

Three observation of interspecific mating attempts by males of the Meadow Brown (*Maniola jurtina* (LINNAEUS, 1758)) in the wild (Lepidoptera, Nymphalidae: Satyrinae, Heliconiinae)

Lukáš SPITZER, Jiří BENEŠ, Pavel VRBA and Marek ZLATNÍK

Lukáš SPITZER, MSc., Faculty of Sciences, University of South Bohemia, Branišovská 31, CZ-370 05 České Budějovice, Czech Republic; spitzerl@yahoo.com. – Department of Ecology and Conservation, Institute of Entomology, Czech Academy of Sciences, Branišovská 31, CZ-370 05 České Budějovice, Czech Republic. – Correspondence: Regional Museum Vsetín, Horní náměstí 2, CZ-755 01 Vsetín, Czech Republic.

Jiří BENEŠ, Department of Ecology and Conservation, Institute of Entomology, Czech Academy of Sciences, Branišovská 31, CZ-370 05 České Budějovice, Czech Republic; benesjir@seznam.cz.

Pavel VRBA, Faculty of Sciences, University of South Bohemia, Branišovská 31, CZ-370 05 České Budějovice, Czech Republic, vrba_pavel@centrum.cz. – Department of Ecology and Conservation, Institute of Entomology, Czech Academy of Sciences, Branišovská 31, CZ-370 05 České Budějovice, Czech Republic.

Marek ZLATNÍK, Kollárova 116, CZ-506 01 Jičín, Czech Republic, mz116@seznam.cz.

Abstract: We report three observations of interspecific mating events between males of *Maniola jurtina* (Nymphalidae: Satyrinae) and females of three butterfly species, *Aphantopus hyperanthus* and *Erebia aethiops* (both Nymphalidae: Satyrinae) and *Argynnis aglaja* (Nymphalidae: Heliconiinae), all under natural conditions. While the pairings with Satyrinae females happened lately in *M. jurtina* flight period, and could be attributed to mate recognition mistakes, the pairing with *A. aglaja* was observed relatively early in *M. jurtina* flight, and we speculate that males reacted to supraoptimal visual stimulus.

Key words: interspecific copulation, mate recognition mistakes, *Argynnis*, *Aphantopus*, *Erebia*, Czech Republic.

Drei Fälle von interspezifischen Paarungsversuchen von Männchen von *Maniola jurtina* (LINNAEUS, 1758) im Freiland (Lepidoptera, Nymphalidae: Satyrinae, Heliconiinae)

Zusammenfassung: Drei Beobachtungen von interspezifischen Paarungen zwischen Männchen von *Maniola jurtina* (Nymphalidae: Satyrinae) und Weibchen von drei verschiedenen anderen Arten (*Aphantopus hyperanthus* und *Erebia aethiops*, beides ebenfalls Nymphalinae: Satyrinae, sowie *Argynnis aglaja*, Nymphalidae: Heliconiinae) werden vorgestellt. Während die Paarungen mit den Satyrinenweibchen spät in der Flugzeit von *M. jurtina* stattfanden und als Fehler in der Arterkennung der Männchen mangels arteigener Weibchen interpretiert werden können, fanden die Paarungen mit *Argynnis aglaja* zu Beginn der Flugzeit von *M. jurtina* statt, und wir vermuten, daß es dabei um überoptimale optische Anreize ging.

Introduction

Although hybridisation between butterflies occurs rather commonly in nature, as summarized by a recent review by DESCIMON & MALLETT (2009), the mating events are rather rarely observed and reported. Observations of *in copula* pairs seem to be more frequent among phylogenetically and/or morphologically close species, such as congeneric pairings between burnet moths (Zygaenidae) (e.g., SKALA 1913, JANICKE 1989, YOUNG et al. 2007), hairstreaks (EDMONDS 1979), nymphalids (GREENEY et al. 2006), swallowtails (HEREAU & SCRIBER 2003), apollo butterflies (DESCIMON et al. 1989, cf. DESCIMON & MALLETT 2009), or among skippers (Hesperiidae) (BLANCHEMAIN 1999). Besides of these pairings among closely related species, there exist observa-

tions of pairings between representatives of different, and distantly related, families, such as between ♂ of the arctiid moth *Amata phegea* (LINNAEUS, 1758) and ♀ of the burnet moth *Zygaena filipendulae* (LINNAEUS, 1758) (NOVOTNÝ et al. 2009), or – again – ♀ *Z. filipendulae* and ♂ of the arctiid moth *Tyria jacobaeae* (LINNAEUS, 1758) (WILLIAMS 1914, TREMEWAN 2005). These rare cases are attributable to mate recognition mistakes, as the moths in question share diurnal habit and mimic each other (*A. phegea* and *Zygaena* spp.), or display similar wing colors (*T. jacobaeae* and *Zygaena* spp.). The rarest, and most difficult to interpret, are observations of *in copula* pairs among unrelated species differing in body size and wing shape and pattern, such as that between ♂ *Lycaena helloides* (BOISDUVAL, 1852) and fresh ♀ *Vanessa* (= *Cynthia*) *annabella* (FIELD, 1971) (SHAPIRO 1973).

