WESTERN BIRDS

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Western Specialty:
Pacific Wren

Photo by Ethan Monk of Walnut Creek, California:

Pacific Wren (*Troglodytes pacificus salebrosus*), Elk Meadows Road, Idaho County, Idaho, 22 June 2025.

Call notes are at least as useful in distinguishing the Winter and Pacific Wrens as their plumage. But variation in these calls and possible overlap had not been quantified until Ethan Monk and Martin Freeland addressed the question in this issue of *Western Birds*. In general, the call of the Winter Wren is significantly lower in pitch than that of the Pacific Wren. In general the trace at the fundamental frequency in the call is more symmetrical in the Winter Wren, more descending in the Pacific Wren, and that trace is usually single in the Winter Wren, doubled in the Pacific Wren. But there is overlap, potentially even within one bird's repertoire. The calls of the interior population of the Pacific Wren, described as subspecies *salebrosus*, while generally resembling those of coastal birds, may vary in the direction of the Winter Wren. Identification of vagrant wrens by call should be made only on the basis of typical calls analyzed in audiospectrograms.

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Front cover photo by © Chezy Yusuf of Torrance, California: Winter Wren (*Troglodytes hiemalis*) at Castaic Lagoon, Los Angeles Co., California, 6 January 2024. Note the distinct pale supercilium, whitish throat, white neck streaking, and pronounced speckling on the mantle and sides of the upper chest, all features typical of the Winter Wren. In this issue of *Western Birds*, Martin Freeland, Ethan Monk, and Peter Pyle quantify the variation in these and other plumage characteristics, assessing their value for distinguishing the Winter and Pacific Wrens.

Back cover photo by © Gary H. Rosenberg of Tucson, Arizona: Eurasian Wryneck (*Jynx torquilla*) at Gambell, St. Lawrence Island, Alaska, 9–16 September 2019. It represents the second record of the species for Gambell, the third for Alaska, and the fourth for North America. It represents one of the many notable birds, migrants from both Asia and North America, with which Paul E. Lehman updates his 2019 *Birds of Gambell and St. Lawrence Island, Alaska*, in this issue of *Western Birds*. Through their observations and photographs, Gambell's own people are playing an increasing role in extending knowledge of birds at this crossroad of continents.

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

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WESTERN BIRDS

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AN ANALYSIS OF PLUMAGE CHARACTERISTICS OF THE WINTER AND PACIFIC WRENS

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ABSTRACT: The Winter Wren (*Troglodytes hiemalis* Vieillot, 1819) and Pacific Wren (*T. pacificus* Baird, 1864) are closely related species occurring primarily in eastern and western North America, respectively. Recent literature on the identification of these cryptic species has focused on vocal cues, but subtle differences in plumage have also been proposed since Spencer F. Baird's original description of the Pacific Wren in 1864. The nature and consistency of these differences need quantification for plumage to be useful in identification. We analyzed 11 prospective characters, finding strong differentiation in 6: Winter Wrens show stronger pale markings on the chest, neck, mantle, and alula, and feature a paler throat and supercilium, on average, than Pacific Wrens. Two variables, relative width of pale and dark bars on the primaries and number of pale tips on the upperwing coverts, are moderately informative, whereas we found three variables—relative tone of pale barring on primaries and on secondaries, relative throat color, and crown color—to show no consistent differences. Although differences in plumage between Winter and Pacific wrens are subtle, consideration of the six informative characters should be of material use in identifying many individuals to species.

The Winter (*Troglodytes hiemalis*) and Pacific (*T. pacificus*) wrens, both formerly considered conspecific with the Eurasian Wren (*T. troglodytes*), have been treated as separate species since Toews (2007) and Toews and Irwin (2008) demonstrated genetic and behavioral (i.e., in song pattern) distinctions in a narrow area of sympatry. From the degree of sequence divergence in the mitochondrial genome, these authors estimated these taxa diverged between 2.3 and 4.3 million years ago. Drovetski et al. (2004) suggested that the Winter Wren may have shared common ancestry with the Eurasian Wren more recently than with the Pacific Wren, though Albrecht et al. (2020) and Imfeld et al. (2024) contested this hypothesis. Despite the relatively early dates of divergence among these three species, morphology in this complex is conservative, with most populations of the Winter, Pacific, and Eurasian wrens resembling one another closely in phenotype.

The Winter Wren (*sensu stricto*) includes two subspecies, one (*T. h. pul-*

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lus) restricted principally to the Appalachians and the other (the nominate, *T. h. hiemalis*) breeding across much of Canada and the northeastern United States (Hejl et al. 2020). These subspecies are at best poorly differentiated, however, and diagnostic criteria distinguishing them are not well established (Pyle 2022, 2025). In the original description of *T. h. pullus*, Burleigh (1935) reported that it averages darker and redder than the nominate subspecies, but if true, this difference is extremely subtle and likely of little relevance to the question of the Winter Wren's distinction from the Pacific Wren. Moreover, the proposed geographic range of *T. h. pullus* does not approach that of *T. pacificus*, and it is at most a short-distance migrant, whereas the nominate subspecies overlaps in range with the Pacific Wren and is a long-distance migrant with clear potential for extralimital occurrence (Hejl et al. 2020).

Various authors have recognized as many as 14 (Rea 1986) or as few as five (Clements et al. 2025, Pyle 2025) subspecies of the Pacific Wren. Toews and Irwin (2020) and Clements et al. (2025) divided the Pacific Wren's subspecies into two groups: *T. p. alascensis* (Baird 1869), *T. p. meligerus* (Oberholser 1900), *T. p. kiskensis* (Oberholser 1919), *T. p. semidiensis* (Brooks 1915), *T. p. tanagensis* (Oberholser 1919), *T. p. seguamensis* (Gabrielson and Lincoln 1959), *T. p. stevensoni* (Oberholser 1930), and *T. p. petrophilus* (Oberholser 1919) constitute the "Alaska group" (*T. p.* [*alascensis* group]), whereas *T. p. pacificus* (Baird 1864), *T. p. salebrosus* (Burleigh 1959), *T. p. obscurior* (Rea 1986), *T. p. muiri* (Rea 1986), *T. p. ochroleucus* (Rea 1986), and *T. p. helleri* (Osgood 1901) constitute the "Pacific group" (*T. p.* [*pacificus* group]). The Alaska group comprises insular populations occupying islands in western Alaska and a limited area of the nearby Alaska mainland (Gibson and Kessel 1997). These birds are evidently resident: one of subspecies *alascensis* found dead at Barrow in October 1929 represents perhaps the only extralimital record for this subspecies group (Bailey 1948, Toews and Irwin 2020). Wrens on the Commander Islands of Russia belong to *T. t. pallescens,* a Siberian subspecies of the Eurasian Wren (Baird 1883), but genetic studies (Pruett and Winker 2008, Pruett et al. 2017) suggest that the Commander Islands population may in fact be more closely allied to Alaska Pacific Wrens than to other Eurasian Wrens. The Pacific group of the Pacific Wren comprises populations on Kodiak Island and the remainder of this species' range to the south and west, including both resident and migratory populations.

We limited our comparisons to three units, corresponding to the subspecies groups delineated in Clements et al. (2025): the Winter Wren, Alaska-group Pacific Wren, and Pacific-group Pacific Wren. We do not consider the Eurasian Wren, including *T. t. pallescens*.

Although Toews (2007) and Toews and Irwin (2008) proposed that distinguishing these taxa by morphology is difficult or impossible and did not attempt to identify plumage characters relevant to their identification, several subsequent authors—most notably Leukering and Pieplow (2010), Sibley (2010), Pyle et al. (2011), and Pyle (2022)—have tentatively proposed grounds for the differentiation of these taxa on the basis of plumage. In addition, some earlier works on taxa then considered subspecies in this complex (e.g., Ridgway 1904, Rea 1986) presented features relevant to the discrimination of the Pacific and Winter (*sensu stricto*) wrens as species. In this analysis, we assess the reliability of published and novel criteria for the identification of these species by plumage.

METHODS

We examined images of 560 wrens from the Cornell Lab of Ornithology's Macaulay Library. These included 234 individuals each of the Winter Wren and the Pacific group of the Pacific Wren, as well as 92 Alaska Pacific Wrens, of which fewer high-quality images are readily available. All selected photographs were taken at locations where only one species is expected; we excluded those from the Rocky Mountains of eastern British Columbia where both may occur (Toews 2007). Photos of Pacific-group Pacific Wrens came from 10 states/provinces, those of Winter Wren from 28 states/provinces, spanning as much of each group's distribution as possible. To attain a reasonably large sample, we were not able to limit our investigation to photos from the breeding grounds and breeding season only, but the typical nonbreeding ranges of these taxa are also spatially segregated to a great degree, and we likewise excluded from our analyses areas of potential overlap in the nonbreeding season (i.e., from south-central California east through central Texas). To avoid duplications of individuals, we used only one photo from each location unless the photos were taken ≥5 years apart. All selected photos were of high resolution, taken in good lighting, and clearly showed a view of the bird in profile or nearly in profile, in order to allow consistent assessment of the plumage features detailed below. Juveniles were excluded, and we combined images of formative and basic plumages as these are similar within each species and difficult to distinguish in the field (Pyle 2022). Additionally, we examined all specimens of these species housed at the California Academy of Sciences, San Francisco.

For most analyses we used photos only, as in comparison to the single set of specimens we examined, our photographic dataset was much more extensive, more geographically diverse, and more readily permitted examination of certain plumage features such as the chest pattern, damaged in some specimens. A limitation of reliance on photographic data is the difficulty of evaluating absolute color, as factors like ambient lighting and camera settings may affect the apparent color of birds in photos quite strongly; we address this by examining only three traits that involve absolute color, all of which were suggested by prior authors (Ridgway 1904, Rea 1986, Sibley 2010, Leukering and Pieplow 2010, Pyle 2022). Two of these (throat color and supercilium color) merely require differentiation between rich rufous-brown and whitish. This determination may be made with confidence in most images, variations in extrinsic factors like lighting notwithstanding. The third feature, crown color, proved problematic to assess in photos because of the confounding effects of lighting and image quality; therefore, our conclusions related to this single trait are informed principally by examination of specimens (see Results). Mensural characteristics are treated in Hejl et al. (2020) for the Winter Wren, in Toews and Irwin (2020) for the Pacific Wren, and in Pyle (2022) for both; we did not re-examine these. Pacific-group Pacific Wrens and Winter Wrens overlap broadly in all measurements (table 46 in Pyle 2022), precluding any usefulness in the field.

The following eleven features were assessed in all photos. We selected these either because our previous experience suggested that they could be relevant or because they have previously been proposed to be of use in distinguishing the Winter and Pacific wrens (Leukering and Pieplow 2010, Sibley 2010, Pyle et al. 2011, Pyle 2022, A. Birch pers. comm.). They are represented visually in Figure 1 and their frequencies are presented in Table 1.

1. *Absolute throat color.* In the Winter Wren, the throat may typically be pale off-white in color, whereas in Pacific Wren, the color of the throat may average richer and darker, approaching a warm brown. We assessed throat color as whitish, rufous, or indeterminate.

2. *Relative throat color.* In the Winter Wren, the throat may be contrastingly paler than the breast; in the Pacific Wren, the breast and throat may be concolorous. We assessed the relative colors of these two regions as contrasting, similar, or indeterminate.

3. *Supercilium color.* The Winter Wren may typically show a paler, cream-colored supercilium, in comparison to the more richly rufous-tinged supercilium possibly characteristic of the Pacific Wren. We categorized supercilium color as whitish, rufous, or indeterminate.

4. *Crown color.* The Winter Wren may show a colder, grayer brown tone on the upperparts, especially on the crown; the Pacific may show a warmer rufous tint. We categorized crown color as cold, warm, or indeterminate. This feature is often challenging to evaluate in photos, and many images were assessed as indeterminate.

5. *Neck pattern.* In the Winter Wren, the area immediately posterior to the auriculars may feature distinct pale streaking; in Pacific Wren, it is often unmarked. We assessed this area as featuring discernible streaking, lacking discernible streaking, or indeterminate.

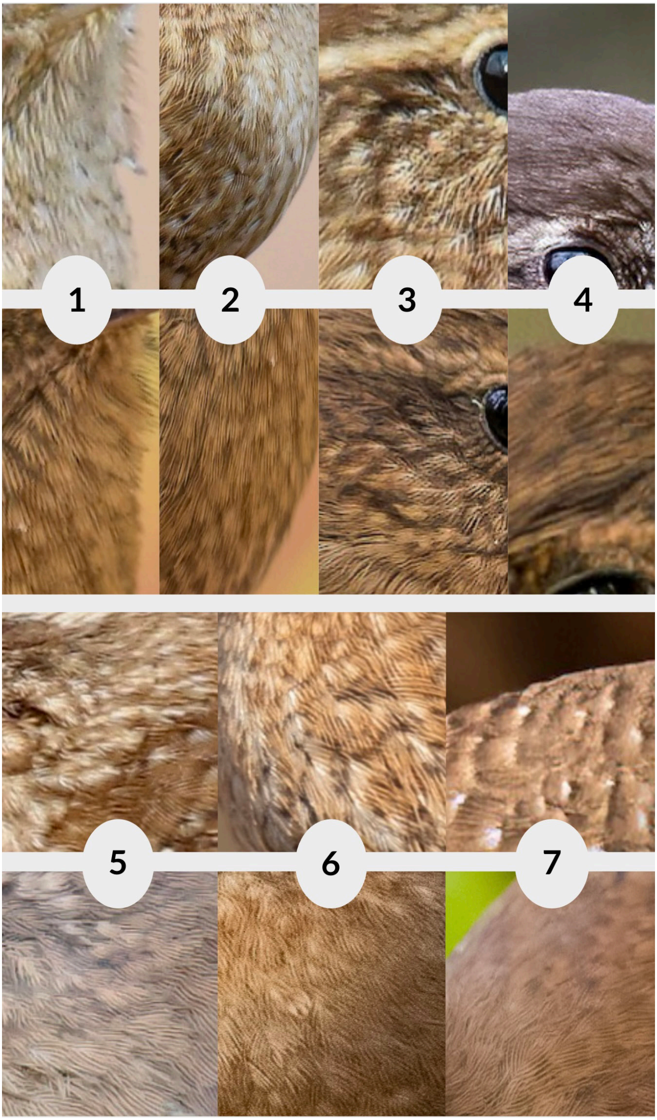
6. *Breast pattern.* In the Winter Wren, the sides of the upper breast may feature fairly prominent black-and-white checkering, much as with the pattern of the mantle described below. Pacific Wrens generally show more evenly rufous and less strongly marked sides to the upper breast. We assessed checkering in this region as bold, faint/absent, or indeterminate.

7. *Mantle pattern.* In the Winter Wren, some dorsal contour feathers may feature contrasting black centers and whitish subterminal bands, creating fairly distinct black-and-white checkering on the reddish brown background of the mantle; in the Pacific Wren, the mantle is typically uniform rich reddish-brown or has at most indistinct dark scaling but no bold checkering. We assessed checkering on the back as bold, faint/absent, or indeterminate.

8. *Alula pattern.* The Winter Wren may more frequently show strong pale barring on the alulae; the alulae of the Pacific Wren may average less distinctly marked. We assessed whitish barring on the alula (excluding the pale tip) as present, absent, or uncertain (i.e., obscured by other feathers).

9. *Number of pale tips to upperwing coverts.* Prominent white tips to some upperwing coverts occur in both species but may be more numerous in the Winter than in the Pacific. We recorded the number of prominent white tips but for most statistical analyses (see below), transformed this variable into a dichotomous categorical variable (for consistency with the 10 other categorical variables). We categorized wings as heavily marked (>5 white tips visible), lightly marked (≤5 white tips), or indeterminate.

10. *Relative tone of pale barring on primaries and on secondaries.* Leukering and Pieplow (2010) suggested that the tone of the pale markings on the primaries of the Winter Wren is notably whiter than that of the pale markings



(continued on next page)

Figure 1. Examples of traits potentially relevant to wren identification examined in our study, with the posited Winter-associated character state above and the corresponding proposed Pacific-associated character state immediately below. 1, Throat color; 2, contrast between throat and breast; 3, supercilium color; 4, crown color; 5, neck pattern; 6, breast pattern; 7, mantle pattern; 8, alula pattern; 9, number of pale tips on upperwing coverts; 10, contrast between pale barring on primaries and on secondaries; 11, relative width of pale and dark bars on primaries.

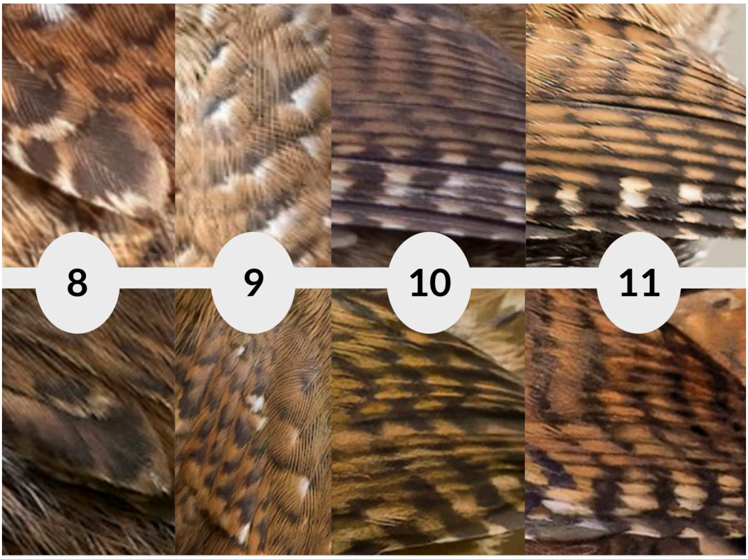


FIGURE 1 (*continued from previous page*).

on the secondaries, whereas in the Pacific Wren, the tones of the pale markings in these two feather groups are similar. We recorded the contrast in color between the pale markings on the primaries and secondaries as perceptible, imperceptible, or uncertain.

TABLE 1 Frequencies by Percentage of 11 Plumage Traits in the Winter Wren and Two Subspecies Groups of the Pacific Wren[a]

	Pacific (Pacific)	Pacific (Alaskan)	Winter
Relative tones of primary and secondary barring	86 / 12 / 2	93 / 4 / 3	92 / 6 / 2
Patterned alula	21 / 78 / 1	19 / 65 / 6	86 / 11 / 3
Patterned mantle	7 / 79 / 14	24 / 58 / 18	71 / 15 / 14
Patterned breast	19 / 80 / 1	27 / 72 / 1	92 / 8 / 0
Patterned neck	16 / 84 / 0	22 / 76 / 2	94 / 5 / 1
Patterned upperwing coverts	18 / 73 / 9	16 / 69 / 15	49 / 36 / 15
Color contrast between throat and breast	31 / 66 / 3	35 / 59 / 6	52 / 38 / 10
Cold crown	72 / 22 / 6	89 / 6 / 5	73 / 26 / 1
Pale throat	24 / 71 / 5	55 / 41 / 4	86 / 10 / 4
Pale supercilium	43 / 56 / 1	35 / 59 / 6	95 / 3 / 2
Relative width of pale and dark primary bars	48 / 14 / 38[b]	45 / 16 / 39[b]	39 / 30 / 31[b]

[a] For each combination of taxonomic category and trait, the percent frequency of the feature potentially associated with the Pacific Wren is listed first, followed by that of the reciprocal feature potentially associated with the Winter Wren, followed by that of cases where no determination could be made.

[b] The third number indicates the percent frequency of cases in which the width of pale and dark bars in the primaries were approximately *equal*, not incapable of being measured.

11. *Relative width of pale and dark bars on primaries.* Counterintuitively, the Winter Wren may show pale bars on the primaries that are on average narrower than the intervening dark zones, whereas in the Pacific Wren the pale bars may be slightly wider than the dark zones. We categorized the contrast in the width of these zones as pale > dark, pale < dark, and pale ≈ dark. This variable is ternary, unlike the 10 described above, which are binary, and was the only variable we could assess for all 560 wrens.

For all statistical analyses we used R version 4.4.1 (R Core Team 2024). For all binary variables we used Fisher's exact test for pairwise comparisons evaluating differences in each plumage character between all combinations of the three taxa under investigation. For the single ternary variable we used the chi-squared test. For each trait, the test considered the subset of the dataset from which individuals that could not be assessed for the feature in question were culled. We applied a Bonferroni adjustment for multiple comparisons to our set of 33 resulting p-values (Table 2). To supplement our computational assessment of the degree to which the 11 plumage traits differentiate the three categories being compared, we applied a permutational multivariate analysis of variance (PERMANOVA) and a nonmetric multidimensional scaling (NMDS) ordination in two dimensions, both using Gower dissimilarities (Maechler et al. 2025, Oksanen et al. 2025).

To assess whether, at the level of the individual, having one heterospecific trait was positively associated with having others, we used Pearson's correlation coefficient to quantify the degree of association among Winter Wren-like traits within the Pacific and Alaska groups combined, and the degree of association among Pacific Wren-like states in the Winter Wren. That is,

Table 2 Results of Statistical Comparison of Differences in the Frequencies of 11 Plumage Traits in the Winter Wren and Two Subspecies Groups of the Pacific Wren[a]

	pacificus vs *hiemalis*		*alascensis* vs *hiemalis*		*pacificus* vs *alascensis*	
	p-value	Odds ratio	p-value	Odds ratio	p-value	Odds ratio
Relative tones of primary and secondary barring	1	0.760	1	0.893	1	0.679
Patterned alula	**<0.0001**	64.1	**<0.0001**	0.0568	1	0.362
Patterned mantle	**<0.0001**	108	**<0.0001**	0	1	0
Patterned breast	**<0.0001**	106	**<0.0001**	0.0493	1	0.510
Patterned neck	**<0.0001**	161	**<0.0001**	0.0180	0.03	2.89
Patterned upperwing coverts	0.01	2.06	1	0.841	1	1.73
Color contrast between throat and breast	1	1.21	1	0.706	1	0.875
Cold crown	1	0.745	1	0.440	1	0.328
Pale throat	**<0.0001**	12.5	0.03	2.89	1	1.18
Pale supercilium	**<0.0001**	10.3	**<0.0001**		1	0.575
Relative width of pale and dark primary bars[b]	0.05	$\chi^2 = 17.2$ (df = 2)	<0.1	$\chi^2 = 7.07$ (df = 2)	1	$\chi^2 = 4.87$ (df = 2)

[a] Except in the last row, the statistics reported are from Fisher's exact tests. Highly significant values of Bonferroni-adjusted p are **bolded**, as are the labels of the corresponding traits; marginally significant ones are underlined.

