WINTERING GRAY-CROWNED ROSY-FINCHES SEGREGATE LATITUDINALLY BY SEX

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ABSTRACT: Analysis of records of 8665 Gray-crowned Rosy-Finches banded over 64 years in Montana, Wyoming, Colorado, and New Mexico revealed that the sexes tend to segregate latitudinally during winter. The sex ratios of Gray-crowned Rosy-Finches banded during winter in these four Rocky Mountain states varied linearly with latitude, males predominating toward the north (male:female ratio 2.2 in Montana), females toward the south (male:female ratio 0.6 in New Mexico).

Differential migration, defined as differences in seasonal movement between sex or age classes of a species, has been documented for over 100 bird species including certain waterfowl, shorebirds, raptors, and passerines (Cristol et al. 1999). In most cases, female migrants from the North Temperate Zone tend to winter farther south than males (Komar et al. 2005). This latitudinal segregation during the nonbreeding (winter) season can expose different sex or age classes of birds to differences in factors that influence survivorship, including inclement weather, intraspecific competition, predation, and food abundance. The Gray-crowned Rosy-Finch (*Leucosticte tephrocotis*) is an understudied species that breeds in extreme environments such as island beaches and near snowfields or glaciers in Alaska's mountains and at high elevations in the Rocky Mountains (MacDougall-Shackleton et al. 2020). There are six subspecies, but only two migrate south for winter, the Brown-cheeked Rosy-Finch (*L. t. tephrocotis*) and the Gray-cheeked or Hepburn's Rosy-Finch (*L. t. littoralis*) (American Ornithologists' Union 1957) (Figure 1). The winter range of these Gray-crowned Rosy-Finches extends from southern Canada through the Great Basin and Rocky Mountains of the western United States to New Mexico, with some straying farther east (Macdougall-Shackleton et al. 2020). Here, using 64 years of banding data, we show that Gray-crowned Rosy-Finches are latitudinally segregated by sex during winter.

From 1999 through 2003 we operated a banding station in Wyoming (42.49° N, –107.84° W), mist netting and box trapping 2875 wintering Gray-crowned Rosy-Finches, banding them with the United States Geological Survey's (USGS) aluminum bands. Following Pyle (1997), we aged and sexed the birds by a combination of plumage characteristics, weight, and morphometrics. Overall, the composition of Gray-crowned Rosy-Finches we banded in central Wyoming was 84% brown-cheeked (Figure 1A), 15% Hepburn's (Figure 1B), and approximately 1% intermediate with the cheeks mottled brown/gray (Figure 2).

According to the USGS Bird Banding Laboratory (data received 11 December 2024), from 1960 to 2024, 20,355 Gray-crowned Rosy-Finches were banded in the United States, 5338 in Canada. The six North American Gray-crowned Rosy-Finch subspecies share the same USGS species code (GCRF). From the data obtained from the laboratory, we selected records of Gray-crowned Rosy-Finches banded in Montana, Wyoming (including our own data), Colorado, and New Mexico because they likely include both of the latitudinally migrating subspecies while excluding records of the two subspecies endemic to Alaska and the two subspecies breeding in Oregon and California. We restricted these records to a working dataset that included birds that were sexed when banded from November through March in four states: Montana (n = 2214 at 4 locations), Wyoming (n = 3243 at 10 locations), Colorado

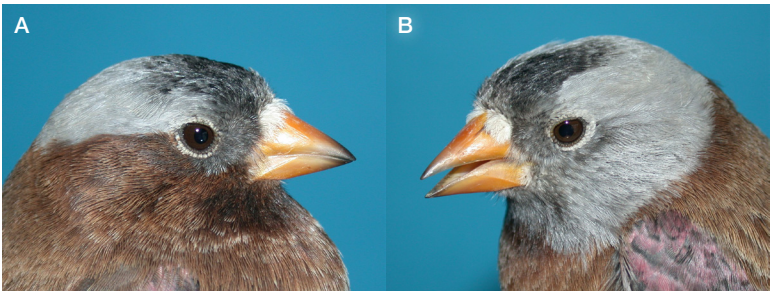

FIGURE 1. (A) The latitudinally migratory Brown-cheeked Gray-crowned Rosy-Finch (*L. t. tephrocotis*) was the subspecies that constituted 84% of rosy-finch flocks wintering in central Wyoming. (B) The latitudinally migratory Hepburn's Gray-crowned Rosy-Finch (*L. t. littoralis*), with gray covering the entire head. Hepburn's constituted 15% of rosy-finch flocks wintering in central Wyoming from 1999 to 2004.

