

NATURA SOMOGYIENSIS 46.

VÁLOGATOTT TANULMÁNYOK XXIX. - MISCELLANEA XXIX.



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Válogatott tanulmányok XXIX.

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A new species of *Myrmeleon* from Mozambique (Neuroptera: Myrmeleontidae)

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MULVANEY, L.R.J. & ÁBRAHÁM, L. 2025: *A new species of Myrmeleon from Mozambique (Neuroptera: Myrmeleontidae)*. – *Natura Somogyiensis* 46: 5-16.

Abstract: *Myrmeleon milibangalala* sp. nov. is described from Maputo National Park, Mozambique and compared to small-sized *Myrmeleon* species from southern Africa, namely *Myrmeleon obscurus* Rambur, 1842, *Myrmeleon caliginosus* Hölzel & Ohm, 1983 and *Myrmeleon stigmalis* Navás, 1912. The characteristics of the new species are depicted on three plates. The species of the genus are typically found in coastal zones of continents and the habitat of the new species is described herein.

Keywords: taxonomy, antlion, Nature Conservation, Africa

Introduction

The genus *Myrmeleon* Linnaeus, 1767 is rich in species, the number of species on Earth is 176 (STANGE 2004), but this number is constantly changing, on the one hand new *Myrmeleon* species are described (PANTALEONI et al. 2010, BADANO et al. 2016, MICHEL & AKOUDJIN 2023), on the other hand species are transferred from the genus *Myrmeleon* to other genera and several species have been synonymised (MANSELL 1979, SURYANARAYANAN et al. 2025).

The species of the genus *Myrmeleon* are distributed all over the world except the Arctic regions. Based on STANGE's (2004) catalogue, there are 49 valid species in Africa. In southern Africa, which includes Angola, Botswana, Comoros, Eswatini, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Zambia and Zimbabwe, the number of valid species is about 15. Five species of *Myrmeleon* are known in Madagascar. Mozambique also has five species (OSWALD 2024), namely *Myrmeleon doralice* Banks, 1911, *Myrmeleon lanceolatus* Rambur, 1842, *Myrmeleon obscurus* Rambur, 1842, *Myrmeleon quinquemaculatus* Hagen, 1853, *Myrmeleon stigmalis* Navás, 1912. The type locality of the latter species was documented in Mozambique.

According to our knowledge (GEPP & HÖLZEL 1989, GRIFFITHS 1986, 1991), the larvae of *Myrmeleon* are pit building species. The pits of the species are found in open habitats, in places exposed to sunlight, wind and rain, mainly in the temperate zone. In protected microhabitats, larvae are not exposed to the effects of rain and wind. These are mainly characteristic of tropical areas, since the larvae must retreat to the shade due to the high temperatures.

Among the species of *Myrmeleon*, there are large e.g. *M. quinque maculatus*, medium e.g. *M. lanceolatus* and small e.g. *M. obscurus*. They are characterised by a high degree of morphological similarity, but can be distinguished by the features of the head, pronotum, and wings. Reproductive organs are also well differentiated, but a high degree of variability is possible in widely distributed species (HÖLZEL 1986). From a taxonomic point of view, the species of the genus are in need of revision almost everywhere, and the separation of several new species or the synonyms are expected (SURYANARAYANAN et al. 2025). This work will be supported in the future by molecular taxonomic studies of African *Myrmeleon* species, since the real distribution of the species is only hardly known due to the lack of faunal surveys.

Maputo National Park (MNP), formerly Maputo Special Reserve (MSR) was established on December 31, 2021, and is the amalgamation of the Ponta do Ouro Partial Marine Reserve and the Maputo Special Reserve (MSR), measuring approximately 1700 km². MNP is located on the south-eastern coast of Maputo Province in the Matutuine District of Mozambique and sits within the Maputaland-Pondoland-Albany biodiversity hotspot in the northern part of the East African Coastal Forests Ecoregion (MYERS et al. 2000). To better understand the insect fauna of this region, a series of entomological research expeditions resulting in many taxonomic works (VOLYNKIN & LÁSZLÓ 2018, LÁSZLÓ & VETINA 2019, BAŁOWSKI et al. 2020, YAKOVLEV et al. 2020, LÁSZLÓ et al. 2021, MILES et al. 2022, RINDOŠ et al. 2022, TABERER & LÁSZLÓ 2022, TAKANO & LÁSZLÓ 2022, 2024) were carried out in the park between November 2016 and February 2018 by the African Natural History Research Trust (ANHRT) in collaboration with the Museu de História Natural (MNM), Maputo and the National Administration of Conservation Areas (ANAC). Fieldwork teams spent a total of 64 days sampling and during the most recent of the three expeditions unusual *Myrmeleon* specimen, not matching any of the previously known species in the genus, was discovered.

In this study, we describe a new small *Myrmeleon* species with a very characteristic morphology from Mozambique.

Material and methods

The new species was collected at Ponta Milibangalala (geographical coordinates: 26°26'58.6"S, 32°55'29.8"E, 15 m asl.) in a mosaic habitat of dune grassland and dune forest which extends along the Indian Ocean coastline. Specimens were collected at light using a 125 W Mercury vapour bulb placed inside a white tent-like structure (Fig. 1). After collection, specimens were preserved in glassine envelopes, desiccated with silica gel and pinned and spread in the ANHRT laboratories on returning from the field.

Habitus photographs were taken using a Canon EOS 6DII digital camera equipped with a Canon 100 mm macro lens fixed to a stand, with the use of a lightbox. In some cases, images were stacked using Helicon Focus image stacking software and all photographs were processed using Adobe Photoshop version 25.9.1 software.

For dissection, the caudal segments of the abdomen were removed and heated in 10% KOH solution for five minutes. The abdomen was then rinsed in distilled water and photographed in glycerine on a concave slide using a Canon EOS 700D digital camera, connected to a Leitz Diaplan microscope using a Best Scientific 1.6X Canon B clamp Leitz microscope adaptor. Genitalia images were stacked using CombineZP software and edited in Adobe photoshop. The genitalia were then transferred to a micro vial filled with glycerine and pinned to the specimen for preservation.



Fig. 1: Antlion specimens were collected at light using a 125 W Mercury vapour bulb inside a square ground plan, white tent

Primary type label data were transcribed verbatim with “//” denoting a different label and “/” denoting a line break. Any additional label information is given in square brackets.

Abbreviations: ANHRT African Natural History Research Trust, Leominster, UK,

Taxonomy

Family **Myrmeleontidae** Latreille, 1802

Subfamily **Myrmeleontinae** Latreille, 1802

Tribe **Myrmeleontini** Latreille, 1802

Genus ***Myrmeleon*** Linnaeus, 1867

Type species: *Myrmeleon formicarium* Linnaeus, 1867, subsequent designation.

Myrmeleon milibangalala sp. nov. (Fig. 2)

lsid:zoobank.org:pub:AE4B5BDA-F365-448A-9CA5-D88038B4217E

Diagnosis: The new species has several characters that allow it to be easily distinguished from other *Myrmeleon* species in the southern African region. Some of its striking features among *Myrmeleon* species are its small size, the uniform dark colouration of the vertex, the remarkably large size of the club, the number of cross-veins (3-4) between Rs1 and Rs2 in the forewing, the pattern of the tergal segments (brown with small semicircular and yellow lateral spots on the caudal margins in lateral view), and male has a large pilula axillaris in the base of the hind wing.

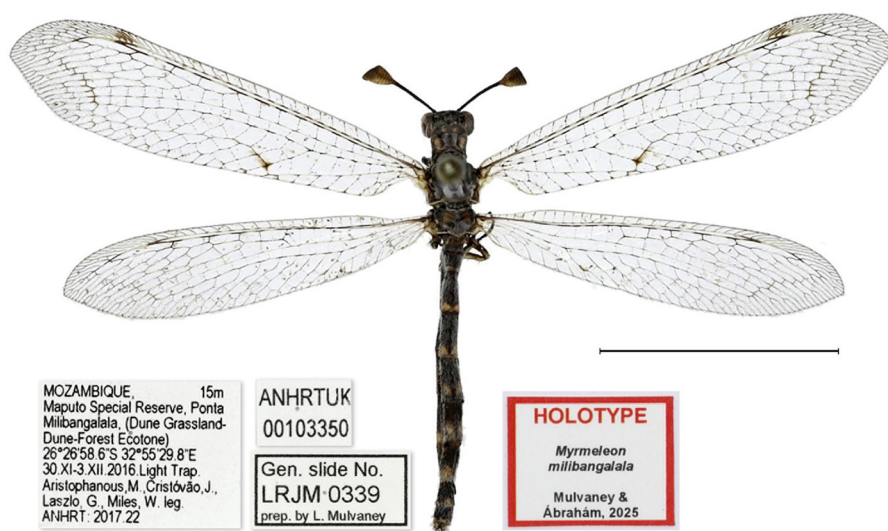


Fig. 2: Habitus of holotype male *Myrmeleon milibangalala* sp. nov. with labels (Scale bar: 10 mm)

The new species is morphologically similar to the relatively small-sized and wide-spread *Myrmeleon obscurus* Rambur, 1842, *Myrmeleon caliginosus* Hölzel & Ohm, 1983 and *Myrmeleon stigmalis* Navás, 1912. However, the latter species is significantly larger (length of forewing: 24–30 mm) than the new species and its tergal segments have a distinct reddish-yellow longitudinal stripe. The yellowish pattern on the abdomen of *M. obscurus* and *M. caliginosus* is on the anterior half of the tergites while that of the new species is on the caudal half of the tergites. The vertex of the new species is unicolour black but both similar species have yellow and black patterns.

Type material: Holotype // MOZAMBIQUE • ♂ 15 m / Maputo Special Reserve [MNP], Ponta / Milibangalala (Dune Grassland) / 26°26'58.6"S, 32°55'29.8"E / 30.xi-3.xii.2016 Light Trap / Aristophanous, M. Cristóvão, J., László, G., Miles, V. leg. / ANHRT:2017.22 // [Unique number:] ANHRTUK / 00103350 //

Paratypes: As the holotype • 8♂♂ and 11♀♀, unique numbers: ♂ ANHRTUK00103332, ♂ ANHRTUK00103336, ♂ ANHRTUK00103337, ♂ ANHRTUK00103342, ♂ ANHRTUK00103344, ♂ ANHRTUK00103346, ♂ ANHRTUK00103351, ♂ ANHRTUK00103355 (Gen slide no: LRJM0343), ♀ ANHRTUK00103331, ♀ ANHRTUK00103333, ♀ ANHRTUK00103334, ♀ ANHRTUK00103338, ♀ ANHRTUK00103339 (Gen slide no: LRJM0342), ♀ ANHRTUK00103341, ♀ ANHRTUK00103343, ♀ ANHRTUK00103347, ♀ ANHRTUK00103348, ♀ ANHRTUK00103349, ♀ ANHRTUK00103352.

// MOZAMBIQUE • 7♀♀ 15m / Maputo Special Reserve, Ponta / Milibangalala (Dune Grassland) / 26°26'58.6"S, 32°55'29.8"E / 17-21.ii.2018 MV Light Trap / László, G., Mulvaney, J., / Smith, L. Leg. / ANHRT:2018.2 // unique numbers: ♀ ANHRTUK00100574, ♀ ANHRTUK00100580, ♀ ANHRTUK00100581, ♀ ANHRTUK00100582, ♀ ANHRTUK00100607, ♀ ANHRTUK00100608, ♀ ANHRTUK00100625.

Additional material examined: Not included in the type material, because they are damaged.

As the holotype • 1♂ unique number: ANHRTUK00103353; MOZAMBIQUE • 1♀ 22m / Maputo Special Reserve, / West Gate (Sand Forest) / 26°30'14.2"S, 32°42'59.6"E / 21-30.xi.2016 General Coll. / Aristophanous, M., Cristóvão, J., / László, G., Miles, W. Leg. / ANHRT: 2017.22 // unique number: ANHRTUK00103330.

The holotype and paratypes are deposited in the entomological collection of ANHRTUK.

Description

Measurements. Holotype male. Antenna: 4 mm long; Body: 19 mm long; Forewing: 18.5 mm long, 5 mm wide; Hindwing: 16 mm long, 3.5 mm wide.

Paratype males (n=8). Antenna: 4 mm long; Body: 15-19 mm long; Forewing: 18.5-19.5 mm long, 5 mm wide; Hindwing: 14-16.5 mm long, 4 mm wide.

Paratype females (n=18). Antenna: 4.5 mm long; Body: 19-20 mm long; Forewing: 19.5-21.5 mm long, 5-5.5 mm wide; Hindwing: 16-18 mm long, 4.5 mm wide.

Head (Fig. 3A–B). Vertex slightly curved in frontal view, entirely dull black, with sparse short setae. Frons with shining black mark below scapes extending medially toward clypeus, frons otherwise yellow, hairless. Gena, clypeus and labrum also yellow and hairless. Basal margin of labrum slightly concave. Base of mandible subdominantly yellow and with dark brown apex and inner margin. Last two segments of maxillar palps yellow, third segment subdominantly dark brown. Last segment of labial palp spindle-shaped with oval sensory pit. One third distal part yellow, remnant part black. Otherwise, basal segments yellow. Eye larger than hemispherical bronze brown. Scape shining black with narrow yellow ring on frons. Pedicel dominantly black with narrow yellow basal and apical margins. Flagellar segments dark brown covering with short brown setae. Club remarkably large as long as one third of total length of the antenna. Most part brown dorsally and entirely yellow ventrally.

Thorax (Fig. 3B–C). Pronotum slightly trapezoid and slightly longer than wide, dark brown with two round yellow spots antero-laterally and two narrow indistinct yellow strips laterally. Anterior and posterior margins partly yellow. Short white setae covering pronotum but long sparse white hairs directed anteriorly on lateral margins. Meso and metanotum almost entirely dark brown with short sparse and white setae. Meso and metascutum with indistinct small yellow spots on each side; meso and metascutellum with narrow yellow caudal margins. Side dark brown with small yellow marks and sparse white setae.

Wings (Fig. 3E). Fore wing long elongated, longer than abdomen in resting position. Apices subacute, anal area obtuse. Venation moderately dense. Posterior Banksian-line visible. Membrane hyaline, indistinct light brown shadow at bifurcated veins along posterior margin in the anal and cubital areas. An oblique brown stripe extending from the junction of Cua₂ and origin of posterior Banksian line in cubital area. Also faint shadow along outer radial cross-veins. Veins dark brown alternating with pale. 6-7 radial cross-veins before origin of Rs. Usually 3-4 cross-veins between Rs₁ and Rs₂. 7 braches in Rs. Pterostigma brownish basally white distally with 6-7 cross-veins.

Hind wing similar to fore wing but without any shadow. Posterior Banksian line not visible. Pterostigma small, indistinct white with 4-5 cross-veins. 5 radial cross-veins before origin of Rs. Rs with 7 braches. Male pilula axillaris large, lenticular-shaped covering with dense reddish tiny setae upperside and dark brown underside. Long brown hairs on distal margin (Fig. 3D).

Legs. Foreleg, coxa dark brown outside and yellow inside with sparse and white hairs. Femur almost entirely brown with yellow strip basally covered with short, smooth, and white hairs. Femur longer than tibia. Tibia almost completely brown with small yellow spot basally on the outer third of part and with white setae outside, and reddish setose inner side and with some outstanding black bristles. Tibial spurs barely noticeable, tiny dark brown. Tarsal segments brown with yellow longitudinal line outside, segment 1 as long as segment 5. Segments 2-4 equal, total length equal length of segment 1 or segment 5. Claws short, reddish brown. Middle leg, coxa dark brown with white hairs.

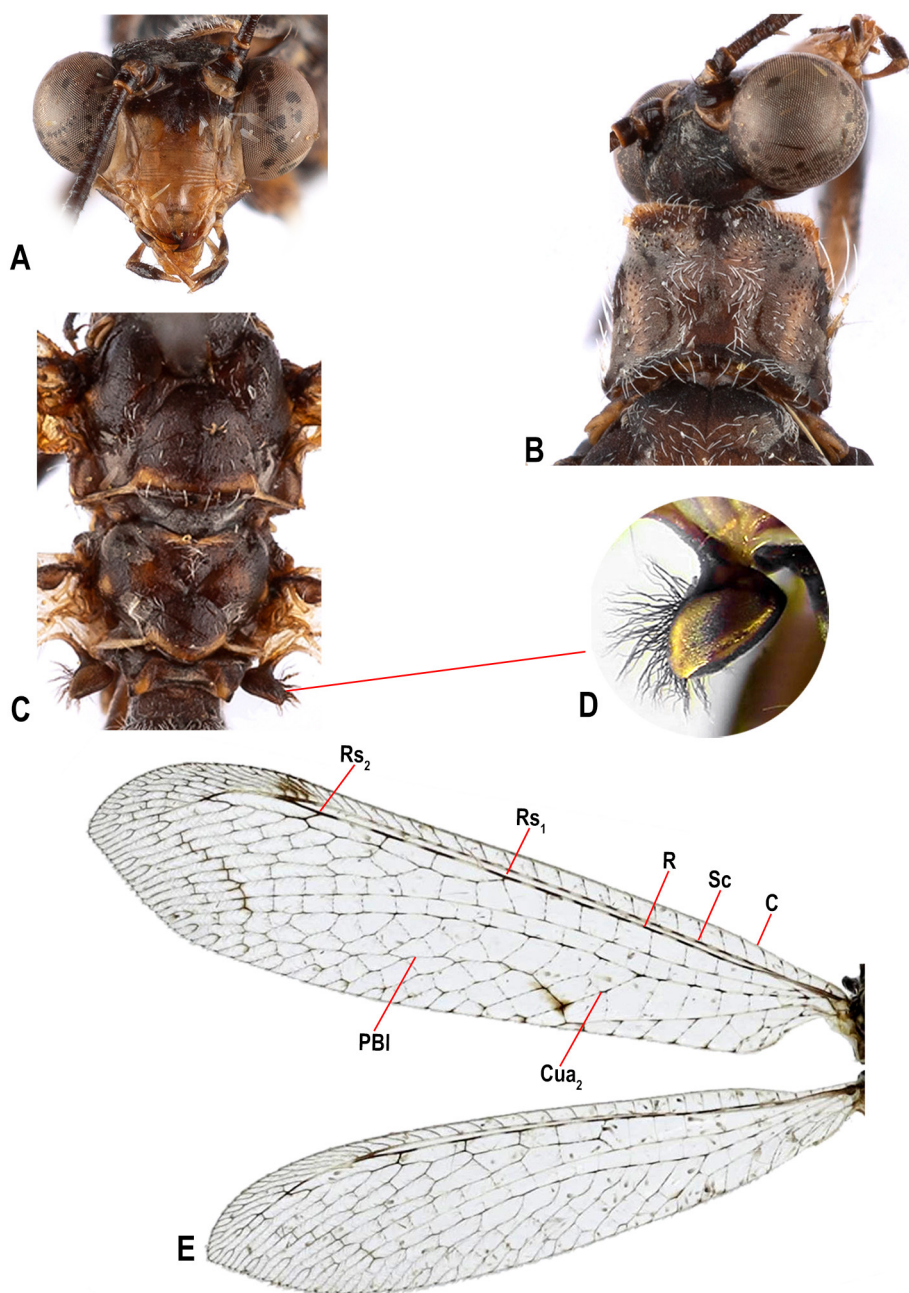


Fig. 3: A – Head in frontal view, B – Vertex and pronotum in dorsal view, C – Meso- and metathorax in dorsal view, D – male pilula axillaris in base of hindwing in dorsal view, E – Wings in dorsal view (Enlarged on different scales)

Abbreviations: C – Costa, Cua_2 – Cubitus anterior 2, Sc – Subcosta, R – Radius, Rs_1 and Rs_2 – Radius sector vein 1, and vein 2, PBI – Posterior Banksian line

Femur dominantly brown with longitudinal yellow stipe outside and with white setae and some upstanding rigid white bristles. Femur as long as tibia. Pattern on tibia similar to femur but setae black. Tibial spurs and tarsal segment similar to those of fore leg. Hind leg similar to middle leg, but yellow pattern more distinct on femur, tibia, and tarsal segments.

Abdomen: Brown with small semicircle-shaped and yellow lateral spots on caudal margins of tergal segments (Fig. 2). Sternites brown with yellow caudal margins. Setae of abdomen short, dense and white.

Terminalia and genitalia: Male (Fig. 4A–E). In lateral view, tergite 9 subrhomboid-shaped, brown with yellow hind margin. Ectoproct oval, brown with short, thick and yellow caudo-ventral protuberance. Protuberance with rigid, acute and black bristles. In ventral view, sternite 9 pentagonal-shaped brown, caudal margin yellow with black

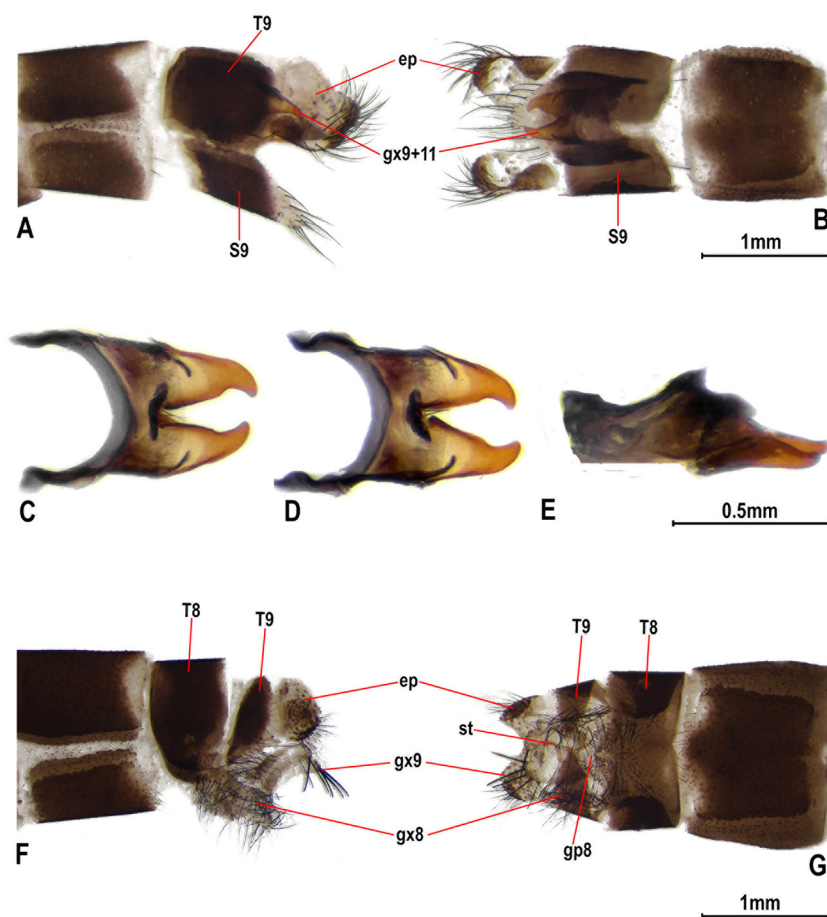


Fig. 4: Terminalia and genitalia A – male terminalia in lateral view, B – ditto in ventral view, C – male genitalia in lateral view, D – ditto in ventral view, E – Female terminalia in lateral view, F – ditto in ventral view

Abbreviations: gx – gonocoxites, gp – gonatal plate, T8, and T9 – tergite 8, and 9, ep – ectoproct S7, and S9 – sternite 7, and 9, st – spermatheca

hairs. In dorsal and lateral view, gx9+11 complex (gonarcus-parameres complex) similar shaped. Gx9 (parameres) elongated claw-shaped, outer margin evenly curved, ending in a blunt apex, inner margin initially curved, then straight. The apex and inner margin well sclerotized. 2 long gonatal setae. Gx11 (gonarcus) evenly curved in dorsal and ventral view. (Fig. 4C–E).

Female (Fig. 4F–G). In lateral view, tergal segment 9 brown with long black hairs ventro-caudally. Ectoproct oval, brown covering only with black hairs and without any strong digging setae. Gx8 slightly bent inward with long black hairs. Gx9 small globular with four or five long rigid and black bristles in a row directed ventro-caudally. In ventral view shape of spermatheca as in Fig. 4G.

Etymology: The new species is dedicated to the type locality, Ponta Milibangalala, Maputo National Park, Mozambique, situated within the Maputaland Centre of Plant Endemism. This region is globally recognised for its rich biodiversity, high levels of endemism and high conservation value. The name is a noun in nominative singular apposition.

Habitat and flight activity: The new species was collected at light in a dune grassland habitat, approximately 100 meters from the ocean, beyond a narrow strip of dune forest (Fig. 5). The area is characterised by a diverse mosaic of ecosystems, including dune vegetation, sand forest, sand forest-woodland mosaic, woodland mosaic, wooded grasslands, savannah, riverine vegetation, and mangroves (BirdLife International 2024, DNAC 2010). The light trap was set up near the edge of the dune forest, with a view overlooking the open dune grassland and the adjacent dune forest stretching across the grassland.

The vegetation in this area is well-developed, featuring low-lying grasses and shrubs interspersed with isolated trees, alongside patches of exposed sandy soil. The primary vegetation type is Poaceae (grasses) and a list of the species of grasses on comparable environments in NE South Africa can be found in TINLEY (1976). with other plant species recorded from the nearby foredune habitats include, such as *Ipomoea brasiliensis*,



Fig. 5: Habitat of *M. milibangalala* sp. nov. in the coastal zone of Maputo Special Reserve

Scaevola plumiera, *Arcotheca populifolia*, and the coastal bean bush *Sophora inhambanensis* (DNAC 2011).

The region receives an annual rainfall of 690-1000 mm and (October to March), average temperatures typically do not exceed 26.6°C (DE BOER & NTUMI 2001). The soil is primarily composed of Aeolian (wind-blown) sand deposits of marine origin, which are low in nutrients (PARK & DE BOER 2000, DE BOER & NTUMI 2001) and in A Natural History of Inhaca Island these sandy soils are reported as alkaline (7.5-8.4) (MACNAE & KALK 1969). The KZN coast experiences frequent onshore northeasterly sea breezes, especially during the summer months (JACKSON et al. 2014), which may influence local insect behaviour, with many likely seeking shelter within the vegetation during the windiest parts of the day.

Sampling was carried out seasonally at three times and in two different habitats (Table 1).

At the beginning of the swarm of antlion imagoes, males usually are on the wings first,

Table 1: Flight activity of the new species in different habitats

Sampling date	Habitat	Male	Female
21-30.xi.2016	Sand Forest	-	1
30.xi-3.xii.2016	Dune Grassland - / Dune-Forest Ecotone	10	11
17-21.ii.2018	Dune Grassland - / Dune-Forest Ecotone	-	7

then the number of females gradually increases and at the end of the swarm, females usually occur in higher numbers than males. Based on Table 1, it can be concluded that the imagoes of the new species are during the hot rainy summer season (November to March). The preferred habitat of the new species is the Dune Grassland - / Dune-Forest Ecotone.

Distribution: *Myrmeleon milibangalala* **sp. nov.** is Milibangalala in Maputo National Park, Mozambique and more specifically from Dune Grassland - / Dune-Forest Ecotone.

Discussion

The antlion fauna of Mozambique is poorly known, according to the LDL (OSWALD 2024), which is updated based on published but not revised publications; a total of 49 antlion species have been identified from Mozambique, excluding the owfly species. In the framework of the research projects that have just started, this number may increase significantly with new species and species found for the first time in the fauna. However, several species are likely to be synonymised. In southern Africa, the names of about 25 species classified in the genus *Myrmeleon* are known, of which about 10-11 are valid species.

The new species is probably an endemic species occurring in a previously unexplored special habitat. Coastal habitats can be very diverse in their vegetation structure, with open and closed sandy grasslands alternating with smaller and larger shrubby, grove-like and wooded areas. At the surface, sand dunes make the habitat even more diverse. Due to the diversity of the surface and the proximity of the sea, humidity also increases the diversity of habitats (PASCAL 2021).

In the southeastern coastal habitat of Africa, which extends from South Africa to Kenya, several species of antlions and owlflies prefer it, e.g. *Palpares inclemens* (Walker, 1853), *Syngenes longicornis* (Rambur, 1842), *Myrmeleon stigmalis* Navás, 1912, *Creoleon* sp. *Paraglenurus* sp. n. (under description), and an owlfly *Afroasca doboszi* Ábrahám, 2017.

The new species may possibly be restricted to specific microhabitats, influenced by environmental factors such as coastal winds or generally not attracted to light. Future studies should consider targeted searches for Myrmeleontidae using head torches and hand nets at dawn, dusk, and during the night as well as deploying automatic portable light traps directly on the beach during the same season that the type specimens was found.

It would be very interesting to conduct larval rearing experiments in this area to gain a better understanding of the life history of this elusive species. The larvae of *Myrmeleon* species are pit-builders. If the larvae build their pits in an open microhabitat on sandy soil, they are exposed to direct sunlight, rain, and wind. Therefore, it is likely that the larvae of the new species build their pits in protected microhabitats shaded by vegetation. This behavior provides the larvae of the new species with a better chance of survival on sandy soil surfaces, which are mainly exposed to sea breezes, heavy rain and strong heating from direct sunshine (ÁBRAHÁM 2003).

To conclude, the new species is another unique element of the Maputaland-Pondoland-Albany biodiversity hotspot and further highlights the conservation value of this biodiverse region.

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Study of the genus *Anthrenus* subgenus *Anthrenops*. Part 7. A new species from Saudi Arabia (Coleoptera: Dermestidae: Megatominae)

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HÁVA, J.: 2025: *Study of the genus Anthrenus subgenus Anthrenops. Part 7. A new species from Saudi Arabia (Coleoptera: Dermestidae: Megatominae).* – *Natura Somogyiensis* 46: 17-20.

Abstract: *Anthrenus (Anthrenops) saudicus* **sp. nov.** from Saudi Arabia is described, illustrated and compared with similar Saudi Arabian species, *Anthrenus (A.) coloratus* Reitter, 1881 and *Anthrenus (A.) subclaviger* Reitter, 1881.

Keywords: Taxonomy, new species, description, Palearctic Region, Saudi Arabia.

Introduction

The subgenus *Anthrenops* Reitter, 1881 of the genus *Anthrenus* Geoffroy, 1762, currently contains 30 species worldwide (HÁVA 2023a,b). Only two species are known from Saudi Arabia (HÁVA 2025): *Anthrenus (A.) coloratus* Reitter, 1881 and *Anthrenus (A.) subclaviger* Reitter, 1881.

The subgenus is characterized by antennae consisting of 9 antennomeres. Males differ from females by the shape of the antennal club. In males, the terminal antennomere is longer than the penultimate one; in females it is as long as the penultimate one. Adults can be found on plants, but also in households, where the larvae are harmful to different commodities of natural origin. They are feared pests in museum collections (PEACOCK 1993, HÁVA 2023, 2024a,b).

Material and Methods

The size of the beetles or of their body parts can be useful in species recognition and thus, the following measurements were made:

TL: total length - linear distance from anterior margin of pronotum to apex of elytra.

EW: elytral width - maximum linear transverse distance.

Acronym of material depositories:

JHAC Jiří Háva, Private Entomological Laboratory & Collection, Únětice u Prahy, Prague-West, Czech Republic.

Specimens of the presently described species are provided with red, printed label with text as follows:

„HOLOTYPE (or PARATYPE) *Anthrenus* (*Anthrenops*) *saudicus* sp. nov. Jiří Háva det. 2025”.

Taxonomy

Anthrenus (*Anthrenops*) *saudicus* sp. nov.

(Figs. 1-4).

Type material: Holotype (♂): Saudi Arabia, distr. Mekkah, 9 km S Marbelle, Wadi Numan, 21°16′.999″N 40°13′14.999″E, 820 m, 15-16. and 27-29.iii.2022, P. Kabátek lgt., (JHAC). *Paratypes* (51 spec.): same data as holotype, (JHAC).

Description: Male. Body TL 1.8 mm, EW 1.2 mm; body brown, small, oval (Fig. 1). Dorsal surface covered by dark brown, light brown and white scales. Individual scales small, broad, subtriangular. Head covered by white scales with individual light brown scales. Antennae brown, with 9 antennomeres, antennal club with three dark brown antennomeres, compact (Fig. 3). Frons with median ocellus. Eyes with entire median margin. Palpomeres dark brown. Pronotum covered by white scales, brown scales discally forming large spot, light brown scales forming small spots (Fig. 1). Scutellum very small, triangular without scales. Elytra with dark brown, light brown and white scales; scales forming spots on each elytron. Epipleuron very short, with white scales. Ventral surface covered with white scales (Fig. 2). Prosternum with only white scales. Metasternum with only white scales, without a small patch of brown scales at lateral margins. Abdominal ventrites I-V with white scales, without spots in the middle and with spots at antero-lateral margins from brown scales. Legs brown with white scales and white setae. Male aedeagus (Fig. 4).

Female: Externally similar to male, except terminal antennomere is smallest.

Variability: Body TL 1.7-2.1 mm, EW 1.2-1.3 mm. Dorsal surface covered by dark brown, light brown (or brownish-yellow) and white scales.

Differential diagnosis: The new species appears very similar to *Anthrenus* (*Anthrenodes*) *haladai* Háva, 2024, but differs from it by the number of antennomeres and shape of the male genitalia; from other Saudi Arabian species *Anthrenus* (*Anthrenops*) *coloratus* Reitter, 1881 and *Anthrenus* (*Anthrenops*) *subclaviger* Reitter, 1881 it differs by the shape of the antennae and male genitalia and the colour of the pronotal and elytral patterns.

Etymology: Named for the country of origin, Saudi Arabia.

Distribution: Saudi Arabia: Mekkah district.

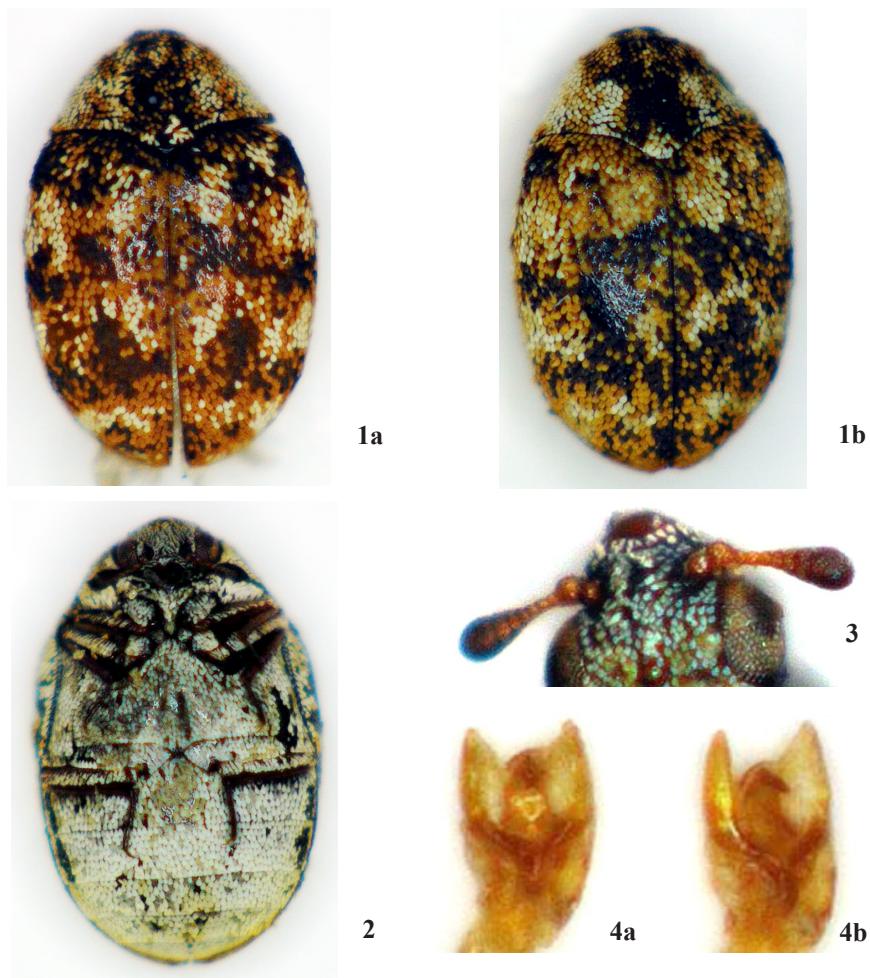


Fig. 1-4: *Anthrenus (Anthrenops) saudicus* sp. nov.: 1a-b- body, dorsal view; 2- body, ventral view; 3- antennae; 4a-b- male genitalia.

