Seasonal Short-Term Diapause in the False Locust Skipper, Chioides marmorosa (Lepidoptera: Hesperiidae, Eudaminae), from Cuba

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Additional key words: Eudaminae, *Chioides*, larval diapause, natural history, temperature, West Indies

Virtually unknown for more than 100 years after its description, the Cuban endemic skipper *Chioides marmorosa* (Herrich-Schäffer, 1865) was rediscovered in the 1990s near its historic western range (Roque-Albelo et al. 1995). Ten years later, a new population was discovered at low altitude in the Trinidad mountains at the center of the island (Núñez 2004). More recently the species was also recorded at Viñales, Pinar del Río, expanding its range 100 km to the west (Barro & Núñez 2011).

The species has become one of the most studied Cuban skippers following the discovery of a population in the vicinity of San Antonio de los Baños, about 25 km south-west of Havana, close to its historical location in the eastern coastal limits of Havana city (Núñez and Armas 2015, Armas and Núñez 2015). An interesting aspect of the natural history of this skipper noted by these authors was "the possible existence of at least a short-term larval diapause or dormancy due to lack of food" (Núñez and Armas 2015). Based on their observations between November 2014 and March 2015, the duration of the final instar was, in some cases, longer than three months. However, additional data obtained by Armas and Núñez (2015) between February and September 2015 showed that the duration of the final instar varied from 12 to 48 days only, and larval diapause was not detected during that time.

Based on new observations of the San Antonio de los Baños population conducted between August 2015 and March 2016, we found that the final instar of *C. marmorosa* enters in diapause or dormancy.

In December 2015, we observed in the field, and also in the laboratory, that some final instar larvae, despite having available food, did not eat. The larvae survived for 25 to 60 days as relatively long-term final instar without feeding similar to that previously recorded by Núñez and Armas (2015).

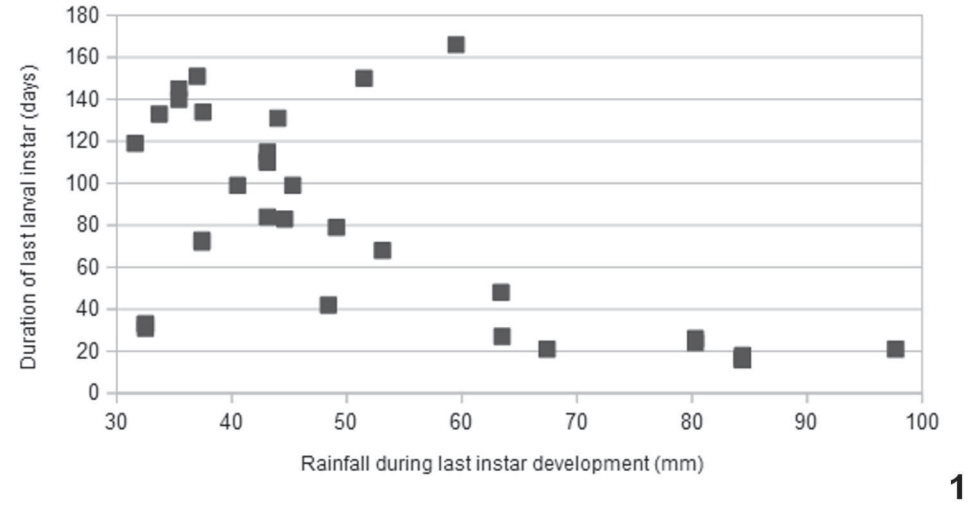
Several final instar larvae that had defoliated their hostplant remained without feeding in their larval shelters for 24 to 100 days between November and March 2015. Armas & Núñez (2015) recorded 16–48 days for the last instar larvae between March and September. Most of these larvae pupated directly from the diapause state, but some larvae fed after the diapause and then pupated.

