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# Review of *Harpactea* ground-dwelling spiders (Araneae: Dysderidae) of Portugal

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## Abstract

We revise the Portuguese spiders of the genus *Harpactea* Bristowe, 1939 (Araneae: Dysderidae). The following seven new species are described: *H. adicensis* **sp. nov.**, *H. crespoi* **sp. nov.**, *H. dolanskyi* **sp. nov.**, *H. henriquesi* **sp. nov.**, *H. korenkoi* **sp. nov.**, *H. krejcii* **sp. nov.** and *H. pekari* **sp. nov.** In three species, *H. algarvensis* Ferrández, 1990*, H. minoccii* Ferrández, 1982 and *H. tavirensis* Wunderlich, 2020 the females are described for the first time. The Portuguese *Harpactea* spiders belong to two species groups, namely the *hombergi* group and the *corticalis* group (*sensu* Deeleman-Reinhold 1993). The majority of the Portuguese representatives of the *corticalis* group probably constitute a monophyletic group endemic for the Iberian peninsula, the *minoccii* subgroup Ferrández, 1990. The synapomorphy of this clade is the unique position of partners during copulation: the male grasps one of the female's chelicerae between his chelicerae. The males' chelicerae are morphologically adapted for this behaviour. Due to this unusual position during copulation the female genitalia are more distant from the male than in other *Harpactea* species. Therefore, the pedipalps are more elongated . Furthermore, the males of this subgroup possess larger basal part of male copulatory organ (the tegulum), where the ejaculate is stored before copulation. We observed that the males of this subgroup invest significantly more time into single copulation than the other representatives of the *corticalis* group with smaller tegulum. Therefore, enlargement of the tegulum might reflect different sperm competition strategy, in which males invest more ejaculate in each copulation. In Portugal, *Harpactea* spiders are frequently found under woody plants that produce slowly decomposing leaf litter, usually *Quercus* spp., or introduced *Eucalyptus* sp. These spiders require slightly humid substratum.

**Key words:** Iberian Peninsula, Mediterranean, new species, taxonomy, endemics

## Introduction

The spider family Dysderidae represents haplogynous spiders characterised by relatively simple genitalia. This family is documented in the European fauna since the Eocene (fossils in 44 million years old baltic amber, Wunderlich 2004). Morphologically, dysderid spiders are characterised by the presence of only six eyes (anterior median eyes are absent) arranged in a compact group. They have a well-developed tracheal system, opening in one pair of spiracles positioned just behind the book lung openings.

Dysderidae is the only spider family endemic to the Palearctic. In particular, dysderids occur throughout the Mediterranean and central Asia, with very few representatives also found in adjacent areas (World Spider Catalog 2021). The cosmopolitan *Dysdera crocata* C. L. Koch, 1838 is an introduced species worldwide (Řezáč *et al.* 2008a, Nedvěd *et al.* 2011), even causing possible extinctions by outcompeting endemic taxa in some islands (Cardoso *et al.* 2010). The vast majority of dysderid species are endemic to very small areas (Řezáč *et al.* 2014, 2018), including extraordinary cases of adaptive radiation on islands (*e.g.*, Arnedo *et al.* 2001, 2007, Řezáč *et al.* 2021). Small distribution ranges of dysderid species contrast with large distribution areas of species from most other spider families. The high level of endemism of the dysderids is probably caused by their disability to migrate passively through ballooning, a very common strategy in many other spider groups.

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The family Dysderidae is divided in three subfamilies, Harpacteinae, Dysderinae and Rhodinae (Deeleman-Reinhold & Deeleman 1988). The first includes the genera *Harpactea* Bristowe, 1939*, Dasumia* Thorell, 1875*, Folkia* Kratochvíl, 1970*, Holissus* Simon, 1882*, Minotauria* Kulczyński, 1903 and *Stalagtia* Kratochvíl, 1970. It differs from the Dysderinae by the presence of a middle claw and absence of claw tufts on leg tarsi and from both Dysderinae and Rhodinae by the front of the sternum having large notches for pedipalp coxae (Deeleman-Reinhold & Deeleman 1988). The generic taxonomy of the subfamily Harpacteinae is provisional (see Deeleman-Reinhold 1993), with future reclassification needed to solve obvious paraphylies (Platania *et al.* 2020).

The most speciose Harpacteinae genus is *Harpactea.* It comprises 181 valid species occuring from the Mediterranean to Iran (World Spider Catalog 2020). Some species colonised central and northern Europe. *Harpactea* spiders are a characteristic component of the leaf litter fauna in the mediterranean forests and bushlands. They are especially speciose in mountainous regions. As they require humid conditions, they tend to retreat inside soil crevices during the dry season. Additionally, some species have colonised karstic caves (Mammola *et al.* 2018), with a few cases of anophthalmy (Ribera 1993). They are non-web building predators that forage on the ground and on tree trunks at night. During the day they take shelter in silken cells in the leaf litter or under wood or stones on the ground. In contrast to *Dysdera* Latreille, 1804 dietary specialised on woodlice*, Harpactea* spiders are polyphagous, capturing a wide range of small arthropods with soft body (Bristowe 1958).

Dysderids present the highest endemic richness in the Iberian Peninsula (58 species). Of these, five species of *Harpactea* are endemic to Portugal (Branco *et al.* 2019a, b). The first descriptions of Portuguese *Harpactea* were not published until the end of the 20th century. Single species were described by Brignoli (*Harpactea fageli* Brignoli, 1980 from Spain), Pesarini (*Harpactea gaditana* Pesarini, 1988 from Spain), Machado & Ferrández (*Harpactea magnibulbi* Machado & Ferrández, 1991) and Ribera (*Harpactea stalitoides* Ribera, 1993). Ferrández described three additional species in 1990 (*Harpactea algarvensis* Ferrández, 1990; *Harpactea proxima* Ferrández, 1990 and *Harpactea subiasi* Ferrández, 1990). Despite this effort, additonal Portuguese *Harpactea* remained undescribed, probably a as result of the narrow ranges of these spiders in Portugal, as they occur in very small areas. Moreover, most species can only be found during the short, humid periods of the year.

In this paper we describe seven new *Harpactea* species from Portugal, more than twice the number of species previouly known in the region, and provide illustrations and data about synonymies, distribution ranges, habitats, phenology, and conservation status.

## Material and methods

### Morphology

The nomenclature of structures of copulatory organs is described in the chapter “Genitalia” in Results, and illustrated in Figs 4A–H, 5A–F, 6A–B, 7A. The width of carapace was measured in its widest point. Gnathocoxa length was measured from the base of the pedipalpal coxa to the tip of gnathocoxa. Measurement of the length of the basal cheliceral segment did not include the proximal part hidden inside the carapace. The bulbus diameter represents the maximum diameter of the basal bulbus sclerite. It is usually the length of the tegulum plus the length of the conductor, however, in some species with short conductor and wide tegulum (for example, *H. tavirensis* and *H. crespoi* **sp. nov.**), the width of the tegulum is the maximum diameter of the basal bulbus sclerite.

### Microscopy

To investigate the morphology of the female genitalia under a light microscope, the vulva was dissected, and brightened using concentrated glycerol. The bodies and prosomas were photographed with a Hirox Japan digital microscope, the vulvae were photographed with a Nikon Eclypse 80i. The photographs were stacked using the NIS-Elements Imaging Software. For scanning electron microscopy (SEM) specimens preserved in ethanol were used. The male prosomas were isolated. The female genitalia were dissected, macerated for 24 hours in 5% KOH until the soft tissues were dissolved, and washed in distilled water. Samples were then dried at room temperature, mounted on a stub, coated with gold and examined using SEM (JEOL 6380 LV). The figure plates were made in the programme Corel PHOTO-PAINT™.

### Distribution, habitat preferences, and natural history

The distribution, habitat preference and phenology were obtained from surveys conducted by the authors. The fecundity was described by counting number of eggs guarded by females in silken cells, collected randomly in nature or in captivity. The eggs were counted under a dissecting microscope.

## Results

## TAXONOMY

### Genus *Harpactea* Bristowe, 1939

Type species *Dysdera latreillii* Blackwall, 1832, by original designation.

**Remarks.** *Harpactea hombergii* is currently stated as the type species of the genus *Harpactea* (World Spider Catalog 2021). It is through synonymy of *Aranea hombergii* and *Dysdera latreillii*. Templeton (1835) described a new dysderid genus *Harpactes* for *Dysdera latreillii*. He was not sure whether his specimens were conspecific with Blackwall's (1832) *Dysdera latreillii,* therefore he called it *D. latreillii* with question mark. Vigors (in Templeton 1835), the editor of the paper, emended the name to *D. templetoni*. Later, Bristowe (1939) noticed that the name *Harpactes* was already preoccupied, so he replaced it with *Harpactea*. In summary, the type species of the genus *Harpactea* is undoubtedly *Dysdera latreillii*, not *Aranea hombergii* (see also Thaler & Knoflach 2002, Řezáč *et al.* 2014).

**Diagnostic characters.** Diagnostic characters of *Harpactea* include the body size, colour of prosoma, leg spination and the shape of male chelicerae and copulatory organs. *Harpactea* are usually small to medium size spiders (carapace length 1.3–2.3 mm, although members of the group *rubicunda* from the eastern Meditteranean are usuay larger), with a homogeneous body shape (Fig. 1), although some species have elongated body and appendages (*e.g.*, Fig. 1C). The prosoma is brown or yellow, usually darker in the anterior part. The abdomen shows no color patterns, its cuticle is hardly pigmented, so that grey or brownish midgut is visible. The shape of the chelicerae and the arrangement of the cheliceral teeth are uniform and characteristic for the majority of species of the genus (see the *fageli* type below).

### Chelicerae

The part of the *Harpactea corticalis* group occurring in the Iberian Peninsula, the *Harpactea minoccii* subgroup (see discussion), shows unique modifications in the chelicerae. They are related to the copulatory behaviour of males; therefore, they are present only in males (see the Discussion). We classify the diversity of male chelicerae of *Harpactea corticalis* group into six types, which can be determined using the following key.

1 Two teeth in posterior row and two teeth between them in frontal row (*e.g.*, Fig. 2C) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **2**
\- Arrangement of teeth different . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **3**
2 Fang without tooth on its anterior side . **Type *fageli*** (beside rest of the *Harpactea corticalis* group this type is present also in all other *Harpactea* species groups and in all *Harpactea* females)
\- Fang with tooth on its anterior side . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **Type *adicensis***
3 Only posterior distal tooth stays independent, the others are fused into semi-circular crest (Fig. 2N) . . . . . . . . . . .**Type *crespoi***
\- At least three independent teeth are present . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **4**
4 Only three teeth are present (the anterior distal one is missing, *e.g.*, Fig. 2E) . . . . . . . . . . . . . . . . . . . . . . . . . . . **Type *minoccii***
\- Four teeth are present . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **5**
5 Teeth are arranged in three rows (the anterior basal tooth is shifted to the front, *e.g.*, Fig. 2L), the basal teeth are next to each other . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **Type *algarvensis***
\- Teeth are arranged in two rows, the anterior basal tooth is more basal than the posterior basal one (*e.g.*, Fig. 2H) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . **Type *magnibulbi***

**Type *fageli*** (Figs 2A–D). Basal cheliceral segment is slender, fang simple. Cheliceral teeth two in anterior and two slightly smaller in posterior row. Anterior teeth between posterior ones, closer to the basal one. The anterior basal tooth is on the edge of cheliceral lamella, it is larger than the anterior distal one. Plesiomorphic cheliceral type present in the vast majority of *Harpactea* species, including *H. hombergii, H. fageli, H. gaditana, H. henriquesi* **sp. nov.**, and *H. pekari* **sp. nov.** treated in this study.

**Type *adicensis*** (Fig. 2I). The basal cheliceral segment is thick. Cheliceral teeth are small, low, two in front and two slightly larger in posterior row. The rows are more distant than in the type *fageli* but less than in the type *magnibulbi*, to which it is the most similar. The basal teeth are next to each other. The posterior distal tooth is slightly bent basally. The fang has a large tooth on the anterior side of its basal half, the posterior side of the fang is slightly bent. This type is present only in the species *H. adicensis* **sp. nov.**

**Type *algarvensis*** (Figs 2J–L). Basal cheliceral segment is thick. The fang has a small tooth on the anterior side of its basal half (not seen in the provided figures as it is visible only in ventral or dorsal view), the posterior side of the fang is slightly bent or straight. Cheliceral teeth small and low, two in anterior and two slightly larger in posterior row. The basal teeth are next to each other. In relation to the distal anterior tooth the basal anterior tooth is shifted more to the front. The posterior distal tooth is slightly bent proximally. The distal anterior tooth is between the posterior teeth, closer to the basal one. This type is present in the species *H. algarvensis, H. krejcii* **sp. nov.**, and *H. dolanskyi* **sp. nov.**

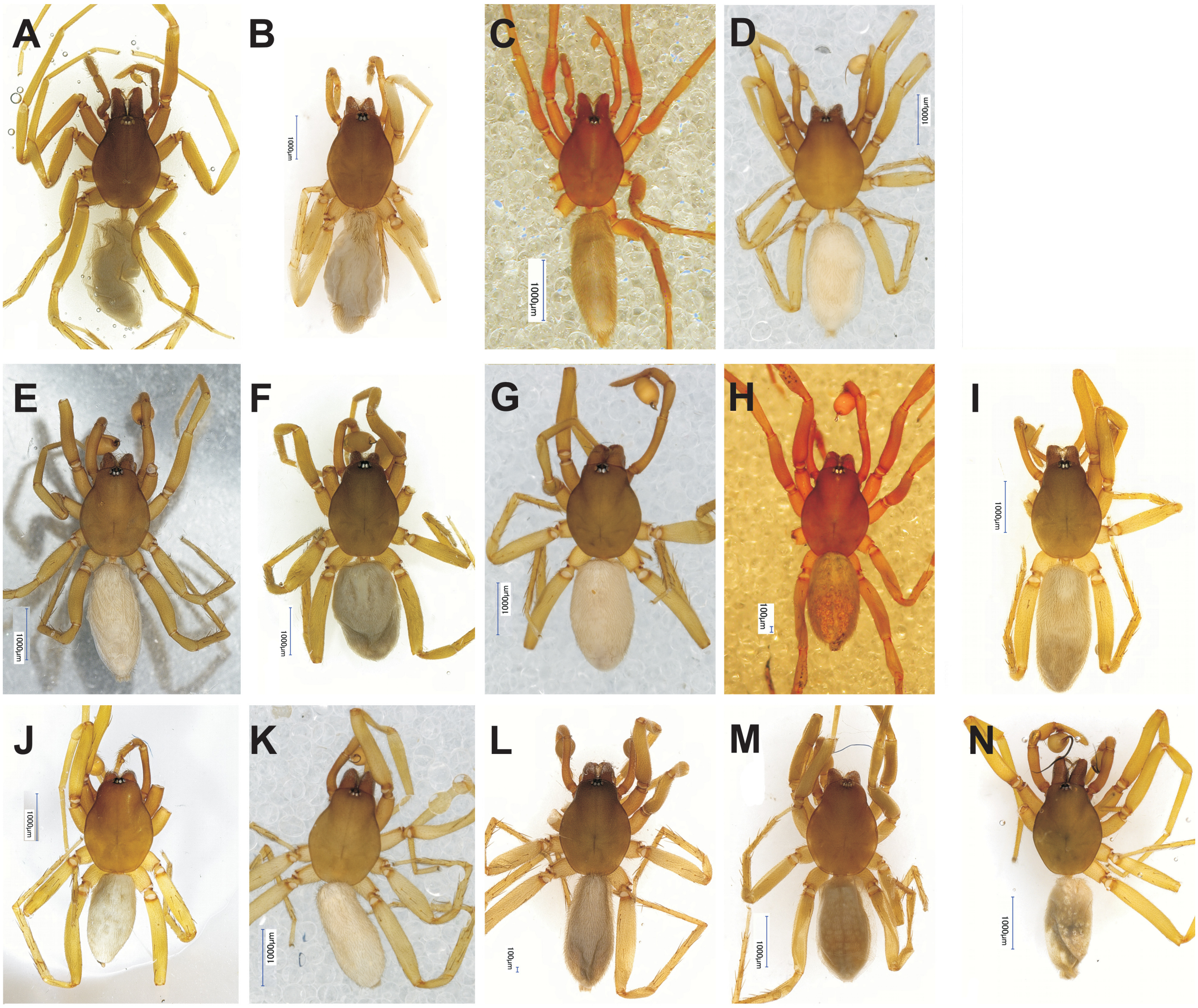

**FIGURE 1.** Portuguese *Harpactea* spiders. Males (dorsal view). A. *H. fageli*. Portugal: Setúbal; B. *H. gaditana*. Portugal: Alcomgosta; C. *H. henriquesi* **sp. nov.** Portugal: Torres Novas; D. *H. pekari* **sp. nov.** Portugal: Corredoura; E. *H. minoccii*. Portugal: Mertola; F. *H. subiasi*. Portugal: Setúbal; G. *H. magnibulbi*. Portugal: Fóia; H. *H. korenkoi* **sp. nov.** Portugal: Carrapateira; I. *H. adicensis* **sp. nov.** Portugal: Sobral da Adiça; J. *H. algarvensis*. Portugal: Barranco do Velho; K. *H. krejcii* **sp. nov.** Portugal: Ameixial; L. *H. dolanskyi* **sp. nov.** Portugal: Mertola; M. *H. tavirensis*. Portugal: Barranco do Velho; N. *H. crespoi* **sp. nov.** Portugal: Sobral da Adiça.

