

STUDY REVEALS EVOLUTIONARY HISTORY, BIOGEOGRAPHIC ORIGINS OF BUTTERFLIES

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With the onset of Spring, a butterfly collects nectar from the flower of an almond tree in the Baadam Vaer or the Almond Alcove, during spring bloom, in Srinagar. File. | Photo Credit: NISSAR AHMAD

Despite being one of the most intensely studied insect groups, the evolutionary history and drivers of butterfly diversification were poorly understood. To address this lacuna, an international team of researchers sequenced 391 genes from nearly 2,300 butterfly species from 90 countries to help reconstruct a new phylogenomic tree of butterflies representing 92% of all general.

While the earlier classification was based more on butterfly morphology, the latest attempt has been based on genome sequencing. As a result, the researchers found that at least 36 butterfly tribes (above genus in taxonomical classification) require reclassification. According to the study published recently in the journal Nature Ecology and Evolution, butterflies originated in the Americas about 100 million years ago.

A butterfly congregation site recorded in 2019 on the foothills of Brahmagiri hills near Thirunelly in Wayanad district. | Photo Credit: P.A. Vinayan

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“Since we sequenced the genomes to reconstruct a large phylogeny (species tree) and used a molecular clock, we were able to estimate the time of origin of butterflies from moths and dispersal of butterflies from North America, which is their place of origin, to the rest of the world,” says Dr. Krushnamegh Kunte from the Bengaluru-based National Centre for Biological Sciences and one of the authors of the paper. “There is no adaptive reason for butterflies to originate in North America. It’s more of coincidence that butterflies had their origin in North America where the closest moth relatives of the earliest butterflies were present.”

“Since we studied representatives of over 19,000 butterfly species across different genera and covered over 90% of all genera, and also sequenced moths and other related insect species, we were able to pinpoint the origin of butterflies in time and place,” he says. The work revealed that butterflies originated in the Americas in the late Cretaceous, about 100 million years after the origin of flowering plants.

While butterflies dispersed from North America to Europe relatively quickly about 75 million years ago due to the landmass then being nearly contiguous, the dispersal from North America to Asia was through colder northern regions and happened around 60 million years ago.

“Both hostile climate and lack of contiguous landmass might have been the reasons why there was a lag in dispersal from North America to Asia compared with dispersal from North America to Europe,” Dr. Kunte says.

A rare spotted Royal butterfly found in Lakkidi in Wayanad. Photo: Special Arrangement

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Despite being its place of origin, North America largely being a temperate region has far less diversity compared with the tropical region in South America and Asia. Speciation is far higher in the tropics than the temperate region. Suitable climate that allows butterflies to live through the year, the greater diversity of habitats, and far higher diversity and absolute number of plant species that serve as source of food for butterflies serve as main drivers for higher speciation of butterflies in the tropics. “These are the reasons why we find greater diversity of butterflies in the tropical region,” he says.

Like in most other animals, the dispersal of butterflies never followed a single direction. According to Dr. Kunte, after initial dispersal of butterflies from temperate to tropical region, butterflies then dispersed from the tropics to the temperate region and vice versa in different butterfly groups that have evolved subsequently. “The dispersal has been seen in both directions, which has been the case in other animal species, as well,” Dr. Kunte says. Butterflies were present on all modern continental landmasses by Late Eocene (34 million years ago).

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