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Review of *Hyllus* C.L. Koch, 1846 in Vietnam, with descriptions of three new species (Araneae: Salticidae)

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Abstract. The jumping spider genus *Hyllus* C.L. Koch, 1846 in Vietnam is reviewed, including descriptions of three new species: *H. taysonensis* sp. nov. (♂♀), *H. vietnamensis* sp. nov. (♂♀), and *H. zabkai* sp. nov. (♀). The species *H. diardi* (Walckenaer, 1837), originally described from southern Vietnam, is redescribed from both sexes. Specimens from northeastern Vietnam previously misidentified as *H. diardi* are assigned to *H. vietnamensis* sp. nov. The species name *Phidippus tirapensis* Biswas & Biswas, 2006 is removed from the synonymy with *H. diardi* and transferred to the genus *Hyllus* as *H. tirapensis* (Biswas & Biswas, 2006) comb. nov. Detailed descriptions, photographs of copulatory organs and somatic characters, as well as a distributional map and an identification key to all Vietnamese species of *Hyllus*, are provided.

Keywords. Plexippini, distribution, jumping spiders, misidentification, Ho Chi Minh City, new combination.

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Introduction

The salticid genus *Hyllus* C.L. Koch, 1846 belongs to the subtribe Plexippina Simon, 1901 in the tribe Plexippini Simon, 1901 (Maddison 2015), with the type species, *H. giganteus* C.L. Koch, 1846. The genus currently consists of 67 named species and is widespread across Africa, south and southeast Asia (World Spider Catalog 2024; Metzner 2024). Yet, the genus remains rather poorly understood, with 44 species known only from one sex (viz., 18 from males, 26 from females) and three from juveniles (World Spider Catalog 2024). The genus seems to be paraphyletic (Logunov 2021) and is mainly recognized by its large body size (Maddison 2015). Thus, a worldwide revision of the genus is urgently needed due to the presence of numerous species that are probably not related to the type species based on the structure of the copulatory organs (see comparative illustrations in Metzner 2024).

Two of the earliest spider species described from Vietnam by Walckenaer (1837) are *Hyllus diardi* (originally described as *Attus d.*) and *Oxyopes cochinchinensis* (originally described as *Sphasus c.*).

Both were collected from Cochinchine (southern Vietnam) by Pierre-Médard Diard (Walckenaer 1837). However, their precise locality remains obscure (Żabka 1985). Between 1822 and 1824, Pierre-Médard Diard lived in Saigon and did not return to Vietnam afterward (Low *et al.* 2019), suggesting that Saigon (Ho Chi Minh City) in southern Vietnam is likely their type locality. Since then, the jumping spider species *H. diardi* has been the subject of numerous studies (Simon 1886; Prószyński 1984; Żabka 1985, 1988; Biswas & Biswas 2006; Jäger *et al.* 2012; Xiong *et al.* 2017; Basumatary *et al.* 2018; Logunov 2021; Caleb 2023). However, its identification remains problematic (Logunov 2021). To clarify the taxonomic status of *H. diardi* s. str., its illustrations and re-description based on specimens collected in southern Vietnam, namely Ho Chi Minh City and Ben Tre Province, are presented here. Thereby, based on the specimens previously misidentified as *H. diardi*, a new species *H. vietnamensis* sp. nov. with a restricted distribution in northeastern Vietnam is described. Furthermore, some records of *H. diardi* from India also appear to have been based on misidentifications (see below).

In the present paper, a complete review of *Hyllus* in Vietnam has been carried out, resulting in the descriptions of three new species: *H. taysonensis* sp. nov. (♂♀), *H. vietnamensis* sp. nov. (♂♀), and *H. zabkai* sp. nov. (♀). In addition, the correctly identified *H. diardi* was rediscovered and redescribed, with its distribution clarified. Thus, four species of *Hyllus* are currently known from Vietnam, all of which are closely related to the type species and therefore are true congeners of *Hyllus*.

Material and methods

The spider specimens were examined with a Leica M205C stereo microscope. Photos were taken using a Jenoptik ProgRes CF Scan 12.5MP camera and Jenoptik ProgRes Capture Pro ver. 2.10.0.1 software, stacked using the Helicon focus ver. 8.2.2 Pro software, and then edited in Adobe Photoshop CS2 ver. 9.0. The male palps and epigynes were examined and illustrated after dissection. The epigyne was cleared in a 10% KOH solution at room temperature for about 12 hours. All measurements are given in millimeters (mm). The description format follows Hoang *et al.* (2022). Leg segment lengths are given as follows: femur + patella + tibia + metatarsus + tarsus (total length). The map is produced using Google Earth Pro ver. 7.3. The specimens examined here have been deposited in the Vietnam National Museum of Nature (VNMN), Hanoi, Vietnam.