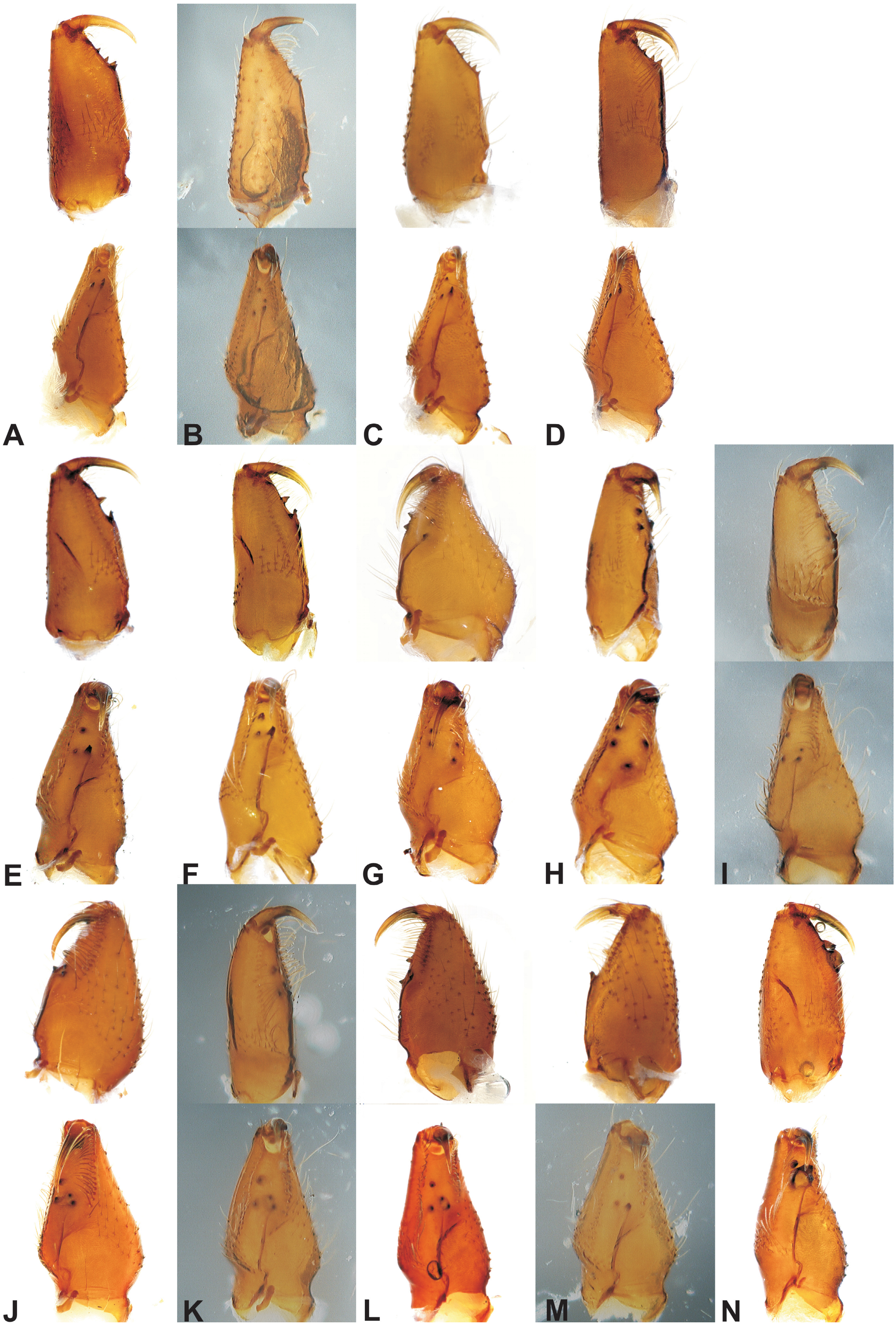

**FIGURE 2.** Portuguese *Harpactea* spiders. Right male chelicera. Above anterior (G, J, L, M) or posterior view (A, B, C, D, E, F, H, I, K, N); below median view. A. *H. fageli*. Portugal: Setúbal; B. *H. gaditana*. Portugal: Alcomgosta; C. *H. henriquesi* **sp. nov.** Portugal: Torres Novas; D. *H. pekari* **sp. nov.** Portugal: Corredoura; E. *H. minoccii*. Portugal: Mertola; F. *H. subiasi*. Portugal: Setúbal; G. *H. magnibulbi*. Portugal: Fóia; H. *H. korenkoi* **sp. nov.** Portugal: Carrapateira; I. *H. adicensis* **sp. nov.** Portugal: Sobral da Adiça; J. *H. algarvensis*. Portugal: Barranco do Velho; K. *H. krejcii* **sp. nov.** Portugal: Ameixial; L. *H. dolanskyi* **sp. nov.** Portugal: Mertola; M. *H. tavirensis*. Portugal: Barranco do Velho; N. *H. crespoi* **sp. nov.** Portugal: Sobral da Adiça.

**Type *magnibulbi*** (Figs 2G–H). Basal cheliceral segment is thick. The fang has a very prominent tooth on the anterior side of its basal half (not seen in the provided figures as it is visible only in ventral or dorsal view), its posterior side is bent. Cheliceral teeth small, low, two in anterior and two slightly larger in posterior row, the rows are very distant from each other. The anterior basal tooth is positioned more basally than the posterior basal one. The posterior basal tooth is directing basally. This type is present in the species *H. magnibulbi,* and *H. korenkoi* **sp. nov.**

**Type *minoccii*** (Figs 2E–F, M). The fang has a tooth on the anterior side of its basal half (not seen in the provided figures as it is visible only in ventral or dorsal view), the posterior side of the fang is slightly bent. One cheliceral tooth in anterior and two in posterior row. The anterior tooth is next to the posterior basal tooth, it is large, obtuse, directing distally. The posterior basal tooth is smaller than the posterior distal one. This type is present in the species *H. minoccii, H. subiasi,* and *H. tavirensis*.

**Type *crespoi*** (Figs 2N). This is the most modified *Harpactea* cheliceral type, perhaps derived from the type *algarvensis*. The fang has a very small tooth on the anterior side of its basal half, the posterior side of fang is straight. The only tooth that stayed unmodified is the posterior distal one. The other three teeth fused to the crest of the semi-circle shape. This type is present only in the species *H. crespoi* **sp. nov.**

## Genitalia

As common across spiders, the genitalia of *Harpactea* is very variable and provides most diagnostic traits for species identification. These structures reflect variation of strategies in sperm competition evolved in males and strategies in male choice in females (Smith 1984). For example, while in different species different spermathecae evolved for storing ejaculate (Burger & Kropf 2007), in *Harpactea sadistica* Řezáč, 2009 spermathecae are atrophied as males inject sperm directly to the body cavity through the integument (the only so far documented case of traumatic insemination in the subphylum Chelicerata, Řezáč 2008, 2009). The nomenclature of the copulatory organ structures of *Harpactea* is presented, for example, in Alicata 1966a, Deeleman-Reinhold 1993, Chatzaki & Arnedo 2006, or Platania *et al.* 2020.

The male copulatory organ, the bulbus, is composed of one or two segments connected by a membrane, the hematodocha (in *Harpactea* species presented in this study only two-segmented bulbi are present). The proximal part, the tegulum, is large, smooth and simple (Fig. 4A—t), while the distal part is complex and composed of two elements: an apophysis (the so-called conductor, in some species it is complex, in others it is a simple rod, Fig. 4A—c) and usually tubuliform and blackish embolus (Fig. 4A—e). In some species the conductor is reduced (Figs 4D, I, N). *Harpactea* females possess no external copulatory organ. Their copulatory organ, the vulva, is internal. It is relatively complex; in some species it holds two types of 'cul-de-sac' sperm storage organs (Fig. 6B). The epigastric furrow is delimited by a sclerotised anterior arc (Fig. 6A—aa) and a posterior transversal bar (Fig. 6A—tb). In some species the anterior arc bears a sclerotised median rod (Fig. 6A—mr), which is usually anteriorly equipped with a sclerotised keel-like projection (Fig. 7A—kp). In some species it contains a cavity connected with the genitalic opening by a duct (Fig. 6B—s), which probably serves as a spermatheca. The whole sclerotised anterior part of the vulva (often of the anchor-shape), especially the keel-like projection, functions as an apodeme for muscles serving for the opening of the epigastric furrow. Posterior to the transversal bar, there is in some species single (Fig. 6B—pd) or paired (Fig. 7A—pd) spherical membranous spermatheca called the posterior diverticle.

## We distinguish four types of vulvae in Portuguese *Harpactea*:

**Type *fageli*** (Figs 6A–B). Both the anterior arc and the posterior transversal bar are sclerotised, they do not protrude deep into the body (the space between them, the copulatory bursa, is shallow). Anterior arc bears a sclerotised rod-shaped spermatheca. Posterior transversal bar bears an elongated pocket-like posterior diverticle, sclerotised only on its distal end. Plesiomorphic *Harpactea* vulva type present in many species, including *H. hombergii, H. fageli,* and *H. henriquesi* **sp. nov.** treated in this study. In *H. gaditana* females are still not known. But its bulbus is almost identical with the one of *H. henriquesi* **sp. nov.** Therefore, we expect, that also vulvae of these species will be very similar. The posterior diverticle is not depicted in the figure of vulva in the original description of *H. stalitoides* (Ribera 1993: 3, figs 3–4). But in this species sclerotised rod-shaped spermatheca is present, thus we preliminarily classify this species to this type of vulva.

**Type *pekari*** (Fig. 6C). Remarkably reduced vulva. Anterior part is reduced to small sclerotised longitudinal rod with widened anterior end and porous surface (Fig. 6C—apparent in the SEM photo in the upper left corner).

Posterior transversal bar is narrow, it bears two furrows running inside. This type is present only in the species *H. pekari* **sp. nov.** Behind the epigastric furrow there is a relatively large ball of a whitish delicate tissue (the posterior diverticle) (Fig. 6C—wt), which may accomodate embolus and receive sperm during copulation, or it is ejaculate on itself (in such case it should be absent in virgin females).

**Type *minoccii*** (Figs 7A–B). Both the anterior arc and the posterior transversal bar are sclerotised, they protrude deep into the body, obliquely to the front (the copulatory bursa is relatively deep, Fig. 7A lat.—cb). Anterior arc (Fig. 7A—aa) bears a large sclerotised crest without cavity (Fig. 7A—kp). Posterior transversal bar is divided by flexible transversal hinge (Fig. 7A—th), which might serve as a valve closing uterus externus. Just behind the tracheal spiracles posterior transversal bar bears a pair of membranous posterior diverticles (Fig. 7A—pd). This type is present in the species *H. minoccii* and *H. subiasi*.

**Type *algarvensis*** (Figs 8A–E). Reduced version of the type *minoccii.* Both anterior arc and a posterior transversal bar are only slightly sclerotised, they protrude deep into the body, almost directly to the front (the copulatory bursa is relatively deep). Instead of sclerotised crest anterior arc bears a weak sclerotised rod, which does not extend the anterior edge of anterior arc much. In *H. crespoi* **sp. nov.** and *H. tavirensis* it is the only sclerotised part of anterior arc and only the posterior edge of the posterior transversal bar is visibly sclerotised. Bellow this posterior edge there is a small spherical structure that might be a rudimentary posterior diverticle. We did not find it in the species *H. korenkoi* **sp. nov.** Connected to sclerotised vulva is a whitish delicate tissue which may accomodate embolus and receive sperm during copulation, or it is ejaculate on itself (in such case it should be absent in virgin females). In *H. algarvensis* such structures were observed in front of the sclerotised vulva (Fig. 8D), in *H. tavirensis* (Fig. 8E) and *H. crespoi* **sp. nov.** they were observed to run towards ovaries. This type is present in the species *H. algarvensis, H. tavirensis*, *H. crespoi* **sp. nov.**, *H. magnibulbi* and *H. korenkoi* **sp. nov.** Females of the species *H. dolanskyi* **sp. nov.** and *H. krejcii* **sp. nov.** have not been examined, however the similarity of their male copulatory organs with those of *H. algarvensis* allows us to place them preliminarily to this group. The male copulatory organ of *H. adicensis* **sp. nov.** is very different from the other species, it most resembles those of *H. magnibulbi* and *H. korenkoi* **sp. nov.**, which might also be truth for its unknown vulva.

## Species descriptions

### *Harpactea adicensis* Řezáč sp. nov.

(Figs 1I, 2I, 3I, 5A, 9)

**Material.** *Holotype.* ♂, Moura, Serra da Adiça, 37.978, -7.294, *Quercus coccifera* bush, 27 March 2013, leg. M. Řezáč, coll. National Natural History Museum, Prague, code P6A 7384.

1 ♂ *Paratype.* Moura, Serra da Adiça, 37.978, -7.294, *Quercus coccifera* bush, 27 March 2013, leg. M. Řezáč, coll. Crop Research Institute, Prague.

**Etymology.** Named after the mountain range Serra da Adiça, the type locality of this species.

**Diagnosis.** *Harpactea adicensis* **sp. nov.** resembles *H. magnibulbi* and *H. korenkoi* **sp. nov.** by the shape of copulatory organs, in particular by almost straight dorsal side of cymbium (Fig. 3I), but it can be distinguished from these species by absence of conductor and the flattened embolus directing distally, growing from the middle of a collar on the terminal part of tegulum (Fig. 5A). Also, the morphology of male chelicerae is unique. The arrangement of teeth is of usual *Harpactea* type (two teeth in posterior row and two teeth between them in anterior row, but the fang is with tooth on its frontal side.

**Description.** *Male (holotype).* Carapace olive brown, matting (Fig. 1I). Sternum yellow-brown, matting. Chelicerae brown. Legs brown yellow, pedipalps brown. For measurements and leg spination see the Table 1. Relative leg length: IV>I>II>III. Cymbium with elongated distal part (Fig. 3I), and concave prolateral side. Tegulum large, longer than wide, terminated by collar surrounding the base of the embolus (Fig. 5A). Conductor atrophied. Embolus dark, regularly bent, flattened, the widest in the middle, directing distally. Opisthosoma cylindrical, whitish.

*Female.* Unknown

**Ecology.** Adults were found in early spring in leaf litter of *Quercus coccifera* forests on northeastern slopes.

**Distribution.** So far known only from Serra da Adiça, a mountain range in southern Portugal.

### *Harpactea algarvensis* Ferrández, 1990
(Fig. 1J, 2J, 3J, 5B, 8D, 9)

*H. algarvensis* Ferrández 1990: 32, fig. 1A–B (description based on male); Le Peru 2011: 263, fig. 379 (♂, redrawn from Ferrández 1990).

