Lathys stigmatisata (Menge, 1869), *Ballus rufipes* (Simon, 1868), *Synageles hilarulus* (C.L. Koch, 1846), *Phrurolithus nigrinus* (Simon, 1878) and *Phycosoma inornatum* (O. Pickard-Cambridge, 1861): five spiders new to the fauna of Luxembourg (Araneae: Theridiidae, Dyctiniidae, Phrurolithidae, Salticidae) with records of other rare species

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Abstract. Five spider species are recorded for the first time from Luxembourg. Their habitats are described. New data are presented for another three species. The importance of the former open-cast iron ore quarries of southwestern Luxembourg for thermophilous spiders is emphasised.

1. Introduction

The first catalogue of the spider fauna of Luxembourg published in 2019 (Kreuels et al.) lists 495 species while the authors estimate that roughly 600 to 700 species should reasonably be expected to occur in the Grand-Duchy. They consider Luxembourg's spider fauna to be rather under-recorded, due to a lack of systematic collecting throughout the different natural regions and habitat types of the country. In 2017 the author started investigating a range of sites, most of them in the larger area around the town of Dudelange, with the aim to study their spider fauna. Indeed, while studying the beetle fauna of dry limestone grassland in this part of the country, the quite impressive number of different spider species encountered in the traps prompted the idea to identify the species and build up a good working knowledge in the field of spider identification. This paper presents the first results of the field work carried out over the last two years. Five species new to Luxembourg are recorded while additional data for several other rare species are given.

2. Material and methods

Spiders were collected using a range of conventional methods which shall be specified in the respective species' paragraph. The spiders were then preserved in 70% isopropanol or 70% ethanol. All the material is kept in the author's collection. Identifications are based on Roberts (1996), Bee et al. (2017) and the following websites: Oger (2019), Nentwig et al. (2019) and Wiki der Arachnologischen Gesellschaft (2019).

3. Results

Theridiidae Sundevall, 1833

Phycosoma inornatum (O. Pickard-Cambridge, 1861)

Gostingen "Op der Bäämchesfiels", 49°37'03.3" N, 6°20'49.9" E, 319 m a.s.l., 16.04.2019, 1 female juv., under stone, leg. R. Gerend.

This theridiid spider is distributed all over Europe including Scandinavia, the United

Kingdom and Ireland but it is not a common species. According to Staudt et al. (2019) the species is very rare in Germany although it has been recently found in the Sarre region and in French Lorraine very close to their borders with Luxembourg (www.alt.delattinia.de/GM/GM_Leuk.htm). Staudt (2019) considers it a very warmth-loving species which, he thinks, is currently expanding its range into the Luxembourg-Sarre-region by way of the Moselle valley. In the UK it is mostly associated with lowland heath and coastal grassland (British Arachnological Society, 2019)

In Luxembourg the author found a juvenile female under a stone at the foot of a drystone wall in a side valley of the Moselle near Gostingen. In fact, the site is part of what is better known as the nature reserve Wéngertsbierg or "Canecher Wéngertsbierg" (Canach vineyard), the south-facing flank of a hill with former (and recently re-created organic) vineyards, scrub and orchards.

Dyctiniidae O. Pickard-Cambridge, 1871

Lathys stigmatisata (Menge, 1869)

Dudelange "Echerdallerbierg" (better known locally as "Roudebierg"), 49°28'17.6" N, 6°05'30.5" E, 356 m a.s.l., 14.04. - 05.05.2018, 2 adult males, pitfall trap, 05.05. - 27.05.2018, 1 adult male, pitfall trap, leg. R. Gerend.

According to Kreuels et al. (2019), *Lathys humilis* (Blackwall, 1855) is the only species of the genus *Lathys* thus far known from Luxembourg. A second species, *L. stigmatisata*, has been recorded in Germany, very close to the border with Luxembourg, in the Our valley near Waldhof-Falkenstein (Staudt et al. 2019). A total of three males, readily identifiable by the characteristic shape of the tibial apophysis, were caught in pitfall traps on a south-facing steep slope with limestone grassland and scrub near Dudelange in 2018. The vegetation of this site is dominated by typical species of this type of grassland, such as meadow brome *Bromus erectus* and sheep fescue *Festuca ovina* gr. The specimens were caught in a series of traps on a smaller patch of grassland surrounded by limestone beech wood and scrub. The ground is well-drained, and the site can become very dry and parched in summer.

