SOME RARE AND NEW CADDIS FLIES RECORDED FOR THE NETHERLANDS (TRICHOPTERA)

Rink Wiggers, Tjeerd-Harm van den Hoek, Barend van Maanen, Bert Higler & Hein van Kleef

Since Higler published his list of extinct and endangered caddis fly species in 1995 a number of new and rare species have been recorded for the Netherlands. These new findings can be partly attributed to the growing interest among researchers to study caddis flies, which has resulted in a more thorough investigation of certain water types. Other records of rare species were discovered by collecting and identifying pupae and adults, such as *Hydroptila vectis* and *Oxyethira falcata*. Some rare species, which have not been recorded since 1950, are common nowadays, possibly caused by the improved water quality of the river systems in the Netherlands. Other new species to the Dutch fauna are the result of new taxonomic insights.

INTRODUCTION

Caddis flies (Trichoptera) have been studied quite well, resulting in a fair understanding of the presence and distribution in the Netherlands (Higler 1995). Recently a number of intensive surveys have been carried out. During these studies several rare and new species for the Netherlands were found. These species have all been included in the recent key by Higler (2005) and some of these have been treated in detail elsewhere. In this paper the most remarkable new data will be discussed. For each species a short description will be given of the sites where it was collected and its ecological requirements. Where necessary taxonomic notes are given.

MATERIAL AND METHODS

The Trichoptera were collected as larvae, pupae and adults. Larvae and pupae were collected using pond nets and by lifting and examining stones. Adult Trichoptera were collected using portable light traps as described by Pleissner et al. (1996). Where necessary, identifications have been checked by specialists.

Species accounts

Table 1 summarizes the species which have been added to the Dutch list after Higler (1995). For each species the recorded life stage is mentioned and the former status of rarity conform Higler (1995) is given. Only *Sericostoma schneideri* Kolenati, 1848 and *Stenophylax mitis* McLachlan, 1875 are not discussed and for further information we would like to refer to Botosaneanu (2001) and Botosaneanu (2005), respectively.

Hydroptilidae

Trichoptera are mostly collected as larvae. For identifying Hydroptilidae this poses a problem as only the adult males can be identified without problems. The females of *Oxyethira, Orthotrichia* and *Hydroptila* require extensive preparation and only some can be identified with certainty. Unfortunately females of *Hydroptila* and *Orthotrichia* were caught eight times more often than males, leaving only few male specimens for identification.

For the genus *Hydroptila* also well-developed male pupae turned out to be useful for species identification, by dissection of the genitalia. As a rule identification of pupae is possible when the wing sheets become dark in colour.

Species	Life stage	Status (Higler 1995)	Current status
Hydroptila angulata	adults		rare
Hydroptila forcipata	adults		very rare
Hydroptila sparsa	adults	> 1950, very rare	rather common
Hydroptila vectis	pupae	< 1950	rare
Orthotrichia tragetti	adults		very rare
Oxyethira falcata	adults	> 1950, very rare	very rare
Oxyethira sagittifera	pupae, adults		rare
Plectrocnemia brevis	larvae		very rare
Psychomyia pusilla	larvae	< 1950	common
Tinodes pallidulus	larvae, adults	> 1950, very rare	rare
Hydropsyche dinarica	1 larva		very rare
Hydropsyche exocellata	larvae		very rare
Hydropsyche incognita	larvae		very rare
Hydropsyche modesta	1 larva		very rare
Ceraclea albimacula	larvae, adults	> 1950, very rare	very rare
Ceraclea annulicornis	larvae	< 1950	very rare
Silo piceus	larvae	> 1950, very rare	very rare
Apatania fimbriata	adults	> 1950, very rare	no recent records
Apatania muliebris	larvae, pupae		very rare
Stenophylax mitis	adults		no recent records
Chaetopteryx major	larvae	> 1950, very rare	very rare
Halesus tesselatus	1 larva	> 1950, very rare	no recent records
Limnephilus hirsutus	larvae	> 1950, rather rare	very rare
Rhadicoleptus alpestris	adults	> 1950, very rare	very rare
Sericostoma schneideri	adults		no recent records

Table 1. New and rare Trichoptera in the Netherlands. The status is based on Higler (1995); Legend: <1950 = only found before 1950; >1950 = found since 1950.
Tabel 1. Nieuwe en zeldzame soorten Trichoptera in Nederland. De status is gebaseerd op Higler (1995); Legenda: <1950 = alleen gevonden voor 1950; > 1950 = gevonden vanaf 1950.

Hydroptila angulata Mosely, 1922

An adult male was caught in May 2003 on the shores of lake De Banen, a shallow soft water lake in the north of the province of Limburg (by H. van Kleef). Most likely the specimen is a drifter as the species is known to occur in large rivers (Tobias & Tobias 1981, Moog 1995) and streams (Robert & Wichard 1994). The species is able to tolerate organic pollution (Moog 1995). *Hydroptila angulata* is a southern species and is found in a large part of Europe but is missing in Scotland, Iceland, Norway and Eastern Europe. The adults of *H. angulata* can be identified with Macan (1973), Malicky (2004) and Tobias & Tobias (1981), whereas the larva of *H. angulata* has not been described yet. The specimen is kept in the collection of the Bargerveen Foundation.

