

WESTERN BIRDS



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European Barn Swallow



Photo by © Cameron D. Eckert of Whitehorse, Yukon, Canada:
European Barn Swallow (*Hirundo rustica rustica*), Herschel Island–Qikiqtaruk, Arctic coast of the Yukon Territory, Canada, 20 June 2019.
Cameron D. Eckert and Richard R. Gordon summarize the status of the Barn Swallow on Herschel Island–Qikiqtaruk, in the Arctic Ocean along the coast of the Yukon Territory, providing evidence that three were of the European subspecies. There are five other records of *Hirundo rustica rustica* along the Arctic coast of Alaska west to Barrow, but no others for hundreds of miles to both the west and the east. The pattern suggests that these birds reached North America by overshooting their spring migration route on a great circle route nearly over the North Pole.

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Front cover painting by © Bryce Robinson of Boise, Idaho: *Leucosticte tephrocotis umbrina*, the subspecies of the Gray-crowned Rosy-Finch endemic to the islands of the Bering Sea: St Matthew, Hall, and the Pribilofs.

Back cover “Featured Photo” by © Matthew Grube of Redlands, California: Apparent hybrid of a Yellow-breasted Chat (*Icteria virens*) × oriole, probably Hooded Oriole (*Icterus cucullatus*), San Timoteo Canyon, San Bernardino County, California, 10 September 2019.

Western Birds solicits papers that are both useful to and understandable by amateur field ornithologists and also contribute significantly to scientific literature. Particularly desired are reports of studies done in or bearing on North America west of the 100th meridian, including Alaska and Hawaii, northwestern Mexico, and the northeastern Pacific Ocean.

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WESTERN BIRDS



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FURTHER INFORMATION ON THE AVIFAUNA OF ST. MATTHEW AND HALL ISLANDS, BERING SEA, ALASKA

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ABSTRACT: In June and July 2018 and July 2019 we surveyed birds on St. Matthew and Hall islands, isolated in the central Bering Sea. Our surveys were focused on the McKay's Bunting (*Plectrophenax hyperboreus*), Rock Sandpiper (*Calidris ptilocnemis ptilocnemis*), and Pelagic Cormorant (*Phalacrocorax pelagicus*) but encompassed all birds and yielded 13 species and four subspecies new to the islands' avifaunal list, and new details and documentation of breeding for eight species. Especially notable discoveries include a mixed pair of Bewick's (*Cygnus columbianus bewickii*) and Whistling (*C. c. columbianus*) Swans, a mixed pair of the Glaucous-winged (*Larus glaucescens*) and an Asian subspecies of the Herring Gull (*L. argentatus vegae*), and discovery of a colony of ~100 pairs of the Red-legged Kittiwake (*Rissa brevirostris*). Also, contrary to many previous expeditions, we found the Gray-crowned Rosy-Finch (*Leucosticte tephrocotis umbrina*) to be common and conclude that it may be resident.

The St. Matthew Island group, including St. Matthew, Hall, and Pinnacle islands, is located in the central Bering Sea (60° 24' N, 172° 42' W; Figure 1), and is part of the Alaska Maritime National Wildlife Refuge (see Winker et al. 2002 for physical descriptions of the islands and details of their habitats).



FIGURE 1. St. Matthew Island and the greater Beringian region, with annotated locations mentioned in the text.

The islands host a unique mixture of Beringian, Asian, and North American avifauna (Winker et al. 2002)—including the entire breeding population of the McKay's Bunting (*Plectrophenax hyperboreus*; Matsuoka and Johnson 2008) and 80% of the population of the nominate subspecies of the Rock Sandpiper (*Calidris ptilocnemis ptilocnemis*; Ruthrauff et al. 2012). Despite the distinctiveness of their avifauna, since the end of the 19th century these remote and uninhabited islands have been visited by ornithologists infrequently, owing largely to their isolation. Winker et al. (2002) reviewed the avifaunal accounts from the sporadic and usually brief scientific visits to St. Matthew Island through the 20th century and provided an annotated list of the 125 bird species observed: 31 breeding, eight possibly breeding, and 86 passage migrants. They concluded that (p. 506) “we have yet to determine the complete breeding avifauna” and “have only scratched the surface of the subject of migrations.” Johnson et al. (2004) updated this list with 11 new species observed from late May to early July 2003 during their systematic line-transect surveys for breeding Rock Sandpipers and McKay's Buntings across St. Matthew and Hall islands (Matsuoka and Johnson 2008, Ruthrauff et al. 2012) and their study of McKay's Buntings nesting on St. Matthew Island (Johnson et al. 2013).

Here we add 13 species and four subspecies (including clarifications) to the avifaunal list for St. Matthew and Hall islands, provide new details and documentation of breeding for eight species, and discuss several other notable observations. We made these observations from 6 June to 7 July 2018 when we revisited both islands to replicate the aforementioned line-transect surveys

and nesting studies aimed at monitoring the global populations of McKay's Bunting and the nominate subspecies of the Rock Sandpiper and to collect bird specimens for the University of Alaska Museum. From 6 to 11 June, eight people conducted line-transect surveys regularly spaced across both islands (1.5 km and 0.5 km apart for St. Matthew and Hall islands, respectively). From 12 June to 7 July, five people remained on the northern end of St. Matthew Island near Bull Seal Point ("Camp 1983" in Johnson et al. 2013; Figure 2) to continue surveys and study the nesting of the buntings and sandpipers. Our nest searching and monitoring were concentrated within 3 km of camp (Figure 2), with only occasional forays beyond that (e.g., to North Lake). From 6 to 14 June, bird specimens were collected at three locations on St. Matthew Island and on Hall Island. In 2019, we returned to St. Matthew and Hall islands from 23 to 31 July to survey the islands by boat for the Pelagic Cormorant (*Phalacrocorax pelagicus*) and to assess the status of breeding of

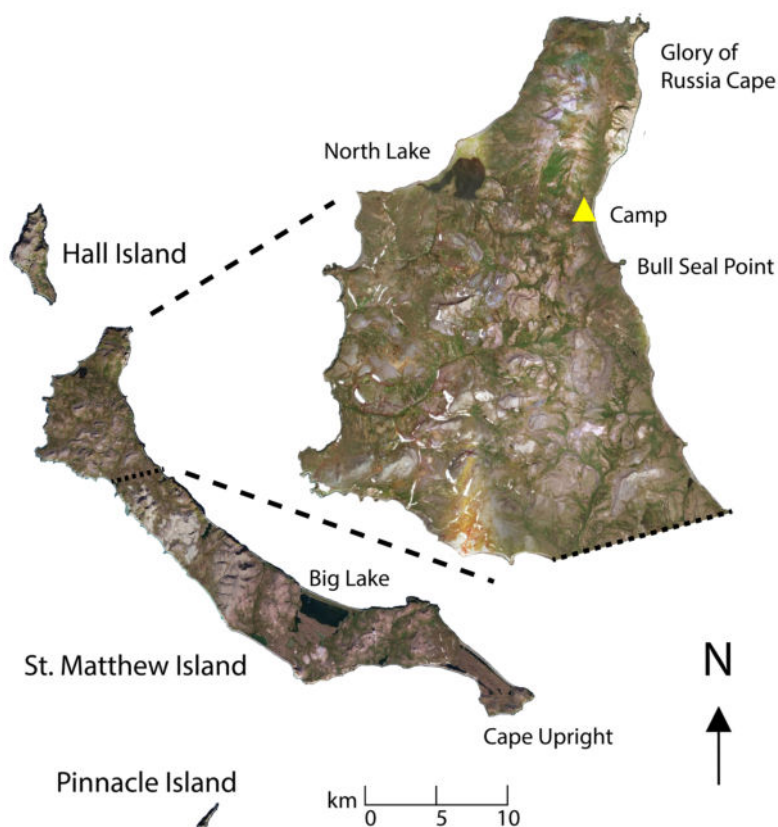


FIGURE 2. St. Matthew, Hall, and Pinnacle islands, showing the study area during our visit in 2018, and points of reference discussed in the text.

the Red-legged Kittiwake (*Rissa brevirostris*). With a three- or four-person crew, we circumnavigated all three islands of the St. Matthew Archipelago (St. Matthew, Hall, and Pinnacle) in a 4.9-m inflatable boat.

In the following accounts, subspecies nomenclature follows Gibson and Withrow (2015), and status and abundance terms follow Kessel and Gibson (1978). We list subspecies parenthetically in the absence of specimens when we identified them by photographs or inferred them from geographic range. We bracket species that we did not substantiate by photograph or specimen. We also revise some species' breeding status (informed by the North American Ornithological Atlas Committee's guidelines; www.bsc-eoc.org/norac/atlascodes.htm) if our observations expand on information in Winker et al. (2002) and Johnson et al. (2004). We provide references to substantiating materials whenever possible through specimens deposited at the University of Alaska Museum (UAM), in Fairbanks, Alaska, and photos deposited at Cornell University's Macaulay Library (ML; www.macaulaylibrary.org). Unpublished reports or field notes are on file at UAM, at the Alaska Resources and Information Services Library (ARLIS), and/or the responsible institution. Dates of observations were in 2018 unless noted otherwise.

SPECIES ACCOUNTS

Branta hutchinsii (leucopareia). Cackling Goose. New subspecies. Seven birds were seen on an inland marsh near Big Lake on 6 June (ML 107537951). Notes: The only reports of white-cheeked geese mentioned by Winker et al. (2002) were a flock of 20–30 birds in May and a flock of four in July, both in 1982. The subspecies was not noted, but in 1982 the population of *leucopareia* was only a few thousand birds (see Byrd 1998), although a single bird resembling *leucopareia* was reported from St. Paul Island that year (Gibson 1982). Since its recovery (see Mini et al. 2011), the Aleutian Cackling Goose has been observed annually on the Pribilof Islands, (e.g., Tobish 2014) and may have reached St. Lawrence Island as well (see photos in Lehman 2019). Both *B. h. taverneri* and *minima* nest as near as the Seward Peninsula and Yukon–Kuskokwim delta, respectively (Gibson and Kessel 1997, Gibson and Withrow 2015).

Cygnus columbianus (columbianus and bewickii). Tundra Swan. First confirmed nesting and new subspecies. Two nests of *C. c. columbianus*, one found on 7 June (UAM 43110) and the other on 17 June (ML 114828061), each with four eggs. On

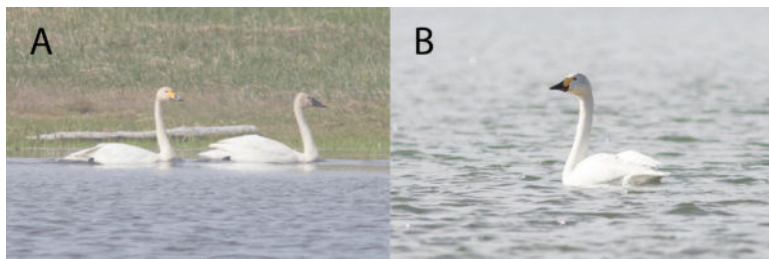


FIGURE 3. Mixed pair of Tundra Swans (A; *bewickii* left, *columbianus* right) observed 12 June 2018 at “North Lake,” and (B) a lone example of subspecies *bewickii* observed 6 June 2018 near “Big Lake,” St. Matthew Island, Bering Sea, Alaska.

12 June we also observed a mixed pair (breeding status unknown) comprising one *C. c. bewickii* and one *C. c. columbianus* (Figure 3A; ML 107541481), and on 6 June a swan with the bill approximately 30% yellow (Figure 3B; ML 154853691), an amount well within the description of *C. c. bewickii* (Evans and Sladen 1980). Throughout our stay on the island we observed multiple pairs and small groups of nominate *columbianus* daily, with a high count of 10 on 19 June. Notes: Almost all Tundra Swans observed in the eastern Aleutians, Pribilof Islands, St. Matthew Island, and St. Lawrence Island have been *C. c. columbianus* (see Preble and McAtee 1923, Gabrielson and Lincoln 1959, Fay and Cade 1959, Fay 1961, Winker et al. 2002). Birds with significant yellow in the bill, identified as *C. c. bewickii*, have been reported several times, usually in late May or early June, in the western and central Aleutians (Gibson and Withrow 2015, Tobish 2015a), the Pribilof Islands (Tobish 2006a, 2015a, b), at King Salmon (Tobish and Isleib 1992, Tobish 2015a), and at least once from St. Lawrence Island (Lehman 2019). Mixed pairs of *bewickii* and nominate *columbianus* have been observed in the northern part of the Chukotski Peninsula (Kondratiev 1991, Arkhipov et al. 2013), and the *C. c. columbianus* phenotype has apparently expanded west there recently (Syroechkovski 2002).

Anas acuta. Northern Pintail. First confirmed nesting. Nest with eight eggs on 6 June. Notes: Klein (1959) listed the species as breeding without providing details. The Northern Pintail nests in small or moderate numbers on St. Lawrence Island (Fay and Cade 1959, Lehman 2019) and the Pribilof Islands (S. Schuette, in litt., 2019).

Anas crecca (*crecca* and *carolinensis*). Green-winged Teal. First confirmed nesting. Two nests with nine eggs both found on the north end of the island, 17 June (ML 115708501) and 21 June. We were unable to determine the subspecies of either nesting female, but we found that among males *A. c. carolinensis* (nine individuals) outnumbered *A. c. crecca* (four). Notes: Nominate *crecca* predominates in the Pribilof Islands (e.g., Gabrielson and Lincoln 1959, DeCicco 2008; UAM unpublished data and specimens), where intergrades are seen regularly, and the species is known to breed (Preble and McAtee 1923). Subspecies *carolinensis* outnumbers *A. c. crecca* on St. Lawrence Island, where there is only one breeding record for the species (Lehman 2019).

Antigone canadensis canadensis. Sandhill Crane. First confirmed nesting. One nest with one egg found 16 June (ML115710441, ML115710451). We observed small numbers regularly throughout our time on the island, in pairs and in flocks numbering up to 17 individuals (Hall Island, 12 June). One specimen: UAM 41976, adult ♂, 12 June, Hall Island. Notes: The species is a regular migrant across the Bering Strait to and from Russia (Krapu and Brandt 2008), a regular spring migrant on the Pribilof Islands (S. Schuette, in litt., 2019), and breeds on St. Lawrence Island (Lehman 2019).

Pluvialis fulva. Pacific Golden-Plover. Probable breeder. A pair, the male in flight display, was seen on 6 June, and a single bird was heard on 7 June, all near Big Lake. A single bird was heard 11, 12, and 14 June, and a pair was seen on 16 and 19 June, all near North Lake. We observed the pair near North Lake behaving as if nesting, giving alarm calls and acting defensively toward a nearby Dunlin (*Calidris alpina*) and Western Sandpiper (*Calidris mauri*). Although we searched extensively throughout the area, we did not find a nest. Notes: The Pacific Golden-Plover breeds in western Alaska and Russia, and uncommonly on St. Lawrence Island (Lehman 2019) and Nunivak (Johnson et al. 2019). It is a common migrant on the Pribilof Islands (S. Schuette, in litt., 2019) and the Aleutians (Gibson and Byrd 2007).

Charadrius hiaticula (tundrae). Common Ringed Plover. Newly documented species. One female seen 11–12 June (ML107540781). Notes: In the absence of photo or specimen substantiation, Winker et al. (2002) treated several reports of single birds, as well as a report of a nest with two eggs, in June 1982 as hypothetical. The

species is a rare to uncommon spring migrant and breeder on St. Lawrence Island (Lehman 2019) and a casual fall migrant on the Pribilof Islands (S. Schuette, in litt., 2019). We regularly encountered Semipalmated Plovers (*C. semipalmatus*) exhibiting breeding behavior (UAM 41905–41909).

[*Bartramia longicauda*. Upland Sandpiper. New species. A single individual seen 16 June (BWR), but not photographed. Notes: Only one other accepted Bering Sea report, from St. Paul Island, 31 May 2002 (Tobish 2002), although there is an undocumented report of two birds from St. Lawrence Island (see Lehman 2019).]

[*Calidris canutus (roselaari)*. Red Knot. New species. A flock of four individuals seen in flight on 7 June (REG) but not photographed. Notes: The Red Knot is a casual spring migrant in the Aleutians and St. Lawrence Island (Kessel and Gibson 1978, Gibson and Byrd 2007) and a rare migrant on the Pribilof Islands (S. Schuette, in litt., 2019). Many thousands of this species stop over at the Yukon–Kuskokwim delta each spring (Gill and Handel 1990).]

Calidris alpina (pacifica). Dunlin. Probable breeder. We observed individuals on five days between 11 and 26 June (high count seven on 23 June). These included a pair copulating on 12 June and one performing distraction displays indicating brood defense on 23 June. Notes: From their plumage characteristics and range, we presume that these birds are *C. a. pacifica* rather than *C. a. arctica* (REG; P. Tomkovich, in litt., 2019). The Dunlin breeds on the Chukotski Peninsula and throughout western mainland Alaska south to the Alaska Peninsula (Warnock and Gill 1996). It is an uncommon spring and fall migrant on the Pribilof Islands (S. Schuette, in litt., 2019), and a common breeder on St. Lawrence Island, where the subspecies is uncertain, although *C. a. pacifica* is the most likely (Lehman 2019).

Calidris mauri. Western Sandpiper. First confirmed nesting. We observed individuals daily throughout our stay, with a high count of 20 and a nest with four eggs on 6 June. Five specimens (UAM 41901–41904) included females with collapsed follicles, birds with incubation patches, and a pair from Hall Island. Notes: Winker et al. (2002:498) described this species as an uncommon migrant and breeder, with “small numbers (<5) seen during most summers,” but saw no evidence of nesting beyond distraction displays. The species breeds in mainland western Alaska and at a few locations on the Chukotski Peninsula (Franks et al. 2014), breeds commonly on St. Lawrence Island (Lehman 2019), and is an uncommon spring and common fall migrant on the Pribilof Islands (S. Schuette, in litt., 2019).

Gallinago gallinago (gallinago). Common Snipe. Newly documented species. We observed one or two individuals winnowing 10–16, 21, and 24 June (ML 107539621). Notes: Winker et al. (2002) did not distinguish the Common and Wilson's snipe because neither species was substantiated by specimen. Although Johnson et al. (2004) did not mention it, both species were observed winnowing in 2003 (D. Ruthrauff, in litt., 2019).

[*Gallinago delicata*. Wilson's Snipe. New species. We observed multiple individuals (high count of three on 12 June) winnowing 7–12 June. Notes: Both *G. gallinago* and *G. delicata* reach the central Aleutians (Gibson and Byrd 2007), the Pribilof Islands as uncommon migrants with one record of successful breeding (*G. delicata*; S. Schuette, in litt., 2019), and St. Lawrence Island as rare migrants (Lehman 2019).]

Xenus cinereus. Terek Sandpiper. New species. A single individual seen 6 June (UAM 41702, adult ♀), and a single individual performing a flight display on 8 June. Notes: The Terek Sandpiper is casual or intermittent in the western Aleutians, in the Pribilof Islands, and at St. Lawrence Island (Kessel and Gibson 1978, Gibson and Byrd 2007, Lehman 2019).

Tringa nebularia. Common Greenshank. New species. A single individual seen 26

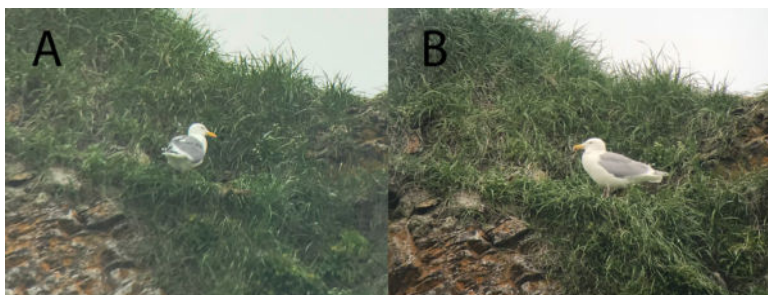


FIGURE 4. Mixed pair of gulls (A, *Larus argentatus vegae*; ML189498441) and (B, *L. glaucescens*; ML189497661) attending at least one nestling at Bull Seal Point, St. Matthew Island, Bering Sea, Alaska, 30 June–2 July 2018. This pair was observed together at the nest on one occasion, but we were unable to obtain a photograph.

June (ML 107547201, ML107547211). Notes: A rare spring migrant in the western Aleutians, in the Pribilof Islands, and at St. Lawrence Island (Kessel and Gibson 1978, Gibson and Byrd 2007).



FIGURE 5. Wings of *Larus hyperboreus* salvaged from St. Matthew Island in early June 2018. The left-most wing (UAM 41662), smaller and darker than the others, is likely an example of *L. h. barrovianus* and not *L. h. pallidissimus*, represented here from left to right by UAM 41658, 41660, and 41661.

Stercorarius parasiticus. Parasitic Jaeger. First confirmed nesting. We found a two-egg nest attended by a pair of light-morph birds on 6 June (UAM 41646, UAM 41647). Another pair, also of the light morph, defended a territory on 19 June, but we were unable to find a nest. Notes: "Pairs" of Parasitic Jaegers have been observed before on St. Matthew (DeGange and Sowls 1978), but they were not previously known to breed on the island (Winker et al. 2002). Parasitic Jaegers are regular and widespread breeders on the Yukon–Kuskokwim delta and Nunivak Island (e.g., Gabrielson and Lincoln 1959), and have bred at least once on St. Lawrence Island (Sauer and Urban 1964), where their breeding status is not well understood (Lehman 2019), but are not known to nest on the Pribilof Islands. Almost all birds breeding in the Aleutian Islands are of the dark morph (Gibson and Byrd 2007).

Rissa brevirostris. Red-legged Kittiwake. First confirmed breeding. We observed ~200 individuals occupying sea cliffs on the northwest side of St. Matthew Island on 19 June, 1, 4, and 6 July (at 60° 29' N, 173° 3' W; Robinson et al. 2019). Birds were seen in courtship displays, carrying nest materials, and nest building, indicative of at least attempted nesting. From 23 to 31 July 2019 we observed ~260 individuals attending cliffs in the same locations as observations in 2018, with ~100 nests containing small or medium-sized nestlings. Notes: Previously this species was considered casual or accidental during summer on St. Matthew (Winker et al. 2002). Nearly all of the world's Red-legged Kittiwakes breed at four main sites, the majority in the Pribilof Islands (Byrd et al. 1997). Only a few smaller colonies are known elsewhere (Gibson and Byrd 2007, Robinson et al. 2019).

Rhodostethia rosea. Ross's Gull. New species. One individual was on Hall Island on 9 June (UAM 41541, second-year ♂). Notes: Ross's Gulls are encountered regularly as fall migrants in the Chukchi and Beaufort seas (Divoky et al. 1988, Maftei et al. 2014), but their wintering areas are not well understood and they appear to be only very rare in Alaska south of the Bering Strait (e.g., Kenyon and Phillips 1965, Kessel and Gibson 1978, Tobish 1997, Gibson and Byrd 2007, Lehman 2019).

Larus gulls. New information. In July 1997 Winker et al (2002) found that nearly 50% of the large white-headed gulls on St. Matthew were Glaucous-winged (*Larus glaucescens*) and predicted their numbers would increase (Winker et al. 2002). In contrast, in 2018 we found Glaucous Gulls (*L. hyperboreus*) far outnumbering Glaucous-winged Gulls (e.g., high count of 11 Glaucous-winged with 50 Glaucous Gulls on 28 June). Of the 11 observable nesting pairs of *Larus* at Bull Seal Point 30 June–2 July, seven were of Glaucous Gulls, three were of Glaucous-winged Gulls, and one was a mixed pair, a Glaucous-winged with a Herring Gull (*L. argentatus vegae*; see below). In 1983, there were 19 Glaucous Gull and at least three Glaucous-winged Gull nests visible at Bull Seal Point (B. E. Lawhead, unpubl. data).

The mixed Glaucous-winged × Herring Gull pair was attending at least one downy young (Figure 4; ML189497661, ML189498441). Additional Herring Gulls (also presumed to be *vegae*) observed include an adult that "long-called" to a Glaucous Gull while both rested together on the ocean behind the R/V *Tigla* on 5 June, 9 km west of Cape Upright; an immature bird on Hall Island on 10 June (*L. a. vegae*, UAM 41648, 3rd cycle ♂); and adults on the north end of St. Matthew on 15, 19, 28, and 30 June, and 2–4 July (high counts of four on 30 June and 4 July). Subspecies *vegae* is a regular breeder on St. Lawrence Island (Fay and Cade 1959, Stephensen et al. 1998, Lehman 2019). Although *L. a. vegae* has been inferred to hybridize with the Glaucous-winged Gull on the basis of phenotypes of birds observed in Japan (*vide* Malling Olsen and Larsson 2003), we are unaware of any other documentation for such a pairing. A bird collected in the Pribilof Islands 5 August 1948 might be the product of such a pairing (USNM 396014; Kenyon and Phillips 1965), in part because the Pribilof Islands lie much farther west than the areas of substantial hybridization between the Glaucous-winged Gull and *L. a. smithsonianus*, in the northern Gulf

of Alaska (Williamson and Peyton 1963, Patten 1974, 1980, Patten and Weisbrod 1974, Patten and Patten 1976, 1983, DeCicco et al. 2017).

We tentatively interpret a salvaged Glaucous Gull wing that is darker and significantly smaller than the others to represent subspecies *barrovianus* (UAM 41662, inferred ♀ [wing chord 420 mm]), when compared with five salvaged wings (UAM 41658–41661) and one breeding pair (UAM 41663, 41664) of *L. h. pallidissimus* (see Malling Olsen and Larsson 2003; Figure 5).

Gavia arctica (viridigularis). Arctic Loon. Newly documented species. One seen offshore near Bull Seal Point 27–30 June (ML107548221). Notes: Winker et al. (2002) assessed *G. arctica* or *G. pacifica* (Pacific Loon) as rare in spring and summer. *Gavia arctica* is a rare migrant in the western and central Aleutians (Gibson and Byrd 2007), casual in the Pribilof Islands where most are observed in mid-June (e.g., Preble and McAttee 1923, Schuette, in litt., 2019), and uncommon in spring on St. Lawrence Island (Lehman 2019).

Pandion haliaetus (ssp.). Osprey. New species. One probable female observed intermittently 9–24 June (ML107539381). Our photographs are inadequate for subspecific identification (see, e.g., Strandberg 2013). Notes: Gibson and Byrd (2007) discussed as hypothetical a half-dozen reports of this species from the Aleutian Islands without substantiating specimen or photo. The Osprey is casual in the Pribilof Islands (e.g., Sladen 1966, Tobish 2015b) and at St. Lawrence Island (Gibson et al. 1987, Lehman 2019); it has occurred at least once on the Chukotski Peninsula (Arkhipov et al. 2013). The subspecies of these birds is unknown. Some, particularly from the western Aleutians and Chukotka, might represent nominate *haliaetus* (see Hartert 1920), but most others in the Bering Sea region are probably of North American origin since this long-distance migrant nests as close as the Yukon–Kuskokwim delta (Mindell 1983).

