Occurrence and conservation of *Somatochlora arctica* in the Netherlands

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Introduction

Somatochlora arctica (Zetterstedt 1840) [figure 1] is regarded as one of the least known and rarest dragonflies of north-western Europe. It is a typical species of peat bogs and wet heaths and a classic example of an arctic-alpine fauna element. Quite rare in the western part of its range, it is rather common in the mountains of central Europe and further east across the northern parts of Eurasia. In the Netherlands, *S. arctica* declined during the twentieth century, and there are only a handful of stable populations left (Groenendijk & Bouwman, 2006a). The Dutch Ministry of Agriculture, Nature and Food Quality recognised the urgency of protecting the species, which resulted in the publication of a Species Protection Plan in 2005 (Ketelaar et al., 2005). This paper describes the present distribution of the species in the Netherlands, and focuses on measures that need to be taken to ensure its survival.

Distribution in Western Europe

Somatochlora arctica is very rare in Western Europe and shows a rather scattered distribution. At the western edge, the species is known only from a few locations in south-western Ireland and northern Scotland (Hammond & Merritt, 1983; Nelson & Thompson, 2004). The species is also very scarce in Denmark, occurring in only a few locations (Nielsen, 1998). *Somatochlora arctica* is not known from Luxembourg and only occurs in the eastern part of Belgium (De Knijf et al., 2006). In France, although the species

Figure 1. A larvae of Somatochlora arctica *found at Wooldse veen (Photo: J. Bouwman).*

Figure 2 Characteristic reproduction habitat of Somatochlora arctica *at Wooldse Veen, Gelderland, close to the German border, 8 June 2007 (Photo: D. Groenendijk).*

Figure 3. Former distribution of Somatochlora arctica *in the Netherlands (1900-1995).*

Figure 4. Location of current populations of Somatochlora arctica *in the Netherlands (2009). Note that all populations are situated relatively close to the Dutch border.*

is quite common in the mountainous regions in the east, lowland populations are hardly found (Grand & Boudot, 2006). The situation in Germany is somewhat confusing. In the higher parts, the species is more common; there are large populations known form the mountainous region in the south. However, in lowland parts, *S. arctica* is only known from a few isolated locations. On the other hand, field surveys held during the last decades in northern Germany (eastern and central Niedersachsen), showed that *S. arctica* is present at many more sites than previously assumed (e.g. Clausnitzer, 1985; Bouwman & Groenendijk, 2007).

Status in the Netherlands

The distribution of *S. arctica* in the Netherlands during the period 1900-1995 is shown in figure 3. Since all records during this period refer to locations with suitable habitat, it can safely be assumed that all records represent populations and not vagrants from elsewhere. The species occurred in a relatively large area in the south-east of the Netherlands. In the early nineties, the species had declined so much that not a single population was known in the Netherlands (van der Weide, 2002); the species was therefore listed as 'endangered' on the Dutch Red List (Wasscher et al., 1998). Furthermore, the characteristic habitat of the species in the Netherlands [figure 2] is under serious threat. Large areas disappeared in the twentieth century as a result of cultivation and peat cutting. What remains is often of poor quality, mainly due to eutrophication and desiccation. These facts have helped raise the national consciousness, resulting in a Species Protection Plan for *S. arctica*. The main aims of this plan can be grouped as 1) to get a better understanding of the ecology of *S. arctica* and the measures required for its conservation, and to convey this knowledge to those concerned with nature conservation in the field; and 2) to integrate this new knowledge into peat restoration projects which in turn will increase insight into the functioning of peat ecosystems (Ketelaar et al., 2005).

Present distribution

Figure 4 shows the location of the seven currently known populations of *S. arctica* in the Netherlands. The history and a brief description of the characteristics of each population is presented below.

Wooldse Veen

Wooldse Veen is a small nature reserve of about 45 ha situated in the eastern corner of the province Gelderland, which continues across the German border as the Burlo-Vardingholter Venn. It consists of very diverse areas of peat moorland surrounded by forest and grassland [Figure 2]. The population of *S. arctica* has been known since 1998 (van der Weide, 2002), although a record from 1955 of the species labelled 'Wooldsche Veen, Winterswijk', shows that a population was probably present in this reserve decades earlier. The population is monitored yearly and dozens of individuals and many exuviae are recorded each year, indicating a relatively large and stable population. Both adults and exuviae have also been found in the neighbouring Burlo-Vardingholter Venn on German territory. The main threats at the Wooldse Veen for the population of *S. arctica* are desiccation of peatland habitat and increasing dominance of *Betula pubescens* at the reproduction sites of *S. arctica*.

Vragenderveen

Vragenderveen is part of a larger nature reserve including the Korenburgerveen and Meddosche Veen. The total area is about 350 ha and is situated approximately 12 km northwest from the Wooldse Veen population. The reserve can be best described as a peat area with old peat cuttings filled with *Sphagnum* mosses. The drier parts show an extensive overgrowth of *Vaccinium uliginosum*. The population of *S. arctica* was discovered in 2003 (Courbois, 2004) and is, judging from the numerous sightings in 2006, both large and vital (Groenendijk & Bouwman, 2006b). At the moment, the population is not threatened.