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Interception of the egg sac of the Spiny-backed Orbweaver *Gasteracantha cancriformis* (Linnaeus, 1758) in the United Kingdom on produce from Costa Rica (Araneae: Araneidae)

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DEADY, R. J., ALLEN, D. & SHERWOOD, D. 2025: *Interception of the egg sac of the Spiny-backed Orbweaver Gasteracantha cancriformis* (Linnaeus, 1758) in the United Kingdom on produce from Costa Rica (Araneae: Araneidae). - *Natura Somogyiensis* 46: 21-24.

Abstract: An egg sac of the non-native spider *Gasteracantha cancriformis* (Linnaeus, 1758) (Araneidae) found on the leaf of an imported shrub *Heptapleurum arboricola* Hayata (Araliaceae) from Costa Rica is described and illustrated following its interception in the United Kingdom.

Keywords: biosecurity, imported, non-native, Central America

Introduction

Gasteracantha cancriformis (Linnaeus, 1758) is distributed across North America, Central America, Caribbean and South America (World Spider Catalog, 2025) with suggestions of diversification from a Mexican ancestor originally (CHAMBERLAND et al. 2020). Adults are recognized by their vivid and polymorphic colouration (Fig. 1A) and typically spinose abdominal projections both of which play roles as attractants or repellents for predators and prey (MACHAROENBOON et al. 2021). The egg sacs produced by females, however, are equally striking being constructed of neon yellow, nylon-like, silk threads, ovate and “green striped” (MUMA 1971). In Florida citrus groves, females typically deposit eggs on the underside of leaves adjacent to their web (MUMA 1971), providing some insight into egg laying behaviour of the species in their natural habitat. Such a habitat in theory is likely to be visually complex, vegetation rich and structurally heterogeneous supporting considerable biodiversity and hosting a range of predators, such as ants, parasitoid wasps, and predatory insects and to a lesser extent avifauna and mam-

mals. The morphology of the eggs sac must provide multiple evolutionary advantages against predators.

In this work, we report an intercepted egg sac of *G. cancriformis* found on a shrub from Costa Rica imported into the United Kingdom and discuss possible evolutionary reasons for the striking colouration of the egg sacs of this species.

Results

On 5th August 2024, the UK Plant Health and Seeds Inspectorate intercepted an egg sac on a leaf of a Dwarf Umbrella plant, *Heptapleurum arboricola* Hayata (Araliaceae; syn. *Schefflera arboricola*), imported from Costa Rica. The egg sac was submitted to the Fera entomology diagnostics team, where the eggs were confirmed through molecular sequencing as belonging to the Spiny-backed Orbweaver *Gasteracantha cancriformis* (Linnaeus, 1758) (Araneidae). This was further supported by examination of spiderlings which later hatched from the egg sac (Fig. 1B). The egg sac of this species (Fig. 2) is distinctive and as far as current knowledge extends there is no suggestion as to the evolutionary advantages of the egg sac's distinct coloration.

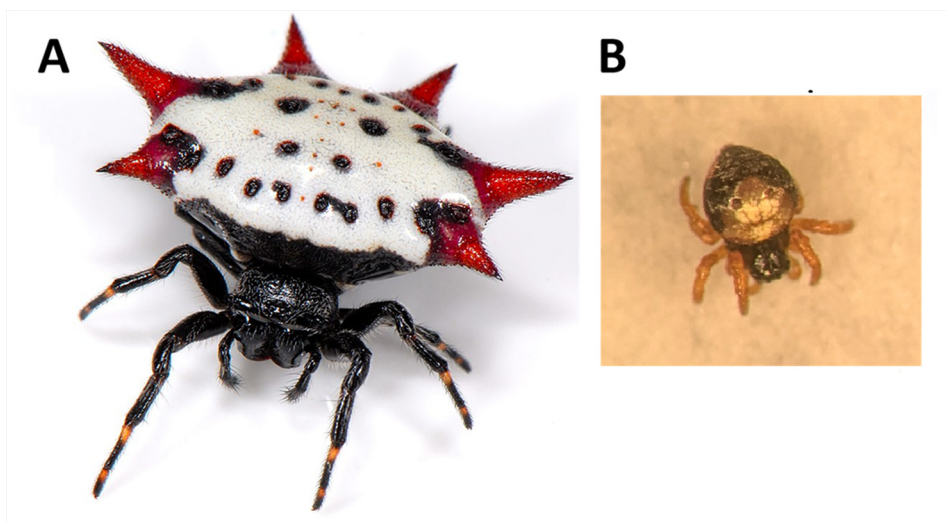


Fig. 1: *Gasteracantha cancriformis* (Linnaeus, 1758). A adult female, white colour form, from Bermuda, B freshly-emerged spiderling from intercepted egg sac.

Photo credits: Fig. 1A Creative Commons Attribution 2.0 Generic, courtesy of Sam Fraser-Smith. Fig. 1B © FERA.



Fig. 2: *Gasteracantha cancriformis* (Linnaeus, 1758) egg sac, intercepted on produce in the United Kingdom from Costa Rica. © Chris Malumphy.

Discussion

The bright coloration of the egg sac may function as a warning signal (aposematism); vivid colours are often associated with toxicity or danger and the neon yellow hue could trick predators into perceiving the sac as unpalatable, even if it lacks chemical defences. The colouration may also serve a camouflaging role. In forests with dappled light, the neon colour could mimic the sunlight reflecting off leaves, making it less obvious to predators that rely on movement or subtle changes in contrast. Meanwhile, the dark green silk line running through the centre of the egg sac could mimic the veins of a leaf or a plant stem, further obscuring the egg sac's true form. This disruptive coloration works to break up the outline of the egg sac, perhaps blending it into the surrounding foliage and reducing the chances that predators such as parasitoid wasps will recognize it as a target.

Interestingly, the egg sac of *G. cancriformis* bears a striking resemblance to certain venomous Lepidoptera larvae. Most of the venomous Lepidoptera of the world are associated with communities of arboreal plants, irrespective of biome (BATTISTI et al. 2024). The Limacodidae (Zygaenoidea), better known as Slug Moths, are an example, with larvae that are often vividly coloured and armed with stinging, urticating hairs arising from scoli that can protect against birds (GRANT 2007). Other studies have shown evidence that limacodid larvae can defend against insects like assassin bugs and paper wasps (MURPHY et al. 2009). The spider egg sac may unintentionally (or intentionally through mimicry) resemble these caterpillars, potentially confusing predators into avoiding the egg mass, mistaking it for a venomous or distasteful prey item like a limacodid larva.

Many spiders have excellent ultraviolet (UV) vision, and bright colours, especially neon yellows, are often highly reflective under ultraviolet light. If the neon colour reflects UV light, it could make the egg mass more visible to the female spider, helping her keep track her eggs in a complex forest environment. It might also help the spider identify the location of her webbing in low light conditions, such as early morning or late evening in a dense forest. Furthermore, the dual combination of neon yellow and green likely serves an additional predator-confusing function. Insects such as ants and parasitoid wasps rely on UV vision. The stark contrast between the reflective yellow silk and the darker green stripe may create a confusing visual pattern that makes it harder for predators to visually lock onto the egg sac as a potential food source or host for parasitism.

Therefore, the coloration and morphology of *Gasteracantha cancriformis* egg sacs likely serves multiple defensive purposes, from camouflage and mimicry to warning signals and visual confusion, enhancing the survival chances of the spider's offspring in a predator-rich environment. Though no formal studies have yet explored these traits in depth, these characteristics fit well within broader categories of antipredator defences observed in other invertebrate species. The intercepted egg sac reported here represents the first published, record of interception of a *Gasteracantha* egg sac in the United Kingdom. Thus, one more species can also be added to the formal list of imported non-native spiders (SHERWOOD 2025).

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The Symphyta Fauna of Ballica Cave Nature Park in Tokat Province, Türkiye with description of a new species (Hymenoptera: Symphyta)

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CAN, I. & HARIS, A. 2025: *The Symphyta Fauna of Ballica Cave Nature Park in Tokat Province, Türkiye with description of a new species (Hymenoptera: Symphyta)*. – *Natura Somogyiensis* 46: 25-36.

Abstract: The sawfly fauna of Ballica Cave Nature Park was investigated in 2024. *Caliroa cothurnata* (Serville, 1823) is a new species for the fauna of Türkiye. A new species, *Macrophya pontica* spec. nov., is described and compared to *Macrophya africana megatlantica* Lacourt, 1991, *Macrophya erythrocnema* Costa, 1859, and *Macrophya diversipes* (Schrank, 1782). The unknown male of *Tenthredopsis harveyi* Benson, 1968 is also described.

Keywords: sawflies, Türkiye, *Macrophya pontica* spec. nov.

Introduction

Ballica Cave Natural Park is located in the Pazar District of Tokat Province, within the Central Black Sea Geographical Region. This area lies at the intersection of two biogeographic regions: the Anatolian and the Black Sea Biogeographic Regions (EEA, 2025). The park stretches between latitudes 40°11'42" and 40°16'23" North, and longitudes 36°16'12" and 36°21'32" East, covering a total area of 32.98 km².

Nestled on the slopes of Akdağ, the park's elevation ranges from 681 to 1850 meters. It falls within the transition zone between the Central Black Sea and Central Anatolia regions, resulting in a blend of climatic characteristics. The northern parts exhibit the Central Black Sea climate, while the southern sections – especially beyond Akdağ – display features of the Central Anatolia climate.

Botanically, the research area hosts 647 taxa from 81 plant families. The most common families in the region include Compositae (Asteraceae), Leguminosae (Fabaceae), Labiatae (Lamiaceae), Gramineae (Poaceae), Cruciferae (Brassicaceae), Caryophyllaceae, Rosaceae, Boraginaceae, Umbelliferae (Apiaceae), and Rubiaceae (DOĞAN et al. 2016).

This study presents the initial findings on the Symphyta fauna in Ballica Cave Nature Park and its vicinity.

Material and methods

This research was conducted between May and September 2024 to document the sawfly fauna in Ballica Cave Nature Park and its surroundings, located in Tokat Province, Türkiye. Specimens were collected using Malaise traps set at three sites within the park. The collected specimens were immediately preserved in 75% ethanol, then dried, pinned, labeled, and stored in a reference collection.

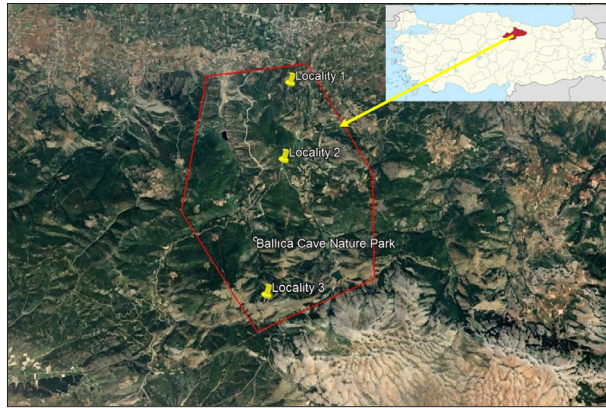


Fig. 1: Map of the investigated area

Localities:

Tokat: Pazar, Dereçaylı: 40°15'36" N, 36°17'34" E, altitude: 735 m. This site is characterized by predominantly coniferous vegetation (Fig. 2).

Tokat: Pazar, Ocaklı: 40°14'37" N, 36°18'13" E, altitude: 1170 m. This site features meadows and oak trees (Fig. 3).

Tokat: Pazar, Ovacık: 40°12'43" N, 36°18'58" E, altitude: 1450 m. This site is dominated by steppe vegetation (Fig. 4).

Species identification was conducted using the comprehensive works of ZHELOCHOVTSEV (1988), LACOURT (2020), MACEK et al. (2020), GUSSAKOVSKIJ (1935, 1947), and BENSON (1968). Additional papers by Lacourt were consulted to analyze newly identified species. Data on species distribution and host plant records were obtained from monographs and books by SUNDUKOV (2017), LACOURT (2020), MACEK (2020), BENSON (1968), as well as various other publications on the Turkish fauna. For the analysis of the new species, the monographs by ENSLIN (1910), LACOURT (2020), BENSON (1968), papers by LACOURT (1991, 2005), ERMOLENKO (1977), ZOMBORI (2016), and many others were studied.



Fig. 2: Coniferous forest at Dereçaylı



Fig. 3: Meadow with oak trees at Ocaklı



Fig. 4: Steppe at Ovacık

Results

List of species

Pamphiliidae

Neurotoma fausta (Klug, 1808): Ocaklı, 01. 06 - 15. 06. 2024, 1 female. Sporadic. Host plant unknown.

Megalodontesidae

Megalodontes phaenicius (Lepeletier, 1823): Ocaklı, 01. 06 - 15. 06. 2024, 1 female. Frequent East-Mediterranean species. Host plant unknown.

Argidae

Arge melanochra (Gmelin, 1790): Dereçaylı, 15. 06 - 02. 07. 2024, 1 male; Ovacık, 01. 06 - 15. 06. 2024, 1 male; Ovacık, 15. 06 - 02. 07. 2024, 1 male; Ovacık, 02. 07 - 16. 07. 2024, 1 male. Frequent. Host plant: *Crataegus oxycantha*.

Arge nigripes (Retzius, 1783): Ovacık, 16. 07 - 31. 07. 2024, 1 male. Frequent. Host plants: *Rosa* spp.

Tenthredinidae

Allantinae

Allantus (Emphytus) cinctus (Linné, 1758): Dereçaylı, 09. 05 - 01. 06. 2024, 1 female, 1 male; Ocaklı, 09. 05 - 01. 06. 2024, 1 male; Ovacık, 01. 06 - 15. 06. 2024, 4 males; Ovacık, 16. 07 - 31. 07. 2024, 2 females. Common. Host plants: *Rosa* spp.

Allantus (Emphytus) cingulatus (Scopoli, 1763): Ovacık, 09. 05 - 01. 06. 2024, 2 females, 1 male; Ovacık, 01. 06 - 15. 06. 2024, 2 females, 2 males. Frequent. Larva on *Fragaria* and *Rosa* spp.

Allantus (Emphytus) didymus (Klug, 1818): Dereçaylı, 09. 05 - 01. 06. 2024, 2 females, 5 males; Dereçaylı, 01. 06 - 15. 06. 2024, 2 males; Ocaklı, 09. 05 - 01. 06. 2024, 5 males; Ocaklı, 01. 06 - 15. 06. 2024, 1 male; Ocaklı, 15. 06 - 02. 07. 2024, 1 male; Ocaklı, 31. 07 - 14. 08. 2024, 1 male; Ovacık, 01. 06 - 15. 06. 2024, 1 male; Ocaklı, 02. 07 - 16. 07. 2024, 1 male. Frequent. Larva on *Sanguisorba minor*; old records from *Rubus* and *Rosa* spp. need checking.

Allantus (Emphytus) laticinctus (Serville, 1823): Ovacık, 09. 05 - 01. 06. 2024, 1 female. Sporadic. Larva on *Rosa* spp.

Allantus (Allantus) viennensis (Schränk, 1781): Dereçaylı, 09. 05 - 01. 06. 2024, 1 female; Dereçaylı, 01. 06 - 15. 06. 2024, 2 females; Dereçaylı, 15. 06 - 02. 07. 2024, 1 male; Ocaklı, 01. 06 - 15. 06. 2024, 1 female; Ocaklı, 02. 07 - 16. 07. 2024, 1 female; Ovacık, 01. 06 - 15. 06. 2024, 1 female; Ovacık, 15. 06 - 02. 07. 2024, 1 female. Host plants: *Rosa* spp. Frequent.

Athalia cordata Serville, 1823: Dereçaylı, 09. 05 - 01. 06. 2024, 1 male; Ocaklı, 09. 05 - 01. 06. 2024, 1 male; Ovacık, 01. 06 - 15. 06. 2024, 1 male. Frequent. Larva on *Misopates orontinum*, *Antirrhinum majus*, *Ajuga reptans*, *Teucrium scorodonia* and *Plantago* spp.

Athalia liberta (Klug, 1815): Ovacık, 01. 06 - 15. 06. 2024, 1 female. Frequent. Feeding on *Alliaria petiolata*, *Arabidopsis thaliana*, *Cardamine hirsuta* and *Sisymbrium officinale*.

Athalia rufoscutellata Mocsáry, 1879: Ocaklı, 09. 05 - 01. 06. 2024, 1 female. Frequent. Host plant unknown.

Taxonus sticticus (Klug, 1817): Ocaklı, 09. 05 - 01. 06. 2024, 1 male; Ovacık, 09. 05 - 01. 06. 2024, 3 females, 2 males; Dereçaylı, 01. 06 - 15. 06. 2024, 1 female. Frequent. Host plant unknown.

Heterarthrinae

Caliroa cerasi (Linné, 1758): Ocaklı, 01. 06 - 15. 06. 2024, 1 female. Frequent. Larva on *Pyrus*, *Malus*, *Prunus*, *Crataegus*, *Sorbus*, *Rosa*, *Cydonia*, *Mespilus*, *Rubus*, *Amygdalus*, *Cerasus*, *Amelanchier*, *Pyracantha*, *Cotoneaster* rarely *Quercus* and *Salix* spp.

Caliroa cothurnata (Serville, 1823): Ovacık, 16. 07 - 31. 07. 2024, 1 female. New record for the fauna of Türkiye. Sporadic. Larvae on *Quercus* spp.

Blennocampinae

Halidamia affinis (Fallén, 1807): Dereçaylı, 09. 05 - 01. 06. 2024, 4 females; Dereçaylı, 15. 06 - 02. 07. 2024, 5 females; Dereçaylı, 15. 06 - 02. 07. 2024, 1 female; Ocaklı, 09. 05 - 01. 06. 2024, 1 female; Ocaklı, 01. 06 - 15. 06. 2024, 1 female; Ovacık, 01. 06 - 15. 06. 2024, 1 female. Frequent. Host plants: *Galium aparine* and *G. molugo*.

Tenthredininae

Aglaostigma (Astochus) fulvipes (Scopoli, 1763): Ovacık, 09. 05 - 01. 06. 2024, 1 male. Frequent. Larva on *Galium mollugo* and *G. verum*.

Macrophya (Macrophya) annulata (Geoffroy, 1785): Ovacık, 01. 06 - 15. 06. 2024, 1 male. Frequent. Larva on *Potentilla reptans*, *Origanum vulgare*, *Euphorbia*, *Rosa*, *Rubus* and *Sambucus* spp.

Macrophya (Macrophya) blanda (Fabricius, 1775): Dereçaylı, 09. 05 - 01. 06. 2024, 7 females; Ocaklı, 09. 05 - 01. 06. 2024, 2 females, 1 male; Ocaklı, 01. 06 - 15. 06. 2024, 5 females. Frequent. Larva on *Fragaria*, *Rubus* spp. and *Potentilla reptans*.

Macrophya pontica sp. n.: Ovacık, 01. 06 - 15. 06. 2024, 1 female.

Macrophya (Macrophya) diversipes (Schränk, 1782): Ocaklı, 09. 05 - 01. 06. 2024, 2 females; Ocaklı, 01. 06 - 15. 06. 2024, 1 female; Ovacık, 01. 06 - 15. 06. 2024, 1 female; Ovacık, 15. 06 - 02. 07. 2024, 1 female. Frequent. Host plant unknown.

Macrophya (Macrophya) duodecimpunctata (Linné, 1758): Ocaklı, 09. 05 - 01. 06. 2024, 2 females. Frequent. Host plants: *Graminae*, *Cyperaceae* and *Carex* spp.

Macrophya (Macrophya) montana (Scopoli, 1763): Ocaklı, 01. 06 - 15. 06. 2024, 1 male. Common. Host plant: *Rubus caesius*.

Macrophya (Pseudomacrophya) punctumalbum (Linné, 1767): Dereçaylı, 02. 07 - 16. 07. 2024, 1 female. Sporadic. Host plants: *Fraxinus* spp. and *Ligustrum* spp.

Tenthredo (Maculedo) maculata Geoffroy, 1785: Ocaklı, 09. 05 - 01. 06. 2024, 1 female. Sporadic. Host plants: *Brachypodium* spp. and *Dactylis* spp.

Tenthredo (Zonuledo) zonula Klug, 1817: Ovacık, 01. 06 - 15. 06. 2024, 1 male. Frequent. Host plant: *Hypericum perforatum*.

Tenthredopsis annuligera (Eversmann, 1847): Ovacık, 09. 05 - 01. 06. 2024, 1 female, 9 males; Ovacık, 01. 06 - 15. 06. 2024, 1 male. Frequent. Hostplant unknown.

Tenthredopsis harveyi Benson, 1968: Ovacık, 09. 05 - 01. 06. 2024, 1 male. Rare, probably local endemism. Hostplant unknown.

Tenthredopsis litterata (Geoffroy, 1785): Ocaklı, 09. 05 - 01. 06. 2024, 1 male, Ocaklı, 01. 06 - 15. 06. 2024, 1 female; Ovacık, 01. 06 - 15. 06. 2024, 3 females, 2 males. Frequent. Larva on *Agrostis*, *Dactylis* and *Calamagrostis* spp.

Nematinae

Cladius (Priophorus) compressicornis (Fabricius, 1804): Ovacık, 31. 07 - 14. 08. 2024, 1 female. Frequent. Host plants: *Betula*, *Cotoneaster*, *Rubus*, *Sorbus*, *Prunus*, *Crataegus*, *Corylus*, *Fragaria* and *Rosa* spp., also *Laurus nobilis* and *Aronia arbutifolia*.

Cladius (Cladius) pectinicornis (Geoffroy, 1785): Dereçaylı, 09. 05 - 01. 06. 2024, 2 males; Dereçaylı, 15. 06 - 02. 07. 2024, 1 female; Ovacık, 09. 05 - 01. 06. 2024, 1 male; Ovacık, 01. 06 - 15. 06. 2024, 1 female, 3 males; Ovacık, 15. 06 - 02. 07. 2024, 2 males; Ovacık, 02. 07 - 16. 07. 2024, 1 female, 5 males; Ovacık, 16. 07 - 31. 07. 2024, 1 female, 12 males; Ovacık, 31. 07 - 14. 08. 2024, 4 males; Ovacık, 14. 08 - 30. 08. 2024, 1 male; Ocaklı, 01. 06 - 15. 06. 2024, 4 males; Ocaklı, 02. 07 - 16. 07. 2024, 1 female, 1 male; Ocaklı, 16. 07 - 31. 07. 2024, 2 males; Ocaklı, 31. 07 - 14. 08. 2024, 2 females, 1 male; Ocaklı, 14. 08 - 30. 08. 2024, 1 male. Common. Host plant: *Rubus* spp.

Pteronidea myosotidis (Fabricius, 1804) [*Euura myosotidis* (Fabricius, 1804)]: Ovacık, 01. 06 - 15. 06. 2024, 1 female. Common. Larval hosts: *Onobrychis* and *Trifolium* spp.

Description of the new species

Macrophya pontica **spec. nov.**

(Figs. 5 and 6)

Holotype: female: Tokat, Pazar, Ovacık, 40°12'43"N 36°18'58"E, 01. 06 - 15. 06. 2024, Malaise trap, steppe. (Deposited at the Rippl-Rónai Museum, Kaposvár)

Head and antenna black. White: scape, labrum, wide anterior margin of clypeus, V-shaped spot on mandible, palpi. Thorax black. White: hind margin of pronotum, tegula, median spot on mesopleuron, scutellum (except black upper scutellar margin). Cenchri brownish white. Anterior and middle legs white. Black: coxae, basal 2/3 of dorsal surfaces of anterior and middle femora, apical 2 tarsal segments. Hind coxa black, trochanter white. Base of hind femur white, most of its surface black, apical 1/4–1/3 reddish orange. Hind tibia reddish orange with yellow basal third. Hind tarsus yellow; 4th tarsal segment white, 5th tarsal segment brown to black. Wings pale brown infumate; stigma and costa yellow, venation blackish brown. Head and thorax covered with dense, short white pubescence, about 1/3× as long as diameter of anterior ocellus. Abdomen black. White: hind margin of tergite 1 (propodeum), lateral spot on tergite 3, wide hind margins of tergites 3–6, narrow hind margin of tergite 7. These margins medially interrupted. Wide, continuous hind margin of tergite 8 and tergite 9 entirely. Ovipositor black. Eyes strongly convergent. Distance between top of eyes : distance between bottom of eyes = 53 : 32. OOL : POL : OCL = 20 : 10 : 9. Postoccipital carina clear and complete. Ratios of antennal segments: 11 : 6 : 32 : 17 : 15 : 11 : 10 : 9 : 9. Antenna very short and wide. Maximal width of head in dorsal view : length of antenna = 17 : 24. Clypeal emargination wide and rounded, about 1/3× as deep as median length of clypeus. Gena linear; width of gena about 0.2× as wide as diameter of anterior ocellus. Head, including temples and vertex, moderately deeply and densely punctured with moderately large punctures, shiny. Interspaces about half as large as diameter of a puncture. Temple with shiny interspaces about 2× as large as diameter of a puncture. Clypeus shiny with moderately large, deep, sporadic punctures. Mesonotal lobes hardly shiny, nearly matte, very densely and uniformly punctured with moderately small punctures. Mesoscutellum with large, shallow, sporadic punctures, shiny. Upper third of mesopleuron roughly punctured with moderately deep, large punctures. Lower 2/3 densely and uniformly punctured as mesonotal lobes. Metapleural epimera without lobe. Abdominal tergites shiny with fine microstriation. Length of ovipositor : length of hind tibia = 61 : 105. Claw bifid; subapical tooth nearly as long as apical but wider. Length: 10.0 mm.

The new species belongs to subgenus *Macrophya* Dahlbom, 1835 (LACOURT 2020, ZOMBORI 2016).

Etymology: The specific name *pontica* refers to the region where the holotype was captured: the Black Sea (Pontus Euxinus) region.

Both authors are credited as authors of the new species: *Macrophya pontica* Can & Haris, **spec. nov.**

In ENSLIN (1910), the new species does not fit the key, since at couplet 17 we must choose whether the four anterior tibiae are yellow, red, or black. However, the new species has entirely white anterior and middle tibiae.

Superficially, the new species resembles *Macrophya chrysura* (Klug, 1817) (colour variation *albimacula*). However, the rich white coloration of the abdomen seen in the new species is completely absent in *M. chrysura*. *M. chrysura* has no white median spot on the mesopleuron, and the scape is black. In contrast, the new species shows a white spot on the mesopleuron, and the scape is white.

In appearance, with its rich white pattern, the new species resembles some *Pseudomacrophya* species like *Macrophya africana megatlantica* Lacourt, 1991. These species have parallel inner margins of the eyes and a wide gena. However, the inner



Fig. 5. Holotype of *Macrophya pontica* spec. nov. in dorsal view



Fig. 6. Holotype of *Macrophya pontica* spec. nov. in lateral view

margins of the eyes of the new species are strongly convergent, and the gena is linear. Additionally, the black hind femora, white scape, and lateral median white spot clearly differentiate the new species from these.

Among all *Macrophya* species, the closest is *Macrophya erythrocnema* Costa, 1859. Differences include the rich white coloration of the abdomen, scape, and mesopleuron, which is completely absent in *M. erythrocnema*. The hind legs also differ: in the new species, the hind femur has three colours (white, black, and red), whereas in *M. erythrocnema* the hind femur is entirely black.

Macrophya diversipes (Schränk, 1782) is a highly variable species; however, the very short antennae, white anterior legs, white mesopleural spot, and white scape distinguish the new species from all known variations of *M. diversipes*.

***The unknown male of Tenthredopsis harveyi* Benson, 1968**

The male *T. harveyi* closely resembles the female as described by BENSON (1968), but there are some differences. These include a white supraclypeal triangular area, a central spot on the scutellum, white mesoscutellar appendages. The subcosta is blackish brown, except for its basal part, which is similar to the female. *Tenthredopsis harveyi* was described from only one female from Bolu (BENSON 1968). Since the time of that description a second female has been found in Erzurum (ÇALMAŞUR & ÖZBEK 2004). This is the third published specimen.

Zoogeographic analysis

Three species have limited distribution areas: *Megalodontes phaenicius* (Lepeletier, 1823) is found in the East Mediterranean region, while *Tenthredopsis harveyi* Benson, 1968 and *Macrophya pontica* **spec. nov.** are likely local endemics. The remaining 29 species have broad geographic distributions, including the Holarctic, Palearctic, West Palearctic, and Cosmopolitan regions.

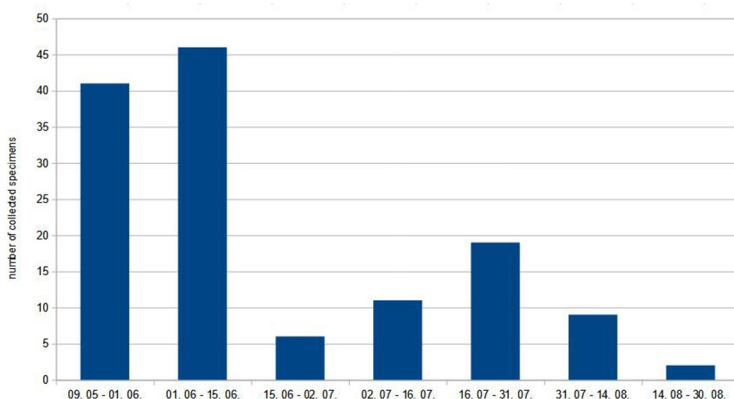


Fig. 7. Change in population numbers of sawflies in the investigated area

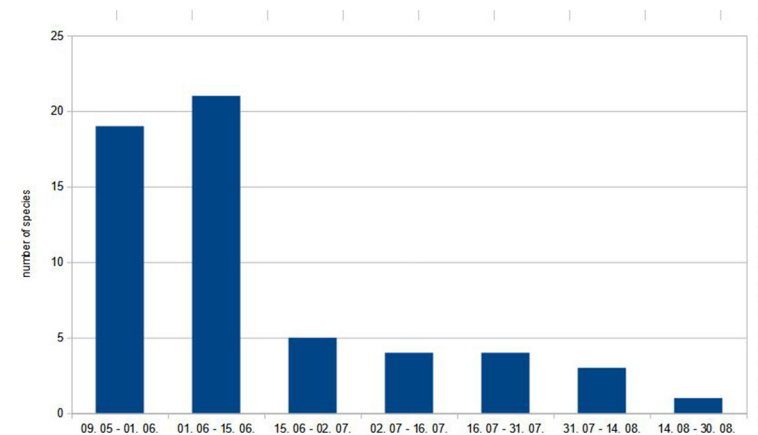


Fig. 8: Change in species richness of sawflies in the investigated area

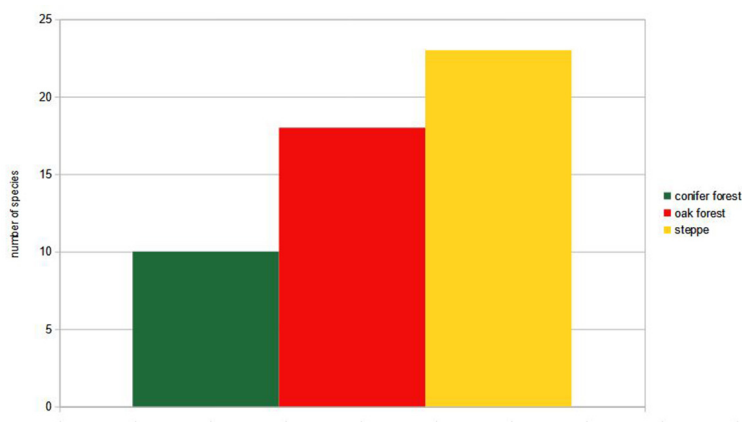


Fig. 9: Species richness of the three different habitats

Flight Period of Sawflies

Figures 7 and 8 show the temporal changes in population density and species richness. It can be seen that all values are low, similar to other landscape units in the Mediterranean region. Unfortunately, the traps were set out too late, so we missed the most exciting phase of the flight period of sawflies. Figure 9 compares the species richness of the three different habitats.

Endangering factors

Livestock farming is intensive in the region, alongside agricultural lands where tomatoes and beans are cultivated. The excessive use of agricultural chemicals, such as pesticides and herbicides, as well as overgrazing, can have harmful effects on the ecosystem. Additionally, Ballica Cave is a major tourist attraction in the area, drawing visitors for various recreational activities. Consequently, human-induced environmental pollution represents a significant threat to the region.

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Odonata of Puducherry, Union Territory of Puducherry, India: an updated checklist and distributional insights

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Abstract: Puducherry, one of the four regions of the Union Territory of Puducherry located along the east coast of India, was surveyed during March, June, and July 2024 to ascertain the present status, diversity, and distribution of odonate species in the region. Surveys were carried out in 27 localities consisting of habitats such as lakes, ponds, rivers, canals, agricultural fields, mangroves, lagoons, sacred groves and tropical dry evergreen forests. The present study documented 30 odonate species under 27 genera and four families, adding 17 new odonate records for the region, increasing the known species count to 31 under 28 genera and five families. The study provides critical baseline data for the future taxonomic and faunistic surveys, as well as it will be valuable for the implementation of conservation strategies to protect these ecologically important insects and their habitats.

Keywords: faunistic, additional records, habitat, lakes, sacred groves

Introduction

The Union Territory of Puducherry comprises four regions, namely Puducherry, Karaikal, Mahe, and Yanam. Puducherry and Karaikal regions are surrounded by the state of Tamil Nadu, whereas Yanam is a coastal enclave within the state of Andhra Pradesh and Mahe is located on the coast of Kerala. Despite having a small geographic area of about 483 km² (about 0.014% of the total geographical area of the country), the Union Territory represents 2.49% of the faunal diversity of the country (RAGHUNATHAN et al. 2023). Out of the four regions, Puducherry with an area of 293 km² is the largest and is characterized by fragmented borders, which encompass a good number of freshwater lakes and ponds, along with rivers, paddy fields, lagoons, estuaries, mangroves and a 24 km long coastline. The region also supports the distinctive ecosystems of tropical dry evergreen forests, most of whose remnants are protected in the form of sacred groves (CHAMPION & SETH 1968).

According to the 'Faunal Diversity of Puducherry', the Union Territory of Puducherry is home to about 722 species of insects (RAGHUNATHAN et al. 2023), of which,

RAGHUNATHAN et al. (2023) enlisted 87 Lepidoptera; 5 Dermaptera; 34 Hemiptera (Auchenorrhyncha), 88 Heteroptera; 11 Coleoptera (Noteridae, Dytiscidae and Hydrophilidae); 60 Hymenoptera (Chalcidoidea, Evanioidea, Apoidea, Vespoidea); 22 Orthoptera; 14 Odonata; 86 Diptera and 11 Blattodea (Isoptera) species from the Puducherry region. However, information on the Odonata of Puducherry is very scanty with respect to its varied habitat types, such as fresh water lakes, ponds, agricultural fields and rivers. In the first comprehensive checklist of the regions' odonates, EMILIYAMMA & RADHAKRISHNAN (2006) reported only 7 species from the district. Hereafter, five species were added to the regions' Odonata list by SUBRAMANIAN et al. (2018). Most recently, BANERJEE (2023) reported an updated account of 14 species from the region, based on the primary and previously published reports (RAGHUNATHAN et al. 2023). The present paper aims to enrich the knowledge of diversity and distribution of odonate species in the Puducherry region district through an intensive survey carried out in 27 localities and by incorporating previously published records.