Haliaeetus leucocephalus. Bald Eagle. New species. A first-cycle bird was seen 6 June (ML 183399941). Notes: The Bald Eagle is rare in the Pribilof Islands (S. Schuette, in litt., 2019) and casual or accidental on St. Lawrence Island (Lehman 2019).

Sayornis saya yukonensis. Say's Phoebe. New species. One on Hall Island 10 June (UAM 41500, adult ♂?). Notes: The first Bering Sea record of this species was from St. Lawrence Island, 10 June 2005 (Lehman 2019), and there have been two fall records at St. Paul Island (Tobish 2006b, 2012).

Corvus corax principalis. Common Raven. Newly documented subspecies. Seen regularly throughout our stay on St. Matthew and Hall islands (high count of seven on 6 June). Notes: Hanna (1917) inferred that the ravens he observed were of this subspecies, but an adult female (UAM 41600, with incubation patch) collected on Hall Island on 13 June 2018 is the first specimen we are aware of. The comparatively small size of this bird (1250 g, wing chord 431 mm, bill length [nares to tip] 46.4 mm) indicates that St. Matthew Island ravens are not part of the large *kamtschaticus* from southwest Alaska and the Aleutian Islands (see Rea 1986). Ravens do not breed in the Pribilof Islands (Hanna 1917, Kenyon and Phillips 1965), where they are only intermittent visitors, but nest regularly at St. Lawrence Island (Fay and Cade 1959, Lehman 2019).

Phylloscopus examinandus. Kamchatka Leaf Warbler. New information. Three males taken on Hall Island, two on 9 June and one on 10 June, had sequences of cytochrome oxidase subunit 1 (CO1) matching this Old-World taxon (UAM 41639–41641; GenBank accession numbers MK659560–65960–65962; Alström et al. 2011). Sequencing was done by Life Scanner (Guelph, Ontario). Notes: Identification to species of Arctic Warblers (*sensu lato*) is difficult without specimens; the only previous specimen from St. Matthew is also *P. examinandus* (Withrow et al. 2016). There

is one spring report of a purported *P. examinandus* for St. Paul Island (S. Schuette, in litt., 2019), where *P. borealis* is the most common Old World warbler with some spring records in mid-June but most records in fall. At St. Lawrence Island, spring (generally early June) records of Arctic Warblers represent *P. borealis* (Lehman 2019).

Leucosticte tephrocotis umbrina. Gray-crowned Rosy-Finch. New information. We found rosy-finches to be common, with birds seen daily throughout our stay with daily high counts of 50+ on the southern third of Hall Island, 9–13 June, and 25 on northern St. Matthew Island on 14 June. This is consistent with the description of them as “common...in proper habitat...usually seen in groups,” during summer 1982 (B. E. Lawhead unpubl. data), but contrasts with the low numbers observed during other visits. For example, only one bird was seen by F. L. Beals (on 11 July), after nearly constant exploring since his arrival of 30 June 1944 (unpubl. notes available from Alaska Resources Library and Information Services, Anchorage); 27 birds total from 15 July to 9 August 1957 despite walking nearly the entire island (Klein 1959); five in 16 km, 22 July 1997 (K. Winker unpubl. data).

In a contemporary series of male rosy-finches collected from St. Paul (27 May–1 June 2018) and St. Matthew islands (6–9 June 2018), the St. Matthew birds are slightly longer winged and heavier, but females are similar in size and weight (Table 1). The St. Matthew Island birds approach the size of *L. t. “maxima”* from the Commander Islands (Ridgway 1901, Brooks 1915, Hellmayr 1938, Murie 1944, but cf. Vaurie 1956), a similarly isolated population, usually synonymized with *griseonucha* (Hellmayr 1938, Vaurie 1959). This conformance with Bergmann’s rule suggests that the St. Matthew breeding population may well be isolated from other rosy-finches.

There is evidence to suggest that St. Matthew rosy-finches are nonmigratory residents (cf. Winker et al. 2002). For instance, other populations of large gray-cheeked rosy-finches (subspecies *umbrina* or *griseonucha*) in the Bering Sea region are effectively nonmigratory, and neither is known north of St. Matthew and Nunivak islands, despite considerable ornithological work in surrounding areas. The apparently lower numbers of rosy-finches in winter on the Pribilof Islands (Preble and McAtee 1923) might reflect partial migration and/or dispersal, population attrition, flocking, and/or weather and observer bias. These low numbers suggest, at minimum, that the Pribilof Islands do not see a winter influx of birds from St. Matthew Island. Farther south, winter banding data from Cold Bay (Bailey 1974) suggests no influx of rosy-finches at that location either. We have seen no specimen of *umbrina* taken from beyond the Pribilof or St. Matthew islands, despite opportunities for such discovery. For example, a specimen of *L. t. littoralis* (UAM 2891) was taken from rosy-finches being banded at Adak Island in the central Aleutians in December 1974. The sole St. Lawrence Island record of this species is based on a June 1988 specimen of *L. t. tephrocotis* (Lehman 2019). We interpret the absence

TABLE 1 Wing Lengths and Masses of Gray-crowned Rosy-Finches Collected on St. Matthew and St. Paul Islands, Alaska, 27 May–1 June 2018^a

Sex	Variable	St. Matthew ^b	St. Paul ^c	P ^d
Male	Wing length	120.1 (116.0–124.6)	117.1 (112.3–122.9)	0.023
	Mass	47.1 (43.5–54.5)	44.1 (39.0–47.5)	0.008
Female	Wing length	111.1 (108.6–114.7)	110.8 (108.7–111.9)	0.763
	Mass	49.6 (47.0–57.0)	47.3 (43.0–50.5)	0.231

^aMeans of unflattened wing (mm) and mass (g), with ranges in parentheses, of UAM 41837–41876.

^bn = 14 males, 6 females.

^cn = 12 males, 8 females.

^dResults two-tailed *t*-tests between means with variances assumed to be equal.

of extralimital reports of *umbrina*, the lack of migration in other closely related populations, the distinct if slight geographic variation, and the apparent dramatic population fluctuations (possibly due to low winter survival of a small population occupying marginal winter habitat) as evidence that the population on St. Matthew Island is nonmigratory.

Plectrophenax nivalis. Snow Bunting. Newly documented species. On 4 July, one very worn female (ML 107598001) was foraging near a female McKay's Bunting, which on one occasion chased it away. We did not observe evidence of breeding. Although small numbers of Snow Buntings have been reported in previous years (Winker et al. 2002, Matsuoka and Johnson 2008), we are unaware of any other archived photos.

Zonotrichia atricapilla. Golden-crowned Sparrow. New species. A single individual was present 6 June (UAM 41638, adult ♂). Notes: This species is an intermittent spring and regular fall visitant in the Pribilof Islands (S. Schuette, in litt., 2019) and a casual spring and regular fall migrant on St. Lawrence Island (Lehman 2019).

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WINTER POPULATIONS OF WAXWINGS IN IDAHO

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ABSTRACT: I explored the winter distributions of the Cedar Waxwing (*Bombycilla cedrorum*) and Bohemian Waxwing (*B. garrulus*) in Idaho by means of the results of Christmas Bird Counts from 1980 to 2016. In northern Idaho the Bohemian was significantly more abundant, but in southern Idaho its numbers declined significantly, as the frequency of large-scale irruptions dropped. Annual variability in the Bohemian Waxwing was significantly greater than that of the Cedar in both regions of Idaho. In neither species was variation in the two regions correlated. In southern Idaho numbers of the Cedar Waxwing decreased with elevation while that of the Bohemian increased. Both species were more numerous in count circles that include mountain slopes than in those consisting of valley floors only, a preference stronger in the Cedar Waxwing than in the Bohemian. A positive correlation between the Cedar Waxwing's abundance and the size of the human population in southern Idaho suggests an effect of ornamental plants. In neither species in neither region did I find a correlation between the birds' abundance and mean temperature in November or December. Limited data on the annual variability in the production of wild fruit in northern Idaho showed no significant correlations with waxwing numbers in that region.

The Cedar Waxwing (*Bombycilla cedrorum*) and Bohemian Waxwing (*B. garrulus*) often form large nomadic flocks in winter. They are highly variable in numbers and occurrence from year to year, lacking philopatry (Witmer 2002, Witmer et al. 2014). This nomadic behavior is tied to their winter diet, which consists almost exclusively of sugary fruits. Waxwings search over wide areas for such fruits, and large flocks can deplete them quickly (Witmer 2002, Witmer et al. 2014).

Waxwings' winter demographics, interspecific interactions, and relations to fruit availability are poorly understood. Witmer (2002) and Witmer et al. (2014) recommended studies to clarify the demographics of annual variation, how wintering Bohemian and Cedar Waxwings interact and influence one another, and their response to food on large geographic scales. The effects of climate and elevation on wintering waxwings are unstudied.

The winter population dynamics and trends of the waxwings in Idaho are unknown. Larrison et al. (1967:171–172) considered both species highly variable in winter in southern Idaho. Statewide, Burleigh (1972:312–315) considered them unpredictable or irregular.

To clarify the status and ecology of wintering waxwings in Idaho, I examined Christmas Bird Count (CBC) data and other data. Specifically, I addressed the following questions:

Were there significant upward or downward population trends in either species in Idaho from 1980 to 2016?

Was one species consistently more abundant or more variable from year to year than the other?

Were annual variations in the two species' numbers correlated at a statewide or local scale?

Were the Cedar and Bohemian Waxwings' winter distribution influenced by elevation or topography?

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Did early winter temperatures affect the abundance of waxwings?
Did fruit productivity or availability influence the waxwings' abundance?

METHODS

Study Area

I analyzed CBC data from 11 circles in southern Idaho and 6 in northern Idaho (Figure 1). Only one circle in central Idaho, the Salmon CBC, was covered during the interval encompassed by my study. It was limited in number of years and level of participation, so I excluded it from analysis. I ascertained the elevation of each circle's center point (Table 1). In southern Idaho, the Snake River Plains gradually rise from west to east, so the CBC circles in

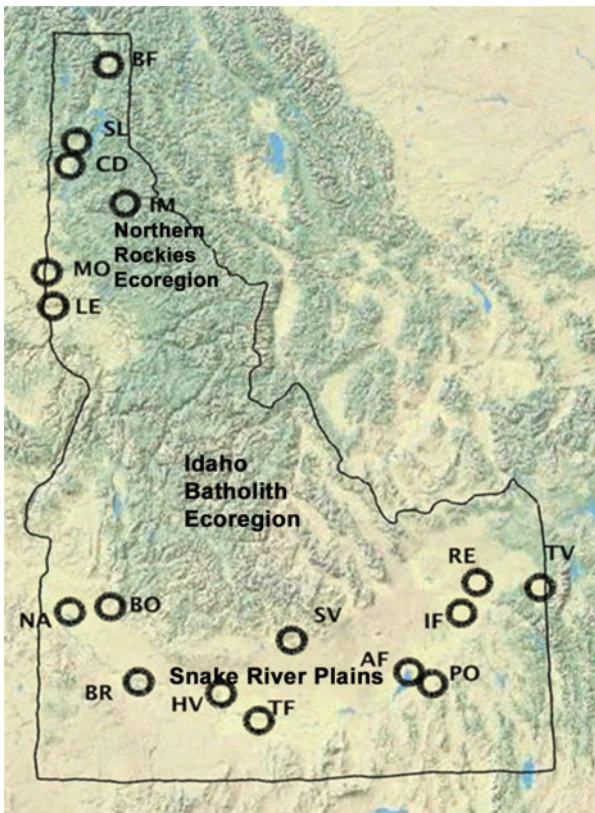


FIGURE 1. Christmas Bird Count circles serving as the basis for analysis of the distribution of the waxwings in Idaho. BF, Bonner's Ferry; SL, Spirit Lake; CD, Coeur d'Alene; IM, Indian Mountain; MO, Moscow; LE, Lewiston; NA, Nampa; BO, Boise; BR, Bruneau; HV, Hagerman Valley; TF, Twin Falls; SV, Sun Valley; AF, American Falls; PO, Pocatello; IF, Idaho Falls; RE, Rexburg; TV, Tetons Valley.

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TABLE 1 Idaho Christmas Bird Counts' Center Points and Their Elevations

Count	Latitude (° N)	Longitude (° W)	Elevation (m)
Southern Idaho			
Nampa	43.568	116.673	770
Bruneau	42.925	115.858	780
Boise	43.618	116.200	830
Hagerman Valley	42.817	114.900	900
Twin Falls	42.557	114.463	1140
American Falls	42.983	112.700	1350
Pocatello	42.868	112.430	1360
Idaho Falls	43.517	112.060	1430
Rexburg	43.797	111.858	1480
Sun Valley	43.308	114.067	1810
Teton Valley	43.723	111.111	1860
Northern Idaho			
Lewiston	46.414	116.952	320
Bonner's Ferry	48.699	116.318	580
Coeur d'Alene	47.738	116.788	670
Spirit Lake	47.966	116.708	720
Moscow-Pullman	46.731	117.040	790
Indian Mountain	47.383	116.083	1160

this region range in average elevation from 767 m at Nampa in the west to 1830 m at Teton in the east. Northern Idaho circles were generally lower in elevation, ranging from 310 m at Lewiston to 1160 m at Indian Mountain.

The counts in southern Idaho were primarily in the Snake River Plains ecoregion, although the Sun Valley count borders the Idaho batholith ecoregion (EPA 2018). Formerly, the vegetation of southern Idaho was dominated by sagebrush (*Artemisia tridentata*) and grass with strings of riparian cottonwood (*Populus* spp.) and willow (*Salix* spp.) on the Snake River Plains (Tisdale 1986). Much of this native sagebrush has been replaced by either farmland or by exotic species, particularly cheat grass (*Bromus tectorum*) (Dixon and Johnson 1999). Mountain slopes in southern Idaho count circles are vegetated with belts of Utah juniper (*Juniperus osteosperma*), patches of coniferous forest, primarily of Douglas fir (*Pseudotsuga menziesii*), and shrubs. The mountain shrub community includes many fruit-bearing species such as snowberry (*Symphoricarpos* spp.), currant (*Ribes* spp.), buckbrush (*Ceanothus* spp.), serviceberry (*Amelanchier alnifolia*), elderberry (*Sambucus* spp.), bitter cherry (*Prunus emarginata*), mountain ash (*Sorbus* spp.), and chokecherry (*Prunus virginiana*) (Tisdale 1986).

Northern Idaho circles lie primarily in the Northern Rockies ecoregion (EPA 2018), consisting of low mountains forested with conifers including Douglas fir, ponderosa pine (*Pinus ponderosa*), western white pine (*P. monticola*), western hemlock (*Tsuga heterophylla*), grand fir (*Abies grandis*), and western red-cedar (*Thuja plicata*) (Tisdale 1986, EPA 2018). The native vegetation also includes mountain shrub communities and cottonwood/willow riparian forests. The Lewiston count circle lies completely within, and the Moscow-Pullman circle borders, the Columbia Plateau (EPA 2018), whose

vegetation resembles that of the Snake River Plains. Because of the ecological and physiographic differences between northern and southern Idaho, I considered them separately for most analyses.

Analyses

I used the number of birds per party-hour as the basis for my analyses. Factors confounding analysis of trends on the basis of CBC data (Sauer and Link 2002) include unique habitats, hard-to-detect species, and increasing count effort. But the waxwings are not hard to detect, and this study did not include unique habitats. The increase in count effort over time was only moderate. The average number of party-hours on the nine southern Idaho CBCs combined was 42 in the 1980s, 40 in the 1990s, 49 in the 2000s, and 50 in the 2010s.

For most analyses, I used data from nine CBCs in southern Idaho that were done consistently and generally had at least 30 party-hours per count. In considering the effects of elevation and the size of the human population in southern Idaho I also included the Bruneau and Teton circles, where counts were run from 1994 to 2016. Consistent data from the six northern Idaho circles are available only from 1999 onward, so I compared the two regions from 1999 to 2016.

I evaluated trends and annual variability on the basis of birds per party-hour in each count circle and over all circles in each region combined. For each region, I summed the number of birds per party-hour for each year and divided by the total number of counts. I also assessed the frequency of each species on the basis of its presence or absence on each count for each year.

To assess differences between the two species in the number of birds per party-hour I used *t* tests. To assess whether there was a change in waxwing populations over time I analyzed the correlation between the combined CBCs' mean number of birds per party-hour and the year.

To examine whether either waxwing species preferred foothill/mountain landscapes or valley floors, I compared the number of birds per party-hour on two pairs of nearly adjacent counts, Nampa–Boise and American Falls–Pocatello, where one circle covers valley floor only and the other includes foothills or mountain slopes. For each year, I scored the circle with the greater number of birds per hour as positive, then tallied the scores for each circle and analyzed the results by a chi-squared test.

To assess whether the waxwings' abundance was influenced by elevation in each region, I analyzed the correlation between each CBC's mean number of birds per party-hour and its elevation.

To examine whether the two species' abundances were correlated on an annual basis I compared the number of birds per party hour by year for southern and northern Idaho separately.

I investigated correlations between November and December mean temperatures and the waxwings' abundance on the basis of data from the National Oceanic and Atmospheric Administration at <http://w2.weather.gov/climate/>. Because mean monthly temperatures within each region are closely correlated, I used the monthly values of Boise to represent all of southern Idaho and those of Coeur d'Alene to represent northern Idaho.

On the basis of long-term annual monitoring, Kasworm et al. (2017)

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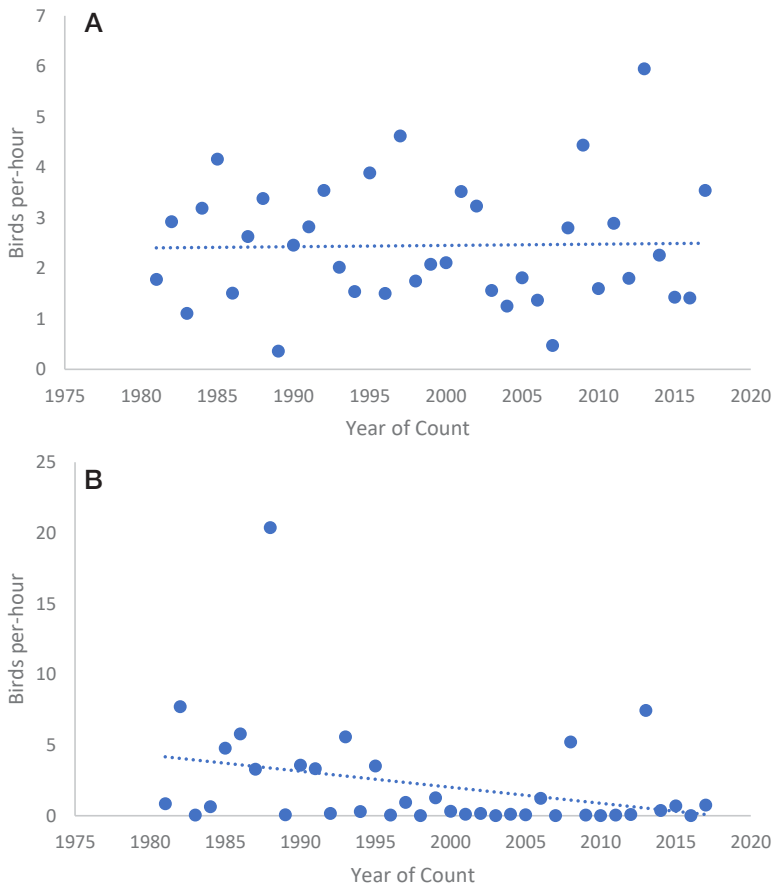


FIGURE 2. Number of waxwings recorded per party-hour on nine combined Christmas Bird Counts in southern Idaho from 1980 to 2016. A, Cedar ($r = -0.02$); B, Bohemian ($r = -0.32$).

reported indices of berry productivity of three important wild shrub species in the Cabinet and Yaak mountains of northern Idaho and adjacent Montana. They classified their productivity per year as low, medium, or high. I tested by ANOVA the association between birds per party-hour and the annual berry productivity of each wild shrub. Waxwings are also attracted to the fruits of ornamental trees and shrubs in suburban areas (Witmer 2002, Witmer et al. 2014). In Idaho these include the Russian olive (*Elaeagnus angustifolia*) (Larrison et al. 1967, Burleigh 1972). Assuming that the number of ornamental shrubs in a CBC circle should be correlated with the circle's human population, I tested for a correlation between waxwing abundance and population size by means of Spearman's rank correlation. To quantify each circle's human population I summed the populations of hamlets and

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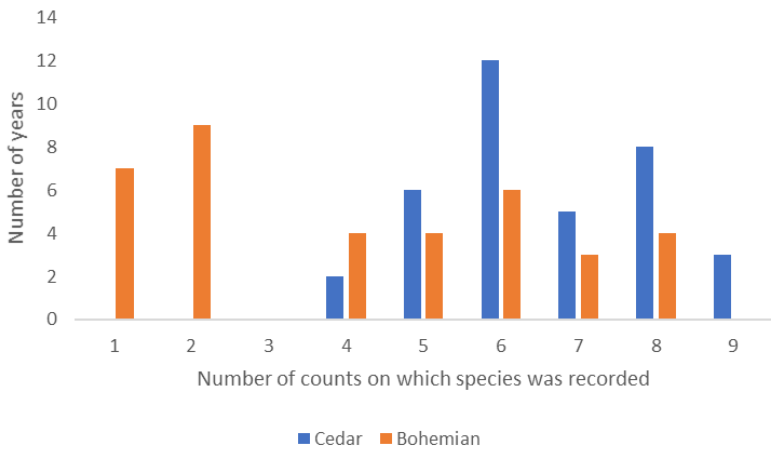


FIGURE 3. Frequency of occurrence of the Cedar and Bohemian Waxwings by number of count circles among nine Christmas Bird Counts in southern Idaho from 1980 to 2016.

towns within it (data extracted from www.factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml?src=bkmk in 2018).

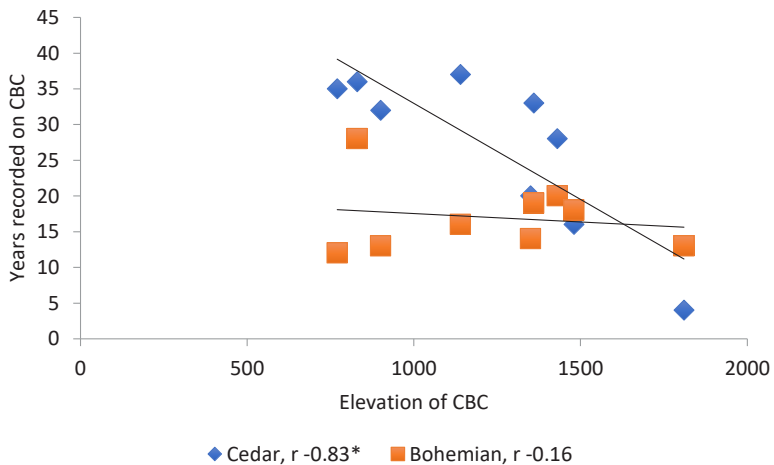


FIGURE 4. Frequency of occurrence of the Cedar and Bohemian Waxwings by elevation among nine Christmas Bird Counts in southern Idaho from 1980 to 2016. Blue diamonds, Cedar ($r = -0.83$); orange squares, Bohemian ($r = -0.16$).

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TABLE 2 Number of Waxwings per Party-Hour on Nine Southern Idaho Christmas Bird Counts, 1980–2016

Count	Range		Mean		Standard deviation		Standard deviation percent of mean	
	Cedar	Bohemian	Cedar	Bohemian	Cedar	Bohemian	Cedar	Bohemian
Nampa	0–15.73	0–0.92	3.08	0.10	2.83	0.23	92	230
Boise	0.2–3.73	0–20.06	5.90	1.39	5.19	3.91	88	281
Hagerman Valley	0–9.54	0–4.17	2.16	0.34	2.16	0.83	100	244
Twin Falls	0.20–18.31	0–13.22	4.87	0.86	4.21	2.65	86	308
American Falls	0–12.15	0–45.50	1.23	5.21	2.73	12.37	222	237
Pocatello	0–11.35	0–60.58	2.35	4.71	2.87	12.55	122	266
Rexburg	0–4.00	0–36.50	0.50	3.42	1.01	8.16	202	239
Idaho Falls	0–8.87	0–53.53	1.93	2.74	3.66	9.11	190	332
Sun Valley	0–1.11	0–6.21	0.04	0.41	0.18	1.42	450	346
All combined	0.36–5.95	0.01–20.38	2.45	2.13	1.22	3.84	50	180

RESULTS

Abundance and Long-term Trends

In southern Idaho, on the basis of the means for nine circles from 1980 to 2016 combined and summed (Table 2), the abundance of the Cedar Waxwing (mean birds per party-hour = 2.45) and Bohemian Waxwing (mean = 2.13) were similar, not differing significantly ($P = 0.76$). The annual mean was higher for the Cedar than for the Bohemian in 27 of 37 years. In northern Idaho the Cedar appeared less abundant (mean birds per party-hour = 0.79) than the Bohemian (2.60 birds per party-hour) (Table 3). This difference was not quite significant statistically ($P = 0.09$), but when the comparison was restricted to the five higher-elevation circles in northern Idaho (the outlying low-elevation Lewiston CBC excluded), the difference was significant ($P = 0.05$). The annual mean for the six northern circles summed was higher for the Bohemian Waxwing in 16 of 18 years.

In southern Idaho, numbers of the Cedar Waxwing showed no trend

TABLE 3 Number of Waxwings per Party-Hour on Six Northern Idaho Christmas Bird Counts, 1996–2016

Count	Range		Mean		Standard deviation		Standard deviation percent of mean	
	Cedar	Bohemian	Cedar	Bohemian	Cedar	Bohemian	Cedar	Bohemian
Lewiston	0–2.76	0–0.18	0.8	0.02	0.8	0.02	114	274
Bonner's Ferry	0–1.08	0–13.33	0.11	3.71	0.26	4.21	241	113
Coeur d'Alene	0–1.15	0–7.30	0.28	1.69	0.38	1.84	137	113
Spirit Lake	0–0.56	0–10.89	0.08	1.34	0.15	2.56	200	192
Moscow	0.13–4.46	0–28.95	0.163	6.47	1.21	8.78	75	136
Indian Mountain	0–8.39	0–8.76	1.82	2.20	2.43	2.82	134	128
All combined	0.05–1.71	0.81–8.49	0.79	2.60	0.56	1.88	71	72

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from 1980 to 2016 ($r = -0.02$, $P = 0.89$), but those of the Bohemian declined significantly ($r = -0.32$, $P = 0.05$) (Figure 2). In northern Idaho, neither the Cedar ($r = 0.59$, $P = 0.21$) nor the Bohemian ($r = -0.09$, $P = 0.59$) showed a significant population trend from 1999 to 2016.

