Tracing the migration path of painted lady butterflies across Africa

April 13 2023, by Justin Jackson

A recently emerged painted lady butterfly in tropical Africa. Credit: Gerard Talavera

An international research team in search of painted lady butterfly breeding grounds in Africa has published the results of years of

fieldwork. In the paper, "The Afrotropical breeding grounds of the Palearctic-African migratory painted lady butterflies (Vanessa cardui)," published in *Proceedings of the National Academy of Sciences*, the team illustrates their search for the migratory insect's hidden winter breeding grounds on the massive continent.

The painted lady butterfly is constantly on the move. The species performs multigenerational round-trip migrations, where the individuals returning to an area will be several generations removed from the individuals that last visited. They are global travelers, found almost everywhere, yet the distribution during the European winter months has been a long-standing mystery. There are some known sites in North Africa, but not enough to account for most of the population over the season, and researchers suspected there should be more sites further to the south.

As a young Douglas Adams might have written for a middle school geography report, "Africa is big. You just won't believe how vastly, hugely, mind-bogglingly big it is. I mean, you may think it's a long way down the road to the chemist's, but that's just peanuts to Africa."

Because the planet Earth is round, and we have a preferred perspective when making maps, the lands which lay across the equator tend to be compressed. This leads to flat maps where Greenland can seem more than half the size of Africa while it is actually 14 times smaller. All of Russia and China would fit into Africa and still have room enough to fit Greenland along with its satellite state of Denmark.

A painted lady butterfly born in Europe rests on a lion footprint in Pendjari National Park, Benin, after having crossed the Mediterranean Sea and the Sahara Desert. Credit: Roger Vila

So the question facing researchers before setting off on their painted lady quest is where to start? The team devised an ecological niche modeling predictor based on observations of eggs, larvae, and pupae from 646 breeding sites in 30 countries. The team assumed that the preferred environments of observed breeding grounds were likely to be preserved in migration to Africa. The resulting data set allowed researchers to predict regions with the highest probabilities down to a monthly resolution.

The initial verification of this approach came as the model predicted that

a semiarid sub-Saharan Sahelian region and the Sudanian Savannah become highly suitable in September, with suitability increasing in October. Researchers went to these locations and waited. The arrival of migratory flocks and the massive presence of immatures in the Sahelian region and the Sudanian Savannah validated the model. The researchers referred back to the ecological niche modeling to find where the butterflies flew next.

Over two years, seven field expeditions were conducted across the Afrotropics during December and January. Researchers documented 2,755 caterpillars and 1,198 adults and collected data on preferred larval hostplants.

The ecological niche modeling was a highly successful predictor of climate niche. However, the researchers note that hostplant availability could explain the locations where no painted ladies were found, something absent from their initial modeling as the migratory butterflies have different preferences depending on where in the world they happen to be.

More information: Gerard Talavera et al, The Afrotropical breeding grounds of the Palearctic-African migratory painted lady butterflies (Vanessa cardui), *Proceedings of the National Academy of Sciences* (2023). DOI: 10.1073/pnas.2218280120