Hydroptila forcipata (Eaton, 1873)

An adult female of this species was collected for the first time in the Netherlands in June 2003 along the shore of lake De Banen, province of Limburg (by H. van Kleef). As the species has

only been reported from streams and rivers (Robert & Wichard 1994, Tobias & Tobias 1981) this specimen is likely to have originated from elsewhere. *Hydroptila forcipata* has been recorded throughout Europe with the exception of Iceland. The species is univoltine (Malicky & Reisinger 1997). The eggs are deposited under water (Ulmer 1909, Hickin 1967). The larvae can be found on macrophytes, organic material and pebbles (Schmedtje & Colling 1996). The adults can be identified with Malicky (2004) and Tobias & Tobias (1981). The larva of *H. forcipata* has not been described yet. The identification has been confirmed by L. Botosaneanu and the specimen is kept in the collection of the Bargerveen Foundation.

Hydroptila sparsa Curtis, 1834

Higler (1995) mentions *H. sparsa* from one location in the Netherlands, but a recent study revealed three additional records (Arnhem, Princenhage and Rotterdam before 1889 and Vries in 1975). Since 1996 however, pupae have been collected from a number of streams, and in 2002 and 2003 adult males have been collected in low numbers (four specimens per night at most) on the shores of eleven shallow soft water lakes using light traps. The adults were caught by H. van Kleef and kept in the collection of the Bargerveen Foundation and the pupae, collected by B. van Maanen, are kept in the collection of Water Authority Roer & Overmaas. The present distribution comprises more than 20 sites, predominantly in the southern part of the country. *Hydroptila sparsa* is probably the most common species of *Hydroptila* in the Netherlands. Probably most of the genus records of larvae and pupae of *Hydroptila* can be attributed to this species and in a lesser amount to *H. vectis*. In the dataset of Water Authority Roer & Overmaas the amount of records of unidentified *Hydroptila* larvae and pupae, show a considerable increase in the period between 1980 and 2001 (fig. 1). This can be accounted for by the improvement of the water quality of the streams concerned. According to Moog (1995), *H. sparsa* is confined to alfa- and beta-mesosaprobic habitats.

Hydroptila sparsa mainly occurs in downstream areas of rivers and lowland streams (Tobias & Tobias 1981, Robert & Wichard 1994). The large number of records near shallow soft water lakes may be explained by dispersing specimens, which can fly up to eight kilometres (Elbersen & Higler 2002).
The adults and fully developed male pupae of *H. sparsa* can be identified with Macan (1973), Malicky (2004) and Tobias & Tobias (1981). The males resemble those of *H. cornuta* Mosely, 1922 but differ with respect to the form of the inferior appendages. The females of both species cannot be distinguished. The larva has not been described yet.

Hydroptila vectis Curtis, 1834

Fischer (1948) mentions catches from the rivers Geul and Jeker, Cuppen (1977) from the Aalsbeek. Recently, *H. vectis* has been discovered in the Vlootbeek near Linne in central Limburg and in three streams in southern Limburg (Terzieterbeek near Epen, Anselderbeek near Kerkrade, and Voer near Eijsden). They were collected by B. van Maanen in 1999, 2001 and 2002. The recent identifications are based on well-developed pupae, mostly males.
The range of *H. vectis* comprises the western Palaearctic and Oriental region. The species is widely distributed over Europe, but has not been found in some northern countries, such as Denmark and Norway (Barnard & Malicky 2004). All Dutch specimens were collected in fast running streams in the province of Limburg. *Hydroptila vectis* can be found in streams and rivers from source to mouth (Moog 1995, Schmedtje & Colling 1996), but according to Tobias & Tobias (1981) and Hübner (2005) it can also occur in canals and retention lakes and even in saline rivers. Although the species is not very sensitive to water pollution, it has its optimum in hardly polluted waters (Moog 1995).

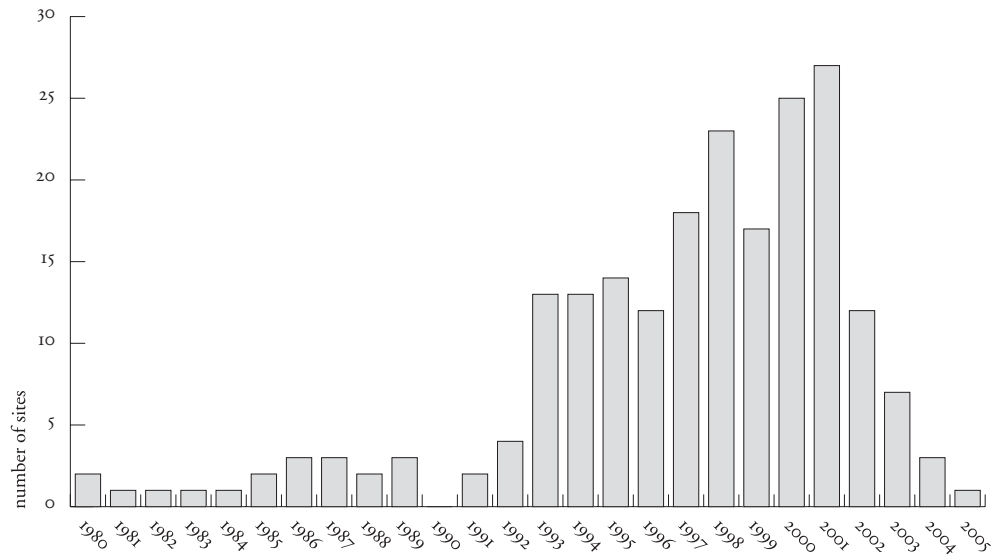

Figure 1. Number of sites of *Hydroptila* (larvae and pupae) recorded in the area of Water Authority Roer & Overmaas in the period 1980-2001.
Figuur 1. Aantal vindplaatsen van *Hydroptila* (larven en poppen) waargenomen in het beheersgebied van Waterschap Roer en Overmaas in de periode 1980-2001.