Annual Variability

In both species variability from year to year was high. In southern Idaho the Bohemian Waxwing was far more variable than the Cedar Waxwing in data for all nine circles combined and on almost all individual counts. For the Bohemian, the standard deviation divided by the mean for all nine circles combined was 3.6 times greater than for the Cedar (Table 2). It was higher, usually considerably so, in all individual circles except for the outlying Sun Valley CBC. In both regions, large irruptions were much more likely in the Bohemian than in the Cedar. In southern Idaho, data from all nine circles combined, the number of birds per party-hour of the Cedar Waxwing exceeded 5 in only a single year and reached a maximum of only 5.95, while that of the Bohemian Waxwing exceeded 5 in 6 years and reached a maximum of 20.38 (Table 2). Similarly, numbers of the Bohemian in southern Idaho were much more likely to swing low. For the Cedar Waxwing, the lowest number of birds per party-hour for the nine combined counts was 0.36, whereas for the Bohemian Waxwing it was 0.01 (Table 2). In 12 of the 37 years the number for the Bohemian was less than 0.10.

Spatially, the Cedar Waxwing was more consistent as well, always being recorded on at least four of the nine southern Idaho counts and occasionally on all nine (Figure 3). In contrast, the Bohemian most frequently occurred on only one or two counts, never on all nine (Figure 3). The Cedar occurred more frequently than the Bohemian except in the two circles highest in elevation (Figure 4). The mean number of years that a southern Idaho count recorded the Cedar Waxwing was 26.7 out of 37, almost 10 more than the Bohemian (mean 17.0 years). Even in irruption years counts often missed the Bohemian Waxwing.

The waxwings' levels of annual variability on the six northern Idaho counts resembled those in southern Idaho (Table 3). In most years both species occurred on three to five of the six counts (Figure 5). In northern Idaho the variability in abundance and frequency of occurrence the two species was very similar. The Bohemian Waxwing occurred in larger numbers overall on all counts except for Lewiston and on all counts combined, and only it experienced large-scale irruptions.

Variation by Elevation

On the nine southern Idaho counts with data from 1980 to 2016 ($r = -0.74$, $P = 0.014$), as well as on the 11 with data from 1994 to 2016 ($r = -0.85$, $P = 0.001$), there was a significant negative correlation between the mean number of Cedar Waxwings per party-hour and elevation. On an annual basis, this correlation with elevation was negative in every year from 1994 to 2016, significantly so in 10 years. There was also a significant negative correlation ($r = -0.83$, $P = 0.006$) between the frequency Cedar Waxwings were recorded on a CBC and the circle's elevation in southern Idaho (Figure 4). Cedar Waxwings

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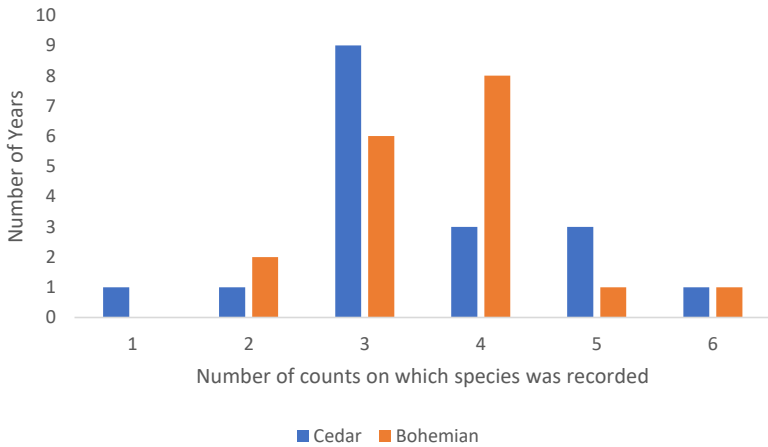


FIGURE 5. Frequency of occurrence of the Cedar and Bohemian Waxwings by number of count circles among six Christmas Bird Counts in northern Idaho from 1999 to 2016.

were recorded annually at Twin Falls and almost annually on the three other lowest counts but were infrequent on the two counts at highest elevations.

Conversely, numbers of the Bohemian Waxwing in southern Idaho tended to increase with elevation. This correlation was not significant for the nine counts combined from 1980 to 2016 ($r = 0.38$, $P = 0.36$) but was for the 11 combined from 1994 to 2016 ($r = 0.67$, $P = 0.02$). On an annual basis, the Bohemian Waxwing's correlation with elevation was positive in 21 of 23 years but significantly so in only two years. The number of years that Bohemian Waxwings occurred on a count and the elevation of the count circle showed a no correlation ($r = -0.16$, $P = 0.67$) (Figure 4).

The more limited northern Idaho data revealed no significant correlations between elevation and abundance of either the Cedar ($r = 0.59$, $P = 0.21$) or the Bohemian ($r = -0.09$, $P = 0.53$). Neither was there a significant correlation in either species between frequency of occurrence in a given year and elevation in northern Idaho (Cedar, $r = 0.05$, $P = 0.92$; Bohemian, $r = 0.58$, $P = 0.23$).

Correlations between Species and Regions

Numbers of the Cedar and Bohemian Waxwings were moderately significantly correlated ($r = 0.33$, $P = 0.04$) on the nine southern Idaho CBCs combined, but there was no such correlation ($r = 0.06$, $P = 0.49$) on the six northern Idaho counts. In neither waxwing species were numbers on the combined southern counts in a given year correlated with those on the six northern counts (Cedar, $r = 0.17$, $P = 0.48$; Bohemian, $r = 0.03$, $P = 0.89$).

Correlations with Topography

The Boise–Nampa and the Pocatello–American Falls CBCs are two pairs of nearby circles (Figure 1). The Boise and Pocatello circles are centered near the

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bases of mountains and include mountains, while the Nampa and American Falls circles are in the middle of the Snake River Plains and lack significant hills or mountains. The number of Bohemian Waxwings per party-hour on a count was significantly more likely to be higher in the Boise circle than in the Nampa circle ($P = 0.001$), but there was no difference between the Pocatello and American Falls circles ($P = 0.26$). But the number of Cedar Waxwings was significantly more likely to be higher in a given year in both circles with mountain slopes (Boise vs. Nampa, $P = 0.025$; Pocatello vs. American Falls, $P = 0.001$).

Correlations between November and December Temperatures and Waxwing Abundance

In southern Idaho I found no correlation between mean November temperature and number of birds per party-hour for either species (Cedar, $r = 0.21$, $P = 0.22$; Bohemian, $r = 0.03$, $P = 0.83$) or between mean December temperature and waxwing abundance (Cedar $r = 0.03$, $P = 0.89$; Bohemian $r = -0.07$, $P = 0.66$). For neither species was there any such correlation between northern Idaho temperatures in November (Cedar, $r = 0.20$, $P = 0.23$; Bohemian, $r = 0.03$, $P = 0.84$) or December (Cedar, $r = -0.22$, $P = 0.20$; Bohemian, $r = -0.16$, $P = 0.35$) and abundances in southern Idaho. For neither species was there a correlation between mean northern Idaho temperature in November (Cedar, $r = 0.06$, $P = 0.83$; Bohemian, $r = 0.31$, $P = 0.23$) or December (Cedar, $r = -0.11$, $P = 0.67$; Bohemian, $r = -0.13$, $P = 0.83$) with waxwing abundance in northern Idaho.

Correlation between Abundance of Waxwings and Production of Wild Fruit in Northern Idaho

On the basis of results from the six northern Idaho CBCs from 1999 to 2016 combined, I found no significant correlation between the abundance of either waxwing species and productivity of fruits of *Amelanchier* (Cedar, $P = 0.74$; Bohemian, $P = 0.43$), *Sorbus* (Cedar, $P = 0.11$; Bohemian, $P = 0.23$) or *Vaccinium* (Cedar, $P = 0.76$; Bohemian, $P = 0.42$).

Correlation between Human Population of a CBC Circle and Waxwing Abundance

When I compared the human population in the southern Idaho CBC circles with waxwing abundance, I found a barely significant positive correlation ($r = 0.62$, $P = 0.05$) for the Cedar Waxwing when the comparison was based on nine circles from 1980 to 2016, but not when it was based on 11 circles from 1994 to 2016 ($r = 0.25$, $P = 0.76$). Abundance of the Bohemian Waxwing in southern Idaho was not correlated with human population in either comparison (1980–2016, $r = -0.18$, $P = 0.33$; 1994–2016, $r = -0.11$, $P > 0.50$).

DISCUSSION

The great variability in numbers of waxwings and the limited sampling of the CBC impede understanding of these species' distributions, but some clear patterns emerged from these long-term data. Since 1980, numbers of the Bohemian Waxwing in southern Idaho have declined significantly. This

decline is consistent with Niven et al. (2004) finding a negative trend in CBCs in the Great Basin region from 1965 to 2003. In contrast, Contreras (1997:203–204) reported a modest positive trend from all of Idaho CBCs from 1959 to 1988. This disparity reflects a decrease in the frequency of invasions of the Bohemian Waxwing into southern Idaho in recent decades. The mean number of Bohemian Waxwings per party-hour for the nine southern Idaho circles combined exceeded 3 in 9 of the 15 years from 1980 to 1994 but in only 2 of the 22 years from 1995 to 2016.

Variation in the Bohemian Waxwing is clearly much greater than that in the Cedar. In southern Idaho, the Bohemian swings from nearly complete absence in some years to infrequent massive irruptions. In contrast, occurrence of the Cedar is more consistent and its peaks are modest. The Cedar Waxwing breeds throughout southern Idaho, so if some birds remain year round they may partially mask the variability in winter visitors. The Bohemian Waxwing breeds only rarely in extreme northern Idaho (Taylor 1918, Larrison et al. 1967:171–172, Burleigh 1972:312–315, Stephens and Sturts 1991). Though the statuses of the two species in northern Idaho are more similar, the Bohemian is the more abundant and more likely to occur in massive numbers. The overall pattern is that Bohemian Waxwings winter consistently in the coniferous-forest region of northern Idaho and invade the Snake River Plains in large numbers only sporadically, while Cedar Waxwings winter consistently throughout the state.

In southern Idaho, the two species' responses to elevation were opposite, numbers of the Bohemian Waxwing moderately increasing with elevation and those of the Cedar sharply decreasing. Comparison of maps of wintering waxwings at www.eBird.org supports this general pattern of the Cedar Waxwing being much more frequent in the western part and along the southern edge of the Snake River Plains and the Bohemian being more frequent on the higher eastern plains and in the mountains. The Bohemian Waxwing is 3/4 larger by mass than the Cedar and breeds farther north so may be better adapted to colder temperatures.

The moderate but significant correlation in southern Idaho between the two species' annual abundance suggests that both species could be responding to some similar environmental factors. But in northern Idaho there was no such correlation. The complete lack of correlation between northern and southern Idaho in annual abundance of either species implies that their movements in the two regions are independent of one another.

The greatest mean abundance of the Cedar Waxwing on any southern Idaho CBC was at Twin Falls, which is located completely within the Snake River Plains. This contradicts the finding of this species preferring mountain slopes. However, the Twin Falls circle includes the Snake River Canyon, whose slopes are clothed with fruit-bearing shrubs such as *Ribes* (pers. obs.). The mountain slopes of southern Idaho have more native fruit-bearing plants than do the Snake River Plains, and waxwings may associate slopes with food sources.

The limited data on variation in berry productivity in northern Idaho revealed no significant trend with either waxwing species. More long-term data on fruit productivity from more regions is needed to clarify how waxwings response to this variable food source. The positive correlation of the Cedar

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Waxwing with human population on nine southern Idaho counts suggests the birds' attraction to ornamental fruit-bearing shrubs and trees affects their distribution on a broad scale. The lack of correlation in the more recent data for the 11 southern Idaho counts may reflect the widespread expansion of the Russian olive along the Snake River (Dixon and Johnson 1999), including the sparsely populated Bruneau, Hagerman, and American Falls CBC circles (pers. obs.), where waxwings are known to concentrate (Larrison et al. 1967, Burleigh 1972, Taylor et al. 1999).

More CBCs are being established in central Idaho and at higher elevations, so future analysis of Idaho CBC data should clarify the population dynamics of wintering waxwings further.

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***HIRUNDO RUSTICA RUSTICA* AT HERSCHEL ISLAND–QIKIQTARUK, YUKON— A BARN SWALLOW SUBSPECIES NEW TO CANADA**

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ABSTRACT: At least three of the 19 Barn Swallows recorded on Herschel Island–Qikiqtaruk, along the Arctic coast of the Yukon Territory, represent the white-bellied Old World subspecies *Hirundo rustica rustica*. The birds were photographed on 3 July 2010, 24 July 2015, and 19–20 June 2019. These first Canadian records are complemented by five from northern Alaska, west to Utqiagvik (Barrow). This subspecies breeds in Europe, Africa, and northwestern Asia, east to the Yenisei River. The lack of Alaska records of *H. r. rustica* to the west of Utqiagvik and of Canadian records east of Qikiqtaruk suggest that these vagrants reached the New World not by orienting or drifting at the wrong angle but by overshooting their normal spring migration path, following a nearly polar great-circle route.

Extralimital birds can reveal unexpected connections among disparate places, they can challenge presumptions as to how birds move around the globe, and they can signal wide-scale ecological change. Herschel Island–Qikiqtaruk (69.6° N, 139.1° W), a Yukon territorial park of 116 km² located 5 km off the Yukon's Arctic coast, in northwestern Canada, has been a site for many extralimital birds over the years (Sinclair et al. 2003, Cooley et al. 2012, Burn 2012). Here we report on occurrences of the Barn Swallow (*Hirundo rustica*) at Qikiqtaruk, including Canada's first records of nominate *H. r. rustica*.

Up to eight subspecies of the Barn Swallow are recognized (Dickinson and Christidis 2014), of which three are known from northwestern North America: *H. r. erythrogaster* (breeds North and South America), *H. r. rustica* (Europe), and *H. r. gutturalis* (Asia). These subspecies can be distinguished by the shape and color of the throat patch, ventral plumage color, breast-band width, and tail length (Turner and Rose 1989, Turner 2006, Robinson and DeCicco 2017, Brown and Brown 2019). Nominate *rustica* is white below, has a broad dark blue-black and generally unbroken breast band (which can variably show some rufous feathers), a relatively longer tail, and a more restricted rufous throat patch; *H. r. erythrogaster* is rufous below, has a narrower breast band restricted to the sides of the breast with a broad wash of rufous in the middle, a more extended rufous throat patch, and is shorter tailed; *H. r. gutturalis* appears somewhat intermediate but is usually notably paler below than *H. r. erythrogaster*. Extralimital individuals intermediate in features might not be identifiable to subspecies, and rufous-bellied birds are generally assumed to be *erythrogaster*. Genetic analyses have shown *erythrogaster* and *gutturalis* to be closely related, while nominate *rustica* is more distant genetically and was considered a distinct species by Turner (2006) and Zink et al. (2006). In identifying Barn Swallows at Qikiqtaruk we referred to the primary identification references (Turner and Rose 1989, Turner 2006, Robinson and DeCicco 2017,

Brown and Brown 2019), as well as to the extensive catalog of georeferenced photos available through the Macaulay Library (<https://eBird.org>).

The Asiatic subspecies *gutturalis* occurs casually in coastal western Alaska (Kessel and Gibson 1978, Gibson and Withrow 2015, Lehman 2019) and bred at Nome in 2016 (Robinson and DeCicco 2017). There are no definitive records of *H. r. gutturalis* in northern Alaska, where *H. r. rustica* has been documented by two specimen records and two photographic records at Utqiagvik (Barrow), and one photographic record at the Colville River delta (Kessel and Gibson 1978, Gibson and Withrow 2015, Robinson and DeCicco 2017, <https://eBird.org>).

BARN SWALLOWS AT QIKIQTARUK

The Barn Swallow is a rare but regular wanderer to the Beaufort Sea region with records across the Yukon's north slope. Nesting has been confirmed at Clarence Lagoon (Johnson and Herter 1989, Sinclair et al. 2003). At Qikiqtaruk the species is a casual visitor with 19 records, of which six represent the American subspecies *erythrogaster*, two were confirmed to be of *H. r. rustica*, and one was suggestive of *H. r. rustica* (Table 1). In May 2015, Eckert exam-

TABLE 1 Records of the Barn Swallow at Herschel Island–Qikiqtaruk Territorial Park

Date	Subspecies ^a	Documentation	Observers	Source ^b
14 July 1987	unknown	sight record	D. Canning	S12050890
19 July 1996	unknown	sight record	C. Gordon, A. Tardiff	S60870391
15 July 1998	unknown	sight record	C. Gordon	S60870440
21 June 2001	unknown	sight record	P. Foisy	S60870752
29 June 2006	unknown	sight record	M. Boothroyd	S40121919
23 June 2007	<i>erythrogaster</i>	sight record	C. Eckert	S25927598
16 June 2008	unknown	sight record	R. Gordon	S60870792
3 July 2010	<i>rustica</i> ^c	photo	S. McLeod,	S60869695
			L. J. Meyook	
3 July 2010	unknown	photo	S. McLeod,	S60869695
			L. J. Meyook	
24 June 2015	<i>rustica</i>	photo	C. Eckert	S25690325
25 June 2015	<i>erythrogaster</i>	sight record	C. Eckert	S25690400
12–14 June 2016	<i>erythrogaster</i>	photo/specimen ^d	C. Eckert	S33927325
12 June 2016	uncertain	photo	C. Eckert	S33927325
28 May 2018	unknown	sight record ^e	S. Goeson, R. Joe	S60871680
10 June 2019	<i>erythrogaster</i>	photo	C. Eckert	S57551123
16–20 June 2019	<i>erythrogaster</i>	photo	C. Eckert	S57545349
19–20 June 2019	<i>erythrogaster</i>	photo	C. Eckert	S57542914
19–20 June 2019	<i>rustica</i>	photo	C. Eckert	S57542914

^aUnknown indicates records for which there is no note of subspecies, while uncertain indicates records for which photos exist but are inadequate to confirm the subspecies.

^bNumber of eBird checklist, accessible as “<https://eBird.org/checklist/S...>”

^cPhotos of this individual, though suggesting nominate *rustica*, left uncertainty in subspecies identification.

^dYukon College M-28-13.

^eTwo individuals.



FIGURE 1. A Barn Swallow at Qikiqtaruk 3 July 2010 with a solid dark breast band and long tail (shown in other photos), suggesting *H. r. rustica* though with some uncertainty.

Photo by Samuel McLeod and LeeJohn Meyook

ined photos taken 3 July 2010 of a pale-bellied bird with a complete thick blue-black neck band, a relatively long tail, and a relatively restricted rufous throat patch consistent with nominate *rustica* (Figure 1). However, the photos left some uncertainty in the identification and so this record is noted with question mark (Table 1). On 24 June 2015, Eckert saw a Barn Swallow that flashed a bright white belly, undertail, and wing lining. It had a thick and



FIGURE 2. Male Barn Swallow (*H. r. rustica*) at Qikiqtaruk on 24 June 2015 with bright white undersides, a broad dark and unbroken breast band, relatively small rufous throat patch, and very long tail streamers.

Photos by Cameron D. Eckert



FIGURE 3. This male Barn Swallow at Qikiqtaruk on 19 and 20 June 2019 was a typical example of *H. r. rustica*, having a bright white underside, thick dark breast band (with just a few scattered rufous feathers), and relatively long tail streamers (though not as long as the bird in Figure 1). See also this issue's inside front cover.

Photo by Cameron D. Eckert

solid blue-black neck band, a relatively limited deep rufous throat patch, and a very long tail (Figure 2). All features of this bird were consistent with nominate *rustica*. The next day, 25 June 2015, Eckert observed another Barn Swallow that flew through the settlement for less than 30 seconds, though enough time for him to get a good look at the rufous undersides and a broken



FIGURE 4. A pair of Barn Swallows at Qikiqtaruk on 12 June 2016 included one *H. r. erythrogaster* (left) and one individual of uncertain identity (right); the latter showed paler undersides and a slightly broken breast band.

Photos by Cameron D. Eckert

rufous-washed band identifying the bird as *H. r. erythrogaster* (Table 1). On 19 June 2019, Eckert spotted a white-bellied Barn Swallow along with two individuals of *H. r. erythrogaster* flying around the settlement (Table 1). The white-bellied swallow roosted for the night in one of the historic buildings and was seen with the other two birds flying around the settlement the following day. It showed pure white undersides, a thick, unbroken dark blue neck band with just a few rufous feathers, a relatively limited rufous throat patch, and a fairly long though uneven tail, which appeared to be in molt or worn, thereby confirming another occurrence of *H. r. rustica* at Qikiqtaruk (Figure 3).

Could Barn Swallows nest at Qikiqtaruk? Robinson and DeCicco (2017) noted that artificial structures provide nest sites for the Barn Swallow at the outer peripheries of its range, potentially leading to population shifts. Historic buildings at Qikiqtaruk offer suitable roosting and nesting sites, but when it snows in June or the fog rolls in off the sea ice, as often happens for days, it can mean the sad end for a wayward Barn Swallow. On 12 June 2016, a pair of Barn Swallows arrived at the settlement (Table 1) and flew around feeding for the afternoon; the male was typical *H. r. erythrogaster*, but the other (possibly female) appeared quite pale bellied and its subspecies is uncertain (Figure 4). Two days later Eckert found the male alive but fluttering in the grass. He went to collect maggots from a dead Glaucous Gull to feed it, but by the time he returned the swallow had perished (specimen preserved as catalog number M-28-13 at Yukon College, Whitehorse). So while Qikiqtaruk provides suitable nest sites, the climate on the outer Yukon still likely limits breeding.

BARN SWALLOWS IN THE CANADIAN ARCTIC

Barn Swallows have been recorded as casual visitants across arctic and subarctic Canada. The most northerly record is from Nasaruvaaalik Island (75.8° N, 96.3° W) in the Canadian Arctic Archipelago (Richards and Gaston 2018). East of the Yukon and Northwest Territories, in Nunavut, Barn Swallows are not of regular occurrence (Richards and Gaston 2018). Across the Canadian Arctic there have been many sightings; the one specimen and four photo-documented records may be evaluated for subspecies (Table 2). Four of the birds are readily identified as *H. r. erythrogaster*. The one at Southampton Island, Nunavut, on 23 and 25 June 2019 (Table 2) appears to have a white belly but a rufous wash through the front of the breast band and a tail that is not especially long. It could be a female of *H. r. erythrogaster* but may be within the range of variation for *H. r. rustica* or *gutturalis* so we list it here as uncertain.

What route might nominate *H. r. rustica*, which winters in central-southern Africa and breeds in Europe and Iceland (Turner 2006, Brown and Brown 2019), take to reach Qikiqtaruk, some 4500 km beyond its range? Considering where vagrants of this subspecies have and have not been documented, we propose that they are extreme overshoots, having passed north of Greenland and the Canadian Arctic Archipelago on a polar route direct to the Arctic coast of the Yukon and Alaska (Figure 5). There are few locations along this route where records may be sought, though this hypothesis is supported by a photograph of *H. r. rustica* at Svalbard, Norway, 23 June 2017 (<https://eBird.org/checklist/S37753446>), and the complete absence of records to date from

TABLE 2 Specimen- and Photo-Documented Records of the Barn Swallow from the Canadian Arctic and Eastern Subarctic

Date	Subspecies	Location	Observers	Source ^a
24 June 1964	<i>erythrogaster</i>	Resolute Bay, Nunavut	J. E. Mason	ROM 105507
12 June 2013	<i>erythrogaster</i>	Pond Inlet, Nunavut	D.-J. Léandri-Breton, F. Senez-Gagnon	S15085271
15 June 2013	<i>erythrogaster</i>	Nasaruvaalik I., Nunavut	I. Pratte	S15247825
8 June 2017	<i>erythrogaster</i>	Paulatuk, Northwest Territories	A. Buckley	S37477760
23–25 June 2019	uncertain	Southampton I., Nunavut	W. English, A. Lenske, S. Neima	S58746341

^aROM, Royal Ontario Museum; otherwise, eBird checklist number accessible as “<https://ebird.org/checklist/S...>”

Newfoundland and Labrador (B. Mactavish pers. comm.). Documenting extralimital birds is a valuable contribution to understanding patterns of vagrancy and inspiring insights into migration and ecological change. The knowledge and tools available to document and share such observations, through <https://eBird.org>, the Macaulay Library, and www.iNaturalist.org, have never been better.

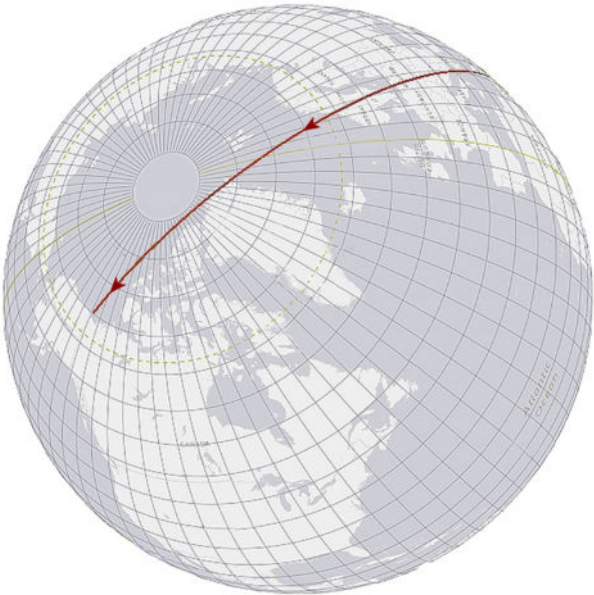


FIGURE 5. The polar route—potential flight path of *H. r. rustica* flying from its winter range in central Africa, overshooting northern Norway for another 4500 km to Qikiqtaruk off the Yukon’s Arctic coast.

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TEMPORAL RESPONSE OF CALIFORNIA BLACK RAILS TO TIDAL WETLAND RESTORATION

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ABSTRACT: From the mid-1800s into the 1960s, many tidal wetlands along the coast of California were isolated from tidal influence and converted to farmland. Since 1976, to restore ecological function and hydrological integrity, tidal influence has been restored to some of these wetlands. My collaborators and I monitored three sites—one on the north edge of San Pablo Bay, one on the west side of San Francisco Bay, and one at the south end of Tomales Bay—to document occupancy by the California Black Rail (*Laterallus jamaicensis coturniculus*), a cryptic marsh bird with an extremely narrow habitat niche in emergent tidal wetlands and considered an indicator of tidal-marsh health and restoration success. A source of prospective colonists had persisted adjacent to all three sites. Black Rails occupied each site within three to ten years, demonstrating the value of these restorations.

