The breeding dynamics of a growing Purple Martin colony at Beaverhill Lake

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Abstract

Purple Martins (*Progne subis*), which are aerial insectivores, have been on a population decline for over 20 years in both Canada and the U.S.A (Kelly et al. 2013). Since they rely mainly on human-made nests to keep their population going, the Beaverhill Bird Observatory acquired two martin houses in Spring 2024, in addition to the two already established in 2020. The focus of this study was to compare the 2025 data to 2024. The percentage of compartments occupied in the two new houses in 2025 is significantly higher than found in 2024. However, the clutch sizes were similar to past results.

Introduction

The eastern population of Purple Martins rely on human-made housing for nesting (Brown and Tarof, 2013). To increase nest success, human landlords can keep the nests free from parasites, other birds, and predators. According to Alberta Environment and Parks in 2021, Purple Martins are not at risk in Alberta, however they require monitoring to ensure this status does not change (Alberta Environment and Parks 2021).

The journey of Purple Martins at the Beaverhill Bird Observatory (BBO) began in 2014 when a single house with 12 compartments was established. Since then, two other houses replaced it in 2020, as well as two more put up May 15, 2024.

Through human intervention, there are a few areas where the Purple Martin population has been restored and is thriving. One of these places is Camrose, AB which is a 45min drive southwest of the BBO. They hold the annual Camrose Purple Martin Festival, where a number of fun and educational activities, draw more attention towards Purple Martins. Camrose now has about 100 nest houses throughout the city, with about 20-30 occupied by martins each year.

However, when first putting up a first purple martin house, it can be difficult to attract the attention of the Martins. Sometimes it can take years to attract Martins to a new house; other times Martins will never come (Stokes et al. 1997). Nevertheless, in 2024 the two houses were almost full which is why two more houses were added last year. Last year at the BBO, only 66.7% of the nests were occupied by Martins, most of which was due to lack of Martins in the two newest houses. This is likely due to the mid-May erection of the houses, well after nest selection is underway.

Martins tend to rely on human-made nest boxes, which can be made in many different ways. The BBO and Camrose both have a wooden “condo structure” houses which seems to be quite popular (Northern Sky’s Purple Martin Colony [date unknown]). According to Stokes Purple Martin Guide, the adults tend to prefer previous nests and subadults prefer the general area where they were born (Stokes et al 1997). This ultimately means that landlords, when trying to attract Purple Martins to new housing, will likely attract subadults (ie. Last year’s nestlings), who arrive 4-6 weeks later than the adults (Johnston and Hardy 1962).

Aiding Purple Martins to manage their own nests has had a positive impact on survival rate for nestlings (Raleigh et al. 2019). One of the main ways we have helped manage these nests has been through nest replacement. The blowfly larvae can attach themselves to Purple Martin nestlings, decreasing their fitness and possibly causing death. Seeing as insecticides are harmful these replacements are the next best option (Airola et al. 2018).

Addison Komarnisky (2024) did a similar study of the martins at Beaverhill Bird Observatory. She found that the newer houses had a higher proportion of subadult martins than

the older houses due to less competition from adults (that is, adults preferred to nest in the older pre-existing houses) and the older houses were available in April when the adults arrived. The clutch sizes in the older houses were larger than the clutch sizes in the newer houses, suggesting that older martin parents had larger clutch sizes than the subadult parents. I expect my results to be different from Addison's last year, mainly in expecting a higher number of adults this year, which leads to larger clutch sizes.

Another study on the eastern population of martins in 2022 found that due to SY (second year) martins coming later there is less competition with ASY (after second year) martins (de Greef et al. 2022). The ASY martins also tended to nest at their previous houses, which I expect will be reflected my study. Considering both of these previous studies, I predict that there will be a higher proportion of subadults to adults in the two newer houses than the two older houses. I hypothesize that there will be more adults in the newer houses than last year, due to the SYs from last year now being ASY and coming back to their old nests.