The Dutch sites show a broad range in water quality and morphology. However, the sites all have a good oxygen supply and hard substrata (stones, pebbles or plant leaves). The good aeration is provided by the interplay of current velocity and water quality.
The genitalia of males and well-developed male pupae are characterized by long and thin black spines under the dorsal plate (Macan 1973, Malicky 2004, Tobias & Tobias, 1981). The larva has not been described yet. The specimens are kept in the collection of Water Authority Roer & Overmaas.

Orthotrichia tragetti Mosely, 1930

The species was captured for the first time in the Netherlands on the shores of a meadow pond in nature reserve Voltherbroek (province of Overijssel). It was an adult male caught in June 2003 (by H. van Kleef). The species is widely distributed in Europe, but has not been recorded from Ireland, Norway, Iceland and the Iberian Peninsula. Next to nothing is known of its ecology. Mosely (1939) reports two records from a private lake in England and findings in France and Russia. The adults can be identified with Macan (1973) and Malicky (2004). The larva of *O. tragetti* has not been described yet. The identification of the adult male has been confirmed by L. Botosaneanu and the specimen is being held in the collection of the Bargerveen Foundation.

Oxyethira falcata Morton, 1893

The first record of *O. falcata* stems from Brunssum, province of Limburg (collected by Geijskes in 1936) and in 1969 specimens were found in Valkenswaard (province of Noord-Brabant) (Higler 1995). In 2002 and 2003 the species has been recorded from two locations in the same area. In June 2002 an adult male was caught near a small shallow soft water lake near the village of Bergeijk and in June 2003 three adult males were

Figure 2. Nature reserve Malpie, where a population of *Oxyethira sagittifera* is present. Photo Hein van Kleef.
Figuur 2. Natuurreservaat Malpie, waar een populatie van *Oxyethira sagittifera* aanwezig is. Foto Hein van Kleef.

collected on the shores of an acid forest pool in nature reserve Cartierheide by (by H. van Kleef). *Oxyethira falcata* has been recorded throughout Europe from springs, streams and standing waters (Kahnert 1995, Tobias & Tobias 1981). The species probably has two generations per year. The adult can be identified using Macan (1973), Malicky (2004) and Tobias & Tobias (1981). The larva of *O. falcata* has not been described yet. The material is kept in the collection of the Bargerveen Foundation.

Oxyethira sagittifera Ris, 1897

In 2002 and 2003 adult males and females of O. *sagittifera* have been recorded by H. van Kleef from four acid and poorly buffered shallow soft water lakes in the south of the country (Weerterbos, Oisterwijkse vennen, Zwartven and Scherpven). In 2005 mature pupae and newly hatched adults were collected in the Malpie reserve in stands of *Juncus effusus* (fig. 2). According to Tobias & Tobias (1981) *O. sagittifera* occurs in the midstream and downstream areas of rivers. However, we found the species also in standing waters. In Europe the species has a northern distribution and has been recorded from Ireland, England, Scandinavia and Poland. *Oxyethira sagittifera* has two generations per year (Nielsen 1948). It is not possible to identify the larvae, but the adults can be identified with Macan (1973), Malicky (2004), Tobias & Tobias (1981). The material has been confirmed by L. Botosaneanu and is kept in the collection of the Bargerveen Foundation.

Polycentropodidae

Plectrocnemia brevis McLachlan, 1871

Recently, several adults of *Plectrocnemia brevis* were discovered in the entomological collection of the Zoological Museum of Amsterdam, the first records for the Netherlands (Botosaneanu 2004). All were collected in the early 1980s in tributaries of the river Geul in southern Limburg. Larvae were encountered for the first time in October 2004 in the spring area of the Hemelbeek, a chalk stream near Bunde (by R. Wiggers and Tj.H. van den Hoek). They were found where

water was trickling over stones, overgrown with mosses. Also larvae of the rare *Ernodes articularis* (Pictet, 1834), a crenobiont caddis fly restricted to springs and trickles with hard water (Wallace et al. 2003) were collected at the same site.
The differences between larvae within this genus are subtle and are given by Edington & Hildrew (1995). The larvae are kept in the collection of Alterra in Wageningen.

Psychomyiidae

***Psychomyia pusilla* (Fabricius, 1781)**
Despite the fact that this species has been mentioned as 'not been found after 1950' (Higler 1995), *P. pusilla* is found regularly nowadays and can be very abundant at some sites. In 1993, Van Maanen found larvae in the small river Roer in Limburg and in the following years, adults and larvae have been recorded throughout the country in 31 5-km squares, (concentrated in the river Rhine and the small rivers Roer and Geul). Larvae of this species, like all the members of the family Psychomyiidae, construct galleries on the surfaces of stones in which they live and feed. It can be collected by lifting and examining stones.
Larvae can be readily distinguished from other species of this family by their black, ornamented mentum and the black thickening on the posterior-lateral part of the pronotum (Edington & Hildrew 1995).