Abbreviations for morphological terms

ALE = anterior lateral eye
AME = anterior median eye
CD = copulatory duct
CO = copulatory opening
E = embolus
FD = fertilization duct
Fm = femur
H = hood
MS = median septum
Mt = metatarsus
PL = posterior lobe
PLE = posterior lateral eye
PME = posterior median eye
Pt = patella
RTA = retrolateral tibia apophysis
S = spermathecae
SD = sperm duct
Tb = tibia

Results

Taxonomy

Class Arachnida Lamarck, 1801
Order Araneae Clerck, 1757
Family Salticidae Blackwall, 1841

Genus ***Hyllus*** C.L. Koch, 1846

Hyllus C.L. Koch, 1846: 161.

Type species

Hyllus giganteus C.L. Koch, 1846, by original designation.

Remarks

In my opinion, *Hyllus* (s. str.) should consist of the species that are closely related to the type species, *H. giganteus*, which is characterized by the male palp having a simple RTA, a bulbus with or without a posterior lobe, an embolus bent and accompanied with a long, retrolateral membrane (= pars pendula); and an epigyne having a pair of large copulatory openings separated by a median septum, a membranous insemination ducts, and a sclerotized and chambered spermathecae. For additional diagnostic characters of the genus, see Żabka (1985) and Prószyński (2022).

Key to Vietnamese species of *Hyllus* C.L. Koch, 1846

1. Male 2
– Female 4

2. Pars pendula notably narrow, arising at 9 o'clock (Fig. 6A) ..... ***H. taysonensis*** sp. nov.
– Pars pendula wide, arising at 8 o'clock (Figs 1A, 3A) 3

3. Palpal tibia short, as long as wide, RTA directed dorsad (Fig. 1B) ..... ***H. diardi*** (Walckenaer, 1837)
– Palpal tibia longer than wide, RTA directed anteriad (Fig. 3B) ..... ***H. vietnamensis*** sp. nov.

4. Median septum narrow (Fig. 2A) ..... ***H. diardi*** (Walckenaer, 1837)
– Median septum wide (Figs 4A, 5A, 7A) 5..... 5

5. Insemination ducts narrow and short (Fig. 7B) ..... ***H. taysonensis*** sp. nov.
– Insemination ducts wide and long (Figs 4B, 5B) 6

6. Hood continuous, proximal chambers notably far apart (Fig. 5B) ..... ***H. zabkai*** sp. nov.
– Hood interrupted, proximal chambers close to each other (Fig. 4B) ..... ***H. vietnamensis*** sp. nov.

Hyllus diardi (Walckenaer, 1837)
Figs 1–2, 8A–B, 10A–B, 11

Attus diardi Walckenaer, 1837: 460 (female).
Plexippus mutillarius C.L. Koch, 1846: 93, figs 1155–1156 (♂, ♀).
Plexippus janthinus C.L. Koch, 1846: 97, fig. 1160 (♂).
Plexippus succinctus C.L. Koch, 1846: 98, fig. 1161 (♂).
Plexippus lacertosus C.L. Koch, 1846: 94, figs 1157–1158 (♂).
Hyllus maskaranus Barrion & Litsinger 1995: 65, fig. 29a–f (♀).

Hyllus diardi – Simon 1886: 139. — Prószyński 1984: 62 (♀). — Żabka 1985: 229, figs 217–220 (♀). — Żabka 1988: 458, figs 97–98 (♀). — Peng *et al.* 1993: 96, figs 310–313 (♀). — Song *et al.* 1999: 514, figs 301e, 326l (♀). — Zhang & Wang, 2017: 587, fig. 7 (♂, ♀). — Xiong *et al.* 2017: 23, fig. 1a–g (♂, ♀). — Peng 2020: 181, fig. 119a–d (♀).

Diagnosis

The male of *Hyllus diardi* closely resembles those of *H. vietnamensis* sp. nov., *H. shanhonghani* Lin & Li, 2022, and *H. qishuoi* Xiong, Liu & Zhang, 2017, but can be easily distinguished from them by the following characters: tibia short (as long as wide), about a half of the cymbial length (Fig. 1) *vs* tibia notably longer, about two-thirds of the cymbial length (Fig. 3A–B; Lin *et al.* 2022: fig. 32a–b; Xiong *et al.* 2017: figs 2a–b, 3b–c); RTA flat and wide tip, directed dorsad (Fig. 1B), vs rough tip in *H. shanhonghani* (Lin *et al.* 2022: fig. 32b), directed anteriad in *H. vietnamensis* sp. nov. (Fig. 3B), with a small dorsal process in *H. qishuoi* (Xiong *et al.* 2017: fig. 2b). The female of *Hyllus diardi* is similar to those of *H. vietnamensis* sp. nov., and *H. zabkai* sp. nov., but can be distinguished by the very large, egg-shaped copulatory openings (longer than wide) that are significantly wider than the median septum (Fig. 2A), vs the small, rounded copulatory openings that are narrower than the median septum in both related species (Figs 4A, 5A).