[b] Statistics reported are from chi-squared tests (see Methods), and the chi-squared statistic is reported in place of an odds ratio.

we assessed the extent to which Winter Wren characters in the Pacific Wren dataset are attributable to a small number of individual Pacific Wrens that resemble Winter Wrens in multiple traits, or to a larger number of individuals that resemble Winter Wrens in fewer traits. And vice versa for the extent of Pacific-associated traits in the Winter Wren dataset. To examine potential systematic variation in the plumage characteristics in question *within* each of the three groups (e.g., of the kind that might be observed if substantial geographic variation exists within any of the three groups), we did latent-class analyses of each of the three groups with all plumage variables included as categorical predictors. We used the package poLCA (Drew et al. 2011) with a maximum of 5000 iterations to generate models that divided each group into one through six classes, each class representing a group of individuals posited to share combinations of plumage character states. We assessed each model's fit with Bayesian and Akaike information criteria. This procedure is based on those suggested by Drew et al. (2011).

RESULTS

Of the eleven traits evaluated in photographic analyses, three showed no statistically significant differentiation among any of the three groups we examined—the Winter Wren, the Pacific group of the Pacific Wren, and the Alaska group of the Pacific Wren. Two showed at most moderately statistically significant differentiation in certain comparisons, and six showed sufficiently substantial differentiation to be useful in the diagnosis of Pacific and Winter wrens to species.

The traits in which we found minimal differentiation (i.e., all pairwise comparisons returned $p = 1$ after Bonferroni correction) were (1) contrast between primaries and secondaries in tone of pale barring, (2) contrast in color between throat and breast, and (3) crown color. Most individual Pacific-group Pacific Wrens and Winter Wrens in our samples shared the same phenotype with respect to these three characters. Traits showing moderate differentiation were (1) relative width of pale and dark bars on the primaries and (2) number of pale tips on the upperwing coverts. For the latter trait the difference between Winter and Pacific-group Pacific wrens was statistically significant ($p = 0.01$) and in the former trait it was marginally significant ($p = 0.05$), but—again—the two groups' distributions of frequencies of these traits overlapped by more than 50%. Moreover, it is possible that the formative and definitive plumages differ in the width of dark bars on the primaries (Taylor 2012, Pyle 2022). The other two pairs (Pacific-group vs. Alaska-group Pacific Wrens and Alaska-group Pacific Wrens vs. Winter Wrens) did not show statistically significant differentiation with respect to these two characters. In any case, all five of the traits discussed so far are unlikely to be of service in differentiating Winter and Pacific wrens because of the great breadth of overlap.

In the remaining six characters, however, the Winter and Pacific wrens diverged consistently. These were (1) neck pattern (presence/absence of discernible streaking), (2) breast pattern (bold vs. faint or absent checkering), (3) mantle pattern (bold vs. faint or absent checkering), (4) absolute throat color (whitish vs. rufous), (5) alula pattern (whitish barring present/absent, excluding tip), and (6) supercilium color (whitish vs. rufous). In all of these cases, the proportion of Winter Wrens displaying the Pacific-associated character state was ≤15% and the proportion of Pacific-group Pacific Wrens displaying the Winter-associated character state was ≤24%. With respect to Alaska-group Pacific Wrens, the proportion displaying the Winter Wren-associated character state was ≤27% for four of the six characters, the exceptions being throat and supercilium color, in which overlap with the Winter Wren was more extensive (55% and 35%, respectively). Pairwise comparisons of the Winter Wren with each group of the Pacific Wren identified statistically highly significant ($p < 0.001$) differences in the frequencies of all these traits, with the lone exception—again—of throat color in the comparison of Alaska-group Pacific Wrens with Winter Wrens. Differences between Pacific-group and Alaska-group Pacific Wrens did not rise to the level of statistical significance for any character except neck pattern, where the tendency of Alaska-group birds to show a more patterned neck than Pacific-group wrens was marginally significant ($p = 0.03$).

Our PERMANOVA returned a highly significant group effect ($R^2 = 0.48$, $F = 260.67$, $p < 0.001$), and our NMDS similarly produced a visually clear clustering of individuals by species (Figure 2, NMDS stress = 0.156). NMDS stress reports the goodness-of-fit of a two-dimensional representation of higher-dimensional data on a 0–1 scale, with lower stress (as seen in our ordination) corresponding to a better fit. While these tests confirm that the differences in plumage of Winter and Pacific wrens are sufficiently consistent

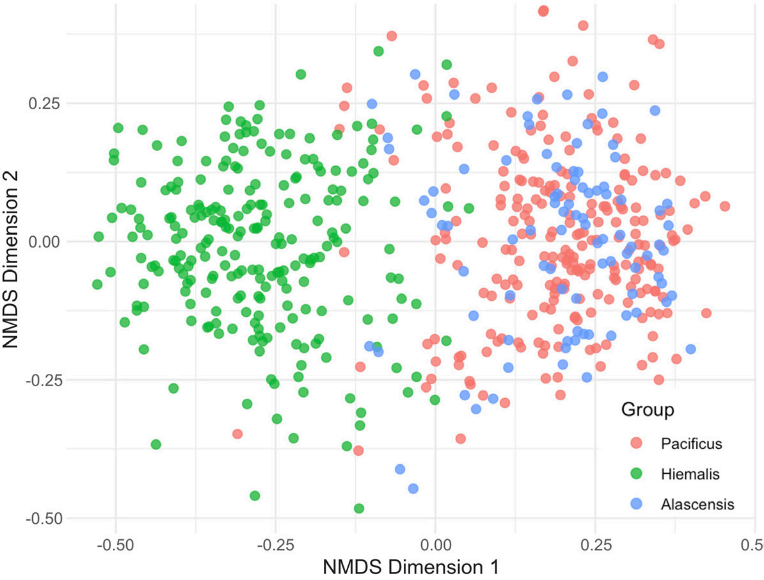


Figure 2. Values of Gower dissimilarity in 11 plumage traits of the Winter and Pacific wrens, plotted in a nonmetric multidimensional scaling (NMDS) ordination. Separation between the Pacific Wren (Pacific and Alaska groups, taken together, in blue and red) and the Winter Wren (green) is fairly clear, although the zone of overlap is wide. Stress = 0.156.

to be detected with very high confidence in statistical analysis, we caution that this does not directly imply separability in the field.

Nevertheless, in general, we found that overlap between Winter and Pacific wrens with respect to the six plumage features detailed above is limited; as a result, when taken together, they may permit the identification of these species. Figure 3 summarizes the differences in these six plumage characters.

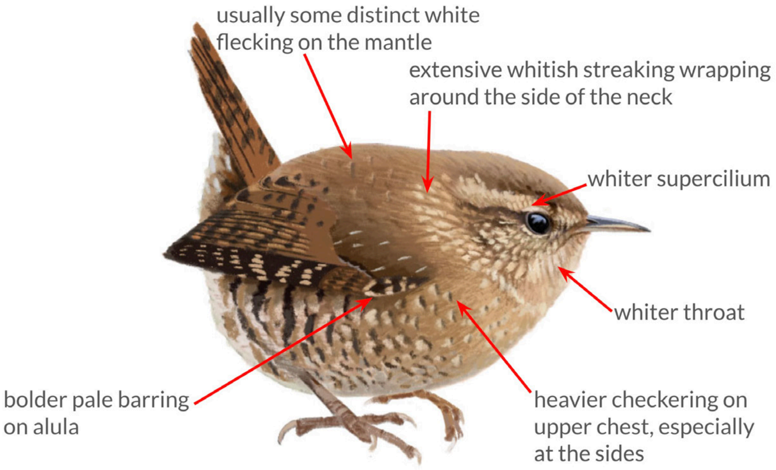
In the Pacific Wren, across all pairwise comparisons of binary traits, the average Pearson correlation between the occurrence of a given Winter-associated state and other such traits in the same individual was 0.092. In the Winter Wren, the corresponding mean correlation for the occurrence of Pacific-associated character states was 0.100. These values are positive but low, indicating that the possession of one heterospecific trait is not a strong positive predictor of the possession of others.

However, as shown in Table 1, overlap between the Winter and Pacific wrens, even with respect to the plumage features identified as most useful in their discrimination, remained fairly extensive, and clearly no trait in isolation can diagnose either species. Combinations of these traits show the most promise in facilitating their identification. Only four of 234 Winter Wrens in our photographic dataset showed more than four (of six) Pacific-like traits, and only ten of 234 Pacific-group Pacific Wrens showed more than four (of six) Winter-like traits.

Examinations of specimens corroborated the usefulness of most features used in photographic analyses; see Figure 4. Except for juveniles and several specimens in poor condition whose plumage was difficult to assess, nearly all Winter and Pacific wrens could be correctly assigned to species by a combination of throat pattern, neck pattern, and mantle pattern, these also being the easiest features to assess on study skins. Crown color, which is the most problematic of the traits we investigated to evaluate in photos, did not differ consistently in the series of Winter and Pacific wren specimens that we examined.

In the Winter Wren, plumage scores for supercilium color (95% pale), neck pattern (94% strongly checkered), and breast pattern (92% boldly patterned) were fairly uniform. By contrast, Pacific Wrens of the Pacific group were consistently more variable: there was no feature for which more than 90% shared the same phenotype. The Alaska group of Pacific Wrens was also more variable than the Winter Wren across nearly all features examined, its plumage in general being somewhat intermediate between that of the other two groups, albeit closer to the Pacific Wrens of the Pacific group.

We did not detect geographic variation within the Winter Wren or the Pacific group of the Pacific Wren, and our sample of the Alaska group of the Pacific Wrens was too small to reveal the described geographic variation (Pruett et al. 2017). In latent-class analyses for each of the three categories, the Bayesian information criterion was lowest for the 1-class model (2588.57 for the Pacific group, 959.54 for the Alaska group, and 2173.61 for the Winter Wren) and increased monotonically thereafter, indicating no support for additional latent classes. In other words, on the basis of the characters we evaluated, the individuals in each sample are best represented as a single, homogeneous group, with no evidence suggesting distinct subgroups that can be defined by the plumage characters we assessed. The Akaike informa-



Winter

Pacific (*pacificus* Group)

Figure 3. A comparison of typical Pacific-group Pacific and Winter wrens. Annotations identify the six plumage features in which these categories differ with some consistency. Alaska-group Pacific Wrens (not pictured) differ from the Winter Wren in most of the same ways, although their throats may be paler than in the Pacific group, on average, and they are also typically larger.

Illustrations by Andrew Birch

tion criterion, which penalizes a model's complexity less heavily, preferred a three-class solution for the Winter Wren, but support was weak and for all traits the classes' probabilities differed only minimally, leading us to prefer the parsimonious one-class solution identified by the Bayesian information

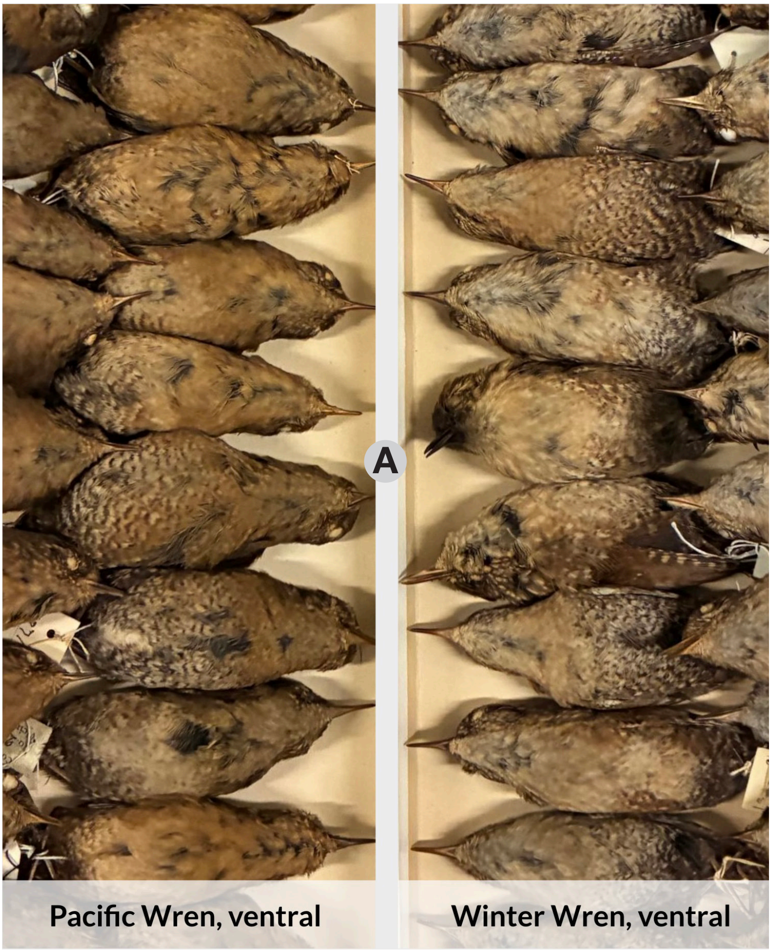


Figure 4. Differences in the color of the throat and breast between Pacific-group Pacific Wrens and Winter Wrens. (A) Ventrally, Pacific-group wrens are warmer, darker, and browner, while the Winter Wren is paler, colder, and whiter; (B) dorsally, the mantle of the Pacific is typically unmarked brown, while that of the Winter often shows distinct pale spangling. (*Continued on next page.*)

criterion. Thus we found no evidence of latent heterogeneity (i.e., systematic differences in plumage within a taxon) for any of the three groups.

SUMMARY

In comparison to Pacific Wrens of both subspecies groups, most Winter Wrens display stronger white streaking at the sides of the neck, more extensive

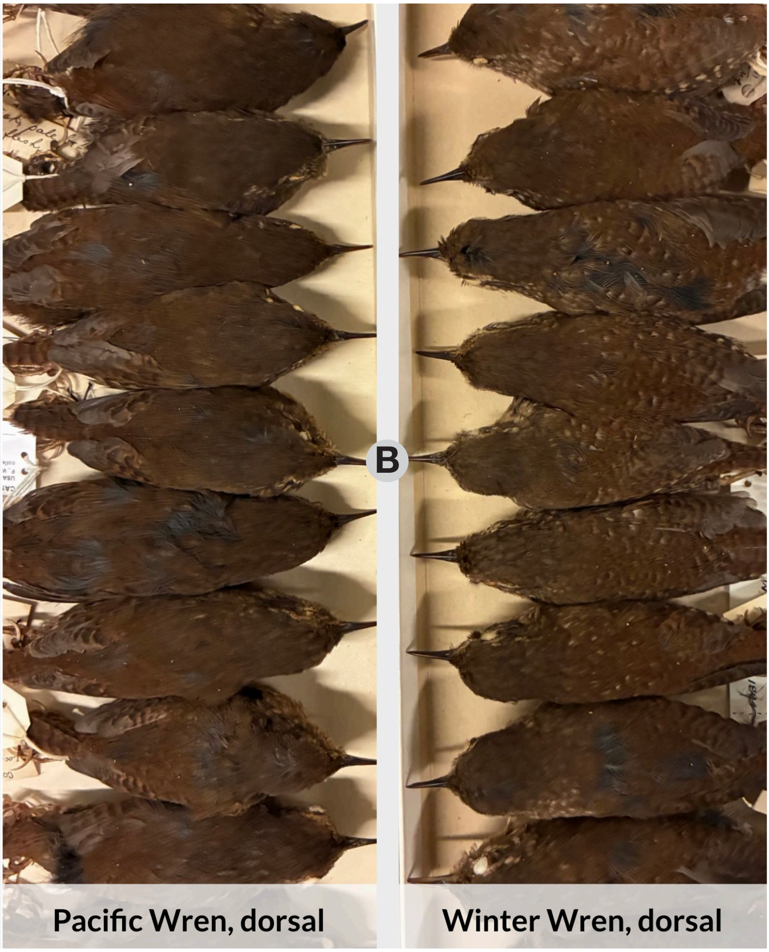


Figure 4 (*continued from previous page*).

and paler white marking on the alula, bolder checkering at the sides of the upper breast, checkered spangling on the mantle (in many individuals), a paler throat, and a paler supercilium, though in many cases the differences from the Winter Wren with respect to the Alaska group are somewhat less pronounced than for the Pacific group. In general, the Winter is paler and more boldly patterned, and the Pacific is darker, browner, and less boldly patterned. These results are in general agreement with some previous, albeit untested, assessments (e.g., Sibley 2010, Pyle 2022). However, it is notable that three of the six features that we identified as most reliable in differentiating Winter and Pacific wrens have not been published previously, to our knowledge. In a similar vein, several previously published marks that we investigated did not receive support in our analyses. For example, we found that primary-bar color and relative throat color were too variable to be consistently of use in distinguishing these species, cf. Leukering and Pieplow (2010), and detected no consistent differences in crown color, cf. Sibley (2010).

DISCUSSION

The plumage of Winter and Pacific wrens differs with sufficient consistency to be at least somewhat useful in identifying most individuals to species. However, some degree of overlap in all assessed plumage characters continues to pose a challenge. It is unlikely that intermediate phenotypes are solely (or even primarily) the result of recent hybridization, as our sample did not include individuals from regions known to contain both parent species at any time of year, and hybridization appears to be limited: in a genetic analysis of 75 Winter and Pacific wrens from a segment of the contact zone, Mikkelsen and Irwin (2021) detected only two first-generation hybrids and one individual showing signs of more distant hybrid ancestry, indicating that the reproductive isolation of these taxa from one another is reasonably robust even in sympatry.

We found that the presence of one heterospecific trait in a given individual was not strongly associated with the presence of others. In other words, the occurrence of heterospecific plumage traits within each species is likely attributable to a relatively large number of individuals exhibiting a few heterospecific traits, as opposed to a small number of individuals that resemble the opposite species in multiple traits. This is perhaps encouraging, as large numbers of birds that deviate slightly from the character states expected in their species pose less of an identification challenge than small numbers that deviate more strongly and in multiple traits convergently. Moreover, it is inconsistent with the idea that variation in our dataset may be due to the inclusion of misidentified photos or highly aberrant birds, in which case nonstandard plumage traits ought to be concentrated in a small number of individuals.

Identification of Extralimital Wrens by Plumage

One of the most pressing challenges in the context of this species complex is the identification of vagrants. Over the past several decades the Winter Wren has occurred in the far western United States repeatedly (e.g., Benson et al. 2025), and at least some populations of Pacific Wren migrate moderate distances and thus might reach midwestern or eastern North America as vagrants.

We propose that a vagrant Pacific Wren of the Pacific group in midwestern or eastern North America be so identified only if it has at least five of the six plumage traits described above, and conversely with a vagrant Winter Wren in the far west. An extralimital Pacific Wren of the Alaska group seems unlikely outside the Bering Sea region, as most populations are nonmigratory island endemics or near-endemics, but in any case, conclusive identification would likely require measurements (Pruett et al. 2017, Pyle 2022). In accordance with Bergmann's Rule, Alaska-group Pacific Wrens are larger, on average, than any other members of the complex in North America. We consider these recommendations as minimum standards rather than formulae for acceptance of extralimital records, paralleling the standards of acceptance of records on the basis of calls outlined in Monk and Freeland (2026).

In applying the plumage criteria described here to all 53 records of the Winter Wren for California accepted by the California Bird Records Committee (CBRC), we found that 28 were incapable of being evaluated because of a lack of good photos. Of the remainder, we recommend three records for re-evaluation. These three birds, along with two others for which high-quality photographs were unavailable, also gave calls inconsistent with the Winter Wren according to the criteria we propose (Monk and Freeland 2026). Figure 5 shows an example of one of these. Although in some photos it appears to show a relatively pale throat and supercilium—characteristic of the Winter Wren, though also occurring with some regularity in the Pacific Wren (see above)—it lacks the crisp pale streaking on the side of the neck that is characteristic of Winter Wren and evident in 94% of the individuals we evaluated. It has an unmarked mantle, a largely dark alula, and relatively limited patterning at the sides of the upper part of the breast, thus showing more plumage characters associated with the Pacific Wren than with the Winter Wren. We recommend that such birds be left unidentified, especially in cases like this one where the call was also atypical.

Intraspecific Variation in Plumage

Our morphological analyses proved incapable of resolving consistent geographic variation within the Winter Wren and within the Pacific group of the Pacific Wren. Although we focused on features that may be relevant in distinguishing the Winter and Pacific wrens and omitted many features that informed the description of subspecies within these groups, our analyses nonetheless included some of the criteria that Rea (1986) presented for the diagnosis of certain subspecies in the Pacific group of Pacific Wren. For example, we assessed breast pattern and supercilium color, which Rea (1986) proposed as relevant in distinguishing *T. p. muiri* from *T. p. salebrosus*. Even with respect to these criteria specifically, we still detected no consistent patterns of geographic variation, i.e., the photos and specimens we examined from the range of *T. p. muiri* did not show higher frequencies of rufous supercilium or lower frequencies of heavy chest marking than did those from the range of *T. p. salebrosus*.

We suggest that a thorough reassessment of the validity of subspecies within the Pacific group of Pacific Wren may be warranted, including examination of type specimens and assessment of an array of characteristics wider than those we examined. Although preliminary, our findings are more in accordance with those of Pyle (2025) and Clements et al. (2025), who (without published analysis) considered morphological variation in the *T. p. pacificus* group insufficient to support the recognition of multiple subspecies within that group, than with those of prior authors who recognized up to five subspecies within this group (e.g., Rea 1986, Toews and Irwin 2020).

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Figure 5. Two views of the same ambiguous bird, which wintered in Riverside County, California, 29 November 2022–21 January 2023 (CBRC 2022-118). With respect to plumage, it resembles the Pacific Wren more closely than the Winter Wren but is somewhat intermediate; it gave calls odd for both species and sang like a Winter Wren. Additionally, see Figure 4 in Monk and Freeland (2026).

Photos by Matthew Grube

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VARIABILITY IN COMMON CALL NOTES OF THE WINTER AND PACIFIC WRENS

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ABSTRACT: We analyzed 175 calls of 91 individual Winter (*Troglodytes hiemalis*) and Pacific (*Troglodytes pacificus*) wrens by measuring characteristics such as peak frequency, frequency range, and complexity. We found considerable overlap in most measurements, but metrics such as peak frequency and trace shape are useful for distinguishing the two species. With these results, we recommend a standard for acceptance of extralimital Winter and Pacific wrens through evaluation of spectrograms quantifying the call's peak frequency (higher in the Pacific, lower in the Winter), the shape and symmetry of the trace at the lowest frequency (more symmetrical in the Winter), and whether the lowest-frequency trace is tightly coupled with a second trace (favoring the Pacific).

