A review of the genus *Sernokorba* Kamura, 1992
(Araneae, Gnaphosidae)

Nikolett Gallé-Szpisjak¹, Róbert Gallé¹,², Tamás Szűts³

¹ ELKH Centre for Ecological Research, Lendület Landscape and Conservation Ecology Research Group, Alkotmány út 2-4. Vácrátót, 2163, Hungary
² MTA-SZTE 'Momentum' Applied Ecology Research Group, Közép fasor 52, Szeged, 6726 Hungary
³ Department of Ecology, University of Veterinarian Medicine Budapest, Rottenbiller u. 50, Budapest, 1077, Hungary

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Corresponding author: Nikolett Gallé-Szpisjak (szpisjak.nikolett@ecolres.hu)

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Abstract

The gnaphosid spider genus *Sernokorba* Kamura, 1992 is reviewed. While *Sernokorba pallidipatellis* (Bösenberg and Strand 1906) and *Sernokorba fanjing* Song, Zhu & Zhang, 2004, occur in the Far East and the Japanese archipelago, *Sernokorba tescorum* (Simon, 1914) is known from Europe. We here describe a fourth species, *Sernokorba betyar* sp. nov. (male and female) from the forest steppe vegetation in southern Hungary in Central Europe. Digital images, comparative drawings (except for *S. fanjing*) and a distribution map are provided for all the species, and an identification key is compiled. The cheliceral dentoation as diagnostic character and its interpretation are discussed.

Key Words

Central Europe, forest steppe, identification key, new species, spider

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Introduction

Kamura (1992) described the monotypic ground spider genus *Sernokorba* to accommodate *Prosthesima pallidipatellis* Bösenberg & Strand, 1906, which was at that time placed in *Zelotes* Gistel, 1848, since it lacks the preening comb on metatarsi III–IV characteristic of the genus. The species occurs also in China (Song et al. 1999), Korea (Namkung 2002) and Russian Far East (Marusik 2009). According to Kwon et al. (2014), this ground-dwelling species occurs in a wide variety of habitats, in forests, vineyards and grasslands. Currently, three species of the genus are known. The second species, *Sernokorba fanjing* Song, Zhu & Zhang, 2004 was described from Mt. Fanjing, Guizhou, China.

The third species occurs in Europe. It was originally described as *Poecilochroa tescorum* Simon, 1914 on the basis of a female specimen. In their recent study, Cornic and Ledoux (2013) revised the species, described the male and proposed a new combination, *Sernokorba tescorum* (Simon, 1914). The species has been collected in nine locations in southern France, in grasslands and pine forests on calcareous soil. Later, Hernandez-Corral et al. (2017) and Breitling (2018) provided new occurrence data from the Iberian Peninsula, from a *Quercus rotundifolia*, Lamarck forest and a dry grassland, respectively. Naumova et al. (2021) reported the species from Bulgaria, from the leaf litter of a mixed forest of *Fagus sylvatica*, Linnaeus and *Pinus heldreichii*, Christ. In this paper we report, describe and illustrate *Sernokorba* specimens from Hungary for the first time, belonging to a hitherto unknown species, which we hereby describe as new to science. We provide an identification key, and illustrate occurrences of the genus, except for *S. fanjing*.
Materials and methods

The specimens of the new species were collected in the calcareous sand-dune area of the Kiskunság, central Hungary. The region belongs to the forest steppe zone, the transitional biome between the temperate deciduous forest and the steppe zones in Eurasia (Gallé et al. 2022a). The region has a semiarid continental climate, as the mean annual precipitation is between 500–550 mm and the annual temperature is between 10 °C and 12 °C (Gallé et al. 2022a). The calcareous soil is poor in organic matter (Tőgyesi et al. 2018). The forest steppe vegetation appears as a mosaic of (1) open dry grasslands: brome sward (Brometum tectorum), calciphilous festucetum steppe (Festucetum vaginateae) and Pannonian sand grassland (Potentillo–Festucetum pseudovaginaleae), (2) wind-grooves between the sand dunes: more humid, with dune-slab purple moorgrass meadow (Molinio–Salicetum rosmarinifolii) as main vegetation type, and (3) small forest patches of native arboreal plants such as Populus alba, Crataegus monogyna and Juniperus communis. Spiders were sampled with funnel traps (Császár et al. 2018). A total of 10 sites was established, and in each site, three habitat types (grassland, forest and forest edge) were sampled with four traps in each habitat. Samplings were done between 18 May and 12 June 2014. We collected 21 out of the 28 specimens in the forest edges.

