

# The dragonflies of the peat bogs and heathlands in Western Münsterland (Westphalia, Germany)

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## Introduction

In former times, extensive transition or raised bogs formed a natural border between Germany and the Netherlands. The peat bogs and heathlands of Western Münsterland are situated close to the north-western border of Westphalia. We investigated the peat bogs and heathlands in the German district of Borken, which is adjacent to the Dutch provinces of Gelderland and Overijssel. Although heathland used to be a widespread biotope in Western Münsterland, nowadays it is almost exclusively confined to the periphery of the peat bogs. A large part of the landscape of Western Münsterland is now dominated by intensive agriculture, with soil rich in nutrients (HAAS ET AL. 2005).

In the last two centuries, the majority of the peat bogs in Western Münsterland have been drained and largely destroyed by peat cutting. Today, hardly any natural bog ponds, the primary habitat for moorland dragonflies, can be found. However, degraded peatlands have been rewetted by carrying out various nature conservation measures, such as blocking drains, damming up water, and using impermeable plastic sheeting (plastic piling) (BIOLOGISCH STATION ZWILLBROCK,

2003). The bog has regenerated in these areas, now having a vegetation characteristic of peat bogs with *Sphagnum spp.*, *Eriophorum spp.*, and *Rhynchospora alba*.

The bog pools serve as a secondary habitat for the typical dragonfly species of peat bogs. An open landscape character is maintained by measures that prevent the growth of woodland, such as clearing young birch trees, or grazing by sheep. Large parts of the moorlands and heathlands are enclosed by wet grasslands, which act as a buffer, preventing excessive nutrient input from the surrounding agricultural land.

## Methodology

Between 1999 and 2005, some 168 investigations were carried out by the research assistants of the Biological Station Zwillbrock (Vreden, Germany) to analyse the dragonflies of eight peat bog and heathland nature reserves in Western Münsterland (table 1). Some nature reserves, such as the Zwillbrocker Venn with 63 investigations, were analysed much more frequently than others, as for example, the Burlo-Vardingholter Venn with seven investigations. Each investigation was carried out between May and October mainly in good weather conditions. In order to

**Table 1**

*Investigated nature reserves in Western Münsterland*

Nature reserves	1999	2000	2001	2002	2003	2004	2005	Number of investigations
Amtsvenn	-	x	x	-	x	-	-	21
Hündfelder Moor	-	x	x	x	x	-	-	26
Zwillbrocker Venn	x	x	x	x	-	-	x	63
Ammeloer Venn	x	x	x	-	x	-	-	24
Burlo-Vardingholter Venn	-	-	x	x	x	-	x	7
Eper Venn	x	x	x	-	x	-	-	9
Graeser Venn	x	x	x	-	x	-	-	9
Witte Venn	x	x	x	-	x	x	-	9

detect *Sympetma* species, extra investigations had to be carried out in March. If we found exuviae or freshly emerged individuals, we categorized the species as a resident. Species in tandem, a copula or depositing an egg were considered as potential residents and other species as guests.

## Results and discussion

Between 1999 and 2005, a total of forty-two dragonfly species were found in the peat bogs and heathlands of Western Münsterland (OLTHOFF & IKEMEYER, 2003). Of these, thirty-five are potential residents, and nine of them are typical species of peat bogs and heathland ponds, which, in Westphalia, are practically only found in these types of biotopes (*Coenagrion lunulatum*, *C. hastulatum*, *Ceriagrion tenellum*, *Lestes virens*, *Somatochlora arctica*, *Aeshna juncea*, *A. subarctica*, *Leucorrhinia rubicunda*, *L. dubia*, see table 2).

*Sympetrum danae* is also a characteristic species of the peat bogs and heathlands. Contrary to the nine species listed above, *S. danae* can also be found in lower densities in other kinds of biotopes, such as ponds in wet grasslands

(OLTHOFF & IKEMEYER, 2002). The low-nutrient bog and heathland pools are practically the only reproduction habitat for most of the moorland dragonflies in the otherwise nutrient-rich, highly fertilised landscape of Western Münsterland.