Material examined

VIETNAM • 1 ; Ben Tre Province, Cho Lach District, Hoa Nghia Commune; 2 Aug. 2023; Q.D. Hoang and T.V. Tam leg.; VNMN-SAL-526 • 1 ♀; same data as for preceding; VNMN-SAL-525 • 1 ♀; Ho Chi

Fig. 1. *Hyllus diardi* (Walckenaer, 1837), ♂ (VNMN-SAL-526), palp. **A**. Ventral view. **B**. Vetrolateral view. Scale bar = 0.4 mm. Abbreviations: see Material and methods.

Minh City, Go Vap District, Gia Dinh Park, 03 Ward; 11 Aug. 2023; Q.D. Hoang and T.C. Thien leg.; VNMN-SAL-527.

Redescription

Male (Figs 1, 8A, 10A)

Measurements and coloration. Total length 12.07; carapace length 5.80, width 5.46; abdomen length 6.27, width 3.79. Clypeus height 0.31. Carapace dark brown, sparsely covered with iridescent metallic yellow setae, and with central line of white setae (Fig. 10A); surroundings of eyes dark. Clypeus dark brown, covered with long grey setae. Sternum yellowish brown. Endites and labium darker than sternum. Chelicerae dark, iridescent metallic green; promargin with two teeth and retromargin with one tooth. Abdomen yellowish brown, covered with iridescent metallic yellow setae, some long grey setae and with line of dense white setae (Fig. 10A); venter yellowish brown. Spinnerets dark brown. Legs dark brown, covered with grey setae (Fig. 10A). Width of eye rows: anterior eye row 3.15; posterior median eye row 2.96; posterior lateral eye row 3.25. Distance between ALE–PME 0.90; ALE–PLE 2.06. Diameter of eyes: AME 1.01; ALE 0.47; PME 0.14; PLE 0.46. Length of leg segments: I 3.91 + 2.80 + 3.87 + 2.25 + 1.06 (13.89); II 3.38 + 2.23 + 2.66 + 1.63 + 0.92 (10.82); III 3.85 + 2.12 + 2.26 + 2.59 + 1.09 (11.91); IV lost.

Palp (Fig. 1). Tibia short (as long as wide), approximately half of cymbial length, and with a notable ventral dent around proximal half of tibia; RTA simple, flat and wide at its tip, oblique and directed more or less dorsad; bulbus with wide posterior lobe, directed prolaterad; embolus wide, bent, pointed at its tip, originating at 8 o'clock, accompanied with wide and long pars pendula.

Female (Figs 2, 8B, 10B)

Measurements and coloration. Total length 12.25; carapace length 4.80, width 4.43; abdomen length 7.45, width 4.72. Clypeus height 0.29. Carapace red-brown, sparsely clothed with short yellow setae, and bearing two tufts of long dark setae resembling 'horns' below PMEs; black around eyes (Fig. 10B). Clypeus red-brown, densely covered with long yellow setae. Sternum yellow-brown. Endites and labium