In 2010, on the basis of genetic data and bioacoustics, Chesser et al. (2010) reclassified the Winter Wren (*Troglodytes hiemalis*) and Pacific Wren (*T. pacificus*) as species, splitting them from what is now known as the Eurasian Wren (*Troglodytes troglodytes*). Differences in song between the two North American taxa aligned closely with genetically distinct clades and were important in establishing that the two represent distinct species. Thus differences in song between the two taxa have been well described (Kroodsma 1980, Toews and Irwin 2008). Many authors have noted average differences between the two species' calls, particularly the call commonly transcribed as "chimp" or doubled as "chimp-chimp" (Ellison 1994:254). But none has studied the differences systematically or thoroughly explored variation in each species' calls (e.g., Pieplow 2009, Leukering and Pieplow 2010, Hejl et al. 2020), despite this call's often being regarded as the most distinctive difference between the two species (e.g., Sibley 2010).

Calls of the Pacific and Winter wrens are presumably innate (Hejl et al. 2020); therefore, in addition to being among the most distinctive differences between the two species, at their most typical, calls are likely the most valuable identification criteria. Toews et al. (2025) presumed these wrens' song to be learned, and patterns of juveniles' dispersal and song learning are unknown or unpublished, making it conceivable that a Pacific or Winter wren could sing a heterospecific song. Yet, troublingly, since 2010 some wrens in western North America and especially in California have been heard giving calls ambiguous by currently published descriptions (e.g., Benson et al. 2025). Because of this, together with known limited hybridization between the two species (Toews and Irwin 2008, Mikkelsen and Irwin 2021), a better understanding of the range of variation possible in the calls of each species will be invaluable. Here we examine the commonly given call note of each species and establish its range of variation. We then provide guidelines for evaluation of extralimital records of each taxon by call.

METHODS

Definition of Terms

High-quality audiospectrograms of Pacific and Winter Wren calls look like vertical stacks of repeated shapes (see Figure 1). Each individual shape is called a "trace." The lowest-frequency trace of a Pacific or Winter Wren call is said to be at the fundamental frequency, and harmonics are whole-number multiples of that fundamental frequency. Because it is at the lowest frequency, and thus appears at the bottom of a spectrogram, we define and measure the fundamental frequency and traces closely clustered with it as the "bottom component." The bottom component is nested below an often longer trace or cluster of traces that includes the first harmonic (i.e., the trace at twice the frequency of the fundamental frequency). We refer to the first harmonic and any traces clustered with it as the "second component" (Figures 1, 2). Finally, if present and distinct, the first well-defined trace or cluster of traces above the second component we refer to as the "third component." Higher frequencies were often not resolvable, and we did not analyze any traces above the third component (Figure 1). We merge individual traces of the second and third harmonics into a single "component" when they are poorly defined, largely inseparable, and of similar shape. But we always refer to the often shorter, quieter trace(s) that cluster together below the second component as the bottom component, even if they are well defined and separate (Figure 1).

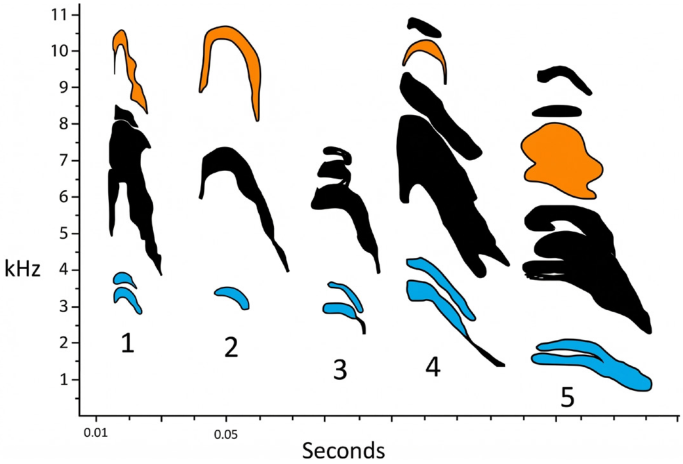

Figure 1. Variability in Pacific Wren calls. Blue, bottom components; orange, third components; black, second components and other unmeasured traces above the third component. From left to right: (1) typical-sounding Pacific Wren recorded in Sonoma Co., California (#29, Table 1); (2) typical-sounding Pacific Wren recorded in Idaho Co., Idaho, in the range of *T. p. salebrosus* (#37, Table 1); (3) presumed Pacific Wren recorded near Calgary, Alberta, near the contact zone (#26, Table 1); (4) typical-sounding Pacific Wren recorded in Cochise Co., Arizona (#20, Table 1); (5) atypical-sounding Pacific Wren recorded in Los Angeles Co., California (#1, Table 1).

Audio by Jim Holmes, Ethan Monk, J. Smith, Micah Riegner, and Lance A. M. Benner

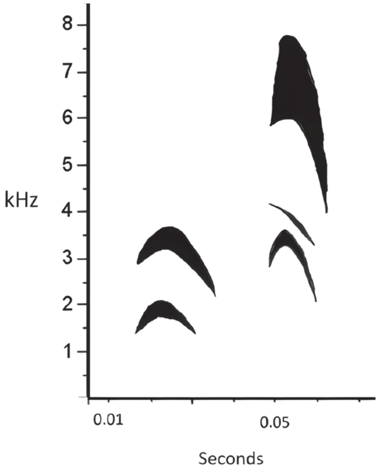

Figure 2. Representations of the bottom and second components of typical "check" or "chimp" calls of the Winter Wren (left) and Pacific Wren (right), drawn on the basis of the median measurements of 175 calls selected for our primary analysis to encompass a broad representation of the ranges of the two species.

Selection of Recordings

For this study, we used only recordings of the typical and commonly heard call, often transcribed as "check" or "chimp" and often doubled. While most such calls are short, clipped, emphatic, and brief, some are distinctly longer and have a wheezy quality. We excluded these wheezy calls from our analysis. Recordings were sourced from Xeno-Canto (https://www.xeno-canto.org), the Cornell Lab of Ornithology's Macaulay Library (https://www.macaulaylibrary.org), our own collections, and via personal communications (see Table 1). Our primary analysis encompassed 82 calls from 45 individual Pacific Wrens and 83 calls from 40 individual Winter Wrens. Recordings were selected with the goal of ensuring seasonal and geographic diversity and for general clarity. We did not include extralimital individuals in this analysis. Winter Wren recordings were selected with the goal of sampling throughout the geographic range of *T. h. hiemalis,* and Pacific Wren recordings aimed to sample across the geographic range of the "Pacific group" of subspecies (*sensu lato*, i.e., Pyle 2022). To compare Pacific Wrens from the western part of their range with Pacific Wrens from the northeastern, interior corner of their range, our primary analysis included recordings of 12 individuals made during the breeding season in the range Phillips (1986) assigned to *T. p. salebrosus* ("interior Pacific Wrens") in northeastern Oregon, Idaho, and Montana and of 16 individuals recorded during the breeding season in western British Columbia, western Washington, western Oregon, and northern California ("western Pacific Wrens"). We loosely defined the breeding season as May through August.

We then undertook a secondary analysis in an attempt to better understand variability within the calls of each species. This analysis used six calls from three Pacific Wrens and four calls from two Winter Wrens, found via personal communications and searching Xeno-Canto (see Table 1). These calls were not included in the primary analysis. These recordings were selected not to account for geographic or seasonal diversity but instead to represent individuals giving notably atypical calls. We inferred that the birds' identity was adequately established, usually because the same birds were also recorded giving calls more easily ascribable to either species by previously published descriptions. We concluded that most recordings of Pacific/Winter Wrens giving atypical calls were not safely assignable to species by previously published descriptions, limiting the size of the sample suitable for the secondary analysis. Also, the Pacific and Winter wrens hybridize to a limited extent (Toews and Irwin 2008, Mikkelsen and Irwin 2021), so a bird capable of giving relatively standard Pacific or Winter Wren calls in addition to more intermediate/ambiguous calls as included in the secondary analysis may not necessarily represent a Pacific Wren or Winter Wren as we have identified it. Instead, these birds may be best considered capable of producing Pacific Wren-like calls, or capable of producing Winter Wren-like calls.

The ranges of measurements reported in the primary analysis may be expanded significantly by the inclusion of results from the secondary analysis. These new measurement ranges provide a more comprehensive understanding of how Pacific and Winter wrens (assuming each bird in the secondary analysis is identified correctly) may sound.

For all audio, we did not distinguish between lossy (e.g., .mp3) and lossless (e.g., .wav) audio formats, despite the lower quality and loss of data with lossy audio (MacPhail et al. 2023). Our samples would have been much smaller if we had used only lossless audio.

Analysis of Recordings

We analyzed all recordings in Raven Pro 1.6.5 (Charif et al. 2010), measuring each call's duration (sec), lowest frequency (Hz), and peak frequency (the frequency at which call energy is highest/the spectrogram is darkest colored, in Hz). Within each call, for each well-resolvable component, we measured its lowest frequency, central frequency, highest frequency, peak frequency, duration, and peak power density (decibels relative to full scale [dBFS] per second), as defined by Charif et al. (2010). Additionally, if a bottom component consisted of multiple discrete traces, we measured these values for each trace. As a quality-control measure, we calculated the signal-to-noise ratio (dB) for the entire call. The signal-to-noise ratio measures the relative strength of a call against background noise. Recordings with low signal-to-noise ratios are more difficult to analyze, and the tails of traces often appear shortened, blending into the background. In other words, the signal-to-noise ratio provides a numerical measure of how distinct the call appears on a spectrogram.

To generate the values listed above, we annotated the entire call and well-resolvable individual components in Raven. That is, we drew selection boxes as tightly as possible around the call and individual components. In response to prompts, Raven then automatically calculated the values listed above for the various "boxed" regions.

Because individual traces and, correspondingly, what we term components can vary significantly in shape from bird to bird and often within a single call, to better quantify the components' shapes we assigned a number (a "shape score") to each (Figure 3). If the component reached its highest

Table 1 Audio Recordings Analyzed for Differences between and Variation within the Pacific and Winter Wrens

	Source[a]	State/ Province	County	Date	Recordist
Winter Wren					
1	XC344954	VA	Albemarle	2016 Dec 02	Ross Gallardy
2	XC 341249	DE	New Castle	2016 Oct 29	Ted Floyd
3	XC339641	IL	DuPage	2016 Oct 21	Matt Wistrand
4	XC208172	PA	Allegheny	2014 Dec 27	Ted Floyd
5	XC175234	MN	Goodhue	2014 Apr 18	Jonathon Jongsma
6	XC860389	NH	Hillsborough	2024 Jan 06	Molly Jacobson
7	XC5769	SC	Richland	2002 Mar 09	Robin Carter
8	XC62503	WI	Vilas	2010 Sep 10	Todd Wilson
9	XC71095	PA	Montgomery	2005 Oct 18	Paul Driver
10	XC71769	NM	Bernalillo	2011 Feb 20	Cole Wolf
11	XC92154	LA	Vermilion	2011 Dec 28	Daniel Lane
12	XC93786	TX	Camp	2012 Jan 29	L. G. Price
13	XC112578	QC	La-Haute-Côte-Nord	2012 Sep 01	Martin St-Michel
14	XC163933	VT	Windsor	2014 Jan 09	Kyle
15	XC171202	AZ	Yavapai	2014 Mar 23	Micah Riegner
16	XC202335	NE	Lincoln	2014 Nov 12	Brooks Rownd
17	XC207348	KS	Hodgeman	2014 Dec 21	Jeff Calhoun
18	XC207349	KS	Hodgeman	2014 Dec 21	Jeff Calhoun
19	XC211193	SC	Richland	2014 Nov 10	Paul Marvin
20	XC211197	SC	Richland	2014 Nov 10	Paul Marvin
21	XC216439	LA	Bossier	2013 Dec 01	Terry Davis
22	XC216450	LA	Caddo	2013 Dec 14	Terry Davis
23	XC251804	NM	Sandoval	2015 Jan 04	Nancy Hetrick
24	XC297043	TX	Kimble	2015 Dec 20	Eric Hough
25	XC321847	AZ	Cochise	2016 Jan 22	Richard E. Webster
26	XC348983	FL	Marianna	2016 Dec 16	Paul Marvin
27	XC357377	VA	Roanoke	2017 Mar 01	Thomas Gray
28	XC455125	KS	Sumner	2019 Feb 04	Ves
29	XC513215	VA	Fairfax	2019 Dec 23	Bobby Wilcox
30	ML170010011	ME	Sagadahoc	2019 Jul 26	Gordon Smith
31	ML364936531	ON	Nipissing	2021 Jun 28	Lisa Cancade Hackett
32	ML474975771	NS	Kings	2022 Aug 13	George Forsyth
33	ML622032554	QC	Les Basques	2024 Jul 31	Guillaume Perron
34	XC216440	LA	Bossier	2013 Dec 21	Terry Davis
35[b]	ML123931581	TX	Harris	2018 Nov 17	Cin-Ty Lee
35[b]	Pers. comm.	TX	Harris	2018 Nov 17	Cin-Ty Lee
36	XC260207	ON	Haliburton	2015 Jul 14	Iain
37	XC190106	BC	Peace River	2014 Jun 18	Richard E. Webster
38	ML638862606	QC	Kamouraska	2025 Jun 27	Jean-Daniel Fiset
39	ML635305759	PA	Chester	2024 Dec 14	Barry Blust
40	ML634552130	NY	Monroe	2025 Apr 20	Chris Wood
41	ML631410005	VT	Bennington	2025 Feb 26	Eric Seyferth
42	ML623106559	ME	Hancock	2024 Aug 30	Scott Dresser
43	ML584728801	VT	Rutland	2023 Jun 14	Joel Tilley
44	ML471513861	NY	Tompkins	2022 Jul 31	Andrew Spencer

(*continued*)

	Source[a]	State/ Province	County	Date	Recordist
Pacific Wren					
1[b]	XC610353	CA	Los Angeles	2020 Dec 19	Lance A. M. Benner
2[b]	Pers. comm.	CA	Los Angeles	2021 Jan 20	Naresh Satyan
3	XC354539	NM	Eddy	2017 Feb 03	Matt Baumann
4	XC401689	CA	Los Angeles	2018 Feb 03	Lance A. M. Benner
5[b]	XC154689	CA	Los Angeles	2013 Nov 17	Lance A. M. Benner
6	XC490933	WA	King	2018 Jul 25	Steve Hampton
7	XC550930	WA	King	2020 Apr 19	Bruce Lagerquist
8	XC602829	WA	San Juan	2020 Aug 13	Steve Hampton
9	XC602839	WA	San Juan	2020 Aug 16	Steve Hampton
10	XC706135	BC	Victoria	2022 Mar 04	Barry Edmonston
11	XC162163	WA	Spokane	2013 Dec 31	Garrett MacDonald
12	XC163178	OR	Tillamook	2013 Feb 08	Paul Marvin
13	XC201358	WA	Thurston	2014 Oct 31	Micah Riegner
14	XC349619	MT	Missoula	2016 Mar 04	Thomas Magarian
15	XC363871	CA	Humboldt	2017 Jan 27	Paul Marvin
16	XC419952	CA	Santa Cruz	2018 Jun 09	Thomas G. Graves
17	XC422034	BC	Fraser-Fort George	2018 Jun 23	Jeff Dyck
18	XC630096	CA	Yolo	2021 Feb 04	Steve Hampton
19	XC76204	WA	King	2011 Apr 20	Andrew Spencer
20	XC112411	AZ	Cochise	2012 Nov 04	Micah Riegner
21	XC156281	AZ	Cochise	2013 Nov 30	Micah Riegner
22	XC934084	BC	Fraser Valley	2024 Sep 15	Justin Flint
23	ML66274581	ID	Ada	2017 Aug 11	Jason Talbot
24	ML345780231	ID	Kootenai	2021 May 30	Andrew Emlen
25	ML612734147	MT	Glacier	2021 Jul 17	Marky Mutchler
26	ML633747631	AB	Calgary	2025 Apr 14	J. Smith
27	ML634315119	MT	Missoula	2025 Apr 23	Shane Slater
28	ML171177901	CA	Sonoma	2019 Aug 01	Teresa & Miles Tuffli
29	ML157910701	CA	Sonoma	2019 May 10	Jim Holmes
30	ML466771301	OR	Tillamook	2022 Jul 22	Cliff Cordy
31	ML170859781	OR	Benton	2019 Jul 24	Bob Nieman
32	Pers. recording	ID	Idaho	2025 Jun 22	Ethan Monk
33[c]	Pers. recording	ID	Idaho	2025 Jun 22	Ethan Monk
34	Pers. recording	OR	Wallowa	2025 Jun 19	Ethan Monk
35	Pers. recording	OR	Wallowa	2025 Jun 19	Ethan Monk
36	Pers. recording	OR	Wallowa	2025 Jun 19	Ethan Monk
37	Pers. recording	ID	Idaho	2025 Jun 22	Ethan Monk
38	Pers. recording	MT	Sanders	2025 Jun 28	Ethan Monk
39	ML635562395	OR	Tillamook	2025 May 06	Jeff Bleam
40	ML637344112	CA	Sierra	2025 Jun 06	Skyler Bol
41	ML638211639	BC	Comox-Strathcona	2025 Jun 28	Daniel Donnecke
42	ML639387282	WA	Clark	2025 Jun 25	Isaac Lang
43	ML639398447	WA	Clallam	2025 Jul 19	Gregory Irving
44	ML32400541	WA	San Juan	2016 Aug 11	Dave Slager
45	ML409291201	WA	Island	2016 Aug 02	Aidan Place
46	ML65621101	OR	Polk	1995 May 31	Gregory Budney
47	ML638781212	CA	Sonoma	2020 Sep 18	Colin Meusel

[a] XC, https://xeno-canto.org; ML, https://www.macaulaylibrary.org/.

[b] Recording contains atypical calls used only in the secondary analysis of intraspecific variation.

[c] Recording contains calls of two individuals.

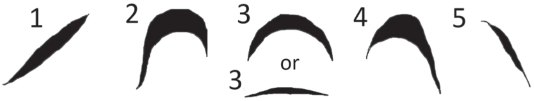

Figure 3. Scale from 1 to 5 of scores describing the shapes of traces within spectrograms of calls of the Pacific and Winter Wrens.

frequency at its end point, and its frequency was lowest at the beginning, so its shape resembled a forward slash ("/"), we assigned it a shape score of 1. If a component's beginning and end were at the same frequency (i.e., its shape resembled "∩" or "—"), we scored it as 3. If the component's frequency was highest at its beginning and its lowest at its end, so that its shape resembled a backslash ("\"), we scored it as 5. Intermediate shapes were assigned intermediate values accordingly. For the bottom and second components, we also measured the interval from the trace's beginning to the point of highest frequency ("left-time") and the interval from the point of highest frequency to the trace's end ("right-time"). Note that the distance and quality of a recording can affect the appearance of the shape of a trace, especially as these values are measured from the very leftmost and rightmost ends of each trace.

To account for hidden complexity, i.e., individual, non-discrete traces subsumed within the components, we counted the number of well-defined rightmost points on the spectrogram of each call (see Figure 4). Additionally, we measured the range of frequencies spanned by the bottom and second components at the time they reach their highest frequency ("height"). This

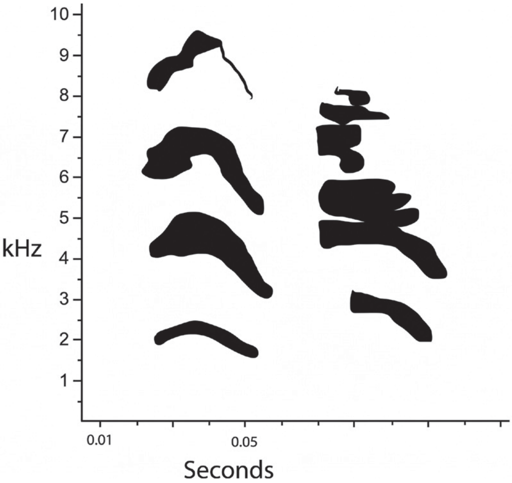

Figure 4. Representations of two calls made by a wren at the University of California, Riverside, Riverside County, California. Peak frequencies of 4875.0 (left; ML509689271) and 6843.8 Hz (right; ML510579921). These calls would be assessed as having four and nine rightmost points, respectively. For a photograph of the bird, see Figure 5 in Freeland et al. (2026).

Audio by Curtis Marantz (left) and Christine Dean (right) was done by measuring from the point of highest frequency in the component down vertically to the point at which the line of measurement exits the component. Height is equal to the hertz spanned by the vertical line.

Statistical Methods

Basic summary statistics were calculated for all measurements. We used the median and interquartile range (IQR) as measures of average and spread, preferring these to the mean and standard deviation because they are more resistant to the influence of outliers. In the evaluation of interspecific differences, we used two-tailed, two-sample *t*-tests to assess whether measurements differed significantly and imported all measurements into Past5 (Hammer 2025). In Past5, using all measurements, we ran a principal component analysis (PCA) with correlative matrices and iterative imputation, and otherwise represented various data graphically to inspect them for difference visually. PCA is a technique that mathematically simplifies large datasets into simpler variables. By plotting the two most informative of these (PC1 and PC2), we can more easily inspect the data for differences. Additional graphic representations, primarily box and whisker plots, we generated in Microsoft Excel. We looked particularly for measurements with a median value outside the range of the same measurement in the other species.

RESULTS

Primary Analysis: Interspecific Differences

Measurements of Winter and Pacific wren calls are reported in Tables 2 and 3. Pacific and Winter Wren calls in their entireties were found to differ significantly ($p < 0.01$) in duration, lowest frequency, and peak frequency. In the bottom component, Pacific and Winter Wren calls differed significantly in lowest frequency, central frequency, highest frequency, peak frequency, and duration. In the second component, the two species differed significantly in all recorded measurements except central frequency. In the third component,

Table 2 Quantification and Comparison of Entire Calls of the Pacific and Winter Wrens

	Winter Wren				Pacific Wren			
	Median	Interquartile range	Min	Max	Median	Interquartile range	Min	Max
Lowest frequency (Hz)	1289.8	226	670.2	2646	2117.6	711.4	1128.8	3069.1
Peak frequency (Hz)	3750.0	485.7	2718.8	6546.1	6890.6	665.0	4593.75	8062.5
Duration (sec)	0.049	0.010	0.026	0.083	0.034	0.008	0.020	0.050
Shape score[a]	2.7	0.4	1.9	4	4.4	0.5	3.3	5

[a] A representation of the shape of the call's traces; lower values represent a rising pitch, intermediate a peaking or flat pitch, and higher values a falling pitch. These values, summarizing the entire call, are averages of numbers assigned to individual traces within the call; see Methods.