Phrurolithidae Banks, 1892

Phrurolithus nigrinus (Simon, 1878)

Dudelange "Gaalgebierg" ("Haard" nature reserve), 49°29'04.4" N, 6°03'40.4" E, 400 m a.s.l., 23.04.2019, 2 ad. males and 1 ad. female, under stone, leg. R. Gerend.

Phrurolithus nigrinus inhabits Western Europe but does not occur in the British Isles. It is known from France, Italy, the Iberian Peninsula, Switzerland, parts of the western Balkans and Germany where it seems to be confined to a small region to the west of Lake Constance (Nentwig et al, 2019 and Staudt et al, 2019). Staudt (2014) mentions records from Pagny-la-Blanche-Côte in the Meuse département made in May 2008 (cf. also: www.alt.delattinia.de/GM/GM_Pagny-La-Blanche-Cote.htm) where a couple of very steep south-facing slopes, partially covered in Jurassic limestone scree, harbour an exceptionally rich array of warmth- and drought-loving species

Near Dudelange the species occurs in the "Haard" nature reserve, where 3 specimens (2 males, 1 female) were found in 2019, under stones in an area of heaped-up barren rock on a former open-cast iron ore mining site with very sparse vegetation of mainly moss and a few grasses. *Synageles hilarulus* (C.L. Koch, 1846) has been found only a hundred metres away. The nature of this habitat is in line with Blick et al. (2008) who describe sites inhabited by the species in southwestern Germany as "open, dry-warm and mostly rocky habitats ….. such as sparsely vegetated vineyards and occasionally limestone grassland".

Salticidae Blackwall, 1841

Ballus rufipes (Simon, 1868) (Fig. 1)

Dudelange "Roudebiergerheck", 49°28'16.9" N 6°05'17.8" E, 345 m a.s.l., 09.06.2019, 1 ad. female beaten from shrub, leg. R. Gerend.

This is another warmth-loving species (Bellmann, 2001) distributed through Western and Mediterranean Europe (Nentwig et al., 2019). In Germany it is above all a south-western species with records concentrated in climatically warmer areas of the Rhine and Moselle valleys (Staudt et al., 2019).

Fig. 1. *Ballus rufipes,* male, F-57 Stromberg near Contz-les-Bains, scale bar 1 mm, photo R. Gerend.

Staudt (2014) has found this jumping spider in dry grassland habitats in French Lorraine in the valleys of rivers Meuse and Moselle, none of them being very close to the border with Luxembourg.

In June 2019 the author beat a single adult female from low scrub in the westernmost part of the "Roudebierg" slope. The much commoner sibling species *Ballus chalybaeus* (Walckenaer, 1802) was also present at this site, as well as a few of the conspicuously coloured juveniles of *Ballus rufipes*. The whole slope is dominated by dry limestone grassland and species-rich scrub as well as copses of thermophilous beech wood.

The species has also been recorded in the French Moselle valley just across the border with Luxembourg at the "Stromberg" site near the village of Contz-les-Bains (49°26'58.2" N, 6°21'16.5" E at 279 m a.s.l.) at the foot of the cliffs of the Muschelkalk quarry face overlooking the river valley. The site is south-facing and famous for its diverse flora and fauna. This jumping spider should thus be looked for in other places with warm and dry conditions in this area, especially the nearby nature reserves of "Hammelsberg" in Germany or Montenach in France.

Synageles hilarulus (C.L. Koch, 1846)

Dudelange "Gaalgebierg" ("Haard" nature reserve), 49°29'03.8" N, 6°03'46.9" E, 400 m a.s.l., 18.04.2019, 1 ad. male, leg. R. Gerend.

Synageles hilarulus is yet another warmth-loving jumping spider. It has a very large Eurasian range extending through Russia to the Far East and reaching Japan and Korea (Nentwig et al., 2019). In Germany it seems to be very rare, with widely scattered records from southern and eastern parts of the country (Staudt et al., 2019). It has been recently recorded from the Moselle valley near Jézainville and from several sites in the valley of

Fig. 2. *Trochosa robusta,* adult female, "Haard" near L-Dudelange, photo R. Gerend.