Photos by Lance Morrow

(*n* = 2545 at 28 locations), and New Mexico (*n* = 663 at 1 location) (Figure 3). Thus we selected a total of 8665 banded Gray-crowned Rosy-Finches from the 64-year dataset for analysis of sex ratios. The birds we banded in Wyoming account for 89% of the wintering Gray-crowned Rosy-Finches banded in that state and about a third of the entire dataset on which our study is based. The Canadian records all listed the birds' sex as "unknown" so were unusable for our analysis. We calculated the

FIGURE 2. Gray-crowned Rosy-Finch showing intermediate cheek pattern of mottled brown and gray, representing 1–2% of Gray-crowned Rosy-Finches wintering in central Wyoming from 1999 to 2004.

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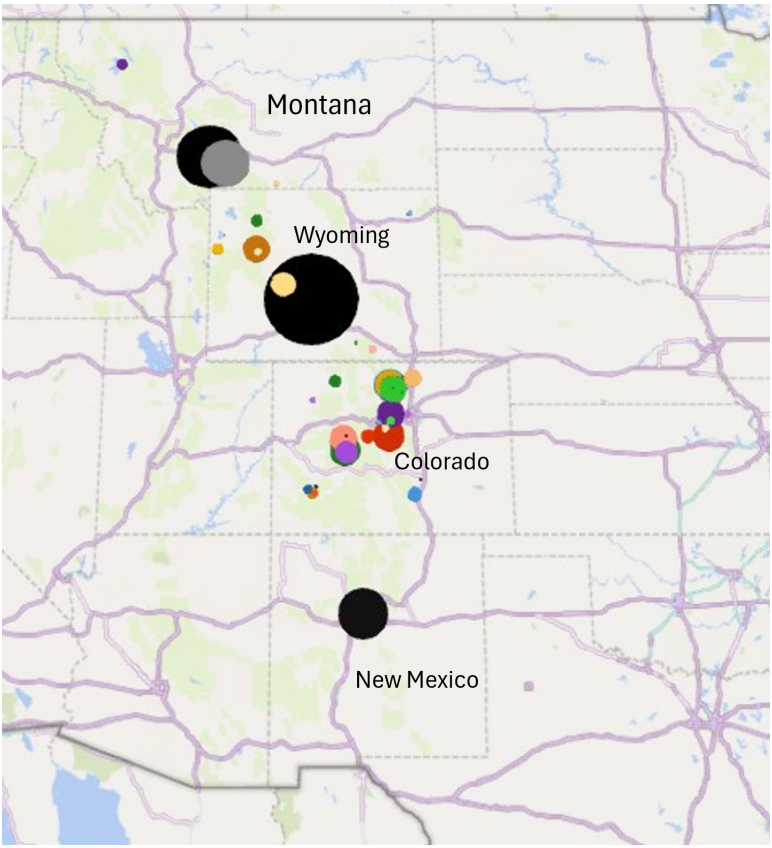

FIGURE 3. Sites of banding of wintering Gray-crowned Rosy-Finches in Montana, Wyoming, Colorado, and New Mexico, November through March, 1960–2024, serving as a basis for calculation of sex ratios (8665 birds banded at 43 sites). Dot size indicates relative numbers of birds captured, sexed, and banded.

sex ratio for each state by dividing the number of wintering males by the number of wintering females banded, regardless of the bird's age. Using Microsoft Excel, we plotted the mean latitude of banding records from each state against the sex ratios (male:female), generated a linear trend line, and calculated the value of R^2.

Wintering Gray-crowned Rosy-Finches tend to segregate latitudinally by sex, with the male-to-female ratio (2.2) highest in Montana (Figure 4). This ratio decreases with latitude through Wyoming (ratio 1.1) and Colorado (ratio 0.9) to New Mexico, where females outnumber males (ratio 0.6). In some cases band records from Wyoming and Colorado mentioned the subspecies of wintering Gray-crowned Rosy-Finches, but not consistently. Since most records did not distinguish the brown-cheeked and gray-cheeked subspecies, in our dataset both of these latitudinally migratory subspecies are pooled.

