Mermessus denticulatus (Banks, 1898) and *Mermessus trilobatus* (Emerton, 1882), adventive species in the Netherlands (Araneae, Linyphiidae)

Peter J. van Helsdingen

ABSTRACT Contrib. Nat. Hist. 12: 617–626.

***Mermessus denticulatus* was found outside buildings in the Netherlands. *Mermessus denticulatus* is diagnosed and the genitalia are depicted for future recognition. *M. trilobatus* has established a strong population in the Netherlands. Colonization of Europe by *M. denticulatus* and other *Mermessus* species is briefly summarized. Other examples of introductions of spider species in the Netherlands are given and the dynamics of expansion of ranges is briefly discussed.**

Keywords: floodplain, functional aspects of genitalia, Linyphiidae, *Mermessus*, *Mermessus denticulatus*, *Mermessus trilobatus*

Introduction

We will remember Konrad Thaler through his faunistic work on arachnids in the Alpine region in the first place: describing the composition of the fauna in the different alpine mountain ranges combined with the necessary taxonomic research. This was the static aproach. But he was also interested in the dynamic aspects of the Austrian fauna. In 1995 (Thaler & Knoflach 1995) a paper was published on adventive species, dealing with the species that had recently arrived from foreign regions. In that paper the two authors summarized the many changes in the Austrian arachnid fauna.

This paper mentions the first free land records of *Mermessus denticulatus* in the Netherlands. In 2002 and 2003 *Mermessus denticulatus* (Banks, 1898) was collected in the Netherlands in two different floodplains along the river Waal, a major branch of the Rhine river system. The two sites were the Gamerensche Waard (2001) and the Hurwenensche Waard (2002). Both sites are natural habitats in a dynamic riverine environment with flooding in the winter

and extensive grazing during the summer. This small linyphiid species was already known from hothouses in the Netherlands (see below) but it had not yet been found outside such protecting environments in the countryside. Considering the floodplain character of the two sites and the distance from buildings we may assume that the species now must have viable populations in the two areas.

Since *M. denticulatus* now can be found in open country outside buildings it might be helpful to give a diagnosis here and depict the genitalia, so as to allow easy recognition. Some remarks on the functional aspects of the genitalia are added. *Mermessus trilobatus* (Emerton, 1882) was already depicted in 2007 (Helsdingen & IJland 2007) after the discovery of a small population in "De Reijerscamp", a nature reserve near Renkum, province of Gelderland (Guelre) in 2007. The population has grown considerably since.

This short contribution to arachnology is dedicated to Konrad Thaler who died too early in the middle of active scientific life.

