

## First record of *Sauron rayi* (Araneae, Linyphiidae) in Austria

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**Abstract.** *Sauron rayi* (Simon, 1881) is recorded in Austria for the first time. Male and female specimens of this rare European spider were found in two "Austrian pine forests" in Lower Austria. Data on distribution, habitat, phenology and Red List status from the Austrian localities and from published records in other countries are presented.

**Keywords:** arachnology, Austrian pine forest, distribution, Europe, faunistics, habitat, phenology, rare spider, Red List status

**Zusammenfassung. Erstnachweis von *Sauron rayi* (Araneae, Linyphiidae) in Österreich.** *Sauron rayi* (Simon, 1881) wurde in Österreich zum ersten Mal nachgewiesen. Männchen und Weibchen dieser seltenen Europäischen Spinne wurden in zwei Schwarzföhrenwäldern in Niederösterreich gefunden. Daten zur Verbreitung, zum Habitat, zur Phänologie und zur Gefährdung dieser Art aus den österreichischen Fundorten und von bereits publizierten Nachweisen aus anderen Ländern werden präsentiert.

*Sauron rayi* was originally described by Simon (1881) under the name *Erigone rayi*. The description was based on male specimens only. Simon (1881) named the species after one of its collectors, Mr. Jules Ray, who was a curator at the Museum in Troyes at that time. Later, Simon (1894) placed the species in the genus *Metopobactrus* where it remained until Marusik et al. (2001) transferred it to the genus *Sauron*, which was established some years before by Eskov & Marusik (1995). Miller (1966) initially described the female of *S. rayi* under the name *Trichopterna fratrensis*. Miller (in Weiss & Marcu 1979: 253) synonymised *Trichopterna fratrensis* (Miller, 1966) with *Metopobactrus rayi* (Simon, 1881). For a detailed overview of the taxonomic history of *S. rayi*, see Platnick (2014).

### Identification

Male and female specimens of *Sauron rayi* (Simon, 1881) were identified by the present authors using keys for (Central) European spiders (Heimer & Nentwig 1991, Nentwig et al. 2013). Excellent drawings of both sexes of *S. rayi* can be found in Miller & Žitňanská (1976) and in Thaler (1993). Bosmans & Kekenbosch (2007) published copies of the drawings from Simon (1881), Miller (1966) and Miller & Žitňanská (1976).

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### First records in Austria

*Sauron rayi* has now been found in two Austrian pine forests (Seslerio-Pinetum nigrae) on Rendzina soil. Twelve males were found by means of pitfall traps in the Nature Forest Reserve "Merkenstein-Schöpf-eben" near Bad Vöslau (47°59'39"N, 16°07'42"E) at 588 m a.s.l. in the year 2004 (between 25 April and 20 November) (Fig. 1), and two males and one female were obtained by means of pitfall traps between 26 May and 23 June 2006 in the study site Stampftal near Oed (47°53'18"N, 16°01'59"E) at 640 m a.s.l. within the framework of the research programme "Soil diversity in Austrian natural forests" (DIANA) (<http://bfw.ac.at/300/2197.html>).

### Distribution

*Sauron rayi* is a rare spider species with a scattered distribution pattern in Europe (Fig. 2). It lives in the grass and moss of open non-forest, as well as forest habitats (Svatoň et al. 2010). *S. rayi* has been reported from 14 European countries: Austria (this study), Belgium (Bosmans 2009), Bulgaria (Deltshev 2005), Croatia (Nikolić & Polnec 1981), France (e.g. Simon 1926), Germany (Staudt 2014), Greece (Buchholz 2007), Hungary (Samu & Szinetár 1999), Italy (Noflatscher 1994), Macedonia (Komnenov 2011), Poland (Staręga & Kupryjanowicz 1996), Romania (Weiss & Urák 2009), Russia (Mikhailov 2013), Slovakia (Gajdoš et al. 1999), Slovenia (Nikolić & Polnec 1981) and the Ukraine (Mikhailov 2013). A map of records of *S. rayi* was compiled by Bosmans & Kekenbosch (2007, fig. 6). Nationwide distribu-



**Fig. 1:** Locality “Merkenstein-Schöpfeben”, an Austrian pine forest, where *Sauron rayi* was found in the year 2004. – Photo by Alexander Pernstich, taken on 8 June 2004.

tion maps for this species are available for Germany (Staudt 2014, five records) and Slovakia (Gajdoš et al. 1999, 14 records).

