is the same as one accepted previously. Decisions in such cases follow the opinion of the majority of members and, if a bird is considered a returning individual, the total number of individuals remains unchanged.

Although the CBRC does not formally review the age, sex, or subspecies of each bird, information on these subjects is often provided during the review process (and, in some cases, a strong majority or consensus is achieved). We report much of this information; the diagnosis of age, sex, or subspecies is the authors' opinion based on the evidence in the files and committee members' comments. Our terminology for age follows that used in text accounts found in CBRC (2007).

The CBRC uses standard abbreviations for California counties; those used in this report are ALA, Alameda; BUT, Butte; CC, Contra Costa; DN, Del Norte; GLE, Glenn; HUM, Humboldt; IMP, Imperial; INY, Inyo; KER, Kern; LAK, Lake; LA, Los Angeles; MRN, Marin; MEN, Mendocino; MER, Merced; MNO, Mono; MTY, Monterey; NEV, Nevada; ORA, Orange; PLA, Placer; RIV, Riverside; SAC, Sacramento; SBE, San Bernardino; SBT, San Benito; SD, San Diego; SF, San Francisco; SLO, San Luis Obispo; SM, San Mateo; SBA, Santa Barbara; SCL, Santa Clara; SCZ, Santa Cruz; SIE, Sierra; SJ, San Joaquin; SON, Sonoma; STA, Stanislaus; TRI, Trinity; TUO, Tuolumne; VEN, Ventura; YOL, Yolo; YUB, Yuba. A list of abbreviations for all 58 California counties is available on the CBRC web site and in Appendix C of CBRC (2007). Other abbreviations used: Co., County; Cr., Creek; Ft., Fort; I., Island; km, kilometer; L., Lake; Mt., Mountain; n. mi., nautical mile; N.W.R., National Wildlife Refuge; Pt., Point; R., River; W.A., Wildlife Area.

Museum collections housing specimens cited in this report, allowing access to committee members for research, or otherwise cited, are the Natural History Museum of Los Angeles County, Los Angeles (LACM); San Diego Natural History Museum, San Diego (SDNHM); Western Foundation of Vertebrate Zoology, Camarillo (WFVZ); National Museum of Natural History, Smithsonian Institution, Washington, D.C. (USNM); University of Michigan Museum of Zoology, Ann Arbor (UMMZ); Museum of Wildlife and Fish Biology, University of California, Davis (WFB); and, Death Valley National Park Museum (DVNPM).

RECORDS

TRUMPETER SWAN *Cygnus buccinator* (77, 1). An adult was at Piute Ponds on Edwards Air Force Base, LA, 23 Feb–9 Mar 2008 (KLG†, SG, MSc†, SLS†; 2008-038). The only accepted record from farther south is of a bird that spent part of the winter in El Monte, LA (1 Jan–17 Feb 1975), and later was present in Covina, LA, 13–15 Mar 1975 (1980-131; Binford 1983).

IDENTIFICATION NOT ESTABLISHED: One was reported vocalizing in flight at Lewiston L., TRI, 29 Dec 2008 (2009-007). Members were hesitant to accept the identification solely on the basis of the call, particularly given that the observer was not experienced with this species.

BAIKAL TEAL *Anas formosa* (7, 1). A first-winter male shot by a hunter near Loleta, HUM, 21 Jan 2008 (MMcCl; 2008-035; photo in *N. Am. Birds* 62:297) is preserved as a life mount in a private collection. Photographs of the mount by Stanley

W. Harris provided documentation of the record. The record passed in its first round of circulation, with one member withholding acceptance over concern of natural origin. This species is known to be kept in captivity, and past records have occasioned discussion of origin (e.g., see Iliff et al. 2007). However, the well-documented recovery of the Baikal Teal population since the 1990s, based on numbers wintering in South Korea and elsewhere in east Asia (Delaney and Scott 2002), may ease acceptance of records in California in the future. Six of the seven California records have involved birds shot by hunters.

SMEW *Mergellus albellus*. IDENTIFICATION NOT ESTABLISHED: The report of a female on the Yuba R. near Smartville, YUB, 4 Mar 2008 (2008-045) included little detail specifically on the bird observed (instead referring to its similarity to a field-guide illustration). Except for its small size in comparison to a Common Merganser (*Mergus merganser*), features described by the observer did not match those of a female Smew.

ARCTIC LOON *Gavia arctica* (7, 2). One seen in close comparison with the three common species of loon at Stone Lagoon, HUM, 12 Feb–5 Mar 2008 (RF†, KR†; 2008-030) provided a county first. A year-old bird in very worn plumage was photographed at close range in Bodega, SON, *12* Jun 2008 (SNGH†; LHu†; 2008-078; Figure 1). Both individuals showed not only extensive white flank patches but also other features indicating the Arctic Loon, such as a flat crown peaked on the forecrown and uptilted head and bill. Reinking and Howell (1993) and Birch and Lee (1997) discussed field identification of this species and discrimination of the Arctic Loon from the similar Pacific Loon (*G. pacifica*).

Figure 1. This year-old Arctic Loon (*Gavia arctica*) was photographed 12 June 2008 at Bodega Harbor, Sonoma County. Although in worn and faded plumage, it shows the extensive white flanks, flattened crown, distinct forecrown peak, uptilted head, and apparently long bill typical of this species.

Photo by Steve N. G. Howell

Figure 2. The subadult Short-tailed Albatross (*Phoebastria albatrus*) on the right was at Cordell Bank off Marin County, 8 August 2008. This photo highlights the differences in size from the Black-footed Albatross (*P. nigripes*) on the left.

Photo by Jan Roletto

Figure 3. The Common Black-Hawk (*Buteogallus anthracinus*) shown here, the first in juvenal plumage in California, was present for one day at Silver Saddle Resort, Galileo Hill, Kern County, 27 April 2008.

Photo by Bob Steele

Figure 4. The adult American Oystercatcher (*Haematopus palliatus*) in the upper right of this photo, taken 27 January 2008, was at Crescent Point in Laguna Beach, Orange County, from 18 January to 1 February 2008. The first-winter bird on the lower right, apparently a hybrid between the American and Black (*H. bachmani*) Oystercatchers, was observed on several occasions during this period.

Photo by Matthew Matthiessen

YELLOW-BILLED LOON *Gavia adamsii* (79, 2). One was 0.5 mi off Lover's Pt. in Monterey, MTY, 26 Oct 2008 (RW†; 2008-172). A second-year bird on L. Havasu, SBE, moved back and forth between California and Arizona, 11 Jan–12 Jul 2008 (DJK; TABe†, BDe†, JSF, PEL‡, SJM†, DJP, KAR†; 2008-025; photo in *N. Am. Birds* 62:302). The latter was one of the few Yellow-billed Loons that have spent all or part of the summer in California, as well as one of the very few inland. Also inland was one at San Luis Reservoir, MER, 15 Sep–*13* Oct 2008 (JLD, JSF, OJ, GMcC, MMR†; 2008-138), considered to be the same as the one there *16*–20 Nov 2007 (2007-282; Singer and Terrill 2009). With its remiges described as either very short or missing entirely, it appeared incapable of flight. So it had likely been present for some time and may have summered.

SHORT-TAILED ALBATROSS *Phoebastria albatrus* (26**, 4). Second- or third-spring birds were 3.8 mi. w. of Pt. Pinos, MTY, 22 Mar 2008 (RW; 2008-048) and 12.7 mi. w. of North Farallon I., SF, 11 Apr 2008 (MB; 2008-076), a first- or second-fall bird was at 38.050° N, 123.450° W, Cordell Bank, MRN, 8 Aug 2008 (JaR†, SNGH; 2008-100; Figure 2), and a first-winter bird was near the Cordell Bank at 38.120° N, 123.479° W, SON, 29 Dec 2008 (VO, LC†, AP; 2009-001). Although this species was near extinction by the end of the 19th century, its population has rebounded. At the end of the 2006–2007 breeding season, the worldwide population was estimated at 2364 (BirdLife International 2009). This population increase is reflected in an increase in records in California waters. No Short-tailed Albatrosses were recorded in the state from 1900 to 1977. Of the 26 records accepted since then, 14 have been since 2005. The committee reviews records of this species from 1900 onward.

Figure 5. Adult Red-necked Stint (*Calidris ruficollis*) on the shore of San Diego Bay in the Naval Amphibious Base, Coronado, San Diego County, 23 July 2008. This photograph clearly shows the dark spotting on the side of the breast extending below the rufous on the upper breast, an important feature in distinguishing this species from the Little Stint (*C. minuta*). Another key character in which these species differ, the lack of rufous edges on the tertials of the Red-necked, is partly visible here. Other features evident in this photo are the extensive and unmarked rufous on the face and breast, split supercilium, extensively rufous scapulars, white stripe on the mantle, and short straight bill.

Photo by Matt Sadowski

*MOTTLED PETREL *Pterodroma inexpectata* (79, 20). Twenty far off the California coast during seabird surveys from the NOAA ship *McArthur II* in October and November 2008 included 11 between 191 n. mi. wsw. of Pt. Arena and 156 n. mi. w. of Pt. Vizcaino, MEN, 21 Oct 2008 (MPF; 2009-021) and single individuals at 38.507° N, 127.691° W (188 n. mi. w. of Pt. Arena, MEN), 21 Oct 2008 (SWW; 2009-019); 39.557° N, 127.292° W (142 n. mi. wsw. of Punta Gorda, HUM), 21 Oct 2008 (SWW; 2009-020); 39.024° N, 128.041° W (185 n. mi. wsw. of Punta Gorda, HUM), 22 Oct 2008 (SWW; 2009-022); 38.764° N, 127.152° W (160 n. mi. w. of Pt. Arena, MEN), 22 Oct 2008 (SWW; 2009-023); 38.905° N, 127.633° W (182 n. mi. w. of Pt. Arena, MEN), 22 Oct 2008 (MPF; 2009-024); 38.864° N, 127.493° W (168 n. mi. wsw. of Punta Gorda, HUM), 22 Oct 2008 (MPF; 2009-025); 35.461° N, 125.636° W (189 n. mi. wsw. of Pt. Sur, MTY), 7 Nov 2008 (SWW; 2009-026); 31.571° N, 122.589° W (181 n. mi. sw. of San Miguel I., SBA), 16 Nov 2008 (MPF; 2009-028); and 32.785° N, 122.947° W (145 n. mi. sw. of San Miguel I., SBA), 27 Nov 2008 (SWW; 2009-029).

In addition to these birds, the same research cruise recorded many more of this species more than 200 n. mi. offshore. Although the CBRC has accepted only 79 Mottled Petrels for California, past records also indicate that this species occurs in relatively large numbers in some years. Prior to 2008, one-day totals of at least eight individuals were recorded on three occasions (Bevier 1990, Heindel and Garrett 1995,

Figure 6. This adult Black-tailed Gull (*Larus crassirostris*), only the second for California, was at Half Moon Bay, San Mateo County, briefly on 29 December 2008. Although neither the signature feature of the species nor its size (slightly smaller than a California Gull, *L. californicus*) is obvious here, this photo does show the dark gray mantle, long wings, long bill with black subterminal band and red tip, and pale eye.

Photo by Christopher N. Gibbins

Patten et al. 1995), accounting for 35 of the 59 individuals accepted. Therefore, the committee concluded that occurrences of the Mottled Petrel within 200 n. mi. of California are not extralimital but reflect the species' passage closer to shore in some years. It removed the Mottled Petrel from the review list at the 2009 meeting and now reviews records only through 2008.

IDENTIFICATION NOT ESTABLISHED: One reportedly seen from Southeast Farrallon I., SF, 26 Nov 2006 (2007-031) received support from a majority of the committee in every round. But others withheld their support because of the brevity and distance of the sighting, along with the fact that the normally conspicuous dark carpal bar on the underwing was not seen.

GALAPAGOS/HAWAIIAN PETREL *Pterodroma phaeopygia/sandwichensis* (24, 2). Three sightings off Ft. Bragg, MEN, 8 Aug 2008 involved at least two individuals (CK†, JoP†, DLS; 2008-101). Several members, in part on the basis of Force et al. (2007), believed that the photographs represent Hawaiian Petrels. At the 2009 annual meeting, the committee concluded that identification of these species in the field is possible and that past records supported by photographs might be assigned to species. Analysis by Peter Pyle showed that, in particular, head pattern is useful for distinguishing between these species. Secondary characters include bill size, contrast between cap and mantle, thickness of the dark trailing edge of the secondaries, overall sleekness, and the presence of a black spot in the axillars. Pyle examined accepted records supported by photographs and recommended acceptance of the Fort Bragg record and 10 others as the Hawaiian Petrel. The committee will vote on whether or not these birds can be identified to species.

Of the 24 accepted records of this species pair through 2008, 11 are for August.

BULWER'S PETREL *Bulweria bulwerii*. IDENTIFICATION NOT ESTABLISHED: A procellariid in the Santa Barbara Channel, VEN, 5 Sep 2007 (2007-243), found

Figure 7. One of only four recorded in California in the past two decades, this Black-billed Cuckoo (*Coccyzus erythropthalmus*) spent just enough time at Huntington Beach Central Park, Orange County, to be photographed on 14 Oct 2008. The yellowish orbital ring (red in adults), buffy throat, and pale fringes to feathers of the upperparts (not visible here) all indicated first-fall plumage.

Photo by James E. Pike

by a British tour group, was photographed through binoculars. The record received substantial support as this species in the first round. However, the poor quality of the photos and doubts about the size of the bird, which to some members seemed more appropriate for the similar but larger Jouanin's Petrel (*B. fallax*), persuaded most in the second round that the bird could not reliably be identified to species. The committee has accepted only one of the three previous reports, of a well-documented bird in Monterey Bay, MTY, 26 Jul 1998 (1998-119; Erickson and Hamilton 2001).

STREAKED SHEARWATER *Calonectris leucomelas* (18, 1). One was 15 mi. off Santa Cruz, SCZ, 12 Oct 2008 (TA, KPe; ToE†, RW; 2008-139). Eleven of the 18 accepted records have come since 2001, and all 18 are from fall. Monterey Bay, which receives substantial coverage at that season, continues to supply most of the records, including all five since 2006.

GREAT SHEARWATER *Puffinus gravis* (7, 1). One was 5 mi. off Pt. Lobos, MTY, 29 Nov 2008 (LST, SBT; ER†, DLS, BLS†; 2008-189). Six of the seven accepted California records of this species, and six of the 11 records for the northeast Pacific, have come from Monterey Bay and surrounding waters. These records are spread widely over the fall and winter months.

WEDGE-TAILED SHEARWATER *Puffinus pacificus* (6, 1). One light-morph bird off Año Nuevo Pt., SM, 23 Aug 2008 (ToE†; JeP†, DSS†; 2008-108; photo in *N. Am. Birds* 63:190) was the first for San Mateo Co. Written details were sparse, but close-range photos clearly show this species, which remains extremely rare in California, although it is common in the tropical Pacific and nests on islands off the western coast of Mexico.

IDENTIFICATION NOT ESTABLISHED: A shearwater 25.5 mi. w. of Bodega Head, SON, 7 Sep 2007 (2007-179) was identified at the time of observation as this species by highly skilled and experienced observers. The record gained strong support during the first round, but some committee members believed the poor photographs showed a bird that was too heavy-bodied and short-tailed to be a Wedge-

Figure 8. None of the 78 Dusky-capped Flycatchers (*Myiarchus tuberculifer*) recorded previously in California was confirmed to be an adult. While a photograph limited to a dorsal view of a bird might ordinarily not merit inclusion in the annual report, this one taken on 6 March 2008 in La Mirada, Los Angeles County, reveals primary coverts darker than the primaries, which generally indicate adult plumage (P. Pyle pers. comm.). Of course, the bird's returning to this location for at least its second winter provides additional proof.

Photo by Curtis A. Marantz

tailed Shearwater. In addition, the photos suggested that the bird had an "M" pattern on the dorsal side and a capped appearance, also wrong for the Wedge-tailed. Most members thought a dark shearwater photographed at Southeast Farallon I., SF, 15 Sep 2008 (2008-160) was probably a Sooty Shearwater (*P. griseus*).

*MANX SHEARWATER *Puffinus puffinus* (111, 2). Individuals were seen from shore at Pt. Pinos, MTY, 11 Sep 2006 (BLS; 2007-267) and at the mouth of Humboldt Bay, HUM, 15 Dec 2007 (BSa; 2008-124). The committee reviews records of this species through 2007.

RED-TAILED TROPICBIRD *Phaethon aethereus* (33, 5). One was at 33.082° N, 123.169° W (155 n. mi. wsw. of Pt. Conception, SBA), 17 Aug 2008 (WTH†; 2008-128), and four were seen equally far off the California coast during seabird surveys from the NOAA ship *McArthur II* in October and November 2008, including two at 35.317° N, 124.977° W (162 n. mi. wsw. of Pt. Sur, MTY), 2 Oct 2008 (SWW; 2009-033); one at 35.111° N, 124.167° W (132 n. mi. sw. of Pt. Sur, MTY), 3 Oct 2008 (SWW; 2009-034); and one at 30.906° N, 121.764° W (180 n. mi. sw. of San Nicolas I., VEN), 17 Nov 2008 (SWW; 2009-035). Similar numbers had been recorded on a research cruise in 2005, when larger numbers were off California but outside the 200-n.-mi. limit (Pyle 2006). As noted by Iliff et al. (2007), this species likely is regular far offshore of the state, although the number of accepted records remains relatively low.

BLUE-FOOTED BOOBY *Sula nebouxii* (92**, 1). One at 32.765° N, 117.777° W (27 n. mi. w. of Mission Bay, SD), 23 Aug 2008 (DP; TABl, BLC, TRS†; 2008-

Figure 9. Even in first-fall plumage, the Bluethroat (*Luscinia svecica*), with its long legs, broad pale supercilium, bib across the lower breast, and rusty tail base, is like no other species likely to occur in California. This individual, photographed on the first day of its 14–18 September 2008 stay on San Clemente Island, Los Angeles County, was the first recorded in the contiguous United States. On the basis of rusty tips to the greater secondary coverts and tertials, it was in its first fall; the lack of blue and red on the breast indicates a female (Svensson 1992). Although this bird's origin cannot be determined, the Bluethroat is last of the species of passerine that breeds in Alaska and normally winters in the Old World to be recorded in California.

Photo by Jason Fidorra

106) was only the second recorded in California away from the mainland. Most records of this species are from the Salton Sea, site of sporadic minor invasions. The most recent of these irruptions was in 2006, following eight years in which only one individual was recorded. However, the three records from the past two years were all coastal or offshore (Singer and Terrill 2009). The committee reviews records of the Blue-footed Booby since 1972.

*BROWN BOOBY *Sula leucogaster*. IDENTIFICATION NOT ESTABLISHED: A first-fall booby photographed while perched on a boat traveling between Santa Catalina I., LA, and Oceanside, SD, 11 Oct 2006 (2006-153) was identified by the photographer as a Brown Booby. Unfortunately, no written description of the bird was provided, and committee members disagreed over the interpretation of various features visible in the photo. When the record circulated for its fourth and final round, nearly half the committee believed the bird was possibly a Red-footed Booby (*S. sula*). The committee reviews records of the Brown Booby through 2007.

NEOTROPIC CORMORANT *Phalacrocorax brasilianus* (17, 1). A first-winter bird was at Fig Lagoon 1.5 mi. s. of Seeley, IMP, 3 Feb 2008 (TEW; 2008-042). One adult at the same location 24 Oct–11 Nov 2008 was joined by a second adult 5–11 Nov (GMcC; KZK†). These were presumed to be the same birds present at this location 23 Nov 2007–16 Feb 2008 (2007-273; Singer and Terrill 2009). Fourteen of California's 17 records are from Imperial Co.

TRICOLORED HERON *Egretta tricolor* (57**, 2). Two records involving single adults, of one at the southeast corner of the Salton Sea, IMP, 25 Jul–1 Aug 2008 (GMcC; DR† 2008-094) and one at Bolsa Chica, ORA, 16–*24* Oct 2008 (GRG†; RBMcN; 2008-145). The committee reviews records of this species since 1990.

*REDDISH EGRET *Egretta rufescens* (93, 0). The dates of a first-fall bird in Anaheim, ORA, 10 Sep 1984 (1984-210) are extended to 10 Sep–27 Oct 1984 (HBK). The committee reviews records for this species through 2001.

YELLOW-CROWNED NIGHT-HERON *Nyctanassa violacea* (43, 5). An adult was at the Ventura R. mouth, VEN, 13 Apr 2008 (RM†; OJ; 2008-056), and another adult was in the Ventura Harbor, VEN, 15 Aug 2008 (DSl†; 2008-129). In Imperial Beach, SD, a pair (2005-079 and 2005-080; Iliff et al. 2007), resident since Jun 2005, fledged three young in the summer of 2008 (GMcC; PEL; 2008-087), one of which was found dead near the nest on 30 Aug (GMcC, SDNHM #52127). One of the remaining juveniles was still present 1 Jan 2009. An immature at the same location 5 Jul 2008–1 Jan 2009 (PEL; GMcC; 2008-088) was probably one of the three (2007-151) fledged here in 2007. The breeding in 2008 represented the third consecutive year the Imperial Beach pair had successfully raised young since establishing the first California nesting record for this species in 2006 (Heindel and Garrett 2008).

GLOSSY IBIS *Plegadis falcinellus* (21, 7). A first-spring bird was at the Prado Basin, RIV, 17 Mar 2008 (JEP; 2008-044), and an adult was near Daggett, SBE, 26 Apr 2008 (JCS†; 2008-072). Adults at Unit 1 of the Salton Sea N.W.R., IMP, 1 Aug 2008 (DWA†, TaE, GMcC; 2008-095), at Calipatria, IMP, 1 Aug 2008 (GMcC; 2008-096), 5.5 km nnw. of Calipatria, IMP, 1 Aug 2008 (TaE†, GMcC; 2008-097), near Ramer L., IMP, 8 Aug 2008 (GMcC; 2008-099), and 6 km nw. of Calipatria, IMP, 15 Aug 2008 (PAG; GMcC; 2008-102) were around the south end of the Salton Sea. This species now appears to be annual in summer in this area, which accounts for 13 of California's 27 accepted records, dating to the first records in 2000 (McKee and Erickson 2002, San Miguel and McGrath 2005, Iliff et al. 2007). The growing number of records in the state in these years has been a part of this species' expansion throughout the western United States (Patten and Lasley 2000).

IDENTIFICATION NOT ESTABLISHED: Photographs of a single bird at the Yolo Bypass W.A., YOL, 10 Oct 2007 (2008-198) were not supported by a written description and suggested that the bird may have been a hybrid of the Glossy and White-faced (*P. chihi*). Photographs of an individual at the Prado Basin, SBE, 5–11 Apr 2007 (2007-133) were accompanied by a written description, but, after three rounds, a majority of the committee concluded the photographic evidence suggested this bird too may have been a hybrid.

ROSEATE SPOONBILL *Platalea ajaja* (137, 1). A first-winter bird collected at Pt. Hueneme, VEN, 15 Dec 1967, by Sid Peyton (DVP†; WFVZ #19575; 2008-219) has not previously been reported in the literature and now provides the first record of the Roseate Spoonbill for the California coast. The specimen is one of five collected in California, not including three additional reported specimens whose disposition the committee has been unable to determine.

MISSISSIPPI KITE *Ictinia mississippiensis* (43, 2). Two juveniles were recorded, one on Pt. Loma, SD, 11–18 Sep 2008 (MJB; DWA†, GMcC, PSp; 2008-114), the other at the Golden Gate Bridge/Marin Headlands, SF/MRN, 25 Oct 2007 (SB†; MMal†, PSa; 2008-168). The latter represents only the fourth coastal record of the Mississippi Kite from north of Santa Barbara Co.

COMMON BLACK-HAWK *Buteogallus anthracinus* (6, 1). An adult flying north near Aromas, SBT, 31 Mar 2008 (DT; 2008-055) and over Tiburon, MRN, 2 Apr (LBl, BS†; 2008-052; photo in *N. Am. Birds* 62:474) was considered the same bird later observed near Santa Rosa, SON, 14 Apr 2008–20 Dec 2009 (SM†; 2008-053). This same individual had spent the previous three summers at this location (2005-060, 2006-057, and 2007-080; Iliff et al. 2007, Heindel and Garrett 2008, Singer and Terrill 2009), before returning for a fourth summer and staying for more than a year and a half. One at Galileo Hill, KER, 27 Apr 2008 (SLS; KH-L†, TGM†, RSt†; 2008-057; Figure 3, photo also in *N. Am. Birds* 62:507) provides the first record for California of a Common Black-Hawk in juvenal plumage.

HARRIS'S HAWK *Parabuteo unicinctus*. NATURAL OCCURRENCE QUESTIONABLE. An adult with damaged and missing wing and tail feathers in Pauma Valley, SD, *7–23 Feb* 2008 (2008-026) was suspected of being an escaped captive bird by six committee members. Some who doubted this bird's origin acknowledged that falconers' birds typically are well cared for but questioned whether a wild bird could show the wear and feather damage shown by this individual. The origin of one in Bonita, SD, *27 Jun* 2008 (2008-086) was questioned by six members, mostly because the bird was tame and near a large urban area, where escaped birds are more likely to be found.

CRESTED CARACARA *Caracara cheriway* (28, 4). A first-winter bird with a distinctive pattern of broken primaries on the right wing was first at Hansen Dam, LA, 29 Jan–1 Feb 2007 (LL†; KLG†, JHa, MJSanM†; 2007-027), then at More Mesa near Goleta, SBA, 2–3 Feb 2007 (DLe†; EvC†; 2007-083), at Pt. Joe in Pebble Beach, MTY, 25 Feb 2007 (DR†; 2007-101), and finally at Moss Landing, MTY, 1 Mar 2007 (JdeM; 2007-101), substantiating northward movement along the coast by one individual. Other new records were of a second-winter bird near Año Nuevo, SM, 14 Feb 2008 (RDS†; 2008-043; photo in *N. Am. Birds* 62:298), an adult near Ft. Dick, DN, 31 Jan 2008–16 Jul 2009 (ADB†; MB, JM†, DEQ; 2008-027; photo in *N. Am. Birds* 62:150), and a second-spring bird in the Kern R. Preserve near Weldon, KER, 25–27 Mar 2008 (DB†; AS†; 2008-047) that was considered the same bird as one at Mojave Narrows Regional Park near Victorville, SBE, 18 Feb 2008 (BDe†, JLD, SJM†; 2008-039; photo in *N. Am. Birds* 62:303). One in the area of the Tijuana R. valley, SD, 15 Jul–21 Nov 2008 (TME; GMcC; 2008-093) was considered the same bird (2006-127 and 2007-144; Singer and Terrill 2009) present sporadically since 9 Sep 2006.

YELLOW-HEADED CARACARA *Milvago chimachima*. NATURAL OCCURRENCE QUESTIONABLE. One was around Ferndale, HUM, 27 Jul–30 Dec 2007, at Humboldt Bay, HUM, 8 Mar 2008, then near L. Earl, DN, 13 Mar 2008 (KR†, GSL; 2008-169). The committee unanimously questioned the origin of this individual, and some questioned whether this nonmigratory, primarily South American species is a candidate to occur in California at all, let alone in the far north of the state. According to Wetmore (1981), the dark bands on the tail of individuals of the more southerly race, *M. c. chimachima*, found from the Amazon southward, are "wider and heavier" than the white bands. If this is correct, photos of the Yellow-headed Caracara originally found in Ferndale suggest it may be *M. c. chimachima*, not the more northerly *M. c. cordata*.

AMERICAN GOLDEN-PLOVER *Pluvialis dominica* (43**, 8). One juvenile was near Arcata, 30 Aug 2008 (DF; 2008-111), and two were there on 21 Oct 2007 (RS; 2007-284). Single fall juveniles were also near Loleta, HUM, 19 Oct–11 Nov 2008 (RF†; KMB; 2008-175) and near Salinas, MTY, 12–23 Oct 2008 (OJ†; BLS†, KVV†; 2008-140 and 2008-151). The record (documented by photo only) of another fall juvenile, at Estero Bluff State Park, SLO, 17 Sep 2007 (JC; 2007-302), was reviewed three times before being endorsed. Single spring migrants were inland at the south end of the Salton Sea, IMP, 6 Apr 2008 (RMW†; 2008-054) and on the coast in San Pedro, LA, 14 May 2008 (DE†; 2008-064).

Figure 10. This first specimen of the Veery (*Catharus fuscescens*) for California was procured on 16 May 2003, when the bird was found dead in a backyard in Davis, Yolo County. The coloration of the upperparts and the distinctiveness of the brown spots on the breast are consistent with *C. f. salicicola*, a subspecies that breeds as close to California as northeastern Oregon. The relatively dark dorsum of this race can overlap with that of the Russet-backed Swainson's Thrush (*C. ustulatus ustulatus*) (Pyle 1997). Some of the early state records of Veery were considered more suggestive of the brighter eastern races (Roberson 1980).

Photo by Andrew Engilis Jr.

IDENTIFICATION NOT ESTABLISHED: The committee considered documentation for individuals at the Salinas R. mouth, MTY, 19 Aug 2008 (2008-104), near Arcata, HUM, 27 Sep 2008 (2008-196), near Salinas, MTY, 23 Sep 2008 (2009-040), and near Gustine, MER, 15 Oct 2008 (2008-200) inadequate to eliminate the Pacific Golden-Plover (*P. fulva*). A juvenile at Owens L., INY, 16 Oct 2007 (2007-293) was suspected to be the same bird (2007-292; Singer and Terrill 2009) photographed nearby the same day but was rejected because of inadequate documentation. The committee removed the American Golden-Plover from the review list at the Jan 2010 meeting and reviews records from 2004 through 2009 only.

WILSON'S PLOVER *Charadrius wilsonia* (13, 1). An adult male was at North Island Naval Air Station, SD, 11–14 Apr 2008 (PLS†; 2008-051; photo in *N. Am. Birds* 62:479). Eight of the 13 records for California, including the past six, have come from San Diego Co.

*AMERICAN OYSTERCATCHER *Haematopus palliatus* (44, 7). Mainland records were of one adult at Crescent Pt. in Laguna Beach, ORA, *18* Jan–1 Feb 2008 (RBMcN; DL†, MMat†, DWN†, JEP, KPl†; 2008-018; Figure 4), one in La Jolla, SD, 13 Feb 2008 (RG†; 2008-031), and one at the entrance to San Diego Bay, SD, 22 Sep–2 Oct 2008 (DP; TABl†; 2008-122) and 6–20 Dec 2008 (WTH†; 2008-220). Channel Is. records included one on Sutil I. off Santa Barbara I., SBA, 16 Sep 2007 (NAL; WTF†; 2007-224) and three together near Laguna Anchorage on Santa Cruz I., SBA, 29 Sep 2007 (KPi†; 2007-244). One at Pelican Bay on Santa Cruz I., SBA, 8 Jan 2006 (DLG†, OJ†, AS; 2006-005) was presumably the same bird as that at nearby Prisoner's Harbor, 16 Apr–14 May 2005 (2005-055; Iliff et al. 2007) and 3 Apr–5 Jul 2004 (2004-058; Cole et al. 2006). The committee removed the American Oystercatcher from the review list at the 2009 meeting and reviews only records through 2008.

Figure 11. This first-fall Cerulean Warbler (*Dendroica cerulea*) (sex unknown) was at Oceano, San Luis Obispo County, on 20 October 2008, and was only the second of this species to be found in the state since 1997. Note the broad supercilium, short, thick bill, bold wingbars, yellowish wash on the underparts, and short extension of the tail beyond the undertail coverts (the shortest of any species of *Dendroica*; Dunn and Garrett 1997). Some past claims of the Cerulean Warbler in California have proven to be based on first-fall female Blackburnian Warblers (*D. fusca*).

Photo by Matt Brady

BAR-TAILED GODWIT *Limosa lapponica* (34, 1). An adult was on Cock Robin I. at the Eel R. delta, HUM, 14–15 Aug 2008 (LBr‡; 2008-105).

RED-NECKED STINT *Calidris ruficollis* (12, 1). An adult on San Diego Bay at Delta Beach, Naval Amphibious Base, Coronado, SD, 23 Jul–*18* Aug 2008 (MSa†; JLD, PAG, MMat†, CAM, GMcC, AM†, MSanM; 2008-091; Figure 5, photo also in *N. Am. Birds* 62:644) was the first recorded in that county. This long-staying individual arrived within the species' normal window of occurrence in California, but it remained seven days later than the previous late date for the species. Like all other Red-necked Stints accepted for California, this one was an adult in alternate plumage.

LITTLE STINT *Calidris minuta* (10, 1). A juvenile was at Moonglow Dairy in Moss Landing, MTY, 14 Sep 2008 (BHi†, DR†; 2008-117). The close-up photos showed a short, fine-tipped bill, dark legs, a clear lack of webbing between the toes, dark-centered tertials with rusty edges, dark-centered lower scapulars, and a split supercilium, a combination eliminating all other stints. This is California's fifth accepted record of a juvenile and the second juvenile from this location.

WHITE-RUMPED SANDPIPER *Calidris fuscicollis*. IDENTIFICATION NOT ESTABLISHED: One reported at Piute Ponds near Daggett, SBE, 20 Sep 2008 (2008-137) was initially reported as a juvenile, although the observer later described it as an adult. No juveniles of this species have been recorded in California or anywhere in the West, and most juveniles do not depart the breeding grounds until mid- to late September (O'Brien et al. 2006). Given the extreme rarity of this species in California in fall, the observer's uncertainty of the bird's age, and the relative brevity of the description, most committee members were unwilling to support this record.

*SHARP-TAILED SANDPIPER *Calidris acuminata* (29, 1). Documentation for a juvenile on Southeast Farallon I., SF, 7 Nov 1979 (EG, TH, JSh, LSp; 2008-205) was taken from the Farallon journal by James R. Tietz. It was the first Sharp-tailed Sandpiper to be recorded on the island and was listed as "not submitted" in CBRC (2007). The committee reviews records of this species from 1966 through 1980.

LITTLE GULL *Hydrocoloeus minutus* (100, 2). One seen flying past Pigeon Pt., SM, 1 May 2008 (RST; 2008-059) was in its second spring or older. A first-spring bird was in Modesto, STA, 25 May 2008 (ErC†; 2008-075).

BLACK-TAILED GULL *Larus crassirostris* (2, 1). An adult at Half Moon Bay, SM, 29 Dec 2008 (CG†; 2009-003; Figure 6, photo also in *N. Am. Birds* 63:356) was present only long enough to be photographed by the observer, who was familiar with this east Asian species. California's lone previous record was of an adult female found at the north end of San Diego Bay, SD, 26 Nov 1954 and collected two days later (1977-143; UMMZ #136176; Luther et al. 1979, Roberson 1986, Heindel and Patten 1996). The 54 years between records is surprising, considering this species has occurred widely as a vagrant, with records from British Columbia (*Birders J.* 11:4), southwestern Washington (*N. Am. Birds* 59:138, 191), northwestern Sonora (Garrett and Molina 1998), and various locations across North America to the east coast (CBRC 2007; P. Lehman pers. comm.).

ICELAND GULL *Larus glaucoides* (7, 1). A first-winter bird at the Yolo County Central Landfill near Davis, YOL, 27 Dec 2007 (SCH†; 2007-299) passed despite reservations expressed by some members in the first round. Ultimately, members were persuaded by its structure (short bill, rounded head, and long wings compared to Thayer's Gull, *L. thayeri*) and by the date of the record, likely too early for a Thayer's Gull to have been bleached so pale. While five of the seven accepted records for this species have come since 2005, ten records from this period were not accepted, and this species continues to have easily one of the lowest acceptance rates of any reviewed. The conservative approach of the committee reflects the poorly understood identification criteria in the Iceland–Thayer's complex and the uncertainty surrounding the taxonomy of these species.

IDENTIFICATION NOT ESTABLISHED: Three records of single birds received support from few members. One at the mouth of Redwood Cr. near Orick, HUM, 3 Jan 2008 (2008-003) was described as a second-winter bird by the single reporting observer. Several members expressed hesitance at voting for a record of this species that lacked photo documentation, as this one did. Several members thought a first-winter gull at the Pajaro R. mouth, SCZ/MTY, 9 Jan 2008 (2008-009) was more likely a hybrid, possibly between the Herring (*L. argentatus*) and Glaucous-winged (*L. glaucescens*), than either an Iceland or a Thayer's. Finally, most members thought a first-winter gull at the Yolo County Central Landfill near Davis, YOL, 27 Dec 2008 (2008-231) was within the phenotypic range of *L. g. kumlieni* but also of a Thayer's × Kumlien's Gull and possibly of Thayer's.

LESSER BLACK-BACKED GULL *Larus fuscus* (61, 14). The 14 new records included three from the coast, four from the Salton Sea, and an additional seven from other inland locations. Surpassing the total number of inland records away from the Salton Sea in all previous years, these seven are of four single adults, at Beal's Pt. on Folsom L., PLA, 7 Feb 2008 (DeR; ToE†; 2008-046), the Nimbus Fish Hatchery near Sacramento, SAC, 5 Dec 2008 (SNGH†; 2009-037), Clearlake, LAK, 1 Nov 2008–3 Jan 2009 (FEH†; JCS†, JW; 2008-170), and L. Perris, RIV, 23 Nov 2008–18 Feb 2009 (MF†; HBK, C-TL†, CMcG†; 2008-195), as well as of a juvenile at Crowley L., MNO, 12 Dec 2008 (JLD†; DH; 2008-211), a second-winter bird at the Buena

Vista Aquatic Recreation Area, KER, 21 Dec 2008 (SLS; RSt†; 2008-222), and a third-winter bird at L. Perris, RIV, 23 Nov 2008–7 Mar 2009 (HBK, TABe†, MF†, C-TL†, CAM; 2008-188). The four new records from the Salton Sea, where this species is now annual, involved single adults at the Whitewater R. mouth, RIV, 5 Jan 2008 (RLMcK†; 2008-004), at Salton City, IMP, 9 Jan 2008 (MBS†; 2008-008), at Mecca Campground, RIV, 27 Jan 2008 (MF, NF†; 2008-022), and near Rock Hill, Salton Sea N.W.R., IMP, 16 Dec 2008–30 Jan 2009 (GMcC; HDD†; 2008-215). Also, a returning bird (same as 2007-260; Singer and Terrill 2009) was around Obsidian Butte, IMP, 24 Oct 2008–22 Feb 2009 (GMcC; BKr†, PEL‡, CMcG†; 2008-163). Singer and Terrill (2009) referred to this individual as a third-winter bird in 2007, but a comparison of photos suggests it may have been in only its second winter that year.

The three coastal records involved an adult at Mayfield Slough in Palo Alto, SCL, 14 Nov 2008 (MMR†; 2009-066), another adult at Alviso, SCL, 16 Dec 2007–13 Jan 2008 (SCR; MMR†; 2008-112), and a bird in at least its third winter at Dana Pt., ORA, 11 Nov 2008 (RBMcN†; 2008-179). The 15 records in 2008 (including one returning bird) extended a period in which an unprecedented number of Lesser Black-backed Gulls have been found in California (although numbers appear to be down in 2009–2010). The 31 new records established from September 2006 through December 2008 represent more than half of the 61 accepted records.

SLATY-BACKED GULL *Larus shistisagus* (35, 6). Single adults were near Ft. Dick, DN, 4 Feb–31 Mar 2008 (ADB†, KR†; 2008-049), the mouth of Redwood Cr. near Orick, HUM, 19 Jan 2008 (JA†; 2008-015), Hiller Park in McKinleyville, HUM, 1 Feb–8 Mar 2008 (LM; KMB, KR†; 2008-024), and at the Tri-cities Landfill, ALA, 18 Jan–4 Mar 2008 (MJM; 2008-017). A bird in at least its second winter was at the Ferndale bottoms in the Eel R. delta, HUM, 1 Feb 2008 (RF†; 2008-023), and a third-winter bird was at Venice Beach in Half Moon Bay, SM, 16 Feb 2008 (DSS†; MD; 2008-033).

IDENTIFICATION NOT ESTABLISHED: The report of a second-winter bird at Harkin's Slough and Sunset Beach near Watsonville, SCZ, 26 Jan 2008 (2008-020) included photographs but no written description, and some members believed the bird to have been a Western Gull (*L. occidentalis*).

GREAT BLACK-BACKED GULL *Larus marinus*. IDENTIFICATION NOT ESTABLISHED: Documentation, including photographs, provided by a single observer of an adult at the mouth of Redwood Cr. near Orick, HUM, 30 Dec 2006 (2007-011) circulated through the committee four times. Before the final circulation, the record was discussed at length during the committee's January 2009 meeting. Peter Pyle later compared the original photographs of the distant bird with specimens at the National Museum of Natural History and attached his findings to the documentation. In the end, the committee concluded that this dark-mantled gull may have been a Great Black-backed Gull, but because of discrepancies between the pattern of white on the primaries and that on correctly identified specimens, along with the apparent oiled condition of the wings and mantle and the consequent potential for abnormal darkening, it decided to await an unquestionable record before adding the species to the California state list. Given that the Great Black-backed Gull was first documented in British Columbia in 1988 (Campbell et al. 1990b), in Alaska in 1995 (Gibson and Kessel 1997), and in Washington in 2004 (Wahl et al. 2005), the wait may not be long.

BRIDLED TERN *Onychoprion anaethetus* (3, 1). An adult at Unit 1 of the Salton Sea N.W.R., IMP, 7 Jul–24 Aug 2008 (KCM†; DWA†, JLD†, TME, JSF, KLG, SNGH†, KZK†, PEL, CAM†, GMcC, DR†, MSanM; 2008-089; photo in *N. Am. Birds* 62:644) represents California's first inland record. On the basis of the amount of white evident in the outer rectrices, the grayish cast to the underparts, the sooty brown mantle, and the extensively darkish undersides to the primaries, the commit-

Figure 12. Two Baird's Sparrows (*Ammodramus bairdii*) were found on Southeast Farallon Island, San Francisco County, in fall 2008, this one on 14 September. The orangish buff color of the head and absence of a postocular stripe, distinguishing Baird's from the Savannah Sparrow (*Passerculus sandwichensis*), can be seen well in this photograph. The sinuous pattern of internal black with marginal rufous in the distal tertials is reminiscent of the Lapland Longspur (*Calcarius lapponicus*) and unlike any other species of North American sparrow. This individual can be aged as first fall on the basis of the combination of feathers of both the juvenal and formative plumages on the upperparts, wing coverts, and tertials; the retained juvenal mantle and scapular feathers create a scaly appearance that is not as marked in adults.

Photo by Matt Brady

tee concluded the bird was the western Mexican *O. a. nelsoni*, the subspecies of the Bridled Tern occurring nearest California (Pyle 2008, Olsen and Larsson 1995, Cramp 1985, Ridgway 1919). *Onychoprion a. nelsoni* is a local summer resident from "at least" the states of Nayarit to Guerrero (Howell and Webb 1995).

LONG-BILLED MURRELET *Brachyramphus perdix* (21, 2). One between the south jetty to Humboldt Bay and the Eel R. mouth, HUM, 15 Jul–7 Aug 2008 (EAE†; JJ†, KR†; 2008-090) was joined by a second, 7 Aug 2008 (KR†; 2008-098).

BLACK-BILLED CUCKOO *Coccyzus erythropthalmus* (17, 1). A first-fall bird was in Huntington Beach Central Park, ORA, 14 Oct 2008 (JEP†; BED†; 2008-141; Figure 7, photo also in *N. Am. Birds* 63:191). Although nine Black-billed Cuckoos were recorded in California in the 1980s, only two were found in the 1990s, and this was just the second recorded in the 2000s (CBRC 2007).

BROAD-BILLED HUMMINGBIRD *Cynanthus latirostris* (73, 1). A first-year male frequented a feeder in Arroyo Grande, SLO, 31 Oct 2008–24 Mar 2009 (WTF†, OJ†, CAM†, DEQ†; 2008-178).

RUBY-THROATED HUMMINGBIRD *Archilochus colubris* (11, 1). An adult male was at a feeder in Nevada City, NEV, 23–31 Aug 2008 (RD†; TB†, WC†, JLD†, JM†, JCS; 2008-107; photo in *N. Am. Birds* 63:191). California's only previous record of an adult male also came from Nevada Co., in 1975, the specimen languishing as a mislabeled Broad-tailed Hummingbird (*Selasphorus platycercus*) in the collection of the University of California, Davis (WFB #972) until its reidentification eight years later (Cole and Engilis 1986).

YELLOW-BELLIED FLYCATCHER *Empidonax flaviventris*. IDENTIFICATION NOT ESTABLISHED: Most committee members thought an *Empidonax* videotaped in Big Sycamore Canyon, VEN, 14 Oct 2002 (2008-167) may have been this species, but the quality of the images was problematic, as was the lack of a written description and, most importantly, the fact that the bird never called. By contrast, one photographed at Horse Thief Springs, SBE, 27 Sep 2008 (2008-130) received no support and was almost certainly a Western Flycatcher (*E. difficilis/occidentalis*). The discrimination of the Yellow-bellied from several of its congeners is an imposing identification challenge, and many records are rejected by the CBRC, especially when no calls are heard. Whitney and Kaufman (1986) and Heindel and Pyle (1999) treated this issue well.

DUSKY-CAPPED FLYCATCHER *Myiarchus tuberculifer* (79, 3). Surprisingly, a bird at Creek Park in La Mirada, LA, 27 Feb–7 Apr 2008 (JoR†; LJS†; 2008-040) and at the same location 25 Nov 2008–*6 Apr* 2009 (JoR†; DWA†, PEL, CAM†; 2008-187; Figure 8) furnished California's first record of a Dusky-capped Flycatcher considered to have returned for a second winter. Given the difficulty of aging *Myiarchus* flycatchers in the field, especially in winter after the completion of preformative molt (Pyle 1997), this record constitutes the first confirmation of an adult Dusky-capped Flycatcher in California (CBRC 2007). Another individual was at Recreation Park in El Segundo, LA, 18–26 Jan 2008 (RB†; JSF, KGL; 2008-016; photo in *N. Am. Birds* 62:303), and a well-documented bird at Zzyzx, SBE, 17 Nov–13 Dec 2008 (DAG†; TABe†, JLD†, CAM†, LS†; 2008-183) supplied the first record for San Bernardino Co.

