

Record of a male-male tandem formation of the Banded Demoiselle, *Calopteryx splendens* (HARRIS, 1780) (Odonata: Zygoptera)

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Abstract

The observation of a male-male tandem of the Banded Demoiselle *Calopteryx splendens* (HARRIS, 1780) is documented. In the discussion, special emphasis is placed on the explanation of the curved abdomen of the seized male. The record was made at the lower reach of the River Traisen (Lower Austria) on 19.VI.2024.

Key words. Lower Austria, Zygoptera, Calopterygidae, *Calopteryx splendens*, damselflies, anomalous connection, male-male tandem linkage.

Zusammenfassung

Die Beobachtung eines Männchen-Männchen-Tandems der Gebänderten Prachtlibelle *Calopteryx splendens* (HARRIS, 1780) wird dokumentiert. In der Diskussion wird besonderes Augenmerk auf die Erklärung des gebogenen Abdomens des ergriffenen Männchens gelegt. Die Sichtung fand am 19. Juni 2024 am Unterlauf der Traisen (Niederösterreich) statt.

Introduction

“Mating errors” and anomalous connections within the reproductive behaviour of Odonata have been documented and discussed extensively. Below is a small selection from the broad literature on this topic: EDA (1970), BICK & BICK (1981), UTZERI & BELFIORE (1990), CORBET (1999), MILLER & FINCKE (2004), KUNZ (2010, 2015) CHOVANEC (2017, 2022a, b, 2025), WORTHEN (2018), CHOVANEC & SCHAUFLE (2023), WILDERMUTH et al. (2023), QUANTE & STUMPNER (2025). This paper presents the documentation of a male-male tandem of the Banded Demoiselle, *Calopteryx splendens* (HARRIS, 1780), observed at the River Traisen in Lower Austria.

Observation site and time

The sighting took place on 19.VI.2024 in a 100-metre-long survey section situated at the lower reach of the River Traisen (Lower Austria; 48.37250° N, 15.81138° E; 185 m above sea level; Fig. 1) at 13:01 CEST in sunny weather, with air temperatures of approximately 30 °C. The Traisen is a right-bank tributary of the Danube. The observed river reach and its accompanying floodplains were subject to an odonatological study in 2024 (MAYER et al. 2024). This part of the Traisen is classified as an epipotamon zone, with *C. splendens* being a river type-specific reference species (CHOVANEC 2019).



Fig. 1: Investigated site at the lower reach of the River Traisen (Lower Austria), where the tandem was recorded, 29.V.2024. © M. Mayer.