Table 3 Quantification and Comparison of the Components[a] of Pacific and Winter Wren Calls

	Winter Wren			Pacific Wren		
	Bottom component	Second component	Third component	Bottom component	Second component	Third component
Lowest frequency (Hz)						
Median (IQR[b])	1283.7 (255.7)	2088.1 (467.6)	4013.9 (502.3)	2114.8 (723.6)	3991.0 (695.1)	8066.7 (1417.8)
Min, max	670.2, 1587.6	1629.2, 2946.7	2266.7, 4768.8	1128.6, 3069.1	2116.8, 8921.3	6192.7, 10013.6
Highest frequency (Hz)						
Median (IQR)	2036.5 (200.5)	3880.1 (430.9)	5639.8 (529.6)	4071.2 (578.3)	7957.0 (1189.7)	10240 (2275.6)
Min, max	1651.8, 2504.5	2320, 4615.8	4320, 6497.4	2678.4, 7731.8	4756.9, 10740.5	7178.2, 11535.2
Central frequency (Hz)						
Median (IQR)	1781.3 (187.5)	3562.5 (344.5)	5081.8 (618.9)	3421.9 (340.1)	6804.5 (430.1)	8957.8 (1808.8)
Min, max	1406.25, 2153.3	1875, 4218.8	3703.71, 5770.9	2203.1, 4921.9	4312, 9843.8	6718.359, 10680.5
Peak frequency (Hz)						
Median (IQR)	1781.3 (187.5)	3656.3 (344.5)	5081.8 (667.2)	3281.3 (258.4)	6890.6 (870.6)	9302.3 (2153.3)
Min, max	1406.3, 2153.3	1968.8, 4218.8	3703.7, 6000	2156.3, 3750	4593.8, 9937.5	6546.1, 10875
Duration (sec)						
Median (IQR)	0.035 (0.013)	0.045 (0.016)	0.038 (0.019)	0.023 (0.013)	0.031 (0.007)	0.018 (0.006)
Min, max	0.014, 0.059	0.024, 0.081	0.015, 0.067	0.007, 0.069	0.015, 0.050	0.009, 0.032
Shape score[c]						
Median (IQR)	3.0(0.6)	3.8(0.4)	2.3(0.9)	4.3 (0.7)	4.4 (0.5)	4.2 (0.8)
Min, max	1, 4	3, 4	1, 4	3, 5	3, 5	3, 5
Left-time[d] (sec)						
Median (IQR)	0.013 (0.006)	0.017 (0.007)		0.006 (0.003)	0.007 (0.004)	
Min, max	0.006, 0.029	0.007, 0.027		0.0003, 0.023	0.0003, 0.012	
Right-time[e] (sec)						
Median (IQR)	0.016 (0.010)	0.025 (0.012)		0.019 (0.012)	0.023 (0.008)	
Min, max	0.007, 0.041	0.013, 0.059		0.004, 0.037	0.014, 0.036	
Height (Hz)						
Median (IQR)	332.7 (219.2)	581.4 (468)		1009.5 (485.9)	2035.2 (1494.2)	
Min, max	65.3, 1968.6	219.8, 1587.6		295.1, 1683.9	417.3, 3470.6	

[a] Defined as individual traces that are poorly defined and of similar shape, so that they appear to cluster tightly; see Methods.

[b] IQR, interquartile range.

[c] On a scale of 1 to 5, a value of 1 represents an ascending contour, a value of 5 represents a descending contour; see Methods, Figure 3.

[d] "Left-time," the interval from the trace's beginning to its point of highest frequency.

[e] "Right-time," the interval from the point of the trace's highest frequency to its end.

they differed significantly in all measures except lowest frequency. With respect to the shape of the components, the bottom and second components in each species differed significantly from those of the other in left-time but not right-time measurements, and the calls overall differed significantly in their average shape scores.

In all three components, bottom, second, and third, the ranges of central and peak frequency of the two species' calls did not overlap (Figure 5), but all other measurements did. Most overlapping measurements had medians that fell outside the range of the same measurement in the other species. The exceptions were the entire call's lowest frequency, entire call's duration, bottom component's lowest frequency (in the Winter Wren only), bottom component's duration, second component's duration, third component's duration (Pacific Wren only), bottom component's left-time (Pacific Wren only), and height of the second component (Pacific Wren only). In the PCA generated in Past5 with these data the Pacific and Winter wrens clustered largely separately (see Figure 6).

Various measures showed the calls of the Pacific Wren to be more complex on average than those of the Winter Wren, despite superficially appearing less complex. In other words, there are possibly more and/or denser traces within the call of the Pacific Wren. The number of individual traces within each call, estimated by the number of distinct right points, averaged five for both species, whereas the number of right points in the bottom and second components was two (IQR = 0) for the Winter Wren and four (IQR = 1) for the Pacific Wren (Figures 1, 7). Most revealingly, 38 of 40 Winter Wrens included in the primary analysis showed a single trace in the bottom com-

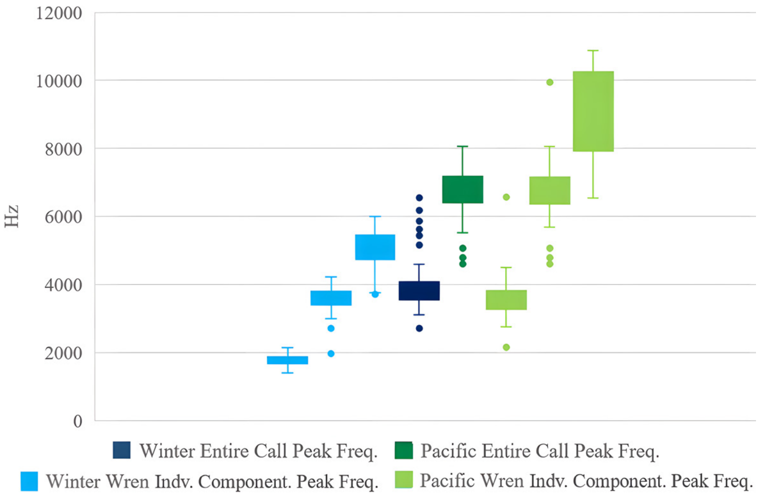

FIGURE 5. Peak frequencies of all measured components (bottom, second, and third, respectively) and entire call in the Pacific and Winter wrens, from our primary analysis of 175 calls selected to encompass a broad representation of the ranges of the two species.

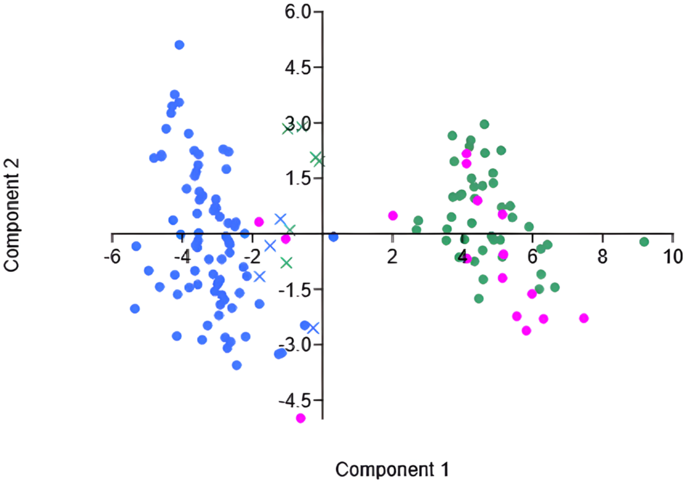

FIGURE 6. Principal-component analysis of all Winter (blue) and Pacific Wren calls (green, western or coastal segment of range; pink, interior segment of range) analyzed, including the 10 atypical calls selected for our secondary analysis. Dots are calls included in the primary analysis of 175 calls selected to encompass the range of both species, while crosses are from the secondary analysis of 10 additional calls selected to include atypical variants. Principal component 1 is driven primarily by frequency-based quantities such as entire call low and peak frequency; loadings for temporal variables are strongly negative. Contrastingly, principal component 2 is driven primarily by temporal variables, with duration and right-time particularly heavily loaded. Because the methods for selecting the recordings in primary and secondary analyses differed, calls marked with crosses are significantly overrepresented in this principal-components analysis.

ponent, whereas only 10 of 45 Pacific Wrens did: most Pacific Wrens instead showed two traces in the bottom component (Figures 1, 2). In Pacific Wren calls with two traces in the bottom component, the median peak frequency and average shape score for the lower trace were 3281 (IQR = 258) and 4.3, respectively; for the upper trace, 3816 (IQR = 605) and 4.5.

Among the Pacific Wren calls showing a single trace in the bottom component, nine of ten were recorded in the breeding season (May 30–July 19). Seven of ten were from the interior section of the species' range, and only one of these seven was recorded outside of the breeding season.

Although our sample is small, the calls of western and interior Pacific Wrens might differ in several other ways. A measurement of complexity, the number of rightmost points, was 6 (IQR = 3.25) for breeding western Pacific Wrens and 4 (1.25) for breeding interior Pacific Wrens. The number of rightmost points in the bottom and second components combined was 4 (2.25) for breeding western Pacific Wrens and 2.5 (1) for breeding interior Pacific Wrens, whereas it was 4 (1) and 2 (0) for overall samples of Pacific and Winter wrens. Additionally, *t*-tests suggested significant difference between these two subsets of the Pacific Wren in the left-time values for the bottom and second

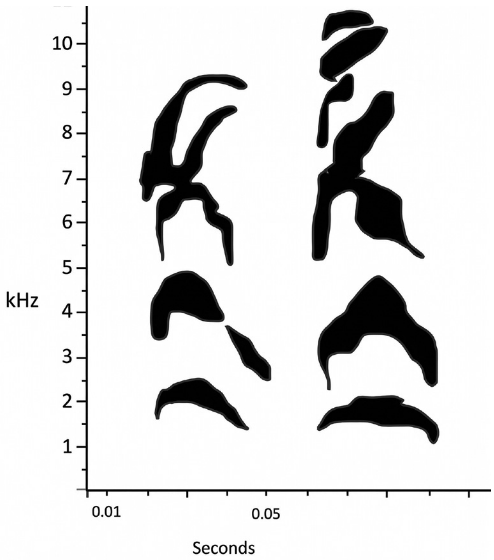

Figure 7. Variability in Winter Wren calls. Left, ML190186441; right, ML471513861 (#44, Table 1).

Audio by Jay McGowan and Andrew Spencer.

components (0.01 < p < 0.05). However, a PCA comparing individuals of both groups included in the primary analysis did not show clear differentiation.

Secondary Analysis: Intraspecific Variation

The secondary analysis was based on recordings of wrens whose specific identity was reasonably established but were giving atypical calls. The measurements of the calls included in the secondary analysis expand several of the ranges from our primary analysis, lessening these measurements' utility for discriminating the two species (Tables 4 and 5). This additional sample increased the upper limit of all measurements of frequency of Winter Wren calls, and decreased the lower limit of several frequency ranges in Pacific Wren calls, most notably the peak frequency of all three components (Tables 4 and 5). Ranges of measurements that reflect traces' shape and complexity (left-time, right-time, height, occurrence of two traces in the bottom component, etc.) were generally unaltered by inclusion of calls in the secondary analysis. Nevertheless, a single Pacific Wren's third component received a shape score of two, expanding the range of shape scores of that component. As expected, calls of two of the three presumed Pacific Wrens in the secondary analysis showed two traces in the bottom component, and those of the third individual also suggested this feature. As expected, calls of the two Winter Wrens in the secondary analysis had only a single trace in the bottom component.

In the PCA plot (Figure 6), although most calls from the primary analysis

Table 4 Minimum and Maximum Values of Characteristics of Calls of Five Pacific and Winter Wrens Selected to Include Unusual Variants

	Winter Wren (*n* = 4)		Pacific Wren (*n* = 6)	
	Min	Max	Min	Max
Lowest frequency (Hz)	819.1	1760	1156.3	1875.8
Peak frequency (Hz)	4031.3	**6656.3**[a]	**4031.3**[a]	7312.5
Duration (sec)	0.035	0.047	0.032	**0.060**[a]
Shape score[b]	2.8	4	**3.3**[a]	4.125

[a]Values that extend the range in Table 2 are in **bold**.

[b]On a scale of 1 to 5, a value of 1 represents an ascending contour, a value of 5 represents a descending contour.

Table 5 Minimum and Maximum Values by Component of Ten Calls of Five Pacific and Winter Wrens Selected to Include Unusual Variants

	Winter Wren			Pacific Wren		
	Bottom Component	Second component	Third Component	Bottom Component	Second component	Third Component
Lowest frequency (Hz)	819.1, **1760**[a]	2006.8, **3340.5**[a]	4832.8, **5477.1**[a]	1156.3, 1875.8	2544.0, 3035.2	**3854.4**[a], 6440.1
Highest frequency (Hz)	2322.6, **2573.3**[a]	4753.7, **5115.6**[a]	7143.5, **7908.6**[a]	**2184.2**[a], 2454.8	4830.8, 5637.8	**5704.5**, 7791.4
Central frequency (Hz)	1968.8, **2250.0**[a]	3962.1, **4565.0**[a]	5906.3, **6750**[a]	**1968.8**[a], 2454.8	**4218.8**[a], 4909.6	**4781.3**[a], 7149.0
Peak frequency (Hz)	2153.3, **2325.6**[a]	4031.3, **4737.3**[a]	5437.5, **6937.5**[a]	**1968.8**[a], 2325.6	**4125.0**[a], 5340.2	**4593.8**[a], 7149.0
Duration (sec)	0.017, 0.042	0.028, 0.045	0.020, 0.033	0.032, 0.050	0.042, 0.050	0.032, **0.057**[a]
Shape score[b]	3, 4	4, 4	1, 4	4, 4	4,4	**2**, 4
Left-time[c] (sec)	0.008, 0.019	0.010, 0.022		0.007, 0.013	0.005, 0.021	
Right-time[d] (sec)	0.007, 0.018	0.015, 0.027		0.020, 0.031	0.025, 0.042	
Height (Hz)	288.8, 672.0	315.0, 1120.0		544.0, 644.5	993.1, 1856.0	

[a]Values that extend the range in Table 3 are in **bold**.

[b]On a scale of 1 to 5, a value of 1 represents an ascending contour, a value of 5 represents a descending contour.

[c]"Left-time," the interval from the trace's beginning to its point of highest frequency.

[d]"Right-time," the interval from the point of the trace's highest frequency to its end.

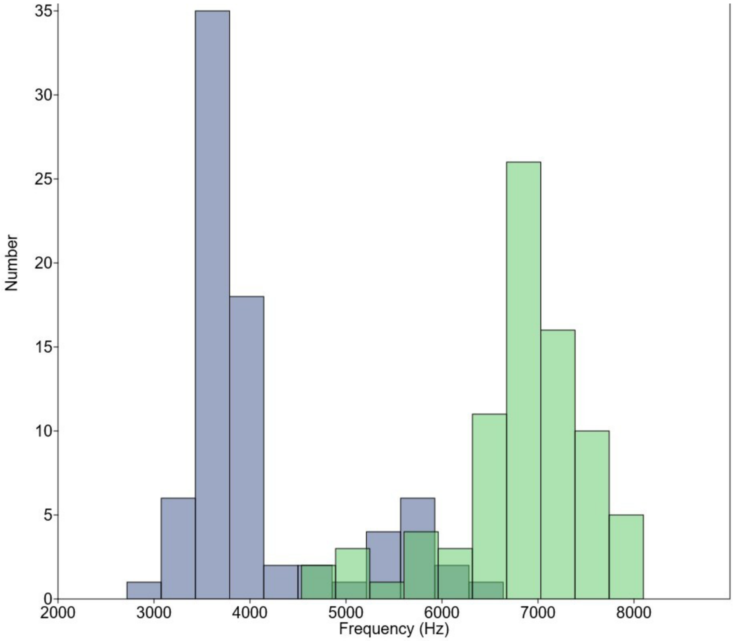

FIGURE 8. Peak frequency of entire call in 175 Winter and Pacific Wren calls selected to encompass a broad representation of the ranges of both species, showing a wide average difference between the two. Green bars, Pacific Wren; blue bars, Winter Wren.

cluster neatly by species, those from the secondary analysis cluster closer to or with typical Winter Wren calls, regardless of the bird's presumed specific identity.

DISCUSSION

Identification of Extralimital Wrens by Call

The typical single or double-noted calls of a Pacific Wren or Winter Wren usually identify the bird readily. Unfortunately, significant variability in the calls of both species confuses the issue. Our analysis of atypical-sounding calls suggests that, in both species, the calls' shape and complexity, as viewed by spectrogram, are less variable than their frequency. Regardless, an extralimital record of either species, based only on a reasonably adequate recording of a single or double-noted call, should be based on a typical call only. Our study suggests the following *holistic* guidelines for identifying an extralimital Pacific or Winter Wren to species conclusively. Because of variability, many Pacific and Winter Wren calls may not satisfy these criteria, though if additional information such as photographic documentation supports a specific identification, not all vocal criteria may need to be met.

Guidelines. We suggest that an acceptable extralimital Winter Wren's call should show (1) a peak frequency that is reasonably typical for the Winter Wren and reasonably atypical for the Pacific Wren (see Figures 5 and 8, Tables 2 and 3); (2) a bottom component consisting of a single trace; and (3) a bottom component that is fairly symmetrical (Figures 9, 10) or, even more favorably, has a shape score of 1 or 2 (see Figure 3).

An extralimital Pacific Wren's call should show (1) a peak frequency that is reasonably typical for the Pacific Wren and reasonably atypical for the Winter Wren (see Figures 5 and 8, Tables 2 and 3); (2) a bottom component consisting of multiple traces; and (3) a bottom component that is asymmetrical, with right-time greater than left-time to the degree reflected in Table 2 and Figures 9 and 10, and preferably with a shape scored 4 or 5 (see Figure 3).

We recommend peak frequency as a discriminator because, unlike the lowest or highest frequency, it is less likely to be obscured in recordings of poorer quality. Although the bottom component is consistently weaker than the second component, its shape is more helpful for diagnosis of species (Figure 9), as is the number of traces constituting it, usually one in the Winter Wren and usually two in the Pacific.

These criteria are conservative but may be interpreted flexibly. Under a conservative interpretation of these criteria, 65 of 83 Winter Wren calls in the primary analysis pass as that species by all three criteria, as do 60 of 82 Pacific Wren calls. In other words, approximately 22% of "typical" Winter Wren calls evaluated do *not* qualify by all three criteria, nor do 27% of "typical" Pacific Wren calls. Among Pacific Wrens breeding in the interior of North America, the failure rate was higher, with approximately half of those failing, failing on the guideline for a doubled trace in the bottom component.

Caveats. Several caveats must be considered when these guidelines are applied. First, in audio recordings of suboptimal quality, information disappears from the spectrogram. As the volume of the background noise approaches the volume of the call, for example, the edges of the spectrogram corresponding to the quieter parts of the call begin to disappear into the background, and/

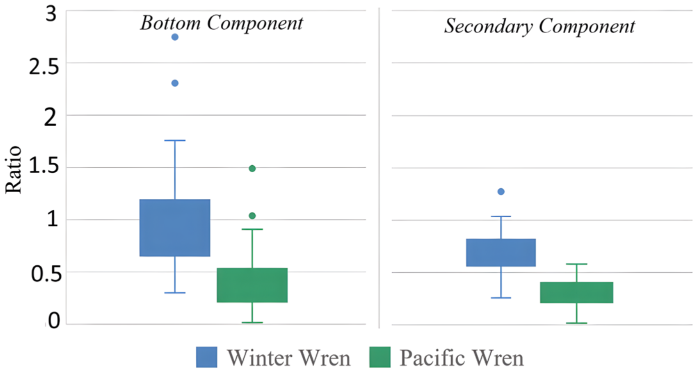

FIGURE 9. Ratios of "left-time" (the interval from the trace's beginning to its point of highest frequency) to "right-time" (the interval from the point of the trace's highest frequency to its end) in the bottom and secondary components of 175 Winter and Pacific Wren calls selected to encompass a broad representation of the ranges of both species. Note that the proportion of the call consisting of the initial rising segment averages shorter in the Pacific Wren than in the Winter Wren.

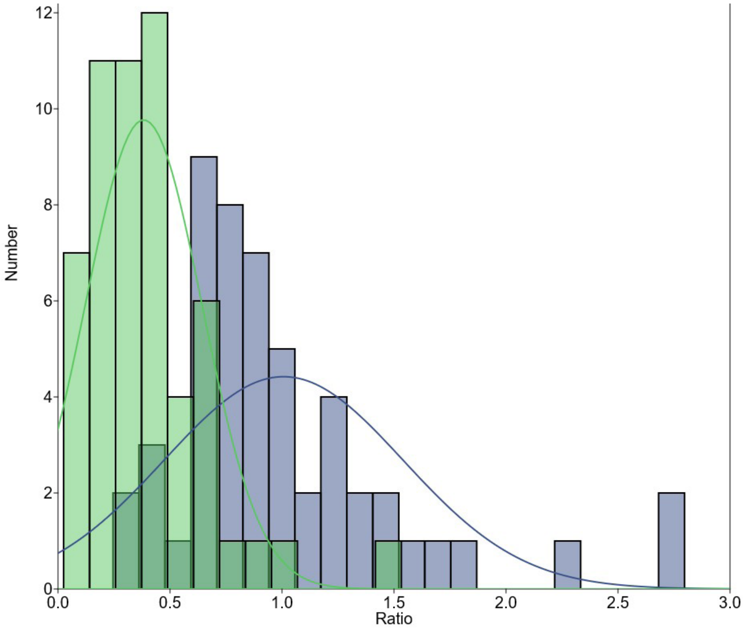

Figure 10. Ratios of "left-time" (the interval from the trace's beginning to its point of highest frequency) to "right-time" (the interval from the point of the trace's highest frequency to its end) in the bottom component of 175 Winter and Pacific Wren calls selected to encompass a broad representation of the ranges of both species. Green bars, Pacific Wren; blue bars, Winter Wren. The curves show normal distributions fit to the data for each species.

or the spectrogram may blur, degrading the graphic representation of the call. Components that may appear to have a shape score of 2 in a good recording may appear to have a score of 1 in a poor recording; similarly, the bottom component—consistently weaker than the second component—may vanish altogether. However, note that in Pacific Wren calls in which the bottom component is doubled (two traces rather than one), the median peak power density of each trace was similar (–38.3 and –36.9 dBFS/sec). Thus in a clear recording showing the bottom component, both traces are likely to be visible if present.