THICK-BILLED KINGBIRD *Tyrannus crassirostris* (18, 1). A first-year bird was at South Coast Botanic Garden, Palos Verdes Peninsula, LA, *9* Dec 2008–27 Apr 2009 (CAM, MSanM†, LS†, LSz†; 2008-206). Although four of the first five Thick-billed Kingbirds to be recorded in the state (1965–1978) were apparently fall transients, all but one record since have pertained to birds that were wintering (CBRC 2007).

WHITE-EYED VIREO *Vireo griseus* (58, 5). A silent bird at Galileo Hill, KER, on 18 May 2008 (BDy†; 2008-066) and singing males at Banner, SD, 20 May 2008 (KS; 2008-065), Paradise, MNO, 14 Jun 2008 (DH†; JLD; 2008-082), and at 8200 feet elevation 10 mi. wsw. of Bishop, in the "Buttermilks," INY, 15 Jun 2008 (JiP, DPa; JLD, DH†; 2008-083) were spring vagrants. One at Ft. Rosecrans National Cemetery on Pt. Loma, SD, 11–27 Sep 2008 (DWA†; GMcC, MSa†, TRS†; 2008-113) was found in fall, when far fewer are recorded.

BLUE-HEADED VIREO *Vireo solitarius* (62, 11). One in Orick, HUM, 1–3 Sep 2007 (LaT *S*; 2008-194) is the earliest accepted for California in the fall and was well-documented by a colored sketch. Single first-fall birds were banded on Southeast Farallon I., SF, 9–10 Sep 2008 (JRT; MB†, RT†; 2008-154), 13–16 Sep 2008 (MB†; 2008-155), and 14–15 Sep 2008 (JRT; MB†; 2008-156). A first-fall male was at Ft. Rosecrans National Cemetery on Pt. Loma, SD, 21–22 Oct 2008 (SES *S;* DWA†, TABl†, EGK†, PEL, TRS†; 2008-149). One in Los Osos, SLO, 11 Nov–7 Dec 2008 (OJ, CAM, AFS†, JCS†, DVP; 2008-177) was apparently attempting to winter. In addition, the committee endorsed five records of single birds seen in the 1980s and 1990s: three in Huntington Beach Central Park, ORA, 4–6 Oct 1984 (DRW; BED; 2008-204), 20 Sep–4 Oct 1989 (BED; 2008-203), and 5–22 Oct 1996 (JEP; BED; 2009-008), one at Pismo Beach, SLO, 1 Oct 1987 (KJZ; 2008-190), and one in Montana de Oro State Park, SLO, 11 Oct 1993 (JR; 2008-192).

YELLOW-GREEN VIREO *Vireo flavoviridis* (93, 3). Three first-fall birds, at DeForest Park in Long Beach, LA, 11–12 Sep 2008 (RB, BED†, JSF; 2008-115), Ft. Rosecrans National Cemetery on Pt. Loma, SD, 21–22 Sep 2008 (MJB; DWA†;

2008-119), and Carpinteria, SBA, 5–14 Oct 2008 (DMC; CAM, MM†, BMM, DiR†, MV†; 2008-132), made about an average number for this species in the fall.

IDENTIFICATION NOT ESTABLISHED: One reported at North Vandenberg Air Force Base, SBA, 30 Oct 2008 (2008-228) was seen briefly by a single observer at close range but without the aid of binoculars, and the description did not definitively rule out a Red-eyed Vireo (*V. olivaceus*).

CAVE SWALLOW *Petrochelidon fulva* (4, 1). A first-spring bird 3 mi. sw. of Niland, IMP, 2–11 May 2008 (GMcC; BED†, JLD†, OJ†, KZK†, ABL†, PEL, TGM†, DWN†, JCS†; 2008-060; photo in *N. Am. Birds* 62:507) was California's first Cave Swallow seen by many observers, as the previous three, also in Imperial Co., were present for only a single day and seen only by the finders.

To date, three of the state records are for May, the other for August. The first Cave Swallows to appear in Arizona three decades ago established a similar pattern, which culminated in breeding within a Cliff Swallow (*P. pyrrhonota*) colony in 1983 (Rosenberg and Witzeman 1999). More recent Arizona records have been in fall and winter (Rosenberg et al. 2007, Rosenberg and Stevenson 2008), illustrating the necessity of the Cave Swallow being considered when any apparent Cliff Swallow is encountered in California from late fall to mid-winter.

DUSKY WARBLER *Phylloscopus fuscatus* (13, 2). Individuals were at Pt. Isabel in Richmond, CC, 9 Oct 2008 (ES†; RoL†; 2008-136; photo in *N. Am. Birds* 63:190 and on the cover of *W. Birds* 40[3]) and at Antonelli's Pond in Santa Cruz, SCZ, 16–18 Oct (OJ; MB†, MMat†, RT, BLS†; 2008-144). The latter bird was at the same spot as the first Dusky Warbler in Santa Cruz Co., in 1997. Documentation for both records provided careful differentiation from the very similar Radde's Warbler (*P. schwarzi*) and other congeners. Vocalizations heard from both birds were variously described as sounding reminiscent of the Common Yellowthroat (*Geothlypis trichas*), Lincoln's Sparrow (*Melospiza lincolnii*), the "smack" of some subspecies of the Fox Sparrow (*Passerella iliaca*), or combinations thereof, and thus sounding distinctly different from the softer calls of Radde's (Mullarney et al. 1999). The Radde's Warbler is a long-distance migrant with a breeding range that extends to the southern Russian Far East, Sakhalin I., northeastern China, and northern Korea (Brazil 2009); it has yet to be recorded in North America. See Erickson and Terrill (1996) for a summary of identification criteria distinguishing the Dusky from Radde's Warbler, with comments on some other similar, highly migratory species of *Phylloscopus* also found in east Asia.

BLUETHROAT *Luscinia svecica* (1, 1). A first-fall female at Lemon Tank on San Clemente I., LA, 14–18 Sep 2008 (JS; JF†; 2008-116; Figure 9, photo also in *N. Am. Birds* 63:192) was the first, not only for California, but also for the contiguous United States. This common Old World thrush had long been considered a candidate for vagrancy to California, given that its breeding range extends broadly across northern Eurasia into northern Alaska and the northern Yukon Territory. In the New World, migrants occur only casually in Alaska south of the Bering Strait region (CBRC 2007).

VEERY *Catharus fuscescens* (12, 1). One that hit a window at a home in Davis, YOL, 16 May 2003 (WH, AE Jr.†; 2009-072; Figure 10) is now a specimen in the Museum of Wildlife and Fish Biology (WFB #6995) at the University of California, Davis. Andrew Engilis Jr. identified the specimen as a male (in its first spring, per Peter Pyle) *C. f. salicicola*, a subspecies with a breeding range that extends from British Columbia and eastern Washington south through the Rocky Mountains to Colorado and formerly ne. Arizona. He found it much duller on the upperparts than specimens of *C. f. fuscescens* in the collection at Davis and took it to the Museum of Vertebrate Zoology, University of California, Berkeley, where he found it to match specimens of *salicicola*. The dorsum of *salicicola* is a duller, darker brown than that of the nominate subspecies of the eastern United States; it also has the ventral spots darker and more distinct (Pyle 1997). This Veery is only the second to be found in California in the past decade and establishes the state's earliest spring record by one day (CBRC 2007).

WOOD THRUSH *Hylocichla mustelina* (24, 1). One was at Galileo Hill, KER, 9 Oct 2008 (K & BK†; 2008-135). Surprisingly, the Wood Thrush hasn't been recorded from Southeast Farallon I., SF, although over half of the state's 21 records of the more furtive and difficult-to-identify Gray-cheeked Thrush (*Catharus minimus*) have come from that locale (CBRC 2007).

EASTERN YELLOW WAGTAIL *Motacilla tschutschensis* (18, 1). A first-fall bird in Goleta, SBA, 1–2 Sep 2008 (NL; DMC†, OJ†, CAM, BKS†; 2008-110; photo in *N. Am. Birds* 63:187) was a first for Santa Barbara Co. and fit neatly within the interval of 27 Aug–25 Sep this Alaska-breeding species has established in California (CBRC 2007). All North American records of the Yellow Wagtail (*M. flava*, *sensu lato*) complex are assumed to represent *M. tschutschensis* (Banks et al. 2004) in spite of our current inability to distinguish first-fall birds definitively in the field. Such first-fall birds are responsible for most if not all of California's records of the Yellow Wagtail (*sensu lato*). As the Western Yellow Wagtail (*M. flava*, *sensu stricto*) is a long-distance migrant with a breeding range that extends across most of northern Siberia as far east as the Kolyma R. (Brazil 2007, Alström and Mild 2003), it is possible that one or more California records pertain to this species.

*SPRAGUE'S PIPIT *Anthus spragueii* (110, 9). Single birds at Fenner, SBE, 28–29 Sep 2008 (TABe†, SJM†, CAM†; 2008-127), Galileo Hill, KER, 8–9 Oct 2008 (JS†; KH-L†, MSanM†, LS†, CT†, MMT†; 2008-134), Santa Fe Dam in Irwindale, LA, 16–17 Oct 2008 (AL†; MSanM; 2008-143), and on Santa Barbara I., SBA, 21 Oct 2008 (WTF; 2008-230) were all migrants. Five additional birds near Calipatria, IMP, 11 Nov 2008–7 Mar 2009 (LdeC†, GE†, KZK†, PEL, GMcC; 2008-213) were in an area where this species has recently proven to be a regular, albeit rare, winter visitor. As a result, the committee has discontinued reviewing records after 2008.

BLUE-WINGED WARBLER *Vermivora cyanoptera* (43, 2). First-fall males were at Crystal Spring in the Kingston Mts., INY, 16–20 Sep 2008 (JEP†; CAM, TEW; 2008-118) and 13 mi. away at China Ranch, INY, 11 Oct 2008 (SLS†; 2008-227).

IDENTIFICATION NOT ESTABLISHED: A bird in Korbel, HUM, 17 May 2008 (2008-073), described as appearing similar to a photo of a male Blue-winged Warbler "found on-line," but having a "black chin stripe," was identified as this species. Most members considered the documentation inadequate, and two believed the observer may have misjudged the size of a first-spring male Bullock's Oriole (*Icterus bullockii*).

GOLDEN-WINGED WARBLER *Vermivora chrysoptera* (72, 2). A first-spring female was at Butterbredt Spring, KER, 31 May 2008 (ToE†, OJ; 2008-077; photo in *N. Am. Birds* 62:480), and a first-fall female was on Southeast Farallon I., SF, 14 Sep 2008 (JRT; MB†, RT†; 2008-158).

BLUE-WINGED × GOLDEN-WINGED WARBLER *Vermivora cyanoptera* × *V. chrysoptera* (5, 1). A *Vermivora* on Southeast Farallon I., 17 Sep 2008 (JRT; MB†, RT†; 2008-157), looking most like an adult male Blue-winged Warbler but having the black eye-line broadening slightly and extending back to include some of the auriculars, was considered by six committee members to be this hybrid. While the bird's phenotype was clearly not that of a classic Brewster's or Lawrence's Warbler, the consensus of expert opinions solicited by the committee (see Acknowledgments) was that it was the product of a Blue-winged × Golden-winged hybrid that had backcrossed with several generations of pure Blue-winged. It is inherently difficult to determine whether an anomalous phenotypic trait on an individual bird of this species pair is the product of natural variation within the taxon or introgressed genes from the other species. Therefore, the committee acknowledges the possibility (if not probability) that some previously accepted state records of Blue-winged and Golden-winged may be of individuals with varying levels of introgressed genes. For additional information on this captivating topic, see Gill (1980, 2004) and Confer et al. (2010).

YELLOW-THROATED WARBLER *Dendroica dominica* (123, 3). First-spring males at Galileo Hill, KER, 25 May 2008 (EP†; 2008-074; photo in *N. Am. Birds* 62:480) and at the San Diego Zoo in San Diego, SD, 13 Jun 2008 (TRS†; 2008-079) were both of the western subspecies *D. d. albilora*, as was a wintering male along the Los Angeles R. in Glendale, LA, 14 Dec 2008–15 Feb 2009 (MSanM; MB†, CAM; 2008-216). The vast majority of California records have involved *albilora*, although the committee has endorsed a handful of late fall and winter records as apparently representing *D. d. dominica*, a subspecies that breeds in the eastern U.S. along the Atlantic seaboard and coast of the eastern Gulf of Mexico.

GRACE'S WARBLER *Dendroica graciae* (57, 1). One near Mendocino, MEN, 31 Dec 2008–31 Jan 2009 (GEC Jr., BEDo, KAH, RH, RJK†, MMat†, RiT, CW, JW; 2009-002) established the northernmost location for this species in California.

PINE WARBLER *Dendroica pinus* (91, 3). A male at Del Mar, SD, 10 Nov 2008 (SES *S*; 2008-176) was apparently a fall migrant. Wintering birds included a first-winter female frequenting Canary Island Pines (*Pinus canariensis*) in Riverside, RIV, 26 Jan 2008 (PT; 2008-021) and a first-winter male at Whittier Narrows Recreation Area, LA, 6 Dec 2008–*5 Jan* 2009 (AL†; MSanM†; 2008-201). Adult males at Friendship Park in Chula Vista, SD, 7 Dec 2008–*14 Mar* 2009 (JD; DWA†, GMcC; 2008-218) and at Estancia Park in Costa Mesa, ORA, 28 Dec 2008–6 Apr 2009 (JEP†; NAG†; 2009-063) were both present for their third winters at these locations (see CBRC records 2007-098 and 2007-263, and 2007-100 and 2008-007, respectively; Singer and Terrill 2009).

CERULEAN WARBLER *Dendroica cerulea* (17, 1). A first-fall Cerulean Warbler in Oceano, SLO, 20 Oct 2008 (JL; MB†, LHa, OJ, DVP; 2008-148; Figure 11, photo also in *N. Am. Birds* 3:158) was only the second to be found in California since 1997, a reflection of this species' declining population in the eastern United States.

WORM-EATING WARBLER *Helmitheros vermivorum* (116, 13). An unprecedented number of this species reached California in the fall and winter 2008–2009. Single birds noted at Furnace Cr. Ranch, INY, 4 Oct 2008 (C & RH†; JLD; 2008-226), Baker, SBE, 4–12 Oct 2008 (AEK; TABe†, SJM†, MSanM; 2008-131), Ventura, VEN, 16 Oct 2008 (RM; 2008-202), the Daggett–Barstow Airport, SBE, 17–22 Oct 2008 (JCS; 2008-164), and at Coyote Cr. Field Station near Alviso, SCL, 16–17 Nov 2008 (GB†; 2008-184) were evidently fall migrants. Individuals at San Dieguito County Park, SD, 31 Oct 2008–16 Jan 2009 (SB; ToE†, PAG, WTH†, EGK†, MMaT†, GMcC, JMM, GLR; 2008-171; photo in *N. Am. Birds* 63:159), Riverside, RIV, 7 Nov 2008–31 Jan 2009 (CAM; JLD, BHo†, GMcC, CMcG†; 2008-173), the San Diego Zoo in San Diego, SD, 21 Nov 2008–20 Apr 2009 (BM†; GMcC, TRS†, JCS†; 2008-186), Camino Real Park in Ventura, VEN, *23* Nov 2008–11 Jan 2009 (MSanM, DP†, DVP; 2008-197; photo in *N. Am. Birds* 63:358), Laguna Niguel, ORA, 8 Dec 2008 (RBMcN; 2009-067), Ferry Park in San Francisco, SF, *11* Dec 2008–28 Feb 2009 (KMB, MgF, JM, DSS†, GT†, KT†; 2008-207), and the Tijuana R. valley, SD, 13 Dec 2008 (CMcF; ME; 2008-209) were all probably wintering locally. The bird in Riverside was a first for that county. In addition, one at Camino Real Park in Ventura, VEN, 6–25 Jan 1997 (RVS; BED; AEK; 1997-085A), which had failed to reach acceptance after four earlier rounds, was reconsidered and accepted after additional documentation surfaced.

CONNECTICUT WARBLER *Oporornis agilis* (111, 2). A first-fall female was trapped and banded at Muddy Hollow on Pt. Reyes, MRN, 21 Sep 2008 (WP†; 2008-120), and another first-fall bird that hit the window of a coffee shop in Brentwood, 3 Oct 2008 (2008-133) was photographed by local Project Wildlife personnel and constitutes a first for Contra Costa Co. and the Central Valley. The bird was rehabilitated and released on 9 Oct 2008.

MOURNING WARBLER *Oporornis philadelphia* (139, 2). First-fall birds were on Southeast Farallon I., SF, 14–17 Sep 2008 (MB†; 2008-159) and at Crystal Spring in the Kingston Mts., INY, 20 Sep 2008 (JLD; 2008-225). Nearly half of all California records of the Mourning Warbler have come from Southeast Farallon I., one reason the committee continues to review this species despite the relatively high number of records. Another reason is the difficulty in distinguishing the Mourning from its sibling species, the MacGillivray's Warbler (*O. tolmiei*) (see records not accepted, below), a problem compounded by the recent discovery of an extensive zone in east-central British Columbia in which these species hybridize (Irwin et al. 2009). See Pyle and Henderson (1990), Curson et al. (1994), and Dunn and Garrett (1997) for additional treatments of this identification challenge.

IDENTIFICATION NOT ESTABLISHED: A reported Mourning Warbler photographed at Campbell Cove, Bodega Bay, SON, 30 Sep 2008 (2008-147) appeared to nearly all members to be an Orange-crowned Warbler (*Oreothlypis celata*); another at the Big Sur R. mouth, MTY, 20 Sep 2008 (2008-150) that looked most like a MacGillivray's Warbler but called like a Mourning failed to reach acceptance on the second round, with several members mentioning the possibility of its being a hybrid.

CASSIN'S SPARROW *Peucaea cassinii* (50, 2). One in a residential yard in Lawndale, LA, 12 Oct 2007 (JI; 2007-239) was only the second definite fall migrant recorded on California's mainland. Nine fall records are from offshore, with eight from Southeast Farallon I., SF, and the other from San Clemente I., LA (CBRC 2007). A "skylarking" male at the Carrizo Plain, SLO, 10–19 May 2008 (SDF†; TME†, JSF, BKS†, JCS†; 2008-062; photo in *N. Am. Birds* 62:481) provided the first record for San Luis Obispo Co.

IDENTIFICATION NOT ESTABLISHED: A drab sparrow 3–4 mi. sw. of Anaheim Hills, ORA, 10 May 2008, was stated to be singing in flight, so could well have been this species. However, the documentation was lacking, as the observer provided no description of the song and little about the appearance of the bird.

BAIRD'S SPARROW *Ammodramus bairdii* (6, 2). Single first-fall birds were well photographed on Southeast Farallon I., SF, 3–4 Sep 2008 (RT†; MB†, JRT; 2008-153) and 14 Sep 2008 (RT; MB†; 2008-152; Figure 12). Amazingly, five of California's six records are from this same locale, also in September. The exception was one at Pt. Loma, SD, 5–10 Oct 1981 (Binford 1985). Notably, Nevada recorded its first Baird's Sparrow on 6 Sep 2008 (Fridell 2009a; www.gbbo.org/nbrc/Web_Photos/2008-068.html) and Utah its first on 5 Oct 2007 (Fridell 2008; www.utahbirds.org/RecCom). California's first record of this secretive sparrow was supported by a specimen (CAS #68476), while all others have been documented by photos.

SNOW BUNTING *Plectrophenax nivalis* (119, 2). One was near Arcata, HUM, 15 Dec 2007 (BS; 2008-125), and a freshly dead first-fall male was on the highway near Emigrant Pass, INY, 15 Nov 2008 (PhJ†; specimen prepared by Kimball L. Garrett, original number 3638, to be transferred from LACM to DVNPM; 2008-182).

RUSTY BLACKBIRD *Euphagus carolinus* (14**, 6). A male at Coyote Pt., SM, 15–16 Nov 2008 (JM†; RF, RST; 2008-181) and a female on San Clemente I., LA, 6 Nov 2008 (JTS†; 2008-217) were fall migrants, whereas males at Furnace Cr. Ranch in Death Valley National Park, INY, *3 Jan*–2 Feb 2008 (AD; CMcC, V & GW; 2008-

005) and Buccaneer Park in Oceanside, SD, 27 Dec 2008–25 Feb 2009 (DWA†, EA†, TEBe, TABl†, DFu†, KH-L†, CAM, GMcC, GLR; 2008-229) and females near Ft. Dick, DN, 19 Dec 2008–15 Feb 2009 (ADB†; KMB, SC, KR†; 2008-221) and near Calipatria, IMP, 15–26 Dec 2008 (OJ†; GMcC, MSanM; 2008-214) were likely all wintering locally. The last record was a long anticipated first for the Salton Sink. Because this species was returned to the CBRC review list in January 2006 as a consequence of a declining population (Niven et al. 2004), it was surprising that five were found in late fall and winter 2008–2009 in California, while another six were found wintering during the same period in Nevada and Utah (Fridell 2009b).

COMMON GRACKLE *Quiscalus quiscula* (79, 3). A one-year old male was at Bassett's Station, SIE, 26 Jun 2008 (MMcCo†; 2008-084), a first-fall female was at Zzyzx, SBE, 18 Nov 2008 (CAM; SJM†; 2008-185), and a wintering male was at Borrego Springs, SD, 30 Nov 2008–18 Feb 2009 (PDJ; GF†, MJ†; 2008-212).

IDENTIFICATION NOT ESTABLISHED: All members considered the identification of one seen briefly from a moving vehicle near Lodi, SJ, 5 Apr 2008 (2008-050) subject to error so were unwilling to endorse the record. The report of one in Big Pine, INY, on the very early date of 31 Aug 2006 (2006-215) circulated for four rounds but never garnered more than six votes for acceptance. Several members were concerned that the documentation did not eliminate the possibility of the bird being a Brewer's Blackbird × Great-tailed Grackle (*Euphagus cyanocephalus* × *Q. mexicanus*), a hybrid that can appear remarkably similar to a Common Grackle. A male giving the appearance of this combination was documented 8 May–5 Jul 1999 (1999-122) in Santa Maria, Santa Barbara/San Luis Obispo Cos. (Rogers and Jaramillo 2002).

STREAK-BACKED ORIOLE *Icterus pustulatus*. IDENTIFICATION NOT ESTABLISHED: The description of an oriole seen for a short time in a residential yard in Los Angeles, LA, 24 Oct 2008 (2008-166) by an observer without binoculars lacked information regarding the presence of streaks on the back, so it was considered inadequate to document such a rarity.

BLACK ROSY-FINCH *Leucosticte atrata* (14, 1). One was with Gray-crowned Rosy-Finches (*L. tephrocotis*) near Bridgeport, MNO, 17 Dec 2008 (JLD; 2008-224). To date, all records of the Black Rosy-Finch in California have come from either Mono Co. or Inyo Co.

COMMON REDPOLL *Acanthis flammea* (79, 1). One photographed at Southeast Farallon I., SF, 5 May 2008 (ZC†; 2008-061) was not only exceptionally late but also provided the southernmost record of the Common Redpoll on the Pacific coast. Notably, several more southerly records of this species in Nevada and Texas in the past decade fit a similar May–June temporal window (CBRC 2007).

ORIENTAL GREENFINCH *Chloris sinica*. IDENTIFICATION NOT ESTABLISHED: A reported Oriental Greenfinch incompletely observed for approximately one minute on Southeast Farallon I., SF, 11 Oct 2008 (2008-161) received only two votes for acceptance. However, the committee noted that the observer was experienced with this species, an indicative call was heard, and what was seen was highly suggestive of this distinctive species. As a result, all members believed that the identification was likely correct but that the brevity of this single-observer sighting and the absence of photo documentation weighed against acceptance of what would be a first state record. The Oriental Greenfinch is a widespread and common resident across central, southern, and eastern China, Korea, the southern Russian Far East, and Japan and a summer visitor from Sakhalin I. through the Kuril Is. to southern and central Kamchatka (Brazil 2009). East of the Kamchatka Peninsula are the Aleutian Is., in the western and central portions of which the Oriental Greenfinch occurs intermittently in spring and casually in fall (Gibson and Byrd 2007). Although no records of the species have been accepted in North America outside of western Alaska, an Oriental Greenfinch in Arcata, HUM, 4 Dec 1986–3 Apr 1987 (1986-450; Patten and Erickson 1994) was rejected on the basis of questionable natural occurrence, as the species has some history of being kept in captivity. That record was sufficiently compelling that the species was placed on the CBRC's supplemental list. Most compelling about the more recent sighting was that it followed several days of strong northwest winds and occurred at a time and location that militates against the probability of an escaped caged bird.

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The committee thanks the following persons for advice on records contained in this report: Chris Corben for his comments on a Wedge-tailed Shearwater, Frank Gill, Leo Shapiro, Rachel Vallender, and Ronald Canterbury for their analyses of a hybrid Blue-winged × Golden-winged Warbler, and Matt Heindel and Steve Leonard for comments on a Yellow-bellied Flycatcher record. The committee also thanks Stanley W. Harris for photo documentation of the Baikal Teal, 2008-035. Guy McCaskie provided invaluable guidance in the creation of this report. Furthermore, Paul Lehman's editorial skills and avifaunal knowledge resulted in substantial improvements to the text, as did additional comments by Louis Bevier, Peter Pyle, Jon Dunn, and Dan Singer. We extend special thanks to James R. Tietz for updating the table of records published in *Rare Birds of California*, and to Joseph Morlan for maintaining the corrigenda to *Rare Birds of California* and for developing and updating the data query, all as available on the CBRC website. The Santa Barbara Museum of Natural History and H. T. Harvey and Associates in Los Gatos graciously hosted the two previous committee meetings. Lastly, much gratitude is extended to William C. Gabrielson of Trepte Construction Company for providing many years of unwavering moral and material support for Guy McCaskie's activities as the committee's secretary.

CORRIGENDA

The following corrections are noted for the CBRC's previous report (Singer and Terrill 2009): The average number of records per report over the first 30 reports was 214.6 (Cole et al. 2006), not 214.4 (p. 159). The location of the reported Trumpeter Swan (2007-064) was Glenn Co., not Butte Co. (p. 162). The Smew at Soulsbyville, TUO, in January 2007 returned the following winter to near Standard, TUO, not nearby Soulsbyville (p. 162). The Crested Caracara reported from the Tijuana R. valley, SD, in 2006-127 was the same bird as involved in 2007-127, which was not listed by number, although the dates for the latter record were included in the date range given for 2006-127 (p. 169). The Iceland Gull reported in 2007-009 was present on 16 Feb 2006, not 16 Feb 2007 (p. 177). Under the Literature Cited, the citation for Iliff et al. (2007) should refer to 2005 records, not 2006 (p. 189). We thank Bruce Deuel for bringing the location discrepancy for the Trumpeter Swan to our attention.

The following corrections are noted for the 32nd annual report (Heindel and Garrett 2008): The committee accepted 14 new American Golden-Plover records, not 13 (pp. 130-131). The location of the reported Pine Warbler at Mission Viejo, ORA (2006-221) was in Barton Spendlove Park, not Bart Speedlove (p. 142).

The following correction is noted for the 30th annual report (Cole et al. 2006): At the top of p. 79, the common and scientific name and opening text for the initial account on the page were separated from the account by several pages. The opening text appears on p. 75 between photos of Bar-tailed Godwits and reads "Oriental Turtle-Dove *Streptopelia orientalis* (1, 2). One at Furnace Creek Ranch. . . ." We thank Joe Morlan for bringing this error to our attention.

The following correction is noted for the 16th annual report (Heindel and Garrett 1995): The author of the account of the record of an Oriental Turtle-Dove

(*Streptopelia orientalis*) in British Columbia was Paterson, not Peterson (p. 23; p. 32 under Literature Cited). We thank Jon Dunn for bringing this discrepancy to our attention.

MISCELLANEOUS

Sightings for 2008 published in *North American Birds* for which **no** documentation was submitted to the CBRC include a possibly returning Smew near Standard, TUO, in mid-February (*N. Am. Birds* 63:319), a Yellow-billed Loon off Pacific Grove, MTY, 15 Jan–2 Feb (*N. Am. Birds* 62:298), a Crested Caracara at Pogonip, SCZ, 27 Feb (*N. Am. Birds* 62:298), one of the two Slaty-backed Gulls in the Smith R. bottoms, DN, 4–8 Feb (*N. Am. Birds* 62:299), a Thick-billed Murre at Pt. Reyes, MRN, 20 Dec (*N. Am. Birds* 63:152), a Worm-eating Warbler on Pt. Reyes, MRN, 11 Sep (*N. Am. Birds* 63:154), and a Rusty Blackbird at Lucas Valley, MRN, 20 Oct (*N. Am. Birds* 63:155). We welcome submission of documentation for these birds. However, until the committee has reviewed and accepted them, we recommend the records not be considered valid.

CONTRIBUTORS

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LITERATURE CITED

Alström, P, and Mild, K. 2003. Pipits and Wagtails. Princeton Univ. Press, Princeton, NJ.

Banks, R. C., Cicero, C., Dunn, J. L., Kratter, A. W., Rasmussen, P. C., Remsen, J. V. Jr., Rising, J. D., and Stotz, D. F. 2004. Forty-fifth supplement to the Am. Ornithol. Union Check-list of North American Birds. Auk 121:985–995.

Bevier, L. R. 1990. Eleventh report of the California Bird Records Committee. W. Birds 21:145–176.

Binford, L. C. 1983. Sixth report of the California Bird Records Committee. W. Birds 14:127–145.

Binford, L. C. 1985. Seventh report of the California Bird Records Committee. W. Birds 16:29–48.

Birch, A., and Lee, C.-T. 1997. Arctic and Pacific Loons: Field identification. Birding 29:106–115.

BirdLife International. 2009. *Phoebastria albatrus*. In IUCN (2009), IUCN Red List of Threatened Species. Available at www.iucnredlist.com. Accessed 15 December 2009.

Brazil, M. 2009. Birds of East Asia: China, Taiwan, Korea, Japan, and Russia. Princeton Univ. Press, Princeton, NJ.

California Bird Records Committee (R. A. Hamilton, M. A. Patten, and R. A. Erickson, eds.). 2007. Rare Birds of California. W. Field Ornithol., Camarillo, CA.

Campbell, R. W., Dawe, N. K., McTaggart-Cowan, I., Cooper, J. M., Kaiser, G. W., and McNall, M. C. E. 1990b. The Birds of British Columbia, Vol. 2. Royal Br. Columbia Mus., Victoria.

Clark, W. S., and Wheeler, B. K. 1995. Field identification of Common and Great Black-Hawks. Birding 17:33–37.

Cole, L. W., Nelson, K. N., and Sterling, J. C. 2006. The 30th report of the California Bird Records Committee: 2004 records. W. Birds 37:65–105.

Cole, R. E., and Engilis, A., Jr. 1986. First record of a Ruby-throated Hummingbird in California. W. Birds 17:41–42.

Confer, J. L., Barnes, K. W., and Alvey, E. C. 2010. Wilson J. Ornithol. 122:273–278.

Cramp, S., ed. 1985. Handbook of the Birds of Europe, the Middle East and North Africa, Vol. 4. Oxford Univ. Press, Oxford, England.

Curson, J., Quinn, D., and Beadle, D. 1994. Warblers of the Americas: An Identification Guide. Houghton Mifflin, Boston.

Delaney, S., and Scott, D. 2002. Waterbird Population Estimates, 3rd ed. Wetlands Internatl., Wageningen, Netherlands.

Dunn, J. L., and Garrett, K. L. 1997. A Field Guide to Warblers of North America. Houghton Mifflin, Boston.

Erickson, R. A., and Hamilton, R. A. 2001. Report of the California Bird Records Committee: 1998 records. W. Birds 32:13–49.

Erickson, R. A., and Terrill, S. B. 1996. Nineteenth report of the California Bird Records Committee: 1993 records. W. Birds 27:93–126.

Force, M. P., Webb, S. W., and Howell, S. N. G. 2007. Identification at sea of Hawaiian and Galapagos Petrels. W. Birds 38:242–248.

Fridell, R. 2008. Fall season: Great Basin. N. Am. Birds 62:125–129.

Fridell, R. 2009a. Fall season: Great Basin. N. Am. Birds 63:135–138.

Fridell, R. 2009b. Winter season: Great Basin. N. Am. Birds 63:307–309.

Garrett, K. L., and Molina, K. C. 1998. First record of the Black-tailed Gull for Mexico. W. Birds. 29:49–54.

Gibson, D. D., and Kessel, B. 1997. Inventory of the species and subspecies of Alaska birds. W. Birds 28:45–95.

Gibson, D. D., and Byrd, V. G. 2007. Birds of the Aleutian Islands, Alaska. Nuttall Ornithol. Club and Am. Ornithol. Union Series in Ornithol. 1.

Gill, F. B. 1980. Historical aspects of hybridization between Blue-winged and Golden-winged Warblers. Auk 97:1–18.

Gill, F. B. 2004. Blue-winged Warblers (*Vermivora pinus*) versus Golden-winged Warblers (*V. chrysoptera*). Auk 121:1014–1018.

Heindel, M. T., and Garrett, K. L. 1995. Sixteenth annual report of the California Bird Records Committee. W. Birds 26:1–33.

Heindel, M. T., and Garrett, K. L. 2008. 32nd report of the California Bird Records Committee: 2006 records. W. Birds 39:121–152.

Heindel, M. T., and Patten, M. A. 1996. Eighteenth report of the California Bird Records Committee. W. Birds 27:1–29.

Heindel, M. [T.], and Pyle, P. 1999. Identification of Yellow-bellied and "Western" Flycatchers. Birders J. 8:78–87.

Howell, S. N. G., and Webb, S. 1995. A Guide to the Birds of Mexico and Northern Central America. Oxford Univ. Press, Oxford, England.

Iliff, M. J., McCaskie, G., and Heindel, M. T. 2007. The 31st report of the California Bird Records Committee: 2005 records. W. Birds 38:161–205.

Irwin, D. E., Brelsford, A., Toews, D. P. L., MacDonald, C., and Phinney, M. 2009. Extensive hybridization in a contact zone between MacGillivray's Warblers *Oporornis tolmiei* and Mourning Warblers *O. philadelphia* detected using molecular and morphological analyses. J. Avian Biol. 40:539–552.

Luther, J. S., McCaskie, G., and Dunn, J. 1979. Third report of the California Bird Records Committee. W. Birds 10:169–187.

McKee, T., and Erickson, R. A. 2002. Report of the California Bird Records Committee: 2000 records. W. Birds. 33:175–201.

Mullarney, K., Svensson, L., Zetterström, D., and Grant, P. J. 1999. Birds of Europe. Princeton Univ. Press, Princeton, NJ.

Niven, D. K., Sauer, J. R., Butcher, G. S., and Link, W. A. 2004. Christmas Bird Count provides insight into population change in land birds that breed in the boreal forest. Am. Birds 58:10–20.

O'Brien, M., Crossley, R., and Karlson, K. 2006. The Shorebird Guide. Houghton Mifflin, Boston.

Olsen, K. M., and Larsson, H. 1995. Terns of Europe and North America. Princeton Univ. Press, Princeton, NJ.

Patten, M. A., and Erickson, R. A. 1994. Fifteenth report of the California Bird Records Committee. W. Birds 25:1–34.

Patten, M. A., Finnegan, S. E., and Lehman, P. E. 1995. Seventeenth annual report of the California Bird Records Committee: 1991 records. W. Birds 26:113–143.

Patten, M. A., and Lasley, G. W. 2000. Range expansion of the Glossy Ibis in North America. N. Am. Birds 54:241–247.

Pyle, P. 1997. Identification Guide to North American Birds, Part I: Columbidae to Ploceidae. Slate Creek Press, Bolinas, CA.

Pyle, P. 2006. Offshore Pacific highlights in summer–fall 2005: Just another year. N. Am. Birds 60:4–13.

Pyle, P. 2008. Identification Guide to North American Birds, Part II: Anatidae to Alcidae. Slate Creek Press, Bolinas, CA.

Pyle, P., and Henderson, P. 1990. On separating female and immature *Oporornis* in fall. Birding 22:222–229.

Reinking, D. L., and Howell, S. N. G. 1993. An Arctic Loon in California. W. Birds 24:189–196.

Ridgway, R. 1919. The Birds of North and Middle America, Part 5. Bull. U.S. Natl. Mus. 50.

Roberson, D. 1980. Rare Birds of the West Coast. Woodcock Publ., Pacific Grove, CA.

Roberson, D. 1986. Ninth report of the California Bird Records Committee. W. Birds 17:49–77.

Rogers, M. M., and Jaramillo, A. 2002. Report of the California Bird Records Committee: 1999 records. W. Birds 33:1–33.

Rosenberg, G. H., and Witzeman, J. L. 1999. Arizona Bird Record Committee report, 1974–1996: Part 2 (passerines). W. Birds 30:94–120.

Rosenberg, G. H., Radamaker, K., and Stevenson, M. M. 2007. Arizona Bird Committee report, 2000–2004 records. W. Birds 38:74–101.

San Miguel, M., and McGrath, T. 2005. Report of the California Bird Records Committee: 2003 records. W. Birds 36:78–114.

Singer, D. S., and Terrill, S. B. 2009. The 33rd report of the California Bird Records Committee: 2007 records. W. Birds 40:158–190.

Shuford, W. D. 2006. Back issues of *Western Birds* now online! W. Birds 37:122.

Stevenson, M. M., and Rosenberg, G. H. 2008. Winter season: Arizona. N. Am. Birds 62:282–285.

Svensson, L. 1992. Identification Guide to European Passerines, 4th ed. L. Svensson, Stockholm.

Wahl, T. R., Tweit, B., and Mlodinow, S. G. 2005. Birds of Washington: Status and Distribution. Ore. State Univ. Press, Corvallis.

Wetmore, A. 1981. Birds of the Republic of Panama, Part 1—Tinamidae (Tinamous) to Rhynchopidae (Skimmers). Comstock, Ithaca, NY.

Whitney, B., and Kaufman, K. 1986. The *Empidonax* challenge. Part IV: Acadian, Yellow-bellied, and Western Flycatchers. Birding 18:315–327.

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MOLECULAR DATA CONFIRM THE FIRST RECORD OF THE LONG-BILLED MURRELET FOR NEW MEXICO

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ABSTRACT: A small alcid of uncertain identity was salvaged from a brine pool associated with a potash mine in Eddy County, New Mexico, on 12 July 2009. The carcass was brought to the Museum of Southwestern Biology, prepared as a specimen, and tentatively identified as a Long-billed Murrelet (*Brachyramphus perdix*), but identification based on measurements and plumage characteristics was not conclusive. DNA sequence from the mitochondrial gene cytochrome-*b* confirmed the specific identity but revealed a previously unrecognized mitochondrial variant of the Long-billed Murrelet. This specimen provides the first documentation of the Long-billed Murrelet in New Mexico, a record that was anticipated from the species' established pattern of vagrancy across North America. This vagrant's novel mitochondrial DNA haplotype reveals previously undescribed population genetic structure within the Long-billed Murrelet.

The Long-billed Murrelet (*Brachyramphus perdix*), of northeastern Asia, has a well-established pattern of intercontinental vagrancy and a tendency to wander far from coastlines. As of 2003, there were over 50 documented records for inland areas of the United States and Canada (Thompson et al. 2003). Remarkably, there were no conclusive records of the species in North America before 1979 (Sealy 1982). It continues to occur in North America regularly (e.g. Barnes 2009, Svingen 2009), and the first record for Europe was in 1997 (Maumary and Knaus 2000). By contrast, there are no records of inland vagrancy of the Marbled Murrelet (*B. marmoratus*), which breeds in northwestern North America. The reason for the recent pulse of long-distance vagrancy by the Long-billed Murrelet is unknown, but various authors have proposed that cyclical regional weather patterns, erratic food supplies, and long-distance dispersal behavior might be contributing to this unique pattern (Sealy et al. 1982, 1991, Mlodinow 1997, Thompson et al. 2003). A better understanding of patterns of geographic variation, dispersal, and migratory behavior in the Long-billed Murrelet will be critical to explaining this phenomenon.

The Long-billed Murrelet was considered to be an Asiatic subspecies of the Marbled Murrelet until genetic studies revealed it to be highly divergent (Friesen et al. 1996). Phylogenies of the genus based on nuclear and mitochondrial DNA demonstrate that the Long-billed Murrelet is sister to a clade containing Kittlitz's Murrelet (*B. brevirostris*) and the Marbled Murrelet (Friesen et al. 1996, Pereira and Baker 2008). Estimates of the time of divergence between the Long-billed Murrelet and its congeners range from 35 to 48 million years, which is surprisingly ancient given the overall phenotypic similarity of the three species of *Brachyramphus* (Pereira and Baker 2008). Previously published DNA sequences from the Long-billed

Murrelet are based on birds collected near Magadan, Russia, and archived at the Burke Museum (University of Washington, Seattle).

On 12 July 2009, staff of Mosaic Corporation found a small alcid dead in a pool of brine associated with a potash mine southeast of Carlsbad in southern Eddy County, New Mexico. The finders did not provide a more exact location, but we estimate it at approximately 23 km east-southeast of Carlsbad. They took the carcass to Desert Willow Veterinary Services where it underwent necropsy, at which time the gonads were discarded without being noted. The carcass was subsequently brought to the Museum of Southwestern Biology (University of New Mexico, Albuquerque), where we tentatively identified it to the genus *Brachyramphus*, pending further investigation. Andrew B. Johnson prepared the specimen as a traditional study skin, partial skeleton, spread wing, and frozen tissue sample (catalog number MSB 29200, tissue number NK170062, preparator number ABJ2319; record accessible at http://arctos.database.museum/guid/MSB:Bird:29200). Its feathers were heavily encrusted with salt, only a portion of which could be removed during specimen preparation. Although not weighed, the bird was not emaciated, and Johnson noted its fat as "light." No evidence of molt was noted. The tip of the maxilla was broken but remained attached.

PLUMAGE

Feathers of the underparts were white, with dark tips forming short bars or scallops that were sparse on the throat and upper breast, becoming dense on the abdomen and flanks (Figure 1A). The plumage of the upperparts, wings, and tail was dark grayish brown. A narrow stripe was formed by white feathers that extended from the side of the neck around to the nape. White scapulars formed a prominent V pattern on the back (Figure 1B, C). The wing, including the underwing coverts, was uniform dark grayish brown with light gray tips on the outer secondaries and on all primaries except the outermost (Figure 1D, E). The Long-billed Murrelet's underwing coverts have been widely reported as being extensively white, but Thompson et al. (2003) showed that white in the wing linings is associated with immature plumages of the Long-billed and, to a lesser extent, Marbled Murrelet. Thus, the color of this bird's wing lining is consistent with that of an adult, even though the breast plumage is much more extensively white than in specimens of adult or subadult Long-billed Murrelets taken during August in California (Sealy et al. 1991) and Washington (Thompson et al. 2003), respectively.

Another characteristic that has been used to diagnose the Long-billed Murrelet is whitish marbling in the outer vanes of the rectrices. Thompson et al. (2003) showed that this characteristic is present in some Long-billed Murrelets but never present in the Marbled Murrelet. Curiously, this specimen has whitish marbling in the outer vanes of the rectrices on the left but not the right half of the tail. Both left and right rectrices have fine pale edging on the tips.

MEASUREMENTS

The measurements were as follows: flattened wing 135.0 mm, tarsus 16.2 mm, exposed culmen 17.1 mm, bill depth at anterior end of nares

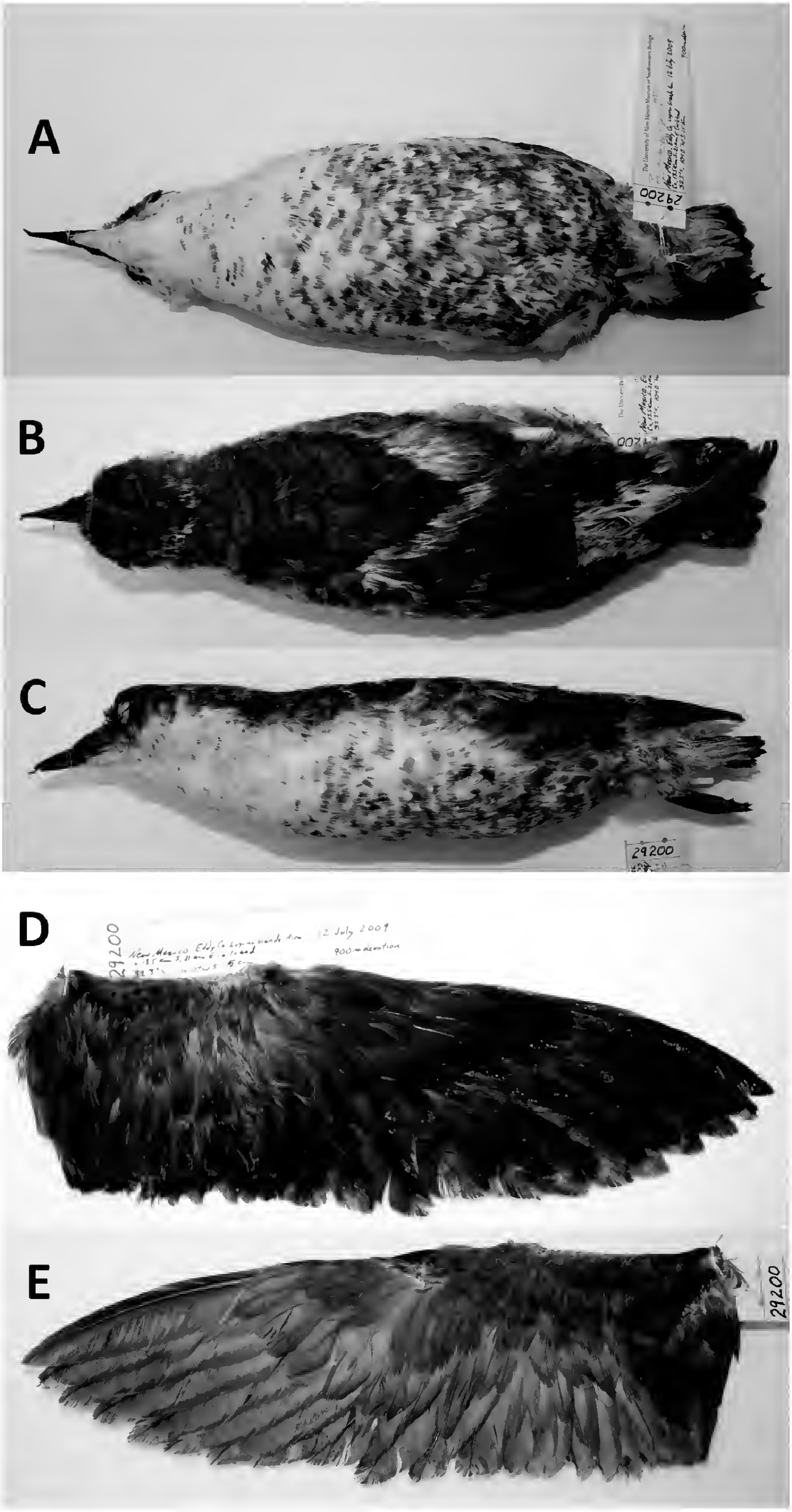

Figure 1. *Brachyramphus perdix*, MSB 29200. Ventral view (A), dorsal view (B), lateral view (C), dorsal surface of spread wing (D), and ventral surface of spread wing (E).