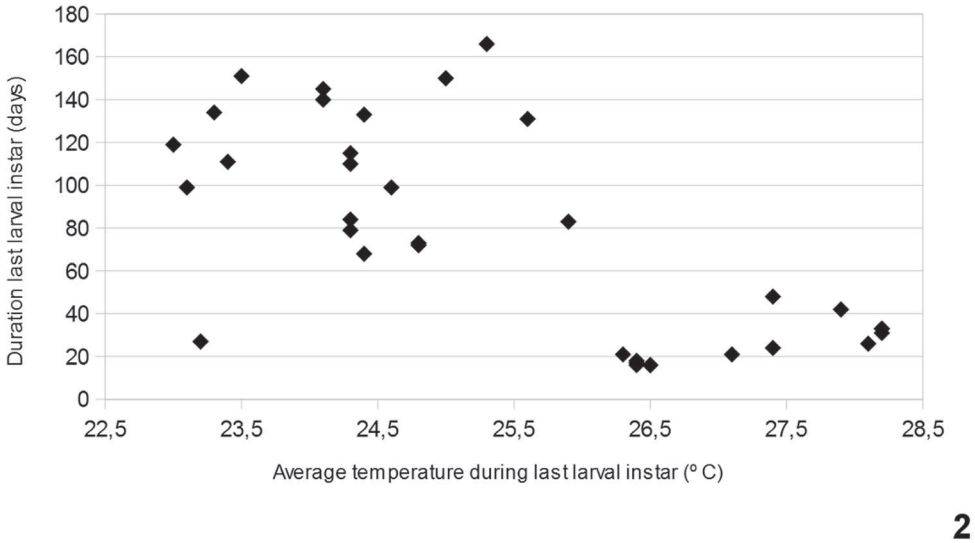
Between May and September 2015, 2 (8.3%) of the 24 pupae observed in the field died. During the period November 2015 to March 2016 the 26 pupae that underwent diapause were kept under observation in the field and, of these, 4 (15.4%) did not hatch. This suggests that short-term diapause might increase mortality of the pupae, but the result is not conclusive and additional observations are needed.

From these observations it is evident that in *C. marmorosa* larval diapause occurs only in the final instar and is restricted to the winter season, associated with the quality of food and its availability. The latter can be affected by defoliation of the host-plant by the larvae and other insects (there are other species that feed on the tree) and the drought during the winter months affects the quality of the foliage; it is much dryer in western Cuba lowlands than the rest of the island (Figure 1). During our study period there was also a noticeable drop of 3.4 °C in average daily temperature during the winter, (average 23.8 °C in winter months November to April, vs. 27.2 °C in summer May to October) which may also have contributed to a slower development (Figure 2). In each figure a change is noted in the duration of the final instar in relation to each abiotic factor, though in both cases exceptions are present. The result is that the span of the immature stage (larvae + pupa) is extended to 5 or 6 months during the winter months. Armas & Núñez (2015) recorded immature periods of only 1.5–3.0 months between February and October.

This is the first time in which seasonal diapause is recorded for a butterfly species in Cuba. Much has been published on larval diapause in Lepidoptera inhabiting temperate regions; however, there is little detailed information on the process in tropical species. Denlinger (1986) reviewed this topic for insects in general noting some Lepidoptera examples but Hesperiidae were not mentioned. Janzen (2004) referred to species of several families, only Papilionidae among butterflies, whose prepupa go through long dormancy periods in dry seasonal forest in Costa Rica.

The few examples we found in the literature on tropical Hesperiidae give only indirect evidence of aestivation in the larval stage due to the absence of adults or other life stages during certain periods of the year (Grund & Hunt 2001, Larsen 2005, Franklin 2011, Palmer & Braby 2012). The only detailed case we found





FIGS. 1–2. Duration in days of the final instar of 36 larvae of *Chioides marmorosa* relative to rainfall and average temperature during final larval instar (Data collected between March 2015 and March 2016 in a population from San Antonio de Los Baños, Artemisa, Cuba). **1**. Rainfall. **2**. Average temperature. Data on temperature and rainfall are from a meteorological station at 4.7 Km south of the studied area.

refers to the larvae of *Hesperia metea* which aestivate during the hot period from late July to early September in Texas (Heitzman & Heitzman 1970). These larvae hibernate during winter as final instars. All of the above cases relate to monocotyledon feeders and members of the subfamilies Trapezitinae and Hesperiinae and this behavior has not been previously reported in the Eudaminae.

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