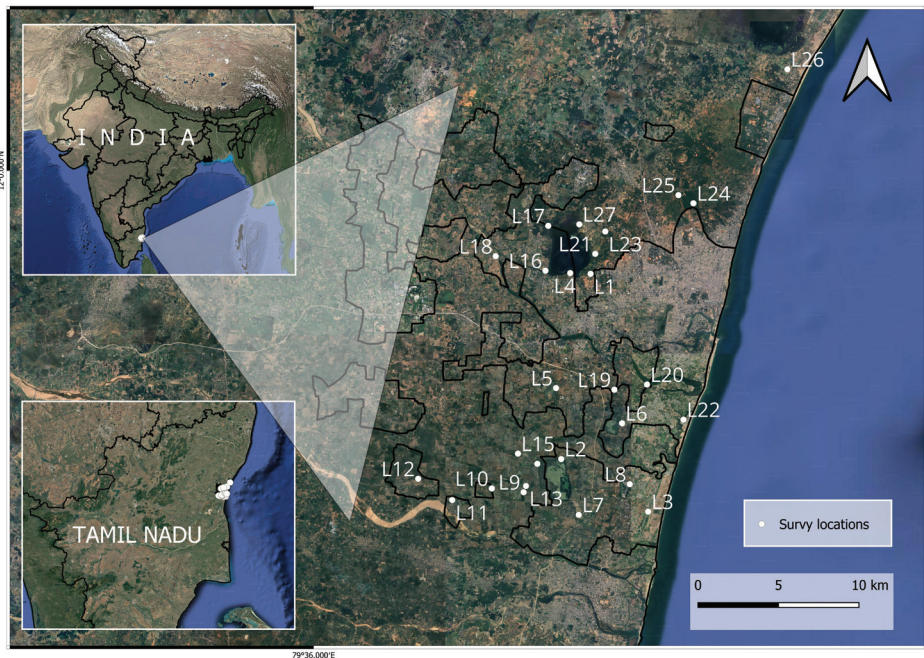


Fig. 1: Map showing the survey localities in Puducherry, Union Territory of Puducherry, India

Material and methods

To understand the Pondicherry's Odonate assemblage, surveys were carried out in two phases of 2024. First, a total of 20 sites (L1-L20) were surveyed for seven days (21 March to 27 March), then 10 (L2, L6, L18, L21-L27) sites (of which 7 sites were new) were monitored in June and July 2024 (details of the survey location provided in Table 1) (Fig. 1). Surveys were carried out chiefly during sunny days, through random walks in different habitat types like ponds, lakes, canals, rivers, agricultural fields, lagoons,

Table 1: List of the sampling localities and habitat characteristics

Location	Name	Latitude	Longitude	Altitude (m)	Habitat Characteristics
L1	Sharanam	11.9412	79.7579	56	Scrubland, Remnant and afforested TDEF vegetation with small water pools
L2	Bahour Lake Era-mudi Ayyanarappan Temple	11.8357	79.7411	45	Lake surrounded by agricultural fields
L3	Near Manapet Road	11.8057	79.7907	38	Pond in the dune slack
L4	Oussudu Lake 1	11.941682	79.7462	41	Lake surrounded by agricultural fields
L5	Korkadu Lake	11.876162	79.7382	39	Lake surrounded by agricultural fields
L6	Abishegapakkam lake south	11.856123	79.7758	38	Lake surrounded by agricultural fields
L7	Manapet lake canal	11.803923	79.7511	39	River canal surrounded by agricultural fields
L8	Pillayarkuppam Lake	11.821412	79.7802	35	Lake surrounded by agricultural fields
L9	Thirupanamapakkam lake	11.816822	79.7197	42	Lake surrounded by agricultural fields
L10	Kaduvanur lake	11.81895	79.7015	44	Lake surrounded by agricultural fields
L11	Manamedu lake	11.812362	79.6790	43	Lake surrounded by agricultural fields
L12	Karayamputhur lake	11.824473	79.6596	46	Lake surrounded by agricultural fields
L13	Ulleripattu lake	11.820385	79.7210	41	Lake surrounded by agricultural fields
L14	Bahour Lake western bank	11.832988	79.7275	41	Lake surrounded by agricultural fields
L15	Pallipattu lake	11.838793	79.7164	44	Lake surrounded by agricultural fields
L16	Ossudu lake Pathukkannu bridge	11.943057	79.7321	46	Lake surrounded by agricultural fields
L17	Ossudu lake thondamanatham bank	11.968603	79.7337	44	Lake surrounded by agricultural fields
L18	Gingee River	11.95128	79.7038	34	River course surrounded by agriculture fields and brick clans
L19	Abhishegapakkam lake north	11.875237	79.7714	37	Lake surrounded by agricultural field
L20	Poonjolaikuppam	11.878184	79.7900	33	River course surrounded by agriculture fields
L21	Aurovanam	11.95264	79.7605	46	Afforested TDEF vegetation with remnant patches and dugout ponds

L22	Nallavadu	11.85817	79.81083	30	Lagoon surrounded by dune vegetation and salt marsh
L23	Aranya	11.96538	79.76626	60	Afforested TDEF vegetation intersected by ravines
L24	Forecomers	11.98145	79.81648	62	Mix of Acacia and afforested TDEF vegetation intersected by ravines
L25	Auroville Botanical Garden	11.9861	79.80796	70	Plantation with TDEF vegetation
L26	Puthupet	12.05783	79.87007	38	TDEF surrounded by agricultural field and natural pond
L27	Oussudu Lake 3	11.96944	79.75145	43	Lake surrounded by agricultural field

mangroves, tropical dry evergreen forests. For the ease of identification, Odonate species were photographed in the field, using Nikon P900 and Canon 1200D cameras. Photographic guidebooks of SUBRAMANIAN et al. (2018) and NAIR (2011) were used for identification. For the compilation of the checklist, we used previously published literature by EMILIYAMMA & RADHAKRISHNAN (2006), SUBRAMANIAN et al. (2018) and BANERJEE (2023). IUCN status of the species was obtained from the IUCN Red List of the Threatened Species (IUCN 2025). Systematic arrangement of odonate species follows SUBRAMANIAN & BABU (2024).

Results & discussion

The present survey resulted in the record of 30 species (7 species of Zygoptera and 23 species of Anisoptera) under 27 genera and four families (Table 2; Figs. 2-28). Family Libellulidae was found to be speciose with 21 species, followed by Coenagrionidae (7 species), Gomphidae and Macromiidae each with one species.

With the addition of 17 species (*Pseudagrion microcephalum* and *Paracercion melanotum* of Coenagrionidae; *Acisoma panorpoides*, *Aethriamanta brevipennis*, *Brachydiplax sobrina*, *Bradinopyga geminata*, *Diplacodes nebulosa*, *Indothemis carnatica*, *Macrodiplax cora*, *Orthetrum sabina*, *Potamarcha congener*, *Rhodothemis rufa*, *Tholymis tillarga*, *Tramea limbata*, *Trithemis aurora* and *Urothemis signata* of Libellulidae; *Epophthalmia vittata* of Macromiidae) the total number of odonate species in the Puducherry district increases to 31 (Libellulidae: 21, Coenagrionidae: 7, Aeshnidae: 1; Gomphidae: 1; Macromiidae: 1). Only one species (*Anax ephippiger*) was reported earlier by SUBRAMANIAN et al. (2018), but was not observed during the present survey. 7 odonate species were exclusively recorded from one locality. *Paracercion melanotum* from L17; *Aethriamanta brevipennis* from L3; *Indothemis carnatica* from L21; *Macrodiplax cora* from L22; *Tramea limbata* from L1; *Trithemis aurora* and *Zyxomma petiolatum* from L24.

As per the IUCN Red List of Threatened Species none of the recorded species were threatened. Of the enlisted 31 species 29 species were classified as 'Least Concern' and the status of the remaining two species was 'Not evaluated' (IUCN 2025).

Site-wise species richness varies between 1 and 17. The highest was observed in L1 (17 species) and the lowest in L25 (1 species). Among the 27 sites, species richness between 10 and 17 was observed in 12 locations (L2, L18, L6, L17, L14, L26, L19, L1,



Figs. 2-7: Photographic records of odonate species in Puducherry, Union Territory of Puducherry, India. 2 – *Agriocnemis pygmaea*, 3 – *Ceriagrion coromandelianum*, 4 – *Ischnura rubilio*, 5 – *Ischnura senegalensis*, 6 – *Pseudagrion microcephalum*, 7 – *Ictinogomphus rapax* (Photos: Parmar, D., Paranjpe, A.)

L12, L21, L27, L8) and between 1 and 9 was observed in rest of the 15 locations (L5, L7, L13, L16, L11, L24, L3, L9, L20, L15, L10, L22, L23, L4, L25). The result of low species richness in these 15 locations may be caused by the low sampling effort, rather than the true species richness. As habitat of most of these sites were lakes and river courses surrounded by agricultural fields. However, in case of some of the sites (L24, L23, L25), low number of species can be inferred to the absence of freshwater aquatic bodies in the plantation or afforested area with TDEF vegetation.

Odonates are depended to freshwater environments, are declining all over the world mainly due to the degradation and loss of natural habitats coupled with climate change



Figs. 8-13: Photographic records of odonate species in Puducherry, Union Territory of Puducherry, India. 8 – *Acisoma panorpoides*, 9 – *Aethriamanta brevipennis*, 10 – *Brachydiplax sobrina*, 11 – *Brachythemis contaminata*, 12 – *Bradinopyga geminata*, 13 – *Crocothemis servilia* (Photos: Parmar, D., Paranjpe, A., Gund, S.)

(ADU et al. 2019). Anthropogenic activities, in the form of urbanization, deforestation, intensive agriculture, overgrazing, pollution, and others, are the key reasons for the loss and degradation of residual habitat odonates (SAMWAYS 2008). In the Pondicherry district, growing urbanization along with the uncontrolled tourism and pollution (discharge of domestic and industrial effluents into rivers and lakes) are the major threats that put serious pressure on freshwater environments and biota (BALACHANDRAN et al. 2009; BANERJEE 2023). Thus, it is the need of the hour to implement a proper management plan to safeguard the habitats of these insects vital to ecosystem functioning.



Figs. 14-19: Photographic records of odonate species in Puducherry, Union Territory of Puducherry, India. 14 – *Diplacodes nebulosa*, 15 – *Diplacodes trivialis*, 16 – *Indothemis carnatica*, 17 – *Macrodiplax cora*, 18 – *Orthetrum sabina*, 19 – *Pantala flavescens*
(Photos: Parmar, D., Paranjpe, A., Patchaiyappan, A.)

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Figs. 20-25: Photographic records of odonate species in Puducherry, Union Territory of Puducherry, India. 20 – *Potamarcha congener*, 21 – *Rhyothemis variegata*, 22 – *Rhodothemis rufa*, 23 – *Tholymis tillarga*, 24 – *Trithemis aurora*, 25 – *Trithemis pallidinervis* (Photos: Parmar, D., Paranjpe, A., Patchaiyappan, A.)



Figs. 26-28: Photographic records of odonate species in Puducherry, Union Territory of Puducherry, India. 26 – *Urothemis signata*, 27 – *Zyxomma petiolatum*, 28 – *Epophthalmia vittata* (Photos: D. Parmar, D., Paranjpe, A., Patchaiyappan, A. K., Gund, S.)

Table 2: An updated checklist of Odonata species of Puducherry region, Union territory of Puducherry, India. (*-new record for the region)

Sl.No	Species	Localities	References	IUCN Status
	Family: Coenagrionidae Kirby, 1890			
1.	<i>Agriocnemis pygmaea</i> (Rambur, 1842)	L1, L3, L5, L6, L8, L13, L14, L25, L26	EMILIYAMMA & RADHAKRISHNAN 2006; BANERJEE 2023	LC
2.	<i>Ceriagrion coromandelianum</i> (Fabricius, 1798)	L1-L3, L5-L8, L10-L14, L16-L22, L24, L26, L27	EMILIYAMMA & RADHAKRISHNAN 2006; BANERJEE 2023	LC
3.	<i>Ischnura rubilio</i> Selys, 1876	L1, L2, L13	EMILIYAMMA & RADHAKRISHNAN 2006	NE
4.	<i>Ischnura senegalensis</i> (Rambur, 1842)	L1, L2, L7-L9, L13, L14-L21, L24, L26, L27	EMILIYAMMA & RADHAKRISHNAN 2006	LC
5.	<i>Pseudagrion decorum</i> (Rambur, 1842)	L9, L11-L14, L17-L19	BANERJEE 2023	LC

6.	<i>Pseudagrion microcephalum</i> (Rambur, 1842) *	L6, L7, L9, L13-L15, L17, L19-L21, L23		LC
7.	<i>Paracercion melanotum</i> (Selys, 1876) *	L17		NE
	Family: Aeshnidae Leach, 1815			
8.	<i>Anax ephippiger</i> (Burmeister, 1839)		SUBRAMANIAN et al. 2018	LC
	Family: Gomphidae Rambur, 1842			
9.	<i>Ictinogomphus rapax</i> (Rambur, 1842)	L4, L6, L16-L18, L21, L24, L26, L27	SUBRAMANIAN et al. 2018	LC
	Family: Libellulidae Leach, 1815			
10.	<i>Acisoma panorpoides</i> Rambur, 1842	L2, L3, L5, L8, L11, L12, L16-L19, L26, L27		LC
11.	<i>Aethriamanta brevipennis</i> (Rambur, 1842) *	L3		LC
12.	<i>Brachydiplax sobrina</i> (Rambur, 1842) *	L3, L5, L8, L16, L19		LC
13.	<i>Brachythemis contaminata</i> (Fabricius, 1793)	L1, L2, L4-L21, L26, L27	EMILIYAMMA & RADHAKRISHNAN 2006	LC
14.	<i>Bradinopyga geminata</i> (Rambur, 1842) *	L1, L24, L27		LC
15.	<i>Crocothemis servilia</i> (Drury, 1770)	L2, L3, L6-L9, L11, L12, L14-L18, L26, L27	BANERJEE 2023	LC
16.	<i>Diplacodes nebulosa</i> (Fabricius, 1793) *	L18, L26		LC
17.	<i>Diplacodes trivialis</i> (Rambur, 1842)	L1, L2, L5-L7, L10-L12, L14, L15, L17, L18, L21, L22, L23	EMILIYAMMA & RADHAKRISHNAN 2006	LC
18.	<i>Indothemis carnatica</i> (Fabricius, 1798) *	L21		LC
19.	<i>Macrodiplax cora</i> (Brauer, 1867) *	L22		LC
20.	<i>Orthetrum sabina</i> (Drury, 1770) *	L2, L6, L7, L10-L14, L17-L20, L21, L26, L27		LC
21.	<i>Pantala flavescens</i> (Fabricius, 1798)	L1, L2, L5, L7, L11, L12, L14, L18, L19, L22, L24, L26	SUBRAMANIAN et al. 2018	LC
22.	<i>Potamarcha congener</i> (Rambur, 1842) *	L1, L6, L12, L18, L21		LC

23.	<i>Rhyothemis variegata</i> (Linnaeus, 1763)	L1, L2, L5-L9, L12, L14, L16-L20, L21, L22, L23, L24, L26, L27	BANERJEE 2023; EMILIYAMMA & RADHAKRISHNAN 2006	LC
24.	<i>Rhodothemis rufa</i> (Rambur, 1842) *	L8, L19, L26		LC
25.	<i>Tholymis tillarga</i> (Fabricius, 1798) *	L12, L14		LC
26.	<i>Tramea limbata</i> (Desjardins, 1832) *	L1		LC
27.	<i>Trithemis aurora</i> (Burmeister, 1839) *	L24		LC
28.	<i>Trithemis pallidinervis</i> (Kirby, 1889)	L9, L12, L15, L17, L18, L21	SUBRAMANIAN et al. 2018	LC
29.	<i>Urothemis signata</i> (Rambur, 1842) *	L2, L3, L5, L8, L14, L16, L18-L20, L26, L27		LC
30.	<i>Zyxomma petiolatum</i> Rambur, 1842	L24	SUBRAMANIAN et al. 2018	LC
	Family: Macromiidae Needham, 1903			
31.	<i>Epopthalmia vittata</i> Burmeister, 1839*	L17, L27		LC

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List of species belonging to the family Bethylidae (Hymenoptera) as parasitoids of the family Dermestidae (Coleoptera)

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HÁVA, J. 2025: *List of species belonging to the family Bethylidae (Hymenoptera) as parasitoids of the family Dermestidae (Coleoptera)*. *Natura Somogyiensis* 46: 49-56.

Abstract: This is the first complete list of Hymenoptera species belonging to the family Bethylidae that parasitise beetle species belonging to the family Dermestidae. New records are presented for *Laelius anthrenivorus* Trani, 1909, a parasite of *Anthrenus verbasci* (Linnaeus, 1767), *Laelius pedatus* (Say, 1836), a parasite of *Trogoderma glabrum* (Herbst, 1783), both of which are from the Czech Republic and *Holepyris sylvanidis* (Brethes, 1913), a parasite of *Trogoderma angustum* (Solier, 1849) from Slovakia.

Keywords: Faunistic, new records, parasitism, Coleoptera, Dermestidae, Hymenoptera, Bethylidae.

Introduction

The Bethylidae are a cosmopolitan family including 11 subfamilies, 131 genera and about 3.200 species (AZEVEDO et al. 2018, LIM & LEE 2024, WANG et al. 2024, SANTOS et al. 2024). Adults are small to medium sized, usually black or brown coloured insects with more or less flattened body and short, stout legs. The head is distinctively prognathous with usually relatively small or reduced eyes and ocelli, prognathous mouthparts. Most of the species have 12 or 13 antennomeres in both sexes. Males are mostly alate, females are alate or with wings reduced (micropterous or brachypterous forms) or absent; females of some species are pterygopolymorphic. The wing venation in some species is strongly reduced. The taxonomic value of many described species is not yet clear, especially due to sexual dimorphism and intraspecific variation (AZEVEDO et al. 2018).

Bethylids are ectoparasitoids of larvae and occasionally of pupae of Coleoptera and Lepidoptera, mostly in concealed situations. The host is usually paralysed (temporarily or permanently), sometimes killed with single or multiple (depending on the size of the host) stings of the female. Poison of bethylids has high efficiency and a sting of some species can be painful as well for humans (MASINI et al. 2025). Females drag the paralyzed larva to sheltered places, in the case of free living hosts or utilize the host shelter in the case of concealed hosts, and oviposit on the surface of the host, one or several eggs depending on size. The hymenopteriform larva develops as an ectoparasite with the

anterior part penetrating the host's body. Females of some species also delay the oviposition and feed on the haemolymph of the paralyzed host. Females of some species (e.g. *Cephalonomia gallicola* (Ashmead, 1887) attacking large hosts in concealed situations stay on the paralyzed host after oviposition and females of some subsocial species of *Sclerodermus* Latreille, 1809 stay with their larvae throughout the larval stage, providing parental care for their progeny controlling egg numbers, licking larvae and guarding them against predators and parasitoids. Larval development is short, from two to 10 days. Pupation takes place mostly in a cocoon, gregarious larvae often pupate collectively; the pupal period lasts from nine days to two months. Males of gregarious species hatch earlier and mate with mature females within their cocoons helping them to get the cocoons open. Due to the common multiple mating of females, the first inbreeding is compensated by subsequent copulation with unrelated males. Inbreeding is common in species with rapid succession of generations developing on the same host and thus the long surviving female can mate with her sons. The first offspring generation consists only of haploid males and after the inbreeding, the mother oviposits both diploid and haploid eggs, the descendants of which are both males and females. Females of most species hibernate (MACEK et al. 2007).

The Betylidae family is known to parasitise beetles in the Dermestidae family. See the table below for a list of species and the authors who have published on parasitism. This is the first complete list of Bethylidae parasitising Dermestidae.

Table 1: List of recorded species

Bethylidae species	Dermestidae species	References
<i>Holepyris sylvanidis</i> (Brethes, 1913)	<i>Trogoderma angustum</i> (Solier, 1849)	Háva (2020)
<i>Holepyris tricarinatus</i> (Kieffer, 1906)	<i>Anthrenus verbasci</i> (Linnaeus, 1767)	Hinton (1945)
<i>Laelius anthrenivorus</i> Trani, 1909	<i>Anthrenus verbasci</i> (Linnaeus, 1767)	Vance & Parker (1932); Hinton (1945); Gadallah et al. (2024)
	<i>Anthrenus museorum</i> (Linnaeus, 1761)	Hinton (1945); Gadallah et al. (2024)
<i>Laelius borealis</i> Vikberg, 2005	<i>Anthrenus museorum</i> (Linnaeus, 1761)	Vikberg & Koponen (2005)
	<i>Dermestes lardarius</i> Linnaeus, 1758	Vikberg & Koponen (2005)
	<i>Dermestes murinus</i> Linnaeus, 1758	Vikberg & Koponen (2005)
	<i>Globicornis emarginata</i> (Gyllenhal, 1808)	Vikberg & Koponen (2005)
	<i>Megatoma undata</i> (Linnaeus, 1758)	Vikberg & Koponen (2005)
	<i>Trogoderma glabrum</i> (Herbst, 1783)	Vikberg & Koponen (2005)

<i>Laelius fumimarginalis</i> Vikberg, 2005	<i>Reesa vespulae</i> (Milliron, 1939)	Vikberg & Koponen (2005)
<i>Laelius microneurus</i> (Kieffer, 1905)	<i>Anthrenus verbasci</i> (Linnaeus, 1767)	Yamada (1955); Iwata (1941); Gadallah et al. (2024)
<i>Laelius naniwaensis</i> Terayama, 2006	<i>Thaumaglossa rufocapil- lata</i> Redtenbacher, 1867	Wang et al. (2024)
<i>Laelius nigrofemoratus</i> Terayama, 2006	<i>Anthrenus</i> sp.	Wang et al. (2024)
<i>Laelius parcepilosus</i> Vikberg, 2005	<i>Megatoma undata</i> (Linnaeus, 1758)	Vikberg & Koponen (2005)
<i>Laelius pedatus</i> (Say, 1836)	<i>Trogoderma granarium</i> Everts, 1898	Athanassiou et al. (2019); Amante et al. (2017); Gad- allah et al. (2024; May- hew & Heitmans (2000); Amante et al. (2017); Gadallah et al. (2024)
	<i>Trogoderma glabrum</i> (Herbst, 1783)	Mayhew & Heitmans (2000); Amante et al. (2017); Klein & Beckage (1990); Gadallah et al. (2024)
	<i>Trogoderma variabile</i> Ballion, 1878	Klein & Beckage (1990)
	<i>Anthrenus verbasci</i> (Linnaeus, 1767)	Mayhew & Heitmans (2000); Mertins (1980); Mertins (1985); Amante et al. (2017); Gadallah et al. (2024)
	<i>Anthrenus flavipes</i> LeConte, 1854	Amante et al. (2017); Gad- allah et al. (2024)
	<i>Anthrenus sarnicus</i> Mroczkowski, 1963	Amante et al. (2017); Gad- allah et al. (2024)
	<i>Reesa vespulae</i> (Milliron, 1939)	Vikberg & Koponen (2005)
	<i>Attagenus unicolor</i> (Brahm, 1790)	Gadallah et al. (2024)
<i>Laelius utilis</i> Cockerell, 1920	<i>Anthrenus fuscus</i> Olivier, 1789	Mertins (1985)
	<i>Anthrenus verbasci</i> (Linnaeus, 1767)	Mertins (1985)
	<i>Anthrenus flavipes</i> LeConte, 1854	Mertins (1985)

	<i>Trogoderma variabile</i> Ballion, 1878	Mertins (1985)
	<i>Trogoderma inclusum</i> LeConte, 1854	Mertins (1985)
	<i>Thylodrias contractus</i> Motschulsky, 1839	Mertins (1985)
<i>Laelius versicolor</i> (Evans, 1970)	<i>Trogoderma ornatum</i> (Say, 1825) [as <i>T. tarsale</i>]	Barbosa & Azevedo (2014)
<i>Laelius virilis</i> Vikberg, 2005	<i>Megatoma undata</i> (Linnaeus, 1758)	Vikberg & Koponen (2005)
<i>Laelius voracis</i> Muesebeck, 1939	<i>Anthrenus flavipes</i> LeConte, 1854 [as <i>A.</i> <i>vorax</i>]	Ayyappa & Cheema (1952); Hinton (1945)
<i>Laelius yamatonis</i> Terayama, 2006	<i>Anthrenus verbasci</i> (Linnaeus, 1767)	Wang et al. (2024)
<i>Laelius</i> sp.	<i>Anthrenus scrophulariae</i> (Linnaeus, 1758)	Perkins (1976); Gadal- lah et al. (2024); Spencer (1942)
	<i>Anthrenus pimpinellae</i> (Fabricius, 1775)	Perkins (1976); Spencer
<i>Sclerodermus domesticus</i> Klug, 1809	<i>Anthrenus museum</i> (Linnaeus, 1761)	Hinton (1945)

Remarks. CAN (2022) mentioned the following species from Turkey as potential prey of *L. pedatus*: *Attagenus unicolor* (Brahm, 1790), *Anthrenus goliath* Saulcy in Mulsant & Rey, 1868, *A. picturatus* Solsky, 1876, *A. scrophulariae scrophulariae* (Linnaeus, 1758), *A. rotundulus* Reitter, 1889, *A. flavidus* Solsky, 1876 and *A. verbasci* (Linnaeus, 1767).

New records

Holepyris sylvanidis (Brethes, 1913) as a parasite for *Trogoderma angustum* (Solier, 1849) from Slovakia: SK, Bratislava env., 15.vi.2008, D.K. lgt., 1 spec. *H. sylvanidis* + 2 spec. *T. angustum*, all on the window sills, observed (pers comm.).

Laelius anthrenivorus Trani, 1909 as a parasite for *Anthrenus verbasci* (Linnaeus, 1767) from the Czech Republic: CZ, Bohemia c., Praha-Krč, 30.viii.2023, Y. Elznicová lgt., 1 spec. *L. anthrenoides* + 3 spec. *A. verbasci*, all on the window sills, author's collection.

Laelius pedatus (Say, 1836) as a parasite for *Trogoderma glabrum* (Herbst, 1783) from the Czech Republic: CZ, Bohemia c., Praha-Suchdol, 6.vi.2021, D. Kmoch lgt., 1 spec. *L. pedatus* + 2 spec. *T. glabrum*, all on the window sills, author's collection.



Fig. 1: *Laelius pedatus* (Say, 1836) alongside an *Anthrenus* sp. larva
(Photo by J.-C. Kommilch)



Fig. 2: *Laelius pedatus* (Say, 1836) alongside an *Anthrenus verbasci* larva
(Photo by M. Schöller)

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A Hanság tölgy-kőris-szil ligetei (*Pimpinello majoris-Ulmetum*)

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KEVEY, B. 2025: *A Hanság tölgy-kőris-szil ligetei (Pimpinello majoris-Ulmetum)*. - *Natura Somogyiensis* 46: 57-98.

Abstract: This study presents the association relationships of the oak-ash-elm grove forests (*Pimpinello majoris-Ulmetum* Kevey in Borhidi – Kevey 1966) of the Hanság in the northwestern part of Hungary based on 50 + 35 coenological records. We are dealing with an azonal association moderately influenced by groundwater. Some submontane elements are noticeable in their stands, which are generally rare in the Great Plain. *Fagetalia* elements are particularly common: *Actaea spicata*, *Aegopodium podagraria*, *Allium ursinum*, *Anemone ranunculoides*, *Arum maculatum*, *Arum orientale*, *Circaea lutetiana*, *Corydalis cava*, *Epipactis helleborine* agg., *Gagea lutea*, *Galanthus nivalis*, *Galeobdolon luteum*, *Galium odoratum*, *Hedera helix*, *Lathraea squamaria*, *Salvia glutinosa*, *Sanicula europaea*, *Listera ovata*, *Moehringia trinervia*, *Myosotis sparsiflora*, *Paris quadrifolia*, *Polygonatum multiflorum*, *Pulmonaria officinalis*, *Scilla vindobonensis*, *Stachys sylvatica*, *Ulmus glabra*, *Vinca minor*, *Viola reichenbachiana*, etc. These plants are probably remnants of the once cooler, more rainy and more balanced climate of the “Beech I Age” (from 2500 BC to 800 BC).

Keywords: Kisalföld, Natura 2000 area, National Park, plant coenology, multivariate analysis.

Bevezetés

A Hanság tölgyeseiről – *Quercetum roburis* néven – ZÓLYOMI (1934) tett először említést az alábbi módon: „A mezofil tölgyesnek ma már csak néhány foszlánya van meg a Hanság környékén. Így a Lébényi tölgyerdő és a Bormászi-erdő magasabban fekvő részei Részletesebb jellemzésükhöz a töredékes felvételek nem elégségesek”. Amikor tervbe vettem a Hanság tölgy-kőris-szil ligeteinek felmérését, nem hittem, hogy ennyi viszonylag fajgazdag cönológiai felvételt sikerül készítenem. Végül is 50 cönológiai felvétel alapján sikerült megadnom a Hanság tölgy-kőris-szil ligeteinek jellemzését.

Anyag és módszer

Kutatási terület jellemzése

A Hanság a Kisalföld jellegzetes – egykor láperdőkben és lápokban gazdag része (Soó 1960). Tölgy-kőris-szil ligeteit az alábbi helyeken őrizte meg: Lébény „Bormászi-erdő”; Jánossomorja „Zsellér-erdő”, „Korona-erdő”, „Hanság-Nagy-erdő”; Ujrónafő „Krisztina-berek”, „Császárreti-erdő”, „Kisudvari-erdő”; Vitnyéd „Fácános”. Ezen erdőkben 50

cönológiai felvételt készítettem. A kutatásba belevettem a fertődi „Lés-erdő”-t is. Ez ZÓLYOMI (1934) szerint ugyan telepített erdő, de faji összetétele annyira természetszerű, hogy a természetes növénytakaróba besorolható.

Alkalmazott módszerek

A cönológiai felvételeket a Zürich-Montpellier növénycönológiai iskola (BECKING 1957; BRAUN-BLANQUET 1964) hagyományos kvadrát-módszerével készítettem. A felvételek táblázatos összeállítását, valamint a karakterfajok csoportrészesedését és csoporttömegét az „NS” számítógépes programcsomag (KEVEY & HIRMAN 2002) segítségével végeztem. A felvételkészítés és a hagyományos statisztikai számítások módszerét korábban részletesen közöltem (KEVEY 2008). A többváltozós elemzéseknél – a SYN-TAX 2000 programcsomag (PODANI 2001) segítségével bináris adatokon alapuló hierarchikus osztályozást, cluster-analízist (hasonlósági index: Baroni-Urbani-Buser; osztályozó módszer: teljes lánc) és szintén bináris alapú ordinációt (hasonlósági index: Baroni-Urbani-Buser; ordinációs módszer: főkoordináta-analízis) készítettem. A fajok esetében KIRÁLY (2009), a társulásoknál pedig az újabb hazai nomenklatúrát (BORHIDI & KEVEY 1996, KEVEY 2008, BORHIDI et al. 2012) követtem. A társulástani és a karakterfaj-statisztikai táblázatok felépítése az újabb eredményekkel (OBERDORFER 1992, MUCINA et al. 1993, KEVEY 2008, BORHIDI et al. 2012) módosított Soó (1980) féle cönológiai rendszerre épül. A növények cönoszisztematikai besorolásánál is elsősorban Soó (1964, 1966, 1968, 1970, 1973, 1980) Synopsis-ára támaszkodtam, de figyelembe vettem az újabb kutatási eredményeket is (vö. BORHIDI 1993, 1995, HORVÁTH et al. 1995, KEVEY 2008).

Eredmények

Termőhelyi viszonyok, zonalitás

BORHIDI (1961) klímazonális térképe szerint a Hanság a zárt tölgyes zónába tartozik. Az erdőkben a csapadékhiányt a talajvíz kompenzálja, s így azonális módon jöttek létre a tölgy-kőris-szil ligetek (*Pimpinello majoris-Ulmetum*).

A felvételezett állományok 111-124 m tengerszint feletti magasság mellett találhatók, kitettségétől mentes termőhelyeken. Az alapkőzetet homokos és iszapos öntésföld képezi, amelynek felső rétege a legtöbb helyen barna erdőtalajszerű öntés erdőtalajjá fejlődött. E talajok a félnedves és üde vízgazdálkodási fokozatba sorolhatók, s üde, páras és hűvös mikroklimát biztosítanak.

Fiziognómia

A vizsgált tölgy-kőris-szil ligetek felső lombkoronaszintje az állomány korától függően 22-30 m néha kevésbé, máskor jól záródó (40-80 %). Állandó fajai (K: IV-V) csak a *Fraxinus excelsior* és a *Quercus robur*. Jelentős borítást (A-D: 3-5) a *Quercus robur* mellett a *Fraxinus excelsior*, a *Populus alba* és a *Populus tremula laevis* érhet el. Az átlagos törzsátmérő 45-70 cm. Az alsó lombkoronaszint igen változóan fejlett. Magassága 10-20 m, borítása pedig 10-70 %. Főleg alászorult fák alkotják. Állandó fajai (K: IV-V) a *Fraxinus excelsior* és az *Ulmus minor*. Nagyobb tömeget (A-D: 3) olykor az *Acer campestre* és a *Fraxinus excelsior* képezhet.

A cserjésint ugyancsak változóan fejlett, amely nagyrészt az erdészeti beavatkozásokkal kapcsolatos. Magassága 2-5 m, borítása pedig 30-80 %. Állandó elemei (K: IV-V) a következők: *Acer campestre*, *Cornus mas*, *Cornus sanguinea*, *Corylus avellana*,

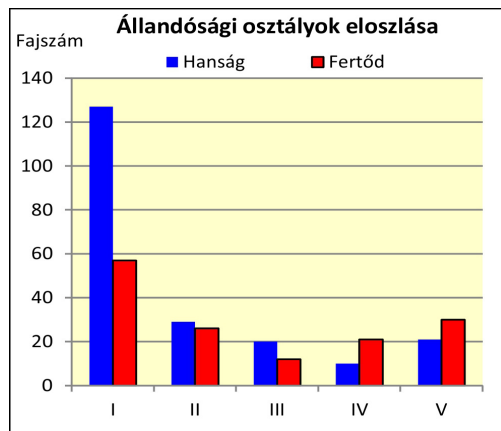
Crataegus monogyna, *Fraxinus excelsior*, *Ligustrum vulgare*, *Padus avium*, *Sambucus nigra*, *Ulmus minor*. E növények mellett olykor a *Corylus avellana*, *Crataegus monogyna*, *Fraxinus excelsior*, *Fraxinus ornus*, *Ligustrum vulgare*, *Padus avium*, *Sambucus nigra* és az *Ulmus minor* érhet el nagyobb tömeget (A-D: 3-4). Az alsó cserjeszint (újulat) borítása szintén változó (1-50 %). Állandó fajai (K: IV-V) az alábbiak: *Acer campestre*, *Cerasus avium*, *Clematis vitalba*, *Cornus sanguinea*, *Corylus avellana*, *Crataegus monogyna*, *Euonymus europaea*, *Fraxinus excelsior*, *Ligustrum vulgare*, *Padus avium*, *Quercus robur*, *Rhamnus catharticus*, *Rubus caesius*, *Sambucus nigra*, *Ulmus minor*, *Viburnum opulus*. Nagyobb tömeget (A-D: 4) e szintben csak a *Hedera helix* ér el.

A gyepszint borítása is igen változó (40-100 %). Állandó elemeinek (K: IV-V) száma viszonylag nagy: *Arctium minus*, *Brachypodium sylvaticum*, *Circaea lutetiana*, *Galium odoratum*, *Geum urbanum*, *Listera ovata*, *Ornithogalum umbellatum*, *Polygonatum latifolium*, *Ranunculus ficaria*, *Viola hirta*, *Viola mirabilis*, *Viola suavis*. Fáciesképző fajok a következők (A-D: 3-5): *Aegopodium podagraria*, *Allium ursinum*, *Buglossoides purpureo-coerulea*, *Colchicum autumnale*, *Convallaria majalis*, *Corydalis cava*, *Galium odoratum*, *Polygonatum latifolium*, *Ranunculus ficaria*, *Viola mirabilis*, *Viola suavis*.