Apart from *S. danae*, only *Aeshna juncea* is frequently seen outside the peat bogs and heathlands, where it sometimes settles in ponds with a short bank vegetation of, for example, *Eleocharis palustris* (SCHMIDT, 2003). In contrast, *Lestes virens* and *Ceriagrion tenellum* are only rarely seen outside peat bogs and heathlands in shallow ponds.

Two species, *Leucorrhinia rubicunda* and *Aeshna juncea*, occur in all nature reserves visited (table 2). While in spring *L. rubicunda* occurs in very high densities, *A. juncea*, a late summer species, can only be found as single individuals. Under ideal observation conditions, up to thirty males can be seen patrolling over the some hundred peat diggings in the nature reserve Zwillbrocker Venn, which can be considered as an optimal habitat for this species (figure 2).

*Leucorrhinia dubia* can be found in all nature reserves, except Amtsvenn. However, it always

**Table 2**

*The moorland dragonflies of the nature reserves in Western Münsterland.*

*p=permanent settler, pp=potential permanent settler, o=guest*

	Amtsvenn	Hündfelder Moor	Witte Venn	Lüntener Wald	Ammeloer Venn	Eper-Graeser Venn	Zwillbrocker Venn	Burlo-Vardingholter Venn
<i>Coenagrion lunulatum</i>	p	p	-	-	pp	-	o	p
<i>Coenagrion hastulatum</i>	-	-	-	-	o	-	pp	-
<i>Ceriagrion tenellum</i>	pp	pp	-	p	o	-	p	p
<i>Lestes virens</i>	-	o	-	-	-	o	pp	-
<i>Somatochlora arctica</i>	-	-	-	-	-	-	-	p
<i>Aeshna juncea</i>	p	o	p	p	o	o	p	o
<i>Aeshna subarctica</i>	-	-	p	-	-	-	pp	-
<i>Sympetrum danae</i>	p	p	p	p	p	p	p	p
<i>Leucorrhinia rubicunda</i>	p	p	p	p	p	p	p	p
<i>Leucorrhinia dubia</i>	-	p	p	p	p	p	p	o



Figure 1. In Western Münsterland *Ceriagrion tenellum* occurs almost exclusively in peat bogs and heathlands (Photo: M. Olthoff).

occurs in a much lower density than its near relative, *L. rubicunda*. *L. dubia* can best be detected as an imago in June, when the flight period of *Leucorrhinia rubicunda* is coming to an end.

In Western Münsterland, *Ceriagrion tenellum* is found almost exclusively in dystrophic, warmed-up bog pools (cf. figure 1). This dragonfly was found in six of the eight nature reserves investigated (table 2), mainly in small numbers. However, in the Burlo-Vardingholter Venn more than 200 individuals were found, mostly in small bog pools dominated by *Eriophorum angustifolium*. According to KRÜNER (1988) and GRIES & ONK (1975) *C. tenellum* occurred very rarely in Westphalia in the second half of the 19th century, suggesting a positive population development and distribution of this species in Western Münsterland. Due to the fact that most of the peat bogs under investigation were only rarely investigated in the past, some occurrences of this species might have been overlooked.

The highest numbers of *Coenagrion lunulatum* can to be found in the bog complex Amtsvenn/Hündfelder Moor. Presumably, the most of the population concentrates in the margin, while the central part of the bog is probably less densely populated (OLTHOFF & IKEMEYER, 2003). In each of the two nature reserves Ammeloer Venn and Burlo-Vardingholter Venn, the species was found to be a potential resident, flying in low densities in both nature reserves.

*Coenagrion hastulatum* is one of the very rare moorland species. A small population is known from a small area with some shallow ponds left by peat cutting in Zwillbrocker Venn. Individuals that are occasionally observed in Ammeloer Venn presumably come from Haaksbergerveen, the Dutch part of the peat bog, where a population of this species is present (NVL 2002). The western border of the distribution areas of both



Figure 2. The old peat diggings in the nature reserve Zwillbrocker Venn are used for species like *Aeshna subarctica*, *Aeshna juncea* and *Ceriagrion tenellum* (Photo: C. Rückriem).