Methods

At Beaverhill Bird Observatory, there are currently 4 houses, each containing 12 compartments. The houses named PA and PB were the two oldest ones, and PC and PD were the two newest. All of the compartments were cleaned at the end of summer 2024 and recleaned before monitoring began in May 2025. The first weekly nest check occurred on May 14, 2025. These checks occurred, mostly on Wednesday mornings until the nestlings were around 22 days when they ended to avoid disrupting their fledging process. After all nest checks were done and nests were empty again, I cleaned the compartments, lubricated the winches and wires, checked the paint, and fixed anything that needed to be.

I considered many factors when collecting data, such as weather during the time of collection. When it was extremely windy or rainy, checks were rescheduled to a different day to reduce stress on the nests and adults. In addition, I assessed if there were any parasitic larvae

present in the nests. If there were any parasites found in the nest, the whole nest was replaced instead of using insecticides.

I used the “Beaverhill Bird Observatory Purple Martin Datasheet” to record all the data, as well as a notebook to record any other observations, such as the age and sex of adults at each house, as well as the number of adults. The martins were identified as after second year male (ASY M), after second year female (ASY F), second year male (SY M), second year female (SY F) and hatching year (HY).

The nest checks started with observing the martins and their activity by lowering the house and checking each cavity. The nest stages were identified as partial, complete without lining, lined and complete with feathers or leaves, or no nest. At each check, I recorded the number of eggs, number of nestlings, and nestling age. The first check to have eggs was June 10, 2025, and the first nestling hatched on June 27, 2025.

Results

The data was collected from BBO in 4 Purple Martin houses; each house contained 12 nests. Exactly 45/48 (94%) of the nests had eggs. However, only 60% of the 45 had hatched eggs. There was no significant difference in clutch sizes of PA and PB (5.27±2.68) vs. PC and PD (4.86±2.60). ($t= 0.835$, $df=42$, $p = 0.409$)

For the nesting start dates, PC and PD started a few days later than PA and PB. PC and PD started nesting around June 4th, whereas PA and PB began around June 1st. Hatching dates were also different in PA and PB; through observations it was obvious that the eggs that had ASY parents (June 12, 2025) started hatching sooner than those with SY parents (June 18, 2025).

There was a significant difference in average clutch sizes between ASY and SY female martins ($t= 5.374$, $df=36$, $p = 0.001$). As well as clutch sizes were different between the two houses. While PA and PB had clutch sizes between 3 and 9, PC and PD had clutch sizes

between 2 and 5. Any nests that had been identified with no PUMA activity were removed from this analysis to maintain a more accurate representation of the data.

Compared to Addison Komarnisky's research paper (2024), houses PC and PD had a much higher occupancy rate this year than last year. House PC had 11/12 occupied and PD had 10/12 occupied, whereas in 2024, PC had 4/12 and PD had 6/12.

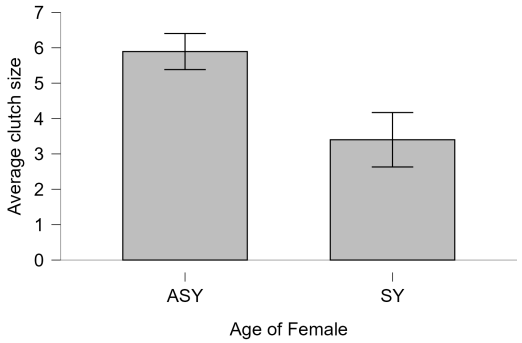

Figure 1. Average clutch size of adult vs. subadult female Purple Martins in summer 2025 at Beaverhill Bird Observatory. Error bars to show variance.