Fajkombináció

Állandósági osztályok

Az 50 cönológiai felvétel alapján a konstans (K V) fajok száma 21: – K V: *Arctium minus*, *Brachypodium sylvaticum*, *Cerasus avium*, *Clematis vitalba*, *Cornus mas*, *Cornus sanguinea*, *Crataegus monogyna*, *Euonymus europaeus*, *Fraxinus excelsior*, *Galium odoratum*, *Ligustrum vulgare*, *Listera ovata*, *Padus avium*, *Polygonatum latifolium*, *Quercus robur*, *Rhamnus catharticus*, *Rubus caesius*, *Sambucus nigra*, *Ulmus minor*, *Viola mirabilis*, *Viola suavis*. Ezek mellett 10 szubkonstans faj került elő: – K IV: *Acer campestre*, *Circaea lutetiana*, *Corylus avellana*, *Geum urbanum*, *Ornithogalum umbellatum*, *Populus alba*, *Prunus spinosa*, *Ranunculus ficaria*, *Viburnum opulus*, *Viola hirta*. A konstans (K V) és a szubkonstans (K IV) elemek mellett a cönológiai táblázatban 20 akcesszórius (K III), 29 szubakcesszórius (K II) és 127 akcicens (K I) faj szerepel (1. táblázat; 1. ábra). Az állandósági osztályok terén tehát a legkisebb fajszám



1. ábra. Az állandósági osztályok eloszlása
Figure 1. Distribution of constancy classes

a szubkonstans (K IV) elemeknél van, míg az akcidens (K I) fajok mellett a konstans (K V) fajoknál jelentkezik egy második maximum.

A fertődi „Lés-erdő”-ben készült 35 felvételen 30 konstans (K V) és 21 szubkonstans (K IV) faj található az alábbiak szerint: K V: *Acer campestre*, *Adoxa moschatellina*, *Allium ursinum*, *Arum maculatum*, *Brachypodium sylvaticum*, *Carex divulsa*, *Carex sylvatica*, *Circaea lutetiana*, *Crataegus monogyna*, *Dactylis polygama*, *Euonymus europaeus*, *Gagea lutea*, *Galium odoratum*, *Geranium robertianum*, *Geum urbanum*, *Hedera helix*, *Lamium maculatum*, *Milium effusum*, *Polygonatum latifolium*, *Polygonatum multiflorum*, *Pulmonaria officinalis*, *Quercus robur*, *Ranunculus ficaria*, *Rubus caesius*, *Sambucus nigra*, *Scilla vindobonensis*, *Stachys sylvatica*, *Ulmus minor*, *Urtica dioica*, *Viola odorata*. – K IV: *Ajuga reptans*, *Carpinus betulus*, *Cerasus avium*, *Chaerophyllum temulum*, *Cornus sanguinea*, *Corydalis cava*, *Cucubalus baccifer*, *Fallopia dumetorum*, *Fraxinus excelsior*, *Galeopsis pubescens*, *Galium aparine*, *Glechoma hederacea*, *Heracleum sphondylium*, *Lapsana communis*, *Ligustrum vulgare*, *Moehringia trinervia*, *Parthenocissus inserta*, *Rumex sanguineus*, *Tilia cordata*, *Tilia platyphyllos*, *Viola suavis*. A felvételekben még 12 akcesszórius (K III), 26 szubakcesszórius (K II) és 57 akcidens (K I) faj található (1. táblázat; 1. ábra).

Karakterfajok aránya

A cönológiai felvételekben viszonylag sok szubmontán (*Fagetalia*) elem található. Az ilyen *Fagetalia* s.l. elemek csoportrészesedése 25,83%, csoporttömegük pedig 27,89%. A fertődi tölgy-kőris-szil ligeteken ez az arány jóval magasabb: 38,64% csoportrészesedés és 63,28% csoporttömeg (1. táblázat).

Fontos szerepet játszanak a keményfaligeti (*Alnion incanae* s.l.) elemek is. Ezek csoportrészesedése 9,88%, csoporttömegük pedig 7,41%. A fertődi állományokban mintegy fordított arányt mutatnak: 7,46% csoportrészesedés és 10,62% csoporttömeg (1. táblázat).

Végül érdemes megemlíteni a *Quercetea pubescentis-petraeae* s.l. elemeket, amelyek 26,39% csoportrészesedést és 32,36% csoporttömeget érnek el. E fajok Fertődön jóval alacsonyabb értékeket érnek el: 15,25% csoportrészesedés és 13,43% csoporttömeg (1. táblázat).

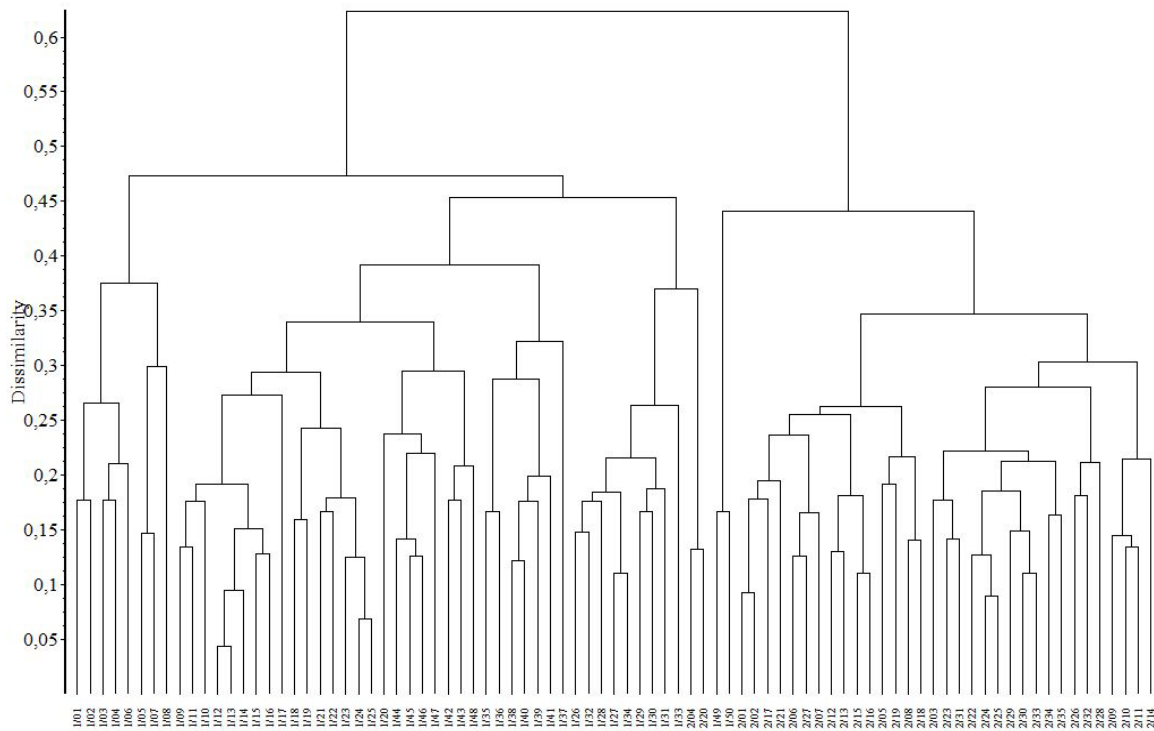
Szociális magatartási típusok aránya

A BORHIDI (1993, 1995) féle szociális magatartási típusok aránya szerint a Hanság természetszerű erdei és a Fertődi „Lés-erdő” között nem mutatható ki lényeges különbség. A specialisták (S 6) ugyan a „Lés-erdő”-ben valamivel kisebb értéket képviselnek, de a zavarástűrők (DT 2) és a természetes gyomok (W 1) aránya nagyon hasonló (8. táblázat).

Sokváltozós elemzések eredményei

Ha a Hanságból készült 50 + 35 felvételt bináris cluster-analízissel (2. ábra) és ordinációval (3. ábra) megvizsgáljuk, a két felvételi anyag gyakorlatilag két külön csoportba rendeződik. Kivételt képez a Hanság természetszerű felvételeiből az utolsó két, valamint a fertődi első két felvétel, amelyek átkerültek a szomszédos csoportokba.

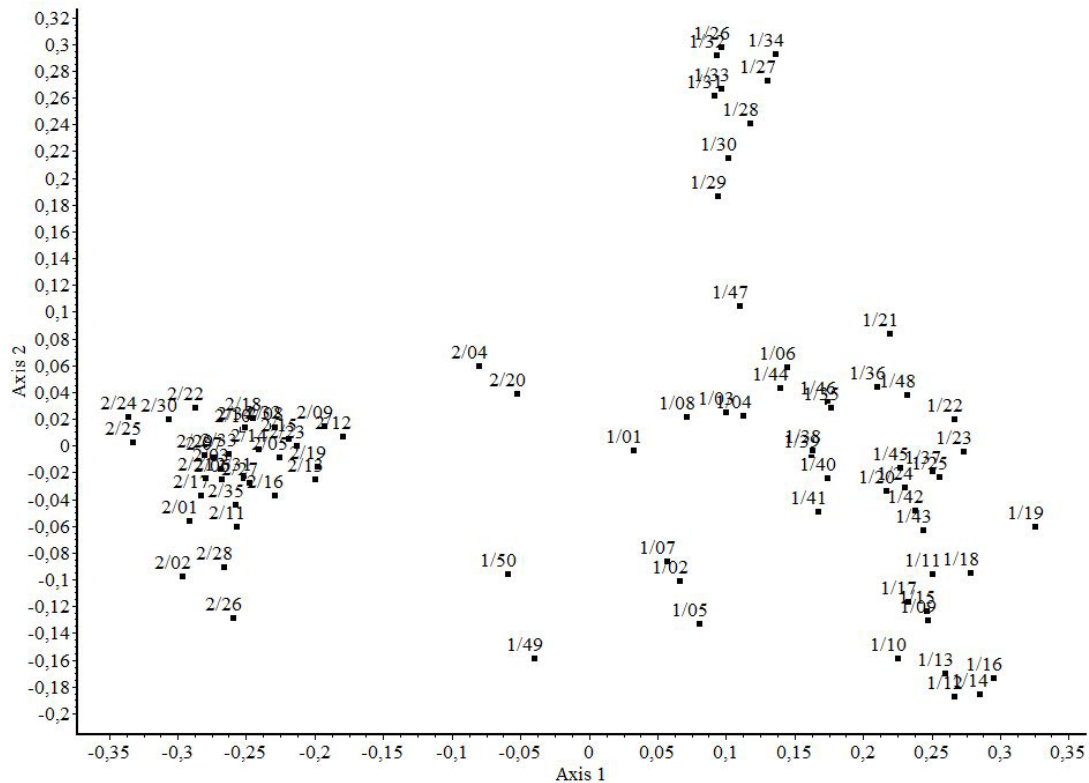
A társulás rokonsági kapcsolatait akkor deríthetjük ki, ha egyéb viszonylag közeli tölgy-kőris-szil ligetekkel is végzünk egy összehasonlítást. Erre a célra a Szigetköz és a Kerka-völgy keményfás ligeteit használtam fel. Ennek eredménye az lett, hogy a Szigetköz tölgy-kőris-szil ligetei szorosan kapcsolódnak a Hanságban készült felvételekhez, a Kerka-völgy tölgy-kőris-szil ligetei viszont mind a dendrogramon (4. ábra), mind pedig az ordinációs diagramon (5. ábra) jól elkülönülő, külön csoportot képeznek.



2. ábra: A Hanság tölgy-köris-szil ligeteinek és a fertődi „Lés-erdő” felvételeinek bináris dendrogramja, (haszonlósági index: Baroni-Urbani-Buser; osztályozó módszer: teljes lánc)

Fig. 2: Binary dendrogram of the relevés, (similarity coefficient: Baroni-Urbani-Buser; clustering method: complete link),

1/1-50: Hanság (*Pimpinello majoris-Ulmetum*), 2/1-35: Fertőd „Lés-erdő” (*Pimpinello majoris-Ulmetum*)

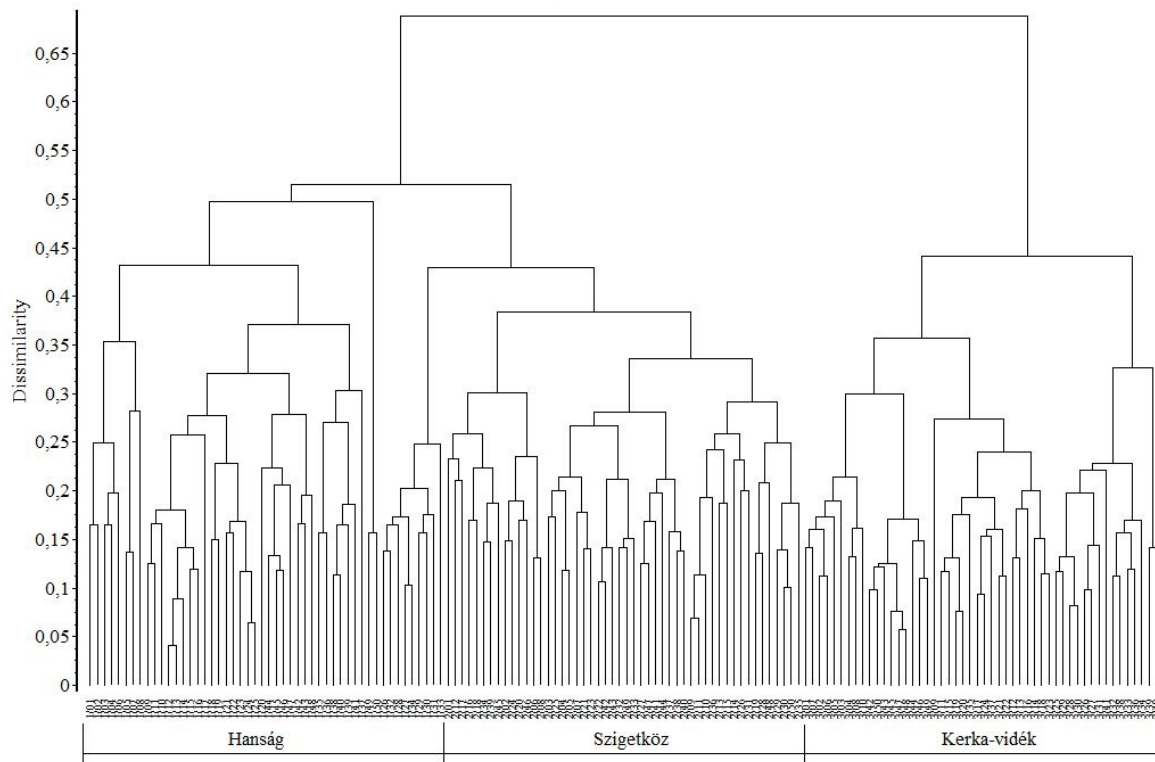


3. ábra: A Hanság tölgy-köris-szil ligeteinek és a fertődi „Lés-erdő” felvételeinek bináris ordinációs diagramja, (hasonlósági index: Baroni-Urbani-Buser; ordinációs módszer: főkoordináta-analízis)

Fig. 3: Binary ordination diagram of the relevés

(similarity coefficient: Baroni-Urbani-Buser; ordination method: principal coordinates analysis)

1/1-50: Hanság (*Pimpinello majoris-Ulmetum*) 2/1-35: Fertőd „Lés-erdő” (*Pimpinello majoris-Ulmetum*)

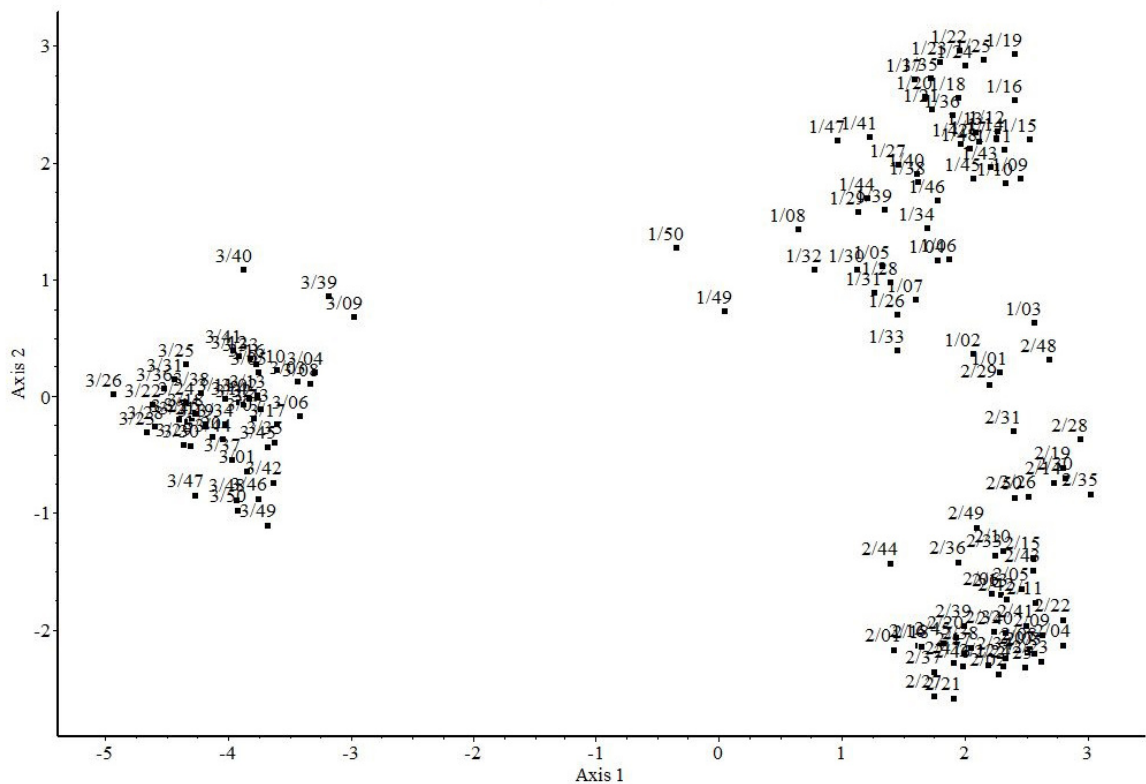


4. ábra: A Hanság, a Szigetköz és a Kerka-vidék felvételeinek bináris dendrogramja
(hasonlósági index: Baroni-Urbani-Buser; osztályozó módszer: teljes lánc)

Fig. 4: Binary dendrogram of the relevés

(similarity coefficient: Baroni-Urbani-Buser; clustering method: complete link),

1/1-50: Hanság (*Pimpinello majoris-Ulmetum*) 2/1-50: Szigetköz (*Pimpinello majoris-Ulmetum*) 3/1-50: Kerka-vidék
(*Carici brizoidis-Ulmetum*)



5. ábra: A Hanság, a Szigetköz és a Kerka-vidék felvételeinek bináris ordinációs diagramja (hasonlósági index: Baroni-Urbani-Buser; osztályozó módszer: teljes lánc)

Fig. 5: Binary ordination diagram of the relevés

(similarity coefficient: Baroni-Urbani-Buser; clustering method: complete link)

1/1-50: Hanság (*Pimpinello majoris-Ulmetum*), 2/1-50: Szigetköz (*Pimpinello majoris-Ulmetum*), 3/1-50: Kerka-vidék (*Carici brizoidis-Ulmetum*)

Megvitatás

Mint fent láttuk, a fertői „Lés-erdő” és a Hanság természetserű tölg-y-kör-is-szil ligeterdei között viszonylagos kapcsolatot sikerült kimutatni (2-3. ábra). Ebből az a következtetés vonható le, hogy természetserű tölg-y-kör-is-szil ligeteket mesterségesen ki tudunk alakítani.

A Hanság tölg-y-kör-is-szil ligeterdei szoros kapcsolatot mutatnak a szomszédos Szigetköz keményfás ligeteivel, ezért mindkét táj tölg-y-kör-is-szil ligetei a *Pimpinello majoris-Ulmetum* asszociációba sorolható.

A Hanság és a Kerka-vidék tölg-y-kör-is-szil ligetei között – a faji összetételt tekintve – lényegesen nagyobb faji összetételt sikerült kimutatni (4-5. ábra), ezért a Kerka-vidék keményfás ligeterdeit a korábban leírt *Carici brizoidis-Ulmetum* asszociációba sorolhatjuk.

Összefoglalva a fentieket, az érintett tölg-y-kör-is-szil ligeterdők a szüntaxonómiai rendszerben az alábbi módon vázolható:

Divisio: QUERCO-FAGEA Jakucs 1967

Classis: QUERCO-FAGETEA Br.-Bl. et Vlieger in Vlieger 1937 em. Borhidi in Borhidi et Kevey 1996

Ordo: *FAGETALIA SYLVATICAE* Pawłowski in Pawłowski et al. 1928

Alliance: *Alnion incanae* Pawłowski in Pawłowski et al. 1928

Suballiance: *Ulmion* Oberdorfer 1953

1. Associatio: *Pimpinello majoris-Ulmetum* Kevey in Borhidi – Kevey 1996 (Hanság, Szigetköz)

2. Associatio: *Carici brizoidis-Ulmetum* Kevey 2008 (Kerka-vidék)

Természetvédelmi vonatkozások

A vizsgált tölg-y-kör-is-szil ligetekben viszonylag sok hegyvidéki növényfaj talál menedéket. Szubmontán jellegű fajai (*Actaea spicata*, *Aegopodium podagraria*, *Allium ursinum*, *Anemone ranunculoides*, *Arum maculatum*, *Arum orientale*, *Circaea lutetiana*, *Corydalis cava*, *Epipactis helleborine* agg., *Gagea lutea*, *Galanthus nivalis*, *Galeobdolon luteum*, *Galium odoratum*, *Hedera helix*, *Lathraea squamaria*, *Salvia glutinosa*, *Sanicula europaea*, *Listera ovata*, *Moehringia trinervia*, *Myosotis sparsiflora*, *Paris quadrifolia*, *Polygonatum multiflorum*, *Pulmonaria officinalis*, *Scilla vindobonensis*, *Stachys sylvatica*, *Ulmus glabra*, *Vinca minor*, *Viola reichenbachiana*, etc.) részben folyók mentén levándorolt elemek, részben pedig az i.e. 2500-tól i.e. 800-ig tartó „Bükk I. kor” maradványfajai (vö. ZÓLYOMI 1936, 1952, JÁRAI-KOMLÓDI, M. 1966a, 1966b, 1968). Így e tölg-y-kör-is-szil ligetek flóra- és vegetációtörténeti szempontból is jelentősek.

A vizsgált állományokból 14 védett növényfaj került elő, amelyek tovább növelik a társulás természetvédelmi értékét: *Cephalanthera longifolia*, *Dryopteris carthusiana*, *Epipactis helleborine* agg., *Galanthus nivalis*, *Leucojum aestivum*, *Lilium martagon*, *Listera ovata*, *Lonicera caprifolium*, *Neottia nidus-avis*, *Omphalodes scorpioides*, *Orchis purpurea*, *Platanthera bifolia*, *Scilla vindobonensis*, *Vitis sylvestris* (1. táblázat).

Mivel e társulás az Alföldön igen megfogyatkozott, örömdetes, hogy a Hanság néhány pontján még mindig vannak természet közeli, fajgazdag állományai. Megőrzésük, helyenkénti rekonstrukciójuk természetvédelmünk fontos feladata lehetne.

Az általam vizsgált erdők részben a Fertő-Hanság Nemzeti Park hatáskörébe, részben pedig a Natura 2000 területek közé tartoznak.

Összefoglalás

Jelen tanulmány Magyarország északnyugati részén, a Hanság tölgy-kőris-szil ligeterdeinek (*Pimpinello majoris-Ulmetum* Kevey in Borhidi – Kevey 1966) társulási viszonyait mutatja be 50 + 35 cönológiai felvétel alapján. Talajvíz által mérsékelten befolyásolt, azonális asszociációval állunk szemben. Állományaikban feltűnőek egyes szubmontán elemek, amelyek az Alföldön általában ritkák. Különösen a *Fagetalia* elemek gyakoriak: *Actaea spicata*, *Aegopodium podagraria*, *Allium ursinum*, *Anemone ranunculoides*, *Arum maculatum*, *Arum orientale*, *Circaea lutetiana*, *Corydalis cava*, *Epipactis helleborine* agg., *Gagea lutea*, *Galanthus nivalis*, *Galeobdolon luteum*, *Galium odoratum*, *Hedera helix*, *Lathraea squamaria*, *Salvia glutinosa*, *Sanicula europaea*, *Listera ovata*, *Moehringia trinervia*, *Myosotis sparsiflora*, *Paris quadrifolia*, *Polygonatum multiflorum*, *Pulmonaria officinalis*, *Scilla vindobonensis*, *Stachys sylvatica*, *Ulmus glabra*, *Vinca minor*, *Viola reichenbachiana*, stb. E növények valószínűleg az egykori hűvösebb, csapadékosabb és kiegyenlítettebb klímájú „Bükk I. kor” (i.e. 2500-tól i.e. 800-ig) maradványfajai.

Rövidítések

A1: felső lombkoronaszint; A2: alsó lombkoronaszint; Adv: Adventiva; AF: Aremonio-Fagion; Agi: Alnenion glutinosae-incanae; Ai: Alnion incanae; APa: Abieti-Picea; AQ: Aceri tatarici-Quercion; AR: Agropyro-Rumicion crisp; Ara: Arrhenatheretalia; Arc: Arction lappae; Arn: Arrhenatherion elatioris; Ata: Alnetalia glutinosae; B1: cserjeszint; B2: újulat; Ber: Berberidion; Bia: Bidentetalia; Bon: Bidenton tripartiti; C: gypeszint; CG: Calluno-Genistion; Cgr: Caricenion gracilis; Che: Chenopodietea; ChS: Chenopodio-Scleranthea; Cn: Calystegion sepium; Cp: Carpinenion betuli; Des: Deschampsion caespitosae; Epa: Epilobietalia; Epn: Epilobion angustifolii; EuF: Eu-Fagenion; F: Fagetalia sylvaticae; FB: Festuco-Bromea; FBt: Festuco-Brometalia; FiC: Filipendulo-Cirsion oleracei; FPi: Festuco-Puccinellietalia; Fru: Festucion rupicolae; Fvg: Festucion vaginatae; Fvl: Festucetalia valesiacae; GA: Galio-Alliarion; GSp: Glycerio-Sparganion; I: Indifferens; ined.: ineditum (kiadatlan közlés); Mag: Magnocaricion; Moa: Molinietalia coeruleae; MoA: Molinio-Arrhenathera; Moa: Molinio-Juncetalia; NA: Nardo-Agrostion tenuis; OCn: Orno-Cotinion; Pla: Plantaginietalia majoris; Pna: Populenion nigro-albae; PQ: Pino-Quercion; Prf: Prunion fruticosae; Pru: Prunetalia spinosae; Pte: Phragmitetalia; Qc: Quercetalia cerridis; QFt: Querco-Fagetalia; Qpp: Quercetalia pubescentis-petraeae; Qr: Quercetalia roboris; Qrp: Quercion robori-petraeae; S: summa (összeg); Sal: Salicion albae; SaS: Sambuco-Salicion capreae; SCn: Scheuchzerio-Caricetalia nigrae; Sea: Secalietalia; s.l.: sensu lato (tágabb értelemben); Spu: Salicetalia purpureae; TA: Tilio platyphyllae-Acerenion pseudoplatani; Ulm: Ulmenion; VP: Vaccinio-Piceetalia.

1. táblázat: *Pimpinello majoris-Ulmetum* (Hanság) Table 1: *Pimpinello majoris-Ulmetum* (Hanság)

1/1. táblázat	0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3 4 4 4 4 4 4 4 4 5	A-D	K	K%
	1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0			
1. Querco-Fagea				
1.1. Salicetea purpureae				
1.1.1. Salicetalia purpureae				
Populus nigra	A1 - - - - - - - - - - 1 - - - - - 1 - - - - - 1 - - - - 1 + - + - - - - -	+1	I	14
1.1.1.1. Salicion albae				
Carduus crispus (Cn)	C + + + + - + - - - - - - - + - + - - + + + + + - - + - + + + 1 + + + + + - - - + -	+1	III	50
Humulus lupulus (Cn, Ata, Ai)	B1 + - + - - + + + -	+	I	14
	C + + + + + + + + -	+	III	44
	S + + + + + + + + -	+	III	44
Cucubalus baccifer (Cn, Ulm)	C + - - - - + + - + -	+	II	22
Alnus incana (Ai, Agi)	A1 -	+	I	2
	A2 - - + - - + -	+2	I	16
	B1 - - + -	+	I	8
	B2 - - + - - + -	+	I	12
	S - - 1 - - + -	+2	I	18
Leucojum aestivum (Des)	C -	+	I	6
Salix alba (Ai, Cn)	A1 -	+	I	2
	A2 - - - - - 1 -	1	I	2
	S - - - - - 1 -	+1	I	4
Salix fragilis (Ai, Cn)	A1 -	+	I	2
1.2. Alnetea glutinosae				
1.2.1. Alnetalia glutinosae				
Alnus glutinosa (Ai, Agi)	A1 + + - 1 - 1 -	+1	II	26
	A2 - - - - - + -	+	I	6
	S + + - 1 - 1 -	+1	II	30
Dryopteris carthusiana (F, Agi, Qr, VP)	C -	+	I	2
1.3. Querco-Fagetea				
Brachypodium sylvaticum (Qpp)	C + + 1 1 1 1 1 1 1 + + + + + + 1 + + 1 2 + 1 + 1 + + + + + + + 2 1 2 1 + 1 1 + + + + + 1 + +	+2	V	100
Crataegus monogyna (Qpp)	A2 -	+	I	4
	B1 + + + + 1 + + + 1 1 1 - - + 2 + 1 2 + 3 2 3 3 + 1 + 1 + 2 1 + + + + 1 1 1 + 2 - - - + - - - - 1 1	+3	V	82
	B2 + + + + + - + + + + + + + + + + + - - + + + + + + + - - + - + + + + + + + + + + + + + + + + +	+	V	90
	S + + + + 1 + + + 1 1 1 + + + 2 + 1 2 + 3 2 3 3 + 1 + 1 + 2 1 + + + + 1 1 1 + 2 + + + + + + + + 1 1	+3	V	100
Euonymus europaeus (Qpp)	B1 + + + + - + + - - + - - - + - - - - + -	+	III	48
	B2 +	+	V	100
	S +	+	V	100

1. táblázat: *Pimpinello majoris*-*Ulmetum* (Hanság) Table 1: *Pimpinello majoris*-*Ulmetum* (Hanság)

1/2. táblázat		0000000001111111111222222222233333333333444444444445	A-D	K	K%
		123456789012345678901234567890123456789012345678901234567890			
Fraxinus excelsior (Qpp, TA)	A1	24443244444444444344444443444421--122-144344444344434444--	1-4	V	90
	A2	+11312222222222222222222221-22-+2--22222-2221+111--	+3	V	84
	B1	-+21222+-+--+-+--111--+-212+23232+2211222+-+--+-+	+3	IV	70
	B2	+--+1111+11+-+1+111+1111-12111222111+++++1111+-+---	+2	V	90
	S	2455435555555555455555455432313533255455554543444++	+5	V	100
Cornus sanguinea (Qpp)	A2	--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--	+1	I	6
	B1	+111+1+1++++-+2+-1-1-+111+2+121+-1-112+-+--+11	+2	IV	78
	B2	+++++++-+--+--+--+--+--+--+--+--+--+--+--+--+--+--	+1	V	84
	C	-----+-----+-----+-----+-----+-----+-----	+1	I	2
	S	+111+1+1++++++2++1+1++111+2+121+-2+112++++++11	+2	V	98
Polygonatum latifolium (Qpp)	C	2221221+44444312544322333++++++1+2+-+1+122333211+	+5	V	98
Clematis vitalba (Qpp)	A2	--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--	+1	II	40
	B1	-+++-+1+-+--+--+--+--+--+--+--+--+--+--+--+--+--	+1	III	52
	B2	+1++++++--+--+--+--+--+--+--+--+--+--+--+--+--+--	+1	V	92
	S	+11+1+1+1+1+111++++++-++1++1121112+2++++++--	+2	V	94
	Ulmus minor (Ai, Ulm, Qpp)	A1	-----1-----+-----+-----+-----+-----+-----	+1	I
A2		+--+222+2+++++11+-+1+1+-----112-1+-+--+1+11221	+2	IV	76
B1		+++221+1+++++11+-+--+--+--+--+--+--+--+--+--+--	+3	V	90
B2		11++11++++++-+--+--+--+--+--+--+--+--+--+--+--+--	+1	V	86
S		111133212111+1121+11111+1+1212+211--1-111111233	+3	V	94
Viola suavis s.l. (Qpp)	C	+1++1++31++++++111--+-+11++122112222121111++	+3	V	94
Quercus robur (Ai, Cp, Qpp)	A1	4111331+-121211312112321111313321--222111123	+4	V	84
	A2	-----++-----++-+-+--+--+--+--+--+--+--+--	+1	II	30
	B1	-----+-----+-----+-----+-----+-----+-----	+1	I	6
	B2	-+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--+--	+1	III	52
	S	4111331++121211312112321111313321--++--222111123	+4	V	92
Ligustrum vulgare (Cp, Qpp)	B1	+++3+31+1+++++1+2++1+1++--+--+--+333+31211--++32	+3	V	84
	B2	+++2+1+-1++++++1++++++--+--+--+122+1+1+-+--+1+	+2	V	84
	S	+++4+31+2+++++1+2++1+1++--+--+--+34431212--++32	+4	V	88
	C	+1+++--+211+1111111333332+++++111231--1332232--	+3	V	86
	Viola mirabilis (F, Qpp)	B1	-----+-----+-----+-----+-----+-----+-----	+1	II
B2		++++++--+--+--+--+--+--+--+--+--+--+--+--+--+--	+1	V	82
S		++++++--+--+--+--+--+--+--+--+--+--+--+--+--+--	+1	V	82

KEVEY B.: A HANSÁG TÖLGY-KÖRIS-SZIL LIGETEI

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1. táblázat: *Pimpinello majoris*-*Ulmetum* (Hanság) Table 1: *Pimpinello majoris*-*Ulmetum* (Hanság)

[illegible]

KEVEY B.: A HANSÁG TÖLGY-KÖRIS-SZIL LIGETEI

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KEVEY B.: A HANSÁG TÖLGY-KÖRIS-SZIL LIGETEI

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KEVEY B.: A HANSÁG TÖLGY-KÖRIS-SZIL LIGETEI

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1. táblázat: *Pimpinello majoris*-*Ulmetum* (Hanság) Table 1: *Pimpinello majoris*-*Ulmetum* (Hanság)

[illegible]

1. táblázat: *Pimpinello majoris-Ulmetum* (Hanság) Table 1: *Pimpinello majoris-Ulmetum* (Hanság)

1/11. táblázat		000000000011111111112222222222333333333344444444445	A-D K K%		
		12345678901234567890123456789012345678901234567890			
Populus x euramericana	A1	- + - 1 - 1 - - - - - - -	+1		6
Fraxinus pennsylvanica	B1	- + - - - - - - -	+		2
	B2	- + - - - - - - -	+		2
	S	- + - - - - - - -	+		4
Impatiens parviflora	C	- + - - - - - - -	+		4
Morus alba	A2	- - - - - + -	+		2
	B1	- + - - - - - - -	+		2
	S	- - - - - + - + - - - - - - -	+		4
Acer negundo	B1	- - - - - + -	+		2
	B2	- - - - - + -	+		2
	S	- - - - - + -	+		2
Erigeron annuus	C	- + - - - - - - -	+		2
Hemerocallis fulva	C	- + - - - - - - -	+		2
Laburnum anagyroides	B1	- -	+		2
Oxalis stricta	C	- -	+		2
Padus serotina	B1	- -	+		2
Syringa vulgaris	B1	- -	+		2

2. táblázat: Felvételi adatok I. (Hanság)
Table 2: Data of the relevés I. (Hanság)

[illegible][illegible]

3. táblázat: Felvételi adatok II. (Hanság)

Table 3: Data of the relevés II. (Hanság)

Kvadrát	Felvételi sorszám	Település	Dűlő	Alapközet	Talajtípus	Felvételt készítő
1	12749	Lébény	Bormászi-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
2	12750	Lébény	Bormászi-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
3	12751	Lébény	Bormászi-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
4	5016	Lébény	Bormászi-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
5	5018	Lébény	Bormászi-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
6	5019	Lébény	Bormászi-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
7	5020	Lébény	Bormászi-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
8	5182	Jánossomorja	Zsellér-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
9	5093	Jánossomorja	Hanság-Nagy-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
10	5098	Jánossomorja	Hanság-Nagy-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
11	5104	Jánossomorja	Hanság-Nagy-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
12	5105	Jánossomorja	Hanság-Nagy-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
13	5143	Jánossomorja	Hanság-Nagy-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
14	5146	Jánossomorja	Hanság-Nagy-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
15	5147	Jánossomorja	Hanság-Nagy-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
16	5148	Jánossomorja	Hanság-Nagy-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
17	5183	Jánossomorja	Hanság-Nagy-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
18	5149	Jánossomorja	Korona-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
19	5150	Jánossomorja	Korona-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
20	5151	Jánossomorja	Hanságliget	homokos öntésföld	öntés erdőtalaj	Kevey ined.
21	5176	Jánossomorja	Hanságliget	homokos öntésföld	öntés erdőtalaj	Kevey ined.
22	5177	Jánossomorja	Hanságliget	homokos öntésföld	öntés erdőtalaj	Kevey ined.
23	5178	Jánossomorja	Hanságliget	homokos öntésföld	öntés erdőtalaj	Kevey ined.
24	5179	Jánossomorja	Hanságliget	homokos öntésföld	öntés erdőtalaj	Kevey ined.
25	5180	Jánossomorja	Hanságliget	homokos öntésföld	öntés erdőtalaj	Kevey ined.
26	5157	Újrónafő	Krisztina-berek	homokos öntésföld	öntés erdőtalaj	Kevey ined.
27	5159	Újrónafő	Krisztina-berek	homokos öntésföld	öntés erdőtalaj	Kevey ined.
28	5160	Újrónafő	Krisztina-berek	homokos öntésföld	öntés erdőtalaj	Kevey ined.
29	5171	Újrónafő	Krisztina-berek	homokos öntésföld	öntés erdőtalaj	Kevey ined.
30	5172	Újrónafő	Krisztina-berek	homokos öntésföld	öntés erdőtalaj	Kevey ined.
31	5174	Újrónafő	Krisztina-berek	homokos öntésföld	öntés erdőtalaj	Kevey ined.
32	5175	Újrónafő	Krisztina-berek	homokos öntésföld	öntés erdőtalaj	Kevey ined.
33	12752	Újrónafő	Krisztina-berek	homokos öntésföld	öntés erdőtalaj	Kevey ined.
34	12754	Újrónafő	Krisztina-berek	homokos öntésföld	öntés erdőtalaj	Kevey ined.
35	5137	Újrónafő	Császárreți-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
36	5138	Újrónafő	Császárreți-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
37	5139	Újrónafő	Császárreți-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
38	5140	Újrónafő	Császárreți-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
39	5141	Újrónafő	Császárreți-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
40	12747	Újrónafő	Császárreți-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
41	12748	Újrónafő	Császárreți-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
42	5152	Újrónafő	Kisudvari-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
43	5154	Újrónafő	Kisudvari-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
44	5155	Újrónafő	Kisudvari-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
45	5156	Újrónafő	Krisztinaberek	homokos öntésföld	öntés erdőtalaj	Kevey ined.
46	12744	Újrónafő	Kisudvari-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
47	12745	Újrónafő	Kisudvari-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
48	12746	Újrónafő	Kisudvari-erdő	homokos öntésföld	öntés erdőtalaj	Kevey ined.
49	5014	Vitnyéd	Fácános	homokos öntésföld	öntés erdőtalaj	Kevey ined.
50	5012	Vitnyéd	Fácános	homokos öntésföld	öntés erdőtalaj	Kevey ined.