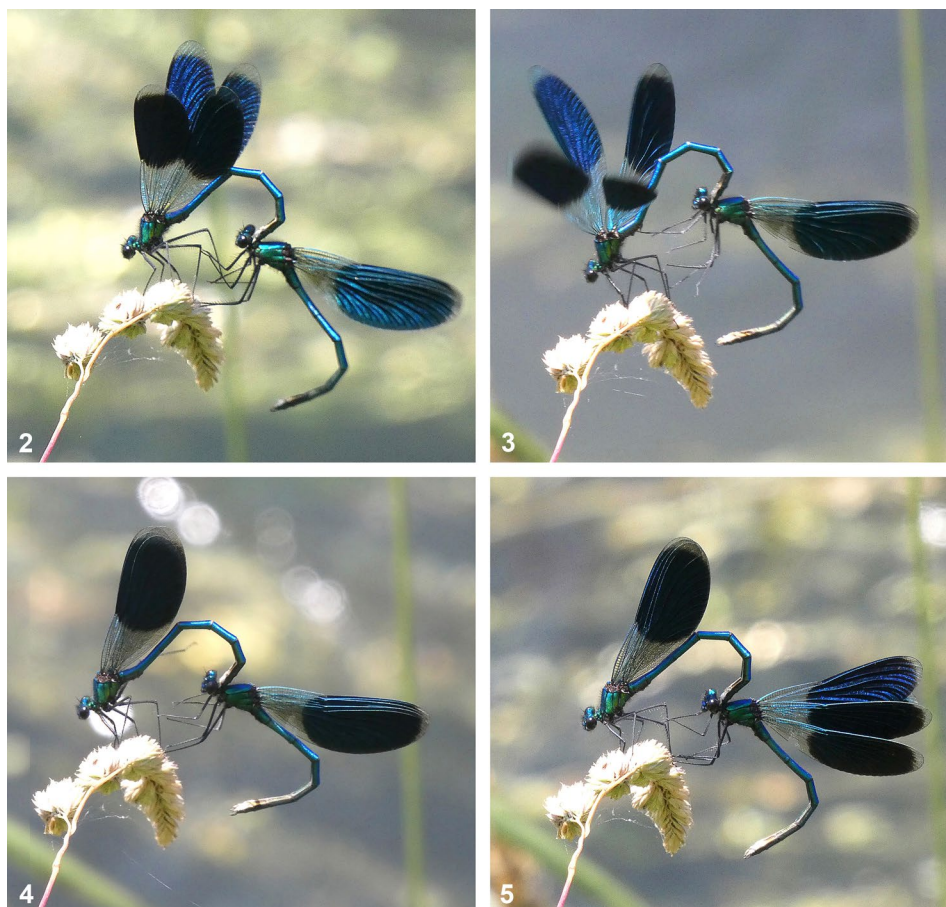
On 19.VI.2024, approximately one hundred individuals of *C. splendens*, including freshly emerged specimens, were observed in the investigated river section. An exuvia of the species was also collected on that day. A significantly higher number of males were noted, with only one copula recorded during survey. Additionally, on the day of the survey, 16 individuals of the Blue Featherleg, *Platycnemis pennipes* (PALLAS, 1771) (including freshly emerged specimens, as well as copulae, tandems, and ovipositions), four individuals of the Blue-tailed Damselfly, *Ischnura elegans* (VANDER LINDEN, 1820), and a freshly emerged Small Pincertail, *Onychogomphus forcipatus* (LINNAEUS, 1758), along with its exuvia, were found at the site.

Observation

The tandem linkage between the two males (Figs 2–5) was already established at the time of sighting. It was observed for approximately two minutes before separating. The grasping male (M1) exhibited significantly more wing movements during the linkage (Figs 2, 3). The wing clapping of M1 appeared to subside only when the legs of M2 achieved a more stable contact with the perch and the hind legs of M1, leading to a more compact tandem positioning (Figs 4, 5). In this posture, the abdominal movements of M1 became restricted.

Discussion

In species of *Calopteryx*, erroneous connections in various variations are relatively common (SCHMIDT 1926, BICK & BICK 1981, WILDERMUTH 1984, UTZERI & BELFIORE 1990, LINDEBOOM 1996, CORBET 1999, MILLER & FINCKE 2004, RÜPPEL et al. 2005, KARJALAINEN



Figs2–5: Phases of the male-male tandem of *Calopteryx splendens*, in which M1 (on the left) attempts to perform intra-male sperm translocation as part of pre-copulation behaviour, or – if this has already occurred – motivates M2 to close the mating wheel, 19.VI.2024. © M. Mayer.

2013, WILDERMUTH & MARTENS 2019, QUANTE & STUMPNER 2025). Heterospecific connections occasionally lead to copulation (e.g., WEICHSEL 1985), and even to hybridisation (DUMONT et al. 1987, 1997, MAIBACH 1987, TERZANI 1993, TYNKKYNNEN et al. 2008, LORENZO-CARBALLA et al. 2014). It should be noted in this context that the issue of taxonomic classification in *Calopteryx*, particularly in the *splendens* species group, has not yet been definitively resolved.

