

WESTERN BIRDS



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Western Specialties:

American Avocet and Long-billed Dowitcher



Photo by © Monica Iglecia of Portland, Oregon:

American Avocets (*Recurvirostra americana*) and Long-billed Dowitchers (*Limnodromus scolopaceus*), Carson Lake and Pasture, Churchill Co., Nevada, 4 March 2020.

The Lahontan Valley of northwestern Nevada is a major stopover site for migrating shorebirds. In this issue of *Western Birds*, Stanley Senner, Brian Tavernia, Jenni Jeffers, Monica Iglecia, Bethany Chagnon, and Larry Neel summarize 34 years of annual surveys of the valley's wetlands, both spring and fall. Even though the surveys were not exhaustive, they yielded an annual average in spring of over 30,000 shorebirds and a maximum of nearly 200,000. Among the 28 species of shorebirds recorded, the American Avocet and the Long-billed Dowitcher dominate. The maximum seasonal counts of these two in the Lahontan Valley represent about 15% and 18%, respectively, of their estimated total population.

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Front cover photo by © Maureen Blackford of Sahuarita, Arizona: Clay-colored Thrush (*Turdus grayi*), Arivaca Ciénega, Buenos Aires National Wildlife Refuge, Arizona, 15–26 May 2020, representing the first Arizona record of the species to be accepted by the Arizona Bird Committee.

Back cover “Featured Photo” by © Jack B. Parlapiano of Albuquerque, New Mexico: European Golden-Plover (*Pluvialis apricaria*), Maxwell National Wildlife Refuge, New Mexico, 28 September–25 October 2020, representing the first record of this species for New Mexico and the second for western North America. Note the diagnostic clean white axillaries. Pectoral Sandpiper (*Calidris melanotos*) in the background.

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WESTERN BIRDS



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SHOREBIRD SURVEYS OF THE LAHONTAN VALLEY, NEVADA, 1986–2019, WITH RECOMMENDATIONS ON MONITORING AND MANAGEMENT

STANLEY SENNER and BRIAN TAVERNIA, National Audubon Society, 231 West 800 South, Suite E, Salt Lake City, Utah 84101; stanley.senner@audubon.org

JENNI JEFFERS, Nevada Department of Wildlife, 380 West B Street, Fallon, Nevada 89406

MONICA IGLECIA, Manomet, P. O. Box 1770, Manomet, Massachusetts 02345

BETHANY CHAGNON, Stillwater National Wildlife Refuge Complex, 1020 New River Parkway, Suite 305, Fallon, Nevada 89406

LARRY NEEL, 3145 Silver State Avenue, Fallon, Nevada 89406

ABSTRACT: Stillwater National Wildlife Refuge and Carson Lake and Pasture are the key components of the Lahontan Valley wetlands, designated in 1988 as a site of hemispheric importance in the Western Hemisphere Shorebird Reserve Network. In 1990, Congress authorized transfer of Carson Lake and Pasture from federal ownership to the state of Nevada, provided that the area be managed consistent with its designation as part of the network. To enhance protection and management of the site, and specifically to inform development of a management plan for Carson Lake and Pasture, we analyzed spring and fall surveys for shorebirds, 1986–2019, archived by the Nevada Department of Wildlife. Over the 34 years of surveys, we documented 28 species, 19 of which occurred in $\geq 50\%$ of the years surveyed. Annual counts of all shorebirds combined exceeded 100,000 in 24% of the survey years and 20,000 in 94%. Annual counts of the American Avocet (*Recurvirostra americana*) exceeded 10% (45,000 individuals) of the estimated global population in three years, and of the Long-billed Dowitcher (*Limnodromus scolopaceus*; 50,000 individuals) in two years. On the basis of their numbers and frequency of occurrence or status as species of national conservation concern, we identified these two species plus nine others as priorities for management. We recommend conducting more consistent surveys and identifying specific opportunities to manage water quantity and quality, vegetation, livestock grazing, or other factors to benefit shorebirds.

The arid Great Basin and more broadly the Intermountain West provide significant habitats for a variety of migrating shorebirds (Recurvirostridae, Charadriidae, and Scolopacidae), some in large numbers (Shuford et al. 2002). Thomas et al. (2013), for example, identified 18 primary and 18 secondary “key” sites for shorebirds. These primary key sites were (a) identified in Oring et al. (2000) or by the Western Hemisphere Shorebird Reserve Network

(WHSRN), (b) supported >5000 shorebirds during peak migration counts, or (c) supported >1% of the biogeographic population of a shorebird species during any one season (Thomas et al. 2013). A “biogeographic population” is defined as the entire population of a monotypic species, the entire population of a subspecies, or a discrete population of a species or subspecies that rarely if ever mixes with other populations of the same species or subspecies (www.ramsar.org/sites/default/files/documents/library/glossary_strategic_framework_en.pdf). Secondary sites supported <5000 migrants during peak counts over one migration season during the surveys described by Shuford et al. (2002).

Many of these important sites, including closed-basin salt lakes and associated wetlands, have been degraded. Diversions and withdrawals of surface water and groundwater for human uses have affected the level, quality, and seasonality of water in the region for decades (Jehl 1994, Neel and Henry 1996, Thomas et al. 2013, Moore 2016, Wilsey et al. 2017, Wurtsbaugh et al. 2017). From 1980 to 2008 the regional climate became drier, leading to earlier streamflow and reduced water availability (Haig et al. 2019). Primarily because of increased evaporation and diversion for irrigation, from 1984–1999 to 2000–2018 the extent of surface water contracted in 18 of the Great Basin's snowmelt-fed lakes and wetlands, including Nevada's Carson Sink. In lakes the reduction was 27%, in wetlands 47% (Donnelly et al. 2020).

In 1988 the Lahontan Valley wetlands complex was designated a WHSRN site of hemispheric importance because of its reported use by more than 250,000 migrant shorebirds annually, including up to 150,000 Long-billed Dowitchers (*Limnodromus scolopaceus*; whsrn.org/whsrn_sites/lahontan-valley-wetlands/; Neel and Henry 1996). In 1990, the Truckee-Carson Settlement Act (P.L. 101-618, Title II) authorized transfer of Carson Lake and Pasture (“Carson Lake” for short), a core part of the WHSRN site, from ownership by the federal Bureau of Reclamation to the state of Nevada, provided that the area be managed consistent with its designation as a WHSRN site. Completion of the transfer is pending in 2021 and will be followed by development of a management plan for what will become the Carson Lake and Pasture Wildlife Management Area (WMA) (A. Jenne pers. comm.).

We used the results of 34 years (1986–2019) of spring and fall surveys compiled and maintained by the Nevada Department of Wildlife (NDOW) to review the status of migrant shorebirds in the Lahontan Valley. It is timely to review the Lahontan Valley surveys, given continuing regional declines of lake and wetland habitats, the anticipated development of a Carson Lake management plan, and broader concerns about the status and future of shorebird populations in the Great Basin and beyond (e.g., Jehl 1994, Page and Gill 1994, Shuford et al. 2002, Senner et al. 2016, 2018, Rosenberg et al. 2019). Publications by Neel and Henry (1996), Chisholm and Neel (2002), and Shuford et al. (2002) drew on the NDOW data, but there have been no subsequent comprehensive analyses. Within the context of the Great Basin and with reference to the WHSRN criteria, we broadly characterize use of the Lahontan Valley by migrating shorebirds, recommend species as priorities for monitoring and management, and discuss insights into water and habitat management and future surveys.

STUDY AREA

The Lahontan Valley is located near Fallon, Churchill County (39° 30' N, 118° 30' W), about 112 km east of Reno (Figure 1). This valley is the terminal delta of the Carson River within Carson Sink, and the historic Stillwater Marsh and Carson Lake are its two primary wetland areas. The Lahontan Valley wetlands WHSRN site includes Carson Lake, currently owned by the Bureau of Reclamation and co-managed by NDOW and the Truckee-Carson Irrigation District, and Stillwater NWR, managed by the U.S. Fish and Wildlife Service (USFWS). The wetlands' total combined area at the time of designation was 89,031 ha (NDOW 1988).

Before the onset of development in the 1880s, Kerley et al. (1993) estimated 60,703 ha as a “representative” value for the extent of the Lahontan wetlands, including open water and adjacent marsh. Depending on the snowpack in the Sierra Nevada, these wetlands may have contracted to as few as 10,118 ha and expanded to as many as 101,171 ha (Kerley et al. 1993). By 1993, Kerley et al. (1993) estimated that wetlands in the Lahontan Valley were only 10% of their historical size.

In 1990, the Truckee-Carson Settlement Act authorized acquisition of sufficient water to maintain a long-term average of 10,118 ha of primary wetlands in the Lahontan Valley, including 5666 ha in Stillwater NWR, 4128 ha at Carson Lake, and 324 ha on the Fallon Paiute-Shoshone Indian Reservation (USFWS 2002). To date, acquired water rights for wetlands at Stillwater NWR, Carson Lake, and the Fallon Paiute-Shoshone Indian Reservation are sufficient to support a long-term average of about 4856 ha of primary wetlands (R. Grimes pers. comm.). Notwithstanding continuing acquisition of water rights, the Lahontan Valley continues to lose wetland habitat: Donnelly et al. (2020) showed that in Carson Sink, from 1984–1999 to 2000–2018, the extent of surface water in lakes declined by 90% and the extent of surface water in wetlands declined by 43%.

Wetlands in the Lahontan Valley are typical of the saline marsh systems found in the closed basins of the Great Basin (Neel and Henry 1996, Chisholm and Neel 2002). Because this is a terminal system, the lakes and wetlands range from fresh to brackish and saline. Historically, wetlands at the upper end of Carson Lake's marsh system contained inflowing fresh water, which became increasingly saline as water moved toward the lower end at Big Water Lake in Stillwater NWR (Figure 1; Bundy 2001, Chisholm and Neel 2002). Water levels were highest during the spring flood and typically decreased as evaporation increased during summer months. When evaporation slowed, water levels increased somewhat in the fall and winter (C. Lunderstadt pers. comm.).

The historical volume and seasonality of water at Carson Lake and Stillwater NWR is now greatly altered because of upstream water use and management for agriculture and protection of endangered species (Chisholm and Neel 2002), and the timing and volume of water delivered vary from year to year (C. Lunderstadt pers. comm.). At both locations the wetlands are intensively managed, though existing infrastructure allows for water conveyance through gravity only (i.e., no pumping). At Carson Lake, management for wildlife is subordinate to other demands for the water (www.tcid.org/policies/sectiond.pdf). To the extent there is management of water for wildlife, it tends

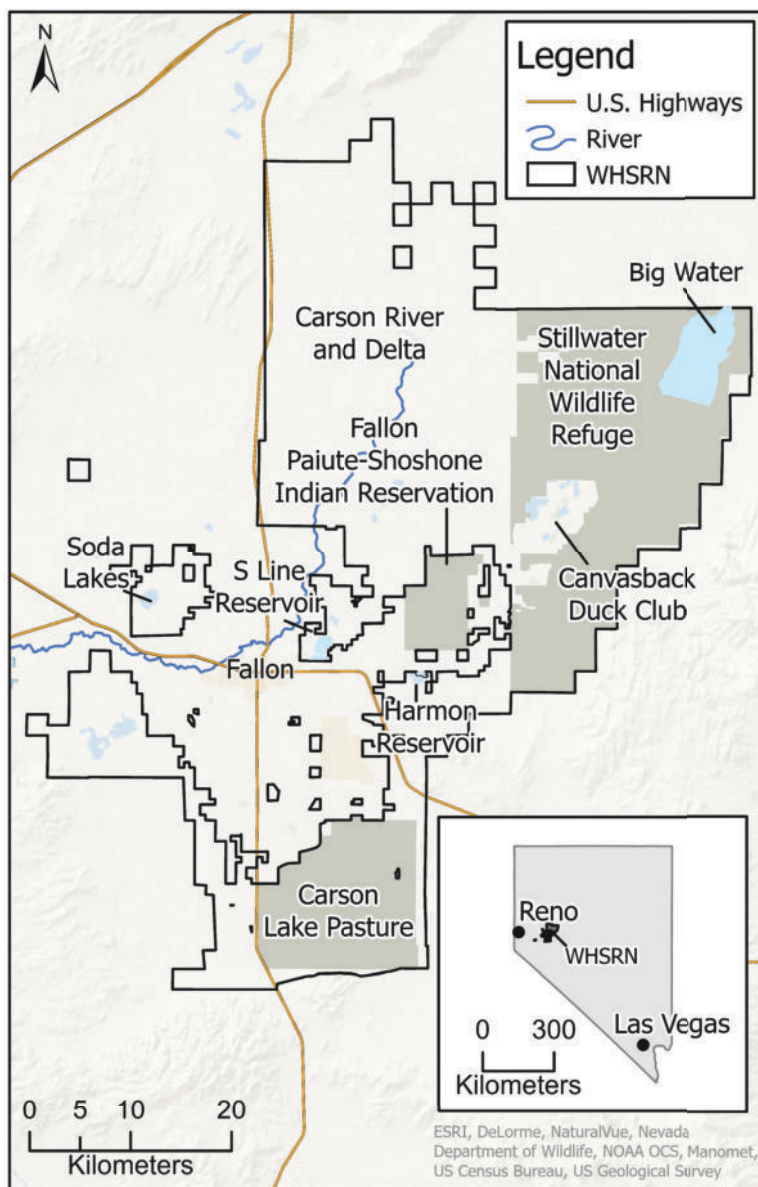


FIGURE 1. Study area, including the Lahontan Valley wetlands site in the Western Hemisphere Shorebird Reserve Network (WHSRN) and related locations. Units surveyed in >4 years are labeled. The Fallon Paiute-Shoshone Indian Reservation and Fallon are mentioned in the text but were not survey units. Big Water Lake, also mentioned in the text, is shown here as a geographic reference, but any surveys at that location are included within those of the Stillwater NWR/Canvasback Club unit.

to focus on providing water to facilitate hunting for waterfowl in the fall. At Stillwater NWR, management is intended to mimic historical hydrological patterns and approximate natural habitat conditions, albeit on a scale smaller than before development and in a manner that maximizes habitat availability and biodiversity throughout the year (USFWS 2002).

METHODS

The NDOW dataset spans 34 years, 1986–2019. Biologists for NDOW conducted all the surveys at Carson Lake: L. Neel from spring 1986 through spring 2001, and J. Jeffers from fall 2001 through fall 2019. Their work was augmented by other professional biologists (e.g., W. Henry, Stillwater NWR) as well as by volunteers (e.g., from Lahontan Audubon Society), especially at Stillwater NWR and the adjacent Canvasback Club. Surveys generally followed the protocols described by Shuford et al. (2002) for the Pacific Shorebird Project, which included the Lahontan Valley from 1989 to 1995. In general, however, the surveys' effort, specific methods, and habitat conditions varied, and the details were not always recorded across the span of years and locations.

Following Shuford et al. (2002), who defined a site as a "complex of wetlands lying within the same drainage basin," we treated the wetlands in the Lahontan Valley as one site and aggregated data by season and year. This facilitates comparisons with other Great Basin sites as reported in Shuford et al. (2002). Individual locations within the Lahontan Valley where surveys were conducted are referred to here as units (e.g., Carson Lake). Each year and each spring and fall season, observers surveyed units within the Lahontan Valley wetlands known to be used by shorebirds on the basis of prior experience or recent observations. Each survey's duration generally depended on the number of shorebirds present in a unit. Seasonally and annually, observers adjusted observation points if visibility became obstructed, for example, by changes in vegetation growth. Surveys were suspended if prevailing environmental conditions, such as rainfall, prevented reliable counts. Survey units were visited once per season, and the order in which survey units were covered on each survey was opportunistic.

Observers surveyed on the ground by foot or from stopped vehicles with the aid of binoculars or spotting scopes. Some surveys were by water from airboats, which were stopped for counts of >10 shorebirds. Only binoculars were used for boat-based counts.

To coincide with peak migrations across the region, most surveys took place during a "specified week" in spring and fall (Neel and Henry 1996). Guided by Chisholm and Neel (2002), we classified counts in April (77 dates) and May (20) as spring surveys ($n = 97$), those in July (8 dates), August (83), and September (15) as fall surveys ($n = 106$). Within a given season and year, the units surveyed were typically not all covered on the same day.

Over the years, Carson Lake and Stillwater NWR/Canvasback Club (Figure 1) received the most consistent survey coverage (Figure 2). With the exception of 2015, when Carson Lake was dry, these two units were surveyed annually. Other units surveyed in >4 years were Soda Lakes, S Line Reservoir, Harmon Reservoir, and Carson River and delta (Figures 1 and 2). Units

surveyed in ≤ 4 years were Sheckler Reservoir, Lahontan Valley, Miller Drain, Mahala Slough, Lattin's field, farm fields, and other areas.

When possible, all shorebirds were identified to species. If that was not possible, species of the genera *Calidris*, *Limnodromus*, *Tringa*, and *Phalaropus* were identified at that level. Although some Short-billed Dowitchers (*Limnodromus griseus*) were recorded on the surveys, they are considered rare in the Lahontan Valley (Chisholm and Neel 2002). Given the difficulty of distinguishing the Short- and Long-billed dowitchers in field surveys (Shuford et al. 2002), we combined all dowitcher observations as "dowitcher spp." and treat them as Long-billed Dowitchers for purposes of analysis and discussion. "Unknown sandpipers" are included only in the analysis of aggregated shorebirds.

Given the surveys' uncertainty and variability in methods, observer numbers, coverage, timing within a season, and measures of effort, these data do not lend themselves to rigorous statistical analysis. Hence our summary is primarily descriptive. For each species, genus, and all shorebirds combined, we pooled counts across the Lahontan Valley by year for spring and fall separately (seasonal totals) and for spring and fall together (annual total). We present seasonal and annual total counts and nonzero median and maximum total counts across all years of the study. We also report the frequency of nonzero counts by spring and fall seasons, across years, and annually (i.e., species occurring in either spring or fall) across years.

To guide recommendations on priority species for future habitat and water management, we used the following criteria: (1) observed regularly (frequency of occurrence of $\geq 50\%$); (2) area of importance scores of 4 or 5 in Bird Conservation Region 9/Great Basin (Thomas et al. 2013); and (3a) median counts ≥ 100 and maximum high counts ≥ 1000 in either spring or fall, or

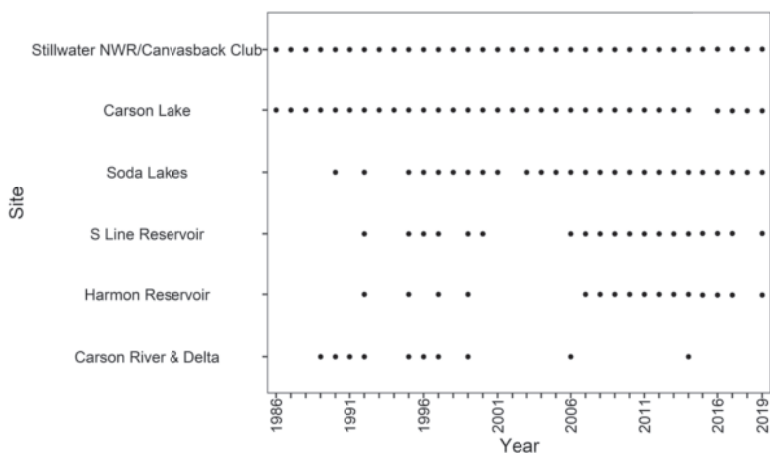


FIGURE 2. Distribution by year and unit of shorebird surveys of Lahontan Valley, in either spring or fall, 1986–2019, for units surveyed in >4 years. Units surveyed in ≤ 4 years were Sheckler Reservoir, Lahontan Valley, Miller Drain, Mahala Slough, Lattin's field, and farm fields.

(3b) identified as species of “greatest” or “high” concern by the U.S. Shorebird Conservation Plan Partnership (2016). Criteria 1, 2, and 3a capture species with important population segments in the Great Basin and are common or regular uncommon migrants in the Lahontan Valley (Chisholm and Neel 2002). Criteria 1, 2, and 3b highlight species of national conservation concern that occur regularly in the Lahontan Valley, even if only in small numbers.

RESULTS

Annual and Seasonal Occurrence

Twenty-eight shorebird species were recorded during the 34 years of surveys in the Lahontan Valley, 1986–2019 (Table 1). The Black-necked Stilt (*Himantopus mexicanus*), American Avocet (*Recurvirostra americana*), and Long-billed Dowitcher were the only species recorded annually in both spring and fall. If most or all *Calidris* sandpipers had been identified to species (Table 1), this likely was also the case for both the Western (*C. mauri*) and Least (*C. minutilla*) sandpipers. An additional 11 species were recorded in both spring and fall in $\geq 50\%$ of the survey years (≥ 17 years); 4 others were recorded in $\geq 50\%$ of the survey years in just one season. Finally, 10 species were recorded in $< 50\%$ of the survey years in either season.

For both seasons combined, 19 species were recorded in at least 17 years and we treat them as regular in occurrence (Figure 3), while the species recorded in $< 50\%$ of the years we consider irregular. Frequency of occurrence for regularly occurring species was similar between seasons (Table 1). Median frequencies of occurrence for the 19 regular species were 27 years in spring and 25 in fall. Among regular species, the Black-bellied Plover (*Pluvialis squatarola*), Semipalmated Plover (*Charadrius semipalmatus*), Long-billed Curlew (*Numenius americanus*), Dunlin (*Calidris alpina*), and Willet (*Tringa semipalmata*) were recorded more often ($\geq 10\%$ more years) in spring than in fall. The Lesser Yellowlegs (*Tringa flavipes*), Wilson's Snipe (*Gallinago delicata*), and Red-necked Phalarope (*Phalaropus lobatus*) were recorded more often in fall than in spring (Table 1).

Seasonal Abundance by Species

Maximum seasonal counts exceeded 10,000 individuals for the American Avocet (spring and fall), Least Sandpiper (spring), Western Sandpiper (spring), Long-billed Dowitcher (spring and fall), and Wilson's Phalarope (*Phalaropus tricolor*; fall). Under the presumption that Western Sandpipers account for many of the unidentified *Calidris* spp. (Table 1, this study; Chisholm and Neel 2002), this species likely exceeds 10,000 in fall as well as in spring. In addition, maximum counts exceeded 1000 individuals for the Black-necked Stilt and Least Sandpiper in both spring and fall, for the Semipalmated Plover, Long-billed Curlew, and Dunlin in spring, and for the Red-necked Phalarope in fall.

The seasonal patterns of median counts were similar to those of maximum counts (Table 1). Median counts of the American Avocet and Long-billed Dowitcher exceeded 1000 individuals in both spring and fall; of the Black-necked Stilt only in fall. The Black-necked Stilt, Least Sandpiper, Western

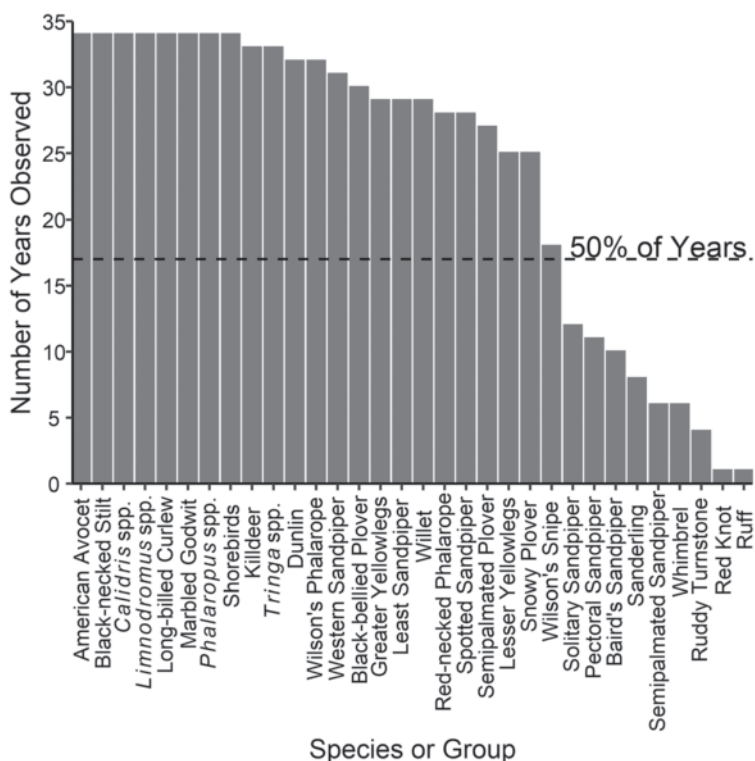


FIGURE 3. Number of years, within the 34-year study period, 1986–2019, in which a species or species group was recorded as present on spring or fall shorebird surveys of the Lahontan Valley wetlands, Nevada.

Sandpiper, and Wilson's Phalarope had median counts of ≥ 100 in both spring and fall. The Dunlin exceeded that threshold only in spring, whereas the Red-necked Phalarope exceeded it only in fall. Among the 19 regularly observed species, the spring median was higher for 8 and the fall median was higher for 10. The seasonal medians were the same for the Long-billed Curlew (Table 1).

Seasonal and Annual Abundance for All Shorebirds Combined

Total counts for all shorebirds combined varied by season and year (Table 1, Figure 4). The number of years in which the spring count was higher equaled the number in which the fall count was higher. Total counts in spring exceeded 100,000 individuals in 3 years, 20,000 in 24 years. Fall counts exceeded 100,000 shorebirds in 2 years and 20,000 in 17 years. No seasonal total count after 1991 exceeded 100,000 shorebirds. Spring and fall totals combined by year, annual totals exceeded 100,000 shorebirds in 8 years (most recently in 2001) and 20,000 in 31 years.

Median counts for all shorebirds combined were 30,758 (maximum:

SHOREBIRD SURVEYS OF THE LAHONTAN VALLEY, NEVADA, 1986–2019

TABLE 1 Number of Years Reported and Nonzero Median and Maximum Totals by Season for Shorebirds on Surveys of the Lahontan Valley, Nevada, 1986–2019

Species	Spring		Fall	
	Frequency ^a	Median (Maximum)	Frequency ^a	Median (Maximum)
Black-necked Stilt <i>Himantopus mexicanus</i>	34	792 (6549)	34	1489 (8166)
American Avocet <i>Recurvirostra americana</i>	34	5871 (17,309)	34	6233 (66,905)
Black-bellied Plover <i>Pluvialis squatarola</i>	28	77 (386)	12	4 (25)
Killdeer <i>Charadrius vociferus</i>	32	29 (829)	32	59 (976)
Semipalmated Plover <i>Charadrius semipalmatus</i>	25	26 (1800)	21	12 (47)
Snowy Plover <i>Charadrius nivosus</i>	18	9 (46)	19	16 (197)
Whimbrel <i>Numenius phaeopus</i>	4	4 (15)	3	1 (5)
Long-billed Curlew <i>Numenius americanus</i>	33	19 (1284)	24	19 (292)
Marbled Godwit <i>Limosa fedoa</i>	32	71 (583)	30	48 (555)
Ruddy Turnstone <i>Arenaria interpres</i>	1	1 (1)	3	1 (10)
Red Knot <i>Calidris canutus</i>	1	1 (1)	—	— (—)
Ruff <i>Calidris pugnax</i>	—	— (—)	1	1 (1)
Sanderling <i>Calidris alba</i>	5	1 (22)	5	2 (3)
Dunlin <i>Calidris alpina</i>	32	560 (9302)	13	3 (200)
Baird's Sandpiper <i>Calidris bairdii</i>	2	3 (4)	9	6 (27)
Least Sandpiper <i>Calidris minutilla</i>	27	341 (15,323)	27	147 (2800)

(continued)

197,594) in spring and 24,230 (maximum: 135,132) in fall (Table 1). The median total annual count was 56,648 (maximum: 230,711).

