

# Recovery and further protection of rheophilic Odonata in the Netherlands and North Rhine-Westphalia

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## Introduction

The water quality of most running waters, such as springs, brooks and rivers, reached an all time low in the period 1960-1980. Many of the dragonflies and damselflies depending on these habitats declined sharply and many species either disappeared (*Gomphus flavipes*, *Ophiogomphus cecilia*), or almost disappeared (*Calopteryx virgo*, *Cordulegaster boltonii*). Since then, environmental policies in Germany and the Netherlands have resulted in an improvement in water quality (see [www.milieubalans.nl](http://www.milieubalans.nl)). In many cases, steps have also been taken to re-naturalise running waters that were canalised on a large scale during agricultural land reforms. This article describes which dragonfly species benefitted from these improvements, and the challenges still ahead for the further recovery of the Odonata of fluvial ecosystems.

## Rheophilic Odonata

A number of Odonata can be found in fluvial habitats. However, most of them are merely species that occasionally reproduce in brooks and rivers. Fifteen species of the Odonata in the Netherlands and North Rhine-Westphalia can be considered to be more or less rheophilic or lotic (table 1). Of these, eleven can be considered to be restricted to fluvial systems, while four of them reproduce more or less regularly in a lentic environment.

## Decline and recovery

Most species declined rapidly during the 20th century (table 1). The distribution ranges of all strictly rheophilic species shrunk (FOR A REVIEW OF THE DISTRIBUTION OF DRAGONFLIES, SEE NVL, 2002 AND [WWW.AK-LIBELLEN-NRW.DE](http://WWW.AK-LIBELLEN-NRW.DE)). The main reasons for the decline of these species are deterioration of the water quality, canalisation, damming of brooks and river and intensive management aiming at optimal drainage of agricultural and

urban areas.

However, since 1985, when this negative trend came to a halt, most species have shown a remarkable recovery (table 1). Some species like *Gomphus flavipes* and *G. vulgatissimus* are possibly more common than they have ever been in the Netherlands and North Rhine-Westphalia. This is mainly the effect of an improvement in water quality, and re-naturalisation projects. Although recent climatic changes have also probably helped. However, a few species have not benefitted from the recent improvement of lotic ecosystems, notably *Coenagrion mercuriale*, *C. boltonii* and *Ophiogomphus cecilia*, all of which are still very scarce.

**Table 1.** Strictly and predominantly rheophilic species of The Netherlands and North Rhine-Westphalia.

Strictly rheophilic	
	<i>Calopteryx splendens</i>
	<i>Calopteryx virgo</i>
	<i>Coenagrion mercuriale</i>
	<i>C. ornatum</i>
	<i>Gomphus flavipes</i>
	<i>G. vulgatissimus</i>
	<i>Ophiogomphus cecilia</i>
	<i>Cordulegaster bidentata</i>
	<i>C. boltonii</i>
	<i>Oxygastra curtisii</i>
	<i>O. coerulea</i>
Predominantly rheophilic	
	<i>Erythromma lindenii</i>
	<i>Platycnemis pennipes</i>
	<i>Orthetrum brunneum</i>
	<i>Sympetrum pedemontanum</i>



Figure 1. Male *Sympetrum pedemontanum* (Photo: R. Ketelaar).

Some predominantly rheophilic dragonflies like *Sympetrum pedemontanum* (figure 1) and *Cercion lindenii* also increased in the past years (MENSING, 2002; VAN EIJK & KETELAAR, 2004).

#### Current distribution in the Netherlands and North Rhine-Westphalia

In preparation for the German-Dutch symposium, data were combined in order to prepare cross-border distribution maps, providing useful information on the status of species on both sides of the border. The maps show the distribution from 1995-2003. The most recent data for the Netherlands is presented in BOUWMAN ET AL., 2008. Recent data for North Rhine-Westphalia (NRW) will appear in the coming distribution atlas as well as on the website of Arbeitskreis Libellen NRW. The current situation of six characteristic species will now be described in detail.