Fig. 3. *Gnaphosa lucifuga*, subadult female, "Haard" near L-Dudelange, photo R. Gerend.

the Meuse (Staudt, 2014) in France. All these sites are not very far from Luxembourg's southern border. In April 2019 a single male could be caught while scrutinizing an area of very dry waste rock in a former open-cast iron ore quarry near Dudelange. The vegetation is very sparse and made up mainly by lichen crusts, moss cushions and mouse-ear hawkweed *Pilosella officinarum* as well as a few scattered wisps of grass. Insolation is high and the place is sheltered by secondary growth of birch, sallow and hazel while the heaped-up rock ensures good drainage, thus providing favourable conditions for a xero-thermophilous fauna and flora. The site is also noticeable for the presence of other rare spiders such as *Gnaphosa lucifuga* (Walckenaer, 1802) and *Trochosa robusta* (Simon, 1876) (see below).

Records of other noteworthy species

Cheiracanthium pennyi O.Pickard-Cambridge, 1873

Dudelange "Echerdallerbierg" (better known locally as "Roudebierg"), 49°28'17" N, 6°05'42.3" E, 363 m a.s.l., 1 ad. male, swept from herbaceous vegetation, 27.05.2018, leg. R. Gerend.

This species is known from Europe, extending into Russia and Central Asia and reaching China, as well as from Turkey and Iran. It is associated with herbaceous vegetation of open, dry and warm habitats (Nentwig et al., 2019). In the region around Luxembourg it has thus far only been recorded from French Lorraine near Metz (Staudt, 2014) and Volmerange-les-Mines (Staudt et al. 2019), hence very close to the border with Luxembourg and less than 2.5 km from the site reported here. In 2018 the author confirmed its presence near Volmerange (49°27'96.3" N, 6°05'21.3" E at 402 m a.s.l.) and it became clear that it would be found sooner rather than later on the Luxembourgish side of the border. According to the Luxembourg Natural History Museum's *Recorder* database, the species has already been found in 1991 in the "Aarnescht" nature reserve (Bouhy leg.) but the whereabouts of the specimen(s) is currently unknown.

The habitat near Dudelange is a south-facing slope with dry limestone grassland, in the process of being invaded by scrub. The spot where the single male specimen was swept is dominated by taller stands of meadow brome *Bromus erectus* and common meadow grass *Poa pratensis*. The species co-exists on this site with *Cheiracanthium punctorium* (Villers, 1789).

Trochosa robusta (Simon, 1876) (Lycosidae) and ***Gnaphosa lucifuga*** (Walckenaer, 1802) (Gnaphosidae)

Dudelange "Gaalgebierg" ("Haard" nature reserve), 49°29'03.8" N, 6°03'46.9" E, 400 m a.s.l., 21.04.2019 for both species, leg. R. Gerend.

Recent records of these two rather large and impressive spiders are from the former open-cast iron ore quarries in Dudelange's "Haard" nature reserve, where specimens could be found hiding away under flat stones in spring and early summer 2019 (cf. fig. 2 and 3). While *Gnaphosa lucifuga* has been recorded in the same area by J. Cungs and identified by S. Christian (*Recorder* database MNHNL) in 2014 and 2015, *Trochosa robusta* had not previously been found in these quarries, disused since the mid-1970s. The exact location consists of areas of heaped-up barren limestone rock with only the thinnest layer of topsoil and a sparse vegetation of drought-tolerant species (as described above). Up to now, only one more species of the genus *Gnaphosa*, i.e. *G. lugubris* (C.L. Koch, 1839), has been recorded from Luxembourg, with all known records being from dry limestone grasslands on Keuper marlstone which are so characteristic for eastern and central Luxembourg (*Recorder* database MNHNL: leg. B. Augenstein (2009-2011) and Y. Bouhy (1989-1990)).

4. Discussion

These newly recorded species bring the tally to 500 species of spiders currently known from Luxembourg. It is likely that more species will be discovered as certain habitat types, such as wetlands, but also the few remnants of heath on sandy soils, will be subjected to a thorough investigation. The further arachnological exploration of the former iron ore quarries in the south-west looks certainly promising too, as they are

the only areas in Luxembourg left with sizable tracts of open rocky ground, as well as being a natural gateway for warmth- and/or drought-loving species expanding their current range northwards in the wake of future climatic warming.

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