Priority Species

We evaluated 26 of the 28 species recorded, the rare Red Knot and Ruff excluded. Of the 26 species, 11 met our criteria for being categorized as priority species (Tables 1 and 2). Of these, seven met criteria 1, 2, and 3a: the Black-necked Stilt, American Avocet, Least Sandpiper, Western Sandpiper, Long-billed Dowitcher, Wilson's Phalarope, and Red-necked Phalarope. Four species met criteria 1, 2, and 3b: the Snowy Plover (*Charadrius nivosus*), Long-billed Curlew, Marbled Godwit (*Limosa fedoa*), and Willet.

SHOREBIRD SURVEYS OF THE LAHONTAN VALLEY, NEVADA, 1986–2019

Species	Spring		Fall	
	Frequency ^a	Median (Maximum)	Frequency ^a	Median (Maximum)
Pectoral Sandpiper <i>Calidris melanotos</i>	5	3 (8)	7	2 (20)
Semipalmated Sandpiper <i>Calidris pusilla</i>	1	1 (1)	5	1 (2)
Western Sandpiper <i>Calidris mauri</i>	27	660 (140,074)	28	571 (8136)
<i>Calidris</i> spp.	34	3886 (162,174)	33	1748 (18,663)
<i>Limnodromus</i> spp. ^b	34	14,540 (82,010)	34	7539 (55,349)
Wilson's Snipe <i>Gallinago delicata</i>	11	2 (16)	13	6 (486)
Spotted Sandpiper <i>Actitis macularius</i>	20	4 (18)	20	7 (25)
Solitary Sandpiper <i>Tringa solitaria</i>	7	2 (6)	8	1 (4)
Lesser Yellowlegs <i>Tringa flavipes</i>	13	6 (44)	24	12 (81)
Willet <i>Tringa semipalmata</i>	24	7 (35)	18	4 (20)
Greater Yellowlegs <i>Tringa melanoleuca</i>	25	14 (172)	25	31 (124)
<i>Tringa</i> spp.	32	34 (145)	33	72 (321)
Wilson's Phalarope <i>Phalaropus tricolor</i>	29	100 (2592)	31	295 (13,776)
Red-necked Phalarope <i>Phalaropus lobatus</i>	16	23 (505)	26	792 (5944)
<i>Phalaropus</i> spp.	32	148 (3395)	34	1659 (21,931)
All shorebirds	34	30,758 (197,594)	34	24,230 (135,132)

^aOf 34 years possible.^bTreated in the text and analysis as the Long-billed Dowitcher, *Limnodromus scolopaceus*.

DISCUSSION

The results and descriptive analysis of 34 years of shorebird surveys at the Lahontan Valley affirm the area's continuing importance to migrant shorebirds. This site is used by a large and diverse assemblage of shorebird species generally consistent with what Shuford et al. (2002) and others (e.g., Oring and Reed 1996) have documented in the Great Basin and more broadly in the Intermountain West.

Shuford et al. (2002) summarized spring and fall counts from 1989 to 1995 at 38 "key" shorebird sites—defined as sites supporting >1000 shorebirds in either spring or fall—across the Intermountain West. They recorded 39 species of shorebirds, with the American Avocet being the most numerous, on the

SHOREBIRD SURVEYS OF THE LAHONTAN VALLEY, NEVADA, 1986–2019

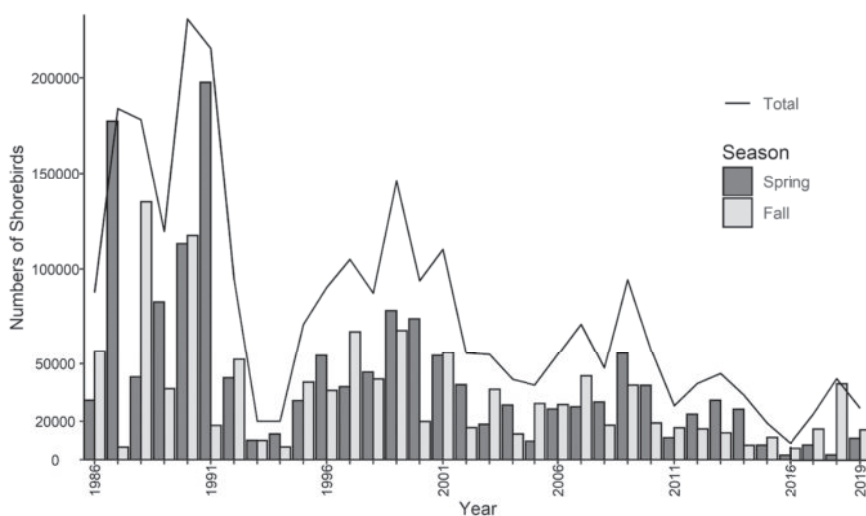


FIGURE 4. Total counts of all shorebirds combined, by season and year, on surveys of the Lahontan Valley wetlands, Nevada, 1986–2019. Solid line is the sum of spring and fall counts for each year.

basis of median and maximum counts. In the Lahontan Valley, 1986–2019, we recorded 28 species, with the Long-billed Dowitcher being most numerous, followed closely by American Avocet. After the Great Salt Lake and Salton Sea, the two sites with the greatest numbers of shorebirds, Shuford et al. (2002) placed the Lahontan Valley among only eight other sites with >10,000 birds in either spring or fall. According to the results of the surveys we describe here, the Lahontan Valley exceeded that threshold in either spring or fall in 33 of 34 years (Figure 4). Including the Lahontan Valley, 7 of the 10 sites identified by Shuford et al. (2002) as having the great numbers of shorebirds were in the western Great Basin.

Shuford et al. (2002) recorded 14 species on $\geq 50\%$ of all spring or fall surveys across the Intermountain West; 8 of those species were recorded on $\geq 50\%$ of all surveys during both seasons. In the Lahontan Valley, we recorded 19 species in $\geq 50\%$ of all years, 14 of them in both seasons. Of these 19 species, 5 did not reach that threshold across the Intermountain West in the surveys summarized by Shuford et al. (2002): the Black-bellied Plover, Snowy Plover, Long-billed Curlew, Marbled Godwit, and Wilson's Snipe. Three of these five species are ranked as of greatest (Snowy Plover) or high (Long-billed Curlew, Marbled Godwit) conservation concern by the U.S. Shorebird Conservation Plan Partnership (2016).

For total shorebirds, Shuford et al. (2002) recorded a fall median 2.5 times higher than the spring median (fall 670,953; spring 271,902). This high fall median was driven by large numbers of species such as the American Avocet and Wilson's Phalarope that gather in fall migration at hypersaline lakes like the Great Salt Lake (e.g., Sorenson et al. 2020). In the Lahontan Valley, median seasonal counts for all shorebirds combined were similar but higher in spring

TABLE 2 Estimated Populations, Regional Importance, and National Level of Conservation Concern of 26 Species of Shorebirds in the Lahontan Valley, Nevada

Species	Biogeographic population ^a		BCR 9/ Great Basin population ^b	BCR 9/ Great Basin importance ^c	Level of conservation concern ^d
	Segment of species to which estimate applies	Estimate			
Black-necked Stilt	<i>H. m. mexicanus</i>	550,000	119,500	5	least
American Avocet	entire species	450,000	411,500	5	moderate
Black-bellied Plover	<i>P. s. squatarola</i>	262,700	15,000	4	moderate
Snowy Plover	<i>C. n. nivosus</i>	22,900	8800	5	greatest
Semipalmated Plover	entire species	200,000	2800	3	least
Killdeer	entire species	2,000,000	47,400	4	moderate
Whimbrel	<i>N. p. rufiventris</i>	40,000	700	3	high
Long-billed Curlew	entire species	140,000	47,800	5	high
Marbled Godwit	<i>L. f. fedoa</i>	172,000	128,700	4	high
Ruddy Turnstone	Alaska population of <i>A. i. interpres</i>	20,000	200?	2	moderate
Sanderling	entire species	300,000	14,900	3	moderate
Dunlin	<i>C. a. pacifica</i>	550,000	25,000	3	moderate
Baird's Sandpiper	entire species	300,000	6300	4	least
Least Sandpiper	entire species	700,000	96,900	4	least
Pectoral Sandpiper	entire species	1,600,000	900	3	high
Semipalmated Sandpiper	entire species	2,260,000	200	3	high
Western Sandpiper	entire species	3,500,000	491,400	5	moderate
Long-billed Dowitcher	entire species	500,000	243,500	5	moderate
Wilson's Snipe	entire species	2,000,000	?	4	least
Spotted Sandpiper	entire species	660,000	9700	4	least
Solitary Sandpiper	<i>T. s. cinnamomea</i>	63,000	2600	3	least
Greater Yellowlegs	entire species	137,000	10,300	3	least
Willet	<i>T. s. inornata</i>	160,000	49,500	5	high
Lesser Yellowlegs	entire species	660,000	11,500	3	high
Wilson's Phalarope	entire species	1,500,000	711,100	5	least
Red-necked Phalarope	entire species	2,500,000	349,700	5	moderate

^aSources: whsrn.org/why-whsrn/is-my-site-eligible/, Andres et al. (2012).^bSources: Thomas et al. (2013), B. Andres (pers. comm.). Estimates rounded to nearest 100.^c5, Critical for supporting the species in the entire Western Hemisphere; 4, important to supporting hemispheric or regional populations; 3, species occurs regularly within the region but in low abundance; and 2, species within its normal range, but in general management for it is not warranted. Sources: Thomas et al. (2013), B. Andres (pers. comm.).^dSource: U.S. Shorebird Conservation Plan Partnership (2016).

(30,758) than in fall (24,230). Although median values for the American Avocet and Wilson's Phalarope in the Lahontan Valley were higher in the fall than in spring, large numbers of Long-billed Dowitchers and *Calidris* sandpipers account for the overall median being higher in spring.

Numbers of shorebirds using the Lahontan Valley annually are undoubt-

edly higher than those recorded on the surveys we describe. Spring and especially fall movements of shorebirds through the Lahontan Valley are spread over several months, and single surveys within each season capture only snapshots of shorebirds passing through over time. Even though these surveys were intended to be carried out during periods of peak shorebird migration, patterns for individual species vary and significant numbers likely were missed. For example, because most fall surveys were conducted in August, we likely missed many Wilson's and Red-necked Phalaropes, which start to peak in July, and Dunlins, which do not arrive until late September (Chisholm and Neel 2002). Furthermore, hard-to-detect species like Wilson's Snipe are likely underrepresented, and specially designed surveys would be required to improve their detection (Warnock et al. 1998).

When the Lahontan Valley wetlands were designated as a WHSRN site in 1988, a number of shorebirds >250,000 was the criterion for defining a site as of hemispheric importance. In 1990, however, the WHSRN criteria were revised as follows: 500,000 shorebirds annually or 30% of a species' biogeographic population for hemispheric status; 100,000 shorebirds annually or 10% of a biogeographic population for international status; or 20,000 shorebirds annually or 1% of a biogeographic population for regional status (whsrn.org/why-whsrn/is-my-site-eligible/).

Annual totals in the Lahontan Valley exceeded the WHSRN criteria of 100,000 and 20,000 shorebirds in 24% and 94% of the survey years, respectively (Figure 4). The maximum number of American Avocets recorded in any season (66,905) was about 15% of the estimated global population, and annual totals of this species were $\geq 10\%$ (45,000 individuals) of the global population in three years (Tables 1 and 2, Figure 5). The maximum number of Long-billed Dowitchers recorded in any season (82,010) was about 18% of the global population, and annual totals of this species were $\geq 10\%$ (50,000) in two years. In addition, the number of Long-billed Dowitchers was $\geq 10\%$ (25,000) of the Pacific Americas Flyway population in 19 years (B. Andres pers. comm.). Consideration of turnover rates and birds missed because of the number, nature, and timing of the surveys would increase these numbers and proportions.

Applying the current WHSRN criteria to these data on annual counts and biogeographic populations affirms the continued importance of the Lahontan Valley wetlands as a site of regional or international importance, but not of hemispheric importance. Reclassifying the site's status would ensure consistency of the Lahontan Valley wetlands with WHSRN sites designated since 1990.

The total annual counts were highest from 1987 to 1991, and all 8 years in which the total annual counts exceeded 100,000 shorebirds fell during the interval 1987–2001 (Figure 4). A visual examination of the data suggests that use of the Lahontan Valley by shorebirds is declining, but given the variability or uncertainty in observer numbers, survey methods, effort, and coverage, the apparent trend may not be real. If the apparent decline is real, several possible explanations, either singly or in combination, may apply.

Declines in regional or continental shorebird populations (Rosenberg et al. 2019) ultimately will be manifest at local scales. For example, the Alaska Shorebird Group (2019) considered the Western Sandpiper to be declining

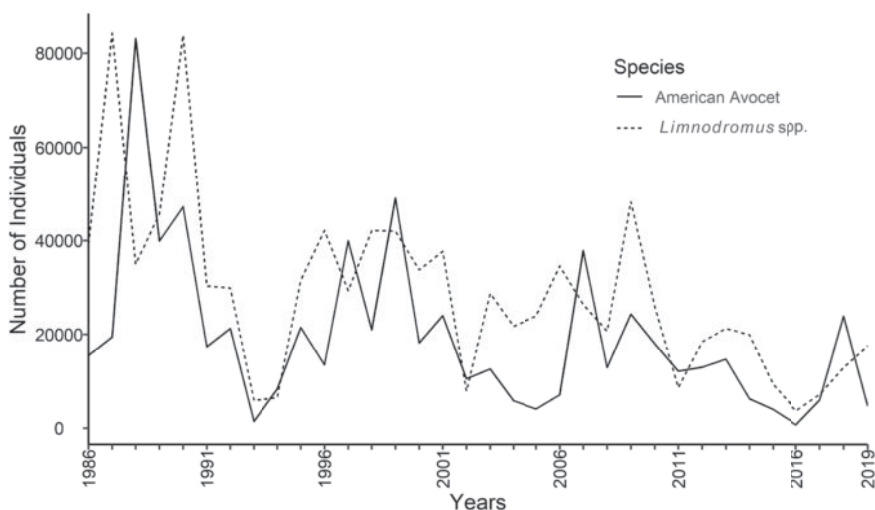


FIGURE 5. Annual totals (sum of spring and fall counts by year) for dowitchers (overwhelmingly Long-billed Dowitchers) and the American Avocet on surveys of the Lahontan Valley wetlands, Nevada, 1986–2019.

on its breeding grounds, and Warnock et al. (2021) documented long-term declines in the numbers of Western Sandpipers at Tomales Bay in coastal California. The declines at Tomales Bay were recorded from 1989 to 2019, essentially concurrent with our surveys and the apparent decline in numbers of Western Sandpipers in the Lahontan Valley.

Changes in the availability of water and wetland habitats at regional scales also may influence shorebird use of the Lahontan Valley. For example, comparing 1972–1993 with 1998–2015, Stenzel and Page (2018) related increased fall flooding of rice fields in California’s Central Valley in the 1990s with changes in use by waterbirds of a coastal site, Bolinas Lagoon. The American Avocet and dowitchers were among the shorebirds whose numbers at Bolinas Lagoon declined during the latter period, as they also appear to have done in the Lahontan Valley. There may or may not be a connection for these species between the Central Valley and Lahontan Valley, but changes in water use elsewhere in the region could affect numbers of these and other shorebirds in the Lahontan Valley similarly.

Finally, there have been major changes in the availability and seasonality of water and wetland habitats in the Lahontan Valley. Neel and Henry (1996) described the influence of fluctuating water levels—locally and regionally—on annual shorebird use of the Lahontan Valley (also see Shuford et al. 2002). For example, exceptionally large numbers of Long-billed Dowitchers were recorded in spring 1987, as water receded from flood conditions in the previous year (Neel and Henry 1986). Carson Lake was completely dry in 2015 and in spring 2016, and it was completely flooded in 2017. Hence annual total counts of shorebirds from 2015 to 2017 were very low (Figure

4). Too little or too much water, as well as changes in the timing of the availability of water, are undoubtedly influencing shorebirds' use of the Lahontan Valley. Unfortunately, the distribution and timing of water in the Lahontan Valley are now so altered and complex that there are no simple proxies, such as snowmelt or precipitation, to characterize each year's water conditions. Improved design and implementation of shorebird surveys and tracking of water conditions are needed for the interplay of shorebirds and water at local and regional scales to be better understood.

Despite the WHSRN designation, system-wide or site-specific management requirements for maintaining shorebird habitat and use of the Lahontan Valley wetlands have not been defined. The Nevada Department of Wildlife and its partners and stakeholders will need to address these issues in the development of a new management plan for Carson Lake. The wetland ecosystem is the primary resource of concern at Stillwater NWR, and refuge staff have identified shorebird populations and habitat characteristics as indicators of wetland health (USFWS 2020). More than three decades after the Lahontan Valley's designation as a WHSRN site, it is timely for NDOW, USFWS, and others to jointly revisit management objectives and practices for the entire wetland complex.

The requirements of priority species we have identified can be used to evaluate and shape habitat and water management for migrant shorebirds. It is beyond the scope of this paper to parse species-specific requirements, but in the Lahontan Valley shorebirds use a range of habitats, including open, standing water of several centimeters or more in depth (e.g., phalaropes and American Avocet), shallow water and adjacent open mudflats or edge habitats with interspersed vegetation (e.g., dowitchers and *Calidris* spp.), playas or salt flats (Snowy Plover), and grasslands (Long-billed Curlew) (Chisholm and Neel 2002). Several of these priority species, such as the Snowy Plover, American Avocet, Long-billed Curlew, and Wilson's Phalarope, also nest in the Lahontan Valley (Chisholm and Neel 2002, Young and Oring 2006) and have different or additional habitat requirements to be considered during the breeding season.

Establishing priorities for habitat and water management can be complex, especially when multiple values and uses must be considered (e.g., irrigation for agriculture, nesting wading birds in the summer, and waterfowl hunting in the fall). However, we offer the following recommendations for enhancing management for shorebirds in the Lahontan Valley, including at Carson Lake, which, under federal law (P.L. 101-618, Title II), must be managed "consistent" with its WHSRN designation:

- Build profiles of priority species, including timing of use and seasonal habitat requirements, such as water depth and vegetation types (see Jones et al. 2016 for the Salton Sea).
- Review management practices and identify areas where there are opportunities to manage water quantity and quality, vegetation, grazing, or other factors to benefit shorebirds.
- Explicitly incorporate shorebirds' habitat requirements and quantitative objectives for their use of the site into site- and unit-management plans. Establish numerical objectives that trigger increased levels of

concern and management when these objectives for shorebird numbers are not met (see Tavernia et al. 2017).

- Reassess current methods and coverage for shorebird surveys and habitat characterization and implement a consistent, rigorous approach to facilitate statistical analyses of population trends, timing of shorebird occurrence, and progress toward habitat-management objectives (e.g., see recommendations in PRISM 2018 and Reiter et al. 2020).
- Coordinate survey and management efforts, including allocation of water across management units, and meet regularly with stakeholders on an interagency basis to plan for and evaluate progress toward integrated area-wide management goals.
- Upgrade the water-management infrastructure to enhance the refuges' ability to allocate and manage water across the wetland complex.
- Repeat some version of the synoptic surveys described by Shuford et al. (2002) throughout the Intermountain West to provide regional context for interpretation of the results of surveys of the Lahontan Valley and to further the understanding of the status and trends of shorebird populations overall.

Continuing declines in surface water and wetlands in the Lahontan Valley and Great Basin as a whole (Donnelly et al. 2020) give urgency to these recommendations, as does the decline of shorebird numbers more broadly in North America (Rosenberg et al. 2019). Shuford et al. (2002), Thomas et al. (2013), and Senner et al. (2016) highlighted the need for coordinated action at regional and flyway scales. Maintaining habitat for shorebirds in the Lahontan Valley is essential to the success of these larger endeavors.

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AUTUMN COPULATORY BEHAVIOR IN CALIFORNIA QUAIL: OBSERVATIONS AND POTENTIAL FUNCTIONS

ALLISON M. ROTH, Department of Biology, University of Florida, Gainesville, Florida 32611; amr2264@columbia.edu

JENNIFER M. GEE, James San Jacinto Mountains Reserve, University of California – Riverside, University of California Natural Reserve System, Idyllwild, California 92549

CARL N. KEISER, Department of Biology, University of Florida, Gainesville, Florida 32611

ABSTRACT: Most birds living in the temperate zones breed in spring or summer. In a variety of species, however, copulatory behavior has been observed out of season in autumn. Such activity has been proposed to represent late breeding attempts, help to maintain pair bonds during the nonbreeding season, or aid in the formation of future breeding pairs. We observed three attempted copulations (one with cloacal contact) in late November between three male and two female California Quail (*Callipepla californica*), a species with a flexible mating system. Given that one of the females, and at least two of the observed males, were under a year of age and, therefore, almost certainly sexually immature, we suggest that these copulation attempts could contribute to pair formation. The two males and two females, whose identities were known, spent more time associating with the individual with which they engaged in copulatory activity than with any other covey member of the opposite sex, also implying a social function of this behavior. Nevertheless, we cannot rule out the unlikely possibilities that the observed activity represented astonishingly early breeding attempts, acted as expressions of intersexual social dominance, or functioned as practice for the upcoming breeding season. Possibly, the behavior served no immediate adaptive purpose. Nevertheless, autumn copulatory activity in the California Quail may be more common than known, and we present these observations as a call for further monitoring to clarify the potential function(s) of this behavior.

Some avian species living in temperate climates have been reported to copulate during the autumn and/or winter, outside of their regular breeding season (Höhn 1947, Marshall 1952, Snow 1955, Orians 1960). In males, this out-of-season copulatory activity may arise as a result of a regeneration of interstitial cells in the testes, following a refractory period after the spring breeding season (Marshall 1952). Moreover, autumn or winter copulatory behavior may reflect late breeding attempts, assist in pair formation, or help to maintain pair bonds between previously mated birds during the nonbreeding season (Höhn 1947, Marshall 1952).

Koenig and Stahl (2007) discovered that, among the 441 North American terrestrial birds they evaluated, nesting activity (i.e., laying or incubation) between 1 September and 30 November had been reported at least once in ~16% (i.e., 69 species). Of these, 66 species breed primarily in the spring or summer, providing support that autumn copulatory behavior may reflect late breeding attempts (Koenig and Stahl 2007). Koenig and Stahl (2007) found that late nesting was more common among resident species than among migrants, and among species that nest colonially or semicolonially than among solitary nesters. Late nesting may arise as a result of natural or anthropogenic

environmental conditions such as warmer temperatures, irregular periods of abundant food, heavy or unpredictable precipitation, or changes in habitat type (MacGregor and Inlay 1951, Snow 1955, Orians 1960, Selander and Nicholson 1962, Ostfeld and Keesing 2000, Koenig and Stahl 2007).

In addition to potential reproductive purposes, copulatory behavior in autumn or winter may serve to assist in the formation of new pairs or help maintain pair bonds during the nonbreeding season (Höhn 1947, Marshall 1952, Spurr and Milne 1976). Pair bonding in the nonbreeding season may confer advantages such as earlier or increased reproductive synchrony of mated pairs, increased winter survival, or reduced partner loss due to death or divorce (Butterfield 1970, Rowley 1983, Ens et al. 1996, Kellam 2003, Culina et al. 2015). When copulatory activity aids in pair-bond maintenance or formation, in some species, copulatory behaviors in the breeding and nonbreeding seasons may differ mechanistically. For example, although copulatory activity has been observed in waterfowl during the winter, when pair bonding occurs, such activity differs from copulations within the breeding season, as males are unable to evert their penis during the pair-bonding phase (Höhn 1947, Brennan and Prum 2012).

The California Quail (*Callipepla californica*; Figure 1) is a nonmigratory sexually dichromatic species with sex-specific social hierarchies (Leopold 1977, Calkins et al. 2014). During the nonbreeding season, it lives in stable social groups, termed coveys (Leopold 1977, Calkins et al. 2014). Coveys typically range in size from 27 to 79 individuals but can get much larger, rarely even exceeding 1000 individuals (Sumner 1935, Leopold 1977, Calkins 2000, Calkins et al. 2014). Annual mortality of adults ranges from 59% to 77%, with the oldest reported wild individual having lived to an age of at least 6.5 years (Raftt and Genelly 1964, Leopold 1977, Calkins et al. 2014). Quail of both sexes reach sexual maturity at the age of 10 months, directly before their first breeding season (Leopold 1977). During the breeding season, individuals may follow a variety of mating strategies including social monogamy, simultaneous polyandry, sequential polyandry, and sequential polygamy (Leopold 1977, Calkins et al. 2014). Facultative inter- and intraspecific brood parasitism and communal rearing of young are also known (Leopold 1977, Lott and Mastrup 1999, Krakauer 2003, Calkins 2007, Calkins et al. 2014). In a mixed-species population in the zone where the California Quail and Gambel's Quail (*C. gambelii*) hybridize, resident quail lay more eggs and hatch more chicks, which hatch on earlier mean dates, than do quail that overwinter in nonresident coveys (Gee 2003). Interestingly, when male and female California Quail were implanted with testosterone or synthetic estrogen, respectively, during the nonbreeding season, they formed pairs but did not exhibit any copulatory activity or courtship behavior (Emlen and Lorenz 1942, Adkins-Regan 2005).

Copulations are seldom seen in wild California Quail, given this species' elusiveness, and much of the evidence we have regarding the timing of reproduction in natural populations is inferred from dates of laying and observations of coveys' break-up. Quail breed primarily with members of their own covey, and females typically raise a single brood (but may raise two broods in productive years; McMillan 1964, Francis 1965, Anthony 1970, Leopold 1977, Calkins et al. 2014). Although the breeding season varies by locality and is influenced by environmental factors such as temperature and precipi-

tation, the majority of breeding occurs in the spring, sometime between late February/March and June (Sumner 1935, Leopold 1977, Calkins et al. 2014). Nevertheless, September clutches have occasionally been observed in the California Quail and its sister species, the Gambel's Quail (Koenig and Stahl 2007; Western Foundation of Vertebrate Zoology, collection searched 2020 at <https://collections.wfz.org>). Additionally, there has been a single sighting of a brood of California Quail chicks, believed to be ≤ 10 days old, in early January, implying laying in early December (Compton 1931). Despite this, there seem to be no direct observations of autumn copulatory activity in California quail.

Here, we report data on several attempted November copulations in a covey of individually color-banded wild California Quail in the Anza-Borrego Desert in California. Both the age and social associations of these birds shed light on the potential functions of autumn copulatory activity in this species.