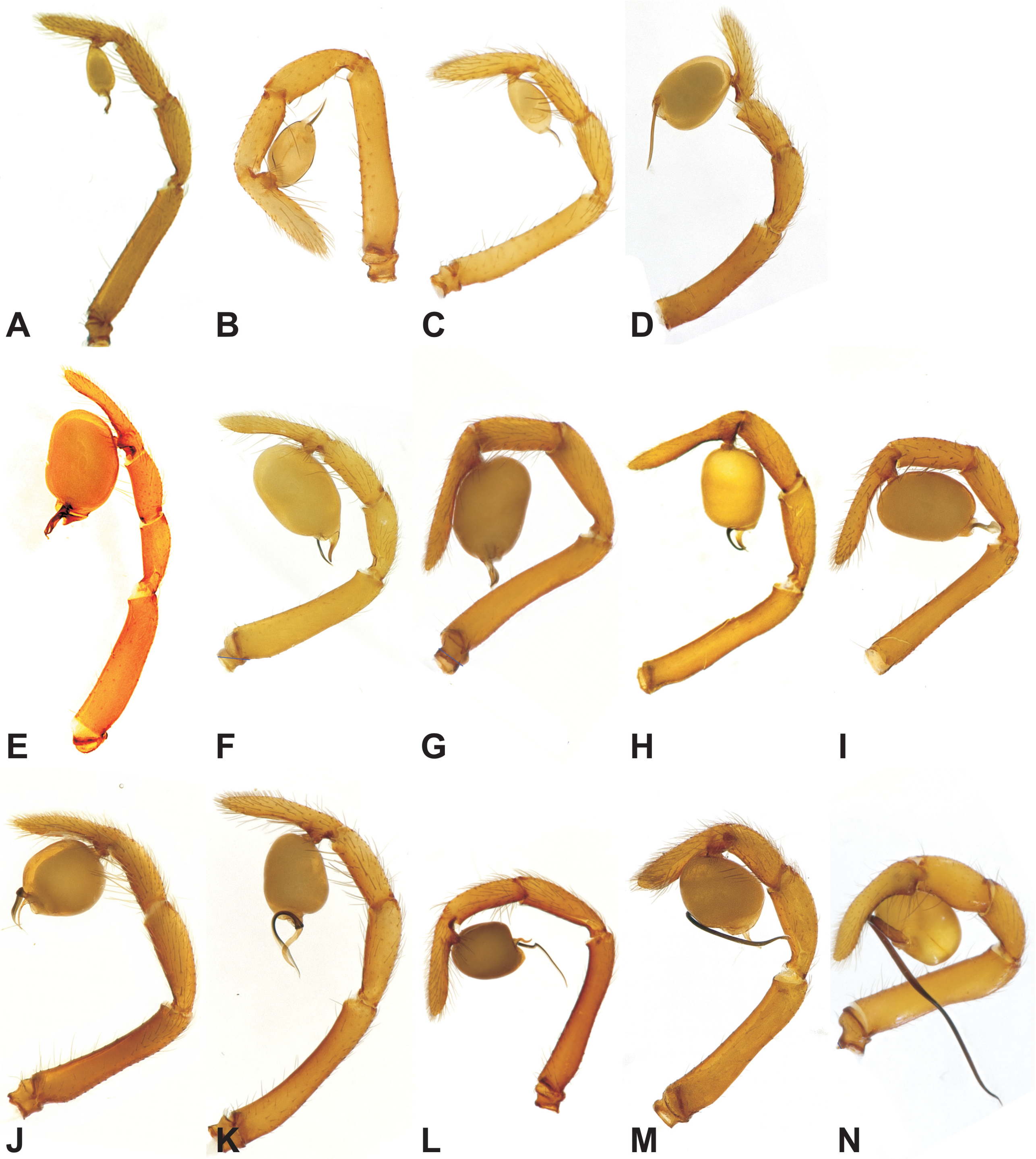

**FIGURE 3.** Portuguese *Harpactea* spiders. Male pedipalp. A, C, D, G, H, J, M, N—right pedipalp, prolateral view; B, E, F, I, K, L—left pedipalp, retrolateral view. A. *H. fageli*. Portugal: Setúbal; B. *H. gaditana*. Portugal: Alcomgosta; C. *H. henriquesi* **sp. nov.** Portugal: Torres Novas; D. *H. pekari* **sp. nov.** Portugal: Corredoura; E. *H. minoccii*. Portugal: Mertola; F. *H. subiasi*. Portugal: Setúbal; G. *H. magnibulbi*. Portugal: Fóia; H. *H. korenkoi* **sp. nov.** Portugal: Carrapateira; I. *H. adicensis* **sp. nov.** Portugal: Sobral da Adiça; J. *H. algarvensis*. Portugal: Barranco do Velho; K. *H. krejcii* **sp. nov.** Portugal: Ameixial; L. *H. dolanskyi* **sp. nov.** Portugal: Mertola; M. *H. tavirensis*. Portugal: Barranco do Velho; N. *H. crespoi* **sp. nov.** Portugal: Sobral da Adiça.

**Material.** Type material was not examined.

*New material.* S. Bras de Alportel, Fonte da Taipa, 37.203, -7.963, *Quercus suber* forest and *Pinus* monoculture, 9 ♂♂, 19 ♀♀, 12 April 2005, 1 ♂, 9 November 2005, 25 ♂♂, 42 ♀♀, 31 March–1 April 2013, leg. M. Řezáč, coll. Crop Research Institute, Prague.

**Diagnosis.** The males are similar to *H. minoccii, H. subiasi*, *H. magnibulbi* **sp. nov.** and *H. korenkoi* **sp. nov.** They differ by relatively longer, markedly flattened embolus. The vulva is of the type *algarvensis*. In contrast to the vulva of *H. minoccii* and *H. subiasi* it is reduced, without paired posterior spermathecae, small and only slightly sclerotised (Fig. 8D). In contrast to vulvae of *H. tavirensis* and *H. crespoi* **sp. nov.** the anterior arc is sclerotised (slightly though), it constitutes two pockets on sides of the median rod (Fig. 8D fro.).

**Description.** The female has not been known so far. The somatic characters are as in males. The vulva is relatively small, only slightly sclerotised. Posterior diverticle is absent. Anterior arc is of rectangular shape in dorsal view, the sclerotised median rod is short. Anteriorly there are two lobes of whitish tissue connected to the anterior arc.

**Ecology.** It was found in humid leaf litter in shaded *Quercus* forests or *Pinus* monocultures. Females were found with eggs (Range = 12–68, mean = 27, SD = 15, N = 20) in April. The presence of independent juveniles in early spring suggests a two-year life cycle.

**Distribution.** It occurs in southern Portugal (Ferrandez 1990: 37, fig. 3; Machado & Ferrandez 1991: 58, fig. 8).

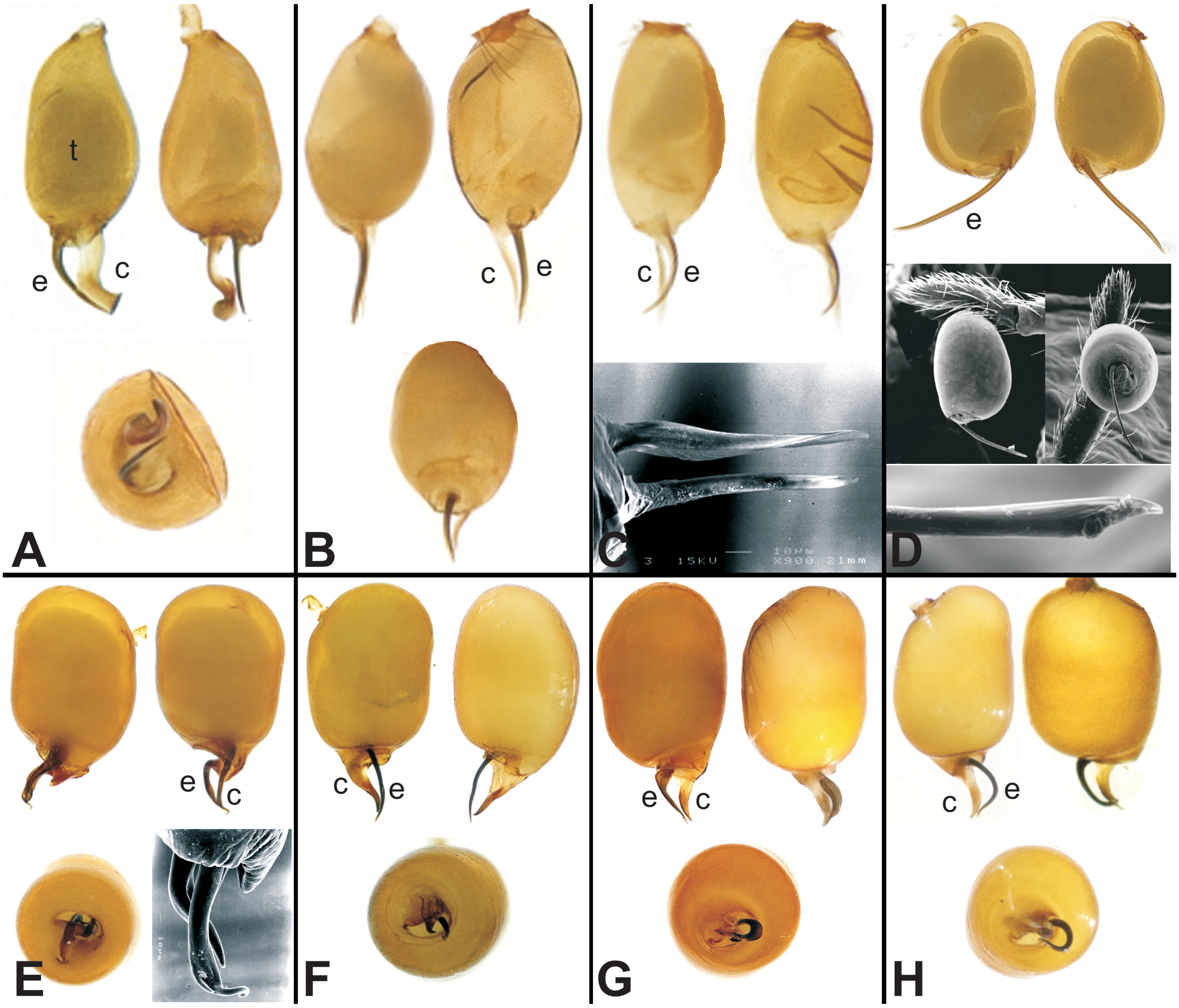

**FIGURE 4.** Portuguese *Harpactea* spiders. Right male bulbus. A. *H. fageli*. Portugal: Setúbal; B. *H. gaditana*. Portugal: Alcomgosta; C. *H. henriquesi* **sp. nov.** Portugal: Torres Novas; D. *H. pekari* **sp. nov.** Portugal: Corredoura; E. *H. minoccii*. Portugal: Mertola; F. *H. subiasi*. Portugal: Setúbal; G. *H. magnibulbi*. Portugal: Fóia; H. *H. korenkoi* **sp. nov.** Portugal: Carrapateira. Structures: c—conductor, e—embolus, t—tegulum. The photos in grey scale are made under the scanning electron microscope.

### *Harpactea crespoi* Řezáč sp. nov.

(Figs 1N, 2N, 3N, 5F, 8C, 9)

**Type material.** *Holotype.* ♂, Moura, Serra da Adiça, 37.978, -7.294, *Quercus coccifera* wood, 27 December 2005, leg. L. Crespo, coll. National Natural History Museum, Prague, code P6A 7385.

*Paratypes.* Moura, Serra da Adiça, 37.978, -7.294, *Quercus coccifera* wood, 1 ♂, 1 ♀, 7 November 2005, leg. M. Řezáč, coll. Crop Research Institute, Prague; 1 ♀, 27 December 2005, leg. L. Crespo, coll. Crop Research Institute, Prague; 6 ♂♂, 13 ♀♀, 27 March 2013, leg. M. Řezáč, coll. Crop Research Institute, Prague.

**Etymology.** Named after the Portuguese arachnologist Luis Crespo, our friend, who helped to discover this species.

**Diagnosis.** The species is characteristic by the cymbium bent around tegulum (Fig. 3N), tegulum wider than long and extremely long embolus (Fig. 5F). The embolus is very long also in *H. dolanskyi* **sp. nov.** and *H. tavirensis*, but these species possess conductor, in *H. crespoi* **sp. nov.** it is absent. The vulva is similar to that of *H. algarvensis*, but it lacks two pockets of whitish tissue in front of the anterior arc, and is less sclerotised, the only obviously sclerotised part of the anterior arc is the median rod (Fig. 8C).

**Description.** *Male (holotype).* Carapace pale brown, matting (Fig. 1N). Sternum brown-yellow, matting. Chelicerae pale brown. Legs are pale yellow, pedipalps darker. For measurements and leg spination see the Table 1. Relative leg length: IV>I>II>III. Cymbium slightly bent around the bulbus, with elongated distal part (Fig. 3N), and slightly concave basal half of the prolateral side. Tegulum wider than long (Fig. 5F). Conductor absent. Embolus dark, extremely long, slightly undulated, directing to the side, the base is bent in 180° angle. Opisthosoma cylindrical, whitish.

*Female (paratypes).* All somatic characters as described for the male. The vulva is of the type *algarvensis* (see Materials and Methods) (Fig. 8C).The vulva is relatively small and only slightly sclerotised. The median rod is very weak. The posterior diverticle is a rudimentary spherical sclerotised spot.

**Size range**. Male carapace length 1.6–2.3 mm (1.9±0.18, N=8), female carapace length 1.53–1.86 mm (1.72±0.17, N=3).

**Ecology.** Adults were found in early spring in leaf litter of *Quercus coccifera* forests on northeastern slopes.

**Distribution.** So far known only from Serra da Adiça, a small mountain range in southern Portugal.

### *Harpactea dolanskyi* Řezáč sp. nov.

(Figs 1L, 2L, 3L, 5D, 9)

**Type material.** *Holotype.* ♂, Mertola, Mertola, 37.643, -7.661, *Eucalyptus* trees, 30 March 2013, leg. M. Řezáč, coll. National Natural History Museum, Prague, code P6A 7386.

*Paratypes.* Mertola, Mertola, 37.643, -7.661, *Eucalyptus* trees, 3 ♂♂, 30 March 2013, 2 ♂♂, 20 March 2022, leg. M. Řezáč, coll. Crop Research Institute, Prague.

**Etymology.** Named after the Czech arachnologist Jan Dolanský, our friend who helped us to discover this species.

**Diagnosis.** This species is characterised by long thin S-shaped conductor and embolus (Fig. 5D). Its bulbus is similar to that of *H. tavirensis*, but tegulum is longer than wide, and embolus is more detached from tegulum. It possesses the cheliceral type *algarvensis* (Fig. 2L). In contrast to the other two representatives of this cheliceral type, *H. algarvensis* and *H. krejcii* **sp. nov.**, its posterior basal cheliceral tooth is shifted more basally (it is not next to the anterior basal tooth, Fig. 2L). The male pedipalpal tarsus is only slightly elongated, it exhibits, like in *H. algarvensis*, no special modifications (Fig. 3L).

**Description.** *Male (holotype).* Carapace olive brown, matting (Fig. 1L). Sternum yellow-brown, matting. Chelicerae brown. Legs yellow-brown, anterior legs and pedipalps darker. For measurements and leg spination see the Table 1. Relative leg length: IV>I>II>III. Cymbium with elongated distal part (Fig. 3L), and concave basal half of the prolateral side. Tegulum large, longer than wide (Fig. 5D). Conductor thin, relatively long, S-shaped. Embolus dark, very long, thin, S-shaped, directing distally. Opisthosoma cylindrical, whitish.

Female unknown.

*Variability.* Male carapace length 1.9–2.5 mm (2.2±0.2, N=4).

**Ecology.** It was found in relatively dry leaf litter under *Eucalyptus* trees on a northern slope in early spring.

**Distribution.** Known only from the type locality, in the valley of Guadiana river, near Mértola, in southern Portugal.