#### *Cordulegaster bidentata*

*Cordulegaster bidentata* is a characteristic species of very small springs. It does not occur

in the Netherlands and only has a few, rather scattered populations in NRW (figure 2). The recent records from near Aachen and Osnabrück are interesting from a Dutch perspective. Also in Belgium, in the vicinity of Liège/Luik a small population is present (DE KNIJF ET AL., 2006). Although the chance of finding *C. bidentata* in the Netherlands is very small, these records show that (small) populations are present just 20 kilometres from the border. Vagrants may enter the Netherlands, and possibly there are potential habitats for reproduction in the southern part of Limburg, especially in very small streams in a semi-forested environment.

#### *Cordulegaster boltonii*

With tens of populations of *Cordulegaster boltonii* present, the situation in NRW is much better than that in the Netherlands, where no more than six populations are left (figure 3). Some recent (re)discoveries (E.G. KALKMAN & KOESE, 2006 AND TERMAAT & GROENENDIJK, 2005) do indicate that the species may be recovering very slowly.

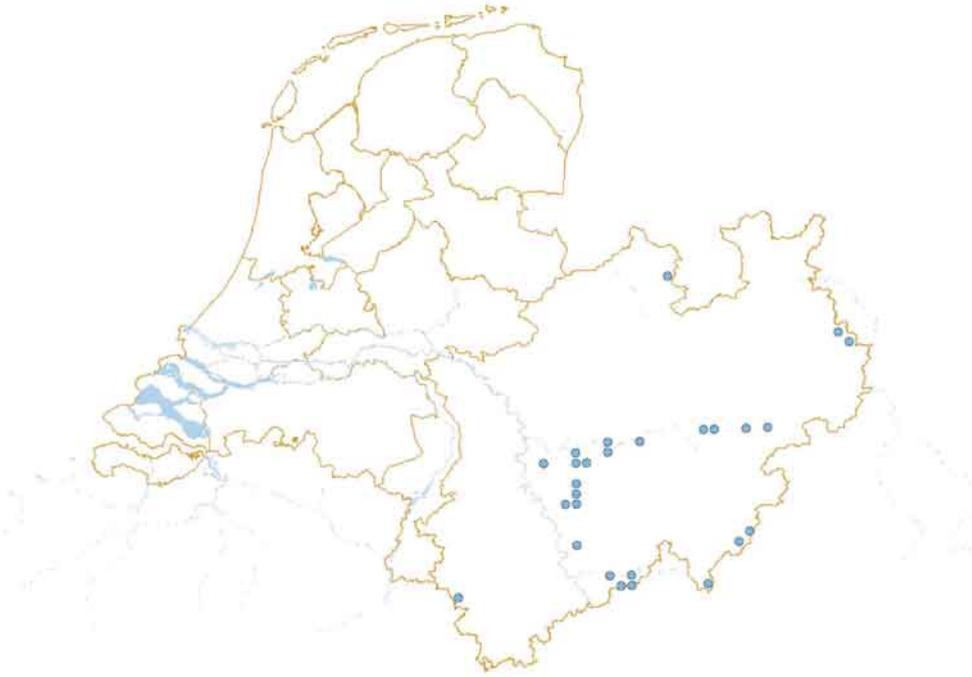


Figure 2. The distribution of *Cordulegaster bidentata* in The Netherlands and North Rhine-Westphalia in the period 1995-2004.