**Belgium:** One population of *S. rayi* was found in calcareous grassland on a rocky substrate in a limestone quarry in Olloy-sur-Viroin (part of the village of Viroinval) in the Department of Namur. Specimens were collected by means of pitfall traps in May and June. In 2004, five males were found in May, 17 males and five females in June; in 2005, nine males and three females were found in May, two males in June (see Bosmans & Kekenbosch 2007, fig. 4).

**Bulgaria:** *S. rayi* was reported from three localities in the Sashtinska Sredna Gora Mountains (Lazarov 1998, Lazarov et al. 2001, fig. 1, Deltshev 2005). One male was found by means of pitfall traps in the area of the Chivira hut (1450 m a.s.l.) in a mountain meadow. According to Lazarov et al. (2001, fig. 1) this site is situated SW of Koprivshitsa, a town in in the Sofia Province. One male was found by means of pitfall traps in the area of Klisura (900 m a.s.l.) in a forest dominated by *Prunus cerasifera*, *Pinus nigra* and *Carpinus orientalis*. Four males and one female were collected by hand in the area of Fetentsi (880 m a.s.l.) in a forest dominated by *Quercus robur*, *Fagus sylvatica* and a meadow characterized by *Trifolium* sp., *Medicago* sp., *Vicia* sp. and *Thymus* sp. According to Lazarov et al. (2001, fig. 1) this site is situated halfway between the towns of Panagyurishte and Koprivshitsa.

**Croatia:** The only record of *S. rayi* was made in Bakar [Buccari], Dalmatia, in July and was published under the name of *Metopobactrus rayi* by Chyzer & Kulczyński (1894, p.95). The collector of this single male specimen was Prof. Narcis Damin, who later also reported the record in his book of spiders from Dalmatia, Croatia, Slavonia and Istria (Damin 1900, p. 26).

**France:** The only records of *Sauron rayi* in France are those given in the first description of the species (Simon 1881) (see above). Accordingly, only male specimens are reported from the communes Gyé-sur-Seine and Villemaur-sur-Vanne [Villemaure] in the Aube department in north-central France.

**Germany:** According to Staudt (2014), there are five known records of *S. rayi*. The species is also mentioned in the check-lists and Red Lists of Baden-Württemberg (Nährig et al. 2003), Bavaria (Blick & Scheidler 2004) and Lower Saxony (Finch 2004). Joger (1997, Tab. 25) found two male specimens in a semi-dry grassland on the Weper, about 10 km west of Northeim and about 15 km north of Göttingen (Lower Saxony). Stubbemann (1980) found one male of *S. rayi* in June in the “Lorenzer Reichswald” near Nuremberg in a pine forest with grassy understorey. The second record from this area came from Kilg (2006). Bauchhenß (pers. comm.) summed up the data from Kilg (2006) as follows: *S. rayi* occurred in a pine forest on dry and nutrient poor sand in the Natural Forest Reserve “Grenzweg”/Altdorf at an elevation of 400–420 m a.s.l. Overall, three female specimens were found in June, two male and two female specimens in July and one male and one female in August by means of pitfall traps and hand sieving of litter in close vicinity to tree stems. The third record in Bavaria was made near Amberg (Oberpfalz) in an open sand habitat (Blick pers. comm.). Blick (pers. comm.) provided data for at least one male specimen which was found by Helge Uhlenhaut in 1997 at 280 m a.s.l.

**Greece:** Buchholz (2007) reported *S. rayi* from two localities in the Nestos Delta, which is situated in the eastern Macedonia region of north-east Greece. Buchholz (2007, Tab. 1) found one specimen in a floodplain and six specimens in forests by means of pitfall traps at an elevation of 1 to 18 m a.s.l.

**Hungary:** Loksa (1966) reported *S. rayi* from two areas: (i) the Bükk Mountains and (ii) the Aggtelek Karst [Tornaer Karst] both of which are part of the north Hungarian Mountains of the Inner

Western Carpathians. In the Bükk Mountains, *S. rayi* was found at the localities Molnár rock, Bélkő and Szarvaskő. In the Aggtelek Karst area [Tornaer Karst], *S. rayi* was found at the localities Alsó hill and Nagyoldal. Loksa (1966, Tables 55 and 61) reported *S. rayi* exclusively from xerothermic oak wood (*Ceraso mahaleb-Quercetum clematidetosum nigrae*) on limestone and Gabbro-Rendzina at an altitude between 280 and 600 m a.s.l.

