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Ecology and distribution of *Dolomedes* in Europe (Araneida: Dolomedidae)

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RIASSUNTO

Dolomedes fimbriatus (Cl.) e *Dolomedes plantarius* (Cl.) possono essere distinti in base alla loro morfologia genitale. Anche i loro habitats risultano differenti: *D. plantarius* è comune nelle zone basse e paludose, soggette a disseccamento, mentre *D. fimbriatus* vive nelle aree umide più ricche di acqua, come stagni, pantani ed acquitrini. L'identificazione delle due specie è stata spesso erronea e si rendono necessari nuovi controlli relativamente alle più antiche località di raccolta. Vengono infine discusse la distribuzione e l'attuale stato di rischio delle due specie studiate.

Parole chiave: *Dolomedes fimbriatus*, *Dolomedes plantarius*, Ecologia, Distribuzione, Rischio di estinzione.

SUMMARY

Dolomedes fimbriatus (Cl.) and *D. plantarius* (Cl.) can best be distinguished by their genitalia. Their habitats are stated to be different: *D. plantarius* is a common species in fenlands, *D. fimbriatus* occurs in marshes and bogs. Misidentifications in collections are frequent and reinvestigations of old sites are necessary. The distributions and degrees of threat are discussed.

Key words: *Dolomedes fimbriatus*, *Dolomedes plantarius*, Ecology, Distribution, Threats.

Introduction

In Europe there occur two species of *Dolomedes*, viz. *D. fimbriatus* (Clerck) and *D. plantarius* (Clerck). In such a simple case one might expect a clear and surveyable situation: a genus with only two well-known wetland species, being among the largest of the continent and very conspicuous with white longitudinal stripes on a dark body. Is there anything to be added?

Taxonomic history

The nomenclatorial confusion has been considerable and even BONNET (1930) in his impressive monograph on *Dolomedes* in Europe could not completely disentangle the confusion of the names used by subsequent authors. *D. plantarius* for a long time was called *D. fimbriatus*, while the now *fimbriatus* was referred to as *D. limbatus* (Hahn), which rendered many published records more or less useless. BONNET tried to recover the true identity of the earlier records by tracing the original specimens, but this proved not to be very easy. His map of the distribution of the two species in Europe, therefore, was not in agreement with the distributions at that time.

Discrimination between the species

BONNET (1930) found the species to differ in the genitalia and also in the shape of the cephalothorax. According to him the length/width ratio was distinctly different for the two species, the ranges showing no overlap. RENNER (1987), using material from a much wider geographical range came to different conclusions: differences in lenght/width ratio of the cephalothorax do not allow of separation of the two species because there is a large overlap. My own measurements are in agreement with those of RENNER.

According to BONNET (1930) the two species could also be distinguished by their colour-patterns. The main difference was to be found in the ventral abdominal patterns, which has one (*plantarius*) or two pairs (*fimbriatus*) of lighter stripes. I find this a very unuseful character, because more often the ventral surface has no stripes at all. The dorsal patterns of cephalothorax and abdomen were also said to be different in the two species. This may be true in many specimens, but the situation is much more complicated than suggested by BONNET.

First, *D. plantarius* appears to be very variable as to its colour and colour-pattern. The general pattern consists of white submarginal bands on the cephalothorax and latero-dorsal bands on the abdomen.

Some specimens have a dark prosomal integument, others are much lighter: the colour varies between nearly black, through brown and light brown, to olive-coloured. The integument is slightly lighter at the sublateral bands. The sublateral light bands become conspicuously white by white setae on these bands.

As said above, variation in pattern is common in *plantarius*. The variation is mainly caused by the setae: in many specimens all setae are blackish and the pattern is all but lost; sometimes there are few scattered white setae present, resulting in vague and barely whitish bands; in some specimens all setae of the lighter integumental bands are chalk-withe and the bands are very striking. Most illustrations presented throughout the literature depict this last type of colour-pattern. On the abdomen the white bands are equally caused by white setae and the bands are flanked by contrasting dark setae which accentuate the white pattern. In specimens with less developed bands on the cephalothorax the abdominal bands are also less striking. Thus there is a whole series of different colour-patterns, ranging from nearly black without stripes, through brown or olive, with or without bands, to black, brown or olive with chalk-white or yellowish bands.

Spiders with different patterns may have been interpreted as different species by arachnologists with limited experience with *Dolomedes*. It is also well possible that dark specimens without a pattern have escaped the eye of collectors because they very well blend with the background.

In *D. fimbriatus* the pattern is always present and only slightly variable; the bands are white to yellowish-white. Complete absence of the light bands as found in *plantarius* has never been observed.

In the second place - still talking about the possible difficulties when distinguishing the two species - both species have been collected as juveniles and the subadult stage more often than the adults. Such specimens in collections have nevertheless been identified, without the ultimate check of the genitalia being possible. I even have found pulli identified to the species.

Confusion in the past, therefore, has been caused by the overall resemblance of the two species, especially in the juvenile and subadult stages, combined with an extreme variation in colour and colour-pattern in one of the species (*plantarius*). The final conclusion thus must be that the genitalia provide the only stable and useful characters to distinguish the two species.

It is interesting to note that the North-American *Dolomedes striatus* Giebel shows a comparable variation in colour-pattern and is now the subject of a genetic investigation.

