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SHORT COMMUNICATION

Subterrestrial life of *Arctosa lutetiana* (Araneae, Lycosidae)

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Abstract. *Arctosa lutetiana* (syn. *Tricca lutetiana*) (Simon 1876) (Lycosidae) is found in many European countries; however, the biology of the species is still unknown because it lives hidden under ground and is difficult to find. The objective of this study was to fill in basic information about the biology of this species. The specimens were obtained between 2005–2006. This species lives in primitive underground burrows that are not lined with silk. Herein we describe, for the first time, the burrows and the prey capture method of this species.

Abstrakt. *Arctosa lutetiana* (syn. *Tricca lutetiana*) (Simon, 1876), slíďák lesostepní (Lycosidae) je druh žijící v mnoha evropských zemích, nicméně jeho biologie je dosud neznámá. Žije totiž skrytým způsobem života pod zemí a je velice obtížné ho v přírodě nalézt. Cílem této práce je doplnit základní data o biologii tohoto druhu. Jedinci byli získáváni převážně ručním sběrem v letech 2005–2006. Díky vhodně zvolené metodě chovu byly u tohoto druhu poprvé popsány jeho podzemní komůrky nevystlané pavučinou a způsob lovu kořisti.

Keywords: Spiders, life history, underground burrow, prey capture, Czech Republic

Arctosa lutetiana (Simon 1876) is an extra-mediterranean (including Ural) wolf spider that dwells in xerothermic forest-grassland habitats (Buchar & Růžička 2002). Unfortunately, it is very difficult to find because of its subterranean lifestyle. Until pitfall trapping was used in the 1950s, only a few specimens were known from collections and little was known about the biology of this species (Dahl 1908; Wiebes 1956). The taxonomic classification is also problematic (Buchar 1981; Dondale & Redner 1983; Buchar & Thaler 1995; Platnick 2007).

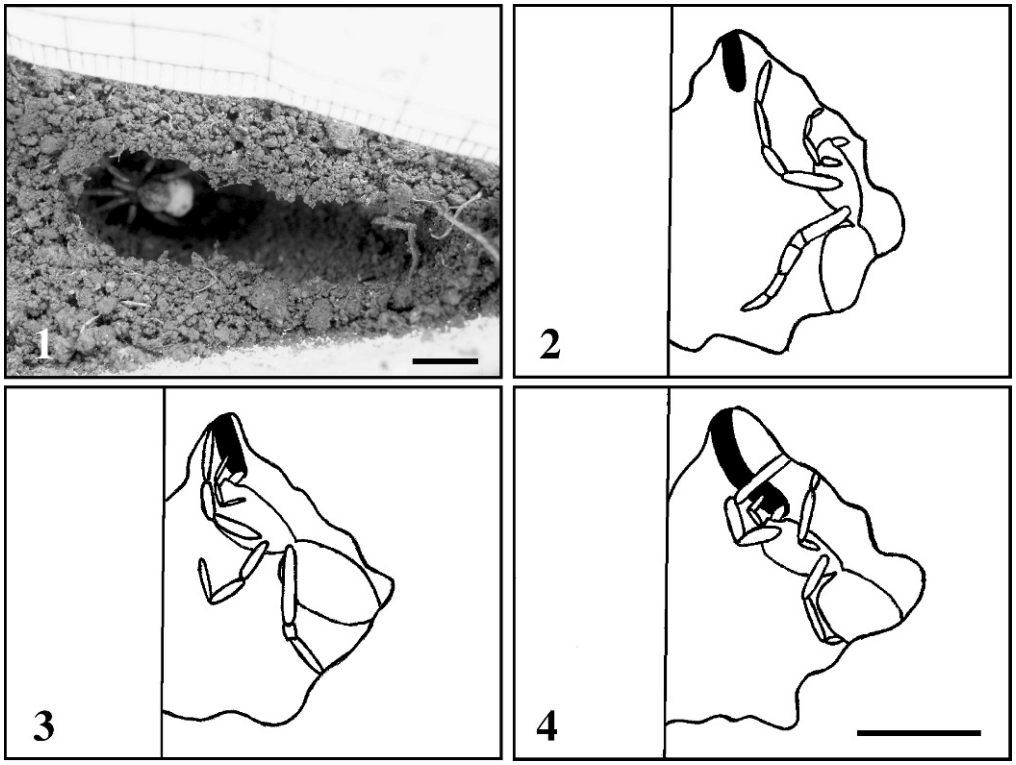
In order to obtain more information about the biology of *A. lutetiana*, we used dry pitfall trap sampling (n = 48) to obtain living specimens. Adult spiders (mostly males) were obtained using this method. We also used the ''lookdown'' technique to collect additional specimens. The spiders were collected from crannies under stones. Variously aged juveniles and females were obtained using the latter method. The study took place in localities Dřínová hora (elev. 345 m, 14°09′E, 49°56′N) and Koda (elev. 380 m, 14°07′E, 49°56′N) in Český kras (Bohemian Karst) PLA in central Bohemia (Czech Republic). The specimens collected included 80 adult males, 20 females, five subadult males, and 25 juveniles. Voucher specimens are deposited in the National Museum (Václavské náměstí 68, 115 79 Prague 1, Czech Rep.).

