

Status and conservation of *Coenagrion mercuriale* in North Rhine-Westphalia

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Introduction

The Southern Damselfly (*Coenagrion mercuriale*) occurs in meadow brooks, ditches and lime fens rich in vegetation. The species is threatened all over Europe. It is indicated as a species of community interest in Appendix II of the Habitats Directive of the EU and listed as 'near threatened' in the IUCN Red List of threatened species. In recent years, a network of protected areas has been designated in order to ensure this species occurrence in North Rhine- Westphalia (NRW). The species present and status, the structure of its habitat in NRW are described, as well as the conservation measures needed.

C. mercuriale (figure 1) is an Atlanto-Mediterranean species. It is quite common in North Africa, the Iberian peninsula, Italy and

France, with its main distribution area in south-western Europe (DIJKSTRA & LEWINGTON, 2006). Several localities are known further north, in Belgium (DE KNIJF ET AL., 2006) and in southern England. The northern limit of its distribution runs through northern Germany; there are single populations in the federal states of Brandenburg and Niedersachsen. In the Netherlands, only two records are certain, the last one a larva found near Winterswijk in 1929 (NVL, 2002). In Germany, NRW is the stronghold for this *C. mercuriale* and there are chances for successful conservation.

Distribution in North Rhine-Westphalia

To our present knowledge, there are about twelve populations of *C. mercuriale* in North



Figure 1. Male *Coenagrion mercuriale* (Photo: R. Ketelaar).

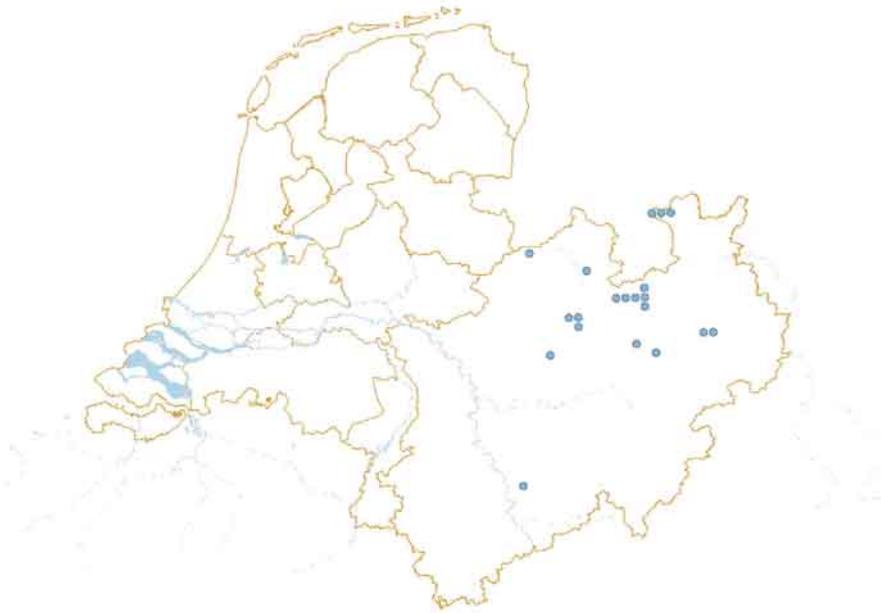


Figure 2. The distribution of *Coenagrion mercuriale* in NRW and the Netherlands (1995-2003).

Rhine-Westphalia. Most of them are located in the Westphalian lowland, on the floodplain of the rivers Ems and Lippe (figure 2). All populations, except the one at Thielenbruch near Cologne, are situated below an altitude of 100 m above sea level (Göcking et al., 2007). Two populations are especially interesting because these are well studied. They are presented in more detail in the following paragraphs.

Emmerbach

South of Münster, near Davensberg, there is a population which was known by Vornefeld as early as 1939 (Gries & Oonk 1975). Mapping projects between 2003 and 2006 brought to light that, with more than 500 individuals this is probably one of the largest populations in NRW. *C. mercuriale* is present along the Emmerbach (figure 4), occupying about 15 km, spread out over a stretch of 36 km in total. This slow-flowing brook has been changed much by human activity. There are no meanders or eroded banks along the water course. The stream bed is sandy-loamy, the stream bank contains a lot of pebbles. The brook runs mostly through an intensively cultivated, agricultural landscape dominated by fields of maize and other grains,

while at the edge of villages, it runs through meadows. Some stretches are in forested areas.

Talgräben of the river Ems

The presence of populations of *C. mercuriale* in the Ems valley has been known since the late 1980s. Regular, but non-systematic, research has been carried out in recent years. A more detailed research into its present status was carried out in 2005.

Due to this investigation, the parts of the ditches with the highest concentrations of *C. mercuriale* are now known (figure 3). One of these lies in the northern valley ditch and is about 10 km long. Another one of about 15 km long is present in the southern valley ditch. Both of these populations are however interrupted by stretches of water that are unsuitable for *C. mercuriale*, either because they are shaded, or because the flow velocity is too low for the necessary plant communities to occur.