6.2 mm, and tail 36 mm. None of the measurements was diagnostic for identification with the possible exception of the tail length, which fits that reported for the Long-billed Murrelet (mean adult tail length 35.9 ± 1.5 mm, *n* = 5) and would be slightly long for a Marbled Murrelet (mean adult tail length 32.8 ± 2.2 mm, *n* = 35; Sealy et al. 1982, 1991, Thompson et al. 2003). By contrast, the exposed culmen was shorter than previously measured for an adult Long-billed Murrelet (18.0–23.5 mm, *n* = 23; Nelson 1997) and fell within the normal range for the Marbled Murrelet (mean for after-hatching-year males 15.5 ± 0.8 mm, *n* = 36, range 13.7–17.6 mm; mean for "adult" females 17.4 ± 0.9 mm, *n* = 108; Sealy 1975, Sealy et al. 1982, 1991). Although the tip of the culmen was partially broken off, we believe the measured length to approximate the intact length closely.

GENETIC METHODS

Following the manufacturer's protocol, we used a Qiagen DNEasy kit to extract DNA from pectoral muscle and a contour feather separately. The feather was used because the muscle tissue appeared to be heavily degraded and impregnated with salt. For the feather extraction, we removed the barbs with a razor blade and added 30 µL of 0.1 M dithiothreitol to the initial tissue incubation and digestion to reduce the disulfide bonds of the keratinous rachis and calamus. Using a NanoDrop spectrophotometer (Thermo Fisher Scientific, Pittsburgh, PA), we assayed each extraction for DNA content. The mitochondrial gene cytochrome-*b* was amplified in a 25-µL reaction with 1 µL of the DNA extract and the following reagents: 2.5 units of Taq polymerase (ExTaq, Takara, Shiga, Japan), 200 µM of each dNTP, 1.5 mM $MgCl_2$, and 1 µM of each primer. Primers used for amplification and sequencing are primers universal for avian cytochrome-*b*, L14841 (Kocher et al. 1989) and H4a (Harshman 1996). We used Eppendorf Mastercycler (Eppendorf, Hamburg, Germany) thermal cyclers to carry out the polymerase chain reaction as follows: 95 °C for 8 min, (95 °C for 45 sec, 50 °C for 30 sec, 72 °C for 45 sec) × 35 cycles, 72 °C for 10 min. We visualized the reaction's products on a 1% agarose gel and cleaned them with Exo-Sap-It (USB, Cleveland, Ohio). For sequencing reactions, with external primers, we used BigDye 3.1 chemistry (ABI, Mountain View, CA), and we read the sequences with an ABI 3130 automated sequencer. Using Sequencher 4.7 (GeneCodes, Ann Arbor, MI), we assembled sequence contigs and inspected chromatograms manually. We used the software package MUSCLE (Edgar 2004) for alignment with all cytochrome-*b* sequences previously published for the genus *Brachyramphus*, as well as with sequences of representatives of the related genera *Synthliboramphus*, *Cepphus*, and *Fratercula* (Pereira and Baker 2008). We used the program MEGA (Kumar et al. 2008) to calculate pairwise distances and for distance-based phylogenetic analysis. We used the program Phyml (Guindon and Gascuel 2003) to analyze phylogeny by maximum likelihood. Using the HKY85 model of molecular evolution and simultaneous estimation of the model's parameters, we ran 500 bootstrap replicates of the maximum-likelihood analysis.

GENETIC RESULTS

According to the Nanodrop, the extraction from muscle tissue contained no detectable levels of DNA (0.0 ng/µL). By contrast, the extraction from the feather contained 4.1 ng/µL of DNA. The cytochrome-*b* gene was successfully amplified and sequenced only from the feather extraction, and reactions using the external primers produced sequences comprising 1036 base pairs, with an overlap between the two strands of 429 base pairs. The chromatograms of the sequences were clean and unambiguous, with no double peaks or conflicts between readings that would suggest the possibility that we had mistakenly sequenced a nuclear DNA pseudogene. The complete sequence is available on Genbank (accession HM072000).

Comparison of the sequence with published sequences for species of the Alcidae revealed uncorrected divergence levels of 0.5% with the Long-billed Murrelet but 8.4% and 9.8% with Kittlitz's and Marbled murrelets, respectively (Table 1). Divergences between the New Mexico specimen and representatives of the related genera *Cepphus* (10.1%), *Fratercula* (11.5%), and *Synthliboramphus* (11.8%) were higher than those within the genus *Brachyramphus*. The five DNA substitutions observed between the New Mexico specimen and published sequences of the Long-billed Murrelet were all transitions, and four out of the five were synonymous changes. The one nonsynonymous difference (codon 23) was at a site for which the New Mexico specimen shares the same amino acid (leucine) with all other alcids examined, but published Long-billed Murrelet specimens uniquely represent a different amino acid (phenylalanine). Phylogenetic analysis based on maximum likelihood corroborated the distance results. The New Mexico specimen's sequence was grouped with previously published sequences of the Long-billed Murrelet with strong bootstrap support (Figure 2).

Table 1 Pairwise Levels of Percent Sequence Divergence (*p* Distances) between the New Mexico Specimen[a] and Representatives of Related Species in the Family Alcidae.[b]

	(1)	(2)	(3)	(4)	(5)	(6)
(1) *Fratercula arctica*						
(2) *Synthliboramphus hypoleucus*	0.107					
(3) *Cepphus columba*	0.096	0.103				
(4) *Brachyramphus marmoratus*	0.109	0.113	0.101			
(5) *Brachyramphus brevirostris*	0.104	0.099	0.093	0.058		
(6) *Brachyramphus perdix*	0.116	0.117	0.100	0.096	0.081	
(7) New Mexico specimen	0.115	0.118	0.101	0.098	0.084	0.005

[a] MSB 29200; tissue NK170062; Genbank accession no. HM072000.

[b] Based on 1036 base pairs of the sequence of the cytochrome-*b* gene. Genbank accession numbers of the previously published sequences used for this analysis: *Fratercula arctica*, DQ385228; *Synthliboramphus hypoleucus*, U37305; *Cepphus columba*, U37293; *Brachyramphus marmoratus*, U63050; *B. brevirostris*, U63058; *B. perdix*, U63057.

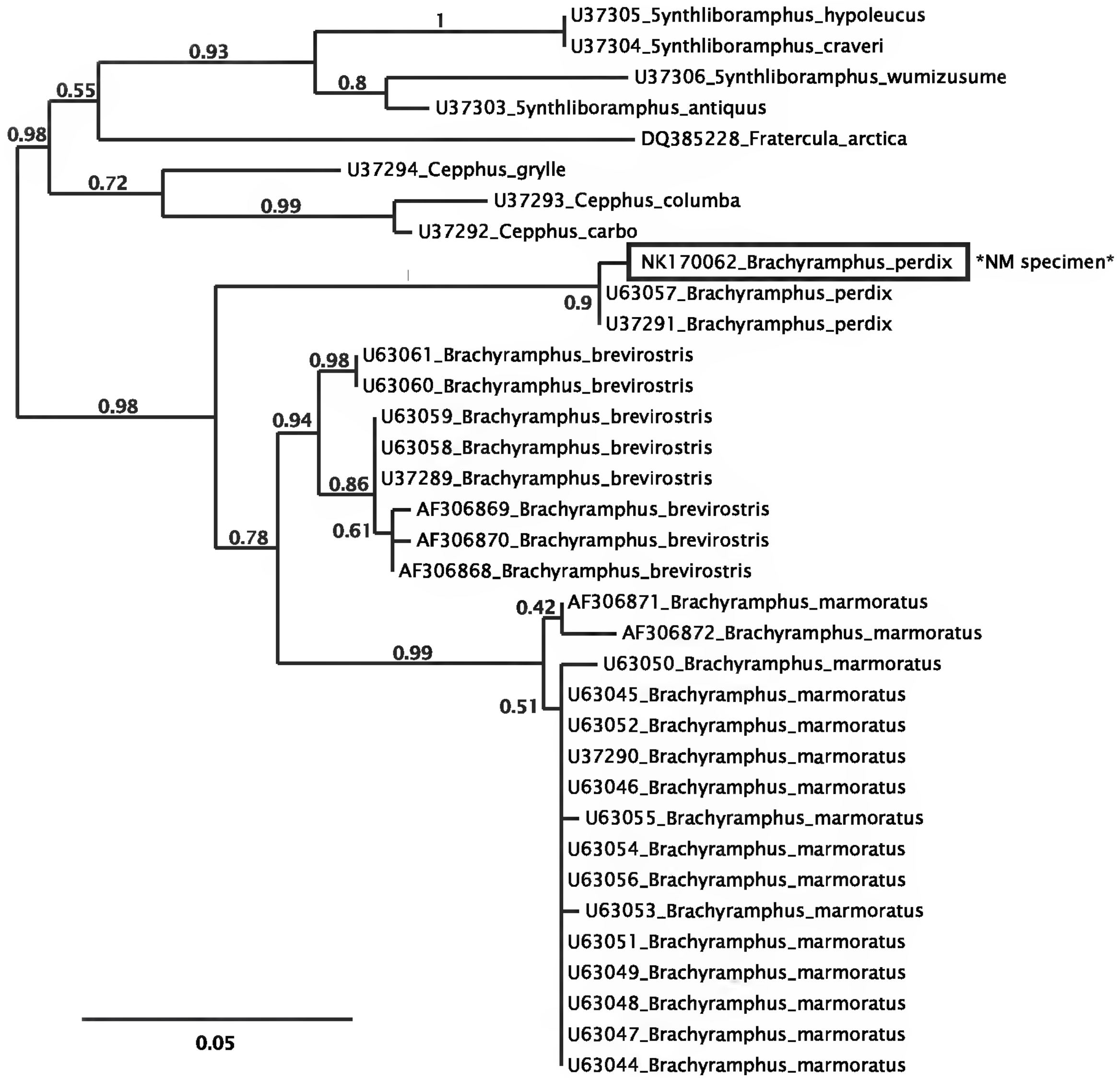

Figure 2. Phylogeny of *Brachyramphus* and related genera based on the cytochrome-*b* gene, estimated by maximum likelihood (HKY85 model). The values at the nodes represent the proportion of 500 bootstrap replicate analyses in which that node appeared. Numbers that are preceded by "U," "DQ," or "AF" correspond to Genbank accession numbers. The New Mexico specimen is grouped with *Brachyramphus perdix*, with strong support.

DISCUSSION

Mitochondrial DNA data confirm that the New Mexico specimen can be identified as a Long-billed Murrelet and therefore represents a transoceanic vagrant and a first state record. We caution that the date of collection, 12 July 2009, should be taken as only an approximation of the bird's date of death. We cannot be certain how long the bird was dead before being discovered because of the unusual circumstance of the carcass being preserved by the salt in the brine pool. A long interval between death and salvage might explain the bird's unusual plumage (for July), the lack of molt, and the absence of DNA of high molecular weight in the muscle tissue.

The mitochondrial DNA of the specimen was not identical to sequences published for the Long-billed Murrelet, diverging by 0.5%. This difference suggests that significant population structure exists within the Long-billed Murrelet and that this vagrant is unlikely to have originated from the same population represented by sequences already recorded in Genbank. The high ratio of transition to transversions and the absence of stop codons in the DNA sequence indicate that the sequence was mitochondrial in origin and did not represent a nuclear DNA pseudogene. The previously published sequences all represent birds collected in the northern Sea of Okhotsk, in the vicinity of Magadan, Russia (Friesen et al. 1996, Pereira and Baker 2008). The breeding distribution of the Long-billed Murrelet extends from Kamchatka, in the Russian Far East, south to Hokkaido, Japan, and is highly fragmented, reflecting the complexity of coastlines in the species' range (Friesen et al.1996, Dickinson 2003). A phylogeographic study with population-level sampling from throughout this range is clearly warranted. Such a study is likely to reveal that the mtDNA variation we observed has a geographic basis and might shed light on the geographic origins of these transoceanic vagrants. Furthermore, this specimen's anomalous variation in plumage and measurements may reflect previously undescribed geographic variation in the Long-billed Murrelet.

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LITERATURE CITED

Barnes, S. 2009. New Jersey's first record of Long-billed Murrelet. New Jersey Birds 35:2-4.

Dickinson, E. C., editor. 2003. The Howard and Moore Complete Checklist of the Birds of the World, 3rd Edition. Princeton Univ. Press, Princeton, NJ.

Edgar, R. C. 2004. MUSCLE: A multiple sequence alignment method with reduced time and space complexity. BMC Bioinformatics 5:113.

Friesen, V. L., Piatt, J. F., and Baker, A. J. 1996. Evidence from cytochrome *b* sequences and allozymes for a "new" species of alcid: the Long-billed Murrelet (*Brachyramphus perdix*). Condor 98:681–690.

Guindon, S., and Gascuel, O. 2003. A simple, fast, and accurate algorithm to estimate large phylogenies by maximum likelihood. Syst. Biol. 52:696-704.

Harshman, J. 1996. Phylogeny, evolutionary rates, and ducks. Ph.D. dissertation, Univ. Chicago, Chicago.

Kocher, T. D., Thomas, W. K., Meyer, A., Edwards, S. V., Paabo, S., Villablanca, F. X., and Wilson, A. C. 1989. Dynamics of mitochondrial DNA evolution in animals: Amplification and sequencing with conserved primers. Proc. Natl. Acad. Sci. USA 86:6196-6200.

Kumar, S., Dudley, J., Nei, M., and Tamura, K. 2008. MEGA: A biologist-centric software for evolutionary analysis of DNA and protein sequences. Briefings in Bioinformatics 9:299–306.

Maumary, L., and Knaus, P. 2000. Marbled Murrelet in Switzerland: a Pacific Ocean auk new to the western Palearctic. Br. Birds 93:190–199.

Mlodinow, S. G. 1997. The Long-billed Murrelet (*Brachyramphus perdix*) in North America. Birding 29:460–475.

Nelson, S. K. 1997. Marbled Murrelet (*Brachyramphus marmoratus*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 276. Acad. Nat. Sci., Philadelphia.

Pereira, S. L., and Baker, A. J. 2008. DNA evidence for a Paleocene origin of the Alcidae (Aves: Charadriiformes) in the Pacific and multiple dispersals across northern oceans. Mol. Phylogenet. Evol. 46:430–445.

Sealy, S. G. 1975. Aspects of the breeding biology of the Marbled Murrelet in British Columbia. Bird-Banding 46:141–154.

Sealy, S. G., Carter, H. R., and Alison, D. 1982. Occurrences of the Asiatic Marbled Murrelet (*Brachyramphus marmoratus perdix* Pallas) in North America. Auk 99:778–781.

Sealy, S. G., Carter, H. R., Shuford, W. D., Powers, K. D., and Chase, C. A. III. 1991. Long-distance vagrancy of the Asiatic Marbled Murrelet in North America, 1979–1989. W. Birds 22:145–156.

Svingen, P. H. 2009. First Minnesota record of the Long-billed Murrelet (*Brachyramphus perdix*). Loon 81:55–60.

Thompson, C. W., Pullen, K. J., Johnson, R. E., and Cummins, E. B. 2003. Specimen record of a Long-billed Murrelet from eastern Washington, with notes on plumage and morphometric differences between Long-billed and Marbled murrelets. W. Birds 34:157–168.

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Long-billed Murrelet

Computer painting by George C. West

COUNTING THE COUNTLESS: ESTIMATING THE NUMBER OF LEAST AUKLETS ATTENDING THE COLONY ON ST. GEORGE ISLAND, ALASKA

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ABSTRACT: Estimating the abundance of auklets at breeding colonies has proven extremely difficult, and no satisfactory method has emerged. Auklets nest in concealed rock crevices and socialize on the sea's surface during portions of the day. Several methods of estimating population trends have been attempted, but a true census has so far been unattainable at any colony. On St. George Island, Alaska, an unusually late snow cover in 2008 made possible a photo count of Least Auklets (*Aethia pusilla*) attending the inland colony at Ulakaia Ridge. We estimated the number of birds in the colony on 15 May 2008 to be 88,263 ± 3056. Because of the timing of the count and the known life history of the species, the count likely represented almost the entire population breeding at the colony that year.

The Least Auklet (*Aethia pusilla*) is among the most abundant seabirds in the North Pacific (Stephensen and Irons 2003), breeding typically in huge colonies on a few islands in the Bering Sea, Aleutian Archipelago, and Sea of Okhotsk. Numbers of these birds attending colonies were described by Gabrielson and Lincoln (1959) as "impossible to estimate and difficult to exaggerate." Indeed, even today, only subjective or highly variable guesses are available for breeding populations of auklets (Shuntov 1999). The reason populations are so hard to enumerate is that auklet nests are concealed in rock crevices. Adults are typically above ground during two daily activity periods (morning and evening) when they socialize on the surface between trips to and from subsurface nest sites or feeding areas at sea (Jones 1993). Their nesting strategy makes it difficult to determine the proportion of the population visible on the surface of the colony at any particular time, and counting is complicated by the presence of tremendous numbers of birds moving erratically both in the air and on the ground.

In recent decades numerous attempts have been made to assess the absolute abundance or to derive population indices of auklets at colonies, including use of "surface" counts, "net movement" counts, time-lapse photography, mark–resighting analysis, and colony mapping (Bédard 1969, Byrd et al. 1983, Piatt et al. 1990, Jones 1992, Sheffield et al. 2006, Renner et al. 2006). Many of these efforts tried to account for aspects of the species' behavioral ecology that might bias counts, but no monitoring method has proven satisfactory primarily because of the high variability of the resulting counts (e.g., Harding et al. 2005; summarized by Renner et al. 2006).

In 2008, we had a rare opportunity to obtain a census of Least Auklets at the Ulakaia colony on St. George Island, Alaska. An unusually late snow cover that spring made it possible to photograph birds at the colony site before they could enter crevices. Because of the timing of the count and the known life history of the species, the effort produced the first total count of auklets at the Ulakaia colony and thus offers a bench mark from which other methods of population assessment can be measured (Anderson 2001).

METHODS

On 15 May 2008, Nikolay Konyukhov photographed the Ulakaia Least Auklet colony at about 10:30 ADT over 2–3 minutes during the morning activity period. He used a digital single-lens reflex camera (with an 80-mm lens at aperture f/11) set on a tripod approximately 500 m downslope of the center of the colony. Following boundaries mapped in 2004 and 2006, Konyukhov provided us with a set of 30 overlapping images of the colony (Renner et al. 2006). We digitally stitched the images together into a composite image by means of the panorama-photo-stitching software Hugin (http://hugin.sourceforge.net/). We omitted one small portion of the colony (see upper left portion of Figure 1—about 3% in a low-density area; Renner et al. 2006) from the composite image because we could not resolve the photo's placement.

Three observers counted the auklets on the composite image (both those in the air and those on the ground) independently. Using Adobe Photoshop, we added a transparent layer to the image, and the observer systematically scrolled across the photo, placing a small dot on the image of each bird with the pencil tool. When all birds had been marked, we converted the layer to a grayscale GIF and counted the dots digitally with the "measure particles" tool in the image-processing software ImageJ (available from the National Institutes of Health at http://rsb.info.nih.gov/ij). Also with ImageJ, we estimated the proportion of the colony covered with snow as well as the extent of snow-free polygons on 15 May by counting pixels in the portion of the photograph corresponding to the occupied colony.

RESULTS

Figure 1 shows the composite of stitched images of the colony taken on 15 May, the approximate 93% snow cover on that date, and the auklets clearly visibly against the white background. The mean of three independent counts of auklets visible on the stitched image was 88,263, standard deviation (SD) 3056.

DISCUSSION

The unusually late snow cover at St. George Island in the spring of 2008 provided a rare opportunity for a snapshot estimate of the number of Least Auklets attending the Ulakaia colony. On 15 May, when the images were taken, huge numbers of birds were present at the colony but they were prevented from reaching their nesting sites under the snow. Thus they were visible and countable against the white background.

The photo count is likely a very close estimate of the number of auklets nesting in the colony that year, but several factors could have biased the number we counted with respect to the number that actually nested in 2008.

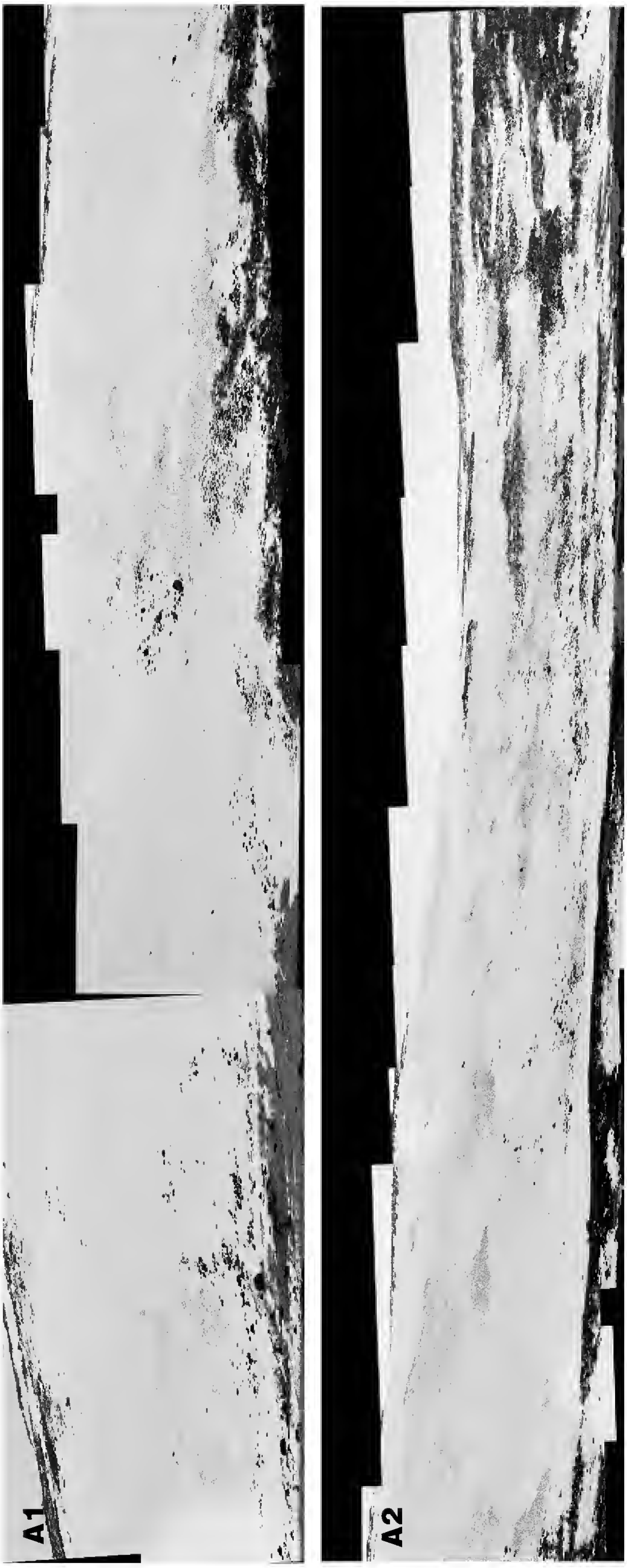

Figure 1. (A) Composite photograph of the Least Auklet colony on Ulakaia Ridge, St. George Island, Alaska, on 15 May 2008. The colony extends approximately 1330 m from left to right. (B) Magnification of a portion of the colony to show how auklets appeared for counting.

Image from photos by Nikolay Konyukhov

Figure 1B.

For example, about 7% of the colony was snow-free, and, while we could distinguish some auklets against dark backgrounds on the images, there were likely others present that we did not detect. Conversely, we are confident that no birds were in crevices under the snow and thus not counted. And, although a minor factor, about 3% of the colony (in a low-density area) was omitted from the composite photo.

We also had to consider that some breeding birds stayed at sea that particular morning and/or that an unknown, but likely small, proportion of the auklets that eventually nested at the colony were not yet attending the colony when the images were taken. We have no information on birds that may have been at sea that morning, but in previous years, resightings of marked birds imply that most individuals that nested were at the colony daily before laying (U.S. Fish and Wildlife Service unpubl. data). Despite the late snow cover on the colony in 2008, the chronology of Least Auklet breeding appeared normal that year. The first birds were observed flying to the colony on 18 April (K. Holser pers. comm.), and the distribution of dates of hatching in 2008 (16 July ± 3.7 SD, n = 39) was similar to that during the preceding and following years when there was no snow cover on 15 May (2007: 18 July ± 4.2 SD, n = 17; 2009: 9 July ± 3.2 SD, n = 67; U.S. Fish and Wildlife Service unpubl. data). Given an incubation period of about 30 days (Jones 1993), the mean date of laying in 2008 would have been 16 June, almost two months after the birds arrived at the colony.

All these factors could lead to underestimates of the number of breeding birds, but the possibility that some birds at the colony on 15 May were prospecting nesting sites but did not nest that year would have produced an overestimate. Mark–resighting data from previous years suggest this rarely occurs when the colony is initially occupied, and it is not until the incubation and chick-rearing stages that nonbreeding adults are common (H. and M. Renner pers. obs.; Jones 1992). Taken together, the factors contributing to this one-day snapshot of the colony's size preclude much of the variability within a day typically observed on small plots within auklet colonies (e.g., Jones 1992) and thus offer a fairly precise measure of the number of Least Auklets breeding at Ulakaia in 2008. This has not been achieved at any other auklet colony

Our estimate of 88,000 auklets (or 44,000 pairs) is markedly lower than the previous estimate of 129,000 birds at the Ulakaia colony in the 1970s (Hickey and Craighead 1977), but it is difficult to assess whether this difference is rooted in the census method or is a true decline due to vegetation encroachment, as suggested by Roby and Brink (1986) and Renner et al. (2006).

In conclusion, we realize what we report here resulted from a rare seasonal event and that it can be replicated only opportunistically rather than on a formal schedule. Counts from photos might be most practical at colonies farther north and during late springs when retention of snow should be more common. Indeed, during late springs at colonies on St. Lawrence and Little Diomede islands, Least Auklets have often been observed sitting on snow (Sealy 1975). However, because of the inherent difficulties in assessing populations of crevice-nesting alcids the method should be capitalized on whenever possible as an added means of calibrating population estimates.

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LITERATURE CITED

Anderson, D. R. 2001. The need to get the basics right in wildlife field studies. Wildlife Soc. Bull. 29:1294–1297.

Bédard, J. 1969. The nesting of the Crested, Least, and Parakeet Auklets on St. Lawrence Island, Alaska. Condor 71:386–398.

Byrd, G. V., Day, R. H., and Knudtson, E. P. 1983. Patterns of colony attendance and censusing of auklets at Buldir Island, Alaska. Condor 85:274–280.

Gabrielson, I. N., and Lincoln, F. C. 1959. The Birds of Alaska. Stackpole, Harrisburg, PA.

Harding, A.M.A., Piatt, J. F., Byrd, G. V., Hatch, S. A., Konyukhov, N. B., Golubova, E. G., and Williams, J. C. 2005. Variability in colony attendance of crevice-nesting Horned Puffins: Implications for population monitoring. J. Wildlife Mgmt. 69:1279–1296.

Hickey, J. J., and Craighead, F. L. 1977. A census of the seabirds of the Pribilof Islands, in Environmental assessments of the Alaskan continental shelf, Annual Reports, vol. 2, p. 96–195. Outer Continental Shelf Environmental Assessment Program, Boulder, CO.

Jones, I. L. 1992. Colony attendance of Least Auklets at St. Paul Island, Alaska: Implications for population monitoring. Condor 94:93–100.

Jones, I. L. 1993. Least Auklet (*Aethia pusilla*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 69. Acad. Nat. Sci., Philadelphia.

Piatt, J. F., Roberts, B. D., and Hatch, S. A. 1990. Colony attendance and population monitoring of Least and Crested Auklets on St. Lawrence Island, Alaska. Condor 92:97–106.

Renner, H. M., Renner, M., Reynolds, J. H., Harding, A. M. A., Jones, I. L., Irons, D. B., and Byrd, G. V. 2006. Colony mapping: A new technique for monitoring crevice-nesting seabirds. Condor 108:423–434.

Roby, D. D., and Brink, K. L. 1986. Decline of breeding Least Auklets on St. George Island, Alaska. J. Field Ornithol. 57:57–59.

Sealy, S. G. 1975. Influence of snow on egg-laying in auklets. Auk 92:528–538.

Sheffield L. M., Gall, A.E., Roby, D. D., Irons, D. B., and Dugger, K. M. 2006. Monitoring planktivorous seabird populations: Validating surface counts of crevice-nesting auklets using mark–resight techniques. Can. J. Zool. 84:846–854.

Shuntov, V. P. 1999. Seabirds of the western Bering Sea, in Dynamics of the Bering Sea (T. R. Loughlin and K. Ohtani, eds.), pp. 651–682. University of Alaska Sea Grant, Fairbanks.

Stephensen, S. W., and Irons, D. B. 2003. Comparison of colonial breeding seabirds in the eastern Bering Sea and Gulf of Alaska. Marine Ornithol. 31:167–173.

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Least Auklet

Computer painting by George C. West

WINTER MOVEMENTS BY CALIFORNIA SPOTTED OWLS IN A BURNED LANDSCAPE

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ABSTRACT: The movements and habitat requirements of the California Spotted Owl (*Strix occidentalis occidentalis*) during the nonbreeding season remain poorly understood in comparison with those during the breeding season, and no data are available on the subspecies' use of burned landscapes in fall and winter. From October 2006 to March 2007, we estimated the locations of daytime roosts of five radio-marked California Spotted Owls in an area of the southern Sierra Nevada that burned in a 60,985-ha wildfire 4 years previously. Our objectives were to determine whether these owls expanded their movements during the nonbreeding season and whether they roosted in the area burned. During the nonbreeding season, two males increased the distance between locations of successive roosts while still remaining within their breeding-season ranges. One pair migrated from its breeding territory for the winter but returned by 1 March. One female dispersed to a new breeding territory. Three of the five owls roosted in burned landscapes during the nonbreeding season, and 30% of all roost locations were within the fire's perimeter. Burned forests may therefore represent important winter habitat for the California Spotted Owl.

The California Spotted Owl (*Strix occidentalis occidentalis*) is an important species for management in the Sierra Nevada and southern California because it is strongly associated with older coniferous forests for nesting, roosting, and foraging (Gutiérrez et al. 1992, Blakesley et al. 2005, Seamans 2005). Spotted Owl populations are highly sensitive to reductions in adult survival (Noon et al. 1992), and mortality of adults is greatest in winter (Franklin et al. 2000, Seamans and Gutiérrez 2007), yet the species' needs for winter habitat are seldom considered in efforts at management (Laymon 1989). Severe fire is invoked as one of the primary threats to the Spotted Owl because of its potential to eliminate suitable habitat (Weatherspoon et al. 1992, SEI 2004). Bond et al. (2009), however, found that during the breeding season California Spotted Owls with burned areas in their home ranges forage preferentially in severely burned forest, suggesting that severe fire may enhance short-term habitat suitability under certain circumstances, possibly by increasing the abundance of prey or the owls' access to it.

Only three studies in the Sierra Nevada have documented habitat use of the California Spotted Owl with radio-telemetry during the nonbreeding season (Laymon 1989, Zabel et al. 1992, Call et al. 1992), but none of these studies took place in a burned landscape. Management of burned forests to conserve the Spotted Owl requires understanding how individuals use such habitat year round because in fall and winter home ranges sometimes expand to incorporate habitats different from those within the breeding range (Laymon 1989, Zabel et al. 1992). Yet the winter habits and habitat requirements of the Spotted Owl in the Sierra Nevada remain poorly understood in comparison to those in the breeding season, and in burned landscapes they are virtually unstudied.

From the air, we estimated the locations of the daytime roosts of five radio-marked California Spotted Owls biweekly during the nonbreeding season (Oct–Mar) in an area that burned in a large wildfire 4 years prior to our study. Our specific objectives were to determine if during the nonbreeding season these owls (1) remained in their breeding ranges, enlarged or shifted their home ranges, or migrated to new areas and (2) whether they roosted in burned landscapes.

METHODS

Study Area

Our study took place in the Greenhorn Mountains, Sequoia National Forest, southern Sierra Nevada, California, at elevations from 1500 to 2500 m. From 1971 to 2000, annual precipitation at the nearest National Weather Service weather station, at Johnsondale (1427 m), averaged 57 cm. The vegetation is Sierran mixed conifer forest (Allen 1988), dominated by ponderosa pine (*Pinus ponderosa*), Jeffrey pine (*P. jeffreyi*), and white fir (*Abies concolor*). Above 2100 m, a transition zone is dominated by red fir (*A. magnifica*). Other common trees include the sugar pine (*P. lambertiana*), incense cedar (*Calocedrus decurrens*), canyon live oak (*Quercus chrysolepis*), and California black oak (*Q. kelloggii*). In July and August of 2002, the McNally Fire burned approximately 60,985 ha in the Sequoia and Inyo national forests, including 33,704 ha of conifer-dominated forests (Odion and Hanson 2006). Like most forest fires, the McNally Fire burned with variable severity, leaving a mosaic of disturbance in the study area.

Capturing and Tracking Owls

Using techniques described by Bond et al. (2009), we captured and radio-marked three male and two female Spotted Owls in three burned territories. These birds were a subsample of the Spotted Owls that had been radio-tracked from May to September 2006 as part of a study of selection of foraging habitat during the breeding season (Bond et al. 2009). We affixed backpack-style radio transmitters designed to minimize contact with the owl's back (AVM Instrument Company, Ltd., Colfax, CA) with Kevlar ribbon (0.63 cm wide; Bally Ribbon Mills, Bally, PA). We sewed the transmitter in place with cotton thread to allow it to be lost within 12–24 months, if we failed to recapture a marked owl and remove the transmitter. With the harness, our transmitter units weighed <20 g, or <4% of each owl's body mass.

Verner et al. (1992) reported that some adult Spotted Owls begin their fall migration early in October. Therefore, we defined the nonbreeding season as beginning on 1 October. During the breeding season (May–September 2006), we visually located Spotted Owls at roosts or nests every 7–10 days by following the strongest signal to the owl's roost or nest site. We used hand-held three-element collapsible directional Yagi antennas and portable receivers supplied by AVM Instrument Company and Telonics (Mesa, AZ) for deciphering signal strength and direction. During the nonbreeding season from 11 October 2006 to 23 March 2007 (January excluded for logistical reasons), we used a Cessna 182 fixed-wing aircraft with an ATS 1000/4

Element Yagi receiver and antennae to locate radio-marked owls every other week. We estimated the error of the telemetry by placing three transmitters at known locations and having a naïve observer estimate their locations from the aircraft on five separate occasions. The average error was 673 m (standard error 118 m, range 79–1585 m, n = 15). We recaptured all five owls and removed their backpack transmitters at the end of the study (May 2007).

Data Analysis

We compared the dispersion of locations of successive Spotted Owl roosts in the breeding and nonbreeding seasons to determine whether owls remained in their breeding ranges, enlarged or shifted their ranges, or migrated during the nonbreeding season. We calculated dispersion as the mean of the linear distances between each owl's successive roosts; larger values indicate greater dispersion (Conner and Leopold 2001). We used a one-tailed repeated-measures t test to compare dispersion by season because we expected nonbreeding-season movements to be greater on the basis of previous studies (Laymon 1989, Zabel et al. 1992). If an owl moved significantly farther from roost to roost during the nonbreeding season than during the breeding season, we presumed that it had enlarged or shifted its breeding-season range. If during the nonbreeding season an owl moved >10 km from the center of its breeding-season territory, we considered it to have migrated.

Because of substantial radio-telemetry error during the nonbreeding season, we could not describe use of roosting habitat at a fine scale. Therefore, we described whether each Spotted Owl roost was inside, on the edge, or outside the fire's perimeter. To define the fire's perimeter, we used digital maps of the severity with which vegetation burned, generated by the U.S. Forest Service (Region 5 Remote Sensing Lab, Sacramento, CA; see Bond et al. 2009). We plotted roosting owls' estimated locations with ArcMap 9.1 (ESRI, Redlands, CA). The overall accuracy of the fire-severity map was 93% correct, as determined by vegetation sampling at 80 randomly located sites within the breeding-season ranges of foraging Spotted Owls (Bond et al. 2009).

We identified breeding-season roosts by visually locating the owl, so we plotted the exact locations as either outside or inside the fire's perimeter without the need to incorporate any telemetry error. On the basis of our average telemetry error during the nonbreeding season, we defined an error circle with a radius of 673 m around each estimated roost location to categorize the location as either outside or inside the fire's perimeter. We categorized locations where the error circle included the perimeter as "edge" roosts. Thus each location was categorized as (1) within the fire perimeter (>673 m inside), (2) at the edge of the fire (within 673 m of the edge, either outside or inside), (3) outside the fire (>673 m from the perimeter but within 10 km of the center of the breeding-season territory), or (4) that the owl had migrated (moved >10 km from the center of the breeding-season territory). We defined the center of an owl's breeding-season territory as the tree in which it nested in 2006 (all pairs attempted to nest, as determined by behavior and evidence of brood patches on females).

RESULTS

During the breeding season (May–September 2006) we identified 7 to 11 daytime roost locations per Spotted Owl (mean = 9), for a total of 45 roosting locations. One male owl's (Mill Creek) nest tree and all daytime roost locations were outside the perimeter of the fire but within 1 km of it, giving this owl access to burned habitat (Bond et al. 2009). The nest tree and roost locations of the other two pairs (Speas Ridge and Burnt Ridge) were located primarily within the fire's perimeter (Bond et al. 2009). During the nonbreeding season, we estimated nine roost locations per owl from 11 October 2006 to 23 March 2007, excluding two fall locations for the Speas Ridge male (pilot had the incorrect radio frequency), for a total of 43 locations.

Our sample of five Spotted Owls moved a mean of 625 m (SE [standard error] 136 m) between successive roost locations during the breeding season and 2468 m (SE 613 m) during the nonbreeding season. For all five, movements between successive roost locations were significantly greater during the nonbreeding season than during the breeding season ($t = -2.78$, df = 4, $P = 0.02$).

One female (Burnt Ridge) moved 2.6 km from the center of her breeding-season territory on 12 September, roosted >1800 m apart from her mate of 2006 for the duration of the nonbreeding season, and was relocated the following spring in a different territory >4 km from the 2006 breeding territory. Two males (Burnt Ridge and Mill Creek) expanded their movements during the nonbreeding season while still remaining within 10 km of their nests of 2006. One pair (Speas Ridge) migrated approximately 13 km southeast of the center of their breeding-season territory from mid-December to mid-February before returning to their previous breeding territory. During the breeding season, the mean distance between same-day roosts of the male and female of the Speas Ridge pair was 406 m (SE 255, range 0–1582 m, $n = 7$). This distance was strongly influenced by one instance on 29 August when the pair roosted 1582 m apart; from May through July these owls roosted in the same tree on three occasions and 35 and 51 m apart on two occasions. During the nonbreeding season, the mean distance between same-day roosts of the male and female was 2801 m (SE 1350, range 116–9852 m, $n = 7$), suggesting that this pair roosted separately more often in the nonbreeding season than during the breeding season.

Of the 45 locations of breeding-season roosts, 29 (64%) were inside the fire perimeter and 16 were outside. During the breeding season, when ground-based telemetry allowed us to identify actual roost trees, we found that all roosts within the fire's perimeter were in burned stands. Of 43 error circles for roosts in the nonbreeding season, 13 (30%) were located entirely within the burned area, 8 (19%) were near the fire's perimeter, and 22 (51%) were completely outside the burned area (Table 1). Two of the five owls roosted mostly inside the fire's perimeter (Speas Ridge male and female), and two roosted mostly outside the perimeter (Burnt Ridge female and Mill Creek male), while 1 owl's roost locations were equally distributed between sites inside and on the edge of the perimeter (Burnt Ridge male). Because of the substantial error associated with aerially based estimates,

Table 1 Dates and Roosting Locations of Five Radio-Marked California Spotted Owls with Respect to the 2002 McNally Fire, Sequoia National Forest, Sierra Nevada, during the Nonbreeding Season, 2006–2007[a]

Date	Mill Creek male	Speas Ridge male	Speas Ridge female	Burnt Ridge male	Burnt Ridge female
11 Oct 2006	Out	—	Edge	Edge	Edge
25 Oct 2006	Out	—	Edge	Edge	Out
22 Nov 2006	Out	In	In	Out	Out
7 Dec 2006	Edge	In	In	In	Out
20 Dec 2006	Out	Migrated	Migrated	Edge	Out
3 Feb 2007	Out	Migrated	Migrated	In	Out
14 Feb 2007	Out	Migrated	In	Edge	Out
1 Mar 2007	Out	In	In	In	Out
23 Mar 2007	Out	In	In	In	Out

[a] In, >673 m inside fire's perimeter; edge, ≤673 m from perimeter, either outside or inside; out, >673 m outside of perimeter but ≤10 km from center of breeding-season territory; migrated, >10 km from center of breeding-season territory.

during the nonbreeding season we were unable to assess the severity of the fire at locations where the owls roosted within the perimeter.

DISCUSSION

During the winter, these five radio-tracked Spotted Owls either increased their movements or migrated fully out of their breeding-season territory. One female moved permanently in an apparent instance of dispersal. In the spring following this study, this female was resighted in a new territory, while her former mate remained on their 2006 breeding territory and was paired with a new, unbanded female.

Our results from a burned study area are similar to those reported from unburned sites. In the Eldorado National Forest of the central Sierra Nevada, Laymon (1989) found that 8 of 10 California Spotted Owls migrated downslope during the winter, whereas none of the 4 owls in the adjacent Tahoe National Forest monitored by Call et al. (1992) migrated. In the Sierra National Forest of the southern Sierra Nevada, Zabel et al. (1992) reported that 7 of 21 owls enlarged or shifted their home ranges and 5 migrated during the nonbreeding season. It remains unknown why some individual owls migrate, shift, or enlarge their ranges and others do not, as no correlation between migration patterns and habitat quality or quantity as defined by vegetation has been found (Verner et al. 1992). Zabel et al. (1992) suspected that the size of the California Spotted Owl's home range may be correlated with variation in its prey, with larger ranges associated with a greater proportion of the northern flying squirrel (*Glaucomys sabrinus*) and smaller ranges associated with a greater proportion of the dusky-footed or big-eared woodrats (*Neotoma fuscipes* and *N. macrotis*). Owls may be enlarging ranges or migrating in response to availability of prey. Patterns of the California Spotted Owl's movement in burned areas in the nonbreeding season appear to be as varied as those in unburned areas. Nonetheless, the expansion of movements, as attested by greater distances between successive roost locations during the nonbreeding season in postfire landscapes, underscores the importance of identifying and conserving winter habitat in addition to that used during the breeding season.

During the nonbreeding season, three of five Spotted Owls roosted within the burned landscape to some degree (Table 1). During the breeding season, this sample of Spotted Owls typically roosted in unburned or lightly burned forest but foraged selectively in severely burned areas close to the territory center (Bond et al. 2009). Spotted Owls often roost near where they foraged the previous night (Guetterman et al. 1991), which may be particularly true during the nonbreeding season when adults are not required to return to a nest to provision young. Thus Spotted Owls that roost in the burned landscape during the nonbreeding season may be continuing to forage in the burned areas throughout the fall and winter. These burned forests may represent important habitat for the California Spotted Owl during both the breeding and nonbreeding seasons.

Further studies of the Spotted Owl's habitat use during the nonbreeding season, as well as research on the population dynamics of key prey species, are needed in both burned and unburned landscapes for a better understanding of how patterns of landscape disturbance affect the owl's pattern of movement in fall and winter.

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LITERATURE CITED

Allen, B. 1988. Sierran mixed conifer, in A Guide to Wildlife Habitat Relationships (K. E. Mayer and W. F. Laudenslayer, eds.), pp. 46–47. California Dept. Fish and Game, Sacramento.

Blakesley, J. A., Noon, B. R., and Anderson, D. R. 2005. Site occupancy, apparent survival, and reproduction of California Spotted Owls in relation to forest stand characteristics. J. Wildlife Mgmt. 69:1554–1564.

Bond, M. B., Lee, D. L., Siegel, R. S., and Ward, J. P. 2009. Habitat use and selection by California Spotted Owls in a postfire landscape. J. Wildlife Mgmt. 73:1116–1124.