In 1971, the California Black Rail (*Laterallus jamaicensis coturniculus*) was designated as threatened under the California Endangered Species Act because of its limited distribution and historic loss of habitat (Evens et al. 1991, Goals Project 1999). The taxon is extirpated as a nesting species in coastal southern California south of Morro Bay (Garrett and Dunn 1981, Unitt 1984). The absence of confirmed detections since 2005, despite intensive surveys in 2010 and 2011, indicate that it is probably extirpated from Morro Bay also (T. Edell pers. comm., Rosen 2011). Small populations occur in freshwater swales of the foothills of the Sierra Nevada (Aigner et al. 1995, Richmond et al. 2008) and in wetland seeps along the lower Colorado River and in the Salton Basin (Evens et al. 1991, Patten et al. 2003, Conway and Sulzman 2007). But population estimates and the extent of available habitat imply that well over 90% of the California Black Rail's population is associated with the tidal marshes of San Francisco Bay and wetlands along the nearby outer coast (Evens and Nur 2002). Around San Francisco Bay the Black Rail typically occupies tidal marshes at elevations ranging from 1.5 to 2.0 m above sea level (with respect to the North American Vertical Datum of 1988). Since the mid-1800s, agriculture, salt production, and urbanization have reduced the historic tidal marshlands of the San Francisco Bay estuary by an estimated 78–85%, and species dependent on tidal marshes have been reduced concomitantly (Nichols et al. 1986, Goals Project 1999).

Habitat critical to the Black Rail is at imminent risk due to increases in frequencies of extreme weather and sea-level rise associated with climate change. These factors are expected to result in increased flooding of marshes' main surface (the "high marsh plain") and loss of intertidal wetlands (Evens and Thorne 2015, Stralberg et al. 2011, Thorne et al. 2012). During periods of inundation, species dependent on tidal marshes, such as the Black Rail, typically take temporary refuge in adjacent vegetated uplands to avoid drowning and predation (Evens and Page 1986, Thorne et al. 2012). The extent of adjacent upland habitat has decreased with the urbanization of the estuary and the hardening of its edges with infrastructure such as roads, levees, breakwaters, and rip-rap (Nichols et al. 1986), further reducing habitat quality

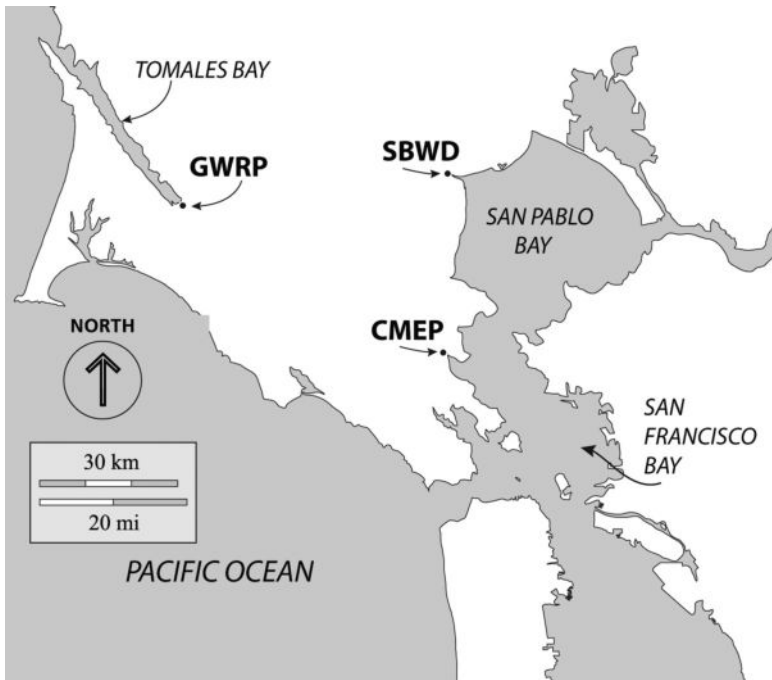


FIGURE 1. Locations of the three restored wetlands in the San Francisco Bay area. SBWD, Sonoma Baylands Wetland Demonstration; CMEP, Corte Madera Ecological Preserve; GWRP, Giacomini Wetland Restoration Project.

for species dependent on tidal marshes. To address this loss and to improve habitat quality, in recent years refugial habitat from high tides and flooding has been incorporated into the design of restorations (e.g., NPS 2012).

Here I summarize the results of intermittent and continuing surveys for the Black Rail at three sites of tidal-marsh restoration in Marin and Sonoma counties, California: the Giacomini Wetland Restoration Project, Tomales Bay, Point Reyes National Seashore; the Corte Madera Ecological Reserve and Muzzi Marsh, along the west shore of San Francisco Bay; and the Sonoma Baylands Wetland Demonstration, along the north shore of San Pablo Bay.

STUDY AREA

Following the restoration of tidal influence, at each site the marsh plain regenerated vegetation characteristic of central California's tidal marshes. Typically, the lower elevations of sloughs and bayshore are colonized by cordgrass (*Spartina foliosa*). In the middle elevation zone, at about mean high water, pickleweed (*Sarcocornia pacifica*) tends to dominate but often in association with salt grass (*Distichlis spicata*), alkali heath (*Frankenia salina*), gumplant (*Grindelia stricta*), and marsh jaumea (*Jaumea carnosa*). On the outer coast,



FIGURE 2. Occupied California Black Rail habitat, Giacomini Wetlands, Tomales Bay, 29 April 2018. The vegetative community is typical of tidal salt marshes between mean high water and mean higher high water on the central California coast. Pickleweed is dominant on the marsh plain with bushy gumplant at slightly higher microelevations. The understory may be an admixture of marsh jaumea, saltgrass, and at slightly higher elevations alkali heath.

at Tomales Bay, or where the water is brackish, sea arrowgrass (*Triglochin*) joins the community of halophytes. Where freshwater enters the upper marsh, sedges (e.g., *Schoenoplectus*), rushes (*Juncus*), and cattails (*Typha*) may form discrete patches. The ecotones between these patches and the more saline marsh community are often “hotspots” for the Black Rail. Once established, these mosaics of marsh-plant communities typically provide nearly complete vegetative cover (90 to 100%), a critical component of Black Rail habitat.

Giacomini Wetland Restoration Project, Tomales Bay, Point Reyes National Seashore

In the late 19th and early 20th centuries, Black Rails occurred in tidal marshlands in the southern reach of Tomales Bay, which Grinnell and Miller (1944:130) mentioned as the location in California where the species was “noted most frequently.” In 1946, 222.6 ha of the marshland of southern Tomales Bay was isolated from tidal influence by a system of levees, tide gates, and culverts, effectively converting tidal marsh to pastureland for a dairy ranch, which operated until the land was purchased by the National Park Service in 2001 (NPS 2012). This conversion eliminated approximately 50% of the emergent marshland in the bay and the preponderance of Black

Rail habitat. In 2008, with the Giacomini Wetland Restoration Project under the auspices of the National Park Service, tidal influence was restored (NPS 2012). Salt-marsh plants colonized the restored wetlands on their own. Land managers planted the high marsh–upland ecotone with species such as coyote bush (*Baccharis pilularis*) and wild rye (*Elymus triticoides*) to provide refugial habitat at high tide (L. Parsons pers. comm.).

In the decades preceding the restoration there still existed, adjacent to and just north of the restoration site, some mature marsh, the Tomales Bay Ecological Preserve, in which the tides were unrestricted and human intrusion was minimal. When surveyed in 1986 and 1987, before the restoration, this mature marsh supported a Black Rail population of moderate density (0.6–2.1 rails per hectare) (Evens et al. 1991). During winter flood tides, birders stood on the northernmost levee to observe rails as they left the marsh vegetation to take refuge in adjacent upland or emergent vegetation until the waters subsided (Evens and Page 1986).

After the National Park Service purchased the area that had been diked, the annual harvest of hay was discontinued. Cattle grazing was reduced, then discontinued completely in 2007. In October 2008, the levees were razed and tidal influence was restored.

Corte Madera Ecological Reserve and Muzzi Marsh

This complex of tidal wetlands is located along the western shore of San Francisco Bay, Marin County. It contains 59 ha of emergent marshlands of which 38 ha are in the Corte Madera Ecological Reserve and 21 ha are in the adjacent Muzzi Marsh, remnants of formerly more extensive marshes. Beginning in 1853, existing marshes expanded into the bay, onto sediment deposited from hydraulic gold mining in the Sierra Nevada. After hydraulic mining ceased in 1884, the site was diked off from tidal action. In the 1920s portions of the Corte Madera marshes were drained for hayfields and cattle grazing (Haehl 2002). In the early 1950s portions were used for dredge-spoil disposal. In the 1960s, levees were built along the bayshore, and the enclosed area was used as pastureland. Under a restoration begun in 1976, cattle grazing was eliminated, the outer levees were breached in 1977, and tidal flow to the sites was restored (Williams and Faber 2001, Harris 2008, CDFW 2018). Sedimentation raised the marsh plain by about 2.5 cm per year and allowed cordgrass to become established. All the revegetation of the site was natural; no planting was done (J. Haltiner pers. comm.).

Sonoma Baylands Wetland Demonstration

This site covers 130 ha of formerly diked farmland in southwestern Sonoma County on the northern shoreline of San Pablo Bay. The 117-ha interior of the restoration site was designed to restore the ecological function of a tidal marsh. The site was once part of an extensive system of tidal wetlands along the north margin of San Pablo Bay with an original elevation approximately equal to mean higher high water (1.05 m; National Geodetic Vertical Datum of 1929) (Williams and Florsheim 1994, SER 2019). After its conversion from tidal marsh to farmland in the mid-1800s, the land subsided up to nearly 2 m below mean tide level. From 1993 to 1996 more than 2.0 million cubic meters of dredge spoils from the Petaluma River and the port of Oakland

were deposited behind the levees to bring the surface of the marsh plain up to the level of mean higher high water (Marcus 2000). The substrate was graded to approximate original elevations, channels were carved to mimic natural marsh drainages, and the site was opened to tidal action on 25 October 1996.

The Sonoma Baylands were designed for natural revegetation. Annual pickleweed and gumplant colonized the site the first year after restoration (Phil Williams pers. comm.).

METHODS

My collaborators and I surveyed for the Black Rail by point counts, broadcasting taped or digital recordings of the species' vocalizations at each point in an attempt to elicit vocal responses, the primary means of detection (Evens et al. 1991, Spear et al. 1999, Evens and Nur 2002, Conway and Seamans 2016). All censuses took place between dawn and 09:30 Pacific Standard Time from mid-March through mid-May and were repeated up to three times per year. Coverage of the sites spanned four decades within 3 to 8 years following the restoration of tidal influence. Years of coverage were as follows: Corte Madera Marsh complex, 1981–1987; Sonoma Baylands, 2004 and 2015; Giacomini Wetlands, 2011–2019.

After arriving at a count point, the observer stood silently for 1.0 minute before broadcasting 1.0 minute of vocalizations. The call sequence consisted of 0.5 minute of repetitive “grr-grr-grr” calls followed by 0.5 minute of “kik-kik-kerr” calls (Eddleman et al. 1994). Following the broadcast, the observer waited silently for 4.0 minutes before moving on the next point. Points were spaced at intervals of 50–200 m (depending on local topography) to avoid duplicative detections. The number of rails at each station was determined by the sum of the responses detected from a different compass direction ($>30^\circ$) within 30 m of the observer during the 5-min census period. The observer considered all calls coming from one direction to represent a single rail unless two or more calls were heard simultaneously; calls from different directions ($>30^\circ$ apart) were considered different individuals. In earlier field testing, Gary Page, Lynne Stenzel, and I determined that observers were able to estimate the distance of vocalizations accurately up to approximately 30 m and that the observer's ability to estimate distance accurately, or to hear soft vocalizations consistently, declined beyond that distance (unpubl. data). Also, Evens and Nur (2002) estimated that during a 5-minute survey Black Rails move toward the source of a broadcast by an average of 6.2 m. Therefore, my collaborators and I counted only detections within 30 m of the observer, but calculated abundance indices under the assumption that the effective radius of each sampling station was 36.2 m, thus covering an area of 0.412 ha. Spear et al. (1999) also added this 6.2-m correction factor and found a high degree of conformance with expected detection values. My collaborators and I ranked the Black Rail's abundance around each point from the density index calculated for the plot within a radius of 36.2 m of each point as follows: low, <0.6 rails per hectare; moderate, 0.6–2.1 rails per hectare; high, 2.1–3.8 rails per hectare (Evens and Nur 2002).



FIGURE 3. Brackish marsh at Giacomini Wetlands, Tomales Bay, 27 April 2019. Black Rails also occupy more brackish portions of the marsh bordering the salt marsh. Dense stands of sea arrowgrass in the foreground adjoining rushes. Cattails also occur, often in discrete stands, in these brackish situations.

RESULTS

Giacomini Wetland Restoration Project

Prior to restoration Black Rails were absent from this site, except as temporary refugees during extreme flooding (Evens and Page 1986, unpubl. data). Following restoration, the staff of Point Reyes National Seashore initiated a program to monitor changes in waterbirds' use of the site. As part of this effort, we selectively surveyed for the Black Rail in patches of likely habitat within the site. Black Rails were first detected within the site in 2011, three years after restoration (ARA 2019). The source of these initial colonizers was most likely the mature, fully tidal marsh adjacent to the northernmost levee where we had detected low to moderate densities during surveys in 1988 and 1996 (Evens and Nur 2002). Post-restoration surveys revealed that between 2012

TABLE 1 Results of Surveys for the Black Rail in the Restored Giacomini Wetlands, Tomales Bay, California

Year	Survey points (<i>n</i>)	Detections (<i>n</i>)	Percentage of points with detections	Mean number of detections per point surveyed	Standard deviation	Estimated density (per hectare) ^a
2011	17	2	12	0.12	0.32	0.3
2012	20	6	10	0.25	0.62	0.7
2016	9	9	44	0.67	0.94	1.0
2018	19	15	53	0.79	1.32	1.9
2019	48	57	69	1.24	1.32	2.9

^aBased on highest rate of detection that year at each point surveyed.

and 2019 the Black Rail's numbers increased and its distribution expanded as the marsh within the restoration site developed and matured. The population increased most sharply from 2016 to 2019 (Table 1). As of 2019, Black Rails occupied the entire site at moderate to high densities (ARA 2019). Eleven years after restoration, the birds had colonized newly established high-marsh habitat extensively (ARA 2019).

Corte Madera Ecological Reserve and Muzzi Marsh

Black Rails were first detected, fortuitously, at Corte Madera Ecological Reserve on 10 December 1981, with four heard during systematic surveys for California Ridgway's Rail (*Rallus obsoletus obsoletus*). Northern Harrier (*Circus hudsonius*) predation on single Black Rails was observed three times in 1982: 22 August, 29 November, and 30 December (unpubl. data). The August date implies that the species was resident and likely nesting. Therefore, Black Rails colonized the site five to six years after the restoration of tidal influence.

Between 23 February and 26 March 1987, Page and Evens (1987) detected Black Rails vocalizing ("kik-kik-kerr") spontaneously in Muzzi Marsh. Although this marsh was not surveyed for Black Rails systematically, the species was both heard and seen subsequently in areas elevated at and above the level of mean high water. Thus, within a decade following restoration, Black Rails had effectively occupied Muzzi Marsh, where they still persist (pers. obs.).

Sonoma Baylands Wetland Demonstration

Before restoration, moderate to high densities of Black Rails occurred in the adjacent fully tidal marsh on the bayshore side of the diked area (Evens and Nur 2002). The species was first detected inside the restoration site by Rich Stallcup, who heard a single bird calling in a marsh of emergent pickleweed on 23 March 2004, eight years after restoration. During the winter of 2014–2015 S. Bunnell and I surveyed the emergent *Sarcocornia*-dominated marsh in the southwest corner of the restoration area. We detected Black Rails in moderate density at three of the five stations. The Black Rail's colonization of the Sonoma Baylands further supports the observations at the other sites that the species will spread into tidal marshes regenerating in restoration sites that are adjacent to occupied habitat in fewer than ten years.

DISCUSSION

The Black Rail's occurrence along irrigation ditches in the Sierra Nevada foothills and in the Salton Basin attests to its ability to colonize patchy habitats at some distance from source populations. The site in the Sierra foothills site of Yuba County is >100 km from the next nearest known populations in the Sacramento–San Joaquin River delta (Manolis 1978, Evens et al. 1991, Aigner et al. 1995, Tsao et al. 2015), yet in a genetic and isotopic study Hall and Beissinger (2017) inferred a modest degree of movement between these two populations. This foothill habitat became established “sometime between 1977 and 1986” but did not exist earlier; Black Rails were first detected in these newly created wetlands in June 1994 (Aigner et al. 1995:157). The species' occupancy of these foothill sites has declined since 2007 because of West Nile virus and drought (Van Schmidt et al. 2019). In the Salton Basin, the Black Rail was first reported in February 1947 (Patten et al. 2003) and small numbers continue into the present (G. McCaskie pers. comm.). The Salton Basin sites are at least ~135 km from previously occupied habitats around San Diego Bay. About 80 km from the Salton Basin, at the Ciénega de Santa Clara, Sonora, the Black Rail was first detected in 1998, 21 years after the creation of this 18,000-hectare wetland (Hinojosa-Huerta et al. 2001).

Van Schmidt et al. (2019) described the Black Rail's dispersal ability as limited. But the observations I report suggest that under favorable conditions effective short-distance dispersal can be expected and that Black Rails readily occupy newly created habitats.

Sea-level rise, the increased frequency and intensity of storms associated with climate change, and land subsidence are predicted to put the California coast and San Francisco Bay at risk through the remainder of the 21st century (Cayan et al. 2008, Shirzaei and Bürgmann 2018). Low-lying tidal wetlands will be the first emergent habitats to experience this increased inundation (Doehring et al. 2016), so a reduction in habitat for the Black Rail and other species associated with tidal marshes is expected (Thorne et al. 2012, Tsao et al. 2015). Restoration of tidal wetlands, especially along the upper edge of current high tides, may ameliorate the effects of increased inundation on the marshes' biota. The Black Rail's fairly rapid response at all three restoration sites that my colleagues and I surveyed demonstrates that the species should benefit from other such restorations.

The three case studies I describe, along with the colonization of other more isolated habitat patches, suggest that, like many rails, the Black Rail is more vagile than commonly assumed. This effective dispersal ability is supported by evidence of juveniles dispersing widely from breeding areas and appearing in atypical habitats (Eddleman et al. 1994). Indeed, extralimital records, including three from the Southeast Farallon Island off San Francisco (Grinnell and Miller 1944, DeSante and Ainley 1980), 30 km from available habitat, illustrate this concept. Effective dispersal ability offers some hope that the species can persist into the next century, given the availability of habitats provided by well-informed efforts at restoration.

Additionally, the Black Rail is one of a suite of vertebrate species dependent on the tidal marshes of the San Francisco Bay area—the Salt-marsh Harvest Mouse (*Reithrodontomys raviventris*), California Ridgway's Rail

(*Rallus obsoletus obsoletus*), San Pablo California Vole (*Microtus californicus sanpabloensis*), Suisun Shrew (*Sorex ornatus sinuosus*), and three endemic races of the Song Sparrow (*Melospiza melodia maxillaris*, *M. m. samuelis*, *M. m. pusillula*). Restoration efforts designed to increase high tidal marshes and adjacent refugial habitat promise to serve this suite of species at risk as well.

SUMMARY

In the San Francisco Bay area, the Black Rail has a very narrow habitat niche within high-tidal marshes, at elevations approximating mean highest high water (Manolis 1978, Evens et al. 1991). The results I have reported illustrate the species' ability to colonize newly restored tidal marshes within 3 to 10 years after the restoration of tidal influence to historic tidal wetlands, but this ability will be challenged by increasing sea-level rise. Restoration efforts at the upland edges of existing emergent tidal marshes, as exemplified by the three projects I have discussed, and the Black Rail's ability to exploit regenerating tidal marshes, provide some hope for the species' persistence into the future.

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VOCAL DIFFERENCES AMONG THE BARRED, CINEREOUS, AND FULVOUS OWLS

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ABSTRACT: The Cinereous Owl (*Strix sartorii*), a Mexican pine forest endemic, has long been considered a subspecies of the Barred Owl (*S. varia*). In this study, we provide the first description and analysis of its vocalizations, which differ markedly from those of the Barred Owl and support the recognition of the Cinereous Owl as a full species. Its rhythmic song consists of seven primary notes and three secondary notes, whereas the analogous song of the Barred Owl consists of six primary notes and two secondary notes, arranged in a different pattern. The rhythmic song of the closely related Fulvous Owl (*S. fulvescens*) has only five or six primary notes, versus seven in that of the Cinereous Owl. The Cinereous Owl's song is much lower in pitch than the Fulvous Owl's. Unlike the Fulvous Owl but like the Barred Owl, the Cinereous Owl also has a distinctive and frequently deployed series song.

In 1873, Robert Ridgway described a subspecies of the Barred Owl that he named *Syrnium nebulosum* var. *sartorii* in honor of Carl Christian Sartorius, a German naturalist who collected the type specimen on his hacienda at Mirador in the mountains of Veracruz (Baird and Ridgway 1873:200). Ridgway wrote,

This form is very different from var. *fulvescens* ... from Guatemala. I have seen a specimen of the latter collected by Van Patten, and now in the Museum of the Boston Society. The var. *nebulosum* stands between the two, being intermediate in nearly all its characters.

The “var. *fulvescens*” to which Ridgway referred was the Fulvous Owl, now known as *Strix fulvescens*. Ridgway's “var. *nebulosum*” was the Barred Owl of the United States and Canada, now known as *Strix varia*. Ridgway considered all three of these taxa conspecific, but soon thereafter authors such as Sharpe (1875) began to recognize the Fulvous Owl as a separate species, on the basis of its much smaller size, its distinctly brighter coloration, and, eventually, its very different voice.

Most authors have continued to consider *sartorii* to be a subspecies of the Barred Owl, despite differences in range (e.g., Mazur and James 2000), habitat (e.g., Binford 1989), and genetics (Barrowclough et al. 2011). This likely stems from the dearth of information available on the taxon. As recently as 2015, no photographs of *sartorii* had been published, and its voice remained undescribed.

We here present an analysis showing the voice of the Cinereous Owl to be quite different from the voices of the Barred and Fulvous Owls. The vocal differences, along with the genetic differences (Barrowclough et al. 2011), support recognizing the Cinereous Owl as a full species.

Vocal Terminology and Song Structure in the Genus *Strix*

The songs of owls in the genus *Strix* differ in their rhythmic patterns. They tend to consist of two types of notes: primary notes that are loud and clearly distinct (i.e., separated by obvious pauses), and secondary notes that are generally softer and shorter than the primary notes. Secondary notes are

also more variable; in different individual owls within a species, they may be clearly distinct from the primary notes or connected to them, and they may range from obvious to nearly absent. When connected to a primary note, they create the impression of a second syllable—for example, turning a primary note “HOO!” into something that sounds like “aHOO!”

Many owls in the genus *Strix*, including the Barred Owl (Mazur and James 2000, Odom and Mennill 2010) and the Spotted Owl (*S. occidentalis*; Gutiérrez et al. 1995), have two song types: a “rhythmic song” with primary and secondary notes arranged in a species-specific syncopated rhythm, and a “series song” with mostly primary notes in a steadier but still distinctive rhythm.

METHODS

In 2015, on Cerro San Juan in Nayarit with Carlos Sanchez, we obtained photographs of a living Cinereous Owl and audio recordings of its voice. We compared our audio recordings of this single individual to those of Barred Owls from the United States and Fulvous Owls from Central America and southern Mexico. We identified rhythmic and series songs in the Barred Owl recordings by comparison with published spectrograms (e.g., McGarigal and Fraser 1985, Mazur and James 2000, Pieplow 2019). Using qualitative comparison of spectrograms and our admittedly meager information about the behavioral context of the songs in our Cinereous Owl recordings, we identified rhythmic and series songs in the Cinereous Owl that we believe to be analogous to the respective songs of the Barred Owl. Because the songs of the Cinereous Owl in our recordings differ obviously from the typical songs of Barred Owls in number and rhythm of notes, our comparison of the two species did not include a statistical component.

We performed a statistical analysis comparing the songs of the Cinereous Owl with those of the Fulvous Owl. Our sample of Fulvous Owls ($n = 88$) included every recording of the species available at www.xeno-canto.org or in the Macaulay Library archive, and a few recordings that we had made. In some recordings, two individuals were audible. We assumed that different recordings were of the same individual or pair if they were made at the same or similar locations in the same year. Thus, we estimated that this sample represented a minimum of 61 different individuals, including 16 apparent male–female pairs. We defined a male–female pair as a pair of birds vocalizing on the same recording in which one bird was higher-pitched than the other. We assumed that the higher-pitched birds in these pairings are females, as has been reported in other species of *Strix* (e.g., Mazur and James 2000, Odom and Mennill 2010). This assumption may not always hold, as some of the recordings might have been of countersinging males.

Our comparison of Fulvous and Cinereous Owl songs included only the rhythmic songs, because we could not identify any series songs in our Fulvous Owl sample. In each recording of both species, we used visual analysis of spectrograms in Raven Pro software (Cornell Bioacoustics Research Program, Cornell Laboratory of Ornithology) to measure the number of notes and the peak frequency of each individual's song on the recording, using the single instance of song with the highest amplitude. In one recording of an apparent pair duet, the female's song was too faint to be measured accurately.

Recordings archived at www.xeno-canto.org are indicated with the abbreviation XC, those in the Macaulay Library archive with the abbreviation ML. Terminology used to describe sounds follows that of Pieplow (2019).

RESULTS

Comparison of Rhythmic Songs

The rhythmic songs of the Barred Owl and the Cinereous Owl are very different. The Cinereous Owl's rhythmic song is much more similar to the Fulvous Owl's, but it is lower and contains more notes.

In the Barred Owl, the rhythmic song consists of six primary notes and two secondary notes (Figure 1A). The secondary notes are inserted before the third and sixth primary notes. In addition, the sixth primary note is drawn out at the end, creating the impression of an additional falling syllable. The result sounds like "HOO HOO! aHOO! HOO HOO! aHOO-wah!" (or the familiar "Who cooks for you? Who cooks for you-all?"). This is the most common song of the Barred Owl; McGarigal and Fraser (1985) recorded it in 20 of 25 instances in which Barred Owls responded to broadcast of their species' vocalizations (80%).

In the Fulvous Owl, the rhythmic song consists of five primary notes and three secondary notes (Figure 1C). The secondary notes are inserted before the first, second, and fourth primary notes, in a pattern that sounds like "aHOO! aHOO HOO! aHOO HOO!" The first secondary note is reduced or absent in some birds. This is the most common vocalization of the species; it appears in every recording of the Fulvous Owl that we were able to locate ($n = 88$).