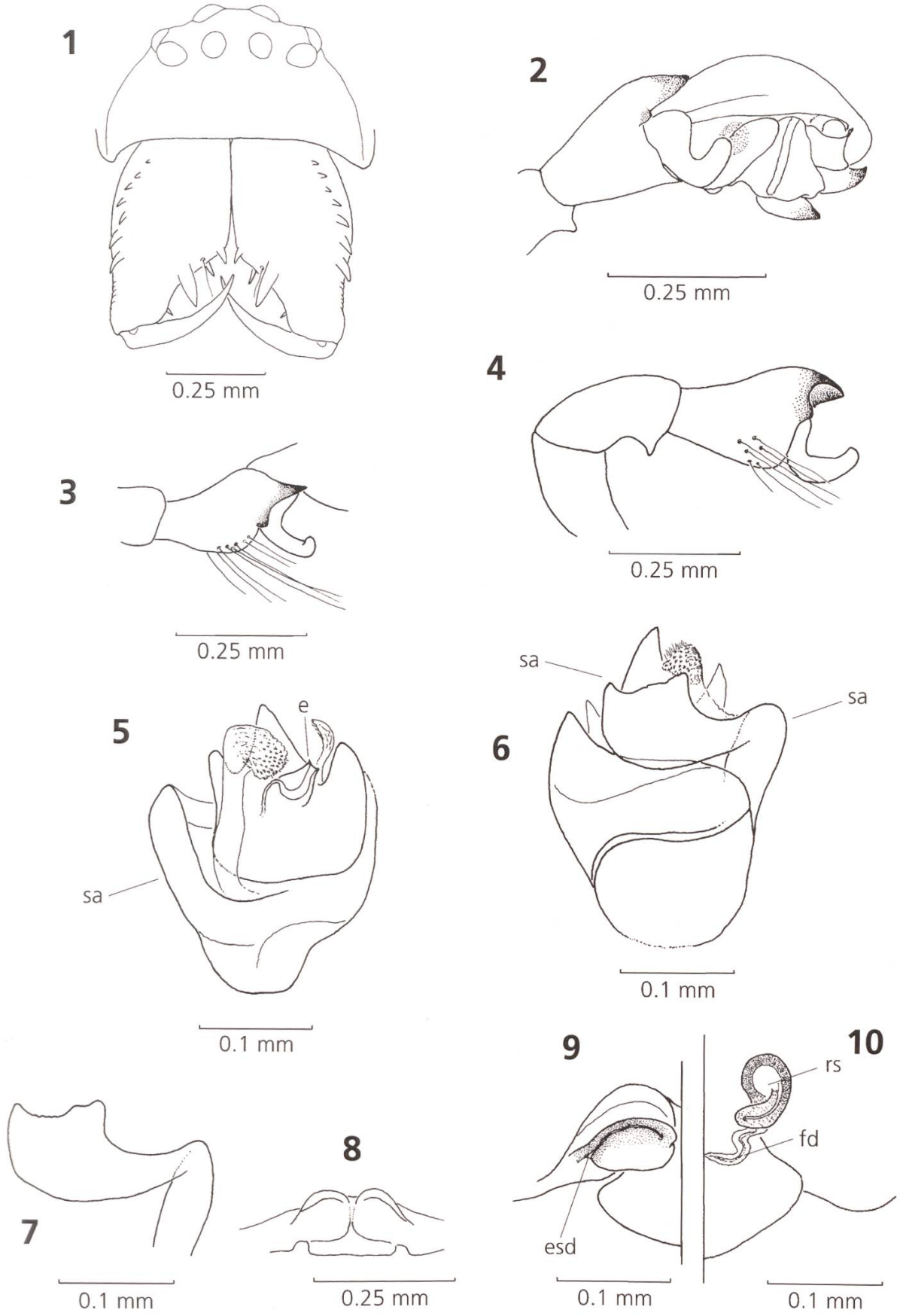
Results

Mermessus denticulatus (Banks, 1898)

Diagnosis:

Small linyphiid spider. Prosoma without cephalic pits or grooves. Eyes rather large. Legs slender, dorsal spines on tibiae 2-2-2-1, no lateral spines, Tm I 0.50, Tm IV present. Chelicerae with meso-frontal tooth and a row of six to seven antero-lateral denticles (at base) or hook-shaped teeth (towards tip) (Fig. 1).

Male palp (Fig. 2): Patella without spines, not very slender, apically with a small ventral protrusion (Fig. 4). Tibia (Fig. 4) with long hairs (as long as tibia itself) on apical half of ecto-lateral surface; dorsally with a sharply pointed (as seen in dorsal view, Fig. 3), dark-brown apical apophysis with a small blunt tooth or tubercle at its ecto-lateral base; tip of tibia and base of cymbium light-brown, other parts light yellow as the legs. Paracymbium (Figs. 2, 4) a simply curved, dark-brown structure with a few minute setae at its base. Suprategular apophysis (sa) (Fig. 7) a slender and curved element which ends flattened and truncated; radical-embolic section (Figs. 5, 6) more or less crown-shaped with three protruding parts on the rim, one finger-shaped and two cone-shaped; between the protrusion a crater-shaped depression with an