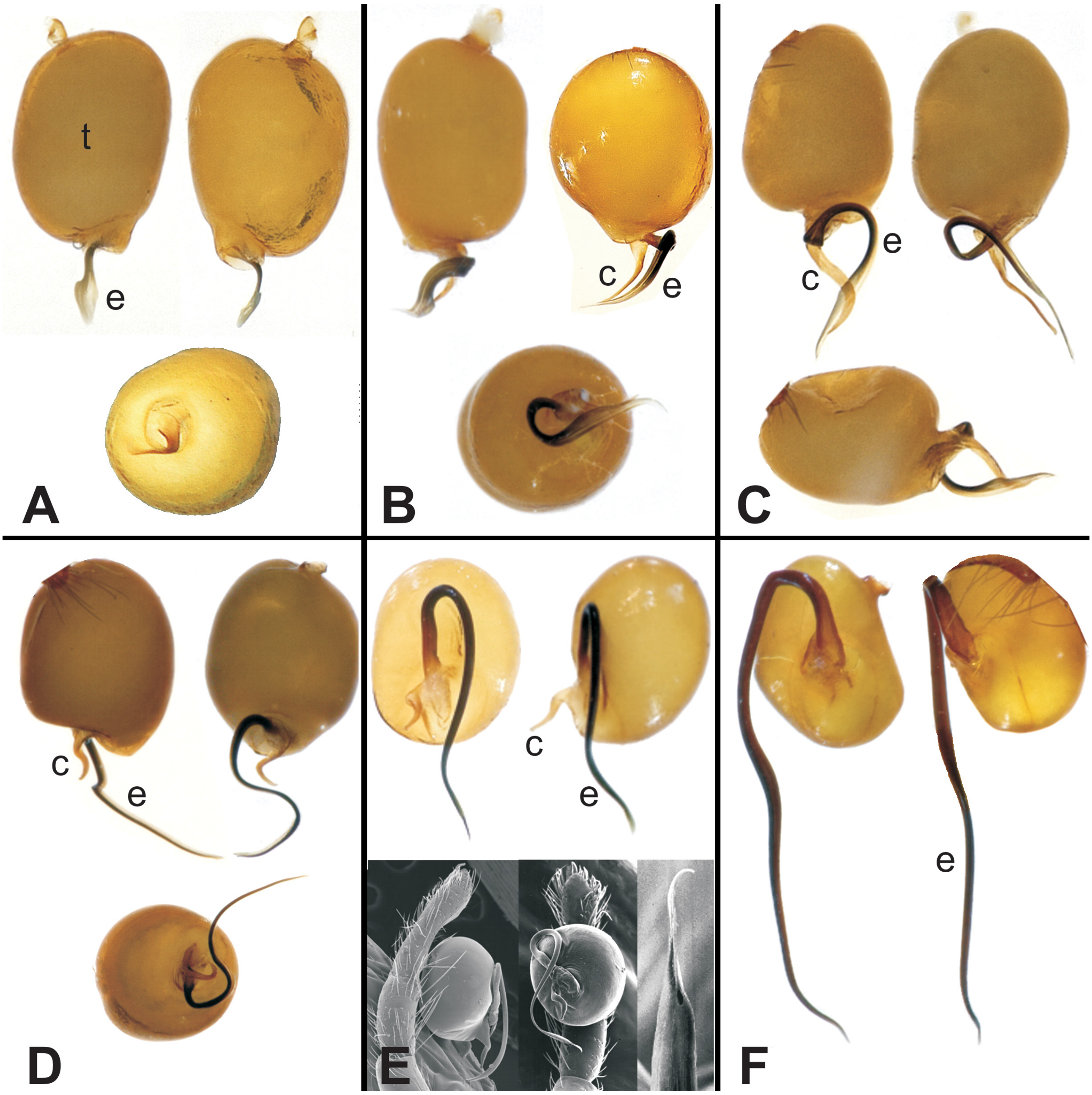

**FIGURE 5.** Portuguese *Harpactea* spiders. Right male bulbus. A. *H. adicensis* **sp. nov.** Portugal: Sobral da Adiça; B. *H. algarvensis*. Portugal: Barranco do Velho; C. *H. krejcii* **sp. nov.** Portugal: Ameixial; D. *H. dolanskyi* **sp. nov.** Portugal: Mertola; E. *H. tavirensis*. Portugal: Barranco do Velho; F. *H. crespoi* **sp. nov.** Portugal: Sobral da Adiça. Structures: c—conductor, e—embolus, t—tegulum. The photos in grey scale are made under the scanning electron microscope.

### ***Harpactea fageli*** **Brignoli, 1980**
(Fig. 1A, 2A, 3A, 4A, 6A, 9)

*H. fageli* Brignoli 1980: 1, figs 1–3 (description based on both sexes); Ferrández & Fernández 1990: 44, fig. 1E–F (♂); Le Peru 2011: 268, fig. 401 (♂♀, redrawn from Brignoli 1980).

**Material.** Type material was not examined.

*New material.* Freixo de Espada a Cinta, Congida, 41.088, -6.793, forest, 1 ♂, 1 juv., 3 October 2007, leg. M.

Řezáč, coll. Crop Research Institute, Prague; Freixo de Espada a Cinta, Freixo de Espada a Cinta, 41.083, -6.817, *Quercus* forest, 6 ♀♀, 1 juv., 4 October 2007, leg. M. Řezáč, coll. Crop Research Institute, Prague; Nisa, Nisa, 39.518, -7.651, *Pinus* plantation, 1 ♀, 1 May 2005, leg. C. Rufino, coll. Crop Research Institute, Prague; Setúbal, Mata do Vidal, 38.487, -8.993, *Quercus coccifera* forest, 12 ♂♂, 4 ♀♀, 14 January 1998, leg. P. Cardoso, Finnish Museum of Natural History, Helsinki (http://id.luomus.fi/KN.23946).

**Diagnosis.** *Harpactea fageli* is similar to *H. henriquesi* **sp. nov.** and *H. gaditana*. The males differ from these two species by thick S-shaped conductor (Fig. 4A—c). The females differ from *H. henriquesi* **sp. nov.** and *H. gaditana* by more sclerotised anterior arc and median rod (Fig. 6A—aa, mr). The median rod lacks terminal globule, it possesses crest for attaching muscles (Fig. 6A—mr).

**Ecology.** It inhabits humid leaf litter in *Quercus* forests as well as *Pinus* plantations.

**Distribution.** It occurs in mountains in central Spain and northern Portugal (Ferrandez & Ferrandez 1990: 49, fig. 4).

### *Harpactea gaditana* Pesarini, 1988

(Fig. 1B, 2B, 3B, 4B, 9)

*H. gaditana* Pesarini 1988: 180, fig. 2 (description based on male); Le Peru 2011: 269, fig. 402 (♂, redrawn from Pesarini 1988).

**Material.** Type material was not examined.

*New material.* Fundao, Alcongosta, 40.117, -7.484, inside house, 1 ♂, 3 June 2008, leg. S. Korenko, coll. Crop Research Institute, Prague.

**Diagnosis.** *Harpactea gaditana* is very similar to *H. henriquesi* **sp. nov.** in thin body with relatively long legs and genitalic morphology. It differs from *H. henriquesi* **sp. nov.** by slightly larger body (Fig. 1B), less curved embolus (Fig. 4B—e), the base of embolus is not covered by the base of conductor.

**Ecology.** Adults can be found in spring (March–June).

**Distribution.** It occurs in southern Spain (near the town Vejer in Cadiz province, Pesarini 1988) and eastern Portugal. In western Portugal it is replaced by the sibling species *H. henriquesi* **sp. nov.**

### *Harpactea henriquesi* Řezáč sp. nov.

(Figs 1C, 2C, 3C, 4C, 6B, 9)

**Type material.** *Holotype.* ♂, Torres Novas, Paul do Boquilobo, 39.39, -8.541, *Quercus suber*, 24 April 2002, leg. P. Cardoso, coll. Finnish Museum of Natural History, Helsinki (http://id.luomus.fi/KN.23947).

*Paratypes.* Coimbra, Botanical Garden of Coimbra, 40.21, -8.42, woody vegetation, 1 ♂, 6 June 2005, leg. L. Crespo, coll. Crop Research Institute, Prague; Lisboa, Monsanto, 38.734, -9.19, woody vegetation, 2 ♂♂, 11 March 2006, leg. L. Crespo, coll. Crop Research Institute, Prague; Lisboa, 38.7418, -9.1606, wasteland, 1 ♂, 10 March 2022, leg. G. Ramos, coll. Crop Research Institute, Prague; Golega, Golega, 39.412, -8.478, woody vegetation, 1 juv., 2 October 2007, leg. M. Řezáč, coll. Crop Research Institute, Prague; Torres Novas, Paul do Boquilobo, 39.39, -8.541, *Quercus suber*, 9 ♂♂, 7 ♀♀, 24 April 2002, leg. P. Cardoso, Finnish Museum of Natural History, Helsinki (http://id.luomus.fi/KN.23948); Torres Novas, Vale Garcia, 39.55, -8.588, Scrubland, 27 ♂♂, 18 ♀♀, 23 April 2002, leg. P. Cardoso, Finnish Museum of Natural History, Helsinki (http://id.luomus.fi/KN.23949); Porto de Mos, Serro Ventoso, 39.556, -8.838, *Quercus faginea* wood, 2 ♂♂, 6 ♀♀, 16-17 April 2005, leg. M. Řezáč, coll. Crop Research Institute, Prague.

**Etymology.** Named after the Portuguese arachnologist Sergio Henriques, our friend who helped us to collect material for this study.

**Diagnosis.** *Harpactea henriquesi* differs from the majority of Portuguese *Harpactea* species by the shape of copulatory organs, in particular by slender tegulum and thin embolus and conductor of approximately the same length (Fig. 4C). Males are also characteristic by markedly slender and elongated abdomen and elongated prosoma (Fig. 1C). It resembles *H. gaditana* and *H. fageli* in that the first leg is longer than the fourth. Concerning bulbus shape, it is most similar to *H. gaditana,* from which it differs by base of embolus covered by the base of conductor (in *H. gaditana* it is not covered). Embolus is uniformly curved (Fig. 4C, in *H. gaditana* the distal part of embolus is less curved than the basal one). Concerning size and body proportions *H. henriquesi* **sp. nov.** is more similar to *H. sciakyi* Pesarini, 1988 from Spain, from which it differs by uniformly curved embolus (in *H. sciakyi* it is strongly bent in the middle), straight conductor with only slightly dilated apex (in *H. sciakyi* conductor is bent at base, its apex is strongly and suddenly spatulated), and femora I with a single, relatively weak subapical prolateral spine (in *H. sciakyi* femora I with a pair of strong prolateral spines).

The vulva is similar to that of *H. fageli,* but it is relatively smaller and less sclerotised, the anterior part is terminated by a globule, it does not carry any crest for attaching muscles. Also the members of *Harpactea hombergii* group possess similar vulva morphology. In the only representative of this group in Portugal, *Harpactea hombergii*, the lateral parts of the anterior arc are bent like in anchor (Fig. 6B).

**Description.** *Male (holotype).* Carapace olive brown, matting, in comparison with other *Harpactea* species elongated (Fig. 1C). Sternum ferruginous, matting. Chelicerae brown. Legs brown-yellow, anterior legs and pedipalps darker. Measurements and spination are shown in Table 1. Relative leg length: I>IV>II>III. Cymbium with only slightly elongated distal part (Fig. 3C, like in *H. gaditana*). Tegulum thin, much longer than wide (Fig. 4C). Conductor straight, directing distally. Embolus dark, parallel to conductor, but regularly bent, of the same length as conductor, directing distally. Opisthosoma cylindrical, markedly elongated and slender (Fig. 1C).

*Female.* In females the carapace is less elongated (especially the posterior part) than in males: the ratio length / maximum width of carapace in females is 1.36–1.40, in males 1.44–1.50. Opisthosoma less elongated than in males. The vulva is of the type *fageli* (see the chapter Diagnostic characters) (Fig. 6B).

*Variability.* Male carapace length 1.17–2.07 mm (1.56±0.23 (mean±SD), N=39), female carapace length 1.18–1.79 mm (1.50±0.16, N=32).

**Ecology.** Found in leaf litter in sparse *Quercus* forests.

**Distribution.** The species was found in several sites in central-western Portugal.

### ***Harpactea hombergii* (Scopoli, 1763)**

(Fig. 9)

*Dysdera latreillii* Blackwall, 1832: 190 (the first description of this species, based on ♂).

**Remarks.** The name *Harpactea hombergi* has been erroneously used for this species (Řezáč *et al.* 2008a). Walckenaer (1830) first used the name *D. hombergii* for the *Harpactea* species. His wrong concept was adopted by the latter authors (see the above list of misidentifications). The species so far called *Harpactea hombergii* was first described as *Dysdera Latreillii* by Blackwall (1832). However, resurrecting a name that has not been used as valid for over 150 years would severely threaten nomenclatoric stability. Therefore, we propose to keep using the name *hombergii* for this species.

*Harpactea hombergii* is usually incorrectly written with a single "i" (for example, World Spider Catalog 2021). It was named after Homberg, latinized in Hombergius; the genitive of Hombergi-us is then Hombergi-i. Therefore, the name "hombergii" does not fit into the cases of incorrect names that must be changed. Thus, the original spelling of the specific name should be maintained according to ICZN, articles 31–33.

**Material.** Type material was not examined.

*New material.* Alcos de Valdevez, Mezio, 41.886, -8.312, inside house, 2 ♂♂, 14 June 2005, leg. S. Henriques, coll. Crop Research Institute, Prague.

**Diagnosis.** *Harpactea hombergii* can be easily distinguished from other Portuguese *Harpactea* by dark brown carapace, especially in males elongated body, slightly annulated legs, remarkably shortened tarsus of male pedipalps, and by the shape of copulatory organs.

**Ecology.** During the day this nocturnal species can be found in leaf litter, under stones and branches lying on the ground or under bark of trees. In the Iberian Peninsula it lives in humid forests, adults are usually found in May. In central Europe it usually lives in sparse dry forests on rocks, especially with predominating *Quercus* spp., less often *Fagus sylvatica* or *Pinus* spp.; it matures at the end of summer.

**Distribution.** *Harpactea* species with the largest area of distribution comprising most of the western, central and southern Europe. It is absent in its southernmost (southern parts of Iberian, Appenine and Balkan peninsulas), northern (Scandinavia, Baltic countries, Russia) and eastern parts (Bielorussia, Ukraine). In Spain (Ferrandez & Ferrandez 1990: 49, fig. 4) and Portugal (Fig. 9) it lives only in the northern parts, with very few southern records that probably are misidentified (see Branco *et al.* 2019b).

### ***Harpactea korenkoi*** **Řezáč sp. nov.**

(Figs 1H, 2H, 3H, 4H, 8B, 9)

**Type material.** *Holotype.* ♂, Aljezur, Carrapateira, 37.184, -8.895, *Quercus coccifera* forest, 2 April 2013, leg. M. Řezáč, coll. National Natural History Museum, Prague, code P6A 7387.

*Paratypes.* Aljezur, Carrapateira, 37.184, -8.895, *Quercus coccifera* forest, 3 ♂♂, 7 ♀♀, 7 April 2008, 7 ♂♂, 15 ♀♀, 2 April 2013, leg. M. Řezáč, coll. Crop Research Institute, Prague.

**Etymology.** Named after the Czechoslovak arachnologist Stanislav Korenko, our friend who helped us to collect material for this study.

**Diagnosis.** It differs from most Iberian *Harpactea* species by almost straight dorsal side of cymbium (Fig. 3H, like in *H. magnibulbi*), and relatively short embolus (approximately of the same length as conductor, Fig. 4H). It resembles *H. magnibulbi*; males differ by the distance between the anterior cheliceral teeth, that is 1.5× longer than the distance between the teeth in the posterior row (Fig. 2H, in *H. magnibulbi* the distance between the dorsal teeth is the same as the distance between the ventral teeth, Fig. 2G); the position of the dorsal distal tooth that is between the ventral teeth (in *H. magnibulbi* it is next to the posterior basal tooth), and by the shape of embolus, which is thinner (Fig. 4H), S-shaped on its distal end; females differ by anterior arc with lobes bent backwards on its prolateral edges and absence of posterior diverticle rudiment (Fig. 8B).