Habitats

Both species are wetland species. Although either depends on the presence of water, there are considerable differences between the two. *D. plantarius* lives on the water surface, where it catches its prey, mates on the floating vegetation, builds its small dome-shaped web on plants on the water, such as Water Soldier (*Stratiotes aloides* L.), or in the shore-vegetation above the water; the pulli and young spiders equally live on the water or hide in the dense shore-vegetation not far above the water surface; it dives below the surface when disturbed or threatened. *D. fimbriatus*, on the other hand, needs an exposed water surface only during the mating-period, but otherwise can occur in marshy areas which more or less dry out during the summer but of which the soil remains wet; the dome-shaped web is built high in the tall herbs, the pulli and young spiders live on the vegetation. Thus for *D. plantarius* a permanent, the whole year round, water surface is obligatory, while for *D. fimbriatus* this is optional during most of the year and only obligatory during the mating-period (April-May).

A second difference concerns the tolerance of shade. *D. plantarius* clearly prefers an open, tree-less habitat: where trees are bordering a fenland the species is only found on the southern side of the trees where it finds a maximum of insolation. *D. fimbriatus*, on the other hand, is found both in open, tree-less terrains, such as meadows and bogs, and in sparsely forested areas, where shrubs, trees and open spaces with tall herbes occur in a mosaic pattern. Apparently *fimbriatus* tolerates shade to a large extent (it can be called semi-ombrophil), while *plantarius* does not.

Although both species occur in the Netherlands, they never have been found together sofar. I presume that the two species exclude each other, or, with other words, that for either species the sum of all ecological factors, the sum of all habitat requirements, amounts to something different. The result is that *D. plantarius* is a species of fenlands, while *fimbriatus* occurs in bogs and wetlands on diluvial gronds.

In several countries *plantarius* occurs near large rivers where cut-off former branches in the water-meadow area provide a comparable habitat. This type of biotope, however, has disappeared in many places, while the quality is very much dependent on the water quality of the river.

Threats

In the Netherlands there are a fair number of fenlands, mostly reserves, and thus we have extensive populations of *plantarius*. However, in comparison with the past we have to admit a severe loss of habitat outside the present reserves. There exist a number of older records from outside the true fenlands where the species was found on and along ditches in agricultural grasslands with extensive cattle-breeding. Ditches then still carried a well-developed vegetation of such plants as Water Soldier (*Stratiotes aloides* L.) and Frogbit (*Hydrocharis morsus-ranae* L.) which are characteristic for mesotrophic waters. Those ditches now carry a vegetation of algae or thick layers of duck-weed. *D. plantarius*, therefore, has been forced back to the larger and relatively well-preserved fenlands, which are less seriously affected by pollution.

D. fimbriatus is still found in many wet situations such as remnants of bogs, swampy forest, wet heathland, margins of wet grassland and along ditches in such terrains, often in half-shade, but since there is a general tendency of drying out of wet areas in the Netherlands because of agricultural drainage schemes part of the original sites have changed to such degree that *fimbriatus* has disappeared. The general impression, however, is that the species is reasonably maintaining itself in the Netherlands.

In most European countries which have made Red Lists of their threatened biota *Dolomedes plantarius* figures as a species threatened with extinction. *D. fimbriatus* is often listed as vulnerable. This is caused by the general drying out of wet areas in many parts of Europe and by changes in land use. Decrease in range and quality of wetlands are of course a direct threat to wetland species, *D. plantarius* being one of them. As most stenoecious species, which are under direct threat when their habitat deteriorates, *plantarius* must have disappeared from many of its original sites. In the Netherlands we are in the exceptionally blessed situation that many of the original sites have been secured by giving them reserve status in time.

Dutch records

During recent years inventories have been carried out in the Netherlands and records from the literature have been checked through the study of collections. As said before, old records regularly have been

based on juvenile specimens or even pulli, while adult specimens from those localities in question are not present in the available collections. Most records prior to the twentieth century are more or less inverifiable. Van HASSELT (faunistic publications, 1858-1898) only left us a reference collection: he kept only a few specimens of each species, regardless the number of sites mentioned in his publications. From many localities in the fenland belt in the western alluvial part of our country he reported both *plantarius* and *fimbriatus* (*limbatus*), which cannot be confirmed because at present only *plantarius* can be found there. It may be safely assumed that he found *plantarius* only and misinterpreted the infraspecific variation. CHRYSANTHUS (1949) also devoted a paper to *Dolomedes* but failed to separate the two species and presented an overall distribution of the two species together. Thus, the provisional distribution maps of the two species still show many a query, only to be replaced by confirmed distribution symbols after a visit to the actual site, if still in existence in the original quality.

Extrapolation

In many countries the situation will not differ to a large extent from what I have found in the Netherlands. An exception might be France, where BONNET (1930) made a thorough study of all records and collected new material. Even in Great-Britain, one of the better, if not the best, investigated countries of Europe as to its spider fauna, the second site for *plantarius* was found only very recently (KIRBY, 1990). The county where the species was discovered, East Sussex, was known as *fimbriatus* range. It demonstrates how cryptic this species really is.

I expect to find a fair amount of misidentifications in most other countries. At present a distribution map of Europe is not easily made. One can only use fresh material or recently published records based on adult specimens (RENNER, 1987) and should distrust earlier records and those based on immature specimens.

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