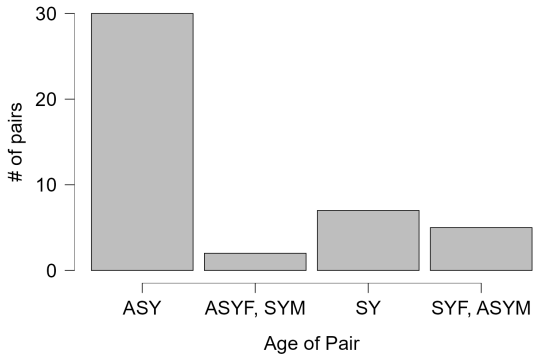

Figure 2. Distribution of age and sex of mated pairs of Purple Martin in the summer of 2025 at Beaverhill Bird Observatory. After Second Year and Second Year, with 4 different combinations.

Discussion

During the second season of the new Purple Martin houses, there were more houses occupied than the first season. In addition, there were more adults this season than the last.

This could be because the subadults from last season returned to the same houses as adults and the new houses were available when the martins first arrived in April. However, there were still more martins, specifically adults, in the previously established houses (PA and PB). Figure 2 shows that there were a high number of ASY pairs than other combinations in 2025. ASY and SY females had average clutch sizes of 5.9±1.7 and 3.4±1.2, respectively ($t= 5.374$, $df=36$, $p = 0.001$). A previous study by Jessica Eads showed that adult females lay 5.23±0.11 eggs and subadult females lay 4.39±0.18 eggs (Eads 2001). Similar to the results found at the BBO, however there is more of a drastic difference between ASY and SY average clutch sizes, 5.9±1.7 and 3.4±1.2, respectively. Ultimately, Komarnisky's average clutch size for Hy and AHY females from the 2024 data proved to be consistent with the data found in the 2025 data.

Brown (1978) found that SY adults laid not only fewer eggs but had more unhatched eggs than ASY martins did. This trend holds true for 2025 data at BBO, where PC and PD had 14 nests that had unhatched eggs; 3 of the nests also had nestlings in it . PA and PB, which consisted mainly of ASY martins, had 12 nests with unhatched eggs, but 5 of those had hatched eggs as well.

In reference to usual predation towards Purple Martins through snakes, starlings, and house sparrows there were no incidents. There were 4 incidents of blowfly larvae in nests, which were removed. Two of the nests had dead nestlings in it, which were also removed.

Limitations

Weather in 2025 was significantly cooler with more rainier days compared to 2024. Another limitation came with observing the age of the martin parents, as they were taken at different times, as well as one parent may have not been present at the nest while they were being observed.

Another limitation this summer was blowfly larvae. They were found in 4 of the 48 nests, 2 of which had dead nestlings in it. These were in houses PB and PC, and I made no

observations found that connected them. One of them, which did not have any dead nestlings in it, was found while cleaning out the nest boxes after the Purple Martins had left.

Future research

A possible future research idea is to continue to look at the newly established houses and the Purple Martins' journey to having more adult martins, banded martins, and larger clutch sizes. Also the frequency of unhatched eggs could be studied to determine their causes. I found that there were a lot of unhatched eggs this summer. Finding out if there is a relationship between the prevalence of unhatched eggs and the age of martins would be interesting. Anna Reichenbach (2025) inspected 10 unhatched eggs and found that they all contained dead embryos. The cause(s) of this mortality should be explored. Another future research idea is to determine if there are any patterns found when there are Blowfly Larvae discovered in a nest (e.g., direction the entrance is facing, age of martins, and weather conditions).

Conclusion

My results supported my hypothesis that there would be larger clutch sizes for ASY pairs than there would be for SY pairs. Another prediction was that there would be more martins in the two new houses in 2025, than in 2024. Both predictions were proved correct. There was a significant difference between the number of Purple Martins found in the two new houses in 2025 (88%) vs. the smaller number found in 2024 (42%).

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Photos taken by Hailey Chalifoux at Beaverhill Bird Observatory in Summer 2025. From left to right: House PD, Growth of Purple Martin Nestlings (youngest to oldest).