4. táblázat: *Pimpinello majoris-Ulmetum* (Fertőd)
Table 4: *Pimpinello majoris-Ulmetum* (Fertőd)

4/1. táblázat		00000000011111111112222222222333333	A-D	K	K%
		12345678901234567890123456789012345			
1. Querco-Fagea					
1.1. Salicetea purpureae					
1.1.1. Salicetalia purpureae					
1.1.1.1. Salicion albae					
Cucubalus baccifer (Cn, Ulm)	C	- - - + - - - + + + + - + - - + + + + + - - + + + + - + +	+	IV	65,71
Humulus lupulus (Cn, Ata, Ai)	C	- - - + + + + - 1 + + - - + - + + - - - - - - - - - - - +	+1	III	42,85
Salix alba (Ai, Cn)	A1	- - - - - - - - - - - - - - - + - - - - - - - - - - - - - -	+	I	2,85
1.2. Alnetea glutinosae					
1.2.1. Alnetalia glutinosae					
Alnus glutinosa (Ai, Agi)	A2	- - - - - - - - - - - - - - - + - - - - - - - - - - - - - -	+	I	2,85
Dryopteris carthusiana (F, Agi, Qr, VP)	C	- + - - - - - - - -	+	I	2,85
1.3. Querco-Fagetea					
Euonymus europaeus (Qpp)	A2	- + - - - - - - - -	+	I	2,85
	B1	+ + + + + + + + + - + - - + + + + + + + - + + - + + - + + +	+	IV	80
	B2	+ + + + + - + + + + + + + + + - + + - + + - + + + + + + - -	+	V	85,71
	S	+ +	+	V	100
Geranium robertianum (Epa)	C	+ + + + + + + + 1 + + + + + 1 + + + + + + + + + + + + + + +	+1	V	100
Geum urbanum (Epa, Cp, Qpp)	C	+ + + + + + + + 1 +	+1	V	100
Quercus robur (Ai, Cp, Qpp)	A1	5 5 5 - 5 4 4 5 5 4 5 5 5 4 5 4 5 + 5 - 5 4 4 4 4 4 4 5 4 4 4 4 4 5 4	+5	V	94,28
	A2	- 1 - 2 - - - - - - -	+2	I	8,57
	B1	- - - + -	+	I	8,57
	B2	+ + - - - + + + + + + - + + + + + + + + + - + + + + + + + +	+	V	85,71
	S	5 5 5 + 5 4 4 5 5 4 5 5 5 4 5 4 5 + 5 + 5 4 4 4 4 4 4 5 4 4 4 4 4 5 4	+5	V	100
Ranunculus ficaria	C	4 4 + 1 1 1 + 1 1 + + 1 1 1 1 1 + + 2 + 1 1 + 2 2 + + + 2 2 1 + +	+4	V	100
Ulmus minor (Ai, Ulm, Qpp)	A1	- -	+	I	2,85
	A2	- 1 + 2 2 + + 1 2 2 1 2 + 1 2 1 1 1 2 + + 2 + - 2 + 1 2 1 + + +	+2	V	94,28
	B1	+ + + 1 2 1 + 1 1 2 2 1 2 1 2 2 2 1 1 1 1 1 + 2 + 1 - 1 1 + 2 + - +	+2	V	94,28
	B2	+ + + + + + + + + + 1 +	+1	V	100
	S	+ 1 1 1 3 2 1 1 2 3 3 2 3 1 2 3 2 2 2 2 1 1 1 3 1 1 + 2 1 1 2 2 1 + 1	+3	V	100

4. táblázat: *Pimpinello majoris*-*Ulmetum* (Fertőd)
Table 4: *Pimpinello majoris*-*Ulmetum* (Fertőd)

4/2. táblázat		0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 2 2 2 2 2 2 2 2 2 3 3 3 3 3 3 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5	A-D K	K%
Acer campestre (Qpp)	A1	- - - - - - - - - - + - - - - - - - - - - 1 - - - -	+1 I	5,71
	A2	- 2 1 - - 2 2 + + - 1 - 1 + 2 2 2 1 + - + 1 + 1 + + 1 2 + 2 2 2 + - 2	+2 IV	80
	B1	2 1 1 + 1 2 2 + - - 1 + 1 - 1 2 2 1 + + + + 2 + + + - 2 2 1 1 2 1 + 2	+2 V	88,57
	B2	+ + + + + + + + + - + + + + + 1 +	+1 V	97,14
	S	2 2 2 + 1 3 3 1 + - 2 + 2 + 2 3 3 2 1 + 1 1 2 1 1 1 1 3 2 2 2 3 1 + 3	+3 V	97,14
Brachypodium sylvaticum (Qpp)	C	+ + + 2 + + - + + + + + - + + + + + 1 + + + + + + + + + + + + + + + + +	+2 V	94,28
Polygonatum latifolium (Qpp)	C	+ 1 + + + 1 + + + + 1 + - + + + 1 1 + + + + + - + + + + + + + 1 + +	+1 V	94,28
Viola odorata	C	- + + + + + + + 1 + + + - + + + 1 + + + + + + + + + + 1 + + + + +	+1 V	94,28
Carex divulsula	C	+ + + - + + + + + + + - + 1 + + + - + + + + + + + + + - + - - -	+1 V	82,85
Crataegus monogyna (Qpp)	A2	- - - - - - + -	+ I	14,28
	B1	2 + - + + + + + 2 2 1 2 + 1 2 1 2 1 + + + + + + + + - + - - + 1 - - -	+2 IV	80
	B2	+ + - - - + - + + + - + + - + + + + - + - - - - - - - - - - - - - - -	+ III	42,85
	S	2 1 - + + + + + 2 2 1 2 + 1 2 1 2 1 + + + + + + + + + - + 1 - - -	+2 V	82,85
Dactylis polygama (Qpp, Cp)	C	+ + + - + + + - + + + + - + + + - + + + - + + + + + + + + + + - + - -	+ V	82,85
Ajuga reptans (MoA)	C	+ + - + + + + + - - + + + + - + + + + - + - + - + + + + + + + + + +	+ IV	80
Galeopsis pubescens (Qpp, Epa)	C	+ + + + - + + + + + - - + + + + + - + + + + + + + - + + + + + - +	+ IV	80
Lapsana communis (Qpp, GA, Epa)	C	+ - + - + + - - + + + + + + - + + - + + + - + + + + + + + + + + +	+ IV	80
Ligustrum vulgare (Cp, Qpp)	A2	- -	+ I	2,85
	B1	+ + + + - + - - 1 - + + - 2 + 1 - + + 1 + + + - + + - + + + + + + +	+2 IV	77,14
	B2	- - + + + - + - + - - - + 1 - - + + + - + + + - - - + + + + + 1 +	+1 III	57,14
	S	+ + + + + + - - 1 - + + - 2 + 2 - + 1 + + + - + + + + - + + + + + +	+2 IV	80
Cornus sanguinea (Qpp)	A2	- -	+ I	2,85
	B1	+ + + 2 + - - + - + 1 2 2 - + 1 + + 1 + - + - - - + + - + + - + - +	+2 IV	68,57
	B2	- - + + + - + + + - + + + - - - + - - - - - - - - - - - - - - - +	+ III	42,85
	S	+ + + 2 + - + + + + 1 2 2 - + 1 + + 1 + - + - - + + + + - + + - +	+2 IV	77,14
Heracleum sphondylium (Qpp, MoA)	C	+ + + - + + + - - + + + - + + + + - + - + + + + + - + + - + + + +	+ IV	77,14
Fraxinus excelsior (Qpp, TA)	A1	- - - 4 - 2 - - - - - - - - - - + 4 - - - - - 2 - - - - - - - - -	+4 II	22,85
	A2	- - - 2 - - 1 2 - 2 1 2 - - 2 2 2 2 2 - - - - - - 1 - + - - - - - 2	+2 III	42,85
	B1	1 + - 2 1 + 1 2 + 2 2 2 + 2 2 2 2 + 2 + - - - - - - - + + + + - +	+2 IV	68,57
	B2	- + - - + 1 1 1 + 1 - 1 + 1 1 + 1 1 + - - - - - 1 - - - - - + - -	+1 III	54,28
	S	1 + - 5 1 2 2 3 + 3 2 3 + 3 3 3 3 2 5 + - - - - - 2 - + + + + - 2 + 5	+5 IV	71,42

4. táblázat: *Pimpinello majoris-Ulmetum* (Fertőd)Table 4: *Pimpinello majoris-Ulmetum* (Fertőd)

4/3. táblázat		00000000011111111112222222222333333	A-D K K%
		12345678901234567890123456789012345	
Tilia cordata (Cp, Qpp)	A1	1 - + - 2 2 2 1 1 + 2 1 1 2 2 2 -	+2 III 42,85
	A2	2 3 2 - - - 2 - - - - - - - - + 1 + - - 2 3 + 2 2 2 + 1 3 3 2 2 2 1	+3 IV 62,85
	B1	+ 3 2 - - 1 1 - - - - - - - + 2 2 + - 2 2 1 2 2 2 - 1 3 + 2 2 3 3 2	+3 IV 68,57
	B2	+ + - - - + - - - - - - - - - + + - - + + + + + - + - - + + + +	+ III 51,42
	S	2 5 3 - - 1 2 - - - - - - - - + 2 2 + - 3 4 2 3 3 1 2 5 3 3 3 4 2	+5 IV 71,42
Viola suavis s.l. (Qpp)	C	+ 1 + + + - - - - - + - - + + + - + - - + + + + 1 - + - - + + + +	+1 IV 71,42
Fallopia dumetorum (Qpp, GA)	C	- + - - - + + + + + - - - + + + + + - + + + + - - - + + + + - -	+ IV 65,71
Clematis vitalba (Qpp)	A2	- - - - - - - - - + - - - - - - - - - - - - - + - - - - - + -	+ I 14,28
	B1	- - - - - - - - - + - - - - - - - - - - - - - + - - - - - - + -	+ II 28,57
	B2	+ - - - - - - + - + + + - - - - - + - + + + - - + + + - + + + +	+ III 54,28
	C	- + - - - - - - -	+ I 2,85
	S	+ - - - - - - + - + 1 + - + - - - - - + - + + + - 1 1 + + + + +	+1 III 60
Veronica sublobata	C	+ + - + + + - + 1 - - - + + - - - - - + + + + - - - - - - -	+1 III 57,14
Bromus ramosus agg. (Qpp)	C	+ + + - - - - + + + - - - + + - - + + + - - - + + + + - - -	+ III 54,28
Rhamnus catharticus (Qpp, Pru)	B1	+ + - - - - - + - + + - - 1 + - + - - - - - - - + - - - - - +	+1 III 54,28
	B2	+ + - - - - - - - + - - - - - + - - - - - - - - - - - - - +	+ II 28,57
	S	+ - - - - - - + - + + - - 1 + - + - - - - - - - + - - - - - +	+1 III 54,28
Corylus avellana (Qpp)	A2	- 1 - - - - - -	+1 I 5,71
	B1	- - - + 1 1 1 - - - - + 1 - 3 1 - - + + - - - - - - - - - - -	+3 II 31,42
	B2	- - - - - + - - - + - - - - - - - - - - - - - + - - - - - -	+ I 11,42
	S	- - - + 1 1 1 - - - + 1 - 3 1 - - + + - - - - - 1 - - - - -	+3 II 40
Fragaria vesca (Qpp, Epa)	C	+ + - + - - - + + + - - - - - - - - - - - - - + - - - - - +	+ II 40
Campanula trachelium (Epa, Cp)	C	- - - + - - - - - - + - - - - - - - - + + + - - + + - + + + +	+ II 37,14
Lonicera xylosteum (Qpp)	B1	+ + - + + + + - - - 1 - - - - + + + - - - - - - - - - - - -	+1 II 37,14
	B2	- - - + - +	+ I 11,42
	S	+ + - + + + + - - - 1 - - - - + + + - - - - - - - - - - - -	+1 II 37,14
Crataegus laevigata	A2	- + - - - - - -	+ I 2,85
	B1	- - - - - - + - - + + - - - - - - - - - - - - - + - - + + + -	+ II 31,42
	S	- - - - - - - + - + + - - - - - - - - - - - - + - + + + - + -	+ II 34,28
Scrophularia nodosa (GA, Epa)	C	+ - + - - + + - - + +	+ II 28,57
Loranthus europaeus	A1	- - - - - + - + + + - - - - - + + + - - - - - - - - - - - -	+ II 25,71
Melica uniflora (Cp, Qpp)	C	- - - - - - - - - - - - - + + + - - - - - - - + - - - - - + +	+ II 25,71

4. táblázat: *Pimpinello majoris*-*Ulmetum* (Fertőd)
Table 4: *Pimpinello majoris*-*Ulmetum* (Fertőd)

4/4. táblázat		000000000111111111112222222222333333	A-D	K%
		12345678901234567890123456789012345		
Viola mirabilis (F, Qpp)	C	- - - - - + - - - - - - - - - - + - - - - + - - - - +	+ II	25,71
Veronica chamaedrys (Qpp, Ara)	C	- - - - - + - - - - - + + - + - - - - - - - - - - -	+ I	20
Poa nemoralis (Qpp)	C	- + - - - - - - - - - - - - - - + - - - - + + - - -	+ I	17,14
Mycelis muralis	C	- - - + - - - - - - - - - - - - - - - - - - + - + -	+ I	11,42
Staphylea pinnata (Cp, TA)	B1	- + - - - + -	+ I	8,57
	B2	- + -	+ I	5,71
	S	- + - - - +	+ I	8,57
Symphytum tuberosum (Cp, Qpp)	C	+ -	+ I	5,71
Primula veris (Qpp, Ara)	C	- - - - - - - - - - - - - - - - + - - - - - - - - -	+ I	2,85
Vicia dumetorum (Qpp)	C	- + - - - - -	+ I	2,85
1.3.1. Fagetalia sylvaticae				
Allium ursinum	C	1 + 1 1 5 5 5 4 4 5 5 5 5 5 5 5 5 5 5 4 5 5 5 5 4 4 5 5 5 5 5 5 5	+5 V	100
Arum maculatum	C	+ + + + 1 1 1 1 1 1 + + 1 1 2 + 1 + + + + 1 + + + + + + + + + +	+2 V	100
Hedera helix	A1	- + + - - + - - - - - + - - + - - + + 1 + - - - - + - - - -	+1 III	48,57
	A2	+ 2 + - - + 1 + - - 1 2 1 - 1 2 2 2 1 2 1 + 1 + - - - - + 2 + +	+2 IV	77,14
	B1	+ 1 + - 1 + - + - - + 1 + - + 1 2 + 1 1 + - + 1 1 1 - - + 1 + 1 1 +	+2 IV	77,14
	B2	4 5 1 5 3 3 2 5 + 1 1 1 1 3 2 4 5 3 2 4 2 2 1 1 2 2 + 2 4 1 3 4 4 2	+5 V	100
	S	4 5 2 5 3 3 2 5 + 1 2 2 2 1 3 3 5 5 4 2 5 2 2 2 2 2 + 2 4 1 4 4 4 2	+5 V	100
Circaea lutetiana (Ai)	C	+ + + + 1 1 1 + 1 1 1 - 1 1 1 1 + + + 1 + + + + + + + + + +	+1 V	97,14
Galium odoratum	C	+ + 5 2 + + 1 1 1 1 1 + 1 1 2 2 1 + + 1 - 1 2 1 1 + + + 1 2 2 + 1 2 +	+5 V	97,14
Stachys sylvatica (Epa)	C	+ + 1 3 + 1 2 2 1 1 1 2 2 1 1 1 2 1 + 2 + 2 + 1 1 - + 1 2 1 + 1 2 + +	+3 V	97,14
Carex sylvatica	C	+ + + + + 1 + - + + + + + 1 1 + 1 + + + + + - + + + + + + + +	+1 V	94,28
Pulmonaria officinalis	C	+ + + + + + + + + + 1 1 + + + 1 1 + + + + + + - + + + + 1 + -	+1 V	94,28
Adoxa moschatellina (Ai)	C	+ 2 + - + + + 2 1 1 + 1 1 + 1 - + 1 - + 1 + + + 1 + + + + 2	+2 V	88,57
Polygonatum multiflorum (QFt)	C	+ + + + + + + + + 1 + + 1 + + + + - - + + + - + - - + + + + +	+1 V	88,57
Scilla vindobonensis (Ai, Cp)	C	+ + + + + - - - + 1 + + + + 1 - - - + + + + + + + + + + 1 + +	+1 V	85,71
Gagea lutea (Ai, Cp)	C	+ + + + + - - 1 1 + + 1 + + - - - + - + 1 + + + + + + + +	+1 V	82,85
Milium effusum	C	+ 1 1 - - + + + 1 + + + + + - - - + + + + + + - + + + +	+1 V	82,85
Corydalis cava	C	1 4 + - + 1 + + 1 1 + 1 + 1 + 1 + - 2 + - + 2 2 + + + - + - -	+4 IV	80

4. táblázat: *Pimpinello majoris-Ulmetum* (Fertőd)Table 4: *Pimpinello majoris-Ulmetum* (Fertőd)

4/5. táblázat	00000000011111111112222222222333333	A-D	K	K%
	12345678901234567890123456789012345			
Cerasus avium (Cp)	A1 + - - - - - - - - - - + - - - - - 1 1 1 1 - - - + 1 1 - - +	+1	II	34,28
	A2 + - 1 - + - + - + 1 1 2 1 - 1 1 - - - 1 - 1 + 1 - - - + - - + -	+2	III	54,28
	B1 - - + - - - - - + + - + - + - - - - + + + - - + - 1 + + -	+1	III	48,57
	B2 + - + - - - - + + - + - + - - - + - + + + - - + + + + + +	+	IV	62,85
	S 1 - 1 + + - + - + 1 1 2 1 + 1 1 + - - 1 - 2 1 2 1 - - + 1 1 2 + 1 1 +	+2	IV	77,14
Moehringia trinervia	C + + + - + - + - + - + - - + - + - + + + + - + - + + - + + +	+	IV	65,71
Carpinus betulus (Cp)	A2 - - + - + - - - - - - + - - - - + - - - + + - - + + - - -	+	II	31,42
	B1 + - - + + - - - + - + + + + + - - + - - + - - - - - - - -	+	III	45,71
	B2 - - - - - - - - + - - - - - - - - + - - - - - + - - - - -	+	I	17,14
	S + + + - + + - - - + - + + + + + - - - 1 + + - - 1 + - - -	+1	IV	62,85
Anemone ranunculoides	C + + + - + - + - - - - - - + - + - + 1 - + + 1 + + 1 - + + +	+1	III	60
Acer platanoides (TA)	A1 - - - - + - - - - - - - - - - - - - - - - - 1 - - - - 2	+2	I	8,57
	A2 - - + - - 1 + - - - - - - - + + - 2 - + - - - 2 + + - - 2	+2	II	34,28
	B1 - - - - - + - + - - - - - - + + - + - - + 1 - - - - +	+1	II	31,42
	B2 + + - - - + + - - - - - - + + - + - - + - - + + - - + - +	+	III	45,71
	S + + + - + 1 1 - + - - - - - + 1 + - 2 - 1 - + + + 2 + + - + 3	+3	III	57,14
Viola reichenbachiana	C + - + - + - + - - - - - - + + - + - - - + + + + 1 + +	+1	III	54,28
Corydalis pumila (Cp, Qpp)	C + - - - - + + + - - + - + - - - + - - 1 - - - - - - -	+1	II	34,28
Galeobdolon luteum	C - - - - - - - 2 - 1 3 - + - - - - - - + 3 + - 2 2 1 - - + - 2	+3	II	34,28
Sanicula europaea	C - + + - - - - + - 1 - - - - - - 1 - - - - - - + + + + -	+1	II	25,71
Ulmus glabra (TA)	A1 -	+	I	2,85
	A2 - - - - - + - - - - - - - - - - - - - - - 2 - - + - - + -	+2	I	14,28
	B1 - - + - 1 - + - +	+1	I	14,28
	B2 - - + - + - - - +	+	I	14,28
	S - - + - 1 + - - - - - - - - - - - - - - - 2 - - + - - + 1	+2	II	25,71
Ribes uva-crispa (Ai, TA, Pru)	A2 - + - - - - -	+	I	2,85
	B1 - - - + + - - - - - - + - - + - - - - - - - - - - - -	+	I	17,14
	S - - - + + - - - - - - + - - + - - - - - - + - - - - -	+	I	20
Acer pseudo-platanus (TA)	A2 - - - - + - - - - - - - - - - - - - - - 1 - - - - -	+1	I	5,71
	B1 - + - - - - - - - - + - - - + - - - - - - + - - - - -	+	I	11,42
	B2 - - - - - - - - - - - - - - - + - - - - - - - - - - -	+	I	2,85
	S - + - - + - - - - - - + - - - + - - - - - - 1 - - - - -	+1	I	14,28

4. táblázat: *Pimpinello majoris-Ulmetum* (Fertőd)
Table 4: *Pimpinello majoris-Ulmetum* (Fertőd)

4/6. táblázat	00000000011111111112222222222333333	A-D	K	K%
	12345678901234567890123456789012345			
Galeopsis speciosa (Epn, Ai)	C - - - - - + - - - - - + - - - - - + - - - - -	+	I	11,42
Omphalodes scorpioides (TA)	C - - - - - - - - - - - + - - - - - + - - - - -	+	I	11,42
Asarum europaeum	C - + - - - - - - - - - - - - - - - + - - - - -	+	I	5,71
Athyrium filix-femina (Qr, VP)	C - - - - - - - - - - - - + - + - - - - - -	+	I	5,71
Dryopteris filix-mas s.str.	C - + - - - - - - - - - - - - - - - + - - - - -	+	I	5,71
Listera ovata (Ata, Ai)	C - - + - - - - - - - - + - - - - - - - - - -	+	I	5,71
Vinca minor (Cp)	C - - - - - - - - - - - - - 2 - - - - - + - - -	+2	I	5,71
Aegopodium podagraria (Ai, Cp)	C - - - - - - - - - - - - - - - + - - - - -	+	I	2,85
Carex digitata (Cp)	C - - - - - - - - - - + - - - - - - - - - -	+	I	2,85
1.3.1.1. Alnion incanae				
Rumex sanguineus (Epa, Pna)	C + + - - + + + + + + + + + + + - - + + + + + + + +	+	IV	80
Padus avium	A2 - - - 2 3 + 1 + - + - - - - - - 2 3 1 - - - - - 1 - - - - -	+3	II	28,57
	B1 + + - 3 3 2 2 3 - 1 - + 1 - 1 - - 2 4 2 + - - - - - - + - - -	+4	III	45,71
	B2 - - - 1 1 + 1 1 - + + - - + - - - + 1 + - - - - - + - - - - -	+1	II	34,28
	S + + - 4 5 2 2 3 - 1 - + 1 - 1 - - 3 5 2 + - - - - - 1 - - - - + - -	+5	III	48,57
Elymus caninus (Pna, Qpp)	C + + + - - - - + + + + + + - + + + + - - + - - - - - -	+	III	42,85
Ribes rubrum	B1 - - + + + + - - + + - + - + - - + - - - - - - - + -	+	II	34,28
	B2 - - + + - + + - - + - + - + + - - - - - - - - - - -	+	II	25,71
	S - - + + + + - - + + - + + + - - + - - - - - - - + -	+	II	37,14
Festuca gigantea (Cn, Epa)	C - - - + - + - + + - + + - + - - - - - - - - - - + -	+	II	28,57
Viburnum opulus (Ata)	B1 - - + + + - + - - + - - - - - + 1 - + - - - - - - - -	+1	II	22,85
	B2 - - + + - - - - - + - - - - - + + - - - - - - - - -	+	I	17,14
	S - - + + + - + - - + - + - - - + 1 - + - - - - - - - -	+1	II	25,71
Ulmus laevis (Sal, Ulm)	A1 - 1 - - -	1	I	2,85
	A2 - - - - - - - - - - - + - - - - - + - - - - - 2 + -	+2	I	11,42
	B1 - - - - - - - - - - - + - - - - - - - - - - - 1 -	+1	I	5,71
	B2 - + -	+	I	2,85
	S - - - - - - - - - - - + - - - - - + - - - - - 2 + -	+2	I	11,42
Populus alba (Sal, AQ)	A1 - - - 2 - - - - - - - - - - 1 - - - - - - - - - -	1-2	I	5,71
	B1 - - - + - - - - - - - - - - + - - - - - - - - - -	+	I	5,71
	B2 - - - - - - - - - - - - - - - + - - - - - - - - - -	+	I	2,85
	S - - - 2 - - - - - - - - - - 1 - - - - - - - - - -	1-2	I	5,71

Table 4: *Pimpinello majoris*-*Ulmetum* (Fertőd)

4/8. táblázat		000000000111111111112222222222333333	A-D	K	K%
		12345678901234567890123456789012345			
<i>Phytolacca alba</i> (Ulm)	C	- - - - - - - - - + + - - - - - - - - -	+	I	5,71
<i>Allium oleraceum</i> (Fru)	C	- - - - - - - - - + - - - - - - - - -	+	I	2,85
<i>Buglossoides purpureo-coerulea</i> (OCn, A)	C	- - - - - - - - - - + - - - - - - - -	+	I	2,85
<i>Calamintha menthifolia</i>	C	- - - - - - - - - - - - - - + - - - -	+	I	2,85
2. Cypero-Phragmitetea					
2.1. Phragmitetea					
<i>Eupatorium cannabinum</i> (Epa, Sal, Ata,)	C	- - - + - - - - - - - + - - + + - - - - + - - - -	+	II	22,85
<i>Lycopus europaeus</i> (Moa, Cn, Bia, Spu, F)	C	- - - - - - - - - + + - - - - - - - - -	+	I	5,71
<i>Carex acutiformis</i> (Mag, Cgr, Moa, Sal, A)	C	- - - - - - - - - - - - - - + - - - -	+	I	2,85
<i>Phalaris arundinacea</i> (Des)	C	- - - - - - - - - - - - - - + - - - -	+	I	2,85
3. Molinio-Arrhenathera					
3.1. Molinio-Juncetalia					
<i>Symphytum officinale</i> (Pte, Cn, Spu, Ata,)	C	- - - - - - - - - - - - - - + + - + - - - - -	+	I	8,57
<i>Deschampsia caespitosa</i> (Des, Sal, Ata, C)	C	- - - + - - - - - - - - - - - - - - - - - - -	+	I	5,71
3.1.1. Molinietales coeruleae					
<i>Angelica sylvestris</i> (Mag, Ata, Ai)	C	- - - - - - - - - + + - + - - + + - - - - -	+	I	14,28
4. Chenopodio-Scleranthia					
<i>Lactuca serriola</i>	C	- - - - - - - - - - - - - - + - - - - - - - -	+	I	2,85
4.1. Chenopodietea					
<i>Arctium minus</i> (Arc, Bia, Pla)	C	- - - + - - - - - + - - + - - - - - - - - - -	+	II	22,85
<i>Ballota nigra</i> (Arc)	C	- - - - - - - - - - - - - - + - - - - - - - -	+	I	2,85
4.2. Galio-Urticetalia					
4.2.1. Calystegietalia sepium					
4.2.1.1. Galio-Alliarion					
<i>Chaerophyllum temulum</i>	C	- - - - - + + + - - + + + + + 1 + + - - - + + + + - - + - -	+1	IV	62,85
<i>Alliaria petiolata</i> (Epa)	C	+ - + - - - - - 1 + + - - - + + + - - + + + - - - - -	+1	III	45,71
<i>Parietaria officinalis</i> (Cn, TA)	C	+ + - - + 1 + - - - - - + - - - - - - - - 1 - - - - -	+1	II	28,57
4.2.1.2. Calystegion sepium					
<i>Lamium maculatum</i> (Pna, Agi, TA)	C	+ + + - + 1 1 2 + 2 1 2 + + 1 1 + - 1 + 1 + 1 + + + + 1 1 + + +	+2	V	94,28
<i>Myosoton aquaticum</i> (Pte, Spu, Ata, Ai)	C	- - - - - - - + - - - - - + - - - - - - - - -	+	I	5,71
<i>Calystegia sepium</i> (Pte, Bia, Pla, Spu, At)	C	- - - - - - - - - - - - - - + - - - - - - - -	+	I	2,85

4. táblázat: *Pimpinello majoris-Ulmetum* (Fertőd)Table 4: *Pimpinello majoris-Ulmetum* (Fertőd)

4/9. táblázat	000000000111111111122222222233333333	A-D	K	K%
	12345678901234567890123456789012345			
5. Indifferens				
<i>Sambucus nigra</i> (Epa, SaS, QFt)	A2 - 2 - - - - - - - -	2	I	2,85
	B1 + + + + 2 2 2 2 4 1 - 2 2 3 2 2 2 2 1 1 2 2 + 1 1 1 - 2 + + 1 2 - 1 +	+4	V	91,42
	B2 + - + + + + + + + - - + + 1 + + 1 - + + + + + + + + + + + + + + +	+1	V	85,71
	S + + + + 2 2 2 2 4 1 - 2 2 3 2 2 2 2 1 1 2 2 + 1 1 1 2 2 + + 1 2 + 1 +	+4	V	97,14
<i>Rubus caesius</i> (Spu)	B2 + + - 2 + + + + + + + + + + + + + + 1 1 + - + + - + 2 + + + - 1 +	+2	V	85,71
<i>Urtica dioica</i> (Arc, GA, Epa, Spu)	C + - + - + + 1 + 1 + 1 + - + + + 1 + - + 1 + 1 1 - + 1 + + + + + + +	+1	V	85,71
<i>Glechoma hederacea</i> (MoA, QFt, Sal, Ai)	C + + + + + + + + + - + + - + - + + + + + + + + - - + + - + + +	+	IV	77,14
<i>Galium aparine</i> (Sea, Epa, QFt)	C + + + - + + + - + + + - + + + + + + + + - - + + + + + - - + - +	+	IV	71,42
<i>Ornithogalum umbellatum</i> (Ara, FBT, Sez)	C - - - + - - - - + + + - + + + + + + - + - - - - - - - - - + - - -	+	II	37,14
<i>Ornithogalum boucheanum</i> (Sea, Arc, Qi)	C + + - + - - - - - - - - - + - - - - - - - - - + - - - - - - - -	+	I	14,28
<i>Allium scorodoprasum</i> (Qpp, Sea, Che)	C - - - - - - - + - - - + - - - + - - - - - - - - - - - - - - - +	+	I	11,42
<i>Stellaria media</i> (ChS, QFt, Spu)	C - - - - - - - + 1 - - + + - - - - - - - - - - - - - - - - - -	+1	I	11,42
<i>Torilis japonica</i> (Arc, GA, Epa, QFt)	C - + - - - - - + + + - - -	+	I	11,42
<i>Chelidonium majus</i> (Che, Arc, GA, Epa)	C - - - - - + - - - - - - - - - - - - - - - + - - - - - - - - -	+	I	5,71
<i>Equisetum arvense</i> (MoA, Sea, Sal, Ata, /)	C - - - - - - - - - - - - - - - - + + - - - - - - - - - - - - -	+	I	5,71
<i>Lysimachia vulgaris</i> (Ai, Pte, SCn, Moa, S)	C - - - - + - - - - - - - - - - - + - - - - - - - - - - - - -	+	I	5,71
<i>Rubus fruticosus</i> agg. (QFt, Epa, SaS)	B2 - + + - - - - - - -	+	I	5,71
<i>Taraxacum officinale</i> agg. (MoA, ChS)	C - - - - - - - - - - - - - - - - + - - - - - - - - - - - - -	+	I	2,85
6. Adventiva				
<i>Parthenocissus inserta</i>	A2 - + - - + - + - - - - + - + - - - - - - - - - + - - - - - -	+	II	22,85
	B1 - + - - + - + - - - + + + + + - - - - - - - + - - - - - - -	+	II	31,42
	B2 + 2 - + + + 1 1 - + + + 1 - + 1 - 1 1 + + + - + + - 2 - + + - + -	+2	IV	71,42
	S + 2 - + 1 + 1 1 - + + + 1 - 1 1 + 1 1 + + + - + + - 2 - + + - + -	+2	IV	74,28
<i>Robinia pseudo-acacia</i>	A1 - - - - - - - - + - - - - - - - - + - - - - - - + - - - - -	+	I	8,57
	A2 - - - - - - + -	+	I	5,71
	B1 - + - - - + - + + - - - - - - - - - - - - - + + - - - - - +	+	I	20
	B2 - - - - - - - - + - - - - - - - - - - - - + - - - - - - - +	+	I	8,57
	S - + - - - + + + 1 - - - - - - - + - - - - - + + + - - - + -	+1	II	31,42
<i>Aesculus hippocastanum</i>	A2 - - - - - - - - - - + - - - - - - - - - - - - - - - - - -	+	I	5,71
	B2 - - - - - - - - - - - - - - - - + + - + - + + - - - - + - +	+	II	22,85
	S - - - - - - - - - - + - - - - - + - + - + - + + - - - - + - +	+	II	28,57

4. táblázat: *Pimpinello majoris*-*Ulmetum* (Fertőd)

Table 4: *Pimpinello majoris*-*Ulmetum* (Fertőd)

4/10. táblázat		000000000011111111112222222222333333	A-D	K	K%
		12345678901234567890123456789012345			
Acer negundo	A2	- - - 1 1 1 + - - - - - - - - + - - - - + + - - - -	+1	II	22,85
	B1	- + - - 1 2 - - - - - - - - - 2 - - - - - - - - - -	+2	I	11,4
	B2	- - - + + + + -	+	I	11,42
	S	- + - - 1 2 2 + - - - - - - - - + - 2 - - - - + + - - -	+2	II	25,71
Celtis occidentalis	A2	- - - - - - + - - - + - - - - - - - - - - - - - - - -	+	I	5,71
	B1	- + - - - - -	+	I	5,71
	S	- - - - - - + - - - + - - - - - - + - - - + - - - - -	+	I	11,42
Juglans regia	B1	- + - + - - - - - - - + - - - - - - - - - + - - - -	+	I	11,42
Juglans nigra	A1	- - - + + - - - - - - - - - - - + - - - - - - - - -	+	I	8,57
	A2	- - - - - - - - - - - - - - - - - + - - - - - - - - -	+	I	2,85
	B1	- - - + + - - - - - - - - - - - - - - - + - - - - -	+	I	8,57
	B2	- - - + + -	+	I	5,71
	S	- - - 1 1 - - - - - - - - - - - 1 - - - - - - - - -	1	I	8,57
Ailanthus altissima	B1	- - - - - - - - - - - - - - - - - + - - - - - - - -	+	I	2,85
	B2	- - - - - - - - - - - - - - - - - + - + - - - - - -	+	I	5,71
	S	- - - - - - - - - - - - - - - - - + - + - - - - - -	+	I	5,71
Aesculus hippocastanum	A2	- - - + -	+	I	2,85

5. táblázat: Felvételi adatok I. (Fertőd)

Table 5: Data of the relevés I. (Fertőd)

[illegible]

5. táblázat: Felvételi adatok I. (Fertőd)
Table 5: Data of the relevés I. (Fertőd)

	31	32	33	34	35
Kvadrát felvételi sorszáma	5126	5129	5120	5121	5118
Felvételi évszám 1.	1986	1986	1986	1986	1986
Felvételi időpont 1.	04.24	04.22	04.22	04.22	04.22
Felvételi évszám 2.	1986	1986	1986	1986	1986
Felvételi időpont 2.	07.25	07.25	07.25	07.25	07.25
Tengerszint feletti magasság	136	134	132	137	137
Kitettség	-	-	-	-	-
Lejtőszög (fok)	0	0	0	0	0
Felső lombkoronaszint borítása (%)	80	75	75	85	70
Felső lombkoronaszint magassága (m)	25	28	28	28	26
Átlagos törzsátmérő (cm)	45	50	50	50	50
Alsó lombkoronaszint borítása (%)	40	35	35	30	40
Alsó lombkoronaszint magassága (m)	18	16	18	16	18
Cserjeszint borítása (%)	45	55	40	35	25
Cserjeszint magassága (m)	2,5	3,5	1,5	2	2
Újulat borítása (%)	5	60	70	75	50
Gyepszint borítása (%)	100	100	100	100	100
Felvételi terület nagysága (m ²)	1600	1600	1600	1600	1600

6. táblázat: Felvételi adatok II. (Fertőd)

Table 6. Data of the relevés II. (Fertőd)

Kvadrát	Felvételi sorszám	Település	Dűlő	Alapkőzet	Talajtípus	Felvételt készítő
1	18119	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
2	5074	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
3	5134	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
4	5135	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
5	5077	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
6	5078	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
7	5079	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
8	5080	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
9	5081	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
10	5082	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
11	5083	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
12	5084	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
13	5085	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
14	5086	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
15	5087	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
16	5088	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
17	5089	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
18	5090	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
19	5091	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
20	5092	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
21	5132	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
22	5096	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
23	5124	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
24	5127	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
25	5128	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
26	5131	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
27	5133	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
28	5136	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
29	5119	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
30	5113	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
31	5126	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
32	5129	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
33	5120	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
34	5121	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.
35	5118	Fertőd	Lés-erdő	öntésföld	öntés erdőtalaj	Kevey ined.

