

## *Theope* spp. butterflies (Lepidoptera, Riodinidae) mating at night

Observations of butterflies mating by night are infrequent and this behaviour is poorly understood. For example, Cannon (2020) does not mention it in his book *Courtship and Mating in Butterflies*, and there is very little literature addressing this topic. Accordingly, we report four observations from Trinidad and Tobago involving *Theope* spp. (Riodinidae).

Butterflies *in copula* are much less mobile than individual butterflies, and any camouflage patterns are likely to be disrupted, so that they must be more vulnerable to predation, for example by birds. Hence, mating by day will normally be as quick a process as practical unless there are other significant advantages to prolonged mating. Shields and Emmel (1973) summarised observations on butterfly mating duration, which may be extended due to lowered temperatures. They mentioned that *Danaus* may pair overnight, and species of several genera of Nymphalidae and Lycaenidae mate in the late afternoon to early evening. Scott (1973) also summarised information on the duration of mating in butterflies, most species taking 10 minutes to several hours, and some Papilionidae, Pieridae and Nymphalidae noted as occasionally or frequently (*Pontia protodice* (Boisduval & Leconte) Pieridae) mating overnight. Laboratory studies by Svård and Wiklund (1988) showed that mating in *Danaus plexippus* (Linnaeus) (Nymphalidae) started by day, but sperm transfer did not happen until nightfall, the pair sometimes remaining *in copula* until daylight. They discussed the potential importance to the male of mate guarding by prolonged mating in order to prevent other males from mating with the same female (see also Cannon 2024). The only recent study we found was that of Molleman *et al.* (2020) who studied mating of the Old World tropical satyrine, *Melanitis leda* (Linnaeus) in captivity. They found that mating was initiated around either dawn or dusk. Although the dawn matings usually lasted an hour or more, and not more than three hours, 42% of the dusk matings lasted overnight. They were unable to establish why mating might last all night, or what advantages there might be in this specific case, but they discounted mate guarding by night as an explanation since there is no mate competition by night. They went on to suggest that the butterflies may have simply followed their normal daily behaviour and fallen asleep at night while still *in copula*.

During the course of night walks (Deo *et al.* 2020), Rainer N. Deo photographed mating *Theope* butterflies at rest in Tobago at 2314h (Fig. 1) and Trinidad at 0316h (Fig. 2) and 2016h (Fig. 3). While making observations in his yard in Trinidad at dusk, Tarran P. Maharaj observed and photographed a pair of a different species of *Theope*

at 1816h (Fig. 4).

The pair in Fig. 1 was photographed in Tobago, where the only known Tobago species of *Theope* with a plain yellow ventral surface is *T. eudocia* Westwood (Barcant 1970, Cock 2017). *Theope eudocia* shows sexual dimorphism, with the male usually larger and with more pointed wings, as here, so that we are confident of the identity of this species. In contrast, in Trinidad, where Fig. 2 was taken, *T. pedias* Herrich-Schäffer, *T. excelsa* Bates, and *T. aureonitens* Bates, as well as *T. eudocia*, all have the ventral surface plain yellow or yellow-orange. *Theope pedias* shows only very slight sexual dimorphism in wing shape; this is a little more pronounced in *T. aureonitens*, and more so in *T. excelsa*, comparable to *T. eudocia*. *Theope excelsa* is larger than the other species, but this cannot be judged from a photograph. However, these three species are considerably less common than *T. eudocia* in Trinidad (Barcant 1970), so it is likely that Fig. 2. also represents *T. eudocia*.

Unlike the other two species treated here, this pair of *T. phaeo* Prittwitz (Fig. 3) is immediately recognizable by the distinctive wing shape and markings. In Trinidad, only *T.*



**Fig. 1.** Mating pair (female on left) of *Theope eudocia*, Tobago, Main Ridge Forest Reserve, 7 August 2020 at 2314h. Photo R.N. Deo.



**Fig. 2.** Mating pair (female on right) of *Theope ?eudocia*, Trinidad, Brasso Seco, 24 July 2021 at 0316h. Photo R.N. Deo.



**Fig. 3.** Mating pair (female above left) of *Theope phaeo*, Trinidad, Arima Valley, entry road to Asa Wright Nature Centre, 14 May 2024 at 2016h. Photo R.N. Deo.



**Fig. 4.** Mating pair (female on right) of *Theope* sp. *foliorum* or *lycaenina*, Trinidad, South Oropouche, Mon Desir, 23 February 2010 at 1816h. Photo T.P. Maharaj.

*terambus* (Godart) (misidentified as *T. syngenes* Bates in Barcant (1970)) has a similar wing shape, but that species is larger and has a dark, diffuse medial line across both wings, and a small, black-centred white spot at the hindwing tornus. Barcant (1970) misidentified the male of *T. phaeo* as *T. apheles* Bates and the female as *T. thootes* Hewitson, but neither of these species is found in Trinidad (M.J.W. Cock and J.P.W. Hall unpublished).

The pair photographed in Trinidad in Fig. 4 have plain grey ventral wings, which indicates one of three species: *T. foliorum* Bates, *T. lycaenina* Bates or *T. leucanthe* Bates (Barcant 1970, M.J.W. Cock and J.P.W. Hall unpublished). *Theope foliorum* and *T. lycaenina* have a row of three to six black dots on the ventral hindwing margin, the two nearest the tornus being more pronounced, and those towards the apex increasingly faint. Hence, in ventral view, the two species cannot be reliably separated. In contrast, *T. leucanthe* has a row of black dots on the margins of both ventral wings. Based on these characters, we consider Fig. 4 to be either *T. foliorum* or *T. lycaenina*.

These are the first observations we have found of Riodinidae butterflies mating by night. In isolation, they tell us little about the mating systems of these species, and the behaviour of the three species of *Theope* is not necessarily the same, although observations of three different species of *Theope* mating at night may indicate a common pattern. The timing suggests that courtship and the initiation of mating occurs late afternoon and may continue until the butterflies are disturbed or until dawn. Mate guarding is a potential explanation for continuing mating into the late afternoon, but as these butterflies are not believed to be active at night, the advantages of remaining *in copula* after dark are not obvious. Perhaps the transfer of sperm is more effective if carried out over a prolonged period, and this can be safely done under the cover of darkness.

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