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The Great Raft Spider *Dolomedes plantarius* rediscovered in Saxony (Araneae: Pisauridae)

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Abstract. *Dolomedes plantarius* has been rediscovered in Saxony (Germany) for the first time since its only previous finding in 1948. The new discoveries were made between 1996 and 2021 in northern Upper Lusatia by sweep netting in the marginal, emergent and floating vegetation around an extensively used swimming lake and three fish ponds. All ponds where the species was recorded are located in areas with several still-water bodies and are characterised by a structurally rich marginal or floating vegetation. The water bodies showed a high nutrient content and the swimming lake had a very low pH. As part of their management, the fish ponds are regularly drained in autumn. We suppose that after the ponds are refilled in spring *D. plantarius* recolonises from neighbouring ponds that retained their water.

Keywords: bathing lake, fish ponds, threatened species, Saxony, water management, water quality

Zusammenfassung. Wiederfund der Großen Jagdspinne *Dolomedes plantarius* für Sachsen (Araneae: Pisauridae). Nach dem ersten und einzigen Fund im Jahr 1948 wurde *Dolomedes plantarius* zwischen 1996 und 2021 wiederholt in der nördlichen Oberlausitz (Sachsen) gefunden. Die Zufallsfunde gelangen in der Ufervegetation beziehungsweise dem Schwimmblattgürtel eines intensiv genutzten Badesees und von drei Fischteichen mit Hilfe von Kescherfängen. Alle Teiche, in denen die Art nachgewiesen werden konnte, liegen in Gebieten mit mehreren Stillgewässern und zeichnen sich durch eine strukturreiche Ufer- oder Schwimmblattvegetation aus. Die Gewässer wiesen einen hohen Nährstoffgehalt auf, der Badesee einen sehr niedrigen pH-Wert. Die Fischteiche werden im Rahmen der Bewirtschaftung regelmäßig im Herbst abgelassen. Es ist anzunehmen, dass *D. plantarius* die Teiche nach der Bespannung im Frühjahr von benachbarten, wasserführenden Teichen wiederbesiedelt.

Dolomedes plantarius (Clerck, 1757) has a Palaearctic distribution that extends from western Europe to central and northern Asia (World Spider Catalog 2022). The semi-aquatic species has been found at water margins in mires (van Helsdingen 2006, Harms et al. 2009) as well as in the shore zone of fish ponds and lakes (Růžička & Holec 1998, Holec 2000, Harms et al. 2009), in reeds beside a wet meadow (Kielhorn 2009), along oxbows and grazed banks of slow-flowing rivers (van Helsdingen 2006, Unruh 2008, Harms et al. 2009, Dickel 2019, Dickel et al. 2020), and on the shore of a flooded open-cast lignite mine (Unruh 2008). In general, the species seems to be restricted to areas with extensive standing or slow-flowing water and a sunny, structurally rich shore zone.

Dolomedes plantarius has become rare in many countries, probably owing to habitat loss, e.g. by intensification of land use, watercourse engineering, bank stabilisation or increased pressure from recreational activities (Davidson 2014). Studies by Smith (2000) have shown that the species has a poor ability to adapt to changing habitat conditions. These results are supported by species distribution models from Leroy et al. (2013, 2014). For this reason, it has been included in many countries' Red List of threatened species and classified as vulnerable by the IUCN (1996); for the conservation status in individual countries see Milano et al. (2021). In Germany, it is listed as critically endangered in the German Red List of spiders (Blick et al. 2016) and as a strictly protected species in the Federal Species Protection Ordinance (BArtSchV 2005).

Another reason why the species is rarely recorded may be confusion with its more common sister species *D. fimbriatus* (Clerck, 1757). One morph of *D. plantarius* is entirely brown or has only indistinct white or yellowish lateral longitudinal bands on the prosoma and opisthosoma. The other morph

bears distinct stripes like *D. fimbriatus*. Renner (1987) and Baillie et al. (2019) compared the two *Dolomedes* species and found that colour and markings are unreliable distinguishing characters. Therefore, a reliable morphological differentiation of the species is not possible for juvenile individuals and only possible for adults on the basis of genital morphology.

According to the record maps of the Arachnologische Gesellschaft (2022, Fig. 1), the only documented Saxonian record is a female found by Karl Hermann Christian Jordan in May 1948 from Lömischau (parish of Malschwitz, district of Bautzen). It was determined and published in a paper on the spiders of eastern Saxony by Rudolf Graul (1969).