Overall, the sex ratio in Gray-crowned Rosy-Finches wintering in Montana,

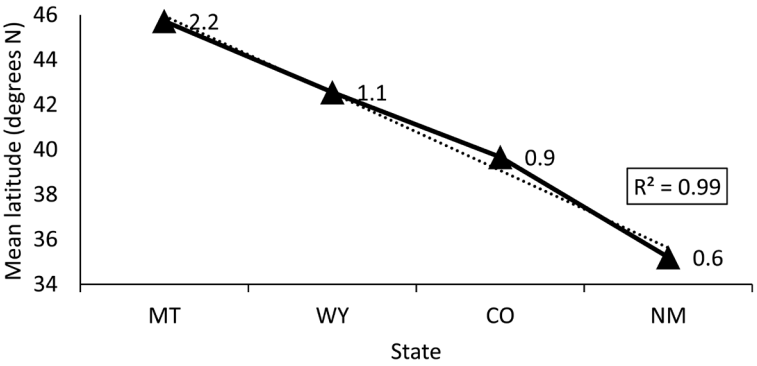

FIGURE 4. Sex ratios (male:female) of Gray-crowned Rosy-Finches wintering in four US states show differential migration by sex, with more males wintering at higher latitudes and more females at lower latitudes. Based on birds banded from November to March, 1960–2024, that were sexed when initially banded in Montana (n = 2214), Wyoming (n = 3243), Colorado (n = 2545), and New Mexico (n = 663). The mean latitude (degrees north) for each state was calculated from the sites of banding. Linear regression, $R^2 = 0.99$ (dotted line), indicates a linear relationship between latitude and sex ratio of wintering Gray-crowned Rosy-Finches (solid line).

Wyoming, Colorado, and New Mexico was slightly skewed toward males, with a male-to-female ratio of 1.18 (n = 8665). This skewed sex ratio might be the result of fewer females surviving the breeding season because they nest in rock crevasses or on the ground where they are more susceptible to predation (MacDougall-Shackleton et al. 2020). Alternatively, females might be wintering in states that are not included in our working dataset. Wintering Gray-crowned Rosy-Finches are found from South Dakota to Iowa (MacDougall-Shackleton et al. 2020) and have been documented rarely as far east as Virginia (https://dwr.virginia.gov/blog/not-myth-a-gray-crowned-rosy-finch-was-in-virginia/), Maine (MacDougall-Shackleton et al. 2020) and Nova Scotia (https://ebird.org/checklist/S126639362). If females spread more widely (i.e., migrate south and east) while the males winter predominantly in northern Rocky Mountain states, this would explain why the sex ratio in our dataset is slightly skewed towards males. Some 854 Gray-crowned Rosy-Finches were banded during winter in South Dakota from 1960 to 2024, but none were sexed or aged when banded, so we cannot explore this hypothesis.

Similarly, we calculated ratios of the age classes of Gray-crowned Rosy-Finches that were aged when initially banded from November through March in the same four states (n = 7911). With the ratio expressed as number of adults (after hatch year or second year in November or December) to immature (hatch year/second year), it was 4.4 in Montana, 2.3 in Wyoming, 2.9 in Colorado, and 1.0 in New Mexico. Nevertheless, the correlation between latitude and ages of wintering birds was not significant.

Finding sexual segregation with latitude is not unexpected, given that several other species of finches also migrate differentially by sex with males wintering farther north than females: the Evening Grosbeak (*Coccothraustes vespertinus*, Prescott 1994), House Finch (*Haemorhous mexicanus*, Belthoff and Gauthreaux 1991), and Common Chaffinch (*Fringilla coelebs*, MacDougall-Shackleton et al. 2020). King and Wales (1964) previously suggested that the skewed sex ratio of wintering Gray-crowned Rosy-Finches near Salt Lake City, Utah, was due to differential migration

of the sexes. They sexed rosy-finches by dissection and found the sex ratio was 3.1 in a sample of 74 Brown-cheeked Rosy-Finches, 0.89 in a sample of 51 Hepburn's.

Reasons for avian sexual segregation during winter are largely unknown, but several hypotheses have been formulated: (1) males have larger bodies and so can withstand colder temperatures than can females (body-size hypothesis), (2) males migrate shorter distances from breeding grounds so they can return early and claim nesting territories early (arrival-time hypothesis), and (3) dominant birds (males) push subordinates (females) to less desirable wintering areas (dominance hypothesis) (Myers 1981). All of these are potential explanations for our findings, but data are insufficient to reveal which is most influential for the Gray-crowned Rosy-Finch or to reveal the consequences of differential migration for this species. Little is known about its migratory pathways (Macdougall-Shackleton et al. 2020). In central Wyoming we recaptured several Gray-crowned Rosy-Finches that had been banded near their breeding habitat at the eastern edge of the Rocky Mountains near Lethbridge, Alberta, Canada (49.69° N, –112.80° W), and this station recaptured several birds that we banded during winter in Wyoming (also located at the eastern edge of the continental divide at the Great Divide Basin). Because of these rare recaptures, we assume some Gray-crowned Rosy-Finches migrate north–south along the eastern face of the Rocky Mountains. Further research on migration routes, timing, and interactions between the sexes in winter could prove informative for present and future conservation of this unique species.

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