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INDEPENDENT EVOLUTION OF "FALSE HEAD" BEHAVIOR IN RIODINIDAE

Although "false head" wing patterns and behaviors, particularly hindwing movements along the sagittal plane, are well-known among Lycaenidae (Robbins, 1980, *J. Lepid. Soc.* 34:194-208; 1981, *Am. Nat.* 118:770-775), it is less well-documented that some Riodinidae have similar wing patterns. It is reported here for the first time that some have also independently evolved hindwing movements similar to those of lycaenids. This situation is intrinsically interesting as an example of convergent evolution and is additionally significant for its phylogenetic implications.

Probably the best-developed riodinid "false heads" occur in *Helicopsis* Fabricius and some species of *Sarota* Westwood. These butterflies have multiple white-tipped tails and metallic markings at the anal angle of the ventral hindwing. They land with their wings folded over their backs, unlike many riodinids, and are often mistaken for Lycaenidae. Maj. Harold Harlan (Ohio State Univ., pers. comm.) first noted a specimen of *Sarota* (a species with hindwing tails) (Canal Zone, Panama) moving its hindwings while landed. In San Carlos de Rio Negro (Amazonas, Venezuela), I observed 11 specimens of *Helicopsis cupido erotica* Seitz and two specimens of *Anteros formosus* Cramer (a species that lacks hindwing tails) moving their hindwings. Curtis J. Callaghan (Petropolis, Brasil, pers. comm.) has also observed this behavior in *Helicopsis*, *Sarota*, and *Anteros* Hübner (and noted in addition that the long tails of *Helicopsis* are easily moved by breezes). Hindwing movements were previously reported only among Lycaenidae.

Hindwing movements in riodinids, as in lycaenids, may occur sporadically. The literature on lycaenid behavior includes cases where one observer noted hindwing movements, whereas, another did not in the same species under similar circumstances (Robbins, 1980, op. cit.). The same appears to be the case in riodinids. Whereas, I did not observe specimens of Panamanian *Sarota* moving their hindwings, Harlan did. Whereas, I noted individuals of *Anteros formosus* moving their hindwings in southern Venezuela, Callaghan did not when he came upon a swarm of this species in Brasil's Mato Grosso. These examples point out the difficulties of interpreting negative evidence with regard to sporadically occurring behaviors.

Although "false head" wing patterns and behaviors of lycaenids and riodinids are superficially similar, they differ in detail. Lycaenid anal lobes are everted outwards while tails project inwards and cross (see fig. 12 in Longstaff, 1912, *Butterfly-hunting in many lands*, Longmans, Green, and Co.). In contrast, both tails and anal lobes of *Helicopsis* flare outwards. Hindwing movements also differ. Lycaenids move both hindwings simultaneously; as one hindwing moves forward, the other moves backwards, and vice versa. In contrast, *Helicopsis* and *Anteros* may move one or both hindwings. If both are moved, they need not be in opposite directions. In addition, their movements are "jerky" and of short duration in contrast to lycaenid movements, but I saw too few specimens to quantify this difference. These morphological and behavioral differences support taxonomic evidence that the "false heads" of lycaenids and riodinids are independently evolved.

The distribution of lycaenid "false heads" are phylogenetically significant. Eliot (1973, *Bull. Brit. Mus. (Nat. Hist.) Entomol.* 28:6) suggested that Theclinae, Polyommatainae, and Lycaeninae form a monophyletic clade. Among the Lycaenidae, "false heads" are known only in these subfamilies and are the only characters of which I am aware that are unique to them. This being the case, it is desirable to have better documentation of the distribution of hindwing movements within the Lycaenidae, particularly among the many Old World tribes.

Riodinid "false heads" are also phylogenetically significant. Stichel (1930-1931, *Lepidopterorum catalogus*, pars 40) and Clench (1955, *Annals Carnegie Museum* 33:261-274) placed *Helicopsis* in its own tribe. Harvey (Univ. Texas, Austin, dissertation in prep.),

on the other hand, proposes that *Helicopsis*, *Sarota*, *Anteros*, and *Ourocnemis* Baker form a closely related group of genera. The behavioral evidence reported here supports Harvey's classification. Further, we can predict that specimens of *Ourocnemis* will be found to also move their hindwings.

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INTERACTIONS OF PARASITOIDS WITH AN *OPSIPHANES* (BRASSOLIDAE) CATERPILLAR IN COSTA RICA

Both hymenopteran and dipteran parasitoids are known to kill the caterpillars of *Opsiphanes* species (Brassolidae) in Central America (Harrison, 1963, Ann. Entomol. Soc. Amer. 56:87-94; Young & Muysshondt, 1975, Stud. Neotrop. Fauna 10:19-56). In these studies, wild-caught caterpillars on their monocot food plants (Musaceae and Palmae) are checked individually for emergence of parasitoids, with little or no direct observations on the ways in which these organisms interact with their host. In this note I describe some behavioral observations on both adult Tachinidae (Diptera) and Chalcidae (Hymenoptera) attempting to parasitize a single *Opsiphanes* caterpillar at the same time. Field observations on the interaction of hymenopteran and dipteran parasitoids on the same host are almost entirely absent in the entomological literature. Given the well-documented and studied roles of individual parasitoid species in the regulation of plant-associated insect populations in both the temperate and tropical zones (e.g., Jumalon, 1964, J. Lepid. Soc. 18:101-104; Herrebout, 1966, Z. Angw. Entomol. 58:340-355; Etchegaray & Nishida, 1975a, Proc. Hawaiian Entomol. Soc. 22:33-39; 1975b, Proc. Hawaiian Entomol. Soc. 22:41-49; Link, 1977, Dusenja 10:201-204; Zaucki, 1981, Aust. Entomol. Mag. 8:3-8; Olaifa & Akingbohunge, Insect Sci. Appl. 3:73-77; Roth et al., 1982, Environ. Entomol. 11:273-277; Stamp, 1982, Environ. Entomol. 11:100-104; Courtney & Duggan, 1983, Ecol. Entomol. 8:271-278; Elzen et al., 1983, Environ. Entomol. 12:1872-1876; Grant & Shepard, 1983, Environ. Entomol. 12:1673-1677; Messina, 1983, Environ. Entomol. 12:807-809; Oatman et al., 1983, J. Econ. Entomol. 76:52-53; Thompson et al., 1983, Environ. Entomol. 12:1312-1314; Maier, 1984, Can. Entomol. 116:443-449; Marston et al., 1984, Ann. Entomol. Soc. Amer. 77:21-28), the field study of the ways in which different parasitoids "interact" at the same host may clarify certain aspects of how these organisms regulate populations of phytophagous species (e.g., Van Driesche, 1983, Environ. Entomol. 12:1611-1622).

A fifth instar caterpillar of *Opsiphanes* sp. was found partly concealed within a silken sleeve on a single pinna of a coconut palm (*Cocos nucifera* "dwarf" variety) on 7 March 1984 at "Finca Experimental La Lola," about 15 km east of Siquirres (10°06'N, 83°30'W), Limon Province, Costa Rica. From 7 to 16 March, I made daily observations at various hours on the presence of tachinids and hymenopterans with this caterpillar. These observations were initiated when, at 1745 h on 7 March, I observed a tachinid (described as "red eyes with gray and white striped body and wings held at about 45° angle to the body") "buzzing" around the caterpillar as the latter crawled towards the silken sleeve from an apparent feeding site elsewhere on the tree (about 2.0 m tall). On 16 March the