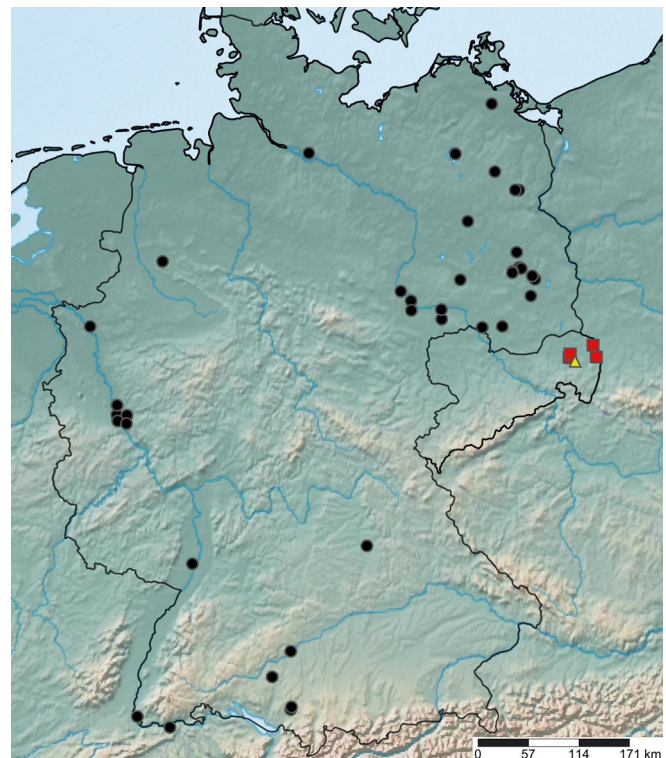


Fig. 1: Localities of *Dolomedes plantarius* in Germany (Arachnologische Gesellschaft 2022). The state border of Saxony is marked (round icons: previously known localities, triangular icon: record from 1948, square icons: new localities)

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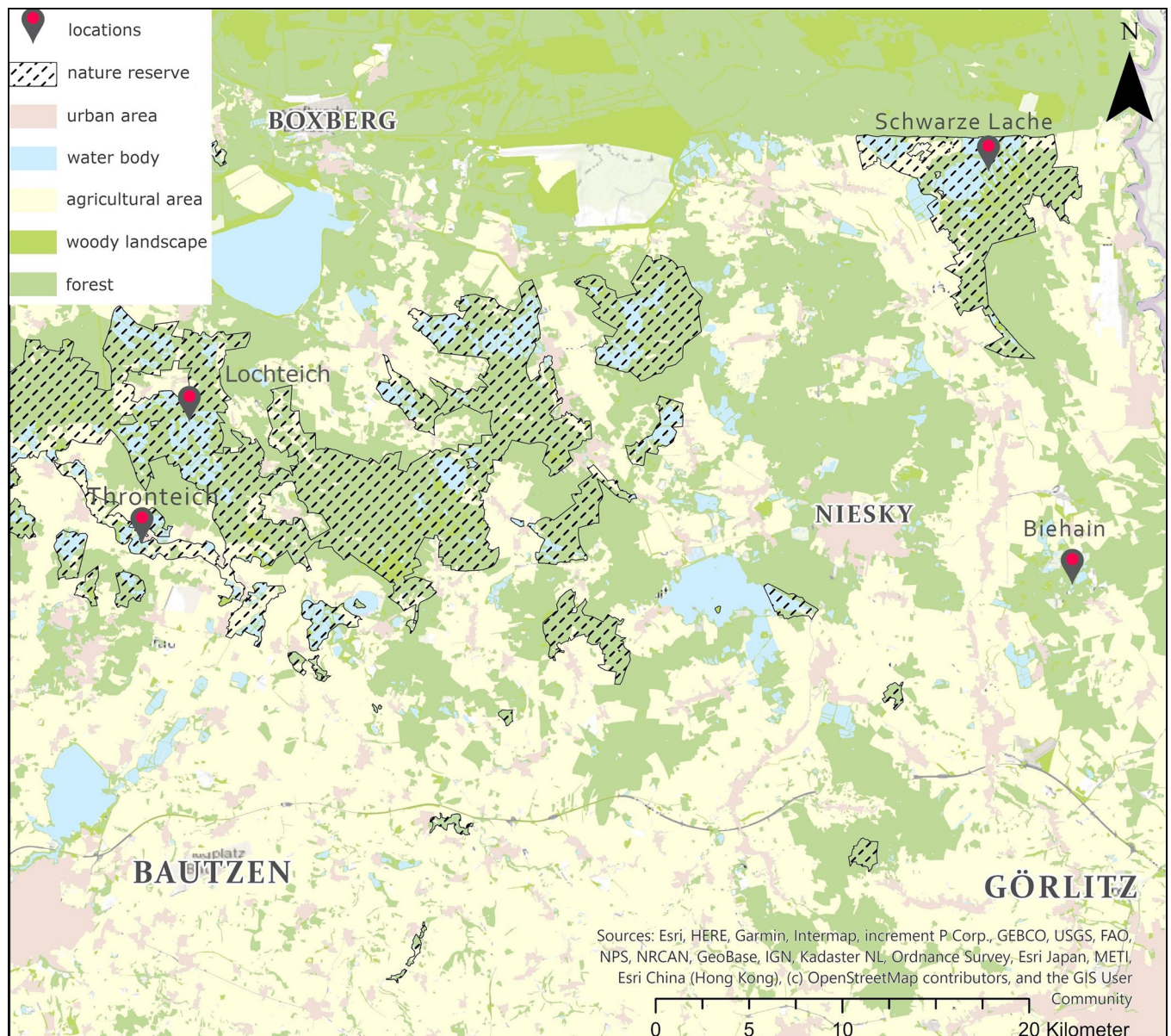