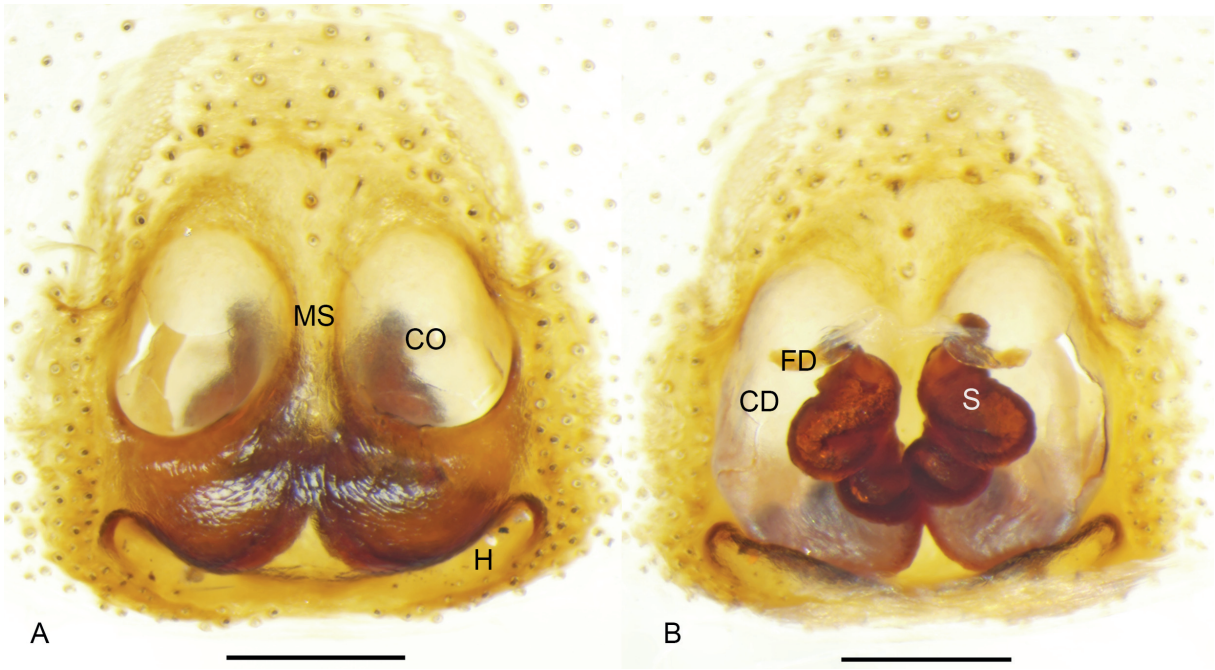

Fig. 2. *Hyllus diardi* (Walckenaer, 1837), ♀ (VNMN-SAL-527), epigyne. **A**. Ventral view. **B**. Dorsal view. Scale bars = 0.3 mm. Abbreviations: see Material and methods.

darker than sternum. Chelicerae red-brown, covered with dense yellow setae dorsally; promargin with two teeth and retromargin with one tooth. Abdomen yellow, covered with grey setae, and decorated with inverted chevrons (Fig. 10B); venter yellow-brown, with central longitudinal continuous band of grey setae. Spinnerets dark brown. Legs reddish brown, with dark femora, densely covered with yellow setae (Fig. 10B). Width of eye rows: anterior eye row 2.84; posterior medial eye row 2.68; posterior lateral eye row 2.94. Distance between ALE–PME 0.88; ALE–PLE 1.97. Diameter of eyes: AME 0.92; ALE 0.42; PME 0.14; PLE 0.43. Length of leg segments: I 3.11+2.37+2.52+1.61+0.84 (10.45); II 3.00+2.22+2.05+1.44+0.88 (9.58); III 3.23+2.05+1.88+2.13+0.99 (10.28); IV 3.34+1.79+2.28+2.38+0.93 (10.72). Leg formula IV-I-III-II.

Epigyne (Fig. 2A–B). Longer than wide; with distinct hood near epigastric furrow; copulatory openings egg-shaped, longer than wide, and twice as wide as median septum; insemination ducts membranous, long and wide, partially covered by spermathecae; spermathecae sclerotized and two-chambered, widest at proximal chambers; fertilization ducts narrow, and slightly bent.

Distribution

China, Thailand, Laos, Philippines, Myanmar, Malaysia, Indonesia and Vietnam (Fig. 11).

Remarks

Prószyński (1984, 2022) illustrated *Plexippus janthinus* and *P. lacertosus* from Indonesia (not the types), and his figures seem to correspond well to those of *H. diardi*. Based on this similarity, Xiong *et al.* (2017) considered the species names *P. janthinus*, *P. succinctus* and *P. lacertosus* to be junior synonyms of *H. diardi*. Yet, to date, the type specimens of these species have never been re-examined and illustrated. Thus, in my opinion, the above synonymy can only be accepted when the corresponding types are re-examined. Based on the illustrations by Prószyński (1984, 2022), the record of *P. janthinus* from India appears to belong to a different species, for its RTA is directed anteriad, in contrast to the more dorsad direction in *H. diardi*.

The species *H. diardi* has also been reported from India (Basumatary *et al.* 2018), but this record seems to have been based on a misidentification, as the width of the copulatory openings in the Indian specimens is significantly narrower than the median septum and is not egg-shaped (see Basumatary *et al.* 2018: figs 3–5). On the other hand, Caleb (2023) argued that two species names – viz., *Hyllus maskaranus* Barrion & Litsinger, 1995 from the Philippine and *Phidippus tirapensis* Biswas & Biswas, 2006 from India – are to be considered junior synonyms of *H. diardi*. However, the synonymy of *P. tirapensis* by Caleb (2023) seems to be incorrect because the width of its copulatory openings is significantly narrower than the median septum and the spermathecae are positioned far from each other (cf. Biswas & Biswas 2006: fig. 5). Yet, as already mentioned by Caleb (2023), the species indeed is a true member of the genus *Hyllus*. Therefore, I propose to remove *P. tirapensis* from the synonymy with *H. diardi* and just transfer it to the genus *Hyllus* as *H. tirapensis* (Biswas & Biswas, 2006) comb. nov. I fully agree with Caleb (2023) in that *H. maskaranus* from the Philippine is conspecific with *H. diardi*. Finally, in my opinion, 'true' *H. diardi* has a limited distribution in southeast Asia and southwestern China (Fig. 11).

Hyllus vietnamensis sp. nov.
urn:lsid:zoobank.org:act:CDDD0F7B-432E-41CF-B599-DA36DA9D48A2
Figs 3–4, 8C–D, 10C–D, 11

Hyllus lacertosus – Żabka 1985: 230, figs 221–226 (♂), misidentification.
Hyllus diardi – Logunov 2021: 1032, figs 41–44 (♀), misidentification.