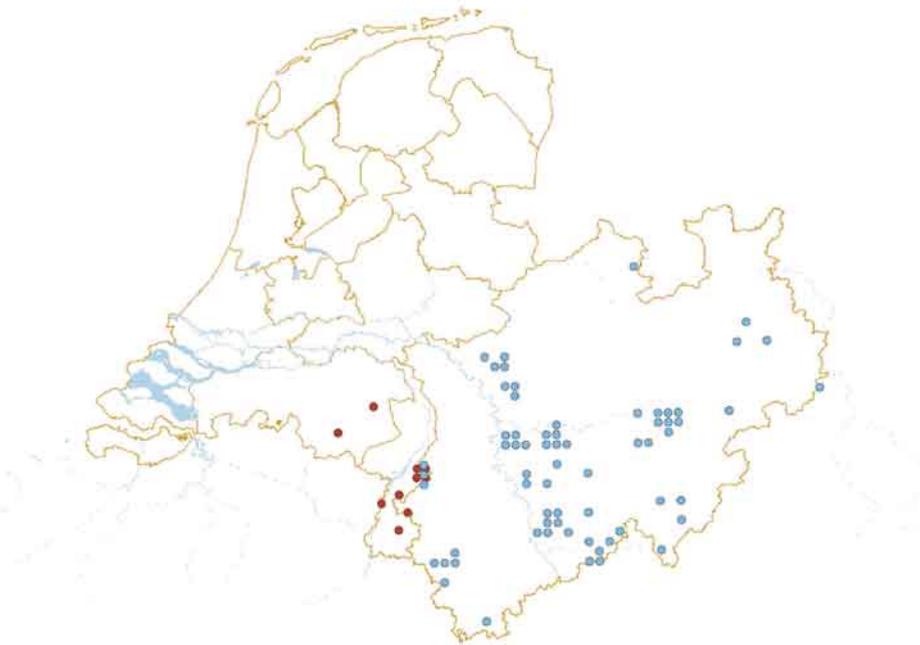


Figure 3. The distribution of *Cordulegaster boltonii* in The Netherlands and North Rhine-Westphalia in the period 1995-2004.

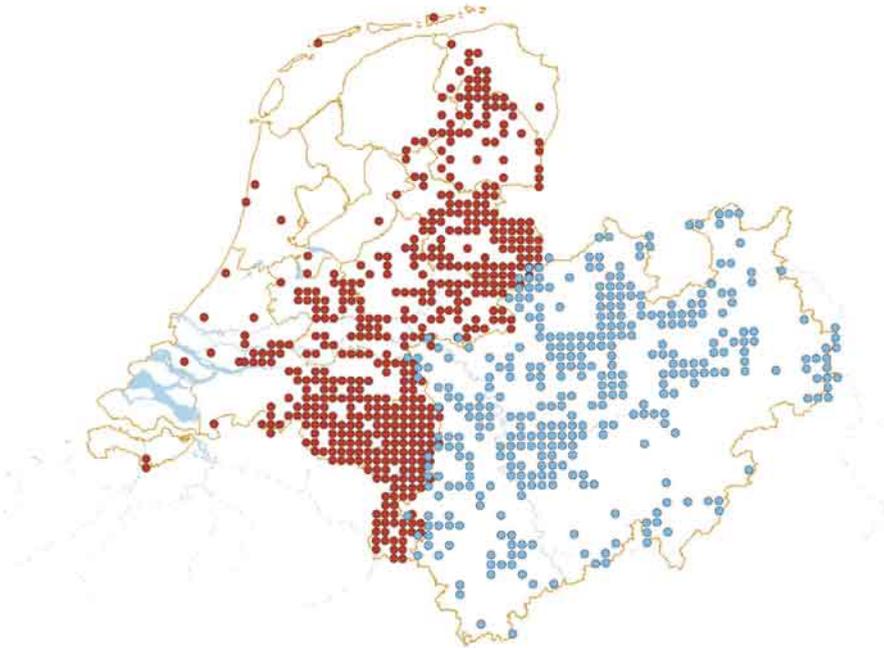


Figure 4. The distribution of *Calopteryx splendens* in The Netherlands and North Rhine-Westphalia in the period 1995-2004 (Photo: R. Ketelaar).