Fig. 2: New localities of *Dolomedes plantarius* in Upper Lusatia, Saxony

The present work is not a systematic survey of *D. plantarius*, but a collection of individual records. The aim of this publication is to present localities of the species in eastern Saxony and thus to provide a first basis for a distribution map and for conservation measures in Saxony.

Material and methods

The material was collected between 1996 and 2021 in northern Upper Lusatia, Saxony at four localities. The area has many shallow ponds, mostly created for fish farming. The specimens of *D. plantarius* were sampled by sweep-netting water plants near the shore.

The discovery in Biehain was made during a survey of aquatic spiders as part of a school project (Reise 2019). In the pond areas of Niederspree, Kauppa and Rauden, especially individuals with lower-contrast markings were collected and examined.

The adult male from Rauden was identified alive by carefully immobilising the spider between a piece of foam and a glass plate. Since the characters important for species identification (tibial apophysis) are relatively large in *Dolomedes*, they can be clearly recognised with the help of a tenfold magnify-

ing glass. The individuals were determined using the descriptions by Renner (1987) and Roberts (1995).

Water quality was recorded with test kits from Macherey-Nagel, visicolor Eco (total hardness, phosphate, nitrate and oxygen content), and temperature and pH with the electronic measuring device HANNA HI 991301.

The area of each pond was determined from Google Earth Pro. The geographical coordinates (decimal, WGS 84) and the altitude were measured using a Garmin etrex VISTA HCx. The map of Germany was created with SimpleMapper (Shorthouse 2010). The voucher specimens are deposited in the spider collection of the Senckenberg Museum of Natural History Görlitz.

Results

A total of five individuals of *Dolomedes plantarius* were recorded from four ponds in the area (Tab. 1), all of which are located in places with several still-water bodies (Fig. 2).

Locality 1. The site was visited on 1. Sep. 1996 and one individual (female) was found. This fish pond “Schwarze Lache”

Tab. 1: Overview of recent Saxonian localities of *Dolomedes plantarius*

Collection Date	Specimens	Site / Pond	Status	Habitat	Coordinates	Altitude [m a.s.l.]
1. Sep. 1996	1 ♀ + egg sac	Niederspree: Schwarze Lache	Nature reserve	Fish pond	51.4015°N, 14.8935°E	153 m
31. Aug. 2018	1 ♀ + egg sac	Biehain	–	Swimming lake	51.2771°N, 14.9341°E	178 m
11. Sep. 2019	1 ♀ + 1 ♂	Kauppa: Thronteich	Biosphere reserve	Fish pond	51.2896°N, 14.4865°E	143 m
21. Jul. 2021	1 ♂	Rauden: Lochteich	Biosphere reserve	Fish pond	51.3263°N, 14.5092°E	139 m