Second, in an evaluation of a spectrogram, it may be unclear if the lowest-frequency trace visible represents the bottom component, as we have described it, or instead belongs to the second component, with the bottom component too weak to be discerned. Peak power density is a measure of loudness, with higher (more positive) numbers appearing darker on the spectrogram. Average peak power densities (dBFS/sec) of the bottom, second, and third components were –36.8, –23.9, and –41.4, respectively, for the Pacific Wren, and –42.9, –28.5, and –34.2 for the Winter Wren. In other words, the bottom component is generally quieter (fainter on the spectrogram) than the second component. If the lowest-frequency trace(s) in a spectrogram are not substantially weaker than the higher-frequency traces, the bottom component is likely not visible on the spectrogram. Additionally, the average height (range of hertz spanned on the *y* axis) of the bottom, second, and third components was 1925.9, 3644.9, 1631.8, respectively for the Pacific Wren and 691.1, 1721.6, and 1582.4 for the Winter Wren. In other words, the bottom component should be significantly shorter (as measured on the *y* axis) than the second component. If the lowest-frequency trace in a recording is not substantially shorter than the component above it, the bottom component is likely not visible on the spectrogram.

Third, it is inappropriate to estimate measurements—particularly peak frequency—without a program designed for rigorous bioacoustic analyses, such as Raven. Similarly, one should look for features in a spectrogram only in applications that allow the user to magnify the spectrogram significantly. Many computer applications other than Raven may be sufficient; the user must simply be able to take a close look at the spectrogram and be able to reliably measure, for example, the peak frequency of a selection.

Fourth, it bears repeating that six of twelve interior Pacific Wrens (identified by range during the breeding season) included in this study showed only one, not two, traces in the bottom component of their calls. If this pattern proves consistent, then a bottom component consisting of two traces may not be as useful for identifying an extralimital Pacific Wren as the species-wide analysis implies, especially because it is Pacific Wrens from this area that are nearest to the normal range of the Winter Wren.

Therefore, these criteria and precautions remain insufficient for identifying some individuals. The few Pacific Wren calls from the primary analysis that clustered with Winter Wren calls were all from interior Pacific Wrens (Figure 6). Calls of ambiguous-sounding Pacific Wrens from the secondary analysis also clustered with Winter Wrens (Figure 6), raising the question whether many relatively ambiguous sounding wrens are interior Pacific Wrens. More troublingly, some individual wrens are capable of making calls that are either entirely ambiguous, or that at times are most similar to the Winter, and at other times most similar to the Pacific (see Figures 4 and 11). Mikkelsen and Irwin (2021) reported limited hybridization at the contact zone but offered no information on the appearance or sound of the hybrids. It is possible that wrens that make entirely ambiguous calls and/or calls appropriate for both species are of mixed ancestry. Alternatively, even unhybridized birds may make calls that fall outside the range of variation we confirmed. Clearly, more study is needed.

Recommendations for Future Study

Further work to establish the range of potential geographic variation in the calls of these taxa, among Pacific Wrens especially, is needed. Our study did not encompass calls of any of the Alaska subspecies (*T. p. helleri*, *alascensis*, *meligerus*, *kiskensis*, and *semidiensis*, which are mostly or completely sedentary). More geographic variation within the calls of each species may remain to be identified. Efforts to characterize the calls of Pacific Wrens breeding as isolated populations, e.g., in South Dakota and Arizona (Toews et al. 2025), are needed, as is a more comprehensive comparison of interior Pacific Wrens and coastal Pacific Wrens.

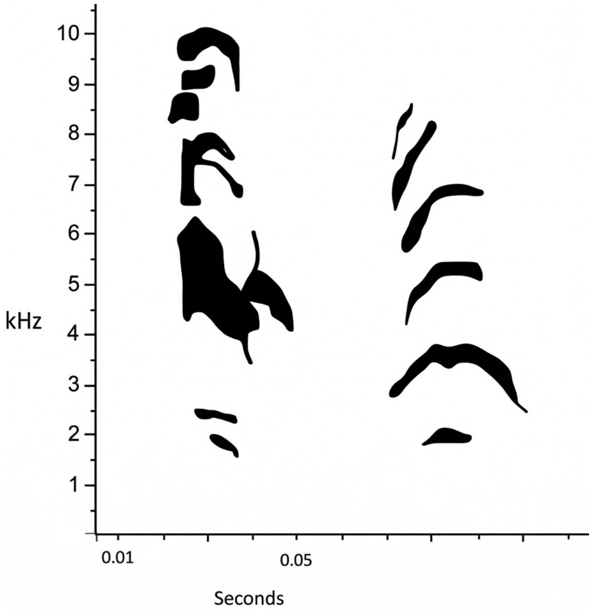

Figure 11. Two calls made by a Winter/Pacific wren at Sycamore Reservoir, Arizona, XC218679. These calls have a peak frequency of 4306.6 Hz and 3359.2 Hz, respectively. The call on the left shows two descending traces of similar size and shape at the lowest frequencies (favoring the Pacific Wren), whereas the right spectrogram shows a single, generally symmetrical trace instead (favoring the Winter Wren). Note additional "soft features," such as the size and shape of the traces centered at 5 kHz (left) and 3 kHz (right), and the call's overall complexity; compare to Figures 1, 2, and 7.

Concrete information on vocal learning in these taxa would deepen our understanding of variation in these wrens' calls, but this information is lacking. Similarly, descriptions of calls of F1 hybrids (confirmed with genetic analysis) might assist with the field identification of problem birds.

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THE BIRDS OF GAMBELL AND ST. LAWRENCE ISLAND, ALASKA: NEW RECORDS AND OTHER UPDATES, 2019–2025

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ABSTRACT: Much noteworthy avian information has accrued since the publication of *The Birds of Gambell and St. Lawrence Island, Alaska* (Lehman 2019). These include first-time records as well as many new early arrival and late departure dates, high counts, and additional records of rare and casual species. From 2019 to 2025, 14 new species were recorded on St. Lawrence Island. Two, Pallas's Grasshopper-Warbler (*Helopsaltes certhiola*) and the Icterine Warbler (*Hippolais icterina*), were also firsts for North America. Another two species were new at the village of Gambell but had previously been recorded elsewhere on the island. In addition, the taxonomic splits of the Vega Gull (*Larus vegae*) and American Herring Gull (*L. smithsonianus*) from the Herring Gull (*L. argentatus*) and of the Siberian Pipit (*Anthus japonicus*) from the American Pipit (*A. rubescens*) were accompanied by the merging of Common Redpoll (*Acanthis flammea*) and Hoary Redpoll (*A. hornemanni*) into a single species. These discoveries and reclassifications bring the species total at Gambell to 303 and on St. Lawrence Island to 307.

This article summarizes the most significant avian records from Gambell and Saint Lawrence Island, Alaska, since the publication of *The Birds of Gambell and St. Lawrence Island, Alaska* (Lehman 2019) by Western Field Ornithologists. This new information comes primarily from 2019 through 2025 but also includes some pre-2019 addenda that have come to light since the book's publication. Many additional records of note could have been included. These may establish new early arrival or late departure dates by only a day or two, add only a small number of individuals to a previous high count, or add new reports of regularly occurring rarities that already had accrued more than 10 records.

Gambell is a village of mostly Yupik people located at the northwest tip of St. Lawrence Island in the northern Bering Sea (63.78° N, 171.73° W). It lies approximately 315 km west-southwest of Nome, 265 km southwest of the closest point on the Seward Peninsula, at Wales, and only 73 km southeast of the nearest point on the Chukchi or Chukotski Peninsula of the Russian mainland (Figure 1). The shortest distance from the island to the Alaska mainland is approximately 200 km. The village of Savoonga (63.69° N, 170.48° W), 62 km east of Gambell, is the only other permanent settlement on this large, mostly volcanic island, which measures just slightly over 160 km in length and 15–65 km in width, encompassing roughly 5200 km^2.

I define "Gambell" as the area from the tip of Northwest Cape ("the point") east to the slopes of Sevuokuk Mountain and south to the first major coastal headland, Ooynik Point, approximately 8 km south of the village (Figure 2).

Birders have visited Gambell annually in spring since about 1973. Most have visited the village area during the last week of May and first week or 10 days of June. Data for this period during the height of spring migration are now extensive, although the periods from April to mid-May and from mid- to late June have received only limited coverage. Autumn observations

Figure 1. Location of Gambell and St. Lawrence Island in the northern Bering Sea. Also shown are several additional islands and island groups that have received varying amounts of observer coverage over the years.

Map by Cindy Lippincott

were extremely sparse until the early 1990s, when birders made visits for up to ten days duration the last week of August and first week of September. From 1999 to 2019, a small number of birders, including me, remained for extended stays of over a month, between late August and the end of September or early/mid-October. Since 2019, however, such extended stays have become

Figure 2. This aerial photo looking southwest over Gambell 9 Sep 2006 shows the village, Troutman Lake to the south, and the three “boneyards” that show up as dark green areas. Northwest Cape (“the point”), where seawatching takes place, is just off the photo to the right. Sevuokuk Mountain is on the left.

Photo by Gary H. Rosenberg

more sporadic. Data for early spring, summer, late fall, and winter are sparse. Several local residents have provided many important records during these seasons. Some of the limited information from Gambell and the Savoonga area during summer comes from studies focused on alcids. Almost all visiting observers since the 1970s have restricted their activities largely to within a few miles of Gambell, with little exploration of other areas on St. Lawrence Island.

Lehman (2019) summarized information on the avifauna at Gambell and the rest of St. Lawrence Island and surrounding waters through March 2019. At that time, 287 species had been recorded at Gambell, with an additional five species found elsewhere on the island, for a total island list of 292 species. Since early 2019, 13 further species new to the island have been recorded at Gambell, and another was found at Savoonga. Two of these species, Pallas's Grasshopper-Warbler (*Helopsaltes certhiola*) and the Icterine Warbler (*Hippolais icterina*), were also firsts for North America. Another two species were new at Gambell but had been recorded elsewhere on the island previously. These finds plus taxonomic changes bring the species total at Gambell to 303 and for St. Lawrence Island to 307.

For each individual record listed below, the initials of the finder(s) are given. Almost all records have been shared via https://eBird.org. A small number are published in *North American Birds* (NAB).

For those interested in a more complete listing of the avian data from St. Lawrence Island, four documents are maintained on the Western Field Ornithologists website. One is a complete database covering the spring and summer seasons, the second is a database covering the fall and winter seasons since 1998, a third is a listing of all addenda and corrigenda to Lehman (2019) through March 2019, and the last covers notable addenda from 2019 to the present. These documents are updated annually and are available at https://westernfieldornithologists.org/wp-content/Studies/Lehman/.

ADDENDA THROUGH 2018

Some significant records prior to 2019 have come to light since the publication of Lehman (2019), many the result of observers sharing their sightings only recently for the first time through eBird. Observers are credited by their initials and listed in the acknowledgments.

BLACK TURNSTONE *Arenaria melanocephala*. Very rare or casual spring visitor. A record-late spring visitor was at Siknik Cape, south shore of St. Lawrence Island, 18 Jun 1997 (MR).

RED KNOT *Calidris canutus*. Very rare spring and fall visitor. A record-late spring visitor or summer wanderer was at Koozata Lagoon, south shore of St. Lawrence Island, 23 Jun 1997 (MR).

RUFF *Calidris pugnax*. Rare spring and casual fall visitor. A displaying male and up to two females were at Gambell 13–16 Jun 2006 (BW). Displaying birds have been noted on several occasions but were not known to linger or breed locally.

RED-NECKED STINT *Calidris ruficollis*. Rare but regular spring and fall visitor. A pair was at Koozata Lagoon 22 Jun 1997 (MR). This species probably breeds on St. Lawrence Island, where there are several summer records and birds seen in display flight, but there are no documented nesting records.

GRAY-TAILED TATTLER *Tringa brevipes*. Very rare spring and rare fall visitor. A late spring visitor or summer wanderer was at Koozata Lagoon 22 Jun 1997 (MR).

SLATY-BACKED GULL *Larus schistisagus*. Rare to uncommon spring and uncommon fall visitor; casual in summer. An additional summer bird was at Gambell 29 Jun 2007 (GC).

FORK-TAILED STORM-PETREL *Hydrobates furcatus*. Casual spring and rare to very rare fall visitor; casual in summer. The first summer record at Gambell was of an individual found dead 5 Jul 1979 (EAC). Apparently the specimen was not saved.

LEACH'S STORM-PETREL *Hydrobates leucorhous*. One photographed from shore ~8 km southeast of Gambell 7 Oct 2012 (RU; Figure 3) represents the first island record. This species is a casual visitor to the northern Bering Sea.

CHINESE POND-HERON *Ardeola bacchus*. Accidental visitor. The adult at Gambell 14–15 Jul 2011 (Gibson et al. 2013) still represents the only record of this species for St. Lawrence island and one of only three for North America (RU; Figure 4). I include this species here because I did not have access to the original photo in 2019, and here take the opportunity to reproduce a version at a resolution higher than it was published in N. Am. Birds 65: 713, 2011.

SAY'S PHOEBE *Sayornis saya*. Casual spring visitor. One on 3 Jun 1981 (Wings Birding Tours) was the first of three recorded at Gambell in spring.

RUBY-CROWNED KINGLET *Corthylio calendula*. Although a rare fall visitor with over 50 individuals recorded, the only spring record was established at Gambell 2 Jun 2009 (TB, KS).

NAUMANN'S THRUSH *Turdus naumanni*. Accidental spring visitor. Because of a taxonomic split from the Dusky Thrush (*T. eunomus*), Naumann's Thrush gained species rank in 2020 (Chesser et al. 2020). Thus a bird photographed at Gambell 5 Jun 2015 (RH, JLD) adds a further species. Naumann's Thrush breeds east to near the northern Sea of Okhotsk (Dunn and Alderfer 2017). Several additional records have been accepted from the Aleutian Islands, but there is a fairly large hybrid zone with the Dusky Thrush (east to the western Anadyr River basin), and several other Alaska reports do not eliminate hybrids (Gibson et al. 2023).

FIRST RECORDS, 2019–2025

GARGANEY *Spatula querquedula*. One was photographed at Gambell 3 Sep 2023 (GS, RLV). This species is a very rare visitor to the Pribilof and Aleutian Islands, mostly in fall (Gibson and Withrow 2015), and is casual elsewhere in North America (Dunn and Alderfer 2017). It breeds north to Kamchatka and the northwest coast of the Sea of Okhotsk (Brazil 2009).

COMMON SWIFT *Apus apus*. One in a weakened condition was photographed inside a shed at Savoonga 31 Jul 2021 (D&JT, TN). This species breeds no closer to St. Lawrence Island than the Lake Baikal region and northeast China (Brazil 2009). There are records from Korea and Japan (Brazil 2009), four records from the Pribilof Islands, all in late June, and one July record from the central Aleutians (S. C. Schuette unpubl. data, W. S. Gibson pers. comm.). The Common Swift is accidental elsewhere in North America.

WESTERN KINGBIRD *Tyrannus verticalis*. One photographed at Gambell 1 Aug 2025 (RU, CI; Figure 5) established the first record for the Bering Sea region. This species is very rare or casual anywhere in Alaska and nests no farther north than southern British Columbia (Dunn and Alderfer 2017).

WOOD-PEWEE SP. *Contopus* sp. One was photographed at Gambell 29 Aug–1

Figure 3. St. Lawrence Island's sole record of Leach's Storm-Petrel, a casual visitor to the northern Bering Sea, was established by this bird seen from shore about 8 km southeast of Gambell 7 Oct 2012.

Photo by Rodney Ungwiluk Jr.

Sep 2019 (AJL, SCH, et al.). From plumage features, distribution, and timing this bird was almost certainly a Western Wood-Pewee (*C. sordidulus*). This species breeds north to interior Alaska (Dunn and Alderfer 2017). Elsewhere on islands in the Bering Sea, there are four previous records of the Western or unidentified wood-pewees from the Pribilof Islands (S. C. Schuette unpubl. data).

ICTERINE WARBLER *Hippolais icterina*. The first recorded in North America was at Gambell 22 Sep 2022 [RU; photo NAB 73(2):23; *Western Birds* 54(2): cover; Gibson et al. 2023]. Subsequently another was found at the Pribilof Islands 7 Oct 2023 [photo NAB 75(2):72]. This species breeds no closer to Alaska than southwest

Figure 4. This photo of St. Lawrence Island's only Chinese Pond-Heron, at Gambell 14–15 Jul 2011, was not available for publication in Lehman (2019).

Photo by Rodney Ungwiluk Jr.

FIGURE 5. The Bering Sea region's first Western Kingbird was at Gambell 1 Aug 2025. *Photo by Rodney Ungwiluk Jr.*

Siberia near Omsk (Kennerley and Pearson 2010), and there are no definite records for east Asia (Gibson et al. 2023).

PALLAS'S GRASSHOPPER-WARBLER *Helopsaltes certhiola*. The first North American record was of one at Gambell 9–12 Sep 2019 [SCH, AJL; photo Lang and Heinl (2021), NAB 71(2):11]. This species breeds northeast in Russia to near the north coast of the Sea of Okhotsk (Kennerley and Pearson 2010).

PACIFIC WREN *Troglodytes pacificus*. One flew inside a house, twice, at Gambell 22–23 Oct 2019 (M&M&FU), was photographed, and subsequently perished (specimen to University of Alaska Museum). This species is resident in the Aleutians and Pribilofs and found on the mainland north to the Alaska Peninsula and south-central Alaska (Dunn and Alderfer 2017), where its status as a migrant or resident is uncertain. The subspecies of the Gambell bird has not yet been identified (J. J. Withrow pers. comm.).

MOUNTAIN BLUEBIRD *Sialia currucoides*. Found at Gambell 10 Sep 2021 [RBB; photo NAB 73(2):54; Figure 6], this species occurs irregularly north to interior Alaska (Dunn and Alderfer 2017) and has been recorded twice in fall on the Pribilofs (W. S. Gibson pers. comm.).

SONG THRUSH *Turdus philomelos*. One was at Gambell 9 Oct 2024 (CI, RW; Figure 7). This species breeds east only to about Lake Baikal (Dunn and Alderfer 2017). It is casual in Japan (Gibson et al. 2023). A small influx brought at least six to western and northern Alaska in fall from 2019 to 2024, including at least three in 2024.

DARK-SIDED FLYCATCHER *Muscicapa sibirica*. Single birds were photographed at Gambell 6 Sep 2022 (RLV), 5–9 Sep 2023 [GS, AT; photo NAB 75(2):61; Figure 8], and 9 Sep 2024 (AJL, SCH, et al.). This species breeds northeast to Kamchatka and the Sea of Okhotsk (Dunn and Alderfer 2017) and is a very rare visitor to the Aleutians (Gibson and Byrd 2007) and Pribilofs (S. C Schuette unpubl. data).

PINE GROSBEAK *Pinicola enucleator*. One was found at Gambell 21 Oct 2022 (CI; Figure 9). On the basis of its apparent smaller bill size, the bird was of the Asian subspecies *P. e. kamtschatkensis* (D. D. Gibson pers. comm.). In Alaska, the subspecies *P. e. leucura* breeds west to the central Seward Peninsula and rarely wanders

FIGURE 6. The sole island record of the Mountain Bluebird was established at Gambell 10 Sep 2021.

Photo by Andy Kraynik

FIGURE 7. Since 2020 the Song Thrush has reached North America as a casual visitor thousands of kilometers east of its known normal range. This individual at Gambell 9 Oct 2024 was one of several seen in Alaska that fall.

Photo by Clarence Irrigoo Jr.

FIGURE 8. The Dark-sided Flycatcher was added to the St. Lawrence Island list with individuals found at Gambell 6 Sep 2022, 5–9 Sep 2023 (shown in this photo), and 9 Sep 2024.

Photo by Greg Scyphers

farther west (Dunn and Alderfer 2017). In Asia, *P. e. kamtschatkensis* occurs as close to St. Lawrence Island as the western Anadyr River basin (Brazil 2009). There are several records of *P. e. kamtschatkensis* from the Pribilofs (S. C. Schuette unpubl. data) and western Aleutians (Gibson and Byrd 2007).

CASSIN'S FINCH *Haemorhous cassinii*. An adult male was photographed at Gambell 24 Oct–1 Nov 2023 [CI; ph. NAB 75(2):67; Figure 10]. This species breeds no closer to St. Lawrence Island than southern British Columbia (Dunn and Alderfer 2017) and is a casual visitor anywhere in Alaska (Gibson and Withrow 2015). This

FIGURE 9. This Pine Grosbeak at Gambell 21 Oct 2022, an island first, represents the Asian subspecies *Pinicola enucleator kamtschatkensis*.

Photo by Clarence Irrigoo Jr.

FIGURE 10. Adult male Cassin's Finch at Gambell 24 Oct–1 Nov 2023. This species is a casual visitor anywhere in Alaska, and this photo established the first record for the Bering Sea region.

Photo by Rodney Ungwiluk Jr.

individual established the first Bering Sea record and was likely associated with a notable incursion of Cassin's Finches north to south-central Alaska during late fall and winter 2023–2024 (eBird).

YELLOW-HEADED BLACKBIRD *Xanthocephalus xanthocephalus*. A young male was photographed at Gambell 1 Oct 2022 (CI; Figure 11). This species breeds

FIGURE 11. The Yellow-headed Blackbird is casual anywhere in Alaska. This example at Gambell 1 Oct 2022 was the second recorded on an island in the Bering Sea.

Photo by Rodney Ungwiluk Jr.

Figure 12. This Western Tanager, at Gambell 23–25 Sep 2023, is the only one yet recorded there.

Photo by Rodney Ungwiluk Jr.

north to central British Columbia and northern Alberta (Dunn and Alderfer 2017) and is a casual visitor to Alaska (Gibson and Withrow 2015). The only other Bering Sea record, for the Pribilofs, preceded the occurrence at Gambell by just a few days (W. S. Gibson pers. comm.).

WESTERN TANAGER *Piranga ludoviciana*. One was photographed at Gambell 23–25 Sep 2023 (CI; Figure 12). This species breeds north to southeast Alaska and southeast Yukon (Dunn and Alderfer 2017). Its appearance on St. Lawrence Island was foreshadowed by six records in fall and one in summer from the Pribilofs and one fall record from the central Aleutians (W. S. Gibson pers. comm.).

Figure 13. Gambell's first Belted Kingfisher was discovered 14 Sep 2019.

Photo by Gary H. Rosenberg

Two species formerly recorded only elsewhere on St. Lawrence Island were found for the first time at Gambell:

BELTED KINGFISHER *Megaceryle alcyon*. Previously recorded once at the east end of St. Lawrence Island. Single individuals were at Gambell 14 Sep 2019 (GHR; Figure 13) and 28 Aug 2023 (RU). This species breeds north to central and southwestern Alaska (Dunn and Alderfer 2017) and has occurred more than ten times in fall on the Pribilofs (S. C. Schuette unpubl. data).