***Tinodes pallidulus* McLachlan, 1878**
Higler (1995) gives one record for this species since 1950 (Seelbeek in 1977). Since 1981 it has been recorded from four streams in the eastern and southern part of the country (Ratumse beek, Buurser beek, Schoolbeek and Zieversbeek). One adult was collected by H. van Kleef near the Mussenslenk, a moorland pool near the river Meuse (31 May 2003, col. Foundation Bargerveen). According to Robert & Wichard (1994) larvae of the species live in small rivers and streams. *Tinodes pallidulus* is found in England, the Balkan, Western and Central Europe. It has one generation per year and adults can be found from June until September.

Hydropsychidae

***Hydropsyche dinarica* Marinkovic-Gospodnetic, 1979**
In September 1986 one larva of *Hydropsyche dinarica* has been collected in the small river Geul near the Belgian border, but at the time it was not recognized. Identification in 2000 by B. van Maanen and B. Higler proved that the specimen belongs to *H. dinarica*. Considering the presence of this species in Belgium (Stroot 1986) its occurrence in the Netherlands could be expected. Before the description of the adult in 1979, the species had not been recognized as separate from *H. pellucidula* (Curtis, 1834) (Stroot 1986, Pitsch 1993a, Robert & Wichard 1994). The larva has been described by Garcia de Jalon (1983) with some reservations, but has been confirmed by Stroot (1986). The distribution is still insufficiently known.
Hydropsyche dinarica is characteristic for upper courses of rivers at higher altitudes. It is sensitive to organic pollution (Pitsch 1993a, Moog 1995, Waringer & Graf 1997). Malicky (1999) mentions small and cold mountain streams and states that it is rarely found together with *H. pellucidula* and *H. incognita*.
The river Geul (fig. 3) is one of the larger upland streams in the Netherlands. The site is characterized by a velocity up to 1 m/s and a substrate of pebbles and stones. Other *Hydropsyche* species found at the site are *H. pellucidula*, *H. instabilis*, *H. siltalai* Döhler, 1963 and *H. angustipennis*. The river Geul is quite large in comparison to the mentioned foreign sites and, moreover, organically polluted. It is therefore possible that the species has drifted downstream from parts of the river further upstream or from one of its many clean tributaries.
Fourth and fifth instar larvae can be identi-

fied with Pitsch (1993a), fifth instar with Higler (2005), Neu & Tobias (2004) and Waringer & Graf (1997). It is the only *Hydropsyche* species with a head width of more than 2 mm when fully grown. The larva is kept in the collection of Water Authority Roer & Overmaas.

Hydropsyche exocellata Dufour, 1841

This species had not been recorded since the beginning of the twentieth century (Higler 1995, Botosaneanu 2005). In 1982 some adults have been collected from the river Meuse by A. Klink (identified by B. Higler in 2005 and kept in the Alterra collection) and since 1994, a flourishing population is present in the small river Worm near Kerkrade (larval records by B. van Maanen, kept in the collection of Water Authority Roer & Overmaas). The northern border of its distribution range reaches to the Netherlands and the south-west of Germany (Pitsch 1993a, Robert & Wichard 1994). It occurs in both small and large rivers (Pitsch 1993a, Schulte & Weinzierl 1990, Tobias & Tobias 1981) and according to Robert (pers. comm.), it prefers warmer stretches of the river (such as cooling water from hydropower stations). The species can endure some organic pollution, but not as much as *H. contubernalis* (Tobias & Tobias 1981, Pitsch 1993a). In the river Worm (fig. 4) the species became established only after considerable water quality improvement, whereas the tolerant species *H. angustipennis* declined. Also *H. contubernalis* and *H. pellucidula*, and to a lesser extent *H. siltalai*, took advantage of the better circumstances (fig. 5). In figure 5 the species *H. angustipennis* (Curtis, 1834), *H. exocellata*, *H. pellucidula* and *H. contubernalis* MacLachlan, 1865 are shown. *Hydropsyche siltalai* has been omitted because of the limited number of records. As an example of water quality improvement the oxygen saturation is drawn (annual mean values). Other water quality parameters, not depicted, show the same trend (i.e. content of ammonium, total phosphor and biochemical oxygen demand).

For the identification of the larvae Pitsch (1993a) and Neu & Tobias (2004) can be used. The attachment areas of the bristles on the parietals and the rear end of the frontoclypeus are surrounded by enlarged and raised light spots.

Hydropsyche incognita Pitch, 1993

The larva of this species was first described in 1993 by Pitch, referring to it as *Hydropsyche* spec. U (Pitsch 1993a) and soon thereafter named *H. incognita* (Pitsch 1993b). The first Dutch record stems from the river Roer in the province of Limburg, near the German border where a single larva (fig. 6) was caught in May 2004 (by R. Wiggers and Tj.H. van den Hoek). Robert & Wichard (1994) assume that the northern border of the Central European population reaches to Nordrhein-Westfalen.
The larvae live in the middle and lower parts of rivers and are sensitive to organic pollution (Pitsch 1993a). The Dutch site is characterized by a substrate of coarse pebbles and stones and a high current velocity. The larva was collected by turning over big stones where it was present amongst larvae of *H. siltalai*, *H. pellucidula* and *Psychomyia pusilla*.
Identification of the larvae can cause problems because of resemblance with the related *H. dinarica* and *H. pellucidula* (Pitsch 1993a). The larval features mentioned in the keys of Neu & Tobias (2004), Pitsch (1993a) and Waringer & Graf (1997) can best be used together because they are complementary. The identification has been confirmed by Peter Neu and the specimen is held in the collection of Alterra in Wageningen.

