



ON THE DISTRIBUTION AND ECOLOGY OF THE RARE FLAT BUG *ARADUS KUTHYI* HORVÁTH, 1899 (HEMIPTERA: HETEROPTERA: ARADIDAE) IN SLOVAKIA

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Abstract: This paper refers to the distribution and ecology of a very rare flat bug *Aradus kuthyi* Horváth, 1899, comparing the ecosozological status in European countries where this species occurs. We also tried to assess the real state of the threat and outline the main points of conservation management.

Key words: Aradidae, flat bugs, Carpathians, Pannonian Region, rare species, ecology, faunistics

INTRODUCTION

Aradidae are true bugs distinguished by their extremely dorsoventrally flattened body of elliptical, oval or rectangular shape and highly cryptic appearance (SCHUH & WEIRAUCH 2020). The vast majority of them are mycetophagous and feed by sucking fungal hyphae, but several species are phytophagous, e.g. *Aradus* (*Aradus*) *cinnamomeus* Panzer, 1806 feeding on the phloem, cambium and xylem of living *Pinus* and occasionally *Larix* (STEHLÍK & HEISS 2001, HEISS & PÉRICART 2007, SCHUH & WEIRAUCH 2020). The vast majority of Aradidae live under the bark of various trees, under twigs or in debris on the floor of moist forest habitats (SCHUH & WEIRAUCH 2020).

Aradus (*Aradus*) *kuthyi* Horváth, 1899 (Hemiptera: Heteroptera: Aradidae: Aradinae) is a very rare Balkan-Pannonian flat bug species collected only in a few places in Central Europe and Balkan Peninsula till now (Fig. 1). The center of its distribution seems to be situated in the Pannonian Basin with some known records from the Bohemian Massif, the Carpathians and the Balkan Peninsula (HEISS & PÉRICART 2007, HEISS & BRUSTEL 2013, KMENT et al. 2013). The species was until now recorded from Albania, Austria, Bosnia and Herzegovina, Czech Republic, Greece, Hungary and Slovakia (HEISS 2001, 2006; HEISS & PÉRICART 2007;

AUKEMA et al. 2013; HEISS et al. 2024). *Aradus kuthyi* has been found only on several tree species: *Juglans regia*, *Quercus cerris*, *Q. petraea*, *Q. robur* and *Pinus sylvestris* (HORVÁTH 1899, HOBERLANDT 1956, ŠTYS 1976, ADLBAUER 1992, HEISS & PÉRICART 2007, WACHMANN et al. 2007). Its food (highly probably some saproxylic fungi) is unknown. In Slovakia, this species has been known even only from three localities (Kováčov surroundings, Pstruša and Plášťovce) with five specimens collected till now (HOBERLANDT 1956, STEHLÍK & HEISS 2001, KMENT et al. 2013). In this paper, we provide two additional records of *A. kuthyi* from two further localities (Dolné Vestenice and Tilič hill near Hajnáčka) which represent a significant update of the current known species distribution in Slovakia.

MATERIAL AND METHODS

Our specimens were collected using a clap net on the dry branches of oak trees (*Quercus* sp.), killed in a vials with vapours of ethyl acetate and dry mounted on card stock. The material is deposited in the two following collections: SNMB – Slovak National Museum, Bratislava, Slovakia; VHJS – Vladimír Hemala private collection, Jalovec, Slovakia. The habitus photograph (Fig. 1a) was taken using a Canon MP-E 65 mm macro lens attached to a Canon EOS 6D Mark II camera and stacked from multiple layers using the Helicon Focus 5.1 Pro software. The photographs of habitats (Fig. 2) where our specimens were collected was taken using a Canon EOS M10 camera. The map of distribution (Fig. 3) was created using the CorelDRAW 12.0.0.536 software from the template available at the Czech Entomological Society website: <https://www.entospol.cz/sit-mapovych-ctvercu/>.