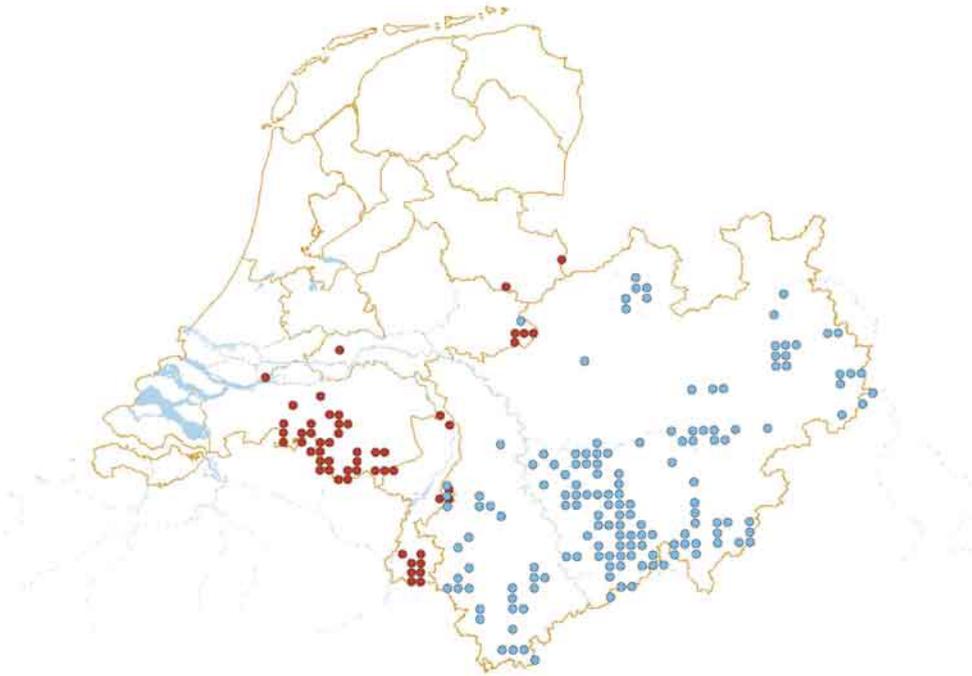


Figure 5. The distribution of *Calopteryx virgo* in The Netherlands and North Rhine-Westphalia in the period 1995-2004 (Photo: E. Schoppers).

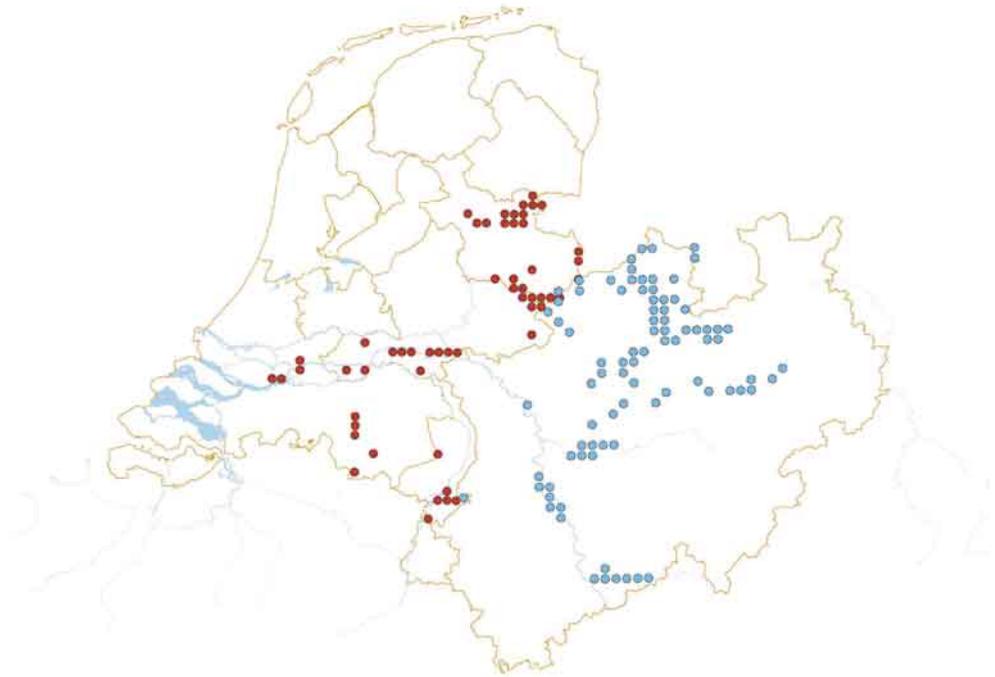


Figure 6. The distribution of *Gomphus vulgatissimus* in The Netherlands and North Rhine-Westphalia in the period 1995-2004 (Photo: E. Schoppers).