METHODS

From 15 to 29 November 2019, Roth observed a covey of wild California Quail daily between 05:30 and 16:30 Pacific Standard Time from the roof of a private home (33.233° N, 116.389° W; Figure S1; see https://archive.westernfieldornithologists.org/archive/V52/Roth_Appendix) in the community of Borrego Springs, California (33.233° N, 116.389° W). Earlier in the month, with the help of field assistants, Roth and Gee had trapped the birds with seed-baited walk-in funnel traps. They sexed, aged, measured, and banded the birds for individual recognition with a unique combination of a single numbered aluminum band and one to three colored Darvic plastic bands. We assigned an age of < 1 year if a bird retained mottled primary coverts and an age of > 1 year if the primary coverts lacked mottling (Williams 1959; Figure 2). Roth observed the covey roosting daily in a large Jojoba (*Simmondsia chinensis*), ~ 5 m from the roof, and all recorded observations were within a 10-m radius of this roost (Figure S1). Vegetative cover in this area was limited, providing optimal conditions for behavioral observation. Although we color-banded 33 birds (14 males and 19 females) at the beginning of the month, only 28 banded individuals were seen at least once from 15 to 29 November, and only 22 banded individuals (8 males and 14 females) remained for the entire range of days. Three factors may have reduced the number of individuals over the course of our study. A suspected fission of the covey—6 birds disappeared over the first 5 days of observation—one male (σ^1561) of which Roth rediscovered in late January 400 m or less from his original roost, paired with a female (ϕ^1563) that had vanished prior to the 15–29 November observation period. Also possible are mortality and a fall shuffle i.e., a period of movement between summer and winter ranges, as individual quail regroup to form coveys (Agee 1957), although Johnsgard (1973) reported little exchange of covey members during the fall shuffle. We estimate that there were about five individuals we were unable to trap and band, given that Roth never saw more than three unbanded individuals at once and never saw more than three unbanded males or more than two unbanded females at the same time.

Roth recorded all copulation attempts, successful attempts defined as those including cloacal contact (i.e., a “cloacal kiss”). We defined unsuccessful

ful copulation attempts as mounting without cloacal contact. We classified females as resisting copulation attempts, regardless of whether the attempt was successful or unsuccessful, when a female was observed struggling to free herself from under the male.

In addition to recording copulation attempts, Roth made three 5-minute focal observations of the 22 individuals that were present for the entire 15–29 November period. During one of the observations of three quail, the focal bird did not associate with any other individual, so Roth made an additional fourth 5-minute observation of each of these individuals so that we had 15 minutes of association data across all individuals. From these focal observations we estimated the relative amount of time each individual spent with each other bird of the opposite sex. The focal observations took place whenever birds were visible (i.e., when they were at our study site and not inside their roost) between 05:30 and 16:30 Pacific Standard Time. We randomized the order in which individuals were followed, and we never sampled an individual more than once per day. Roth recorded the order and identities of all individuals with which the focal bird associated during each focal observation. We defined associations as instances in which the focal individual came within one body length of another quail, as most of the California Quail's social interactions occur within this distance. Whitehead and Dufault (1999) and Whitehead (2008) recommended that individuals be scored as associating if they are within a distance in which interactions typically occur. Birds often associated with the same individual more than once over the course of a focal observation. We considered all associations between heterosexual pairs, regardless of whether the focal bird was male or female.

Our work was authorized under permit SC 949 from the California Department of Fish and Wildlife and approved by the University of Florida's institutional animal care and use committee (permit 201910744).

RESULTS

Roth observed three attempted copulations, one successful and two unsuccessful. On 24 November 2019 at 14:09, an unbanded male attempted an unsuccessful copulation with ♀002, which was >1 year old. The unbanded male grasped the nape of ♀002's neck with his beak and attempted to mount her. The female immediately resisted the attempt and was able to free herself from under him almost instantaneously. She had been feeding prior to the attempted copulation and quickly resumed foraging. After just a couple of minutes, however, ♂1558, <1 year old, mounted ♀002 and successfully copulated with her at 14:11. Unlike before, ♀002 did not resist the copulation attempt. With ♂1558 firmly on top of her back and grasping the nape of her neck with his beak, ♀002 raised her tail to facilitate cloacal contact. This activity was relatively quick, lasting ~5 seconds. Both copulation attempts on 24 November 2019 occurred in roughly the same location, within ~0.5 m of the roost where there was no vegetative cover directly overhead (Figure S1).

On 26 November 2019 at 07:28, Roth observed an unsuccessful copulation attempt between ♂1550 and ♀1547, both <1 year of age. The male mounted the female and trod on her back, repeatedly lifting each foot briefly, as he attempted to secure a firm hold on the female's nape with his beak. The female

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FIGURE 1. Male California quail with mottled primary coverts (<1 years old) in the hand.

Photo by Allison M. Roth



FIGURE 2. Detail of primary coverts of the California Quail. (A) Mottled coverts of an immature; (B) uniform gray coverts of an adult.

Photos by Jennifer M. Gee and Philip Unitt

did not resist the attempt. She remained still, adopting a crouched position, while ♂1550 tried to gain balance. Nevertheless, after ~15 seconds, ♂1550 dismounted ♀1547, and cloacal contact never occurred. This last copulation attempt took place within ~2.5 m of the roost and within ~0.25 m of the base of a cholla cactus (*Cylindropuntia* spp.) with several overhanging limbs providing slight overhead cover (Figure S1). All observed copulation attempts occurred in the presence of other members of the covey while the covey was feeding on scattered seed. Furthermore, while female California Quail sometimes solicit copulations by emitting quiet sexual calls while crouching in front of a male (Raitt 1960, Leopold 1977, Calkins et al. 2014), we did not observe any solicitation by either ♀002 or ♀1547.

In addition to the activity described, we also observed an isolated incident of tidbitting at 06:57 on 23 November 2019, between two birds both <1 year old (♂001 and ♀1566). While vocalizing, ♂001 repeatedly picked up and dropped an unknown item of food in front of ♀1566, which she then consumed. We did not record the exact location of this interaction, but as with all observations, it occurred within a 10-m radius of the roost.

Of the 14 females present for the full 15–29 November 2019 observation period, ♂1550 and ♂1558 were each seen associating with 6 (Table 1; see Table S1 at https://archive.westernfieldornithologists.org/archive/V52/Roth_Appendix for the full heterosexual association matrix). Both ♂1550 and ♂1558 associated with the females with which they attempted to copulate (i.e., ♀1547 and ♀002, respectively) more than they associated with any other female (Table 1). The reverse was also true. While ♀1547 and ♀002 both were seen associating with four of the eight males that were present for the entire observation period, ♀1547 associated more with ♂1550, and ♀002 more with ♂1558, than with any other male (Table 2). ♂1550 associated with ♀1547 6.67× more than with the female he spent the second greatest amount of time with; ♂1558 associated with ♀002 1.57× more than with the female he spent the second greatest amount of time with. Conversely, ♀1547 associated with ♂1550 6.67× more than with the male she spent the second greatest amount of time with, and ♀002 associated with ♂1558 2.75× more than with the male she spent the second greatest amount of time with.

DISCUSSION

In a banded covey of California Quail living in the Anza–Borrego Desert, California, we observed three instances of copulatory behavior out of season in autumn. Although we did not see any female solicitation, which sometimes occurs during the normal breeding season, the copulatory behaviors we report are consistent with descriptions of those during the breeding season (Raitt 1960, Leopold 1977, Calkins et al. 2014). Furthermore, the copulatory activity we observed occurred while other members of the covey were feeding in close proximity. Our observations match Raitt's (1960) findings that, during the breeding season, pairs are more likely to copulate in the presence of feeding conspecifics. Nevertheless, Leopold (1977) relayed a personal observation by M. Erwin that copulations are more likely to take place in isolation.

Might the observed copulatory behavior have functioned as an expression of intersexual social dominance, rather than serving to confer any reproduc-

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TABLE 1 Association Matrix between ♂1550 and ♂1558 and Their Female Covey Mates^a

	♂1550	♂1558
♀002	0	11
♀1546	0	5
♀1547	20	0
♀1548	0	3
♀1553	1	0
♀1554	3	7
♀1564	0	0
♀1565	0	0
♀1566	2	3
♀1568	0	0
♀1569	0	0
♀1570	0	0
♀1571	1	0
♀1573	1	6

^aOf females present throughout the observation period, 15–29 November 2019. Each association of a dyad during a focal observation was given a score of 1. Rectangles indicate dyads in which copulatory activity was seen. Dark gray shading represents the female with which each male spent the most time associating; light gray shading represents the female with which each male spent the second most time associating.

tive benefit, whether immediate or delayed? Although the California Quail’s social hierarchies are believed to be sex-specific (Calkins et al. 2014), we did observe eight instances of males directing aggression toward females. Nevertheless, none of these aggressive interactions occurred between the birds we saw copulating. As in other Galliformes (e.g., Persaud and Galef 2003, Løvlie and Pizzari 2007, Roth et al. 2021), these interactions could have been a form of sexual harassment. And although we recorded 33 instances of male–male aggression and 24 instances of female–female aggression, we recorded no same-sex mounting. Moreover, aggression implies no reason for cloacal contact, as was the case in the successful copulation observed between ♂1558 and ♀002. Thus, while we cannot completely rule out the possibility that the observed copulatory activity functioned as an expression of intersexual social dominance, that explanation seems implausible.

Both ♂1550 and ♂1558 were under a year of age, as was ♀1547, so none had yet participated in their first breeding season. Therefore, in at least two of the three copulation attempts we observed, the activity could not have functioned to maintain bonds between previously mated pairs (although ♀002 could have been paired with the unbanded male, whose copulation attempt she resisted, during a previous breeding season). Moreover, because both male and female California Quail reach sexual maturity at 10 months of age, just in time for the beginning of spring breeding (Leopold 1977), it is highly unlikely that ♂1550, ♂1558, and ♀1547 were sexually mature at the time of the reported copulatory behavior, and it is reasonable to assume that copulation attempts involving these individuals were not intended to produce offspring. Further-

TABLE 2 Association Matrix between ♀1547 and ♀002 and Their Male Covey Mates^a

	♀1547	♀002
♂001	1	2
♂005	0	0
♂1550	20	0
♂1551	0	0
♂1552	0	4
♂1555	3	0
♂1558	0	11
♂1567	1	1

^aOf males present throughout the observation period, 15–29 November 2019. ♀002 also associated with ♂1561 four times, but because ♂1561 was not seen past 18 November 2019, he received only a single focal observation and cannot be compared to males that received three focal observations. Each association of a dyad during a focal observation was given a score of 1. Rectangles indicate dyads in which copulatory activity was seen. Dark gray shading represents the male with which each female spent the most time associating; light gray shading represents the male with which each female spent the second most time associating.

more, although Compton (1931) documented the sighting of California Quail chicks, thought to be ~10 days old, in early January, implying laying in early December, he posited that these chicks were a product of an astonishingly late clutch, rather than an early one. This suggests that even if ♂1550, ♂1558, and ♀1547 had been sexually mature, it is improbable that they would have copulated for reproduction for the first time months before the start of the breeding season. Similarly, the male-initiated copulation attempts we report could not have arisen as a result of post-nuptial regeneration of the interstitial cells of the testes, as ♂1550 and ♂1558 had not yet participated in their first breeding season. Furthermore, unlike some Galliformes, such as the Ring-necked Pheasant (*Phasianus colchicus*; Kirkpatrick and Andrews 1944, Hiatt and Fisher 1947) and domestic chickens (*Gallus gallus domesticus*; Parker et al. 1942), in which precocious spermatogenesis has been recorded in juveniles, California Quail have shown no evidence of initiating spermatogenesis before ~9 months of age (Lewin 1963). Thus it is highly unlikely that the observed copulatory activity was intended for immediate reproduction, given that these three interactions would reflect the earliest recorded reproductive attempts in California Quail, by far, and it is almost certain that one of the females and at least two of the males were sexually immature.

One question that arises is whether the copulatory activity observed in our study was a way for sexually immature individuals to practice mating prior to the breeding season. To the best of our knowledge, there have been no studies to suggest that sexually immature birds practice copulation, although male Java Sparrows (*Lonchura oryzivora*) rehearse courtship dances prior to sexual maturity (Soma et al. 2019). Nevertheless, if the observed copulatory activity functioned solely as a means for immature birds to practice the mechanics of copulation, it seems odd that ♀002, a sexually mature female, would have

allowed ♂1558 to copulate with her successfully, given the costs associated with mating (e.g., increased risk of predation, sexually transmitted diseases; Magnhagen 1991, Lehtonen et al. 2012).

As intersexual dominance, early reproduction, and practice are highly improbable explanations for the observed copulatory activity, we suggest that a more likely explanation is that at least two of the three observed copulation attempts acted to assist in pair formation. This idea is further supported by our finding that, of the individuals whose identities were known, birds of both sexes spent more time with the individuals with which they engaged in copulatory activity than with any other bird of the opposite sex. During the breeding season, a positive correlation between the frequency with which a pair associates and their probability of mating or producing offspring has previously been demonstrated in quail, as well as in another galliform, the Red Junglefowl (*Gallus gallus*; McDonald et al. 2019, Zonana et al. 2021, Roth et al. 2021). Stronger prebreeding pair bonds may impart benefits including, but not necessarily limited to, earlier or enhanced reproductive synchrony between mated pairs, increased winter survival, and/or a reduction of loss of a partner via death or divorce (Butterfield 1970, Rowley 1983, Ens et al. 1996, Kellam 2003, Culina et al. 2015). Autumn copulatory activity may be one mechanism that assists in the formation of such bonds. Nevertheless, it is reasonable to assume that, for many individuals, pair bonds are not fully established months in advance of the breeding season, and individuals may sample a variety of partners prior to settling on a social mate (Firth et al. 2018). The back-to-back copulatory activity seen between ♀002 and an unbanded male then ♂1558 may suggest that ♀002 was still in the process of sampling potential mates. Furthermore, it may be beneficial for individuals to form social bonds with more than one member of the opposite sex (Beck et al. 2020), given that the California Quail's mating system is not sexually monogamous (Leopold 1977, Calkins et al. 2014). Nevertheless, ♀002 resisted the copulation attempt by the unbanded male, prior to allowing ♂1558 to copulate with her successfully, suggesting a preference for ♂1558. We unfortunately have no way of knowing the proportion of time with which ♀002 spent with the unbanded male, as there was more than one unbanded male present during our study.

Additional evidence suggesting that California Quail may pair during the autumn lies in the tidbitting we observed. Widespread among the Galliformes, tidbitting is a form of courtship feeding believed to assist in pair bonding (Williams et al. 1968, Calkins et al. 2014). Like the copulating pairs, the individuals involved in this tidbitting associated more with each other than with any other covey member of the opposite sex (Table S1).

Although autumn copulatory behavior of immature California Quail may assist in pair formation, it remains possible that these interactions served no immediate adaptive value. The observed copulatory activity may simply be a reflection of the competitive sexual environment in which these quail live, causing the birds to be prepared to seek out any potential chance for copulation, regardless of whether or not fertilization is possible. Furthermore, although we present evidence to support pair formation as the function of the observed copulatory activity, our sample size is extremely limited, and other potential functional explanations cannot be eliminated with certainty.

Most information regarding breeding of the California Quail comes from

nesting records and observations of the timing of covey breakup. Thus it is possible that autumn copulatory behavior in this species has previously been underestimated, as nesting records can only capture the proportion of autumn copulations that serve an immediate reproductive function. A more intensive investigation of autumn mating patterns in wild California Quail is needed for the potential causes and consequences of this activity to be better understood.

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GARY H. ROSENBERG, P. O. Box 91856, Tucson, Arizona, 85752-1856
ghrosenberg@comcast.net

KURT RADAMAKER, 6132 E Morning Vista Lane, Cave Creek, Arizona, 85331

ABSTRACT: From 2018 to 2020 the Arizona Bird Committee reviewed 195 reports and updated the Arizona bird list through 2020, adding two species—the White-throated Thrush (*Turdus assimilis*) and Clay-colored Thrush (*Turdus grayi*)—bringing the Arizona state list to 567 species in good standing.

This is the 10th published report of the Arizona Bird Committee (ABC) (Speich and Parker 1973, Speich and Witzeman 1975, Rosenberg and Witzeman 1998, 1999, Rosenberg 2001, Rosenberg et al. 2007, 2011, 2017, 2019). This report covers records from 2018 to the end of 2020 and includes some records from prior years reviewed during that interval. The ABC reviewed a total of 195 reports, of which 184 (94%) became accepted records. Two different White-throated Thrushes (*Turdus assimilis*) and a Clay-colored Thrush (*T. grayi*) added two species to the Arizona state list—bringing it to 567 species in good standing.

Other highlights in this report include acceptance of Arizona's third Eurasian Green-winged Teal (*Anas crecca crecca*), second Common Crane (*Grus grus*), sixth and seventh Northern Jacanas (*Jacana spinosa*), second Black Turnstone (*Arenaria melanocephala*), fifth and sixth Sharp-tailed Sandpipers (*Calidris acuminata*), 10 different Lesser Black-backed Gulls (*Larus fuscus*)—nearly doubling the number of state records, seventh Arctic Tern (*Sterna paradisaea*), fifth Blue-headed Vireo (*Vireo solitarius*), fifth Carolina Wren (*Thryothorus ludovicianus*), two Gray-crowned Rosy-Finches (*Leucosticte tephrocotis*), representing a third state record, two flocks of Black Rosy-Finches (*L. atrata*), representing the seventh and eighth records, and seventh through ninth Field Sparrows (*Spizella pusilla*), as well as four different Tropical Parulas (*Setophaga pitayumi*) and four different Canada Warblers (*Cardellina canadensis*).

The current Arizona Bird Committee (2021) consists of Chris D. Benesh (who serves as chair), Troy Corman, Sean Fitzgerald, Felipe Guerrero, Lauren Harter, Keith Kamper, Ryan O'Donnell, and David Vander Pluym. Recent committee members who also voted on records in this report include Andrew Core, Eric Hough, Scott Olmstead, Kurt Radamaker (who is also our web master), Magill Weber, and Gary H. Rosenberg (who serves also as secretary). Janet Witzeman serves in a nonvoting capacity as assistant secretary, as she has done since the committee began in the early 1970s.

The ABC's web site (<http://abc.azfo.org>) includes the Arizona state list, a list of species currently reviewed, the ABC's bylaws, a list of current committee members, a brief history of the ABC, an electronic form for reporting, and all past reports of the ABC (as published in *Western Birds*). When a species is removed from the ABC review list, we mention that information in the species accounts in the reports, as well as in the "News" of the committee.

The ABC encourages observers to submit documentation for species on

the review list, as well as for species new to Arizona. All material should be submitted via <http://abc.azfo.org> or sent to Rosenberg at the address above. The committee would like to emphasize the importance of submitting documentation of sightings directly to the ABC for review. The posting of reports, including those with written descriptions, on local “listservs” and at www.eBird.org may not be assumed to have been discovered by the ABC, nor be assumed to be intended as documentation of a rarity. The ABC prefers reports submitted directly to the committee. The ABC thanks the many observers (180+) who have submitted their documentation of sightings to the Arizona Field Ornithologists (AZFO) and ABC for this report. Each record listed below includes a locality, county (abbreviations: see below), date span, and initial observer if known. Additional observers who submitted written reports (as indicated by the symbol †), photographs, video recordings, and sound recordings are also listed. All records are of sight reports unless noted otherwise with a symbol for a photograph, sound recording, or specimen (abbreviations: see below). As of 2021 the ABC’s current policy is to review reports of birds recurring in successive years only if the bird has departed and then returned. Reports of individual birds that persist for multiple years without leaving are not reviewed after the initial acceptance. In most cases, the total number of Arizona records for a species includes the number of records accepted by the ABC plus those published in *Birds of Arizona* (Phillips et al. 1964) or in the *Annotated Checklist of the Birds of Arizona* (Monson and Phillips 1981). The ABC emphasizes that a report listed under “reports not accepted” means that the documentation supplied was insufficient and/or did not meet the standards of the committee for substantiation.

Abbreviations for Arizona counties are APA, Apache; COS, Cochise; COC, Coconino; GIL, Gila; GRA, Graham; GRE, Greenlee; LAP, La Paz; MAR, Maricopa; MOH, Mohave; NAV, Navajo; PIM, Pima; PIN, Pinal; SCR, Santa Cruz; YAV, Yavapai; YUM, Yuma. Other abbreviations used include †, written description; ph., photograph; s.r., sound recording; v.r., video recording; NM, National Monument; NRA, National Recreation Area; NWR, National Wildlife Refuge; SP, State Park; WMA, Wildlife Management Area. The finder of a bird who also submitted details is acknowledged first; other observers who submitted details follow.

Of the numbers appearing in parentheses (*n, n, n*) after each species’ name, the first represents the total number of reports published by Phillips et al. (1964) or Monson and Phillips (1981) that the ABC considers correct but has not formally reviewed, provided the species was included on the ABC’s first (1972) checklist. (The “#” symbol denotes a species not recognized or not on the review list at that time.) The second number is the number of records accepted by the ABC from 1972 until this report, and the third number is the number of records of the species published in this report. For example, in the case of the Red-eyed Vireo, (5, 43, 3) signifies that five records were published in *Birds of Arizona*, 43 records were accepted and published in previous ABC reports, and three others are published in this report. All totals reflect the number of reports and not the number of individual birds (e.g., 200 Least Storm-Petrels at Lake Havasu, MOH, after Tropical Storm Nora on 26 September 1997 constitute one record).



FIGURE 1. This adult male Eurasian Green-winged Teal in Phoenix, Maricopa Co., 3 Jan 2019 provided only the third Arizona record of this form.

Photo by Ryan P. O'Donnell

HISTORICAL RECORDS

Several species on the Arizona list are founded on specimen records of species that have not occurred since being published by Phillips et al. (1964). These include the Eastern Whip-poor-will (*Antrostomus vociferus*), Bumble-bee Hummingbird (*Selasphorus heloisa*), Anhinga (*Anhinga anhinga*), White-tailed Hawk (*Geranoaetus albicaudatus*), Aplomado Falcon (*Falco femoralis*),



FIGURE 2. Arizona's second Common Crane accompanied Sandhill Cranes at Willcox, Cochise Co., 28–29 Nov 2020.

Photo by Gary H. Rosenberg



FIGURE 3. Arizona's sixth Northern Jacana was this immature on a golf course in Green Valley, Pima Co., and subsequently at nearby Canoa Ranch, 9–11 Sep 2020.

Photo by Patricia Isaacson



FIGURE 4. Arizona's seventh Northern Jacana was this adult along the Santa Cruz River in Tucson, Pima Co., from 26 Sep 2020 through at least 9 Apr 2021.

Photo by Patricia Isaacson

Thick-billed Parrot (*Rhynchopsitta pachyrhyncha*), Acadian Flycatcher (*Empidonax virescens*), and Gray-cheeked Thrush (*Catharus minimus*). These species have been grandfathered onto the ABC's list. Also in this category are two extirpated species, the Masked Northern Bobwhite (*Colinus virginianus ridgwayi*) and California Condor (*Gymnogyps californianus*), which have both been reintroduced into Arizona, but neither has yet become established.

Other species listed as hypothetical by Phillips et al. (1964) or Monson and Phillips (1981) were based on undocumented sight reports or were presumed by the ABC to be likely escapees. These include the Greater Sage Grouse (*Centrocercus urophasianus*), Yellow Rail (*Coturnicops noveboracensis*), Black Oystercatcher (*Haematopus bachmani*), American Woodcock (*Scolopax minor*), Great Frigatebird (*Fregata minor*), Scarlet Ibis (*Eudocimus ruber*), Snowy Owl (*Bubo scandiacus*), Pileated Woodpecker (*Dryocopus pileatus*), San Blas Jay (*Cyanocorax sanblasianus*), and Orange-billed Nightingale-Thrush (*Catharus aurantirostris*). These species are not on the ABC's Arizona state list, and they have not been reviewed by the ABC.

EXOTICS

Several species of exotics are accepted on the basis of their having been introduced (or having arrived on their own from other introduced populations) and having been established for ≥15 years (see American Birding Association criteria for determining establishment of exotics; <https://www.aba.org/criteria-for-determining-establishment-of-exotics/>). These include the California Quail (*Callipepla californica*), Ring-necked Pheasant (*Phasianus colchicus*), Chukar (*Alectoris chukar*), Rock Pigeon (*Columba livia*), Eurasian Starling (*Sturnus vulgaris*), and House Sparrow (*Passer domesticus*). The California Quail, Ring-necked Pheasant, and Chukar were added to the list on the basis of information in *Arizona Game Birds* (Brown 1989). Two additional exotics have been accepted, the Eurasian Collared-Dove (*Streptopelia decaocto*), which arrived in the state on its own and is now abundant, and the Rosy-faced Lovebird (*Agapornis roseicollis*), which was originally released or escaped from captivity and is well established in the Phoenix area (see http://arizonabirds.org/sites/default/files/articles/arizona-birds-status-rosy-faced-lovebird-phoenix-arizona_0.pdf). The ABC is currently monitoring other exotic species such as the Monk Parakeet (*Myiopsitta monachus*) as potential additions to the state list.

ACCEPTED REPORTS

FULVOUS WHISTLING-DUCK *Dendrocygna bicolor* (6, 11, 2). One was at the Green Valley wastewater-treatment plant, PIM, 25 Jul–30 Aug 2018 (ph. CMC, CMG); one was at Canoa Ranch, PIM, 8 Sep 2020 (JH). Formerly a regular visitor to southern Arizona and a breeding summer resident in southern California, this species has declined and is now only a casual and irruptive visitor (Monson and Phillips 1981, Hamilton et al. 2007) with most recent reports in winter.

BRANT *Branta bernicla* (2, 16, 1). One record of two at Roper Lake SP, GRA, 21 Nov 2019 (ph. KW). Both individuals were Black Brant (*B. b. nigricans*), like all

of Arizona's Brant previously identified to subspecies. This species remains a casual fall and winter visitor to the state.

TRUMPETER SWAN *Cygnus buccinator* (0, 9, 2). One immature was at Shield Ranch near Camp Verde, YAV, 2 Jan 2019 (ph. KH, LG, KR); one adult was at Peck's Lake, YAV, 17 Feb–8 Mar 2019 (ph. SH). One immature photographed at the Phoenix Zoo, MAR, 14 Jan 2018 (ph. KWa) is under further review. The number of records in Arizona continues to increase; the ABC continues to regard this species' occurrence in Arizona a result of birds dispersing from "wild" populations (see Rosenberg et al. 2007), unless records can be linked to a relocation program.

EURASIAN GREEN-WINGED TEAL *Anas crecca crecca* (0, 2, 1). One adult male was discovered at the Phoenix Federal Prison, MAR, 3 Jan 2019 (ph. ROD; Figure 1), providing a third Arizona record of this form.