The Ems alluvial plain, including the valley ditches, was completely canalised in the 1930s. The ditches lie at the northern and southern edge of the alluvial plain, running in western direction. Fed by seepage, they drain the alluvial

plain. The light, sandy soil, and the constant soil moisture level make the Ems alluvial plain and its surroundings ideal for growing maize and other grains. The water level in the valley ditches is regulated by dams and small weirs. There are no plunge pools or meanders.

The areas with the largest populations of *C. mercuriale* are characterised by a comparatively high flow rate, a sandy substrate low in detritus, and submerged and emergent, herb-rich vegetation.

Other locations

There are more populations elsewhere in NRW. A detailed description of the knowledge of these populations with notes of their conservation status is given in Göcking et al. (2007). One of these populations is in the Tallewiesen near Paderborn, where the species is known since 1988. The oldest known population, at Thielenbruch in Cologne, was described in 1979 as a 'strong, indigenous population'. It still exists,

but at present there are clearly fewer individuals. Near Thielenbruch medium to large populations can be found in the ditches of Tiefenriede, in Minden-Lübbecke (known thanks to Clausen since 1980) and Dattelner Mühlenbach. There are two other small populations, one in the Loddenbach, in the district of Gütersloh, and the other in an affluent of the Eltingmühlenbach, in Steinfurt. Besides these populations, some single records or temporary populations are known in NRW. In the district of Steinfurt, a single dead individual was found in a spiderweb. In the district of Soest, one flying animal was observed and a temporary small population was present on the Liese in the district of Warendorf.

Although most populations are well studied, it is likely that more populations can be found. Recently, there are some indications that the species might be expanding its range, possibly due to climatic changes. Extensive research in suitable habitats might reveal more populations.



Figure 3. Habitat of *Coenagrion mercuriale* at Talgraben (Photo: N. Menke).

Habitat in North Rhine-Westphalia

C. mercuriale mostly inhabits smaller, sunny waters with well-developed submerged and emergent vegetation (see details in Göcking et al. 2007). In Thielenbruch, one population occurs in a lime fen. Other populations are present in dike-systems, like in Tiefenriede and in the Ems valley ditches, but also in canalised flowing waters, such as the Emmerbach, Ortsteinbach and Tallewiesen. The Dattelner Mühlenbach is the only semi-natural meadow brook in the area, and the occurrence of *C. mercuriale* shows that this species can occur in semi-natural flowing waters in NRW, as long as appropriate structures are present. It is essential that the water never freezes or dries up, but also important that the flow velocity is not too high.

Due to the low flow velocity, in some parts of inhabited brooks, communities of macrophytes are present, with floating-leaved species, such as *Nuphar lutea* and *Potamogeton natans*.

However, most segments of the brook where *C. mercuriale* is present are characterised by:

- running water with a higher flow velocity rich in oxygen,
- stream bedding poor in detritus
- submerged and emergent vegetation with *Berula erecta*, *Myosotis palustris*, *Mentha aquatica*, *Nasturtium officinale*
- sunny conditions in the whole brook
- highly structured vegetation close to the water

The first three factors seem to be important for the larvae. Highly structured vegetation close to the water is important for the adults as a hunting and mating site. Such vegetation may be found in riparian zones, in fallow fields, but also in mown wet meadows, reed beds or extensively grazed meadows. The most important habitat requirement for *C. mercuriale* is therefore the vegetation structure. In an analysis of the ditches of the Ems valley (MÜLLER, 2003), Müller observed that in locations with *C. mercuriale*, the emergent vegetation had a cover of 20-60%. A vegetation cover of more than 90% is not tolerated. The absence of *Berula erecta*



Figure 4. The Emmerbach, one of the strongholds of *Coenagrion mercuriale* in North Rhine-Westphalia (Photo: N. Menke).

and *Phalaris arundinacea* in the lime fen at Thielenbruch is remarkable since these plants occur in all other locations. The species avoids stretches with dense, tall vegetation, such as reeds (*Phragmites australis*). Large numbers of *Nuphar lutea* with their large floating leaves are unfavourable for the species, because of the high cover. The presence of submerged vegetation is essential, being a habitat requirement for the larvae (MÜLLER, 2003, RÖHR, 2005). The cover of the submerged vegetation should always be more than 10%. An optimum of approximately 40% can be found in the Ems valley ditches. A well-developed submerged and emergent vegetation with *Berula erecta* seems to be essential. Moreover, submerged *Callitriche*, or in Thielenbruch, *Characea*, is often found in the habitat of *C. mercuriale*.

