Study finds that long-distance migration shapes butterfly wings

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A University of Georgia study has found that monarch butterflies that migrate long distances have evolved significantly larger and more elongated wings than their stationary cousins, differences that are consistent with traits known to enhance flight ability in other migratory species.

As part of a National Science Foundation and UGA-funded study, researchers in the Warnell School of Forestry and Natural Resources and the Odum School of Ecology examined the size and shape of monarchs from migratory and non-migratory populations using sophisticated computer imaging that was able to measure precise details about the insects' wings. Warnell doctoral candidate Andy Davis and Odum Associate Professor Sonia Altizer compared migratory monarchs from the eastern and western U.S. to those in Hawaii, Costa Rica, South Florida and Puerto Rico that do not migrate. They also measured the wings of lab-grown monarchs to rule out environmental causes of differences in size and shape, and to demonstrate a genetic basis for variation in wing traits among individual monarchs.

Altizer and Davis' findings were recently published in the online edition of the scientific journal *Evolution*.

The findings in monarchs were consistent with previous studies comparing migratory and non-migratory bird species, which indicate that the best shape for long-distance flight involves long wings with a narrow tip to help reduce drag. In addition to their findings on wing size and

shape, the team also found that monarchs from the two migratory populations in the U.S. differed in body size, suggesting that each population could have adapted to the demands of migration in subtly different ways. Larger bodies might help eastern monarchs, with their much longer migration, carry fat deposits to fuel the long journey and five-month overwintering period in Mexico.

Monarchs in eastern North America, famous for migrating the longest distances of any insect species in the world, face a number of threats, to the point that monarch migration is considered to be an "endangered phenomenon." Davis has published previous research indicating that female monarch butterflies are on a 30-year decline in the eastern U.S., a troubling pattern that paints a dire picture for population recruitment. Furthermore, monarchs from this population are prone to periodic population crashes from storms at the Mexican overwintering site. Although monarchs worldwide are not threatened, Altizer said, those with the larger wingspan are. "Our study shows that we would lose an evolutionarily unique population if the migration of eastern monarchs were to unravel," she said.

Provided by University of Georgia

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