7. táblázat: Karakterfajok aránya
Table 7. Percentage of characteristic species

	Csoportrészesedés		Csoporttömeg	
	Hanság	Fertőd	Hanság	Fertőd
Quercus-Fagea	0,00	0,00	0,00	0,00
Salicetea purpureae	0,00	0,00	0,00	0,00
Salicetalia purpureae	1,50	0,78	0,65	0,22
Salicion albae	2,12	0,99	1,54	0,18
Populion nigro-albae	0,05	1,04	0,00	0,24
Salicion albae s.l.	2,17	2,03	1,54	0,42
Salicetalia purpureae s.l.	3,67	2,81	2,19	0,64
Salicetea purpureae s.l.	3,67	2,81	2,19	0,64
Alnetea glutinosae	0,00	0,00	0,00	0,00
Alnetalia glutinosae	2,07	0,62	0,26	0,07
Alnetea glutinosae s.l.	2,07	0,62	0,26	0,07
Quercus-Fagetea	19,28	22,19	32,71	16,51
Fagetalia sylvaticae	11,06	23,30	9,79	40,95
Alnion incanae	8,12	6,19	6,21	9,49
Alnion glutinosae-incanae	0,31	0,41	0,12	0,18
Ulmion	1,45	0,86	1,08	0,95
Alnion incanae s.l.	9,88	7,46	7,41	10,62
Fagion sylvaticae	0,00	0,00	0,00	0,00
Eu-Fagenion	0,05	0,00	0,00	0,00
Carpinion betuli	3,21	4,90	2,71	7,79
Tilio-Acerenion	1,63	2,54	7,98	3,88
Fagion sylvaticae s.l.	4,89	7,44	10,69	11,67
Aremonio-Fagion	0,00	0,44	0,00	0,04
Fagetalia sylvaticae s.l.	25,83	38,64	27,89	63,28
Quercetalia roboris	0,56	0,21	0,36	0,04
Quercion robori-petraeae	0,06	0,00	0,01	0,00
Quercetalia roboris s.l.	0,62	0,21	0,37	0,04
Quercus-Fagetea s.l.	45,73	61,04	60,97	79,83
Quercetea pubescentis-petraeae	20,90	13,67	28,82	13,18
Orno-Cotinetalia	0,00	0,00	0,00	0,00
Orno-Cotinion	0,98	0,59	1,03	0,07
Orno-Cotinetalia s.l.	0,98	0,59	1,03	0,07
Quercetalia cerridis	0,81	0,14	0,43	0,03
Aceri tatarici-Quercion	0,77	0,05	1,53	0,05
Quercetalia cerridis s.l.	1,58	0,19	1,96	0,08
Prunetalia spinosae	1,91	0,59	0,22	0,07
Berberidion	0,20	0,00	0,21	0,00
Prunion fruticosae	0,82	0,22	0,12	0,03
Prunetalia spinosae s.l.	2,93	0,81	0,55	0,10
Quercetea pubescentis-petraeae s.l.	26,39	15,26	32,36	13,43
Quercus-Fagea s.l.	77,86	79,73	95,78	93,97
Abieti-Picea	0,10	0,00	0,03	0,00
Vaccinio-Piceetea	0,01	0,03	0,00	0,00
Pino-Quercetalia	0,00	0,00	0,00	0,00
Pino-Quercion	0,22	0,17	0,11	0,04
Pino-Quercetalia s.l.	0,22	0,17	0,11	0,04
Vaccinio-Piceetea s.l.	0,23	0,20	0,11	0,04
Abieti-Picea s.l.	0,33	0,20	0,14	0,04
Cypero-Phragmiteta	0,00	0,00	0,00	0,00
Phragmiteta	0,39	0,18	0,04	0,02
Nasturtio-Glycerietalia	0,00	0,00	0,00	0,00
Glycerio-Sparganion	0,01	0,00	0,00	0,00
Nasturtio-Glycerietalia s.l.	0,01	0,00	0,00	0,00
Magnocaricetalia	0,00	0,00	0,00	0,00
Magnocaricion	0,14	0,07	0,01	0,01
Caricion gracilis	0,10	0,01	0,01	0,00

7. táblázat: Karakterfajok aránya (folytatása)
Table 7. Percentage of characteristic species (continuation)

	Csoportrészesedés		Csoporttömeg	
	Hanság	Fertőd	Hanság	Fertőd
Magnocaricion s.l.	0,24	0,08	0,02	0,01
Magnocaricetalia s.l.	0,24	0,08	0,02	0,01
Phragmitetea s.l.	0,64	0,26	0,06	0,03
Cypero-Phragmitetea s.l.	0,64	0,26	0,06	0,03
Oxycocco-Caricea nigrae	0,00	0,00	0,00	0,00
Scheuchzerio-Caricetea nigrae	0,00	0,00	0,00	0,00
Scheuchzerio-Caricetalia nigrae	0,01	0,02	0,00	0,00
Scheuchzerio-Caricetea nigrae s.l.	0,01	0,02	0,00	0,00
Oxycocco-Caricea nigrae s.l.	0,01	0,02	0,00	0,00
Molinio-Arrhenathera	1,12	1,34	0,33	0,12
Molinio-Juncetea	0,29	0,05	0,03	0,00
Molinietales coeruleae	0,68	0,07	0,27	0,01
Deschampsia caespitosa	0,08	0,04	0,01	0,00
Filipendulo-Cirsium oleracei	0,01	0,00	0,00	0,00
Molinietales coeruleae s.l.	0,77	0,11	0,28	0,01
Molinio-Juncetea s.l.	1,06	0,16	0,31	0,01
Arrhenatheretea	0,00	0,00	0,00	0,00
Arrhenatheretalia	0,52	0,27	0,07	0,02
Arrhenatherion elatioris	0,01	0,00	0,00	0,00
Arrhenatheretalia s.l.	0,53	0,27	0,00	0,00
Arrhenatheretea s.l.	0,53	0,27	0,07	0,02
Nardo-Callunetea	0,00	0,00	0,00	0,00
Nardetalia	0,00	0,00	0,00	0,00
Nardo-Agrostion tenuis	0,01	0,00	0,00	0,00
Nardetalia s.l.	0,01	0,00	0,00	0,00
Nardo-Callunetea s.l.	0,01	0,00	0,00	0,00
Calluno-Ulicetea	0,00	0,00	0,00	0,00
Vaccinio-Genistetalia	0,00	0,00	0,00	0,00
Calluno-Genistion	0,10	0,00	0,03	0,00
Vaccinio-Genistetalia s.l.	0,10	0,00	0,03	0,00
Calluno-Ulicetea s.l.	0,10	0,00	0,03	0,00
Molinio-Arrhenathera s.l.	2,82	1,77	0,74	0,15
Puccinellio-Salicornia	0,00	0,00	0,00	0,00
Festuco-Puccinellietea	0,00	0,00	0,00	0,00
Festuco-Puccinellietalia	0,01	0,00	0,00	0,00
Festuco-Puccinellietea s.l.	0,01	0,00	0,00	0,00
Puccinellio-Salicornia s.l.	0,01	0,00	0,00	0,00
Festuco-Bromea	0,01	0,00	0,00	0,00
Festucetea vaginatae	0,00	0,00	0,05	0,01
Festucetalia vaginatae	0,00	0,00	0,02	0,00
Festucion vaginatae	0,01	0,00	0,02	0,00
Festucetalia vaginatae s.l.	0,01	0,00	0,04	0,00
Festucetea vaginatae s.l.	0,01	0,00	0,09	0,01
Festuco-Bromea	0,40	0,15	0,09	0,01
Festucetalia valesiacae	0,21	0,05	0,00	0,00
Festucion rupicolae	0,21	0,02	0,00	0,00
Festucetalia valesiacae s.l.	0,42	0,07	0,00	0,00
Festuco-Bromea s.l.	0,82	0,22	0,00	0,00
Festuco-Bromea s.l.	0,84	0,22	0,00	0,00
Chenopodio-Scleranthia	0,15	0,11	0,01	0,01
Secalietea	0,80	0,56	0,09	0,05
Chenopodietea	0,90	0,18	0,09	0,02
Artemisietea	0,00	0,00	0,00	0,00
Artemisietalia	0,00	0,00	0,00	0,00
Arction lappae	1,03	0,50	0,11	0,08
Artemisietalia s.l.	1,03	0,50	0,11	0,08

7. táblázat: Karakterfajok aránya (folytatása)
Table 7. Percentage of characteristic species (continuation)

	Csoportrészesedés		Csoporttömeg	
	Hanság	Fertőd	Hanság	Fertőd
Artemisieta s.l.	1,03	0,50	0,11	0,08
Galio-Urticetea	0,00	0,00	0,00	0,00
Calystegietalia sepium	0,00	0,00	0,00	0,00
Galio-Alliarion	2,24	2,70	0,32	0,31
Calystegion sepium	1,26	1,29	0,13	0,28
Calystegietalia sepium s.l.	3,50	3,99	0,45	0,59
Galio-Urticetea s.l.	3,50	3,99	0,45	0,59
Bidentetea	0,00	0,00	0,00	0,00
Bidentetalia	0,53	0,12	0,05	0,01
Bidention tripartiti	0,01	0,00	0,00	0,00
Bidentetalia s.l.	0,54	0,12	0,00	0,00
Bidentetea s.l.	0,54	0,12	0,05	0,01
Plantaginetea	0,00	0,00	0,00	0,00
Plantaginetalia majoris	0,42	0,10	0,00	0,00
Agropyro-Rumicion crispi	0,01	0,00	0,00	0,00
Plantaginetalia majoris s.l.	0,43	0,10	0,04	0,01
Plantaginetea s.l.	0,43	0,10	0,04	0,01
Epilobietea angustifolii	0,00	0,00	0,00	0,00
Epilobietalia	3,37	5,36	0,68	2,02
Epilobion angustifolii	0,06	0,06	0,01	0,01
Epilobietalia s.l.	3,43	5,42	0,69	2,03
Epilobietea angustifolii s.l.	3,43	5,42	0,69	2,03
Urtico-Sambucetea	0,00	0,00	0,00	0,00
Sambucetalia	0,00	0,00	0,00	0,00
Sambuco-Salicion capreae	0,41	0,42	0,27	0,71
Sambucetalia s.l.	0,41	0,42	0,27	0,71
Urtico-Sambucetea s.l.	0,41	0,42	0,27	0,71
Chenopodio-Scleranthea s.l.	11,19	11,40	1,80	3,51
Indifferens	2,85	2,32	0,94	1,06
Adventiva	2,30	3,23	0,30	1,12

8. táblázat: Szociális magatartási típusok aránya
Table 8: Percentage of social behaviour types (SBT)

	Csoportrészesedés		Csoporttömeg	
	Hanság	Fertőd	Hanság	Fertőd
S 6	10,16	6,41	6,66	4,80
Su 10	0,00	0,00	0,00	0,00
Sr 8	0,00	0,00	0,00	0,00
C 5	12,69	13,24	42,43	53,37
Cu 9	0,00	0,00	0,00	0,00
Cr 7	0,00	0,00	0,00	0,00
G 4	49,75	51,48	45,54	34,46
Gu 8	0,00	0,00	0,00	0,00
Gr 6	0,00	0,00	0,00	0,00
NP 3	0,00	0,00	0,00	0,00
DT 2	21,50	22,65	4,69	5,96
W 1	3,49	2,86	0,36	0,27
I -1	0,69	1,01	0,10	0,15
A -1	0,00	1,20	0,00	0,50
RC -2	0,04	0,05	0,00	0,00
AC -3	1,57	1,01	0,20	0,48
Ign	0,08	0,09	0,02	0,01
Val	3,65	3,54	4,43	4,44

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Hidden treasures of the Caribbean: two new genera and one new species of Lesser Antillean ischnocoline spiders (Araneae: Theraphosidae)

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Abstract: The new genus *Caribothele* **gen. nov.** is described to house its type species *Caribothele culebrae* (Petrunkévitch, 1929) **comb. nov.**, from Puerto Rico, transferred from *Holothele* Karsch, 1879. Another new genus, *Encantarana* **gen. nov.** is described to house *Encantarana hamiltoni* **gen. et sp. nov.** based on both sexes, also from Puerto Rico, and is presently monotypic. Four other species misplaced in *Holothele* Karsch, 1879 are transferred to *Caribothele* **gen. nov.**, creating the following new combinations: *Caribothele denticulata* (Franganillo, 1930) **comb. nov.**, *Caribothele maddeni* (Esposito & Agnarsson, 2014) **comb. nov.**, *Caribothele shoemakeri* (Petrunkévitch, 1926) **comb. nov.**, and *Caribothele sulfurensis* (Maréchal, 2005) **comb. nov.**

Keywords: Lesser Antilles, morphology, spider, taxonomy

Introduction

The subfamily Ischnocolinae Simon, 1892 currently contains 17 genera, namely: *Acanthopelma* F. O. Pickard-Cambridge, 1897 (2 species), *Catumiri* Guadanucci, 2004 (5 species), *Chaetopelma* Ausserer, 1871 (8 species), *Cyrtogrammomma* Pocock, 1895

(3 species), *Dolichothele* Mello-Leitão, 1923 (10 species), *Heterothele* Karsch, 1879 (9 species), *Heterophrictus* Pocock, 1900 (4 species), *Holothele* Karsch, 1879 (6 species), *Ischnocolus* Ausserer, 1871 (9 species), *Neoheterophrictus* Siliwal & Raven, 2012 (8 species), *Nesiergus* Simon, 1903 (3 species), *Plesiophrictus* Pocock, 1899 (8 species), *Psalistops* Simon, 1889 (2 species) *Reichlingia* Rudloff, 2001 (1 species), *Scopelobates* Simon, 1903 (1 species), *Thalerommata* Ausserer, 1875 (12 species), and *Trichopelma* Simon, 1888 (29 species).

Of these, *Chaetopelma*, *Heterothele*, *Heterophrictus*, *Ischnocolus*, *Neoheterophrictus*, *Nesiergus* and *Plesiophrictus* are restricted to the Old World and the remainder of the genera are endemic to the New World. The genus *Holothele* presently contains the following species (World Spider Catalog, 2025): *Holothele culebrae* (Petrunkévitch, 1929) (♀, Puerto Rico), *Holothele denticulata* (Franganillo, 1930) (♂♀, Cuba), *Holothele longipes* (L. Koch, 1875) (♂♀, Bolivia, Brazil, Colombia, Ecuador, French Guiana, Guyana, Panama, Peru, Suriname, Trinidad and Tobago, and Venezuela; being the type species of the genus), *Holothele maddenii* (Esposito & Agnarsson, 2014) (♀, Dominican Republic), *Holothele shoemakeri* (Petrunkévitch, 1926) (♀, Saint Thomas), and *Holothele sulfurensis* Maréchal, 2005 (♂♀, Guadeloupe). Only one species of *Holothele* occurs on the mainland of Latin America, namely the widespread *H. longipes*. The remainder of the taxa are biogeographically disjunct, found only on islands of the Lesser Antilles.

This disjunctive distribution makes *Holothele* questionable as a taxonomic entity as these mygalomorphs are dispersal-limited (BOND & STOCKMAN 2008, FOLEY *et al.* 2021). Habitats occupied by these spiders are naturally fragmented (e.g., populations found on different islands or continent). Therefore, we investigated the taxonomic unity of species composing *Holothele* based on morphology, especially the patterns of male genitalic variation, as it is almost universally studied in spider taxonomy for *a priori* species delimitation (see BOND *et al.* 2022) and deeply linked to their evolution. We assumed that the complex structures of the male *Holothele* palp best reflect species divergence, using a morphology-based discovery approach. Conversely, we expected variation in body size and coloration within species to be uninformative for species delineation because these characters often show intraspecific variation in theraphosid spiders (e.g. GALLON 2002).

Recently, through the kindness of Chris A. Hamilton (University of Idaho), a loan of recently-collected Caribbean theraphosids was sent to DS for examination and description. Amongst this material, we found several taxa which were ischnocolines but clearly belonged to no known lineage, both at the generic, and one also at the species, level. Further investigation has revealed they represent two new genera and one new species, which are described in this work.

Material and methods

Specimens were examined under binocular microscopes. Photographs of palpal bulbs, tibial apophyses and spermathecae were made by DS with an Olympus BX63 with an Olympus DP23 camera except for the types of *C. sulfurensis* **comb. nov.** which were made by RG on a Leica M125C auto-montage. Description style follows SHERWOOD *et al.* (2020). Drawings were made by DS. Abbreviations – Repositories of material examined: MMUE = Manchester Museum, Manchester, United Kingdom; MNHN = Muséum national d'Histoire naturelle, Paris, France; NHMUK = Natural History Museum,

London, United Kingdom; OUMNH = Oxford University Museum of Natural History, Oxford, United Kingdom. Type material of the new taxa are deposited in MMUE. Structures: ALE = anterior lateral eyes, AME = anterior median eyes, PLE = posterior lateral eyes, PME = posterior median eyes; PB = prolateral branch (of tibial apophysis), RB = retrolateral branch (of tibial apophysis).

New term introduced: VRB = ventro-retrolateral branch (of tibial apophysis). Other: leg. = collected by (legit), m.a.s.l = metres above sea level. Leg spine terminology follows PETRUNKEVITCH (1925) with the modifications proposed by BERTANI (2001): d = dorsal, v = ventral, r = retrolateral, p = prolateral. Palpal bulb terminology follows BERTANI (2000) with modifications for the retrolateral keel: A = apical keel, PI = prolateral inferior keel, PS = prolateral superior keel, RS = retrolateral superior keel, SA = subapical keel, TH = tegular heel, and one newer term: PACK = prolateral accessory central keel (*sensu* PEÑAHERRERA -R. *et al.* 2024). Leg formulae start with the longest leg to the shortest in order of decreasing size, e.g. 4,1,2,3. All measurements are in mm. Authors' emphases in []. Species concept used: Unified Species Concept (*sensu* de QUEIROZ 2007). Methodology used: morphology-based discovery. Hypothesis: *Holothele* is a paraphyletic genus based on morphology and biogeographic patterns.

ZooBank: urn:lsid:zoobank.org:pub:7564E864-C2F0-43DB-B3C3-2C949995082E.

Taxonomy

Order **Araneae** Clerck, 1757
Infraorder **Mygalomorphae** Pocock, 1892
Family **Theraphosidae** Thorell, 1869
Subfamily **Ischnocolinae** Simon, 1892

Caribothele gen. nov.

Type species: *Ischnocolus culebrae* Petrunkevitch, 1929 by designation herein.

Diagnosis: *Caribothele* **gen. nov.** most closely resembles *Holothele* but can be distinguished by the spiralled course of the embolus keels (not spiralled in *Holothele*), presence of a third (VRB) branch of the leg I tibial apophysis in addition to the regular PB and RB (VRB absent in *Holothele*), and presence of more than 2 keels on the embolus (keels absent in *Holothele*). The sinuous embolus and numerous, spiralled, keels furthermore easily distinguish *Caribothele* **gen. nov.** from *Encantarana* **gen. nov.** (embolus straight, with only two non-spiralled keels in *Encantarana* **gen. nov.**). The presence of a VRB readily distinguishes *Caribothele* **gen. nov.** from the Ecuadorian genus *Pululahua* Dupérré & Tapia, 2025 (VRB absent in *Pululahua*).

Etymology: The generic epithet is formed from the word Caribbean, in reference to the area in which this genus occurs, and *Holothele*, alluding to the prior assignment of many of the species. The gender is feminine.

Description: For description of genus characters, see descriptions of non-type male and female of *C. culebrae* **comb. nov.** below.

Distribution: Endemic to the Caribbean, known from Cuba, Dominican Republic, Guadeloupe, Puerto Rico, and Saint Thomas.

Remarks: In addition to the overwhelming morphological evidence, *Caribothele* **gen. nov.** is recovered as a sister group to *Holothele* in molecular analyses, which will be published elsewhere in due course (HAMILTON *et al.* in prep.).

Species included: *C. culebrae* **comb. nov.**, *C. denticulata* **comb. nov.**, *C. maddeni* **comb. nov.**, *C. shoemakeri* **comb. nov.** and *C. sulfurensis* **comb. nov.**

Caribothele culebrae* (Petrunkévitch, 1929) *gen. et comb. nov.

Ischnocolus culebrae Petrunkévitch, 1929: 31, figs 18–24.

Holothele culebrae: Rudloff, 1997: 8, fig. 23.

Holothele aff. *culebrae*: Guadanucci, 2020: 88, figs 3.4F–J, 3.5O.

Type material: Holotype ♀ (AMNH), Cuelbra Island, Puerto Rico, 6 March 1906, leg. W. M. Wheeler, not examined.

Other material examined: 1 ♂ (MMUE G7731.13), outside of El Yunque, Puerto Rico (18.321522, -65.769688), 843 m.a.s.l., 10 June 2011, leg. C. Hamilton and M. Brewer, ‘AUMS 16286’; 1 ♀ (MMUE G7731.14), same data except ‘AUMS 16297’; 1 ♀ (MMUE G7731.12), same data except ‘AUMS 16285’.

Diagnosis: *Caribothele culebrae* **comb. nov.** can be distinguished from *C. denticulata* **comb. nov.** by the softer curvature of the embolus in ventral view (sharper in *C. denticulata* **comb. nov.**) and the weakly developed neck constriction of the spermathecal receptacles (developed in *C. denticulata*), from *C. maddeni* **comb. nov.** by the wider receptacles (narrower in *C. maddeni* **comb. nov.**), and from *C. sulfurensis* **comb. nov.** by the presence of 5 PACK (3 in *C. sulfurensis* **comb. nov.**) and shorter RB (RB elongate in *C. sulfurensis* **comb. nov.**). A full morphological diagnosis from *C. shoemakeri* **comb. nov.** is not possible until the genitalia of that species is described, but they are nonetheless biogeographically disjunct (see Discussion).

Description of non-type male: Total length including chelicerae: 14.9. Carapace: length 6.6, width 5.2. Caput: slightly raised. Ocular tubercle: raised, length 0.6, width 1.3. Eyes: AME > ALE, ALE > PLE, PLE > PME, anterior eye row procurved, posterior row slightly recurved. Clypeus: narrow; clypeal fringe: medium. Fovea: shallow, transverse. Chelicera: length 1.9, width 1.2. Abdomen: length 6.4, width 2.6. Maxilla with 140–150 cuspules covering approximately 57% of the proximal edge. Labium: length 0.6, width 0.9, with 55 cuspules most separated by 0.5–1.0 times the width of a single cuspule. Labio-sternal mounds: separate. Sternum: length 2.7, width 2.5, with three pairs of sigilla. Tarsi I–IV divided by band of setae. Metatarsal scopulae: I 70%; II 58%; III 30%; IV [uninterpretable, legs lost]. Lengths of legs and palpal segments: see table 1, legs 4,1,2,3 [deduced from known data of historical specimens]. Spination: femur III d 0–3–3, patella III p 0–0–1, tibia I p 0–1–1, v 1–0–2, II r 1–0–1, v 1–1–3, III p 1–0–2, r 1–1–1, v 1–1–3, IV [uninterpretable, legs lost], palp p 2–3–2, metatarsus I p 0–1–0, v 1–0–1 (apical), II r 0–1–0, v 0–1–1 (apical), III p 1–1–1, r 1–1–1, v 2–2–5 (3 apical), IV [uninterpretable, legs lost]. Tibia I with tri-branched apophysis, RB longer than PB, each with a single megaspine situated apically, VRB present behind RB and half the size of RB, apex rounded and with absence of a megaspine (Figs 2A–F). Femur

Table 1: *Caribothele culebrae* (Petrunkevitch, 1929) comb. nov. non-type male (MMUE G7731.13), length of legs and palp. * = missing segment.

	I	II	III	IV	Palp
Femur	5.3	5.1	4.7	*	3.3
Patella	3.1	2.9	2.5	*	1.7
Tibia	4.6	3.6	3.3	*	2.6
Metatarsus	4.0	3.7	4.2	*	—
Tarsus	2.7	2.5	2.2	*	1.1
Total	19.7	17.8	16.9	*	8.7

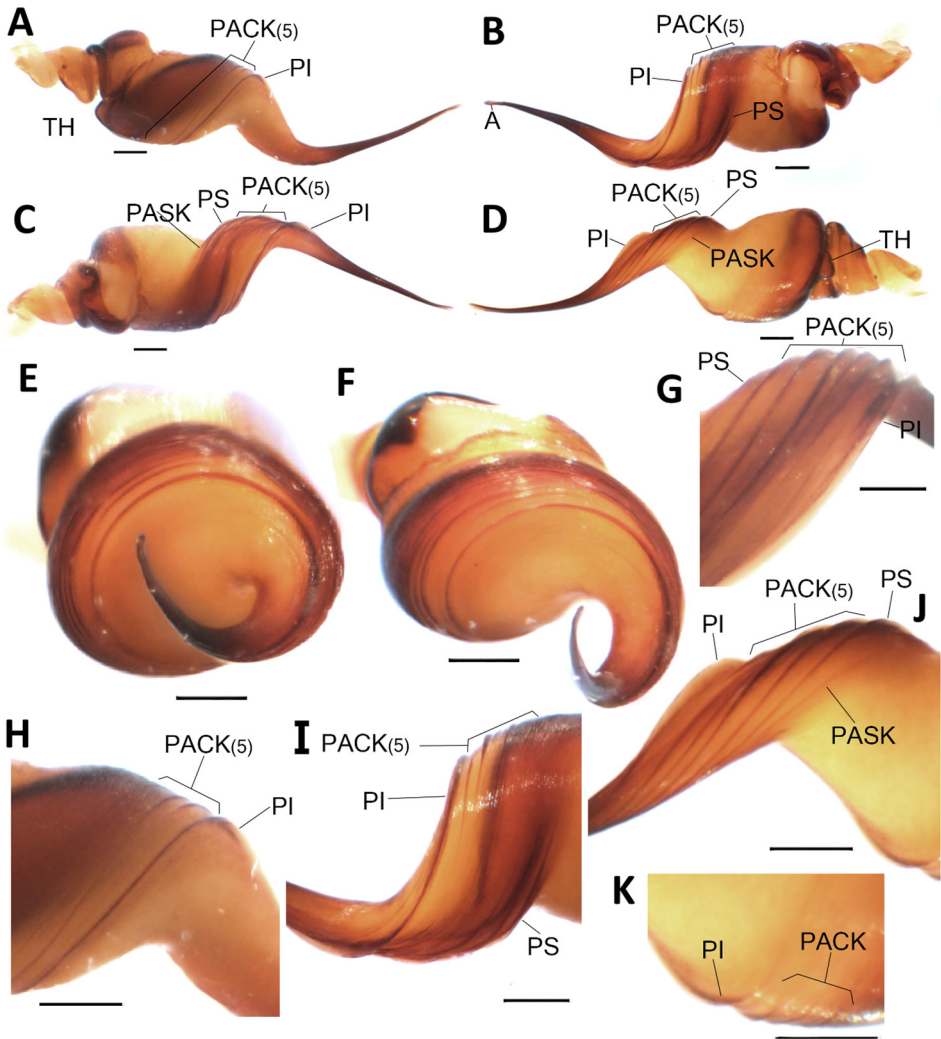


Fig. 1: *Caribothele culebrae* (Petrunkevitch, 1929) comb. nov. non-type male (MMUE G7731.13). Palpal bulb (left-hand side), A prolateral view, B retrolateral view, C dorsal view, D ventral view, E apical view, F prolatero-apical view, G close-up of embolus keels, dorso-prolateral view, H Idem, prolateral view, I Idem, retrolateral view, J Idem, ventral view, K close-up of emergence point of keels on base of bulb, retrolateral view. Scale bars = 0.2 mm.

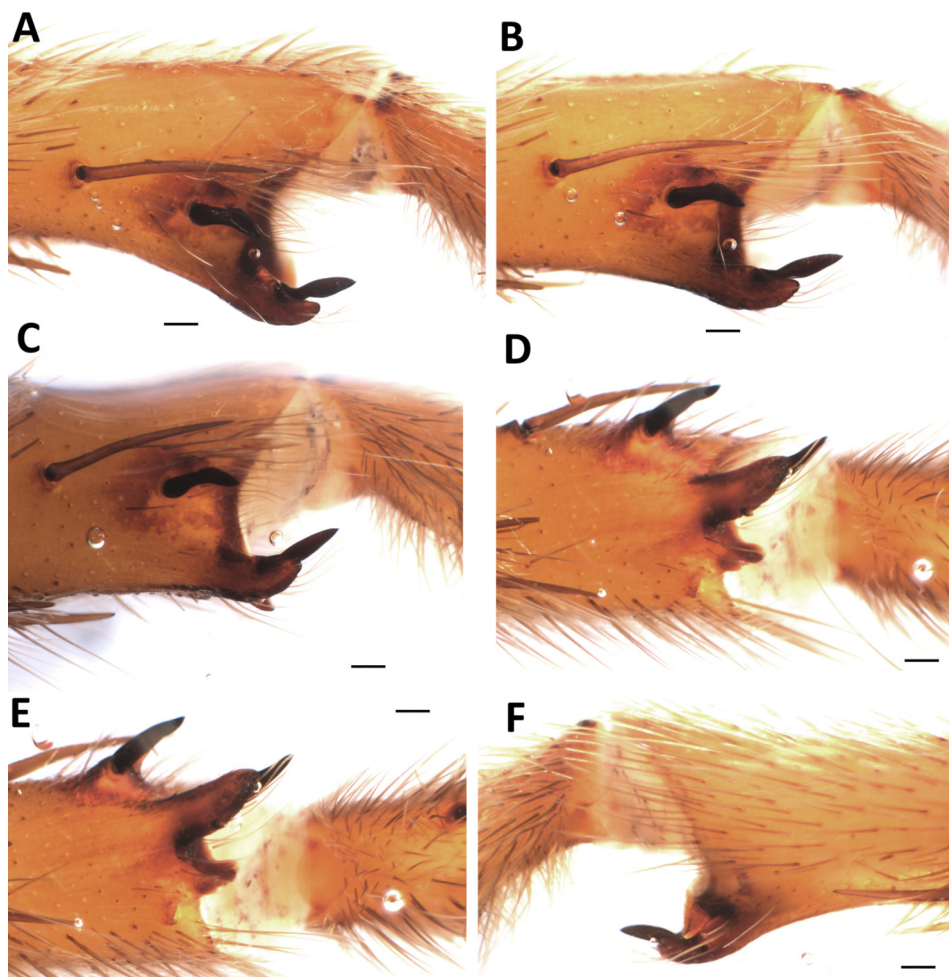


Fig. 2: *Caribothele culebrae* (Petrunkevitch, 1929) comb. nov. non-type male (MMUE G7731.13). Tibial apophysis (left-hand side), A prolateral view, B prolatero-ventral view 1, C prolatero-ventral view 2, D ventro-prolateral view, E ventral view, F retrolateral view. Scale bars = 0.2 mm.

III: incrassate. Palpal tibia: incrassate. Palpal cymbium: unmodified. Metatarsus I: slightly curved. Posterior lateral spinnerets with three segments, basal 1.1, median 0.8, digitiform apical 1.0. Posterior median spinnerets with one segment. Palpal bulb with developed TH, base of bulb long, embolus approximately 25% longer than base of bulb; embolus sinuous with distinct retrolateral then prolateral curvature; PS, PI, PASK, and 5 PACK present, developed, PI elongate; PC present and constricted in all but basal quarter (Figs 1A–K). Colour: alcohol preserved brown.