BOHEMIAN WAXWING *Bombycilla garrulus*. Single birds seen at Southwest Cape 21 Oct 2022 (fide RU) and photographed at Gambell 23 Oct 2022 (CI) established the second and third records for St. Lawrence Island. This species occurs regularly in interior western Alaska as close to St. Lawrence Island as the central Seward Peninsula (Dunn and Alderfer 2017), very rarely farther west. In Asia, it nests as close as the western Anadyr River basin (Brazil 2009). Bohemian Waxwings occur casually on other Alaska islands, including at least two records of the Asian *B. g. centralasiae* from the Aleutians (Gibson and Withrow 2015).

SECOND AND THIRD RECORDS, 2019–2025

All records below are from Gambell.

BEWICK'S TUNDRA SWAN *Cygnus columbianus bewickii*. Casual spring visitor. One was photographed 29 May–4 June 2019 (AJL, GB), and another was seen 31 May 2022 (AJL). These bring the total number of records for St. Lawrence Island to four. In addition, a report of Whooper (*C. cygnus*)/Bewick's Swan 5 Jun 2022 (KJZ) was the second of such. Bewick's is a casual visitor to western Alaska (Gibson and Withrow 2015).

FORK-TAILED [PACIFIC] SWIFT *Apus pacificus*. Accidental fall visitor. St. Lawrence Island's second record was of one on 31 Aug 2022 (SCH; Figure 14). This species is a casual visitor to both offshore and mainland Alaska (Gibson and Withrow 2015).

DOUBLE-CRESTED CORMORANT *Nannopterum auritum*. Casual spring visitor. St. Lawrence Island's third and fourth records involved two individuals photographed 27–28 May (GB) and 4 Jun (KJZ) 2019 (same birds?). Since the 2010s this species has spread north in western Alaska and is now an annual visitor to Nome and the Pribilofs.

BALD EAGLE *Haliaeetus leucocephalus*. Casual spring and fall visitor. The second fall record and third overall was of an immature photographed 5–7 Nov 2022 (NRH). This species nests as close to St. Lawrence Island as interior western Alaska and the central Aleutians (Dunn and Alderfer 2017) and is an uncommon visitor to the Pribilofs (S. C. Schuette unpubl. data).

EURASIAN WRYNECK *Jynx torquilla*. Accidental fall visitor. One from 9 to 16 Sep 2019 (pers. obs.; Figure 15) established the second local record (the first was also in fall) and the fourth accepted record for North America (three in Alaska, one in California).

EURASIAN HOBBY *Falco subbuteo*. Accidental visitor. One photographed by a local resident on 7 Jun 2025 (GK) established the island's second record and its first in spring.

ALDER FLYCATCHER *Empidonax alnorum*. Accidental fall visitor. One photographed 28 Aug 2022 (AJL) was the second recorded on St. Lawrence Island. There are only two other records for Bering Sea islands, both from the Pribilofs in late August/early September (W. S. Gibson pers. comm.).

FIGURE 14. Gambell's second Fork-tailed Swift was discovered 31 Aug 2022.

Photo by Aaron J. Lang

BLYTH'S REED WARBLER *Acrocephalus dumetorum*. Casual fall visitor. The third North American record was established 12 Sep 2022 (SCH, AJL, RU). All three records are from Gambell in September.

LESSER WHITETHROAT *Curruca curruca*. Accidental fall visitor. One on 24 Sep 2025 (RU; Figure 16) established the second Gambell and third Alaska record.

FIGURE 15. This Eurasian Wryneck, seen 9–16 Sep 2019, was the second recorded at Gambell and the fourth for North America.

Photo by Gary H. Rosenberg

FIGURE 16. Gambell's second and Alaska's third Lesser Whitethroat was found 24 Sep 2025.

Photo by Rodney Ungwiluk Jr.

RUFOUS-TAILED ROBIN *Larvivora sibilans*. Accidental spring and fall visitor. One on 9 Sep 2019 (AJL; Figure 17) was only the second recorded, the first in fall, and the first to be photographed. This species is a casual spring and fall visitor to offshore western Alaska (Gibson and Withrow 2015).

PINE BUNTING *Emberiza leucocephalos*. Accidental fall visitor. The second record was of one 4–10 Oct 2023 (CI; Figure 18). There are three other fall records from the western Aleutians and Pribilofs (Gibson and Withrow 2015).

FIGURE 17. The Rufous-tailed Robin is a casual visitor to offshore western Alaska. This example, photographed 9 Sep 2019, was the second recorded at Gambell, and the first in fall.

Photo by Steven C. Heinl

Figure 18. This Pine Bunting from 4 to 10 Oct 2023 was the second recorded at Gambell in fall. There are three other records from western Alaska, all in fall.

Photo by Clarence Irrigoo Jr.

YELLOW-BROWED BUNTING *E. chrysophrys*. Accidental fall visitor. Two or three birds occurred in 2025: one on 11 Sep (RW, CI; Figure 19) and two on 14 Sep, of which one remained through 16 Sep (ZP, RW). These and the one previous Gambell occurrence in 2007 are the sole North American records.

CAPE MAY WARBLER *Setophaga tigrina*. Accidental spring and fall visitor. The second record was of a late spring vagrant 26 Jun 2024 (CI; Figure 20). The first record was from fall. This species has been found possibly breeding as close as extreme east-central Alaska (Gibson and Withrow 2015) and is a casual visitor farther north and west, including once in fall on the Pribilofs (S. C. Schuette unpubl. data).

Figure 19. Two or three Yellow-browed Buntings at Gambell during the fall of 2025 included this individual on 11 Sep. There was only one previous record for Gambell and North America.

Photo by Riley Wyna

Figure 20. This Cape May Warbler was at Gambell 26 Jun 2024. There was a previous Gambell record in fall, and elsewhere in the Bering Sea another fall record from the Pribilof Islands.

Photo by Clarence Irrigoo Jr.

OTHER SIGNIFICANT RECORDS, 2019–2025

All records below are from Gambell unless otherwise specified.

SNOW GOOSE *Anser caerulescens*. Uncommon migrant to and from Wrangel Island in northern Russia. Four at Savoonga 26 Jun 2022 (NRH) established the first summer record for St. Lawrence Island.

GREATER WHITE-FRONTED GOOSE *A. albifrons*. Uncommon spring and very rare fall visitor. One on 10 Oct 2019 (pers. obs.) was late.

TUNDRA BEAN-GOOSE *A. serrirostris*. Very rare spring and casual fall visitor. Additional individuals seen 26 May, 28 May, and 29–30 May (2) 2019 (Tobish 2022a); 1 Jun 2024 (JDL); and 26 May 2025 (GB). Also, single unidentified bean-geese were seen on 17 Jun 2019 (CI) and 4 Jun 2022 (MS).

EURASIAN WIGEON *Mareca penelope*. Uncommon spring and fall visitor. One from 6 to 17 Oct 2019 established a new late fall record (pers. obs.).

MALLARD *Anas platyrhynchos*. Very rare spring and casual fall visitor. One on 27 May 2021 (DK) was the 14th recorded in spring, but one on 2 Sep 2024 (RLV) was only the sixth in fall.

NORTHERN PINTAIL *A. acuta*. Fairly common spring and fall visitor and breeder. One from 12 to 17 Oct 2019 set a new late fall date (pers. obs.).

GREEN-WINGED TEAL *A. crecca*. Uncommon spring and rare fall visitor. Both American (*A. c. carolinensis*) and Eurasian (*A. c. crecca*) Green-winged Teal are found on St. Lawrence Island in spring. Fall birds are in eclipse plumage and have not been definitively identified to subspecies. New late fall records were of one remaining through 11 Oct 2019 (CF) and one on 19 Oct 2023 (CI).

EIDERS. Numbers of most species appear to be declining. An apparent hybrid Spectacled Eider (*Somateria fischeri*) × Common Eider (*S. mollissima*) was photographed 27 Oct 2022 (RU).

SURF SCOTER *Melanitta perspicillata*. Rare or very rare spring and casual fall migrant. The second fall record was established by two birds on 1 Sep 2019 (ZP).

WHITE-WINGED SCOTER *M. deglandi*. Uncommon migrant. One on 13 Nov 2025 set a record late fall date (RW).

STEJNEGER'S SCOTER *M. stejnegeri*. Rare but regular spring visitor. This species continues to occur during late spring in numbers ranging from one to 11 annually, with a high count of 14 between 26 May and 6 Jun 2019. It remains unrecorded in fall. Gambell and Nome remain the two most reliable sites for this species in North America.

BUFFLEHEAD *Bucephala albeola*. Very rare spring and accidental fall visitor. The first fall record was of a very late individual at Akeftapak Lagoon, southeast of Gambell, 12 Nov 2019 (MA).

COMMON GOLDENEYE *B. clangula*. Rare spring and casual fall visitor. The fourth and fifth fall records involved two on 30 Sep 2019 (GHR) and a high count of nine on 14 and 15 Oct 2020 (CI).

HORNED GREBE *Podiceps auritus*. Very rare spring and casual fall visitor. Two further spring observations raise that season's total to 15 records. In fall, one on 15 Sep 2019 (CF) and up to three from 6 to12 Oct 2019 (pers. obs.) bring that season's total to five records.

COMMON CUCKOO *Cuculus canorus*. Casual spring visitor. One was photographed 31 May 2025 (RU), the first since 2014. There are still no reports in fall, when there are two records of the Oriental Cuckoo (*C. optatus*).

BLACK-BELLIED PLOVER *Pluvialis squatarola*. Very rare spring and casual fall visitor. One on 19 and 20 May 2021 (RU) set a new early arrival date.

PACIFIC GOLDEN-PLOVER *P. fulva*. Uncommon spring migrant and fairly common fall visitor and breeder. One on 30 Apr 2019 (CI) was exceptionally early, and a juvenile from 15 to 17 Oct 2019 (CI) was the second latest.

BRISTLE-THIGHED CURLEW *Numenius tahitiensis*. Casual spring and fall visitor. The fifth recorded in spring was seen 30 May 2024 (JLD), and the sixth in fall was photographed 12 Aug 2024 (RW).

GREAT KNOT *Calidris tenuirostris*. Casual spring and accidental fall visitor. The 12th recorded in spring (and 16th at any season) was seen 29 May 2024 (GB).

RUFF *C. pugnax*. The first recorded at Gambell in fall, and the second recorded at that season for St. Lawrence Island, was of a very late juvenile photographed 8–13 Oct 2019 (pers. obs.).

SHARP-TAILED SANDPIPER *C. acuminata*. Casual spring but uncommon fall visitor. A new one-day high count was of 112 birds 31 Aug 2021 (CB). The previous high was 46.

CURLEW SANDPIPER *C. ferruginea*. Casual spring and fall visitor. A juvenile 22 Aug 2021 (AK) was only the second in fall.

BUFF-BREASTED SANDPIPER *C. subruficollis*. Casual spring and fall visitor. A juvenile 7 Sep 2022 (SCH) was the seventh recorded in fall.

SNIPE *Gallinago* spp. Six Common Snipe (*G. gallinago*) seen in spring bring that season's total to 19. Three additional very rare Wilson's Snipe (*G. delicata*) were recorded in spring, but only the third in fall was found 2 Sep 2022 (SCH). Additional Common/Wilson's Snipe included single birds 2 Sep 2023 (RLV) and 9 Sep 2024 (AJL, SCH, et al.).

COMMON SANDPIPER *Actitis hypoleucos*. Rare or very rare spring and casual fall visitor. One present 28 Aug–3 Sep 2023 (RU) was only the second recorded in fall.

LESSER YELLOWLEGS *Tringa flavipes*. Casual spring and fall visitor. The seventh and eighth spring records were of single individuals found 22–25 May (GB) and 31 May (SL et al.) 2024.

COMMON GREENSHANK *T. nebularia*. Very rare spring visitor. Three additional birds bring the total to 22. The species remains unrecorded in fall.

WOOD SANDPIPER *T. glareola*. Rare spring and casual fall visitor. The third and fourth fall records were of juveniles 14–18 Aug (RW) and 26–28 Aug (CI) 2024.

RED-NECKED PHALAROPE *Phalaropus lobatus*. Fairly common spring and fall visitor and breeder. A juvenile 14 Sep 2024 (DL) set a new late date.

POMARINE JAEGER *Stercorarius pomarinus*. Fairly common spring and fall visitor. Although no breeding is known from St. Lawrence Island, a juvenile reluctant to fly and guarded by an adult at Gambell 28 Aug–13 Sep 2021 (CF) suggests it.

ALCIDS: Notable declines in the numbers of many species of locally nesting alcids have been observed during the past decade, although these lower numbers vary substantially from year to year and from season to season. More study is needed at the St. Lawrence Island breeding colonies away from Gambell. One species that has declined substantially is the Common Murre (*Uria aalge*), which formerly flew past Gambell in the thousands each day, but now may go unrecorded on many days in spring and occurs mostly in fall, in number between 10 and 100 per day. This followed a huge die-off of perhaps half of the Alaska population, likely associated with a major marine heat wave during the late 2010s (U.S. Fish and Wildlife Service, https://share.google/xsqM347iR31WpogdC).

DOVEKIE *Alle alle*. Uncommon breeder. One on 21 May 2019 set a new early arrival date (RBB). Numbers at Gambell have declined notably since their peak pre-2010, when counts reached up to 11 individuals on the slopes of Sevuokuk Mountain. Since 2019, only one or two individuals have been found annually, except for a total of five flying past on 4 Jun 2025 (AJL, SCH, et al.).

MARBLED MURRELET *Brachyramphus marmoratus*. Casual spring and fall visitor. An unknown number of different individuals were seen 6 Sep, 20 Sep, 22 Sep, and 6 Oct 2019 (RLV, RU, pers. obs.).

ANCIENT MURRELET *Synthliboramphus antiquus*. Rare spring and uncommon fall visitor. In fall, post-breeding dispersing birds from as far south as British Columbia pass Gambell northbound in moderate numbers to late-season feeding areas in the northern Bering and southern Chukchi seas (A. J. Gaston pers. comm.). On 28 and 29 Sep 2019 a count of 410 birds set a new high; surprisingly, almost all were southbound (pers. obs.).

CRESTED AUKLET *Aethia cristatella*. Abundant breeder and visitor. This species' winter status in the northern Bering Sea is uncertain. There are several previous early- and mid-winter records at Gambell. Twenty birds were at Savoonga 10 Dec 2020 (NRH).

ROSS'S GULL *Rhodostethia rosea*. Very rare visitor in spring and early fall; rare but regular in late fall and early winter. From 2019 to 2025 there were several additional spring and late fall sightings of single birds and small groups. After two on 4 Jun 2024, an unprecedented flight of 68 passed the next day (AJL, SCH, KJZ, BG, et al.; Figure 21). Also, an exceptionally early fall juvenile was found 30 Aug 2024 (RLV).

SHORT-BILLED GULL *Larus brachyrhynchus.* Very rare spring and casual fall visitor. A count of seven Short-billed and three Short-billed/Mew (*L. canus*) Gulls on 6 Jun 2023 during moderate east winds was exceptionally high (AJL).

Figure 21. An unprecedented spring flight of 70 Ross's Gulls passed Gambell 4–5 Jun 2024 (photographed with a Black-legged Kittiwake, *Rissa tridactyla*).

Photo by James D. Levison

VEGA GULL *L. vegae*. Common visitor and fairly common breeder. Casual in winter. St. Lawrence Island is the only known regular breeding site in Alaska and North America for this species, split from the American Herring Gull by Chesser et al. (2025). Current nesting sites, all well away from Gambell, and numbers of pairs are uncertain, as is whether this species nests primarily on seacliffs or, perhaps surprisingly, mostly on islands in coastal lagoons, or in both habitats (Fay and Cade 1959, Stephensen et al. 1998). The latter authors estimated 859 breeding Vega Gulls at 21 sites on the island in 1996 and 1997.

AMERICAN HERRING GULL *L. smithsonianus*. Very rare fall visitor. There are now 21 records, mostly of adults, between late August and early October, plus a late individual 11 Nov 2025 (RW).

ICELAND GULL *L. glaucoides*. Casual spring and rare or very rare fall visitor. All records represent *L. g. thayeri*, Thayer's Gull. The fifth and sixth spring records at Gambell were established 2 Jun 2021 (SL et al.) and 8 Jun 2022 (RBB), plus two birds were at Savoonga 6 Jun 2023 (RBB). Additional fall records bring the island's total to 28 individuals. One on 28 Nov 2025 (RW) was the latest yet recorded. A one-year-old at Gambell 9 Jul 2024 (RW) is the island's first Thayer's Gull recorded in summer.

ARCTIC TERN *Sterna paradisaea*. Uncommon spring and fall visitor and breeder. A count of ~100 on 5 Aug 2024 (RW) was a new high for fall.

RED-THROATED LOON *Gavia stellata*. Uncommon to fairly common migrant and breeder. A new high count of 56 birds was set 3 Jun 2024 (AJL, SCH, et al.).

ARCTIC LOON *G. arctica*. Uncommon spring and rare fall visitor. Counts of 24 birds on 8 Jun 2023 (AJL, SCH, et al.), 25 on 3 Jun 2024, and 25 on 2 Jun 2025 (SL, AJL, SCH, et al.) were new highs for single days; a new high single-season total was 47 in 2024. A new late fall date was set 13 Oct 2019 (CF).

PACIFIC LOON *G. pacifica*. Common spring and fall visitor and scarce breeder. A large loon flight 3 Jun 2024 produced 352 Pacifics (AJL, SCH, et al.), one of the higher counts. A large flight of 800 birds 26 Sep 2024 (ZP) set a high one-day record for fall.

COMMON LOON *G. immer*. Casual spring, summer, and fall visitor. The eighth in fall was seen 3 Sep 2022 (AJL).

FORK-TAILED STORM-PETREL *Hydrobates furcatus*. Occurrences in fall included 10 birds 27 Sep 2019 (pers. obs.) and one found alive inside a cabin east of Savoonga 7 Sep 2022 (SW).

SHORT-TAILED SHEARWATER *Ardenna tenuirostris*. Casual spring but abundant fall visitor. There were very few reports in late spring prior to the 2010s. Now up to several birds are seen almost annually, with a high count of 60 on 31 May 2025 (GB). In late summer and fall, immense numbers occurred on a regular basis, with well over 500,000 tallied on many days and a million or more on some. But since 2019, high totals most years have been under 100,000.

NORTHERN FLICKER *Colaptes auratus*. Casual spring and fall visitor. The fourth island record was of one found dead for an uncertain length of time at Niyrakpak Lagoon, southeast of Gambell, 13 Jun 2022 (Tobish 2022b). I am unaware if the specimen was saved.

NORTHERN SHRIKE *Lanius borealis*. Casual spring and fall visitor. The fourth noted in spring occurred 28 May 2023 (GB), and the third in fall was on 8 Oct 2022 (RU).

WARBLING-VIREO SP. Very rare fall visitor. Seven records since 2019 bring the fall total to a surprising 20 individuals. It is uncertain whether Gambell records represent the Eastern (*V. gilvus*) or Western (*V. swainsoni*) Warbling-Vireo, split as species by Chesser et al. (2025). From its distribution the Western is more likely, and a few photographed birds appear to match this taxon in color and bill size more closely. The Western nests in southeast Alaska, while the Eastern is unreported in Alaska (Gibson and Withrow 2015).

EURASIAN SKYLARK *Alauda arvensis*. Very rare spring and casual fall visitor. The ninth and tenth fall records were of one on 13 Sep 2025 (ZP) and up to two 26 Sep–5 Oct 2025 (GS). There are now 24 spring records.

MIDDENDORFF'S GRASSHOPPER-WARBLER *Helopsaltes ochotensis*. Casual fall and summer visitor. Individuals on 8 Sep 2019 (RLS) and 4 Sep 2021 (RLV) bring the total to six. The five fall records are clustered between 30 Aug and 8 Sep.

BARN SWALLOW *Hirundo rustica*. Rare or very rare spring/early summer and casual fall visitor. Most records involve an Asian subspecies, presumably *H. r. gutturalis*. Since 2019, several additional spring records have accrued, as expected. In 2020, a pair of Asian Barn Swallows began building a nest on 15 Jun; it had nestlings during the second half of July, both adults and two fledged young were still present 29 Aug, and two birds lingered late through 16 Sep (CK; Figure 22). The first documented successful nesting of Asian Barn Swallows in North America was near Nome in 2016 (Robinson and DeCicco 2017).

SIBERIAN HOUSE-MARTIN *Delichon lagopodum*. Casual spring and accidental fall visitor. Two additional records from 2 Jun 2022 (Tobish 2022b) and 1–4 Jun 2023 (SL et al.; Figure 23) bring the spring total to 11.

GOLDEN-CROWNED KINGLET *Regulus satrapa*. Casual fall visitor. One on 9 Oct 2021 (CI) was the tenth recorded on the island.

RUBY-CROWNED KINGLET *Corthylio calendula*. Several additional fall reports included record late dates 27–30 Oct 2019 (CI), 27–29 Oct 2020 (CI), and 28 Oct 2023 (CI).

WILLOW WARBLER *Phylloscopus trochilus*. Very rare fall visitor. Additional fall records 22 Aug 2021 (CI), 2 Sep 2023 (AJL), 6 Sep 2023 (SCH, GS), and 21 Aug 2025 (RU) bring the sum to 24 individuals, a large percentage of the North American total.

FIGURE 22. A pair of Barn Swallows (*Hirundo rustica gutturalis*) at Gambell during the summer of 2020 fledged two young (one shown in this photo taken 18 Aug), perhaps establishing only the second documented record of that Asian subspecies' successful nesting in North America.

Photo by Clarence Irrigoo Jr.

FIGURE 23. This Siberian House-Martin at Gambell 1–4 Jun 2023 was the 11th noted there in spring. Note the extensively white rump and medium tail fork, characters distinguishing the Siberian from other species of house-martin.

Photo by Steven C. Heinl

These birds presumably represent the east Asian subspecies *P. t. yakutensis*, although *P. t. acredula/trochilus* has been documented in the Aleutians (Gibson et al. 2023).

COMMON CHIFFCHAFF *P. collybita*. Casual spring and fall visitor. One additional spring record of one from 5 to 7 Jun 2025 (SCH). One or two birds between 26 Aug and 5 Sep 2021 (RU) and another from 19 Aug to 21 Sep 2025 (RU) were earlier than noted previously in fall. The latter bird was joined by a second on 11 Sep (AJL, SCH, et al.). There are now 13 or 14 Gambell records, all since 2012, which represent more than half of those for North America. All records likely involve the Asian subspecies *P. c. tristis*.

DUSKY WARBLER *P. fuscatus*. Casual spring and very rare fall visitor. One on 30 Aug 2021 (AT) and a total of three between 4 and 7 Sep 2021 (GS) bring the fall total to 32, a majority of North American records.