**Description.** *Male (holotype).* Carapace yellow, matting (Fig. 1H). Sternum yellow, matting, with long hair on the edges. Chelicerae yellow brown. Legs yellow brown, pedipalps ferruginous. Measurements and spination are shown in the Table 1. Relative leg length: IV>I>II>III. Cymbium with very elongated distal part (Fig. 3H), and very concave prolateral side. Tegulum large, longer than wide (Fig. 4H). Conductor regularly bent, flattened, tapering. Embolus dark, parallel to conductor but more bent, only slightly longer than conductor, flattened, its end is S-shaped. Opisthosoma cylindrical, whitish.

*Female.* All somatic characters as described for the male. Vulva is of the type *algarvensis* (see Materials and Methods) (Fig. 8B).

*Variability.* Carapace length 1.5–2.2 mm (both sexes) (N=33).

**Ecology.** It lives in leaf litter in shaded *Quercus coccifera* forests. Females lay eggs in early spring. The presence of independent juveniles together with mothers with egg sacs suggests a possible two-year life cycle.

**Distribution.** Forests around the south Portuguese city of Carrapateira.

### ***Harpactea krejcii*** **Řezáč sp. nov.**

(Figs 1K, 2K, 3K, 5C, 9)

**Type material.** *Holotype.* ♂, Loule, Ameixial, 37.357, -7.965, litter under *Quercus suber*, 1 ♂, 30 March 2013, leg. M. Řezáč, coll. National Natural History Museum, Prague, code P6A 7388.

*Paratype.* Loule, Ameixial, 37.357, -7.965, litter under *Quercus suber*, 1 ♂, 30 March 2013, leg. M. Řezáč, coll. Crop Research Institute, Prague.

**Etymology.** Named after the Czech arachnologist Tomáš Krejčí, our friend who helped us to discover this species.

**Diagnosis.** It resembles *H. algarvensis* in tegulum longer than wide, and conductor and embolus of approximately the same length (Fig. 5C), but it can be distinguished from the last species by the longer conductor and embolus.

**Description.** *Male (holotype).* Carapace yellow brown, matting (Fig. 1K). Sternum yellow, matting. Chelicerae brown. Legs pale yellow, pedipalps brown. For measurements and leg spination see the Table 1. Relative leg length: IV>I>II>III. Cymbium tapering, with elongated distal part (Fig. 3K, like in *H. algarvensis*). Tegulum large, longer than wide (Fig. 5C). Conductor long, thin, S-shaped, pointed, directing distally. Embolus dark, very long, thin, flattened, its basal part directs distally, then it is bent proximally and distally, so its tip directs distally again. Opisthosoma cylindrical, whitish.

Female unknown.

**Ecology.** It was found in early spring in humid leaf litter under *Quercus suber* on the bottom of the valley.

**Distribution.** So far known only from Ameixial in the mountain range in southern Portugal.

### *Harpactea magnibulbi* Machado & Ferrández, 1991

(Fig. 1G, 2G, 3G, 4G, 8A, 9)

*H. magnibulbi* Machado & Ferrández 1991: 54, figs 1–7 (description based on both sexes); Le Peru 2011: 274, fig. 425 (♂♀, redrawn from Machado & Ferrández 1991).

**Material.** Type material was not examined.

*New material.* Monchique, Fóia, 37.316, -8.597, mountainous forest, 4 ♂♂, 1 ♀, 7 April 2008, leg. M. Řezáč, coll. Crop Research Institute, Prague.

**Diagnosis.** *Harpactea magnibulbi* is very similar to *H. korenkoi* **sp. nov.** Males differ from *H. korenkoi* **sp. nov.** by the distance between the anterior cheliceral teeth, that is the same as the distance between the teeth in the posterior row (Fig. 2G); the dorsal distal tooth is next to the posterior basal tooth (in *H. korenkoi* **sp. nov.** it is between the posterior teeth—Fig. 2H); the embolus is thicker (Fig. 4G—e). Females differ from *H. korenkoi* **sp. nov.** by the anterior arc without lobes bent backwards on its prolateral edges (Fig. 8A).

**Ecology.** Adult males and females as well as juveniles were observed in leaf litter in early spring.

**Distribution.** It occurs in Sierra de Monchique in southern Portugal (Machado & Ferrandez 1991: 58, fig. 8).

### *Harpactea minoccii* Ferrández, 1982

(Fig. 1E, 2E, 3E, 4E, 7A, 9)

*H. minoccii* Ferrández 1982: 23, fig. 1a–e (description based on ♂); Ferrández 1990: 32, fig. 1g (♂); Le Peru 2011: 275, fig. 426 (♂, redrawn from Ferrández 1982).

**Material.** Type material was not examined.

*New material.* Mertola, Corredoura, 37.746, -7.642, *Quercus coccifera* bush, 1 ♀, 15 April 2005, 1 juv., 8 November 2005, 1 ♀, 3 April 2008, 3 ♀♀, 29 March 2013, leg. M. Řezáč, coll. Crop Research Institute, Prague; Mertola, Mertola, 37.643, -7.661, *Eucalyptus* trees, 5 ♀♀, 30 March 2013, leg. M. Řezáč, coll. Crop Research Institute, Prague; Mertola, Mertola (montado), 37.652, -7.66, *Quercus suber*, 31 ♂♂, 25 ♀♀, 15 May 2000, leg. P. Cardoso, Finnish Museum of Natural History, Helsinki (http://id.luomus.fi/KN.23950); Mertola, Alcaria Ruiva, 37.7, -7.762, woody vegetation, 4 ♀♀, 6 juv., 2 April 2008, leg. M. Řezáč, coll. Crop Research Institute, Prague; Mertola, Corte da Velha, 37.687, -7.729, woody vegetation, 1 ♀, 2 April 2008, leg. M. Řezáč, coll. Crop Research Institute, Prague; Mertola, Mesquita, 37.543, -7.518, woody vegetation, 1 ♀, 4 April 2008, leg. M. Řezáč, coll. Crop Research Institute, Prague; Sines, 37.955, -8.867, woody vegetation, 1 ♂, 10 November 2005, leg. S. Henriques, coll. Crop Research Institute, Prague; Loule, Santa Catarina, 37.746, -7.642, woody vegetation, 1 ♀, 6 April 2008, leg. M. Řezáč, coll. Crop Research Institute, Prague; Nisa, Nisa, 39.518, -7.651, *Eucalyptus* grove, 1 ♀, 27 May 2005, leg. C. Rufino, coll. Crop Research Institute, Prague; Moura, Serra da Adiça, 37.978, -7.294, *Quercus ilex* wood, 2 ♀♀, 20 April 2005, leg. M. Řezáč, coll. Crop Research Institute, Prague; Evora, Herdade da Mitra, 38.532, -8.018, woody vegetation, 1 ♀, 5-7 November 2004, leg. S. Pekár, coll. Crop Research Institute, Prague; 5 ♂♂, 17-19 April 2005, leg. M. Řezáč, coll. Crop Research Institute, Prague; 2 ♂♂, 26 March 2009, leg. S. Pekár, coll. Crop Research Institute, Prague; Campinho, 38.3752, -7.4236, *Quercus ilex* wood, 1 ♂, 22 March 2022, leg. M. Řezáč, coll. Crop Research Institute, Prague.

**Diagnosis.** Males can be distinguished from the similar *H. subiasi* by very concave prolateral side of pedipalp tarsus, and by proportions of conductor and embolus. The embolus is thicker and relatively shorter, and the conductor is of similar width in its whole length, while in *H. subiasi* it is markedly tapering (Fig. 4E).

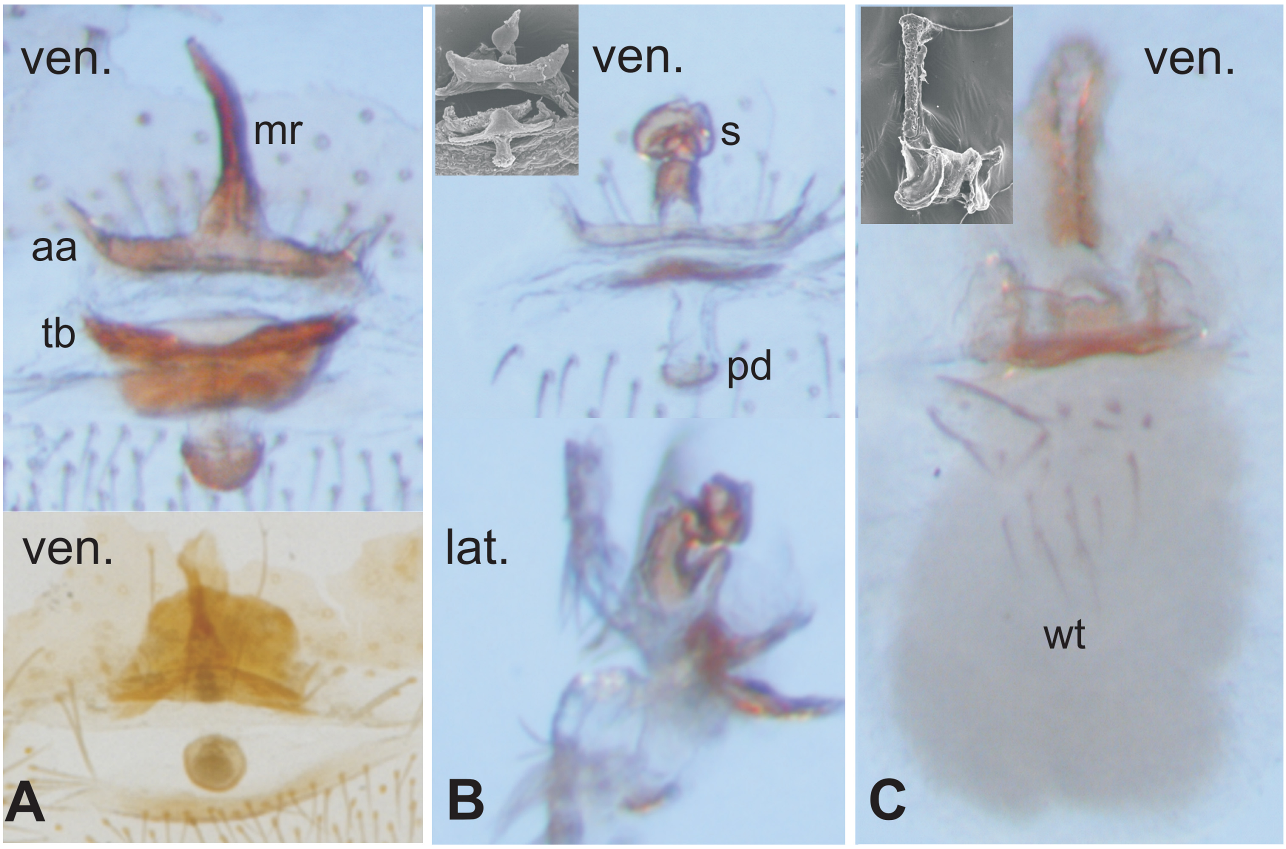

**FIGURE 6.** Portuguese *Harpactea* spiders. Vulva. A. *H. fageli*. Portugal: Setúbal; B. *H. henriquesi* **sp. nov.** Portugal: Torres Novas; C. *H. pekari* **sp. nov.** Portugal: Corredoura. Views: dor.—dorsal, fro.—anterior, hin.—posterior, ven.—ventral. Structures: aa—anterior arc, cb—copulatory bursa, kp—keel-like projection, mr—median rod, pd—posterior diverticle, s—spermatheca, tb—posterior transversal bar, th—transversal hinge, wt—whitish tissue. The photos in grey scale are made under the scanning electron microscope.

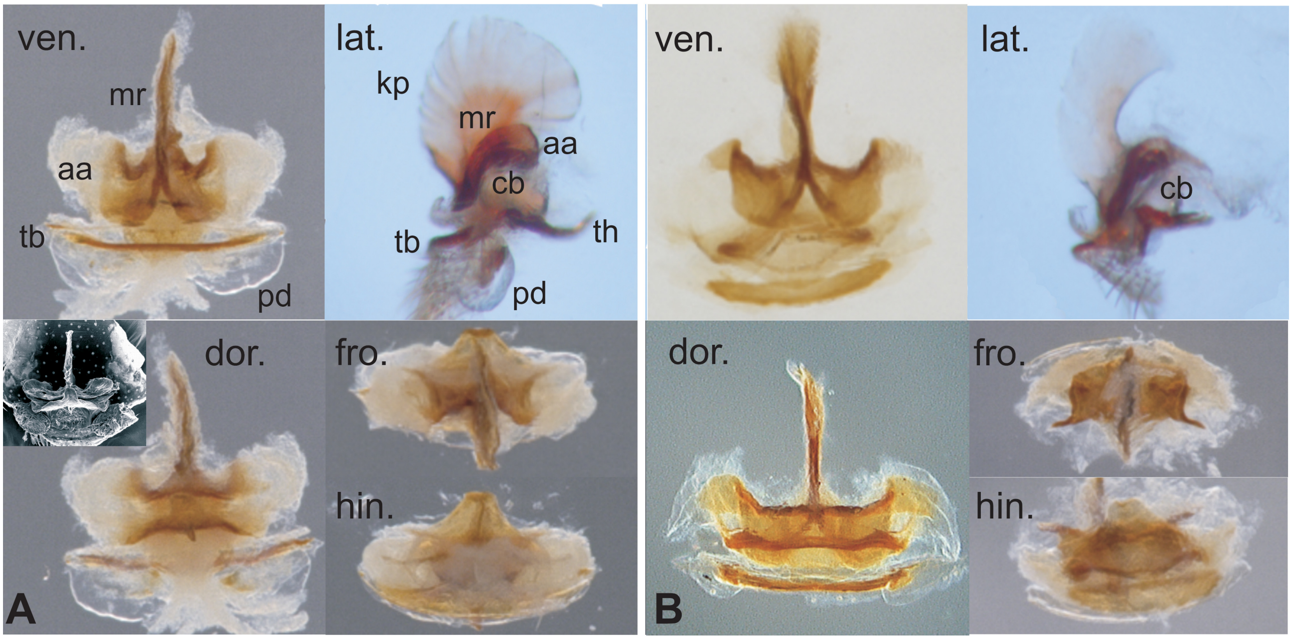

**FIGURE 7.** Portuguese *Harpactea* spiders. Vulva. A. *H. minoccii*. Portugal: Mertola; B. *H. subiasi*. Portugal: Setúbal. Views: dor.—dorsal, fro.—anterior, hin.—posterior, ven.—ventral. Structures: aa—anterior arc, cb—copulatory bursa, kp—keel-like projection, mr—median rod, pd—posterior diverticle, s—spermatheca, tb—posterior transversal bar, th—transversal hinge, wt—whitish tissue. The photo in grey scale is made under the scanning electron microscope.