*Coenagrion lunulatum* and *C. hastulatum* is located in the Netherlands (NVL 2002). This can be seen as one reason for their rare occurrence in the West Münsterland peat bogs. Unlike the partly high density occurrence of both species in many peat bogs of Lower Saxony (my observation), the population in the bogs of Western Münsterland can be considered relatively small.

*Lestes virens* is also a rare species in the nature reserves. The only potential residents are in Zwillbrocker Venn. The small number of individuals in Hündfelder Moor possibly come from a heathland pond on the Dutch side of the bog in Aamsveen, where residents have been observed.

*Aeshna subarctica* was only found in small numbers in the Witte Venn and Zwillbrocker Venn reserves, where relatively extensive mats of regenerating *Sphagnum* make reproduction possible. While the species in Zwillbrocker Venn

find their reproduction places in the more than one hundred small peat diggings dominated by *Sphagnum* mats (figure 2), the discovery of some exuviae of *Aeshna subarctica* are proof of a small population in a relatively small boggy heathland pool rich in *Sphagnum*.

The rarest dragonfly species of the bogs of Western Münsterland is *Somatochlora arctica*, which is only found in the Burlo-Vardingholter Venn (table 2). The population is concentrated in an open peat bog area of only a few hectares on the Dutch-German border. The Dutch bog area, Wooldsche Veen, is as important for the survival of the population as the German Burlo-Vardingholter Venn (KETELAAR ET AL., 2005). This cross-border bog is a complex of hillocks and hollows typical of upland moors; here *Somatochlora arctica* finds the habitat it needs, small ponds with a vegetation dominated by *Sphagnum*. As this well-developed structure of hillocks



Figure 3. A cross-border population of *Somatochlora arctica* – here an ovipositing female – can be found at the nature reserve Burlo-Vardingholter Venn (Ger.) / Wooldse veen (NL) (Photo: D. Ikemeyer).

and hollows can hardly be found in any other of the nature reserves we investigated, protection of this population demands Dutch-German cooperation. This will involve continual careful rewetting, a regular clearing of birches and pines, and reduction of the nutrient input from the surrounding agricultural land.

The two species *Libellula quadrimaculata* and *Sympetrum danae* belong to the most common species in the bogs and heathlands of Western Münsterland. While *L. quadrimaculata* and *Leucorrhinia rubicunda* are the dominant Anisoptera species in spring, *S. danae* can be found in very high numbers in late summer, and can be considered as the most frequent Anisoptera species in the bogs and heathland pools.

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## Summary

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### Summary

The dragonflies of the peat bogs and heathlands in Western Münsterland, most of them situated nearby the Dutch-German borderline, were investigated between 1999 and 2005. Altogether 42 species of dragonflies were recognized, among them stenotopic moorland dragonflies (e.g. *Aeshna subarctica*, *Somatochlora arctica*). The peat bogs and heathlands are of a great importance for the protection of dragonflies in an otherwise well-fertilized landscape of the Western Münsterland.

### Zusammenfassung

Die Libellen der Moore und Heiden im Westmünsterland wurde zwischen 1999 und 2005 untersucht. Insgesamt konnten 42 Libellenarten festgestellt werden, unter ihnen hochspezialisierte Moorlibellen (z.B. *Aeshna subarctica* und *Somatochlora arctica*). Die Moore und Heiden haben eine große Bedeutung für den Schutz der Libellenfauna in der ansonsten von intensiven Nährstoffeinträgen beeinflussten Landschaft des Westmünsterlandes.

### Samenvatting

De libellen van hoogvenen en heiden in Westmünsterland, veelal gelegen nabij de grens tussen Nederlands en Duitsland, zijn onderzocht tussen 1999 en 2005. In totaal werden 42 soorten libellen waargenomen waaronder enkele kenmerkende hoogveensoorten (o.a. *Aeshna subarctica* en *Somatochlora arctica*). De hoogvenen en heiden zijn van groot belang voor de bescherming van libellen in het verder sterk vermeste landschap van Westmünsterland.

**Keywords:** Odonata, conservation, peat moor, ecology, North Rhine-Westphalia, *Aeshna subarctica*, *Somatochlora arctica*