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**Intensive feeding of the robberfly *Eutolmus rufibarbis*
(Diptera Asilidae) on the damselflies
Enallagma cyathigerum and *Lestes sponsa* (Odonata)**

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Summary

*During a population study of the damselfly *Lestes sponsa* at a fen in northern Belgium several predatory acts of *Eutolmus rufibarbis* on the damselfly species *Enallagma cyathigerum* and *L. sponsa* were reported. Despite the sporadic nature of our observations we noted 44 damselflies killed by this robber fly. All animals were caught in flight. More males than females were eaten. This reflects the male biased sex-ratio of both damselfly species at the fen. Our data suggest that robber fly predation may form an important mortality factor of adult damselflies in our study population.*

Key words: Asilidae, predation, *Eutolmus rufibarbis*, Zygoptera, *Enallagma cyathigerum*, *Lestes sponsa*.

Introduction

There is a wide spectrum of animals feeding upon mature dragonflies (REHFELDT, 1995). Despite the extensive list of sporadic observations of asilids feeding on Odonata (see LAVIGNE, 1976 and PLATT & HARRISON, 1995) there is only one study reporting regular predatory acts (MOSS, 1992). We report here on the intensive feeding of the robber fly *Eutolmus rufibarbis* (MEIGEN, 1848) on two damselfly species at a heathland fen.

Materials & Methods

All observations were made at a fen in the 'Groot Schietveld', a large heathland relic in the north of Belgium (Brasschaat). This fen is surrounded by a heathland dominated by *Molinia*. To the north this zone is border-

ed by a pine forest. While studying a population of the damselfly *Lestes sponsa* (HANSEMANN, 1823) data were collected on robber fly predation on 4, 6, 8 and 9 August and 4 September 1996. The robber fly was identified with VAN VEEN (1996). In this period two damselfly species were particularly abundant: *Lestes sponsa* and *Enallagma cyathigerum* (CHARPENTIER, 1840). All differences between sexes and ages were analysed using binomial tests. Exact two-sided p-values were calculated with StatXact 3.0 (MEHTA & PATEL, 1995).

Results

In total 44 acts of predation by *E. rufibarbis* on damselflies were observed: 28 on *E. cyathigerum*, and 16 on *L. sponsa*. At all these occasions, the flies caught the damselflies close to the fen, in the *Molinia* vegetation. The asilids were sitting on the stems waiting for damselflies that flew low overhead. They caught their prey in flight and flew away, mostly in the direction of the pine forest. At one occasion, we saw a copulating pair of *E. rufibarbis* sitting on a *Molinia* stem of which the female was eating a male *E. cyathigerum*.

The robber flies ate more males than females of *E. cyathigerum* ($p < 0.001$). In *L. sponsa* the same may be true, but the difference was just not significant ($p = 0.077$) (Fig. 1). Also mature specimens were more abundant as prey item than teneral in *E. cyathigerum* ($p < 0.001$), but there was no difference in *L. sponsa* ($p = 0.80$) (Fig. 2). We observed one male *E. cyathigerum* being caught while still in tandem with his female. After the male was killed, the tandem link broke, and the female could escape.

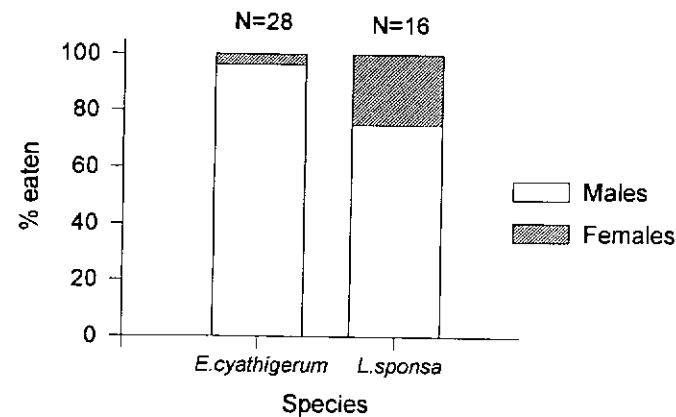


Fig. 1. Sex of *E. cyathigerum* and *L. sponsa* taken by *E. rufibarbis* (numbers above the bars represent the sample sizes).

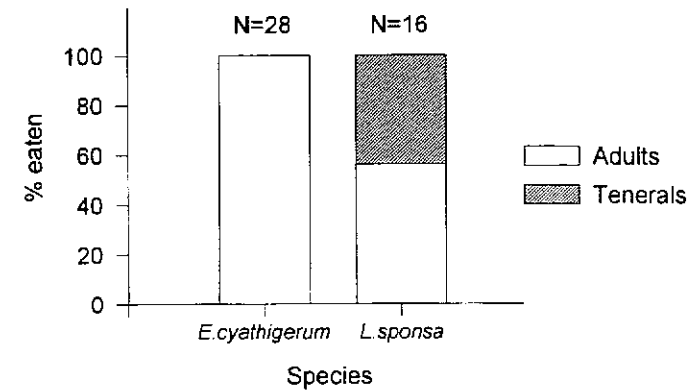


Fig. 2. Maturity status of *E. cyathigerum* and *L. sponsa* taken by *E. rufibarbis* (numbers above the bars represent the sample sizes).

