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DISTRIBUTION AND ECOLOGY OF STREAM DWELLING AGABUS SPECIES (COLEOPTERA: DYTISCIDAE)  
IN THE NETHERLANDS

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### 1. Introduction

One of the larger projects of the Dutch contribution to the European Invertebrate Survey is the waterbeetle mapping scheme. The author started seven years ago with a revision of the Dytiscidae of the Netherlands. To date the major museum collections have been revised, but the publication of an atlas containing all recent information cannot be expected for several years. This article details the kind of information that eventually may be included in a distribution atlas.

Stream inhabiting organisms are especially suitable for mapping purposes in the Netherlands, as this habitat is at present limited in its distribution, and is subject to severe threats. The distribution maps are thus easily interpreted and may give an impression of the decline of this habitat and its characteristic species.

### 2. Material

The maps are based on material in the collections

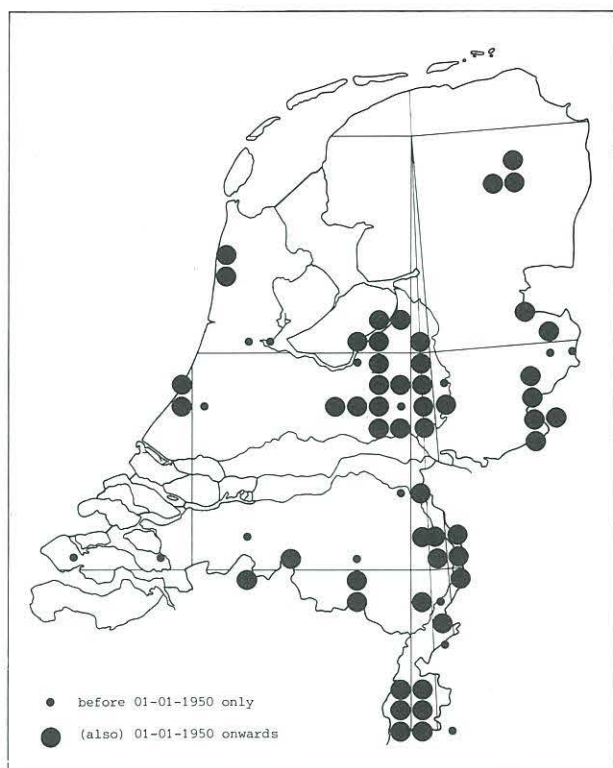
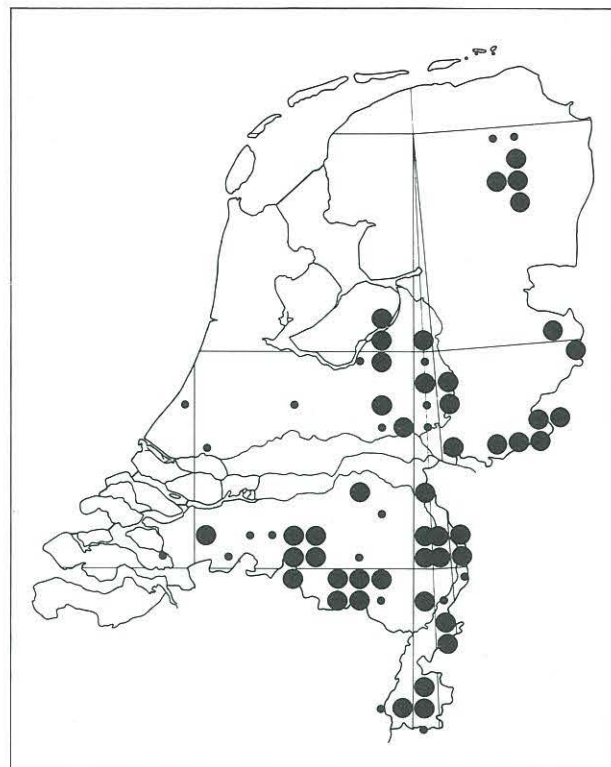
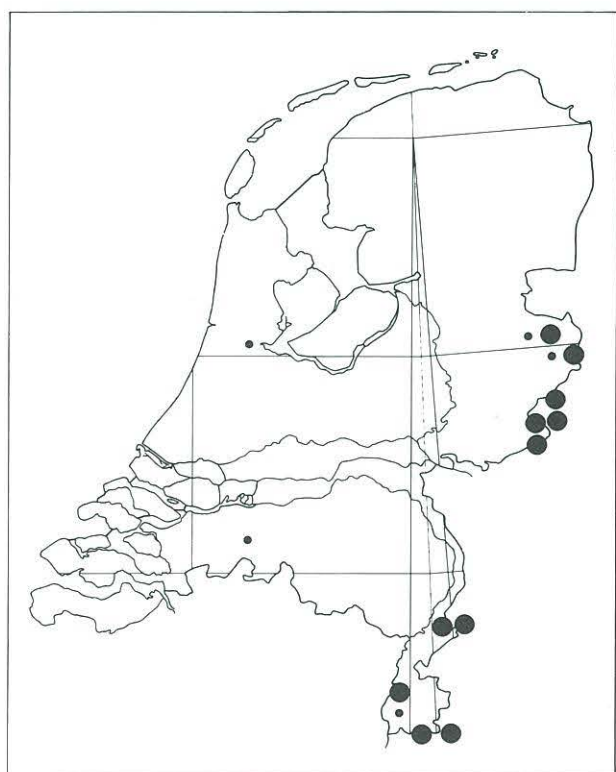
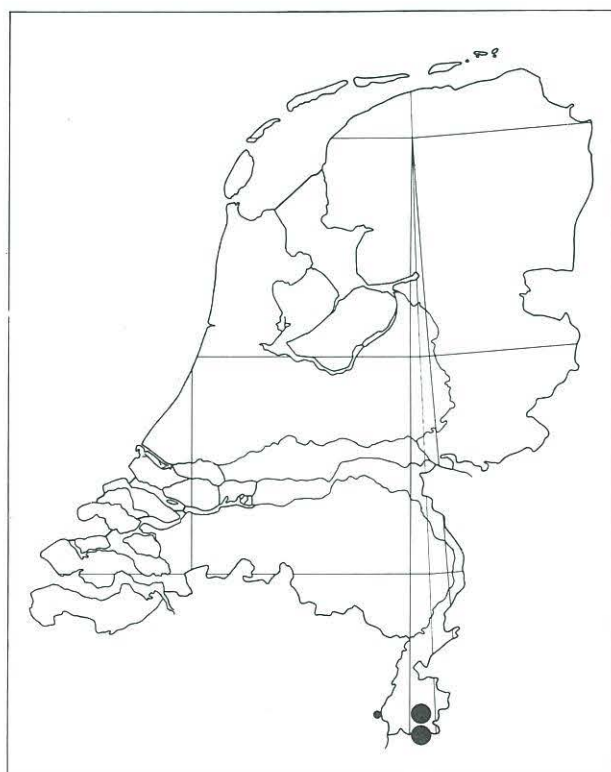
of the Rijksmuseum van Natuurlijke Historie, (RMNH), Zoological Museum, Amsterdam (ZMA), Research Institute for Nature Management, Leersum (RIN, dry collection only), Biological Station, Wijster and extensive material recently collected by H.P.J.J. Cuppen, J.G.M. Cuppen, B. Drost, J. van Tol, B.J. van Vondel and the author. A few records from the literature are added.

### 3. Distribution and ecology of the species

*Agabus paludosus* (Fabricius, 1801) (Fig. 1)

This species is recorded from 51 squares since 1950 and 16 additional squares before 1950 only. It occurs mainly in the following regions: Drentse Aa (northern part of Drenthe), Twente, Achterhoek, around the Veluwe, northern and southern Limburg, southern part of Noord-Brabant, and along the dunes, where it is the only stream dwelling *Agabus*.