Diagnosis

In having a long tibia, approximately ⅔ cymbial length, a bulbus with a posterior lobe proximally, an embolus strong, bent, pointed tip and a wide, long pars pendula wide and long, the male of *H. vietnamensis* sp. nov. closely resembles those of *H. qishuoi* Xiong, Liu & Zhang, 2017 and *H. shanhonghani* Lin & Li, 2022. But it can be distinguished from them by the following characters: RTA directed anteriad, with smooth tip and without a dorsal process (Fig. 3B; vs with a small dorsal process in *H. qishuoi*; (Xiong *et al.* 2017: fig. 2b); rough tip and directed dorsad in *H. shanhonghani* (Lin *et al.* 2022: 32b)). The female of the new species is similar to that of *H. shanhonghani*, in having a distinct red pattern on the dorsum, but can be separated by the epigyne with a deep hood (Fig. 4A), which is poorly developed in *H. shanhonghani* (Lin *et al.* 2022: fig. 33a), the proximal chambers narrow and closer together (Fig. 4B) compared with *H. shanhonghani* (Lin *et al.* 2022: 33b).

Etymology

The specific epithet '*vietnamensis*' (adjective) is derived from Vietnam, the country where this species is first discovered.

Type material

Holotype

VIETNAM – **Bac Kan Province** • ♂; Duc Xuan Ward; 5 Jan. 2024; Q.D. Hoang and T.V. Vinh leg.; VNMN-SAL-535.

Paratype

VIETNAM – **Bac Kan Province** • 2 ♀♀; same data as for holotype; VNMN-SAL-534.1-2.

Description

Male (Figs 3, 8C, 10C)

Measurements and coloration. Total length 13.82; carapace length 6.69, width 5.98; abdomen length 7.13, width 4.32. Clypeus height 0.35. Carapace reddish brown, sparsely clothed with yellow setae, and prominent long dark setae (Figs 8C, 10C). Clypeus dark brown, covered with long yellow setae. Sternum yellowish brown. Endites and labium dark brown, and lighter at tip. Chelicerae dark brown, adorned with dense long yellowish setae dorsally; promargin and retromargin with one tooth each. Abdomen reddish brown, covered with dense short iridescent metallic yellow setae, and sparse long dark setae, highlighted by two pairs of white spots on posterior half of dorsum (Figs 8C, 10C); venter yellow brown, marked by longitudinal continuous band of grey setae medially. Spinnerets greyish brown (Figs 8C, 10C). Legs reddish brown. Width of eye rows: anterior eye row 3.41; posterior medial eye row 3.16; posterior lateral eye row 3.44. Distance between ALE–PME 0.91; ALE–PLE 2.26. Diameter of eyes: AME 1.16; ALE 0.55; PME 0.09; PLE 0.49. Length of leg segments: I 4.79+3.37+4.59+2.92+1.25 (16.92); II 4.17+2.87+3.16+2.16+1.09 (13.45); III 4.28+2.42+2.51+2.92+1.21 (13.34); IV 4.25+2.24+2.90+3.22+1.06 (13.67). Leg formula I-IV-II-III.

Palp (Fig. 3A–B). Tibia long, over ⅔ of the cymbial length; RTA simple, wide and flat at its tip, directed anteriad as seen in retrolateral view. Bulbus oval, with wide posterior lobe. Embolus bent, originating at 7 o'clock, with pointed tip, accompanied with wide and long pars pendula.

Female (Figs 4, 8D, 10D)

Measurements and coloration. Total length 14.41; carapace length 6.64, width 5.97; abdomen length 7.77, width 5.03. Clypeus height 0.35. Carapace reddish brown, densely covered with yellow setae and features two tufts of long dark setae below PMEs, resembling 'horns', black around eyes (Figs 8D, 10D). Clypeus dark brown, covered with dense long yellow setae. Sternum yellowish brown. Endites

and labium dark brown, and lighter at tip. Chelicerae dark brown, covered with dense long yellow setae dorsally; promargin with two teeth and retromargin with one tooth. Abdomen yellow, covered with dense short iridescent metallic yellow setae, and long yellow band medially, noticeable with red pattern on posterior half of dorsum, along with pair of circular white setae (Figs 8D, 10D); venter yellow brown, with longitudinal continuous band of grey setae medially. Spinnerets greyish brown (Figs 8D, 10D). Legs reddish brown. Width of eye rows: anterior eye row 3.64; posterior medial eye row 3.38; posterior lateral eye row 3.77. Distance between ALE–PME 1.10; ALE–PLE 2.55. Diameter of eyes: AME 1.30; ALE 0.65; PME 0.12; PLE 0.49. Length of leg segments: I 4.03+2.92+3.12+2.03+1.25 (13.35); II 3.62+2.72+2.63+1.78+1.11 (11.86); III 4.22+2.49+2.43+2.67+1.10 (12.91); IV 4.21+2.32+2.96+3.04+1.03 (13.56). Leg formula IV-I-III-II.