Hydropsyche modesta Navas, 1925

In 1997 a single larva of *H. modesta* has been collected by the Institute for Inland Water Management and Waste Water Treatment (Dordrecht) near Lobith in the river Rhine. The identification has been confirmed by Waringer, Pitsch, Neu and Tachet. The species occurs upstream in the Rhine near Mainz (Malicky

Figure 3. The river Geul close to the border with Belgium, where *Hydropsyche dinarica* and *Silo piceus* were collected. Photo Barend van Maanen.
Figuur 3. De Geul nabij de grens met België, de vindplaats van *Hydropsyche dinarica* en *Silo piceus*. Foto Barend van Maanen.

Figure 4. The river Worm near the village Haanrade (Kerkrade). Photo Barend van Maanen.
Figuur 4. De Worm bij Haanrade (Kerkrade). Foto Barend van Maanen.

1980). The European distribution is concentrated in the southern part of Central Europe (Pitsch 1993a) and therefore the species is not expected to become established.
Hydropsyche modesta is characteristic of large rivers. Organic pollution is tolerated (Malicky 1980) but siltation of the habitat can destroy the population (Bournaud et al. 1982).
The larvae can be distinguished from *H. exocellata* by the lack of light spots at the sides of the aboral part of the frontoclypeus and by much smaller light areas on the frontoclypeus (Pitsch

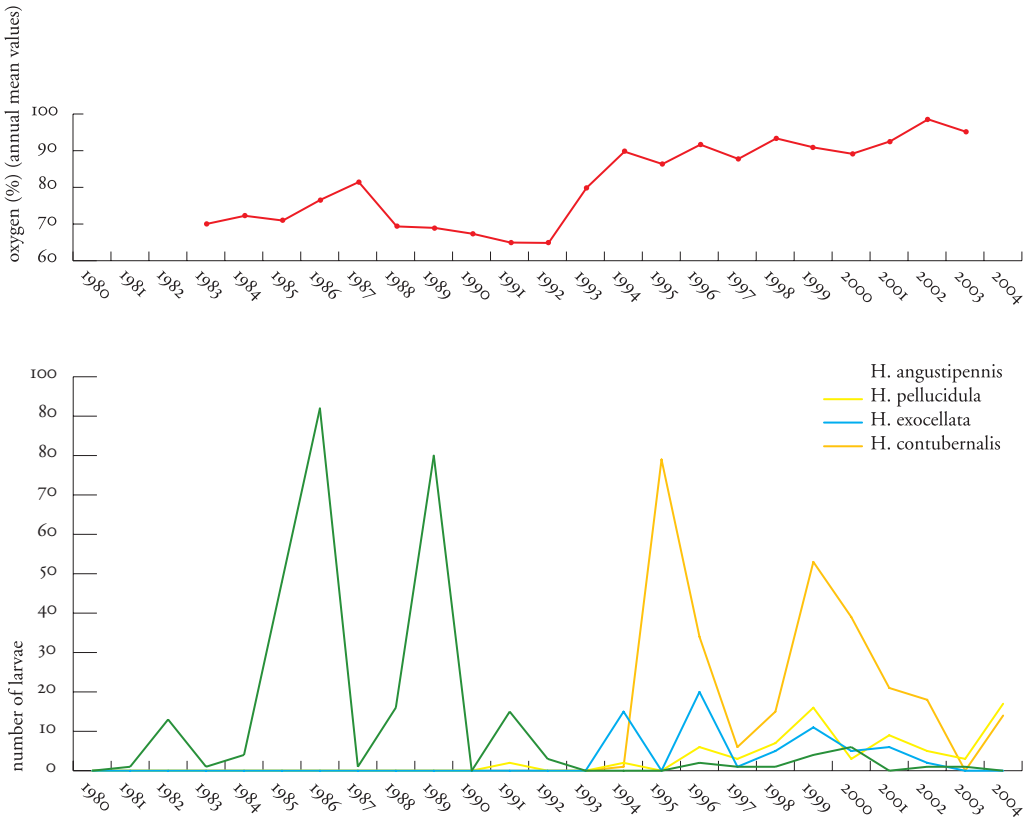

Figure 5. The abundance of different *Hydropsyche* species in the river Worm, in relation to water quality change (Waterschap Roer & Overmaas).
Figuur 5. De aantallen van verschillende *Hydropsyche* soorten in het riviertje de Worm, in relatie tot waterkwaliteitsverandering (Water Authority Roer & Overmaas).

1993a). The material is kept in the collection of the Institute for Inland Water Management and Waste Water Treatment (Dordrecht).

Leptoceridae

***Ceraclea albimacula* (Rambur, 1977)**
Fisher (1934) mentions four records of *Ceraclea albimacula* from small and large rivers. Since 2000 larvae have been found in the river Roer and adults of this species have been recorded in small numbers from seven locations throughout the south of the Netherlands. The larvae were collected by B. van Maanen (collection Water Authority Roer & Overmaas) and the adults by H. van Kleef (collection Bargerveen Foundation) and Spijkers & Van Wielink (collection Alterra Wageningen and collection Natural History Museum Brabant).
Robert & Wichard (1994) only mention large rivers as the habitat. However, the recent findings of adults near moorland pools may indicate an additional habitat. The species is known from Northern, Western and Central Europe. According to Tobias & Tobias (1981)

C. albimacula has one generation per year and adults can be found from June to September. In the Netherlands adults have been observed from the end of May until August. The larvae can be identified with Higler (2005) and the adults with Tobias & Tobias (1981) and Malicky (2004).