Here, we report three observations of interspecific pairings of the Meadow Brown ♂♂ (*Maniola jurtina* LINNAEUS, 1758) with ♀♀ of three species of nymphalid butterflies, two rather related – *Aphantopus hyperanthus* (LINNAEUS, 1758) and *Erebia aethiops* (ESPER, 1777) –, belonging to the subfamily Satyrinae just like *M. jurtina* itself, and one rather unrelated species of the subfamily Heliconiinae – *Argynnis aglaja* (LINNAEUS, 1758). All three observations originated from the Czech Republic, year 2009.

Material

- Moravia mer., Kudějov, Kamenný vrch reserve (7066, 48°57'58"N, 16°45'8"E), 330 m alt., 9. VIII. 2009, 14:20 h CEST; ♂ *Maniola jurtina* & ♀ *Aphantopus hyperanthus*, Marek ZLATNÍK observ. et det., Jiří BENEŠ revid. Observed for ca. 100 min, and not until termination.

The habitat was a south-oriented calcareous grassland. Both species are abundant at the locality, but in the observation day, in late season for both species, there were about 20 *M. jurtina* and 2 *A. hyperanthus* individuals present in close vicinity of the near mating pair, and both the ♂ and the ♀ were quite heavily worn, presumably old, individuals (Fig. 1).

- Bohemia mer., Studánky nr. Vyšší Brod (7451, 48°35'42"N, 14°20'32"E), 670 m alt., 26. VII. 2009, 14:40 h CEST; ♂ *Maniola jurtina* & ♀ *Erebia aethiops*,

Pavel VRBA observ. et det. Observed for ca. 10 min, the pair then flew away, still *in copula*.

The habitat was a dry woodland mantle, with dozens *M. jurtina* individuals (both sexes) and three *E. aethiops* individuals (2 ♂♂, 1 ♀). While the *M. jurtina* ♂ was quite worn, the *E. aethiops* ♀ appeared fresh (Fig. 2).

- Moravia or., Velké Karlovice, part Bzové (6675, 49°22'16"N, 18°15'47"E), 575 m alt., 12. VII. 2009, 14:20 h CEST; ♂ *Maniola jurtina* & ♀ *Argynnis aglaja*, Jiří BENEŠ & Lukáš SPITZER observ. et det. Observed for ca. 15 min.

The habitat was south-oriented mountain pasture. The pairing took place under sunny weather, the pair alternated sitting on vegetation with short flyovers, the ♀ actively carried the pair. *M. jurtina* was abundant (hundreds of individuals), *A. aglaja* was present in dozens of individuals. Both individuals appeared rather fresh.

Discussion and conclusion

We observed 3 ♂♂ of *M. jurtina* pairing with ♀♀ of 3 different species of the family Nymphalidae. The pairings with same-subfamily ♀♀, *A. hyperanthus* and *E. aethiops*, are attributable to simple mate-recognition mistakes (DESCIMON & MALLET 2009), as both *A. hyperanthus* and *E. aethiops* ♀♀ are visually quite similar to ♀♀ of *M. jurtina*. ♂♂ of *M. jurtina* seek for ♀♀ by slow patrolling flights over herbaceous vegetation, presumably using visual orientation. In addition, both sexes usually show aggregated behavior, which facilitates meeting of sexes (BRAKEFIELD 1982). The pairing with *A. aglaja* (subfamily Heliconiinae) is more intriguing, as the two species are phylogenetically distant, and *A. aglaja* differs from *M. jurtina* slightly in forewing length (*M. jurtina*: 23–26 mm, *A. aglaja*: 23–32 mm) but considerably in wing area

(much larger in *A. aglaja*), coloration (brown with rusty spots in *M. jurtina*, brightly reddish with black checker in *A. aglaja*), and pearly pattern on ventral hind wings (never present in subfamily Satyrinae).

Given the wing wears of observed individuals, and the general rule (e.g., RUTOWSKI 1998) that butterfly ♂♂ maximize their fitness by preferential mating with fresh ♀♀, whereas old or unmated ♀♀ may actively solicitate mating, we can speculate on circumstances of the three mistakes.

The first Satyrinae case was observed rather lately in *M. jurtina* ♂♂ flight period, which usually begins in late June/early July, and very lately for an *A. hyperanthus*, whose flight usually begins earlier than that of *M. jurtina* (BENEŠ et al. 2002). It is hence possible that there were not enough *M. jurtina* ♀♀ present, and in the same time, the worn *A. hyperanthus* ♀ could had been less inclined to avoid mating, as old and/or unmated *A. hyperanthus* ♀♀ are known to actively solicit copulation (WIKLUND 1982). The pairing with *E. aethiops* ♀ also occurred lately in *M. jurtina* flight, when there was possible shortage of receptive *M. jurtina* ♀♀. The mating with *A. aglaja* ♀ is somehow more intriguing. Receptive *A. aglaja* ♀♀ wait for patrolling ♂♂ hidden in vegetation (ZIMMERMANN et al. 2009). Speculatively, the *M. jurtina* ♂ could have responded to such a ♀ as to supernormal stimulus, a reaction which is well established in many taxa (e.g., KREBS & DAVIES 1997), but rarely considered in butterflies (e.g., TINBERGEN et al. 1942).

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Fig. 1: Photograph of *M. jurtina* with *A. hyperanthus* copulation. Fig. 2: Photograph of *M. jurtina* with *E. aethiops* copulation.

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