Aspects of the biology of *A. lutetiana* were studied in the laboratory. The spiders (adult females and juveniles) were kept in individual glass terraria (14 x 11 x 8 cm) with either 2–2.5 or 5 cm of soil from the collecting localities in each. This height of soil was sufficient as the spider's body length is 7–8 mm. Small stones were placed on the soil surface in the corners of each terrarium. Rearing temperature was 23° C, and the photoperiod was 14L:10D. A digital Olympus C-7070 WZ camera and a Panasonic NV-GS400 video camera were used to record the spider's activity.

Immediately upon being placed in the terraria, females and juveniles typically begin digging. Females move through the ground in an oblique or vertical position with their prosoma oriented down (n = 20). They push the soil laterally using their legs, but they do not otherwise move the soil outside the burrow. The resulting underground burrows have various sizes, shapes, and positions. In nature, they are either under a stone or under a surface without vegetation. The burrows take a variety of forms. They can be simple bowl-like burrows with a diameter 1.5–2 cm (n = 16), have a deeper and shallower part (similar to the letter L or Γ), have one deeper part with two more shallow parts (similar to the letter J or U), or be oblong up to 3 cm (Fig. 1), but never with an entrance or exit. The burrows of gravid females are bigger and deeper–up to 2.5 cm (n = 11), although three of them were housed in a terrarium with 5 cm of soil depth as a control to determine whether the spiders would build deeper burrows in an alternative depth of soil. On the other hand, burrows with a depth of 7 mm (made under a stone) were also observed (n = 6). Females push the residual material from the burrow up forming a small ''molehill'' above the underground burrow (n = 11); however, this is not done if the burrow is situated under a stone. When we picked up the stone situated above the burrow, the spiders (mainly juveniles) tended to clog the open entrance that resulted, with material (soil, detritus) from the surroundings (n = 17). Because the soil depth in the terraria was 2–2.5 cm, the majority of females (n = 14) made their burrows on the bottom of the terrarium and thus it was possible to observe what was happening inside the burrows.

It is remarkable that the walls of the burrows were not silk-lined. Only several silk fibers reinforcing the roof of the burrow were sometimes observed, mainly in the burrows of hibernating females (n = 16). These fibers create a fragile ''dome.'' Similar fibers were observed in two burrows situated under the stone. These burrows did not have a ''roof'' (the stone constituted the roof) but they were reinforced with several fibers in the area of contact with the stone. So these fibers created a ''ring beam.'' The lower part of these burrows was not reinforced by any fibers. Therefore, *A. lutetiana* differs from the other species from the genus *Arctosa*, which live in silk-lined burrows (Dondale & Redner 1983).

We also wanted to determine how *A. lutetiana* captures prey when it spends most of its time underground. Several females built their burrows in the corner of the terrarium and thus it was possible to observe prey capture from the side of the terrarium. A *Tribolium* larva was put above the burrow and the female's behavior was recorded. When the larva moved through the ground (above the burrow) in the space of the female's burrow, the female immediately moved to the larva (Fig. 2) and caught it using her legs I and chelicerae (Fig. 3) and pulled the prey inside her burrow using her pedipalps and chelicerae (Fig. 4). Sometimes, the female damaged a part of the roof of the burrow during this action. This is further evidence that the burrow is



Figures 1–4.—*Arctosa lutetiana* females in earthen burrows. 1. Uncovered burrow (stone was removed) revealing resident female with an egg sac. 2–4. *A. lutetiana* female catching a prey. Lateral view (vertical line is the wall of a terrarium): 2. Female moves towards *Tribolium* larva (black); 3. Female bites the larva; 4. Female pulls the prey inside the burrow. Schematized – not all legs are shown, for clarity. Scale = 5.0 mm.

not reinforced by silk. The observations were successfully repeated many times (with all spiders living in the terraria). This method of prey capture in which spiders wait in burrows passively until a small soil animal comes inside, is likely to be the reason why the burrows are not silk-lined.

Generally, wolf spiders' burrows are usually longer vertical tubular holes in the ground. They are not used for catching prey but as a shelter (Shook 1978). Exceptionally, burrows can be small and entirely closed, typically for Central European *Trochosa* C.L. Koch 1848 species (Engelhardt 1964). In all cases mentioned so far, the burrows are silk lined, e.g., *Arctosa cinerea* (Fabricius 1777) (see Nielsen 1932), *Hogna carolinensis* (Walckenaer 1805) (see Shook 1978), *Donacosa merlini* Alderweireldt & Jocqué 1991, etc. On the contrary, the closed, non-silk lined burrows and the peculiar lifestyle of *A. lutetiana*, described here for the first time, may contribute to a better understanding of the taxonomy and phylogenetic relationship of the genus. Nevertheless, further investigation of life history traits is necessary.

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