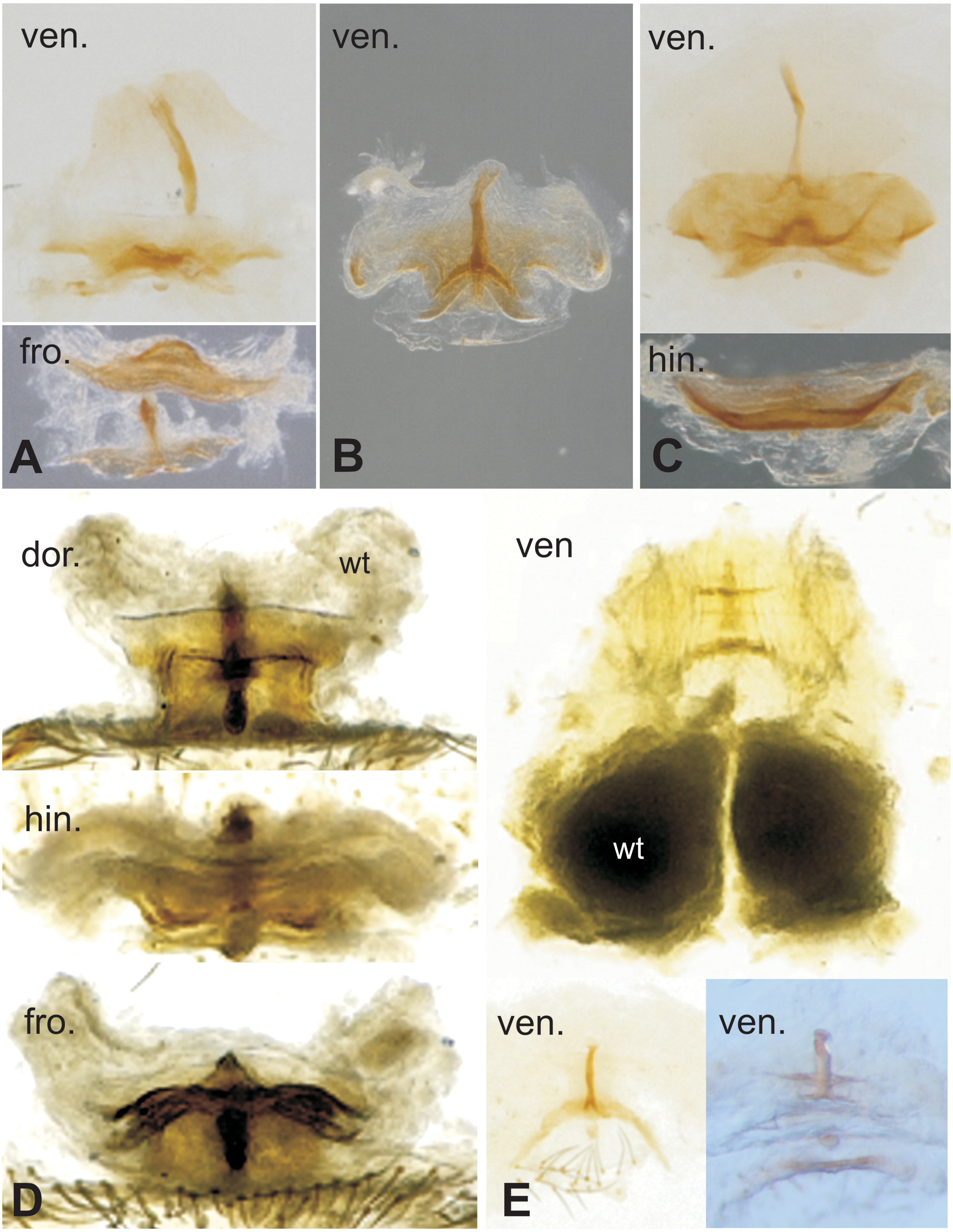

**FIGURE 8.** Portuguese *Harpactea* spiders. Vulva. A. *H. magnibulbi*. Portugal: Fóia; B. *H. korenkoi* **sp. nov.** Portugal: Carrapateira; C. *H. crespoi* **sp. nov.** Portugal: Sobral da Adiça; D. *H. algarvensis*. Portugal: Barranco do Velho; E. *H. tavirensis*. Portugal: Barranco do Velho. Views: dor.—dorsal, fro.—anterior, hin.—posterior, ven.—ventral. Structures: aa—anterior arc, cb—copulatory bursa, kp—keel-like projection, mr—median rod, pd—posterior diverticle, s—spermatheca, tb—posterior transversal bar, th—transversal hinge, wt—whitish tissue.

**TABLE 1.** Measurements and spination of holotypes of the new Portuguese *Harpactea* species and *Harpactea tavirensis*. The numbers in brackets indicate the number of spines on left legs. Measurements are in mm.

| | *Harpactea korenkoi* **sp. nov.** | *Harpactea henriquesi* **sp. nov.** | *Harpactea pekari* **sp. nov.** | *Harpactea crespoi* **sp. nov.** | *Harpactea tavirensis* | *Harpactea adicensis* **sp. nov.** | *Harpactea krejcii* **sp. nov.** | *Harpactea dolanskyi* **sp. nov.** |
|---|---|---|---|---|---|---|---|---|
| **Carapace** | | | | | | | | |
| Length | 2.1 | 1.38 | 1.62 | 1.6 | 1.73 | 1.69 | 1.78 | 2.22 |
| Maximum width | 1.59 | 0.95 | 1.18 | 1.24 | 1.29 | 1.21 | 1.33 | 1.64 |
| Anterior lateral eye diameter | 0.11 | 0.08 | 0.08 | 0.1 | 0.07 | 0.08 | 0.07 | 0.1 |
| Posterior lateral eye diameter | 0.1 | 0.07 | 0.06 | 0.08 | 0.08 | 0.07 | 0.06 | 0.07 |
| Posterior median eye diameter | 0.08 | 0.06 | 0.06 | 0.07 | 0.07 | 0.07 | 0.06 | 0.07 |
| **Legs** | | | | | | | | |
| Relative length ratio lenght of the first leg femur / length of carapace | 0.87 | 0.87 | 0.82 | 0.94 | 0.82 | 0.9 | 0.89 | 0.96 |
| Spines on proapical femur I | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 |
| Spines on proapical femur II | 2(1) | 1 | 2 | 2 | 1 | 2 | 2 | 2 |
| Spines on apical femur III | 3(5) | 4 | 5 | 5(6) | 3 | 3 | 7 | 4(5) |
| Spines on dorsal femur IV | 1 | 1 | 4 | 4 | 1(2) | 1(2) | 3 | 5 |
| Spines on prodorsal tibia III | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Spines on retrodorsal tibia III | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Spines on proventral tibia III | 2 | 1(2) | 2 | 2 | 1 | 2 | 2 | 2 |
| Spines on ventral tibia III | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Spines on apical ventral tibia III | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Spines on prodorsal tibia IV | 2 | 2 | 3(2) | 4(3) | 3(2) | 2 | 2 | 3 |
| Spines on retrodorsal tibia IV | 3(4) | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Spines on proventral tibia IV | 2 | 2 | 2 | 3(2) | 2(3) | 2 | 2 | 3 |
| Spines on retroventral tibia IV | 2(1) | | 2 | 2 | | 0(1) | 2 | 2 |
| Spines on ventral tibia IV | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Spines on apical ventral tibia IV | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Spines on prodorsal metatarsus III | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Spines on retrodorsal metatarsus III | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Spines on proventral metatarsus III | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Spines on retroventral metatarsus III | | | 1 | 1 | | | 1 | 1 |
| Spines on apical ventral metatarsus III | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 |
| Spines on prodorsal metatarsus IV | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Spines on retrodorsal metatarsus IV | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Spines on proventral metatarsus IV | 2 | 2 | 2 | 2 | 2(3) | 2 | 3 | 2 |
| Spines on retroventral metatarsus IV | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| Spines on apical ventral metatarsus IV | 2 | 2 | 2 | 2 | 2(1) | 2 | 2 | 2 |

*......continued on the next page*

**TABLE 1. (Continued)**

| | *Harpactea korenkoi* **sp. nov.** | *Harpactea henriquesi* **sp. nov.** | *Harpactea pekari* **sp. nov.** | *Harpactea crespoi* **sp. nov.** | *Harpactea tavirensis* | *Harpactea adicensis* **sp. nov.** | *Harpactea krejcii* **sp. nov.** | *Harpactea dolanskyi* **sp. nov.** |
|---|---|---|---|---|---|---|---|---|
| Length of coxa I | 0.94 | 0.62 | 0.71 | 0.69 | 0.71 | 0.77 | 0.8 | 1.08 |
| Length of femur I | 1.83 | 1.2 | 1.33 | 1.51 | 1.42 | 1.52 | 1.59 | 2.12 |
| Length of patella I | 1.28 | 0.87 | 0.84 | 1.02 | 0.95 | 0.99 | 1.06 | 1.59 |
| Length of tibia I | 1.59 | 1.02 | 1.15 | 1.38 | 1.18 | 1.3 | 1.4 | 1.95 |
| Length of metatarsus I | 1.35 | 0.93 | 1 | 1.2 | 1.04 | 1.23 | 1.23 | 1.66 |
| Length of tarsus I | 0.46 | 0.4 | 0.38 | 0.44 | 0.4 | 0.43 | 0.43 | 0.53 |
| Length of leg I | 7.45 | 5.04 | 5.42 | 6.24 | 5.71 | 6.24 | 6.51 | 8.94 |
| Length of coxa II | 0.77 | 0.49 | 0.6 | 0.64 | 0.62 | 0.6 | 0.67 | 0.89 |
| Length of femur II | 1.66 | 0.98 | 1.2 | 1.44 | 1.24 | 1.35 | 1.45 | 1.98 |
| Length of patella II | 1.13 | 0.69 | 0.8 | 0.98 | 0.89 | 0.84 | 0.96 | 1.42 |
| Length of tibia II | 1.47 | 0.84 | 1.07 | 1.22 | 1.11 | 1.16 | 1.3 | 1.78 |
| Length of metatarsus II | 1.28 | 0.75 | 0.98 | 1.15 | 0.95 | 1.06 | 1.13 | 1.59 |
| Length of tarsus II | 0.46 | 0.38 | 0.36 | 0.44 | 0.38 | 0.41 | 0.41 | 0.51 |
| Length of leg II | 6.77 | 4.13 | 5 | 5.88 | 5.19 | 5.42 | 5.93 | 8.17 |
| Length of coxa III | 0.51 | 0.27 | 0.38 | 0.4 | 0.4 | 0.39 | 0.41 | 0.58 |
| Length of femur III | 1.35 | 0.84 | 1 | 1.2 | 1.07 | 1.11 | 1.21 | 1.61 |
| Length of patella III | 0.7 | 0.4 | 0.47 | 0.51 | 0.53 | 0.51 | 0.6 | 0.82 |
| Length of tibia III | 1.16 | 0.67 | 0.78 | 0.95 | 0.8 | 0.89 | 1.04 | 1.47 |
| Length of metatarsus III | 1.21 | 0.75 | 0.93 | 1.11 | 0.93 | 1.04 | 1.16 | 1.61 |
| Length of tarsus III | 0.39 | 0.38 | 0.36 | 0.42 | 0.36 | 0.36 | 0.39 | 0.48 |
| Length of leg III | 5.3 | 3.31 | 3.91 | 4.6 | 4.08 | 4.29 | 4.8 | 6.58 |
| Length of coxa IV | 0.6 | 0.38 | 0.47 | 0.51 | 0.53 | 0.48 | 0.55 | 0.72 |
| Length of femur IV | 1.9 | 1.22 | 1.38 | 1.73 | 1.55 | 1.61 | 1.74 | 2.34 |
| Length of patella IV | 0.96 | 0.62 | 0.62 | 0.84 | 0.8 | 0.75 | 0.84 | 1.16 |
| Length of tibia IV | 1.69 | 1.07 | 1.27 | 1.55 | 1.33 | 1.37 | 1.52 | 2.12 |
| Length of metatarsus IV | 1.83 | 1.09 | 1.29 | 1.69 | 1.49 | 1.52 | 1.66 | 2.36 |
| Length of tarsus IV | 0.51 | 0.42 | 0.4 | 0.47 | 0.38 | 0.43 | 0.48 | 0.6 |
| Length of leg IV | 7.5 | 4.8 | 5.42 | 6.79 | 6.08 | 6.17 | 6.8 | 9.3 |
| Length of leg spine | 0.29 | 0.27 | 0.27 | 0.27 | 0.18 | 0.24 | 0.27 | 0.43 |
| **Abdomen** | | | | | | | | |
| Length | 2.51 | 2 | 1.93 | 2.02 | 2.12 | 2.31 | 2.07 | 2.58 |
| Length of hair on dorsal abdomen | 0.07 | 0.08 | 0.07 | 0.08 | 0.07 | 0.1 | 0.08 | 0.12 |
| **Chelicerae** | | | | | | | | |
| Basal segment length | 0.72 | 0.53 | 0.6 | 0.62 | 0.62 | 0.67 | 0.72 | 0.77 |
| Fang length | 0.43 | 0.27 | 0.33 | 0.36 | 0.31 | 0.39 | 0.39 | 0.53 |

*......continued on the next page*

**TABLE 1. (Continued)**

| | *Harpactea korenkoi* **sp. nov.** | *Harpactea henriquesi* **sp. nov.** | *Harpactea pekari* **sp. nov.** | *Harpactea crespoi* **sp. nov.** | *Harpactea tavirensis* | *Harpactea adicensis* **sp. nov.** | *Harpactea krejcii* **sp. nov.** | *Harpactea dolanskyi* **sp. nov.** |
|---|---|---|---|---|---|---|---|---|
| **Pedipalps** | | | | | | | | |
| Length of gnathocoxa | 0.77 | 0.53 | 0.62 | 0.67 | 0.69 | 0.65 | 0.72 | 0.75 |
| Length of palpal coxa | 0.36 | 0.24 | 0.31 | 0.29 | 0.31 | 0.29 | 0.67 | 0.41 |
| Length of palpal femur | 1.23 | 0.62 | 0.73 | 0.98 | 0.87 | 0.92 | 1.01 | 1.25 |
| Length of palpal patella | 0.8 | 0.36 | 0.4 | 0.47 | 0.53 | 0.58 | 0.58 | 0.75 |
| Length of palpal tibia | 0.55 | 0.31 | 0.33 | 0.49 | 0.4 | 0.46 | 0.51 | 0.63 |
| Length of palpal tarsus | 0.89 | 0.4 | 0.42 | 0.71 | 0.58 | 0.67 | 0.65 | 0.77 |
| Length of palp | 3.83 | 1.93 | 2.2 | 2.93 | 2.69 | 2.92 | 3.42 | 3.81 |
| Bulbus diameter | 0.84 | 0.33 | 0.35 | 0.51 | 0.58 | 0.53 | 0.7 | 0.7 |

The vulva is of the type *minoccii*. It resembles *H. subiasi* but it can be distinguished from the later species by larger paired posterior diverticles, easy to overlook in *H. subiasi* (Fig. 7B—pd) and by more compact hooks of the anchor-shaped anterior arc (Fig. 7A ven.).

**Description.** The female has not been known so far. The somatic characters correspond with those described for the holotype male. The vulva is well developed. The anterior arc is high in ventral view. The median rod carries large crest, it does not contain any spermatheca. The anterior arc with median rod strongly resemble anchor in the ventral/dorsal view. The transversal bar carries a couple of translucent membranous pockets (Fig. 7A).

**Ecology.** In humid leaf litter under trees or bush on shaded slopes. Females lay eggs at the beginning of spring. The presence of independent juveniles at the same time suggests a two-year life cycle.

**Distribution.** Relatively large area comprising southern Spain (Ferrandez 1990: 37, fig. 3; Ferrandez & Ferrandez 1990: 49, fig. 4; Machado & Ferrandez 1991: 58, fig. 8) and southern Portugal.

### *Harpactea pekari* Řezáč sp. nov.

(Figs 1D, 2D, 3D, 4D, 6C, 9)

**Type material.** *Holotype.* ♂, Mertola, Corredoura, 37.746, -7.642, *Quercus coccifera* and *Q. ilex* wood, 29 March 2013, leg. M. Řezáč, coll. National Natural History Museum, Prague, code P6A 7389.

*Paratypes.* Mertola, Corredoura, 37.746, -7.642, *Quercus coccifera* and *Q. ilex* wood, 9 ♂♂, 1 ♀, 1999, 13 ♂♂, 2 ♀♀, 2000, leg. P. Cardoso, coll. Finnish Museum of Natural History, Helsinki (http://id.luomus.fi/KN.23951); 1 ♀, 1 juv., 8 November 2005, 1 ♀, 3 April 2008, 3 ♀♀, 3 juv., 29 March 2013, leg. M. Řezáč, coll. Crop Research Institute, Prague.

**Etymology.** Named after the Czechoslovak arachnologist Stano Pekár, our friend who helped us to collect material for this study.

**Diagnosis.** The smallest and more gracile Portuguese *Harpactea* species. It resembles *H. gaditana, H. fageli* and *H. henriquesi* **sp. nov.** by slightly elongated unmodified cymbium (Fig. 3D). It can be distinguished from the former species by spherical tegulum, no conductor and long regularly curved embolus, transversal in respect to tegulum (Fig. 4D). The reduced (small, only slightly sclerotised and without spermathecae) vulva resembles *H. algarvensis, H. tavirensis* and *H. crespoi* **sp. nov.** but it can be distinguished from these species by narrow posterior transversal bar bearing two furrows (Fig. 6C). It co-occurs with *H. minoccii,* from which it differs by smaller and lighter body.