BLACK SCOTER *Melanitta americana* (0, 31, 6). Accepted records are of one at the Bill Williams delta, MOH, 4 Nov 2018 (†RA; †LHa); a different bird below Parker Dam, LAP, 4 Nov 2018–12 Feb 2019 (†, ph. DVP; †, ph. LHa); an adult male at the north end of Lake Havasu, MOH, 13 Apr 2019 (†DVK); a female at a pond lined with plastic 7 km west of Wellton, YUM, 16 Oct 2019 (†, ph. BJ); an immature at Lake Havasu City, MOH, 21 Oct–22 Dec 2019 (†DVP); and one male on Lake Pleasant, MAR, 23–28 Jan 2020 (ph. MVW). During the past decade this species has become more regular in Arizona (see Rosenberg et al. 2017) and elsewhere in the Southwest, including Nevada (Tinsman and Meyers 2019). The ABC discontinued the Black Scoter as a review species in January 2020.

LEAST GREBE *Tachybaptus dominicus* (4, 21, 4). A previously unreported bird was at Bear Grass Tank, near Tucson, PIM, 2 Jan 2017 (ph. PS). Other records include single birds at Patagonia Lake SP, SCR, 28–29 Mar 2018 (KHe; ph. ES, CM) and (likely the same bird) 10 May 2018 (ph. BL); one at Peña Blanca Lake, SCR, 23 Aug 2019 (†, ph. SA); and one at Quitobaquito, Organ Pipe NM, PIM, 1 Mar 2020 (†, ph. CH; ph. RT). Despite nesting in Arizona at Peña Blanca Lake 2010–2012, and scattered records there up to April 2014 (see Rosenberg et al. 2017), this species remains a casual and irregular visitor and has yet to become established as a regular breeding species in the state.

GROOVE-BILLED ANI *Crotophaga sulcirostris* (3, 25, 4). One was at a residence about 8 km northeast of Arivaca, PIM, 14 Jun 2018 (†, ph. KG); one was at Whitewater Draw WMA, COS, 10 Jul–7 Aug 2018 (†, ph. LHa; ph. KM); one was at the Patagonia–Sonoita Creek Preserve outside Patagonia, SCR, 6 Jul 2019 (†, ph. KWe); and one was at St. David, COS, 31 Oct 2020 (†, ph. MM). There are now more than 30 Arizona records, so the ABC has removed this species from the review list.

BUFF-COLLARED NIGHTJAR *Antrostomus ridgwayi* (5, 14, 3). Accepted records are of one calling at Mineral Creek near Superior, PIN, 27 Jun 2017 (s.r. MB); up to four individuals at California Gulch, SCR, 16 Apr–16 Aug 2018 (†SK; ph. LH; ph. PO); and at least two in Brown Canyon, Buenos Aires NWR, PIM, 11 Jun 2018 (†, s.r. CC). Reports have increased in recent years, and the species has become regular (presumably breeding) at the bottom of California Gulch, Brown Canyon, and likely elsewhere in the Atascosa and Santa Rita Mountains. As a result, the ABC has removed this species from the review list.

BLACK SWIFT *Cypseloides niger* (3, 6, 2). Well-described birds were in Phoenix, MAR, 16 Apr 2018 (†AK) and in South Fork of Cave Creek Canyon near Portal, COS, 4 Aug 2018 (†GK). There is just one Arizona specimen (see Rosenberg et al. 2019), and no photographs of living birds.

CHIMNEY SWIFT *Chaetura pelagica* (2, 1, 2). One well described and photographed along the Little Colorado River near Cameron, COC, 19 May 2018 (†, ph.



FIGURE 5. This Black Turnstone in Yuma, Yuma Co., 13 May 2020 represented only the second record for Arizona.

Photo by Gary H. Rosenberg



FIGURE 6. Arizona's sixth Sharp-tailed Sandpiper was this juvenile at Spot Road Farm, Yuma Co., 29 Oct 2020.

Photo by Derik Bowen



FIGURE 7. Arizona's first photographed Arctic Tern (and seventh recorded) was this adult at Canoa Ranch, Pima Co., 18 May 2020.

Photo by Gary H. Rosenberg

JWi; see Wilder 2020) and one at Buckeye, MAR, 17 Sep 2020 (†, ph. CS) were the only Chimney Swifts accepted. The status of this species in Arizona remains cloudy; it was well documented in small numbers in Tucson during the 1970s and early 1980s, but only a few reports have been submitted since.

RUBY-THROATED HUMMINGBIRD *Archilochus colubris* (0, 7, 1). An adult male at the Hassayampa River Preserve near Wickenburg, MAR, 12 Jul 2018 (ph. MM) provided the eighth Arizona record.

PURPLE GALLINULE *Porphyrio martinicus* (4, 16, 4). Accepted records are of an adult along the Santa Cruz River, in Tucson, PIM, 11–17 Sep 2019 (KAs; ph. ML; ph. JMc; ph. NP; ph. PG; ph. LP); one at the Renaissance Drive pond in Tucson, PIM, 27 Jul–2 Aug 2020 (†, ph. JMc; ph. EB); one at a private residence on the Buenos Aires NWR, PIM, 3 Aug 2020 (†, ph. JS); and one on the University of Arizona campus in Tucson, PIM, 21 Aug 2020 (ph. DK). This species remains a casual late summer visitor to Arizona.

COMMON CRANE *Grus grus* (0, 1, 1). After a one-year hiatus in 2018, one adult returned to Mormon Lake, COC, 11 May–9 Sep 2019 (†LH) and again 9 May–13 Jul 2020 (ph. JWi). One adult with Sandhill Cranes (*Antigone canadensis*) at Willcox, COS, 28–29 Nov 2020 (AA; †, ph. DD; †, ph. CDB; †, ph. GHR; Figure 2), provided a second Arizona record, under the inference that the three occurrences at Mormon Lake represent the same individual.

AMERICAN GOLDEN-PLOVER *Pluvialis dominica* (21, 35, 2). One was at Petrified Forest NP, APA, 11 Jun 2018 (†, ph. AB); one was at Lyman Lake SP near St. Johns, APA, 15 Oct 2018 (ph. CB). Though the ABC removed the American Golden-

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Plover from its review list in 2019, we continue to recommend care in distinguishing this species from the similar Pacific Golden-Plover (*P. fulva*), much rarer in Arizona.

NORTHERN JACANA *Jacana spinosa* (0, 5, 2). One immature was discovered at a golf course pond in Green Valley, PIM, 8 Sep 2020 (ph. CB, DG) and later re-located about 2 km away at Canoa Ranch, PIM, 9–11 Sep 2020 (†, ph. CT; ph. PI; †, ph. GHR; †, ph. NP; †, ph. BP; ph. PG; Figure 3). An adult was along the Santa Cruz River in Tucson, PIM, 26 Sep 2020–9 Apr 2021+ (†, ph. JMc; ph. PI; †, ph. NP; Figure 4). This species occurs regularly in Sonora as far north as Ciudad Obregon and Navajoa, about 480 km south of the Arizona border.

UPLAND SANDPIPER *Bartramia longicauda* (3, 10, 2). One was in Tucson, PIM, 20 Aug 2020 (†MMS); another two were found the same day in Marana, PIM, 20 Aug 2020, remaining through 26 Aug 2020 (†, ph. JMc; †, ph. MSk; †, ph. EB). Most records in Arizona are from mid to late August.

RUDDY TURNSTONE *Arenaria interpres* (2, 11, 1). One immature was at Yuma, YUM, 23 Aug 2019 (†, ph. BJ). In the 20th century this species was more regular in Arizona during fall migration (see Rosenberg and Witzeman 1998), but there have been few records since it was returned to the review list in 2002.

BLACK TURNSTONE *Arenaria melanocephala* (0, 1, 1). Arizona's second Black Turnstone was discovered at Yuma, YUM, 13 May 2020 (†, ph. HD; †, ph. GHR; Figure 5). One at Willcox, COS, 2 Jun 2005 (Stevenson 2005, Rosenberg et al. 2011) provided the only previous record. This species is fairly regular in small numbers at the Salton Sea, California (Patten et al. 2003).

RED KNOT *Calidris canutus* (2, 18, 3). Single juvenile-plumaged birds were at Sacaton, PIN, 8 Sep 2017 (†, ph. DP); at Paloma Ranch, MAR, 31 Aug–3 Sep 2018 (†, ph. BJ, CS); and near Florence, PIN, 22 Sep 2018 (ph. DB). This species was encountered more regularly from the 1970s to 1990s (see Rosenberg and Witzeman 1998). It remains a casual migrant for which the ABC resumed reviewing reports in 2002.

RUFF *Calidris pugnax* (0, 10, 3). Accepted records are of one at Aztec, YUM, 21 Oct 2019 (†, ph. GHR, DS); one at Stanfield, PIN, 20 Sep–7 Oct 2020 (KMi; †, ph. GHR; †, ph. PD); and one at Willcox, COS, 29 Sep–6 Oct 2020 (ph. EK; †, ph. NP). This species remains a casual visitor, last recorded in 2010 (see Rosenberg et al. 2019).

SHARP-TAILED SANDPIPER *Calidris acuminata* (0, 4, 2). Two juveniles were found, one at Patagonia Lake SP, SCR, 28 Oct 2019 (†, ph. JK) and another at Spot Road Farm, near Aztec, YUM, 29 Oct 2020 (HD; †, ph. GHR; †, ph. DB; Figure 6). All but one of Arizona's Sharp-tailed Sandpipers have been recorded from mid-October to early November.

WHITE-RUMPED SANDPIPER *Calidris fuscicollis* (0, 17, 3). Adult birds were at Gilbert Water Ranch, MAR, 3 Jul 2018 (†, ph. SF) and at Willcox, COS, 15–17 May 2019 (ph. KB) and 5 Jun 2020 (†, ph. DS; ph. EB). Most Arizona records are from mid-May to early June.

POMARINE JAEGER *Stercorarius pomarinus* (2, 8, 2). Accepted records are of an adult at Roper Lake SP, near Safford, GRA, 21 Nov 2019 (†, ph. KW) and an immature at the Glendale recharge ponds, MAR, 28 Nov 2019 (ph. JR; ph. SB). The Pomarine is the jaeger most expected in Arizona so late in the fall, as there are only three records of the Parasitic after 1 October.

PARASITIC JAEGER *Stercorarius parasiticus* (2, 15, 3). Juveniles were at Lake Havasu City, MOH, 10–23 Sep 2018 (†, ph. DVP; †, ph. LH; ph. MG) and at San Carlos Lake, GIL and PIN, 12–26 Sep 2018 (†, ph. TD). An adult was at Havasu Springs, LAP, 10 Nov 2018 (ph. JWe). Virtually all of Arizona's records of the Parasitic Jaeger are from September, the November bird being the latest ever.

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LONG-TAILED JAEGER *Stercorarius longicaudus* (0, 16, 2). A long-staying juvenile was at Lake Pleasant, YAV and MAR, 17 Sep–4 Oct 2019 (†, ph. MMc). An adult at the same location 18 Oct 2019 (†, ph. MMc) was the latest recorded in Arizona by 10 days (see Rosenberg et al. 2011).

BLACK-LEGGED KITTIWAKE *Rissa tridactyla* (1, 18, 5). Single first-cycle birds were at Site Six launch ramp, Lake Havasu City, MOH, 3–11 Jan 2018 (†, ph. DVP); north of Willow Beach at Mile 60 along the Colorado River, Lake Mead NRA, MOH, 12 Dec 2018 (†GM); at Lake Havasu City, MOH, 21 Dec 2018–20 Jan 2019 (†, ph. DVP; †, ph. MG; †, ph. TBn); and at Thunderbird Conservation Park, Glendale, MAR, 27 Dec 2018–1 Jan 2019 (†, ph. SF; ph. CR; †, ph. SHo). An adult was at Upper Lake Mary near Flagstaff, COC, 18–25 Nov 2019 (ph. RS; †, ph. JWi). Most of the Arizona records are from mid-November to early January.

LAUGHING GULL *Leucophaeus atricilla* (1, 28, 2). One first-cycle bird was at Lake Havasu, MOH, 14 Jan–16 Apr 2018 (BO; †, ph. DVP; †, ph. TBn), providing a first winter record for Arizona, and an immature was at Willcox, COS, 19–20 Apr 2018 (†, ph. JG). Most Arizona records fall between mid-March and late August. The ABC removed the Laughing Gull from its review list in 2018.

MEW GULL *Larus canus* (0, 26, 2). One adult was at the north end of Lake Havasu, MOH, 11 Mar 2018 (†DVP). One first-cycle bird at Lake Havasu City, MOH, 18 Nov 2018 (†, ph. DVP) was probably the same individual as one there on 20 Jan 2019 (†, ph. MG; †, ph. TBn) and on 21 Mar 2019 (†, ph. LHa). The Mew Gull is a casual late fall and winter visitor, most occurring along the Colorado River.

ICELAND GULL *Larus glaucoideus* (3, 15, 2). First-cycle individuals were at Lake Pleasant, MAR, 13–27 Nov 2018 (†, ph. MH; ph. CR) and at Roper Lake SP, near Safford, GRA, 7–17 Jan 2019 (†, ph. KW; ph. DVP). All Arizona records involve *L. g. thayeri*.

LESSER BLACK-BACKED GULL *Larus fuscus* (0, 11, 10). Accepted records are of an adult at Willow Beach, Lake Mead NRA, MOH, 16 Sep 2018 (†, ph. BZ); an immature in the Bill Williams arm of Lake Havasu, MOH, 12 Nov 2019 (†, ph. DVP); a first-cycle bird at Roosevelt Lake, GIL, 14 Nov 2019 (†, ph. TD); a first-cycle bird at Lake Havasu City, MOH, 4 Jan 2020 (†, ph. DVP); a first-cycle bird at Lake Havasu City, MOH, 22 Sep 2020 (†, ph. KKa), and likely the same individual there 24 Oct 2020 (†, ph. VA); an adult at Lake Pleasant, MAR, 24 Sep 2020 (ph. CS); a first-cycle bird at Walnut Canyon Lakes, Flagstaff, COC, 15 Oct 2020 (†, ph. DS); an adult at Meteor Crater Rest Area along I-40 east of Flagstaff, COC, 24 Oct 2020 (ph. JC; †, ph. JWi); a first-cycle bird at the Glendale recharge ponds, MAR, 31 Oct 2020 (†, ph. PD); and a first-cycle bird at Lake Pleasant, MAR, 6–13 Nov 2020 (ph. MMc; †, ph. ROD). This species' frequency in the western U.S. has increased greatly during the last decade; the first Arizona record was in 2006 (Rosenberg et al. 2011).

ARCTIC TERN *Sterna paradisaea* (2, 4, 1). One adult at Canoa Ranch, PIM, 18 May 2020 (ph. CT; †, ph. GHR; ph. BN; ph. PI; †, ph. NP; Figure 7) was almost certainly the same individual as the one 57 km to the north at Columbus Park, Tucson, PIM, 19 May 2020 (SR; †, ph. GHR). It was the first Arctic Tern to be photographed in Arizona. Previous spring records were from mid-May to early June.

ELEGANT TERN *Thalasseus elegans* (0, 17, 4). Two were at Amado, PIM, 1 May 2018 (†, ph. TR); two were at Willcox, COS, 10 Apr 2019 (†, s.r. REW); one was at the Glendale recharge ponds, MAR, 14 Mar 2020 (JR; †, ph. MH; †, ph. RR); and an unprecedented 12 birds were at Canoa Ranch, PIM, 19 May 2020 (†, ph. RWi). These last flew in, circled the small pond a few times, and departed, remaining for less than a minute! This species remains a casual spring and summer visitor.

WOOD STORK *Mycteria americana* (3, 10, 2). One was at St. David, COS, 8 Sep



FIGURE 8. This immature male Eared Quetzal was discovered along the Herb Martyr Road in Cave Creek Canyon, Chiricahua Mountains, Cochise County, 8–16 Jun 2020, and spent the summer and most of the fall wandering around the mountain range before settling back in Cave Creek Canyon, where it was last seen 25 November.

Photo by Bob Rodrigues

2018 (†, ph. LS); one was at Canoa Ranch, PIM, 22 Sep 2019 (†, ph. BN). Virtually all Arizona records fall between early June and mid-September.

MAGNIFICENT FRIGATEBIRD *Fregata magnificens* (4, 11, 2). One was at Canoa Ranch, PIM, 30 Jul 2019 (ph. MSm); one was flying over I-10 in Green Valley, PIM, 18 May 2020 (ph. NB, RRe). Two additional reports, of one along Highway 80 near San Simon, COS, 18 Mar 2020 (ph. DO, DZ) and one at Yuma, YUM, 26 May 2020 (†GB), were accepted only as frigatebird (sp.). Given the several inland North American records of both the Great Frigatebird (*F. minor*) and Lesser Frigatebird (*F. ariel*) (see Sullivan et al. 2007), the ABC does not regard the Magnificent as the default frigatebird in Arizona.



FIGURE 9. Arizona's fifth Blue-headed Vireo was this bird at Ajo, Pima Co., 9–10 Dec 2019.

Photo by Doug Buckland



FIGURE 10. This White-throated Thrush in lower Madera Canyon, Pima Co., 9 Jan–20 Feb 2019 established a first Arizona record.

Photo by Mark Stratton

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BLUE-FOOTED BOOBY *Sula nebouxii* (3, 8, 2). Accepted records are of one on Lake Havasu, MOH, 12–18 Sep 2018 (†, ph. LHa; ph. MG; ph. DVP) and one at Alamo Lake SP, LAP, 1–24 Nov 2019 (ph. SFo; †, ph. JMc). The November record is the latest for Arizona record, as all of the previous Blue-footed Boobies were discovered between mid-July and late September.

GLOSSY IBIS *Plegadis falcinellus* (0, 19, 4). Adults in breeding plumage were at Dome Valley, YUM, 30 May 2018 (†, ph. HD); at Paloma Ranch, MAR, 3 May 2020 (†, ph. PD); and at Willcox, COS, 20–29 May 2020 (†, ph. GHR, DS). One winter adult was at Vicksburg, LAP, 26 Sep 2020 (ph. CS). The ABC remains concerned about possible hybrids with the White-faced Ibis (*P. chihii*) being identified as pure Glossy Ibises.

EARED QUETZAL *Euptilotis neoxenus* (0, 25, 2). One, previously unreported, was in Gardner Canyon, SCR, 17 Apr 2015 (†KKa; v.r. PT). One immature male was along the Herb Martyr Road in Cave Creek Canyon, Chiricahua Mts., COS, 8–16 Jun 2020 (†, ph. PA, HS; ph. SW, CR, BR, GHR, PI, MMc, JMc; Figure 8), and a female was there 19 and 25 Jun 2020 (ph. RSe). Presumably the same two were discovered in Rucker Canyon on the west side of the Chiricahuas 16 Aug–7 Sep 2020 (†JA, LS; †, ph. GHR). They returned to Cave Creek Canyon 15 Sep 2020, the male remaining until 25 Nov 2020 (ph. PI; ph. SW). The ABC is considering the male and female wandering around the Chiricahua Mountains in 2020 as one single record. Most of Arizona's 27 Eared Quetzals occurred during the 1990s; these records are the first since November 2013.

ROSE-THROATED BECARD *Pachyramphus aglaiae* (#, 9, 6). A male along the Santa Cruz River, near Tubac, SCR, 20 Jan 2018 (ph. BM), was joined by a female, and the pair successfully nested and fledged young in early June 2018. Another male was at Rancho Santa Cruz, SCR, 23 Nov 2018 (ph. CDB). A female was near Tubac, SCR, 14 Jan 2019 (ph. BL); a male was there 4 May 2019 (ph. PG). A female found at the Patagonia–Sonoita Creek Preserve, SCR, 13 Jul 2019 (†JSt) was feeding a fledgling there 4 Aug 2019 (ph. JMo); another female was along Blue Haven Road near Patagonia, SCR, 20 Apr–17 May 2020 (†LD; †JK; †CSm). Rose-throated Becards have been along the Santa Cruz River between Tubac and Tumacacori almost continuously since at least 2017, and several pairs are apparently nesting along this stretch of the river. The exact number of individuals this set of records substantiates is difficult to ascertain. The ABC had reinstated this species on the review list when it appeared to be absent from Arizona for more than a decade, but now that it is once again breeding (at least along the Santa Cruz River), we removed it from the review list again in 2020.

LEAST FLYCATCHER *Empidonax minimus* (3, 8, 3). One was near Sonoita, SCR, 17 Sep 2017 (ph. CSm); one was in Pasture Canyon, near Tuba City, COC, 23 Oct 2018 (†, ph. JW; †CL); and one was at Dateland, YUM, 19–20 Sep 2020 (ph. CS; ph. BJ). This species remains a casual migrant in Arizona, with many of the records from mid-September.

BLUE-HEADED VIREO *Vireo solitarius* (0, 4, 1). One was at Ajo, PIM, 9–10 Dec 2019 (†, ph. DBa; †, ph. BN; Figure 9). Photos of that individual are definitive, perhaps the best documentation of the Blue-headed Vireo in Arizona to date, but potential confusion with bright-plumaged Cassin's Vireo (*V. cassinii*) remains an identification problem.

PHILADELPHIA VIREO *Vireo philadelphicus* (5, 17, 2). Accepted records are of one at the Boyce Thompson Arboretum, PIN, 20 Oct 2018 (†TC) and one near Kino Springs, SCR, 4 Oct 2020 (†, ph. RF). Most Arizona records are from October,

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and the ABC still cautions observers about possible confusion of the Philadelphia Vireo with bright-plumaged fall Warbling Vireos (*V. gilvus*).

RED-EYED VIREO *Vireo olivaceus* (5, 43, 4). One was along Morgan City Wash, MAR, 13 Sep 2016 (†SF, TD); one was along the Santa Cruz River near Tumacacori, SCR, 21 Aug 2018 (ph. BL); one was at the Sweetwater Wetlands in Tucson, PIM, 27 May 2019 (†, s.r. MP); and one was along the Santa Cruz River near Tumacacori, SCR, 8 Oct 2019 (†LH). The ABC removed the Red-eyed Vireo from its review list at the end of 2019.

YELLOW-GREEN VIREO *Vireo flavoviridis* (1, 13, 4). One was along the Santa Cruz River near Tumacacori, SCR, 29 Jul–8 Aug 2018 (†, ph. BL; †, ph. CMc); one was at Paton's Center in Patagonia, SCR, 5 Jul 2019 (†, s.r. KKa); one was at Empire Gulch, Las Cienegas National Conservation Area, PIM, 1 Aug 2019 (†, ph. CDB); and one was at the Hassayampa Preserve near Wickenburg, MAR, 15 Sep 2020 (ph. CS). Most of the Arizona records extend from June to August, the latest also being at Las Cienegas, 17 Sep 2017 (see Rosenberg et al. 2019).

CAVE SWALLOW *Petrochelidon fulva* (0, 10, 1). An adult was at San Carlos Lake, PIN, GRA, and GIL, 18 Jun 2019 (†, ph. TD). Apart from the birds nesting in Tucson during the late 1970s and early 1980s (on the University of Arizona campus), all the other Arizona records have been during fall and winter.

BLACK-CAPPED CHICKADEE *Poecile atricapillus* (4, 9, 1). One was along Kanab Creek in Fredonia, COC, 21 Nov 2020 (ph. FG). Given the proximity of the nesting range in southwest Utah, the paucity of Arizona records might reflect a lack of coverage in the state's far north.

CAROLINA WREN *Thryothorus ludovicianus* (0, 4, 1). One at Patagonia Lake SP, SCR, 8 Mar–25 Apr 2018 (†, ph. MB, TW; ph. MBg) provided a fifth record for Arizona. In New Mexico, this species has been found during the past decade at various locations along the Rio Grande.

WOOD THRUSH *Hylocichla mustelina* (0, 20, 2). Accepted records are of one in Hunter Canyon, Huachuca Mts., COS, 6 Oct 2018 (†, ph. RWo) and one in Whitetail Canyon, Chiricahua Mts., COS, 14 Oct 2018 (†, ph. RTa). Most Arizona records are from fall between early October and early December.

WHITE-THROATED THRUSH *Turdus assimilis* (0, 0, 2). Arizona's first White-throated Thrush was in lower Madera Canyon, PIM, 9 Jan–20 Feb 2019 (†, ph. LGr; ph. AC; †, ph. MSt; ph. SHe; ph. BG; ph. FM; ph. PSv; Figure 10). A second bird was found in central Tucson, PIM, 28 May 2019 (ph. LJ; †, ph. GHR; Figure 11). See Grant and Jenness (2020) for a summary of these two records. Previously, the species was known no closer than the Yecora area in central Sonora, about 400 km south of Madera Canyon.

CLAY-COLORED THRUSH *Turdus grayi* (0, 0, 1). The first Clay-colored Thrush the ABC has accepted was a singing male at Arivaca Cienega, Buenos Aires NWR, PIM, 15–26 May 2020 (†, ph. MBL, SJ, DR; †, ph. GHR; ph. NP; †, ph. ROD; see Blackford et al. 2021; this issue's front cover). This species occurs regularly in the Rio Grande Valley, Texas, and it has been found in the Big Bend Region. The few extralimital records include one near La Cueva, New Mexico, 22 Nov 2001 (Williams 2007), representing the only New Mexico record; and one from El Dorado, Texas, 19 May 2012 (<https://ebird.org/checklist/S10878730>), well north of its normal range in Texas. Also, Rea and Hargrave (1984) identified the skull of a Clay-colored Thrush recovered from a packrat midden in Stanton's Cave, Grand Canyon, during an excavation in 1969. The skull was carefully distinguished from all other species of *Turdus* known from Arizona, the Rufous-backed (*T. rufopalliat*) and White-throated as



FIGURE 11. Arizona's second White-throated Thrush was in central Tucson, Pima Co., 28 May 2019.

Photo by Gary H. Rosenberg



FIGURE 12. One of two Gray-crowned Rosy-Finches in a flock of 75+ Black Rosy-Finches at Echo Cliffs south of Page, Coconino Co., 9 Dec 2018–10 Mar 2019, representing the third record of the Gray-crowned for Arizona.

Photo by Jason Wilder



FIGURE 13. One of 75+ Black Rosy-Finches at Echo Cliffs south of Page, Coconino Co., 9 Dec 2018–10 Mar 2019, representing the seventh Arizona record of this species.

Photo by Jason Wilder



FIGURE 14. This American Tree Sparrow at Badger Springs, Agua Fria National Monument, Yavapai County, represented one of only a few southern Arizona records ever.

Photo by Adam Stein

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well as the American Robin (*T. migratorius*), but its age is unclear, possibly as great as 40,000–80,000 years. The ABC is currently re-evaluating a previous report (photo) from Portal, COS, 21 Jun 2015, which had not been accepted because its provenance was questioned (Rosenberg et al. 2019).

GRAY-CROWNED ROSY-FINCH *Leucosticte tephrocotis* (0, 2, 1). Two individuals were with a large flock of 75+ Black Rosy-Finches at the Echo Cliffs along Highway 89 south of Page, COC, 9 Dec 2018–10 Mar 2019 (CL; †, ph. JW; †, ph. BJ; ph. DB; ph. CR; Figure 12). This species was not mentioned by Phillips et al. (1964); its inclusion on the Arizona list is based on 10 specimens collected at the Snow Bowl, near Flagstaff, between 16 and 25 February 1967 (Rosenberg and Witzeman 1999; <http://eebweb.arizona.edu/Collections/Birds/Bird%20Web/Specimen1.htm#leucteph>).

