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SOME PRELIMINARY NOTES ON THE DISTRIBUTION PATTERNS OF
EPHEMEROPTERA IN THE NETHERLANDS

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Mayflies (Ephemeroptera) have never been very popular among Dutch entomologists. When the project of mapping of the distribution of these insects within the scope of the European Invertebrate Survey started a few years ago, little was known of the distribution of this group. Only two publications contained a survey of localities, viz. a catalogue by Albarda (1889) and a brief account on the larvae by de Vos (1930). Both, however, were rather incomplete and did not offer a possibility to get familiar with the distributions of the species.

At the moment most of the material present in museum collections has been studied. Together with the data from some private collections that contain much more recent material, they offer a first, although still incomplete, view on the distribution of Ephemeroptera in the Netherlands.

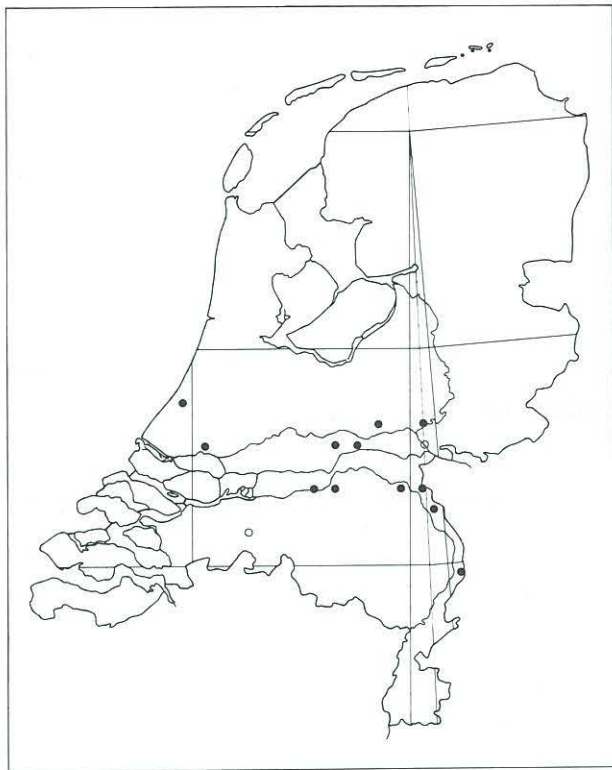
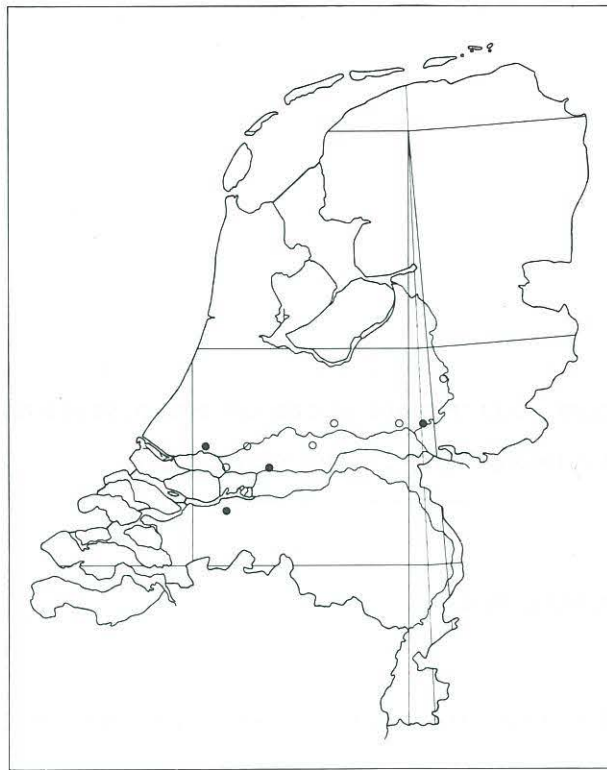
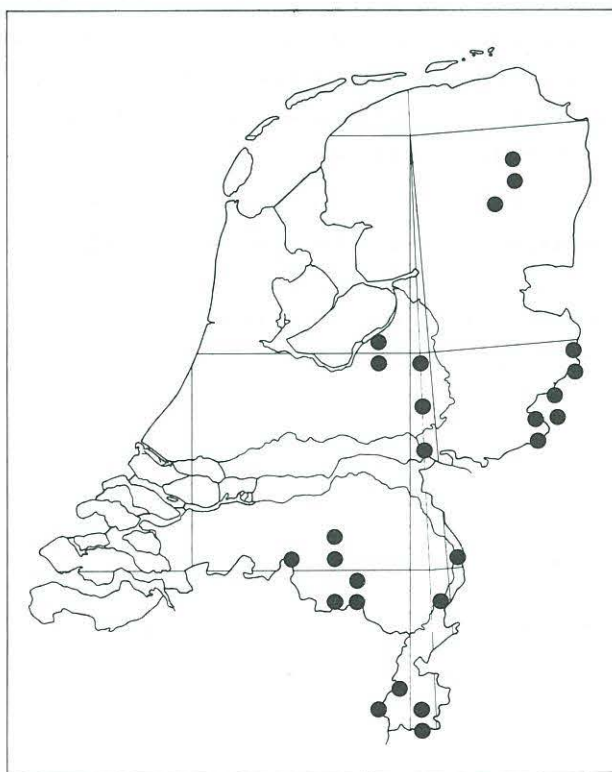
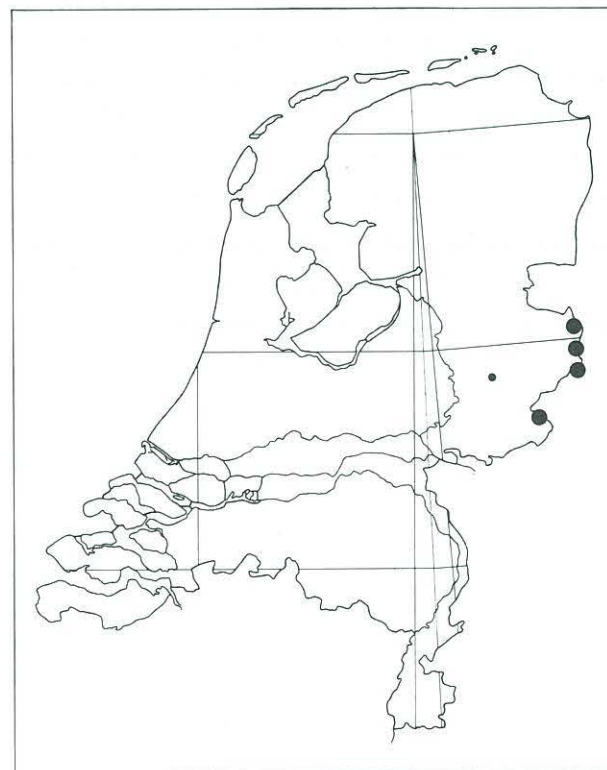
Roughly four main types of larval habitats are distinguished below; (a) large rivers, (b) slow running small rivers and lowland brooks, (c) the more fast running stony streams in hilly areas and (d) stagnant waters.