Type material of the new species will be deposited in the Hungarian Museum of Natural History, Budapest (HMNH, curator: E. Deákné Lázányi-Bacsó). A male of S. tescorum has been kindly loaned to us by Antonio Melic (Sociedad Entomológica Aragonesa: PCAM). Specimens of S. pallidipatellis have been kindly donated to HNHM (Hungarian Natural History Museum, Budapest,) by Prof. Takahide Kamura (Otemon Gakuin University). We did not have access to specimens of S. fanjing.

Results

Key to the species

1 Females ........................................................................................................................................................................ 2
   - Males......................................................................................................................................................................... 5
2 Copulatory openings well visible (Figs 46, 47) .......................................................... Sernokorba fanjing
   - Copulatory openings not clearly visible (Figs 40–45) .......................................................... Sernokorba pallidipatellis
3 Spermathecae relatively small (i.e., ~50% of the height of the vulva); sperm ducts straight (Figs 44, 45) .......................................................... Sernokorba pallidipatellis
   - Spermathecae relatively large (i.e., over 70% of the height of the vulva); sperm ducts with a proximal characteristic switchback (Figs 40–43) .......................................................... Sernokorba tescorum
4 Lateral edge of spermatheca with an angular posterior edge (Figs 28, 40, 41) ............... Sernokorba betyar sp. nov.
   - Lateral edge of spermatheca round (Figs 42, 43) .......................................................... Sernokorba tescorum
5 Embolar tip slightly bent (Figs 23, 33, 34) ........................................................................... Sernokorba pallidipatellis
   - Embolar tip straight (Figs 20–22, 29–32) ........................................................................... Sernokorba tescorum
6 Conductor blunt (Figs 29, 30, 35, 36), spermophore strongly bent as seen in retrolateral view, ventral bump on the RTA absent (Figs 13, 30) .......................................................... Sernokorba tescorum
   - Conductor with fin-like branches (Figs 17–19, 31, 32, 37, 38), spermophore almost straight as seen in retrolateral view, ventral bump on the RTA present (Figs 14, 15, 32) ........... Sernokorba betyar sp. nov.

Abbreviations

AME anterior median eyes; 
d dorsal; 
p prolateral; 
r retrolateral; 
RTA retrolateral tibial apophysis; 
v ventral.

Specimens were photographed using a Nikon D300S camera and a Tucsen TrueChrome Metrics camera attached to a Nikon S800 stereomicroscope and a Nikon Eclipse E200 compound microscope at the Department of Ecology, University of Veterinary Medicine Budapest. Digital multifocal images were assembled using HeliconFocus image stacking software. Epignyes were removed and illustrations of them were made after a day-long maceration in commercial pancreatic enzyme solution. Palps were examined immersed in methyl-saliclylate and mounted in a slightly modified Coddington mount (Coddington 1983). We modified the mount as the coverslip is not horizontal, but touching the slide itself, thus creating a triangle allowing more precise manipulation and more stable fixation of the object. Illustrations of the new species, S. tescorum and S. pallidipatellis were redrawn from digital images, while for S. fanjing they were produced from the figures of the original description (Song et al. 2004). We used Adobe Illustrator CS6 vector graphics software. We illustrated the distribution of the Sernokorba species with Google Earth satellite images, and Adobe Photoshop CS6 software.

Measurements are given in mm. Lengths of leg segments and total length were measured on the dorsal view. Leg formula developed by Ono (1988) is used; lengths of leg segments are given as: total length (femur, patella, tibia, metatarsus, tarsus).
Figures 1–4. The habitat and distribution of Sernokorba species; 1, 2. Habitat of *S. betyar* in Fülöpháza (Hungary); 3. Occurrences in Europe, red dots: *S. betyar*, yellow dots: *S. tescorum*; 4. Occurrences in Asia, green dots: *S. pallidipatellis*. 
Taxonomy

Subfamily: Herpyllinae Platnick, 1990 (type genus Herpyllus Hentz, 1832)

Genus Sernokorba Kamura, 1992

Diagnosis. The genus is a member of the Herpylline group (Azevedo et al. 2018), with a conspicuous black and white abdominal pattern (Figs 5–7). Males can be recognized by the following combination of characters: a single RTA that is about as long as the cymbium, thin, slightly bent, evenly narrowing terminally, and with a hook–shaped end (Figs 13–16). The conductor is about as long or longer than the tegulum, not twisted around the embolus (Figs 9–11, 13–15, 29, 31, 33). Females can be recognized by the kidney–shaped spermathecae (Figs 40, 42) and the sperm ducts being as long as the height of the spermathecae (Figs 40, 42, 44, 46).