YELLOW-BROWED WARBLER *P. inornatus*. Casual fall visitor. Three individuals during fall 2025—10 Sep (AJL, SCH, et al.), 14 Sep (ZP), and 26–28 Sep (GS)—brought the total to nine.

ARCTIC WARBLER *P. borealis*. Uncommon spring and fairly common fall visitor. No definite breeding records. One on 23 Jul 2019 (CI) set a new earliest date of a presumed fall migrant.

SWAINSON'S THRUSH *Catharus ustulatus*. Casual spring and very rare fall visitor. One found 29 Aug 2019 (ZP) established a new early arrival date in fall.

HERMIT THRUSH *C. guttatus*. Rare to very rare spring and fall visitor. One on 16 Jun 2021 (CI) set a new late spring date, and one on 21 Aug 2025 (RU) set a new date for early arrival in fall.

DUSKY THRUSH *Turdus eunomus*. Casual spring and fall visitor. One from 21 Oct to 5 Nov 2019 (CI), late for fall, brings the total to eight.

AMERICAN ROBIN *T. migratorius*. Very rare spring and rare fall visitor. Nine additional birds at Gambell in fall bring that season's total to 22; in addition, one was at Southwest Cape 20 Oct 2022 (fide RU). The 11th in spring was a late individual 13 Jun 2024 (RU).

VARIED THRUSH *Ixoreus naevius*. Very rare spring and casual fall visitor. Six additional birds in spring. In fall, one each on 1 Oct 2023 (RU), on 9 Oct 2024 (CI), and from 15 to 21 Nov 2025 (RSi)—exceptionally late—bring the fall total to ten.

SIBERIAN RUBYTHROAT *Calliope calliope*. Very rare spring and casual fall visitor. The fifth and sixth fall records were established 13 Oct 2019 (pers. obs.) and 15 Sep 2025 (ZP).

RED-FLANKED BLUETAIL *Tarsiger cyanurus*. Casual spring and fall visitor. The second reported in spring was present 25–31 May 2019 (Tobish 2022a), and the fifth and sixth in fall were somewhat early on 14 Sep 2024 (DL) and 13 Sep 2025 (ZP).

TAIGA FLYCATCHER *Ficedula albicilla*. Casual spring and fall visitor. The third fall record, and fourth overall, was of one on 22 Sep 2025 (CI).

ASIAN [SIBERIAN/AMUR] STONECHAT *Saxicola maurus*. Casual spring and fall visitor. One each 1 Jun 2023 (SL et al.) and 31 May 2025 (AJL) were the ninth and tenth in spring, and one 6–7 Sep 2022 (SCH) was the fifth in fall.

SIBERIAN ACCENTOR *Prunella montanella*. Rare fall visitor. With the addition of four birds in 2019, a high seven in 2021, one each in 2023 and 2024, and three in 2025, the fall total now stands at an impressive 53 individuals, representing well over half of the North American records.

WHITE WAGTAIL *Motacilla alba*. Fairly common visitor and breeder. A new high count of 26 birds was set 31 Aug 2019 (AJL). One on 7 and 8 May 2022 (RU) was the earliest yet reported in spring, and one on 19 Oct 2020 (CI) was exceptionally late for fall. Five additional records of the Black-backed Wagtail (*M. a. lugens*), a very rare visitor, included an early arrival 9–11 May 2022 (NRH) and a late departure 29 Sep 2022 (RU).

TREE PIPIT *Anthus trivialis*. Casual fall and accidental spring visitor. Single individuals on 22 Sep 2019 (CF), 29 Sep–1 Oct 2023 (CI), and 10–11 Sep 2024 (CI) bring the fall total to six. These and the one older spring record constitute a large majority of North American records of the Tree Pipit.

OLIVE-BACKED PIPIT *A. hodgsoni*. Very rare spring and fall visitor. Additional records 2 Jun 2021 (TD) and 4 Jun 2023 (AJL) bring the spring total to 14. In fall, individuals 28 Aug–1 Sep (ZP; early), 27 Sep and 7 Oct (pers. obs.) 2019; 10 Oct 2021 (RU); 14 Oct 2022 (CI); 7 Sep 2023 (AJL); and 1 Oct 2025 (GS) bring that season's total to 17.

PECHORA PIPIT *A. gustavi*. Very rare fall visitor. One each from 3 to 6 Sep 2022 (AJL), from 30 Aug to 4 Sep 2023 (RU), and up to two from 29 Aug to 5 Sep 2025 (RW, CI) bring the fall total to a 27—a large percentage of North American records. I now believe uncertain the three spring records cited by Lehman (2019), including an undated specimen.

SIBERIAN PIPIT *A. japonicus*. Very rare spring and uncommon fall visitor. This taxon was split as a species from the American Pipit (*A. rubescens*) by Chesser et al. (2024). Because of the regularity of intermediate-looking individuals, its status is somewhat uncertain, especially in spring. Through 2025, there were over a dozen spring reports. In fall, found annually in small numbers between late August and early October, with as many as 39 individuals reported during several years prior to 2019.

BRAMBLING *Fringilla montifringilla*. Rare spring and very rare fall visitor. Since 2019 there have been additional records in both spring and fall. In spring, up to 19 birds (a high count) were present 29 May–6 Jun 2023, and two late birds were seen 21–24 Jun 2023 (RU). The greatest incursion of Bramblings yet recorded reached much of western Alaska during May 2022. Unusually early, it followed the passage of a large storm with strong southwest winds. At Gambell, 20+ individuals arrived 7–8 May (RU, CI), increased to 90–132 birds from 9 to 14 May (high on 14 May), and two still remained 3 Jun (AJL); in addition, up to five were at Savoonga 7–14 May (BR). Fall occurrences are of an early individual 3–4 Sep 2019 (LP), a high count of up to 10, 18–29 Sep 2022 (RU), and a very late Brambling that remained through 6 Nov 2022 (RU).

HAWFINCH *Coccothraustes coccothraustes*. Casual spring visitor. One additional record from Gambell 27 May 2024 (GS) was at least the ninth there. The first Hawfinch reported at Savoonga was found 1 Jun 2023 (TT).

COMMON ROSEFINCH *Carpodacus erythrinus*. Very rare spring and fall visitor. Up to two birds between 5 and 15 Jun 2025 (IR) and single individuals 16 Jun 2022 (Tobish 2022b), 15–22 Jun 2023 (RU), and 18 Jun 2024 (CI) were getting late and bring the spring total to 18. In fall, two additional birds from 4 to 7 Sep 2023 (AJL, SCH, et al.) and on 2 Sep 2025 (AJL, SCH, et al.) bring that season's total to 11.

EURASIAN BULLFINCH *Pyrrhula pyrrhula*. Casual spring and fall visitor. The island's third fall record was of one on 14 Oct 2020 (CI).

PURPLE FINCH *Haemorhous purpureus*. Casual fall and accidental spring visitor. The fourth and fifth fall records, 17–18 Oct 2019 (CI) and 14–16 Sep 2020

(CI, RU), also represented the third and fourth island records of nominate *H. p. purpureus*.

REDPOLL *Acanthis flammea*. Uncommon to fairly common spring and fall visitor and rare breeder; casual in winter. A new high count in spring was of 48 Common Redpolls (*A. f. flammea*) 29 May 2024 (GB). Some 120 Hoary Redpolls (*A. f. exilipes*) 24–25 Sep 2019 (pers. obs.) tied the high fall count. One new winter record of a Common Redpoll, 11 Jan–21 Feb 2024 (CI), and one of a Hoary, 19 Dec 2019 (CI).

RED CROSSBILL *Loxia curvirostra*. Casual summer and fall visitor, accidental in spring. Two additional fall records were of one each on 4 Aug 2021 (CI) and 1 Sep 2024 (AJL).

WHITE-WINGED CROSSBILL *L. leucoptera*. Casual spring, summer, and fall visitor. One additional fall record, 10 Aug 2023 (RU), brings the overall Gambell total to five.

PINE SISKIN *Spinus pinus*. Casual visitor in spring and summer, rare in fall. The fourth spring record was of one from 31 May to 1 Jun 2024 (AJL). Six additional fall records included the first for Savoonga, of two birds 22 Sep 2020 (NRH).

McKAY'S BUNTING *Plectrophenax hyperboreus*. Rare but regular spring and fall visitor, sometimes in small flocks. Casual in summer and winter. One additional mid-summer individual, 21 Jul 2024 (RW). Two additional winter records of up to 12 birds during Jan 2024 (CI) and up to 11 from 2 to 30 Dec 2025 (RW). This species winters regularly along the nearby coast of the Alaska mainland.

LITTLE BUNTING *Emberiza pusilla*. Rare fall and accidental spring visitor. Nineteen additional fall birds, including one as late as 28 Oct 2020 (CI), bring the total for that season to an impressive 55 individuals. These constitute the large majority of records of the Little Bunting for North America.

RUSTIC BUNTING *E. rustica*. Very rare spring and casual fall visitor. Three new spring records included an early arrival 9 May 2022 (NRH). The seventh and eighth records in fall were of one on 18 Oct 2019 (CI) and up to two 19–29 Sep 2022 (RU).

PALLAS'S BUNTING *E. pallasi*. Casual spring and fall visitor. The second and third spring records were 2–3 Jun 2021 (SL et al.) and 6 Jun 2025 (AJL, SCH, et al.); the sixth in fall was 29–30 Aug 2019 (AJL). These nine occurrences constitute the majority of the sightings of Pallas's Bunting known for North America.

CHIPPING SPARROW *Spizella passerina*. Rare fall and accidental spring visitor. Since 2019, five additional fall Chipping Sparrows have brought the total to a surprising 47 and included a record-early arrival 14 Aug 2023 (RU) and a record-late departure 14 Oct 2023 (RU).

FOX SPARROW *Passerella iliaca*. Although the Fox Sparrow is a rare but regular visitor in fall, single Red Fox Sparrows (*P. i. zaboria*) 26 May 2021 (DK) and 23 May 2024 (GB) were only the third and fourth of that subspecies in spring. Late fall dates were of a Red Fox Sparrow 26 Oct 2020 (CI), of a Sooty Fox Sparrow (*P. i. unalaschcensis* group), which is a rare but regular visitor, 18 Oct 2019 (CI), and of an intermediate-looking individual 4 Nov 2025 (RU).

AMERICAN TREE SPARROW *Spizelloides arborea*. Rare to very rare spring and fall visitor. New early and late fall dates were 27 Aug 2024 (CI) and 16 Oct 2020 (RU), respectively.

WHITE-CROWNED SPARROW *Zonotrichia leucophrys*. Very rare spring and rare but regular fall visitor. A new high count of 12 birds was set 31 Aug 2024 (AJL), and a new late date was set by one that remained from 26 to 31 Oct 2020 (CI).

GOLDEN-CROWNED SPARROW *Z. atricapilla*. Very rare spring and rare but regular fall visitor. A new high count of 24 birds was set 3 Sep 2019 (AJL), and a new late date was set by one that remained from 15 to 18 Oct 2019 (CI).

LINCOLN'S SPARROW *Melospiza lincolnii*. Casual spring and very rare fall visitor. One additional occurrence in spring, 3 Jun 2025 (AJL, SCH, et al.). Eight additional fall records brought the total for that season to 26 and included a new early arrival date of 31 Aug 2019 (AJL) and late dates of 14 Oct 2023 (RU) and 29 Oct 2019 (CI).

BROWN-HEADED COWBIRD *Molothrus ater*. Casual fall visitor. Single individuals 25–26 Aug 2025 (CI) and 17–20 Sep 2025 (ZP) represent the sixth and seventh records. The latter bird was Gambell's first adult cowbird.

RUSTY BLACKBIRD *Euphagus carolinus*. Casual spring and fall visitor. The third and fourth spring records involved at least two birds 26–28 May 2021 (RU, CI) and one 28 May 2023 (AB). The fourth and fifth fall records at Gambell were of one each on 21 Sep 2024 (CI, RU) and 16 Sep 2025 (ZP).

NORTHERN WATERTHRUSH *Parkesia noveboracensis*. Casual fall and accidental spring visitor. The island's eighth in fall was found 11 Sep 2019 (pers. obs.).

ORANGE-CROWNED WARBLER *Leiothlypis celata*. Casual spring and rare but regular fall visitor. One from 10 to 14 Aug 2023 (RU) set a new early date for fall arrival . Two additional birds appearing to be of the brighter yellow subspecies *L. c. lutescens*, a casual fall visitor, were present 3 Sep 2019 (RLV) and 6 Sep 2022 (AJL).

MACGILLIVRAY'S WARBLER *Geothlypis tolmiei*. Casual fall visitor. The fourth and fifth records were 11 Sep 2021 (AJL; adult male) and 11 Sep 2023 (RU).

MOURNING WARBLER *G. philadelphia*. Casual fall visitor. This species breeds no closer to St. Lawrence Island than extreme southeast Yukon and is casual anywhere in Alaska. Thus the addition of three individuals brings the total to a surprising six birds: 7–10 Sep 2022 (AJL, SCH, RLV), 12 Sep 2023 (AJL), and, exceptionally late, 22 Oct 2022 (CI).

AMERICAN REDSTART *Setophaga ruticilla*. Casual fall visitor. The fifth in fall was very late, 8–14 Oct 2023 (RU, CI).

YELLOW WARBLER *S. petechia*. Rare fall visitor. One on 11 Oct 2019 (pers. obs.) established new late date, late for anywhere in Alaska.

BLACKPOLL WARBLER *S. striata*. Casual spring and fall visitor. The fourth and fifth fall records were 14 Sep 2022 (RU, CI) and 30–31 Aug 2025 (RW).

PALM WARBLER *S. palmarum*. Casual fall visitor. The seventh in fall was very late, 24–30 Oct 2023 (CI). All records are of the expected nominate subspecies.

YELLOW-RUMPED WARBLER *S. coronata*. Very rare spring and fall visitor. All records represent the Myrtle Warbler (*S. c. hooveri/coronata*). Two new spring and six additional fall records included new late dates in spring, 6–7 Jun (ST) and 9 Jun (SCH) 2023, and a new early date in fall of 14 Aug 2023 (RU).

TOWNSEND'S WARBLER *S. townsendi*. Very rare fall and accidental spring visitor. The island's second spring record, and the first at Savoonga, was of one photographed 10 Jun 2025 (LK). Four new fall records bring that season's total to 12.

POSTSCRIPT

RICHARD'S PIPIT *Anthus richardi*. A bird seen briefly (ZP, CI) and documented with distant photographs at Gambell on 9 Sep 2025 was tentatively identified as a

Richard's Pipit. The identification was subsequently endorsed by pipit experts Per Alström, Paul Dufour, Daniel López-Velasco, and Killian Mullarney. This record would be a first for North America and thus awaits review by the checklist committees for both Alaska and the American Birding Association.

CITED OBSERVERS (FINDERS)

Merle Apassingok, Andrew Bankert, R. Brad Benter, Gavin Bieber, Charlie Bostwick, Ted Buerger, Eugene A. Cardiff, Geoff Carpentier, Terry Doyle, Jon L. Dunn, Chris Feeney, Brian Gibbons, Nicholas R. Hadjukovich, Steven C. Heinl, Rich Hoyer, Clarence Irrigoo Jr., Lucy Kingeekuk, Chris Koonooka, Gerry Koonooka, Andy Kraynik, David Krueper, Aaron J. Lang, James D. Levison, Drew Lindow, Stephan Lorenz, Tessie Noongwook, Larry Peavler, Zachary M. Pohlen, Ivan Ramirez, Mark Rauzon, Bryan Rookok Jr., Gary H. Rosenberg, Robert L. Scher, Greg Scyphers, Roger Silook Jr. (RSi), Michelle Sopoliga, Keith Swindle, Alycia Tieken, Dinah & Jenna Toolie, Tetto Toolie, Steven Tuttle, Mary & Maxine & Fabian Ungott, Rodney Ungwiluk Jr., Raymond L. VanBuskirk, Susan Waghiyi, Billy Weber, Riley Wyna, and Kevin J. Zimmer.

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SITE USE AND SITE FIDELITY OF POST-BREEDING SWAINSON'S THRUSHES IN SOUTHERN OREGON

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ABSTRACT: Because the relative threats to survival during each stage of the life cycle remain uncertain, understanding all aspects of the full annual cycle has become a priority for bird conservation. The time between the end of breeding and the onset of fall migration is poorly known in most neotropical migrants and may be fraught with peril as birds move away from accustomed breeding areas to find food sufficient to prepare for migration. Therefore, we explored the use by post-breeding adult Swainson's Thrushes (*Catharus ustulatus*) of two bird-banding stations in southwestern Oregon over a combined total of 31 years. Though the stations are within the species' breeding range it nests at neither. Of 547 nonbreeding adults captured, 15.5% (85) were molting flight feathers during at least one capture. On average, these molters arrived and left earlier (2 August–29 September) and stayed longer (18.5 days) than nonmolters (30 August–21 October; 7 days). Molters' probability of being recaptured at the same site in subsequent years was higher. The estimated fidelity of molters was 0.35; that of nonmolters was 0.15. We infer that both categories represent short-distance movements of birds nesting nearby.

Understanding a species through all phases of its life cycle is paramount for its conservation (e.g., Faaborg et al. 2010, Marra et al. 2015). The importance of breeding, winter, and migration periods is well recognized, but the post-breeding period, between the end of reproduction and the departure for migration, is also critical to the success of subsequent stages of the annual cycle (e.g., Vega Rivera et al. 1998, 1999, Pagen et al. 2000, Vitz and Rodewald 2006). Among the essential aspects of the post-breeding period are the accumulation of energy for migration, imprinting on sites for future breeding, and, in some cases, the pre-basic molt prior to migration.

Most North American birds that migrate to the Neotropical Region molt after breeding but before departing for migration (Leu and Thompson 2002). Contrary to common assumptions, this molt may not actually be completed on a bird's breeding territory. Some individuals might move short distances seeking different habitats and resources to support the energetically costly activity of molt (e.g., Vega Rivera et al. 1999, Vitz and Rodewald 2006). Others may undertake long-distance flights, along or across elevational gradients, to molt at sites still within the breeding range (Rohwer et al. 2008, Wiegardt et al. 2017, Pyle et al. 2018).

In avian ecology, the post-breeding period has been less studied than other phases of the life cycle and is commonly not considered as a separate period (e.g., Marra et al. 2015). In part, this is because of the difficulty of

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distinguishing the post-breeding period and migration in migratory birds. It is also challenging to distinguish whether a bird is molting at a site during the post-breeding period before migration, or if the bird is using the site for a stopover during migration. Further, it is difficult to determine how far a bird disperses from its breeding site before starting the migration. Gow and Stutchbury (2013) demonstrated that off-territory movements for molt, whether during breeding period or after, are difficult to identify without radio-telemetry.

In this study, we investigated the use of two sites by post-breeding adults of Swainson's Thrush (*Catharus ustulatus*), a Neotropical migrant, both within a season and in successive years. At these sites of long-term monitoring we captured and banded thrushes both in and after flight-feather molt. On the basis of the capture–recapture data this effort generated, we tested the hypothesis that whether an individual was molting should affect the way it used these sites. Specifically, should a thrush in molt (1) arrive earlier, (2) stay longer, or (3) be more likely to be recaptured the following year. This study sheds light on the post-breeding period of the Swainson's Thrush's annual cycle and highlights the importance of sites that are used during this less-studied period.

METHODS

Data Collection

We used capture–recapture data on adult Swainson's Thrushes from two banding stations in southern Oregon. We selected these two stations because of the large number of thrushes captured there (more than 100 across all years sampled). Also, the proportion of breeding adults among these captures was low, minimizing the issue of calculated fidelity rates being inflated with breeding birds still on their territories. Specifically, since fewer than 5% of Swainson's Thrushes captured showed any signs of breeding (e.g., a medium to large cloacal protuberance or a vascularized or wrinkled brood patch) as described in Ralph et al. (1993), we categorized these stations as "post-breeding."

The two stations are located within the breeding range of the Russet-backed Swainson's Thrush (*ustulatus* subspecies group) in the forests of the Pacific coast of North America (Mack and Yong 2020). The stations are along the Rogue (42.49° N, 123.48° W) and Applegate (42.29° N, 123.23° W) rivers just under 30 km apart and are part of the Klamath Bird Monitoring Network, which encompasses more than 100 mist-netting stations where effort is consistent (Alexander et al. 2004, Alexander 2011). Both stations included mist nets located in riparian habitat dominated by invasive Himalayan blackberry (*Rubus armeniacus*) with willows (*Salix* spp.), cottonwood (*Populus trichocarpa*), and alder (*Alnus rubra*). One site also included cultivated fruit trees. Monitoring at both stations followed a constant-effort mist-netting protocol (Ralph et al. 1993, Stephens et al. 2010). Capture and banding were scheduled once every 10 days between May and August, and as much as weekly or three times a week from September to early November. Ten to twelve mist nets were opened for 5 to 6 hours per day, beginning 15 minutes prior to sunrise.

Stations were operated from 1994 to 2013 at the Rogue River station (WIIM) and from 1997 to 2007 at the Applegate River (APRI) station. For the analysis, we considered all efforts at these stations, even if no thrushes were captured. Recording of morphometric data followed Ralph et al. (1993), and the birds' identification to species, age, and sex followed Pyle (1997).

Data Analysis

For analysis, we categorized each nonbreeding adult Swainson's Thrush as a molter or a nonmolter. If an individual was captured in symmetrical flight-feather molt in at least one year, we categorized it as a molter across all years. Individuals that were never captured in molt we categorized as nonmolters. We believe that these nonmolting, post-breeding birds very likely had already undergone their prebasic molt, but we did not collect sufficient data on this for analysis. The <5% of individuals captured at least once with the characteristics of breeding mentioned above were excluded from the analysis.

In our analysis we quantified the extent to which Swainson's Thrushes used each site during their post-breeding period or during their migration. Specifically, we examined (1) when and for how long each individual occupied the site; and (2) calculated the probability of molters and nonmolters being recaptured in a following year. We analyzed captures both within a year and in successive years. The within-year analysis aimed to estimate the (1) length of stay at the site, (2) dates over which birds were encountered at the site (the period), and (3) probability of recapture, that is, the chance of individual being detected on a given day, provided that the individual was at the site. For the within-year analysis, we used Pradel's (1997) reverse-time model. This model runs a Cormack–Jolly–Seber (Cormack 1964, Jolly 1965, Seber 1965, Lebreton et al. 1992) analysis of each individual's history of capture within a year in two directions: (1) forward, estimating the probability of the departure date being in fact after the last date the individual was detected; and (2) backward (i.e., reverse-time), estimating the probability that the arrival date was in fact before the date it was first detected. The reverse-time model also estimates the probability of recapture, both forward and backward. We kept probability of recapture constant in both directions, meaning that the model assumes that an individual's chance of being detected before its first capture is the same as its chance of being detected after its last capture. The output of the reverse-time model provides the estimated time of arrival and departure of individual birds (and consequently the period that the molter and nonmolter groups spend at the site) and the estimated probability for the species' recapture. We used the model's estimated dates of arrival and departure of each individual to calculate the molter and nonmolter groups' estimated length of stay at the post-breeding sites.