Large rivers

These are the river Meuse, entering from Belgium and the river Rhine, entering from Germany, with its branches Waal, Lek and IJssel. They are all heavily affected by human activities: not only by water pollution, but also by building weirs to regulate stream velocity and seasonal variation, and by the wash of the waves caused by powerful engines and large ship-propellers, which destroy river banks.

The river fauna is rather poor at the moment, consisting only of a few species with wide ecological ranges, like *Cloeon dipterum* and *Caenis horaria*. Due to the activities of some entomologists living in the second half of the 19th century near those rivers, we know that a rich fauna was present there once. A number of species can be regarded as typical for large rivers, e.g. *Isonychia ignota*, *Ametropus fragilis*, *Rhithrogena diaphana*, *Heptagenia coerulans*, *Ecdyonurus affinis*, *Ecdyonurus insignis*, *Choroterpes picteti*, *Potamanthus luteus*, *Ephemera lineata*, *Ephoron virgo* and *Palingenia longicauda*.

The best known distribution is that of *Ephoron virgo* (Fig. 1). It is a species that attracts

Fig. 1. *Ephoron virgo*Fig. 2. *Palingenia longicauda*Fig. 3. *Baetis vernus*Fig. 4. *Habrophlebia fusca*

attention by its striking swarming behaviour and perhaps therefore it was more collected than others. The most recent record is from 1936. Another example is the well known *Palingenia longicauda* (Fig. 2), once occurring there in immense numbers. Now there are only 16 specimens left in our entomological collections, the most recent one from 1907. The other species mentioned above were only known from very few localities and none of them was found later than the first decades of the 20th century. Probably all have had distribution patterns similar to the ones figured. This is rather difficult to confirm, however, as there is little reason to believe that they still occur in the Netherlands.

Slow running small rivers and lowland brooks

These are formed over a large area, mainly in the pleistocene part of the country. These waters are often polluted nowadays, but throughout the whole country localities may be found where the situation is less worse and a number of species is still present. Many work is still to be done to trace the distribution of these species in detail, but some general remarks can be made.