Description. See Kamura (1992). Furthermore, males in all the three examined species have a characteristic apical depression on the retrolateral side of gnathocoxae (Fig. 8), which females do not have (Kamura 1992: fig. 4, Murphy 2007: 296, 310). This sexually dimorphic character, was not mentioned in the original descriptions of S. pallidipatellis and S. tescorum, or in the description of the genus itself.

Distribution. The genus has been reported from East Asia (Korea, China, Russia and Japan) and from Western, Central and Southern Europe.


Sernokorba pallidipatellis (Bösenberg & Strand, 1906)

Fig. 12, 16, 23, 33, 34, 39, 44, 45, 48–50

Remark. As mentioned by Kamura (1992), Herpyllus coreanus Paik, 1992 is most likely conspecific with S. pallidipatellis; however, we do not propose a formal synonymy as we did not examine the type specimen of H. coreanus.


Diagnosis. Males can be recognized by the slightly bent embolar tip (Figs 23, 33) and by the large conductor reaching the tip of the embolus (Figs 33–34). Distal tip of the conductor is blunt and triangular. RTA with a ventral bump and bearing a distal invagination, resulting in two subequal branches.

Description. See Kamura (1992).

Sernokorba tescorum (Simon, 1914)
Figs 5, 9, 13, 20, 24, 29, 30, 35, 36, 42, 43

Remark. This species was recently reported from the Balkans, Bulgaria (Naumova et al. 2021). Fortunately, the record is accompanied with high quality images, and it is clear that the specimen shows some differences (i.e., in size of the cymbium, shape of the cymbium, the absence of clear finger-like extensions, and the coil shape of the spermatophore) from the new species. However, we do not suggest any identification without examining the specimen itself.

Material examined. Spain: Cantoblanco: 1 male, Monte de Valdelatas Madrid. UTM: 30TVK4287, 40°32'11.5"N, 3°41'05.0"W, 700 m, 2002 May 27. A. Jiménez leg. (PCAM 5949).

Diagnosis. Abdominal pattern consists of three pairs of elongated white spots. Males have blunt conductor (Figs 9, 29, 35, 36). The female is very similar to that of the new species, but can be differentiated by the round spermathecae (Figs 42, 43).

Description. See Hernández-Corral et al. (2017) and Cornic and Ledoux (2013).
**Distribution.** France, Spain and Bulgaria (Naumova et al. 2021; Nentwig et al. 2022). A combination of all the published occurrences until 2020 (Corin and Ledoux 2013; Hernández-Corral et al. 2017; Breitling 2018) is shown in fig. 3.

*Sernokorba betyar* sp. nov.

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Figs 6–8, 10, 11, 14, 15, 17–19, 21, 22, 25–28, 31, 32, 37, 38, 40, 41, 51, 52

**Type material.** **Holotype:** HUNGARY: Fülopáhza: male (46°51’55.00”N, 19°24’27.18”E) forest edge, pitfall trap, 1–10. June 2014, R. Gallé & N. Gallé-Szpisjak leg. (HNHM Araneae-9230).

**Paratypes:** HUNGARY: Fülopáhza: 1 male, 46°30’27.62”N, 19°30’2.22”E, forest edge, pitfall trap, 1–10. June 2014, R. Gallé & N. Gallé-Szpisjak leg. (HNHM Araneae-9229);

HUNGARY: Fülopáhza: 1 female, 46°52’47.57”N, 19°24’17.36”E, forest edge, pitfall trap, 1–10. June 2014, R. Gallé & N. Gallé-Szpisjak leg. (HNHM Araneae-9228);

HUNGARY: Fülopáhza: 1 male, 46°52’46.93”N, 19°24’43.59”E, forest edge, pitfall trap, 18–25. May 2014 R. Gallé & N. Gallé-Szpisjak leg. (HNHM Araneae-9231);