Its optimal habitat consists of small ditches or streams with slowly flowing water and much vegetation such as *Phragmites* and other grasses

Fig. 1. *Agabus paludosus* (Fabricius)Fig. 2. *Agabus didymus* (Olivier)Fig. 3. *Agabus guttatus* (Paykull)Fig. 4. *Agabus biguttatus* (Olivier)



(e.g. Cuppen 1977, Cuppen & Dirkse 1978, Cuppen & Moller Pillot 1978). These streams often dry out during the summer. Along the dunes it has recently been found in some remnants of small streams (van Nieuwerkerken & van Tol 1978 a, b), a habitat that has almost disappeared. On the other hand it has been found by the same authors in a short brook in the dunes near Katwijk, which was recently formed due to secondary upwelling of infiltrated water of the river Rhine. In the ZMA there are also two specimens from a drain in the dunes near The Hague, collected shortly before infiltration started in 1956.

From these records it may be concluded that *A. paludosus* has a better dispersal power than could be expected, since normal flight muscles are lacking in most specimens (Jackson 1956a, 1973).

The paucity of records from Noord-Brabant, especially compared with *A. didymus*, is probably due to undersampling of the smallest streams.

*A. paludosus* has a very wide distribution in Europe and Siberia as far as Tomsk in the east, with a northern limit halfway in Skandinavia, but it has not yet been recorded from Greece and Corsica.

*Agabus didymus* (Olivier, 1895) (Fig. 2)

This species was recorded from 46 squares since 1950 and 21 additional squares before 1950. Its distribution is restricted to the eastern and southern parts of the Netherlands, mainly in the north of Drenthe (Drentse Aa), around the Veluwe, Achterhoek, Brabant and Limburg. From the western part there are only three very old records: Rotterdam, 19th century (V.d. Hoop) in ZMA; Den Haag (= The Hague), 8.viii.1907 (De Vos) in RMNH; Utrecht, 19th century (Fokker) in RMNH.

It is usually found in slightly larger streams than *A. paludosus*, although it can often be collected together with that species. It has not been collected in the southern part of Limburg during an investigation of the wells and springs, whereas *A. paludosus* was present there (Cuppen & Moller Pillot 1978). In small semipermanent streams in the Achterhoek (near Winterswijk) both species did occur together (Cuppen & Dirkse

1978), but Moller Pillot (1971) only found this species during his research on larger streams (lowland brooks) in the province of Noord-Brabant. This slight difference in habitat probably explains the different distribution of both beetles: in the western part larger streams do not exist any more, and around the Veluwe there are more small and semipermanent streams which *A. paludosus* frequents.

*A. didymus* reaches its northern limit in our country and northern Germany. In western Poland it reaches its eastern limit. It occurs throughout southern Europe, England and in northern Africa.

*Agabus guttatus* (Paykull, 1798) (Fig. 3)

In the Netherlands *A. guttatus* is a local and rare species. Brakman (1966) only lists the provinces of Overijssel and Limburg, but it is known for some time from the eastern part of Gelderland. Since 1950 it has been recorded from 11 squares and it has been found before 1950 in five additional squares.

The main regions of occurrence are Twente, from which area a very large number of specimens is present in museum collections (Oldenzaal and De Lutte), the region of Winterswijk (Gelderland), the Boschbeek and Roode Beek near Herkenbosch (Werkgroep Beken 1976) and the southern part of Limburg.

Abroad this seems mainly a mountain species (Balfour-Browne 1950). Its habitat is narrow trickling streams, wells and springs, where it often creeps under stones or pieces of wood. Near Winterswijk it frequents small streams which run dry during the summer (Cuppen & Dirkse 1978). As *A. guttatus* has lost the ability to fly (Jackson 1956a, 1973), it possibly burrows itself in the bottom or stays in the restpools during the drought. In June 1974 I collected six specimens in a restpool in such a ditch, together with *Hydroporus discretus* (Fairmaire).

