Student Profile

Is the Migration of Manitoba's Purple Martin Population Mistimed with Prey Emergence?

Final year ecology and environmental biology honours student Ellyne Geurts has loved birds since she was a child. After learning about avian diversity as an eight-year-old she started to see and recognize bird species everywhere. It wasn't long before she began bird watching and keeping a bird observation list as a hobby.

Having always wanted to work with bird conservation, she was thrilled when the opportunity arose to study purple martins (*Progne subis*) and investigate a proposed mechanism for their population decline — "ecological mismatch".

"When my supervisor, Dr. Kevin Fraser, suggested the idea of ecological mismatch with his study species, purple martins and their prey odonates (dragonflies and damselflies), I was excited to work on this project."

Purple martins are a migrant bird species that travel thousands of miles every year to their overwintering sites in South America and back to North America for the summer. The martins are one of the fast-declining aerial insectivores in North America, but, like other aerial insectivores, the decline is poorly understood.

"I wanted to know if the timing of purple martin breeding in relation to the timing of peak odonate abundance affected martin breeding success such as average nestling mass or number of fledged young," Geurts said.

"Ecological mismatch has been proposed because more northern regions of the globe generally experience more seasonality and temperatures are increasing more rapidly in the north with climate change," she explained.

Insectivores may be at risk of mismatch given that they are generally slower than their prey in responding to changes such as earlier springs. And if these species breed in more northern latitudes like the Manitoban purple martin populations do, they may be at even greater risk of population decline given that they have relatively short summers to arrive, adjust to the environment, feed, breed, and reach maturity.

As timing of ideal weather conditions is changing yearly, time of odonate emergence and time of arrival of martins from the south may be mismatched, possibly leading to misalignment between the purple martins' peak breeding time, coinciding with high energetic needs, and prey abundance.

"We stayed up all night after having done fieldwork during the day, catching and banding birds until sunrise," Geurts described as a memorable moment — alongside designing and making of her own dragonfly traps.

Over the summer she would go out to the field to monitor nests and band adult martins for migration studies.

To test the ecological mismatch hypothesis she measured whether there was asynchrony between purple martins' peak breeding time and their prey odonate abundance. But she also needed to measure whether the level of asynchrony, if any was observed, had any relationship to the purple martin reproductive success.

Once the adult martins were caught, their morphometric measurements were taken and then they were either tagged with GPS or with archival light-level geolocators. The GPS and geolocators were used to monitor the bird migration as part of the "Hemisphere to Hemisphere (H2H)" and "migratory connectivity" projects the ABC lab runs.

Martin nestlings and their parents were counted and summed up to estimate the population size. A total of 56 nests were observed every 2 to 3 days to determine number of fledglings per brood and the average brood mass. These measures helped determine the reproductive success of the martins in the Winnipeg, Manitoba region for the year 2017.

Geurts's results showed that there was some asynchrony between the timing of peak abundance of odonates and the timing of peak energetic demand of the purple martins. The timing of peak abundance of odonates was on July 7, 2017 — not too far off from the timing of peak energetic demand of the purple martins, on July 3 and July 15.

"Number of fledglings and average nestling mass [reproductive success] were not related to the degree of synchrony between timing of peak odonate abundance and martin breeding," she concluded.

These results spelled good news because it meant that an ecological mismatch did not occur in the Manitoban population she sampled in 2017. But this also leaves the puzzle of the reason behind martin population decline largely unsolved.

"Several things changed in my undergrad life as I became involved in research. Lab assignments began to feel easier as research experience granted me skills in literature searching and study design. I felt more confident in my abilities."

In addition to developing her writing skills, she cultivated an interest in statistics as she tried to understand her research results using various statistical measures. This newfound interest drove her to do a minor in statistics.

Besides her sheer grit and her ability to be organized with her time, Geurts attributes her ability to successfully complete her thesis to the comradery she shared with fellow honours students.

— David Zirangey

Originally published at pmuserjournal.wordpress.com