Figs. 1–10. ***Mermessus denticulatus*****. – 1: Male chelicerae, frontal aspect; – 2: male palp, lateral aspect; – 3: tibia of male palp, dorsal aspect; – 4: idem, lateral aspect; – 5: radical-embolic section of male palp, showing urn-shaped embolus (e) and basal part of suprategular apophysis (sa); – 6: idem, showing terminal part of suprategular apophysis; – 7: tip of suprategular apophysis of male palp; – 8: epigyne, caudal aspect; – 9: vulva, caudal aspect (esd: opening of sperm duct); – 10: idem, ventral aspect (fd: fertilisation duct; rs: receptaculum seminis).**

urn-shaped embolus (e) at the bottom, the wall of the crater consisting of a narrow embolic membrane next to it; the whole crater is covered by a large mebraneous structure which stands over it like an umbrella and derives from the connective tissue between tegular and radical sections.

Epigyne (Fig. 8): simple but spatially complex; two lobes at either side of a fissure stand perpendicular to the ventral surface in front of the epigastric furrow. The lobes have a transverse ridge over most of the width on the posterior side not far below the upper margin. Vulva (Figs. 9, 10): openings of the spermducts (esd) at the posterior (caudal) side of the lobes far below the rim; I would expect them more towards the tip of the lobe, but I have not succeeded in locating any entrance there, nor a duct towards the base. Receptacula (rs) pointing in anterior direction. Fertilization ducts (fd) simple.

Functional aspects: Not easy to understand. We may assume that, as usual, sexual stimulation will bring the epigyne to a more exposed position, sticking out from the ventral surface of the abdomen. It is clear that the crown-shaped embolic section during copulation is cupped over the relevant lobe of the epigyne (the left lobe if the left male palp is used, and vice versa) in such a way that the urn-shaped embolus fits into the entrance of the spermduct of the epigyne on the caudal side of the lobe. Because the opening of the spermduct (esd) is situated caudo-laterally and rather far from the tip of the lobe, the embolic section must be cupped from the side rather than from the top. The long and very large suprategular apohysis probably anchors the palp to the epigyne, most likely by being pressed, through the pressure of the haematodocha, to the posterior (caudal) wall of the lobes of the epigyne. The transverse ridge on the caudal side of the lobes may function as support for the suprategular apophysis during this phase.

Mermessus and its spreading potential

Mermessus is a large genus with its main distribution in the New World, from Alaska and Canada in the North to Peru in the South and with its nucleus in Central America, the northern part of South America and the Caribbean. Platnick (2006) lists 78 species. Millidge (1987) revised the genus but did not study the anatomy of the genitalia in detail. He limited the use of the genitalia to the use of fingerprint images for the recognition of the species.

One species (*M. fradeorum* (Berland, 1932)) scores "cosmopolitan" (Platnick 2006). Some apparently occur outside the main distribution area, in China and Japan (*M. naniwaensis* (Oi, 1960)). *M. bryantae* (Ivie & Barrows, 1935) apparently was introduced in the Azores.

Mermessus denticulatus (Banks, 1898) has been introduced in Europe. The species was found in a hothouse in the Netherlands (Prinsen 1996, as *Eperigine eschatologica*). In Germany it was also recorded from a hothouse (Jäger 1996; Klein & al. 1995). In Belgium it was imported with exotic plants and found in a hothouse (Van Keer 2007). The specimens now collected in floodplains in the Netherlands are the first ones outside hothouses.

Mermessus maculatus (Banks, 1892) was found in a hothouse in Switzerland (Holzapfel 1932, Hänggi 2003). This is a record from 1931 which cannot be re-examined because the specimen cannot be located.