**Description.** *Male (holotype).* Carapace yellow-orange, head region darker, matting (Fig. 1D). Sternum yellow, matting. Chelicerae brown. Legs yellow, femora I and pedipalps darker. For measurements and leg spination see the Table 1. Relative leg length: IV>I>II>III. Cymbium with only slightly elongated distal part (Fig. 3D). Tegulum large, longer than wide (Fig. 4D). Conductor atrophied. Embolus dark, long, regularly bent, directing to the side. Opisthosoma cylindrical, whitish.

*Female.* All somatic characters as described for the male. The vulva is of the type *pekari* (see the Material and Methods). It is very reduced and does not possess any posterior diverticle (Fig. 6C).

*Variability.* Male carapace length 1.33–1.84 mm (1.58±0.14, N=21), female carapace length 1.51–1.60 mm (1.54±0.04, N=4).

**Ecology.** Adults are found in early spring in leaf litter and under stones on humid northern slopes with *Quercus ilex* and *Juniperus turbinata* bush.

**Distribution.** Known only from the valley of the river Guadiana near Mertola in southern Portugal.

### *Harpactea proxima* Ferrández, 1990

(Fig. 9)

*H. proxima* Ferrández 1990: 33, fig. 1c–d (description based on ♂); Le Peru 2011: 277, fig. 436 (♂, redrawn from Ferrández 1990).

**Material.** Type material was not examined.

**Diagnosis.** *Harpactea proxima* is very similar to *H. minoccii*. According to Ferrández (1990) *H. minoccii* differs from *H. proxima* by absence of femoral spines. However, all our *H. minoccii* specimens possess femoral spines. Their absence is very unusual in the genus *Harpactea* in general, which lead us to conclude that the holotype of *H. minoccii* is just an individual with aberrant spination. Further, *H. proxima* possesses conductor (not embolus as stated in Ferrández (1990)) that is uniformly curved (in *H. minoccii* it is sinuous—Fig. 4E). Because we found only *Harpactea* with bulbus morphology of *H. minoccii* in the region from where *H. proxima* was described, we can not exclude the possibility that these two morphotypes are in fact the same species.

**Ecology.** So far unknown (*cf.* Ferrández 1990).

**Distribution.** It is recorded from southern Portugal (Ferrandez 1990: 37, fig. 3; Machado & Ferrandez 1991: 58, fig. 8).

### *Harpactea stalitoides* Ribera, 1993

(Fig. 9)

*H. stalitoides* Ribera 1993: 2, fig. 1–4 (description based on female); Reboleira *et al.* 2011: fig. 3a.

**Material.** Type material was not examined.

**Ecology.** It occurs in the afotic zone of caves. The adult females were collected in winter and early spring (Ribera 1993).

**Distribution.** It is known from few caves in southern Portugal (Algarão Menor do Paulino, Algarão dos Mouros, Gruta do Vale Telheiro, Loulé and Gruta da Senhora, Moncarapacho) (Reboleira *et al.* 2011, Ribera 1993).

### *Harpactea subiasi* Ferrández, 1990

(Fig. 1F, 2F, 3F, 4F, 7B, 9)

*H. subiasi* Ferrández 1990: 35, fig. 1e, 2 (description based on both sexes); Le Peru 2011: 282, fig. 455 (♂♀, redrawn from Ferrández 1990).

**Material.** Type material was not examined.

*New material.* Loule, Ameixial, 37.357, -7.965, litter under *Quercus suber*, 2 ♂♂, 1 ♀, 30 March 2013, leg. M.

Řezáč, coll. Crop Research Institute, Prague; Setúbal, Mata do Solitario, 38.462, -9.002, *Quercus coccifera* forest, 6 ♂♂, 6 ♀♀, 17 November 1997, leg. P. Cardoso, coll. Finnish Museum of Natural History, Helsinki (http://id.luomus.fi/KN.24633); 10 ♂♂, 15 ♀♀, 4 April 2013, leg. M. Řezáč, coll. Crop Research Institute, Prague; Setúbal, Portinho da Arrabida, 38.476, -8.985, *Quercus coccifera* forest, 1 ♀, 1 juv., 7 October 2007, leg. M. Řezáč, coll. Crop Research Institute, Prague; Santiago do Cacem, 38.0000, -8.7356, *Quercus ilex* wood, 1 ♂, 1 ♀, 20. March 2022, leg. M. Řezáč, coll. Crop Research Institute, Prague.

**Diagnosis.** It closely resembles *H. minoccii* from which it can be distinguished by the remarkably tapering tarsi of male pedipalp in dorsal view (not visible in Fig. 3F as it is a lateral view) For the other differences from *H. minoccii* see the diagnosis in *H. minoccii*.

**Ecology.** It lives in humid leaf litter in *Quercus* forests in shaded places. The females lay eggs (Range = 11–39, mean = 19, SD = 11, N = 5) in spring. The presence of independent juveniles in spring suggests a two-year life cycle.

**Distribution.** It occurs in southern Portugal (maps in Ferrandez 1990: 37, fig. 3 and Machado & Ferrandez 1991: 58, fig. 8).

### *Harpactea tavirensis* Wunderlich, 2020

(Figs 1M, 2M, 3M, 5E, 8E, 9)

*H. tavirensis* Wunderlich 2020: 7, figs 4–6 (description based on ♂).

**Material.** *Type material.* 1 ♂ paratype, 5 km WNW of Tavira, leg. et coll. J. Wunderlich, R178/ARICJW.

*New material.* S. Bras de Alportel, Fonte da Taipa, 37.203, -7.963, *Quercus suber* forest with *Erica* sp., 3 ♂♂, 13 ♀♀, 12 April 2005, 2 ♂♂, 9 November 2005, 3 ♂♂, 6 ♀♀, 31 March–1 April 2013, leg. M. Řezáč, coll. Crop Research Institute, Prague; Santa Bárbara de Nexe, 37.111, -7.982, 3 ♂, April 1963, leg. leg. Henry Coiffait?, coll. National Natural History Museum, Prague; Barranco do Velho, 37.238, -7.941, *Quercus suber* forest, 3 ♂♂, 2 ♀♀, December 1964, leg. Henry Coiffait?, coll. National Natural History Museum.

**Diagnosis.** It can be distinguishged from any other Iberian *Harpactea* by cymbium with concave retrolateral side, unlike retrolateral side of cymbium being either convex or straight, in other species (only the prolateral side is concave in some species), and concave hairless dorso-apical side. It possesses the cheliceral type *minoccii* (see the Materials and Methods) characterised by only three cheliceral teeth. In contrast to other two representatives of this cheliceral type, *H. minoccii* and *H. subiasi*, it has slightly obtuse posterior distal tooth (in two mentioned species it is pointed) and thicker basal cheliceral segment (Fig. 2M). Vulva is similar to that of *H. algarvensis*, but it can be distinguished by sclerotization only present at the median rod of the anterior arc (Fig. 8E). A couple of bands of white delicate tissue run from the epigastric furrow towards the ovary and turn dorsally in the middle of the abdomen (Fig. 8E—wt, when the spider is in certain level of saturation, it can be observed by transparency, without dissecting). It co-occurs with *H. algarvensis*, from which it can be distinguished by smaller size (*H. algarvensis* 2.2 mm, *H. tavirensis* 1.4–2.0 mm), darker coloration and slightly annulated legs.

**Description.** *Male.* Carapace red-brown, matting (Fig. 1M). Sternum brown-yellow, matting. Chelicerae red brown. Legs yellow-brown, anterior legs and pedipalps are darker. For measurements and leg spination see the Table 1. Relative leg length: IV>I>II>III. Cymbium slightly elongated (Fig. 3M), distally widened, with concave retrolateral side. Tegulum wider than long (Fig. 5E). Conductor relatively short, slightly S-shaped. Embolus dark, extremely long, its base directs to the opposite side than the conductor but then it is bent in 180° angle, so its tip directs to the same side as conductor. Opisthosoma cylindrical, whitish.

*Female.* All somatic characters as described for the male. The vulva is of the type *algarvensis* (Fig. 8E). The vulva is very small and weakly sclerotised, anterior arc, transversal bar and median rod are only tiny rudiments. Rudiment of posterior diverticle is tiny circular spot. Behind the epigastric furrow there is a paired mass of whitish tissue.

*Variability.* Male carapace length 1.51–2.00 mm (1.77±0.14, N=9), female carapace length 1.38–2.00 mm (1.65±0.13, N=22). The twisting of embolus is variable. Moreover, its appearance depends on the angle of view.

**Ecology.** The adults occur in early spring in leaf litter of *Quercus suber* and *Erica* forests on eastern slopes. Females lay 16–21 eggs (N=2).

**Distribution.** So far known only from mountains in Algarve, southern Portugal.

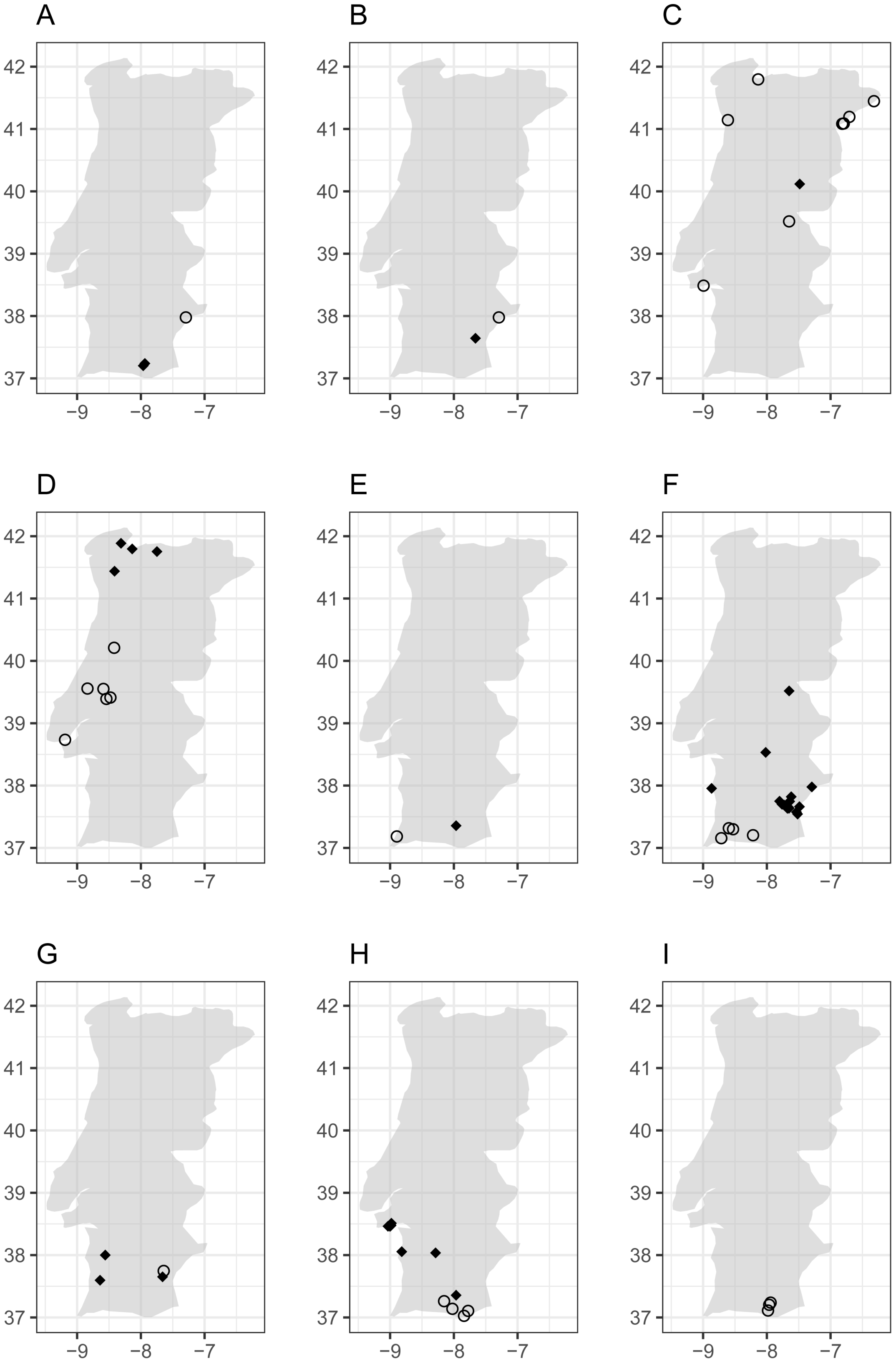

**FIGURE 9.** Known distribution of Portuguese *Harpactea* species. In each map the first species is represented by a transparent circle and the second species by a black diamond: A) *H. adicensis* & *H. algarvensis*; B) *H. crespoi* & *H. dolanskyi*; C) *H. fageli* & *H. gaditana*; D) *H. henriquesi* & *H. hombergii*; E) *H. korenkoi* & *H. krejcii*; F) *H. magnibulbi* & *H. minoccii*; G) *H. pekari* & *H. proxima*; H) *H. stalitoides* & *H. subiasi*; I) *H. tavirensis*.

## Discussion

### Morphological affinities

The Portuguese *Harpactea* fauna is composed of representatives of several groups. *Harpactea hombergii* represents the species group *hombergi* as defined by Deeleman-Reinhold (1993). *Harpactea hombergii* is characterised by shortened male pedipalpal tarsus, lobated conductor and embolus fixed to tegulum without articulation, and by vulva with rounded edges of anterior arc and median rod without a crest. Most species in this group are distributed in the southern Balkan peninsula (e.g. *H. coccifera* Brignoli, 1984, *H. nausicaae* Brignoli, 1976, and *H. villehardouini* Brignoli, 1979 from Greece). However, *H. hombergii* probably survived the last glacial period in the Iberian Peninsula, as it does not occur in any other European glacial refuge (it is absent in Balkan and Italian peninsulas).

The species *H. fageli, H. gaditana, H. henriquesi* **sp. nov.** and probably also *H. pekari* **sp. nov.** may be included in the group *corticalis* as defined by Deeleman-Reinhold (1993). This group is characterised by slender body, simple rod-shaped conductor and embolus and presence of two types of unpaired ampullate spermathecae of similar size, the posterior diverticle is small and tubiliform (Deeleman-Reinhold 1993). In *H. pekari* **sp. nov.**, a novel fertilisation strategy might have led to the loss of conductor and atrophy of both spermatheca types. The majority of the species diversity of the group *corticalis* is concentrated in the western Mediterranean, namely *H. corticalis* (Simon, 1882) from southern France, *H. blasi* Ribera & Ferrández, 1986 and *H. sciakyi* Pesarini, 1988 from Spain, *H. dufouri* (Thorell, 1873) from the Balearic Islands and Catalonia (Bosselaers 2018), *H. carusoi* Alicata, 1974*, H. gridellii* (Caporiacco, 1951)*, H. piligera* (Thorell, 1875) and *H. zannonensis* Alicata, 1966 from Italy, *H. sicula* Alicata, 1966 from Sicily, *H. angustata* (Lucas, 1846)*, H. major* (Simon, 1911)*, H. mitidjae* Bosmans & Beladjal, 1991*, H. oranensis* Bosmans & Beladjal, 1991*, H. ouarsenensis* Bosmans & Beladjal, 1991 and *H. senalbensis* Beladjal & Bosmans, 1997 from Algeria, and *H. punica* Alicata, 1974 from Tunisia). The only species reported outside the western Mediterranean is *H. rucnerorum* Polenec & Thaler, 1975, which occurs in the northwestern Balkans.