REVIEW OF THE RECORDS FROM SLOVAKIA

A list of accessible old and recent records from Slovakia in chronologic order is given below. Coordinates of sites are given only in the case of records that are precisely localised by the authors. Older locations are supplemented with codes of the Central European mapping grid (EHRENDORFER & HAMANN 1965) follow NOVÁK (1989).

Slovakia merid. – Kováčovské kopce Mts (= Burda Hills), Kováčov (8178), on the trunk of an old walnut tree, 16.v.1950, 1 ♀, L. Heyrovský lgt. (HOBERLANDT 1956).

Slovakia merid. – Kováčovské kopce Mts (= Burda Hills), southern slopes (8178), dry branches of *Quercus cerris*, 29.v.1954, 1 ♀, L. Hoberlandt lgt. (HOBERLANDT 1956).

Slovakia centr. – Pstruša (7481), 350–400 m a.s.l., 14.vi.1960, 1 ♀, L. Korbel lgt. (STEHLÍK & HEISS 2001).

Slovakia merid. – Kováčov (8178), andesite slope, 120–150 m a.s.l., v.1961, 1 ♀, J. Gottwald lgt. (STEHLÍK & HEISS 2001).

Slovakia merid. – Plášťovce (7879), 30.v.1993, 1 ♀, B. Zbuzek lgt., Z. Jindra det. et coll. (KMENT et al. 2013).

Slovakia occ. – Dolné Vestenice (7276; 48°42'43.68" N, 18°23'55.94" E, 345 m a.s.l.), limestone forest steppe (Fig. 2a), beaten down from the branches of a sessile oak (*Quercus petraea*) infected by mycelium, together with a rare beetle species *Phloiotrya vaudoei* Mulsant, 1856 (Coleoptera: Melandryidae, 7.vi.2008, 1 ♀, V. Franc lgt., coll. et det., V. Hemala revid. (SNMB) (Fig. 1b) (previously unpublished). This location is apparently the northernmost within Slovakia.

Slovakia merid. – Cerová vrchovina Upland – Tilič hill, ca. 30 m under the peak (7785; 48°12'28.6"N, 19°55'51.2"E, 450 m a.s.l.), basalt forest steppe (Fig. 2b), beaten down from the branches of a Turkey oak (*Quercus cerris*) infected by mycelium, together with a scarce beetle species *Colobicus hirtus* (Rossi, 1790) (Coleoptera: Colydiidae), 24.iii.2023, 1 ♀, V. Franc & V. Hemala lgt. et det. (VHJS) (Fig. 1a).

Note: The small amount of records is a reflection of the insufficient research of Heteroptera in Slovakia, which has always been carried out by only a very small number of specialists.