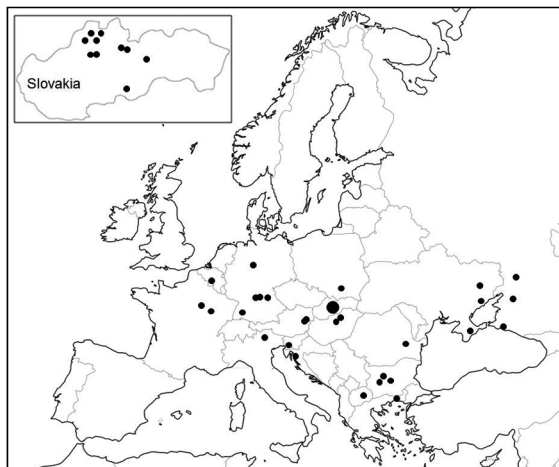
**Italy:** Noflatscher (1993) as well as Thaler (1993) reported *S. rayi* from South Tyrol (Alto Adige) on southern slopes between Naturns and Mals at an elevation between 700 and 1350 m a.s.l. *S. rayi* was found in three habitats at the “Vinschgauer Sonnenberg”: (i) a chestnut (*Castanea sativa*)-forest, (ii) a dry grassland and (iii) a rock steppe. Furthermore, Thaler (1993) reported five males and two females in June and one male in July.

**Macedonia:** Komnenov (2011) found two male and two female specimens of *S. rayi* in a xerothermic oak-hornbeam forest (*Quercus-Carpinetum orientalis*) by means of pitfall traps between 3 May and 12 June at 889 m a.s.l. near Leshki in the Osogovo Mountains.

**Poland:** Starega & Kupryjanowicz (1996) reported *S. rayi* from the Gorce Mountains which are situated in Małopolska Province at the western tip of the long Carpathian range. Here, one male specimen was found in June in an abandoned ant-nest in a spruce forest (*Piceetum tatricum*) located in the Studniska slope in the Jaszczce valley at 850 m a.s.l.

**Romania:** Weiss & Marcu (1979) reported *S. rayi* from the river dune reserve of Hanu Conachi (district Galati). Here, one male specimen each was found in an oak-forest (*Quercetum pedunculiflorae*) and dry grassland (*Achilleo (kitaibeliana)-Secalinetum silvestris*). The two specimens were found in April and June.

**Russia:** Ponomarev & Dvadnenko (2012, p. 47) provided the following data concerning records of *S. rayi* from Russia: three females, Rostov region, Razdorskaya village, locality “Atamanskaya balka”, 25 May-16 June 2001; one female, locality “Pukhlyakovskiy sklony (= Puhlyakovsky slopes), in a steppe meadow with bushes, 15-20 May 2004, two males, *ibid.*, in a forest belt, 31 May-9 June 2004; one male, Krasnodar region, Kushchovskaya village, in a tree plantation, 22 April-4 May 2004, six males, three females, *ibid.*, 4 May-1 June 2004; two males, one female, Krasnodar region, Anapa village, locality



**Fig. 2:** Distribution map of *Sauron rayi*. Small black dots represent records of *Sauron rayi*; the single large black dot comprises several localities in Slovakia shown in insert (upper left corner).

“Bolshoy Utrish” (= Big Utrish), Vodopadnaya Valley, in an oak-hornbeam-forest (*Quercus* sp., *Carpinus orientalis*), in forest litter along the stream, 2 May 2010; the latter records from the locality “Bolshoy Utrish” are also mentioned in Ponomarev & Volkova (2013, p. 236).

**Slovakia:** Miller (1966) found two females of *S. rayi* on 1 September 1935 on Malý Kriváň in the Malá Fatra Mountains (near Liptovská Mara) in grassland above the tree line. Additionally, Miller & Žitňanská (1976) reported the record of one male on a south-orientated grassy slope (forest edge, Žitňanská 1981) of Váh near Vlašky on 23 May 1972. On 10 July 1974, the two authors additionally found three males and eight females on a south-west-orientated slope of Ostrá (Suchý Jasienok) in the Veľká Fatra. Miller & Žitňanská (1976) considered *S. rayi* to be a species that is bound to sunny submontane mountain slopes which are covered with grass. The habitat of the locality Vlašky is a xerophilous mountain meadow mainly covered with *Brachypodium pinnatum*, the locality Suchý Jasienok is a steep limestone slope covered sparsely with scattered grass cushions and lichens on rock boulders and stones. Thus, Miller & Žitňanská (1976) classified *S. rayi* as photophilic-hemiombrophilic. Svatoň (1983a) found several specimens of *S. rayi* on a grassy hillside below the summit of the Čierny kameň in the State Nature Reservation Čierny kameň in the Veľká Fatra