There are two old records from the western part of the Netherlands: Breda, 21.iv.1875, 1 ♀ (Heylaerts) in RMNH, Everts collection; Amsterdam, 7.vii.1892, 1 ♀ (Bolten) in RMNH, Everts collection. Because of the former presence of many



brooks and rivulets in the environs of Breda, this record is possibly correct, but the occurrence of this species near Amsterdam is at least very remarkable. Nowadays no brooks nor streams exist in this area, and to my knowledge there are no indications that this type of habitat existed there the last century, although there were some larger lowland rivers, such as the Amstel. *A. guttatus* is, especially in the north-eastern part of its distribution in the Netherlands an endangered species as a consequence of extensive drainage due to the land development projects in the agricultural districts. Disturbance of its habitat is especially damaging to this species as a consequence of its very low dispersal power. In the province of Noord-Brabant (no recent records) its habitat has already disappeared almost entirely and in Twente only a few remnants are left. Near Winterswijk there is still a wealth of small streams, but these are all subject to serious threat (Cuppen & Dirkse 1978). The localities in the southeastern part of the Netherlands seem to be less threatened, but protection of this habitat against pollution and other disturbances is also important.

Abroad this species has a wide distribution in Europe, western Siberia and possibly northern India.

*Agabus biguttatus* (Olivier, 1795) (Fig. 4)

? *A. nitidus* (Fabricius, 1801)

The rarest species of *Agabus* in the Netherlands occurs only in the southernmost part of Limburg. There are only four records: Maastricht, vii. 1908, 1 ♂ 1 ♀ (De Wispelaere) in RMNH, coll. Everts; Ubachsberg, 7.vii.1963, 1 ♂ (H.K.M. Moller Pillot) in coll. H.P.J.J. Cuppen; Putberg, Voerendaal, 2.v.1965, 1 ♂ (S. Daan) in coll. RIN; Schweiberg, Nutbron, 18-19.viii.1977, 2 ♂ (more specimens present) (H.P.J.J. Cuppen) in coll. H.P.J.J. Cuppen & J.G.M. Cuppen.

This species lives in springs and small brooks. Cuppen & Moller Pillot (1978) collected it in a small trough, which was buried in a spring. These authors investigated the fauna of about 200 springs and wells in Limburg, but did not

collect *A. biguttatus* in any other locality, although some seemed quite suitable for this species. Balfour-Browne (1950) found that *A. biguttatus* and *A. guttatus* generally do not occur together, although their habitat preferences seem rather similar. The few records from our country do not contradict this conclusion. In Limburg *A. biguttatus* reaches its northern limit, only in Great Britain it does occur more northerly. Its main distributional centre is the Mediterranean region, and the Middle East as far as Kashmir in India.

Several authors (e.g. Franciscolo 1979) regard *A. nitidus* as a separate species. In that case the Dutch specimens might belong to that species, but this question needs further investigation, especially of type material.

#### 4. Discussion

The maps presented here give a rather good picture of the recent distribution of the species treated. This is due to the increasing interest in the biocoenose of Dutch running waters. Unfortunately the collections do not contain enough material to compare the recent distribution with the old situation. The limited number of records, however, does give an indication of a considerable decrease of stream dwelling *Agabus* species, especially in the western part of the Netherlands. Natural streams have almost disappeared from this region, and we can hardly imagine the wealth of interesting habitats which must have occurred here. There are some remnants in the form of dune-brooks near Schoorl, Egmond and Wassenaar, and some streaming parts in the broads area, where recently *Platambus maculatus* has been collected (Ankeveen, June 1981, leg. E.J. van Nieuwerkerken).

In the east and south these species are also threatened by large scale land-development projects and the fall of groundwater level. Many of the localities in Noord-Brabant possibly do not exist any more as a consequence of regulation of the many brooks since the late sixties. Brooks in and around the Veluwe run the risk of drying out due to extensive withdrawal of water, and one of the remaining well

preserved areas, the region of Winterswijk, is now severely threatened.

In the southern part of Limburg most brooks run their original course, but are becoming more and more polluted and eutrophicated.

Protection of streams is very difficult, and can only be successful when the complete drainage-area is included. By protecting only small remnants of streams the rare species will eventually become extinct as the populations become too small and too far separated for recolonization (cf. den Boer 1977). This extinction process will be especially fast in species with a poor dispersal power such as *A. guttatus* and to a lesser extent *A. paludosus*. However, also the good flyers *A. didymus* and *A. biguttatus* (cf. Jackson 1956a, b, 1973) will run the risk of extinction as the chance for survival of colonizing specimens will diminish (den Boer 1977).

## 5. Acknowledgements

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