

Do beetles have maternal instincts?

September 26 2013



This image shows *D. paykulli* larvae moving to a new leaf followed by their mother in Panama. Credit: S. Van Bael

Hidden in the thick foliage of tropical forests a subfamily of colorful beetles hides the secrets of the earliest stages of social behavior, showing explicit signs of maternal instincts and care. An international team of scientists from the Smithsonian Tropical Research Institute, Centro

Universitário de Lavras, Staatliches Museum für Naturkunde Karlsruhe, and Université libre de Bruxelles looked into the complex subsocial behaviors present in the extraordinary Chrysomelinae subfamily to discover and describe in detail the different degrees of maternal instincts present within 8 species. The exciting insight into the biology of these species was published in the 4th "[Research on Chrysomelidae](#)" special issue of the open access journal [Zookeys](#), alongside 6 other research articles on the family.

Within the leaf beetles, [maternal care](#) of offspring is found in just two of 15 subfamilies, the broad-shouldered leaf beetles (Chrysomelinae) and the tortoise beetles (Cassidinae), groups possibly more vulnerable to predators and parasitoids due to slow-moving and exposed immature stages. The study of subsocial behavior, additional to its intrinsic appeal, may offer a perspective on selective forces at work during the earliest stages of insect [social evolution](#).

Complex subsocial behavior was observed in pairs of one of the species studied, *D. paykulli*, interacting aggressively on newly expanded leaves. Whether these were contests over resources or precopulatory courtship is unclear, however, analysis of video taken of one of these interactions shows the use of the mesosternal horn in dislodging a competitor. Adult females were discovered during mid-May in close proximity to eggs attached to the cupped apical leaves.

Observations of additional species associated with a different family of plants, the Solanaceae, suggest that mothers modify leaf resources in advance of bearing live offspring, and later block and herd movement of larvae among leaves on the same food plant. An adult was also recorded following a tightly arranged group of larvae moving between leaves on their food plant. Mothers at times tightly straddled their aggregated first and second instar larvae on the natal leaf, preventing their advance down the leaf petiole.



This image shows a female *D. reticulata* straddling first instar larvae in Campo Cerado vegetation of Brazil. Credit: Fernando A. Frieiro-Costa

While guarding, mothers reacted aggressively by charging to the edge of the leaf when a thin stick was introduced to the area by an observer. Charges, stamping and shaking continued for a short period of time after the stimulus was removed. The strongest reaction was given to a camera held approximately 10 cm under and to the side of the natal leaf.

Observations and field studies find evidence that mothers actively defend offspring in at least eight species and three genera of Neotropical Chrysomelinae tightly associated with two host plant families. Reports on the three *Doryphora* species that feed on vines in the dogbane family,

Apocyanaceae, reveal that mothers defend eggs and larvae by straddling, blocking access at the petiole and greeting potential predators with leaf-shaking and jerky advances. A less aggressive form of maternal care is found in two *Platyphora* and four *Proseicela* species associated with shrubs and small trees in the nightshade family Solanaceae.



This image shows a *P. microspina* female tending overlapping cohorts of larvae on their solanaceous food plant in Panama. Credit: Donald M. Windsor

"Large voids remain in our understanding of the natural history of both groups, including the identity and importance of predators and parasitoids and the diverse ways in which mothers may be influencing the survival of offspring," comments Dr Windsor, one of the authors of the study. "We urge continued study of these magnificent insects, their

enemies and their defenses, both behavioral and chemical, especially in forests along the eastern versant of the Central and South American cordillera."

More information: Windsor DM, Dury GJ, Frieiro-Costa FA, Lanckowsky S, Pasteels JM (2013) Subsocial Neotropical Doryphorini (Chrysomelidae, Chrysomelinae): new observations on behavior, host plants and systematics. In: Jolivet P, Santiago-Blay J, Schmitt M (Eds) Research on Chrysomelidae 4. *ZooKeys* 332: 71-93. [DOI: 10.3897/zookeys.332.5199](https://doi.org/10.3897/zookeys.332.5199)

Provided by Pensoft Publishers

Citation: Do beetles have maternal instincts? (2013, September 26) retrieved 26 April 2024 from <https://phys.org/news/2013-09-beetles-maternal-instincts.html>

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