We here propose that the species *H. minoccii, H. subiasi, H. algarvensis, H. magnibulbi, H. korenkoi* **sp. nov.***, H. crespoi* **sp. nov.***, H. tavirensis, H. adicensis* **sp. nov.***, H. krejcii* **sp. nov.** and *H. dolanskyi* **sp. nov.** probably constitute a subgroup, named by M. Ferrández as the *minoccii* subgroup (Ferrández 1990), within the group *corticalis*, restricted to the Iberian peninsula. Beside enlarged tegulum and elongated male palpal tarsus mentioned already by Ferrandez (1990), a putative synapomorphy of the subgroup is the modification of male chelicerae, in particular the cheliceral teeth and fangs. These modifications may be related to a unique mating behavior where the male grasps one of the female‘s chelicerae between his own chelicerae during copulation (M. Řezáč, pers. observ.). Thus, modified cheliceral teeth and cheliceral fang with a tooth are probably morphological adaptations allowing the male a more efficient grasping. During mating, the male and female copulatory organs are further away from each other than in the more widespread mating position across the family, in which the male locates itself below the female sternum (e.g. Řezáč 2009). The different mating position might explain the elongation of male pedipalps in the *minoccii* subgroup. Interestingly, the morphology of the copulatory organs is very variable in this subgroup. In *H. tavirensis, H. dolanskyi* **sp. nov.***, H. crespoi* **sp. nov.** and *H. krejcii* **sp. nov.** the embolus is extremely elongated. However, the arrangement of cheliceral teeth in *H. dolanskyi* **sp. nov.** and *H. krejcii* **sp. nov.** males more closely resembles *H. algarvensis*, which bears a relatively short embolus, while the cheliceral teeth arrangement in *H. tavirensis* suggest a closer affinity with *H. minoccii* and *H. subiasi*, also bearing short emboli (see the cheliceral types defined in the Materials and Methods). These morphological similarities suggest that the extremely elongated embolus may have evolved independently. Similarly, the conductor also seems to have been lost several times independently during the evolution of Portuguese *Harpactea*. It is absent in the species *H. pekari* **sp. nov.**, *H. crespoi* and *H. adicensis* **sp. nov.**, which show very different male cheliceral morphologies and tegulum shape.

Since sperm is stored in the tegulum before copulation, the enlarged tegulum in the species of the *minoccii* subgroup (compare the Figs 3A–C with 3E–N) may be related to a different sperm competition strategy, in which males would prioritise in larger ejaculates at expenses of lesser mating partners. This hypothesis is supported by behavioural observations. Males of this subgroup spend significantly more time into single copulation than the typical representatives of the *corticalis* group (specifically *H. henriquesi* **sp. nov.**) (M. Řezáč personal observation).

In the majority of the studied species the male palpal tarsus is elongated and bears some kind of modification, which seem to be related to the size and shape of the bulbus. The shape of the male palpal tarsus is probably the result of a compromise between securing protection of the copulatory organ during non-copulatory activities, and facilitating copulation.

Female genitalia are also very variable within the *corticalis* group, and in particular in the *minoccii* subgroup. The ancestral female genitalia in the *corticalis* group is probably the one present in *H. fageli, H. gaditana* and *H. henriquesi* **sp. nov.**, as it is the only type known in this group, except for *minoccii* subgroup. The species *H. fageli, H. gaditana* and *H. henriquesi* **sp. nov.** possess spermatheca and posterior diverticle that are both simple and ampuliform. In the species *H. pekari* **sp. nov.**, which share similar male chelicerae morphology with the fomer species, the spermatheca is reduced in both size and sclerotisation and the posterior diverticle is absent. In the species *H. minoccii* and *H. subiasi* the spermatheca and posterior diverticle are also reduced. The spermatheca is replaced by a large chitinous crest without any cavity for storing sperm, where large muscles responsible for opening the gonopore are attached. Instead of the unpaired posterior diverticle, there are two transparent pouches, which might represent secondary spermathecae. The anterior arc and the transversal bar are anterio-dorsally directed into the opisthosoma. They compose the anterioventral (anterior arc) and posterio-dorsal (transversal bar) walls of the large copulatory bursa (*e.g.*, Fig. 7A lat.), where the emboli are inserted. We suggest that the female genitalia morphology in the other species, namely *H. magnibulbi, H. korenkoi* **sp. nov.**, *H. algarvensis, H. tavirensis* and *H. crespoi* **sp. nov.**, is a modificaiton of the morphology exhibited by *H. minoccii* and *H. subiasi.* The former species have a relatively large copulatory bursa (space between anterior arc and transversal bar), running anteriorly from the epigastric furrow, parallel to the ventral wall of the opisthosoma, but, in contrast with *H. minoccii* and *H. subiasi,* they lack paired posterior spermathecae and the sclerotised anterior crest for attachment muscles is reduced to a small sclerotised rod on the ventral side of the anterior arc. Finaly, the vulva of *Harpactea stalitoides* resembles that of the type *fageli*, which may hint at a closer relationship with the species *H. fageli, H. gaditana* and *H. henriquesi* **sp. nov.**

## Ecology

The studied species were always found under woody plants that produce slowly decomposing leaf litter, usually *Quercus* spp., or introduced *Eucalyptus* sp. They probably require slightly humid leaf litter; both damp leaf litter on bottoms of brook valleys and dry leaf litter on southern and southwestern slopes are usually avoided. The species were collected mainly in spring and winter months, which correspond to the rainy seasons in Portugal. During these months mating and egg laying takes place. During the dry summer months, the spiders are probably hidden in soil crevices. This is most obvious in dry regions, for example, almost all specimens of *H. pekari* **sp. nov.** from the dry slopes of the Guadiana river were collected in winter. In spring, individuals are rarely seen on the surface. The lack of pigmentation and slightly reduced eyes of this species might be the result of a mostly subterranean life. *Harpactea stalitoides* would represent an extreme of the transition towards the subterranean environment. This eyeless and depigmented species has never been found in epigean habitats. Conversely, some *Harpactea* species, e.g. *H. minoccii, H. algarvensis* or *H. henriquesi* **sp. nov.**, seem to be less sensitive to drier conditions, as they can be found on the ground even during summer months.

According to diet experiments performed while breeding the studied species in laboratory (Řezáč, unpublished data), all *Harpactea* species from Portugal capture and consume small arthropods with soft body, such as flies, crickets, spiders, springtails, and centipedes. They are probably dietary generalists, unlike the majority of *Dysdera* species that specialise on capturing and feeding on woodlice (Řezáč *et al.* 2008b; Řezáč & Pekár 2007; Pekár *et al.* 2016). Several Portuguese *Harpactea* overlap distributions and even co-ocurr in the same localities. As co-occuring *Harpactea* species probably utilize the same prey and occur in the same microhabitats, they could potentialy compete for food. Interestingly, sympatric species usually differ in body size: the large *H. minoccii* and the small *H. pekari* **sp. nov.** co-occur in Corredoura, the large *H. dolanskyi* **sp. nov.** and the small *H. minoccii* near Mertola, the large *H. algarvensis* and the small *H. tavirensis* near Barranco do Velho. Divergence of size in co-existing *Harpactea* species can be a result of trait displacement, selection against competition for prey. However, we did not detect significant size difference between *H. subiasi* and *H. krejcii* **sp. nov.** coocuring near Ameixial and *H. crespoi* **sp. nov.** and *H. adicensis* **sp. nov.** coocuring near Sobral da Adiça.

## Distribution

Except for *H. hombergii*, which occurs through most of Europe, Portuguese *Harpactea* are usualy narrow endemics in the Iberian Peninsula. Some of them occur in relatively larger areas, namely *H. minoccii, H. subiasi, H. fageli, H. gaditana, H. henriquesi* **sp. nov.**, *H. algarvensis, H. magnibulbi*, while others, namely *H. stalitoides, H. korenkoi* **sp. nov.**, *H. pekari* **sp. nov.**, *H. crespoi* **sp. nov.**, *H. tavirensis, H. adicensis* **sp. nov.**, *H. krejcii* **sp. nov.**, and

*H. dolanskyi* **sp. nov.**, are known from only one or few sites (Table 2). Narrow distribution ranges are a trademark for the vast majority of species in the family Dysderidae. A possible explanation for the restricted distribution of dysderids is their inability to conduct balloning, an airborn long distance disperal by means of silk threads and with the help of wind. Despite possessing major ampullate silk glands, dysderids rarely release dragline, the main silk type used for ballooning, and when they occasionally released dragline, this is very weak, not capable to carry them (Řezáč, pers. observ.). Moreover, they have never been reported to perform the typical pre-ballooning tiptoeing behaviour, even in laboratory experiments with conditions optimized for ballooning, and have never been collected in suction traps targeted towards aerial plankton sampling.

**TABLE 2.** Known distribution of Portuguese *Harpactea* species.

| Species | Site | Longitude | Latitude | Reference |
|---|---|---|---|---|
| *Harpactea adicensis* | Serra da Adica | -7.294 | 37.978 | This work |
| *Harpactea algarvensis* | Barranco do Velho | -7.9372 | 37.23902 | Ferrandez 1991 |
| *Harpactea algarvensis* | Fonte da Taipa | -7.963 | 37.203 | This work |
| *Harpactea crespoi* | Serra da Adica | -7.294 | 37.978 | This work |
| *Harpactea dolanskyi* | Mertola | -7.661 | 37.643 | This work |
| *Harpactea fageli* | Freixiosa | -6.31968 | 41.44577 | Cardoso 2004 |
| *Harpactea fageli* | Lagoaca | -6.70557 | 41.19412 | Cardoso 2004 |
| *Harpactea fageli* | Mata da Albergaria | -8.13633 | 41.7953 | Cardoso *et al.* 2008b |
| *Harpactea fageli* | Porto | -8.6113 | 41.14293 | Machado 1941 |
| *Harpactea fageli* | Congida | -6.793 | 41.088 | This work |
| *Harpactea fageli* | Freixo de Espada a Cinta | -6.817 | 41.083 | This work |
| *Harpactea fageli* | Nisa | -7.651 | 39.518 | This work |
| *Harpactea fageli* | Mata do Vidal | -8.993 | 38.487 | This work |
| *Harpactea gaditana* | Alcongosta | -7.484 | 40.117 | This work |
| *Harpactea henriquesi* | Paul do Boquilobo | -8.541 | 39.39 | This work |
| *Harpactea henriquesi* | Botanical Garden of Coimbra | -8.42 | 40.21 | This work |
| *Harpactea henriquesi* | Monsanto | -9.19 | 38.734 | This work |
| *Harpactea henriquesi* | Golega | -8.478 | 39.412 | This work |
| *Harpactea henriquesi* | Vale Garcia | -8.588 | 39.55 | This work |
| *Harpactea henriquesi* | Serro Ventoso | -8.838 | 39.556 | This work |
| *Harpactea hombergi* | Mata da Albergaria | -8.13633 | 41.7953 | Cardoso *et al.* 2008b |
| *Harpactea hombergi* | Morgade | -7.74763 | 41.75302 | Ferrandez 1986 |
| *Harpactea hombergi* | Joane | -8.41298 | 41.43825 | Machado 1937 |
| *Harpactea hombergii* | Mezio | -8.312 | 41.886 | This work |
| *Harpactea korenkoi* | Carrapateira | -8.895 | 37.184 | This work |
| *Harpactea krejcii* | Ameixial | -7.965 | 37.357 | This work |
| *Harpactea magnibulbi* | Algarao da Ribeira de Alte | -8.21668 | 37.20343 | Machado & Ferrandez 1991 |
| *Harpactea magnibulbi* | Foia | -8.59663 | 37.3157 | Machado & Ferrandez 1991 |
| *Harpactea magnibulbi* | Furna da Seiceira | -8.7151 | 37.15608 | Machado & Ferrandez 1991 |
| *Harpactea magnibulbi* | Picota | -8.53035 | 37.29955 | Machado & Ferrandez 1991 |
| *Harpactea magnibulbi* | Fóia | -8.597 | 37.316 | This work |
| *Harpactea minoccii* | Algodor | -7.80045 | 37.74927 | Cardoso 2004 |
| *Harpactea minoccii* | Cerro das Antenas | -7.65262 | 37.63575 | Cardoso 2004 |
| *Harpactea minoccii* | Corredoura | -7.64217 | 37.74623 | Cardoso 2004 |
| *Harpactea minoccii* | Mertola | -7.65988 | 37.65165 | Cardoso 2004 |
| *Harpactea minoccii* | Mertola | -7.6767 | 37.63448 | Cardoso 2004 |

*......continued on the next page*

**TABLE 2. (Continued)**

| Species | Site | Longitude | Latitude | Reference |
|---|---|---|---|---|
| *Harpactea minoccii* | Ribeira de Limas | -7.61775 | 37.82055 | Cardoso 2004 |
| *Harpactea minoccii* | S. Domingos | -7.48815 | 37.66127 | Cardoso 2004 |
| *Harpactea minoccii* | Pomarao | -7.535 | 37.575 | Cardoso *et al.* 2009 |
| *Harpactea minoccii* | Corredoura | -7.642 | 37.746 | This work |
| *Harpactea minoccii* | Mertola | -7.661 | 37.643 | This work |
| *Harpactea minoccii* | Mertola | -7.66 | 37.652 | This work |
| *Harpactea minoccii* | Alcaria Ruiva | -7.762 | 37.7 | This work |
| *Harpactea minoccii* | Corte da Velha | -7.729 | 37.687 | This work |
| *Harpactea minoccii* | Mesquita | -7.518 | 37.543 | This work |
| *Harpactea minoccii* | Sines | -8.867 | 37.955 | This work |
| *Harpactea minoccii* | Santa Catarina | -7.642 | 37.746 | This work |
| *Harpactea minoccii* | Nisa | -7.651 | 39.518 | This work |
| *Harpactea minoccii* | Serra da Adiça | -7.294 | 37.978 | This work |
| *Harpactea minoccii* | Herdade da Mitra | -8.018 | 38.532 | This work |
| *Harpactea pekari* | Corredoura | -7.642 | 37.746 | This work |
| *Harpactea proxima* | Mertola | -7.65988 | 37.65165 | Cardoso 2004 |
| *Harpactea proxima* | Abela | -8.55892 | 38.0005 | Ferrandez 1991 |
| *Harpactea proxima* | Odemira | -8.64085 | 37.59682 | Ferrandez 1991 |
| *Harpactea stalitoides* | Gruta da Senhora | -7.77639 | 37.10528 | Reboleira *et al.* 2011 |
| *Harpactea stalitoides* | Gruta do Vale Telheiro | -8.02295 | 37.13878 | Reboleira *et al.* 2011 |
| *Harpactea stalitoides* | Algarao do Paulino | -8.15342 | 37.2612 | Ribera 1993 |
| *Harpactea stalitoides* | Algueirao dos Mouros | -7.84058 | 37.02628 | Ribera 1993 |
| *Harpactea subiasi* | Vale da Rasca | -8.98062 | 38.51133 | Cardoso *et al.* 2008a |
| *Harpactea subiasi* | Areias Brancas | -8.818 | 38.05533 | Carvalho *et al.* 2011 |
| *Harpactea subiasi* | Canhestros | -8.28702 | 38.036 | Ferrandez 1991 |
| *Harpactea subiasi* | Ameixial | -7.965 | 37.357 | This work |
| *Harpactea subiasi* | Mata do Solitario | -9.002 | 38.462 | This work |
| *Harpactea subiasi* | Portinho da Arrabida | -8.985 | 38.476 | This work |
| *Harpactea subiasi* | Mata do Solitario | -9.00195 | 38.46185 | ZMUC (Col Pedro Cardoso) |
| *Harpactea subiasi* | Mata do Vidal | -8.99253 | 38.48663 | ZMUC (Col Pedro Cardoso) |
| *Harpactea subiasi* | Terras do Risco | -9.03397 | 38.46275 | ZMUC (Col Pedro Cardoso) |
| *Harpactea tavirensis* | Fonte da Taipa | -7.963 | 37.203 | This work |
| *Harpactea tavirensis* | Santa Bárbara de Nexe | -7.982 | 37.111 | This work |
| *Harpactea tavirensis* | Barranco do Velho | -7.941 | 37.238 | This work |

In terms of species richness, there is a clear north to south gradient. The south of Portugal harbours higher *Harpactea* species richness than the north of the country. It is probably a consequence of glacial cycles, which restricted the biodiversity of the north of the Iberian peninsula more than its south.

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