Epigyne (Fig. 4A–B). As long as wide, with copulatory openings located medially, and slightly narrower than median septum, insemination ducts membranous, with small portion covered by spermathecae

Fig. 3. *Hyllus vietnamensis* sp. nov., holotype, ♂ (VNMN-SAL-535), palp. **A**. Ventral view. **B**. Retrolateral view. Scale bar = 0.5 mm.

(in dorsal view), spermathecae sclerotized and two-chambered, fertilization ducts straight and extend laterad.

Distribution

Vietnam (Thai Nguyen – formerly known as Bac Thai, Vo Nhai, Phuong Hoang; Tuyen Quang; and Bac Kan provinces) (Fig. 11).

Remarks

The male of *H. lacertosus* from Vietnam illustrated by Żabka (1985: figs 221–223) perfectly matches the photos of *H. vietnamensis* sp. nov., and is characterized by the long palpal tibia (about ⅔ of the cymbial length). Similarly, the female of *H. diardi* illustrated by Logunov (2021: figs 41–44) exhibits a red pattern on the dorsum, consistent with that of *H. vietnamensis* sp. nov. (Figs 8D, 10D). Besides, both the male presented by Żabka and the female by Logunov were recorded from northeastern Vietnam. Thus, it is safe to conclude that both records belong to the same species described here as *H. vietnamensis* sp. nov.

Finally, the female of the new species and that of *H. shanhonghani* from southeastern China share the similar red pattern on their dorsum, but their copulatory organs differ significantly, along with notable differences in their geography. Therefore, both species can be considered distinct.

Hyllus zabkai sp. nov.
urn:lsid:zoobank.org:act:18EF3CB9-D847-43C6-B7D6-EF4AF4E26E99
Figs 5, 9A–B, 10E, 11

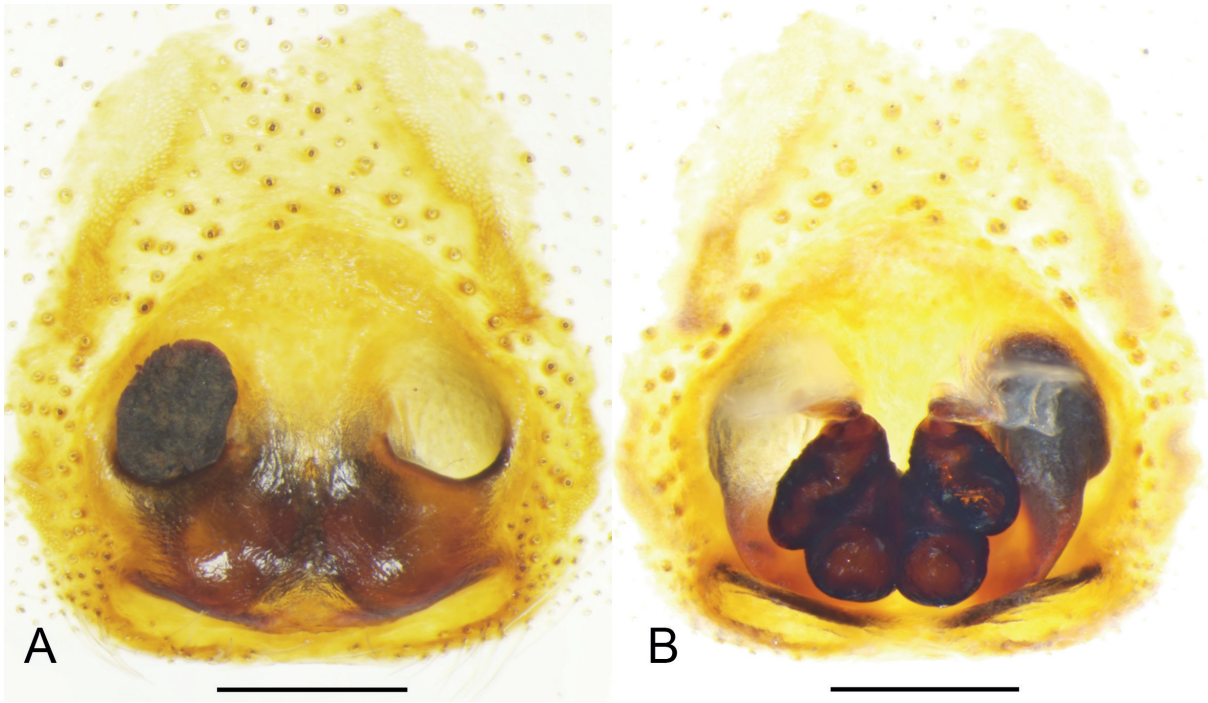

Fig. 4. *Hyllus vietnamensis* sp. nov., paratype, ♀ (VNMN-SAL-534), epigyne. **A**. Ventral view. **B**. Dorsal view. Scale bars = 0.4 mm.

