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Evolutionary Biology

A valuable work lying at the crossroad of neuro-ethology, evolution and ecology in the fruit pest *Drosophila suzukii*

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doi: 10.24072/pci.evolbiol.100017

Open Access

Cite as: Estoup A and Hufbauer RA. 2017. A valuable work lying at the crossroad of neuro-ethology, evolution and ecology in the fruit pest *Drosophila suzukii*. *Peer Community in Evolutionary Biology*. 100017. doi: 10.24072/pci.evolbiol.100017

A recommendation of

Karageorgi M, Bräcker LB, Lebreton S, Minervino C, Cavey M, Siju KP, Grunwald Kadow IC, Gompel N, Prud'homme B. 2017. **Evolution of multiple sensory systems drives novel egg-laying behavior in the fruit pest *Drosophila suzukii*.** *Current Biology* 27: 1-7. doi: 10.1016/j.cub.2017.01.055

Published: 14 March 2017

Adaptations to a new ecological niche allow species to access new resources and circumvent competitors and are hence obvious pathways of evolutionary success. The evolution of agricultural pest species represents an important case to study how a species adapts, on various timescales, to a novel ecological niche. Among the numerous insects that are agricultural pests, the ability to lay eggs (or oviposit) in ripe fruit appears to be a recurrent scenario. Fruit flies (family Tephritidae) employ this strategy, and include amongst their members some of the most destructive pests (e.g., the olive fruit fly *Bactrocera olea* or the medfly *Ceratitis capitata*). In their manuscript, Karageorgi *et al.* [1] studied how *Drosophila suzukii*, a new major agricultural pest species that recently invaded Europe and North America, evolved the novel behavior of laying eggs into undamaged fresh fruit. The close relatives of *D. suzukii* lay their eggs on decaying plant substrates, and thus this represents a marked change in host use that links to substantial economic losses to the fruit industry.

Although a handful of studies have identified genetic changes causing new

behaviors in various species, the question of the evolution of behavior remains a largely uncharted territory. The study by Karageorgi *et al.* [1] represents an original and most welcome contribution in this domain for a non-model species. Using clever behavioral experiments to compare *D. suzukii* to several related *Drosophila* species, and complementing those results with neurogenetics and mutant analyses using *D. suzukii*, the authors nicely dissect the sensory changes at the origin of the new egg-laying behavior. The experiments they describe are easy to follow, richly illustrate through figures and images, and particularly well designed to progressively decipher the sensory bases driving oviposition of *D. suzukii* on ripe fruit.

Altogether, Karageorgi *et al.*'s [1] results show that the egg-laying substrate preference of *D. suzukii* has considerably evolved in concert with its morphology (especially its enlarged, serrated ovipositor that enables females to pierce the skin of many ripe fruits). Their observations clearly support the view that the evolution of traits that make *D. suzukii* an agricultural pest included the modification of several sensory systems (i.e. mechanosensation, gustation and olfaction). These differences between *D. suzukii* and its close relatives collectively underlie a radical change in oviposition behavior, and were presumably instrumental in the expansion of the ecological niche of the species. The authors tentatively propose a multi-step evolutionary scenario from their results with the emergence of *D. suzukii* as a pest species as final outcome. Such formalization represents an interesting evolutionary model-framework that obviously would rely upon further data and experiments to confirm and refine some of the evolutionary steps proposed, especially the final and recent transition of *D. suzukii* from non-invasive to invasive species.

References

[1] Karageorgi M, Bräcker LB, Lebreton S, Minervino C, Cavey M, Siju KP, Grunwald Kadow IC, Gompel N, Prud'homme B. 2017. Evolution of multiple sensory systems drives novel egg-laying behavior in the fruit pest *Drosophila suzukii*. *Current Biology*, 27: 1-7. doi: 10.1016/j.cub.2017.01.055