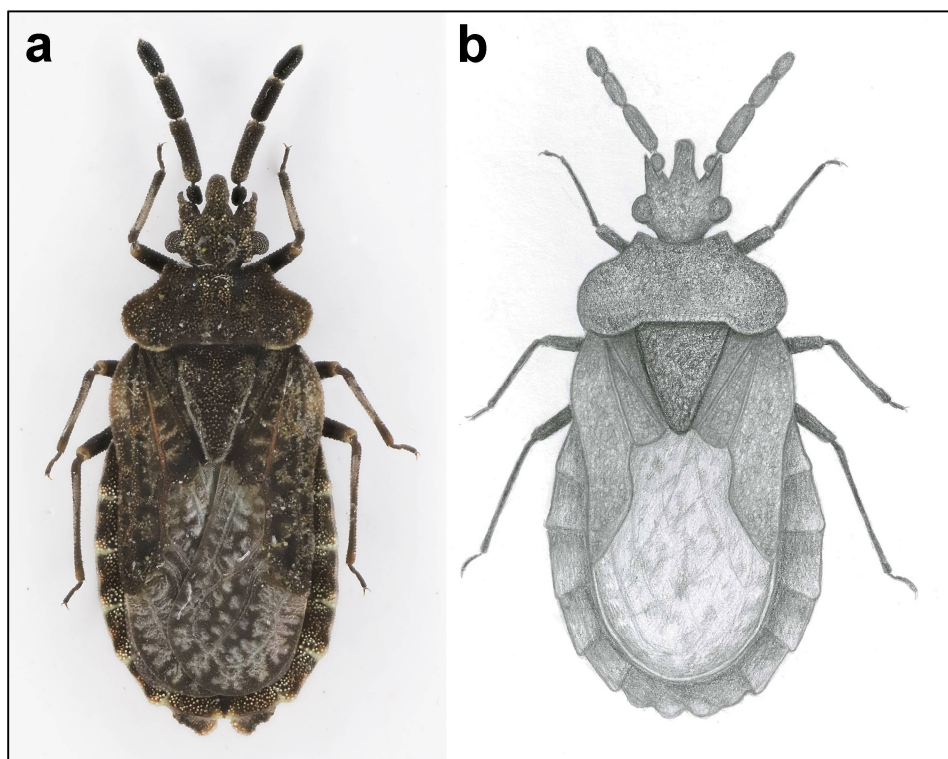


Fig. 1. Habitus of *Aradus kuthyi* Horváth, 1899: a) photograph of female from Tilič hill (photo: V. Hemala); b) drawing of female from Dolné Vestenice (orig. V. Spišiaková).



Fig. 2. Habitats of *Aradus kuthyi* Horváth, 1899 in Slovakia: **a)** forest steppe above the village of Dolné Vestenice; **b)** the top part of Tilič hill in Cerová vrchovina Upland with fragment of sparse Turkey oak steppe. (Photo: V. Hemala).

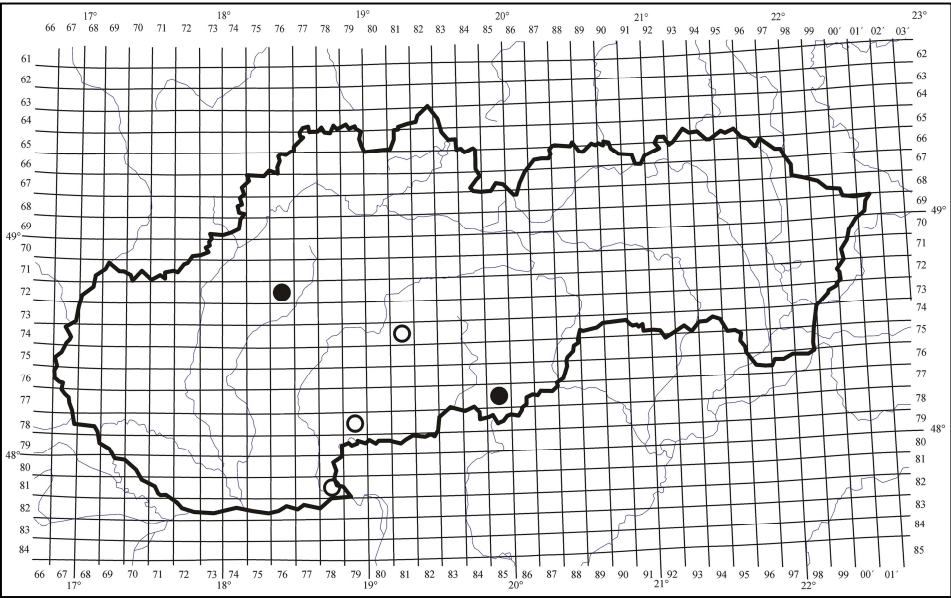


Fig. 3. Distribution of *Aradus kuthyi* Horváth, 1899 in Slovakia. Empty circles – records from 1950–1961 and 1993, filled circles – recent records from 2008 and 2023.

DISCUSSION

In Slovakia, *Aradus kuthyi* was firstly reported from Burda Hills (called “Kováčovské kopce Hills” at that time) based on only two females recorded in 1950 and 1954 (HOBERLANDT 1956). Several years later, further two females were collected in Pstruša in 1960 and repeatedly in Burda Hills in 1961 (STEHLÍK & HEISS 2001). After a 32-year gap, the species was recorded in Slovakia again as one female collected in Plášťovce in 1993 (KMENT et al. 2013). Each one of these records is based on only one female specimen. Our two recent records from Dolné Vestenice in 2008 (this paper) and from Tilič hill near the Hajnáčka village in 2023 (this paper) represent the confirmation of the presence of this species in Slovakia.