BLACK ROSY-FINCH *Leucosticte atrata* (3, 3, 2). A flock of 75+ Black Rosy-Finches was along the Echo Cliffs along Highway 89 south of Page, COC, 9 Dec 2018–10 Mar 2019 (ph. GN; ph. DB; ph. CR; ph. DRo; Figure 13), and up to three were there 3 Dec 2020–8 Jan 2021 (BJ; †, ph. EB). A flock of 80+ spent the winter of 1996–1997 at that locality (Rosenberg and Witzeman 1999). A flock of about 45 rosy-finches reported from the Vermilion Cliffs, COC, 1 Feb 2020 were identified as Black Rosy-Finches, but given the recent Arizona history of two species, and that the description did not conclusively differentiate one from the other, the ABC took a conservative position and considered them unidentified rosy-finches.

AMERICAN TREE SPARROW *Spizelloides arborea* (#, 7, 2). One was at Round Rock, APA, 10 Dec 2020 (ph. FG); and one was at Badger Springs, Agua Fria NM, YAV, 14 Dec 2020–21 Jan 2021 (ph. AS; ph. PD; Figure 14). This species is a rare, somewhat irregular winter visitor to northern Arizona, and the ABC is interested in all reports of this species in the state.

FIELD SPARROW *Spizella pusilla* (0, 6, 3). Accepted records are of one in Portal, COS, 17 Nov 2020 (†, ph. LC); one along the Santa Cruz River near Tumacacori, SCR, 19–20 Nov 2020 (†, ph. NM); and one at Whitewater Draw WMA, COS, 20–21 Nov 2020 (†, ph. SRo, RAB; ph. CR; Figure 15). All appeared to be examples of western *S. p. arenacea*, being noticeably grayer than eastern birds (see Rising 1996).

BOBOLINK *Dolichonyx oryzivorus* (#, 21, 2). One was at Joseph City, NAV, 18 Aug 2020 (†EH); one was at Whitewater Draw, COS, 7–10 Sep 2020 (†, ph. JMcL). This species is a casual visitor to Arizona, mostly in fall.

STREAK-BACKED ORIOLE *Icterus pustulatus* (5, 22, 1). One was in central Tucson, PIM, 22 Jan–1 May 2018 (ph. LM; ph. JMe). The Streak-backed Oriole has proved to be a casual visitor (almost annual) to southern Arizona, with numbers of records increasing in recent years; the ABC discontinued reviewing it at the end of 2018.

RUSTY BLACKBIRD *Euphagus carolinus* (9, 26, 1). One was at a feedlot 4 km west-southwest of Red Rock, PIN, 31 Dec 2018 (†, ph. RF). In spite of the number of records accumulated, the ABC retains this species on the review list because of its similarity to Brewer's Blackbird (*E. cyanocephalus*).

COMMON GRACKLE *Quiscalus quiscula* (0, 38, 2). Accepted records are of one at a private residence in Hereford, COS, 29 Oct 2018 (†, ph. CHa) and one at a recreational-vehicle park 8 km north of Meteor Crater, COC, 21 Sep–18 October 2020 (CL; †, ph. JW). This species has proven to be a casual visitor (almost annual) in Arizona, with numbers of records increasing in recent years; the ABC removed it from the review list at the end of 2020.

BLUE-WINGED WARBLER *Vermivora pinus* (1, 16, 2). One was at Ramsey

Canyon Nature Preserve, COS, 31 Aug 2019 (ph. KKO); one was at Joseph City, NAV, 26 Aug–3 Sep 2020 (TD; †, ph. CMc). Arizona records are split about equally between spring and fall, with these two August records being the earliest in fall.

CRESCENT-CHESTED WARBLER *Oreothlypis superciliosa* (0, 15, 1). An apparent pair (a second male was reported) was along West Turkey Creek on the west side of the Chiricahua Mts., COS, 27 Apr–11 July 2020 (DRA; †, ph. GHR; ph. BJ; ph. TL; †, ph. BP; ph. CS; †, ph. NP; Figure 16). Although present continuously through May and June, and observed nest-building on a few occasions, the birds did not appear to have fledged young. Nesting of the Crescent-chested Warbler has been reported in Arizona only once previously, on the basis of an adult seen feeding a fledgling along East Turkey Creek, Chiricahua Mountains, COS, 12–16 Jul 2007 (Rosenberg et al. 2011).

KENTUCKY WARBLER *Geothlypis formosus* (3, 34, 6). One male was in Box Canyon, Santa Rita Mts., PIM, 15 Apr 2018 (†, ph. SP); one was near Petaluma, YUM, 19 May 2018 (†, ph. CMc); one was at Havasu NWR, MOH, 6 Jun 2018 (†, ph. CD); one was in Cave Creek Canyon near Portal, COS, 11 May 2019 (†, ph. EC); one was in Chandler, MAR, 2 May 2020 (†, ph. VB); and one was in the South Fork of Cave Creek Canyon, COS, 29 Sep 2020 (†, ph. DDa). There are now well over 30 Arizona records, so the ABC removed the species from the review list at its January 2021 meeting.

CAPE MAY WARBLER *Setophaga tigrina* (1, 12, 2). Accepted records are of one at the headquarters of Buenos Aires NWR, PIM, 29–31 May 2018 (†, ph. JS) and one in Surprise, MAR, 28 Sep–17 Oct 2020 (ph. JB; †, ph. CKS). The one at Buenos Aires was only the second Cape May Warbler recorded in Arizona in spring.

TROPICAL PARULA *Setophaga pitiayumi* (0, 7, 4). One was in Ramsey Canyon, COS, 9 Jun–29 Jul 2018 (†, ph. M&CS); one was in Florida Canyon, Santa Rita Mts., PIM, 27 Aug–21 Sep 2019 (†, ph. DPa; ph. LH; †, ph. AC); a singing male was in Huachuca Canyon, COS, 18–23 Jun 2020 (ph. JSL; †, ph. PI; †, ph. DB; †SC); and another singing male was in upper Ramsey Canyon, COS, 7–11 Jul 2020 (†, ph. SO, EO). Most Arizona records involved singing males in June and July.

BAY-BREASTED WARBLER *Setophaga castanea* (0, 21, 2). One was along Proctor Road, Madera Canyon, PIM, 8 Dec 2019 (†, ph. ML); one was at Lake Pleasant, MAR, 2 Nov 2020 (†EH). Fall Arizona records extend from late September to early December, with most after mid-October.

BLACKBURNIAN WARBLER *Setophaga fusca* (0, 24, 5). Accepted records are of one at Willow Lake, Prescott, YAV, 24 Sep 2019 (†, ph. DM); another at Willow Lake, Prescott, YAV, 18 Sep 2020 (†DI); one at Gilbert Water Ranch, MAR, 28–30 Sep 2020 (†, ph. TLo; †, ph. PD); one at Christopher Columbus Park, Tucson, PIM, 9–13 Nov 2020 (†, ph. CSh; †, ph. GHR; ph. PI; †, ph. NP; ph. SO); and one along the Santa Cruz River near Tumacacori, SCR, 13 Nov 2020 (†, ph. CB). The 18 September record is the earliest fall record (by five days); most fall Arizona records range from late September to mid-October.

BLACKPOLL WARBLER *Setophaga striata* (4, 30, 5). One, previously unreported, was at Maricopa, PIN, 15 Jun 2013 (ph. NB); an adult male was in Sycamore Canyon, SCR, 28 Apr 2018 (†, ph. JWi); one was in Oro Valley, PIM, 19 Sep 2019 (†, ph. TDJ); an immature was in Winslow, NAV, 22 Sep 2019 (†, ph. RF); and an adult male was at Holbrook, NAV, 20 May 2020 (†, ph. EH). As there are now more than 30 records, the ABC removed this species from the review list at the end of 2020.

PRAIRIE WARBLER *Setophaga discolor* (3, 15, 3). One at Saguaro Lake, MAR, 5 Jan–3 Mar 2018 (†DW; ph. GK) returned 5–27 Mar 2019 and again for a third winter 21 Oct 2019. Other accepted records are of one in Rucker Canyon, COS, 16



FIGURE 15. This Field Sparrow, at Whitewater Draw WMA, Cochise Co., 20–21 Nov 2020 was one of three in southern Arizona during the fall of 2020; there had been only six previous records.

Photo by Susan Rogers



FIGURE 16. This Crescent-chested Warbler was one of at least two along West Turkey Creek, Chiricahua Mountains, Cochise County, 27 Apr–11 Jul 2020, where they attempted nesting, but were apparently unsuccessful in fledging any young.

Photo by Tom Lindner



FIGURE 17. Arizona's 11th Fan-tailed Warbler was in Whitetail Canyon in the Chiricahua Mountains, Cochise Co., 13–18 Apr 2018.

Photo by Rick Taylor



FIGURE 18. This Canada Warbler at Gilbert Water Ranch, Maricopa County, 12–15 Sep 2020 was one of three different Canada Warblers found in Arizona during the fall of 2020.

Photo by Chris D. Benesh

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May 2019 (†, ph. RAR, REW) and one at the headquarters of Buenos Aires NWR, PIM, 28 Sep–14 Dec 2019 (LN; †, ph. AC; ph. JKi; eBird). A number of Arizona records are from late fall and winter, involving long-staying birds.

BLACK-THROATED GREEN WARBLER *Setophaga virens* (7, 27, 5). One adult was in the South Fork of Cave Creek Canyon near Portal, COS, 10–11 Apr 2018 (†, ph. D&JP); an immature was along Tonto Creek near Tonto Basin, GIL, 17 Oct 2019 (†, ph. TD); an adult male was at Northsight Park, Scottsdale, MAR, 24 Mar–13 Apr 2020 (ph. MVW); an immature was in Whitetail Canyon, Chiricahua Mts., COS, 10 Oct 2020 (†, ph. RTa); and one was in Peña Blanca Canyon west of Nogales, SCR, 22 Oct 2020 (†LD). There are more than 30 Arizona records, but because of potential identification issues with similar species and hybrids, the species remains on the review list.

FAN-TAILED WARBLER *Basileuterus lachrymosa* (1, 9, 1). One was in Whitetail Canyon, Chiricahua Mts., COS, 13–18 Apr 2018 (†, ph. RTa; †, ph. NMC; ph. CR; ph. SH; †, ph. AC; Figure 17). There are now 11 Arizona records of this Mexican species, most from May and June, the previous earliest being from Ramsey Canyon, COS, 7–10 May 2010 (see Rosenberg et al. 2017).

CANADA WARBLER *Cardellina canadensis* (0, 13, 4). Two birds (apparently a male and female) were in Page, COC, 23 May 2020 (BBO, KS; †, ph. RM), equaling the earliest spring record; one was at Gilbert Water Ranch, MAR, 12–15 Sep 2020 (†, ph. HT, CDB; ph. MA; ph. MN; ph. JBu; ph. LP; Figure 18); one was at Box Bar Recreation Area, MAR, 16 Sep 2020 (ph. CS); and one was at Brandi Fenton Park, Tucson, PIM, 21–24 Oct 2020 (†, ph. SO; †, ph. GHR; ph. CR; ph. PI; ph. PG; †, ph. NP). This species is a casual visitor to Arizona in both late spring and fall.

FLAME-COLORED TANAGER *Piranga bidentata* (0, 21, 3). One (likely returning) male was in upper Ramsey Canyon, COS, 9 Apr–5 Aug 2018 (ph. JA); a female was in Ash Canyon, Huachuca Mts., COS, 12 Apr 2020 (†, ph. RAB); and a male was in upper Miller Canyon, COS, 19 May–17 Jun 2020 (LD; †, ph. TH). A majority of Arizona records come from either the Santa Rita or Huachuca mountains.

YELLOW GROSBEAK *Phaeucticus chrysopheplus* (1, 24, 1). An apparent female was along the Santa Cruz River near Tubac, SCR, 28 May 2019 (†, ph. BL). Most Arizona records are from mid-May to mid-August.

NON-ACCEPTED REPORTS

NORTHERN JACANA *Jacana spinosa*. A report of an apparent immature at Ari-vaca Lake, PIM, 7 Sep 2020 was intriguing, given the record of one in Green Valley, PIM, the following day (see above), but the description lacked critical details, such as any mention of yellow in the wings, and the flight was described as “heron-like,” leading to most on the committee voting to not accept this written description.

BLACK SKIMMER *Rynchops niger*. A report of one at Tempe Town Lake, MAR, 18 Nov 2018 lacked critical details and received little support from the committee.

WHITE IBIS *Eudocimus albus*. One reported seen “briefly” by an experienced observer near Wellton, YUM, 26 Aug 2020 received a mixed vote; the description (and view of the bird) lacked any mention of either the bill or legs.

RED-HEADED WOODPECKER *Melanerpes erythrocephalus*. The description of one from Harshaw Canyon, outside Patagonia, SCR, 17 Dec 2020 suggested a very brief sighting and lacked convincing details.

MILITARY MACAW *Ara militaris*. An old photo of two “green-colored” macaws, from “up to seven” reported at Patagonia, SCR, 23 August 1992 was intriguing, but

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they were regarded by some on the committee as not identifiable to species, and no further details were available for evaluation. The ABC remains concerned as well about possible escaped macaws. This species is known to wander from its breeding areas, as close as 160 km south of the border, so it certainly might occur as a wild vagrant in Arizona (D. Vander Pluym pers. comm.).

LEAST FLYCATCHER *Empidonax minimus*. Photographs of an *Empidonax* at Patagonia Lake SP, SCR, 23 Jan 2019 did not eliminate Hammond's Flycatcher (*E. hammondi*).

EASTERN WOOD-PEWEE *Contopus virens*. One was reported from Gilbert Water Ranch, MAR 23 May 2019, but not by the original observer, and photos of a *Contopus* seen later that day were inconclusive.

RED-EYED VIREO *Vireo olivaceus*. Photographs of a vireo at Tres Rios Wetlands, Tolleson, MAR, 14 Aug 2018 were inconclusive.

CAROLINA WREN *Thryothorus ludovicianus*. A report of one "heard only" at the Patagonia–Sonoita Creek Preserve near Patagonia, SCR, 4 Dec 2018 was insufficient for identification. The ABC could not evaluate the report of the unseen bird without a voice recording.

STREAK-BACKED ORIOLE *Icterus pustulatus*. Photographs of a bird identified as this species from Tucson, PIM, 10 May 2018 were of an immature Bullock's Oriole (*I. bullockii*).

RUSTY BLACKBIRD *Euphagus carolinus*. A report of one with Yellow-headed Blackbirds near McNeal, COS, 31 Jan 2019 lacked critical identification details, and the circumstances of the sighting seemed odd for a Rusty Blackbird in Arizona.

CONTRIBUTORS

Peg Abbott, Jane Addis, Vernie Aikins, Marsh Alphonso, Aaron Ambos, Jesse Amesbury, Richard Aracil, Keith Ashley (KAs), Seth Ausubel, Doug Backlund (DBA), Kenneth Bader, Julie Barnhill, Cathy Beck (CB), Robert A. Behrstock (RAB), Chris D. Benesh (CDB), Nancy Bent, Deanna Bibbee, Maureen Blackford (MBI), Geoffrey Bland, Valerie Boman, Harold Bond, Derik Bowen (DBo), Erin Bowen, Steve Boyack, Andy Bridges, Mark Brogie (MBg), Matt Brown (MBr), Jim Burns (JBu), Marissa Buschow, Ed Conrad, Lori Conrad, John Coons, Andrew Core, Troy Corman, Charles Corson, Scott Crabtree, Debra Davison (DDa), Tommy DeBardeleben, Timothy DeJonghe (TDJ), Thomas Benson (TBn), Henry Detwiler, Pierre Deviche, Chris Dodge, Louie Dombroski, Diane Drobka, Sean Fitzgerald, Sally Foster (SFo), Richard Fray, Brendan Galvin, Joel Gilb, Pat Goltz, Linda Grant (LGr), David Griffin, Kathleen Groschupf, Lisa Grubbs, Matthew Grube, Felipe Guerrero, Carla Hall, Laurens Halsey (LH), Chris Harbard (CHa), Lauren Harter (LHa), Kay Hawlee, Stuart Healy (SHe), Melanie Herring, Karen Herzenberg (KHe), John Hirth, Tonya Holland, Steve Hosmer (SHo), Eric Hough, Sam Hough, Patricia Isaacson, Diane Iverson, Lynn Jacobs, Sally Johnsen, Brian Johnson, Eric Kallen, Keith Kamper (KKa), Gordon Karre, Dalton Kelahan, Adam Kent, Simon Kiacz, Joanne Kimora (JKi), Kordeen Kor (KKo), Jim Krakowski, Chuck LaRue, Max Leibowitz, Tom Lindner, Bill Lisowsky, Tyler Loomis (TLö), Jennie MacFarland (JMc), Curtis Marantz (CM), Janine McCabe (JMc), Chris McCreedy (CMC), Chet McGaugh (CMG), Michael McGee, Barry McKenzie, Josh McLaughlin (JMcL), Mary McSparen (MMc), Jeremy Medina (JMe), Linda Merrick, Greg Meyer, Kent Miller (KMí), Jake Mohlmann (JMo), David Moll, Nick Moore, Narca Moore-Craig (NMC), Francis Morgan, Ken Murphy, Gerry Nealon, Muriel Neddermeyer, Larry Norris, Brittany O'Connor, Ryan O'Donnell (ROD), Erin Olmstead, Scott Olmstead,

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Parker O'Neil, BB Oros (BBO), Brian Nicholas, Damian O'Sullivan, David Palmer (DPa), Debby & Jim Parker (D&JP), Bryan Patrick, David Pearson, Levi Plummer, Molly Pollock, Steven Prager, Nick Pulcinella, Dylan Radin (DRa), Sarah Ramsey, Diane Rand, Roger Reason (RRe), Ronnie Reed, Jeff Ritz, Bob Rodrigues, Susan Rogers (SRo), Chris Rohrer, David Rosenberg (DRo), Gary H. Rosenberg (GHR), Terry Rosenmeier, Kristen Rothrock, Rose Ann Rowlett (RAR), Mike and Corinne Schall (M&CS), K. Schroeck, Larry Scritchfield, Ryan Seppala, Cathy Sheeter (CSH), Eric Sibbald, Jonathon Sleger (JSI), Michael Skinner (MSk), Chrissy Kondrat-Smith (CKS), Curtis Smith (CSm), Joshua Smith, Matt Smogor (MSm), Helen Snyder, Adam Stein, David Stejskal, Mark M. Stevenson (MMS), Laura Stewart, Caleb Strand, Mark Stratton (MSt), Justin Streit (JSt), Paul Suchanek, Peder Svingen (PSv), Rick Taylor (RTa), Patty Tersey, Craig Thayer, Holly Thomas, Renee Tressler, David Vander Pluym (DVP), Marceline VandeWater (MVW), Kyle Waites (KWa), Richard E. Webster (REW), John West (JWe), Kathy West (KWe), David Wiedenfeld, Jason Wilder (JWi), Richard Willot (RWi), Steve Wolfe, Diane Wong-Kone (DWK), Tom Woods, Robert Woodward (RWo), Kelly Wright, Dawn Zappone, Ben Zyla.

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A CONTACT ZONE BETWEEN COASTAL AND INTERIOR FOX SPARROWS IN SOUTH-CENTRAL ALASKA*

LUCAS H. DeCICCO, Department of Ecology and Evolutionary Biology and Biodiversity Institute, University of Kansas, Lawrence, Kansas 66045; lhdecicco@gmail.com

ABSTRACT: I report observations, supported by museum voucher specimens, photographs, and audio recordings, from an area of breeding contact between two divergent groups of subspecies of the Fox Sparrow (*Passerella iliaca*) in upper Cook Inlet, south-central Alaska. In this area, covering ~50 km², the interior *iliaca* group comes in contact with the Pacific coast *unalaschcensis* group in lowland mixed boreal forest. Phenotypically pure *P. i. zaboria* and *P. i. sinuosa* (subspecies representing the *iliaca* and *unalaschcensis* groups, respectively) occur in approximately equal abundances and outnumber intermediate phenotypes. These subspecies co-occur on a fine scale, males of *zaboria* and *sinuosa* often holding adjacent territories. I conclude that some form of pre- or post-zygotic isolating mechanism between these two subspecies-groups is hindering free interbreeding.

Areas of secondary contact between closely related taxa form ideal scenarios for studying myriad aspects of compatibility, isolating mechanisms, and speciation (e.g., Harrison 1993). Although intermediate phenotypes indicating regions of hybridization have been recognized since early in the biological exploration of North America (e.g., Audubon in 1843, *in* Short 1965), focused research on hybrid zones in North America started in earnest with descriptions of clines in plumage variation (e.g., Short 1965, Rising 1983). Subsequently, research on hybrid zones has expanded into more detailed studies of the associations among plumage, vocalizations, and genomic clines (e.g., Dixon 1989, Mettler and Spellman 2009, Manthey and Robbins 2016, Toews et al. 2016, Irwin et al. 2018, Billerman et al. 2019, Oswald et al. 2019). Levels of compatibility and hybridization across these secondary contact zones vary with degree of divergence and breeding isolation between contacting taxa and cover a continuum from free interbreeding with wide clines of intermediate phenotypes, as in the flickers (e.g., Short 1965), to very narrow contact or overlap zones, as in the scrub-jays (e.g., Delaney et al. 2008). The latter scenario may result in an overlap zone with a mix of phenotypes at any single site including apparently pure parental and intermediate phenotypes.

Although some contact zones are very well studied (e.g., Sibley and Short 1964, Rising 1970, Jacobsen and Omland 2012, Baldassarre et al. 2014, Walsh et al. 2020), others remain barely described. Despite the attention contact zones have received from evolutionary and genomic research, there is still a

* I dedicate this paper to the memory of Leonard J. Peyton (1924–2010), a determined field ornithologist and a pioneer in audio recording the vocalizations of Alaska's birds. He harbored a keen interest in the variation of the Fox Sparrow's song, particularly in the contact area between subspecies groups in south-central Alaska, including upper Cook Inlet. Leonard's audio recordings were deposited at the University of Alaska Museum's Film Center, documenting his interest in the subject. I hope he would be proud to see a subject so close to his heart come into print.

need for descriptive ornithological work on under-studied areas of contact. Here I take the opportunity to describe a poorly known area of contact between two subspecies-groups of the Fox Sparrow (*Passerella iliaca*) to provide a foundation for future research.

The Fox Sparrow is “variable to an extreme degree” (Swarth 1920) and comprises 19 described subspecies, ranking it among the species with the most complex geographic variation in North America. These 19 subspecies are parsed into three (Swarth 1920) or four (Zink and Weckstein 2003) groups and have also been considered to represent four species (e.g., Gill et al. 2020), though the contact zones remain poorly studied. Two subspecies-groups occur in Alaska, the *iliaca* group, which nests across boreal North America from western Alaska to maritime Canada, and the *unalaschcensis* group, which nests along the Pacific coast from southern British Columbia to the eastern Aleutian Islands (Gibson and Withrow 2015). Within Alaska the *iliaca* group is represented by subspecies *zaboria* and the *unalaschcensis* group by the subspecies *unalaschcensis*, *insularis*, *sinuosa*, *annectens*, *townsendi*, and *chilcatensis* (Gibson and Withrow 2015).

The *iliaca* and *unalaschcensis* groups come into breeding contact in limited areas where interior and coastal faunas mix along the Pacific coast. From intermediate specimens collected in the winter range, Swarth (1920) suggested that these groups interbreed, and Zink (1994) found evidence of genetic mixing between these groups near Telegraph Creek in British Columbia. Williamson and Peyton (1962) discussed an area of confusing mixing of three subspecies on the Alaska Peninsula, where they suggested *unalaschcensis*, *sinuosa*, and *zaboria* all came into breeding contact. Of interest, Williamson and Peyton (1962) noted that intergrades between *zaboria* and *unalaschcensis* or *sinuosa* were rare and that this zone of contact was narrow, suggesting recent contact of well-differentiated forms. If contact between *zaboria* and *chilcatensis* or *townsendi* occurs in major river drainages along the Pacific coast of southeastern Alaska, such contact has not been noted in the literature. In south-central Alaska there are three known regions of contact between *sinuosa* and *zaboria*: the Copper River valley, the Tsina/Tiekel River drainage inland of Valdez, and the Cook Inlet area (Williamson and Peyton 1962, Gibson and Withrow 2015; University of Alaska Museum [UAM] specimens). Regarding the Cook Inlet contact area near Anchorage, Williamson and Peyton (1962:63) were the first to make mention of this apparently unknown contact area and noted that “hybrids are rare, even in areas where pairs of both races nest in proximity.” These areas are known for drawing interior taxa to otherwise coastal faunal regions, and vice versa (Gibson and Withrow 2015).

Here I detail observations from a contact area in upper Cook Inlet made opportunistically over four years, assess the breeding interaction between these two subspecies, and describe their variation in plumage and voice. I mean this publication to provide preliminary documentation of the poorly understood contact area in upper Cook Inlet in hopes that future research may build on this groundwork.

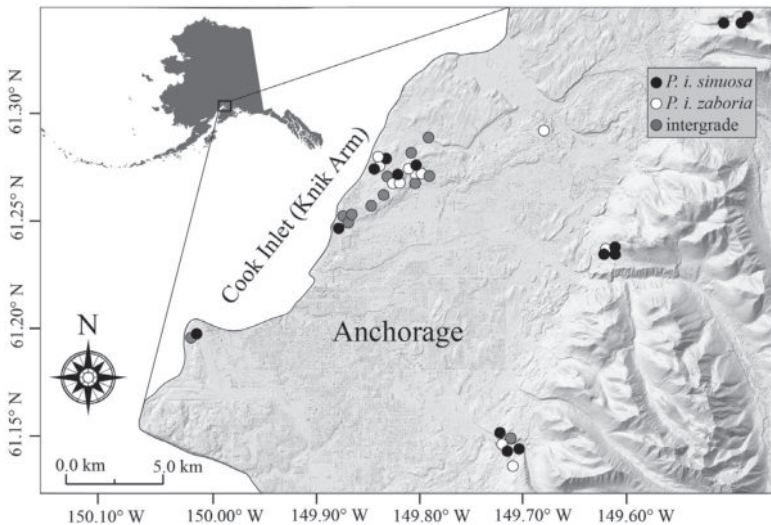


FIGURE 1. Map of the Anchorage area and foothills of the Chugach Mountains with sites of specimens of *Passerella iliaca* indicated by circles. Black fill, the coastal subspecies *sinuosa*; white fill, the interior subspecies *zaboria*; gray fill, intermediate specimens. Note the thorough spatial mixing of phenotypes in this area.

METHODS

Over four years (2013–2016), I made observations, collected specimens (deposited at the UAM, in Fairbanks), and made audio recordings (deposited at the Macaulay Library, Cornell Lab of Ornithology [ML]) of breeding Fox Sparrows around upper Cook Inlet, south-central Alaska. Most of the observations were in lowland mature mixed boreal forest ~10 km northeast of Anchorage, an area measuring $\sim 5 \times 10$ km and ranging in elevation from 0 m to 100 m above sea level (61.282° N, 149.800° W; Figure 1). These mixed boreal forests are characterized by aspen (*Populus tremuloides*), balsam poplars (*Populus balsamifera*), and paper birch (*Betula papyrifera*) interspersed with stands of white spruce (*Picea glauca*) and patches of alder (*Alnus* sp.) in natural openings or along forest edges. I also made observations in the foothills of the Chugach Mountains at elevations up to ~600 m (Figure 1). I took note of the habitat associations of territorial birds and any information I could obtain on pairing. All my observations come from late April through June (spring arrival in this area is typically mid- to late April), and most information is from territorial males. I lacked the time required to assess levels of assortative mating and the frequency of mixed pairings by identifying both individuals of a pair. Therefore, it was unusual for me to be able to observe, photograph, or collect a paired female. As my goal was to document this area of contact, my sampling focused on providing representative examples of the phenotypes and does not represent the abundance of each phenotype—intergrades are over-represented in my specimen series with respect to their observed abundance in the field.