Call, D. R., Gutiérrez, R. J., and Verner, J. 1992. Foraging habitat and home-range characteristics of California Spotted Owls in the Sierra Nevada. Condor 94:880–888.

Conner, L. M., and Leopold, B. D. 2001. A Euclidean distance metric to index dispersion from radiotelemetry data. Wildlife Soc. Bull. 29:783–786.

Franklin, A. B., Anderson, D. R., Gutiérrez, R. J., and Burnham, K. P. 2000. Climate, habitat quality, and fitness in Northern Spotted Owl populations in northwestern California. Ecol. Monogr. 70:539–590.

Guetterman, J. H., Burns, J. A., Reid, J. A., Horn, R. B., and Foster, C. C. 1991. Radio telemetry methods for studying Spotted Owls in the Pacific Northwest. U. S. Forest Service Gen. Tech. Rep. PNW-GTR-272.

Gutiérrez, R. J., Verner, J., McKelvey, K. S., Noon, B. R., Steger, G. N., Call, D. R., LaHaye, W. S., Gingham, B. B., and Senser, J. S. 1992. Habitat relations of the California Spotted Owl, in The California Spotted Owl: a technical assessment of its current status (J. Verner, K. S. McKelvey, B. R. Noon, R. J. Gutiérrez, G. I. Gould, Jr., and T. W. Beck, eds.), pp. 79–99. U. S. Forest Service, Pacific Southwest Res. Sta. PSW-GTR-133.

Laymon, S. A. 1989. Altitudinal migration movements of Spotted Owls in the Sierra Nevada, California. Condor 91:837–841.

Noon, B. R., McKelvey, K. S., Lutz, D. W., LaHaye, W. S., Gutiérrez, R. J., and Moen, C. A. 1992. Estimates of demographic parameters and rates of population change, in The California Spotted Owl: a technical assessment of its current status (J. Verner, K. S. McKelvey, B. R. Noon, R. J. Gutiérrez, G. I. Gould, and T. W. Beck, eds.), pp. 175–186. U. S. Forest Service, Pacific Southwest Res. Sta. PSW-GTR-133.

Odion, D. C., and Hanson, C. T. 2006. Fire severity in conifer forests of the Sierra Nevada, California. Ecosystems 9:1177–1189.

Seamans, M. E. 2005. Population biology of the California Spotted Owl in the central Sierra Nevada. Ph.D. dissertation, Univ. of Minn., St. Paul.

Seamans, M. E., and R. J. Gutiérrez. 2007. Sources of variability in Spotted Owl population growth rate: testing predictions using long-term mark–recapture data. Oecologia 152:57–70.

SEI (Sustainable Ecosystems Institute). 2004. Scientific evaluation of the status of the northern Spotted Owl. Sustainable Ecosystems Inst., Portland, OR.

Verner, J., Gutiérrez, R. J., and Gould, G. I., Jr. 1992. The California Spotted Owl: General biology and ecological relations, in The California Spotted Owl: a technical assessment of its current status (J. Verner, K. S. McKelvey, B. R. Noon, R. J. Gutiérrez, G. I. Gould, and T. W. Beck, eds.), pp. 55–77. U. S. Forest Service, Pacific Southwest Res. Sta. PSW-GTR-133.

Weatherspoon, C. P, Husari, S. J., and van Wagtendonk, J. W. 1992. Fire and fuels management in relation to owl habitat in forests of the Sierra Nevada and southern California, in The California Spotted Owl: a technical assessment of its current status (J. Verner, K. S. McKelvey, B. R. Noon, R. J. Gutiérrez, G. I. Gould, and T. W. Beck, eds.), pp. 247–260. U. S. Forest Service, Pacific Southwest Res. Sta. PSW-GTR-133.

Zabel, C. J., Steger, G. N., McKelvey, K. S., Eberlein, G. P., Noon, B. R., and Verner, J. 1992. Home-range size and habitat-use patterns of California Spotted Owls in the Sierra Nevada, in The California Spotted Owl: a technical assessment of its current status (J. Verner, K. S. McKelvey, B. R. Noon, R. J. Gutiérrez, G. I. Gould, and T. W. Beck, eds.), pp. 149–163. U. S. Forest Service, Pacific Southwest Res. Sta. PSW-GTR-133.

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NOTES

FIRST EVIDENCE SUGGESTING HYBRIDIZATION BETWEEN THE SUMMER TANAGER AND WESTERN TANAGER

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There are very few reported cases of hybridization among the four species of *Piranga* commonly found in North America north of Mexico, the Hepatic Tanager (*Piranga flava*), Summer Tanager (*P. rubra*), Scarlet Tanager (*P. olivacea*), and Western Tanager (*P. ludoviciana*). McCormick (1893) reported a bird presumed to be a hybrid between the Scarlet and Summer tanagers. Subsequently, Tordoff (1950) and Mengel (1963) described birds hypothesized to be products of hybridization between the Scarlet and Western tanagers. The one hybrid of *Piranga* regularly occurring in the United States is the Western Tanager × Flame-colored Tanager (*P. bidentata*) (Morse and Monson 1985, Rosenberg and Jones 2001, Williams 2007, Retter 2008, S. O. Williams pers. comm.). This hybridization is not unexpected, as the Flame-colored Tanager is at the extreme northern edge of its range in the United States (Arizona) and the two species are each other's closest relatives (Burns 1998). Rosenberg and Jones (2001) suggested that, in Arizona, these hybrids may be more frequent than pure Flame-colored Tanagers, particularly in the Huachuca Mountains (G. Rosenberg pers. comm.). There are no published reports of hybridization between the Summer and Western tanagers, in spite of large areas of the southwestern United States in which both the Western Tanager and the western subspecies (*cooperi*) of the Summer Tanager occur.

During the first week of May 2006 P. and L. Risser observed an adult male Summer Tanager on their property near Colfax, Placer County, California (39° 04′ N, 120° 55′ W; elevation 790 m), representing only the second record of the species for Placer County. This location is well outside the normal range of this species, the nearest area where Summer Tanagers regularly breed being over 400 km southeast of Colfax in the Kern River Valley in northern Kern County. The local habitat is low-density rural residential with mixed conifer and oak (*Quercus* spp.) woodland. This Summer Tanager mainly frequented an area of open pine (*Pinus* spp.)/oak woodland dominated by ponderosa pine (*Pinus ponderosa*) and black oak (*Quercus kelloggii*) interspersed with areas of chaparral and burned snags left over from a recent fire. The bird remained until late July and sang frequently during its stay. Many observers saw this bird, and many photographs were taken. On 5 May 2007 the (presumably) same bird returned to this site. On 4 June 2007 P. Risser observed the Summer Tanager feeding a female Western Tanager sitting on a nest in a ponderosa pine, approximately 8 m above ground and 2 m from the trunk. Over the next few days P. and L. Risser and other observers saw the Summer Tanager feed the female Western Tanager on the nest at least ten times. During the first week of July 2007, P. and L. Risser saw the Summer Tanager feeding the two, possibly three, nestlings. Both the Summer Tanager and the female Western Tanager fed these nestlings regularly over next two weeks.

During the third week of July, P. and L. Risser first observed two fledglings within 12 m of the nest. The fledglings were difficult to see, and observers were unable to obtain useful photographs. The fledglings were generally dull yellowish with noticeably darker wings, lacking evident whitish wingbars. However, the nature of the observations made it difficult to conclude with certainty whether wingbars were absent or not. These observations (at least four) were generally from more than 15 m away, and thick foliage often obscured the views and kept the fledglings largely in shadow. Both the adult Western and Summer tanagers brought food to the fledglings on at least 15 occasions. A fledgling pursued the Summer Tanager on 22 July and was fed. The fledglings were last observed in late July, and the Summer Tanager remained in the area until 16 September. The Summer Tanager returned for the third consecutive year on 6 May 2008. It sang frequently and remained until 13 July. There was no evidence of its attempting to breed during 2008. On 21 May 2009 the Summer Tanager returned for a fourth year and on 14 June was again seen feeding a female Western Tanager on a nest. P. and L. Risser observed the female being fed on the nest numerous times over the next week. On 23 June both birds appeared to be feeding nestlings as they flew to the nest and leaned in (photos taken), but nestlings were neither seen nor heard. We made plans to obtain blood samples once the presence of nestlings was confirmed. After 25 June neither bird visited the nest, and subsequently P. and L. Risser inspected the nest and found no signs of nestlings. The Summer Tanager returned for the fifth consecutive year on 4 May 2010.

We conclude that these observations constitute evidence of probable hybridization between these two species. In the absence of photographs or specimens we cannot rule out the possibility that the young observed were the offspring of a male Western Tanager. The apparent lack of visible wingbars on the young birds suggests that they were hybrids, as this feature should be obvious on fledgling Western Tanagers (Pyle 1997). However, the observations were insufficient to confirm this conclusion absolutely. Although Western Tanagers breed in the general vicinity of this location, observers never noted a male Western Tanager near the female or the young. However, it is possible that a Western Tanager fathered these birds and either abandoned the female or died. It is also possible that the male Summer and female Western Tanager were paired but the young were the result of an extra-pair copulation with a male Western Tanager. There are no confirmed reports of extra-pair copulation in the Western Tanager, but male Western Tanagers often follow females early in the breeding season, seemingly guarding them from extra-pair opportunities (Hudon 1999).

Given the large areas of general sympatry between Western and Summer tanagers, there should be ample opportunity for hybridization. Within the Summer Tanager's range in the southwestern U.S., significant numbers of Western Tanagers migrate in late April and May through riparian areas where Summer Tanagers of the subspecies *cooperi* are simultaneously present and singing on territory (B. Barnes pers. comm.). The species' different habitat preferences during the breeding season may limit the opportunities for hybridization. While the western-breeding subspecies *cooperi* of the Summer Tanager prefers deciduous riparian habitats at lower elevations for breeding (Robinson 1996), the Western Tanager uses mainly higher-elevation mixed conifer habitats (Hudon 1999). Differences between these two species in songs and calls may also provide an effective barrier to hybridization. The calls of the Western and Flame-colored tanagers are similar, and their songs are practically indistinguishable (G. Rosenberg pers. comm.), while the songs and calls of the Western and Summer tanagers are very different (Shy 1984, Shy 1985, Robinson 1996, Hudon 1999) . Thus the degree of difference in vocalizations between these species pairs is consistent with the observed high frequency of hybridization between the first pair of species and the lack of prior evidence of hybridization between the second. The combination of different preferences in breeding habitat and elevation, plus differences in songs and calls, may explain the lack of hybridization between Summer and Western tanagers, despite their sympatry.

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LITERATURE CITED

Burns, K. J. 1998. Molecular phylogenetics of the genus *Piranga*: Implications for biogeography and the evolution of morphology and behavior. Auk 115:621–634.

Hudon, J. 1999. Western Tanager (*Piranga ludoviciana*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 432. Birds N. Am., Philadelphia.

McCormick, L. M. 1893. A hybrid tanager. Auk 10:302–303.

Mengel, R. M. 1963. A second probable hybrid between the Scarlet and Western Tanagers. Wilson Bull. 75:201–203.

Morse, R. J., and Monson, G. 1985. Flame-colored Tanager in Arizona. Am. Birds 39:843–844.

Pyle, P. 1997. Identification Guide to North American Birds. Part 1 (Columbidae to Ploceidae). Slate Creek Press, Bolinas, CA.

Retter, M. 2008. Sightings. Winging It 20:12–13.

Robinson, W.D. 1996. Summer Tanager (*Piranga rubra*), in The Birds of North America (A. Poole and F. Gill, eds.), no 248. Acad. Nat. Sci., Philadelphia.

Rosenberg, G. H., and Jones, R. M. 2001. Spring migration. N. Am. Birds 55:332–335.

Shy, E. 1984. Sympatry and allopatry of song in North American tanagers. Behav. Ecol. Sociobiol. 15:189–195.

Shy, E. 1985. Songs of Summer Tanagers (*Piranga rubra*) and geographical variation. Am. Midland Nat. 114:112–124.

Tordoff, H. B. 1950. A hybrid tanager from Minnesota. Wilson Bull. 62:3–4.

Williams, S. O. 2007. Spring migration. North American Birds 63:487–491.

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KILLDEER OBSERVED DEPREDATING A WESTERN SNOWY PLOVER NEST

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Since 2001, the East Bay Regional Park District has managed nesting habitat for the California Least Tern (*Sternula antillarum browni*) at the Hayward Regional Shoreline (37° 37′ 47″ N, 122° 8′ 46″ W) on the eastern shore of San Francisco Bay, California. As has happened elsewhere in coastal California (Powell and Collier 2000), our efforts have resulted in the recent attraction of breeding Western Snowy Plovers (*Charadrius alexandrinus nivosus*) to the site. In 2008 and 2009 the plovers attempted one and four nests, respectively, within the Least Tern colony.

In 2009, from a distance of 25 m, we witnessed a nesting Killdeer (*C. vociferus*) harass two pairs of breeding Snowy Plovers. The Killdeer repeatedly ran up to a Snowy Plover, crouched, then lunged toward it with fluttering wings in an apparent attempt to drive it from its nest. Each time, in response to the Killdeer's approach, the attending Snowy Plover crouched and depressed its body over its nest. The two Snowy Plover nests, containing two and three eggs, were 14 and 47 m, respectively, away from the nest of the harassing Killdeer. On 29 May, after the Killdeer chased the closer of the two Snowy Plovers from its nest, it picked up one of the two eggs, pierced it with its bill and dropped it about 0.5 m away from the nest. After the Killdeer left the area, the Snowy Plover returned to the damaged egg, tried to push it back into its nest, but failed and later abandoned it. The plover resumed incubation of the remaining egg. To avoid any further disturbance to nesting plovers and terns, we made no attempt to enter the colony on that date to recover and examine the depredated egg. On the next day, after repeated episodes of harassment by the Killdeer, the pair of Snowy Plovers nearest the Killdeer abandoned their nest. The three eggs in the more distant Snowy Plover nest hatched, but we did not observe the chicks again.

Along the Pacific coast, important predators taking Snowy Plover eggs include the Common Raven (*Corvus corax*), American Crow (*C. brachyrhynchos*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), and striped skunk (*Mephitis mephitis*) (Page et al. 2009). Anecdotally, the Long-billed Curlew (*Numenius americanus*), Marbled Godwit (*Limosa fedoa*), and Willet (*Tringa semipalmata*) are suspected nest predators in Ventura County (R. Smith pers. comm.), but the Whimbrel (*N. phaeopus*) is the only shorebird known to depredate Snowy Plover eggs (Page et al. 2009). At Monterey Bay, California, Snowy Plovers defend territories against migrating Semipalmated Plovers (*C. semipalmatus*) and Whimbrels but are often not aggressive toward Black-necked Stilts (*Himantopus mexicanus*) or American Avocets (*Recurvirostra americana*) unless they approach within a meter of the plovers' nest (Page et al. 2009). At Cheyenne Bottoms, Kansas, Boyd (1972) reported that Snowy Plovers defend territories against both Killdeers and American Avocets.

To our knowledge, and on the basis of our informal conversations with other Snowy Plover biologists, ours is the first observation of the Killdeer as a cause of mortality of Snowy Plover eggs. Although the prevalence of such behavior by the Killdeer and its effect on Snowy Plover populations are unknown, observations such as these may bring to light complex and potentially important interactions between closely related species that often share the same nesting habitats.

LITERATURE CITED

Boyd, R. L. 1972. Breeding biology of the Snowy Plover at Cheyenne Bottoms Waterfowl Management Area, Barton County, Kansas. M. S. thesis, Emporia State University, Emporia, KS.

Page, G. W., Stenzel, L. E., Warriner, J. S., Warriner, J. C., and Paton, P. W. 2009 (revised). Snowy Plover (*Charadrius alexandrinus*), in The Birds of North America Online, no. 154 (A. Poole, ed.). Cornell Lab. Ornithol., Ithaca, NY; http://bna.birds.cornell.edu/bna/species/154.

Powell, A. N., and Collier, C. L. 2000. Habitat use and reproductive success of Western Snowy Plovers at new nesting areas created for California Least Tern. J. Wildlife Mgmt. 64:24–33.

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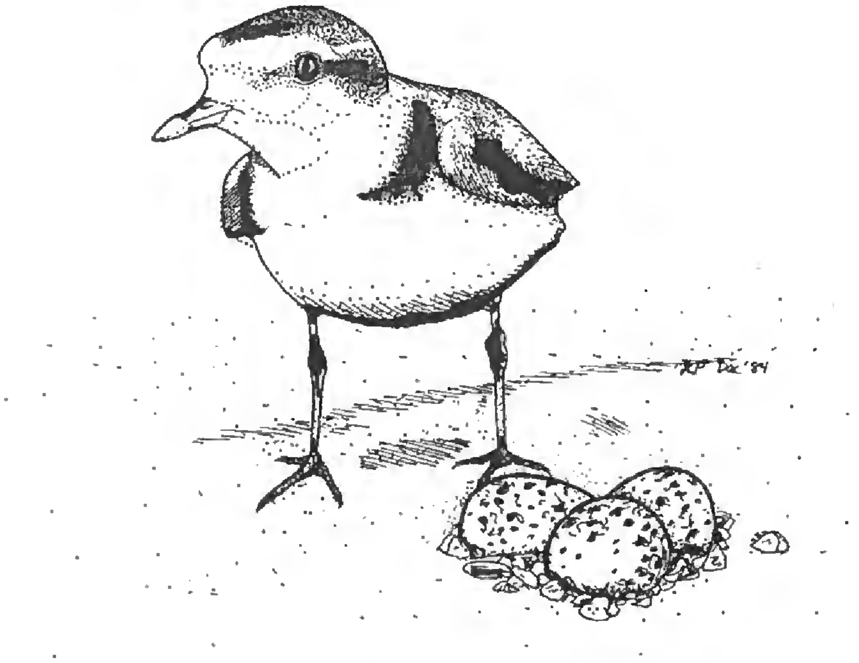

Western Snowy Plover

Sketch by Robert Patton

NESTING OF THE GOLDEN EAGLE IN THE GUADALUPE VALLEY, BAJA CALIFORNIA, MEXICO

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The Golden Eagle (*Aquila chrysaetos*) has a wide global distribution (Kochert et al. 2002), in North America covering Alaska, Canada, the contiguous United States, and Mexico. In Mexico its distribution ranges from the Baja California Peninsula east to the highlands of northeastern Sonora (Russell and Monson 1998) and Chihuahua and south to Colima, San Luis Potosí, Guanajuato, and Querétaro (Howell and Webb 1995). In Mexico, the Golden Eagle inhabits temperate forest, grasslands, and xeric scrub (Rodríguez-Estrella 2002). It may be extirpated as a breeding species in the central area from Guanajuato and Querétaro (Kochert et al. 2002) and is listed as a threatened species in the Norma Oficial Mexicana (SEMARNAT 2002) as a result of mortality caused by electrocution, pesticide poisoning, hunting, and habitat loss. In the Baja California Peninsula, juveniles as well as adults of the Golden Eagle have been reported (Rodríguez-Estrella et al. 1991, Rodríguez-Estrella 2002, Erickson et al. 2002, Ruiz-Campos et al. 2005), but there is little information about nesting sites. Nesting in Baja California has been reported previously from San Telmo (30° 49′ N; Anthony 1893, cited by Grinnell 1928), San José (30° 48′ N; nest in good repair, Hill and Wiggins 1948), and along the Río Santo Domingo (30° 45′ N; active nest, Erickson et al. 2002). But no systematic effort to find Golden Eagle nests has been made in northern Baja California (L. F. Kiff pers. comm. through R. A. Erickson).

On 6 and 14 July 2007 we observed three Golden Eagles, two adults and one juvenile, in Arroyo El Barbón, Guadalupe Valley, 31 km northeast of Ensenada and 12 km east of the community of Guadalupe. The juvenile was identified by white coloration at the base of primary feathers and a wide white band in the base of rectrices. We observed the eagles for 2 hours on 6 July and 1 hour on 14 July 14. On 18 August we did not observe any eagles at the site.

On 6 July, we located the nest on a cliff 80 m high, situated in cracks of the rocks. One of the adults carried a Black-tailed Jackrabbit (*Lepus californicus*) toward the top of the cliff. Suitable prey, both the jackrabbit and California Ground Squirrel (*Spermophilus beecheyi*), are common in the area. The three eagles were near the nest, but the juvenile, accompanied by both adults, was already flying within the canyon and vocalizing. On the basis of the Golden Eagle's incubation and nestling periods and the apparent age of the juvenile, in the process of becoming independent, the egg was likely laid at the end of March.

The nest was in a canyon with vegetated with scrub, coast live oaks (*Quercus agrifolia*), willows (*Salix lasiolepis*), and cottonwood trees (*Populus fremontii*). Along the canyon are several hot springs connected by a stream. The nest is above the natural pools, 4 km from the closest agricultural area, consisting of vineyards, in an area often visited by local tourists. Human access to the eagle's nest is difficult but not impossible, but we expect the main threats to be fires, disturbance, and hunting. According to the landowner, raptors occur in the canyon every year, although he had not identified them as Golden Eagles. The site offers the opportunity for further research.

LITERATURE CITED

Anthony, A. W. 1893. Birds of San Pedro Martir, Lower California. Zoe 4:228–247.

Erickson R. A., Patten, M. A., Palacios, E., and Carmona, R. 2002. Baja California Peninsula. N. Am. Birds 56:489–490.

Grinnell, J. 1928. A distributional summation of the ornithology of Lower California. Univ. Calif. Publ. Zool. 32:1–500.

Hill, H. M., and Wiggins, L. 1948. Ornithological notes from Lower California. Condor 50:155–161.

Howell, S. N. G., and S. Webb. 1995. A Guide to the Birds of Mexico and Northern Central America. Oxford Univ. Press, Oxford, England.

Kochert, M., Steenhof, K., McIntyre, C. F., and Craig, E. H. 2002. Golden Eagle (*Aquila chrysaetos*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 684. Birds N. Am., Inc., Philadelphia.

Rodríguez-Estrella, R., Llinas, J., and Cancino, J. 1991. New Golden Eagle records from Baja California. J. Raptor Res. 25:68–71.

Rodríguez-Estrella, R. 2002. A survey of Golden Eagles in northern Mexico (1984), and some recent records in central and southern Baja California Peninsula, in The Golden Eagle: its status, conservation and management in 1999 (M. J. McGrady, R. Rodríguez-Estrella, M. Bechard, and E. Iñigo-Elias, eds). J. Raptor Res. 36 (supplement): 3–9.

Ruiz-Campos G., Palacios., E., Castillo-Guerrero, J. A., González-Guzmán, S., and Batche-González, E. H. 2005. Spatial and temporal composition of the avifauna from small coastal wetlands and adjacent habitats in northwestern Baja California, Mexico. Ciencias Marinas 31:553–576.

Russell, S. M., and Monson, M. 1998. The Birds of Sonora. Univ. of Ariz. Press, Tucson.

SEMARNAT. 2002. Norma Oficial Mexicana NOM-059-ECOL-2001, Protección ambiental–Especies nativas de México de flora y fauna silvestres–Categorías de riesgo y especificaciones para su inclusión, exclusión o cambio–Lista de especies en riesgo. Diario Oficial de la Federación, segunda sección, 6 de marzo.

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SOFTWARE AND BOOK REVIEWS

DIGITAL REVOLUTION IN PACKAGING RECORDINGS OF BIRDS

Audubon Birds—A Field Guide to North American Birds, Version 1.3.1, by Green Mountain Digital. 2010. www.audubonguides.com.

BirdJam, by MightyJams, LLC. 2010. www.birdjam.com.

iBird Explorer PRO, Version 2.3, by Mitch Waite Group. 2010. www.ibirdexplorer.com.

National Geographic's Handheld Birds, Version 1.0.0, by National Geographic Society. 2009. www.handheldbirds.com.

The Sibley eGuide to the Birds of North America, Version 1.01, by Cool Ideas, LLC. 2010. www.mydigitalearth.com.

There are many reasons birders and field ornithologists use pre-recorded bird sounds in the field, and we used to have but one option: a tape player and cassette, and our choices for sounds were limited to a very few commercially available recordings or our own. Through a dizzying series of technological steps over the past 20 years, we have arrived at solid-state digital players, the most advanced today being the popular iPod Touch.

For those who are unfamiliar with this gizmo but know what a regular iPod is (classic, nano, or whatever), there is one basic difference: whereas older iPods and other mp3 players are capable of very little other than playing sounds (or displaying photos or even video) that were uploaded from a desktop or laptop computer, an iPod Touch is like a miniature computer with a wireless internet connection. Just as your desktop computer allows you to create memos, play video games, read your e-mail, and surf the web, so does an iPod Touch, just on a more limited level. Not to make things confusing, there is also the iPhone, which is nearly identical to an iPod Touch, the added function of a cell phone being the most obvious difference.

In this review, I compare five products for the iPod Touch (Table 1); four are standalone applications (called "apps" by iPod users), while the fifth is a product that merely adds a function to the iPod application called Music, which is essentially the same as iTunes. The four applications have multiple features that make them more like a field guide (such as photos, drawings, range maps, and other identification aids and information); here I look only at their utility related to the playback of bird voices. In

Table 1 Comparison of Five Applications Providing Recordings of Bird Sounds through the iPod Touch

	Audubon	birdJam	iBird	NGS	Sibley
Time to reach species list (sec)	15	3	9	6	12
Time to reach a species (average of seven species; sec)	29	11	17	13	21
Number of clicks needed to play song (browsing excluded)	6	3	3	3	5
Average length of recordings (sec)	43	28	11	20	43
Average number of vocalization types	4	2	1	2	4
Progress bar shown?	Yes	Yes	No	Yes	No
Source of recordings	Stokes and Martyn Stewart	Stokes	Martyn Stewart	Cornell	Stokes and Martyn Stewart

judging how well these applications work, rather than trying to cover every imaginable use one might have for bird sounds on an iPod, I start from the assumption that the user has a species in mind and simply wishes to play a vocalization. From there, the existence of that species in the application, the ease and speed of getting to it, the number of vocalization types available, and the quality of the recordings are the focus of my review. I offer subjective comments on the general use of each application, especially its user-friendliness in the field.

One might wonder what makes any of these tools any different from just playing bird sounds uploaded to your classic iPod, and the answer is "not much." Assuming that the source of your recordings is one of the many commercially available CD sets, the primary difference is that with these iPod applications, the announcement of the species name has been removed. The added functions of the newer iPod Touch also allow for more information about each track to be displayed, whereas formerly all you saw was whatever information was included with just the track, album, and artist names that scrolled across the iPod screen upon playback.

I'll start off by describing birdJam, which stands out from the rest in not actually being its own application but rather a utility that adds a function to the Stokes CDs for North America (Elliot et al. 1997, Colver et al. 1999). You must first actually own a copy of this CD set and have it uploaded to your computer's iTunes program. Then, once you upload birdJam, it does in just a few minutes what would otherwise take you days with sound-editing software (e.g., Raven, Amadeus, Audacity): it edits the information in each track so that playback begins after the voice announcement. For those tracks that included two species, a duplicate copy is made so that each species has its own track (I remember once being driven mad by not being able to find MacGillivray's Warbler on my iPod; it turns out it is the latter half of the Stokes Northern Waterthrush track). BirdJam also puts a phonetic description in place of the artist's name, the scientific name as the album information, and what would be lyrics appear as notes about the recordings, such as a more thorough description, subspecies, location, and season of the recording. Furthermore, the common names are repackaged in index style so that the group name appears first, and one scrolls down a list that goes from Bittern, Least, to Blackbird, Brewer's, and from Swift, White-throated, to Tanager, Hepatic.

The other four applications come with their own system of organizing and presenting data and are uploaded with a full set of self-contained recordings. You start each of them by clicking on the icon on the iPod's main screen. After the application loads, you then have to navigate to the species you want (by either browsing a list or searching via a virtual keypad), which then brings up only the species account; it's then another click or two before you actually play the vocalization.

Speed of Access and Playback Looping

Getting to a particular recording quickly is always important to me. I timed myself how long it took with a not-so-random set of species: the Rufous-crowned Sparrow, Montezuma Quail, Lazuli Bunting, Brown-crested Flycatcher, American Wigeon, Hutton's Vireo, and Whiskered Screech-Owl. I also timed how long it took to play the species that appeared first when I started the application. The primary difference between birdJam and the other four applications is that birdJam does not have species accounts, so the vocalization begins playing the moment you click on the bird's name—but it also does not have a search function. This means that though any recording is no more than three clicks away, you need to be proficient at scrolling, something that takes practice. If you're good, birdJam is by far the quickest of the applications—up to five times faster than the slowest. One more difference that stands out with birdJam is that it's easy to tell the iPod to loop a track; without having to touch or look at the iPod, one could play a track for, say, a 90-second broadcast survey. None of the other applications have this option, and once the cut is finished playing, you must click on it (on some twice) to play it again. Among the other four applications, speed of access varied with the size of the application (which affects how long it takes to upload) and how many screens you have to click through. Those applications that brought up a list of species as the first screen (NGS and iBird) were the fastest, while the Audubon application took the longest, with a large database of sounds and the necessity of having to click through several layers to get to the sounds.

Quality and Source of Recordings

The recordings are all of high quality, as they are derived from pre-published sources and professional recordists. The NGS application is the only one that has a set different from the others, taken from the Cornell Lab of Ornithology's Macaulay Library—the Rufous-crowned Sparrow and Montezuma Quail are the same recordings by Geoff Keller used on Keller (2001) and Cornell's CDs for southeastern Arizona and northwestern Mexico, for example. All the others share some or all vocalizations: birdJam is strictly from the Stokes Field Guide to Bird Songs (both western and eastern regions), while Audubon and Sibley (which share exactly the same set of recordings) provide a combination of some cuts from the Stokes guides and recordings from Martyn Stewart. All but iBird actually give credit to their sources, so I had to compare recordings of several species to figure that one out, and it appears that iBird simply uses recordings from Martyn Stewart, and, for the ones I checked, they are the same recordings included in the Audubon and Sibley apps. The only drop in quality I noticed was a tinny, filtered sound in some cuts, such as those of the Rufous-crowned Sparrow and Lazuli Bunting, on the NGS application.

Species Included

While all five applications appear to include every bird breeding regularly in North America (except Audubon and Sibley are missing the White-tailed Ptarmigan for some reason), iBird is the most thorough for species coverage. It is the only one to have Nutting's Flycatcher, for one example, and it is the only one to include all three of the Streak-backed Oriole, Black-capped Gnatcatcher, and Red-throated Pipit; among the other applications, birdJam and NGS have two of the three, while Audubon and Sibley have none of these rarities.

Length and Variety of Recordings

It is in these variables where these products differ the most, I think, each has strengths and weaknesses. In a comparison of the seven species considered above, the Audubon and Sibley apps (remember, their database of recordings is identical) offer the most in the number of recordings, total length of recordings, vocalization types, and how their information is presented. Each vocalization type, whether represented by examples of different song types, songs from different populations, or call notes, receives its own track and is clearly labeled. The birdJam recordings usually have a good variety of vocalization types represented but are included in one long track. The NGS and iBird applications similarly have only one track, but NGS has fewer vocalization types (generally two, such as a song and a call), and iBird includes just one short cut, usually limited to one song type for each species.

Added Information

Some of the applications include further information on the vocalizations. As mentioned above, Audubon and Sibley do this well. BirdJam does sometimes include information on subspecies, location, and time of year, but only irregularly (and it is not always correct; for the Lazuli Bunting, the information given is actually from the Indigo Bunting track). NGS offers the least information, with comments such as "songs" or "calls" being the limit; hardly better is what iBird offers—a phonetic transcription of the song, which is often close to no use at all (such as "chip-chip," "deer") for the Rufous-crowned Sparrow.

User Interface

Finally, some general comments on how these applications work overall. BirdJam is the most straightforward, especially if you've used an iPod before or even have used iTunes on a computer. Bird sounds are organized by playlists (the most useful for me is one with all the birds of North America organized alphabetically), and you merely browse the list and click on the species you want.

IBird isn't that much different when it comes to finding the species you want, and it's straightforward to play the sound by clicking on the icon that looks like a speaker. But once the cut is over it's not obvious how to play it again. It turns out you must click on the bird name under the list of "similar sounding" species to uncheck it, then click on it again to choose it; the speaker icon remains but is no longer active on that screen unless you navigate away and then back—so in any event replaying the song is still two clicks away. Also, there is no progress bar, so you can't know where you are at in the recording or how long it is.

NGS works in a similar way, with a "play" button available on the first screen, from which you hear the recording but have no other controls or information. If you scroll down, there is an "audio" button that brings up a screen with a progress bar, play, pause, and stop buttons, and volume control. I find this a little more user-friendly, but the lack of information on where the recording was made is not good.

Sibley has one more click on a main menu before you can see a list of birds, which is annoying (you have to choose whether you want to browse them taxonomically, alphabetically, or do a search; the previous two applications allow you to toggle between similar options with small buttons on the first screen). After that extra click, it's then much like the others with the icon to play the vocalizations being an eighth note. Clicking on this icon starts the sound right away and brings up a screen with a clever scrolling dial that lets you choose among the various vocalization types. Each one is labeled as a song, call, etc., and with an abbreviation of the state or province where recorded (usually, in any event; this is missing from Harris's Sparrow, and I looked at only a few species). Each cut stops at its end and cannot be played again without scrolling away from it or clicking on the eighth-note icon twice. There is also no progress bar.

Finally, the Audubon guide has the most laborious process of getting to the actual bird recordings. Since the application comes with additional references on other branches of natural history, once it loads you first have to click on the one for birds. Then, as with Sibley, you must click on which format you wish to browse (taxonomic, alphabetic, etc.). Once you finally get to a species list and click on the species name, clicking on the sound icon (another eighth note here, but with the word "voice" next to it) brings up the page that lists the available sounds but does not start playing the sounds – that is yet one more click away on the arrow next to each cut. There is a progress bar, each cut is labeled with vocalization type and location, and the duration of the recording is indicated, all positive features. It requires one click to replay any of the cuts.

In summary, none of these apps is perfect, and for my own use I'll probably be spending the time to edit and label recordings manually with sound-editing software and create my own playlists. The perfect application would combine the simplicity of birdJam (and its ability to loop tracks), the species coverage of iBird, the variety of recordings and separated vocalization types from Audubon, the user interface of Sibley, and the speed of NGS.

LITERATURE CITED

Keller, G. A. 2001, Bird Songs of Southeastern Arizona and Sonora, Mexico. Cornell Lab of Ornithology, Ithaca, NY.

Elliott, L., and Stokes, D. and L. 1997. Stokes Field Guide to Bird Songs Eastern Region. Time Warner, New York.

Colver, K. J., and Stokes, D. and L. 1999. Stokes Field Guides to Bird Songs Western Region. Time Warner, New York.

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BOOK REVIEW

Birds of Wyoming, by Douglas W. Faulkner. 2010. Roberts and Company Publishers, Greenwood Village, CO. 404 pages, at least 250 color photos, 242 range maps. Hardback, $45.00. ISBN 978-1-936221-02-8.

Birds of Wyoming is a handsome book with a color photo of a Great Gray Owl on the cover. It is a grand first attempt to summarize the distribution and status of birds in one of the most lightly birded states in the nation. The entire human population of Wyoming is only about 550,000, with a land area of roughly 100,000 square miles.

The book seems to show considerable bias toward the eastern half of the state and would have benefited from a year's delay and input from western Wyoming birders/ ornithologists. Inside the front and back covers is a map showing Wyoming's counties and 67 well-known birding localities. There is no table of contents, which would have made finding a species account easier, as the accounts are somewhat arbitrarily categorized by "resident" and "non-resident" species. There is, however, an index at the back of the book with scientific and common names.

Each of the 242 "resident species" gets a full page (often leaving unused space), a color photo (usually of a breeding male), and a color-coded distribution map (yellow for summer, blue for winter, and green for year-round). The maps are rather coarse and vague with many gaps, especially in the west. For example, the Rough-legged Hawk, Northern Shrike, Black-billed Magpie, Mourning Dove, and Eurasian Collared-Dove are all found in the Jackson area, where the maps show white gaps on the maps.

Each species account has a discussion of seasonal status, taxonomy, and subspecies if relevant, distribution, and conservation status. The last is a code maintained by the Wyoming Game and Fish Department for the status of native species and ranges from 1 through 7 from the most to least threatened in the state. Only species ranked NSS1 through NSS4 are considered priority species and have their code listed in this book.

There are 184 "non-resident" species, which include regular migrants, winter residents, and truly rare species. These are covered in the back third of the book at two per page, with no pictures or maps but with the same status categories as the resident species. Then follows a list of 28 species for which the Wyoming Bird Records Committee has insufficient evidence. This committee has been in existence since 1988, but the book does not refer to its website.

Finally, there are 14 pages of references with about 580 citations. These provide a tremendous historical summary of Wyoming bird distribution.

The front of the book contains six short essays by knowledgeable ornithologists that add considerably to an understanding of bird distribution. The history of Wyoming ornithology is described in 12 pages by Jane Dorn. We learn that Thomas Nuttall and John Kirk Townsend crossed the state on the Oregon Trail in 1834, collecting the Mountain Plover and Sage Thrasher that first introduced those species to science.

Many collections were made by the railroad surveys and by surgeons at early forts. C. Hart Merriam joined a collecting party in the Tetons and Yellowstone area in 1872 at the tender age of 16. The Game and Fish Department began an atlas of Wyoming bird distribution by latilong in 1976.

The conservation of birds in Wyoming is discussed by Bob Oakleaf, Andrea Orabonn, and Alison Lyon-Holloran in five pages. Global warming may kill off 20% of the conifers in the state, so special attention should be paid to the Brown Creeper and Northern Goshawk. Habitat fragmentation from oil and gas drilling is frightening—in 2000 there were 12,477 producing wells, but by 2007 it was projected that 58,000 new wells would be drilled in the state. Populations of the Greater Sage Grouse have been in decline since the 1930s, but all this new development may well render it an endangered species.

Richard Hutto uses two pages to ask whether stand-replacement fire is good for the birds. Most fires at mid- to high elevations indeed replace most of the forest, and there are fifteen species, such as the Black-backed Woodpecker and Mountain Bluebird, that increase after fires. As practiced, most logging is a poor substitute for replacement fires, as it leaves few snags standing. Hutto does a good job of helping us understand fire ecology and how it affects bird populations.

Terry Rich discusses the sagebrush habitat in a wonderfully aesthetic two-page essay. He suggests that the Greater Sage Grouse would be an excellent umbrella species for the protection of other birds restricted to sagebrush, such as the Sage Sparrow, Brewer's Sparrow, and Sage Thrasher. The grouse needs large preserves where such disturbances as off-road vehicles, fences, invasive weeds, livestock, power lines, wind farms, and drilling roads and rigs are at a minimum. In short, he suggests we need a Sagebrush National Park.

Management of short-grass prairie is discussed in two pages by Scott Gillhan. Populations of grassland birds are declining faster and across a wider area than those of any other group of birds. Prairie dogs provide habitat for nesting as well as prey for a whole suite of birds, and they are still being poisoned. Gillhan lists fourteen specific management practices that are needed, including control of invasive weeds, maintenance of large patches, rotational grazing, and limiting invasion by trees.

Finally, Robert Dorn provides an excellent three-page discussion of Wyoming's landforms and vegetation, which gives an overview of the state's varied habitats and their distribution. He again emphasizes the negative effects of fragmentation, development, drilling, and livestock grazing in a very dry environment. All these chapters should be required reading because they add depth to the understanding of bird distribution not only in Wyoming but in much of the West.

All in all I would say that this book is a pretty good first attempt at the Birds of Wyoming. Knowledge of Wyoming bird distribution can be expected to grow rapidly because of it, as well as because of reports to e-Bird and an effective Wyoming list server. As Paul Lehman says on the back cover, "Every serious student of bird distribution in North America should own a copy."

Chuck Trost

FEATURED PHOTO

CAROTENISM IN CASSIN'S FINCH

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The red hues of a typical male Cassin's Finch can be described as crimson. In March 2009 I noted an aberrant male, with yellow-orange coloration instead of crimson visiting seed feeders in the company of a large flock of normally colored Cassin's Finches 19 km west-southwest of Livermore, Larimer County, Colorado, elevation 2440 m.

In almost all birds, plumage coloration is determined by two primary types of pigments, melanins and carotenoids. Melanins are responsible for black, gray, brown and chestnut feathers and are synthesized by the birds and deposited as granules in the skin and feathers. Carotenoid pigments produce colors ranging from pale yellow to scarlet red. For the most part birds cannot synthesize these pigments and must obtain them from food in the diet. These fat-soluble pigments are non-granular and are deposited during a feather's growth before its keratinization is complete (Gill 1990). Many different carotenoid pigments may be responsible for a particular shade of color in a bird, and a diet unbalanced in one or more of these necessary pigments may produce an aberrant yellow, orange, or red color. An abnormality of carotenoid pigmentation, called carotenism, "results from one or more of four causes: (1) change in the normal distribution or extent of carotenoid pigments; (2) increase or decrease in carotenoid concentration, resulting in a change in color or color intensity; (3) change in carotenoid pigment type and therefore a change in color; and (4) total absence of carotenoids from all or part of the plumage or skin" (Davis 2007).

Xanthochromism (or xanthochroism or flavism) is another term that has been applied to this type of aberrant coloration where a bird's normally red plumage is yellowish or orange. According to Wapedia (http://wapedia.mobi/en/Xanthochromism), "xanthochromism is a term that may be applied to birds, fish and other animals whose coloration is unusually yellow through an excess of yellow pigments, or possibly a loss of darker pigments that allows yellow pigments to be unusually dominant. It is often associated with the lack of usual red pigmentation and its replacement with yellow." In aviculture, several species of parrot have been bred for unusual yellow or orange variants. Wild birds in which xanthochromism has been identified include the Yellow Wagtail (*Motacilla flava*), Wood Warbler (*Phyllocsopus sibilatrix*), Cape May Warbler (*Dendroica tigrina*), Rose-breasted Grosbeak (*Pheucticus ludovicianus*), Evening Grosbeak (*Coccothraustes vespertinus*), Red-bellied Woodpecker (*Melanerpes carolinus*), Scarlet Tanager (*Piranga olivacea*), Northern Cardinal (*Cardinalis cardinalis*), Purple Finch (*Carpodacus purpureus*), Crimson-breasted Shrike (*Laniarius atrococcineus*) (Wapedia), and Eastern Bluebird (*Sialia sialis*; Welty and Baptista 1988).

It is well known that wild male House Finches (*Carpodacus mexicanus*) vary in plumage color from pale yellow to bright red. Hill (1992) found by experiment that the red in a male House Finch is dependent on the carotenoid content of its diet and that a normal red individual can be made to become yellow through manipulation of its diet. Variation in access to carotenoid pigments at the time of molt causes the variations in plumage color (Hill 1992). Inouye et al. (2001) proposed that variation in the red pigment of male House Finches may be due to differences in carotenoid metabolism, dietary access to carotenoids, or exposure to environmental factors, such as parasites, that may affect pigmentation.

In Cassin's Finch, carotenism has been reported rarely, and the photograph featured on this issue's back cover may be the first one of this aberration published. Van

Rossem (1921) reported that an adult male Cassin's Finch collected in Sierra County, California, on 17 July 1916 had the normally red areas entirely replaced by lemon yellow. Arvey (1938) reported that a normal red captive Cassin's Finch grew yellow instead of red feathers while on an artificial diet. Once pyracantha berries were added to the diet, new feathers grew in as normal red, resulting in a mottling of yellow and red head and breast feathers.

I thank Jeff N. Davis, who commented on an earlier version of this note.

LITERATURE CITED

Arvey, D. 1938. Color changes in captive Cassin Purple Finch. Condor 40:263.

Davis, J. N. 2007. Color abnormalities in birds: A proposed nomenclature for birders. Birding 39:36–46.

Gill, F. B. 1990. Ornithology. Freeman, New York.

Hill, G. E. 1992. Proximate basis of variation in carotenoid pigmentation in male House Finches. Auk 109:1–12.

Inouye, C. Y., Hill, G. E., Stradi, R. D., and Montgomerie, R. 2001. Carotenoid pigments in male House Finch plumage in relation to age, subspecies, and ornamental coloration. Auk 118:900–915.

Van Rossem, A. J. 1921. A yellow phase of the Cassin Purple Finch. Condor 23:163.

Welty, J. C., and Baptista, L. F. 1988. The Life of Birds, 4th ed. Saunders, Fort Worth, TX.

IN MEMORIAM

MICHAEL R. SAN MIGUEL, 1939–2010

PRESIDENT OF WESTERN FIELD ORNITHOLOGISTS, 1999–2003

Photo by Lisa San Miguel

While attending California State University, Long Beach, in 1990, I had a course in marine biology. One of the labs for this class involved a field trip to Upper Newport Bay and Bolsa Chica to study coastal flora and fauna of southern California. It brought back many of my memories as a child in the 1970s, when my father and I ran around the state looking for birds. I recollect phoning my Dad and suggested that we spend a day birding, just like we had done in the "old days." From that day forward, he was hooked all over again, and obsessed with an enthusiasm and passion that never waned for the next 21 years of his life. He was an unstoppable presence in the birding community of California and the West until his untimely death on 14 July 2010. Not only did I lose my father, I lost my best friend in the world.

Many people have asked me when my interest in birding started. My answer has always been, "it is in my blood." For as long as I can remember, Dad had a pair of binoculars around my neck. Memories of being in our old VW van, heading to his banding stations at Buckhorn Campground in the Angeles National Forest, Morongo Valley, Fish Canyon near Duarte, California, and Deep Springs College in Inyo County as a child in the early '70s are forever chiseled into my memory. Trips to the far reaches of California as a child will never be forgotten. The "Big Year" trip in 1975 may have been the most memorable. Sleeping under the stars at Furnace Creek or Mesquite Springs, tombstone-hopping at Fort Rosecrans National Cemetery, crossing the Whitewater River on his shoulders at the north end of the Salton Sea are fond memories. I recall days where he contemplated pulling me out of elementary school to take me down to San Diego to look for a Philadelphia Vireo and Blackburnian Warbler at Fort Rosecrans Cemetery. Or another time where he dragged me down to Malibu in 1974 to look for the King Eider. A classic "Mike" moment was when he left my mother, Gayle, and sister, Lisa, and a house full of guests on New Year's day with Robert and Elizabeth Copper and several other birders to chase a Trumpeter Swan at Legg Lake. To say my mother was upset is an understatement.