is located in the nature reserve Niederspree. The water management of the ponds is oriented towards the objectives of nature conservation while allowing their use as fish farms (SMUL 2010). With its many ponds and extensive siltation zones, this FFH-Natura2000 area is an important wetland and provides habitats for numerous endangered species. The aquatic vegetation was characterised by common water crowfoot (*Ranunculus aquatilis* agg.), common arrowhead (*Sagittaria sagittifolia* L.), wavy bladderwort (*Utricularia* cf. *austriacalis* R.Br.), fine-leaved water dropwort (*Oenanthe aquatica* (L.) Poir.), floating sweet-grass (*Glyceria* cf. *fluitans* (L.) R. Br.) and duckweed (*Lemna* spp. L.) (Fig. 3). The female captured here carried an egg sac and was distinguished from the other individuals of the genus *Dolomedes* living there by its low-contrast coloration.

Locality 2. Another female of *D. plantarius* was recorded between Biehain and Kaltwasser on 31. Aug. 2018 (Fig. 4). It also carried an egg sac. The vegetation at this site consisted mainly of common soft rush (*Juncus effusus* L.), bulbous rush (*Juncus bulbosus* L.) and bottle sedge (*Carex rostrata* Stokes). The locality is a clay- and sand-mining area with several residual lakes and ponds embedded in the Biehainer Forst. This blueberry-pine forest (*Myrtillo-Cultopinetum sylvestris*) extends up to the lake, which is used infrequently for swimming.

Localities three and four, sampled on 11. Sep. 2019 and 21. Jul. 2021, respectively, are located in the biosphere reserve “Oberlausitzer Heide- und Teichlandschaft”, in the Kauppa and Rauden pond areas. Sustainable management of these carp ponds aims to preserve the unique cultural landscape.



Fig. 3: Collecting site of *Dolomedes plantarius* at the Schwarze Lache in the Niederspree nature reserve

Locality 3. One male and one female were found at the Thronteich in Kauppa (Fig. 5). The shore vegetation of the pond was characterised by lesser bulrush (*Typha angustifolia* L.), rigid hornwort (*Ceratophyllum demersum* agg.) and a bladderwort (*Utricularia* sp. L.), in other areas by common reed (*Phragmites australis* (Cav.) Trin. ex Steud.).

Locality 4. At the shore of the pond Lochteich in Rauden we found an adult male, and close by a nursery web of a *Dolomedes* sp. without a female spider. The Lochteich had sparse shore vegetation at the collecting site, mainly bushgrass (*Calamagrostis epigejos* (L.) Roth), but had floating vegetation: the white waterlily (*Nymphaea alba* L.) (Fig. 6).

The water quality of the ponds differed in only a few aspects (Tab. 1). Particularly noteworthy are the very low pH value in the Biehain lake, and the high phosphate and the very low oxygen content of the pond Lochteich. The size of the ponds and the width of the vegetation belt as well as its plant species differed considerably. At Biehain, Kauppa, and Rauden, *D. plantarius* was found in shore areas that are sunlit in summer for a large part of the day. By contrast, in Niederspree it was found in a semi-shaded area under common alder (*Alnus glutinosa* (L.) Gaertn.).

Discussion

There have been several previous studies on the habitat requirements of the two European *Dolomedes* species and how commonly each occurs. *Dolomedes fimbriatus* is a widespread species in the north-eastern part of Saxony, with a concentration in the biosphere reserve “Oberlausitzer Heide- und Teichlandschaft” and in the nature reserve Niederspree



Fig. 4: Collecting site of *Dolomedes plantarius* close to the villages Biehain and Kaltwasser



Fig. 5: Collecting site of *Dolomedes plantarius* at the Thronteich in the pond region Kauppa



Fig. 6: Collecting site of *Dolomedes plantarius* at the Lochteich in the pond region Rauden

(Arachnologische Gesellschaft 2022). By contrast, its sister species *D. plantarius* had previously been recorded only once in Saxony, in 1948 (Graul 1969). This may be connected to the habitat preferences of the species and its lower adaptability compared to *D. fimbriatus*. Dickel et al. (2020) found higher demands of *D. plantarius* with regard to the structural richness of the shore vegetation, sunlight and water quality. Also, according to Duffey (1995), the species avoids highly eutrophic or polluted waters. However, the ponds in the present study are managed – the fish stock is fed and thus the waters are eutrophic – as can be seen in Tab. 2. Although these values are based on single measurements in summer, they show a high nutrient content of the ponds. Thus, we can confirm the occurrence of *D. plantarius* in eutrophic fish ponds (Holec 2000).