FIGURE 2. Side view of Fox Sparrow specimens from the area of contact of *Passerella iliaca zaboria* and *sinuosa* around upper Cook Inlet, south-central Alaska. (A, UAM 34095) Subspecies *zaboria*, representing the interior *iliaca* subspecies-group; (B, UAM 41232) individual of intermediate plumage assumed to be an intergrade; and (C, UAM 36901) subspecies *sinuosa*, representing the coastal *unalaschensis* subspecies-group. Note differences in patterning and coloration of the face, flanks, and greater wing coverts.

Photos by Lucas DeCicco

RESULTS

Between 2013 and 2016, I collected 39 Fox Sparrow specimens, 15 of which have associated audio recordings (Table 1). Twenty-three of these specimens came from the 5×10 -km area of mixed lowland boreal forest described above and represent the mix of phenotypes at a single site in a contact area between the *iliaca* and *unalaschensis* subspecies-groups. Of the 45 nesting-season specimens available from upper Cook Inlet (39 collected from 2013 to 2016 and six collected in 1969), I identified 12 as *zaboria*, 24 as *sinuosa*, and nine as showing intermediate characteristics so presumably representing intergrades. Of the 23 from the 5×10 -km area of lowland mixed boreal forest, I identified eight as *zaboria*, eight as *sinuosa*, and seven as intergrades. Again, this is not an appropriate assessment of the abundance of intergrades because I targeted those phenotypes to provide adequate representation in the specimen series.

On the basis of these specimens and observations I conclude that phenotypically pure examples of *zaboria* and *sinuosa* occur at approximately equal abundances in this area, they freely intermix spatially, and phenotypically intermediate individuals occur but are less numerous than parental phenotypes (Figure 1, Table 1). At this location, it is not uncommon for males of the two taxa to hold neighboring territories, but these subspecies differ in habitat

COASTAL AND INTERIOR FOX SPARROWS IN SOUTH-CENTRAL ALASKA

TABLE 1 Specimens of the Fox Sparrow from the Anchorage Area, South-Central Alaska

Specimen ^a	Sex	Date	Locality	Latitude	Longitude	Elevation (m)	Audio ^b
<i>P. i. sinuosa</i>							
4337	♂	16 June 1969	Point Woronzof	61.200	-150.022	28	—
4342	♂	16 June 1969	Point Woronzof	61.200	-150.022	28	—
4350	♂	16 June 1969	Point Woronzof	61.200	-150.022	28	—
4357	♂	16 June 1969	Point Woronzof	61.200	-150.022	28	—
4359	♂	16 June 1969	Point Woronzof	61.200	-150.022	28	—
34099	♂	26 May 2013	upper Carol Cr.	61.342	-149.506	537	118745
34100	♂	26 May 2013	upper Carol Cr.	61.342	-149.489	745	—
34101	♂	27 May 2013	S Fork Campbell Cr.	61.144	-149.704	348	118751
34102	♂	1 June 2013	Arctic Valley Rd.	61.235	-149.612	350	118759
36899	♂	17 June 2014	upper Campbell Cr.	61.147	-149.713	274	—
36900	♂	17 June 2014	upper Campbell Cr.	61.150	-149.714	273	—
36901	♂	18 May 2014	upper Campbell Cr.	61.147	-149.713	274	—
38224	♂	19 May 2015	Triangle Lake	61.272	-149.815	107	—
38225	♂	24 May 2015	Ship Creek Valley	61.237	-149.610	400	516992
38226	♂	24 May 2015	Ship Creek Valley	61.236	-149.621	290	—
38227	♂	24 May 2015	Ship Creek Valley	61.237	-149.400	615	516993
38228	♂	23 May 2015	Campbell Track	61.147	-149.712	285	—
38230	♂	19 May 2015	Triangle Lake	61.272	-149.794	89	—
40393	♂	4 June 2016	W end Dena'ina Rd.	61.247	-149.878	41	56804531
40394	♂	23 May 2015	Campbell Track	61.147	-149.713	273	—
40395	♂	15 May 2016	Green Lake	61.281	-149.840	44	—
40397	♂	5 June 2016	W end Dena'ina Rd.	61.248	-149.869	60	—
40398	♂	15 May 2016	Green Lake	61.281	-149.840	44	—
41230	♂	27 May 2017	Fish Lake	61.276	-149.806	98	—
<i>P. i. zaboria</i>							
34095	♂	7 June 2013	Hillberg Lake	61.272	-149.821	62	118767
34096	♂	27 May 2013	S Fork Campbell Cr.	61.136	-149.710	368	118748
34097	♂	1 June 2013	Arctic Valley Rd.	61.237	-149.620	304	118757
36902	♂	17 June 2014	upper Campbell Cr.	61.147	-149.715	244	—
40402	♂	20 May 2015	Sixmile Lake	61.290	-149.793	37	516708
40403	♂	29 May 2016	Triangle Lake	61.272	-149.798	90	64923281
40404	♂	13 May 2015	Green Lake	61.281	-149.838	32	516681
40405	♂	28 May 2016	Triangle Lake	61.272	-149.801	101	—
40406	♂	15 May 2016	Green Lake	61.280	-149.840	35	—
40407	♂	29 May 2016	Fish Lake	61.269	-149.817	94	64923911
40408	♂	14 May 2016	Otter Lake	61.292	-149.680	49	—
41233	♂	27 May 2017	Fish Lake	61.275	-149.809	103	—
<i>P. i. zaboria</i> × <i>sinuosa</i>							
4360	♂	16 June 1969	Point Woronzof	61.200	-150.022	28	—
34098	♂	5 June 2013	Hillberg Lake	61.272	-149.822	56	118764
36903	♂	18 May 2014	Upper Campbell Cr.	61.149	-149.712	274	—
38229	♂	13 May 2015	Sixmile Lake	61.281	-149.807	65	516680
40399	♂	4 June 2016	W end Dena'ina Rd.	61.247	-149.876	41	—
40400	♂	29 May 2016	Fish Lake	61.268	-149.805	93	—
40401	♂	15 May 2016	Triangle Lake	61.261	-149.835	93	—
41231	♂	27 May 2017	W end Dena'ina Rd.	61.248	-149.874	44	—
41232	♂	10 June 2017	Dena'ina Rd. & Fairchild Ave.	61.257	-149.847	75	—

^aAll specimens archived at the University of Alaska Museum (UAM).^bAll recordings archived at the Macaulay Library (ML), Cornell Lab of Ornithology.

preferences, and their songs are recognizably different in the field. Due in part to this difference in habitat preference, there is also an elevational gradient, with *sinuosa* being more numerous at higher elevations where alder thickets, its preferred habitat, dominate over mixed boreal forest. Only in mixed boreal forest with natural openings with alder thickets did I find thorough spatial mixing of these subspecies.

Phenotype Descriptions and Assessment

The coastal *unalaschensis* group differs from the interior *iliaca* group in many plumage aspects (Figures 2 and 3). In the *iliaca* group, the facial plumage is much more patterned with rusty-red auriculars contrasting with a gray crown and nape and a pale malar (Figure 2a). In *sinuosa*, the face is plain gray-brown with pale speckling in the lores and distal portion of the malar (Figure 2c). Individuals of subspecies *sinuosa* occurring near Anchorage show slight patterning with diffuse warmer brown plumage along the edge of the auriculars and upper nape into the crown (Figure 2c). The pattern of the mantle differs clearly, with *zaboria* showing a strongly patterned mantle with pale brownish gray contrasting with rich red-brown stripes (Figure 3a), *sinuosa* showing a uniform dark brown mantle (Figure 3c). Following these general patterns, the colors of the tail and upper tail coverts also differ, the tail being a rich rufous contrasting with the rump and back in *zaboria* (Figure 3a), while *sinuosa* has a dark chestnut tail and upper tail coverts barely contrasting with the upper rump and mantle (Figure 3c). Flank and breast patterning also differ: in *zaboria* the chevrons are rufous or chestnut-colored (Figure 2a), in *sinuosa* brown and denser (Figure 2c). The wing pattern, due primarily to the coloration and patterning of the wing coverts, differs with *zaboria* showing rufous-brown greater and median coverts with pale terminal spots that form a double wing bar (Figure 2a), *sinuosa* showing uniformly brown wing coverts (Figure 2c). Specimens I identified as intergrades were intermediate in these plumage characteristics (Figures 2b and 3b). My identifications in the field and of the specimens were based primarily on these characteristics, with specimens also being compared to those from areas that should not show influence from other subspecies.

Intergrades between *zaboria* and *sinuosa* were intermediate, showing a diffusely striped mantle, faint facial pattern with a paler auricular triangle, flanks with streaks intermediate between the light streaks of *zaboria* and the heavy streaks of *sinuosa*, and a faint set of wing bars. In the field, these intermediate individuals might appear to be *sinuosa*, as their overall appearance was darker than *zaboria*, but the more subtle intermediate characteristics listed above clearly separate them from phenotypically pure *sinuosa*. It is worth noting that these phenotypes may not be representative of true levels of intergradation, as may be assessed by molecular techniques. For example, Zink (1994) found mtDNA haplotypes of the *unalaschensis* group in individuals that appeared to be pure *iliaca* group on the basis of plumage. Thus introgression is likely greater than may be assessed from the phenotype alone.



FIGURE 3. Dorsal view of Fox Sparrow specimens from the area of contact of *Passerella iliaca zaboria* and *sinuosa* around upper Cook Inlet, south-central Alaska. (A, UAM 34095) Subspecies *zaboria*, representing the interior *iliaca* subspecies-group; (B, UAM 41232) individual of intermediate plumage assumed to be an intergrade; and (C, UAM 36901) Subspecies *sinuosa*, representing the coastal *unalaschensis* subspecies-group. Note the differences in mantle patterning and coloration and coloration and in contrast of the lower back, rump, and tail plumage.

Photos by Lucas DeCicco

Habitat Association

These two subspecies also differed in habitat association, with *zaboria* preferring deciduous boreal forest dominated by paper birch and aspen and *sinuosa* preferring thickets of alder that occurs as a successional or edge species. Within the area of mixed lowland boreal forest near Anchorage (elevation 0 to ~100 m), there are ample disturbed areas or natural openings where alders persist, constituting a natural mosaic of mature deciduous boreal forest and alder thickets (Figure 4). This intermixing of habitats facilitates close association of these two subspecies. A similar mosaic of habitat occurs at middle elevations (~200–400 m) along the foothills of the Chugach Mountains, where I also found both *sinuosa* and *zaboria* co-occurring. Above ~400 m elevation in the Chugach Mountains, however, the habitat changes into subalpine meadows and alder thickets. At this higher elevation I was able to find examples of *sinuosa* only. Although the mosaic of habitat at the lowland site on which I focused is partially a result of anthropogenic disturbance, this same mosaic of habitat occurs naturally both at middle elevations and in lowland areas.

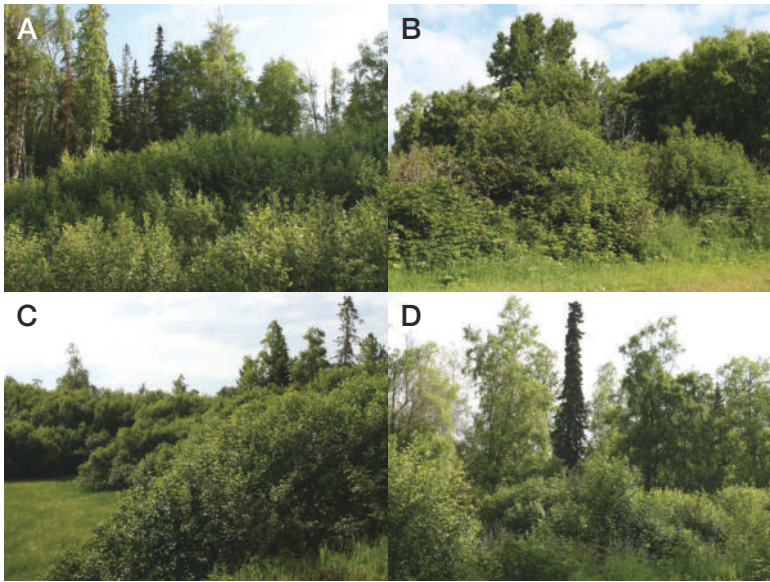


FIGURE 4. Examples of the mosaic of mixed boreal forest and alder thickets near sea level around upper Cook Inlet that hosts representatives of two subspecies-groups of the Fox Sparrow. *Passerella i. zaboria* prefers the mixed boreal forest (e.g., D, and background in rest), whereas *P. i. sinuosa* prefers alder thickets (e.g., C, and foreground in rest).

Photos by Laura McDuffie

Vocal Variation

The songs of *sinuosa* and *zaboria* differ notably in pattern, cadence, and variability. I have not assessed vocal variation between these two taxa comprehensively, but many of the specimens have archived linked audio recordings (Table 1), and here I interpret their songs' differences roughly. The songs of *zaboria* were generally very consistent, both from individual to individual and within a single individual's repertoire, to the extent that around upper Cook Inlet this subspecies appeared to sing a single song type. The songs of *zaboria* were more drawn out, languid, and had more pure-toned upswept notes than did the songs of *sinuosa* (Figure 5). In comparison, the songs of *sinuosa* were much choppy, less lyrical, and varied more, within a single individual's repertoire as well as from bird to bird. Many examples of *sinuosa* gave multiple notes between songs, a pattern that was generally absent in *zaboria*. Many examples of *sinuosa* sang songs of two alternating types. One song type included a terminal series of repeated notes that was absent in songs of *zaboria* (Figure 5). Most individual Fox Sparrows were identifiable to subspecies in the field by their song. More research on this subject is needed to quantify the amount of individual variation and degree of overlap (if any) in songs between these subspecies.

I recorded the songs of three individuals that I later identified as intergrades from specimens (Table 1). One of these (UAM 34098) sang a relatively

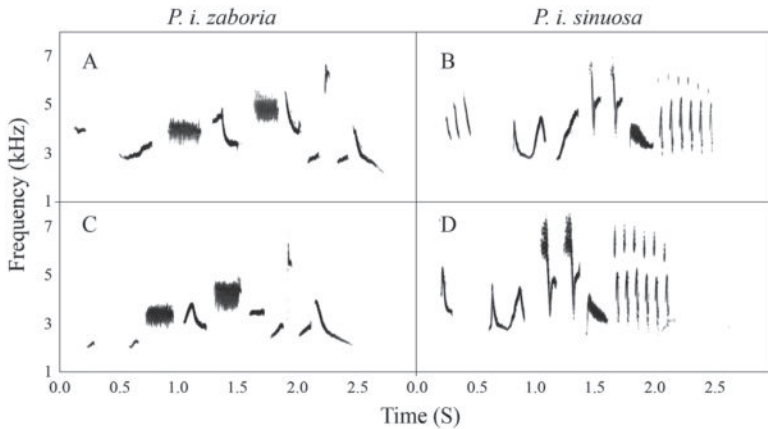


FIGURE 5. Songs of the two subspecies of the Fox Sparrow breeding around Anchorage, from recordings archived at the Macaulay Library (ML), Cornell Lab of Ornithology. Left column, *zaboria*, right column, *sinuosa*. Note the repeated notes at the end of the songs of *sinuosa*, repetitions that are missing entirely from songs of *zaboria*. These selected songs represent the extremes in differences; this topic requires additional investigation. (A), UAM 34095 and ML 118767; (B), UAM 34101 and ML 118751; (C), UAM 34096 and ML 118748; (D), UAM 38225 and ML 516992.

typical *sinuosa* song, another (UAM 40402) sang a relatively typical *zaboria* song, and the last (UAM 38229) sang a song that was intermediate but more similar to that of *zaboria*. This assessment should be taken with care, as characterizing the vocalizations in this area of contact was not my focus, and more work is needed for a thorough understanding of the vocal variation between these two subspecies-groups in areas of contact.

DISCUSSION

This is the first detailed published account of breeding contact between *Passerella iliaca zaboria* and *sinuosa*, representatives of the *iliaca* and *unalaschcensis* subspecies-groups of the Fox Sparrow. From my observations, specimens, and recordings, it is clear that near Anchorage these taxa do not meet in a homogeneous intergradation zone of phenotypically similar but intermediate individuals. The fact that in a discrete zone of contact, parental and intermediate phenotypes occur together, rather than a broad cline of intermediate individuals, suggests that evolutionary pressure is restricting free interbreeding or reducing the fitness of intergrades. There are many mechanisms that could result in this pattern, from pre-zygotic mechanisms such as positive assortative mating to post-zygotic mechanisms such as negative selection of intergrades. Another explanation is that contact between these subspecies is so recent that despite free interbreeding a continuous phenotypic gradient has not yet been established. It is unknown how long *sinuosa* and *zaboria* Fox Sparrows have been in contact in upper Cook Inlet. However, on the basis of specimens at UAM collected by Leonard Peyton in

1969, who was the first ornithologist to make note of this contact area, and the brief description in Williamson and Peyton (1962), it is apparent that these subspecies were in contact by the early 1960s and likely much earlier. Furthermore, it is difficult to exclude the possible influence of anthropogenic habitat changes that may have facilitated the recent contact of these two taxa, as Hunn and Baudette (2014) showed for subspecies of the White-crowned Sparrow (*Zonotrichia leucophrys*). However, in both mature lowland boreal forest and mid-montane transitional forest, I observed both *zaboria* and *sinuosa* in what appeared to be natural habitats unaltered by anthropogenic factors. With that said, *sinuosa* also took advantage of recent regrowth of alders in disturbed areas (e.g., overgrown gravel pits), particularly in the lowland area. I refrain from suggesting that these results provide support for recognizing these two subspecies groups as independent species. My observations lack a genetic assessment for such a conclusion and come from a single small point of contact that should not be used as a proxy for a comprehensive understanding of the interactions between these two subspecies-groups in all areas of their contact.

The pattern I observed of sympatry of *zaboria* and *sinuosa* with limited intergradation around upper Cook Inlet stands in contrast to the situation of other species whose coastal and interior forms come into contact in the same region. The best comparable example is of the Orange-crowned Warbler (*Leiothlypis celata*), of which the interior subspecies *celata* and coastal *lutescens* intergrade from the Kenai Peninsula through at least upper Cook Inlet (Gilbert and West 2015). Unlike those of the Fox Sparrow, these two warbler subspecies form a broad cline of intermediate populations. In the Anchorage area (pers. obs.) and the Kenai Peninsula (Gilbert and West 2015; UAM specimens) populations are relatively homogeneous and phenotypically intermediate (i.e., both parental phenotypes do not occur in sympatry).

There are many avenues for more research on this contact area between these two groups of Fox Sparrow subspecies. First, the spatial limits of this contact area need to be identified. Sampling to the north into the Alaska Range in the Susitna River drainage and to the northeast into the Talkeetna Mountains along the Matanuska River drainage would identify the northern (interior) extent of the influence of coastal *sinuosa*. Similarly, sampling to the south along Turnagain Arm and into the Kenai Peninsula would define the southern (coastal) limit of the influence of *zaboria*. Studies that address the degree of assortative mating between these two subspecies groups would provide information essential to our understanding of this situation. Furthermore, this contact area might lend itself well to genomic research on factors that limit intergradation between these forms or regions of the genome linked to differences in plumage or migration routes. I hope that future researchers can build on these observations and begin to answer some of the more interesting evolutionary questions that can be asked through the Fox Sparrow.

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NOTES

A HOODED CRANE (*GRUS MONACHA*) AT DELTA JUNCTION, A FIRST FOR ALASKA

JACK J. WITHROW, University of Alaska Museum, Fairbanks, Alaska 99775; jjwithrow@alaska.edu

MICHAEL LENZE, Goose Shack Guide Service, 735 Orion Drive, North Pole, Alaska 99705

On 29 September 2020, while crane hunting near Delta Junction, Alaska (64° 02' N, 145° 44' W), Lenze took a Hooded Crane (*Grus monacha*) when it landed among decoys with a flock of 70+ Sandhill Cranes (*Antigone canadensis*). The bird had been in the vicinity for several days, but its exact arrival date is unknown. The specimen (University of Alaska Museum 45000) was a male weighing 3300 g, with light fat; it appeared to be in good health. We inferred that the bird was in its second year (~15 months old) from its adult-like head and neck plumage, unlike that of first fall juveniles, which do not have a black crown/forehead patch (Figure 1). The relatively worn, brownish remiges that are uniformly shorter than one replaced secondary on the right wing (Figure 2) represent juvenal feathers (i.e., first generation). The replaced secondary 5 and other feathers appeared too new to have gone through a year's wear and had likely been replaced as part of the second prebasic molt before the bird started its southward migration. The tail had two retained juvenal feathers (faded and shorter than the rest) on the right side, and there were at least two generations of feathers in the wing coverts (Figure 2). The details of molt in cranes, the Hooded Crane being no exception, are not well understood (see Howell 2010,



FIGURE 1. Dorsal and ventral views of the Hooded Crane specimen from Delta Junction, Alaska, 29 September 2020 (UAM 45000). The right leg remained with the partial skeleton. In addition to the skin and skeleton, a separate spread wing (Figure 2), duplicate tissue samples, a section of the lower gastrointestinal tract, and external parasites from the bird were preserved and archived.

Photos by Jack J. Withrow

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FIGURE 2. Upper (top) and under (bottom) wing views of the right wing of the Hooded Crane (UAM 45000) showing a complex mix of retained juvenile (browner) and replaced second-generation feathers (grayer). All of the remiges except for secondary five (s5) and the innermost four (tertials) are juvenile, as implied by their uniformly shorter length in comparison to s5 and overall faded brown appearance. The replacement of the tertials and s5 represents a common pattern for second basic plumage among diastataxic species with incomplete molt of the remiges, such as cranes (Pyle 2008). On the upper side of the wing the greater primary coverts are juvenile except for the innermost, which has been replaced. On both the upper and undersides of the wing the secondary coverts comprise a mixture of two or three feather generations including juvenile, second basic, and, possibly, some formative coverts. Molt patterns on the left wing were largely similar except s5 had not been replaced (the tertials had). We interpret this pattern to represent a bird in its second fall, i.e., about 15 months old (see text).

Photos by Jack J. Withrow

Rohwer and Rohwer 2018), but at least in other species of smaller cranes, a bird in its third fall is likely to have replaced more wing feathers (see Nesbitt and Schwikert 2005, Pyle 2008, Masatomi 2020).

The Hooded Crane was accepted unanimously by the Alaska Checklist Committee as a wild bird. The occurrence in fall, of a second-year bird, migrating with

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Sandhill Cranes in Alaska, is compelling evidence of unassisted wild origin. Hooded Cranes are not kept in captivity in Alaska (S. Jensen, Alaska Zoo, in litt., 2021), and only 30 are registered with the Association of Zoos and Aquariums (AZA) for North America. None of these had been lost recently (J. Azua, Denver Zoo, AZA, in litt., 2021). How and where this bird may have taken up with Sandhill Cranes bound for North America is unknowable, but immature and/or nonbreeding Hooded Cranes are known to wander widely in Mongolia, northeast China, and the Amur River region of eastern Russia during the summer months (Johnsgard 1983, Mi et al. 2018). The Hooded Crane's breeding range is not well understood (Degtyarev 2020), although it is centered on the upper Lena and Amur river basins, including parts of extreme northeast China (Rank 1993). It is not known to be closer than ~1000 km south and west of the Sandhill Crane's breeding range in Russia, which extends west along the coast of the Arctic Ocean to the deltas of the Yana, Indigirka, and Kolyma rivers (Krapu and Brandt 2005, Watanabe 2006 and citations therein). Perhaps more likely than spring overshooting or summer wandering by a second-year bird, this crane may have taken up with the small (but increasing) numbers of Sandhill Cranes that winter with Hooded Cranes in Japan (Gao et al. 2019) and subsequently migrated north and then south with Sandhill Cranes. The most recent estimate of the Hooded Crane's population, from winter 2014–2015, was of ~15,000 individuals, trending upward from a decade before (BirdLife International 2021; datazone.birdlife.org/species/factsheet/hooded-crane-grus-monacha/text, accessed 15 Jan 2021).

Most Hooded Cranes winter in southern Japan; numbers wintering in South Korea and eastern China are much smaller (del Hoyo and Collar 2014). To our knowledge, extralimital occurrences of the Hooded Crane are scarce, but interestingly the two other accidental occurrences we were able to find were also in 2020. In February a flock of seven was observed in the Philippines (G. Laude, www.ebird.org, Macaulay Library 211642441+), and in April a lone bird was shot by a hunter in Pakistan (Karam and Shaikh 2020). The Hooded Crane is apparently casual in Taiwan (Ding et al. 2017) and on the hypothetical list in India (Rasmussen and Anderton 2005; see also Dement'ev and Gladkov 1951). Patterns, if any, of extralimital occurrence north of breeding areas are unknown to us.

The Tanana River valley is a major migratory corridor for Sandhill Cranes breeding in western Alaska and Siberia (Kessel 1984, Krapu et al. 2011), and most or all of the cranes breeding in those areas pass through the Tanana Valley in spring and fall. The segment of the Sandhill Crane population that nests in western Alaska and Siberia appears to migrate through the Tanana River valley somewhat later than do birds from interior Alaska (Krapu et al. 2011). Most cranes have departed the Tanana Valley by October, and the Hooded Crane was thus at the tail end of this movement.

The area around Delta Junction is one of few areas in Alaska that has significant agriculture (predominantly barley, hay, or pastures; see Thomas and Lewis 1981) and is used as a stop-over and feeding site for large numbers of migratory waterfowl and cranes in both spring and fall. Alaska's two records of the Common Crane (*Grus grus*), another Asian species that has occurred in North America, also come from this area. One Common Crane at Fairbanks (~150 km northwest of Delta Junction) 24 April–10 May 1958 (Kessel and Kelly 1958) arrived a week before the Sandhill Cranes and "showed no particular affinity toward them" once they did arrive. The second, at Delta Junction 15–20 September 1998 (Tobish 1999), was also associated with Sandhill Cranes. The only other Asian species of crane that has been recorded in Alaska was a Demoiselle Crane (*Grus virgo*) found in southeast Alaska at Gustavus 13–18 May 2002. Circumstantial evidence suggests it was the same Demoiselle Crane that had wintered in California and was subsequently seen in British Columbia just before it arrived in Alaska (see Cole and McCaskie 2004). The Alaska Checklist Committee unanimously decided to treat that bird as of questionable origin (see also Chesser et al. 2015).