As I grew into my junior- and high-school years, my interest in birding faded and so did my father's. In the late 1980s he focused on his job and our family. He took up hobbies such as playing basketball, collecting baseball cards, collecting wine, and building his rock walls in the backyard. He never quit teaching me and Lisa valuable life lessons. Although birding and banding were no longer there to keep us connected, we certainly found other activities to keep our relationship strong. Our marathon sessions of cribbage or gin rummy were dramatic and certainly heated at times. We constantly were running around the San Gabriel Valley in search of great Chinese or Mexican food. We certainly made a few "all you can eat" sushi restaurants groan every time we entered.

But my father's concern for the environment and local conservation remained constant. His battles against the Army Corps of Engineers in the late '60s and early '70s were epic. Confronting quarrelsome and arrogant representatives of various construction firms, city managers, or just people he ran across butchering native habitats never ended. He was well respected because he always fought for what is right. He did this with such grace and poise that rarely did he make enemies. His battles for conservation were also waged at home. The oak trees around the yard were never trimmed, despite years of pleading from both my mother and my sister. His backyard "native grass garden" was never pleasing to the eye and horrified my mother as it looked unkept and cluttered. But Dad never gave in.

A few years ago I suggested to him that he set up more than two hummingbird feeders in the backyard, just to see what would happen. Well, thousands of hummingbirds later, and gallons upon gallons of sugar water later, Dad had easily one of the greatest hummingbird-feeding stations west of Arizona. I recall the hours we spent during peak hummingbird migration looking at those feeders, drinking wine, talking about the kids, the Dodgers, birds, whatever was on our minds. His yard list was nothing short of spectacular. I am not sure of the final number, but he amassed well over 225 species. Such rarities for southern California as the Dickcissel, Bobolink, Broad-winged Hawk, Eastern Kingbird, Blackpoll Warbler, Summer Tanager, are just a few that come to mind. I remember his "best" bird of the yard was either a White-headed Woodpecker or the Yellow-bellied Sapsucker that spent the winter this past year. We spent hours in early June scouring the skies above his house every year looking for Black Swifts or Purple Martins. I treasure the memories of awakening to him hunched over the table on the back patio, measuring and banding birds. In some years he banded hundreds of Lazuli Buntings, Purple Finches, and Wilson's Warblers in the backyard.

In recent years the two of us started birding together more often. Birding trips to southeastern Arizona, Texas, Michigan, the Salton Sea, Death Valley, Galileo, the Los Angeles River, and the big days shared with Jon Feenstra, Todd McGrath, and Kimball Garrett remain some of the fondest memories with my father. As I grew older and began the process of raising a family, my hours in the field dropped significantly. Essentially, birding for me has been narrowed to local patches near my home in La Verne, California. But I was always in constant contact with my father, who was updating me on what rarities were around or just to tell me about his frustration with the Dodgers. We always made a point to have lunch with one another and catch up on all the things that were going on in our lives. I was able to spend some time on the phone with him the day of his death. The conversation was the same as it always was, "What time is Jake's game on Saturday, how is Alex, are you guys coming over for dinner on Sunday, did you get the e-Bird list I shared with you from 1993?" I hung up the phone and that was it. . . .

Birdwatching and conservation aside, Lisa and I could not have asked for a better father. He was an astonishing grandfather to my two children, a wonderful husband to my mother, and a mentor to so many. The loss of my Dad is indefinable, but I have a lifetime of memories to cherish, and the lessons in life he taught me will not go to waste on my two children.

Rest well, mi amigo!!!

Michael J. San Miguel

Mike San Miguel's family specified that donations in memory of Mike be made to Western Field Ornithologists. WFO and the family gratefully acknowledge the donation of $5000 from the Pasadena Audubon Society to establish a Mike San Miguel Youth Scholarship Fund. We also thank and recognize the following people, organizations, and companies who have contributed so generously, over $10,000, to the Mike San Miguel Memorial Fund or the Youth Scholarship Fund.

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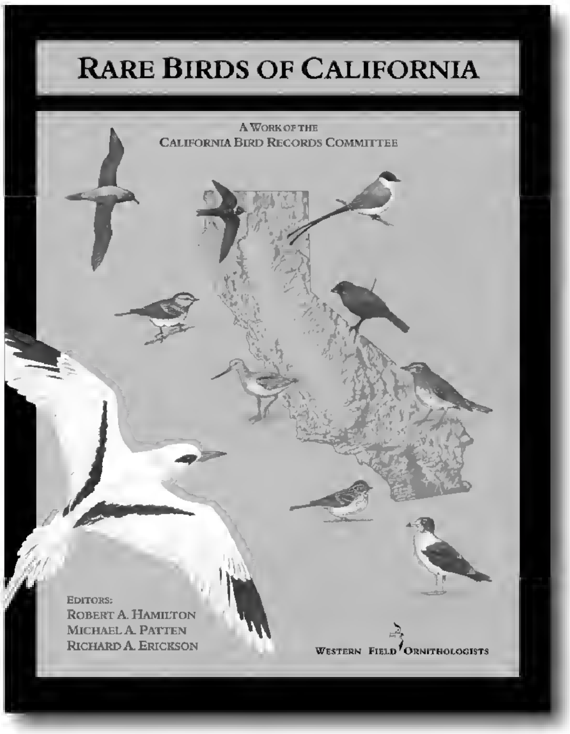

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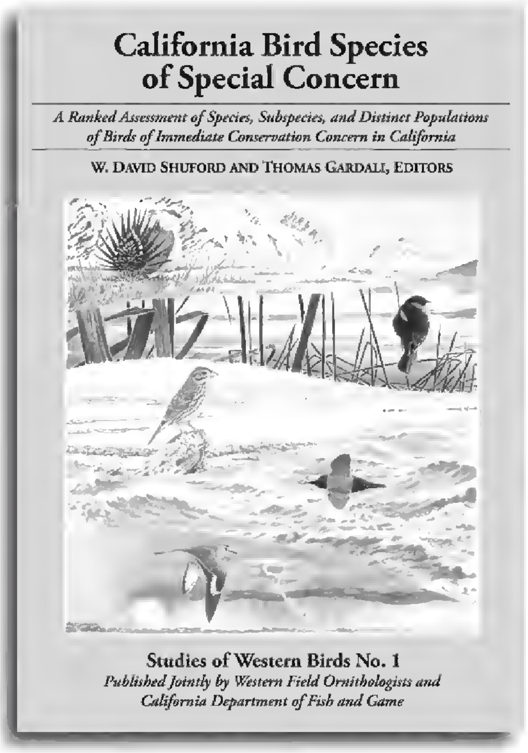

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Photo by © Thomas A. Blackman of San Diego, California:
Bar-tailed Godwit (*Limosa lapponica*)
Imperial Beach, San Diego County, California, 3 August 2010.
Thanks to the work of the U.S. Geological Survey's Alaska Science Center, the subspecies of the Bar-tailed Godwit nesting in Alaska, *Limosa lapponica baueri*, has been revealed as the bird undertaking the longest nonstop migration of any bird, up to 11,700 km from Alaska to New Zealand. Tracked by satellite with a transmitter attached to the bird, one female made the flight in 8 days (http://alaska.usgs.gov/science/biology/shorebirds/barg.html). Very rarely do Bar-tailed Godwits stray from this route to be noted as vagrants farther south along the Pacific coast of North America.

WESTERN BIRDS

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Western Specialty:
Dark - rumped Leach's Storm - Petrel

Photo by © Steve N. G. Howell of Bolinas, California:
Dark-rumped Leach's Storm-Petrel (*Oceanodroma leucorhoa*)
off Santa Barbara, California, 21 July 2007.
Dark-rumped Leach's Storm-Petrels are vexing from the viewpoints of both taxonomy and field identification (see Howell et al. 2010; *North American Birds* 63:540–549). These birds breed on islands off Mexico's Baja California peninsula and range north in late summer and fall to waters off southern California. Birds like this one with variable whitish smudges on the sides of the rump are particularly frequent in the population breeding on Islas Los Coronados off Tijuana.

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NOTES

Front cover photo by © Richard A. Wagner: Male (rear) and female Short-tailed Hawks (*Buteo brachyurus*) at their nest in the Chiricahua Mountains, Arizona, 2007. Although the diet of the pair was mostly small birds, it also included Cliff Chipmunks (*Eutamias dorsalis*), seen here, and lizards.

Back cover "Featured Photos" (top) by © Eric Kallen of San Diego, California: Snow Bunting (*Plectrophenax nivalis*), Ocean Beach, San Diego County, California, 2 May 2009 and (bottom) by © Brian Sullivan of Carmel Valley, California: same individual, Point Pinos, Monterey County, California, 26 May 2009.

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 include 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 Kathy Molina, Section of Ornithology, Natural History Museum of Los Angeles County, 900 Exposition Blvd., Los Angeles, CA 90007. For matters of style consult the Suggestions to Contributors to *Western Birds* (at www.westernfieldornithologists.org/docs/journal_guidelines.doc).

WESTERN BIRDS

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SHORT-TAILED HAWKS NESTING IN THE SKY ISLANDS OF THE SOUTHWEST

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ABSTRACT: Credible sightings of the Short-tailed Hawk (*Buteo brachyurus*) in southern Arizona, Sonora, and southwestern Chihuahua commenced in the 1980s and since then have become increasingly numerous throughout the sky islands of Arizona, New Mexico, Sonora, and Chihuahua. In this report we summarize previously unpublished sightings and breeding records from this region and compare aspects of the species' breeding biology in Arizona and Florida. In 2007 we intensively monitored one successful nest in the Chiricahua Mountains of Arizona—the first fully confirmed nest in the western U.S.—and in 2009 we documented, but did not monitor, another active nest in the Sierra la Madera of Sonora—the first nest known in northwestern Mexico. Like other described nests of the species, both nests were placed near the tops of tall live trees, fully exposed to the sky. Both had broods of two nestlings, the maximum brood size known for the species. Both young fledged from the 2007 nest in the Chiricahuas, matching the productivity of three other probable nestings in the same locality that were documented by sightings of pairs of juveniles in 2003, 2006, and 2010. Together with sightings of single juveniles in 2001, 2004, 2005, 2008, and 2009, these records suggest a very high level of local breeding success. The diet at the 2007 nest was predominantly small birds (83% of 137 identified prey), similar to the diet of the species elsewhere. The majority of Short-tailed Hawks observed so far in the sky islands, including all individuals we have seen (with the exception of one bird in northwestern Chihuahua), have been of the light morph.

The sky islands of southeastern Arizona, southwestern New Mexico, and northern Chihuahua and Sonora are an array of towering isolated peaks rising from the desert and grasslands between the Mogollon Rim and the Sierra

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Madre Occidental (Warshall 1995). The high elevations of these mountains are vegetated with oak woodlands and coniferous forests that support highly diverse communities of birds, including many species at the northern limits of their ranges (Phillips et al. 1964). One of the less familiar of these is the recently arrived Short-tailed Hawk (*Buteo brachyurus*). Before the 1940s, this species was recorded only from tropical and subtropical regions of South and Central America north to southeastern Mexico and Florida (Brown and Amadon 1968, Williams et al. 2007). The Short-tailed Hawk is an unusual *Buteo* in that it feeds primarily on small birds, but it resembles many other species of this genus in having both dark and light color morphs (Miller and Meyer 2002). Observations of the last decade indicate that this species now breeds regularly in the sky islands, though in small numbers, and in this paper we summarize aspects of its recent penetration of the region and its breeding biology under conditions that are ecologically quite different from those of the only other region where it has been closely studied, the Florida peninsula.

REVIEW OF RECENT SIGHTINGS AND EXPANSION OF KNOWN RANGE

In early years of the 20th century, the Mexican range of the Short-tailed Hawk was not known to extend north or west of southern coastal Tamaulipas (Williams et al. 2007). Since then, however, the boundary of the known range has progressed in both these directions, reaching Michoacán by 1941 (Blake and Hanson 1942) and Colima by 1958 (Schaldach 1963). By the mid 1960s, Alden (1969) found Short-tailed Hawks to be common in parts of Nayarit and Sinaloa.

By the time another 30 years had elapsed, Howell and Webb (1995) mapped southern Sonora and southwestern Chihuahua as part of the species' range. Howell (1999:322) noted the Short-tailed Hawk as occurring regularly in all regions of Mexico except Baja California, the region around Monterrey, and northern Sonora and Chihuahua. Erickson and Howell (2001) likewise did not include the species in the avifauna of Baja California. Williams et al. (2007) documented its occurrence yet farther north in Mexico and in Texas, New Mexico, and Arizona. Here we add to the published records for the northwestern region, which Howell (1999) excluded from the known range, and also expand the known records for Sinaloa.

Records in Sinaloa

Records of the Short-tailed Hawk in Sinaloa date from Crossin's observations of a pair in 1964 at Rancho Carrizo in pine–oak forest at an elevation of 1830 m (Hubbard and Crossin 1974) and Alden's sightings from the mid 1960s (Alden 1969). Additional records are plotted in Figure 1. A Short-tailed Hawk was observed by Alan Craig (pers. comm.), Pierre Devillers, Jean Devillers-Terschuren, and Xenia de Heering on 19 August 1968 north of Esquinapa, about 30 km from Mazatlán. In northern Sinaloa, Moore-Craig observed a light-morph adult at El Fuerte on 24 April 1998—a location outside the range given by Howell (1999).

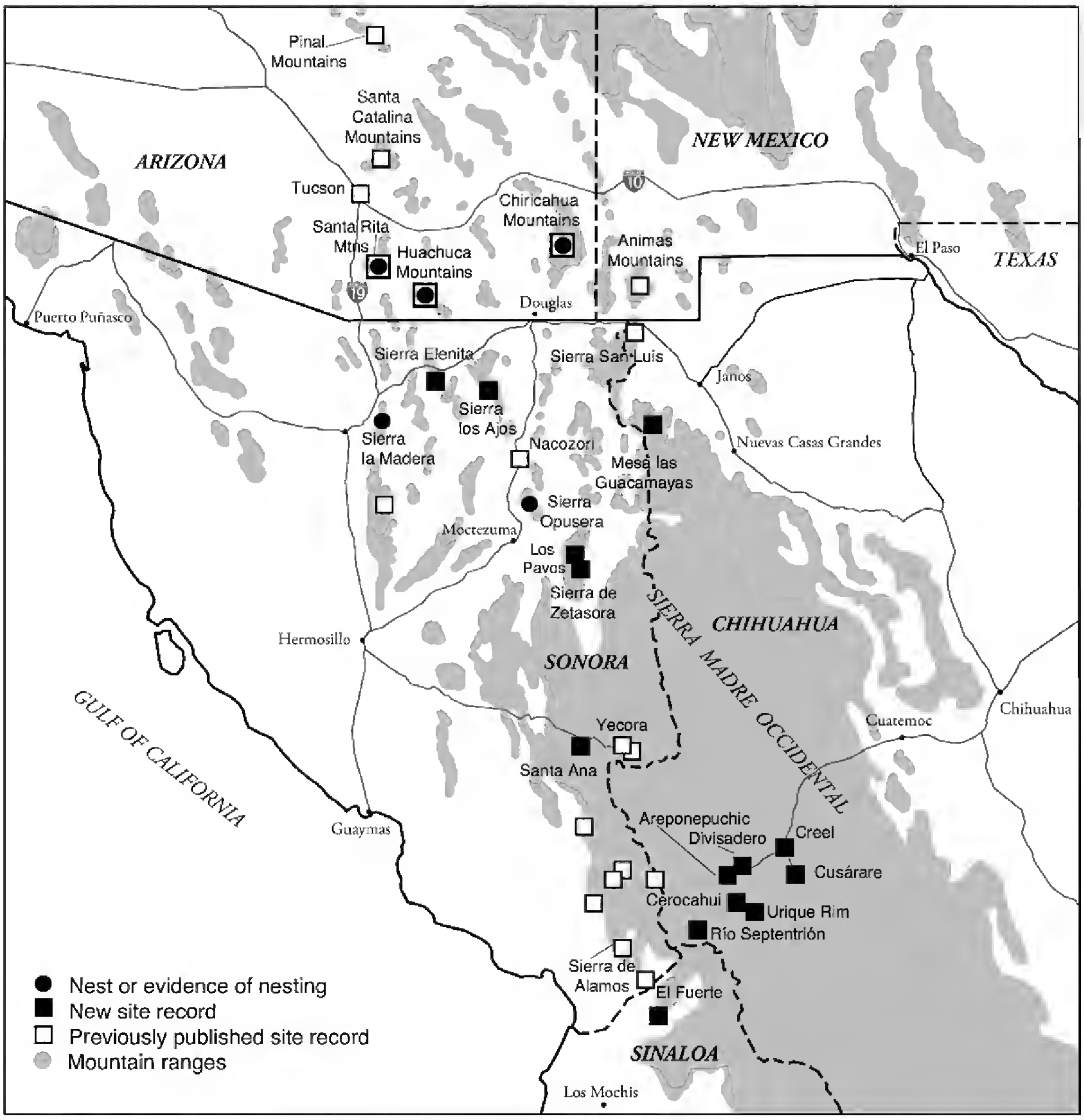

Figure 1. Locations of records of the Short-tailed Hawk in the southwestern United States and northwestern Mexico.

Status in Chihuahua

Williams et al. (2007) called attention to the dearth of published records of the Short-tailed Hawk in Chihuahua. There are credible unpublished records for Chihuahua, however, beginning in the mid 1980s, and since that time, researchers and guides of birding tours have reported (Table 1, Figure 1) that the Short-tailed Hawk is a rare but regular resident of the mountains of southwestern Chihuahua, especially in Barrancas del Cobre (Copper Canyon). In their landmark *Field Guide to the Birds of Mexico and Northern Central America*, Howell and Webb (1995) mapped the bird's presence in this region, on the basis of unspecified information that may have included some of these reports. Many of these sightings may have remained unpublished largely because they fell within the range mapped by Howell and Webb. Most of the Chihuahua sightings have involved light-morph birds.

Especially noteworthy in the context of range expansion are the 1997 sightings by N. F. R. Snyder, K. Concagh, and R. Otto of a single dark-morph

Table 1 Previously Unpublished Records of the Short-tailed Hawk in Chihuahua, Mexico

Date	Location	Sighting	Observers
30 May 1986	Urique Rim near Cerocahui	1 light-morph adult	R. Taylor
2 Apr 1987	Divisadero	1 dark-morph adult	R. Taylor
10 Oct 1989	Cerocahui	1 light-morph adult	R. Taylor
18 Apr 1990	Cerocahui	1 light-morph adult	R. Taylor
22 Apr 1991	Cusarare Falls near Creel	1 light-morph adult	R. Taylor
29 Mar 1995	Urique Rim near Cerocahui	1 light-morph adult	N. Moore-Craig, R. Taylor
27 Jun 1995	Urique Rim near Cerocahui	1 light-morph adult	R. Taylor
26–30 Jul 1997	Mesa las Guacamayas	1 dark-morph bird	N. Snyder, R. Otto, K. Concagh
25 Apr 1998	Cerocahui	1 light-morph adult	N. Moore-Craig
14 Mar 2001	Areponapuchic	1 light-morph adult	N. Moore-Craig
15 Aug 2004	Divisadero	2 light-morph adults	R. Taylor
14 Aug 2005	Rio Septentrion above reservoir, near Sinaloa	1 light-morph adult	R. Taylor
16 Aug 2007	Divisadero	1 light-morph adult	R. Taylor

individual near the top of Mesa las Guacamayas, a 2750-m, pine-forested location near the borders of both Sonora and New Mexico. Mesa las Guacamayas is the northernmost rim of the Sierra Madre Occidental. Visible from the Chiricahua Mountains in Arizona and the Animas Mountains of New Mexico, it is also the site of the northernmost known nesting colony of the Thick-billed Parrot (*Rhynchopsitta pachyrhyncha*). This locality is only about 50 km south of the Sierra San Luis, where J. P. DeLong observed a Short-tailed Hawk in 2005 (Williams et al. 2007; Figure 1). The two sites are connected by a corridor of hills and ridges.

Status in Sonora

Van Rossem (1945) and Marshall (1957) did not encounter the Short-tailed Hawk in Sonora. This result, together with sightings at 11 localities between 1982 and 1995 reported by Russell and Monson (1998), suggests that the Short-tailed Hawk's expansion into the state has been relatively recent, as was also suggested by Russell and Monson. Seven localities noted by Russell and Monson were in southeastern Sonora, two were near Yécora, and one was as far north as Nacozari de García. These sites are plotted in Figure 1 but are omitted from Table 2, which presents more recent Sonora records. Interestingly, 9 of the 13 birds reported by Russell and Monson were of the dark morph, whereas almost all other records for Sonora have involved light-morph birds. As most of the dark-morph birds were reported from different locations, they may not have included any individuals sighted repeatedly.

More recently, Flesch (2008a, b) has observed light-morph individuals in five mountain ranges in Sonora (Figure 1, Table 2): the Sierra Elenita, Sierra los Ajos, Sierra Opusera, Sierra Zetasora (north of Sahuaripa), and Sierra la Madera (east of Magdalena de Kino; site of the nest described below). His

Table 2 Recent Records, Mostly Unpublished, of the Short-tailed Hawk in Sonora, Mexico

Date	Location	Sighting	Observers
22 Dec 1998	Alamos	1 light-morph bird	D. Krueper, D. MacKay, Alamos CBC
20 Dec 1999	Yécora	2 birds	Yécora CBC
21 Dec 1999	Santa Ana, 25 km from Yécora	1 dark-morph bird	D. Krueper
21–23 Dec 2003	Sierra de Alamos	1 dark-morph bird	R. Taylor, Alamos CBC
31 Mar 2004	Los Pavos, Northern Jaguar Preserve	1 light-morph adult	N. Snyder
22 Dec 2004	Yécora	1 bird	Yécora CBC
28 Dec 2004	Alamos	1 bird	Alamos CBC
15 Mar 2006	Sierra de Alamos	1 light-morph adult	R. Wright
10 Jul 2006	Sierra Elenita (Cananea)	1 light-morph adult	A. Flesch
12 Jul 2006	Sierra los Ajos	1 light-morph adult	A. Flesch
10 Sep 2007	Sierra Opusera	2 light-morph adults, 1 juvenile	A. Flesch
11 Jul 2008	Sierra Zetasora, Northern Jaguar Preserve	1 light-morph adult	A. Flesch, M. Ali
19–21 Jun 2009	Sierra la Madera	1 light-morph adult, 2 nestlings	A. Flesch
8–9 Jul 2009	Sierra Opusera (same location as 10 Sep 2007)	2 light-morph adults	A. Flesch
11–12 Jul 2009	Sierra Opusera (>7 km from preceding sighting)	2 light-morph adults	A. Flesch

efforts and continuing surveys of the sky islands of northern Sonora (Flesch et al. 2009) indicate that Short-tailed Hawks occur at low densities in many of the ranges of northern Sonora that support pines (Figure 2).

Additionally, Short-tailed Hawks have been recorded on Christmas Bird Counts near Yécora (20 December 1999 and 22 December 2004) and Alamos (22 December 1998, 21 December 2003, and 28 December 2004; www.audubon.org/bird/cbc) and by other observers in these general locations (Table 2).

Status in New Mexico

Records for New Mexico are limited to a single light-morph bird seen on 24 May and 28 June 2005 high in the Animas Mountains (Williams et al. 2007). The scarcity of records in this state may be due mainly to a scarcity of high mountains in southwestern New Mexico and to limited access to the highest range in this region, the Animas Mountains. Surveys at high elevations in more northerly ranges that support pines, such as the Burro Mountains, the Black Range, and the Gila Wilderness, may provide additional records in the future.

Status in Arizona

The earliest accepted record of the Short-tailed Hawk in Arizona was of an adult seen by John Arvin near Barfoot Junction in the Chiricahua

Figure 2. Short-tailed Hawk breeding habitat in northern Sonora, like that in Arizona, appears to be limited to relatively high elevations with at least some pine forest.

Photo by A. D. Flesch

Mountains on 7 August 1985 (Rosenberg et al. 2007)—a location close to the nest of 2007 that we describe in this paper. The second Arizona record was of an adult in Sawmill Canyon of the Huachuca Mountains, found by Jon Dunn on 21 July 1988 (Rosenberg 2001). The first photographic documentation of the Short-tailed Hawk in Arizona was obtained by Rich Hoyer and Gary Rosenberg in Miller Canyon of the Huachuca Mountains in 1999 (Rosenberg 2001).

The Arizona Bird Committee (ABC) has reviewed 31 recent records of Short-tailed Hawks and accepted 25 (Rosenberg et al. 2007, G. Rosenberg pers. comm.): 12 from the Chiricahua Mountains, 7 from the Huachuca Mountains, 1 from the Pinal Mountains, 2 from Madera Canyon of the Santa Rita Mountains, 1 from Mt. Lemmon in the Santa Catalina Mountains, and 2 from the city of Tucson, where a bird wintered in 2008–2009 and 2009–2010 (Figure 1). Our summary of Arizona sightings excludes all reports not accepted by the ABC but includes some credible sightings that were never submitted to the committee (Appendix).

ABC records indicate "an almost annual presence in the Barfoot Park region of the Chiricahua Mountains since 1999" (Rosenberg et al. 2007). We found a successful nest of the species in this location in 2007, and birds have continued to be present there in spring and summer through 2010 (Appendix).

To date, only three of the many dozens of sightings in Arizona (representing an unknown total number of individuals) have involved the dark morph. Likewise in Chihuahua and Sonora, nearly all sightings other than those reported by Russell and Monson (1998) have involved the light morph. The single individual seen in New Mexico by Williams et al. (2007) was also a light-morph bird. The recent preponderance of the light morph in the sky islands matches the recent situation in northeastern Mexico and Texas (see Williams et al. 2007, Lockwood 2001) but contrasts with the heavy and long-standing preponderance of the dark morph in Florida (see Miller and Meyer 2002, Meyer 2005).

EVIDENCE OF BREEDING IN ARIZONA AND SONORA

Evidence of breeding (Tables 3 and 4) is provided by (1) presence of paired birds during the breeding season, (2) summer sightings of juveniles (recognizable in the light morph by their buffy underparts; Figure 3), and (3) presence of active nests. Of these categories, the last two provide the strongest evidence of reproduction. No juvenal-plumaged birds have been well documented at high elevations of the sky islands prior to July, suggesting that July is the normal month for the start of fledging. Because the juvenal plumage of the Short-tailed Hawk is normally replaced by the bird's second summer (Ogden 1988, Miller and Meyer 2002, Wheeler 2003), and because the period of dependency of fledglings on adults in home territories is lengthy (sometimes exceeding 2 months), juveniles detected during summer are likely to have originated nearby. By fall, sightings of juveniles may more likely include some birds originating elsewhere.

From 19 to 21 June 2009, Flesch and Sky Jacobs observed a nest of Short-tailed Hawks at 1920 m in open pine–oak woodland in the Sierra la Madera of Sonora (east of Magdalena de Kino), the first reported nest for the state. The nest was situated at the very top of a Chihuahua Pine (*Pinus leiophylla*) and contained two chicks. Two years earlier, Flesch observed a pair together with a juvenile on 10 September in the Sierra Opusera, suggesting another nesting, and on 8 and 9 July 2009, he again found a pair behaving agitatedly at this latter location. Several days later he found another pair in the same mountain range but at least 7 km farther south, suggesting two occupied territories in 2009.

Probable nesting in the Huachuca Mountains of Arizona can be inferred from the presence of a pair near Miller Peak in 1999, a pair and juvenile in Carr and Miller canyons from 18 August to 9 September 2001 (*N. Am. Birds* 56:84, 2002), and two territorial birds near Carr Peak on 20 August 2006 (W. Walraven pers. comm.), but no nest has yet been found in that

Table 3 Evidence of Breeding of the Short-tailed Hawk in Sonora, Mexico[a]

Date	Location	Elevation	Sighting
10 Sep 2007	Sierra Opusera	2000 m	2 adults with 1 juvenile
19–21 Jun 2009	Sierra la Madera	~2000 m	1 adult at nest with 2 nestlings
8–9 Jul 2009	Sierra Opusera	2000 m	agitated pair of adults
11–12 Jul 2009	Sierra Opusera (>7 km from preceding sighting)		pair of adults

[a] All observations by A. D. Flesch.

Table 4 Evidence of Breeding of the Short-tailed Hawk in Arizona

Date	Observation	Observers or reference
Huachuca Mountains, Cochise County (elevation 2000–2500 m)		
26 Jul–4 Sep 1999	pair in Miller Canyon	Rosenberg et al. 2007
5 Aug–3 Sep 2001	1 adult with 1 juvenile in Carr Canyon	Rosenberg et al. 2007
20 Aug 2006	2 territorial birds near Carr Peak	W. Walraven
Santa Rita Mountains, Santa Cruz County (elevation 2150 m)		
13 Sep 2008	1 "fresh" juvenile at Josephine Saddle	NAB 63:132, 2009; www.azfo.org
Barfoot Park area, Chiricahua Mountains, Cochise County (elevation 2400–2700 m)		
5 Aug–3 Sep 2001	1 adult with 1 juvenile	Rosenberg et al. 2007
31 Mar–Aug 2002	1 pair	Rosenberg et al. 2007
19 Jul 2003	1 adult with 1 recent fledgling	NAB 57:528, 2003
25 Jul 2003	2 adults with 1 begging juvenile	NAB 57:528, 2003
5 Aug 2003	1 adult with 2 juveniles	NAB 57:528, 2003
7–16 Aug 2003	2 adults with 2 juveniles	Rosenberg et al. 2007
1 May–3 Jul 2004	1 pair	Rosenberg et al. 2007
5 Sep 2004	1 adult feeding 1 juvenile	NAB 59:125–126, 2005
11 Aug 2005	1 juvenile	NAB 60:116, 2006
15 Aug 2005	1 juvenile	N. Moore-Craig, J. Ruth
Summer 2006	1 pair	NAB 60:562, 2006
7 Aug 2006	3 birds, at least 1 adult and 1 juvenile	R. E. Webster
9–18 Aug 2006	2 juveniles	G. Rosenberg
25 May–4 Jul 2007	2 adults, 2 nestlings at nest	This paper
8–11 Aug 2008	1 juvenile	NAB 63:132, 2009
25 Aug 2009	1 adult with 1 juvenile	N. Moore-Craig, N. Snyder
15–18 Jul 2010	2 adults with 2 juveniles	N. and H. Snyder, N. Moore-Craig

range. A 13 September 2008 sighting and photograph by Dave Stejskal of a fresh juvenile in Madera Canyon suggests that the species may also have begun breeding in the Santa Rita Mountains. However, this record is from sufficiently late in the summer that the juvenile involved might have fledged from some other location.

In the Chiricahuas, indications of nesting date back to 2001, when an adult and juvenile were observed at Barfoot Park from 21 to 25 August (*N. Am. Birds* 56:84, 2002). Additional sightings of juveniles, some giving begging vocalizations, suggested successful nestings at the same location each year from 2003 through 2010, whereas observations of an adult pair without any accompanying juveniles in 2002 may have represented an unsuccessful nesting attempt. An active nest we found and studied in an Arizona Pine (*Pinus arizonica*) in the Barfoot region in 2007 successfully fledged two young in early July (see below).

BREEDING BIOLOGY OF THE SHORT-TAILED HAWK IN ARIZONA

On 25 May 2007 H. A. and N. F. R. Snyder found an active Short-tailed Hawk nest at approximately 2600 m adjacent to the Barfoot Park region

Figure 3. Nestling Short-tailed Hawks showing developing feather tracts at a nest in the Chiricahua Mountains. After fledging, light-morph juveniles are most easily distinguished from adults by their largely buff ventral coloration.

Photo by Richard A. Wagner

of the Chiricahua Mountains. This nest was first suspected from repeated, distant sightings of adults dropping from the sky into what proved to be the nest canyon. The actual site was found by 6 days of progressively closer ground-tracking of aerial adults carrying prey and by homing in on their vocalizations. The site represents the first documented nest of the species for the western U.S. but was surely not the first nesting in the region. Chris Benesh (*fide* M. Stevenson) obtained distant photographs on 20 July 2002 of a Short-tailed Hawk perched atop what appears to be the nest tree of 2007, which together with sightings of nearby juveniles in 2001, 2003, 2004, 2005, and 2006, raises the possibility that the same nest had been active for at least 6 years prior to 2007. However, this nest was not active in 2008, 2009, or 2010 (although nesting evidently took place nearby in these years), and Meyer (2005) has reported that in Florida Short-tailed Hawks rarely reuse nests from year to year.

The 2007 nest was constructed of coarse twigs with a few green sprigs and rested about 30 m from the ground near the very top of an Arizona Pine on a steep northeast-facing slope (Figure 4). It contained two downy nestlings, estimated at about 1 week of age on the day of discovery. One adult, presumably the female, remained at the nest without flushing or giving alarm calls at the time of discovery.

The nest itself was partially visible from one location on the ground upslope from the nest tree and approximately level with the nest. We began

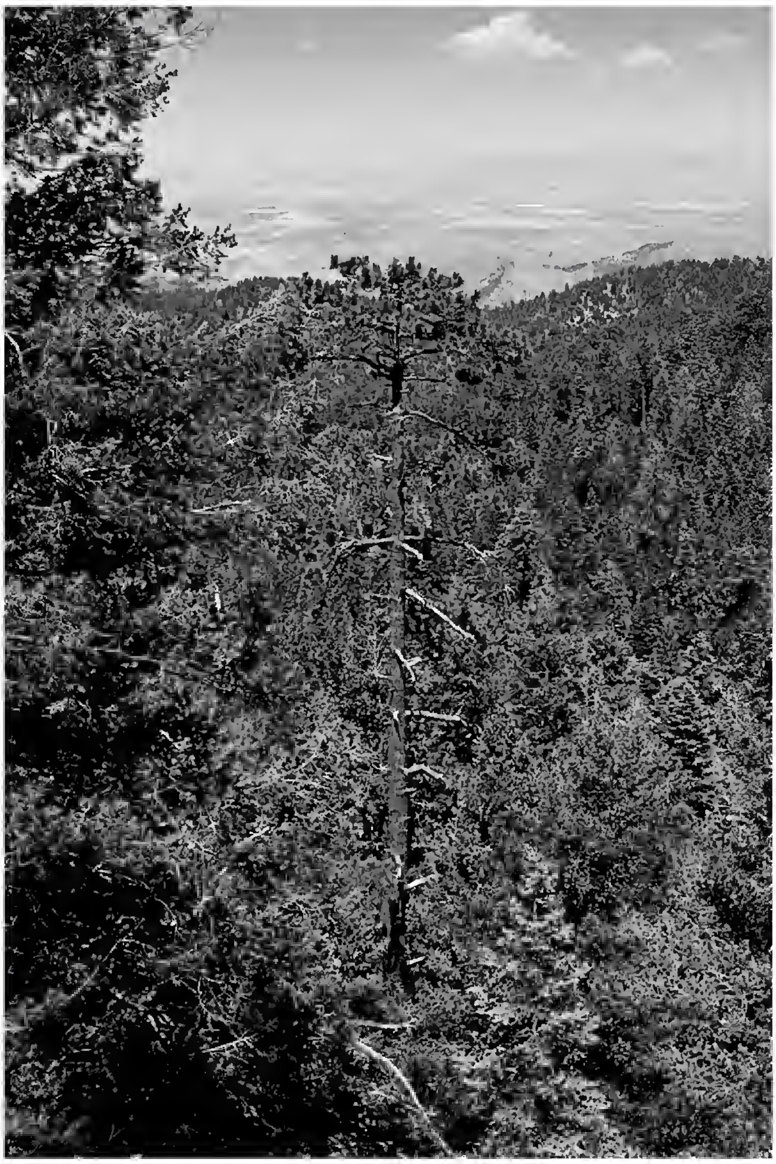

Figure 4. The first nest of the Short-tailed Hawk found in the western United States was at the top of this Arizona Pine (*Pinus arizonica*) at about 2600 m elevation in the Chiricahua Mountains, Cochise Co., Arizona, in 2007.

Photo by N. F. R. Snyder

observations of nesting activities from a blind at this site on 28 May. By 13 June, we had erected a tower blind that was higher and closer to the nest and was embedded in foliage of a live Douglas-fir (*Pseudotsuga menziesii*). This blind gave a better view of the nest from about 35 m, and after this date we observed mostly from this location.

The adults were not obviously disturbed by observers or the blinds and appeared to be behaving normally throughout the period of intensive observations, which ended when the chicks were flying with some competence. Altogether, we observed the nest from 4 to 12 hr per day on 29 days from 28 May to 4 July 2007. Observation periods were uninterrupted, exceeded 8 hr on all but 5 days, and averaged 8.8 hr per day. The observers were N. F. R. Snyder, Wagner, Rowlett, Moore-Craig, and H. A. Snyder. No attempt was made to climb the nest tree at any time, and no observation periods included periods of construction of the blinds.

The two adults at the nest were both of the light morph and were quite similar in appearance, but they could be reliably differentiated by an extensive gap from damage to the feathers in the outermost secondaries of the left wing of the presumed male (Figure 5). The presumed female lacked this conspicuous damage (Figure 6). Despite his disrupted wing, the male appeared highly proficient at capturing prey and accounted for most and perhaps all prey recorded during our observations.

We identified prey by direct observation through a scope and through photographs of prey in the bill or talons of adults landing at the nest. In most cases it was possible to determine if the prey was a lizard, mammal, or bird, and all identified prey fell into these categories, but we could not identify many of the birds to species because they arrived nearly fully plucked and headless. All prey not identifiable as lizards, mammals, or birds were items that were obscured from our view because the female dismembered them behind obstructions. We doubt these represented an atypical sample of prey.

Diet and Provisioning Rates

We observed 145 prey at the nest during the 29 days of observation. Of these, 137 (95%) were identified as vertebrates (bird, mammal, or reptile), and 8 were unidentified. Of the identified prey 114 (83%) were birds, 16 (12%) were mammals (mostly—perhaps all—Cliff Chipmunks, *Eutamias dorsalis*), and 7 (5%) were lizards (mostly—perhaps all—Yarrow's Spiny Lizard, *Sceloporus jarrovi*). Overall, there were 0.55 prey per hour of observation during 255.3 hr of study, but before 07:30 and after 18:00 MST observation periods were few. Rates of prey delivery varied greatly by time of day, peaked in the mid-morning (when the average rate approached 0.9 prey per hour), and declined steadily through the afternoon to just over 0.3 prey per hour in late afternoon (Figure 7). We recorded as many as 9 or 10 prey on some days, and young appeared to be well fed throughout, except on one rainy, foggy morning (11 June) when no prey was delivered. Average daily rates of provisioning showed an irregular peak during weeks 2–5 of observations (when young were approximately 3–6 weeks old), potentially paralleling the nestlings' need for food (Figure 8).

Avian prey ranged in size from the Mexican Chickadee (*Poecile sclateri*) to Steller's Jay (*Cyanocitta stelleri*) and American Kestrel (*Falco sparverius*), but most were the size of juncos or tanagers, and indeed often were Yellow-eyed Juncos (*Junco phaeonotus*) or Western Tanagers (*Piranga ludoviciana*). Prey diversity was much lower among the mammals and lizards, with only chipmunks and *Sceloporus* lizards clearly identified (see front cover).

We witnessed few attempts at capture of prey, but virtually all seen followed the usual pattern known for the species, of rapid dives from high in the sky to the surfaces of vegetation. Birds observed hunting hung consistently over slopes above 2000 m elevation, taking advantage of rising air masses, but they hunted over both forested and open habitats, and the variety of prey delivered to the nest suggested captures in both forested and open areas. Hunting adults commonly soared at an altitude above the ground that was three or more times higher than the altitude at which other species of *Buteo* and vultures were soaring. Only once did we seen an apparent attempt at

Figure 5. Male Short-tailed Hawk delivering a small bird to the nest in the Chiricahua Mountains in 2007. Damaged and displaced outer secondaries on the left wing allowed reliable identification of this individual. The wing damage was clearly more than just feathers missing from molt, and observations and photos as late as summer 2010 indicate that an adult bird with apparently the same pattern of wing damage still occupies the same territory.

Photo by N. F. R. Snyder

Figure 6. Female Short-tailed Hawk landing at nest to take over prey brought by her mate. Only the female ripped apart prey for the nestlings.

Photo by N. F. R. Snyder

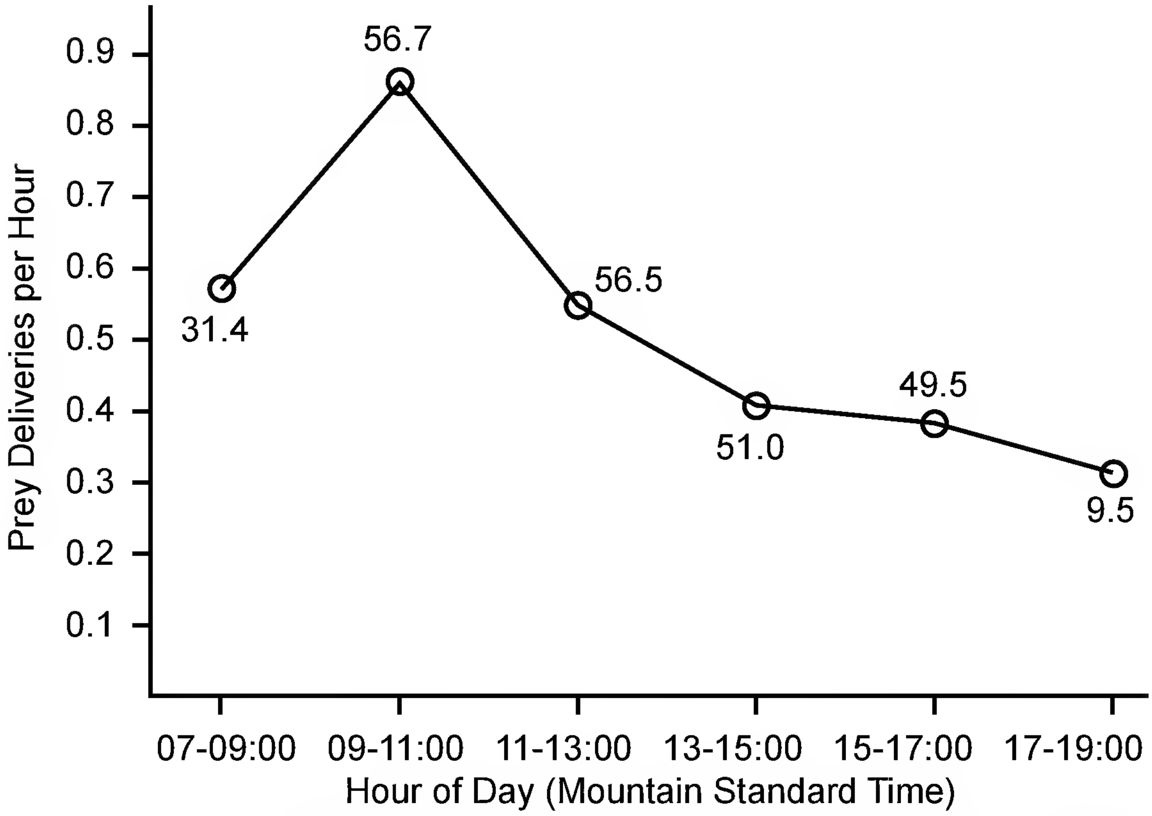

Figure 7. Rate of prey delivery by time of day during the nestling period, 28 May–4 July 2007, by the Short-tailed Hawk in the Chiricahua Mountains. Data points represent total prey delivered divided by total hours of observation during the hours of the day (MST) in question. Numbers next to data points give hours of observation.

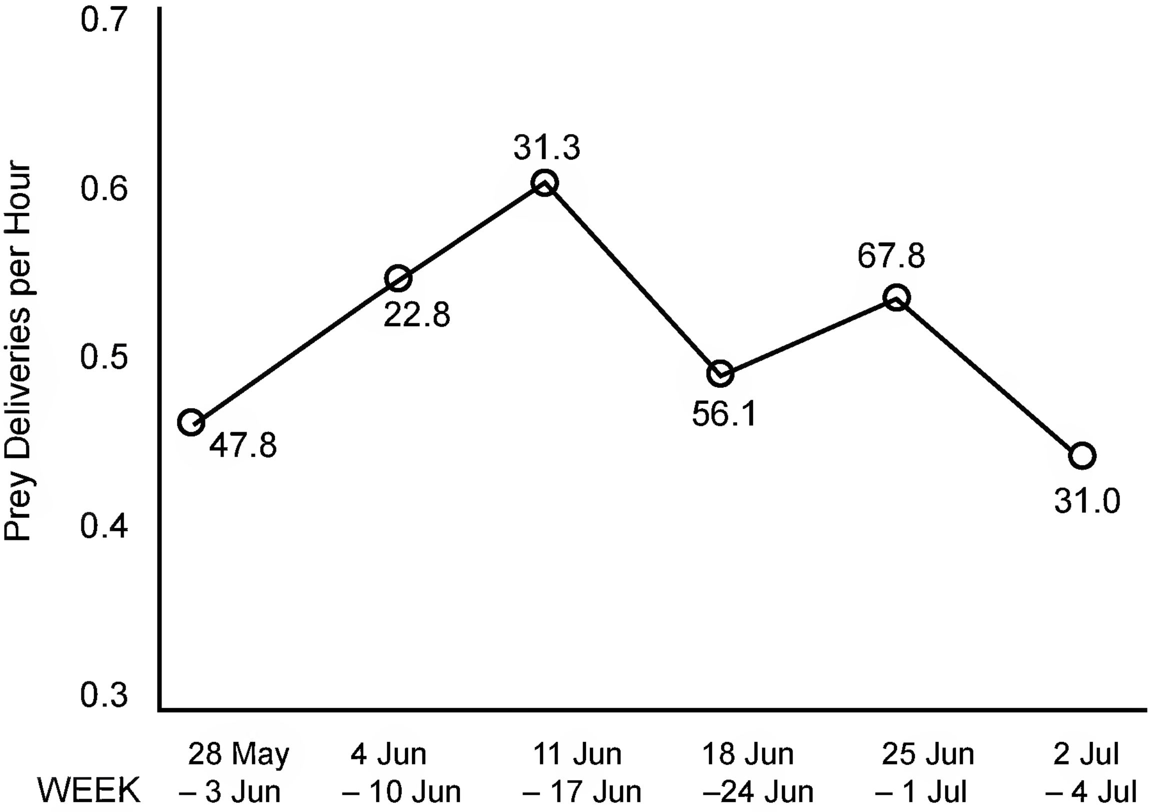

Figure 8. Rate of prey delivery by week during the nestling period, 28 May–4 July 2007, by the Short-tailed Hawk in the Chiricahua Mountains. Data points represent total prey deliveries divided by total hours of observation for the weeks in question. Numbers next to data points give hours of observation.

prey capture that was initiated from a perch, when an adult perched in the top of a live conifer on a cliff made a near-vertical dive and crashed into the top of another conifer lower on the cliff perhaps 100 m distant.