The rhythmic song we recorded from the Cinereous Owl in Nayarit (ML 21681321, Figure 1B) consisted of seven primary notes and three secondary notes. As in the Fulvous Owl, the secondary notes were inserted before the first, second, and fourth primary notes. The first secondary note was reduced and nearly absent. The pattern thus sounded like the Fulvous Owl's, but with two additional loud hoots at the end: "aHOO! aHOO HOO! aHOO HOO! HOO! Hoo." The final note was lower than the rest in both frequency and amplitude.

The frequency of the Cinereous Owl's rhythmic song fell outside the range of variation we measured in Fulvous Owl songs. The peak frequencies of the presumed female Fulvous Owls in our sample (mean 696 Hz, range 648–772 Hz, SD = 32 Hz, $n = 15$) averaged substantially higher than the peak frequencies of the presumed males (mean 563 Hz, range 505–655 Hz, SD = 46 Hz, $n = 16$). Thus the ranges overlapped only slightly, and an independent-sample two-tailed t -test found the difference of the means to be highly significant ($t_{29} = -9.22$, $p < 0.001$).

We measured the peak frequency of the Cinereous Owl's rhythmic song as 453 Hz ($n = 1$). This is more than 50 Hz below the lowest recorded peak frequency in our Fulvous Owl sample. Therefore, we think it likely that the Cinereous Owl we recorded was a male.

The number of notes in the rhythmic song represents another difference between the Cinereous and Fulvous Owls. Most rhythmic songs of the Fulvous Owl in our sample consisted of five primary notes ($n = 61$), but we found two examples of six-note songs (ML 127222, ML 27299401). We found zero examples of seven-note rhythmic songs like that of the Cinereous Owl in Nayarit.

VOICES OF THE BARRED, CINEREOUS, AND FULVOUS OWLS

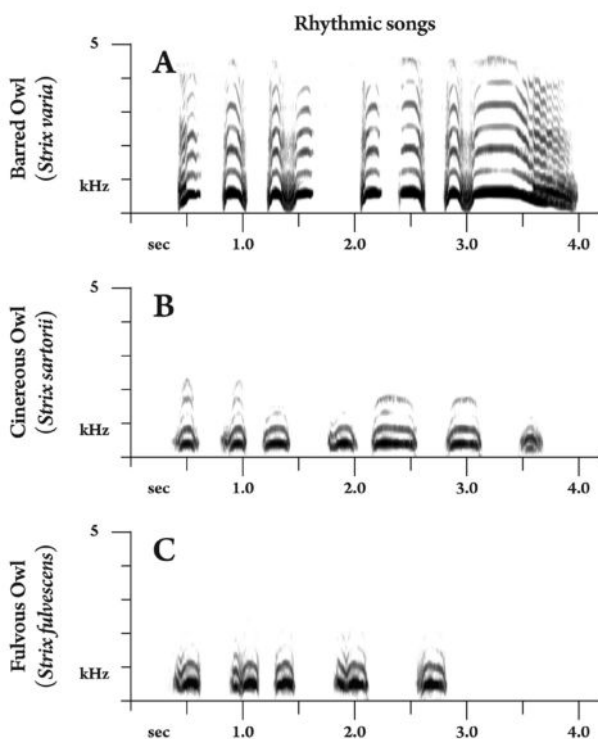


FIGURE 1. (A) Rhythmic song of a Barred Owl (*Strix varia*), Arkansas, 20 March 2005 (Gerrit Vyn and Benjamin Clock, ML 128926). (B) Rhythmic song of a Cinereous Owl (*S. sartorii*), Rancho La Noria, Nayarit, Mexico, 4 June 2015 (Nathan Pieplow, ML 21681321). (C) Rhythmic song of a Fulvous Owl (*S. fulvescens*), Finca Las Nubes, Guatemala, 8 March 2013 (Mike Nelson, XC 125759). Spectrograms have been graphically edited to remove echo and insect noise. Note that the number of visible harmonics depends greatly on the distance from the microphone to the bird.

Comparison of Series Songs

The series songs of the Barred and Cinereous Owls are just as distinct as their rhythmic songs, while a series song has not been reported in the Fulvous Owl.

The series song of the Barred Owl (Figure 2A) consists of a series of six to nine primary notes that rises slightly but consistently at an even pace before ending in a slightly modulated falling note (“aHOO-wah!”) that resembles the final note of the rhythmic song. Pieplow (2019) described it as “who who who who WHO WHO for YOU.” In the Barred Owl the series song is nearly as common as the rhythmic song. McGarigal and Fraser (1985) recorded it in 14 of 25 instances in which Barred Owls responded to broadcast of their species’ vocalizations (56%).

The series song of the Cinereous Owl (e.g., ML 21688921; Figure 2B)

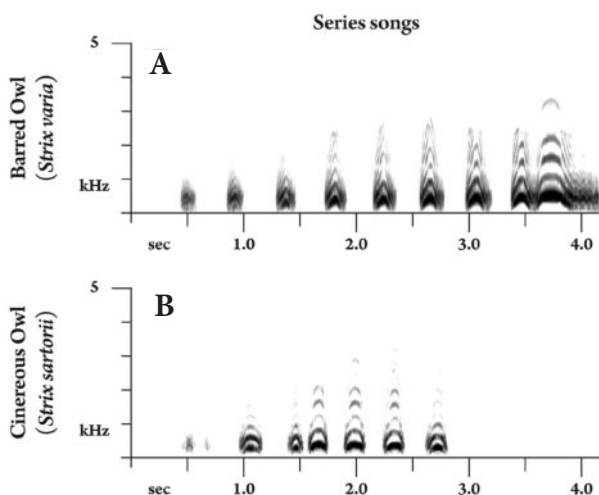


FIGURE 2. (A) Series song of a Barred Owl, West Virginia, 3 May 2010 (Andrew Spencer, XC 48645). (B) Series song of a Cinereous Owl, Rancho La Noria, Nayarit, Mexico, 5 June 2015 (Nathan Pieplow).

consists of six to nine primary notes introduced by one or two softer, lower secondary notes. The first few primary notes are not evenly spaced; the gap between the first and second is slightly elongated, and the gap between the second and third is slightly shortened. The remaining three or four notes are loud and evenly spaced, all on the same pitch, except that the last one or two are slightly lower and softer. This song differs from the Barred Owl's series song in its syncopated beginning and its uniformity in pitch. In the Barred Owl's series song, the highest and loudest notes are at the end, while in the Cinereous Owl's, the highest and loudest notes are in the middle.

We also recorded songs from the Cinereous Owl that appear intermediate between the rhythmic and the series song, beginning with a pattern similar to the "HOO! aHOO HOO!" from the start of the rhythmic song and ending with the three or four evenly spaced notes from the end of the series song. Perhaps this version represents an excited, extended variant of the rhythmic song.

Mark Stackhouse (pers. comm.) reports that in approximately 20 attempts to draw responses from Cinereous Owls on Cerro San Juan since 2015, he has found that the birds respond more quickly and aggressively to the series song than they do to the rhythmic song. They almost always give the series song in response to broadcast of either song type. His experience matches our experience in 2015. An adult bird gave unsolicited rhythmic songs at the beginning of our encounter, but after we recorded the rhythmic song and played it back, the owl approached giving only series songs and intermediate songs. We hypothesize that the Cinereous Owl's rhythmic song serves more of an advertising function, while the series song and intermediate song serve more of an aggressive, territorial function.

A series song is unreported in the Fulvous Owl. It does not occur in any of

the 88 audio recordings of the Fulvous Owl that we were able to review. When Fulvous Owls respond aggressively to broadcast of the rhythmic, both males and females give that same song. In high agitation, they may give the rhythmic song several times in a row with one or two nasal barking notes in between (XC 125755; ML 78779481). Pairs responding together to recordings of such songs often sing overlapping songs that together can give the impression of a series song, but careful analysis of recordings reveals that in all cases these duets consist of typical rhythmic songs from each member of the pair, with occasional nasal barks between songs. In extreme agitation, Fulvous Owls may give variable barks that grade into wails (XC 302861, around 1:38). The absence or rarity of a series song constitutes a major difference between the vocal repertoire of the Fulvous Owl and that of the Barred or Cinereous Owl.

Other Vocalizations of the Cinereous Owl

Barred Owls are well known for the cackling and wailing notes they give during excited pair duets, known as “caterwauling.” The excited pair duets of the Fulvous Owl are more subdued, though the occasional barking notes do recall those of the Barred Owl. The pair duets of Cinereous Owl have not yet been recorded.

We recorded a shriek from a begging young Cinereous Owl in 2015 (ML 21689041). It rose distinctly in pitch and lasted about 1 second. It resembles the begging shrieks of the Barred Owl (ML 4549) and the Fulvous Owl (XC 42718). We also recorded several other sounds during a feeding of the same juvenile by an adult Cinereous Owl (ML 21689041, XC 250345). The feeding took place out of our sight, but it seems likely that both the adult and the juvenile gave chitter calls, as almost all North American owl species do in close family contact. We also heard a low-pitched overslurred wail that was apparently given by the adult.

CONCLUSIONS

It seems clear that the Cinereous Owl deserves species status. Vocalizations in owls are presumed to be innate (e.g., Gahr 2000), are typically species-specific, and discriminate closely related species (Wiens et al. 2011).

The Cinereous Owl also differs strikingly from the Barred Owl in range, with a gap of 700 km between the southernmost area occupied by the Barred Owl in Texas (Mazur and James 2000) and the northernmost specimen location of the Cinereous Owl in San Luis Potosí (Louisiana Museum of Natural History specimens 15053, 15054). It occupies a very different habitat, being restricted to high-elevation pine and pine-oak forests. The Cinereous Owl is closer to the Fulvous Owl in vocalizations, range, and habitat, but is physically quite distinct from it, sharing the Barred Owl's larger size and grayish coloration.

The distinctness of the Cinereous Owl is supported by genetic evidence. Barrowclough et al. (2011) called for elevating the Cinereous Owl to species status on the basis of genetic differentiation. J. Maley and J. Salter at the Moore Laboratory of Zoology sequenced the mitochondrial DNA of three Cinereous Owl specimens from Guerrero and confirmed that they form a clade separate from other species of *Strix* (unpubl. data).

We hope that the recognition of the Cinereous Owl as a full species endemic to Mexico will spur interest in its study and conservation. Very little

is currently known of its biology or the reasons for its apparently precipitous decline (Pieplow et al. 2020).

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MOLT, AGE, AND IDENTIFICATION OF THE MASKED AND NAZCA BOOBIES IN CALIFORNIA

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ABSTRACT: I examined photographs compiled by the California Bird Records Committee to assess bill-color and plumage-color changes with molt of the primaries in Masked (*Sula dactylatra*) and Nazca (*S. granti*) boobies recorded in California. I evaluated a total of 134 individuals initially discovered between 5 April 1990 and 19 November 2019. For each individual I scored the stage of molt of the primaries, coloration of seven areas of the plumage, and color and brightness of both the base and tip of the bill. Two distinct bill-color patterns emerged as the birds aged from juvenile to definitive plumage. Birds with dusky, horn color (medium-pale brownish, often tinged mustard or olive), orange, and/or pink in the bill base commonly had brighter orange-yellow or golden yellow but not green in the bill tip. By contrast, birds with dark blue, green, and/or yellow in the bill base commonly had green and/or yellow but not orange in the bill tip, and the tip was less often brighter than the base. I propose that the first category represents Nazca Boobies and the second represents Masked Boobies. A horn-colored base and a brighter golden-yellow tip of the bill of birds in their first and second plumage cycles (including most juveniles) evidently indicates the Nazca Booby. Some birds probably reach definitive appearance by completion of their first primary molt, at 20–22 months of age. The central rectrices of apparent Nazca Boobies (by bill color) average whiter than those of apparent Masked Boobies, the extent of white increasing from juvenile to second basic to definitive plumage. But there is species overlap in this feature. According to provisional identifications in my sample, Nazca Boobies have outnumbered Masked Boobies in California (92 vs. 27 individuals through 2019).

The Nazca Booby (*Sula granti*) was split from the Masked Booby (*S. dactylatra*) by the American Ornithologists' Union ([AOU] 2000) after Pitman and Jehl (1998) documented differences in morphology, bill color, and plumage color, along with assortative pairing and habitat selection on islands where both taxa breed. The Nazca Booby breeds primarily on the Galapagos Islands but also on Malpelo Island off Colombia and sparingly north to Clipperton Atoll and the Revillagigedo Islands off Mexico (Howell and Pyle 1997, Pitman and Jehl 1998, AOU 2000). The Masked Booby of subspecies *S. d. personata* (including *S. d. californica*; Pitman and Jehl 1998) breeds on islands throughout the tropical Pacific Ocean. In the eastern Pacific, it breeds primarily on Clipperton Atoll and the Revillagigedo Islands and sparingly on the Alijos Rocks off Baja California (Everett and Pitman 1995). Hybridization, or at least mixed pairing, of Masked and Nazca boobies has been reported occasionally on Clipperton Atoll and the Revillagigedo Islands (Pitman and Jehl 1998, California Bird Records Committee [CBRC] 2007) as well as in the Hawaiian Islands (VanderWerf et al. 2008).

Boobies apparently lack a preformative molt; the molt that replaces the juvenile plumage following the first cycle is the second prebasic. This molt (and the second plumage cycle) begins when the bird is 7–9 months old, with the dropping of the tertials and the innermost primary, p1 (Pyle 2008, Howell 2010). The primaries are molted sequentially and distally, the outermost pri-

mary (p10) being replaced when the bird is an estimated 18–22 months old, before which time a second wave of primary molt from p1 commences the third plumage cycle in a Staffeldmauser or stepwise molt sequence (Dorward 1962, Pyle 2006, 2008, Howell 2010). The remaining secondaries and rectrices are replaced during molt of primaries, the rectrices beginning with the central pair and proceeding laterally but in a haphazard and often asymmetrical sequence. In adults, the prebasic molt occurs annually and is complete or nearly so, with up to three waves of active molt proceeding through the primaries at the same time (Pyle 2008). Molt takes place largely at sea, when birds are not breeding, and it is likely continuous or nearly so throughout the nonbreeding period (Pyle 2008, Howell 2010).

During the second prebasic and subsequent molt cycles, the head, back, rump, and upper secondary coverts gradually change from entirely or predominantly brown in juveniles to entirely white in adults. The definitive plumage is reportedly attained during the third or fourth cycle. But there appears to be substantial individual variation in the rate of plumage maturation, which is poorly known because of lack of data from individuals of known age (Pyle 2008).

In the third to definitive basic plumages, the bill of a Nazca Booby is pinkish orange to orange at the base, while that of a Masked Booby is greenish yellow to yellow, allowing virtually all birds to be distinguished in the field (Pitman and Jehl 1998, Roberson 1998, CBRC 2007, Howell et al. 2014, Howell and Zufelt 2019). The identification of juveniles and birds undergoing the second prebasic molt, however, has been problematic. The bill color is dark or dull in nestlings and juveniles of both species. It has been speculated that, in the Nazca Booby, the orangish coloration of adults' bills may begin appearing at 4–8 months of age, and should allow identification of all birds at 12 months of age (Pyle 2008, R. Pitman *in* Singer et al. 2020). But this has not been based on evidence from birds of known age, and the rate of bill-color change varies with the individual. Precisely when and how the bill colors change in Masked and Nazca boobies in their first and second plumage cycles is currently undocumented.

Various plumage features have also been proposed to distinguish first-cycle birds, including a white hind collar that is more frequent and distinct in juvenile Masked Boobies than in juvenile Nazca Boobies, and more white at the base of the central pair of rectrices in the Nazca than in the Masked (Pitman and Jehl 1998, Roberson 1998, Pyle 2008, Howell et al. 2014, Howell and Zufelt 2019). However, juveniles of each species have been reported to show characters of the other species (Roberson 1998, Pyle 2008, Howell et al. 2014, Rottenborn et al. 2016). Because birds of these ages are rarely found on the breeding grounds after fledging, assessment of change in these characters relative to molt and bleaching of the plumage has been equivocal.

Both the Masked and Nazca boobies have been recorded as vagrants in California and Oregon (CBRC 2007, Rottenborn et al. 2016, McCaskie et al. 2018, OBRC 2020, Singer et al. 2020), and at least one adult Nazca Booby has strayed as far north as the Gulf of Alaska (Gibson et al. 2018). Through 2017, the CBRC had accepted records of 26 Masked Boobies and 15 Nazca Boobies from California, as well as of 25 Masked/Nazca Boobies that it did

not distinguish to species (CBRC 2007, Singer et al. 2020). In 2018 and 2019 a surge of additional records representing 97 individuals was submitted, and by February 2020 the CBRC had accepted records of 43 Masked, 59 Nazca, and 43 Masked/Nazca boobies (T. Benson pers. comm.). The CBRC continues to use bill color as the only criterion distinguishing these two species, but its members have struggled with many records of first-cycle and second-cycle birds because of lack of specific knowledge regarding bill-color development in each species, along with variability in the appearance of bill colors in photographs taken at different angles of lighting, as taken by different cameras, and as viewed on different computer monitors (CBRC 2007, McCaskie et al. 2018, Singer et al. 2020).

Many birds that occurred in California in 2018 and 2019 were well photographed during the second prebasic molt of their primaries, allowing for a broad comparison of the bill color and plumage of individuals at various stages of molt and, hence, estimated age through the first and second plumage cycles. Here I assess the progress of molt, plumage change, bill-color change, and identification of all Masked or Nazca boobies photographed in California through 2019. My goals were (1) to assess bill-color and plumage-color changes as molt of the primaries progresses from the first through the definitive molt cycles, (2) assess age-determination criteria, and (3) suggest criteria by which these two species can be identified in the first and second plumage cycles.

METHODS

I reviewed all photographs of Masked and Nazca boobies taken in California and submitted to the CBRC through 2019. These are listed in Appendix 1, available at www.westernfieldornithologists.org/archive/V51/Pyle-Boobies. I evaluated a total of 147 accepted records, one record that was not accepted because the bird rode on a ship from Mexican waters, and 10 pending records. The committee considered 11 of the accepted records to represent the same bird as in one or more other records. In these cases I assessed only the record with the most complete photographic documentation, except in one case (CBRC 2003-065 and 2003-128) in which I considered them different individuals (see Appendix 1). All records but five were of single birds. The exceptions involved two (three records), three, or four birds (see Appendix 1). In these cases I evaluated each individual separately. Accepted records that did not include photographs ($n = 17$) or included only very poor photographs, precluding any assessment of bill color or plumage patterns ($n = 5$), were excluded from analysis, leaving a total of 134 individuals assessed. These birds were initially discovered on dates from 5 April 1990 (CBRC 1990-052) to 14 November 2019 (2019-179). With respect to season, the birds were initially discovered during all months of the year except March, though predominantly from July to October (Figure 1).

For each individual I attempted to score the stage of primary molt, the color of seven areas of the plumage (head, nape, lower back, upperwing coverts, uppertail coverts, underwing coverts, and central rectrices), and the color of the bill base and bill tip. I could assess primary molt on 108 of

the 134 individuals, categorizing it as active ($n = 83$) or inactive ($n = 25$). If feasible, I scored the progression of replacement of the juvenile primaries during the second prebasic molt ($n = 62$) as the outermost primary that had been dropped or was growing, from p0 (primary 1 not dropped yet) to p10 (primary 10 growing).

I scored the head, nape, back, uppertail coverts, upperwing coverts, and underwing coverts from 0 to 5, as each progressed from essentially all dark (0) to all white (5). Coloration of the central rectrices was also scored from 0 to 5 on the basis of the extent of white visible beyond the tips of the longest uppertail coverts, from none (0) to white or white with small dark markings (5). I categorized the generation of the central rectrices as juvenile, second basic, or definitive basic as based on replacement of the primaries and body plumage. Two individuals showed full-grown central rectrices of different generations, each of which I scored separately. Sample sizes for the seven plumage variables ranged from 131 for head color to 80 for underwing color; some individuals were not scored for one or more variables because the area was not visible or reliably assessable in available photographs.

I categorized the bill base (basal ~65%) and bill tip (distal ~35%) as up to two of seven colors, one dominant and one secondary. For example, a bill base of "greenish yellow" was predominantly yellow and secondarily (e.g., washed) green. In some cases only one color appeared evident, and in these I assigned it as both dominant and secondary. Colors included dusky (dark grayish to blackish), dark blue, horn (medium-pale brownish, often tinged mustard or olive), green, yellow, orange, and pink. The bill base could be any of these seven colors, whereas only three, green, yellow, and orange, were found in the bill tip. In addition, I scored the brightness of both base and tip colors as dull, medium-dull, medium, medium-bright, or bright. All colors were scored on a single laptop monitor, on which the warmth of colors was roughly average when compared against the same images of Masked and Nazca boobies on five or six other computer monitors during the CBRC's 2019 meeting in Los Angeles. To reduce unintended bias, I scored bills as much as possible without referring to the species under which the record was being considered or had been accepted by the CBRC. I scored most bills (74% of 120 individuals) in one sitting, and changed no score in light of subsequent reference to species identification by the CBRC.

RESULTS

Primary Molt

Seven individuals were in juvenile plumage and had not started primary molt (primary score p0). In 56 individuals, replacement of juvenile primaries was in progress and the molt could be scored from p1 to p10 (Figure 2). Nine birds with juvenile outer primaries could not be assessed for progress of molt of the inner primaries. In no bird did the molt of juvenile primaries appear to have been suspended, while several (potentially all) boobies replacing the juvenile p9 and/or p10 had begun a second wave of primary molt at p1. From the distribution of data, I assigned each bird undergoing molt of juvenile primaries to one of six categories for analysis of bill color and plumage

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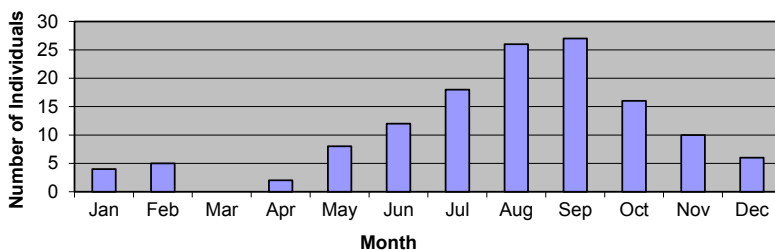


FIGURE 1. Seasonal distributions of Masked and Nazca boobies recorded in California, indicating a peak in observations from June to October. Dates are of the initial detection; some individuals remained into subsequent months including March and April.

change by age: p0 ($n = 6$), p1–p4 ($n = 13$), p5–p6 ($n = 8$), p7 ($n = 12$), p8 ($n = 13$), and p9–p10 ($n = 20$). A seventh category included birds in their third cycle in which growth of p10 was completed during the second prebasic molt and a second wave of replacement had begun or presumably begun at p1 ($n = 12$). Among these, four were in active molt in which the second wave of replacement had reached p3 ($n = 1$), p4 ($n = 1$), or p5 ($n = 2$). The molt had been suspended after the second wave reached p3 in one bird and p4 in two birds. For 5 of the 12 birds I could not determine if a molt was in progress. I considered individuals with completely white body feathers and wing coverts ($n = 40$) to be in definitive basic plumage; in 17 of these the primaries were in active molt, in 13 they were not in active molt, and in 10 birds I could not determine the molt status.

Bill Color

I was able to score bill color in 120 of the 134 individual boobies. In the remaining 14 birds the bill colors could not be reliably assessed because of post-mortem changes (carcasses or specimens) or unfavorable lighting, distance, or angle of the bird in photographs. For the bill base, I recorded the primary and/or secondary color as including dusky in 14 individuals, as dark blue in 22, as horn in 34, as green in 16, as yellow in 29, as orange in 61, and as pink in 19. I recorded the bill tip as including green in 18 individuals, yellow in all 120, and orange in 82.

Combinations of colors of the bill base and bill tip fell into two distinct categories. Birds with dusky, horn, orange, and/or pink in the bill base commonly had yellow and orange in the bill tip, but none of these birds had green in the bill tip (Figure 3). By contrast, birds with dark blue, green, and/or yellow in the bill base commonly had green and/or yellow in the bill tip, but only three with these colors in the base were scored with orange, each with blue in the base and orange in the tip (see below). The predominant and secondary colors in the bill base were also associated nonrandomly. For example, no bill bases with dusky, horn, orange, or pink were scored with green as well, and only two of these were also scored with yellow (one as yellowish-horn and one as yellowish-orange). Likewise, no bill bases with dark blue, yellow, or green were also scored with orange or pink.

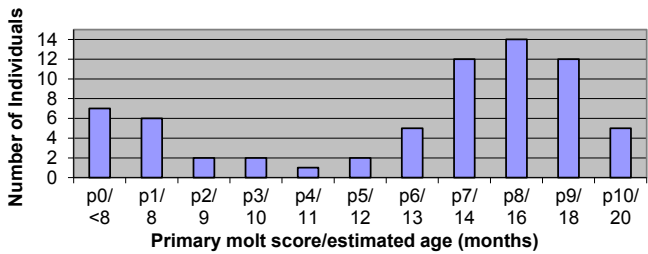


FIGURE 2. Number of subadult Masked and Nazca boobies recorded in California by stage of primary molt and estimated age. Ages are estimated from data on progression of molt in marked birds of an Atlantic population of the Masked Booby (Dorward 1962).

From these differences and further analysis of bill-color changes by age (below), I propose that the birds in the first category, with more dusky, horn, orange, and pink scored in the bill, be considered, provisionally, as Nazca Boobies and those in the second category, with more blue and green in the bill, be considered, provisionally, as Masked Boobies. The three individuals with both bluish in the base and orange in the tip, along with two individuals that showed conflicting colors in different photographs, were analyzed separately (see Discussion for more on these five birds). On the basis of bill-color categorization alone, 88 individuals qualified provisionally as Nazca Boobies and 27 as Masked Boobies. Examples of individuals of each category, with scores of various colors and brightnesses, are shown in Figures 4–6.

Bill Color Versus Age

Provisional Masked Boobies varied little in scored bill color according to age. All three colors, dark blue, green, and yellow, appeared in similar frequency in the bases of the bills of birds in all categories of primary molt, from juveniles to definitive basic plumage. For the bill tip, both green and yellow appeared in all age groups, with a tendency for bill tips to be brighter, with more yellow and less green, in birds in definitive plumage. In provisional

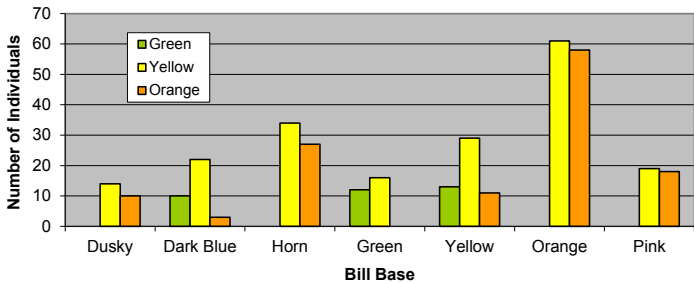


FIGURE 3. Distribution of bill-tip color according to bill-base color in Masked and Nazca boobies recorded in California. Note that no or few birds with blue, green, or yellow in the base also showed orange in the tip, whereas no birds with dusky, horn, orange, or pink in the base also showed green in the tip.