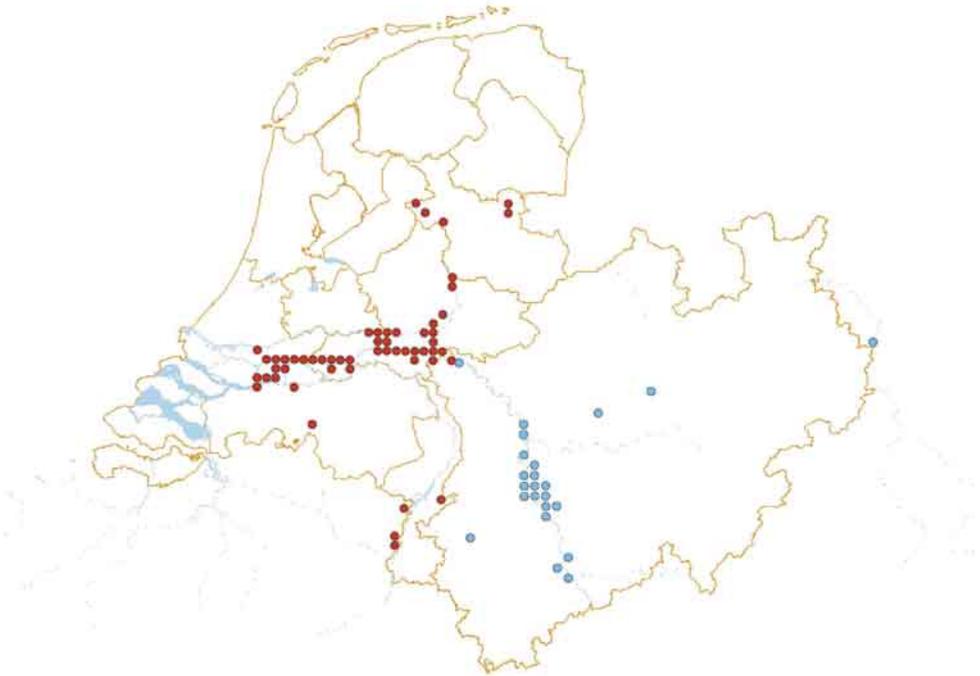


Figure 7. The distribution of *Gomphus flavipes* in The Netherlands and North Rhine-Westphalia in the period 1995-2004 (Photo: E. Ruiter).



Figure 8. The distribution of *Ophiogomphus cecilia* in The Netherlands and North Rhine-Westphalia in the period 1995-2004 (Photo: R. Manger).



Figure 9. *Orthetrum coerulescens* is one of the threatened dragonflies that is insufficiently protected by the Habitat Directive (Photo: R. Manger).

The records from Naturpark Hohe Mark (not far from Winterswijk in the Netherlands) do indicate that *C. boltonii* might also be present in the nearby Dutch regions of the Achterhoek and Twente.

#### **Calopteryx splendens and C. virgo**

Although *C. splendens* (figure 4) has never completely disappeared, its expansion in the past two decades is one of the strongest recoveries among the European Odonata. It is now a common damselfly of the lower reaches of brooks in both the Netherlands and NRW (figure 4). However, the species distribution is interesting. It is almost absent from the western part of the Netherlands and eastern NRW. In the Netherlands, this is because there are hardly any flowing waters, while in NRW, most brooks are cold, shadowy, fast-flowing waters in their upper courses in mountain ranges (e.g. Eifel, Westerwald). These are more suitable for *C. virgo* than for *C. splendens*. It is not surprising that *C. virgo* shows an almost opposite distribution pattern, occurring almost exclusively along forested brooks in the southern part of the

Netherlands (but not in western regions!), and in the mountain ranges of NRW (figure 5).

#### **Gomphus vulgatissimus**

*Gomphus vulgatissimus* is a characteristic species of the lower reaches of broader brooks and rivers. Genuine cross-border populations are present along (north to south) the Dinkel, Berkel, Rhine and the Roer/Rur. The Dutch and NRW distribution areas connect very well; the range of *G. vulgatissimus* is still expanding on both sides of the border (figure 6).

#### **Gomphus flavipes**

Most people have special memories about the first time they encountered *Gomphus flavipes*. Because of its ecology, the species almost reaches mythical proportions among odonatologists. Is it its preference for very large rivers, is it the dramatic transition from larva to adult dragonfly, sometimes accented by a walk of tens of meters over sandy shores, or is it the dancing flight above rough vegetation along the river banks? Or maybe it has something to do with its dramatic increase in the last few years.