Roles of the Sexes at the Nest

The division of labor between adults resembled that of many other raptors during the early nestling period, with the female remaining in attendance at the nest or nearby, and with the male off out of sight, presumably foraging, for the great majority of the day (see Newton 1979). Transfers of prey from male to female sometimes took place away from the nest, sometimes in mid air, but the male also often brought prey directly to the nest, leaving it there without attempting to feed the chicks. If the female was already at the nest, she immediately took the prey delivered by the male and began ripping off pieces for the chicks (Figure 9). If the female was perched nearby at the time of the male's arrival, she usually followed him to the nest immediately (Figure 6) and began feeding chicks as the male departed the nest area.

In the latter stages of the nestling period, however, the division of labor between the sexes became rather different from that of many raptors, in that the female continued to remain at the nest or perched near the nest vicinity nearly throughout our observations, though she was often only detectable by her intermittent vocalizations, as she commonly perched on a snag uphill from the nest and out of sight from the blind. Her two primary roles at this stage appeared to be guarding the nest and continuing to rip apart prey for the nestlings.

Figure 9. Female Short-tailed Hawk presenting fragments of a *Sceloporus* lizard to her nestlings in the Chiricahua Mountains.

Photo by Richard A. Wagner

In many species of raptors, the female shifts to hunting nearly full time in the late stages of the nestling period when young no longer need brooding. But at the nest we studied, despite its relatively large brood, this shift clearly did not occur. While some of the prey deliveries to the nest were made by the female, only occasionally did such deliveries occur without evidence, vocal or visual, of a preceding exchange of prey from the male. Even in these cases, the prey may have been caught by the male and simply transferred to the female too far from the nest for us to detect it, or it may have been cached earlier by the female. At most the female captured very few prey for her nestlings during the nestling period and apparently sustained herself largely, if not completely, on portions of the prey brought in by the male.

Although prey were sometimes left temporarily uneaten in the nest throughout the nestling period, mostly when chicks appeared sated by food, only in the last week or so of observations did chicks begin to rip apart prey on their own. Initially, dismemberment of prey by nestlings was considerably slower and clumsier than that by the adult female, but the chicks improved rapidly, and by the time of fledging were consistently feeding themselves from prey left at the nest by the adults.

Nest Building and Other Activities

Adults rarely perched anywhere but on the nest itself when at rest in the nest tree, and despite potential use of the nest over several years, the nest was not a notably large or thick structure. Only once did we see an adult transporting nesting material to the nest, a delivery by the female of a green sprig of Douglas-fir on 6 June. However, we also noted fresh green material in the nest's bottom on two other occasions, apparently delivered prior to the start of observations. The low observed frequency of nest-building trips by these Short-tailed Hawks contrasts with the frequent collection of nesting material, especially greenery, seen during the nestling phase in some other species of raptors (e.g., Snyder 1975, Newton 1979, Dykstra et al. 2009).

On several occasions the female adult was seen digging or "excavating" in the nest litter with thrusts of her bill, a behavior of unclear function also seen in many other accipitrids (Schnell 1958, Newton 1979). It may involve a reaction to nest-inhabiting arthropods.

The adults' activity levels appeared to be generally low in the early morning and late afternoon, very likely due at least in part to relatively calm conditions at these times of day. The Short-tailed Hawk's hunting behavior, involving long periods of kiting over ridges and other topographic features, appears to be most efficient when winds are moderately strong, and the daily fluctuations in prey-delivery rates may relate most importantly to wind conditions. The apparent restriction of the Short-tailed Hawk during the breeding season to very high elevations in the sky islands may likewise be largely a reflection of wind conditions.

Both the adult female and nestlings, once they were several weeks old, frequently gave begging calls as the adult male approached the nest with prey, but such vocalizations, especially by the nestlings, were not limited to arrivals of the male. Over a 2-day period (30 June–1 July) the young gave seemingly endless begging calls whenever distant airplanes that were fighting a forest fire several kilometers to the southeast appeared above the horizon. The nestlings apparently were not differentiating distant planes from the male parent. Begging calls of the adult female and nestlings were often imitated by Steller's Jays resident near the nest, but the imitations were generally weak in volume and usually intermixed with other calls typical of the jays. The hawks showed no clear responses to the jays' imitations of their calls.

Fledging Behavior

As in many other accipitrids, fledging of the Short-tailed Hawks we studied was a gradual process, with youngsters first moving about branches surrounding the nest in short flapping hops from branch to branch. Feedings at this stage were still confined to the nest itself, and chicks were beginning to participate in the ripping apart of prey. One young made what appeared to be an accidental foray from the nest in the midafternoon of 27 June—a journey that entailed the bird desperately hanging upside down from a small branch and finally coming to rest on a thicker branch about 3 m under the nest, where it spent the night. The following day, while its sibling was fed several times at the nest by the female, the wayward chick worked cautiously on foot back up among branches under the nest, finally reaching the nest again at 09:48 where, evidently eager for food, it aggressively usurped prey from the adult female.

In the days following, chicks made progressively bolder short flights from branch to branch but still fed at the nest, increasingly without assistance from the adult female. Finally, on 4 July, a very windy day, we observed several uncertain flights of both nestlings up into the sky from the very top of the nest tree, returning back down to the treetop after a few seconds (Figures 10 and 11). Perhaps this day should be considered the day of true

Figure 10. Nestling Short-tailed Hawk in the Chiricahua Mountains about to launch into the unknown on 4 July 2007.

Photo by N. F. R. Snyder

Figure 11. A moment of panic, as a young Short-tailed Hawk fledges in the Chiricahua Mountains on 4 July 2007.

Photo by N. F. R. Snyder

fledging from this nest, although the young had not yet landed in any tree other than the nest tree.

Adults continued to provision the young after fledging, as observed in irregular checks of the nest area in succeeding weeks. On 8 July, the first day of observations after 4 July, Moore-Craig watched an adult fly with prey to a snag occupied by one of the young (perhaps 100 m from the nest tree) and leave the prey on a lower branch of the snag. The fledgling climbed down about 2 m to the prey and consumed it. Again on 17 July, H. A. Snyder observed both fledglings high in the sky over the nest area, followed by one of the two diving down to the nest. On 21 July Moore-Craig and N. F. R. Snyder observed both fledglings high in the sky near Barfoot Peak, where one of them subsequently landed. Then on 6 August, a rainy, foggy day, H. A. Snyder watched a begging fledgling pursuing the adult male, still with damaged left secondaries, high over the Onion Saddle Road more than 2 km from the nest. On 7 August 2006, Richard Webster (pers. comm.) observed a mid-air prey exchange between an adult and fledgling in the same general area.

The only instances we have observed of a fledgling foraging were on 30 July 2010, when H. A. Snyder saw a juvenile high over the Barfoot nesting territory twice making a short mid-air dive to capture and eat out of its talons what appeared to be a large flying insect, possibly a dragonfly. Sightings of adults feeding juveniles as late as early September (*N. Am. Birds* 59:125–126, 2005) suggest that dependency may sometimes last for 2 months or longer beyond fledging, a period of dependency comparable to that of other species of *Buteo* and bird-feeding raptors (see Snyder and

Wiley 1976, Newton 1979). However, the report of Salvador and Silva (2009) documenting a juvenile Short-tailed Hawk in Brazil still associated with parents in the vicinity of its nest of origin 7 months after fledging suggests that in this species dependency can sometimes last considerably longer, at least in the tropics.

DISCUSSION

Although to some extent the rapidly increasing number of records of the Short-tailed Hawk in the sky islands could reflect increasing numbers of observers and increasing familiarity of observers with the species, it seems doubtful that the species was present yet overlooked before the 1980s, especially in the U.S. No Short-tailed Hawks were observed by experienced ornithologists (e.g., Brandt 1951, Balda 1967, Snyder et al. 1973) working intensively at Arizona locations where the Short-tailed Hawk now occurs, even though several of these observers were closely familiar with the species from earlier work in Florida (e.g., Brandt 1924). Nor was the species reported by any of the numerous ornithologists working out of the Southwestern Research Station of the American Museum of Natural History in the Chiricahuas during the 1950s, 1960s, and 1970s.

Similarly, Short-tailed Hawks were never reported in northwestern Mexico prior to the 1980s, despite intensive field work by Lumholtz (1905), Nelson and Goldman (1926), van Rossem (1945), Goldman (1951), Marshall (1957), and Lanning and Shiflett (1983; J. Shiflett pers. comm.). Thus it likewise seems unlikely that the species occurred in Chihuahua or Sonora prior to the 1980s either.

Another strong argument that the Short-tailed Hawk was not present in low numbers in northwestern Mexico and Arizona prior to recent records comes from the steady geographic progression northward of first local sightings from Michoacán up the Sierra Madre Occidental to southern Arizona between the early 1940s and mid 1980s. As detailed by Williams et al. (2007), many of these sightings had been preceded by earlier ornithological investigations in the same locations that did not record the species.

The same general progression northward has been evident in Arizona, where the first two birds were detected in the 1980s in the southernmost sky islands of the U.S., the Chiricahua and Huachuca mountains. More recently, the Short-tailed Hawk has been sighted in other neighboring, and mostly more northerly, ranges: the Pinals in 2005, the Santa Ritas in 2008, and the Santa Catalinas in 2009.

Similarly in Texas, Lockwood and Freeman (2004) reviewed the first sighting in July 1989 in the lower Rio Grande valley (*Am. Birds* 43:1339), followed by records in neighboring Hidalgo County. By June 1995, Short-tailed Hawks had been found roughly 400 km farther north at Dripping Springs on the Edwards Plateau (Lockwood 2001).

The progression of first sightings in western Mexico, assuming it paralleled first actual occurrences of the species fairly closely, suggests a rapid range expansion, averaging roughly 30–40 km per year between Michoacán and southern Arizona. The rate may have been even more rapid in Texas, where sightings advanced north from the lower Rio Grande valley to the

Edwards Plateau at roughly 60–70 km per year following the first record in the state. Perhaps the rapidity of the northward advance in first sightings in both regions can be attributed both to good reproduction in newly occupied territories and to a necessity for the species to leapfrog extensive areas of unsuitable territory to find suitable new habitats to occupy.

In any event, until evidence to the contrary emerges, we believe the northward range expansion of the Short-tailed Hawk, as presented by Williams et al. (2007) and Lockwood and Freeman (2004), should be considered real and geographically extensive. However, we caution that the first actual occurrence in a location may sometimes precede the first sighting by a substantial period; calculations of rates of range expansion based on first sightings should be considered only preliminary.

Seasonally, sightings of Short-tailed Hawks at high elevations of the sky islands extend from 31 March to 24 October, but whether the birds are present or absent at high elevations in this part of the range in winter is uncertain because of a general lack of observers at high elevations during this season. Access to high elevations is usually difficult in winter because of snow and blocked roads. Nevertheless, we suspect the Short-tailed Hawks of this region may leave their high-elevation breeding grounds in winter because many of the small birds on which the hawk preys withdraw from high elevations at this season and most lizards and chipmunks become quiescent underground and under snow.

It is unknown whether the Short-tailed Hawks of the sky islands move south in winter, as has been demonstrated for the Florida population (Ogden 1974, Miller and Meyer 2002, Meyer 2005). The only winter sightings in the sky-islands region so far have been in the city of Tucson: an odd-plumaged bird seen from 11 February to 13 April 2008, from 20 November 2008 to 4 April 2009, and from 3 December 2009 through 12 March 2010. These sightings support a view that the birds move seasonally, but since Tucson, in addition to being at a relatively low elevation of 780 m, lies near the northern edge of the known range, it also appears possible that the species' seasonal movements may be as much altitudinal as latitudinal.

The nests of Short-tailed Hawks studied in Arizona in 2007 and in Sonora in 2009 appeared to be typical of the species, in that they were located near the very tops of the tallest trees in their surroundings and were quite fully exposed to the sky, allowing birds to land directly from above and also providing the birds with a commanding view of their surroundings (Figure 12; see Miller and Meyer 2002, Snyder and Snyder 2006). But, like the highly exposed nests of the Osprey (*Pandion haliaetus*) and Bald Eagle (*Haliaeetus leucocephalus*), Short-tailed Hawk nests tend to be in full view of other raptors and potentially vulnerable to their depredations. Perhaps this vulnerability was a primary factor leading to the Barfoot female's nearly constant guarding of her nest through the nestling period of 2007. In part, nest guarding was achieved from the nest itself, but more often, once the young were several weeks old, the female exercised her vigilance from an exposed snag uphill from the nest.

The importance of nest guarding was reflected in the frequency of battles of the hawks with natural enemies. Throughout our observations we saw repeated instances of nest defense in which an adult, usually the female,

Figure 12. Like other nests of the Short-tailed Hawk, the nest of 2007 in the Chiricahua Mountains was reached from above by adults and was fully visible to other raptors in the sky. The female adult guarded the nest almost constantly through the nestling period, while her mate hunted for the entire family.

Photo by N. F. R. Snyder

aggressively chased off Common Ravens (*Corvus corax*), Turkey Vultures (*Cathartes aura*), Red-tailed Hawks (*Buteo jamaicensis*), and Zone-tailed Hawks (*B. albonotatus*). In one instance the female adult repeatedly struck an Apache Fox Squirrel (*Sciurus nayaritensis chiricahuae*) climbing the nest tree until the squirrel retreated down the tree (Figure 13). We have also witnessed instances of Short-tailed Hawk nest defense in other regions. In Florida H. A. Snyder once observed a nesting female successfully driving off a Yellow Rat Snake (*Elaphe obsoleta quadravittata*) from the nest rim, and in Sonora Flesch observed a nesting Short-tailed Hawk successfully driving off a Golden Eagle (*Aquila chrysaetos*). Other observers have reported nesting Short-tailed Hawks chasing off Bald Eagles, Red-shouldered Hawks (*B. lineatus*), and Broad-winged Hawks (*B. platypterus*) (Miller and Meyer 2002).

Vulnerability of the nest may be one of the most important factors leading to a low clutch and brood size in the species, to the extent that it reduces the potential for females to forage for their broods by demanding their continuous presence near their nests. Throughout the Short-tailed Hawk's range, clutch size has uniformly been reported as only one or, more commonly, two eggs (Miller and Meyer 2002). Five of six Florida nests reported by Ogden (1988) had only single nestlings, including a nest H. A. and N. F. R. Snyder studied in 1979. However, Meyer (2005) has noted that nests with two young predominate in the most heavily forested nesting areas of Florida.

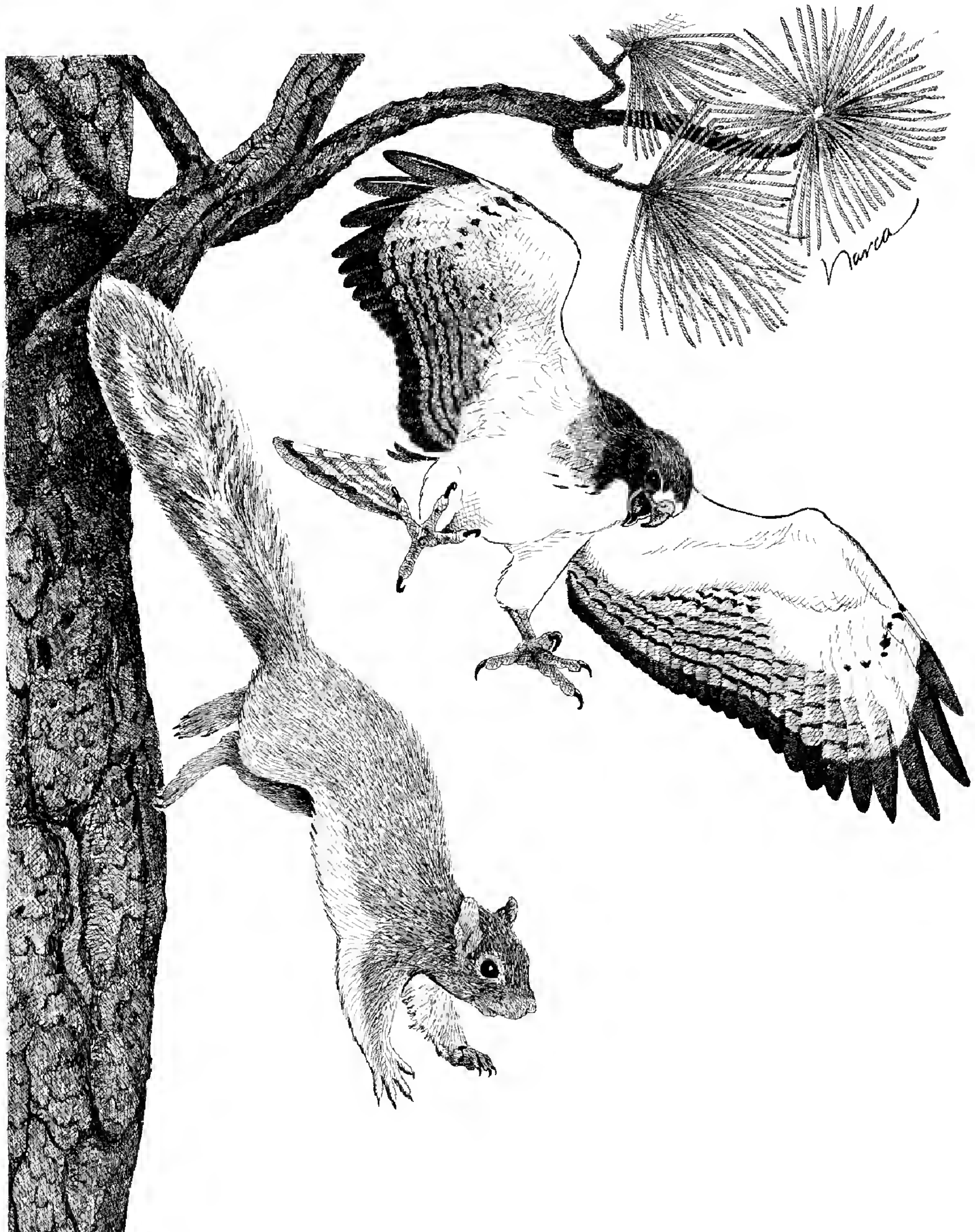

Figure 13. Female Short-tailed Hawk driving an Apache Fox Squirrel from the nest tree in the Chiricahua Mountains on 17 June 2007. Other enemies driven from the vicinity of the nest included Common Ravens, Zone-tailed Hawks, and Red-tailed Hawks.

Pen-and-ink drawing by N. Moore-Craig

By comparison, clutches and broods are characteristically much larger in the Cooper's Hawk (*Accipiter cooperii*), another Arizona raptor often found at high elevations that is very similar in body weight and prey to the Short-tailed Hawk but which does not normally nest in exposed locations and in which females hunt extensively late in the nestling stage. In fact, in 1971,

H. A. and N. F. R. Snyder studied the nest of one pair of Cooper's Hawks that was located at nearly the same elevation as the Short-tailed Hawk pair of 2007 and only a few hundred meters distant. The diet at this nest was very similar to that at the Short-tailed Hawk nest (i.e., 70% birds and 30% lizards and chipmunks), and the range of prey sizes was also very similar. The usual clutch size of Cooper's Hawks we have studied in Arizona, however, was 4 eggs (range 3–5), and pairs commonly fledged 3 or 4 nestlings. Potentially, the differences in clutch and brood sizes are in part related to the differing roles that females of these two species have in foraging for their broods, resulting from differences in the vulnerability of their nests to other predators. It appears the Short-tailed Hawk may be making an evolutionary tradeoff between maximizing brood size and ensuring nest safety. Potentially supporting this idea, nesting female Ospreys also do very little hunting prior to fledging young (Poole et al. 2002), possibly reflecting a similar crucial need to guard nests that are highly exposed and vulnerable (especially to Bald Eagles and Raccoons, *Procyon lotor*). However, whether support for such relationships might also be found in an examination of nest-site vulnerability, female attentiveness, and clutch size across all diurnal raptors is yet to be studied and lies beyond the scope of this paper.

An obvious question remains: if tree-top nesting entails a penalty for the Short-tailed Hawk's clutch size, why has the species evolved this trait, while other similar-sized and partially sympatric species of *Buteo*, such as the Red-shouldered and Broad-winged Hawks, nest in more concealed locations within the canopy? Clutch size generally runs 2–3 eggs for the Broad-winged Hawk and 3–4 eggs for the Red-shouldered Hawk (Goodrich et al. 1996, Crocoll 1994), seemingly consistent with the possibility that concealed nesting may allow greater clutch size in at least some close relatives. But could there be advantages for the Short-tailed Hawk in tree-top nesting that compensate for its relatively low clutch size?

We have no compelling answer to this question, but perhaps, lacking the especially short wings and a long tail typical of many raptors adapted to cluttered aerial environments, the Short-tailed Hawk is simply not well adapted to maneuvering among branches within the canopy of trees, and perhaps it nests in tree tops mainly to minimize risks of damage to its wings and flight feathers. In its daily activities, the species does concentrate on relatively open air spaces. However, its wings and tail do not differ greatly in length from the wings and tails of forest-adapted *Buteo*s such as the Broad-winged and Red-shouldered Hawks (see Goodrich et al. 1996, Crocoll 1994). As noted by Miller and Meyer (2002), the Short-tailed Hawk, despite its name, has, for its genus, an average tail length relative to body size. Although its wings are relatively long for the bird's weight, they are somewhat shorter than the wings of the Red-shouldered Hawk. Conceivably the main advantages of tree-top nesting to the Short-tailed Hawk may come after fledging, with so much of the activity of fledglings and adults taking place above the canopy and the nest still serving as an easily accessible platform for prey deliveries and feedings.

In 40 hours of observation at three successful Florida Short-tailed Hawk nests with single nestlings, Ogden (1988) found an average feeding rate of 0.30 prey per hour—a rate about one half the overall rate we observed at the Arizona nest of 2007 (0.55 prey per hour), in reasonable consistency with the difference in brood size. But such comparisons should be viewed as only rough and suggestive, especially because the times of day and times in the nestling cycle when observations were made in Florida were not specified and may have differed substantially from the times of day and times in the nesting cycle represented in our study—factors with potentially substantial influences on provisioning rates (see Figures 6 and 7).

Also, comparisons of feeding rates in terms of prey per hour can be misleading if the average size of prey in Florida and Arizona differed. Unfortunately, comprehensive data on average prey sizes are not available for either Florida or Arizona. We suspect from Ogden's (1974) description of the range of prey taken that average sizes of prey in the two regions may have been reasonably similar.

Ogden reported only two or three prey deliveries per day at nests with a single young, while at the Arizona nest with two nestlings, deliveries averaged at least 5.2 prey per day for the 19 days that included at least 9 consecutive hours of observation covering the portion of the day with peak deliveries of prey. This comparison, like that of prey per hour, could be taken as some indication that foraging conditions in Arizona compare favorably with those in Florida. Unfortunately, in addition to other difficulties already mentioned with such comparisons, the extent to which the overall prey-delivery rates in Florida and Arizona may have reflected the maximum potential of males to provide food for their broods is not known. If they came close to reflecting the full potential in each region, there may be little advantage in pairs ever attempting broods larger than two young.

The Short-tailed Hawk's rapid occupancy of high elevations of southern Arizona and New Mexico and northern Chihuahua and Sonora in recent decades implies that this region currently offers good habitat for the species. The relatively large brood in the nest we studied in 2007, the apparent fledging of broods of two young in the Chiricahuas in 2003, 2006, and 2010, and the quite consistent presence of at least one fledgling at this location in nearly all recent years likewise suggest that local conditions may be generally good for the species. Average nesting success for the pair/locality in question from 2001 to 2010 was evidently at least 90%, and average productivity was at least 1.3 fledglings per year. By comparison, the species' overall nesting success in Florida has averaged only about 40–45%, with frequent nest failures during the egg stage and an average production of only 0.64 fledglings per nesting attempt (Miller and Meyer 2002, Meyer 2005). Nevertheless, it is unknown how typical of Arizona habitats the Barfoot territory may be in its suitability for the species.

Have there been any fundamental recent changes in the sky islands that might have favored colonization by the Short-tailed Hawk? The most obvious habitat change in the region in recent decades is that extensive stand-replacing fires have substantially increased the extent of open areas at high elevations in both the Huachucas and Chiricahuas (as well as on other nearby sky islands). But it is not clear that this change has been beneficial to this species, as it hunts both forested and open habitats. Indeed, telemetry studies in Florida suggest the birds prefer forested habitats for both nesting and winter foraging (Meyer 2005). As documented in detail by Williams et al.

(2007), the recent expansion of the species into Arizona and New Mexico appears to be just part of a much broader expansion throughout northern Mexico that has been taking place since the early 20th century. The species' arrival in the sky islands may not be related to changes in local conditions but to a steady population expansion farther south.

The influx of the Short-tailed Hawk into the various sky islands parallels a recent northward expansion of the Gray Hawk (*B. nitidus*) in the same region (Williams and Krueper 2008), while Phillips et al. (1964) and a variety of contemporary studies (e.g., Crick 2004, Inkley et al. 2004, Parmesan 2006) similarly indicate that the distributions of many other western birds have been shifting substantially northward in recent decades, correlated with increases in mean temperatures. However, provided that the progression of first records from Michoacán northward comes close to portraying the range expansion of the Short-tailed Hawk accurately, this species' northward movement has been of much greater magnitude than that seen in many others, raising the question of whether it is due to similar causes.

In contrast, no concurrent range expansion of the Florida population of the Short-tailed Hawk has been documented (Miller and Meyer 2002). We suspect that the difference between western and eastern populations may prove to be related to better reproduction and/or survival in the West than in Florida, but demographic data are currently too few for this possibility to be tested conclusively.

Despite only modest nest success, the Short-tailed Hawk population of Florida has been considered potentially stable and self-sustaining during recent decades, although it is very small, probably under 200 pairs (Miller and Meyer 2002, Meyer 2005). Whether the sky islands will provide adequate habitat for the Short-tailed Hawk in the long term, and may even serve as a source region for further range expansion of the species, remains to be seen. The history of animal invasions of new territories includes examples of some species doing very well initially, followed by population crashes and extirpations as natural communities adjust to their presence. Despite what appears to be a truly impressive recent record of expansion of the Short-tailed Hawk into northern Mexico and the southwestern U.S., we offer no firm predictions for the future.

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LITERATURE CITED

Alden, P. 1969. Finding the Birds in Western Mexico. Univ. of Ariz. Press, Tucson.

Balda, R. P. 1967. Ecological relationships of the breeding birds of the Chiricahua Mountains, Arizona. Ph.D. dissertation, Univ. of Illinois, Urbana.

Blake, E. R., and Hanson, H. C. 1942. Notes on a collection of birds from Michoacán, Mexico. Field Mus. Nat. Hist., Zool. Ser. 22, No. 9:513–551.

Brandt, H. W. 1924. The nesting of the Short-tailed Hawk. Auk 41:58–64.

Brandt, H. W. 1951. Arizona and its Bird Life. Bird Research Foundation, Cleveland.

Brown, L., and Amadon, D. 1968. Eagles, Hawks, and Falcons of the World, vol. 2. McGraw-Hill, New York.

Crick, H. Q. P. 2004. The impact of climate change on birds. Ibis 146 (Suppl. I):48–56.

Crocoll, S. T. 1994. Red-shouldered Hawk (*Buteo lineatus*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 107. Acad. Nat. Sci., Philadelphia.

Dykstra, C. R., Hays, J. L., and Simon, M. M. 2009. Selection of fresh vegetation for nest lining by Red-shouldered Hawks. Wilson J. Ornithol. 121:207–210.

Erickson, R. A., and Howell, S. N. G., eds. 2001. Birds of the Baja California Peninsula. Am. Birding Assoc. Monogr. Field Ornithol. 3.

Flesch, A. D. 2008a. Distribution and status of breeding landbirds in northern Sonora, Mexico. Studies in Avian Biology 37:28–45.

Flesch, A. D. 2008b. Distribution and status of birds of conservation interest and identification of important bird areas in Sonora, Mexico. Report to U.S. Fish and Wildlife Service, Sonoran Joint Venture, Tucson, AZ.

Flesch, A. D., Larson, M. D., and Hutto, R. L.. 2009. Distribution and status of breeding birds in the sky islands of northern Sonora. 2009 Annual Report to National Park Service; http://avianscience.dbs.umt.edu/projects/documents/SkyIslandBirdsAnnualReport2009_Fleschetal..pdf.

Goldman, E. A. 1951. Biological investigations in Mexico. Smithsonian Misc. Coll. 115:1–476.

Goodrich, L. J., Crocoll, S. C., and Senner, S. E. 1996. Broad-winged Hawk (*Buteo platypterus*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 218. Acad. Nat. Sci., Philadelphia.

Howell, S. N. G. 1999. A Bird-Finding Guide to Mexico. Cornell Univ. Press, Ithaca, NY.

Howell, S. N. G., and Webb, S. 1995. A Guide to the Birds of Mexico and Northern Central America. Oxford Univ. Press, Oxford, England.

Hubbard, J. P., and Crossin, R. S. 1974. Notes on northern Mexican birds: An expedition report. Nemouria 14:1–41.

Inkley, D. B., Anderson, M. G., Blaustein, A. R., Burkett, V. R., Felzer, B., Griffith, B., Price, J., and Root, T. L. 2004. Global climate change and wildlife in North America. Wildlife Soc. Tech. Rev. 04-2. Wildlife Soc., Bethesda, MD.

Lanning, D. V., and Shiflett, J. T. 1983. Nesting ecology of Thick-billed Parrots. Condor 85:66–73.

Lockwood, M. W. 2001. Birds of the Texas Hill Country. Univ. Tex. Press, Austin.

Lockwood, M. W., and Freeman, B. 2004. The Texas Ornithological Society Handbook of Texas Birds. Tex. A&M Univ. Press, College Station.

Lumholtz, C. 1905. Unknown Mexico. Unwin, London.

Marshall, J. T. 1957. Birds of pine–oak woodland in southern Arizona and adjacent Mexico. Pac. Coast Avifauna 32.

Meyer, K. D. 2005. Biology and conservation needs of the Short-tailed Hawk in Florida. Final report. Fla. Fish and Wildlife Conservation Commission, Tallahassee.

Miller, K. E., and Meyer, K. D. 2002. Short-tailed Hawk (*Buteo brachyurus*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 674. Birds N. Am., Philadelphia.

Nelson, E. W., and Goldman, E. A. 1926. Mexico, in Naturalist's Guide to the Americas (V. E. Shelford, ed.), pp. 547–596. Williams and Wilkins, Baltimore.

Newton, I. 1979. Population Ecology of Raptors. A. D. Poyser, Berkhamsted, England.

Ogden, J. C. 1974. The Short-tailed Hawk in Florida, I. Migration, habitat, hunting techniques, and food habits. Auk 91:95–110.

Ogden, J. C. 1988. Short-tailed Hawk, in Handbook of North American Birds (R. S. Palmer, ed.), vol. 5, pp. 34–47. Yale Univ. Press, New Haven, CT.

Parmesan, C. 2006. Ecological and evolutionary responses to recent climate change. Annu. Rev. Ecol. Evol. Syst. 37:637–669.

Phillips, A., Marshall, J., and Monson, G. 1964. The Birds of Arizona. Univ. of Ariz. Press, Tucson.

Poole, A. F. R., Bierregaard, R. O., and Martell, M. S. 2002. Osprey (*Pandion haliaetus*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 683. Birds N. Am., Philadelphia.

Rosenberg, G. H. 2001. Arizona Bird Committee report: 1996–1999 records. W. Birds 32:50–70.

Rosenberg, G. H., Radamaker, K., and Stevenson, M. M. 2007. Arizona Bird Committee report, 2000–2004 records. W. Birds 38:79–80.

Rosenberg, G. H., and Witzeman, J. L. 1998. Arizona Bird Committee report, 1974– 1996, part 1 (nonpasserines). W. Birds 29:199–224.

Russell, S. M., and Monson, G. 1998. The Birds of Sonora. Univ. of Ariz. Press, Tucson.

Salvador, L. F. Jr., and Silva, F. A. 2009. Rapinantes diurnos em uma paisagem fragmentada de Mata Atlântica no alto rio Doce, Minas Gerais, Brasil. Bol. Mus. Biol. Mello Leitão (n. ser.) 25:53–65.

Schaldach, W. J. Jr. 1963. The avifauna of Colima and adjacent Jalisco, Mexico. Proc. W. Found. Vert. Zool. 1:1–100.

Schnell, J. H. 1958. Nesting behavior and food habits of Goshawks in the Sierra Nevada of California. Condor 60:377–403.

Snyder, N. F. R. 1975. Breeding biology of Swallow-tailed Kites in Florida. Living Bird 13:73–97.

Snyder, N. F. R., and Snyder, H. A. 2006. Raptors of North America. Voyageur Press, St. Paul, MN.

Snyder, N. F. R., Snyder, H. A., Lincer, J. L., and Reynolds, R. T. 1973. Organochlorines, heavy metals and the biology of North American accipiters. BioScience 23:300–305.

Snyder, N. F. R., and Wiley, J. W. 1976. Sexual size dimorphism in hawks and owls of North America. Ornithol. Monogr. 20:1–96.

Van Rossem, A. J. 1945. A distributional survey of the birds of Sonora, Mexico. Occ. Papers Mus. Zool. La. State Univ. 21:1–379.

Warshall, P. 1995. The Madrean sky island archipelago, in Biodiversity and Management of the Madrean Archipelago (L. F. DeBano, P. F. Ffolliott, A. Ortega-Rubio, G. J. Gottfried, R. H. Hamre, and C. B. Edminster, tech. coords.), pp. 6–18. Gen Tech. Rep. RM-GTR-264. Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO.

Wheeler, B. K. 2003. Raptors of Western North America. Princeton Univ. Press, Princeton, NJ.

Williams, S. O. III, DeLong, J. P., and Howe, W. H. 2007. Northward range expansion by the Short-tailed Hawk, with first records for New Mexico and Chihuahua. W. Birds 38:2–10.

Williams, S. O. III, and Krueper, D. J. 2008. The changing status of the Gray Hawk in New Mexico and adjacent areas. W. Birds 39:202–208.

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APPENDIX. Arizona records of Short-tailed Hawk by area and year. Records not accepted by the Arizona Bird Committee have been excluded. Where additional important details, such as color morph, were included in messages circulated through the listserve for Arizona–New Mexico birding, BIRDWG-05, it is cited as a reference. (Nearly all eBird reports fall within the ranges of dates available from other sources.)

Chiricahua Mountains, Cochise County

1985: 7 Aug, Barfoot Junction, 1 light adult; J. Arvin, Rosenberg et al. 2007, AB 40:150, 1986

1999: 5 Apr, Onion Saddle, 1 light bird; M. Lanzone, Rosenberg et al. 2007
 22 Aug, Onion Saddle, 1 light bird; C. Benesh, NAB 54:83, 2000, Rosenberg et al. 2007

2001 (sightings represent at least 3 individuals, a probable pair and 1 fledgling): 5 Aug–3 Sep, Barfoot Park, 1 light adult, 1 light juvenile; F. Gallo, J. Havlena, C. Benesh, N. Moore-Craig, et al., NAB 56:84, 2002
 27 Aug, Barfoot Park, 1 light adult with prey, H. Snyder

2002 (sightings represent at least 2 individuals): 31 Mar–Aug, Barfoot Park, 2 light adults; C. McIntyre, J. Burns (photo), Rosenberg et al. 2007, NAB 56:338, 465, 2002
 2 Jul, Barfoot Park, 1 light adult; C. Benesh (photo) et al., fide M. Stevenson through 6 Sep, Barfoot Park, 2 light adults, J. Smith et al., NAB 57:99, 2003

2003 (sightings represent at least 4 individuals): 23 May, Barfoot Park, 1 bird; B. Chapman et al., NAB 57:387, 2003
 28 Jun, Barfoot Park, 1 light adult; R. Hoyer, Rosenberg et al. 2007
 19 Jul, Barfoot Park, 1 light adult, 1 light fledgling; J. Dunn, NAB 57:528, 2003
 25 Jul, Barfoot Park, 2 light adults, 1 light juvenile begging; R. Taylor et al., NAB 57:528, 2003
 2 Aug, Barfoot Park, 2 light adults, 1 light juvenile; M. Pollock et al., BIRDWG 05
 5 Aug, Barfoot Park, 1 light adult, 2 light juveniles; R. Webster, NAB 57:528, 2003
 7–16 Aug, Barfoot Park, 1 adult, 2 juveniles; R. Hoyer (photo), Rosenberg et al. 2007
 22 Aug, Barfoot Park, 1 light adult, 2 juveniles; R. Webster
 18 Sep, Barfoot Park, 1 adult; B. Chapman, NAB 58:122, 2004

2004 (sightings represent at least 3 individuals): from 9 May, Barfoot Park, 2 light adults; D. Stejskal, NAB 58:414, 520, 2004
 1 May–3 Jul, Barfoot Park, 2 light adults; B. Sullivan (photo), D. Stejskal et al., NAB 58:414, 520, 2004, Rosenberg et al. 2007, www.azfo.org
 23 Aug, Rustler Park, 1 light adult; R. Webster
 30 Aug, Barfoot Park, 1 light bird, probably juvenile; R. Webster
 5 Sep, Barfoot Park, 1 adult feeding 1 juvenile; M. Kehl, NAB 59:125–126, 2005
 17 Oct, up to 3 birds; many observers, NAB 59:125–126, 2005

2005 (sightings represent at least 3 individuals, a probable pair and 1 fledgling): 11 Apr, 1 adult; many obs., NAB 59:477, 2005
 all summer, Barfoot Park, 1 light adult; J. Dunn et al., NAB 59:638, 2005, BIRDWG 05
 11 Aug, 1 juvenile; C. Benesh, NAB 60:116, 2006
 15 Aug, Rustler Park, 1 light juvenile; N. Moore-Craig, J. Ruth

30 Aug, Long Park Road, 1 dark bird; R. & L. Taylor, NAB 60:116, 2006, BIRDWG 05

2006 (sightings represent at least 4 individuals): 13–20 Apr, South Fork, Cave Creek, 1 bird; A. Grenon, S. Kennedy, NAB 60:417, 2006

22 Apr, Barfoot Junction, 1 adult; A. Grenon, G. Rosenberg pers. comm.

17 May–1 Sep, Barfoot Junction, 1 light pair; D. Jasper et al., NAB 60:417, 562, 2006, O. Niehuis (photo), www.azfo.org, G. Rosenberg pers. comm.

7 Aug, Onion Saddle, 3 light birds (1 adult, 1 juvenile, 1 unknown), food transfer; R. Webster

9–18 Aug, Barfoot Park, 2 juveniles; J. Pike, G. Wolbek, G. Rosenberg pers. comm.

from 7 Aug, 2 light adults, 2 light juveniles; R. Webster et al., NAB 61:119, 2007

1 Sep, Onion Saddle, 1 light juvenile; R. Webster

2007 (sightings represent at least 4 individuals): 28 Apr, Barfoot Park, 1 bird; J. Arnett, eBird

9 May, Barfoot Park, 1 light adult; R. Webster

25 May–4 Jul, Barfoot Park, 2 light adults, 2 light nestlings; this paper, NAB 61:492, 625, 2007

through 25 Sep, Barfoot Park, 2 birds; many obs., NAB 62:121, 2008

2008 (sightings represent at least 3 individuals, a probable pair and 1 fledgling): 14 Apr, 1 light adult, H. Snyder, NAB 62:458, 2008

7 May, Barfoot area, 1 light adult; P. Lehman, N. Moore-Craig, B. Carlson, G. McCaskie

19 May, Barfoot Park, 1 adult; D. Stejskal, BIRDWG 05

17 Jun, 1 bird, R. A. Rowlett

8–11 Aug, Barfoot Park, 1 light juvenile; C. Benesh, G. Smith (photos), NAB 63:132, 2009, www.azfo.org, G. Rosenberg pers. comm.

2009 (sightings represent at least 3 individuals, a probable pair and 1 fledgling): 14 Apr, Barfoot Park, 1 light adult; N. Moore-Craig, NAB 63:478, 2009

24 May, Portal, 1 light adult; R. Webster, R. A. Rowlett

26 May, Rustler Park, 1 adult; R. A. Rowlett, R. Webster

8 Aug, Barfoot Park, 1 light adult; M. Henscell (photo), G. Rosenberg pers comm., www.azfo.org

12 Aug, Barfoot Park, 1 light juvenile; S. Whittle, G. Rosenberg pers comm.

25 Aug, Barfoot Junction, 1 light adult, 1 light juvenile; N. Moore-Craig, N. Snyder

24 Oct, Barfoot Road, 1 light adult; N. Moore-Craig, J. Fletcher

2010 (sightings represent at least 4 individuals, a probable pair and 2 fledglings): 8 May, Barfoot Park, 1 light adult; N. Snyder, J. Miller

15–18 Jul, Barfoot Park, 2 light adults, 2 light juveniles; N. and H. Snyder, N. Moore-Craig, C. Rustay, C. Sandell

Huachuca Mountains, Cochise County

1988: 21 Jul, Sawmill Canyon, 1 light adult; J. Dunn., Rosenberg et al. 2007

1999 (sightings represent at least 2 individuals): 26 Jul–4 Sep, Miller Canyon, 1 light bird; R. Hoyer, NAB 53:416, 1999, 54:83, 2000, Rosenberg 2001

31 Jul–4 Sep, Miller Canyon, 1 dark bird; R. Hoyer (photo), G. Rosenberg (photo), many obs., Rosenberg 2001, NAB 53:416, 1999, 54:83, 2000

2001 (sightings represent at least 3 individuals, a probable pair and 1 juvenile): 5 Aug–9 Sep, Miller and Carr canyons, 1 light bird, 1 light juvenile; F. Gallo, C. Benesh, many obs., Rosenberg et al. 2007, NAB 56:84, 2002, BIRDWG 05

2004: from 9 May, Miller and Carr canyons, 1 adult, B. Feltner et al., NAB 58:580, 2004

8 Aug, Miller Canyon. 1 adult; NAB 59:125–126, 2005

2005 (sightings represent at least 2 individuals): 23 Jul–4 Aug, Carr Canyon, single birds; many obs., NAB 59:638, 2005, 60:116, 2006

13 Aug, Miller Canyon, 2 light birds; T. Beatty, E. Wade, BIRDWG 05

2006 (sightings represent at least 2 individuals): 13–31 Aug, up to 3 birds (at least 1 light, 1 dark); NAB 61:119, 2007, BIRDWG 05

13 Aug, Carr Canyon, 1 light bird; C. Runk, BIRDWG 05

20 Aug, Carr Peak, 1 light adult, 1 dark adult, territorial behavior; W. Walraven, BIRDWG 05

2007: 26 Jun, Miller and Carr canyons, 1 light bird; M. Ali, S. Healy, NAB 61:624, 2007, BIRDWG 05

9 Aug, Sawmill Canyon, 1 or 2 light birds; L. Hoy et al., BIRDWG 05

9 Aug–8 Sep, Miller Peak, 1 or 2 birds; R. Hoyer, P. Kline, NAB 62:121, 2008, G. Rosenberg pers. comm.

2008 (sightings represent 1 or 2 individuals): 1 Aug, Carr Canyon, 1 light "adult or near-adult"; J. P. Smith (photo), NAB 63:132, 2009, www.azfo.org

2 Aug, Hereford Road, 1 bird; B. Fisher, NAB 63:132, 2009, G. Rosenberg pers. comm.

Pinal Mountains, Gila County

2005: 17 Jun, Upper Pinal Picnic Area, 1 light adult; D. Pearson, J. Alcock, NAB 59:638, 2006, Rosenberg pers. comm., BIRDWG 05

Tucson, Pima County

Apparently the same bird has returned for three winters to the same roost but atypically has retained mostly juvenal plumage for all three winters (see Wheeler 2003). We accept the Arizona Bird Committee's decision on its identification while recognizing that the plumage is inexplicable.

2008; 11 Feb–13 Apr, 1 light juvenile (?); D. Stejskal, J Hecimovich, NAB 283, 458, 2008, G. Rosenberg pers. comm.

2008–2009: 20 Nov–4 Apr, 1 light juvenile (?), D. Stejskal, many obs., NAB 63:132, 304, 2009, BIRDWG 05, G. Rosenberg pers. comm.

2009–2010: 3 Dec–7 Mar, 1 light juvenile (?); J. Hecimovich, many obs., BIRDWG 05; photos at www.azfo.org

Santa Rita Mountains, Santa Cruz County

2008: 13 Sep, Josephine Saddle, 1 light juvenile; D. Stejskal (photo), NAB 63:132, 2009; BIRDWG 05, www.azfo.org, G. Rosenberg pers. comm.