HUNGARY: Fülopáhza: 1 female 46°53’13.61”N, 19°24’33.89”E, forest edge, pitfall trap, 18–25. May 2014 R. Gallé & N. Gallé-Szpisjak leg. (HNHM Araneae-9230);

**Other material examined.** HUNGARY: Tázlár: 1 male, 46°31’7.83”N, 19°31’10.80”E, forest edge, pitfall trap 19°24’17.36”E, forest edge, pitfall trap, 1–10. June 2014 R. Gallé & N. Gallé-Szpisjak leg.;


**Diagnosis.** The male can be identified by the finger-like extensions on the tip of the conductor (Figs 37, 38), and by the almost straight spermatheca as seen from the retrolateral side (Fig 25, 32). Also, the male has an apical ecital depression on the gnathocoxae (Fig. 8), similar to that of *S. tescorum*. The female can be distinguished by the edge of the spermatheca: the lateral edge is more or less straight (vs. rounded in *S. tescorum*) and the posterior edge is concave (vs. convex in *S. tescorum*). Also, it can be distinguished by the deep atrial pockets (Figs 27, 28, 40, 41) opposed to the shallow atrial pokets of the *S. tescorum*. Colour. Carapace light brown with pale brown radiating stripes, covered with white fine setae (Fig. 7); thoracic groove dark brown (Fig. 7). Chelicerae pale brown (Fig. 7). Gnathocoxae brown with a dark brown outline; terminal part in ventral view pale yellow. Labium brown (Fig. 8). Sternum brown with radial light brown spots, posterior end dark brown. Trochanter I brown, all other trochanters pale yellow. All femora dark brown; all other leg segments pale yellow. Abdomen dark greyish brown with a reddish scutum; an anterior transverse line and two pairs of whitish spots present in the area of the scutum; anterior pair of spots placed closer to the midline, posterior pair situated laterally. Venter light greyish yellow, with two thin longitudinal stripes starting at epigastric furrow and extending towards spinnerets. Epigastric area yellowish–brown. Sides of abdomen dark brown. Spinnerets’ proximal segments dark brown/black, distal part pale yellow.

Carapace suboval, cephalic region much narrower (about 40% of maximal width), posterior region truncated (Fig. 7) and elevated, about twice as high as in front. Chelicerae thin, with one tooth on promargin and two teeth on retro-margin. Gnathocoxae with an oblique depression on the lateral margin (Fig. 8). Sternum longer than wide. Labium as long as wide (Fig. 8), triangular. Clypeus low, about the diameter of AME high. Abdomen ovoid, longer than wide, truncated in front, with scutum covering 60% of the dorsum (Fig. 5). Total length, not including spinnerets, 4.32. Carapace 1.35 long, 0.98 wide, 0.41 high, highest at coxae III, widest at coxae II. Abdomen 2.72 long, 0.87 wide, with large bristles on proximal margin. Clypeus low, 0.10.

**Leg measurements:** I 3.05 (1.01, 0.42, 0.65, 0.51, 0.46); II 3.00 (0.99, 0.43, 0.63, 0.48, 0.47); III 2.89 (0.94, 0.39, 0.63, 0.47, 0.46); IV 3.99 (1.07, 0.57, 0.82, 1.0, 0.53). Leg formula IV-I-II-III.

**Leg spination:** I: femur d 1-1-1, p 0-0-1; tibia v 0-1-1; II: femur d 1-1-1, p 0-0-1; tibia v 0-1-1; III: femur d 1-1-1, p 0-0-1, r 0-0-1; patella p1, r1; tibia p 0-1-1 v 0-1-1, r 0-1-1; IV: femur d 1-1-1, p 0-0-1, r 0-0-1, v 0-1-0, r 0-1-1; metatarsus p 1-2-2, v 1-0-0, r 1-1-2.

Palp: Tibia longer than wide, RTA about 70% at cymbium’s length (Figs 10, 11, 21, 22, 25), thin, bent in its middle and with an apical hook (Figs 14, 15, 32); spermophore U-shaped, proximal pair of tegulum is tight (Figs 10, 11, 21, 22) (vs. loose in that of *S. tescorum*, as shown in Figs 9, 20). Spermophore bent slightly in retro-lateral view (Figs 15, 25). Conductor membranous, with finger-like extensions (Figs 17–19, 31, 32, 37, 38).