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The only other reports of the Hooded Crane in North America are of one (or more?) birds seen in Idaho, Nebraska, Tennessee, and Indiana from April 2010 to February 2012. Chesser et al. (2015:761) characterized the unassisted wild origins of that (those?) Hooded Crane(s) as “best considered unresolved” (see also Pranty et al. 2014, 2015, Pranty 2015, cf. Brogie 2013, Kendall et al. 2015). The Hooded Crane at Delta Junction would no doubt have continued south with Sandhill Cranes, tempering the issues of provenance that plagued the previous history of this species in North America.

The Alaska Department of Fish and Game forwarded the frozen specimen to UAM. The Alaska Checklist Committee provided useful discussions of natural occurrence and other extralimital records of the Hooded Crane. Peter Pyle and Philip Unitt offered constructive reviews.

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LOCALITY AND DATE OF COLLECTION OF THE TYPE SPECIMEN OF THE SLATE-COLORED FOX SPARROW

W. ROSS SILCOCK, 6810 Tournament Drive, Houston, Texas 77069; silcock@rosssilcock.com

It has been generally accepted that the type specimen of the Slate-colored Fox Sparrow (*Passerella iliaca schistacea* Baird, 1858), preserved in the U.S. National Museum of Natural History as USNM A 5718, was collected 19 July 1856 in southwestern Nebraska (AOU 1910, 1931, 1957, Deignan 1961). Questions regarding the locality of collection persist, however, primarily because it is in short-grass prairie (Kaul and Rolsmeier 1983) some 370 km east of the nearest known sites of breeding in the Medicine Bow Mountains of southeastern Wyoming (Faulkner 2010; www.eBird.org, species map accessed January 2021). The stage of molt of the adult female specimen (Swarth 1920, Pyle 1997) suggests a date later than mid-July or a different collection location. Mid-July significantly precedes the Fox Sparrow's usual time of fall migration in September and October. There have been no records documented by specimen or photograph of this taxon in Nebraska in the ensuing 160+ years (Silcock and Jorgensen 2020); the nearest such records are along the Front Range of eastern Colorado during migration (eBird.org, accessed January 2021). Finally, questions have been raised (Swarth 1920, Goetzmann 1959, Moore 1986, Wright 2019) about the accuracy of the record as presented by Baird et al. (1858). Here I address these questions in more detail.

The specimen was collected by W. S. Wood, a rod man with a party of the Corps of Topographical Engineers of the U.S. Army. The party was under the command of Lieut. F. T. Bryan during a survey to locate a practicable route for a road between Fort Riley, Kansas, and Bridger's Pass, Wyoming (Baird et al. 1858, Bryan 1945, Jackson 1949, Goetzmann 1959). There is no question that the party was in southwestern Nebraska on 19 July 1856 (Bryan 1945), the purported date of collection.

However, further examination of the route taken by the Bryan party shows that from 7 to 25 August 1856 it camped for several nights in or near the Fox Sparrow's breeding habitat in the northern Medicine Bow Mountains (Table 1). At 2380 m elevation the 9–10 August campsite was the Bryan party's highest in the northern Medicine Bow Mountains and possibly the only one at an elevation where *P. i. schistacea* breeds. Although no subsequent specimens of the Fox Sparrow from the Medicine Bow Mountains are recorded in the collections searchable through www.vertnet.org, there are at www.ebird.org (accessed February 2021) five recent sightings reported as *P. i. schistacea* at similar elevations (2250–2400 m) in the northern Medicine Bow Mountains. Two birds were at Rock Creek Access (41.626° N, –106.166° W) on 1 July 2020 (T. Leukering and K. M. Dunning; recording), one was at Brush Creek Ranch (41.360° N, –106.543° W) on 13 July 2020 (K. M. Dunning), one was at Little Laramie Crossing (41.295° N, –106.035° W) on 13 July 2020 (K. M. Dunning), two were at 6 Mile Campground (41.044° N, –106.399° W) on 27 July 2020 (D. Kibbe and M. Goldthwait), and two (one singing) were at Rock Creek Canyon (41.580° N, –106.231° W) on 30 August 2015 (C. Porter). Furthermore, some 20 additional June–July eBird records of the Fox Sparrow for the same region undoubtedly also represent *P. i. schistacea*.

Although the 9–10 August campsite may have been the only one at an elevation where *P. i. schistacea* breeds, in fall this subspecies moves downslope from higher altitudes and then migrates (Weckstein et al. 2002). This possibility suggests that any of the sites where the Bryan party camped during the outward trip 7–12 August

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TABLE 1 Approximate Locations and Elevations of Bryan Party Campsites in and near the Northern Medicine Bow Mountains, Wyoming, 7–25 August 1856^a

Date	Location ^b	Coordinates ^c	Elevation ^d
7–8 Aug	West branch Medicine Bow River, near town of Elk Mountain	41.702, –106.397	2190
9–10 Aug	Divide between Elk Mountain and Medicine Bow mountains to the south along Pass Creek Road	41.596, –106.474	2380
11 Aug	On Pass Creek, west of Elk Mountain	41.588, –106.715	2130
12 Aug	On North Platte River, near Saratoga	41.535, –106.885	2040
18–21 Aug	On North Platte River, north of 12 Aug campsite	41.582, –106.953	2040
22 Aug	On Pass Creek, near 11 Aug campsite	41.588, –106.715	2130
23–24 Aug	On Rattlesnake Pass Road north of Elk Mountain, on Rattlesnake Creek	41.694, –106.547	2290
25 Aug	Near 7–8 Aug campsite near town of Elk Mountain	41.702, –106.397	2190

^aAs determined from Bryan (1945).

^bBy reference to current towns and highways.

^cIn decimal degrees north latitude and west longitude.

^dIn meters above sea level.

(four sites) or the return trip 18–25 August (four sites) may have been collecting locations (Table 1). Furthermore, Wood may have made collecting trips higher into the nearby mountains from any of the two-night campsites listed in Table 1, and even quite likely from the four-night campsite of 18–21 August on the North Platte River. Intriguingly, if the specimen was collected 19 August on a trip from this camp, one might conclude that “19 July” was written on the specimen’s label inadvertently and that at least the location given by Baird et al. (1958) as “head of the Platte” may have been in fact correct.

The specimen was described by Swarth (1920) as an adult female in “badly molting condition.” According to Pyle (1997:579), the prebasic molt of adult Fox Sparrows is complete, occurring on the breeding grounds from July to September.

The timing of the Fox Sparrow’s fall migration in this region can be ascertained by examining data from the Colorado Front Range at eBird. In this source, as of January 2021, there were 10 records during fall migration along the east edge of the Front Range in northeastern Colorado, all from 24 September to 24 October, except for one on 6 September.

The information discussed above provides considerable support that the type of *P. i. schistacea* was in fact collected in the northern Medicine Bow Mountains in Wyoming between 7 and 25 August 1856 rather than in Nebraska on 19 July 1856 and suggests the specimen may have been mislabeled.

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FIRST SPECIMEN OF THE NORTHERN SAW-WHET OWL FROM BAJA CALIFORNIA, MEXICO, WITH DATA ON ITS ABUNDANCE IN THE SIERRA SAN PEDRO MÁRTIR

TONATIUH GAONA-MELO, GONZALO DE LEÓN-GIRÓN, GORGONIO RUIZ-CAMPOS, and IRAK RODRÍGUEZ-HERNÁNDEZ, Colección Ornitológica, Facultad de Ciencias, Universidad Autónoma de Baja California, Carretera Transpeninsular Ensenada-Tijuana no. 3917, Colonia Playitas, 22860, Baja California, México; gruiuz@uabc.edu.mx

PHILIP UNITT, San Diego Natural History Museum, P.O. Box 121390, San Diego, California 92112-1390

During surveys (January 2018–November 2020) for the Northern Saw-whet Owl (*Aegolius acadicus*) in the Parque Nacional Sierra de San Pedro Mártir, Gaona-Melo collected one individual of this species at the site known as La Capilla (31.011° N, -115.534° W, elevation 2336 meters above sea level) on 18 June 2020 (Figure 1). The specimen, a juvenile male measuring 190 mm in total length, 430 mm in wing span, 140 mm in wing chord, 76 g in weight (Figure 2), was taken by mist net at 21:36 during sampling for nocturnal raptors in a riparian stand of Quaking Aspen (*Populus tremuloides*) adjacent to mixed coniferous forest comprising Jeffrey Pine (*Pinus jeffreyi*), White Fir (*Abies concolor*), and Sugar Pine (*Pinus lambertiana*). The right testis measured 3.1×1.8 mm, the left 3.4×1.4 mm. This individual represents the first known specimen of this species in Baja California (Anthony 1893, Grinnell 1928, Wilbur 1987, Erickson et al. 2020). Furthermore, the age of the bird strongly suggests local nesting, being the first such evidence for Baja California. The

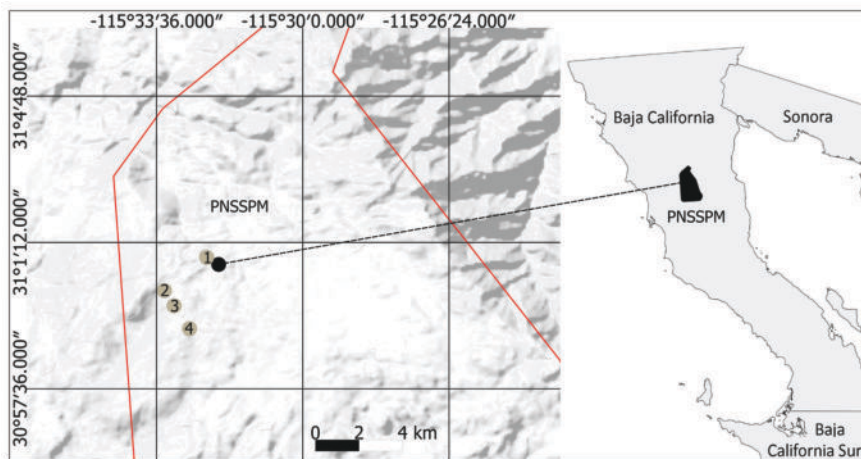


FIGURE 1. Collection and survey sites for the Northern Saw-whet Owl in the San Pedro Mártir National Park, Baja California, Mexico. (●) Collection site: La Capilla. Survey sites: (1) Arroyo Los Alamitos, (2) Corona de Arriba (camping area), (3) Charco de La Rana, and (4) Torre de Piedra.

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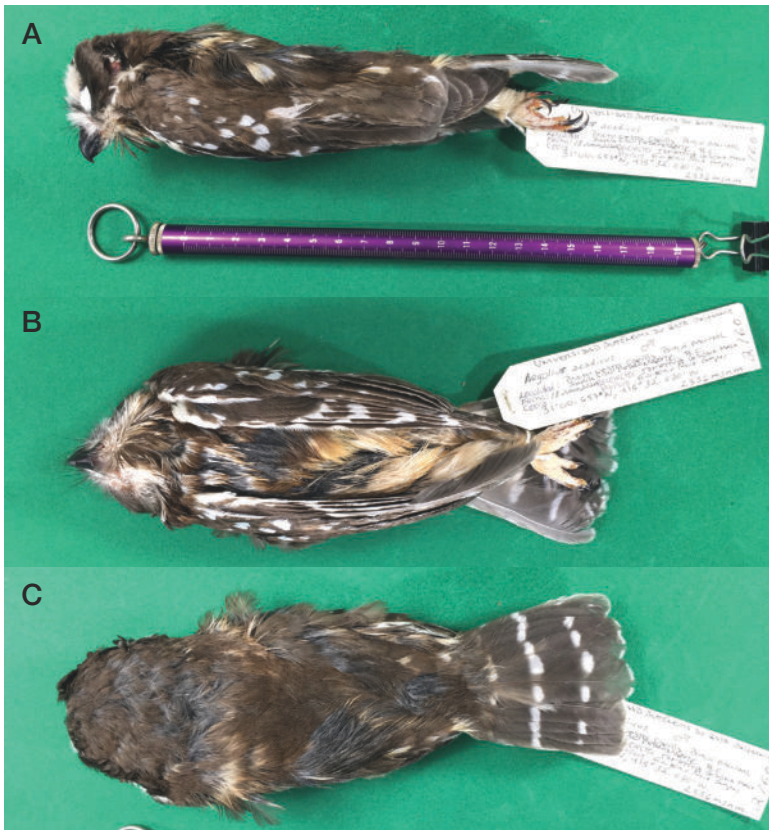


FIGURE 2. Lateral (A), ventral (B), and dorsal (C) views of the juvenile male specimen of the Northern Saw-whet Owl (*Aegolius acadicus*) collected at La Capilla, San Pedro Mártir National Park, Baja California, Mexico, 18 June 2020.

Photos by Gorgonio Ruiz-Campos

specimen is catalogued as number 2160 in the collection of birds of the Universidad Autónoma de Baja California.

The Northern Saw-whet Owl is widely distributed across much of North America from southern Alaska and southern Canada south to southern Mexico (American Ornithologists' Union 1998). In mainland Mexico, the Northern Saw-whet Owl occurs on both the Atlantic and Pacific slopes and in the interior, inhabiting the mountains from northeastern Sonora, Chihuahua, the Trans-Mexican Neovolcanic Belt, Puebla, and Hidalgo south to Oaxaca (Howell and Webb 1995, Lavariega et al. 2011), with isolated populations in southeastern Coahuila, southeastern Nuevo León, and northern San Luis Potosí (Holt et al. 1999). Its habitat includes humid to semi-humid pine, fir, and pine-oak forests (Howell and Webb 1995).

In the Baja California peninsula, Erickson et al. (1994) and Erickson and Wurster (1998) first reported this species from La Corona in the Parque Nacional Sierra de

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San Pedro Mártir, on the basis of calls and songs heard. Subsequent records (auditory or visual) have been reported from this same national park via www.ebird.org. During seasonal samplings (October 2017–August 2018) of nocturnal raptors, Rodríguez-Hernández (2019) recorded an average density of 1.7 individuals/km², in coniferous forest dominated by Jeffrey Pine. However, no specimens or even photographs have been taken for confirmation.

The population of Northern Saw-whet Owl nearest the Sierra San Pedro Mártir is located in the Laguna Mountains east of San Diego, over 200 km north (Unitt 2004). The Cedar Fire of 2003 may have extirpated Northern Saw-whet Owl from the Cuyamaca Mountains in central San Diego County, as since that year there has been only one report from those mountains to www.ebird.org, of a single individual in 2008. Farther north, the species is resident in small numbers on Volcan Mountain, Palomar Mountain, Hot Springs Mountain, and Santa Rosa Mountain (Unitt 2004).

Even though these southernmost populations are probably sedentary, a surprising number of wanderers have been found in atypical habitat in the deserts of southeastern Upper California. Patten et al. (2003) cited four records from the Colorado Desert, and two specimens were found at Picacho State Recreation Area along the Colorado River 33 km north of Yuma in the winter of 2000–2001 [San Diego Natural History Museum (SDNHM) 50579 and 50580]. There are three reports from Borrego Springs (*N. Am. Birds* 61:328, 2007; 62:303, 2008; 70:119, 2017) and at least two from the Coachella Valley (Palm Desert, *N. Am. Birds* 61:328, 2007, Los Angeles County Museum of Natural History 114591; Thousand Palms Oasis, *N. Am. Birds* 68:554, 2015). Even though there are isolated resident populations on Santa Cruz and Santa Catalina islands, the only evidence of vagrancy toward the coast in San Diego County, is a specimen collected in the town of El Cajon just east of San Diego on 27 November 2015 (SDNHM 54658) and a bird photographed 7.5 km south of San Marcos in February 2016 (*N. Am. Birds* 70:232, 2018). Hamilton and Willick (1996) cited two occurrences at low elevations in Huntington Beach, Orange County. There are no records in Baja California away from the Sierra San Pedro Mártir.

In order to quantify the abundance of Northern Saw-whet Owl in the Parque Nacional Sierra de San Pedro Mártir, we carried out a total of 67 nocturnal surveys at four sites from January 2018 to November 2020, encompassing all the seasons of the year (Figure 1, Table 1). The survey areas were defined by transects located in forest suitable for this species as identified from observations in 2017 (Rodríguez-Hernández 2019). The survey points were spaced 1 km apart (Groves et al. 1997). At each survey point, we started with 1 minute of silence to assess the presence or absence of other owl species in the site (Valencia et al. 2012). Northern Saw-whet Owl calls were broadcast intermittently (Fuller and Mosher 1981), in the pattern of 1 minute of broadcast, 4 minutes of silence, 1 minute of broadcast, 4 minutes of silence, 1 minute of broadcast, and finally 4 minutes of silence, all this giving a total sampling effort of 15 minutes per point (Aguilar et al. 2001). Also, the sampling at each survey point was stopped as soon as a different owl species, either the Great Horned Owl (*Bubo virginianus*) or Long-eared Owl (*Asio otus*) was detected. The number of individuals detected per hour at each site of sampling is shown in Table 1, with a total average for all sites and seasons pooled of 2.6 individuals. Locally (all seasons pooled), the highest frequency of individuals detected per hour was at Charco de la Rana (3.3) followed by Corona de Arriba. Seasonally (all sites pooled), the higher frequency of individuals detected per hour was in winter and fall with 2.7 and 2.9, respectively (Table 1).

We thank personnel from the Parque Nacional Sierra de San Pedro Mártir, especially Francisco Arce, Juan Pablo Medina, Daniel Orona, Juan Bencomo, Alfredo Madriles, Diego Toscano, Gustavo Bencomo, and Aldo Guevara for help in the field sampling and logistic support for this study. Richard A. Erickson made useful comments and suggestions that improved the content of the manuscript.

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TABLE 1 Results of Surveys for *Aegolius acadicus* in San Pedro Mártir National Park, January 2018–November 2020

Locality and data of surveys	Dates of sampling	Winter	Spring	Summer	Fall	Total
1. Arroyo de Los Alamillos	23 Jan 2018– 30 Sep 2020					
Number of surveys		5	8	15	2	30
Number of records		5	9	27	3	44
Sampling effort (hours)		2.9	5.4	10.3	0.5	19.1
Individuals detected per hour		1.7	1.7	2.6	6.0	2.3
2. Corona de Arriba	27 Jan 2018– 22 Nov 2020					
Number of surveys		6	2	3	19	30
Number of records		9	2	3	33	47
Sampling effort (hours)		2.5	0.9	0.7	11.7	15.8
Individuals detected per hour		3.6	2.2	4.3	2.8	3.0
3. Charco de La Rana	27 Oct 2018– 9 Nov 2019					
Number of surveys		0	1	0	2	3
Number of records		0	2	0	2	4
Sampling effort (hours)		0	0.5	0	0.7	1.2
Individuals detected per hour		0	4	0	3	3.3
4. Torre de Piedra	5 Jul 2019– 9 Feb 2020					
Number of surveys		1	1	2	0	4
Number of records		1	1	2	0	4
Sampling effort (hours)		0.2	0.7	1.6	0	2.5
Individuals detected per hour		5	1.4	1.3		1.6
All sites pooled	23 Jan 2018– 22 Nov 2020					
Number of surveys		12	12	20	23	67
Number of records		15	14	32	38	99
Sampling effort (hours)		5.6	7.5	12.6	12.9	38.6
Individuals detected per hour		2.7	1.9	2.5	2.9	2.6

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GROUND NESTING BY *AECHMOPHORUS* GREBES IN ORANGE COUNTY, CALIFORNIA

GARY M. SANTOLO, Jacobs, 2485 Natomas Park Drive, Suite 600, Sacramento, California 95833; gary.santolo@jacobs.com

Nesting by grebes of any species on a solid nonfloating surface, such as the ground, rocks, or a concrete structure, is very rare and has been reported in only five species: the Least Grebe (*Tachybaptus dominicus*; Hayes 2018), Great Crested Grebe (*Podiceps cristatus*; Simmons 1955, Ulfvens 1988), Horned Grebe (*Podiceps auritus*; Fjeldsø 1973), and Western Grebe (*Aechmophorus occidentalis*) and Clark's Grebe (*A. clarkii*; Nero et al. 1958, Nero 1959). In the latter two species such nests are considered rare (Riensch et al. 2009, LaPorte et al. 2013). For example, Hayes et al. (pers. comm.) observed no active nests on land during a ten-year study of 32,234 nests of the Western and Clark's Grebes at Clear Lake, Lake County, California, although a few with abandoned eggs were stranded by receding water levels. Here I report on *Aechmophorus* grebes nesting on the ground in a wetland in southern California.

Western and Clark's grebes and their hybrids nest along San Diego Creek at the Irvine Ranch Water District's San Joaquin Marsh and Wildlife Sanctuary, Irvine, California. The sanctuary includes over 121 hectares of constructed coastal freshwater wetlands above the creek's outlet to upper Newport Bay. These ponds are used to clean urban runoff, and these grebe species have been identified in Sea and Sage Audubon's regular surveys of the ponds since 2004. Since 2014 the number of grebes using the ponds has been increasing, especially during the breeding season from April through June (<https://www.seaandsageaudubon.org/BirdInfo/BirdCounts/SJWScensus/SJWScensus.htm>). The ponds' turbid waters are surrounded by cattails (*Typha* sp.) and bulrush (*Schoenoplectus* sp.). Fish species found in the ponds include the bluegill (*Lepomis macrochirus*), common carp (*Cyprinus carpio*), fathead



FIGURE 1. Ponds 1 and 2 of the Irvine Ranch Water District's San Joaquin Marsh and Wildlife Sanctuary along San Diego Creek, Orange County, California.

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minnow (*Pimephales promelas*), green sunfish (*Lepomis cyanellus*), largemouth bass (*Micropterus salmoides*), mosquitofish (*Gambusia affinis*), inland silversides (*Menidia beryllina*), red shiner (*Notropis lutrensis*), and threadfin shad (*Dorosoma petenense*), none of which is native to the area. From at least 2013, when their nesting was first observed, through 2017, grebes nested from late June to early July and the only nests found were the typical floating nests. In 2018, I observed the first ground nest in early June.

From 2004 to 2020 I surveyed bird nests as part of biological monitoring in the Newport Bay watershed that included sampling fish and bird eggs (Santolo et al. 2016). This effort included monitoring in two ponds at San Joaquin Marsh (ponds 1 and 2; Figure 1). Searches for nests of the Pied-billed (*Podilymbus podiceps*) and *Aechmophorus* grebes, American Coot (*Fulica americana*), Black-necked Stilt (*Himantopus mexicanus*), American Avocet (*Recurvirostra americana*), Killdeer (*Charadrius vociferus*), Forster's Tern (*Sterna forsteri*), and Black Skimmer (*Rynchops niger*) took place every other week from about 1 May to 1 July each year; for each species, searches were discontinued after eight nests with two or more eggs were found. Waterfowl and shorebird nests were found on the island in Pond 2 in all years except 2016, when only Canada Goose (*Branta canadensis*) nests were observed; however, no nests of any species were found on the island in Pond 1 until 2016, when three Black-necked Stilt nests were found and Caspian Terns (*Hydroprogne caspia*) also began nesting on the island. Since 2016, the numbers of species and nests on the Pond 1 island have increased. I had observed *Aechmophorus* grebes incubating in typical floating nests attached to the water-side edges of cattails and bulrush surrounding the ponds in the years I had been monitoring, but on 4 June 2018, I observed an *Aechmophorus* grebe nest with three eggs on the shore of the island in Pond 1. In 2019, I found five ground and three floating nests, and in 2020, five ground and two floating nests. All nests were photographed, and examples of the ground nests are shown in Figure 2. These active nests were all located about 1.0–3.0 m from the water's edge, and I was able to observe various nests under construction, nests where additional eggs were laid after the nest was found, and, on occasion, incubation by a parent (Figure 3). Before 2018, when the first ground nest was found, *Aechmophorus* grebe nests were not observed until late June or early July.

I collected a single egg from each nest (up to eight eggs total per year; no egg was collected from the ground nest found in 2018) and measured the eggs as described by Santolo (2018). There were no significant differences in morphometrics between the eggs from the ground and floating nests (Table 1; unpaired *t*-test). All of the eggs collected were viable, and their incubation ages and the embryos' developmental stages (based on Hamilton 1952, Pisenti et al. 2001), at the time they were collected, ranged from day 0, stage 3 (recently laid) to day 26, stage 45 (near hatching) for floating nests and from day 0, stage 3 to day 9, stage 32 for ground nests. I did not monitor nests for success.

From 2018 to 2020, *Aechmophorus* grebe nests were initiated earlier in the season than had been typical for these species at this location, and all of the earliest nests were ground nests. However, the timing of breeding is not remarkable, as in southern California Western Grebes may nest as early as January (Lee 1967), and in San Diego County breeding extends through most of the year (Unitt 2004). Although there appears to be adequate vegetation around the perimeter of the ponds early in the season, grebes may choose to nest on the ground early in the season at this site because of water management that changes the water levels in the ponds, although no signs of inundation or stranding of nests were observed. Further studies would be needed to determine factors influencing the timing of breeding.

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TABLE 1 Sizes of Clutches and Characteristics of Eggs in Floating and Ground Nests of *Aechmophorus* Grebes at the San Joaquin Marsh, Orange County, California

Variable	Floating nests (n = 5)			Ground nests (n = 10)			t	P
	Mean	SD	Range	Mean	SD	Range		
Clutch size	3.6	0.55	3–4	3.3	0.67	2–4	0.858	0.407
Mass (g)	43	2.2	40–46	44	2.8	38–48	0.739	0.473
Length (mm)	57	1.9	55–60	57	1.6	55–60	0.021	0.984
Width (mm)	38	0.91	37–40	38	1.0	37–40	0.127	0.901
Volume (mL) ^a	42	1.8	40–45	42	2.1	39–45	0.125	0.903
Density (g/cm ³) ^a	1.0	0.05	0.95–1.1	1.0	0.03	0.99–1.1	1.35	0.199
Shell thickness (mm) ^b	0.34	0.02	0.32–0.36	0.33	0.04	0.26–0.37	0.306	0.764

^aBy the methods of Hoyt (1979).

^bBy the method of Santolo (2018).

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FIGURE 2. Selected *Aechmophorus* grebe ground nests found at the San Joaquin Marsh. (A) 17 May 2019, Pond 1; (B) 17 May 2019, Pond 1; (C) 3 June 2019, Pond 1; (D) 3 June 2019, Pond 1; (E) 4 May 2020, Pond 2; (F) 4 May 2020, Pond 1; (G) 18 May 2020, Pond 2; (H) 18 May 2020, Pond 2.



FIGURE 3. Western Grebe nesting on the island of Pond 1 at the San Joaquin Wildlife Sanctuary in Irvine, California, in May 2020.

Photo by Trude Hurd

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BOOK REVIEWS

Owls of the Eastern Ice: A Quest to Find and Save the World's Largest Owl, by Jonathan C. Slaght. 2020. Farrar, Straus and Giroux, New York. 348 pp. \$28.00, e-book \$14.99, audio book \$24.99. ISBN: 978037422848.

It was on a flight over the Primorye, a Russian province formerly part of Manchuria, abutting North Korea and China, that Jonathan Slaght recalls falling in love with the Russian Far East, and particularly Primorye. Straddling the Sea of Japan, it is a mysterious mountainous Russian province that during the Soviet era was off limits to foreigners for military reasons, and the exotic wild home of the Amur Tiger and Amur Leopard.