2009: 14 May, Madera Canyon, 1 adult; C. Cathers, NAB 63:478, 2009

Santa Catalina Mountains, Pima County

2009: 3 Sep, Mt. Lemmon, 1 light adult; J. Lebowitz, J. Edison (photo), et al.; G. Rosenberg pers. comm.

2010: 24 Apr, Summerhaven, 1 light adult; J. Yerger; record circulating through Arizona Bird Committee

AN APPARENT HYBRID PHILADELPHIA × RED-EYED VIREO ON SOUTHEAST FARALLON ISLAND, CALIFORNIA

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ABSTRACT: Interspecific hybrids in the Vireonidae have seldom been reported, and the hybrid combination of the Philadelphia (*Vireo philadelphicus*) and Red-eyed (*V. olivaceus*) Vireos has been reported only twice before. We here report an apparent hybrid that remained on Southeast Farallon Island 7–13 September 2008. Its breast color, head pattern, head shape, and measurements were intermediate between those of the Philadelphia and North American subspecies of the Red-eyed. Details of the wing structure eliminated the Warbling (*V. gilvus*) and South American subspecies of the Red-eyed as possible parental species.

Hybrids have been extensively documented in the wild and in captivity (Phillips 1991) in many families of birds (McCarthy 2006), yet hybridization is reported more frequently in some groups than in others. Within the Vireonidae, hybrids are rarely documented (Pyle 1997). On 7 September 2008, while operating the long-term research station on Southeast Farallon Island, we noticed an unusual vireo that seemed to defy identification; we suspected it to be either an eastern Warbling Vireo (*Vireo g. gilvus*), a Chivi Red-eyed Vireo (*V. olivaceus* of the South American *chivi* complex), or of hybrid origin. The bird was subsequently mist-netted, examined, measured, and photographed in the hand (Table 1, Figures 1–4). We suggest that this bird is a hybrid Philadelphia (*V. philadelphicus*) × Red-eyed Vireo. We thoroughly studied the bird in the field and photographed it extensively during its stay until it was last seen on 13 September.

The Philadelphia Vireo breeds across much of the boreal forest of Canada, east to Nova Scotia and west to eastern British Columbia and extreme southeast Yukon; its winter range is mostly in Central America (Moskoff and Robinson 1996). The vast breeding range of the North American subspecies of the Red-eyed Vireo, to which we refer subsequently simply as the Red-eyed Vireo, encompasses that of Philadelphia Vireo and extends south to the coast of the Gulf of Mexico and west to eastern Oregon, Washington, and parts of coastal British Columbia (Cimprich et al. 2000); local populations breed on the west side of the Cascades in Washington and northwestern Oregon (Marshall et al. 2003, Wahl et al. 2005). The winter range of the Red-eyed Vireo lies entirely within South America (Cimprich et al. 2000) or extends uncertainly to eastern Panama (Ridgely and Gwynne 1989). Elsewhere in the Pacific coast states, the Red-eyed Vireos and Philadelphia Vireos are vagrants (Hamilton et al. 2007). The Red-eyed outnumbers the Philadelphia in all parts of California and at all seasons except for winter, during which two records of

Table 1 Measurements of the Apparent Hybrid Vireo on Southeast Farallon Island, Other Reported Hybrid Red-eyed × Philadelphia Vireos, and Similar Species[a]

Measurement	Southeast Farallon bird[b]	USNM 109920 (Quebec)	Ontario bird[c]	Western Warbling Vireo (*V. g. swainsonii and V. g. brewsteri*)	Eastern Warbling Vireo (*V. g. gilvus*)	Philadelphia Vireo (*V. philadelphicus*)	Red-eyed Vireo (*V. o. olivaceus*)	Chivi Vireo (*V. o. chivi and V. o. diversus*)	Yellow-green Vireo (*V. flavoviridis*)
Wing chord	63	70.5[d], 73[c]	73, 74	62–75[e]	66–74[e]	61–70[e]	72–85[e]	67.5–74.5[d]	71–83[e]
p9 – p5	1.95			–(0.4–1.5)[f]	–(1.1–2.0)[f]	0–3.2[f]	4–8[e]	–(1–1.5)[g]	1–5[e]
p10 – primary coverts (*n* = 5)	–5.45	<0[c]	–4	2.0–5.3[f]	2.1–4.6[f]	–(2–5)[e]	–(3–9)[e]	–(3.6–4.4)[f]	–(6.8–7.5)[h]
Tail	49		50[d], 51	46–56[e]	47–55[e]	40–49[e]	47–60[e]	50–56[d]	49–60[e]
Exposed culmen	11.35	14.9[d], 13[c]	11.0[d], 11.3	8.0–9.2[f]	9.0–10.9[f]	9.5–10.5[e]	11.6–13.6[e]	11.5–14[d]	12.9–15.3[e]
Nares to bill tip	8.35			6.5–7.9[e]	7.5–8.8[e]	7.7–8.1[h] (*n* = 6)	8.7–10.2[g]	0.4–9.9[h] (*n* = 13)	9.0–11.4[h] (*n* = 12)
Tarsus	18.25	17.1[d]		16.9–18.0[f]	17.2–18.5	16.6–18.4[i]	17.4–19.3[g]	15.0–17.3[h] (*n* = 13)	17.0–19.5[g] (*n* = 9)
Weight	13.4					10.3–16.1[i]	15.1–29.5[g]		

[a] All measurements are in millimeters except weight, which is in grams. Ranges of negative values are in parentheses.

[b] Measurements taken by Tietz on 7 September 2008. Other measurements taken: longest primary minus longest secondary, 17.1 mm; longest undertail covert to tail tip, 17.2 mm.

[c] Chartier (2008).

[d] Measurement recorded by Peter Pyle in February 2009.

[e] Pyle (1997).

[f] Measurements taken by Terrill at LSUMZ (*n* = 5 for all measurements).

[g] Cimprich et al. (2000).

[h] Measurements provided by Kimball L. Garrett from specimens in Natural History Museum of Los Angeles County.

[i] Moskoff and Robinson (1996).

the Philadelphia (Hamilton et al. 2007) contrast with a lack of any records of the Red-eyed. This difference is likely due to the more southerly natural winter range of the Red-eyed Vireo, in South America, whereas the Philadelphia regularly winters as far north as southern Mexico (AOU 1998). In California, the bulk of Red-eyed Vireos have occurred along the coast during the fall, but they have occurred in all seasons except winter and in most regions. Philadelphia Vireo records, in contrast, are limited almost exclusively to fall, mostly on the coast, with only eight interior and eight coastal records and in late spring/early summer (California Bird Records Committee 2007; *N. Am. Birds* 54:327, 2000; 58:597, 2004; 59:652, 2005) Since daily monitoring began in 1967, Southeast Farallon Island has recorded 101 Red-eyed Vireos, 60 in the spring (5 May–2 Jul, mean date 9 Jun), 41 in the fall (18 Jul–6 Oct, mean date 12 Sep). In contrast, only 15 Philadelphia Vireos have been recorded, 2 in spring (6 Jun and 12 Jun), 13 in fall (11 Sep–9 Nov, mean date 29 Sep) (Richardson et al 2003, updated with current data).

DESCRIPTION

The apparent hybrid we report here was a medium-sized vireo with a relatively short tail, long undertail coverts, and long primary projection. The bill appeared slightly longer and thicker than that of nearby Warbling Vireos, and the basal half of the culmen was straight before it increasingly curved downward to a distinctly hooked tip. The maxilla was mostly dark gray, whereas the lower mandible had a flesh-colored base. The crown was blue-gray with a brownish tinge, and there was a distinct slate-colored lateral crown stripe. The bird frequently had a somewhat crested appearance, which caused the forehead to appear long and relatively flat; the posterior edge of the blue-gray on the crown terminated near the top of the crest. The nape was olive-green and abruptly cut off from the blue-gray crown. The supercilium was mostly white with a little buff along the upper border; it arched slightly over the eye and ended abruptly about an eyeball's length behind the eye at the rear of the auricular. The eye appeared small and dark—the iris was dark brown. The eyeline was a dark slate color, which was strongest in the lores and ended posteriorly at the rear of the auricular. The face had a white lower eye-arc on a buffy-olive auricular. The throat was pure white, and the rest of the underparts were washed lightly with yellow, splotched variably with white across the chest and belly; the yellow was slightly more concentrated across the chest, down the sides, and on the undertail coverts. The legs were blue-gray.

The mantle, rump, uppertail coverts, and innermost scapulars were uniform olive-green. The outer scapulars, however, were retained juvenal feathers that had broad rusty fringes. The lesser and median secondary coverts were olive-green. The innermost two to four greater secondary coverts were olive-green with greenish edging and had been replaced during the bird's preformative molt, whereas the outer five coverts were retained juvenal feathers with pale white fringes. The primary coverts were also retained juvenal feathers that were pointed and dusky with pale greenish fringes.

The primaries, secondaries, tertials, and rectrices had worn, pointed tips, characteristic of juvenal flight feathers. The remiges had dusky inner webs, green edging on the outer webs, and white edging on the tips. The green

Figure 1. A hybrid Philadelphia × Red-eyed Vireo in one of Southeast Farallon Island's Monterey cypress trees on 8 September 2008, after being banded. It remained on the island for 6 days and was captured many times, allowing for extensive measurement and study.

Photo by Ryan S. Terrill

Figure 2. Philadelphia × Red-eyed Vireo (on right) in comparison with a Warbling Vireo (*V. g. swainsoni* or *brewsteri*) on Southeast Farallon Island, 8 September 2008. Note especially the dark lores, thick bill, supercilium shape, bulky, crested head, and yellow wash across the breast of the hybrid.

Photo by Ryan S. Terrill

Figure 3. Philadelphia × Red-eyed Vireo on Southeast Farallon Island, 8 September 2008. Note especially the strong face pattern, peaked head, and supercilium shape.

Photo by Matthew L. Brady

Figure 4. Philadelphia × Red-eyed Vireo on Southeast Farallon Island, 8 September 2008. Note especially the molt limit in the secondary coverts and the pointed tips to the rectrices, indicating a hatch-year bird.

Photo by Matthew L. Brady

edging became increasingly broad toward the tertials such that the outer webs of the tertials were entirely washed olive. The rectrices were dusky, edged with olive-green, and pointed. In addition to the retained juvenal feathers discussed above, the bird's skull was less than 30% pneumatized, which corroborated its age.

OTHER REPORTED HYBRIDS

Given the large area in which the Red-eyed and Philadelphia Vireos breed sympatrically, these two species have the opportunity to hybridize, and two previous instances have been reported from within the range of overlap in southeastern Canada. The first was a bird found dead in Quebec on 13 May 1883 and preserved in alcohol at the National Museum of Natural History, Smithsonian Institution (USNM 109920). It was originally labeled by C. H. Merriam as *Vireo flavoviridis*, the Yellow-green Vireo, which would represent a first record for eastern Canada, but in 1984 A. R. Phillips annotated the label "presumably *V. virescens* × *philadelphicus*" (Red-eyed/Yellow-green × Philadelphia). Although Phillips (1991) later listed this specimen as a hybrid, as it was subsequently referenced by Pyle (1997) and McCarthy (2006), Holder (2002) disagreed with the identification and suggested that it was more likely a Yellow-green Vireo. In February 2009, Peter Pyle (pers. comm.) measured the specimen's exposed culmen as 14.9 mm, which is beyond the range of Philadelphia and Red-eyed Vireos but well within the range of the Yellow-green. Considering the poor state of the alcohol-preserved specimen and the continued debate about its identification, we suggest that this bird is most appropriately left unidentified until perhaps genetic study can shed more light on the situation.

Chartier (2008) reported a vireo captured on 20 September 2003 at the Holiday Beach Migration Observatory in Essex County, Ontario, as a Red-eyed × Philadelphia. Good-quality photographs published of this bird allowed us to compare it with the one on Southeast Farallon. The birds were similar in many aspects, most notably the face pattern and the length of primary (p) 10 relative to the primary coverts. The dark lores and faint lateral crown stripes of both birds gave their faces a very similar look. A few differences are also worth mentioning. In Chartier's photographs, the crown seems perhaps to be more rounded, with less of an effect of a crest, as seen on the Red-eyed, which the Southeast Farallon bird showed both in the field and in the hand. Furthermore, the bill of the bird at Holiday Beach appears larger, heavier, and more strongly angled than that of the bird on Southeast Farallon. In addition, the eye of the Holiday Beach bird appears relatively larger, and the auricular and malar are whiter than on the Southeast Farallon bird. The bird at Holiday Beach provided the first well-documented instance of this hybrid combination, and the one on Southeast Farallon seems quite similar to it despite a few minor differences.

COMPARISONS OF POTENTIAL PARENTAL SPECIES

Molt limits and schedules can occasionally provide clues to a bird's identification. According to Pyle (1997), the preformative molt of the Warbling and Philadelphia Vireos occurs in summer and includes all greater secondary coverts, except for western Warbling Vireos of the subspecies *swainsoni* and *brewsteri*, which may complete their preformative and prebasic molts on the wintering grounds. Although prebasic molt of the Red-eyed Vireo is suspended over migration, preformative molt occurs in the summer range and includes all greater secondary coverts (Pyle 1997). Mulvihill and Rimmer (1997) stated that >90% of the first-year Red-eyed Vireos captured at the Powdermill Nature Reserve in southwestern Pennsylvania had molted all body feathers and wing coverts prior to stopping over at Powdermill. Although the Yellow-green Vireo's molt has not been studied thoroughly, Pyle (1997) suspected it to be similar to that of the Red-eyed. Thus the retained juvenal scapulars and outer greater secondary coverts are not typical of any known similar species of vireo, and at least hint that the bird is unusual.

To eliminate other possibilities, we considered all similar species while studying this bird, and we believe that a combination of field marks and measurements is sufficient to eliminate any pure species of vireo.

Philadelphia Vireos have rounded heads and weak or no lateral crown streaks. In addition, Philadelphia Vireos typically have yellow equally concentrated in the center of the chest and throat (Terrill and Terrill 1981), whereas the Farallon bird's throat was much whiter than its chest. Furthermore, the wing and tail measurements were at the maximum for a Philadelphia Vireo (Table 1), contrary to expectations for a first-year bird (Pyle 1997). Finally, the outermost primary was very slightly shorter than measurements published for the Philadelphia Vireo (Table 1)

Although a pure Red-eyed Vireo can show yellow on the vent and flanks, it lacks yellow on the chest (Terrill and Terrill 1981), where our apparent hybrid showed splotchy yellow. In addition, the wing was 3 mm shorter than expected for the shortest-winged Red-eyed (Table 1). Moreover, the eye seemed to be too dark, even for a hatch-year Red-eyed Vireo, and the face pattern was not quite as strong as typical of that species.

The Yellow-green Vireo is superficially similar to the bird we captured, but it is even larger than the Red-eyed, has a larger bill with a pink or horn-colored base to the lower mandible, and has more weakly contrasting facial features (eyeline, supercilium, and lateral crown streak). Although the bird on Southeast Farallon did have substantial yellow on the underparts, its splotchy pattern did not match that of a Yellow-green Vireo, which has this color concentrated on the sides (including the neck) and vent, contrasting against a white chest and belly.

Nine subspecies of the Chivi Vireo complex occur in South America, although only the two most southerly subspecies are known (*V. o . chivi*) or suspected (*V. o. diversus*) to migrate north for the austral winter (Cimprich et al. 2000). Terrill inspected Chivi Vireos at the Louisiana State University Museum of Natural Sciences (LSUMZ) in March and August 2009 and August 2010 and at the Museum of Vertebrate Zoology (MVZ), University of California, Berkeley, in April 2009. These specimens were generally similar in size and shape to the Red-eyed, if not larger. Although some individuals of each subspecies showed a fairly bright yellow wash to the sides of the chest, none showed yellow in the center of the chest. In February 2009, Peter Pyle (pers. comm.) measured the wing chord, tail length, and exposed culmen of the migratory Chivi Vireos at USNM, *V. o. chivi* (n = 5) and *V. o. diversus*

($n = 5$). Although in these subspecies p10 is shorter than the primary coverts (Terrill pers. obs.), the wings of Chivi Vireos are substantially shorter and rounder than those of Red-eyed Vireos (Cimprich et al. 2000). Moreover, in comparison to that of the migratory Chivi Vireos that have the longest and most pointed wings (Cimprich et al. 2000), the wing chord of the Southeast Farallon bird was >4 mm shorter, and the difference between p9 and p5 was >3 mm greater (Table 1); thus the wing of the Southeast Farallon bird was substantially shorter yet more pointed than that of migratory Chivi Vireos. Although Chivi Vireos are diverse and variable, none of the specimens at these museums appeared to be similar to the Southeast Farallon bird.

We eliminated the Warbling Vireo (both eastern *V. g. gilvus* and western *V. g. swainsoni* and *V. g. brewsteri*, hereafter referred to by group names *gilvus* and *swainsoni*) by plumage features and structure. The strong dark eyeline, lores, and lateral crown stripe were too bold for either *gilvus* or *swainsoni*. Terrill examined *V. g. gilvus* at LSUMNS, and even the brightest, most well-marked specimens did not show dark lateral crown stripes or yellow on the center of the chest. In addition, the flat, sloping crown rising to a peak at the back of the crown is quite different from a typical Warbling Vireo's rounded head. Although this shape may change with the bird's disposition, it was noticeable during the bird's entire stay on the island, and all observers noted the contrast with the Warbling Vireos on the island simultaneously. Another feature atypical of the Warbling Vireo is the long primary projection—a Warbling Vireo's primary projection is approximately half the length of the length of the visible tertials. The final and probably most critical mark against this individual being a Warbling is that p10 was 5.5 mm shorter than the primary coverts. The outermost primary of a Warbling Vireo of any subspecies should be at least 2 mm longer than the primary coverts (Table 1).

As the Warbling and Philadelphia Vireos are more closely related to each other than to the Red-eyed (Johnson et al. 1988, Murray et al. 1994), it might be expected that their hybridization is more likely, yet it has never been reported, and overlap of these two species' breeding ranges is minimal (Pyle 1997). The length of the longest primary relative to the primary coverts fits nicely within the range of the Red-eyed Vireo but well outside the range of the Warbling Vireo. If a Warbling Vireo were one of the parents, then the outermost primary should have been closer in length to the primary coverts. Furthermore, the shape of the supercilium was consistent with the Red-eyed, being straight, flared, and slanted upward posteriorly, as opposed to the curving, tapering supercilium of a Warbling Vireo. With the Warbling eliminated, the only hybrid pair that fits morphologically is Red-eyed × Philadelphia. By appearance, this bird does show features that look remarkably similar to a Red-eyed Vireo, such as the flat, sloping crown that peaks at the rear, dark lateral crown streaks, and a complete, dark eyeline, which, taken as a whole, gave this bird a "sterner" appearance than either a Warbling or a Philadelphia. The yellow wash across the middle of the chest is a trait of neither the Warbling nor the Red-eyed Vireo, and we infer that this mark came from Philadelphia Vireo parentage.

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LITERATURE CITED

American Ornithologists' Union. 1998. Checklist of North American Birds, 7th ed. Am. Ornithol. Union, Washington, D.C.

California Bird Records Committee (R. A. Hamilton, M. A. Patten, and R. A. Erickson, eds.). 2007. Rare Birds of California. Western Field Ornithologists, Camarillo, CA.

Chartier, A. T. 2008. An apparent hybrid vireo at Holiday Beach, Ontario. N. Am. Bird Bander 33:109–112.

Cimprich, D. A., Moore, F. R., and Guilfoyle, M. P. 2000. Red-eyed Vireo (*Vireo olivaceus*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 527. Birds N. Am., Philadelphia.

Gardali, T., and Ballard, G. 2000. Warbling Vireo (*Vireo gilvus*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 551. Birds N. Am., Philadelphia.

Holder, M. 1996. Identification and status of Yellow-green Vireo in North America: with special reference to a Canadian record. Birders Journal 5:78–89.

Johnson, N. K., Zink, R. M., and Marten, J. A. 1988. Genetic evidence for relationships in the avian family Vireonidae. Condor 90:428–445.

Marshall, D. B., Hunter, M. G., and Contreras, A. L. 2003. Birds of Oregon: A General Reference. Ore. State Univ. Press, Corvallis.

McCarthy, E. M. 2006. Handbook of avian hybrids of the world. Oxford Univ. Press, Oxford, England.

Moskoff, W., and Robinson, S. K. 1996. Philadelphia Vireo (*Vireo philadelphicus*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 214. Acad. Nat. Sci., Philadelphia.

Mulvihill, R. S., and Rimmer, C. C. 1997. Timing and extent of the molts of adult Red-eyed Vireos on their breeding and wintering grounds. Condor 99:73–82.

Murray, B. W., McGillivray, W. B., Barlow, J. C., Beech, R. N., and Strobeck, C. 1994. The use of cytochrome *b* sequence variation in estimation of phylogeny in the Vireonidae. Condor 96:1037–1054.

Phillips, A. R. 1991. The Known Birds of North and Middle America. Part 2, Bombycillidae, Sylviidae to Sturnidae, Vireonidae. A. R. Phillips, Denver, CO.

Pyle, P. 1997. Identification Guide to North American Birds. Part 1. Slate Creek Press, Bolinas, CA.

Richardson, T. W., Pyle, P., Burnett, R., and Capitolo, P. 2003. The occurrence and seasonal distribution of migratory birds on Southeast Farallon Island, 1968–1999. W. Birds 34:58–96.

Ridgely, R. S., and Gwynne, J. A., Jr. 1989. A Guide to the Birds of Panama, 2nd ed. Princeton Univ. Press, Princeton, NJ.

Terrill, S. B., and Terrill, L. S. 1981. On the field identification of Yellow-green, Red-eyed, Philadelphia, and Warbling Vireos. Continental Birdlife 2:144–149.

Wahl, T. R., Tweit, B., and Mlodinow, S. G. (eds.). 2005. Birds of Washington: Status and Distribution. Ore. State Univ. Press, Corvallis.

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NORTHERN GOSHAWK: FIRST NESTING RECORD FOR SANTA BARBARA COUNTY AND CURRENT BREEDING STATUS IN SOUTHERN CALIFORNIA

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ABSTRACT: The Northern Goshawk (*Accipiter gentilis*) is extremely rare and apparently irregular as a breeding species in southern California. Nesting has been confirmed only 13 times, twice at Mt. Abel, Kern County (1989 and 1990), five times at Mt. Pinos, Kern/Ventura counties (1904, 1960, 1989, 1990, and 2009), once in Ventura County (1919), once in the San Bernardino Mts., San Bernardino County (2004), three times in the Cuyamaca Mts., San Diego County (1937–1938), and once at Big Pine Mt., Santa Barbara County (2009). The nest at Big Pine Mt. was notable not only in being the first for Santa Barbara Co. but in being built in an exposed situation in a dead burned tree in partially burned forest.

On 13 June 2009, we discovered an active Northern Goshawk (*Accipiter gentilis*) nest (Figure 1) in the San Rafael Range near Big Pine Mountain. This remote portion of the San Rafael Range supports an "island" of montane coniferous forest that has been the subject of a long-term study of breeding birds. The documentation of this nest, which fledged two young, is the first confirmed record of breeding of the Northern Goshawk for this mountain range and for Santa Barbara County. The Northern Goshawk is an elusive species that occurs in southern California as a casual fall and winter visitor and as an extremely rare resident and breeder in some of the higher mountain ranges. Very low population densities, combined with the habitat's remoteness and difficulty of access, have limited our knowledge of the species' breeding in the region.

BIG PINE MOUNTAIN

Big Pine Mountain, in the San Rafael Range, is the highest peak in Santa Barbara County (2081 m). In 1968 and 1984, two wilderness areas were designated—the San Rafael Wilderness and the Dick Smith Wilderness—and these areas, totaling 107,277 ha, comprise the majority of the San Rafael Range. In 2007, the Zaca Fire burned just over 97,000 ha in Santa Barbara's backcountry, including portions of Big Pine Mountain. The habitat on the north slope of Big Pine Mountain can be classified as "mixed conifer series" (Sawyer and Keeler-Wolf 1995), consisting of a mature forest of white fir (*Abies concolor*), incense cedar (*Calocedrus decurrens*), canyon live oak (*Quercus chrysolepis*), sugar pine (*Pinus lambertiana*), Coulter pine (*P. coulteri*), and Jeffrey pine (*P. jeffreyi*) with a broken canopy. A few small, grassy meadows and chokecherry (*Prunus virginiana*) thickets are interspersed within open areas and areas of sparse canopy cover. The south-facing slopes around Big Pine Mountain are covered with chaparral now early in succession; before the fire, they had been dominated by areas of dense manzanita (*Arctostaphylos* spp.), yucca (*Hesperoyucca whipplei*), scrub oak (*Quercus berberidifolia*), chamise (*Adenostoma fasciculatum*), and California buckwheat (*Eriogonum fasciculatum*). Although in the two years since the fire regrowth has been substantial, as of 2009 much of the intensely burned areas remained open and sparsely vegetated.

Big Pine Mountain received little ornithological coverage prior to the 1970s (Lentz 1993). Access into these mountains was facilitated when a road was built by the Civilian Conservation Corps in the early 1930s, and some of the first visits shortly thereafter involved informal surveys for the California Condor (*Gymnogyps californianus*). It was here that some of the last remaining wild condors persisted, and in 1985 Big Pine Mountain was the location of one of the last attempts by the condor to breed before the remaining wild birds were taken into captivity (Snyder and Snyder 2000).

During the summer of 1981, Joan E. Lentz initiated surveys of the breeding avifauna of Big Pine Mountain, and these surveys have continued on an almost annual basis through the present. During each survey, one to three observers cover eight sites over one to two days. From 1981 through 2010 and between 30 May and 22 July, there have been 33 surveys, including 24 visits to the location where we found the Northern Goshawk nest in 2009 (Lentz 1993 and unpubl. data). Although we cannot discount the possibility that Northern Goshawks had gone undetected prior to the 2009 survey, we believe that this nest represents a recent colonization of the area. The origin of these birds is uncertain, but there is a high likelihood that it was the mountains of southern Kern and northern Ventura counties. This region, which includes Mount Abel and Mount Pinos, is approximately 50 km to the northeast and has produced the most frequent reports and breeding records of the goshawk in southern California.

CURRENT BREEDING STATUS IN SOUTHERN CALIFORNIA

The first nesting record for southern California is based on a set of three eggs collected by Elmer Bowen on 6 May 1904 at Mount Pinos (Garrett and Dunn 1981; Western Foundation of Vertebrate Zoology 45214). Now, more than a century later, only a handful of additional Northern Goshawk nests have been found, and the species remains elusive and extremely rare throughout the region at any time of year.

There are summer sight records for the San Rafael Wilderness (Santa Barbara County), Mount Pinos (Kern and Ventura counties), Mount Abel (Kern County), Pine Mountain (Ventura County), Clark Mountain and the San Bernardino Mountains (San Bernardino County), San Jacinto Mountains (Riverside County), and Cuyamaca Mountains (San Diego County), but before 2009 nesting had been confirmed only 11 times, at Mount Pinos, Mount Abel, the San Bernardino Mountains, and the Cuyamaca Mountains.

For Ventura and southwestern Kern counties, there are two historical records and six more recent records from 1960 through 2009. In addition to the 1904 egg set mentioned above, E. J. Percy collected set of two eggs at an unknown location in Ventura County on 9 April 1919 (Keane 2008; Denver Museum of Natural History 31544). Also within Ventura County,

Figure 1. Northern Goshawk nest in burned tree, Big Pine Mountain, San Rafael Mountains, Santa Barbara County, California, 13 June 2009; nestlings 14–17 days old.

Photo by Matt Victoria

there was an active nest with nestlings attended by two adults at Mount Pinos in 1960 (J. Wiley pers. comm.). In 1989 in Kern County, two nests were active simultaneously: one at Mount Abel, where a nest with two nestlings was discovered on 10 June (McCaskie 1989, Lentz 1993) and later fledged both young, and at the base of Mt. Pinos, where another pair was attending a nest (McCaskie 1989). The Mt. Abel nest was active again in 1990 and hatched two young in June, but it was later abandoned (McCaskie 1990, Lentz 1993), possibly because of predation of the nestlings. An observation of an adult and one or two fledglings 19–20 July 1990 at Mount Pinos in Kern County (McCaskie 1991, Lentz 1993) represents another successful nesting in this area, and two fledglings seen in both the Ventura and Kern portions of the mountain in 2009 represent a fourth. A sighting of an immature in the Grade Valley/Mutau Flats area, 19 km from Mt. Pinos and 16 km east of Pine Mountain, Ventura County, on 13 June 2001 (McCaskie 2001) suggests additional nesting in the area. A juvenile in Quatal Canyon, northwestern Ventura County, 9 October 2005 (D. Pereksta pers. comm.) may have been a dispersing bird that fledged nearby, as this locality is 21 km west of Mount Pinos. Northern Goshawks have probably bred around Mount Pinos more regularly, as additional observations both during and outside the breeding season in this region suggest, but the paucity of breeding records is probably a result of low observer coverage, limited survey efforts, and the likelihood that Northern Goshawks breed here, as throughout southern California, only intermittently. In contrast to the core of this species' breeding range in

Figure 2. Recently fledged Northern Goshawk at Big Pine Mountain, 6 July 2009; approximately 40 days old.

Photo by Larry Sansone

California (e.g., the northern Sierra Nevada), where suitable habitat is more extensive and continuous, the southern California mountains offer smaller, disjunct patches at the extreme southwestern edge of the species' range.

In San Diego County, there are three breeding records, all from the Cuyamaca Mountains. E. E. Sechrist collected a set of three eggs on 7 May 1937 (Puget Sound Museum 13196) and noted on the back of the data card an observation of two young birds in the same area in June of the following year (Kiff and Paulson 1997). He collected another set of three eggs just two days after the first set on 9 May 1937, now preserved at the Delaware Museum of Natural History (31545). These represent the southernmost breeding records in California, and there have been no other summer observations in this county since (Unitt 2004).

There is only one record of confirmed breeding for San Bernardino County. E. A. Cardiff (pers. comm.) heard Northern Goshawks vocalizing on 10 August 2004 at a location in the San Bernardino Mountains where nesting had been suspected. He subsequently found one fledgling, and another may have been present. Although breeding at this location has only been confirmed once, there are four summer sight records from the vicinity of the 2004 nest, in June 1997, 1999, on 16 July 2008 (E. A. Cardiff pers. comm.) and 4 July 2010 (R. McKernan pers. comm.).

In Riverside County, no nesting has been confirmed, but there are multiple spring and summer reports from the San Jacinto Mountains, as near Lake Fulmor 6 May 1978 (P. E. Lehman, McCaskie 1978), at Tahquitz Meadow 7 June 1978 (D. M. Morton, McCaskie 1978), and near Lawler Lodge 30 May 1987 (C. McGaugh, McCaskie 1987), suggesting that goshawks probably breed there sporadically in very small numbers. Most recently, Larry

Mauran reported one adult at Laws Camp, junction of Tahquitz and Willow creeks, on 28 July 2007, but surveys of the San Jacinto Mountains by the San Diego Natural History Museum beginning in 2008, retracing the 1908 expedition of Grinnell and Swarth (1913), have so far failed to record any Northern Goshawks (P. Unitt pers. comm.).

OCCURRENCE IN SANTA BARBARA COUNTY

In his journal for 14 July 1971 (Santa Barbara Museum of Natural History library archives), Dick Smith (after whom the Dick Smith Wilderness in Los Padres National Forest is named), described an encounter with an adult Northern Goshawk and later two birds circling together near Lonnie Davis Campground, 13 km from the 2009 nest site. Although compelling, the details confirming the identification, and photos accompanying the notes are inconclusive.

Otherwise, all of the previous occurrences of the Northern Goshawk from the mainland of Santa Barbara County involve winter visitors between November and February (Lehman 1994). Only one of these records is from the San Rafael Mountains; the other three are of one at 914 m in the more coastal Santa Ynez Mountains (La Cumbre Peak/San Marcos Pass, 31 December 1982, adult male struck a window, SBMNH 4651), and two from the lowlands, one in the interior (Paradise Campground, Santa Ynez Valley, 7 December 1972, adult male struck a window, SBMNH 2109) and one coastal (Santa Barbara, 16–23 December 1972, immature). Also, Stewart and Delong (1984) reported an adult Northern Goshawk interacting with a Peregrine Falcon on San Miguel Island 12 November 1982, the only record for the eight California Channel Islands. One spring and one summer record published by Lehman (1994) have since been retracted by the observers.

Do these birds and others recorded at low elevations in southern California in winter originate from the few nesting in the local mountains or from much farther north? In contrast to eastern North America, where substantial movements of this species are noted every few years, in the West the Northern Goshawk is generally considered a resident or a facultative migrant that undertakes only short movements to lower elevations in winter. Even in the West, however, fluctuations in the number of prey in the northern portions of the goshawk's range can lead to sporadic invasions or irruptions in which birds migrate longer distances southward. During these irruptions, adults outnumber immatures. In the winter of 1916–1917 a large-scale invasion reached the western United States, including California (Grinnell 1917). Although the distinction between a western subspecies *A. g. striatulus* and a northern and eastern subspecies *atricapillus* is no longer recognized, Grinnell identified three California specimens collected in November 1916 (all adult males, including one in southern California from northeastern Imperial County) as the eastern subspecies. An invasion of this magnitude, which included reports of an additional 25 birds statewide, has not been paralleled since. More recent irruptions, from the 1970s through the 1990s, occurred every 10 years, in 1972, 1982, and 1992 (Wheeler 2003). The records from the lower elevations of Santa Barbara County fit this pattern and make a strong case for birds originating far to the north. Lowland records for southern California in other years are more difficult to explain.

Nest in Santa Barbara County

On 13 June 2009 when we discovered the nest at Big Pine Mountain, we observed both adults; the adult male was paired with a female that appeared to be in pre-definitive plumage, with a brownish cast to the upperparts, a dull eye, and coarsely barred chest, belly, and wing coverts. These characteristics suggest that she was probably two years old. We distinguished the female by her larger size and lower-pitched calls, the difference being especially evident when both birds were vocalizing simultaneously. On each wing primary 5 was missing, so the bird was in active molt, a process that is typically suspended while adults are feeding chicks and resumed after breeding (Pyle 2005), an adaptation to concentrate available energy on providing for the young. A bird in good physical condition, however, may continue molting during this period, and good condition may also contribute to a readiness to breed as a subadult (P. Pyle pers. comm).

The nest contained two nestlings that we estimated (on the basis of the criteria of Boal 1994) to be between 14 and 17 days old. It was placed at the broken top of a dead Jeffrey pine, approximately 20 m high, at an elevation of 1597 m. The nest tree had been burned by the recent Zaca Fire and was charred, with no limbs extending out from the trunk (Figure 1). The fire apparently burned the area around the nest with varying intensity, leaving a mosaic of some patches untouched or lightly burned, others completely devastated. The nest tree measured 124 cm in diameter at breast height and was situated at the bottom of a gradual (7%) northeast-facing slope. An intermittent stream was flowing 12 m from the nest tree. Some of the trees immediately surrounding the nest tree were alive and only partially burned, but none had branches overhanging the nest tree, which left the nest and nestlings completely exposed. Nesting in a burned tree and the lack of vegetation over and immediately surrounding the nest are atypical of the Northern Goshawk, which generally places its nests under the forest canopy and in a live tree (Squires and Reynolds 1997, Keane 2008). Other aspects of the nest site, such as the slope, maturity of the forest, tree height, and distance to water were typical of goshawk nests studied elsewhere (Shuster 1980, Hayward and Escano 1989). Both nestlings fledged sometime just prior to 6 July, when Jon Dunn, Larry Sansone, and Wes Fritz found them in a nearby tree. At this time, the fledglings were capable of short flights, but their feathers were not fully grown (see Figure 2). Gaede observed both fledglings again on 27 July, 0.5 km from the nest. Both were very vocal and remained together, frequently flying short distances under the forest canopy.

In 2010, we visited Big Pine Mountain 12–14 June, and Curtis Marantz and Wes Fritz visited 6–8 July. We observed two Northern Goshawks in the same area as in 2009, but the nest was not occupied, and we found no evidence of nesting.

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LITERATURE CITED

American Ornithologists' Union. 1998. Checklist of North American Birds, 7th ed. Am. Ornithol. Union, Washington, D.C.

Boal, C. W. 1994. A photographic and behavioral guide to aging nestling Northern Goshawks. Studies in Avian Biology 16:32–40.

Garrett K., and Dunn, J. 1981. Birds of Southern California: Status and Distribution. Los Angeles Audubon Soc., Los Angeles.

Grinnell, J. 1917. An invasion of California by the Eastern Goshawk. Condor 19:70–71.

Grinnell, J., and Miller, A. H. 1944. The distribution of the birds of California. Pac. Coast Avifauna 27.

Hayward, G. D., and Escano, R. E. 1989. Goshawk nest-site characteristics in western Montana and northern Idaho. Condor 91:476–479.

Keane, J. J. 2008. Northern Goshawk (*Accipiter gentilis*), in California Bird Species of Special Concern (W. D. Shuford and T. Gardali, eds.), pp. 156–162. Studies of Western Birds 1. W. Field Ornithol., Camarillo, CA, and Calif. Dept. Fish and Game, Sacramento.

Kiff, L. F., and Paulson, D. R. 1997. Northern Goshawk breeding records from San Diego County, California. W. Birds 28:113–114.

Lehman, P. E. 1994. The Birds of Santa Barbara County, California. Vert. Mus., Univ. of Calif., Santa Barbara.

Lentz, J. E. 1993. Breeding birds of four isolated mountains in southern California. W. Birds 24:201–234.

McCaskie, G. 1978. Southern Pacific Coast region. Am. Birds 32:1206–1211.

McCaskie, G. 1987. Southern Pacific Coast region. Am. Birds 41:1486–1489.

McCaskie, G. 1989. Southern Pacific Coast region. Am. Birds 43:1366–1369.

McCaskie, G. 1990. Southern Pacific Coast region. Am. Birds 44:1184–1188.

McCaskie, G. 1991. Southern Pacific Coast region. Am. Birds 45:1160–1163.

McCaskie, G. 2001. Southern Pacific Coast region. N. Am. Birds 55:481–484.

Pyle, P., 2005. Remigial molt patterns in North American Falconiformes as related to age, sex, breeding status, and life-history strategies. Condor 107:823–834.

Sawyer, J. O., and Keeler-Wolf, T. 1995. A Manual of California Vegetation. Calif. Native Plant Soc., Sacramento.

Shuster, W. C. 1980. Northern Goshawk nest site requirements in the Colorado Rockies. 1989. W. Birds 11:89–96.

Snyder, N., and Snyder H. 2000. The California Condor: A Saga of Natural History and Conservation. Academic Press, San Diego.

Stewart, B. S., and Delong, R. L. 1984. Black-shouldered Kite and Northern Goshawk interactions with Peregrine Falcons at San Miguel Island, California. W. Birds 15:187–188.

Squires, J. R., and Reynolds, R. T. 1997. Northern Goshawk (*Accipiter gentilis*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 298. Birds N. Am., Philadelphia.

Unitt, P. 2004. San Diego County bird atlas. Proc. San Diego Soc. Nat. Hist. 39.

Wheeler, B. K. 2003. Raptors of Western North Amercia. Princeton Univ. Press, Princeton, NJ.

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DIET OF THE WESTERN SCREECH-OWL IN SOUTHEAST ALASKA

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ABSTRACT: We studied the diet of the Western Screech-Owl (*Megascops kennicottii*) at the northern edge of its range, in southeast Alaska. To describe the diet in the breeding season we collected pellets from beneath roost trees or nest cavities of 10 radio-marked owls, their mates, and their young. Mammals (found in 46 of 48 groups of pellets, 98%) and invertebrates (81%) were the most frequently taken prey, birds (23%) the least. We tallied 115 mammalian and 25 invertebrate prey items (all insects). Mammalian prey was either rodents (Cricetidae) or shrews. To eliminate bias associated with pellet analysis and to describe the diet during the nonbreeding season, we analyzed stomach contents of 15 owl carcasses salvaged from September to February. Insects (47 of 57 prey items; 82%), particularly beetles and caterpillars dominated the contents of these stomachs numerically; mammals constituted only 5 of 57 items (9%). Thus in southeast Alaska Western Screech-Owls feed to a large extent on small mammals, primarily deer mice (*Peromyscus*), and supplement that diet with insects, especially in the winter.

The Western Screech-Owl (*Megascops kennicottii*) is well distributed across western North America (Johnsgard 2002, Duncan 2003), in many parts of which it is associated primarily with riparian habitats. In the Pacific Northwest, habitat loss in productive riparian areas and predation by the recently arrived Barred Owl (*Strix varia*) have raised concern for the status of this species (Elliott 2004), prompting listing of two subspecies, *M. k. kennicottii* and *M. k. macfarlanei*, as of special concern and endangered, respectively, in British Columbia (Cannings and Angell 2001, COSEWIC 2002). Despite recent conservation concerns and the species' wide distribution, little information on its diet is available (Cannings and Angell 2001, COSEWIC 2002).

Knowledge of a bird's diet is fundamental to an understanding of its ecology (Marti et al. 2007). Because lack of sufficient prey is a primary factor limiting growth of populations of birds of prey (Newton 1979, 1998), an understanding of diet can only improve efforts at management and conservation, as it has for the Northern Goshawk (*Accipiter gentilis*; Reynolds et al. 1992). Across the Western Screech-Owl's range, its diet comprises primarily small mammals, birds, worms, insects, and crayfish (Cannings and Angell 2001). In general, southern populations consume more invertebrates than do northern populations, which feed primarily on small mammals, supplementing the summer diet with insects (Hayward and Garton 1988, Cannings and Angell 2001, Davis and Cannings 2008). There is little specific information on the Western Screech-Owl's diet in the northern coastal forests, where the diversity of mammalian prey is more limited than in other parts of its range (MacDonald and Cook 2007).

We sampled the diet of the Western Screech-Owl at the northern edge of the species' range, in southeast Alaska, by analysis of both pellets and stomach contents. Our objective was to identify and quantify the prey taken in both the breeding (March–August) and nonbreeding (September–February) seasons.

METHODS

Study Area

We analyzed pellets collected near Petersburg on Mitkof Island (56° 48′ N, 132° 56′ W), in southeast Alaska, a sparsely populated region characterized by steep, rugged topography, coastal fjords, and large tracts of temperate rainforest. Mitkof Island is 545 km^2 in size and ranges up to 1011 m in elevation. The island is naturally fragmented by mountainous terrain, wetlands, and various fine-scale disturbances such as wind-throw. Its forest is dominated by western hemlock (*Tsuga heterophylla*) and Sitka spruce (*Picea sitchensis*), the understory by blueberry (*Vaccinium* spp.), devil's club (*Oplopanax horridus*), and salmonberry (*Rubus* spp.). Commercial logging has entailed extensive clearcutting on some parts of the island. Mitkof Island has a cool, wet maritime climate with average annual precipitation of 288 cm evenly distributed throughout the year (National Weather Service, Alaska Climate Database, http://pajk.arh.noaa.gov/cliMap/akClimate.php).

Data Collection

Using mist nets with an audio lure and a mouse as a decoy (Lewis and Kissling 2009), we captured 10 Western Screech-Owls and attached backpack-mounted radio transmitters (model TW-4, Biotrack, Ltd) with Teflon ribbon to three females and seven males. To describe their habitat use and nesting areas, we located these radio-marked birds at roost and nest sites approximately twice a week from March to May in 2005 and 2006 (Kissling and Lewis 2009). To study the breeding-season diet, we collected pellets (we found no prey remains) from beneath roost trees or nest cavities of the radio-marked birds, their mates, or their young from 26 April to 21 September. Pellets were filed in envelopes labeled with date, time, location, and the individual owl's identity. We also recorded whether the pellet was found alone or in a cluster with other pellets. We dried, weighed, and dissected pellets in the laboratory, separating mammalian, avian, and invertebrate contents. We then identified items to the lowest possible taxon—mammals by dentition and skull characteristics (MacDonald and Cook 2006) and invertebrates by consultation with experts and collections (P. Atkins, U.S. Forest Service, Forestry Sciences Laboratory, Juneau). We were unable to identify birds to species or higher category because of the degradation and fragmentation of feathers and bones in the pellets. To eliminate some biases associated with pellet data (Lewis et al. 2004), we also obtained information from specimens at the University of Alaska Museum of the North, Fairbanks (UAM), where only three of 19 specimens included information on stomach contents: a pair of adults (UAM 4180, 4181) collected in April 1982 near Sitka and a juvenile (UAM 20146) collected in August 2004 at Juneau.

To describe the diet in the nonbreeding season, we obtained 15 carcasses of Western Screech-Owls (eight adult and seven juvenile) found dead as a result of collisions with vehicles or windows in southeast Alaska from September to February, 2000–2007. We sexed the specimens and examined their stomach contents. Three of the stomachs were empty. Although we were able to assemble only 12 useful specimens, these data offer the only information about the species' diet in southeast Alaska in the nonbreeding season.

Data Analysis

To avoid counting more than once a single prey item regurgitated in multiple pellets, we analyzed pellets collected at the same time and location as a group. We estimated the biomass of small mammals only, using the midpoint of the range of the species' mass (MacDonald and Cook 2006). In estimating biomass, we considered all unidentified shrews to have the same mass as *Sorex cinereus*, the commonest shrew in southeast Alaska (MacDonald and Cook 2007) and the only one we positively identified. We assumed the proportions of unidentified rodents in our pellet samples were the same as those of the identified rodents (88% mice [*Peromyscus*] and 12% voles [*Microtus*] or lemmings [*Synaptomys*]) and used a weighted average value of 32.0 g for the mass of rodents (MacDonald and Cook 2006). We did not include unidentified mammals in the estimation of frequency or biomass because we were unable to approximate their mass reliably.