**Female (Paratype; HNHM 9241).** Colouration as in male, except carapace and abdomen lighter (Fig. 6). Epigastric area yellowish–dark grey. Shape of carapace and abdomen (Fig. 6) as in males, except for absence of abdominal scutum. Total length, not including spinnerets, 4.04. Carapace 1.98 long, 1.50 wide, 0.57 high. Abdomen 3.58 long, 2.03 wide, 1.19.

**Leg measurements:** I 4.19 (1.45, 0.58, 0.82, 0.74, 0.60); II 4.13 (1.43, 0.57, 0.80, 0.75, 0.58); III 4.11 (1.30, 0.54, 0.81, 0.89, 0.57); IV 5.67 (1.65, 0.63, 1.21, 1.45, 0.73). Leg formula. IV-I-II-III.

**Leg spination:** I: femur d 1-1-1, p 0-0-1; tibia v 0-1-1; II: femur d 1-1-1, p 0-0-1; tibia v 0-1-1; III: femur d 1-1-1, p 0-0-1, r 0-0-1; patella p1, r1; tibia p 0-1-1 v 0-1-1, r 0-1-1; metatarsus p 0-1-2, r 0-0-2, v 0-0-1. IV: femur d 1-1-1, p 0-0-1, r 0-0-1, tibia d 0-1-0, p 1-1-1, v 1-1-1, r 0-1-1; metatarsus p 1-2-2, v 1-0-0, r 1-1-2.

**Epigyne:** copulatory openings positioned medially on anterior part; copulatory ducts short; spermathecae robust and pear-shaped.
Figures 40–47. Illustrations of the female genitalia; 40, 41 Sernokorba betyar sp. nov.; 40. Dorsal view; 41. Ventral view; 42, 43. Sernokorba tescorum; 42. Dorsal view; 43. Ventral view; 44, 45. Sernokorba pallidipatellis; 44. Dorsal view; 45. Ventral view; 46, 47. Sernokorba fanjing; 46. Dorsal view; 47. Ventral view.
Etymology. The specific name is a Hungarian noun in apposition and refers to the outlaws “betyár” found in hiding places on the Hungarian Great Plain, just as this species has been avoiding its discovery so far.


Discussion

In the genus description of *Sernokorba*, Kamura (1992) mentioned concerning *S. pallidipatellis*: “I recognized that this species is unique in having a serrated carina on the promargin of fang furrow of chelicera”, unequivocally illustrated (Kamura 1992: fig. 3), and used in this sense by subsequent authors (Song et al. 2004; Kim and Lee 2013) for *S. fanjing* and *S. pallidipatellis*. However, Cornic and Ledoux (2013) reports teeth, but only on the promargin: “Marge antérieure des chélicères garnie de trois dents, marge postérieure mute”. We compared the dentation of specimens of *S. pallidipatellis* (Figs 48–50) to both literature images and to that of *S. betyar* sp. nov. (Figs 51, 52). The cheliceral dentation of *S. pallidipatellis* (Figs 48–50) looks almost identical to literature sources (Kamura 1992: fig. 3). However, we also agree with Cornic and Ledoux (2013) and interpret it as teeth rather than a keel or carina. Azevedo et al. (2018) well illustrated the non-serrated cheliceral promargin (Azevedo et al. 2018: fig 20. e, g), which is diagnostic to the subfamily Herpyllinae. However, the keel on the promargin may not just “be a subtle projection or may appear as teeth with fused bases” (Kamura 1992). Despite Kamura’s (1992) description and subsequent authors (Song et al. 2004; Kim and Lee 2013) implies the latter; we observed that the bases of the teeth are in fact separated as viewed from an oblique view (Figs 49, 50). We observed five teeth lumped together with a smaller one further placed, whereas there was one clear tooth on the retromargin. Such dentation has been observed (but not illustrated) in *Latonigena* Simon, 1893 by Ott et al. (2012), thus this character may require a second look with more genera involved. The dentation of *S. betyar* sp. nov. (i.e., two teeth on the promargin and one on the retromargin, Figs 51, 52) is different also from *S. tescorum* (i.e., three teeth on the promargin, none on the retromargin) which seems a good confirmation to separate the two species.

Species of the genus occur in a wide variety of habitats including lowland forests and grasslands, however,
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