Our models of Swainson's Thrush use of the sites included dates much earlier than any confirmed arrival and after most departures. During these early and late periods, birds were almost certainly absent (before the onset of post-breeding movements into the area and after individuals had migrated farther south, respectively), so the model did not provide any reliable estimate of presence. We removed these intervals from posterior analysis (quantified as time periods with posterior standard deviation >0.25).

For the within-year analysis, with both the Pradel's reverse-time model and length-of-stay calculation, we compared two models: (1) an "all birds" model, in which molters and nonmolters were pooled, and (2) a "split groups" model with molters and nonmolters grouped separately. We compared the two models by the deviance-information criterion (Ando 2011). The results of the best model then served as the basis for the analysis of successive years. The multi-year analysis aimed to estimate site fidelity. We adapted a Cormack–Jolly–Seber model by adding "fidelity" as a third parameter, in addition to survival and recapture. The drawback of adding this new parameter is that an apparent lack of fidelity can also represent the bird's death, confounding fidelity and survivorship. Similarly, an apparent lack of fidelity can also represent failure to recapture a bird that is in fact present. To solve this issue, we fed the model with prior information on probabilities of survival and recapture based on the literature and from our within-year analysis, reducing its uncertainty.

The distributions for probability of survival were based on DeSante et al. (2015). We used these to build a normal distribution for survival priors with values from the averaged spatial model for Swainson's Thrush (mean = 0.60, SD = 0.02). We used the estimated probability of recapture and length of stay from our within-year analysis as the prior distribution for recapture, combined with the sampling schedule (dates of mist netting). Since the sampling schedule varied both by station and season, we used different distributions of recapture probabilities for each year and site.

With these priors for probabilities of survival and recapture, we focused the Cormack–Jolly–Seber model on our latent parameter to quantify fidelity. To better understand how the fidelity of molters and nonmolters differed, we calculated the two groups' overlap in posterior distribution of probability of fidelity. For this, we used the function "overlap," from the package "Overlapping" (Pastore et al. 2025) in program R (R Core Team 2019). The models were built on a Bayesian framework and were run on six Markov Chain Monte Carlo chains of 75,000 iterations each, burn-in of 50,000, and thinning of 100, by means of the package "jagsUI" (Kellner 2017) in program R. We assessed convergence by using the Gelman–Rubin potential scale-reduction factor ($\hat{R}$) (Gelman and Rubin 1992).

RESULTS

Our dataset from the two stations included 608 captures of 547 individual nonbreeding adult Swainson's Thrushes. Of those, 15.5% (85) were molting during at least one capture so that they were put in the "molter" group. The remainder of individuals using these stations we categorized as "nonmolters," captured neither breeding nor molting. Sixteen individuals from the nonmolter group (3% of the total captured) and 10 individuals (12%) from the molter group were captured in more than one year, thus showing some degree of site fidelity across years.

We found that treating the captured thrushes as two independent, distinct groups, molters and nonmolters, better fit our data. Specifically, the value of the deviance-information criterion being lower for the model "split groups" (3689), than for the model "all birds" (3888) indicated that allowing independent estimates for molter and nonmolter described our data better.

All further results are based on categorizing the birds as two groups, molters or nonmolters.

We found that molters occurred at the banding stations earlier than did nonmolters. Within our defined period of post-breeding and migration (2 August 2–21 October), molters were confined to the interval 2 August–29 September, while nonmolters occurred later, 10 September–21 October (Figure 1).

The two groups' estimated length of stay (Figure 1) also differed. Molters spent more time at the sites than did nonmolters (median of 18.5 and 7.0 days, respectively). Notably, however, in both groups, we found that the length of stay varied widely, depending on when the bird was captured. In both the molter and nonmolter groups, birds captured earlier or later during the post-breeding period tended to spend less time at the site than those captured toward the middle of the period (Figure 1).

Our results suggest that molters were more likely to use the same post-breeding site in the following years than were nonmolters, though there was

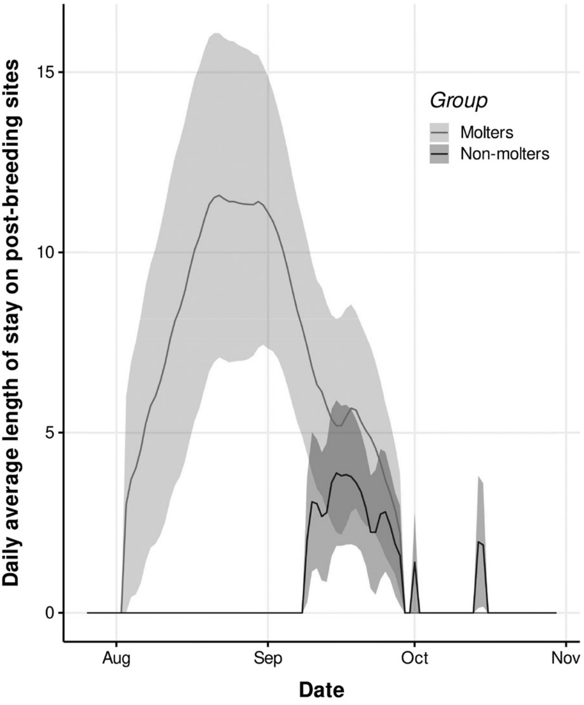

FIGURE 1. Estimated timing of occurrence and average length of stay of post-breeding adult Swainson's Thrushes categorized as molters or nonmolters (see Methods) at two sites in southwestern Oregon. The lines represent the median estimated length of stay value and the gray shadings represent the 95% credible interval. The values on the *y* axis represent the average length of stay of all individuals of each group at the site at a given time, thus some individuals might be staying longer than the values presented.

considerable (20%) overlap in the two groups' estimated site fidelity (Figure 2). The estimated probability of a Swainson's Thrush returning to the same site in subsequent years was higher among the molters, for which the median value was 0.35 and the 95% credible interval was broader (0.19–0.60). The nonmolters' probability of return was lower (0.16) and the 95% credible interval was narrower (0.10–0.25).

DISCUSSION

Our examination of Swainson's Thrush's use of and fidelity to post-breeding habitat improves our knowledge of the species' ecology between breeding and winter. At sites we studied, a few individuals (15.5%) were molting in at least one year they were captured, indicating some thrushes leave their breeding territories to molt. We found detectable site fidelity to post-breeding sites by individuals categorized as both molters and nonmolters. Yet the two categories differed in fidelity, as well as in the timing and duration of stay at the site: molters arrived and departed earlier in the season. They stayed longer

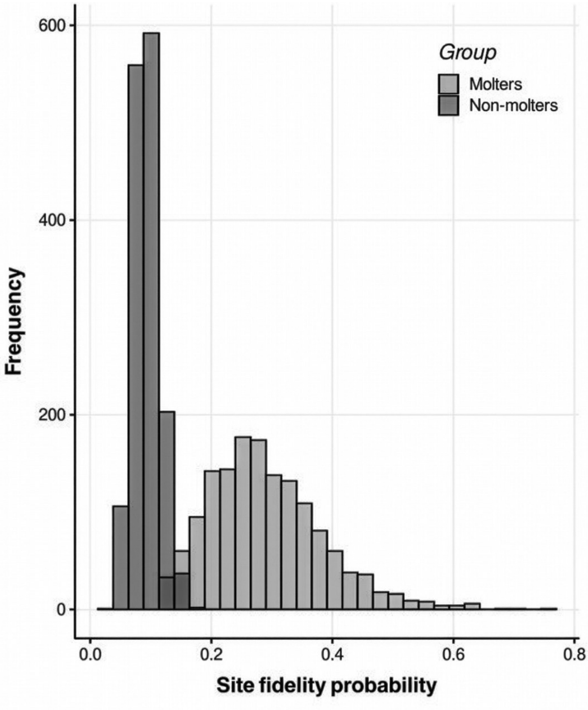

Figure 2. Estimated probability of fidelity to two sites in southwestern Oregon by post-breeding Swainson's Thrushes categorized as molters (light gray) or nonmolters (darker gray) (see Methods). The *y* axis shows the number of times a given interval of probability of fidelity appears on the posterior distribution of the Cormack–Jolly–Seber model (see text for details).

than nonmolters did, and their site fidelity was greater. Notably, however, length of stay varied widely within both groups, with shorter stays associated with captures earlier or later in the post-breeding period (Figure 1).

The groups' differences in post-breeding site use can be related to various factors, both at the individual and population levels. Since it was beyond the scope of this study to determine where the birds captured at these sites bred, we suggest two possible scenarios. First, the molter and nonmolter groups may have come from different regions. In this case, molters would be individuals breeding nearby that moved to a different habitat for at least part of their molt, while nonmolters are migrants, breeding farther north and stopping over at our sites. For example, Delmore et al. (2012) showed that Swainson's Thrushes breeding in coastal British Columbia, Canada, follow a fall migration route that includes our study region in southwestern Oregon. Because the availability of habitat along migration routes varies, however, and as do weather conditions affecting flight route and timing, small birds are not expected to depend on particular sites while en route between their breeding and wintering grounds (Catry et al. 2004). Thus the post-breeding site fidelity of nonmolters in our study either contradicts this premise or makes this scenario unlikely.

The second and more likely scenario is that both molters and nonmolters come from nearby breeding sites in southern Oregon. After the birds have bred, their habitat selection may differ from what is required for a breeding territory, and they may shift to nearby areas, possibly just a few hundred meters from nesting territories (as discussed by Vega Rivera et al. 1999, Pagen et al. 2000, White and Faaborg 2008, Vitz and Rodewald 2011). In this scenario, some thrushes leave their breeding territories to molt at other sites before departing the species' breeding range, consistent with recent studies on other songbird species that disperse within their breeding range to molt away from where they breed (e.g., Wiegardt et al. 2017, Pyle et al. 2018, Figueira et al. 2020). Sites that apparently lack the characteristics required for breeding might nonetheless be of great importance during the post-breeding period (Vega Rivera et al. 1999, Gow and Stutchbury 2013). Post-breeding site fidelity—when a site used after breeding is adjacent to or near the breeding territory—has been previously documented in Swainson's Thrush. Using radio telemetry, White and Faaborg (2008) found that adults were faithful to post-breeding sites located hundreds of meters from where they nested and led fledglings to these same sites. White and Faaborg (2008) also suggested that these sites might have important roles in territory and nest-site selection.

Molters staying longer at our post-breeding sites could be explained by birds' reduced mobility during molt (as shown by Vega Rivera et al. 1999), individuals remaining at the site until molt is complete. Nevertheless, the length of stay our models estimated for the molters is not long enough for them to complete a full molt. Cherry (1985) estimated that it takes a Swainson's Thrush around 32 days to complete the flight-feather molt, almost twice the maximum estimated time molters spent at our sites. While birds might be less mobile during molt, they nevertheless move to some extent. Molt-migration, as defined by Tonra and Reudink (2018), is the temporal overlap of the life-history stages of molt and migration, and is known in Swainson's Thrush (Cherry 1985, Wiegardt et al. 2017, Morales et al. 2022). Morales et al. (2022) reported the average time molt-migrant Swainson's Thrushes stopped over at a site in Canada as 47 days. In our study, the brevity of stays, shorter than required for molt, suggests either dispersal over molt-migration or methodological constraints, since the low mobility of thrushes during molt might depress capture rates (Poirier et al. 2024).

Studies such as ours that explore birds' fidelity to nonbreeding sites for post-breeding dispersal, molt, or stopover in fall migration, begin to fill an information gap regarding when and where migratory birds are most limited. The post-breeding period, when birds molt, accumulate fat, and migrate, is a critical stage that may determine a bird's fate. The repeated use of a post-breeding site indicates the importance of these habitats and sites that, although not selected for breeding, may provide resources essential for molt and other post-breeding activities. Future studies using new tracking technologies are likely to further clarify the frequency, importance and extent of site fidelity in this and other species.

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NOTES

THE OREGON DARK-EYED JUNCO SHOULD BE CALLED *JUNCO HYEMALIS OREGANA*

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ABSTRACT: John Kirk Townsend introduced the Oregon Junco to science as *Fringilla oregana*, but since 1856 it has been classified in the genus *Junco* as *Junco oreganus*, *Junco oregonus*, *Junco hyemalis oreganus* or *Junco hyemalis oregonus*. The change of spelling to *oregonus* is not justified under the current International Code of Zoological Nomenclature, and since 1901 *oreganus* has been used universally. Under the code's articles 31 and 34 adjectival species-group names (both species and subspecies) must agree in grammatical gender with the genus with which they are combined. Under Article 30, *Junco* is masculine, whereas *Fringilla* is feminine. If *oregana* is an adjective, as it has generally been construed, it needed to be changed to *oreganus* to agree with *Junco.* But the termination "-*a*" is ambiguous, and in ambiguous cases the code prescribes that the word be construed as a noun in apposition that remains unchanged regardless of the gender of the genus in which the species or subspecies is classified. This case parallels other similar examples that have been treated inconsistently in recent literature. A comprehensive review of such cases at the level of both species and subspecies is needed.

Articles 31 and 34 of the International Code of Zoological Nomenclature (ICZN 1999) note that adjectival species-group names (both species and subspecies) need to agree in grammatical gender with the generic name with which they are combined, as in Latin and many other languages. Article 30 determines how to tell the gender of a genus. Linnaeus (1758:179) included the name *Fringilla* as a genus in the tenth edition of his *Systema Naturae*, which the code (Article 3) designates as the earliest source of valid publication of scientific names of any animal. *Fringilla* is a feminine Latin word attested in antiquity (Lewis and Short 1879), so according to Article 30 the genus must be treated as feminine.

In the case of *Junco* Wagler, 1831, the gender is masculine. The etymology of *Junco* is unclear, as none is given in the original publication (Wagler 1831:526). *Junco* could be a masculine medieval Latin word, used in the Renaissance-era *Avium Praecipuarum* (Turner 1544) and included in the *Dictionary of Medieval Latin from British Sources* (Ashdowne et al. 2018). But, according to its glossary, the code considers only classical and medieval Latin as Latin, so this interpretation might not be applicable—the time of transition from medieval to modern Latin is not defined.

Coues (1884) noted that the name could also be derived from the Latin *juncus* (meaning rush, the plant), of which *junco* would be the singular dative or ablative form. Article 11.8 of the code mandates that generic names be in the nominative case, however, which would preclude treatment of *junco* as a Latin word under Article 26. Under this reading, the name may be treated as a neologism that should still be considered masculine under Article 30.2.4. According to either interpretation, *Junco* must be treated as masculine.

John Kirk Townsend made the specific name *oregana* available (meaning first used it correctly in a published article) in his initial description of the taxon in 1837. He wrote the name "*F. [= Fringilla] Oregana*," as he considered it a full species at the time, for which he used the informal English name "Oregan [*sic*] Snow-Finch" (Townsend 1837:188).

Before touching on the final suffix, I must address the spelling of Oregon as

Oregan. This rendition might not have been a misspelling. Oregon wasn't formalized as a U.S. state until 1859, and previous spellings varied. Two years after his original publication, Townsend (1839:154) used the spelling *oregona* for the same taxon, which reflects the opposite view.

Many subsequent authors besides Townsend himself, including Audubon (1839:68), Sclater (1856:306, 1857:7), Baird (1858:466), and Baird et al. (1874:584), have changed the name to *oregona*. Audubon (1839:68) cited the original spelling along with his spelling of *Fringilla oregona*, which makes his name an unjustified emendation and a junior homonym under Article 33.2.3. Prevailing usage today, a condition necessary for a change under this subarticle, follows the original spelling as *Junco hyemalis oreganus* (Townsend, 1837) with the correct citation (when a species is reclassified in a different genus or reranked as a subspecies, the citation does not change). The American Ornithologists' Union's (AOU) *Checklist of North American Birds* used *oregonus* in 1886 (p. 274) and 1895 (p. 234), but, following Ridgway (1901:283), subsequently reverted to the original spelling *oreganus* (1902:323, 1910:266, 1931:346, 1957:608–611, 1983:716–717, and 1998:625–626). The original spelling of *oreganus* or *oregana* has been followed by most taxonomies in the past hundred years (see https://avibase.bsc-eoc.org/avibase.jsp?lang=EN; Lepage et al. 2014).

Article 32.5.1 deals with incorrect original spellings: "If there is in the original publication itself, without recourse to any external source of information, clear evidence of an inadvertent error, such as a lapsus calami or a copyist's or printer's error, it must be corrected." Townsend's original article in 1837 did not include the spelling "Oregon," and the use of "Oregan Snow-Finch" suggests that this is how Townsend preferred to spell it in 1837. There is no clear evidence of an inadvertent error in the original publication itself, so the spelling of *oregana* cannot be corrected. Later corrections, by Baird and others, might have been possible under earlier understandings of the code or Linnaean classification, but under the current code they are not.

The priority of original spellings does not apply to mandatory corrections, such as for agreement in gender under Articles 31 and 34; here, such as the change from *oregana* to *oreganus* might represent. Sclater (1856:306) was the first to suggest that "*N*[*iphaea*]. *oregona* [*sic*]" should be combined with *Junco*. (*Niphaea* Audubon, 1839, type species *Fringilla hyemalis* Linnaeus, 1758, is a name that quickly entered the synonymy of *Junco* Wagler, 1831, type species *Junco phaeonotus* Wagler, 1831, and it is no longer used.) Sclater (1857:7) was the first to combine the current specific and generic names formally: "As I have already observed, the name *Junco* ought to be employed instead of *Struthus* for all the three closely allied species of this genus, which will henceforth stand as *J. cinereus*, *J. oregonus*, and *J. hyemalis*." In this nomenclatural act, Sclater treated *oregana* as an adjective (and misspelled), changing its ending to -*us* to match in gender with *Junco.* This name has been universally applied since.

Why does it matter if *oregana* is an adjective or a noun? Because of Articles 31 and 34. Article 31 states, "A species-group name, if it is or ends in a Latin or latinized adjective or participle in the nominative singular, must agree in gender with the generic name with which it is at any time combined." Article 34.2 goes further: "if the gender ending is incorrect it must be changed accordingly." Both articles have exclusions for nouns, as in Article 34.2.1: "If a species-group name is a noun in apposition its ending need not agree in gender with the generic name with which it is combined and must not be changed to agree in gender with the generic name [Art. 31.2.1]."

If *oregana* is a noun, then the name should now be *Junco hyemalis oregana*; if an adjective, *Junco hyemalis oreganus*. As the word *oreganus* or *oregana* is not found in dictionaries of classical or medieval Latin, its usage under a standard definition is unclear. Normally, in taxonomic nomenclature, the endings -*anus* and -*ana* are clearly adjectival; but because *oregan* already ends in -*an*, the suffix should be -*a* (or the name would be *oreganana*). This ending can be an adjectival ending, as David and Gosselin (2011:108) argued for *amazona*, citing Woods (1944), who did not state that the suffix *-a* was used solely for creating adjectives (Woods 1944:XI). The suffix could also be a nominal ending, as in Latin *-a* is also used to make feminine nouns (for example, *equa* from *equus*, "horse"). Without an indication of the author's intent, there is no way to determine the intended part of speech.

The code has a way of resolving these issues, Article 31.2.2: "Where the author of a species-group name did not indicate whether he or she regarded it as a noun or as an adjective, and where it may be regarded as either and the evidence of usage is not decisive, it is to be treated as a noun in apposition to the name of its genus (the original spelling is to be retained, with gender ending unchanged; see Article 34.2.1)." This subarticle must be applied in the case of *Fringilla oregana*. The first clause is not conclusive. In the text of the original publication, Townsend did not indicate clearly and decisively whether *oregana* was a noun or an adjective. The name may be regarded as either a noun or an adjective: either a noun ending in *-a* (like almost all first declension Latin nouns, such as *puella*), or an adjective ending in *-a* or even *-ana* (like *amica*, or *americana*). The evidence of usage in the original text is not decisive on this point. The English usage of "Oregan Snow-finch" is not helpful, either (What part-of-speech is *Oregan*? Is it a noun in a compound noun phrase, like "Oregon State," or is it an adjective?)

Since the usage is not decisive, and since it can be considered as either, and since Townsend didn't put it one way or the other, *oregana* must be considered a noun according to the code. If this is the case, the formal name of this subspecies of the Dark-eyed Junco should be *Junco hyemalis oregana*.

The code states that these changes for grammatical agreement are mandatory. Similar suggestions for other names have been made before, such as for the Kākapo (*Strigops habroptila*; Savage and Digby 2023), the Dwarf Jay (*Cyanolyca nanus*: Jiménez and Cicero 2020) or the Black-capped Chickadee (*Poecile atricapillus*; Chesser et al. 2009: 709), or for many species at the same time (David and Gosselin 2011) and later adopted by taxonomic authorities (e.g., Chesser et al. 2009, 2020). Taxonomy is never complete and some inconsistencies will always occur, as can be seen by proposals to active taxonomic committees (e.g., North American Classification Committee 2026). A broader approach to resolving these ambiguously adjectival geographic specific epithets would be valuable, even though the details of the cases may defy a blanket solution. There are at least 33,684 available scientific names for birds alone, not including synonyms (AviList Core Team 2025). Ideally, taxonomic databases such as ZooBank (ICZN 2026; also administered by the International Commission on Zoological Nomenclature, which maintains the code) could cover not just nomenclatural acts but also provide generic genders and the determinations of parts of speech for species-group names. Since a code is only as useful as its consistent application, we should follow it.

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Photo by © Frank Lospalluto of Ashland, Oregon:

Swainson's Thrush (*Catharus ustulatus*), upper Neil Creek drainage basin, Mt. Ashland, Jackson Co., Oregon, 19 June 2022.

The behavior of migratory birds during the interval between the end of breeding and departure for fall migration is a trending topic in ornithology. During this interval, many species molt, but the molt may take place away from the site of breeding. In an effort to quantify this kind of habitat use in Swainson's Thrush, Pedro Martins, Luiza Figueira, Jaime L. Stephens, John D. Alexander, and C. John Ralph analyzed the results of a combined 31 years of captures of 547 post-breeding Swainson's Thrushes at two bird-banding stations in southwestern Oregon. Thrushes that were still molting their flight feathers arrived earlier and stayed longer, on average, than those that had presumably already completed their molt. The probability of a molting bird being recaptured in a subsequent year was over twice as high as that of a bird that was not molting, implying some degree of site fidelity to locations of molt.