Its distribution areas in the Netherlands and NRW connect well. The largest populations can be found in the Rhine system (with the rivers Nederrijn, IJssel and Waal in the Netherlands). There are smaller populations along the Maas and Roer in the Netherlands, and along the Weser and Rur in NRW (figure 7).

### **Ophiogomphus cecilia**

The scarcity of *Ophiogomphus cecilia* is rather in contrast to the commonness of other rheophilic dragonflies. This species has always been very scarce in NRW; recent records are from the Rhine, Sieg and Weser, but nowhere are large populations present. In the Netherlands, *O. cecilia* was locally common in the province of Limburg in the first half of the 20th century (NVL, 2002), but has since disappeared completely. However, populations were recently discovered along the Roer (IN 2000: VAN SCHAİK & GERAEDS, 2001) and Swalm (IN 2006: V. VAN SCHAİK, PERS. COMM.). The Dutch records indicated that it was highly probable that *O. cecilia* occurred along the German parts of these large brooks. This triggered a search by German odonatologists and indeed the species was found upstream along the German part of the Rur (figure 8).

### **Constraints for further recovery**

Although the lotic Odonata are among the most successful species in terms of recovery, there is still work to do. The following constraints hamper these dragonflies from being fully protected:

The ongoing worsening situation concerning springs. Due to the large-scale lowering of groundwater tables these groundwater-fed systems continue to be under threat of desiccation. A further problem is the high nitrogen content of groundwater in many sandy soils. In combination with the increased mineralisation of spring water, this aids significantly to the eutrophication of these habitats.

Water quality of flowing waters. In the past decades, their quality has without doubt improved significantly, but it is still nowhere near the ecological reference value of 100 years ago. A related constraint is the unnatural hydrology of brooks and rivers. Peak discharges are extremely high because of rapid drainage

in catchment areas, and consequently some brooks suffer from desiccation in a dry summer period.

The hydromorphology of flowing waters in the Netherlands and NRW is anthropogenic, despite many improvements in the past years. Many rivers and brooks are canalised and dammed to improve drainage and facilitate shipping.

### **Two international challenges for the future**

There are many ways of further improving the ecological quality of flowing waters, as well as legal obligations to do so. However, working within the scope of cross-border co-operation, societies for dragonfly conservation may be helped in achieving their common objectives by two major European treaties, namely the Habitats Directive and the Water Framework Directive. Both directives are solid European legislation. Especially with regard to lotic ecosystems, with their rheophilic flora and fauna, the success of this legislation largely depends on international co-operation. The distribution of species on both sides of the border, for example *Gomphus flavipes* and *G. vulgatissimus*, is a good illustration (figures 7 and 9).

BAL & GROENENDIJK (2006) give a review on the significance of the Habitats Directive for the protection of Dutch dragonflies. Five rheophilic species from table 1 are listed in the Habitats Directive, of which three are part of Annex 2. BAL & GROENENDIJK show that only a few special protection zones have been assigned, mainly for *Coenagrion mercuriale* in NRW. No special protection zones have been assigned for *Coenagrion ornatum* and *Ophiogomphus cecilia* in NRW despite a number of populations there. In the Netherlands two special protection zones were assigned for *O. cecilia*.

Special protection zones are also assigned for the conservation of habitat types (Annex 1). However, only two habitat types are relevant for rheophilic dragonflies: H3260, water courses of plain to montane level with Ranunculion fluitantis and *Callitricho-Batrachion* vegetation and H7220, petrifying springs with tufa formation (*Cratoneurion*). The first habitat type refers to brooks and rivers, and most situations in the Netherlands and NRW do not meet the

European criteria for assignment to this type. The latter is a very specific and scarce habitat, but is the primary habitat for *Cordulegaster bidentata*. It is therefore obvious that the protection of rheophilic Odonata through the assignment of special protection zones is inadequate. It only works well for *Coenagrion mercuriale* and *Cordulegaster bidentata*, and partly for *Ophiogomphus cecilia*.