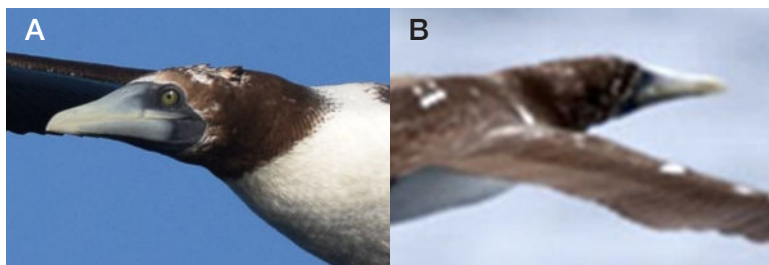


FIGURE 4. Bill color in a provisionally identified juvenile Masked Booby (A, off Point Fermin, Los Angeles County, 22 August 2018; CBRC 2018-106) and a provisionally identified juvenile Nazca Booby (B, off Pt. Loma, San Diego County, 23 July 2010; CBRC 2010-077). In neither of these birds had p1 of the juvenile plumage been replaced, so their estimated age is <8 months. Masked Boobies appear to acquire a bluish bill base and a greenish tone to the remainder of the bill, whereas Nazca Boobies appear to acquire horn coloration in the base and a yellow to orange-yellow or golden-yellow bill tip that is brighter at a younger age than is found in the Masked Booby. Although the photograph of the apparent Nazca Booby above (B) is rather soft, the golden-yellow tip is readily discernable. These birds were scored as (A) bill base medium-bright greenish blue and bill tip medium greenish yellow; and (B) bill base medium dull dusky-horn and bill tip medium orangish yellow. See also Figure 5.

Photos by Naresh Satyan (A) and Michael H. Smith (B)

Nazca Boobies, the color of the bill base generally changed from dusky (occasionally tinged bluish) in juveniles, to horn during the first wave of primary molt, to orange and pink in birds in definitive plumage. The frequency of horn coloration in the bill base gradually dropped, from 65% in 23 birds through the first dropping of p6, to 43% of 7 birds in third basic plumage (that had completed the first molt of primaries), to 0% of 32 birds in definitive basic plumage. Horn was replaced by orange, which was found in 20% of 10 birds in which p5 had not yet been replaced for the first time, 44% of 23 birds with p5 to p8 molting, and 100% of 32 birds in definitive basic plumage. Seven birds showed both horn and orange in the bill base; in the four of these in which primary molt could be assessed it scored between p6 and p9. No pink appeared until definitive basic plumage was attained; it was scored in 56% of 32 birds in this plumage.

The tips of the bills of provisional Nazca Boobies were largely orangish or golden yellow. Some 82% of 61 birds through the second cycle of primary molt (including 65% of 17 birds that had not yet dropped p5) showed this color, while 28.1% of 32 birds in definitive plumage had gained more orange coloration to the tip and were scored with bills of yellowish orange (i.e., with orange rather than yellow predominating). It is possible that bill bases gain more pink and bill tips gain more orange before or during courtship or breeding, then become yellower (duller) during molt and nonbreeding periods, paralleling the changes in the soft-part colors of herons, rails, and other taxa (Pyle 2008). However, because the schedule of breeding of the individuals photographed is unknown, I could not address seasonal variation in bill color

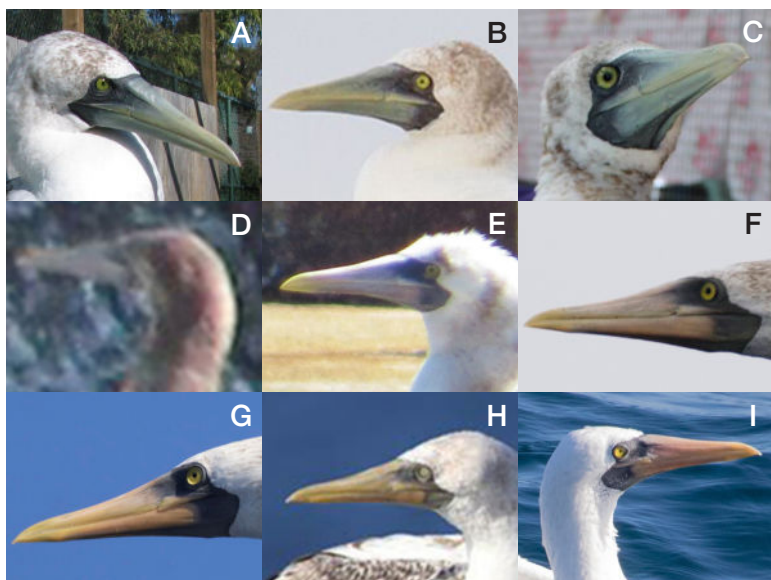


FIGURE 5. Progression of bill colors in provisionally identified Masked (A–C) and Nazca (D–I) boobies through their first primary molt. Note the bluish and greenish tones to the bills of the apparent Masked Boobies vs. the horn and orange tones to the bases and brighter golden-yellow tips to the bills of the apparent Nazca Boobies. The bill color of provisional Masked Boobies does not change substantially during the first plumage cycle (see also Figure 4). That of provisional Nazca Boobies gets brighter and oranger with age, but not necessarily consistently. Some younger birds (e.g., those in photos E and G) can show bills brighter than those of birds older according to molt progression (e.g., F and H, respectively). See Table 1 for locations, dates, scores, and photo credits.

with this data set. Photographs supporting these bill color patterns in both species as provisionally identified are shown in Figures 4–6.

The brightness of the color of both the bill tip and the bill base also varied by both apparent species and estimated age. Among the 120 individual boobies I scored for bill color, I rated the bases of four bills as dull, of nine as medium-dull, of 24 as medium, of 52 as medium-bright, and of 31 as bright. With respect to the tips I rated one as dull, seven as medium-dull, 16 as medium, 56 as medium bright, and 40 as bright. The bill tips averaged brighter overall and brighter relative to the bill bases on provisional Nazca Boobies than on provisional Masked Boobies at the same stage of molt of the primaries (Figure 7). Among birds with primary scores of p1 to p8, 7% of 14 Masked Boobies but 58% of 40 Nazca Boobies had the bill tip brighter than the base. By contrast, 43% of 14 Masked Boobies but only 2.5% of 40 Nazca Boobies had the tip duller than the base. Examples of individuals with various scores for bill brightness are shown in Figures 4–6.

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TABLE 1 Approximate Ages, Bill-Color Scores, and Background Data on Masked and Nazca Boobies Shown in Figure 5

Apparent species ^a and photo	CBRC record	County	Date ^b	Age (months) ^c	Bill base ^d	Bill tip ^d	Photographer
Masked							
A	2007-215	Los Angeles	6 Oct 2007	9	MB-GB	MB-YG	Akiko Kannan
B	2011-217	Orange	17 Dec 2011	14	MB-YB	MB-YY	Christopher Taylor
C	2018-160	Ventura	6 Oct 2018	16	MB-BG	ME-YY	Trish Gussler
Nazca							
D ^e	2015-103	Santa Barbara	28 Sep 2015	8	MD-HH	MB-OY	Jean Scholes
E	2018-100	Los Angeles	19 Aug 2018	11	ME-HH	MB-OY	Brittany O'Connor
F	2018-159	San Diego	23 Sep 2018	13	ME-OH	MB-OY	Nicole Desnoyers
G	2018-243	Ventura	5 Oct 2018	13	MB-OO	MB-YO	Michael Force
H ^e	2013-287	Los Angeles	13 Oct 2013	14	MB-HH	MB-OY	Jon Feenstra
I	2018-060	San Diego	10 Jun 2018	15	MB-OO	BR-OY	Mel Senac

^aApparent species is as identified in this analysis of bill color; identification in CBRC records may not match.

^bDate is that of photograph; may differ from date of first observation listed in Appendix.

^cApproximate age in months based on progression of primary molt (see text).

^dBills scored for brightness (first two characters) and color (second two characters). For brightness: MD, medium dull; ME, medium; MB, medium bright; BR, bright. For colors, the first letter represents the secondary color and the second letter represents the dominant color (e.g., GB indicates greenish blue or blue washed green): G, green; Y, yellow; B, dark blue; H, horn (medium-pale brownish, often tinged mustard or olive); O, orange.

^eAccepted as a Masked/Nazca booby by the CBRC.

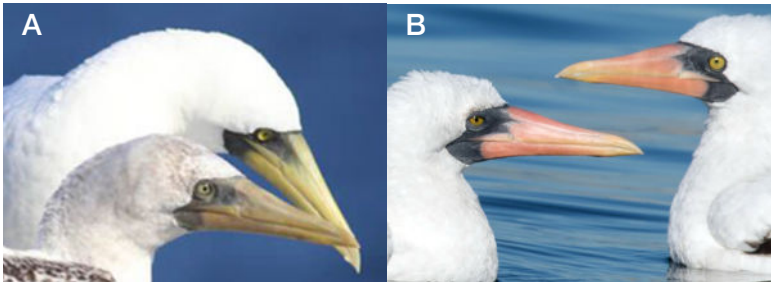


FIGURE 6. Bill color in adults (definitive plumage) of the Masked Booby (A, rear bird) and Nazca Boobies (B). The front bird in photo A is the same individual as in Figure 5G (which see for bill-color scoring), provisionally identified as a Nazca Booby. In definitive basic plumage these species differ diagnostically in bill color. A, rear bird, CBRC 2013-173, Los Angeles Co., 13 October 2013, bill base bright greenish yellow, bill tip bright yellow; B, 2017-155, San Diego Co., 13 December 2017, bill bases bright pinkish orange (left) and bright orange (right); bill tips bright yellowish orange in both birds.

Photos by (A) Jon Feenstra and (B) Mel Senac

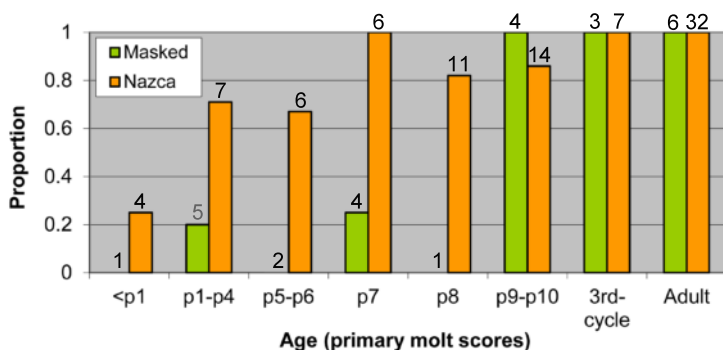


FIGURE 7. Proportion of provisionally identified Masked and Nazca boobies with medium-bright or bright bill tips by primary score and thus estimated age (see Figures 4–6 for examples of scores for colors of the tip and base of the bill). Sample sizes given above each bar. In birds in which the juvenile p9 has not yet been replaced, the proportion of bills whose tip is brighter than the base is greater in the Nazca than in the Masked Booby (see also text).

Thus younger presumed Nazca Boobies with dusky and horn bill bases ($n = 11$ in my sample; mean score for primary molt 4.3) transitioned to orangish horn ($n = 7$; mean 4.7) then orangish or pinkish-orange bases ($n = 51$; mean 6.0), while often showing brighter orangish-yellow or golden bill tips, a pattern not appearing in provisional Masked Boobies at any age. Among provisional Masked Boobies, 82% of 17 birds in the first and second cycles (before completion of the first molt of primaries) showed green in either the bill base or bill tip, whereas none of 47 provisional Nazca Boobies of these ages showed green in the bill base or tip (Figures 4–6).

Variation in Body Plumage and Wing Coverts by Age and Species

Mean scores for body plumage and wing coverts, by progression of primary molt (age), are shown in Figure 8. I found little or no difference between the provisionally identified species regarding change in any of the six areas of plumage evaluated. The head averaged slightly whiter in Masked than in Nazca boobies once p7 had dropped (mean head score for categories from p7 to the second basic plumage was 4.67 in 12 Masked Boobies and 4.16 in 38 Nazca Boobies). Otherwise there appeared to be no species-specific patterns by age among plumage scores. Therefore, in Figure 8, all birds are pooled.

The colors of the nape and underwing of the Masked and Nazca boobies have been suggested as changing at different rates, at least on average (Roberson 1998, Pyle 2008, Howell et al. 2014, Howell and Zufelt 2019). In my sample, by the time p7 had dropped, the nape had become fully white in all boobies. Prior to this, the mean nape score was 3.5 in eight provisional Masked Boobies and 2.5 in 16 provisional Nazca Boobies. Thus there was a tendency for the nape to be whiter in young Masked than in young Nazca boobies (as first suggested by Roberson 1998), but there was variation and overlap, especially among Nazca Boobies. For example, among birds that

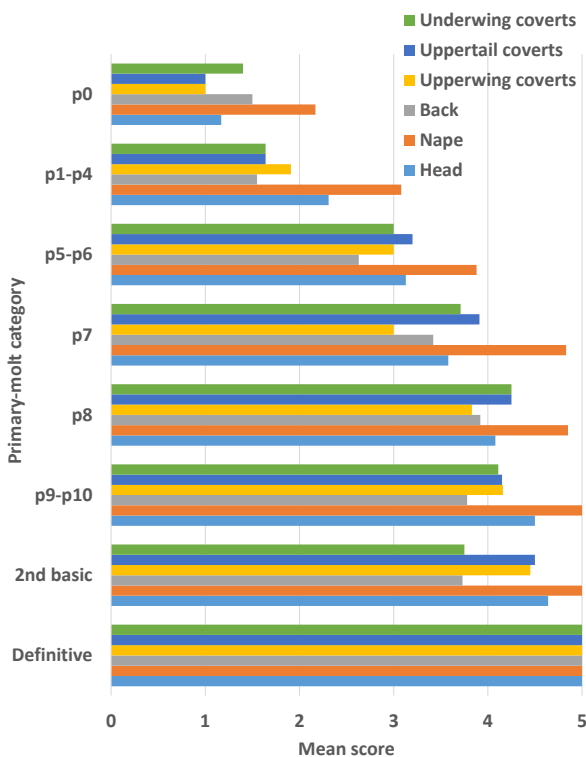


FIGURE 8. Development of appearance in six areas of body plumage and wing coverts with progression of molt of the primaries (age). A score of 0 indicates completely or almost completely dark, while a score of 5 indicates completely white. All individuals pooled, as few or no species-specific differences were evident (see text). Sample sizes: 5–6 (for category p0), 7–8 (p1–p4), 5–7 (p5–p6), 7–10 (p7), 7–12 (p8), 8–15 (p9–p10), 3–7 (second basic), and 15–25 (definitive basic). Sample sizes are presented as a range because not every bird in each age category could be scored for every variable.

had not yet dropped p7, apparent Nazca Boobies (by bill color) showed fully white napes (score 5) in at least three cases (CBRC 2018-100, 2018-159, and 2018-243), while one Masked Booby (CBRC 2014-099) showed a darker nape (score 3). It is possible that most birds had begun molting their nape feathers by the time they reached California, and that differences may be more marked among younger juveniles closer to the breeding grounds. Among the juveniles in my sample (p1 not yet replaced), one apparent Masked Booby (CBRC 2018-106) had a fully white nape (score 5), while four Nazca Boobies had nape scores of 1, 2, 2, and 2, supporting this species-specific difference.

Underwing-covert scores showed no consistent patterns by species. Mean scores for each provisionally identified species were the same or very similar for all age categories through the second and third basic plumages (sometimes

greater in provisional Masked Boobies, sometimes greater in provisional Nazca Boobies). For birds undergoing the first wave of primary molt, the mean underwing score was 2.4 in five Masked Boobies and 2.9 in 26 Nazca Boobies, opposite to the pattern reported by Howell and Zufelt (2009), darker in the Nazca than in the Masked.

In birds in second or third basic plumage in which p9 and/or p10 were growing or had completed growth, the nape and uppertail coverts had become fully white, whereas mean scores for the back of 3.8 ($n = 29$) and underwing coverts of 4.0 ($n = 13$) indicated the birds retained more dark feathering in these areas. However, at least three birds meeting these criteria scored 5 (pure white) for either the back or the underwing coverts, and several others (e.g., those in CBRC 2018-098, 2018-101, and 2018-108) had definitive plumage except for very slight mottling in these areas and/or the upperwing coverts. This suggests that some birds may approach the definitive color pattern by the time the last juvenile primary is dropped. Note that the difference in Figure 8 between second basic plumage and definitive basic appearance is based on circular reasoning (all tracts being white categorizing definitive basic appearance), so it is quite possible that some of the sample of birds of definitive appearance includes some in second or early third basic plumage. Among birds in which the second basic outer primary was fully grown there appeared to be no differences in any plumage score relative to progression of the second molt of inner primaries, although the sample size for this category was small ($n = 6$).

Variation in the Central Rectrices by Age and Species

Boobies provisionally identified as the Nazca by bill color consistently showed more white in the central pair of rectrices, of all three feather generations—juvenile, second basic, and definitive basic—than did those provisionally identified as the Masked (Figure 9). The central rectrices of most provisional Masked Boobies, of all three feather generations, scored 1 or 2; only two of 21 birds received a score of 3 (cf, Figure 10; CBRC records

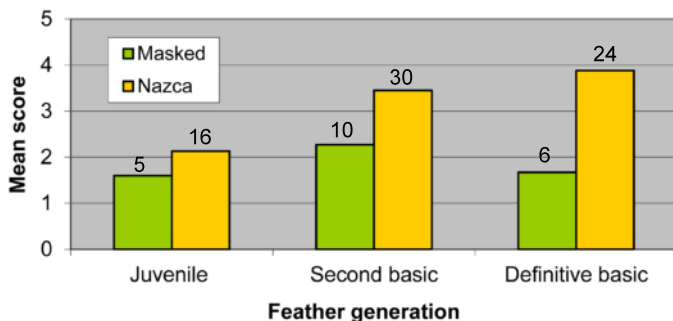


FIGURE 9. Mean score for extent of white in three generations of central rectrices of presumed Masked and Nazca boobies. Sample sizes are given above bars. Scores vary from 1 (central rectrix completely dark beyond uppertail coverts) to 5 (central rectrix completely or almost completely white); see Figure 10 for examples.

2007-215 and 2018-160), and one received a score of 5 (2006-155). In the last individual, one or both central rectrices appeared to be pure white, without markings, and thus may have been leucistic (most central rectrices that were scored as 5 had reduced dark markings at the tip). In all three of these cases (score > 2) the rectrices were second basic. Among provisional Nazca Boobies, six of 70 birds, all with juvenile rectrices (e.g., 2018-243; cf. Figure 10), received a score of 1. Notably, these included a bird confirmed by DNA analysis as a Nazca Booby (2001-107, which reached California on a ship; see photo in CBRC 2007:277). In all nine of these birds, the bill color clearly supported the provisional species identification. The extent of white in the rectrices also increased with age in the Nazca Booby (Figure 9), with the proportion of birds with central-rectrix scores of 4 or 5 increasing from 12% of 17 birds with juvenile rectrices to 50.0% of 30 birds with second basic rectrices to 55.2% of 29 birds with definitive basic rectrices. Photographs of tails exemplifying the scores, including some interesting variations, are shown in Figure 10.

DISCUSSION

Molt, Plumage, and Age

Molt and age. The majority of Masked and Nazca boobies reaching California were undergoing molt of primaries: 82.4% of 108 birds whose stage of molt status was visible in photographs. Of actively molting birds, 68.7% of 83 were undergoing the first molt of primaries. A large number of these (70% of 66 with known primary-molt score) were observed when the juvenile p6 to p10 were being replaced (Figure 2), and in no birds did the molt of juvenile primaries appear to be suspended. Post-juvenile dispersal thus appears to account for most records of these two species in California, and the predominance of birds in molt suggests that second- and third-cycle boobies, lacking the constraints of breeding, may replace their flight feathers continuously while foraging at sea (Pyle 2008, Howell 2010). Among adults, 57% of 30 birds whose status with respect to molt could be identified were actively molting, suggesting that these boobies may reach California shortly after post-breeding dispersal (before molt begins) but also later, once definitive prebasic molt commences. The predominance of first-cycle, second-cycle, and third-cycle birds in this sample provides an opportunity for plumage change to be examined in relation to replacement of primaries.

Dorward's (1962) analyses of banded Masked Boobies of known age on Ascension Island in the Atlantic Ocean allow estimation of the age of birds replacing their primaries for the first or second time. In Dorward's sample, p1 was dropped when the birds were about 7 months of age (about two months post-fledging; Nelson 2005), each successive juvenile primary from p1 to p7 was dropped about a month later than the preceding one, and the longer primaries from p8 to p10 were each dropped about 2 months following the preceding primary. Thus a bird growing p1 during the second prebasic molt should be 8 months old, one growing p6 should be 13 months old, one growing p8 should be 16 months old, and one growing p10 should be 20 months old (Figure 2), as long as molt is continuous. On the basis of Dorward's analysis

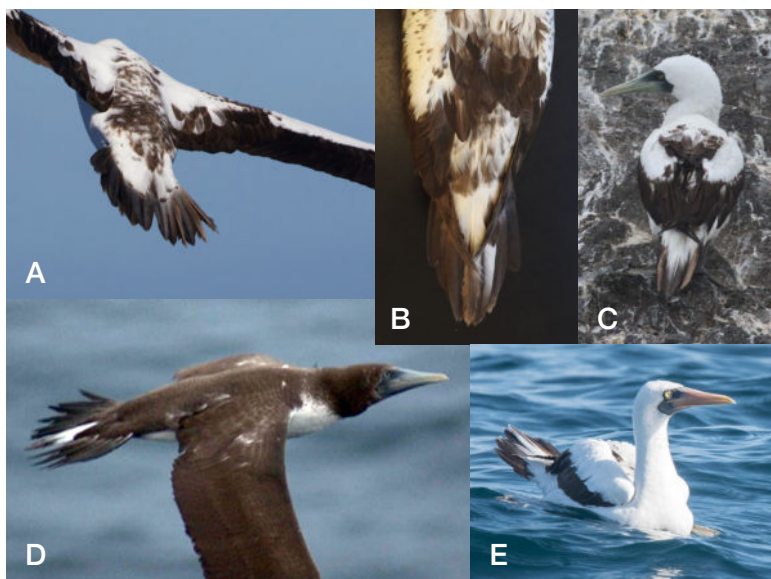


FIGURE 10. Examples of central-rectrix scores (1–5) in provisionally identified Masked and Nazca boobies. A, Ventura County, 5 October 2018 (CBRC 2018-243). One of six apparent Nazca Boobies assigned a central rectrix score of 1 (all dark beyond coverts). In this case the rectrices represent the second basic plumage. B, Nazca Booby, Ventura County, died 7 August 2018 (CBRC 2018-088, LACM 121174). Left rectrix juvenile with a score of 2; right rectrix second basic with score of 3, exemplifying an increase in white in the central rectrix in successive generations of feathers (see Figure 9). C, Ventura County, 27 September 2018 (CBRC 2018-160). Provisionally identified Masked Booby assigned a central-rectrix score of 3. In this case both rectrices represent the second basic plumage. D, Los Angeles County; 1 November 2007 (CBRC 2008-070). Different photographs of this bird show conflicting bill colors, so I did not identify it to species by bill color alone; however, the extent of white in the juvenile central rectrices (score 4) led to a provisional identification as a Nazca Booby. E, San Diego County, 10 June 2018 (CBRC 2018-060), Nazca Booby with central rectrices, of the definitive plumage, scored 5.

Photos by (A) Michael Force, (B) Kimball Garrett, (C) David Vander Pluym, (D) Michael Smith, and (E) Nancy Christensen

of birds that had completed the second prebasic molt, I estimate that those in my sample in which the second wave had reached p3, p4, and p5 were about 21, 22, and 23 months of age, respectively. These estimates must be considered approximate because of uncertainty in the precise age of chicks when Dorward banded them and individual variation in the rates of primary growth. By the time p6 was dropped, these rates could differ by up to a month. Only six boobies in my sample had not begun the first primary molt, suggesting that only a small proportion of the boobies reaching California are <2 months post fledging (<7 months of age). Most are first observed when p6–p10 are growing (Figure 2), when 6–17 months post fledging (11–22 months of age).

Plumage and age. This analysis implies that some Masked and Nazca boobies assume definitive appearance by completion of the first wave of primary molt, at ~22 months of age. Most references on plumage maturation in the Masked Booby indicate that all third-cycle birds (in which the second wave of primary molt has begun) should have dark mottling in at least the lower back and wing coverts (Witherby et al. 1940, Marchant and Higgins 1990, Nelson 2005, Pyle 2008, Grace and Anderson 2009, Howell and Zufelt 2019), the last areas of the plumage to attain definitive appearance, as I also found (Figure 8). Some references (e.g., Pyle 2008, Grace and Anderson 2009, Howell and Zufelt 2019) indicate that some individuals in their fourth cycles may retain black mottling in these areas. But in this analysis I found that no birds in which the second and third waves of replacement of primaries overlapped (in a Staffeldmauser pattern) retained black mottling in the plumage. Therefore essentially all of these boobies achieve definitive appearance during the third prebasic molt, by about 32 months of age according to Nelson (2005), but my analysis suggests that some birds may reach definitive appearance by an age of 20 months.

I recommend that the age of these boobies should thus be estimated solely from the progress of primary molt. Birds wearing their second generation of primaries and white body plumage but retaining light mottling on the lower back, upperwing coverts, and underwing coverts are in their third plumage cycle as defined here (20–32 months of age, depending on progress of the second wave of primary replacement). These criteria apparently apply to the Masked and Nazca Boobies equally (cf. Figure 8). The Northern Gannet (*Morus bassanus*) has been confirmed not to reach definitive appearance until at least the fourth plumage cycle at 36+ months of age (Cramp and Simmons 1977, Nelson 2005, Pyle 2008, Howell and Zufelt 2019). Perhaps the tropical foraging environment allows for more frequent feather replacement on an annual basis and a quicker rate of plumage change in Masked Booby than is possible in the less productive, colder northern waters the Northern Gannet most commonly inhabits in winter.