Ceraclea annulicornis (Stephens, 1836)

Larvae of *C. annulicornis* were recently found at two sites in Twente (province of Overijssel). A single fully grown larva (fig. 7) was found where a groundwater fed pond is discharging water onto a small woodland stream (Tj.H. van den Hoek, Springendalse beek, April 2006, collection Alterra Wageningen). Larvae were also collected in the small river Dinkel (H. Cuppen, October 2005) and are kept in the collection of Water Authority Regge & Dinkel. The species is mainly known from rivers but Robert & Wichard (1994) also mention stagnant waters. Wallace et al. (2003) note that the species is associated with big stones. Adults can be found from May to August (Robert & Wichard 1994).

Goeridae

Silo piceus (Brauer, 1857)

Silo piceus is known only from the southernmost part of the province of Limburg. There are several old records of this species from 1955 (Higler 1995), 1965 (Mur-Atzema 1965) and some records between 1959 and 1975 (Geijskes, unpublished data). The larvae of Mur-Atzema (1965) were collected in some small streams in the south of the province of Limburg, but they have not been checked. Moreover, literature for identification of larvae was not sufficient in those years. In 2002 and 2003 some larvae and well-developed male pupae have been collected in the river Geul near the Belgian border by B. van Maanen. The range of *Silo piceus* is western Palaearctic. In Western Europe the northern border is situated in northern Germany (Tobias & Tobias 1981, Pitsch 1993a). In Nordrhein-Westfalen and Belgium it is a common species in hilly and mountainous areas (Robert & Wichard 1994, Stroot 1984). *Silo piceus* occurs in streams and small rivers in hilly and mountainous areas (Robert & Wichard 1994, Moog 1995, Pitsch 1993a, Tobias & Tobias 1981). The preferred substrates are pebbles, stones and to a lesser extent sand (Schmedtje & Colling 1996). The Dutch site is described under *Hydropsyche dinarica*. The species has probably returned to the Geul due to recent improvement of the water quality. The best key for the identification of the larvae is Grenier et al. (1969). The material is kept in the collection of Water Authority Roer & Overmaas.

Limnephilidae

Apatania muliebris McLachlan, 1866 and *Apatania fimbriata* Pictet, 1834

Apatania muliebris has only recently been recognized as belonging to the fauna of the Netherlands. Larvae were found during an Alterra survey in 2002 in a spring of the Kingbeek, a gravel stream in the province of Limburg (by R. Wiggers and Tj.H. van den Hoek). The larvae are kept in the collection of Alterra. Specimens from old material collected at the same site (1980) and re-examined by R. Wiggers, Tj.H. van den Hoek and B. Higler also turned out to be *A. muliebris*. At the time they were wrongly identified as *A. fimbriata* because of the lack of keys for larvae. A single specimen found in 1982 in the Tankenberg, a helocrenous headwater spring in Twente, also belonged to *A. muliebris* (identified by Tj.H. van den Hoek and R. Wiggers). This is surprising as in Nordrhein-Westfalen, bordering Twente, *A. muliebris* seems to be absent. Only *A. fimbriata* has been recorded in this area (Robert & Wichard 1994). Also a female pupa from the small stream Vliekerwaterlossing (Bunde), collected by Broeder Arnoud before 1970 (exact date not known) turned out to belong to *A. muliebris* (identification B. Higler). It has also been found in Germany and Belgium close to Limburg (Pitsch 1993a). *Apatania*

muliebris lives in streams and trickles close to springs with a stony substratum (Wallace et al. 2003). Pupae were found from mid March till mid April.
In the past, only *Apatania fimbriata* was found. Adults of *A. fimbriata* (Pictet, 1834) from Duno (province of Gelderland) have been found by Geijskes (1936, 1937), also mentioned by Fischer (1948). A female pupa from the Zieversbeek (province of Limburg) has been confirmed by L Botosaneanu. The specimens, all being females, are in the collection of the Zoological Museum of Amsterdam. Another adult male from Oosterbeek (province of Gelderland) is kept in the Rotterdam Natural History Museum.
In the mountainous regions of Germany, *A. fimbriata* is quite common in springs, spring brooks and the upper stretches of rivers. It is the commonest species of this genus, but no recent records from the Netherlands are known. Looking at its distribution and its habitat preferences its occurrence is quite possible, e.g. in small headwater springs in Limburg.

The taxonomic differences between larvae of *Apatania muliebris* and *Apatania fimbriata* are rather subtle. *Apatania muliebris* has two dark areas on its frontoclypeus contrasting with the brown head (fig. 8), which are lacking in *A. fimbriata*. On some specimens of *A. fimbriata* a hint of those dark areas may be present but never very prominent (Pitsch 1993a). Pitsch (1993a) and Waringer & Graf (1997) use the difference in distance between the seta on the frontoclypeus and the frontoclypeal suture as the best character. In *A. muliebris* the seta is positioned further away from the frontoclypeal suture than in *A. fimbriata*. The relative proportion between the distance of a and b (fig. 8) for *A. muliebris* ranges from 3.5 - 4.5 and for *A. fimbriata* from 8 - 12 (Higler 2005). Finally fully grown larvae and pupae of *A. muliebris* are larger than *A. fimbriata* (Pitsch 1993a). Interesting notes about the life history and biology were given by Elliott (1971).