RESULTS

Pellet Analysis

We collected 125 pellets in 48 groups, with 1–13 groups per owl (mean 5; standard deviation 4). The total mass of the pellets was 90.3 g, mean 0.72 g), comprising mammalian (84.5 g; 94% by weight), invertebrate (3.1 g; 3%), and avian remains (2.7 g; 3%; Table 1). By group of pellets, mammals were most frequent (98%; *n* = 46), invertebrates were less so (81%; *n* = 39), and birds were least frequent (23%; *n* = 11; Table 1).

We tallied at least 115 mammalian prey items in the pellets. Of these, we could not further identify 5; the remaining 110 represented either shrews (Soricidae; *n* = 38) or rodents (Cricetidae; *n* = 72; Table 2). We identified 65 of the mammalian items to one of five species: cinereous shrew (*n* = 3), northern bog lemming (*Synaptomys borealis*; *n* = 2), meadow vole (*Microtus pennsylvanicus*; *n* = 5), long-tailed vole (*M. longicaudus*; *n* = 1), and Keen's deer mouse (*Peromyscus keeni*; *n* = 60; Table 2).

Two pellets were composed primarily of bird remains, but nine additional pellets had traces of feathers, possibly from the owl itself. We were unable to identify the birds to species or species group, but, given the density of the feathers and bones in the pellet, we are confident that at least two species of birds were depredated.

We identified 25 invertebrate prey items (all insects) to four families in the orders Coleoptera (84%) and Hemiptera (16%; Table 3). Coleopteran

Table 1 Contents (n = 125) by Mass and Frequency of Occurrence in Pellets Collected at Roost and Nest Sites of the Western Screech-Owl, Southeast Alaska, 2005–2006

	Mass		Frequency of occurrence[a]	
Type of prey	Total (g)	%	*n*	%
Mammalian	84.5	94	46	98
Avian	2.7	3	11	23
Invertebrate	3.1	3	39	81

[a] By group of pellets found together (n = 48).

remains belonged to the Carabidae (n = 5), Dytiscidae (n = 5), and Curculionidae (n = 6); the only Hemipteran family represented was the Belostomatidae (n = 4; Table 3).

Carcass Analysis

In the 15 Western Screech-Owl carcasses, mammals (5 of 57 prey items; 9%) did not constitute a large portion of the stomach contents; insects (47 of 57 prey items; 82%) dominated the prey of both adults and juveniles (Table 4) in both the nonbreeding and breeding seasons (Figure 1). Caterpillars (67%) constituted a large portion of the stomach contents from the carcasses, particularly of adults (Table 4). We found no mammals in adults' stomachs, but 5 of the 7 juvenile birds (71%) had mammal hair or bones in their stom-

Table 2 Frequency of Occurrence and Proportion of Biomass of Small Mammals in Pellets Regurgitated by Western Screech-Owls, Southeast Alaska, 2005–2006[a]

Prey	Minimum number	Frequency (%)	Total biomass (g)	Biomass (%)
Soricidae				
Sorex cinereus, cinereous shrew	3	3	11.4	0.5
Unidentified shrew	35	32	133.0	5.5
Cricetidae				
Synaptomys borealis, northern bog lemming	2	2	60.8	2.5
Microtus pennsylvanicus, meadow vole	5	4	177.5	7.3
Microtus longicaudus, long-tailed vole	1	1	45.0	1.9
Unidentified rodent	4	4	128.0	5.3
Peromyscus keeni, Keen's deer mouse	60	54	1860.0	77.0

[a] Unidentified mammals (n = 5) excluded.

Table 3 Minimum Number of Insects Found in Pellets Regurgitated by Western Screech-Owls, Southeast Alaska, 2005–2006

Prey	Description	*n*
Coleoptera		
Unidentified	beetles	5
Carabidae		
Unidentified	ground beetle	2
Pterostichus sp.	woodland ground beetle	3
Dytiscidae: *Dytiscus* sp.	predaceous diving beetle	5
Curculionidae		
Unidentified	snout and bark beetle	4
Hylobius sp.	snout and bark beetle	2
Hemiptera		
Belostomatidae:		
Lethocerus americanus	Giant Water Bug	4

achs (Table 4). Soft-bodied invertebrates other than beetles identified in the stomachs included worms and spiders (Table 4), both of which were limited to specimens recovered in the nonbreeding season (Figure 1).

DISCUSSION

Collection and analysis of pellets is an indirect method of studying birds' diet, but the method allows a large sample to be collected with little disturbance to the birds (Lewis et al. 2004, Marti et al. 2007). Owls typically swallow their prey whole, and highly acidic gastric juices assist in digestion (Duke et al. 1975). Undigested bones and fur and feathers are cast into a pellet that is regurgitated, so pellet analysis is biased toward prey that are not fully or easily digested. Mammals, in particular, are overestimated and

Table 4 Identification and Minimum Number of Prey Items Identified in Stomachs of Carcasses Found Dead (*n* = 12) and Specimens (*n* = 3) of the Western Screech-Owl, Southeast Alaska, 1982–2007

	Juvenile (*n* = 7)	Adult (*n* = 8)
Prey	n	n
Mammalia	4	
Unidentfied		
Sorex sp. (shrew)	1	
Insecta	4	
Coleoptera: unidentified		2
Coleoptera: *Pterostichus melanarius*.	3	
Lepidoptera: unidentified caterpillar	4	24
Lepidoptera: Noctuidae (caterpillar)		10
Arachnida: Linyphiidae (spider)	2	
Oligochaeta: Lumbricidae (earthworm)		3

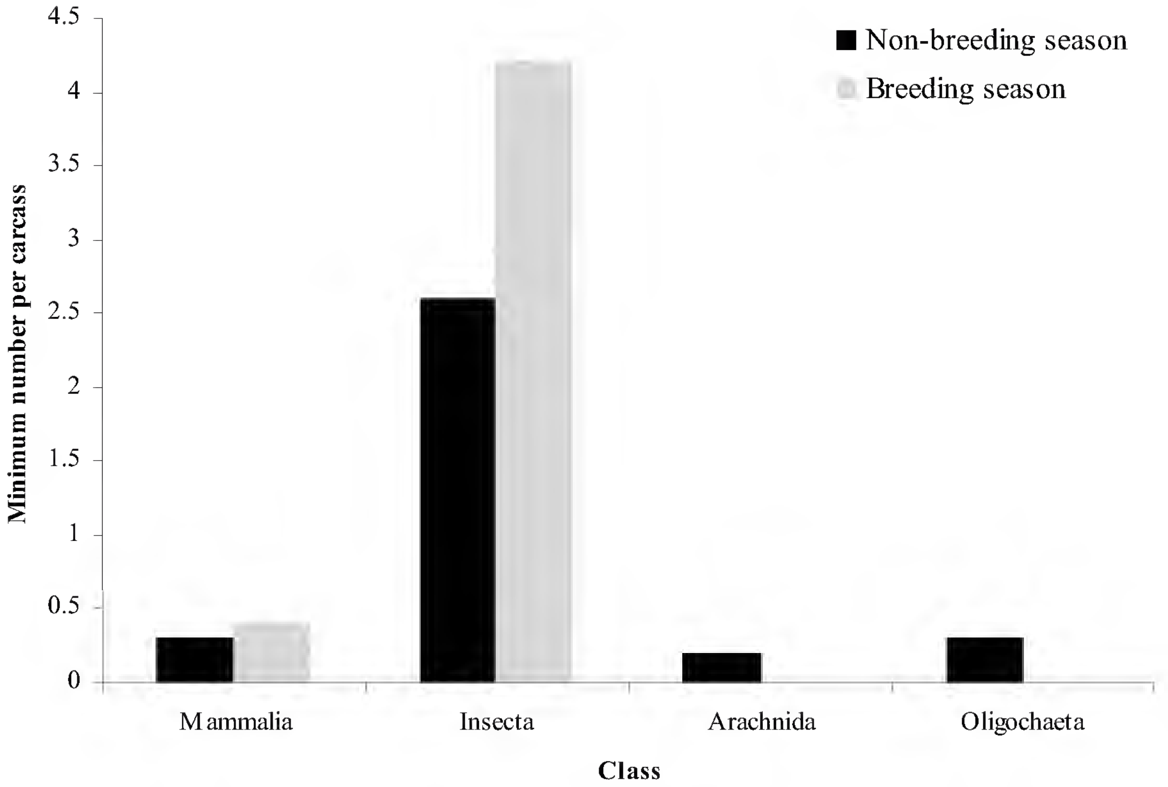

Figure 1. Minimum number per carcass of prey items by class identified in stomachs of carcasses and specimens of the Western Screech-Owl in the nonbreeding (September–February; *n* = 10) and breeding (March–August; *n* = 5) seasons in southeast Alaska, 1982–2007.

soft-bodied prey (e.g., earthworms) underestimated when a diet is described from pellets (Lewis et al. 2004).

In Alaska, on the basis of our analysis of regurgitated pellets, the Western Screech-Owl consumes primarily small mammals during the breeding season. Keen's deer mouse, one of the most common and widely distributed mammals in southeast Alaska (MacDonald and Cook 2007), dominates the diet at this season. Although invertebrate remains contributed very little to the pellets' total mass, they occurred in nearly all groups of pellets. All invertebrates in pellets were insects and nearly all were beetles (Coleoptera), the hardened forewings (elytra) of which often persisted and allowed identification of beetle remains. It is likely that other soft-bodied invertebrates were digested without leaving evidence in pellets. Invertebrates are notoriously difficult to detect with an indirect technique like pellet analysis, and the diets of known insectivores, such as the Flammulated Owl (*Otus flammeolus*), are not studied by pellet analysis (McCallum 1994). Thus, by this method, it is difficult to assess the importance of invertebrate prey to the Western Screech-Owl in southeast Alaska. Because both insects and mammals were consistently represented in the pellets, we conclude that, during the breeding season, these owls feed on small mammals, primarily deer mice, but supplement their diet with numerous invertebrates, which were probably underestimated in our analysis. Avian remains were insignificant in the diet.

We intended carcass analysis to provide information about diet without the bias associated with pellet analysis (Lewis et al. 2004). Yet, except for the two specimens from Sitka, the carcasses were of birds found dead, so they may not be an unbiased sample, possibly composed of birds predisposed to mortality, as from starvation. Because Keen's deer mouse and the other mammalian prey species are active in southeast Alaska year round, we were surprised that few owl stomachs contained mammalian remains. Western Screech-Owls regurgitate a large pellet about 4 hours after consuming a small mammal, then usually produce a second pellet about 1/3 of the size of the first 1 hour later; after the second pellet is cast, the bird is ready to begin hunting and feeding again (Cannings and Angell 2001). Therefore, analysis of stomach contents might be positively biased toward invertebrates, in terms of frequency of occurrence, because an owl cannot cast a pellet without a large amount of undigested material (e.g., mammalian remains) in the stomach. In other words, to cast a pellet, an owl would need to consume many invertebrates but only one small mammal. Regardless, the carcass analysis provided information on soft-bodied invertebrates, especially insects, which appear to constitute an important part of the Western Screech-Owl's diet year round. Although our sample is small, we found a greater diversity of invertebrates eaten in the nonbreeding season. Perhaps invertebrates provide an alternative food source when foraging is restricted to areas with little snow cover. The value of invertebrates in the Western Screech-Owl's diet has been documented elsewhere throughout the year (Smith and Wilson 1971, Fraser et al. 1999).

One benefit of pellet analysis in the study of the diet of mammal-eating owls is that it can provide specimen evidence of small mammals that are rare or difficult to trap. For example, there are no specimen records of the northern bog lemming for Mitkof Island (MacDonald and Cook 2007), yet we found two individuals in our study. Because these owls were equipped with radio transmitters, we are confident that they were not flying to neighboring islands to hunt (Kissling and Lewis 2009). Such records are especially important in an island ecosystem where endemism has become a heightened concern for conservation biologists and managers (Cook et al. 2006). Analysis of owls' diet, therefore, may contribute to the understanding of small mammals' distribution, given some basic understanding of the owls' food habits and preferences.

Despite the limitations and potential biases of our methods, we provide the first data on the diet of the Western Screech-Owl in southeast Alaska. As elsewhere, this species' diet is diverse, with small mammals, especially deer mice, constituting most of the biomass, but insects contribute significantly throughout the year (Cannings and Angell 2001 and references therein, Davis and Cannings 2008). We suspect that the diet varies little spatially across southeast Alaska because deer mice and, presumably, insects, are ubiquitous and well-distributed on all islands (MacDonald and Cook 2007). Temporally, however, we speculate that invertebrates are especially important food when small mammals are scarce or unavailable, as during heavy snow. Because Western Screech-Owls defend their territories year round (Cannings and Angell 2001), their diet may in part explain their close association with riparian habitats in southeast Alaska, where an overstory of large trees provides protection from heavy snow accumulation on the ground and thus increased access to prey there

(Harestad and Bunnell 1981, Kirchhoff and Schoen 1987). Therefore, to provide year-round habitat for the Western Screech-Owl, and likely other birds, we advocate protecting low-gradient streams at low elevations in southeast Alaska.

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LITERATURE CITED

Cannings, R. J., and Angell, T. 2001. Western Screech-Owl (*Megascops kennicottii*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 597. Birds N. Am., Philadelphia.

Cook, J. A., Dawson, N. G., and MacDonald, S. O. 2006. Conservation of highly fragmented systems: The north temperate Alexander Archipelago. Biol. Conserv. 133:1–15.

COSEWIC [Committee on the Status of Endangered Wildlife in Canada]. 2002. The status of the Western Screech-Owl (*Otus kennicottii*) in Canada. COSEWIC, Ottawa.

Davis, H., and Cannings, R. J. 2008. Diet of Western Screech-Owls in the interior of British Columbia. Br. Columbia Birds 18:19–22.

Duke, G. E., Jegers, A. A., Loff, G., and Evanson, O. A. 1975. Gastric digestion in some raptors. Comp. Biochem. Physiol. A 50:649–656.

Duncan, J. R. 2003. Owls of the World: Their Lives, Behavior, and Survival. Firefly Books, Buffalo.

Elliott, K. 2004. Declining numbers of Western Screech-Owl in the lower mainland of British Columbia. Br. Columbia Birds 14:2–11.

Fraser, D. F., Harper, W. L., Cannings, S. G., and Cooper, J. M. 1999. Rare Birds of British Columbia. Ministry of Environment, Lands and Parks, Victoria.

Harestad, A. S., and Bunnell, F. L. 1981. Prediction of snow-water equivalents in coniferous forests. Can. J. Forest Res. 11:854–857.

Hayward, G. D., and Garton, E. O. 1988. Resource partitioning among forest owls in the River of No Return Wilderness, Idaho. Oecologia 75:253–265.

Johnsgard, P. 2002. North American Owls. Smithsonian Inst. Press, Washington, DC.

Kirchoff, M. D., and Schoen, J. W. 1987. Forest cover and snow: Implications for deer habitat in southeast Alaska. J. Wildlife Mgmt. 51:28–33.

Kissling, M. L., and Lewis, S. B. 2009. Distribution, abundance, and ecology of forest owls in southeastern Alaska—final report. U.S. Fish and Wildlife Service, Juneau Field Office, Juneau, AK, and Alaska Department of Fish and Game, Division of Wildlife Conservation, Douglas, AK.

Lewis, S. B., Fuller, M. R., and Titus, K. 2004. A comparison of 3 methods for assessing raptor diet during the breeding season. Wildlife Soc. Bull. 32:373–385.

Lewis, S. B, and Kissling, M. L. 2009. A technique for capturing Western Screech-Owls (*Megascops kennicottii*) in southeast Alaska. N. Am. Bird Bander 34:179–185.

MacDonald, S. O., and Cook, J. A. 2006. The Small Mammals of Southeast Alaska: An Identification Guide to the Shrews and Small Rodents. Mus. of Southwestern Biol., Univ. of New Mexico, Albuquerque.

MacDonald, S. O., and Cook, J. A. 2007. Mammals and amphibians of southeast Alaska. Spec. Pub. 8, Mus. of Southwestern Biol., Univ. of New Mexico, Albuquerque.

Marti, C. D., Bechard, M., and Jaksic, F. M. 2007. Food habits, in Raptor Research and Management Techniques (D. M. Bird and K. L. Bildstein, eds.), pp. 129–151. Hancock House, Blaine, WA.

McCallum, D. A. 1994. Flammulated Owl (*Otus flammeolus*), in The Birds of North America (A. Poole and F. Gill, eds.), no. 93. Acad. Nat. Sci., Philadelphia.

Newton, I. 1979. Population Ecology of Raptors. Buteo Books, Vermillion, SD.

Newton, I. 1998. Population Limitation in Birds. Academic Press, San Diego.

Reynolds, R. T., Graham, M. H., Reiser, R. L., Bassett, R. L., Kennedy, P. L., Boyce, D. A., Jr., Goodwin, G., Smith, R., and Fisher, E. L. 1992. Management recommendations for the Northern Goshawk in the southwestern United States. USDA Forest Service Gen. Tech. Rep. RM-217.

Smith, D. G., and Wilson, C. R. 1971. Notes on the winter food of Screech-Owls in central Idaho. Great Basin Nat. 31:83–84.

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Western Screech-Owl

Sketch by George C. West

NOTES

A POSSIBLE HOSTILE TAKEOVER OF A MATED FEMALE BY A MALE AMERICAN DIPPER

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We report a possible hostile takeover of a female (and a territory) by a male American Dipper (*Cinclus mexicanus*) near Juneau in southeastern Alaska in 2006. The evidence is circumstantial but strongly suggestive, in light of previous studies.

Infanticide by unrelated conspecific individuals, both male and female, is widespread among mammals (Hrdy 1979) and birds (Chek and Robertson 1991, Møller 2004, Veiga 2004). Usurping males kill existing offspring, quickly making the bereft female ready to mate again (e.g., Hrdy 1979, Freed 1986, 1987). In passerine birds, infanticide by adult males occurs in a variety of species (e.g., swallows, wrens, sunbirds, starlings; Møller 1988, Freed 1986, 1987, Kermott et al. 1990, Goldstein et al. 1986, Robertson and Stutchbury 1988, Smith et al. 1996), often giving the usurper a mate or sometimes both a mate and a nest (Hansell 2000). Infanticide by a usurping male at a given nest may be spread over more than one day (Goldstein et al. 1986, Kermott et al. 1990, Yoerg 1990).

J. P. Loegering (in Kingery 1996) reported a possible case of infanticide and usurpation of a female and her nest by a male American Dipper in Oregon. An intruding male drove away a parental male, whose nestlings were found dead in the stream the next day. The intruder mated with the female of the original pair; they replaced the old nest lining and nested together. Infanticide by the White-throated Dipper (*C. cinclus*) of Eurasia has been reported also, but in that case it was not followed by usurpation of the mate (Yoerg 1990).

We studied American Dippers near Juneau from 2003 through 2008 (Willson and Hocker 2008 and 2009, Willson et al. 2009). The information from that project provides the background for interpreting this observation of usurpation of a mated female (and a territory) by a male dipper on a tributary of Fish Creek on Douglas Island, in Juneau.

On 13 June 2006, we observed a pair tending a nest (A), feeding chicks, and brooding, but we also saw a dead hatchling (with broken egg shells) in the creek. On 14 June, the pair was still feeding chicks. We banded the attentive male; the female was already banded with a distinctive combination of colored plastic bands. On 20 June, the banded female was lining a new nest (B) just a few meters downstream, with an unbanded male in attendance. An unbanded male was carrying mayflies to nest B on 27 June, presumably to the incubating female. Nest A had failed by then, but nest B fledged several chicks by 8 August, and an unbanded male was carrying fish and insects to them. The nearest neighboring pairs nested hundreds of meters away, both upstream and downstream, and the new male had acquired the territory of the original male, which we never saw again.

If the chicks in nest A died independently of mate replacement, we would have expected the banded pair to renest together, as observed for several other banded pairs whose first attempt failed (our observations). If the original male died, we would have expected the widowed female to raise the chicks by herself, because we have observed several such females to do so successfully (Willson and Hocker 2008). Neither of these expectations was met in this case. The original male appeared to be in good condition and within the normal weight range when he was banded.

Nest B was being lined just 6 days after young chicks were being fed and brooded in nest A, indicating that the construction of nest B must have begun several days earlier. Because the large amount of moss used to build the exterior of dipper nests normally requires several days at least, the replacement of the original male by the new male must have occurred soon after the former was banded. It is unlikely that the banding itself had any negative effects; we have banded over 100 dippers with no observable ill effects. It is likely that usurpation was already beginning on 13 June, when the dead chick was found.

The breeding season of 2006 followed a year of good apparent annual survival of adults and high nest success (Willson and Hocker 2008, Willson et al. 2009) suggesting that the local population was relatively high and few potential territories were vacant (Willson et al. 2009). These conditions would increase the likelihood of intense competition for mates and territories, as documented for the Barn Swallow (*Hirundo rustica*; Møller 2004).

We thank Ray Danner for expert field assistance.

LITERATURE CITED

Chek, A. A., and Robertson, R. J. 1991. Infanticide in female Tree Swallows: A role for sexual selection. Condor 93:454–457.

Freed, L. A. 1986. Territory takeover and sexually selected infanticide in tropical House Wrens. Behav. Ecol. Sociobiol. 19:197–206.

Freed, L. A. 1987. Prospective infanticide and protection of genetic paternity in tropical House Wrens. Am. Nat. 130:948–954.

Goldstein, H., Eisikovitz, D., and Yom-Tov, Y. 1986. Infanticide in the Palestine Sunbird. Condor 88:528–529.

Hansell, M. 2000. Bird nests and construction behaviour. Cambridge Univ. Press, Cambridge, England.

Hrdy, S. B. 1979. Infanticide among animals: A review, classification, and examination of the implications for the reproductive strategies of females. Ethol. Sociobiol. 1:13–40.

Kermott, L. H., Johnson, L. S., and Brinton, H. 1990. Brood adoption and apparent infanticide in a north-temperate House Wren population. Wilson Bull. 102:333–336.

Kingery, H. E. 1996. American Dipper (*Cinclus mexicanus*), in The Birds of North America (A. Poole and F. Gills, eds.), no. 229. Acad. Nat. Sci., Philadelphia.

Møller, A. P. 1988. Infanticidal and anti-infanticidal strategies in the swallow *Hirundo rustica*. Behav. Ecol. Sociobiol. 22:365–371.

Møller, A. P. 2004. Rapid temporal change in frequency of infanticide in a passerine bird associated with change in population density and body condition. Behav. Ecol. 15:461–468.

Robertson, R. J., and Stutchbury, B. J. 1988. Experimental evidence for sexually selected infanticide in Tree Swallows. Anim. Behav. 38:749–753.

Smith, H. G., Wennerberg, L., and von Schantz, T. 1996. Adoption or infanticide: options of replacement males in the European Starling. Behav. Ecol. Sociobiol. 38:191–197.

Veiga, J. P. 2004. Replacement female House Sparrows regularly commit infanticide: gaining time or signaling status? Behav. Ecol. 15: 219–222.

Willson, M. F., and Hocker, K. M. 2008. Natural history of nesting American Dippers (*Cinclus mexicanus*) in southeastern Alaska. Northwest. Nat. 89:97–106.

Willson, M. F., and Hocker, K. M. 2009. Nestling provisioning by American Dippers near Juneau, Alaska. W. Birds 40:29–34.

Willson, M. F., Pendleton, G. W., and Hocker, K. M. 2009. Distribution and abundance of nesting American Dippers near Juneau, Alaska. W. Birds 40:191–209.

Yoerg, S. I. 1990. Infanticide in the Eurasian Dipper. Condor 92:775–776.

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BOOK REVIEW

The Contra Costa County Breeding Bird Atlas, by Steven Glover. 2009. Mount Diablo Audubon Society, Walnut Creek, CA. 260 pages, 56 black and white illustrations by Dana Gardner. Two color maps and numerous black and white maps. Paperback $26.80 (with shipping and taxes). Purchase through www.diabloaudubon.com. ISBN: 978-0-615-30194-5.

Situated in northern California, Contra Costa County is one of nine counties that make up the San Francisco Bay Area. It extends from San Francisco Bay north to the San Joaquin Delta and east to the western edge of the Central Valley. Located in the heart of the county is Mount Diablo, a major geographic feature and focal point. These diverse regions contribute to the avian richness of the county, which supports habitats for such nesting species as the Black Oystercatcher, Swainson's Hawk, and probably the Black Rail. Additional breeding birds of conservation concern include the Tricolored Blackbird, Yellow-billed Magpie, and Least Tern. In size, Contra Costa County ranks 48th among California's 58 counties, but as of 2008, it was the ninth most populated, with over a million people.

This atlas presents accounts for 161 species, of which 149 were confirmed breeding during the study from spring 1998 through summer 2002. Additional information updates the accounts to 2008. Glover notes that publication was "long overdue," but frustration over the six year delay was offset by online access to excellent color maps for each breeding species. At this writing, the maps are still available at www.flyingemu.com/ccosta/.

Compared to other published atlases for the San Francisco Bay Area, this book is longer than the ones for San Mateo, Sonoma, and Napa counties but shorter than those for Marin or Santa Clara. Fifty-six fine scratchboard drawings of local birds by the famous illustrator Dana Gardner, 53 of which were originals created especially for this atlas, add a consistent touch of beauty to the book. All but two drawings are located near the corresponding species accounts.

Printed on the inside front and back covers are two attractive color maps of the county. That in the front is an enhanced version of the maps in the species accounts and one of the most valuable features of this atlas. There is nothing to fold out or lose, and the map can be located immediately when needed. It shows bays and waterways, some relief in the Coast and Diablo ranges, regional and state parks, and major reservoirs and watershed lands. Key features such as town and city names, major highways, and the atlas's block grid make this map very useful for identifying additional locations that were necessarily omitted from the smaller maps. The land-cover (vegetation) map on the inside back cover shows the county with a key to the colors identifying various habitats. Readers unfamiliar with the county's exact location may have also benefited from a simple map showing Contra Costa County within California.

The text for this atlas is quite reader-friendly. After the introduction and three pages of extensive acknowledgments, a section addresses the topography and geography of the county, including climate. The section on plant communities is followed by a description of methods employed for this atlas. The number of breeding species, new species (no fewer than six were confirmed breeding for the first time during the atlas period), and other highlights, as well as questions left unanswered, are discussed in the results section. Also included is a table ranking the species by number of blocks, though it is apparently missing two species. The section on birds of conservation concern presents a preliminary list of species of concern for Contra Costa County, as well as those on federal and state lists and Audubon's watch list. As a resident of this county, I found the pages comparing the breeding birds in 1927 and 2008 especially interesting, a glimpse into the avian world of a less populated Contra Costa County I will never know.

After a brief introduction, the species accounts begin on page 25, most fitting onto one page, some slightly longer, all written by Glover. Beneath the family, common, and scientific name of each species is an atlas map with its key. The maps are smaller, less detailed, gray-scale versions of the color map on the inside front cover. The only place name on each map is Mount Diablo, reducing cluttering text. The maps contain 107 5-km squares, defined by the Universal Transverse Mercator grid. Just as in the atlas for Marin County (Shuford 1993), three small circles, black, half black, or white, indicate confirmed, probable, and possible breeding respectively, allowing for easy viewing of the map beneath.

In each account, the text begins with a brief introduction, many with charming and perceptive quotes by Dawson (1923), followed by four standardized sections that follow the format of the Monterey County atlas (Roberson and Tenney 1993). "Current Status and Distribution" examines where the species can be found within the county, comments on abundance, and comments briefly on habitat. "Historical Occurrence" was well researched, with many references to Grinnell and Wythe (1927), Grinnell and Miller (1944), Bousman (2007), and others. "Breeding and Natural History" distills atlas data and information from other resources to interpret each species' chronology of breeding. Detailed aspects of breeding and natural history were covered in depth in the Marin and Monterey County atlases so are not included here. The accounts conclude with "Conservation." Comments on the future of many species take on a foreboding sense of doom, or at least of decline. Loss of suitable habitat is often cited as a primary reason, especially in the eastern part of the county. But other species are stable or increasing, often adapting to human development or protected by the county's extensive parklands and watersheds.

The appendices complete the atlas with comments on former breeding species (2), species confirmed after 2002 (2), potential breeding species (41), scientific names of plants mentioned in the text, and, last, a comprehensive chart of the atlas's blocks, with numbers of species, hours, and observers. Take note of how many blocks were surveyed by Glover himself. Eight pages of references cited present many wonderful resources. Glover notes, "The finished product is the result of the best efforts of a group of amateur field ornithologists." These people are to be commended, especially the author himself, who worked hard to present an atlas worthy of a place in California's ornithological history. As one who has birded extensively in this county, I return to this reference repeatedly. I highly recommended *The Breeding Bird Atlas of Contra Costa County* to anyone who wants to learn more about the breeding birds of this county of the "opposite coast," as well as the amazing avian diversity of the San Francisco Bay area and California.

LITERATURE CITED

Bousman, W. G. 2007. Breeding Bird Atlas of Santa Clara County, California. Santa Clara Valley Audubon Soc., Cupertino, CA.

Grinnell, J., and Miller, A. H. 1944. Distribution of the Birds of California. Pac. Coast Avifauna 27.

Grinnell, J., and Wythe, M. W. 1927. Directory to the bird life of the San Francisco Bay region. Pac. Coast Avifauna 18.

Dawson, W. L. 1923. The Birds of California. South Moulton Co., San Diego.

Roberson, D., and Tenney, C., eds. 1993. Atlas of the Breeding Birds of Monterey County, California. . Monterey Peninsula Audubon Soc., Carmel, CA.

Shuford, W. D. 1993. The Marin County Breeding.Bird Atlas. Bushtit Books, Bolinas, CA.

Denise Wight

VIRGINIA P. JOHNSON RECEIVES WFO'S ALAN M. CRAIG AWARD

In 1987, Western Field Ornithologists instituted the Alan M. Craig Award, to be given "on an irregular basis for exceptional service to the organization." After considerable discussion last year, WFO's board of directors decided to resurrect this award and to set about seeking and evaluating nominees.

Ultimately there was little question of whose service has been so exceptional as to deserve the award: Virginia (Ginger) P. Johnson, who has served WFO continuously throughout its existence. The award was presented at WFO's annual meeting in Palm Desert on 16 October 2010 and included a framed print of Sabine's Gulls in flight, specially created by Andrew Birch.

Since 1970, when she was one of the founding members of the organization and one of the founding editors of *California Birds*, Ginger has volunteered her time to produce our journal. Her sketch of a Sabine's Gull provides the logo that has identified us since the outset.

Before the advent of the computer age Ginger painstakingly assembled each issue by hand, cutting the typeset copy and arranging it into pages for the printer. After this task became electronic, she continued working on other basic steps of quality control in production of a journal, checking the work of the typesetter to ensure all corrections are made properly and all the illustrations are in place. Every issue of *Western Birds* bears the stamp of Ginger's high standards. As we publish ever more color photographs, the importance of another of her roles looms ever larger. In the process of printing, eight pages are still printed on a single large sheet, which is folded and cut into what printers call a signature. WFO pays for color in the journal on the basis of the signature, so we maximize the bang for our buck when we distribute the maximum number of color photos onto the minimum possible number of signatures. For each issue with color photos, Ginger finds this minimum and directs the photos' placement, often reordering the articles, in a process equivalent to solving a complex puzzle, requiring balance, ingenuity, and good judgment. By ensuring we maximize our efficiency, Ginger has saved WFO thousands of dollars over the years. Ginger's work has contributed substantially to *Western Birds*' improvement and WFO's financial health at a time when the economy is sagging and many organizations and publications are struggling.

In addition to her work on *Western Birds*, Ginger continues her work as an experienced bird bander, monitors Least Tern colonies in San Diego, participates regularly in the San Diego Christmas bird count, and participated in the San Diego County bird atlas. She enjoys birding with her many friends in San Diego and the Southwest and has taken numerous birding trips farther afield.

Ginger's work has been quiet and behind the scenes, but every member of WFO and every reader of *Western Birds* benefits from her diligence and dedication. In a span of 40 years each of us must face crises, and Ginger has been no exception. Yet through all the ups and downs she has kept working on our behalf on every issue of the journal published since its inception in 1970. Such steadfast dedication to WFO's mission merits recognition with the Alan M. Craig award and inspires our heartfelt thanks.

The award's name honors another individual who, like Ginger, was both a founding member of the organization and a founding editor of *California Birds*. In 1973, when the organization expanded its range of interest and *California Birds* became *Western Birds*, Alan became the journal's editor. He guided the publication in that role for another 14 years. Fittingly, Alan was the first recipient of the Alan M. Craig Award. Ginger is the second.

Philip Unitt and David E. Quady

FEATURED PHOTO

DOCUMENTING REPEATED OCCURRENCES OF INDIVIDUAL BIRDS WITH DIGITAL IMAGES

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The currency of bird records committees has been "records," but the definition of a record is not as simple as it may seem. Does a flock of 17 Hudsonian Godwits (*Limosa haemastica*) in Oregon constitute 1 or 17 records? What about a Thick-billed Kingbird (*Tyrannus crassirostris*) that returns winter after winter but is gone each spring, or a Neotropic Cormorant (*Phalacrocorax brasilianus*) that occurs off and on at the same location for years but is absent for months at a time? Multiple records at different locations, furthermore, might or might not consist of repeated sightings of the same individual. It is these sorts of scenarios that have led the California Bird Records Committee (CBRC 2007) and others to focus more on individual birds than on records per se.

It is therefore useful, when possible, to determine whether the occurrence of a rare bird is simply a repeated observation of the same individual or a unique observation of a new individual. A better understanding of this issue promotes a clearer assessment of vagrancy patterns within a given geographic region, and an assessment of how many individuals are involved in a set of records is now typically part of record-committee processes. Evaluating "same-bird" issues is often easier said than done, but the advent of digital photography along with improved knowledge of molt and age/sex determination has enhanced our ability to analyze and assess individual birds. Here we consider the recognition of the same bird observed at multiple locations, at times hundreds or more kilometers apart.

Reports of the Snow Bunting (*Plectrophenax nivalis*) in California are reviewed by the California Bird Records Committee. Of 100 individuals recorded through February 2004, 97 occurred in the northern half of the state and 99 from late October through February (CBRC 2007). It was thus of some significance that two individuals appeared in southern and central California in April and May 2009, one at Ocean Beach, San Diego County, 30 April–7 May (McCaskie and Garrett 2009; CBRC record 2009-083) and one at Point Pinos, Monterey County, 23–26 May (Rottenborn et al. 2009; CBRC 2009-091). The unusual dates and locations plus the timing of the two records led us to suspect that only a single individual may have been involved, and we believe that flight-feather-wear patterns and other plumage features captured in digital images confirm this possibility.

The upper image on the outside back cover of this issue was taken by Eric Kallen at Ocean Beach on 2 May 2009, the bottom image was taken by Sullivan at Point Pinos on 26 May 2009, and enlarged cropped images of the primaries and rectrices in each photo are shown on the inside back cover. In each case, the worn flight feathers and wing coverts along with the extensive dark on the primary coverts and other feathers indicate a female Snow Bunting in its first cycle (first spring) (Pyle 1997). The Snow Bunting has no prealternate molt, so its appearance in the breeding season is the result of the whitish to rusty veiling of fresh feathers wearing off to reveal the black feather centers and a blacker overall aspect. The upperparts being darker at Point Pinos than at Ocean Beach is thus consistent with the effects of feather-edge loss during the 24-day interim. Likewise, the Snow Bunting's bill can change quickly from yellowish with a black tip in winter to black in summer, explaining the difference in bill color in the two images.

The preformative molt of the Snow Bunting is partial; the juvenal wing and tail feathers are retained through the first cycle and often appear uniform in wear (rather than showing "limits" or "clines" resulting from molts). On a single individual, however, primaries of the same generation often vary in their degree of fading or bleaching as a result of variation in the feathers' quality and their exposure to the elements as related to both the position of the feather on the wing and the bird's individual habits. Individual feathers can also be replaced accidentally or "adventitiously" during a cycle, an occurrence that should not be confused with molt. We believe that a combination of such factors has led to diagnostic signatures of primary wear on each wing that can be used to confirm that the Ocean Beach and Point Pinos Snow Buntings represent the same individual.

In the Snow Bunting, which has nine primaries, p8 and/or p7 are the longest primaries, with p9 shorter, so the outermost visible primary in the field is often p7, and this is the case on both wings in both images, with the inner edge and tip of p8 variably visible behind p7 as well. Note that on both right wings p7 is bleached and notched at the tip near the shaft, p6 is moderately bleached with a pale shaft streak near the tip, p5 is fresher, p4 is more bleached and ragged near the tip, and p3 is fresher and cleaner. On the left wing, note that p7 and p8 are worn, the latter having a double notch at the tip, and that p6 is much fresher and has a small pale spot at the tip. Pyle's examination of 30 specimens of first-cycle Snow Buntings at the California Academy of Sciences revealed that none of 60 wings had patterns of wear similar to those on these birds, most showing an expected gradation in bleaching from the innermost (least exposed) to the outermost (most exposed) feather (see Pyle 2008 for discussion of such wear clines). We suspect that on this bird the right p5 may have been lost accidentally and replaced during the previous fall, helping to explain its appearing fresher than both p4 and p6 on this wing.

Several other feather details indicate that the two images represent the same individual. These include the pointed tip and notch to the inner web of the left middle tertial (s8), the cleaner and more tapered right middle tertial, and the attenuated left central rectrix along with the more sinuate right central rectrix, a probable effect of wear because the left feather, lying atop the tail, is more exposed. Additionally, given the Snow Bunting's variability in plumage, the head and body are very similar in appearance when the effects of feather wear described above are accounted for. On the basis of examination of feather details in tens of thousands of bird specimens, Pyle is convinced that all of the similarities described above cannot have resulted from chance and that these two "records" represent the same individual, despite the fact that the observations were 610 km apart. The CBRC has concurred with this opinion (G. McCaskie pers. comm.).

Digital imagery is allowing us to address "same-bird" issues such as this example more effectively, but molt and feather wear must be accounted for when such comparisons are made. We suspect that one suggestion that the two Snow Buntings were different individuals (Rottenborn et al. 2009) was based on lack of consideration of these factors. Other individual birds recently documented at different locations through the use of digital imagery include a Harlan's Hawk (*Buteo jamaicensis harlani*) photographed in Colorado and Alaska (Schmoker and Ligouri 2010), a second-cycle Yellow-billed Loon (*Gavia adamsii*) that moved between Tomales and Bodega bays in California from November 2008 to August 2009 (CBRC unpubl. data), several examples of Crested Caracaras (*Caracara cheriway*) moving up and down California (e.g., Figure 1, Pike and Compton 2010, K. Nelson unpubl. data), and a Wandering Albatross (*Diomedea exulans*) that was observed 13 September 2008 off Oregon (Gillson 2009) and, 12 days later, 430 km SSW of Point Arena, Mendocino County,

Figure 1. First-winter Crested Caracara (*Caracara cheriway*) at Hansen Dam, Los Angeles County, 31 January 2007 (A); near Goleta, Santa Barbara County, 2 February 2007 (B); and at Pebble Beach, Monterey County, 25 February 2007 (C). On the right wing note the broken p6 and hole in p10, which, along with many other features distinctive of individual primary tips of both wings, confirm that these images depict the same individual (Pike and Compton 2010). The extensive northward movements of this and other Crested Caracaras in California (K. Nelson pers. comm.) suggests they dispersed naturally from their breeding range farther south rather than being escapees from captivity.

Photos by Linda Leroy (A), David Levasheff (B), and Don Roberson (C)

California (outside of the 370-km limit within which the CBRC reviews records), approximately 675 km from the Oregon locality (Figure 2). We suspect that many other cases of the same bird at different locations will be documented, and we encourage bird records committees and others to consider this possibility carefully when evaluating digital images.

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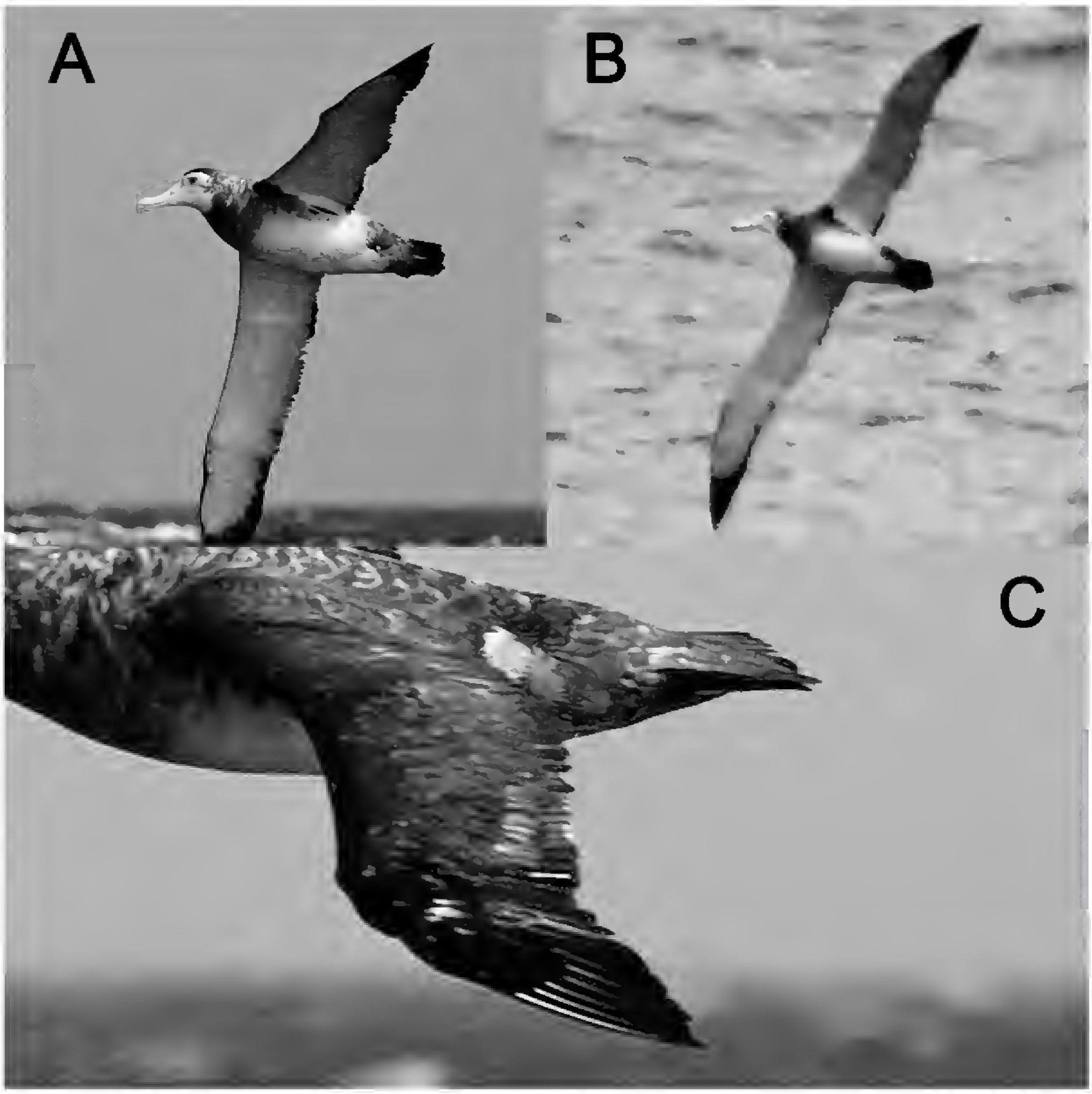

Figure 2. Wandering Albatross (*Diomedea exulans*) 65 km off Rock Point, Lincoln County, Oregon, 13 September 2008 (A, C) and 430 km SSW of Point Arena, California, 25 September 2008 (B). The similarity in head plumage and (especially) the pattern of molt of the secondaries, as indicated by the raggedness along the trailing edges of the wings, imply that these two observations involve the same individual. In the albatrosses, patterns of molt of the secondaries are complex (Pyle 2008); on this individual, it appears that s1–s6, s14, and s18–s30 (or so) of the left wing had been replaced, whereas s7–s13 and s15–s17 were retained juvenal feathers (C), suggesting that this bird was in its second or third cycle.

Photos by Greg Gillson (A, C) and Jim Cotton (B)

LITERATURE CITED

California Bird Records Committee (CBRC; R.A. Hamilton, M.A. Patten, and R.A. Erickson, eds). 2007. Rare Birds of California. W. Field Ornithol., Camarillo, CA.

Gillson, G. 2009. Photo salon: Wandering Albatross in Oregon. N. Am. Birds 63:182–183.

McCaskie, G., and Garrett, K. L. 2009. Southern California. N. Am. Birds 63:502–507.

Pike, J. E., and Compton, D. M. 2010. The 34th report of the California Bird Records Committee: 2008 records. W. Birds 41:130–159.

Pyle, P. 1997. Identification Guide to North American Birds, Part I. Slate Creek Press, Bolinas, CA.

Pyle, P. 2008. Identification Guide to North American Birds, Part II. Slate Creek Press, Point Reyes Station, CA.

Rottenborn, S. C., Rogers, M. M., Davis, J. N., and Pandolfino, E. 2009. Northern California. N. Am. Birds 63:497–502.

Schmoker, B., and Ligouri, J. Photo-recovery of a Harlan's Red-tailed Hawk in Colorado and Alaska. Colo. Birds 44:16–19.

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Wing tips and tail of Snow Bunting (*Plectrophenax nivalis*) at Ocean Beach, San Diego County, 2 May 2009. Note the patterns of wear on the primaries of both wings, the double notch in the tip of the left p7, the attenuated left central rectrix, and the more sinuous inner edge of the right central rectrix, demonstrating that this individual is the same as that found in Monterey County on 26 May 2009 and depicted in the other images here and on the back cover.

Photo by © Eric Kallen

Wing tips and tail of Snow Bunting (*Plectrophenax nivalis*) at Point Pinos, Monterey County, 26 May 2009, same individual photographed in San Diego County on 2 May 2009.

Photo by © Brian Sullivan