Identification of the Masked and Nazca Boobies in Predefinitive Plumage

I propose that, given good photographs of bill coloration, the majority of Masked and Nazca boobies can be identified to species away from their nesting colonies. Masked Boobies have bluish-green bill bases with greenish-yellow tips, and these colors appear to be relatively consistent while becoming brighter with age, from juvenile to definitive plumage. Nazca Boobies, by contrast, from juveniles through the first wave of primary molt, have dusky bill bases that are mixed with horn color (medium-pale brownish, often tinged mustard or olive) at younger ages and bill tips that are a brighter yellow and usually tinged orangish or golden. No Nazca Boobies show green in the bill and only a small proportion show bluish in the base (see below). In addition, the golden-yellow tips of Nazca Booby bills are often (>55%) brighter than the bases, an effect observed in only a small proportion (<8%) of Masked Boobies in predefinitive plumage. During the second basic and in later plumages, the base of a Nazca Booby's bill becomes bright orange to pinkish orange and the tip becomes bright orangish yellow to yellowish orange (Pitman and Jehl 1998,

Roberson 1998, CBRC 2007, Pyle 2008, Howell and Zufelt 2019). Younger Nazca Boobies thus have horn-colored bill bases (mixed dusky or occasionally bluish) that become mixed horn and orange, then orangish or pinkish orange, with brighter orangish-yellow or golden bill tips, a combination of colors not shown by Masked Boobies at any age (Figures 4–6). Even from poor photographs (e.g., in Figures 4 and 5), I propose that a brighter, golden-tipped bill is enough to confirm a Nazca Booby (Figure 4B). Rottenborn et al. (2016) suggested that the bill of the Nazca Booby averages thinner and with a culmen more concave than in the Masked Booby. Although I did not evaluate possible differences in bill shape, the photos in Figures 4–6 seem to support this hypothesis. Because subtle differences in bill shape cannot be quantified easily in photos taken in the field at various angles, this hypothesis should be tested with measurements of specimens.

Photographs at www.eBird.org and other websites indicate that these color differences may become evident in juveniles at or near breeding colonies. For example, see photographs of juvenile Masked Boobies from Clipperton Atoll (www.oceanlight.com/photo/brown-booby-clipperton-island-33088.jpg) and in the Northwestern Hawaiian Islands (www.ebird.org/checklist/S54437701, www.storage.needpix.com/rsynced_images/masked-booby-79774_1280.jpg), and of juvenile Nazca Boobies from the Galapagos Islands (www.ebird.org/checklist/S20648069, www.ebird.org/checklist/S52286384, www.ebird.org/checklist/S57729904). More study on the breeding grounds, however, will be needed to clarify when exactly bill colors of nestlings (<5 months old) at these colonies change from blackish to colors that may allow the two species to be distinguished, and the degree of individual variation in rates of bill-color change with age. Further investigation will also be useful in determining if the pattern of bill-color change I describe applies throughout the pantropical range of the Masked Booby. In some populations the bill of adults appears to average brighter than it does in the eastern Pacific Ocean.

More extensive white in the visible portions of the central pair of rectrices appears to be useful as a supporting character distinguishing the Nazca from the Masked Booby in some cases. As has been reported in the literature (Roberson 1998, CBRC 2007, Pyle 2008); however, each species' rectrices vary from completely dark to completely white (Figure 10). For example, one booby in my sample confirmed to be a Nazca Booby by DNA analysis (CBRC 2001-107) had all-dark central rectrices beyond the coverts (score 1), as do two juvenile Nazca Boobies with photographs in Howell and Zufelt (2019:307). Despite this overlap, I consider the lack of brown extending past the uppertail coverts (central rectrix score 1 here) a supporting character for the identification of Masked Boobies, especially those with second basic or definitive rectrices, whereas white extending well past the coverts (rectrix scores 3–5) can be considered a supporting character for the identification of Nazca Boobies, especially those with juvenile rectrices. Coloration of the nape and underwing coverts does not appear to be as helpful for distinguishing these two species, at least by the time they reach California. A white nape or hind collar in juvenile Masked Boobies vs. a dark nape in juvenile Nazca Boobies could be a supporting character on the breeding grounds, although

Roberson (1998) reported the opposite pattern in as many as 25% of the photographs of juveniles of each species that he examined.

Masked or Nazca boobies whose bills have not been well photographed or described should not be identified to species, except in cases of confirmation by DNA analysis (cf. CBRC 2001-107 and 2013-285; CBRC 2007, Rottenborn et al. 2016). Occasionally, photographs of the same booby show conflicting bill colors (e.g., Figure 11). A problem with a few records prior to 2010 may be related to use of older photographic formats (e.g., Kodak Kodachrome vs. Ektachrome slides) and the effect of lighting or production on these formats (Figure 11A–D). It appears that advancement of digital imaging technology since 2010 has lessened this problem, as the apparent bill color did not vary as much among more recent photographs taken with different cameras and in various lighting situations. Another problem is variation in the warmth of the color as seen in the same photograph on different computer monitors (Singer et al. 2020), which has caused CBRC members to vote differently on records of the same bird. Perhaps this problem will also lessen with technological advances in computer monitors. I predict, however, that a greater understanding of bill color variation, as I have documented, will improve the accuracy of identifications as observers account for potential variations in photographs taken under different lighting and in computer monitor display.

Three birds (CBRC records 2015-103, 2018-138, and 2018-244) were scored with blue in the bill base but medium-bright orange-yellow in the bill tip. Both 2015-103 (Figure 5D) and 2018-144 had medium bluish-horn bill bases, and this, as well as their brighter golden bill tips (and score of 3 for the second-basic rectrices of 2018-144) lead me to identify them provisionally as Nazca Boobies. Record 2018-138 was unique in its bill having a medium-bright bluish base (without horn) and orange-yellow tip of the same brightness, defying categorization by the criteria I have outlined (Figure 11E, F). Although I suspect it was a Nazca Booby by bill color, it may have been a hybrid. Otherwise, birds with intermediate characters or possible hybrids accounted for a very small proportion of my sample (4.2% of 120).

The Recent Invasion of California by the Masked and Nazca Boobies

According to my sample of provisional identifications, Nazca Boobies far outnumber Masked Boobies in California (92 vs. 27 individuals through 2019). Only 32 of the provisional Nazca Boobies in my sample were identified prior to 2018 (vs. 60 in 2018 or 2019), whereas the 26 records of the Masked Booby are more evenly distributed between these two periods (12 before 2018 and 14 in 2018 or 2019). Pitman and Jehl (1998) and Roberson (1998) reported the Nazca Booby's pelagic distribution as more coastal than that of the Masked, possibly leading to observations of the Nazca being more frequent near the California coast. The recent increases of both species as well as other boobies in California may also be affected by global ocean warming as connected to El Niño–Southern Oscillation and climate change (Anderson 1989, Tompkins et al. 2017, Cha et al. 2018). Potentially, temperature differentials in the eastern Pacific are diminishing as the ocean warms, leading to a greater likelihood of Nazca Boobies dispersing into waters of the California Current, but further research is needed on this. Such factors may also lead

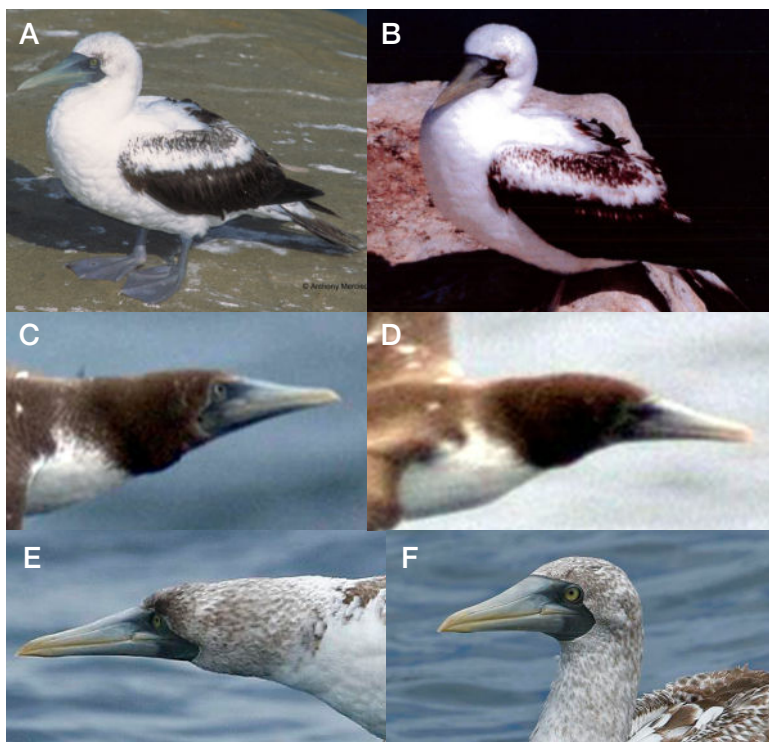


FIGURE 11. Boobies with bill-coloration scores showing conflicting colors relative to species identification. A, San Diego County, 30 December 2001 (CBRC 2002-001) and B, Orange County, 11 February 2002 (CBRC 2002-038) represent the same individual, as details of the plumage match. From photograph A, I scored the bill base as medium (in brightness) dark blue and the tip as medium-bright greenish yellow, suggesting a Masked Booby. From photograph B, I scored the bill base as medium-dull dusky horn and the tip as medium orangish yellow, suggesting a Nazca Booby. C and D, Los Angeles County, 1 November 2007 (CBRC 2008-070), one bird photographed at the same time but in different lighting. From photograph C, I scored the bill base as medium (in brightness) dark blue and the tip as medium yellow, suggesting a Masked Booby. From photograph D, I scored the bill base as medium dusky horn and the tip as medium-bright orangish yellow, suggesting a Nazca Booby. On the basis of photographs B and D, the precise color of the bill tips in photographs A and C, examination of additional photographs, and, for C and D, a central rectrix score of 4, as shown in Figure 10, I suspect both are Nazca Boobies. This problem of bill-color variation in photographs appears to have lessened with technological advancements in digital imagery after about 2010. E and F, photographed southwest of San Clemente Island, Los Angeles County, on 6 September 2018 (CBRC 2018-138), I scored as having a medium-bright bluish bill base and a medium-bright orange-yellow bill tip, contradictory characters precluding categorization to species (see text).

Photos by (A) Anthony Mercieca, (B) Don Lockshaw, (C and D), Michael H. Smith, and (E and F) Dave Pereksta

MOLT, AGE, AND IDENTIFICATION OF MASKED AND NAZCA BOOBIES

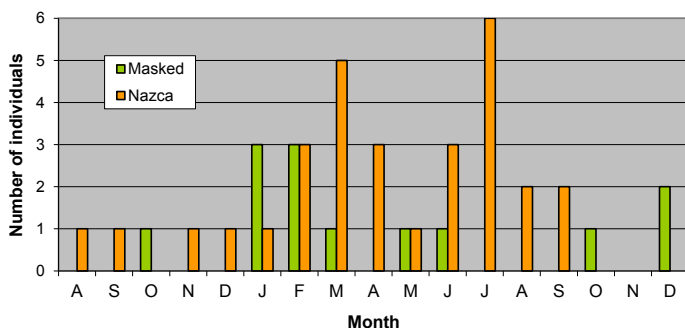


FIGURE 12. Estimated months in which provisionally identified Masked and Nazca boobies were hatched, from August 2016 to December 2017, as based on estimated age in months (see text) and date of observation. Note the preponderance of apparent Nazca Boobies estimated as hatching from February to September 2017, indicating that this breeding period may have been relatively productive for this species, which in turn may have been a factor fueling the 2018–2019 surge in records to California. By contrast, hatchings appear to have been less seasonal in apparent Masked Boobies that reached California in 2018 and 2019.

to a paucity of food resources in the area, resulting in greater dispersal of boobies (cf. Tompkins et al. 2017), as far as California. Another factor that may contribute to invasions or die-offs of seabirds is a spike in productivity. From the estimated months of hatching among Nazca Boobies reaching California in 2018 and 2019 (Figure 12), it would appear that a productive breeding season from February to September 2017 may have been a factor in this species' invasion of California, despite a warning that its breeding success may be declining (Tompkins et al. 2017). All of these factors may be contributing to the increase in boobies recorded over the past decade in California.

Standardization and Possible Re-evaluation of CBRC records

As part of this analysis I reviewed every CBRC record of the Masked and/or Nazca boobies supported by photographs. One of my goals was to apply standard criteria for identification by bill color, summarized above, when possible. Provisional identifications as based on my initial bill-color analyses differed from the CBRC's decision on 37 of the 134 individual birds. In some of these cases, however, photographs only marginally depicted the bird's bill color, and my scores may not have been accurate. In others the identifications suggested by the pattern of the central rectrices and the bill color conflict. With these eliminated, approximately 25 records remain that I believe the CBRC should re-evaluate. Most of these records were accepted as representing the Masked Booby but I believe should be left unidentified, or had been left unidentified but I think represent the Nazca Booby.

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TWO PHOTOGRAPHED AMERICAN COOT × COMMON GALLINULE HYBRIDS

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ABSTRACT: To the three previous reports of hybrids of the American Coot × Common Gallinule we add two, one from Mountain View, California, in July 1995 and one from Tijuana, Baja California, in December 2019 and January 2020. The hybrids were similar in their coot-like build and intermediate plumage coloration, but they differed in size, bill and leg coloration, extent of lobes on the toes, and some plumage details. The one in Tijuana was larger than either parental species but made vocalizations of both species. Such intergeneric hybrids are rare, but at least 11 examples of *Fulica* × *Gallinula* have been reported from the Old World.

Fulica (coots) and *Gallinula* (moorhens and gallinules) are widespread related genera that share many habits and habitats. Intergeneric hybrids between the Eurasian Coot (*F. atra*) and Eurasian Moorhen (*G. chloropus*) are rare but have been well documented in Europe (McCarthy 2006). Hybrids between their American counterparts, the American Coot (*F. americana*) and Common Gallinule (*G. galeata*), have been reported three times previously (Louisiana, McIlhenny 1937; northern California and Colorado, Brinkley 2001:137). However, no specimen or photo exists, and this cross remains largely unknown; e.g., it is not mentioned in the Birds of North America accounts by Bannor and Kiviat (2002) or Brisbin and Mowbray (2002). Intergeneric hybrids are uncommon in birds, but many pairings have been recorded, particularly in waterbirds (Ottenburghs 2019). The deeper divergence between these lineages (10–15 million years ago in the case of *Fulica* and *Gallinula*; Garcia-R. et al. 2014) results in a higher chance of pre- or post-mating reproductive incompatibilities. Here, we report the details of two observations of American Coot × Common Gallinule hybrids, both photographed, one each from California and Baja California.

CALIFORNIA RECORD

On 22 July 1995, Michael J. Mammoser and Rottenborn found an adult American Coot × Common Gallinule hybrid in the Stevens Creek Nature Study Area adjacent to Shoreline Park in Mountain View, Santa Clara County, California. The bird was with American Coots, and although it was similar in overall size and shape to the coots, the unusual bill coloration caught the observers' attention, leading to closer scrutiny. Rottenborn returned on 24 July and was able to study the bird more closely before visiting nearby areas to look at Common Gallinules for comparison.

The bird's head, neck, and body were slightly smaller than on coots in direct comparison, but still larger, thicker, and bulkier (in proportion to body size) than on Common Gallinules studied subsequently (Figures 1 and 2). The head was large and blocky like that of a coot, not small and rounded as on a

gallinule, and the neck was proportionately thicker than on a gallinule. The bill pattern differed from both parent species. The top of the frontal shield was rounded as on a coot, not squared off as on an adult gallinule. The frontal shield was bright red as on an adult gallinule, with this red extending forward along the culmen over the proximal one quarter to one third of the maxilla. Except for small, vague orangish patches near the base of the mandible and toward the distal end of the culmen, the bill was otherwise bright yellow like the tip of the bill of a gallinule rather than the ivory of a coot. The bill's shape was more coot-like, being slightly deeper, more gradually tapered toward the tip, and more blunt than that of a gallinule, but, in direct comparison, the bill was slightly more slender than on pure coots. The irides were bright red like those of adult American Coots, whereas irides of all seven adult Common Gallinules studied nearby on 24 July were a duller, deeper red, with most having a dull brownish tinge.

The back was slightly more brown than the slate-gray backs of the nearby coots, but lacking the extensive pure brown color of the back of a gallinule. All of the adult gallinules studied nearby on 24 July had plain brown feathers on the back and brown remiges, whereas those of the hybrid were a blend of brown and slate gray, contrasting less with the slate gray sides and neck than on the gallinules. Two white-striped gray feathers were present on each flank (such as would be found on a gallinule but not a coot), but most of the feathers of the sides and flanks were plain slate-gray as on a coot.

The structure of the toes looked perfectly intermediate between the two parent species (Figure 3). In direct comparison, the toes were proportionately longer and narrower than on a coot, with much smaller fleshy lobes along the edges. However, the narrow fringe of skin along the edges of the toes was more extensive than on a gallinule. The toes were greenish or yellowish-green, perhaps slightly more green than the legs; the toes of nearby gallinules were similarly colored, whereas the toes of coots seen in direct comparison were pale green with a bluish-gray cast, paler and less yellow than on the hybrid.

BAJA CALIFORNIA RECORD

On 9 December 2019, Erickson found an adult American Coot $\times$ Common Gallinule hybrid on Lago la Amistad in Parque de la Amistad, a city park on the east side of Tijuana, Baja California. The bird was superficially similar enough to the many coots present that he had actually walked past it before it made a gallinule-like call, and he turned back to look for the Common Gallinule that he then assumed to be present. Upon realizing its hybrid nature, Erickson spent some time watching and photographing this cooperative bird. René Valdés and Erickson returned to the park on 20 January 2020 and found the hybrid on the same portion of the lake as the previous month. Gerardo Marrón photographed the bird on 30 January 2020 (see this issue's inside back cover).

In all respects the hybrid acted like the coots with which it associated; all were well adjusted to human presence. On the water, the size and structure of the hybrid pretty well matched nearby coots, but the hybrid was slightly larger (heavier) than the coots (Figure 4). Positive heterosis is frequently observed in avian hybrids. Crosses between domestic chickens (*Gallus gallus*) and Hel-

AMERICAN COOT $\times$ COMMON GALLINULE HYBRIDS



FIGURE 1. Overall coot-like shape, but unusual bright yellow and red bill, of hybrid American Coot $\times$ Common Gallinule in Mountain View, California, 24 July 1995.

Photo by Stephen C. Rottenborn



FIGURE 2. Comparison of size and shape between the hybrid American Coot $\times$ Common Gallinule and pure American Coots in Mountain View, California, 24 July 1995.

Photo by Stephen C. Rottenborn



FIGURE 3. Toes of the hybrid American Coot $\times$ Common Gallinule in Mountain View, California, 24 July 1995; the fleshy lobes on the toes were more extensive than on a pure gallinule but smaller than on a coot.

Photo by Stephen C. Rottenborn

meted Guineafowl (*Numida meleagris*) may be up to twice as large as either parent (McCarthy 2006). The hybrid was observed during many interactions with coots and was dominant on every occasion. When the hybrid was on shore, the toes revealed themselves as lobed, much like a coot's (Figure 5).

In terms of bare-part coloration, the hybrid showed more intermediate characteristics. The bill and frontal shield were not white or black as on a coot but yellow and red as on a gallinule (Figure 6). The distribution of colors was



FIGURE 4. Size comparison of hybrid American Coot $\times$ Common Gallinule with American Coot in Tijuana, Baja California, 9 December 2019.

Photo by Richard A. Erickson



FIGURE 5. Hybrid American Coot $\times$ Common Gallinule in Tijuana, Baja California, 9 December 2019, showing overall structure and lobed toes similar to those of an American Coot.

Photo by Richard A. Erickson

different than on a gallinule, however, with the shield red and the bill primarily pale yellow, with traces of reddish at the base and tip of the maxilla and at the base of the mandible. Only a hint of reddish color was visible above the intertarsal joint (Figures 5 and 7), much reduced from what an adult gallinule shows.

The hybrid's plumage was also intermediate between the two species. There was no evidence of the white flank stripes that show on gallinules. The upperparts were largely brownish (Figure 7), unlike a coot's, but they



FIGURE 6. Quizzical hybrid American Coot $\times$ Common Gallinule in Tijuana, Baja California, 9 December 2019, showing details of bill and frontal shield coloration.

Photo by Richard A. Erickson



FIGURE 7. Hybrid American Coot $\times$ Common Gallinule in Tijuana, Baja California, 9 December 2019, showing close-up of the upperparts.

Photo by Richard A. Erickson

were much less richly colored than on a gallinule. There was more whitish mottling on the hybrid's belly than on any nearby coot, though the potential significance of this is unclear.

The hybrid called occasionally. Most notable was a "keek" call much like the typical gallinule "keek" described by Pieplow (2017). The bird also uttered several low volume "grunts," perhaps within the range of variation for the American Coot "croak" described by Pieplow (2017). Examples of both calls are included at www.ebird.org/checklist/S63668709.

DISCUSSION

We were unable to obtain any more information on the appearance of the previous California and Colorado hybrids, but McIlhenny (1937) described the Louisiana bird as follows: "red beak of the Florida Gallinule with the white shield above the beak as in the Coot. The eyes were colored as in the Florida Gallinule. The legs were like those of the Florida Gallinule even to the color and the red bare space above the knee joint [i.e., ankle]. The feet were semi-palmated like the Coot's and the entire body coloring and general body build were like that of the Coot, except the plumage of the back which had the coloring of the Florida Gallinule. The bird was much smaller than an adult Coot." So the Mountain View, Tijuana, and Louisiana birds were similar in overall coot-like build and overall plumage coloration, but they varied in size, bill and leg coloration, foot structure, and some plumage details, variability not unexpected in F1 hybrids. McCarthy (2006) described European hybrids as having "traits both of Common Coot (size and lack of white on flank) and of Common Moorhen (white undertail and green legs)." Numerous photographs were published by van Balen et al. (2001) and Rodríguez et al.

(2010). Van Balen et al. (2001) were the only ones to discuss vocalizations of any of these hybrids, describing calls unlike either parent species.

Both American Coots and Common Gallinules breed in the Mountain View area, and that bird may have resulted from local breeding. The provenance of the Tijuana hybrid is unknown. Lago la Amistad is managed irregularly and typically provides habitat for a wide range of waterbirds (e.g., www.ebird.org/checklist/S62180263 and <https://ebird.org/checklist/S63668709>, which also include additional photographs of the hybrid). Marsh habitat is not extensive and varies in quality, but has been sufficient to support nesting coots, gallinules, and even White-faced Ibis (*Plegadis chihi*) on occasion (approximately 20 birds in 2008 and 2019, Erickson pers. obs.). Nevertheless, given the small sizes of the local populations, it seems more likely that the hybrid came from elsewhere and arrived on the lake with the large number of coots that descend upon the region in winter.

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COURSE REVIEW

Learning California Bird Sounds, 4th edition, by Sylvia Ranney Gallagher. 2016. Sea & Sage Audubon Society. Includes flash drive with introductory and practice sounds covering 89 species, worksheets, and other printed documentation. \$39.00 (plus 6.75 shipping and handling). Available from Sea & Sage Audubon Bookstore, P.O. Box 5447, Irvine, CA 92616; www.seaandsageaudubon.org/AudubonHouse/natureshop.htm. Additional species are covered by Gallagher's companion works: *Learning MORE California Bird Songs*, *Learning (Western) Mountain Bird Songs*, and *Learning Desert Bird Sounds* (each priced identically to LCBS).

Bird sounds are a conspicuous part of the natural world that delight the ear, mark the changing seasons, pique our curiosity, and provide the background music to daily life. Besides bringing us simple pleasure, the study of bird sounds can open us to an entirely new world as we learn new languages that allow us to identify species and eavesdrop on their communications sight unseen. Anyone who has spent any time in the field knows how important it is to master the basic songs and calls of birds given how many individuals are heard only rather than seen. Knowledge of bird songs is also vital to conservation work, as detecting population trends of species, from the rarest to the most common, often depends on surveys that require aural identification (e.g., Breeding Bird Survey). When I began birding in the 1970s, there were few resources for learning bird songs other than some basic recordings available on LP record albums (including vocal recreations of bird calls, e.g., Big Jake's *Calls the Waders*; www.discogs.com/Big-Jake-Calls-The-Waders-/release/7763703), verbal descriptions of songs and calls in field guides and other books, and field outings with more accomplished companions. Today, after the dawn and maturation of the digital age, there is a dizzying array of sources, including online access to world-class sound-recording collections, such as Cornell Lab of Ornithology's Macaulay Library (www.macaulaylibrary.org) or Xeno-canto (www.xeno-canto.org/), recent field guides devoted entirely to bird song (e.g., Nathan Pieplow's 2019 *Peterson Field Guide to Bird Sounds of Western North America*, Houghton Mifflin Harcourt), and various smartphone apps. Yet, many novices may find the detail and complexity contained in such sources daunting and may seek guidance from other introductory or regionally focused materials.

The present work is a set of materials honed over many years as the foundation for a 10-week in-person workshop (and accompanying field trips) on Learning California Bird Songs, held in Huntington Beach in southern California and sponsored by Sea & Sage Audubon. Essential to the workshop is a flash drive with 1607 sound files, organized by eight bird-sound groups, in 18 folders, and totaling 3.44 gigabytes of disk space. These recordings, captured by shotgun microphone, cover 89 species of year-round or summer resident birds (primarily landbirds) of lowland, cismontane California. Hard-copy materials include four pages of introductory information (Introduction, How to Use the Sounds and Worksheets, What the Workshop Covers, and Equipment and How to Use It). The core of the printed (photocopied) matter includes 121 pages of worksheets (two pages per one side only of an 8.5 × 11 sheet), organized by eight sound groups, plus an index by species. Additional materials include Sources of Introductory Sounds (18 pp.), which has descriptions of the type of sound, location and date of recording, and the location on the original tape; comparable information (44 pp.) is provided for recordings that are the answers to Home Practice Sounds. A single sheet summarizes ways of describing bird songs, including various objective characteristics (e.g., pitch, inflection, tone quality, cadence, rhythmic pattern), intuitive ways (e.g., putting words to a song, making up sound-alike words, or comparing to a familiar sound), and drawing a crude sonogram. Gallagher also emphasizes the use of free Raven Lite software for

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making sonograms (www.store.birds.cornell.edu/Raven_Lite_p/ravenlite.htm) as an aid to visualizing bird sounds. As well as getting out in the field a lot, using both your eyes and ears and searching down vocalizing birds you cannot see.