First of all there is a group of species whose known locality sites are scattered throughout the entire pleistocene area or a large part of it. Fig. 3 shows such a distribution pattern for *Baetis vernus*. The dots approximately show the outline of the area involved, but between the groups of dots large white areas occur, mainly due to our present lack of knowledge. It may be expected that *B. vernus* is present on many of these 'white areas'. A similar pattern is known for *Ephemerella danica*, and may be expected for some other species, e.g. *Centroptilum luteolum*, *Procladius bifidus* and *Brachycercus harrisella*. These, however, often occur in low densities and are easily overlooked. Other species may have had a similar distribution, but have disappeared by human activities. This might be true for *Heptagenia flava*, still present on some isolated places, or for *Heptagenia fuscogrisea* and *H. sulphurea*, both almost disappeared from the Netherlands.

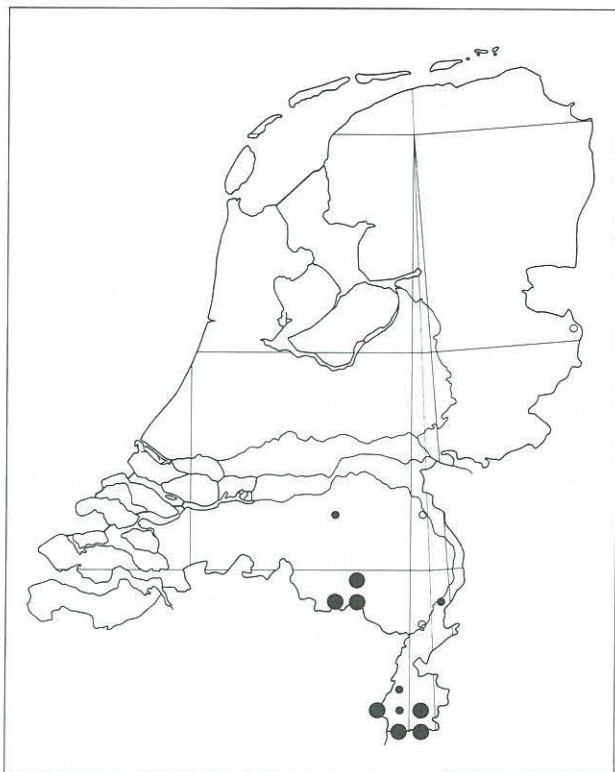
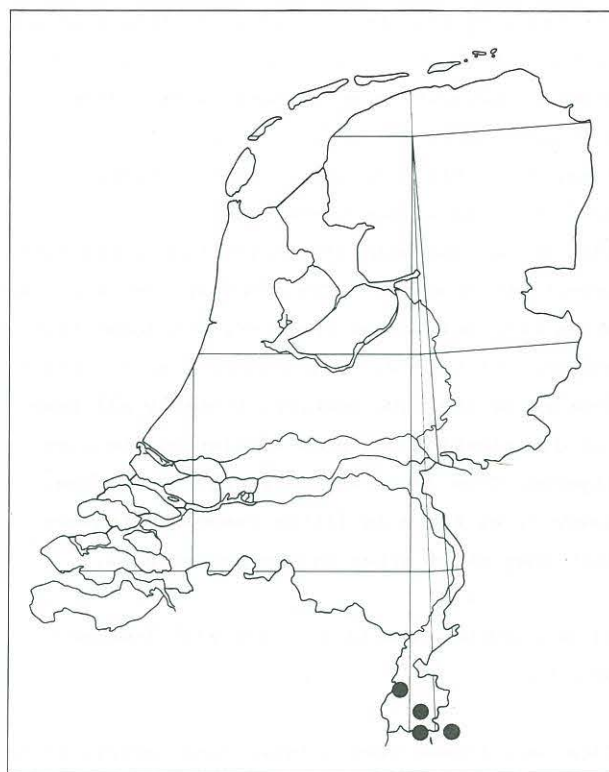
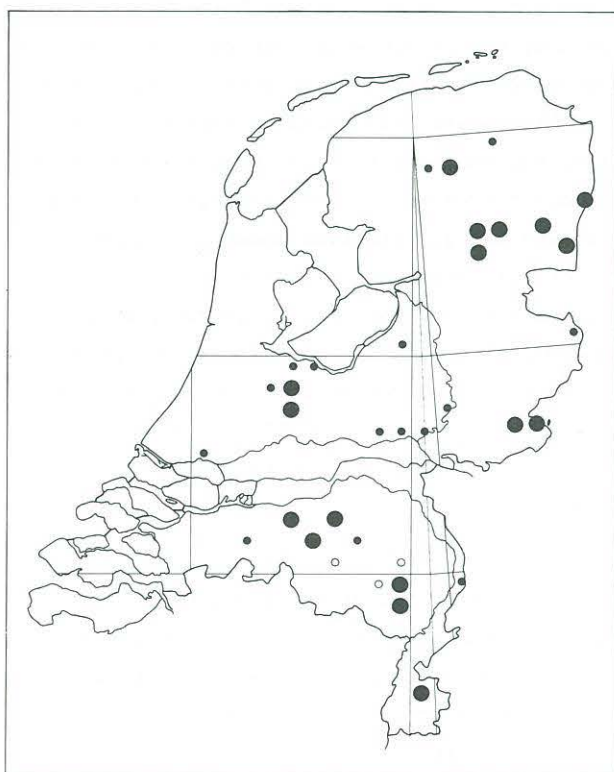
Some species occupy only a small part of the area in which small rivers and lowland brooks occur. An example is *Habrophlebia fusca* (Fig. 4), which is found only in the eastern parts of the provinces Overijssel and Gelderland. Within its distribution area it is locally common, but in the rest of the country it has not yet been found, although some parts are rather well investigated. Another example is *Ephemerella ignita* (Fig. 5), which is fairly common in the fast running streams of the southern part of Limburg, but occupies only the neighbouring parts of the lowland and not the entire area. A rather similar case is *Baetis rhodani*, which is very abundant in the south of Limburg, but is found further north only on some places along the eastern border of the country.