The Water Framework Directive may be more promising, and it has recently started to be implemented. This directive forces countries to achieve rather ambitious goals for the improvement of the surface water quality in terms of chemical and hydromorphological parameters. With regard to the protection of rheophilic dragonflies, priority should be given to implementing this directive to meet the ecological needs of threatened dragonflies (figure 9). By co-operating, Dutch and German conservationists can exchange experiences, incorporating them into their own activities. Most brooks and rivers do cross borders, and measures for the improvement of their ecological quality should be taken in at least two countries. Dutch and German odonatologists should make use of that, and the exchange of distribution data is a first step. This article has shown the relevance of good data for understanding distribution patterns. Now the data should be used for the conservation of the dragonflies concerned.

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## Summary

**Ketelaar, R., 2010. Recovery and further protection of rheophilic Odonata in the Netherlands and North Rhine-Westphalia. *Brachytron* 12 (1/2): 38-49.**

### Abstract

This article describes and discusses the current distribution of lotic dragonflies in The Netherlands and North Rhine-Westphalia. Combined distribution maps of seven species are published: *Calopteryx splendens*, *C. virgo*, *Cordulegaster bidentata*, *C. boltonii*, *Ophiogomphus cecilia*, *Gomphus flavipes* and *G. vulgatissimus*. It is concluded that most dragonflies of running waters are recovering since 1990.

Although the trend is undoubtedly positive, some species are still very rare and threatened, especially *Coenagrion mercuriale*, *C. ornatum* and *Cordulegaster bidentata*. The European Habitat Directive will provide new activities for the protection of these species. However, more promising seems to be the Water Framework Directive. To make further recovery of these species possible cooperation of odonatologists is necessary, the exchange of distribution data is a first step.

### Zusammenfassung

Dieser Artikel beschreibt und diskutiert die aktuelle Verbreitung von Fließgewässerlibellen in den Niederlanden und in Nordrhein-Westfalen. Es werden gemeinsame Verbreitungskarten von sieben Arten publiziert: *Calopteryx splendens*, *C. virgo*, *Cordulegaster bidentata*, *C. boltonii*, *Ophiogomphus cecilia*, *Gomphus flavipes* und *G. vulgatissimus*. Es wird festgestellt, dass sich die meisten Libellenarten der Fließgewässer seit 1990 wieder ausbreiten.

Obwohl der Trend zweifellos positiv ist, sind doch einige Arten nach wie vor sehr selten und bedroht, besonders *Coenagrion mercuriale*, *C. ornatum* und *Cordulegaster bidentata*. Die Europäische FFH-Richtlinie fordert Aktivitäten zum Schutz dieser Arten. Die Wasserrahmenrichtlinie jedoch ist noch aussichtsreicher. Um die Wiederausbreitung der genannten Arten zu beschleunigen sind Kooperationen von Odonatologen notwendig, der Austausch von Verbreitungskarten ist der erste Schritt.

### Samenvatting

Dit artikel bespreekt de huidige verspreiding van de libellen van stromende wateren in Nederland en Noordrijn-Westfalen. Grensoverschrijdende verspreidingskaartjes van de volgende soorten worden weergegeven: *Calopteryx splendens*, *C. virgo*, *Cordulegaster bidentata*, *C. boltonii*, *Ophiogomphus cecilia*, *Gomphus flavipes* en *G. vulgatissimus*. De meeste soorten van stromende wateren herstellen zich sinds 1990. Hoewel de trend ontegenzeggelijk positief, zijn sommige soorten nog steeds er zeldzaam en bedreigd, met name: *Coenagrion mercuriale*, *C. ornatum* en *Cordulegaster bidentata*. De Europese Habitatrichtlijn biedt nieuwe kansen voor de bescherming van deze soorten. De Kaderrichtlijn Water biedt waarschijnlijk nog meer kansen. Voor een goed herstel van deze soorten is een goede samenwerking tussen libellenonderzoekers van groot belang, uitwisseling van verspreidingsdata is daarbij een eerste stap.

**Keywords:** Odonata, conservation, rheophilic species, distribution, Habitat Directive, Water Framework Directive, the Netherlands, North Rhine-Westphalia