Chaetopteryx major McLachlan, 1876

This species was only known from old records of adults, in southern Limburg in 1980 (Higler 1995) and a record of two adult males at Kerkrade (Limburg) from 1964 (Fischer 1948). The larva was unknown until the publication of Waringer & Graf (1997). Since then several new records of the species were presented. Larvae were found in the Bunderbosbeek, a woodland stream near Bunde (Limburg) with a substratum of gravel. The larvae were found during an Alterra research in 2002 and kept in the Alterra collection.
The species was also found in a neighbouring forest stream in May 2000 as well as in the Berversbergbeek near Cottessen in the province of Limburg (several larvae, April 2000) by Tj.H. van den Hoek (collection Alterra Wageningen). One larva of *C. major* was found in the Bommerigerbeek (province of Limburg) in 1977 (identified by B. Higler) and is kept in the Alterra collection. Another larva has been recorded in the Beekbergse beek (province of Gelderland) (April 2004, Dolf Venema) and is kept in the collection of Water Authority Groot Salland.
Chaetopteryx major has a group of fine setae directly behind the dorsal protuberance (fig. 9), which is lacking in the more common *C. villosa* (Waringer & Graf 1997).

Halesus tesselatus (Rambur, 1842)

Fischer (1934) mentions only two localities for this species: Maastricht (Albarda 1889) and Heerde (by Koornneef). Other records are based on larvae, but until recently these could not be identified (Panzenböck 1995). Higler collected a larva in the river Geul (May 1967) and recently identified it as *H. tesselatus.*
Halesus tesselatus is a Palaearctic species occurring in Northern, Western and Central Europe, but is lacking in Great Britain, Iceland and the Mediterranean countries. Panzenböck (1995) describes the habitat as a fourth order stream on sandstone with low current velocities (0-16 cm/sec) and a temperature range of 2 to 20ºC. The site at the river Geul shows a higher

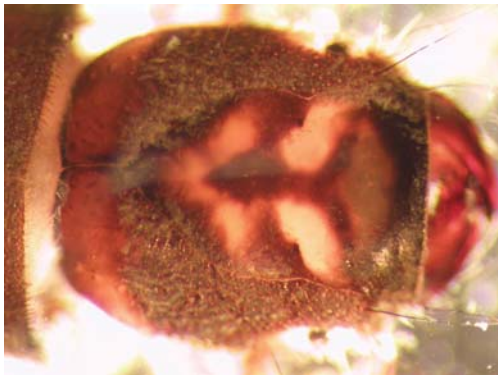

Figure 6. Head pattern of *Hydropsyche incognita*. Photo Tjeerd-Harm van den Hoek.
Figuur 6. Koppatroon van *Hydropsyche incognita*. Foto Tjeerd-Harm van den Hoek.

Figure 7. The larva of *Ceraclea annulicornis*. Photo Tjeerd-Harm van den Hoek.
Figuur 7. De larve van *Ceraclea annulicornis*. Foto Tjeerd-Harm van den Hoek.

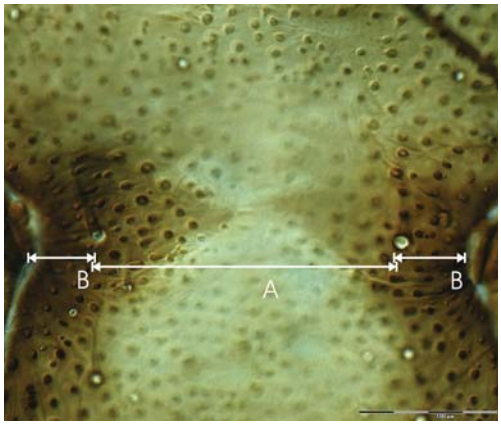

Figure 8. Detail of the frontoclypeus of *Apatania muliebris*. Photo Tjeerd-Harm van den Hoek.
Figuur 8. Detail van de frontoclypeus van *Apatania muliebris*. Foto Tjeerd-Harm van den Hoek.

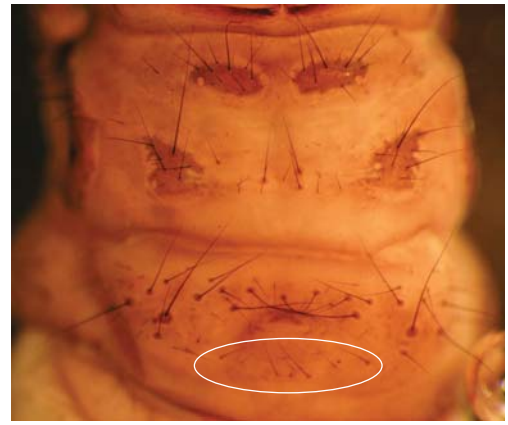

Figure 9. Metanotum and first abdominal segment of *Chaetopteryx major*. Photo Tjeerd-Harm van den Hoek.
Figuur 9. Metanotum en eerste abdominale segment van *Chaetopteryx major*. Foto Tjeerd-Harm van den Hoek.

velocity and is calcareous. *Halesus tesselatus* feeds on detritus and coarse plant material and can also be carnivorous. Larvae can be identified with Higler (2005). The material is kept in the collection of Alterra.