Mountains. Svatoň (1983b) reported *S. rayi* from the Nízke Tatry [Low Tatra], where he found two males and three females on 25 August 1980 by means of pitfall traps in Ohnište, Pod Mníchom, in a limestone forest steppe on a south-orientated slope. The same record is mentioned by Svatoň (1989) with more detailed information on the forest stand that consists of *Pinus silvestris*, *Pinus nigra* and *Larix decidua*. Additionally, Svatoň (1989) also reported *S. rayi* from a second study site in the nature protection area Ohnište: on 9 July 1981, he found one male at the edge of a rock steppe islet, just above the Púchalky valley. Svatoň (1985) reported *S. rayi* from a grassy hillside in the Suchý Nature Reserve in the Malá Fatra [Little Fatra]. Previously, Miller (1966) reported *S. rayi* from the Malý Kriváň [Little Kriváň] in the Malá Fatra. Žitňanská (1988) recorded *S. rayi* from Dedinky, about 4 km north of Dobšiná in the protected landscape area Slovenský Raj. Here, she found one male by means of pitfall traps at 850 m a.s.l. at the border of a mixed forest with an adjacent SW slope covered by a thin growth of young *Picea excelsa*, *Juniperus communis* and deciduous trees on Mesozoic limestone and dolomite ground. Franc & Hanzelová (1995a, b, 1997) reported *S. rayi* from the Pohanský hrad Nature Reserve near Hajnáčka. Here, one male was found at 29 May 1995 in a pseudocarst cave of a south-orientated boulder scree slope at about 500 m a.s.l. Gajdoš et al. (1999, p. 110) assembled all records of *S. rayi* (Nr. 2910), i.e. 14 records of *S. rayi* from eight different geomorphological units. Later, Krajca & Svatoň (1999) reported *S. rayi* from rock (dolomite and limestone) forest-steppes in the National Nature Reserve Roszutec in Mala Fatra Mountains. One male specimen was collected in the locality Poludňové skaly at 965 m a.s.l. and three females were found in the locality Medziholie at 1170 m a.s.l.

**Slovenia:** Polenec (1978) found six male specimens of *S. rayi* in a xerothermic hophornbeam-forest (*Sesleria autumnalis*-*Ostryetum carpinifoliae*) near Podgorje village (510 m a.s.l.) at the SW slope of the Slavnik, which is the highest peak (1028 m a.s.l.) of the North Istrian Karst-Mountains in Slovenia. Unfortunately, Polenec (1978) failed to report the exact position and elevation of the study site.

**Ukraine:** In the Ukraine, *S. rayi* was mentioned from the Crimean Peninsula (Gnelitsa 2004, Kovblyuk et al. 2008) and from Eastern Ukraine (Prokopenko, pers. comm.: left-bank Ukraine; Polchaninova

& Prokopenko 2013, Polchaninova & Prokopenko 2006, sub *Sauron fissocornis* Eskov, 1995; Prokopenko 2003, sub *S. fissocornis*). In the Crimean Peninsula *S. rayi* has recently been reported from the Karadag Nature Reserve (Gnelitsa 2004, Kovblyuk et al. 2008). Kovblyuk (pers. comm.) reported that he and Nicolai N. Yunakov collected seven males and three females of *S. rayi* in the Karadag Nature Reserve by sifting between 28 and 31 May 2010. In left-bank Ukraine, data on numbers of *Sauron rayi* specimens are only given in Prokopenko (2003, sub *S. fissocornis*). Prokopenko (pers. comm.) provided full information about these records which were obtained in two different localities: (i) one female from the Donetsk region, in an artificial tree plantation ("Rakovka") in the city of Donetsk, between 14 and 21 June 2001; (ii) one male, five females between 11 and 22 June 2001 and one female between 19 and 22 June 2008 in a forest belt in the Bilosaraiska Kosa village of the Per-shotravnevyi district.