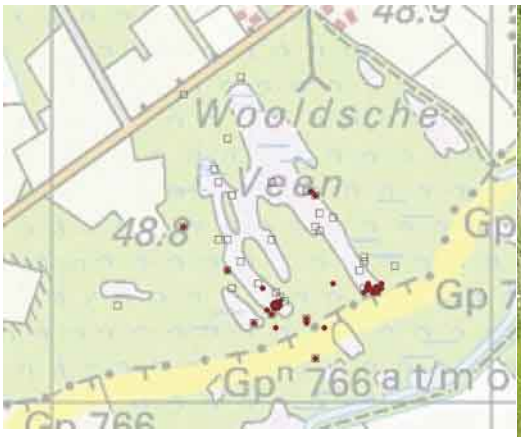

Figure 5. Example of distribution map of Somatochlora arctica, *in this case Wooldse Veen, Gelderland, as presented to local conservation managers. Open squares indicate observations of non-reproductive imagos. Dots indicate observations indicating reproduction (exuviae, teneral adults and egg-laying females; small dot: 1-2 individuals; medium dot: 3-6 individuals; large dot: 7-10 individuals). Note that reproduction was also recorded at the German side of the border.*

Reuselse Moeren

On some Dutch topographic maps, the nature reserve Reuselse Moeren is called 'Het Goor'. It is situated on the Belgium border in the southern part of the province Noord-Brabant, and the area covers about 150 ha. It is characterised by dense stands of *Myrica gale*. Small peat pits filled with extensive growth of *Sphagnum* mosses are found throughout the area and these form the main reproduction habitat for *S. arctica.* The species was discovered in 1998 (Verdaat & Heesterbeek, 2000) and small numbers have been seen since 2003. The population is most likely quite small (Groenendijk & Bouwman 2006c). The main threats are desiccation of the reproduction sites and the risk that the small peat pits will become overgrown with B*etula pubescens* or *Myrica gale.*

Brunssummerheide

The Brunssummerheide area covers about 575 ha and is situated in the southern part of the province Limburg on the German border. The reproduction site of *S. arctica* is a peat bog which is mainly fed by seepage. The species was discovered in 1996 (Wakkie & Hermans, 1997) and has since been observed yearly. This probably is a new settlement as the area was investigated regularly and thoroughly by experienced observers for some decades before the discovery took place (Krüner et al., 1987). The population is stable and probably quite large and, at the moment, there are no direct threats. However, future extraction of sand from a nearby area may disturb the hydrology and lead to a desiccation of the reproduction site; extensive monitoring of the population is needed.

Twickel

Twickel is a country estate of about 4000 ha in the eastern part of the province of Overijssel. The estate comprises large areas of meadows, woodlands, fens and heaths; *S. arctica* is found in small, rather dry *Sphagnum* pits on sheltered wet heaths. The population of *S. arctica* was discovered in 2005 and is probably quite small. As nearly all known reproduction sites dried up during the summer of 2006, arguably desiccation is the main threat; measures to counter it are urgently needed (Groenendijk,

2007). Furthermore, the number of reproduction pits is quite low. In addition, the dominance of *Betula pubescens*, as well as locally of *Myrica gale*, might be a problem at the reproduction sites as well.

Witte Veen

The crossborder nature reserve Witte Veen is located in the eastern part of the province of Overijssel. The total area is about 300 ha of which only 30 ha of peat moor is left. The population of *S. arctica* is discovered in 2008 and inhabits a peat area which is dominated by *Eriophorum angustifolium, Molinea caerulea* and *Sphagnum*-mosses. A short communication on this discovery is in preparation by the second author. There is no information available yet on population size or trends.

Lankheet

The estate Het Lankheet is about 500 ha in size and located in the province of Overijssel at the border with the province Gelderland. The population of *S. arctica* is discovered in 2008 and inhabits a high quality but very small peat area with *Narthecium ossifragum, Eriophorum angustiofolium* and *Sphagnum* species like *S. cuspidatum* en *S. magellanicum.* A short communication on this discovery is in preparation by the second author. There is no information available yet on population size or trends. It was, however, clear during the first visits that there was a great risk that the small peat reproduction pits will become overgrown. During the winter of 2008 measures were taken to counter this problem. Future monitoring of *S. arctica* will hopefully shown the success of these measures.

Conservation

Shortly after the publication of the Species Protection Plan (Ketelaar et al., 2005), a research programme was started up. During the first two years, it mainly focused on identifying the precise location of the reproduction sites within each population. Furthermore, a list was made of all local threats, and the measures required for the conservation of each population were formulated. This information, together with detailed distribution maps (figure 5), was presented to the local conservation managers and follow-ups were planned. These mainly consisted of short-term measures, such as coppicing trees and bushes, creating new peat pits where *Sphagnum* can grow, and blocking drains to stop local run-off. To formulate long-term measures, it is necessary to integrate the acquired knowledge of ecology and conservation into those parts of peat restoration projects that deal with the functioning of peat ecosystems, in order to maintain healthy peat bogs and ensure habitat for *S. arctica* and many other species in the future.