Mermessus trilobatus (Emerton, 1882) was for the first time found in Europe in Germany, in a beech forest near Karlsruhe (Dumpert & Platen 1985). In Switzerland it has been found in a number of different dry and wet grassland types in Tessin (Hänggi 1990, 1992), and in Austria the species was found in Vorarlberg (Breuss 1999). In Belgium *M. trilobatus* was recorded from the eastern part of the country (province Limburg) (Aminal 2000) and from the south (province Namur) (De Koninck 2004); also on the Mechelse Heide on a heathland site with strong *Molinia* cover (Lambrechts & al. 2002). The species was also discovered on three more sites in Büllingen in the eastern part of the country (see Van Keer & al. 2006, Van Keer 2007). Most recently it was found near Antwerp (Van Keer & al. 2006). According to Thaler & Knoflach (1995) this species was also found in Trentino, Northern Italy, without further details. It also turned up in England in Essex close to the Thames (Harvey 2008). Some grey literature sources are mentioned by Hänggi & al. (1995) for the Swiss Jura and the Kaiserstuhl in Germany.

Obviously the above species of *Mermessus* were transported by man. Usually this is most likely to happen with species which are common in their original distribution area. I have not found any literature source with an indication of the abundance of *Mermessus* species or population densities. From Millidge's revison (1987) one can only infer the size of the species' range. Specimens can be transported with plant material or other goods as juveniles, adult specimens or egg batches. The success in their new environment and their chances of establishing a small population, may depend on the frequency of introduction of new specimens. *M. denticulatus* has a southern distribution (southern states of the U.S.A. and Mexico) and therefore probably has better chances to survive in a protected environment such as hothouses. On the other hand, *M. maculatus* and *M. trilobatus* are northern species in North America, which should be able to survive in open country in the more temperate climatic belt of Europe. Since *M. denticulatus* has now been found in two different localities in two different years, it seems to have adapted to the climatic conditions in the Netherlands, which has a comparatively mild maritime climate.

If we summarize the distribution of the three *Mermessus* species which now occur in Europe, we can conclude that *M. trilobatus* has settled in the open country over a large area (Austria, Germany, Switzerland, Northern Italy, many places in Belgium, in Britain and now in the Netherlands) and thus has become a European species, even though of North American origin. Of *M. maculatus* we have only a single record from a hothouse in Switzerland. For *M. denticulatus* we now have records from hothouses in the Netherlands, Belgium, and Germany, while it has spread into the countryside in the Netherlands. However, we should realize that specimens of such small Linyphiid species as *Mermessus* are prone to escape attention in the field. They will be detected more easily and sooner in hothouses. Only inventories with the use of pitfall traps will bring them to light more easily.

Earlier introductions in the Netherlands and some remarks on general dynamical aspects of fauna

In principal a fauna indeed is static when looked at over a not too long period. However, there are not many places which have stable conditions over an extended period. Climatic change is a general, natural phenomenon. Europe became warmer after the last glacial period, the Würm glaciation, allowing species to spread and adapt to the new sitiuation. We may still be in a warming-up phase after the last glaciation. Many nowadays assume that a major and rapid climatic change is caused by man's activities. What we observe is a shift in distribution ranges of species. In Europe, Mediterranean and Central-European species spread northward and westward.

Many species are imported, mostly accidentally with goods brought in. This is another form of range extension but not a natural one. Most specimens will not settle on the new site because of the adverse conditions deviating from their habitat requirements or because of the absence of a mating partner. Females with egg batches, however, can be successful. Incidentally imported species usually are common species in their country of origin and often do not have very strict requirements, but if imported from a tropical or subtropical region they may meet with adverse climatic conditions which they are unable to cope with. If able to settle they may have the best chances of survival in protected circumstances such as in houses, hothouses, warehouses in harbours etc.

The most illustrative example of natural northward spreading is the well-documented range extension of *Argiope bruennichi* (Scopoli, 1772). Its advance through the Netherlands started in 1980 at the extreme southern tip

of the country and the species now can be found throughout most of the country, although it seems not to have reached the Wadden Islands along the north coast yet. In 25 years it advanced 300 km (Van Helsdingen 2007). In Germany the advance of *Argiope bruennichi* was followed and documented by several arachnologists (Guttmann 1979, Kordges & Kronshage 1995, Kordges & al. 1997). By now it has reached Poland, the Baltic States, Denmark and Sweden (see Van Helsdingen 2006). The strategy followed is ballooning whereas it survives the winters as egg batch.

