

A small dragonfly is found to be the world's longest-distance flyer

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The body and wings of the dragonfly *Pantala flavescens* have evolved in a way that lets the insect glide extraordinary distances on weather currents. Credit: Greg Lasley

A dragonfly barely an inch and a half long appears to be animal world's most prolific long distance traveler - flying thousands of miles over oceans as it migrates from continent to continent - according to newly published research.

Biologists at Rutgers University-Newark (RU-N) who led the study - which appears in the journal *PLOS ONE* - say the evidence is in the genes. They found that populations of this dragonfly, called *Pantala flavescens*, in locations as far apart as Texas, eastern Canada, Japan, Korea, India, and South America, have genetic profiles so similar that there is only one likely explanation. Apparently - somehow - these insects are traveling distances that are extraordinarily long for their small size, breeding with each other, and creating a common worldwide gene pool that would be impossible if they did not intermingle.

"This is the first time anyone has looked at genes to see how far these insects have traveled," says Jessica Ware, an assistant professor of biology on the faculty of RU-N's College of Arts and Sciences and senior author of the study. "If North American *Pantala* only bred with North American *Pantala*, and Japanese *Pantala* only bred with Japanese *Pantala*," Ware says, "we would expect to see that in genetic results that differed from each other. Because we don't see that, it suggests the mixing of genes across vast geographic expanses."

But how do insects from different continents manage to meet and hook up? These are not large birds or whales that one would expect to travel thousands of miles. Ware says it appears to be the way their bodies have evolved. "These [dragonflies](#) have adaptations such as increased surface areas on their wings that enable them to use the wind to carry them. They stroke, stroke, stroke and then glide for long periods, expending minimal amounts of energy as they do so."

Dragonflies, in fact, have already been observed crossing the Indian Ocean from Asia to Africa. "They are following the weather," says Daniel Troast, who analyzed the DNA samples in Ware's lab while working toward his master's degree in biology, which he earned at the university in 2015. "They're going from India where it's dry season to Africa where it's moist season, and apparently they do it once a year."

Moisture is a must for Pantala to reproduce, and that, says Ware, is why these insects would be driven to even attempt such a perilous trip, which she calls a "kind of suicide mission." The species depends on it. While many will die en route, as long as enough make it, the species survives.

Flight patterns appear to vary. The hardiest of the dragonflies might make the trip nonstop, catching robust air currents or even hurricane winds and gliding all the way. Others may, literally, be puddle jumpers. Pantala need fresh water to mate and lay their eggs - and if while riding a weather current they spot a fresh water pool created by a rainstorm - even on an island in the middle of a vast ocean - Ware and Troast say it's likely they dive earthward and use those pools to mate. After the eggs hatch and the babies are mature enough to fly - which takes just a few weeks - the new dragonflies join the swarm's intercontinental and now multi-generational trek right where their parents left off.

For the moment, the details of this extraordinary insect itinerary are an educated best guess, as are specific routes these migrations might take. Much more work is needed to bring many loose ends together. But now that their work has established a worldwide population of intermingling dragonflies, Ware and Troast hope that scientists can work on plotting those routes in earnest. They would need to be innovative, because tracking devices that can be attached to larger animals are far too big to put on insects.

What the Rutgers scientists have discovered puts this dragonfly far ahead of any identified insect competitor. "Monarch butterflies migrating back and forth across North America were thought to be the longest migrating insects," traveling about 2,500 miles each way, says Troast, "but Pantala completely destroys any migrating record they would have," with its estimated range of 4,400 miles or more. It also exceeds Charles Lindbergh's celebrated solo flight from New York to Paris by at least several hundred miles.

Pantala leaves many of its fellow dragonflies even farther behind. The mysteries of evolution are such that while Pantala and its cousin the Green Darner (*Anax junius*) have developed into world travelers, Ware says that by contrast, other members of the family "don't ever leave the pond on which they're born - traveling barely 36 feet away their entire lives."

More information: Daniel Troast et al. A Global Population Genetic Study of *Pantala flavescens*, *PLOS ONE* (2016). [DOI: 10.1371/journal.pone.0148949](https://doi.org/10.1371/journal.pone.0148949)

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