Description of non-type female (MMUE G7731.14): Total length including chelicerae: 14.6. Carapace: length 6.1, width 4.4. Caput: raised. Ocular tubercle: slightly raised, length 0.6, width 1.1. Eyes: AME > ALE, ALE > PLE, PLE > PME, anterior row pro-curved, posterior row recurved. Clypeus: narrow; clypeal fringe: medium. Fovea: shal-

Table 2: *Caribothele culebrae* (Petrunkевич, 1929) comb. nov. non-type female (MMUE G7731.14), length of legs and palp. * = missing segment.

	I	II	III	IV	Palp
Femur	5.3	5.1	4.7	*	3.3
Patella	3.1	2.9	2.5	*	1.7
Tibia	4.6	3.6	3.3	*	2.6
Metatarsus	4.0	3.7	4.2	*	—
Tarsus	2.7	2.5	2.2	*	1.1
Total	19.7	17.8	16.9	*	8.7

low, transverse. Chelicera: length 2.2, width 1.3. Abdomen: length 6.3, width 2.4. Maxilla with 150–160 cuspules, covering approximately 55% of proximal edge. Labium: length 0.8, width 1.1, with 60 labial cuspules most separated by 0.5–1.0 times the width of a single cuspule. Labio-sternal mounds: separate. Sternum: length 2.6, width 2.3, with three pairs of sigilla. Tarsi I–IV divided by band of setae. Metatarsal scopulae: I 100%; II 100%; III 33%; IV [uninterpretable, legs lost]. Lengths of leg and palpal segments: see table 2, legs 4,1,2,3 [deduced from known data of historical specimens]. Spination:

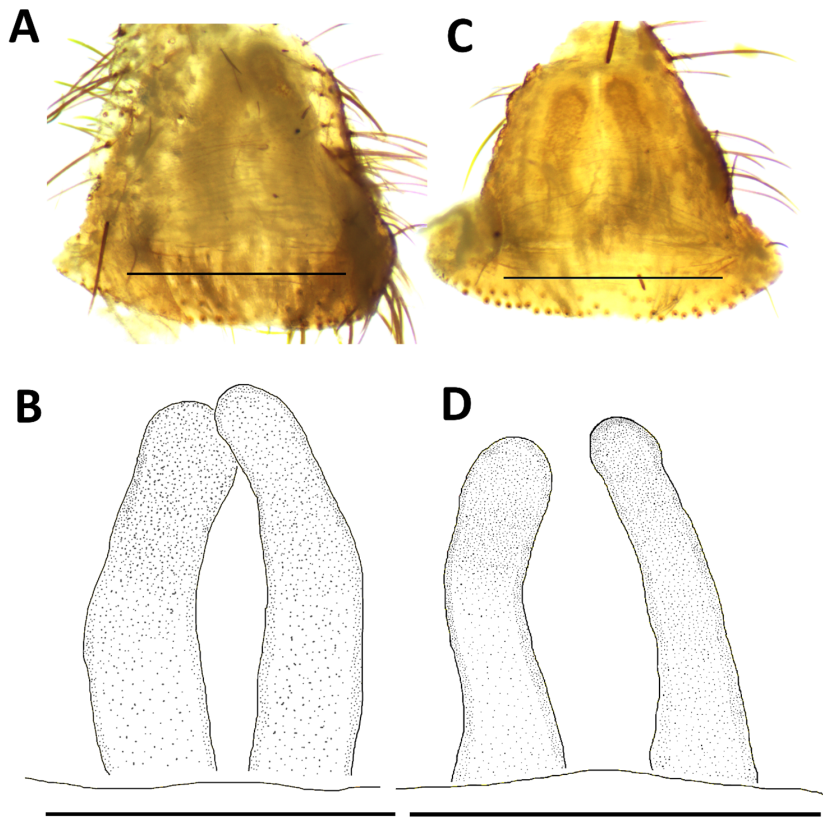


Fig. 3: *Caribothele culebrae* (Petrunkевич, 1929) comb. nov. non-type females, spermathecae. A–B female 1 (MMUE G7731.14), C–D female 2 (MMUE G7731.12). Scale bars = 1 mm.

femur I d 0–0–1, II d 0–0–1, III d 0–0–3 patella III p 0–0–2, tibia I p 0–0–1, v 1–1–2, II p 0–1–1, v 1–2–2, III p 2–1–1, r 0–1–2, v 1–1–2, IV [uninterpretable, legs lost], palp p 0–2–0, v 0–1–2, metatarsus I v 0–1–1 (apical), II v 0–1–1 (apical), III p 1–1–1, r 1–1–1, v 2–3–3 (apical), IV [uninterpretable, legs lost]. Posterior lateral spinnerets with three segments: basal 1.4, medial 0.8, digitiform apical 0.9. Posterior median spinnerets with one segment. Spermathecae with two receptacles, each with a single lobe, left receptacle wider, with indistinct neck construction, right receptacle narrower, with more pronounced neck constriction (Figs 3A–B). Colour: alcohol preserved brown.

Colour in life: Only male photographed alive (Figs 4A–B) but female has same colouration in life (C. Hamilton pers. comm.).



Fig. 4: *Caribothele culebrae* (Petrunkévitch, 1929) comb. nov. non-type male (MMUE G7731.13), habitus in life. A dorso-lateral view (right-hand side), B dorso-lateral view (left-hand side). Photographs courtesy of Chris Hamilton.

Distribution: Puerto Rico.

Remarks: We also depict the spermathecae (Fig. 3C–D) of another female (MMUE G7731.12) to show the (minimal) variation. Unfortunately, in both specimens both legs IV are missing from each side of both specimens and cannot be found (C. Hamilton pers. comm.), the specimens were previously used for DNA extraction but it would be unusual to take a whole pair of legs; this appears to be accidental. PETRUNKEVITCH (1925) designates one female as the [holo]type but mentions various other adult and immature female specimens which must be regarded as non-types as he did not explicitly designate as paratypes.

***Caribothele sulfurensis* (Maréchal, 2005) gen. et comb. nov.**

Holothele sulfurensis: Maréchal, 2005: 212, figs 1A–D, 2A–B, 3A–B, 4A–B.

Type material: Holotype ♀ (MNHN), Base sud-ouest du dôme de la Soufrière (16°02'30"N, 61°39'40"W), Guadeloupe, 1150 m.a.s.l, June 2001, leg. C. Rollard and P. Maréchal, examined; allotype ♂ (MNHN), same data, examined.

Diagnosis: *Caribothele sulfurensis* **comb. nov.** is closest to *C. culebrae* **comb. nov.** and thus differs from all species except the aforementioned by the same characters which separate *C. culebrae* from these taxa. The diagnosis of *C. culebrae* **comb. nov.** from *C. sulfurensis* **comb. nov.** is given above. A full morphological diagnosis from *C. shoemakeri* **comb. nov.** is not possible but the species differ biogeographically based on type localities (see Discussion).

Description: See Maréchal (2005).

Distribution: Guadeloupe.

Remarks: Since this is the only species in the genus other than *C. culebrae* **sp. nov.** which is known from both sexes, photographs of the palpal bulb (Figs 5A–H) and tibial apophysis (Figs 6 A–E) of the allotype are presented.

Further misplaced species: The following species are wrongly included in *Holothele* Karsch, 1879. One, where the male is known, possesses a spiralled embolus with multiple keels, as found in *Caribothele* **gen. nov.** and with a thin and elongate embolus tip unlike *Pululahua*. The other two are known only from females, one of which has had its spermathecae illustrated, providing evidence for its placement. The other species is transferred based on its disjunct geographic distribution from *Holothele* (see Discussion). We hope their transfer will stimulate the publication of fuller data and proper diagnoses, as the species are currently not as well known as other congeners. Their removal technically renders the genus *Holothele* monotypic, but this is a temporary artefact, as a number of current junior synonyms of the type species *H. longipes* (L. Koch, 1875) are in fact distinct species based on our examination of type specimens and non-type specimens (pers. obs.). This matter is outside the scope of this work.

***Caribothele denticulata* (Franganillo, 1930) gen. et comb. nov.**

Ischnocolus denticulatus Franganillo, 1930: 5.

Ischnocolus denticularis: Roewer, 1942: 235.

Holothele denticulata: Rudloff, 1997: 9, figs 5–7.

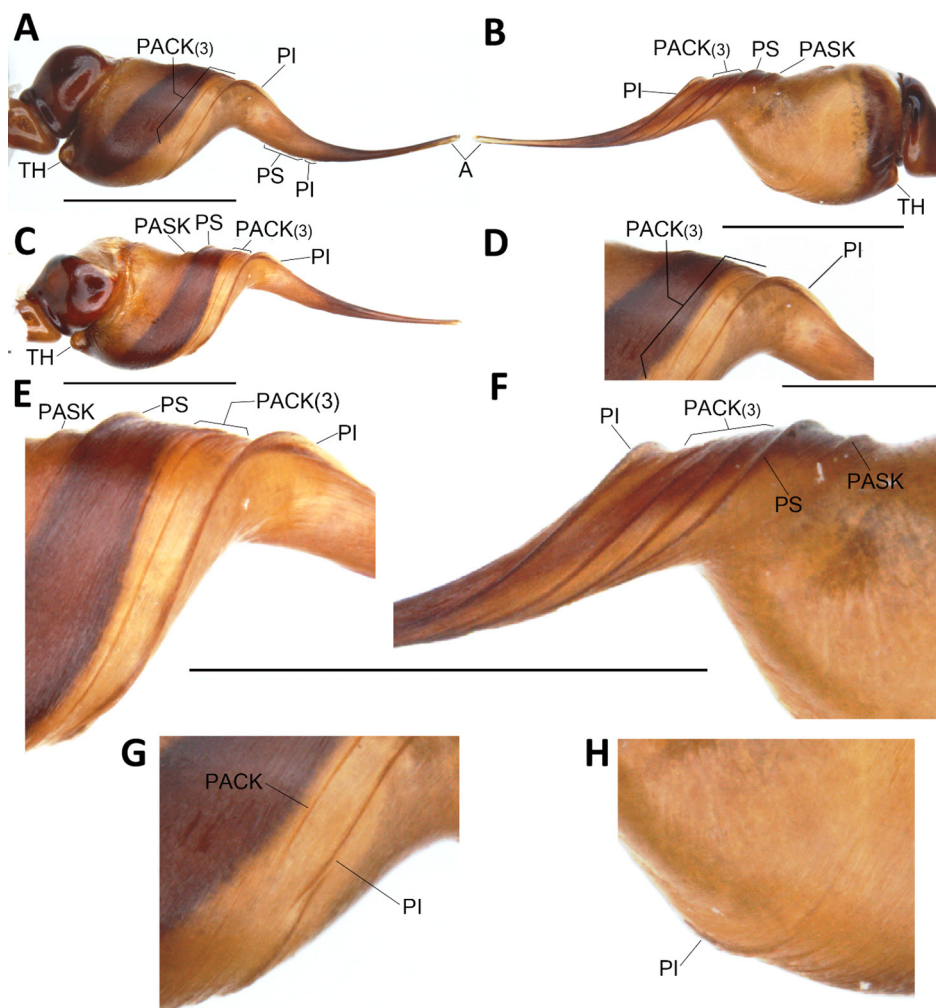


Fig. 5: *Caribothele sulfurensis* (Maréchal, 2005) gen. et comb. nov. allotype male (MNHN). Palpal bulb (left-hand side), A prolateral view, B retrolateral view, C dorsal view, D close-up of keels, dorsal view, E Idem, prolateral view, F Idem, retrolateral view, G Idem, base of bulb, prolateral view, H Idem, retrolateral view. Scale bars = 1 mm (A–C, E–H), 0.5 mm (D).

Distribution: Cuba.

Remarks: Only the male of this species has been illustrated, but the illustrations in RUDLOFF (1997) clearly show this taxon belongs to *Caribothele* gen. nov. based on palpal bulb morphology.

***Caribothele maddenii* (Esposito & Agnarsson in Bloom *et al.*, 2014) gen. et comb. nov.**

Trichopelma maddenii Esposito & Agnarsson, in Bloom *et al.*, 2014: 152, figs 3a–g.

Holothele maddenii: Mori & Bertani, 2020: 123.

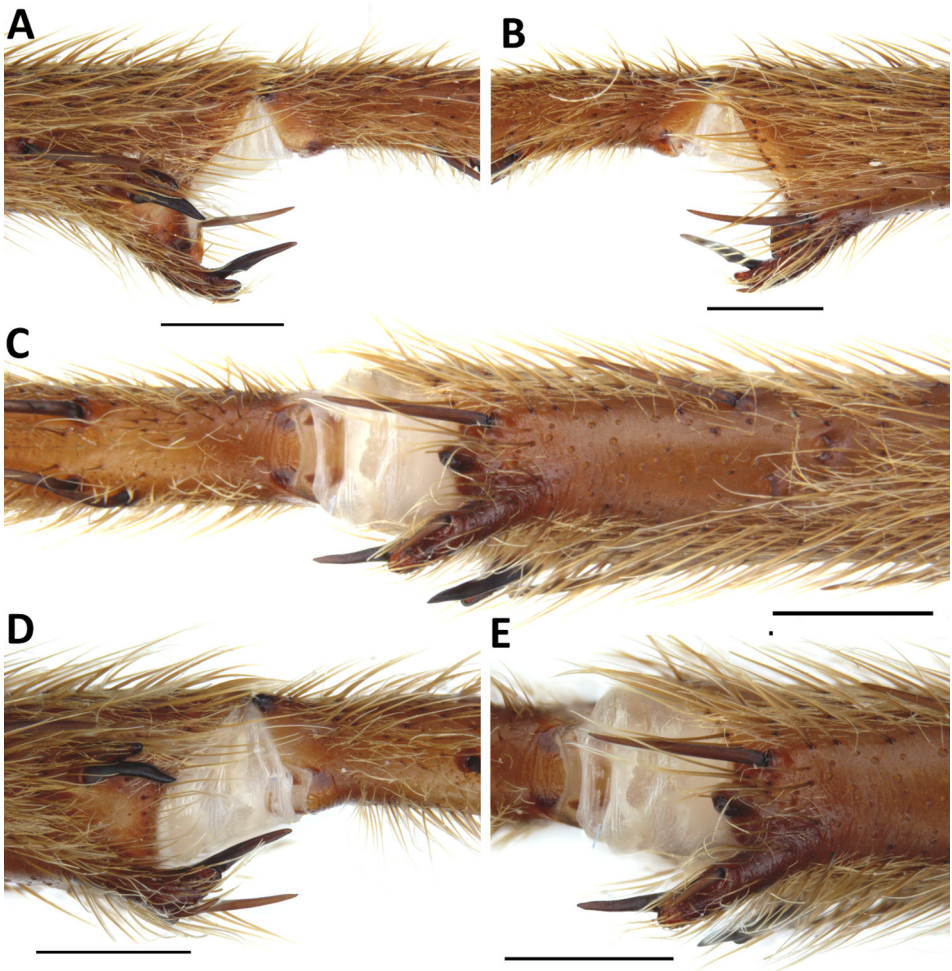


Fig. 6: *Caribothele sulfurensis* (Maréchal, 2005) gen. et comb. nov. allotype male (MNHN). Tibial apophysis (left-hand side), A prolateral view, B retrolateral view, C ventral view, D prolateral-ventral view, E retro-ventral view. Scale bars = 1 mm.

Distribution: Dominican Republic.

Remarks: The species was well-described and the spermathecal morphology of this species, as illustrated in BLOOM et al. (2014), support the placement of this species in the genus.

***Caribothele shoemakeri* (Petrunkévitch, 1926) gen. et comb. nov.**

Ischnocolus shoemakeri Petrunkevitch, 1926: 36, figs 2–3.

Holothele shoemakeri: Rudloff, 1997: 11.

Distribution: Saint Thomas.

Remarks: This species is in need of redescription, due to the fact the genitalia of the holotype (if it is indeed adult) was not dissected or described (see BOND *et al.* 2022). We were unable to access the holotype for this study and its whereabouts are unknown. However, its biogeographic distribution and somatic characters given in the original description support the hypothesis that it does not belong to *Holothele sensu stricto*. Therefore, it is more congruently placed in *Caribothele* **gen. nov.**

***Encantarana* gen. nov.**

Type species: *Encantarana hamiltoni* **gen. et sp. nov.** by monotypy.

Diagnosis: *Encantarana* **gen. nov.** most closely resembles *Holothele* but can be distinguished by the presence of keels on the embolus in the type species (keels absent in males of *Holothele*) and by the presence of neck construction on the receptacles of the female spermathecae in the type species (constriction absent in *Holothele*). It is readily distinguished from *Caribothele* **gen. nov.** by the non-sinuuous embolus and low number of [non-spiralled] keels of the type species (vs. sinuous embolus with numerous spiralled keels in *Caribothele* **gen. nov.**).

Etymology: The generic epithet is formed from the Spanish word encanto meaning enchanted (in reference to Puerto Rico's other name, the enchanted isle) and araña referring to spider. The gender is feminine.

Description: For description of genus characters, see descriptions of holotype male and paratype female of *E. hamiltoni* **sp. nov.** below.

Distribution: Endemic to the Caribbean, known only from Puerto Rico.

Species included: *E. hamiltoni* **sp. nov.**

***Encantarana hamiltoni* sp. nov.**

Type material: Holotype ♂ (MMUE G7731.2), Guanica State Park, E outside Guanica on 33;; on Camino Julio Velez trail, Puerto Rico (17.98149, -66.87568), 165 m.a.s.l, leg. C. Hamilton and M. Brewer, 'APH_3047'; paratype ♀ (MMUE G7731.11), same data except 'APH_3046'; paratype 1♀, 5 imm. (MMUE G7731.1), same data except 'APH_3048'; paratype imm. (MMUE G7731.1), same data except APH_3048 [separated from rest of APH_3048 sample].

Diagnosis: See diagnosis for genus.

Etymology: The specific epithet is a patronym in honour of our friend and colleague, Chris A. Hamilton (University of Idaho), who collected the specimens and has contributed significantly to the taxonomy of tarantulas through his revision of US '*Aphonopelma*' species and ongoing work. The authors have had the good fortune to know Chris for many years and are grateful for support he has rendered us.

Description of holotype male: Total length including chelicerae: 20.0. Carapace: length 9.4, width 8.0. Caput: slightly raised. Ocular tubercle: raised, length 1.0, width 1.4. Eyes: AME > ALE, ALE > PLE, PLE > PME, anterior eye row procurved, poste-

Table 3: *Encantarana hamiltoni* gen. et sp. nov. holotype male (MMUE G7731.2), length of legs and palp.

	I	II	III	IV	Palp
Femur	7.1	6.1	6.4	8.2	5.4
Patella	3.7	3.1	2.9	4.3	2.2
Tibia	6.3	5.3	4.2	5.9	2.9
Metatarsus	5.6	5.0	5.6	7.1	—
Tarsus	4.0	3.1	3.2	3.9	1.3
Total	26.7	22.6	22.3	29.4	11.8

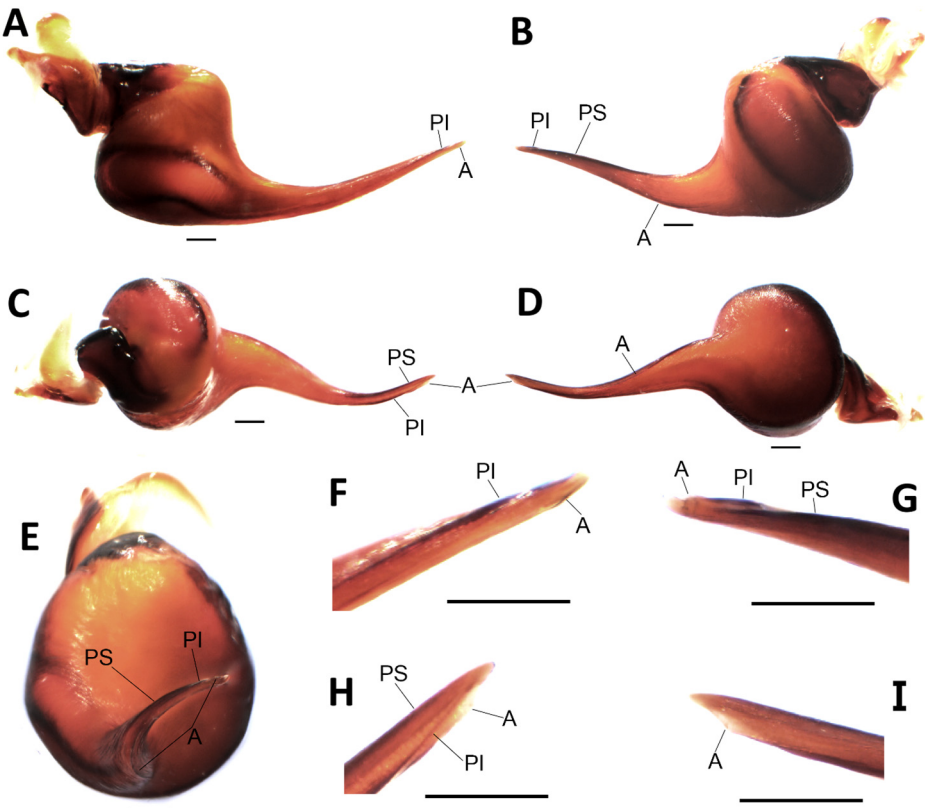


Fig. 7: *Encantarana hamiltoni* gen. et sp. nov. holotype male (MMUE G7731.2). Palpal bulb (left-hand side), A prolateral view, B retrolateral view, C dorsal view, D ventral view, E apical view, F close-up of embolus, prolateral view, G Idem, retrolateral view, H Idem, dorsal view, I Idem, ventral view. Scale bars = 0.2 mm.

rior row slightly recurved. Clypeus: narrow; clypeal fringe: long. Fovea: shallow, transverse. Chelicera: length 2.4, width 1.7. Abdomen: length 8.2, width 4.3. Maxilla with 60–70 cuspules covering approximately 30% of the proximal edge. Labium: length 0.9, width 1.2, with 11 cuspules most separated by 0.5–1.0 times the width of a single cuspule. Labio-sternal mounds: joined. Sternum: length 4.1, width 3.9, with three pairs of sigilla. Tarsi I–IV divided by a band of setae. Metatarsal scopulae: I 100%; II 100%; III

Table 4: *Encantarana hamiltoni* gen. et sp. nov. paratype female (MMUE G7731.11), length of legs and palp.

	I	II	III	IV	Palp
Femur	6.8	5.9	5.3	6.7	4.4
Patella	4.1	4.1	3.1	3.3	2.0
Tibia	4.7	3.7	3.3	4.2	2.6
Metatarsus	4.3	4.1	4.7	6.6	–
Tarsus	2.8	2.7	2.5	3.0	3.1
Total	22.7	20.5	18.9	23.8	12.1

37%; IV 12%. Lengths of legs and palpal segments: see table 3, legs 4,1,2,3. Spination: femur III d 0–4–2, IV d 0–0–1, patella III p 0–0–1, tibia I p 0–1–1, v 0–2–3, II p 0–1–1, v 1–1–2, III p 1–1–0, r 1–1–0, v 2–2–3, IV r 1–0–2, v 3–2–3, palp p 0–1–1, metatarsus I v 0–1–1 (apical), II v 1–0–1 (apical), III p 1–1–1–, r 0–1–1, v 2–0–3 (apical), IV p 1–1–1, r 0–1–1, v 2–3–3 (apical). Tibia I with apophysis absent, presence of two megaspines, each with a pointed apex and bend immediately prior to said apex (Figs 8A–E). Femur III: slightly incrassate. Palpal tibia: slightly incrassate. Palpal cymbium: unmodified. Metatarsus I: unmodified. Posterior lateral spinnerets with three segments, basal 1.4, median 0.7, digitiform apical 1.0. Posterior median spinnerets with one segment. Palpal bulb with absence of TH; base of bulb rounded, embolus more than 50%

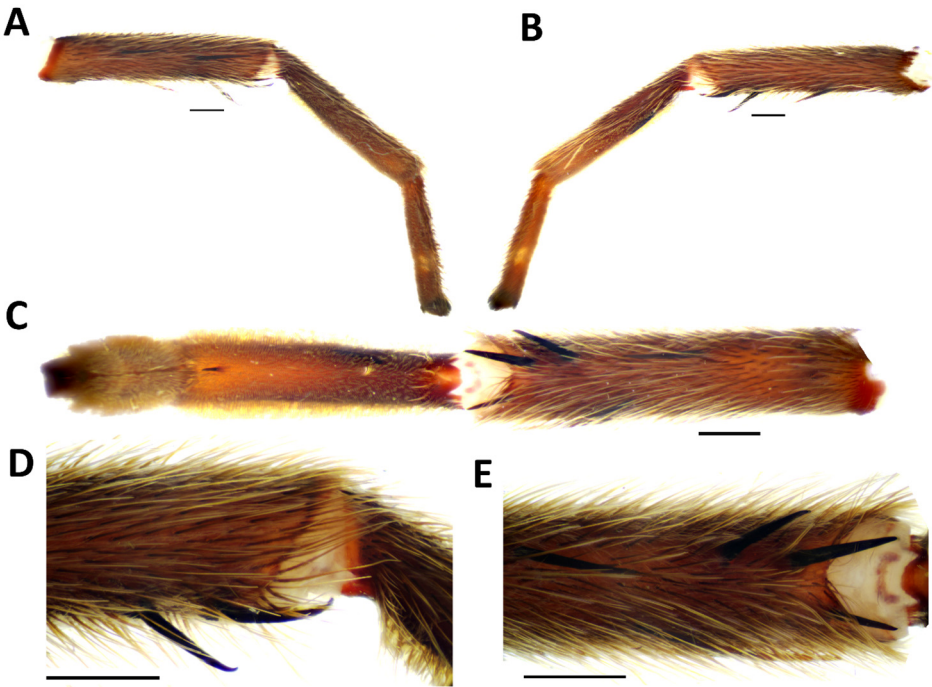


Fig. 8: *Encantarana hamiltoni* gen. et sp. nov. holotype male (MMUE G7731.2). A–C tibia, metatarsus and tarsus I (left-hand side), D–E tibia I (left-hand side), A prolateral view, B retrolateral view, C ventral view, D prolateral view, E ventral view. Scale bars = 0.2 mm.

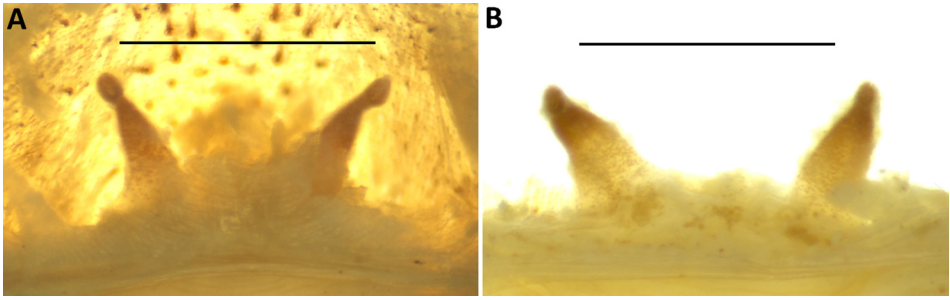


Fig. 9: *Encantarana hamiltoni* gen. et sp. nov. paratype females, spermathecae, dorsal view. A female 1 (MMUE G7731.11), B female 2 (MMUE G7731.1). Scale bars = 1 mm.

longer than base of bulb; PS, PI and A weakly developed; PC present and constricted its entire length (Figs 7A–I). Colour: alcohol preserved brown.

Description of paratype female (MMUE G7731.11): Total length including chelicerae: 20.1. Carapace: length 9.2, width 7.3. Caput: raised. Ocular tubercle: slightly raised, length 0.8, width 1.6. Eyes: AME > ALE, ALE > PLE, PLE > PME, anterior row pro-curved, posterior row recurved. Clypeus: narrow; clypeal fringe: long. Fovea: shallow, transverse. Chelicera: length 2.9, width 2.2. Abdomen: length 8.0, width 6.3. Maxilla with 60–70 cuspules, covering approximately 35% of proximal edge. Labium: length 0.8, width 1.3, with 16 labial cuspules most separated by 0.5–1.0 times the width of a single cuspule. Labio-sternal mounds: joined. Sternum: length 3.8, width 3.5, with three pairs of sigilla. Tarsi I–IV divided by a band of setae. Metatarsal scopulae: I 100%; II 100%; III 32%; IV 20%. Lengths of leg and palpal segments: see table 4, legs 4,1,2,3. Spination: femur III d 0–2–4, palp d 0–0–1, patella III p 0–0–1, tibia I r 0–2–2, v 1–1–2, II r 0–1–1, v 1–1–1, III p 1–1–0, r 0–1–1, v 2–2–2, IV r 1–0–1, v 2–2–3, palp p 0–2–2, metatarsus I v 1–0–1 (apical), II v 1–0–1 (apical), III p 1–2–1, r 0–1–1, v 1–1–3 (apical), IV p 1–1–1, r 0–1–1, v 2–2–3 (apical). Posterior lateral spinnerets with three segments: basal 0.7, medial 0.3, digitiform apical 0.3. Posterior median spinnerets with one segment. Spermathecae with two receptacles, wide basally and thinning in apical quarter, each ending in a single asymmetrical lobe with neck constriction (Fig. 9A). Colour: alcohol preserved brown.

Colour in life: See Figs 10A–B.

Distribution: Known only from the type locality.

Remarks: We also present the spermathecae (Fig. 9B) of another paratype (MMUE, G7731.1), which was collected with offspring (C. Hamilton pers. comm.). One of these offspring (also ‘APH_3048’ but placed by C. Hamilton in separate tube) has been sequenced and will appear in an upcoming DNA phylogeny by HAMILTON *et al.* (in prep.).



Fig. 10: *Encantarana hamiltoni* gen. et sp. nov. holotype male (MMUE G7731.2) and paratype female (MMUE G7731.1) in life. A male, B female. Photographs courtesy of Chris Hamilton.

Discussion

The Lesser Antilles in particular features a wide variety of ecoregions (*sensu* DINERSTEIN *et al.* 2017), for instance two ischnocolines treated herein both occur on Puerto Rico but inhabit two distinct ecoregions: the Puerto Rican moist forests (*C. cul-ebrae* **gen. et comb. nov.**) and Puerto Rican dry forests (*E. hamiltoni* **gen. et sp. nov.**). The other known species of *Caribothele* **gen. nov.** also currently inhabit distinct and separate ecoregions: Cuban moist forests (*C. denticulata* **gen. et comb. nov.**), Hispaniolan moist forests (*C. maddenii* **gen. et comb. nov.**), Caribbean shrublands (*C.*

shoemakeri **gen. et comb. nov.**), and Leeward Islands moist forests (*C. sulfurensis* **gen. et comb. nov.**). Whilst it is plausible that species of *Caribothele* **gen. nov.** may be found in more than one ecoregion on an island itself (although this has not yet been demonstrated with voucher specimens in any study), the low dispersal ability and sheer variation of ecoregions between islands makes a strong case against the possibility of widespread species within the Caribbean ischnotheline lineages.

Our hypothesis that *Holothele* was a paraphyletic genus is strongly supported by both morphological and biogeographic evidence. Morphologically, the newly described genus *Caribothele* **gen. nov.** shares similarities with *Holothele* but is distinguished by key features such as the spiralled course of the embolus keels (not so in *Holothele*), the presence of a VRB branch on tibia I (absent in *Holothele*), and a greater number of keels on the embolus. Biogeographically, the distribution of these lineages across the diverse and distinct ecoregions of the Lesser Antilles, ranging from moist forests to arid shrubland, corroborates their separation, especially considering their low dispersal ability and the ecological differentiation of these habitats. The scattered and region-specific presence of species within these lineages suggests they do not form a monophyletic group, thus validating the reclassification and the recognition of *Caribothele* **gen. nov.** as a distinct genus. Additionally, *Encantarana* **gen. nov.**, another closely related, and previously unrecognised, new genus is readily distinguished from *Caribothele* **gen. nov.** morphologically (see Diagnoses) and occurs in a separate ecoregion on the same island as another member of the same subfamily (*Caribothele culebrae* **gen. et comb. nov.**), demonstrating that speciation and even clades are diverging in short, ecoregionally distinct, areas on single islands in the Caribbean.

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Supplementary data on the Auchenorrhyncha fauna of Szársomlyó Hill, Hungary (Hemiptera: Auchenorrhyncha)

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SCHLITT, B. P., KISS, B., KOCZOR, S. & OROSZ, A. 2025: *Supplementary data on the Auchenorrhyncha fauna of Szársomlyó Hill, Hungary (Hemiptera: Auchenorrhyncha)*. – *Natura Somogyiensis* 46: 117-126.

Abstract: An occasional collecting trip was carried out in Nagyharsány, Szársomlyó Nature Reserve Area (Szársomlyó Hill) at the end of October 2024. Several valuable faunistic records were made. Until this paper, faunistic information on the Auchenorrhyncha fauna of Szársomlyó has not been published. Altogether 55 species from 36 genera and five families were documented. Among them, *Arboridia* (*Arboridia*) *simillima* (Wagner, 1939) (Cicadomorpha: Membracoidea: Cicadellidae: Typhlocybinae) is a new record for the Hungarian fauna.

Keywords: faunistics, distribution, Cicadomorpha, Fulgoromorpha, Villányi Hills, new records

Introduction

The first comprehensive faunistic investigation of the Hungarian Auchenorrhyncha fauna was conducted by HORVÁTH (1895) and published in the book series “*Fauna Regni Hungariae*”, a notable initiative to document the Hungarian fauna. In this enumeration, 322 species were reported from the present-day Hungary (GYÖRFFY et al. 2009). The recent checklist of Hungarian Auchenorrhyncha species was published by GYÖRFFY et al. (2009), listing 540 species within the current borders of Hungary. As a result of targeted research on the Hungarian fauna, the known auchenorrhynchan fauna increased further in the past decade (SCHLITT et al. 2024b). Nevertheless, the ongoing "mediterraneanization" and the increased intensity of faunistic investigations are expected to result in the discovery of additional new species.

Material and methods

The survey was made in Nagyharsány, Szársomlyó Nature Conservation Area (collecting permit file number PE–KTFO/329-16/2019) between 26th and 29th of October, 2024. The insect fauna of Szársomlyó Hill was extensively studied across various orders; however, faunistic survey of the Auchenorrhyncha fauna was not published before (UHERKOVICH 2000). The specimens were collected using a sweeping net and a mouth aspirator. Several specimens were collected from sweeping the canopy or collecting them with entomological light traps, which were used by lepidopterists.

The specimens were examined using a VEVOR 30x–90x stereomicroscope. Photographs were taken with a Canon EOS 6D M2 digital camera attached with Canon 100 mm EOS EF f/2.8 objective in the Rippl-Rónai Museum (RRM), Kaposvár. Several voucher specimens from every listed species were deposited in the Natural History Department of the RRM. Some voucher specimens of *Arboridia simillima* (Wagner, 1939), *Philaia jassargiforma* Dlabola, 1952, *Balclutha frontalis* (Ferrari, 1882), *Chiasmus conspurcatus* (Perris, 1857), and *Ficocyba ficaria* (Horváth, 1897) were deposited in the Hemiptera Collection of the Hungarian Natural History Museum Public Collection Centre – Hungarian Natural History Museum (HNHM).

Results and discussion

A total of 55 species from 36 genera and five families were collected during the designated collecting period. The identification of certain species proved unfeasible at the species level, primarily due to the absence of male specimens. Further taxonomic investigations are required for the identification of certain species. Consequently, in these cases, we provided the generic names. The list of the collected species is given in this section. The sequence of the list is in accordance with GYÖRFFY et al. (2009).

FULGOROMORPHA Evans, 1946

Cixiidae Spinola, 1839

Cixiinae Spinola, 1839

– *Cixius wagneri* China, 1942

Delphacidae Leach, 1815

Asiracinae Motschulsky, 1863

– *Asiraca clavicornis* (Fabricius, 1794)

Stenocraninae Wagner, 1963

– *Stenocranus* sp.