With the breakup of the Soviet state and its opening to outsiders, Slaght returned for several visits, one for three years as a Peace Corps volunteer. It was while out hiking in 2000 that he encountered his first Blakiston's Fish Owl, the world's largest owl, endangered and likely down to under 2500 individuals.

Thankfully, Slaght's sighting made a strong impression on him and led to choosing this species for his Ph.D. research project. His *Owls of the Eastern Ice* is a well-written and well-edited tale of his 20 months of field work as well as his love and appreciation of this poorly known corner of Russia and the area's people.

Blakiston's Fish Owl has been more extensively studied in Japan, where in recent decades conservationists have managed to reverse a population decline on the island of Hokkaido. In Russia, it occurs in more remote areas and until recently received less attention. Its status in China is not well known. Slaght notes that a nest had not been discovered in Russia till 1971, and the country's population was thought to be a total of 300–400 pairs.

Slaght understood that with the commercial opening of the Russian Far East the future of this rare species was at risk, and it would be critically important to have good conservation science inform decisions being made about timber harvests, roads, fishing, and other forms of resource extraction.

For his Ph.D. research at the University of Minnesota, under Rocky Gutiérrez, Jonathan Slaght selected a project focused on understanding what landscape features the fish owl requires. The intent was to be able to help develop a conservation strategy for the species that could guide management decisions to safeguard the fish owl and the entire ecosystem.

Several factors were key to Slaght's ultimate success. First was his collaboration with Sergey Surmach, an ornithologist with the Federal Scientific Center of East Asian Terrestrial Biodiversity, whose collaborative spirit and experience in the rigors of remote field work were key to Slaght's success. Surmach is credited for his knowledge of the fish owl, Primorye, and logistical magic. Second, Slaght clearly is talented, tenacious, and was able to build on his previous experience as a Peace Corps volunteer in Primorye. Finally, he seems to bring a Zen-like patience in the face of failures, and dry humor to his encounters with field and village life in the remote Russian wilds.

Owls of the Eastern Ice is a field-work adventure tale that does not bog down in field work (though occasionally it is hard to keep the various river basins and associated owl pairs straight). Slaght has a keen eye for the people he works with and a generous spirit for the rigors of eking out a living on this Russian frontier. It is a good story, and Slaght's writing gives us a front row seat to field life in Russia: "the room grew smoky from both tobacco and the sieve-like woodstove. I sat in for a few shots of ethanol, eating meat and raw onion, and listening to the men impress one another with stories of hunts and close encounters with bears, tigers and the river" (p. 23). Along the way Slaght learns critical survival skills: "I had learned that silence was the best policy when encountering strangers, especially drunken ones,

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as the most common reaction to meeting a foreigner was demands of communal vodka ingestion to facilitate a lengthy exploration of cultural differences" (p. 128). He is committed to the living in close quarters and rough field conditions with his field crew that he needed to succeed, however challenging: "Everyone on the field crew snored, but he (Katkov) was a virtuoso" (p. 242). Undoubtedly humor is an important bridge to his success: "He fueled his monologues with sausage and cheese, then belched zeppelins of aroma into that confined space" (p. 268).

Slaght tells his story not as an expert but as a student gaining experience and knowledge in the field with others. His perspective is refreshing, as he is not afraid to share near misses with disaster on river ice while learning to trap owls through trial and error.

Most importantly, his work is driven by a passion to better understand fish owls and their use of Primorye's riverine habitats. His project's GPS tracking of fish owls and vegetation mapping has helped illuminate the species' habitat needs and its home range over the course of a year.

These owls need dense broadleaf or mixed broadleaf/coniferous forest with old-growth trees suitable for nesting. They need clear braided rivers with channels of slow-moving water, particularly segments that do not freeze over in the cold Russian winters. While nesting the owls do not have a particularly large range, but they move seasonally, particularly in the autumn, to follow fish migration upstream. This work has allowed Slaght and his collaborators to map out potential habitat. Not surprisingly, once his maps are overlaid on logging companies' leases, he recognizes the need to engage with these companies directly. He points to some success working with companies in protecting nesting trees and closing roads into fish owl habitat.

Slaght's work is an inspiring example of a scientist's commitment to in-depth field work to develop and analyze data in order to guide the conservation of a poorly known species in the face of rapid transformation of its territories. He is also a scientist who is a close student of people, the key driver threatening the fish owl. He has found a way to remain living and working in Primorye and recognizes that the fish owl's conservation is a long-term commitment. His work helped double the population estimated for Russia to perhaps 735 pairs (800 to 1600 individuals). Yet Slaght is not naïve about the threats the fish owl faces, from natural (typhoons) to anthropogenic (collisions with vehicles, poaching, habitat loss, and a likely reduced prey base). He notes that in Russia the fish owl's clutch sizes have declined over time, likely reflecting a decline in its prey.

While Slaght's current work with the Wildlife Conservation Society is not focused on Blakiston's Fish Owl directly, he continues to moonlight with Surmach and others to both study and advocate for conservation of old-growth riparian forest. His parting reminder: "like the owls, we'll have to stay vigilant." For anyone working on conservation, there are no truer words, even on a good day.

[Editor's Note: Subsequent to submission of *Owls of the Eastern Ice* for review in *Western Birds*, this book was nominated for the 2020 National Book Awards and was feted as one of the best books of 2020 by notable organizations and publications. Slaght is the English-language editor of the Far-eastern Journal of Ornithology and writes a guest column/blog for Scientific American, East of Siberia.]

Graham Chisholm
Bird Conservation Fund (birdfund.org)

“The Hungry Bird,” a series of columns by David Leatherman, published in *Colorado Birds*, the journal of Colorado Field Ornithologists, 2010–2019, all available at <https://cobirds.org/Publications/HungryBird.aspx>.

Many books consist of a collection of essays. Here I review a set of essays that could well have been assembled in a book but were instead published in *Colorado Birds*, the quarterly journal of the Colorado Field Ornithologists. For ten years, from 2010 to 2019, one of that organization's prominent members, David Leatherman, wrote a regular column titled “The Hungry Bird,” whose stated goal was to provide uncommon background deepening insight into bird observations. He did this by using his experience as an entomologist and professional field biologist to better understand birds through their behavior, what they eat, and who eats them.

David Leatherman obviously knows how to write for professional scientists. But throughout this decade of columns, he shows remarkable skill in writing simultaneously for amateurs without losing accuracy and reliability. He focuses on a species of insect, plant, or bird adaptation, and then with intriguing details weaves a story around it that educates while it fascinates. His ability to use personal stories, metaphors, and similes is well honed.

As I read his 37 columns, I tried to peruse them from the point of view of both a professional scientist and an amateur birder, and I found myself regularly engrossed in the subject of that issue. For me, 22 of the columns were of “Oh my!” quality. Standout articles that best walk the line between these two types of readers include “Dragonflies” (July 2011), “A Loggerhead Larder” (October 2015), and “Breakfast at Jane’s” (July 2016). I rank as the best of all “Birds Exploring Defect as a Proven Foraging Strategy” (April 2016). Each of these essays has a clear story that tied birds into what and how they eat specific types of food. In the case of my favorite, it revealed how a birder could learn to see what a bird sees and judge food availability by the appearance of clues such as insect-damaged and dried leaves.

When I looked for details that distinguish the best columns, I noticed a direct relationship between the number of inserted citations, use of scientific names, formal family names, and a general drift into a more standard scientific writing style. My amateur birder self was not as enthralled in wading around the articles of a more formal style, such as “What Kind of Food Would a Woodcock Find, if a Woodcock Could Find Food?” (April 2015). It had 11 citations, a somewhat disconnected introduction, unnecessary lists of formal family names, and a more affected presentation. “Solifuges” (October 2016) had an overwhelming 22 citations and no photo or illustration of the subject organism. “Green Ash Seeds” (April 2017) had a mind-boggling 56 citations and long lists of mammals’ scientific names that distracted me from the central message of the article.

Overall, however, it amazes me how well these columns were written, the ideas on which they were based, and the messages they communicate to scientists and birders. I don’t know how many authors would be able to conjure up such a plethora of intriguing connections to make birds more understandable. My hat is off to Leatherman and *Colorado Birds* for an overall productive set of columns from which amateurs and professionals can continue to harvest insights and novel ideas that enhance our knowledge and appreciation of birds.

David L. Pearson
School of Life Sciences, Arizona State University

Photography: Birds: Field Techniques and the Art of the Image, by Gerrit Vyn. 2020. Mountaineers Books, Seattle, 256 pp. ISBN: 978-1-68051-099-7.

Catherine Waters of the Western Field Ornithologists called me to ask if I would review a book on bird photography, and specifically if I thought it was of suitable content for an average birder. As any experienced tour leader can attest, birders and bird photographers share a love of birds, but the similarities end there. Upon seeing an interesting bird, the birder will watch it, maybe make notes, snap a few photos, and move on to find the “next one.” Bird photographers want to stay there, continuing to photograph the bird until it leaves or they have recorded the best possible images that the bird and the scene will allow them. That is why many of the birding tour companies are now running tours dedicated to bird photographers.

I assume that Catherine chose me because I started birding as a photographer back in the 1970s-era of manually controlled 35-mm film cameras, and have happily made the transition to the world of digital SLR cameras and being a birder. To me, the most remarkable development in birders and birding over the past two decades is without a doubt the embracing of photography for documentation, record-keeping, and personal enjoyment. In 2020, a records committee expects to receive photos of a rare bird, whereas in the 1970s, a detailed field sketch was the birder’s “proof” of what he or she saw. Digital SLR cameras with 100- to 400-mm zoom lenses, superzoom point-and-shoot cameras, and cell phones taking images through spotting scopes have completely changed the landscape when it comes to reporting and documenting bird records.

The book arrived—*Photography: Birds*, subtitled *Field Techniques and the Art of the Image*, by Gerrit Vyn, in partnership with the Cornell Lab of Ornithology. Published by Mountaineers Books, which publisher also has in its catalog *Photography: Outdoors* and *Photography: Night Sky*, so these books are definitely intended for dedicated photographers.

However, the image on the front cover really got my attention—not a Great Gray Owl, Golden-cheeked Warbler, or Roseate Spoonbill (all superb images featured within the body of the book), but a ground-level photo of a juvenile Sharp-tailed Sandpiper! OK, maybe this will be suitable for birders after all!

Gerrit Vyn has a long and impressive résumé for bird photography, and the images that he has included in the book are outstanding. I would imagine that the hardest part of writing the book was deciding which images to include and which ones would not make the cut. He relates that his first efforts at bird photography were with his father’s Nikon F3 35mm camera during spring migration at Point Pelee National Park in Ontario, Canada. That connected with me, as I did the same, only it was a Nikon Ftn Photomic with a 500-mm f/8 Reflex-Nikkor lens at Point Pelee in 1977.

After the Introduction, the first section is entitled Ethics, which includes a very complete round-up of how to get the bird photos you desire while keeping the birds safe and respecting the natural environment. Excellent. The next six chapters are meant to be a resource for the reader—finding birds, understanding bird behavior, choosing equipment to do the job at hand, operating that equipment in the field, and making creative decisions with respect to composition, exposure, and effects. The book finishes with Vyn’s thoughts on post-processing routines and techniques.

The book encapsulates virtually everything you will need to know about how to gear up, find, and photograph birds. All the bird-image captions include the lens used, exposure data, and location of the bird, but not the specific camera body. Vyn shares my own outlook—the lens is the most important part of the system, not the camera body. The book not meant to be a step-by-step instructional or self-help guide to becoming a better photographer. That task is left to the reader. Vyn states from the beginning that the information presented is what works for *him*, and the specific gear shown and discussed are his preferences. Fair enough. A beginning

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or non-photographer will likely benefit from a glossary of photographic terms, but making the effort to become familiar with those terms is a rite of passage for any photographer.

Here is where we can be sure that the book is *not* intended for birders—Vyn is a big-lens guy. There are roughly 100 bird photos included in the text, and all are tack-sharp, impeccably framed, and properly exposed. Two lens combinations dominate the photos: 41 images were taken through a 600-mm f/4 with a 1.4× teleconverter, and 20 images were taken through a 500-mm f/4 lens with a 1.4× teleconverter. These are not birder-friendly, being larger and heavier than what an average birder is willing to carry.

Evidently, Vyn has at some point switched between Canon and Nikon systems, as those are the ones he refers to in the sections on gear and field techniques. He is obviously familiar and comfortable with them, and does not seem to have a specific brand preference.

That is my only criticism of the book—I was surprised at the complete lack of acknowledgment or discussion of the newest type of digital camera, the mirrorless camera, pioneered by Panasonic, followed by Olympus and Sony. The industry giants Canon and Nikon finally debuted their models in 2019. Presumably, Vyn has not had the chance to use either of those camera bodies in the field. I forecast that mirrorless cameras will in fairly short order do to traditional DSLR bodies what digital did to 35-mm film—relegate it to the niche user or stubborn traditionalist.

Conclusion: An excellent overview of photography as it pertains to wild birds, especially for photographers looking to raise their game. It is definitely a great resource for any birder who wants to get better bird photos, but do not expect to see tips on bird identification, using superzoom cameras, digiscoping, or phonescoping.

Clayton Taylor
Corpus Christi, Texas

FEATURED PHOTO

FIRST RECORD OF THE EUROPEAN GOLDEN- PLOVER (*PLUVIALIS APRICARIA*) IN NEW MEXICO WITH NOTES ON AGE, PROVENANCE, AND *PLUVIALIS* MOLT

JODHAN FINE, 4304 Rio Grande Blvd. NW, Albuquerque, New Mexico 87107;
jodhanfine22@gmail.com

RAYMOND L. VANBUSKIRK, 10524 Princess Jeanne Ave. NE, Albuquerque,
New Mexico 87112; newmexicobirder@gmail.com

JACK B. PARLAPIANO, 1341 Camino Cerrito SE, Albuquerque, New Mexico
87123; parj220@aa.edu

MATTHEW J. BAUMANN, Department of Biology and Museum of
Southwestern Biology, University of New Mexico, MSC03-2020, Albuquerque,
New Mexico 87131-0001; mbaumann22@gmail.com

On 2 October 2020, Tony B. Godfrey alerted the New Mexico birding community about an interesting plover of the genus *Pluvialis* at Maxwell National Wildlife Refuge, Colfax County, northern New Mexico (36° 34' 15" N, 104° 34' 54" W, elevation 1840 m). The refuge is located in an open basin enclosed from the west by the Sangre de Cristo Mountains and from the east by high, scattered mesas. The refuge contains 3699 acres of playa lakes, short-grass prairie, woodlots, and crop fields. This plover had apparently been photographed by another birder at the same location several days earlier, on 28 September, but it was originally reported as a Black-bellied Plover (*Pluvialis squatarola*) via www.eBird.org and therefore wasn't flagged for attention by that site's reviewers for the date and location. Photos from 28 September were not submitted until many days after the observer's initial report. The series of photos taken by Godfrey on 2 October displayed pale underwings and bright white axillaries, the latter unique among the species of *Pluvialis* to the European Golden-Plover (*P. apricaria*; see this issue's outside back cover). In addition to the white axillaries, the thin bill, bright golden plumage, and short primary projection further supported the identification and eliminated both the Black-bellied Plover and American Golden-Plover (*P. dominica*). The last *Pluvialis* considered was the Pacific Golden-Plover (*P. fulva*), which is phenotypically similar and has a history of vagrancy, including to inland locations in the western United States. For example, there are four accepted records from Arizona, three from Utah, and one from Idaho (Rosenberg et al. 2017, <https://ibrc.idahobirds.net/rare-bird-reports/3-a-03-pacific-golden-plover>, <http://www.utahbirds.org/RecCom/RareBirdsIndex.html>). The Pacific and European Golden-Plovers both have similarly short primary projections, but the smaller bill, shorter legs, more prominent white bases to the inner primaries, and especially the white axillaries and underwing coverts are diagnostic field marks of the European Golden-Plover. Given that the latitude of Maxwell National Wildlife Refuge (~36° N), similar to that of the southernmost portion of the European Golden-Plover's winter range, it is plausible that the Maxwell plover could have survived the winter on the refuge. However, on 26 October, exactly four weeks after the bird was originally found, a strong cold front moved through the state, bringing temperatures of nearly -18° C and substantial snow. The plover was not seen after this date, and it is unknown whether it was killed or pushed to a more suitable location.

The European Golden-Plover breeds at northern latitudes from Iceland and the British Isles east through Scandinavia, the Taymyr Peninsula in northwestern Russia,

FEATURED PHOTO

and Siberia to ~100°E longitude. It spends the winter months in western Europe, the British Isles, across the Mediterranean, and locally along the far northwest coast of Africa (Hayman et al. 1986, Wiersma et al. 2016). The European Golden-Plover is rarely found in North America away from the far northeastern portion of the continent, where it is an uncommon but regular visitor. It is a local breeder in northeastern Greenland and a regular vagrant to other parts of that island (Boertmann 1994). It is a nearly annual vagrant in Newfoundland and Labrador, sometimes showing up by the hundreds, especially in spring after strong northeasterly winds. There are very few fall records in that province. The species is casual in the French territory of St. Pierre and Miquelon in spring. Quebec has one spring and two summer records, and there are one spring and two fall records from Nova Scotia (Howell et al. 2014, www.eBird.org, accessed 10 January 2021). A European Golden-Plover in Massachusetts in 2021 marked the first spring record for the United States. There are single fall records from Maine and Delaware, two summer records from New Jersey, and four from Alaska, which are all from June, except a January specimen (University of Alaska Museum 12100) that represents the first substantiated record from the Pacific (Piston et al. 2001, Gibson et al. 2003, Howell et al. 2014, www.eBird.org). The report of a European Golden-Plover from late January in Santa Barbara, California, was endorsed by experts from Europe but was ultimately rejected by the California Bird Records Committee (Benson et al. 2020).

New Mexico is a highly unusual and unexpected location for a European Golden-Plover. Until the occurrence at Maxwell, there had never been a New World record of a European Golden-Plover away from a coast, much less in a landlocked U.S. state thousands of miles from any previous record. Needless to say, this bird represents a first state record for New Mexico and the first record of European Golden-Plover for interior North America. It also represents the fifth record for the western United States.

Excellent photos of the New Mexico European Golden-Plover show details of the upper wing feathers useful for ageing the bird (Figure 1). The European Golden-Plover follows a complex alternate molt strategy, including a partial preformative molt early in the first year of life and a prealternate molt (O'Brien et al. 2006). Interestingly, Jukema et al. (2014) reported that it regularly retains secondary and primary coverts for more than a year, an aspect of molt not regularly seen in any other species of shorebird. The Maxwell plover was in active primary molt, replacing p9, while p10 had yet to be replaced. The latter was heavily worn, narrow, pointed, and light brown, suggesting that it was a juvenile feather grown shortly after hatching (1 in Figure 1). The median primary coverts, carpal coverts, and greater coverts showed prominent contrast between two generations of feathers. The greater coverts appeared to contain multiple generations of retained feathers: two heavily worn, brownish, juvenile feathers near the outer portion of the tract (2 in Figure 1); seven worn, grayish, and pale-edged formative feathers in the middle section of the tract (3 in Figure 1); and a new feather of the second basic plumage between the two generations of feathers (4 in Figure 1). This pattern appeared to be symmetrical in both wings, suggesting it was not related to accidental feather loss. The carpal covert was replaced with a fresh second basic feather that contrasted starkly with the juvenile and formative feathers in the greater coverts (5 in Figure 1). The median primary coverts clearly showed at least two generations of feathers: multiple brownish feathers in the middle section of the tract, which appear to be juvenile feathers, and two fresh, blackish, second basic feathers in the innermost part of the tract (6 in Figure 1). The presence of black feathers of the alternate plumage on the belly and breast, the three generations of feathers in the secondary coverts, and the molt limit in the outer primaries rule out the possibility that this individual had hatched the year it was observed. They indicate that it was in its second calendar year of life undergoing a second prebasic molt out of its first alternate plumage.

Pluvialis plovers can often be reliably identified by the presence of flight-feather

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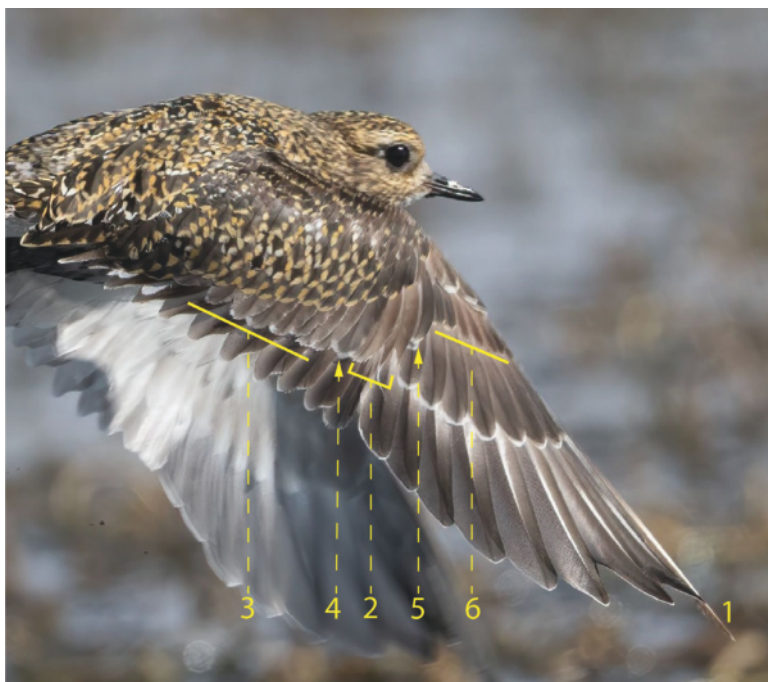


FIGURE 1. Detail of the spread wing of the New Mexico European Golden-Plover (*Pluvialis apricaria*), showing three generations of feathers. 1, Worn and tattered juvenile p10; 2, two heavily worn, presumed juvenile greater coverts; 3, seven greater coverts presumed to represent the formative plumage; 4, new feathers of the second basic plumage between the two generations of coverts; 5, fresh carpal covert of the second basic plumage; 6, two generations of feathers in the median primary coverts.

Photo by Larry Sansone

molt and wear in conjunction with the timing and location of observations (Jaramillo 2004). The European Golden-Plover typically retains juvenile primaries and replaces them during the second prebasic molt, a pattern also reported in Pacific and Black-bellied Plovers of similar ages (Johnson 1985, O'Brien et al. 2006). Primaries retained for this amount of time can be readily identified by their extremely worn appearance, as exemplified by the outermost primary on each wing of the Maxwell plover. The American Golden-Plover is unique in the genus *Pluvialis* in replacing all primaries on the winter grounds—even juveniles—as part of a delayed prebasic molt. Therefore, that species should not be encountered in primary molt away from its South American winter range, and it should not show extensively worn primaries at any age, as is often seen in other species of *Pluvialis* in their second fall (Jukema et al. 2011). Finally, adult Pacific Golden-Plovers molt their primaries on the winter grounds nearly two months before American Golden-Plovers do (Jaramillo 2004). For these reasons, careful documentation of molt and the extent of wear in golden-plovers' primaries, especially during fall migration, is useful for species identification. In North America, symmetrical flight-feather molt or extensive primary wear

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presumably eliminates the American Golden-Plover as a possibility. It is important to note that the absence of flight-feather molt is not nearly as useful as the presence of *symmetrical* flight-feather molt in identifying the species of *Pluvialis* in the fall since fall migration precedes any flight-feather molt in juveniles of all species in the genus.

The sequence of primary molt in the Icelandic and continental populations of the European Golden-Plover differs, and this difference might provide insight into the geographic origin of the Maxwell plover. Machín et al. (2018) reported Icelandic populations to complete primary molt on the breeding grounds before departing them. Conversely, continental populations begin molt of their primaries on the breeding grounds, then suspend it typically after replacing 4 or 5 inner primaries, before departing to complete molt at stopover or wintering sites. Siberian and Alaskan breeding populations of the Pacific Golden-Plover differ similarly, likely as an adaptation to the differing pressures of trans-continental versus trans-oceanic migration, respectively (Jukema et al. 2015). The Maxwell plover was in active primary molt, which suggests that it originated from continental Eurasia and not from Iceland. Given its lengthy stay at Maxwell, it is possible that it may have been staging at this location while it completed molting. Continental populations migrate the farthest and travel to the southernmost end of the species' winter range on the Mediterranean coasts of Europe or Africa and make abrupt long-distance flights in response to cold weather (Machín et al. 2015). Long-distance migrants from the continental population are more likely to produce a vagrant so far out of its normal range than is the Icelandic population, which makes a shorter flight to the British Isles for the nonbreeding season (Hayman et al. 1986, Wiersma et al. 2016). However, European Golden-Plovers presumably from Iceland have been observed in active primary molt upon arrival in Ireland between the months of August and October (K. Mullarney pers comm.). Furthermore, given the variability of molt among contour feathers between individuals or populations, due to age or environmental variables, especially in migratory shorebirds (Conklin and Battley 2012, Remisiewicz et al. 2017), active primary molt alone may not be a character reliable enough to reveal the origin of the Maxwell plover.

We thank Larry Sansone for providing an excellent photograph, Peter Pyle for providing useful comments about the bird's age, and Tony Godfrey for his timely alert to the New Mexico birding community about the Maxwell plover. Jon Dunn provided valuable information about the California European Golden-Plover record. Jessie Williamson, Michael L. P. Retter, Adam Searcy, and Killian Mullarney provided helpful reviews of the manuscript.

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Featured Photo: Ryan Terrill, Moore Laboratory of Zoology, Biology Department, Occidental College, 1600 Campus Rd., Los Angeles, CA 90041

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Photo by © Lucas H. DeCicco of Lawrence, Kansas:

Fox Sparrow (*Passerella iliaca*), 4 km north of Anchorage, Alaska, in mixed mature boreal forest and alder thickets at elevation 50 m, 29 May 2017.

The Fox Sparrow is renowned for its multiple divergent subspecies, yet the interactions of these subspecies where their breeding ranges come into contact have been little investigated. In this issue of *Western Birds*, Lucas H. DeCicco addresses the contact between *Passerella iliaca sinuosa*, the plain brown-backed subspecies breeding in coastal south-central Alaska, and *P. i. zaboria*, the boldly patterned, richly colored subspecies breeding in Alaska's interior. He also describes the differences in their songs and habitat preferences. In the area of overlap near Anchorage, variously intermediate birds, such as the one in this photo, may be seen. But they are outnumbered there by Fox Sparrows with plumage typical of the two parental subspecies, suggesting some degree of reproductive isolation. The intergrades from the Anchorage area resemble *P. i. altivagans*, which breeds in the interior of British Columbia. Whether they differ in any way from *altivagans*, itself intermediate between two of the main groups of Fox Sparrow subspecies, is a question still to be considered.



"Featured Photo" by © Jack B. Parlapiano of Albuquerque, New Mexico: European Golden-Plover (*Pluvialis apricaria*), Maxwell National Wildlife Refuge, New Mexico, 28 September–25 October 2020, representing the first record of this species for New Mexico and the second for western North America. Note the diagnostic clean white axillaries. Pectoral Sandpiper (*Calidris melanotos*) in the background.