Note on nocturnal activity of a skipper, *Pseudonascus paulliniae*, in French Guiana

Andrei Sourakov[1] and Peter R. Houlihan[1,2]

[1]McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, Gainesville, FL 32611, USA; [2]Department of Biology, University of Florida, Gainesville, FL 32611 USA

Abstract: We report an observation and provide photographic evidence of nocturnal activity of *Pseudonascus paulliniae* (Hesperiidae) in French Guiana, which was observed several hours after dark with the help of flash lights and in association with foraging by the army ants.

Key Words: ecology, niche partitioning, symbiotic relationships, army ants, foraging, Lepidoptera, vision, moths, butterflies

Despite being nestled within butterflies (Kawahara & Breinholt, 2014), skippers (Hesperiidae) appear to have more in common with hawkmoths (Sphingidae) with respect to their eye structure than with other butterflies, according to Yagi & Koyama (1963). This latter study's conclusions were based on examining 22 species of skippers, *ca*. 200 species of butterflies, and over 100 species of moths including 17 species of hawkmoths, and are not contradicted by later studies on the anatomy of skipper eyes (e.g., Shimohigashi & Tominaga, 1986). Therefore, it would not be surprising if skippers displayed both nocturnal and diurnal behaviors, and even if they could switch between the two within a lifetime.

Many lepidopterists have hypothesized that some genera of skippers may be active at night. For instance, Burns *et al*. (2010) proposed that some *Porphyrogenes* Watson are nocturnal. DeVries *et al.* (2008), based on years of observations by George Austin in Brazil, demonstrated temporal partitioning of activity among Neotropical skippers, and observed that members of *Bungalotis* Watson, *Salatis* Evans, *Sarmientoia* Berg, *Dyscophellus* Godman & Salvin, and *Nascus* Watson fly mostly at dusk. The authors also note that "30 years of field observations … indicate that both sexes of *Bungalotis* … may even fly after dark." Sourakov (pers. obs. in Misiones, Argentina) also saw *Bungalotis* actively flying and feeding at dawn in dim light before sunrise. Houlihan (pers. obs., Sarawak, Malaysia) witnessed a species of *Matapa* Moore feeding on spider lilies of the genus *Hymenocallis* (Amaryllidacea) shortly after dusk (Apr 12, 2013, 18:48), just prior to foraging by hawkmoths, and Jong (1983) also noted that *Matapa* is mostly crepuscular.

However, the direct evidence for truly nocturnal activity of skippers is limited. While some crepuscular skippers such as *Bungalotis* commonly come to moth-collecting lights (e.g., Mielke, 1973; Sourakov, pers. obs.), in itself this does not constitute direct evidence of nocturnal activity, as skippers may be resting in the area and, disturbed by the lights, maybe then exhibit an unnatural behavior. To our knowledge, the only published direct evidence of truly nocturnal behavior in skippers comes from DeVries *et al.* (1987), who recorded synchronous nocturnal activity and gregarious roosting in the Neotropical skipper *Celaenorrhinus fritzgaertneri* (Bailey, 1880). This species was active at night only during the dry season when it also was in a reproductive diapause, but switched to diurnal activity in the wet season.

Here we report an observation and provide photographic evidence of nocturnal activity in *Pseudonascus paulliniae* (Sepp, [1842]) in French Guiana. Observations were made in complete darkness inside primary forest using a flash light on March 2, 2016 at 21:20 in the vicinity of St. Laurent, Plateau Mines (05°19' N, 54°04' W). An individual of *Pseudonascus paulliniae* (Fig. 1) was observed within a few centimeters from army ants that were devouring their insect prey. It appeared fully awake and flew off after photographs were taken. Neotropical skippers feeding on droppings left by birds that are following army ants is a well-documented phenomenon (e.g., Zikán, 1929; Austin *et al.*, 1993), but to our knowledge, this is the first observation that describes such a possible association at night time.

ACKNOWLEDGMENTS

We thank Andy Warren for identifying the skipper, our hosts and guides in French Guiana, Isabelle, Franck, Dennis, and Meg Keirsgieter, and André Freitas for helpful comments on the manuscript.

LITERATURE CITED

Austin, G. T., Brock, J. P., Mielke, O. H. H. 1993. Ants, birds, and skippers. *Tropical Lepidoptera* 4(suppl. 2): 1–11.

Burns, J. M., Janzen, D. H., Hallwachs, W. 2010. Of many similar species in the Neotropical genus *Porphyrogenes* (Lepidoptera: Hesperiidae), a new one, repeatedly reared in Costa Rica, is relatively distinct. *Proceedings of the Entomological Society of Washington* 112: 32-42.

Devries, P. J., Austin, G. T., Martin, N. H. 2008. Diel activity and reproductive isolation in a diverse assemblage of Neotropical skippers (Lepidoptera: Hesperiidae). *Biological Journal of the Linnean Society* 94: 723-736.

DeVries, P. J., Schull, J., Greig, N. 1987. Synchronous nocturnal activity and gregarious roosting in the neotropical skipper butterfly *Celaenorrhinus fritzgaertneri* (Lepidoptera: Hesperiidae). *Zoological Journal of the Linnean Society* 89: 89-103.

Jong, R. de. 1983. Revision of the Oriental genus *Matapa* Moore (Lepidoptera,

Fig. 1. *Pseudonascus paulliniae* (Hesperiidae) in French Guiana. This specimen was found fully alert several hours after dark in presumed association with foraging by the army ants.

Hesperiidae) with discussion of its phylogeny and geographic history. *Rijksmuseum van Natuurlijke Historie* 57: 243-270.

Kawahara, A. Y., Breinholt, J. W. 2014. Phylogenomics provides strong evidence for relationships of butterflies and moths. *Proceedings of the Royal Society of London B Biological Sciences* 281: 20140970.

Mielke, O. H. H. 1973. Contribuição ao estudo faunistico dos Hesperiidae americanos. III. Espécies coletadas em duas excursões ao Pará e Amapá, Brasil (Lepidoptera). *Acta Biologica Paranaense* 2: 17- 40.

Shimohigashi, M., Tominaga, Y. 1986. The compound eye of *Parnara guttata* (Insecta, Lepidoptera, Hesperiidae): Fine structure of the ommatidium. *Zoomorphology* 106: 131-136.

Warren, A. D., Ogawa, J. R., Brower, A. V. 2009. Revised classification of the family Hesperiidae (Lepidoptera: Hesperioidea) based on combined molecular and morphological data. *Systematic Entomology* 34: 467-523.

Yagi, N, Koyama, N. 1963. *The compound eye of Lepidoptera*. Tokyo, Maruzen & Co. 319 pp.

Zikán, J. F. 1929. Myrmekophilie bei Hesperiden? *Entomologische Rundschau* 46: 27–28.