SCIENCE

IISER team maps evolutionary dispersal patterns

Shoumojit Banerjee

PUNE , AUGUST 02, 2020 19:52 IST
UPDATED: AUGUST 02, 2020 19:52 IST

Study of biological movement is applicable to epidemiology, conservation and agricultural pests

The prestigious U.S. biology journal *Evolution* has published the findings of a team of researchers at the Pune-based Indian Institute of Science Education and Research (IISER) dealing with the dispersal patterns of organisms across different environments.

The three scientists, Professor Suthirth Dey at IISER's Biology Department, Abhishek Mishra and Partha Pratim Chakraborty, carried out experiments to study the phenomena of 'density-dependent dispersal' by observing around 29,000 fruit flies to see if evolution had modified their tendency to move towards or away from crowded regions.

"Many animals, including humans, move from one place to another. Such 'dispersal' is generally to find resources like food or escape from potential threats. The study of this biological dispersal finds applications in epidemiology, conservation of biodiversity as well as control of agricultural pests," said Prof. Dey.

The scientists authored a paper titled 'Dispersal evolution diminishes the negative density dependence in dispersal', which was published in *Evolution* last week.

Mr. Mishra observes that a number of factors influence how, why or when individuals disperse, not least of it is their population density.

"This is similar to people's preferences of living in rural (low-density) vs. urban (high-density) areas. Populous areas often offer greater opportunities and more socialisation, but also incur competition for space and high costs. As a result, we can see movement of individuals from scanty to crowded areas, and vice versa, depending on the relative costs and benefits," he said.

Likewise, non-human species, too, experience similar pros and cons of 'high' versus 'low-density' areas.

"Just as some species live in large groups while others are solitary, movement occurs away from a crowd in some species and towards it in some others. This pattern, termed as 'density-dependent dispersal', is central to our understanding of which life forms occur where," says Prof. Dey.

Strangely, little is known about how or why 'density-dependent dispersal evolves'.

"In fact, there had been no report of an evolutionary change in the direction of this movement in sexually reproducing species. It was to address this that the team published their findings in the journal. If we don't know how the pattern of density-dependent dispersal emerges or changes over time, prediction of movement patterns becomes difficult," says Prof. Dey.

The team first "evolved" tens of thousands of fruit flies for over 75 generations (or three years), thus making them "better" dispersers than their ancestors.

"We observed around 29,000 fruit flies over this period to see if evolution had modified their tendency to move towards or away from crowded regions. Not only did we find a sharp change in this behaviour owing to evolution, but a crucial discovery was that the dispersal rates of males and females had changed completely," observes Prof. Dey, adding while females had been dispersing more than the males initially, the males overtook females in movement after evolution.

He said that this finding was perhaps the first evidence for an evolutionary reversal in the dispersal of the two sexes.

Prof. Dey says that by establishing that these behaviours are evolutionarily malleable, the study highlights the need to frequently assess movement patterns of ecologically relevant species.

"On the one hand, moving further away from each other hampers the survival chances of endangered species. On the other hand, the very same behaviour accelerates the takeover of an ecosystem by invasive species. Similarly, this can affect pathogen spread via altered movement of disease vectors," he said.

Related Articles