Note, however, that all populations of *S. arctica* are situated close to the border and some of the reproduction sites of populations are even situated in both countries; this is best illustrated by the population of *S. arctica* in the Wooldse Veen and the Burlo-Vardingholter Venn (figure 5). Historically, these border areas are either left uncultivated or are extensively cultivated, and naturally have a high biodiversity. These ecological hotspots can only be maintained by co-operation between conservationists from both countries. We conclude, therefore, that cross-border protection is urgently needed.

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Summary

Groenendijk, D., & Bouwman, J.H. 2010. Occurrence and conservation of *Somatochlora arctica* in the Netherlands. Brachytron 12 (1/2): 18-24.

Abstract

Somatochlora arctica is one of the least known and rarest dragonflies of northwest Europe. As one of the most characteristic species of raised bog, its decline is paralleled by the diminishing quantity and quality of this habitat type. Since the publication of the Species Protection Plan in 2005, seven populations are known to be present in the Netherlands. Locating the breeding grounds and understanding the adult's behaviour were given priority. Small pools, about a metre deep and largely covered with *Sphagnum* moss, were frequented by both males and females. Females were seen ovipositing, and larvae in various stages and empty skins were found. These pools have been targeted for measures on the short term; depending on the local situation, managers are given advice either on how to protect them or how to dig new ones. On the long term, the existence of such pools needs to be included into plans for the restoration of the bog, ensuring suitable breeding grounds for this rare and beautiful species. Moreover, as most populations are located in border areas, cross-border protection is urgently needed.

Samenvatting

Voorkomen en bescherming van de Hoogveenglanslibel (*Somatochlora arctica*) in Nederland

In Noordwest-Europa is de Hoogveenglanslibel een van de onbekendste en meest zeldzame libellen. De soort is karakteristiek voor levend hoogveen en is sterk achteruitgegaan door de achteruitgang van zowel de kwaliteit als de kwantiteit van dit habitattype. In 2005 is het Soortbeschermingsplan Hoogveenglanslibel verschenen en zijn zeven populaties bekend geworden. Het achterhalen van de reproductiebiologie en de voortplantingslocaties heeft in de eerste jaren van het beschermingsplan prioriteit gekregen. Kleine veenputjes en slenkjes die voor het grootste deel met veenmossen zijn bedekt vormen de belangrijkste voortplantingsbiotoop. Hier werden vele ei-afzettende vrouwtjes, patrouillerende mannetjes en larvenhuidjes gevonden. Het voorbestaan van dit type leefgebied is voor de korte termijn de belangrijkste inzet van het Soortbeschermingsplan. Op de lange termijn is grootschalig herstel van hoogveengebieden nodig zodat de Hoogveenglanslibel zich kan versterken in de huidige leefgebieden en zich mogelijk kan uitbreiden naar andere locaties. Omdat de meest de vindplaatsen dichtbij de Nederlandse grens gelegen zijn is het van groot belang dat er gewerkt wordt aan grensoverschrijdende bescherming van het leefgebied.

Zusammenfassung

Somatochlora arctica ist eine der am wenigsten bekannten und seltensten Libellenarten in Nordwest Europa. Als eine der charakteristischsten Hochmoor-Arten verläuft ihr Rückgang parallel mit der qualitativen und quantitativen Abnahme dieses Vegetationstypes. Seit der Publikation eines Artenschutzprogramms im Jahr 2005 sind sieben Populationen in den Niederlanden bekannt. Priorität hat die Kenntnis der Reproduktionsgewässer sowie das Verständnis des Verhaltens der adulten Tiere. Kleine Pools, etwa 1 Meter tief und mit ausgedehnten *Sphagnum*-Decken, werden von Männchen und Weibchen besucht. Weibchen wurden bei der Eiablage beobachtet und Larven verschiedener Entwicklungsstadien sowie leere Larvenhäute wurden gefunden. Diese Pools wurden für Kurzzeitmessungen besucht, Gebietsbetreuer wurden auf ihren Schutz aufmerksam gemacht oder gebeten mehr zu graben, je nach der lokalen Situation. Langzeituntersuchungen dieser Pools sollten in Planungen für die Moorrestauration einbezogen werden, um brauchbare Reproduktionsgewässer für diese seltene und schöne Art zu erhalten. Da die sich meisten Vorkommen in der Nähe der niederländischen Grenze befinden, besteht eine weitere Notwendigkeit für einen grenzübergreifenden Schutz.

Keywords: Odonata, *Somatochlora arctica*, The Netherlands, distribution, ecology, conservation, habitat preference, peat moor