

Possible Function of Spatulate Setae Surrounding the Papillae Anales of Sarota Butterflies (Riodinidae: Helicopini)

Authors: Greeney, Harold F., Penz, Carla M., DeVries, Phillip J., and Walla, Thomas R.

Source: The Journal of the Lepidopterists' Society, 64(4) : 216-217

Published By: The Lepidopterists' Society

URL: <https://doi.org/10.18473/lepi.v64i4.a7>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Journal of the Lepidopterists' Society
64(4), 2010, 216–217

POSSIBLE FUNCTION OF SPATULATE SETAE SURROUNDING THE PAPILLAE ANALES OF
SAROTA BUTTERFLIES (RIODINIDAE: HELICOPINI)

Additional key words: Camouflage, Costa Rica, Ecuador, epiphylls, oviposition

Lepidopteran eggs can face high levels of mortality due to a variety of factors including environment, predators, and parasitoids (e.g., Hilker 1994; Obermaier et al. 2006; Sansone & Smith 2001). Ovipositing females are thought to show various traits that may help escape these pressures, including egg placement, shell toxins, and chemical crypsis (e.g., Obermaier et al. 2006; Scoble 1992).

During the course of fieldwork in Central and South America, we observed oviposition by several species of *Sarota* (Riodinidae) butterflies. As far as is known, larvae of this genus feed on tiny epiphyllic lichens, mosses, and liverworts growing on the surface of tropical leaves (DeVries 1988, 1997). We observed a distinctive behavior associated with egg laying in *S. subtessellata* (Costa Rica, n = 1), *S. gyas* (Ecuador, n = 2), and *S. chrysus* (Ecuador, n = 1). After landing on a leaf, females walked slowly across its surface, dragging the tips of their abdomens, sometimes for up to five minutes before depositing an egg (Fig. 1). They occasionally walked to the lower surface of the leaf, sometimes pausing for several minutes, but always returning to oviposit on the upper surface. Upon close examination of the eggs, we noted that each was entirely covered with scraps of epiphylls glued to the chorion. Subsequently, when observing the external morphology of female genitalia of these and other *Sarota* spp., we

noted the obvious presence of strange, stiff, apically-recurved, spatulate setae surrounding the papillae anales. These have been described and illustrated by Hall (1998), though he indicated their function remains a mystery. Although these setae are considered a synapomorphy of the Helicopini, encompassing *Helicopsis*, *Sarota*, *Anteros*, and *Ourocnemis* (Hall 1998), similar structures are present in some moths in the Geometridae and Tortricidae (Pellmyr 1980; Scoble 1992). For *Sarota*, we also clearly observed the spine-like setae described by Hall (1998), located between the spatulate setae and the ostium bursae.

In at least one tortricid moth these spatulate scales are considered to facilitate covering eggs with debris (Scoble 1992). In concert with these assertions, our observations strongly suggest that spatulate and spine-like scales and setae of *Sarota* are used to scrape and gather scraps of epiphylls, which are then glued to the egg. This behavior likely provides effective visual and chemical camouflage for eggs deposited on their epiphyll-covered oviposition substrates. Future observations and experiments on the covering of eggs with debris by lepidopterans may yield important clues as to the effectiveness of this behavior in deterring ants and/or egg parasitoids. Similarly, observations on the function of these structures in other genera within the Helicopini may shed light on their evolutionary origin.

ACKNOWLEDGEMENTS

We thank J. O. Stireman III for help with literary sources and J. P. W. Hall for confirmation of species identifications. We are grateful to the owners and staff of La Selva Lodge and Hakuna Matata Lodge for their hospitality in Ecuador, and the Smithsonian Tropical Research Institute for support in Panama. HFG acknowledges the support of Matt Kaplan & John V. Moore. This study was funded in part by NSF grants DEB-0346729 and DEB-0527441. This is publication no. 193 of the Yanayacu Natural History Research Group.

LITERATURE CITED

- DEVRIES, P. J. 1988. The use of epiphylls as larval hostplants by the neotropical riodinid butterfly *Sarota gyas*. *Journal of Natural History* 22: 1447-1450.
- . 1997. The butterflies of Costa Rica, Vol. 2, Riodinidae. Princeton University Press, Princeton, New Jersey. 288 pp.
- HALL, J. P. W. 1998. A review of the genus *Sarota* (Lepidoptera: Riodinidae). *Tropical Lepidoptera* 9 (Suppl. 1): 1-21.
- HILKER, M. 1994. Egg deposition and protection of eggs in Chrysomelidae, pp. 302-330. *In*: Jolivet, P., Cox, M. L. & Petitpierre, E. (eds). *Novel aspects of biology of Chrysomelidae*. Dordrecht, E. Kluwer Academic Publishers.



FIG. 1. A female *Sarota subtessellata* drags her abdomen across an epiphyll-covered leaf, presumably using modified setae surrounding the papillae anales to scrape and gather epiphyll scraps for camouflaging her eggs. (Photo P. J. DeVries).

- OBERMAIER, E., A. HEISSWOLF, B. RANDLKOFER, & T. MEINERS. 2006. Enemies in low places – insects avoid winter mortality and egg parasitism by modulating oviposition height. *Bull. Ent. Research* 96: 337-343.
- PELLMYR, O. 1980. Morphology of the genitalia of Scandinavian brachypterous female Geometridae (Lepidoptera). *Ent. Scand.* (Copenhagen), 11: 413-423.
- SANSONE, C. G. & J. W. SMITH, JR. 2001. Natural mortality of *Helicoverpa zea* (Lepidoptera: Noctuidae) in short-season cotton. *Env. Ent.* 30: 112-122.
- SCOBLE, M. J. 1992. *The Lepidoptera. Form, function, and diversity.* Oxford University Press, Oxford, U.K. 404 pp.
- HAROLD F. GREENEY, *Yanayacu Biological Station and Center for Creative Studies, Cosanga, Ecuador c/o Foch 721 y Amazonas, Quito, Ecuador, email: revmmoss@yahoo.com*, CARLA M. PENZ & PHILLIP J. DEVRIES, *University of New Orleans, Department of Biological Sciences, New Orleans, LA 70148*, and THOMAS R. WALLA, *Department of Biology, Mesa State College, 1100 North Avenue, Grand Junction, CO 81501, USA.*

Received for publication 5 March 2009, revised and accepted 23 January 2010