Threats

C. mercuriale is classified in the Red Data Books of Germany (1998) and NRW (1998) as an endangered species. It is mentioned in Appendix II of the FFH-Guidelines. Therefore, special conservation measures must be



Figure 5. Tandem *Coenagrion mercuriale* (Photo R. Ketelaar).

implemented for this species, and conservation areas have to be designated. In NRW, the problems for conservation management have already been published (GÖCKING ET AL 2007 and (www.LANUV.NRW.de) The most important threats are:

- Inappropriate maintenance. Maintenance can be too intensive, leaving vegetation with no structure. Lack of maintenance is also a threat, leaving too much vegetation on the bank, which is unfavourable to *C. mercuriale*, especially in combination with shade due to trees.
- Groundwater depletion and temporary desiccation (e.g. Tiefenriede, probably Thielenbruch) can destroy the larval habitat.
- Suboptimal use of the surroundings with maize crops (Emmerbach) and intensive agricultural practice, resulting in eutrophication (Tiefenriede).
- Reduction of flow velocity by damming or canalisation. This can result in colonisation by still-water species, such as *Nuphar lutea*, that makes the habitat unsuitable for *C. mercuriale* (Emmerbach).

Conservation

The most important conservation measure is oriented towards the maintenance of vegetation.

Appropriate management and maintenance measures help maintain the vegetation structure that *C. mercuriale* (figure 5) requires in its habitat:

- Weeding should only be done if necessary, at most, once in 2-3 years; it should only be done in parts.
- Clearing the stream bed in parts with more than 95% cover of vegetation, no more than once in 4-5 years. The stream bed should not be deepened.
- Mowing the banks should only be done alternately, one side each year or by mowing only one third of the bank. Mowing should be done before the middle of May or later than the beginning of August.
- In order to minimise eutrophication in an area of intensive agriculture, a buffer zone of at least 10 metres wide should be created between the stream and the cultivated land; it should only be mown twice a year, in the same period as the banks.

- Re-naturalisation of brooks where *C. mercuriale* occurs should only be done very carefully.
- No trees should be planted near the stream.
- Extensive grazing can maintain the vegetation which is characteristic for brooks where *C. mercuriale* occurs. The development of the vegetation should be monitored well.

In some of the areas, special conservation measures have already been carried out, e.g. in the period before the adults emerge, the reed in Dattelner Mühlenbach is mown to prevent the water from becoming too shaded and to make room for *Berula erecta*. This is essential, because the extensive, controlled grazing, that had previously prevented reed development, was discontinued.

In the area of Tiefenriede, officials of the local district and the Water and Ground Board for the maintenance of the ditches agreed to work together, taking into account the requirements of the species. There was a similar agreement for the Ems valley ditches in the district of Gütersloh. Furthermore, discussions on the management for this species take place regularly between the Nature Conservation Association and the Water and Ground Board of Emmerbach in the district of Coesfeld.

Conclusion

In order to ensure the future of *C. mercuriale* in NRW, all streams where the species occurs should be protected and the present water quality and quantity should be maintained.

As a result of its protected status, that appropriate management will take place is relatively well

ensured. It should be intensive enough to prevent encroachment and shading, but not so intensive that it prevents the formation of well-structured vegetation in and around the streams. This delicate balance should be maintained by concentrating on a few small areas at a time leaving other areas unmanaged.

When management is implemented as suggested, *C. mercuriale* has a bright future in NRW, especially with the current climate change. And, with a bit of luck, it might also have a future in the Netherlands.

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Summary

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The Southern Damsel fly (*Coenagrion mercuriale*) occurs in North Rhine- Westphalia (NRW) in small, sunny, alkaline meadow brooks and ditches poor in detritus, with submerged and emergent vegetation. A herb-rich vegetation is present on the banks. To our present knowledge, there are about twelve populations in NRW; two are discussed here in detail. In order to protect the species, conservation measures concerning the management of the water bodies are suggested.

Samenvatting

De Mercurwaterjuffer (*Coenagrion mercuriale*) komt in NRW voor in kleine, zonbeschenen, basenrijke en plaatselijk detritusarme, stromende wateren met een uitgesproken kruidenrijke, maar niet te dichte (onder)water- en oevervegetatie. Momenteel zijn er ongeveer 12 populaties bekend in NRW. Om de soort te beschermen en het beheer van de wateren te optimaliseren worden beschermingsmaatregelen voorgesteld. Twee populaties worden in meer detail besproken.

Zusammenfassung

Die Helm-Azurjungfer (*Coenagrion mercuriale*) besiedelt in NRW bevorzugt kleinere, besonnte, basenreiche und stellenweise detritusarme Fließgewässer im Flachland mit einer ausgeprägten krautreichen, aber nicht zu dichten Unter- und Überwasservegetation. Derzeit liegen Nachweise von 12 Vorkommen in NRW vor. Zum Schutz der Art sowie zum Management der Gewässer werden Maßnahmenvorschläge dargestellt und zwei Vorkommen werden ausführlicher beschrieben.

Keywords: *Coenagrion mercuriale*, North Rhine-Westphalia, conservation, ecology, habitat preference, threats