All known records of *A. kuthyi* in Slovakia are placed in the hilly parts of the warm Pannonian climate region of the country (Burda Hills; Plášťovce at the southern slopes of the Krupinská planina Plateau; Tilič hill in the Cerová vrchovina Mts) or in the peripheral mountain ranges of the inner parts of the Western Carpathians (Pstruša near Poľana Mts, southern slopes of the Strážovské vrchy Mts near the village of Dolné Vestenice) which have also very warm climate due to their close touch with the northernmost protrusions of the Pannonian Region. The record from Dolné Vestenice is very remarkable as the northernmost known record of this species from Slovakia.

In the Czech Republic, *A. kuthyi* was firstly recorded in central Bohemia (Závist near Praha) in 1958 (ŠTYS 1976). Later, it was recorded repeatedly in central Bohemia from two further localities: Šance in Praha–Točná (in 1979 and 2001) and Vonoklasy (in 2005) (KMENT et al. 2013). The species was found also in Moravia, where it is known only from two localities: Liščí skála rocks in Podyjí National Park (recorded in 1995) and Senorady (recorded in 2012) (KMENT et al. 2013). Each of these records is based on only one collected individual, while the male was collected only in one case (Šance in Praha–Točná in 2001). The central Bohemian records of *A. kuthyi* from Praha and its surroundings are remarkable as the northernmost known records of this species from the entire area of its occurrence as well.

The type locality of *A. kuthyi* is Isaszeg situated in central Hungary (only few kilometers eastern from Budapest) (HORVÁTH 1899); the description of this species was based on only one female. This record was only one known record from Hungary in the 19th century (HORVÁTH 1907). Later, the male of *A. kuthyi* was recorded in Velence Hills in 1951 (VÁSÁRHELYI 1975) and further female was recorded in Mecsek Hills in 1964 (ROUBAL 1966). The morphology of two larvae of *A. kuthyi* (fourth and fifth instar) from Pilisborosjenő was detaily described in VÁSÁRHELYI (1985), but the date of their collecting is not mentioned there. Later

records of *A. kuthyi* from Hungary are unknown (see VÁRÁSHELYI 1990, KONDOROSY 1999, TORMA & RÉDEI 2012).

The fourth Central European country with known occurrence of *A. kuthyi* is Austria, where two males and three females of this species were recorded in Steinbruch (eastern Styria) in 1991 (ADLBAUER 1992) and further one specimen in Breitenbrunn (Burgenland) in 2015 (HEISS et al. 2024). Further European records of *A. kuthyi* are known only from the Balkan Peninsula, where the species was recorded in three countries until now: Albania (Munela in Mirdita region) without known date (VÁSÁRHELYI 1975), Bosnia and Herzegovina (Žeravečki Potok) in 1957 (HEISS 2006) and Greece (Chelmos forest in Kalavryta and Kalambaka-Kastraki in Thessalia) in 2000 and 2008 (HEISS 2006, HEISS & BRUSTEL 2013). Due to the considerable distances between these three Balkan countries, it is possible to assume that *A. kuthyi* can be present also in further countries of the Balkan Peninsula.

Aradus kuthyi apparently indicates habitats with the highest biodiversity value. The degree of endangerment of this species may be debatable. It is regarded an endangered species in both the Czech Republic (KMENT et al. 2017) and Slovakia (ŠTEPANOVIČOVÁ & BIANCHI 2001, HEMALA 2025). It is notable that it is missing in the Red List of Southern Austria (RABITSCH 2007). Nevertheless, we suppose that it is not directly threatened, unlike commercially attractive beetles, for example. In Slovakia, especially in the southern regions, there is a relatively large number of suitable habitats. Although the population of this species is probably low, it is apparently stable. As long as a wide scale of forest steppes and edges remains preserved in Slovakia, the risk of threat from humans will be only low.

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