Limnephilus hirsutus Pictet, 1834

This species was found in 2000 in the helocrenous spring of a small headwater (Springendalse beek, province of Overijssel) in the eastern part of the Netherlands near Germany (by Tj.H. van den Hoek). This spring spontaneously re-emerged after the restoration of the groundwater regime by filling in surrounding drainage ditches (Nijboer et al. 2003). The headwater is very small and the velocity is low. Adjacent to the stream a patch of forest is present and alongside the stream young alder trees have sprouted. Soon after the emerging of the new spring area larvae were found. The species was also abundant in a nearby puddle, receiving seepage from the surrounding area. *Limnephilus hirsutus* is possibly a pioneer of helocrenous sources of headwaters. In this part of the Netherlands the species has also been found in the Tankenberg (province of Overijssel), another helocrenous spring (pers. comm. Bert Knol, November 2000, collection Water Authorithy Regge & Dinkel). Together with a larva found in 1984 (B. Higler, Uddelerveen beek, province of Gelderland) and an adult from 1980 from the Kunderberg, province of Limburg (by Geijskes), these are the only four sites where the species has been found since 1980. Before 1980, there are 15 records of adults from all over the country (Higler in prep.).
In Nordrhein-Westfalen (Germany), which is bordering Twente, the species is locally scarce but widely distributed and can be found in slow flowing streams and stagnant waters in marshy areas (Robert & Wichard 1994).
The larva constructs a case of small sand grains resembling the case of *L. extricatus* MacLachlan, 1865. A striking feature of the larva of *L. hirsutus*, which rules out confusion with *L. extricatus,* is the presence of a few hairs on each side of the anal slit and numerous long hairs on the pro- and mesonotum.
The larvae are kept in the collection of Alterra Wageningen.

Rhadicoleptus alpestris (Kolenati, 1848)

Recently this species has been recorded from two raised bog remnants. A single larva was found near Kloosterhaar (province of Overijssel) by Van Haren (in 1988) and an adult was caught near Haaksbergen (province of Gelderland) by Peeters (in 2000). Both specimens were identified by Higler. The adult is kept in the collection of the Natural History Museum Brabant and the larva in the collection of Alterra Wageningen. Adults have also been collected at an acid moorland pool (Lake Steenhaarplas, province of Overijssel) (Van Kleef 2002). The specimens are kept in the collection of the Bargerveen Foundation. According to Wallace et al. (2003) it lives in small, temporary bog pools, which is in concordance with the Dutch records. Robert & Wichard (1994), however, describe *R. alpestris* as a rheophilic species living in springs. The species has one generation per year and adults can be found from May to August.

CONCLUDING REMARKS

Why have we found so many new and rare species in the last decade? There are several answers to this question.

1. Some species which have been described recently, proved to be present in the Netherlands.
2. Identification is made possible or easier through the availability of new literature on larvae and adults (Waringer & Graf 1997, Wallace et al. 2003, Higler 2005, Malicky 2004).
3. Research on adult Trichoptera has intensified, especially by using light traps. Large scale collection of adults had not taken place since the 1960s. More attention has been paid to

the research in certain water types, especially soft water lakes.

4 The water quality in the large and smaller rivers has improved considerably, due to water pollution control and river restoration. Many species have returned.

5 Climate change could be a reason for the appearance of southern species.

Another question is: how complete are our investigations? If we look at the regular research efforts in the country, we can conclude that certain habitats have never been investigated, such as semi-aquatic habitats and other potential sites for larvae. The new records of adults of species which were considered to be rare show that the larvae of these species are likely to occupy environments not routinely sampled.

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SAMENVATTING

Nieuwe en zeldzame waarnemingen van kokerjuffers in Nederland (Trichoptera)
Sinds de lijst van uitgestorven en bedreigde kokerjuffers is gepubliceerd zijn er diverse nieuwe soorten voor de Nederlandse fauna gevonden. Deels zijn deze aanwinsten het gevolg van een groeiende interesse van onderzoekers voor kokerjuffers, maar daarnaast is het ook het gevolg van gericht verzamelen van adulte kokerjuffers in onderbemonsterde habitats. Verder dragen nieuwe inzichten en veranderingen in de taxonomie hieraan bij. Ook de verbeterde oppervlaktewaterkwaliteit van de Nederlandse rivieren, alsmede klimaatsfactoren hebben bijgedragen aan toename en het herstel van de Nederlandse kokerjuffers.

R. Wiggers
Alterra, Centre for Ecosystem Studies
Wageningen University & Research
P.O. Box 47
6700 AA Wageningen
rink.wiggers@wur.nl

Tj.H. van den Hoek
Alterra, Centre for Ecosystem Studies
Wageningen University & Research
P.O. Box 47
6700 AA Wageningen

B. van Maanen
Water Authority Roer & Overmaas
Department of Policy, Research and Advise
P.O. Box 185
6130 AD Sittard

H. van Kleef
Bargerveen Foundation
Department of Animal Ecology
c/o Department of Environmental Studies
Faculty of Science, Radboud University of Nijmegen
P.O. Box 9010
6500 GL Nijmegen

L.W.G. Higler
Hoogstraat 5
3956 NA Leersum