The Migrants Above: A North American Shorebirds Investment

Natalie Jesski

University of South Florida St. Petersburg, Undergraduate Research BSC 4910

Introduction

Shorebirds are athletes in nature. North American shorebirds (order Charadriiformes) migrate thousands of kilometers a year between Artic nesting grounds and wintering grounds in Central and South America. Migration routes typically follow coastlines or interior water sources. Staging areas and stopover sites in North America provide abundant food resources crucial for supplying the energy needed to complete migration[1]. About 70 species migrate through North America each year. However, declining numbers have been observed at many staging grounds[2].

Shorebirds have the greatest diversity of parental care of any order of birds. This diversity ranges from fully biparental, with incubation and brood-rearing equally shared by both parents, to care provided exclusively by the male or by the female[4]. The majority of shorebirds have precocial offspring in which the chicks leave the nest within a day and are able to feed themselves[5]. To date there has yet to be a comprehensive study linking migration distance to parental investment.

In this study, I compiled comprehensive data on North American shorebirds. I hypothesize that migration distance is significantly correlated with various categories of maternal investment including female mass/length, relative offspring quality (mass/length), incubation time, nestling time and fledgling length.

Methods

For this study I utilized information from All About Birds and Birds of North America (Cornell Ornithology Lab) and The Handbook of Birds of the World Alive to create a data base of all North American shorebird species. The data was then analyzed using the statistics software, JMP.

Results

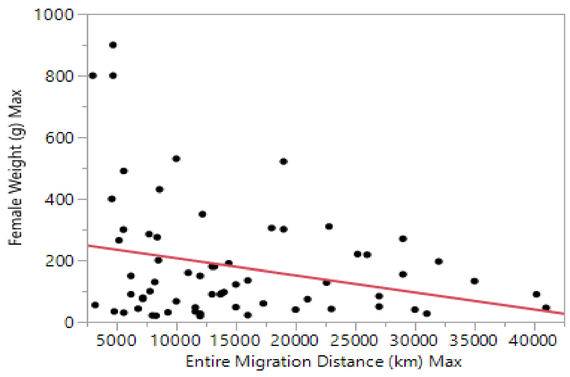

Figure 1: Female shorebird weight (g) was significantly correlated with migration distance (Regression: R^2 =0.073; p = 0.025). Female shorebirds lighter in weight (g) traveled farther distances.

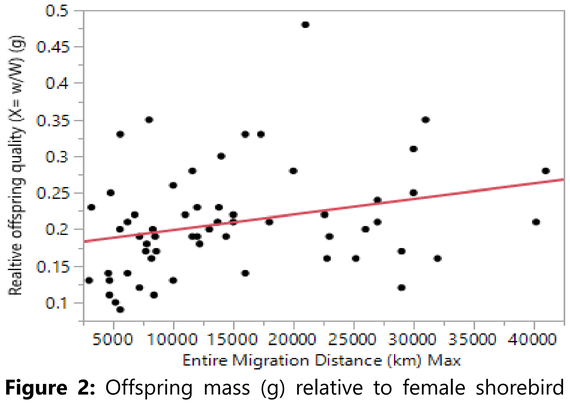

Figure 2: Offspring mass (g) relative to female shorebird was significantly correlated with migration distance (Regression: R^2 =0.078; p = 0.029). Female shorebirds that rear larger offspring (g) migrate farther distances.

Results

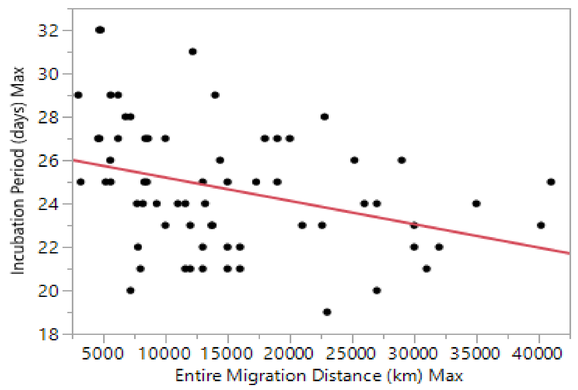

Figure 3: Incubation period was significantly correlated with migration distance (Regression: R^2 =0.118; p = 0.004). Incubation period was shorter for birds migrating long-distances.

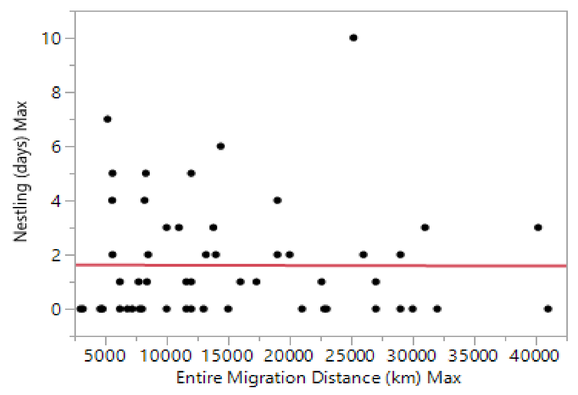

Figure 4: Nestling period was not significantly correlated with migration distance (Regression: R^2 = 2.623e-5; p = 0.970).

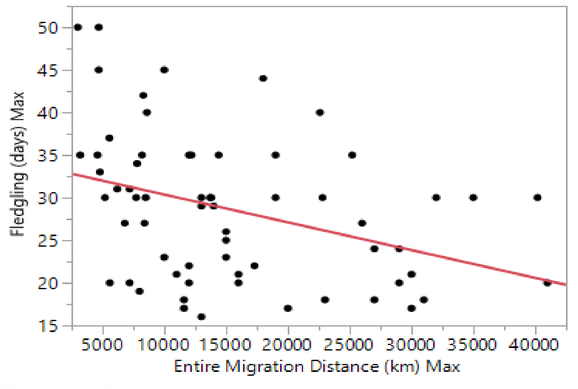

Figure 5: Fledgling period was significantly correlated with migration distance (Regression: R^2 = 0.131; p = 0.003). The birds with the earliest successful flight migrated longer distance.

Conclusions

In this study, I found that Female shorebirds lighter in weight (g) traveled farther distances (**Figure 1**) and that female shorebirds that rear larger offspring (g), relative to their body mass, migrate farther distances (**Figure 2**). This data shows that females invest in larger eggs and that investment is significantly correlated with longer migration distances. I also found that shorter incubation periods (**Figure 3**) and birds with the earliest successful flight (**Figure 5**) migrated longer distances. North American shorebirds face seasonal changes that require them to migrate for food recourses and conducive breeding grounds. For birds migrating farther, it is advantageous for incubation periods and fledgling periods to be shorter to respond to the distances they travel. There was no significant correlation between the time the hatched shorebirds spent in the nest and the distance of migration (**Figure 4**). This is due to 59% of the birds in this study being precocial at birth and that 61% left the nest within a day.

The origins of long-distance migration are complex having evolved over thousands of years. While migration is partially controlled by genetic makeup, it is also a response to weather, geography, food source, day length and other factors. Further investigation into migratory bird studies involving specific species individual factors could play an important role in the conservation of declining individual populations.

Bibliography

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