The recordings and worksheets are meant to be used closely together. The user is instructed to listen to the sounds, starting with the first sound group, and to fill in blanks in the worksheet, referring constantly to the printed Sources of Introductory Sounds. Information in the worksheets is arranged by species within each sound group and usually discusses the recordings of a wide variety of sounds ranging from typical songs and call notes to more specific sounds such as pre-dawn and aerial courtship songs, and flight, aggressive, scolding, copulatory, and begging calls. Comparisons are made between similar-sounding species, between males and females, between juveniles and adults of the same species, and sometimes among songs of different subspecies of a single species (e.g., three subspecies of the White-crowned Sparrow, *Zonotrichia leucophrys*). The user is also asked to answer many stimulating questions about the sounds heard and discussed. After filling out the worksheets, the user is instructed to play all the sounds through several times, and to test his or her identifications on random segments, which is facilitated by the species name being announced *after* the last of its sounds. Once the user is fairly confident of having learned the sounds, the next step is a self-test on the practice sound recordings for that group. Following the practice sounds by group are many sounds from the eight groups combined, most of which are mixtures of sounds “some close, some distant, some familiar, and some unfamiliar—just as you would hear them in the field.” These recordings also include segments with individuals apparently mimicking songs or calls of several other species. Overall, the depth and variety of the material in the paired sound recordings and worksheets is impressive.

Gallagher cautions that although one can learn a great deal by using the sounds and worksheets yourself, attendance at the in-person workshop will greatly enhance the experience. Hence, for the many unable to attend a workshop, these materials might appeal the most to self-directed learners, those seeking materials complementary to some they already have, or someone designing his or her own bird-sound classes. Regardless, almost anyone except the most advanced bird-sound expert is likely to learn a great deal from the trove of information contained in the carefully paired recordings and printed materials.

If future editions are contemplated, or if others want to design their own course by building on this foundation, it would be valuable if all materials were available online (or if printed material is maintained, to print double-sided to reduce environmental cost) and to expand the offering to seamlessly include materials discussed at in-person lectures but not now covered in the printed materials. Such additions I would recommend are the differences between songs and calls, how sounds are affected by habitat and distance, the context in which various sounds are used, and how birds learn to sing. If you are considering offering a course in bird-sound identification, I highly recommend you consider adopting Gallagher's structured approach, adapting it as needed to a different area or to emphasize particular themes.

W. David Shuford

NOTES

FIRST RECORD OF THE PURPLE MARTIN BREEDING IN IDAHO

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The Purple Martin (*Progne subis*), the largest swallow (Hirundinidae) that is widespread in North America north of Mexico, breeds commonly over much of the eastern U.S. and central Canada (Brown and Tarof 2013). Sparser and often isolated breeding populations are scattered through the Pacific states (Kostka and McAllister 2005, Airola and Williams 2008) and southern British Columbia (Cousens et al. 2005), as well as the interior West from north-central Utah and western Colorado south to northern Mexico (Behle 1968, Doughty and Fergus 2002). The location of reported breeding nearest to Idaho is about 35 km to the south in northern Utah, where Purple Martins nest mainly in abandoned woodpecker holes in mature aspen or mixed forests near water at high elevations (Hayward 1941, 1958, Brown and Tarof 2013).

Here, we report the first documented instance of the Purple Martin breeding successfully in the state of Idaho. On 30 June 2019, Evan Lipton and Waters noted a one-year-old female (Figure 1; Pyle 1997) and a definitive-plumaged male (Figure 2) Purple Martin foraging around Lake Cleveland at 2530 m elevation in the Albion Mountains of central Cassia County, south-central Idaho (42° 19' N, 113° 39' W). The next day, 1 July, Kathy Eklund observed martins entering a woodpecker cavity 20 m above the ground in a dead lodgepole pine (*Pinus contorta*). The nest tree was in a cluster of lodgepole pine snags on a small peninsula jutting into the lake. Lake Cleveland is surrounded by subalpine fir (*Abies lasiocarpa*), lodgepole pine, and exposed rock. The tree also contained a nest of the Tree Swallow (*Tachycineta bicolor*) with a nestling. On 2 August, birders observed both the male and female martin carrying food into the nest cavity, and on 3 August heard the nestlings' vocalizations. Similar observations, including the adults removing fecal sacs, continued through 6 August, until two nestlings were observed peering from the nest cavity on 7 August. Fledglings were first observed outside the nest cavity on 10 August, when two were seen being fed on adjacent branches (Figure 1). Observations of adults feeding fledglings continued through the last observation on the afternoon of 14 August. Searches on 16 August proved unsuccessful. It is worth noting the ages of the birds because colonizing Purple Martins are typically one year old (D. Airola pers. comm.); the female was that age, but the male was older.

The Purple Martin is considered casual in Idaho with only four records accepted by the Idaho Bird Records Committee (IBRC; Table 1, Figure 3). The additional 10 reports listed in Table 1 that have not been accepted by the IBRC were not rejected but have simply not been reviewed by the committee. Nonetheless, the unreviewed reports are valuable because they indicate potential locations where Purple Martins have occurred in the past and may occur again in the future. Most reports, including those not endorsed by IBRC, have been of birds in female-like plumage (which may have included yearling males, whose plumage may be superficially similar) from late April through June. In contrast, there are also four reported sightings of more than one individual between July and September (see Table 1), a pattern that suggests possible breeding or post-breeding dispersal from locations to the south. Two reports prior to ours suggest possible nesting of the Purple Martin in Idaho.

NOTES

TABLE 1 Reports of the Purple Martin in Idaho

Date	Notes	Locality	Citation ^a
20 Jul 1948	Three individuals	4 mi. sw of Lolo Pass, Idaho Co.	Orr 1951
28–29 May 1964	Three individuals	Minidoka National Wildlife Refuge, Cassia Co.	Wilbur 1976
1 Jun 1973	Three individuals	Glenns Ferry, Elmore Co.	AB 27:900, 1973
13–14 Jul 1974	One male observed at cavity; one female observed 14 July ^b	Micah Bay, Coeur d'Alene, Kootenai Co.	IBRC report 2-B-76
25 Jun 1977	One individual	Twin Falls, Twin Falls Co.	AB 31:1165, 1977
6 Sep 1979	Six foraging individuals	Swan Falls, on Snake River, Ada Co.	Field notes of John Dean
27 Jun 1982	Unconfirmed pair	Stanley, Custer Co.	Field notes John Dean
21 Apr 1984–12 May 1984	One individual observed in two counties	Mountain Home, Elmore Co., and Boise, Ada Co.	AB 38:938, 1984
21 Jun 1989	One female ^b	Heise Hot Springs, Bonneville Co.	IBRC report 2-A-89
12 May 1995	One female	Deer Flat National Wildlife Refuge, Ada Co.	NASFN 49:279, 1995
11 Sep 2002	One individual	Boise, Ada Co.	NAB 57(1):88, 2002
24 Apr 2004	One individual	Elmore Co.	NAB 58(3):403, 2004
29–30 Jun 2007	One female ^b	Heise Hot Springs, Bonneville Co.	IBRC report 74-B-07
31 Jul 2019	One male, one female, two juveniles ^b	Lake Cleveland, Cassia Co.	IBRC report 22-B-2019

^aAB, *American Birds*; IBRC, Idaho Bird Records Committee; NASFN, *National Audubon Society Field Notes*; NAB, *North American Birds*.

^bRecord endorsed by the Idaho Bird Records Committee.

These include one near Coeur d'Alene in northern Idaho on 13 July 1974, where a male was observed visiting a nest cavity and a female joined him the following day. Through the summer, however, only the male was observed (Table 1). The only other instance of possible breeding is an unconfirmed report of a pair observed in central Idaho on 27 June 1982 (Table 1). Unfortunately, no detailed notes or subsequent observations were recorded.

Purple Martins express high fidelity to a breeding site, seasonal social monogamy, and moderately high natal philopatry (Stutchbury et al. 2009, Brown and Tarof 2013). In light of these characteristics, it is possible that the pair and/or offspring may return to Lake Cleveland in future years, especially as western martins using tree cavities tend to nest in a solitary fashion with only one to two pairs per site (Stutchbury 1991, Brown and Tarof 2013). Other western martins, particularly in urban areas, tend to nest colonially, and sites supporting single pairs tend to be abandoned at a rate higher than do sites of colonies (Airola and Kopp 2018). Observations, or the lack thereof, during the following nesting season at this site and other areas of apparent suitable habitat may be valuable to understanding the Purple Martin as a species and follow up on an already notable nesting record.

We thank local birders for submitting their observations to www.eBird.org and local birding listservs, and to the Idaho Bird Records Committee for public access to its database (www.idahobirds.net/distribution/maps/martins-and-swallows/purple-martin). Bryce W. Robinson, Daniel D. Gibson, and Chris W. Swarth were helpful in the process of creating and preparing this article. Daniel Airola provided

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FIGURE 1. Female Purple Martin (one year old) feeding two fledglings at Lake Cleveland, Cassia Co., Idaho, on 11 August 2019.

Photo by Teresa Meachum

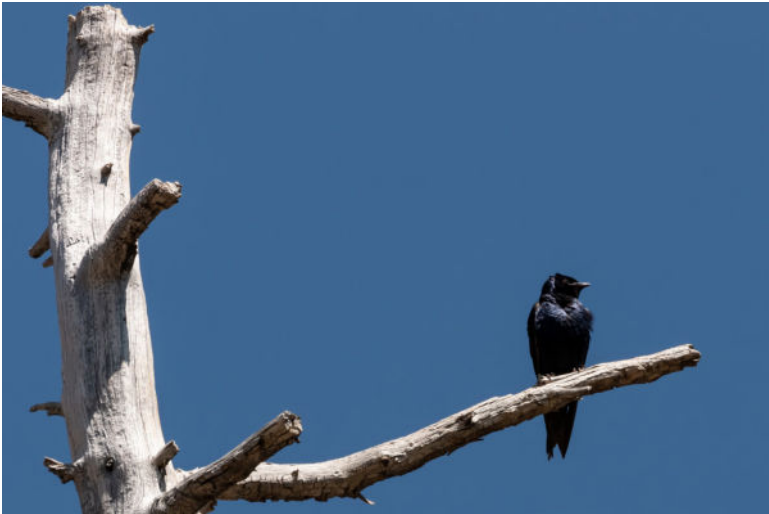


FIGURE 2. Adult male Purple Martin perched above the nest cavity at Lake Cleveland, Cassia Co., Idaho, on 11 August 2019.

Photo by Teresa Meachum

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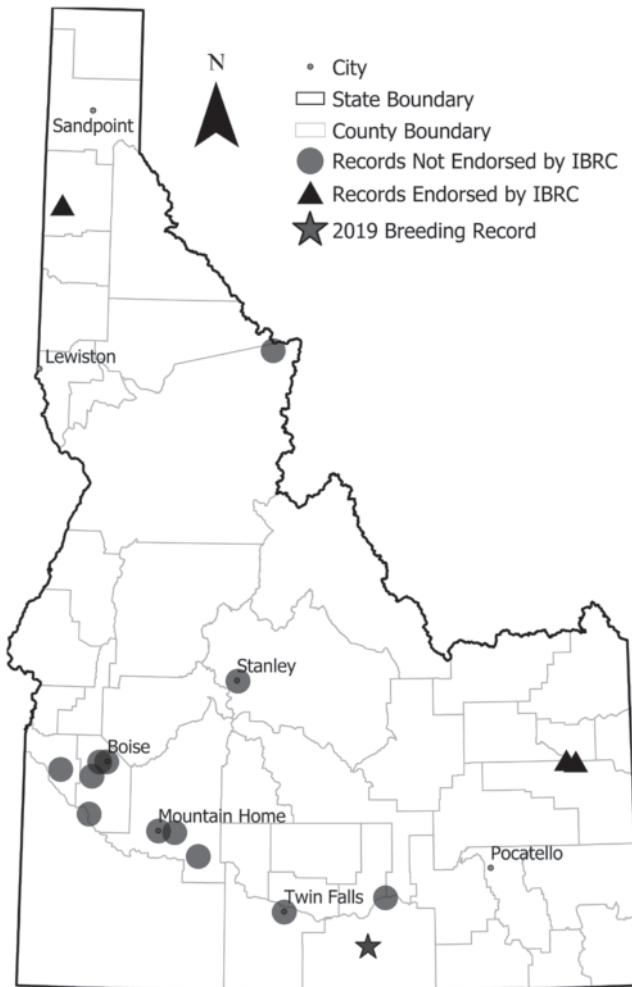


FIGURE 3. Idaho reports of the Purple Martin.

detailed information about Purple Martin ecology. We thank local birder Teresa Meachum for her photographs.

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POST-BREEDING EXTRA-PAIR PSEUDOCOPULATION IN THE PYGMY NUTHATCH

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Nonreproductive sexual behaviors such as pseudocopulation (also referred to as noncopulatory mounting and backstanding), homosexuality, and autoeroticism have been reported in more than 230 species of birds in at least 37 families (Bagemihl 1999, Balcombe 2006). The functions of nonreproductive sexual behaviors in birds are poorly understood. Such behaviors, which include reverse mounting during the breeding season (e.g., Nuechterlein and Storer 1989) and pseudocopulation outside of the breeding season (e.g., Short 1971), are often associated with courtship or pair bonding. Reverse mounting and pseudocopulation may also occur in social contexts outside of the pair bond, perhaps to maintain group dynamics by reducing aggression (e.g., MacRoberts and MacRoberts 1976, Moynihan 1990, Dawson and Mannan 1991, Hagemeyer 2016).

Nuthatches of the genus *Sitta* are socially monogamous, with pairs often remaining together throughout the nonbreeding season and through multiple breeding seasons (Matthysen 1998). Nevertheless, genetic studies have revealed that extra-pair paternity is frequent in at least two species: the European Nuthatch (*S. europaea*), of which about 10% of offspring are sired by a male other than the female's social mate (Segelbacher et al. 2005), and the Brown-headed Nuthatch (*S. pusilla*), of which about 32–45% of offspring are so sired (Han et al. 2015). Nonreproductive sexual behavior has not been previously reported in any species of nuthatch. In this note we provide the first documentation of extra-pair pseudocopulation in the Pygmy Nuthatch.

At 09:21 on 6 September 2019, Walker and Giusti observed three Pygmy Nuthatches noisily foraging on pine nuts along the Enchanted Forest Trail that leads to the Virgin Creek Beach section of MacKerricher State Park in Fort Bragg, California (39° 28' 26" N, 123° 47' 59" W). Their photos revealed that all three birds were adults, by the marked contrast between the brown crown and bluish gray back (juveniles are grayer with less contrast) and the absence of a yellow rictus (Norris 1958, Pyle 1997, Kingery and Ghalambor 2001). Because the Pygmy Nuthatch is a sexually monochromatic species (Pyle 1997, Kingery and Ghalambor 2001), our identification of sexes in the following behavioral descriptions is based on its known copulation behavior, in which the female initiates copulation, then the male mounts the female (Kingery and Ghalambor 2001).

A presumed female hunkered down on a branch, made an unfamiliar high-pitched call resembling that of a begging juvenile, quivered her wings, and was quickly approached by two presumed males. After each male took turns mounting the female in rapid succession, Giusti obtained a 16-second sequence of photographs illustrating each male mounting the female a second time (Figure 1). The three nuthatches were briefly together (Figure 1A). Male A, which held a seed in its beak, mounted the female while male B, which lacked a seed in its beak, perched about 0.5 m away (Figure 1B–C). A few seconds later, male A dismounted the female and male B approached the pair, with all three birds within a few centimeters of each other (Figure 1D–E). A few seconds later, male A departed and male B mounted the

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female (Figure 1F). The female did not struggle when mounted and appeared cooperative with both males. We could not determine whether cloacal contact occurred. We observed no aggression between the two males. The trio flew away immediately after the second round of mounting.

In coastal California, egg dates for the nominate race of the Pygmy Nuthatch range from 20 April to 17 June (Norris 1958, Kingery and Ghalambor 2001). Because our observation of mounting by the trio of nuthatches occurred in early September, well after the normal breeding season, mounting by the trio was almost certainly nonreproductive and should be regarded as pseudocopulation.

The Pygmy Nuthatch is a cooperatively breeding species in which breeding pairs are often joined by up to three nonbreeding helpers, usually yearling males related



FIGURE 1. Sequence of a presumed female Pygmy Nuthatch mounted by two presumed males: (A) the trio together; (B, C) male A mounts while male B is perched nearby; (D, E) male A dismounts while male B approaches; and (F) male B mounts after male A flies away.

Photos by Kevin A. Giusti

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to the breeding pair (Norris 1958, Sydeman et al. 1988). Several lines of evidence suggest that the helpers do not contribute genetically to the offspring (Sydeman et al. 1988). However, the genetic relationships among mated parents, helpers, and offspring in the Pygmy Nuthatch have never been studied. The social and genetic relationships among the trio we observed are unknown, so it is uncertain whether the trio consisted of a mated pair and a male helper.

The function of the pseudocopulation that we observed in the Pygmy Nuthatch is unknown. It may strengthen the bond or reduce aggression among a cooperatively breeding trio or among individuals of a larger flock. Research with banded individuals of known genetic relationships would better document the full repertoire of sexual behaviors and clarify their functions in the Pygmy Nuthatch.

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FEATURED PHOTO

A POSSIBLE FIRST HYBRID OF *ICTERIA* × *ICTERUS*

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On 10 September 2019, along my typical birding route along San Timoteo Creek near Redlands, San Bernardino County, California, I encountered a rather odd bird. About a mile into the walk I first noticed at a distance what superficially appeared to be a Yellow-breasted Chat (*Icteria virens*). It struck me as interesting initially just because I had not seen a chat well in a few weeks, because it was actually out in the open, and it allowed me to advance up to it slowly for decent photographs (Figures 1 and 2). The bird was silent, and after a minute or two it flew off. The bird was unusual for a chat not only in its approachability but also in its patterned back, more greenish color on the back and head, evident wing bars, and blackish tail.

On a nearly weekly basis I walk along San Timoteo Creek, which is in a broad canyon with a riparian corridor on the coastal slope of southern California (Figure 3). In the summer the site is home to a robust population of the Least Bell's Vireo (*Vireo bellii pusillus*), along with other summer residents such as the Ash-throated Flycatcher (*Myiarchus cinerascens*), Yellow Warbler (*Setophaga petechia*), Blue Grosbeak (*Passerina caerulea*), Hooded (*Icterus cucullatus*) and to lesser extent Bullock's Oriole (*I. bullockii*), and Yellow-breasted Chat (www.ebird.org/barchart?r=L899956&yr=all&m=). In September, many of those summer breeders are beginning to depart, with only a few Bell's Vireos and Yellow Warblers remaining. I had not conclusively seen or heard a Yellow-breasted Chat since 2 August, although I had a brief view of a silent bird resembling a chat on 2 September.

I couldn't help but wonder why the bird appeared so unusual. The pattern didn't seem correct for leucism, and I couldn't find any examples of a juvenile plumage that matched. I sent the photos to some of my local birding friends, and they all agreed that it clearly wasn't a typical Yellow-breasted Chat. I then distributed the photos to expert birders across the country and started to receive feedback over the next day.

On 12 September 2019 I returned to look for the bird again, and after a brief search refound it at nearly the same location, this time feeding in an elderberry tree. Again, I heard no definite vocalizations, but I obtained a few more photos as well as a short video clip of it plucking elderberries (<https://westernfieldornithologists.org/archive/V51/Grube/>). I played songs and calls of the Yellow-breasted Chat, Hooded Oriole, Baltimore Oriole (*Icterus galbula*), Orchard Oriole (*I. spurius*), and Scott's Oriole (*I. parisorum*) but could not detect any physical or vocal response.

On 13 September I returned with a few other local birders, but on this day the bird was much more secretive, and only a few of us had any sort of confirmatory view. The next day we returned again, and with some effort saw and photographed it. Although collection of at least a DNA sample was desirable, because of the habitat and behavior of the bird, collection of a fecal sample did not prove possible. As the land is owned by the city of Redlands, and because the Yellow-breasted Chat is a species of special concern to the California Department of Fish and Wildlife, authorization of any collection would have been time-consuming at the least. Unfortunately, the bird could not be relocated after that final sighting on 14 September, so any further plans to pursue this option were aborted.

From its physical appearance, the bird appears intermediate between a Yellow-breasted Chat and an oriole. It may be a hybrid or, possibly, a Yellow-breasted Chat expressing some latent ancestral genes, resulting in an oriole-like pattern with or without leucism.

FEATURED PHOTO



FIGURE 1. Apparent chat $\times$ oriole in San Timoteo Canyon, San Bernardino County, California, September 2019. Notice how the wing bar can be obscured depending on the bird's posture. An album with additional photos can be found at <https://westernfieldornithologists.org/archive/V51/Grube/>.

Photos by Matthew Grube

Of course either option would be extremely odd. I have been unable to find previous documentation of a hybrid Yellow-breasted Chat $\times$ oriole. In his *Handbook of Avian Hybrids of the World*, McCarthy (2006) mentioned no cases of hybridization concerning the Yellow-breasted Chat. The affinities of the Yellow-breasted Chat, the sole member of genus *Icteria*, have long been unclear. Traditionally it was grouped with the wood-warblers (e.g., American Ornithologists' Union 1998), but more recently, on the basis of DNA-sequencing studies finding it may be slightly closer to the Icteridae than to the Parulidae, has been placed in its own family Icteriidae (Barker et al. 2013, 2015, Chesser et al 2017). Under the current taxonomy, this proposed hybrid may represent the first interfamilial hybrid among the nine-primaried oscines.

Table 1 compares notable features of the apparent hybrid with those of the Yellow-breasted Chat and orioles.

FEATURED PHOTO



FIGURE 2. Dorsal view of apparent chat $\times$ oriole in San Timoteo Canyon, San Bernardino County, California, September 2019.

Photo by Matthew Grube

Provided one of the bird's parents was an oriole, ascertaining the species of oriole is a difficult problem. The pattern on the back feathers and scapulars with dark centers and broad greenish edges is reminiscent of the fresh plumage an adult male Hooded Oriole, in which the edges are buff. On the wing, the white median coverts recall Bullock's Oriole.

I cannot say whether this bird was a summer resident in San Timoteo Canyon. The Yellow-breasted Chats at this location often are not seen well, if at all, during



FIGURE 3. Habitat along San Timoteo Canyon. The riparian strip is in the background; some open valley floor lies between the riparian strip and the hills. The apparent hybrid was seen both in elderberry trees in the center of the valley as well as in the edge of the riparian strip.

Photo by Matthew Grube

FEATURED PHOTO

TABLE 1 Comparison of the Typical Plumage and Structure of the Yellow-breasted Chat and California Orioles with the Possible Hybrid

Feature	Yellow-breasted Chat	Orioles	Possible chat × oriole
Bill	Heavy, gray, fairly short, with curved culmen	Longer and more pointed bill, coming to a sharper tip; culmen nearly straight (e.g., Bullock's, Baltimore) to slightly curved (Hooded); black with the mandible pale bluish basally	Length intermediate; curvature of culmen intermediate; lower mandible bluish
Back pattern	Plain olive	Variable from nearly plain olive to grayish in females and immatures, to black with buff to olive edges in adult males in fresh plumage	Black streaks and chevrons patterned on olive background
Facial markings	Dark lores with white "spectacles"	Variable from plain olive to confluent areas of black; no eye ring	Dark lores with pale malar area, pale supraloral line, narrow white eye ring with slight posterior extension
Wing bars	Absent	Present	White upper wing bar (median coverts)
Scapulars	Plain olive	Variable; dark centers typical for Baltimore and may be seen on Bullock's	Black centers with greenish edges
Tail	Plain, nearly concolor with rest of upperparts	Dull yellow in female and immature, graduated and solid black with white tips in adult male Hooded, and mixture of black and orange in adult male Bullock's	Graduated black rectrices with white tips on the three outer pairs

my typical walks. This bird could well have been present for some time without my encountering it. If it was indeed a local bird, the oriole parentage would be limited to the Hooded and Bullock's. Between those two options, the Hooded Oriole is the far more abundant of the two in my experience, and it tends to occupy habitat similar to that of the Yellow-breasted Chat in the riparian strip. Bullock's is much less common, and I generally see it only in the eucalyptus groves. If this was not a local bird but a migrant passing through, that opens up many more possibilities.

The bird's characteristics and their interpretations are summarized in Table 2. Ultimately, the color patterns of the wing and tail may be the strongest indicators of the possible parent oriole, and would seem to favor the Hooded. The extent of black in the plumage implies the bird is an adult male, provided one parent was an oriole. Therefore even if the hybridization had taken place locally, the bird had migrated and returned at least twice since hatching.

The apparent hybrid was in entirely fresh plumage. The Yellow-breasted Chat differs from the Hooded and Bullock's Orioles in that it molts before migration, in its breeding range, whereas the Hooded and Bullock's Orioles molt after migration. If the bird in question was a hybrid chat × oriole, the freshness of the plumage implies that the chat pattern of molt dominated over the oriole pattern and that the bird may have summered in or near San Timoteo Canyon.

FEATURED PHOTO

TABLE 2 Characteristics of the Proposed Yellow-breasted Chat × Oriole and Their Interpretation

Characteristic	Interpretation
Wing feathers of a single generation of plumage; black in the rectrices, primary coverts, etc.	Bird is an adult male provided that <i>Icterus</i> was one parent
Graduated black rectrices with white tips on the three outer pairs	Favors Hooded; Bullock's would be mostly orange and lacking white tips
White median coverts, but dark greater coverts with white tips	Favors Hooded; an adult male Bullock's with white median coverts should also show mostly white greater coverts.
Black-centered, green-fringed back feathers	Compatible with either species of oriole
Bill shape and color	Might suggest Bullock's, but of limited value

Despite experts' analysis, there still is no absolute way to ascertain this bird's identity. While many of the features suggest a Yellow-breasted Chat × oriole sp., perhaps even a Yellow-breasted Chat × Hooded Oriole, this hypothesis would be hard to prove without analysis of DNA.

I will certainly keep my eyes open for this bird this year when I continue with my usual walks at my home patch in San Timoteo Canyon.

Thanks to the following for identification comments and critique of this intriguing bird: Thomas Benson, Louis Bevier, Kimball Garrett, Alvaro Jaramillo, Tony Leukering, Curtis Marantz, Steve Mlodinow, Jim Pike, Peter Pyle, Van Remsen, and Philip Unitt.

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Hybrid American Coot × Common Gallinule



Photo by © Gerardo Marrón of La Paz, Baja California Sur, Mexico:

Hybrid American Coot (*Fulica americana*) × Common Gallinule (*Gallinula galeata*),
Tijuana, Baja California, Mexico, 30 January 2020.

In this issue of *Western Birds*, Richard A. Erickson and Stephen C. Rottenborn report two instances of this intergeneric hybrid, noting similarities and differences between them, as well as with the one of the three previous reports of such hybrids accompanied by a published description.



“Featured Photo” by © Matthew Grube of Redlands, California: Apparent hybrid of a Yellow-breasted Chat (*Icteria virens*) × oriole, probably Hooded Oriole (*Icterus cucullatus*), San Timoteo Canyon, San Bernardino County, California, 10 September 2019.