A third group is formed by species clearly belonging to the fauna of slow running waters, but scarcely found up to now, so that it is impossible yet to decide whether they are limited to certain areas or not. Examples are *Siphonurus aestivalis*, *Paraleptophlebia cincta* and *Centroptilum pennulatum*.

Fast running stony streams

These occur only in a rather limited area in the south of the province of Limburg, and have a characteristic fauna. Restricted to this area are *Rhithrogena semicolorata*, *Rhithrogena iridina*, *Ecdyonurus lateralis*, *Ecdyonurus torrentis*, *Habroleptoides modesta* and *Torleya major*. They all have the distribution shown in Fig. 6 for *Ecdyonurus lateralis*. Other species, like the above mentioned *Ephemerella ignita* or *Baetis rhodani*, have much larger numbers here than elsewhere in the Netherlands, or may prove to have when more material will be available, for example *Paraleptophlebia submarginata* or *Baetis scambus*.

Although the fast running streams have suffered also from water pollution, the ephemeropteran fauna is less affected than in other parts of the country, as no species are known to have disappeared from this area or are heavily decreased in number.

Fig. 5. *Ephemerella ignita*Fig. 6. *Ecdyonurus lateralis*Fig. 7. *Leptophlebia vespertina*

 Symbols used

- confirmed records before 1950 only
- (also) confirmed records 1950 onwards
- unconfirmed records before 1950 only
- (also) unconfirmed records 1950 onwards

Stagnant water

This is present nearly everywhere in the Netherlands and some species may therefore be found all over the country, e.g. *Cloeon dipterum* and *Caenis horaria*. Nevertheless much work has to be done to confirm this statement, as the present maps still show large gaps. The distribution of two other common species, *Cloeon simile* and *Caenis robusta*, is not clear at the moment, although they seem to occur almost everywhere. One species, *Leptophlebia vespertina* (Fig. 7), seems to be confined to stagnant waters of the pleistocene part of the country and some peaty localities along the border of the holocene part. The distribution of the two remaining species of stagnant waters, *Caenis luctuosa* (= *C. moesta*) and *C. lactea*, is poorly known, the latter found so far only in two larger lakes.

Conclusions

Most Dutch species of Ephemeroptera can be regarded as typical for slowly running water, and some others for stagnant water. Species adapted to fast running streams only occur in a very small area in the extreme south of the country. Real mountain streams, with characteristic species as *Epeorus sylvicola* and *Baetis alpina*, do not occur at all. Many of the Dutch mayfly species are affected by human activities, and for the cenose of large rivers, once perhaps the most characteristic part of the mayfly fauna in the Netherlands, it has been disastrous already in the 19th century.

The above account has by no means the intention to be complete. Out of approximately 55 species of Ephemeroptera, found in the Netherlands so far, the distribution of only few can be regarded as well known. The mapping activities have not been finished yet. It is possible however, to distinguish groups which need different attention in the future.

First of all a number of species is probably extinct. When all material, present in museum collections, has been checked, little or no extra information can be expected about these

species. The second group inhabits very limited areas, e.g. the fast running streams. The distribution of most of these species is rather well known and probably only details can be added in the future to complete it. Thirdly there are species with a large but more or less predictable area. Much work has to be done yet, but if visits to the 'white spots' are made at the right time of the year, many of them can be filled in without much trouble. The last group causes most difficulties as it concerns the scarce species, so far mostly found incidentally. Here it will take probably still a long time before our knowledge on their distributions will be more or less complete.

References

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