Delphacinae Leach, 1815

– *Jassidaeus lugubris* (Signoret, 1865)

– *Delphacodes mulsanti* (Fieber, 1866)

Tettigometridae Germar, 1821

Tettigometrinae Germar, 1821

– *Tettigometra sulphurea* Mulsant et Rey, 1855

CICADOMORPHA Evans, 1946**Aphrophoridae** Amyot & Audinet-Serville, 1843**Aphrophorinae** Amyot & Audinet-Serville, 1843

- *Neophilaenus campestris* (Fallén, 1805)
- *Neophilaenus lineatus* (Linnaeus, 1758)
- *Neophilaenus modestus* (Haupt, 1922)
- *Philaenus spumarius* (Linnaeus, 1758)

Cicadellidae Latreille, 1825**Typhlocybinae** Kirschbaum, 1868

- *Hebata affinis* (Nast, 1937)
- *Hebata decipiens* (Paoli, 1930)
- *Hebata vitis* (Göthe, 1875)
- *Chlorita* sp.
- *Zyginella pulchra* Löw, 1885
- *Zyginidia pullula* (Boheman, 1845)
- *Zygina angusta* Lethierry, 1874
- *Zygina tithide* Ferrari, 1882
- *Zygina* sp.
- *Arboridia parvula* (Boheman, 1845)
- *Arboridia pusilla* (Ribaut, 1936)
- *Arboridia ribauti* (Ossiannilsson, 1937)
- *Arboridia simillima* (Wagner, 1939)
- *Arboridia velata* (Ribaut, 1952)
- *Frutioidia bisignata* (Mulsant et Rey, 1855)
- *Linnavuoriana* cf. *sexmaculata* (Fallén, 1806)
- *Erasmoneura vulnerata* (Fitch, 1851)
- *Ficocyba ficaria* (Horváth, 1897)

Megophthalminae Kirkaldy, 1906

- *Megophthalmus scabripennis* Edwards, 1915
- *Anaceratagallia ribauti* (Ossiannilsson, 1938)
- *Anaceratagallia venosa* (Fourcroy, 1785)
- *Anaceratagallia glabra* Dmitriev, 2020
- *Anaceratagallia* sp.
- *Austroagallia sinuata* (Mulsant & Rey, 1855)

Deltocephalinae Fieber, 1869

- *Fieberiella florii* (Stål, 1864)
- *Neoliturus fenestratus* complex
- *Neoliturus inscriptus* (Haupt, 1927)
- *Balclutha frontalis* (Ferrari, 1882)
- *Cicadula frontalis* (Herrich-Schäffer, 1835)
- *Doratura heterophyla* Horváth, 1903
- *Chiasmus conspurcatus* (Perris, 1857)
- *Aconurella proluxa* (Lethierry, 1885)
- *Platymetopius undatus* (De Geer, 1773)
- *Platymetopius* sp.
- *Allygidius atomarius* (Fabricius, 1794)
- *Phlepsius intricatus* (Herrich-Schäffer, 1838)
- *Eohardya fraudulenta* (Horváth, 1903)

- *Rhopalopyx vitripennis* (Flor, 1861)
- *Psammotettix agrestis* Logvinenko, 1966
- *Psammotettix alienus* (Dahlbom, 1850)
- *Psammotettix confinis* (Dahlbom, 1851)
- *Psammotettix nodosus* (Ribaut, 1925)
- *Psammotettix notatus* (Melichar, 1896)
- *Philaia jassargiforma* Dlabola, 1952
- *Hishimonus hamatus* Kuoh, 1976

The list of the new and remarkable species:

Arboridia (Arboridia) simillima (Wagner, 1939)
(Fig. 1)

Material examined. Hungary: Heves county, Ecséd, 6.VII.2011. leg. Kiss B., two male [sweep netting]; Heves county, Ecséd, 15.IX.2011. leg. Kiss B., one male [sweep-netting]; Baranya county, Pécs, 18.X.2012 leg. Koczor S., one male [sweep netting]; Baranya county, Nagyhasánd, Szársomlyó, 26-29.X.2024 leg. Schlitt B. P., one male [collected on light]

Diagnosis. The species belongs to the subgenus *Arboridia* Zakhvatkin, 1946 based on the well-developed preatrium of the aedeagus (DLABOLA 1958, DWORAKOWSKA 1970, HAN et al. 2024). The species is closely related to *Arboridia (Arboridia) parvula* (Boheman, 1845), but it can be distinguished by the shape of aedeagus and style. The aedeagus is similar to that of *A. parvula*, but the appendages arise from the basal part, distinctly separated from the main shaft. The distance between the base of the shaft and the origin of the appendages is approximately equal to the length of the appendages themselves. The main shaft is more strongly curved than in *A. parvula* (WAGNER 1939: fig. 369). The terminal process of the style is longer than in *A. parvula* (cf. WAGNER 1939: fig. 366 and 368), and the apex of the outer horn is closer to the apex of the inner horn than to that of the terminal horn (cf. WAGNER 1939: fig. 368). A detailed description of related *Arboridia* species is given by WAGNER (1939) and DWORAKOWSKA (1970).



Fig. 1: Male specimen of *Arboridia (Arboridia) simillima* (Wagner, 1939) in dorsal view

Distribution. Austria, Germany, Switzerland (MÜHLETHALER et al. 2018), Transcaucasia (DWORAKOWSKA 1970)

Remarks. It is a new record for the Hungarian fauna. The species occurs in colline to montane regions, where it feeds on *Rosa* spp. (Rosaceae), monophagously on a generic level (MÜHLETHALER et al. 2018). In the description, the species was collected from *Rosa spinosissima* L. (Rosaceae) (syn. *Rosa pimpinellifolia* L.) in Höllberg, Austria (WAGNER 1939).

Philaia jassargiforma Dlabola, 1952

(Figs 2–5)

Material examined. Baranya county, Nagyharsány, Szársomlyó, 26-29.X.2024 leg. Schlitt B. P., two females, two males [collected by sweeping on herbaceous vegetation]



Figs. 2-4: Habitus of *Philaia jassargiforma* Dlabola, 1952, 2 – male (dorsal view), 3 – female (dorsal view), 4 – male (lateral view)

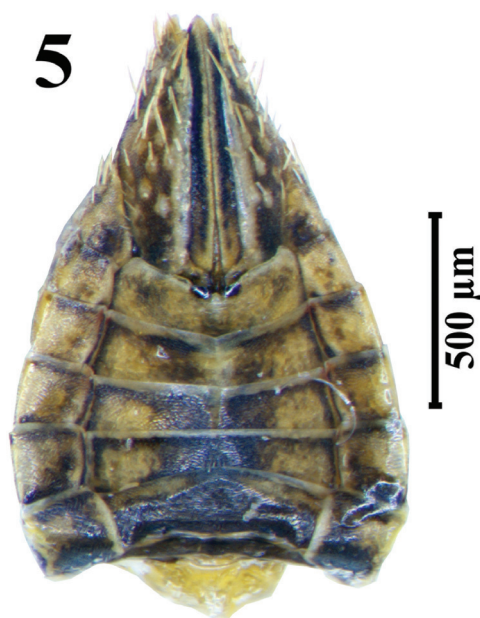


Fig. 5: Female abdomen of *Philaia jassargiforma* Dlabola, 1952 in ventral view

Distribution. Slovakia, Mongolia, USSR, Hungary, Bulgaria, Central Asia (DLABOLA 1952, DLABOLA 1965, DLABOLA 1974)

Remarks. The species is not listed in the latest checklist of the Hungarian Auchenorrhyncha fauna published by GYÖRFFY et al. (2009). However, DLABOLA (1974) has already reported the species from Hungary, Máriagyűd, near Siklós, in a forest-steppe habitat on limestone bedrock, close to the location of our collecting sites. This may indicate that the species has a stable population in this region. Here we represented the first specimens collected from Hungary and deposited in the Hemiptera Collection of the HNHM.

***Erasmoneura vulnerata* (Fitch, 1851)**

(Fig. 6)

Material examined. Baranya county, Nagyharsány, Szársomlyó, 26-29.X.2024 leg. Schlitt B. P., 15 males, 10 females [collected by sweeping on evergreen shrubs]

Remarks. The species was first documented in Hungary by SCHLITT et al. (2024). The species appears to be distributed extensively throughout the country. In the case of Szársomlyó Hills, overwintering specimens of *E. vulnerata* were collected in high numbers from *Ruscus aculeatus* L. (Asparagaceae). This species poses a considerable threat to viticulture, a subject that is thoroughly explored in Szársomlyó. It is recommended that further investigations be conducted into plant protection interactions.

***Chiasmus conspurcatus* (Perris, 1857)**

(Fig. 7)

Material examined. Hungary: Baranya county, Nagyharsány, Szársomlyó, 26-29.X.2024 leg. Schlitt B. P., one male, one female [collected by sweeping between grapevine lines]

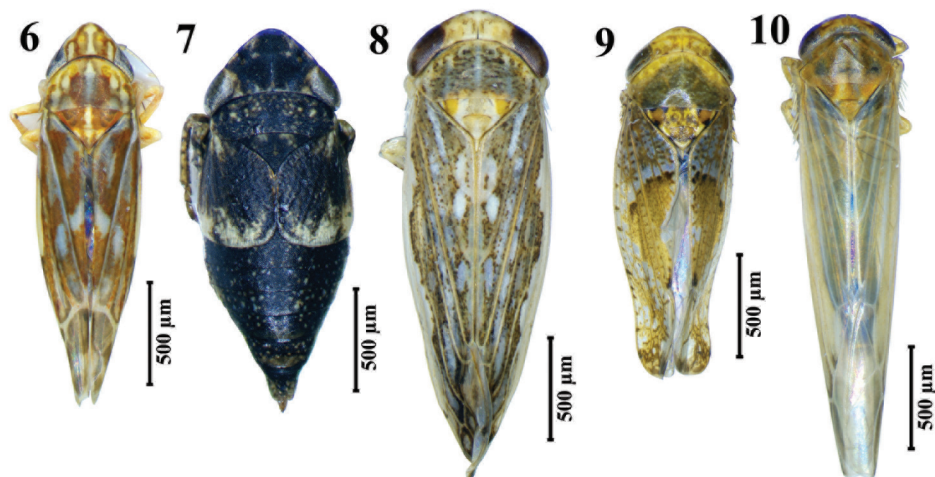
Remarks. Rarely collected in Hungary. The species was first reported from Hungary by GYÖRFFY et al. (2009) based on specimens from Bugac, Bács-Kiskun county. However, voucher specimens were not presented in the HNHM until SCHLITT (2025) collected specimens from Fenyőfő. Other unpublished records of the species are known from Hungary by the authors.

***Neoliturus inscriptus* (Haupt, 1927)**

(Fig. 8)

Material examined. Baranya county, Nagyharsány, Szársomlyó, 26-29.X.2024 leg. Schlitt B. P., two females [collected by sweeping on *Lycium barbarum* L. (Solanaceae)]

Remarks. The species was first reported from the Carpathian Basin by SCHLITT et al. (2024), based on specimens collected during this fieldwork. Some voucher specimens are deposited in the entomological collection of the Rippl-Rónai Museum.



Figs. 6-10: Habitus photos of some interesting faunistic records in dorsal view, 6 – *Erasmoneura vulnerata* (Fitch, 1851), female, 7 – *Chiasmus conspurcatus* Perris, 1857, female, 8 – *Neoliturus inscriptus* (Haupt, 1927), female, 9 – *Hishimonus hamatus* Kuoh, 1976, male, 10 – *Balclutha frontalis* (Ferrari, 1882), female

Hishimonus hamatus Kuoh, 1976

(Fig. 9)

Material examined. Hungary: Baranya county, Nagyharsány, Szársomlyó, 26-29.X.2024 leg. Schlitt B. P., one male [collected on light]

Remarks. The species was first recorded by OROSZ et al. (2024) as a potential invasive species collected in high numbers and at several locations in Hungary. The species seems to be widely distributed in the country and has stable populations; therefore, it can usually be collected in large quantities.

Balclutha frontalis (Ferrari, 1882)

(Fig. 10)

Material examined. Baranya county, Nagyharsány, Szársomlyó, 26-29.X.2024 leg. Schlitt B. P., two males, one female [collected by light]

Remarks. The species was first reported from Hungary by OROSZ (2009) from Gyűrűfű as *Balclutha rosea*. Before this study, a new locality of this species from Hungary was not published. However, the species could have stable populations in the country and could be more widely distributed.

Ficocyba ficaria (Horváth, 1897)

Material examined. Baranya county, Nagyharsány, Szársomlyó, 26-29.X.2024 leg. Schlitt B. P., one male [collected on light]

Remarks. The species was first reported from Hungary by KOCZOR et al. (2025), which also comes from Szársomlyó Hill.

Frutoidia bisignata (Mulsant & Rey, 1855)

Material examined. Baranya county, Nagyharsány, Szársomlyó, 26-29.X.2024 leg. Schlitt B. P., two females [collected on light]

Remarks. Rarely collected in Hungary. The species was first reported from Hungary by OROSZ (2009) based on specimens from Gyűrűfű, Baranya county. After that, only SCHLITT (2024) reported the species from Vinye, Veszprém county.

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Preliminary Inventory of Ant Fauna from the Serenity Trust Library and Botanical Garden, Ahmedabad, Gujarat, with Five New State Records

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Abstract: An ant diversity survey was conducted at The Serenity Trust Library and Botanical Garden, Ahmedabad, Gujarat, India during August 2025. A total of 23 ant species belonging to 16 genera and 5 subfamilies were recorded from the study area. The subfamily Formicinae was co-dominant with Myrmicinae, each represented by 8 species (34.78%), followed by Ponerinae with 3 species (13.04%), and Dolichoderinae and Pseudomyrmecinae with 2 species each (8.70%). Among the recorded species, five species i.e. *Camponotus parvus* Emery, 1889; *Pheidole latinoda* Roger, 1863; *Brachyponera luteipes* (Mayr, 1862); *Leptogenys diminuta* (Smith, 1857); and *Tetraponera nigra* (Jerdon, 1851) constitute new records for Gujarat state. This study contributes to the understanding of ant diversity in urban botanical gardens and expands the known distribution of these species in western India.

Keywords: Formicidae, Myrmecology, Urban biodiversity, Gujarat, New records, Botanical Garden

Introduction

Ants (family Formicidae) are among the most successful and ecologically dominant groups of organisms on Earth (HÖLLDOBLER & WILSON 1990). They occur in nearly all terrestrial ecosystems, with their greatest diversity found in tropical regions (GUÉNARD 2013). Global estimates suggest that ant species richness exceeds 20,000 species (HÖLLDOBLER & WILSON 1990). These eusocial insects exhibit remarkable abundance, with conservative estimates placing their total population at approximately 20 quadrillion individuals, representing a combined biomass of 12 megatons of dry carbon, exceeding the total biomass of all wild birds and mammals (SCHULTHEISS et al. 2022). As of 2025, 16 subfamilies, 38 tribes, 346 genera and 14,384 valid ant species have been described globally (BOLTON 2025). In India, the ant fauna comprises 887 valid species and subspecies (BHARTI et al. 2016, AntWiki 2025).

Globally, urban development has been expanding rapidly. By 2050, an estimated 70% of the world's human population is projected to reside in cities, leading to a substantial increase in urbanized areas (SETO et al. 2013). In this context, understanding the role of

urban habitats in maintaining biodiversity and identifying the species that persist in such environments is critical for future ecological research and conservation planning (LEONG 2017). Botanical gardens and managed green spaces, in particular, play a vital role in urban biodiversity conservation, serving as refugia for native flora and fauna and acting as living repositories of ecological diversity (LEE 2023).

Gujarat State, located in western India and characterized by climatic zones ranging from sub-humid to semi-arid conditions (Ministry of Environment & Forests [MoEF] 2014), remains relatively poorly surveyed for myrmecological research, with scattered records and limited systematic studies on its ant diversity. In view of this, The Serenity Trust Library and Botanical Garden, situated in Koteshwar village near Motera, Ahmedabad, was selected as a representative site to document ant diversity in an urban semi-arid landscape. The garden, occupying approximately four hectares (40,000 m²), comprised diverse microhabitats including moist gardens, lawns, a water body, a dry deciduous forest patch, butterfly and pollinator gardens, a vegetable garden, and a medicinal herb garden. The campus supported over 800 botanical species and harbored notable faunal diversity, including 178 bird species, 78 butterfly species, over 135 moth species, 23 mammal species, 27 reptile species, and 10 amphibian species (The Serenity Library 2025). Given such ecological heterogeneity and documented faunal richness, the site provided an excellent opportunity to investigate the composition and diversity of its ant fauna.

Species checklists provide essential baseline documentation for biodiversity conservation and ecological planning, facilitating the assessment of distribution patterns, taxonomic completeness, and conservation status (MAGAGULA & HAWKES 2023). The present study on the ant fauna of The Serenity Trust Library and Botanical Garden contributes valuable baseline data on ant diversity within an urban semi-arid landscape of Gujarat. It also reports five new state records, expanding the known distribution of these species in India, and underscores the conservation significance of small, well-maintained urban green spaces in sustaining insect biodiversity amidst rapid urbanization.

Materials and methods

The survey was conducted in August 2025 at The Serenity Trust Library and Botanical Garden (23.111825°N, 72.623190°E) in Koteshwar village near Motera, Sabarmati, Ahmedabad District, Gujarat (Fig. 1). The garden comprises diverse native and exotic vegetation, including mixed tree canopies, shrub layers, and open areas that provide heterogeneous microhabitats for ant communities. Sampling was carried out during the post-monsoon period using hand-picking and aspirator methods. In the hand-picking method, ants were actively collected from ground surfaces, leaf litter, under stones, logs, and vegetation using soft forceps, while the aspirator was employed to collect small or fast-moving species from bark crevices and foliage. Specimens were preserved in 70% ethanol, sorted, cleaned, and card-mounted for examination. Morphological analysis was performed using a Nikon SMZ 1500 stereo zoom microscope (max. magnification 112.5×), and standard morphometric parameters were recorded. Species identification was based on standard taxonomic keys which includes BINGHAM 1903, BOLTON 1994 and comparison with reference collections, and distributional data were verified using BHARTI et al. 2016 and AntWiki, 2025. Photographs of newly recorded species were captured using a Nikon D5600 DSLR camera with a Laowa 25 mm ultra-macro lens; multiple focal-plane images were focus-stacked to enhance depth of field and highlight diagnostic characters.

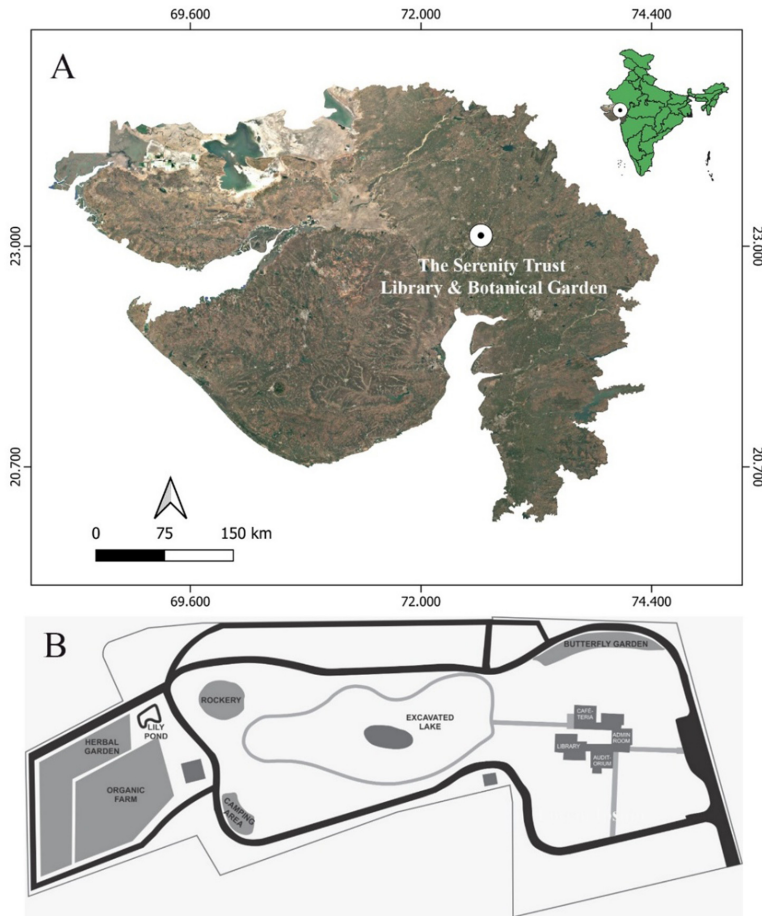


Fig. 1: Location of The Serenity Trust Library and Botanical Garden, Ahmedabad, Gujarat, India. (A) Regional position within Gujarat and India; (B) Detailed site layout.

Morphological terminology and standard measurements followed BHARTI & WACHKOO (2014), BAIDWAN et al. 2024

Head length (HL): Maximum length of head in full-face view, measured in straight line from the anteriormost point of the median clypeal margin to the midpoint of a line drawn across the posterior margin of head.

Head width (HW): Maximum width of head in full-face view (excluding the portion of eyes that extends past the lateral margins of the head).

Eye length (EL): Maximum length of eye as measured normally in oblique view of the head to show full surface of eye.

Eye width (EW): In lateral view maximum width of eye.

Scape length (SL): Maximum length of the scape, excluding the basal neck and condyle.

Pronotal width (PnW): Maximum width of the pronotum in dorsal view.

Mesosoma length (ML): Mesosomal length in profile, from the anteriormost border of the pronotum, excluding the neck to the posterior basal angle of the metapleuron.

Postpetiole length (PPTL): Maximum length of the postpetiole in profile, from the anterior and posterior extensions of the postpetiolar node, excluding the anterior and posterior condyles.

Gaster length (GL): The length of the gaster in profile from the anteriormost point of the first gastral segment to the posteriormost point (excluding sting).

Total length (TL): Total outstretched length of a specimen, excluding mandibles.

The following ratios were calculated from the preceding measurements and multiplied by 100 are denominated as indices:

Cephalic index (CI): $HW/HL \times 100$.

Scape index (SI): $SL/HW \times 100$.

Repository

PUAC = “Punjabi University Patiala Ant Collection” at Department of Zoology and Environmental Sciences, Punjabi University, Patiala, Punjab, India

Results

A total of 23 ant species belonging to 16 genera and 5 subfamilies were recorded from The Serenity Trust Library and Botanical Garden during the survey period (Table 1). The recorded fauna represents a diverse assemblage with representation from major ant sub-families occurring in the Indian subcontinent.

Table 1: List of ant species recorded from The Serenity Trust Library and Botanical Garden, Ahmedabad, Gujarat

S. No.	Species	Subfamily
1.	<i>Tapinoma melanocephalum</i> (Fabricius, 1793)	Dolichoderinae
2.	<i>Technomyrmex albipes</i> (Smith, 1861)	Dolichoderinae
3.	<i>Camponotus compressus</i> (Fabricius, 1787)	Formicinae
4.	<i>Camponotus irritans</i> (Smith, 1857)	Formicinae
5.	<i>Camponotus parius</i> Emery, 1889	Formicinae
6.	<i>Lepisiota bipartita</i> (Smith, 1861)	Formicinae
7.	<i>Paratrechina longicornis</i> (Latreille, 1802)	Formicinae
8.	<i>Plagiolepis jerdonii</i> Forel, 1894	Formicinae
9.	<i>Polyrhachis exercita</i> (Walker, 1859)	Formicinae
10.	<i>Polyrhachis lacteipennis</i> Smith, 1858	Formicinae
11.	<i>Crematogaster rothneyi</i> Mayr, 1879	Myrmicinae
12.	<i>Crematogaster subnuda</i> Mayr, 1879	Myrmicinae
13.	<i>Meranoplus bicolor</i> (Guérin-Méneville, 1844)	Myrmicinae
14.	<i>Monomorium indicum</i> Forel, 1902	Myrmicinae
15.	<i>Monomorium pharaonis</i> (Linnaeus, 1758) (I)	Myrmicinae
16.	<i>Pheidole latinoda</i> Roger, 1863	Myrmicinae
17.	<i>Pheidole sulcaticeps</i> Roger, 1863	Myrmicinae
18.	<i>Trichomyrmex destructor</i> (Jerdon, 1851)	Myrmicinae
19.	<i>Anochetus sedilloti</i> Emery, 1884	Ponerinae
20.	<i>Brachyponera luteipes</i> (Mayr, 1862)	Ponerinae
21.	<i>Leptogenys diminuta</i> (Smith, 1857)	Ponerinae
22.	<i>Tetraponera nigra</i> (Jerdon, 1851)	Pseudomyrmecinae
23.	<i>Tetraponera rufonigra</i> (Jerdon, 1851)	Pseudomyrmecinae

The subfamily-level analysis revealed co-dominance of Formicinae and Myrmicinae, each represented by eight species (34.78% each). Ponerinae was represented by three species (13.04%), while Dolichoderinae and Pseudomyrmecinae each contributed two species (8.70%) (Fig. 2). This composition reflects a typical pattern in tropical and sub-tropical ant assemblages, where Formicinae and Myrmicinae collectively account for the majority of species richness. A total of sixteen genera were recorded from the study area. The genus *Camponotus* was the most species-rich with three species, followed by *Polyrhachis*, *Crematogaster*, *Monomorium*, *Pheidole*, and *Tetraponera*, each represented by two species. The remaining genera – *Tapinoma*, *Technomyrmex*, *Lepisiota*, *Paratrechina*, *Plagiolepis*, *Trichomyrmex*, *Meranoplus*, *Anochetus*, *Brachyponera*, and *Leptogenys* – were each represented by a single species.

Five species collected during this survey represent first records for Gujarat state, significantly expanding the known distribution of these taxa in western India. Detailed accounts of these species are provided below.

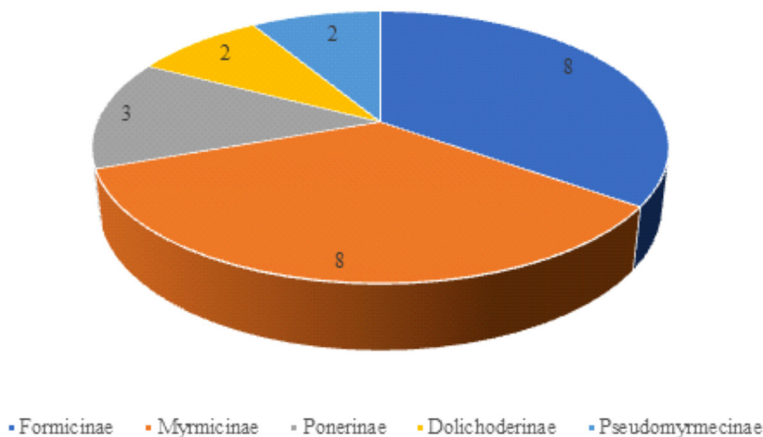


Fig. 2: Proportion of ant species across different subfamilies in the study area

New State Records for Gujarat

Camponotus parius Emery, 1889 (Fig. 3)

Camponotus micans r. *paria* Emery, 1889: 513 (w.) Myanmar. Indomalaya.

Material examined: India, Gujarat, The Serenity Trust Library and Botanical Garden, 23.111389 N 72.623611 E, 84m, Hand picking, 22-08-2025, 12w, Rakeshwar Kapoor leg. (PUAC).

Worker measurements: HL 2.41-2.82; HW 2.17-2.58; EL 0.49-0.53; EW 0.41-0.43; SL 2.09-2.17; PnW 1.41-1.45; ML 2.78-3.15; PL 0.65-0.69; GL 2.82-3.64; TL 8.66-10.30mm. Indices: CI 90.41-90.48; SI 84.10-96.31. (n=7).

Diagnostic characteristics: In full-face view, the head is subtriangular in shape with length approximately equal to width, the posterior margin of the head is straight to slightly concave, while the lateral margins are convex. Head lateral and ventral setae absent to short, and never abundant, clypeus lobe is anterolaterally rounded and medially emarginated; in lateral view, the mesosomal profile forms a smooth, continuous arch that is not interrupted by the propodeum; the petiolar node is relatively broad and compressed, with silky pilosity that is dense and evenly distributed; gaster is completely covered with sericeous yellow pubescence.



Fig. 3: *Camponotus parius* Emery, 1889: Profile view of the worker

Distribution: Previously recorded from Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Goa, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Maharashtra, Meghalaya, Nagaland, Orissa, Punjab, Sikkim, Tamil Nadu, Uttar Pradesh, Uttarakhand and, West Bengal. This represents the first record from Gujarat and extends the known distribution to western India.

***Brachyponera luteipes* (Mayr, 1862) (Fig. 4)**

Ponera luteipes Mayr, 1862: 722 (w.q.) India (Nicobar Is). Indomalaya.

Material examined: India, Gujarat, The Serenity Trust Library and Botanical Garden, 23.112778 N 72.624167 E, 80m, Aspirator, 24-08-2025, 7w, Rakeshwar Kapoor leg. (PUAC).

Worker Measurements: HL 1.01-1.07; HW 0.92-0.98; EL 0.17-0.19; EW 0.12-0.16; SL 0.93-0.98; PnW 0.58-0.64; ML 1.31-1.39-3; PL 0.26-0.29; GL 1.32-1.78; TL 3.87-4.56mm. Indices: CI 89.08-92.98; SI 99.01-102.75. (n=5).

Diagnostic characteristics: Head longer than wide, finely punctate, posteriorly slightly emarginate, with broadly rounded depression at posterior margin, Mandible finely punctured and triangular with nine teeth; clypeus anteriorly with a broad medial lobe; antennae 12-segmented with scape exceeding posterolateral corner, flagellar segments first and second as long as broad, or wider than long. pronotum and mesonotum dorsum rough; lateral mesosoma smooth and shiny; petiolar node and gaster finely punctate. Body black; mandible, antennae flagellum, tibiae, tarsus, and end of gaster reddish brown.

Distribution: Previously recorded from Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Mizoram, Nagaland, Orissa, Punjab, Sikkim, Tamil Nadu, Tripura, Uttarakhand and West Bengal. Not previously reported from Gujarat.



Fig. 4: *Brachyponera luteipes* (Mayr, 1862): Profile view of the worker

***Leptogenys diminuta* (Smith, F., 1857) (Fig. 5)**

Ponera diminuta Smith, 1857a: 69 (w.) Borneo (East Malaysia: Sarawak). Indomalaya.

Material examined: India, Gujarat, The Serenity Trust Library and Botanical Garden, 23.110000 N 72.622778 E, 82m, Hand picking, 23-08-2025, 5w, Parvinder Singh Baidwan leg. (PUAC).



Fig. 5: *Leptogenys diminuta* (Smith, 1857): Profile view of the worker

Worker measurements: HL 1.39-1.47; HW 1.14-1.23; EL 0.28-0.36; EW 0.17-0.24; SL 1.59-1.64; PnW 0.86-0.90; ML 2.17-2.50; PL 0.57-0.62; GL 2.50-2.70; TL 6.63-7.29mm. Indices: CI 82.01-83.67; SI 133.33-139.47. (n=4).

Diagnostic characteristics: Head longitudinally striated anterior to eyes and transversely striated posterior to eyes; median clypeal lobe triangular, apex bluntly rounded with two setae, strongly carinate in middle; pronotum smooth without striation laterally, mesonotum and metanotum rugose; propodeal declivity transversally striated; petiole nodiform, anterior and posterior petiolar margins straight, inclined not forming continuous convexity in profile, dorsal margin convex; node in dorsal view longer than wide; sub-petiolar process absent; gaster cylindrical, curved posteriorly, dorsal convex; body covered with sparse suberect hairs, no appressed pubescence; head, mesosoma, node and most of gaster black; antennae, mandibles, clypeus, legs and apex of gaster brown; coxae black.

Distribution: Previously recorded from Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Goa, Jammu & Kashmir, Karnataka, Kerala, Maharashtra, Meghalaya, Mizoram, Nagaland, Orissa, Sikkim, Tamil Nadu and, West Bengal.

***Pheidole latinoda* Roger, 1863 (Fig. 6)**

Pheidole latinoda Roger, 1863a: 195 (s.) Sri Lanka? Indomalaya.

Material examined: India, Gujarat, The Serenity Trust Library and Botanical Garden, 23.112778 N 72.623333 E, 79m, Hand picking, 23-08-2025, 12w, Himender Bharti leg. (PUAC).

Worker measurements: HL 1.8-1.88; HW 1.92-1.98; EL 0.28-0.32; EW 0.24-0.30; SL 1.32-1.38; PnW 0.9-1.0; ML 1.84-1.92; PL 0.41-0.45; PPTL 0.45-0.49; GL 2.20-2.32; TL 6.70-6.94mm. Indices: CI 105.31-106.66; SI 68.75-69.69. (n=4).



Fig. 6: *Pheidole latinoda* Roger, 1863: Profile view of the worker

Diagnostic characteristics: Head anteriorly longitudinally striate, posterior and laterally reticulate, the head is noticeably broader at the posterior end compared to the anterior of the head and vertex bears a broad, well-defined transverse impression; clypeus anterior margin medially biangular; antennae 12 segmented, terminal three flagellar segments forming a distinct club; mesometanotal suture distinct, mesosoma anteriorly transversely striate, metanotal spines erect and stout; petiole with a projection and appendix beneath, petiole without emargination above; abdomen only striate at base rest smooth and shiny; body with light chestnut-red colour and covered with abundant soft, erect, reddish hairs.

Distribution: Previously known from Arunachal Pradesh, Assam, Bihar, Delhi, Himachal Pradesh, Jharkhand, Maharashtra, Manipur, Mizoram, Nagaland, Sikkim, Tamil Nadu, Tripura, Uttar Pradesh, and West Bengal. It has not been listed from Gujarat previously. The present record extends its known distribution to western India.

***Tetraponera nigra* (Jerdon, 1851) (Fig. 7)**

Eciton nigrum Jerdon, 1851: 112 (w.q.) India (Karnataka/Kerala). Indomalaya.

Material examined: India, Gujarat, The Serenity Trust Library and Botanical Garden, 23.113333 N 72.624444 E, 77m, Hand picking, 25-08-2025, 6w, Parvinder Singh Baidwan leg. (PUAC).

Worker measurements: HL 1.23-1.27; HW 1.10-1.16; EL 0.41-0.43; EW 0.30-0.34; SL 0.69-0.75; PnW 0.69-0.78; ML 1.87-1.96; PL 0.84-0.90; PPTL 0.60-0.68; GL 2.08-2.20; TL 6.62-7.01. Indices: CI 89.43-91.33; SI 56.09-59.05. (n=4).

Diagnostic characteristics: The head exhibits relatively sparse punctation with noticeably shiny interspaces between the punctures; head without or very rarely with two or



Fig. 7: *Tetraponera nigra* (Jerdon, 1851): Profile view of the worker

three faint ocelli; compound eyes large size; mandible robust, with four teeth on the masticatory margin; petiole long and slender; body black colour with most of the pilosity standing in profile on mesosoma, petiole, postpetiole mesosternum devoid of pubescence, the fourth abdominal tergite is characteristically covered with dense pubescence.

Distribution: Previously recorded from Andhra Pradesh, Arunachal Pradesh, Assam, Delhi, Goa, Haryana, Himachal Pradesh, Jammu & Kashmir, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Meghalaya, Nagaland, Odisha, Punjab, Sikkim, Tamil Nadu, Uttar Pradesh, Uttarakhand, and West Bengal. The present record from Gujarat represents a significant range extension of the species.

Discussion

The Serenity Trust Library and Botanical Garden in Ahmedabad supports notable ant diversity despite its small size and urban setting, with 23 species representing five sub-families. The co-dominance of Formicinae and Myrmicinae reflects typical tropical community patterns, as reported from other regions of the Indian subcontinent (DAD et al. 2019, SUBEDI et al. 2021). The presence of Ponerinae and Pseudomyrmecinae indicates habitat heterogeneity, suggesting availability of varied nesting and foraging sites. Five new state records: *Camponotus parius*, *Pheidole latinoda*, *Brachyponera luteipes*, *Leptogenys diminuta*, and *Tetraponera nigra* extend the known distribution of these species into western India, revealing that Gujarat's urban green spaces remain underexplored. Well-maintained urban gardens can maintain ecological complexity and function as refugia and stepping stones for biodiversity (GIBB & HOCHULI 2002). This study highlights the ecological significance of conserving even small urban habitats and emphasizes the need for continued, systematic surveys to document and protect urban ant diversity.

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