Diagnosis

In having large copulatory openings and a distinct hood, the female of *H. zabkai* sp. nov. is very similar to those of *H. diardi* and *H. vietnamensis* sp. nov. It differs from that of *H. diardi* in having the copulatory openings significantly narrower than the median septum and more rounded (Fig. 5A). It differs from that of *H. vietnamensis* sp. nov., in having the copulatory openings closer to the epigastric furrow (Fig. 5A) and the continuous hood (Fig. 5B), vs discontinued in *H. vietnamensis* sp. nov. (Fig. 4B). Yet, the new species has no red pattern on the dorsum (Figs 9A, 10E), vs present in *H. vietnamensis* sp. nov. (Figs 8D, 10D).

Etymology

This specific is named in honor of Prof. Marek Żabka (Poland), who has made great contributions to the taxonomy of Vietnamese salticid fauna.

Type material

Holotype

VIETNAM – **Dak Lak Province** • ♀; Buon Don District, Yok Don National Park; 12.8708° N, 107.8066° E; 180m a.s.l.; 3 Feb. 2024; Q.D. Hoang leg.; VNMN-SAL-487.

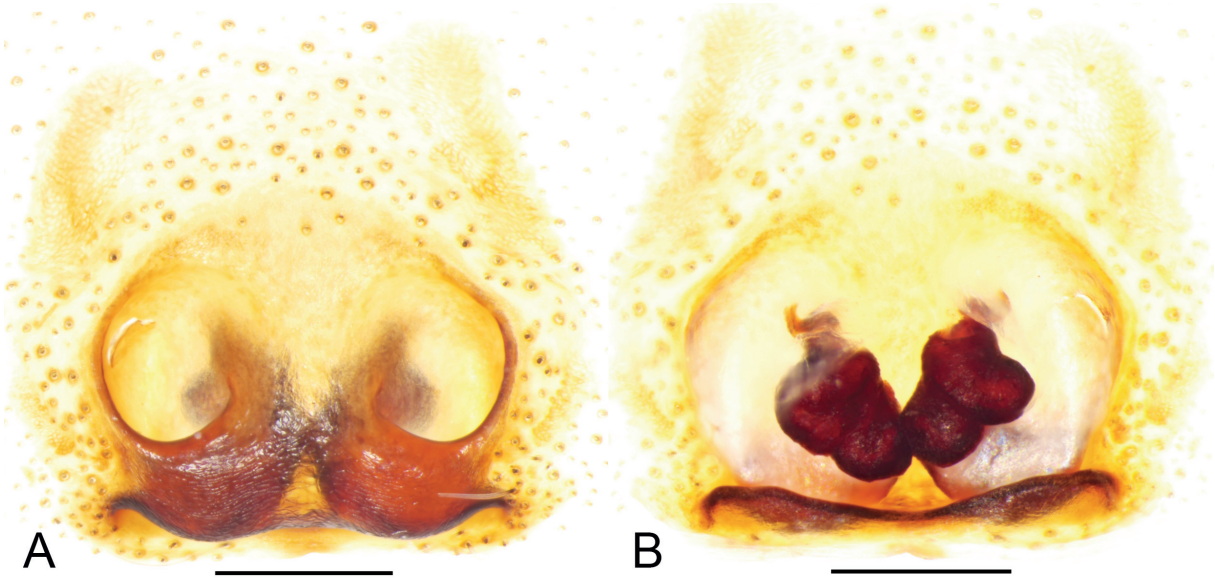

Fig. 5. *Hyllus zabkai* sp. nov., holotype, ♀ (VNMN-SAL-487), epigyne. **A**. Ventral view. **B**. Dorsal view. Scale bars = 0.4 mm.

Other material examined

VIETNAM – **Dak Lak Province** • 1 juv. ♂; same data as for holotype; 6 Jun. 2024; Q.D. Hoang leg.; VNMN-SAL-619.

Description

Female (Figs 5, 9A–B, 10E)

Measurements and coloration. Total length 15.73; carapace length 6.43, width 5.84; abdomen length 9.30, width 7.08. Clypeus height 0.21. Carapace reddish brown, sparsely clothed with white setae, featuring two tufts of long dark setae below PMEs, resembling 'horns', black around eyes (Figs 9A, 10E). Clypeus reddish brown, covered with dense long white setae. Sternum yellow-brown. Endites and labium dark brown, lighter at their tips. Chelicerae dark, covered with long white setae dorsally; promargin with two teeth and retromargin with one tooth. Abdomen yellow, covered with grey setae, adorned with several inverted chevrons on dorsum (Figs 9A, 10E); venter yellow, with longitudinal continuous band of grey setae medially. Spinnerets dark brown. Legs reddish brown (except for dark femora), densely covered with dark and white setae. Width of eye rows: anterior eye row 3.29; posterior medial eye row 3.21; posterior lateral eye row 3.66. Distance between ALE–PME 0.86; ALE–PLE 2.18. Diameter of eyes: AME 1.07; ALE 0.56; PME 0.14; PLE 0.53. Length of leg segments: I 4.18 + 3.08 + 3.41 + 2.21 + 1.10 (13.98); II 3.91 + 2.52 + 2.88 + 2.04 + 0.99 (12.34); III 4.26 + 2.70 + 2.53 + 2.89 + 1.17 (13.55); IV 4.38 + 2.38 + 3.04 + 3.30 + 0.96 (14.06). Leg formula IV-I-III-II.