During a day, the earliest predation on a damselfly was seen at 10:15h, the latest at 19:02h. Most catches occurred in the afternoon, with a peak between 14:00h and 15:00h (Fig. 3).

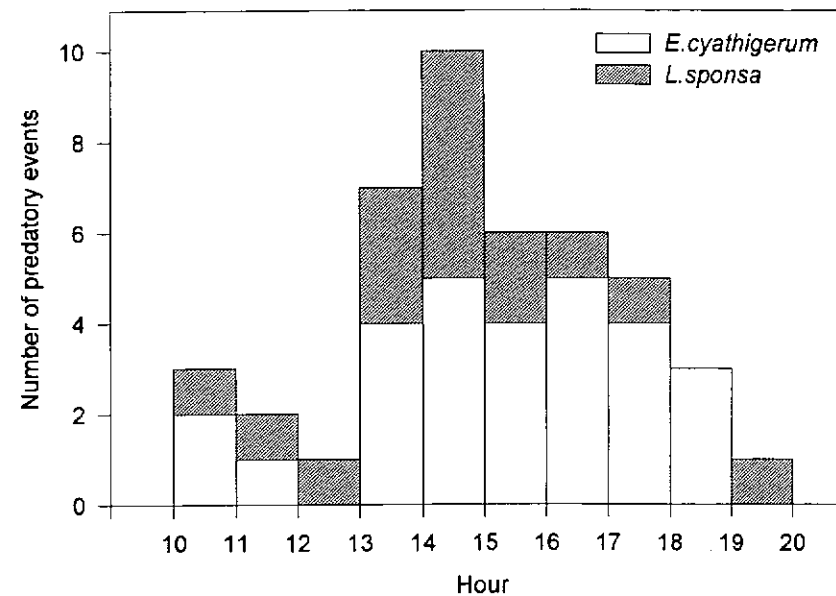


Fig. 3. Temporal predation pattern of *E. rufibarbis* on *E. cyathigerum* and *L. sponsa*.

Discussion

All our observations fall into the flight period of *E. rufibarbis* given by VAN VEEN (1996). At the heathland 'Groot Schietveld' the species is one of the most common robber flies (MAES, 1996; pers. obs.). In the Netherlands it occurs especially in woods and only rarely in heathland (VAN VEEN, 1996). VAN VEEN (1996) found *E. rufibarbis* mainly at the edge of pineforests which agrees with our finding that, after taking a damselfly, they mostly flew towards the pine forest lining the heathland to the north. The activity pattern is in accordance with the thermophilic nature of Asilidae. All animals had their observation-post on *Molinia* stems. This is in contrast with VAN AARTSEN & VAN DER GOOT (1981) which categorize it as a leafhunter. In our study site it was distinctly a high herb hunter. Although CORBET (1962) and REHFELDT (1995) assume asilids to be important predators of perching dragonflies, all damselflies in our study were caught in flight. There are other observations of robber flies feeding while mating. LAVIGNE (1970) occasionally observed males courting females feeding on prey.

The main prey items of asilids belong to the insect orders Hymenoptera (40%), Diptera (29%), Coleoptera (12%), and Lepidoptera (9%) (Musso, 1978). Predation of robber flies on damselflies has only rarely been documented (see PLATT & HARRISON, 1995). At most occasions it concerns single incidents (LAVIGNE, 1976). MOSS (1992) however classified them, together with a dragonfly, as the main predators of *E. civile* in his study site. LAVIGNE (1976) mentioned two accidental occasions of predation of asilids on *E. cyathigerum*: one by *Philonicus albiceps* MEIGEN and one by *Lasiopogon cinctus* FABRICIUS. VAN VEEN (1996) already reported *L. sponso* as a prey species of *E. rufibarbis* but gives no information how common this is. In view of its preferred habitat, it may be rather uncommon for the species to catch damselflies. Because we were unable to monitor the whole pond at the same time, our data are both fragmentary in space and time. Despite this, our observations indicate that at our study site the predation pressure caused by the robber fly was high. This is not surprising given the nutritive value of the damselflies, their high abundance at the study site and the complete overlap in flight season between predator and prey (pers. obs.). The only other predators of adult damselflies at the fen were anisopterans of the species *Libellula quadrimaculata*. Because we observed predation by this species only on two occasions the robber flies seemed to be the major predator on adult damselflies. Probably they exercise an important role in damselfly population size at this fen. Musso (1978) already found that adult asilids are important in regulating population dynamics of members of the orders Hymenoptera, Diptera, Coleoptera, and Lepidoptera.

The sex-bias in prey items is not surprising and reflects the sex-biased presence of the damselflies at the fen. The fact that more adults than teneral were taken as prey in *E. cyathigerum*, and this in contrast with *L.*

sponso, can be explained by the fact that in the former species the emergence period was nearly ended while in the latter a lot of animals were still emerging during the observation period. These analyses therefore suggest that the observed intensive predation of damselflies reflects merely an opportunistic behaviour of the robber fly species at this fen rather than a specialised feeding (although we saw only once a robber fly eating another prey, namely a beetle). The killing of a tandem male illustrates a direct cost of intense contact-mate guarding for male damselflies.

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