### Habitat

*S. rayi* has been reported from forests and open non-forest habitats. It can be considered a thermophilic spider due to its occurrence in xerothermic habitats, such as xerothermic oak wood (e.g. Loksa 1988), dry pine-forest (e.g. Stubbemann 1980), chestnut (*Castanea sativa*) forest (e.g. Noflatscher 1993) or xerothermic hophornbeam forest (e.g. Polenec 1978). The open non-forest habitats also include a variety of xerothermic sites, such as calcareous grassland, dry grassland, rock steppe, xerophilous mountain meadow and even a limestone slope covered sparsely with scattered grass cushions and lichens. Accordingly, the soils of these habitats are poor in nutrients, and the prevalent soil type is Rendzina mostly associated with limestone or dolomite bedrock. Due to its occurrence in a cave, Franc & Hanzelová (1995b, 1997) considered *S. rayi* to be a glacial relict. Interestingly, the temperature in the lowest parts of pseudocarst caves never exceeds 9–10°C and the air has a high humidity (Franc & Hanzelová 1995b). However, the surface of the scree slope is covered by xerothermic forests and rocky steppes, and this area hosts thermophilic spider species (Franc & Hanzelová 1995b). Therefore, Svatoň (2000) classified *S. rayi* as a troglone species, because it is not a permanent cave inhabitant, but accidentally enters caves through the cracks and crevices of the surrounding bedrock.

### Altitude

*S. rayi* was found from nearly sea level at 1–18 m a.s.l. in the Nestos Delta in Greece (Buchholz 2007) to a maximum of 1450 m a.s.l. in the Sredna Gora Mountains in Bulgaria (Lazarov et al. 2001). On the one hand, there are many records from other Mountain areas, such as the Eastern Alps (Austria), the Southern Alps (Italy), the Bükk Mountains (Hungary), the Osogovo Mountains (Macedonia), the Gorce Mountains (Poland), the Big and Little Fatra mountains and the Low Tatra Mountains (Slovakia), the North Istrian Karst-mountains (Slovenia) and the Caucasus (Russia). On the other hand, *S. rayi* was also found in lowland areas, such as the Russian Plain (Mikhailov 2013).

### Phenology

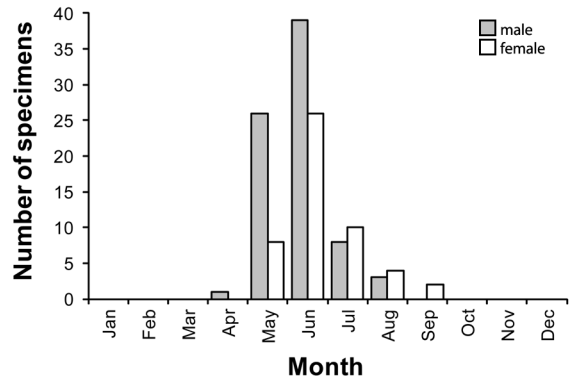
In the literature, males of *S. rayi* are reported from April to August, females from May to September. The activity peak of males and females is in June (Fig. 3). Thus, *S. rayi* can be considered a stenochronous species with an activity peak the late spring and early summer (main activity period May, June and July). The two males and the one female in Austria perfectly fit into this picture as they were caught in a sampling period between 26 May and 23 June.

### Red List

In the Red List of spiders of Baden-Württemberg (Germany), *S. rayi* is classified as extremely rare (Nährig et al. 2003). In Bavaria (Germany) it is categorized as Endangered (Blick & Scheidler 2004). In the new Red List of German spiders the species is categorized as Endangered and Very Rare (Blick et al. in press). In Lower Saxony, *S. rayi* is placed in the category Data Deficient (Finch 2004). In South Tyrol (Italy), Noflatscher (1994) also classified *S. rayi* as Endangered (Category 2). In Slovakia, Gajdoš et al. (1999) categorized *S. rayi* under LC (Least Concern)/NT (Near Threatened), due to its occurrence in at least 11 square grids across the whole country. Currently, Slovakia is the country with the most records of *S. rayi*.

### Acknowledgements

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**Fig. 3:** Phenology of *Sauron rayi*. Grey bars = males (N=77), white bars = females (N=50). All available data from the literature and the present study are represented.

[ac.at/300/2197.html](http://ac.at/300/2197.html)). We would like to express our gratitude to Sophie Zechmeister-Boltenstern who laid the foundation of this study while leading the DIANA-project. We are also grateful to Franz Starlinger for sharing his forest expertise and to John Plant for checking the English. Finally, we wish to thank Helene Prokopenko, Mykola Kovblyuk and Alexander Ponomarev for providing literature pertaining to records from Russia and the Ukraine, and Stefan Otto for information concerning the records from the Caucasus.

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