Pholcus phalangioides (Fuesslin, 1775) must have settled in the Netherlands in the same way. It was mentioned for the Netherlands for the first time by A.W.M. van Hasselt (Van Hasselt 1869) after finding a single specimen in 1865 followed by subsequent statements in following years after having received a second specimen in 1868 (Van Hasselt 1870). Clearly it was not a common species at that time. Like *Argiope bruennichi* it must have reached our country from the warm Mediterranean region and settled inside houses, but houses in those days were cold in winter without central heating. *Pholcus phalangioides* is now common everywhere in the Netherlands, spreading outside buildings in the summer and returning inside in winter. Hardly any house is without this striking species.

Another example is *Hasarius adansoni* (Audouin, 1826). This beautiful species can always be found in hothouses throughout the country, as in many European countries. In the Mediterranean region it occurs also outside buildings. In 2005 this species was found in debris in a riverine flood area (along the Hollandse IJssel, municipality of Ameide, province Zuid-Holland) in the Netherlands far from buildings (Van Helsdingen 2005). Apparently the species can live outside now and survive the climate in the Netherlands which got much milder over recent years.

Coleosoma floridanum Banks, 1900 settled in commercial hothouses in the west of the Netherlands (Honselersdijk in the province Zuid-Holland) (Van Helsdingen 1995) where it still maintains a breeding population, and may have spread to other comparable hothouse complexes. A similar case is presented by *Uloborus plumipes* Lucas, 1846, which turned up in a hothouse near the city of Groningen, province of Groningen in 1986 (Van Helsdingen 1986) from where it subsequently spread through the Netherlands and maintains breeding populations in many places throughout the country. Or there were several independent introductions, we will never know. Neither of these two species established outside populations as far as known, but both survive very well in their protected environments.

Of course we should not forget the occurrence of *Segestria florentina* (Rossi, 1790) in the Netherlands. This species clearly is of Mediterranean ori-

gin and must have reached our country by means of transport or other human activities long ago. The earliest record dates from the province Zealand (Becker 1879) and more precisely from the (then) island Walcheren (Van Hasselt 1885). It is firmly established there and most likely can survive in the relatively mild climate in this southwestern part of the country close to the sea (Van Helsdingen 1990). Apart from this region the species has (semi)permanent populations in larger cities such as Rotterdam, The Hague, and Amsterdam, while it is recorded occasionally from other places.

It is difficult to understand why some species are transported more easily and frequently, while others are not. The extremely common species *Linyphia triangularis* (Clerck, 1757) of northern temperate Europe was not found in the Nearctic Region until 1991 when specimens were discovered in Maine, the northernmost state of the USA on the East coast (Jennings & al. 2003). Jennings and his co-authors list a number of other immigrants to North America, most of them common in Europe. They consider *L. triangularis* also an immigrant from Europe. The reason for its relatively late introduction into North America may be caused by the behaviour of the species, which easily drops from its web when disturbed and does not cling to a plant or shrub when transported. Moreover, the species attaches its egg batch to dry leaves in the soil layer and does not carry them along. The chances of introduction of eggs are probably strongly diminished because of that. In my experience the traditional niche of *L. triangularis* in Europe (shrubs, hedges and taller plants) are occupied by other species in the Nearctic region, such as *Pityohyphantes* species, *Frontinella communis* (Hentz) and *Agelenopsis naevia* (Walckenaer), which might make it more difficult for newly arrived specimens to successfully compete for space.

Abbreviations used:

e	embolus
esd	entrance spermduct in epigyne
fd	fertilization duct
rs	receptaculum seminis
sa	suprategular apophysis.

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Address of the author:

Dr. Peter J. van Helsdingen
European Invertebrate Survey – Nederland
Leiden, Netherlands

E-mail: helsdingen@nnm.nl