According to the literature, the two *Dolomedes* species also differ in the pH value of their habitats. *Dolomedes plantarius* seems to prefer neutral to slightly alkaline waters (Smith 2000, Kitt & Nährig 2002, Unruh 2008), while *D. fimbriatus* has shown a steady occurrence in bogs (Duffey 1995, Kitt & Nährig 2002, Smith 2007, Unruh 2008, Dickel et al. 2020). The latter is in agreement with the results of investigations of the Dubringer Moor, where several authors found *D. fimbriatus*, sometimes in high numbers, but could not find its sister species (Hiebsch 1984, Platen 1995, Haase & Balkenhol 2015). Probably, the pH of the water plays a subordinate role here, as in Biechain *D. plantarius* was found in a pond with a pH of 3 during the present study (Tab. 2). In all pond areas investigated, we also found the sister species *D. fimbriatus*. The syntopic occurrence of these two species was thereby demonstrated several times in north-eastern Saxony. Dickel et al. (2020) suspected that a common occurrence of the two species can be explained by a broader niche of *D. fimbriatus*, which partly overlaps with that of *D. plantarius*. The syntopic occurrence of these species might conceal a segregation at the microhabitat level.

With exception of the lake in Biechain, the sites are fish ponds that are drained in autumn as part of their management. Results of other studies (van Helsdingen 1994, Hänggi et al. 1995, Smith 1996) indicate that, in contrast to its sister species, *D. plantarius* does not survive in temporarily

dry ponds or lakes, because it cannot, or does not, retreat to neighbouring marshy or wet habitats. Duffey (2012) assumed that this stronger tie to permanent water in *D. plantarius* is due to the different hunting behaviour of the two species. According to him, juvenile *D. plantarius* depend on water as a feeding habitat, while juvenile *D. fimbriatus* also catch prey on land. This would mean that for *D. plantarius* draining the ponds in autumn right before the hibernation period, has a less negative effect on the population than in summer, when early developmental stages appear. This could also explain the occurrence of the species at fish ponds in the Czech Republic (Holec 2000), which were potentially managed in a similar way. Alternatively, it is also possible that individuals from neighbouring, undrained ponds reinvade the drained ones every spring. A high mobility of the species is shown by the observations of Unruh (2008) at an open-cast mining lake. Both in Niederspree and Biechain we found individuals carrying egg sacs, indicating that the species is established in the ponds of northern Upper Lusatia. This assessment is supported by visual observations of additional low-contrast individuals (more likely to be *D. plantarius*) that were not collected.

Dickel et al. (2020) found *D. plantarius* mainly in areas by slow-flowing rivers. Future studies in Saxony should therefore also consider this biotope type in addition to still water bodies. Duffey (1995), Smith (2000), Kitt & Nährig (2002), Dickel et al. (2020) and others found that structurally rich shore vegetation is of great importance to *D. plantarius*, especially for their nursery webs. The shore vegetation should therefore also be taken into account when surveying such locations, in addition to water vegetation and quality. This would allow the management of water margins to be directed towards the habitat requirements of *D. plantarius*. Using the method of Dickel et al. (2020) for the live determination of adult Raft Spiders, extensive studies examining several individuals can be carried out without affecting the populations of the two legally protected species. A larger-scale study might clarify why *D. plantarius* has hardly ever been found in Saxony until now and why only single adults of the species were found at each of the sites. One hypothesis for the latter is that fish ponds do not offer optimal habitat conditions for this species.

Tab. 2: Characterisation of the ponds where *Dolomedes plantarius* was found. Water quality measured c. 30 cm below surface (*total phosphate, n.d.: not detectable); vegetation = approximate width of reed belt or aquatic vegetation at the collecting site itself

Pond	pH-value	Nitrate [mg/l]	Phosphate [mg/l]*	Oxygen [mg/l]	Total hardness [°dH]	Vegetation [m]	Size [m ²]
Schwarze Lache	6.8	n.d.	1.8	8.0	9	16	50000
Biehain	3.0	2.0	2.1	9.0	7	2	8700
Thronteich	6.6	2.0	0.3	7.0	8	1	23000
Lochteich	6.9	0.5	7.5	2.0	6	0.5	70000

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