Connections between two males of *C. splendens* were already described by SCHMIDT (1926; see also for example QUANTE & STUMPNER 2025). RÜPPELL & HILFERT-RÜPPELL (2024) documented an intra-specific triple linkage (“Type A” sensu EDA 1970) involving two males and one female (see also QUANTE & STUMPNER 2025). KARJALAINEN (2013) recorded an inter-specific Type A triple linkage consisting of two *C. splendens* males and one *C. virgo* female. RÜPPELL & HILFERT-RÜPPELL (2023, 2024) reported a “Y-shaped linkage”

sensu WADA (2000), in which two *C. splendens* males were attached to a female, with the second male attempting to disrupt an existing tandem (see also HILFERT-RÜPPELL & RÜPPELL 2008, JANA et al. 2022).

The images published here show that M1 strongly arches its abdomen, similar to the “classical” mating posture. Possibly, M1 is attempting sperm transfer from its genital opening at the ventral ninth abdominal segment to the secondary genital apparatus at the ventral second abdominal segment by bending its abdomen while vigorously beating its wings. Alternatively, sperm transfer may have already taken place before the observation began, and M1 is attempting to encourage M2 to close the mating wheel. It remains uncertain whether M1 is urging M2 to copulate without prior sperm transfer. Vigorous wing clapping during pre-copulation and copulation is commonly exhibited by *Calopteryx* spp., even on stable perches (HEYMER 1973).

The seized male, M2, displayed no obvious defensive or threatening movements through intense wing beating, as has been documented for Calopterygidae and other families (BUCHHOLTZ 1951, PAJUNEN 1963). If sperm transfer has not yet occurred, M1 is particularly hindered by the defensive leg movements of M2.

Notably, the forward-bent abdomen of M2 appears to signal a “readiness” to complete the mating wheel. A similar body posture in intra-specific male tandems in *Calopteryx* spp. can be seen in images published by RÜPPELL et al. (2005: *C. virgo*), RÜPPELL & HILFERT-RÜPPELL (2024: *C. splendens*), and QUANTE & STUMPNER (2025: *C. splendens*). In the present case, the reason why M2 bent its abdomen may be that this individual had grasped a female before releasing it upon being taken by M1. The muscular tension built up in the abdomen during sperm transfer and mating wheel formation could persist after releasing the female, resulting in this unusual posture. This may also be the reason for the abdominal posture of the previously mentioned seized *C. virgo*- and *C. splendens*-males depicted by RÜPPELL et al. (2005) and QUANTE & STUMPNER (2025).

However, this explanation does not apply to the *C. splendens* tandem documented by RÜPPELL & HILFERT-RÜPPELL (2024): The grasped M2 was juvenile and not yet fully coloured, making it unlikely that it had previously captured a female. Thus, in all four cases, the posture of the abdomen might have a static background – bending forward may help the male maintain a relatively straight head posture even in the unfamiliar hanging position.

The image of the *C. splendens* tandem documented by RÜPPELL & HILFERT-RÜPPELL (2024) particularly resembles an attempt by M1 to form a mating wheel with M2. The analysis of relevant video recordings further supports this explanation (G. Ruppell, personal communication, 10.III.2025).

In the case documented here, the motivation of M1 to grasp another male may stem from high sexual stimulation combined with a low availability of females (see also WADA 2000, WÜNSCH et al. 2013, BROCKHAUS 2014, CHOVANEC 2022a, 2024). SWITZER & SCHULTZ (2000) discussed whether male-male tandems might represent an aggressive form of “mate guarding”. This interpretation suggests that territorial males may occasionally seize conspecifics approaching the females they are guarding during oviposition and transport them out of the territory (see also RÜPPELL & HILFERT-RÜPPELL 2024). In such cases, the phenomenon would not be classified as an erroneous or anomalous connection. However, since no ovipositing females were observed near the sighting location and M1 exhibited typical reproductive behaviours, this explanation for the male-male tandem in the present case must be ruled out.

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