Epigyne (Fig. 5A–B). Epigynal field quadrangle, as long as wide, and with continuous hood near epigastric furrow. Copulatory openings narrower than median septum and almost rounded. Insemination ducts membranous, and wide, partially covered by spermathecae (in dorsal view). Spermathecae sclerotized and two-chambered, and touching each other posteriorly.

Distribution

Known only from the type locality (Fig. 11).

Hyllus taysonensis sp. nov.

urn:lsid:zoobank.org:act:9009C0D2-800E-4099-BC1C-395C445BC47A

Figs 6–7, 9C–D, 10F–G, 11

Diagnosis

In having the elongate bulbus without any lobe and the embolus accompanied with a narrow pars pendula, *H. taysonensis* sp. nov. closely resembles *H. pudicus* Thorell, 1895 from India and Myanmar. It can be easily distinguished from its male by the following characters: the male palp with the long tibia, about ⅔ of cymbial length (Fig. 6A–B) (about half of the cymbial length in *H. pudicus*, cf. Prószyński 1984: 65; 1992: figs 58–59); RTA oblique, directed dorsad (in retrolateral view) (Fig. 6B) vs almost straight and directed anteriad (cf. Prószyński 1984: 65; 1992: figs 58–59). The female differs from that of *H. pudicus* in having the insemination ducts extremely narrow, short and partially covered by the spermathecae (in dorsal view) (Fig. 7B) vs the thick insemination ducts, covering a significant part of the spermathecae (in dorsal view) (cf. Prószyński 1984: 64).

Etymology

The specific epithet is taken from the type locality, Tay Son District, Binh Dinh Province, Vietnam.

Type material

Holotype

VIETNAM – **Binh Dinh Province** • ♂; Tay Son District, Phu Phong Town; 2 Aug. 2023; Q.D. Hoang and B.V. Tam leg.; VNMN-SAL-524.

Paratype

VIETNAM – **Binh Dinh Province** • 1 ♀; same data as for holotype; VNMN-SAL-529.

Description

Male (Figs 6, 9C, 10F)

Measurements and coloration. Total length 5.83; carapace length 2.67, width 2.36; abdomen length 3.16, width 1.55. Clypeus height 0.12. Carapace dark brown, sparsely clothed with grey setae, and prominent long grey setae (Figs 9C, 10F). Clypeus dark brown, densely covered with grey setae. Sternum dark brown. Endites and labium dark, and lighter at their tips. Chelicerae dark brown,

Fig. 6. *Hyllus taysonensis* sp. nov., holotype, ♂ (VNMN-SAL-524), palp. **A**. Ventral view. **B**. Retrolateral view. Scale bar = 0.2 mm.

and covered with white setae; promargin with two teeth and retromargin with one tooth. Abdomen yellowish brown, with dark brown inverted chevrons on posterior half of dorsum (Figs 9C, 10F); venter yellow, with wide longitudinal continuous band of grey setae medially. Spinnerets greyish brown (Figs 9C, 10F). Legs dark brown, densely covered with grey setae. Width of eye rows: anterior eye row 1.73; posterior medial eye row 1.65; posterior lateral eye row 2.07. Distance between ALE–PME 0.47; ALE–PLE 1.20. Diameter of eyes: AME 0.70; ALE 0.32; PME 0.08; PLE 0.30. Length of leg segments: I 1.73+1.39+1.41+0.93+0.55 (6.01); II 1.61+1.23+1.09+0.82+0.49 (5.24); III 1.97+1.20+1.15+1.17+0.54 (6.03); IV 1.87+1.02+1.30+1.24+0.65 (6.08). Leg formula IV–III–I–II.

Palp (Fig. 6A–B). Tibia longer than wide, more than two thirds of cymbial length; RTA oblique, dorsad in retrolateral view and with several serrations at tip. Bulbus oval, without any proximal lobe. Embolus bent, originating at 9 o'clock, pointed at its tip and accompanied with narrow, poorly developed pars pendula.

Female (Figs 7, 9D, 10G)

Measurements. Total length 7.36; carapace length 3.52, width 3.01; abdomen length 3.84, width 2.30. Clypeus height 0.14. Carapace dark brown, sparsely clothed with short white setae, and protruding long grey setae, featuring with two tufts of long dark setae below PME, resembling 'horns', black around eyes (Figs 9D, 10G). Clypeus dark brown, densely covered with white setae. Sternum light yellow. Endites and labium yellowish brown, and lighter at tip. Chelicerae greyish brown, covered with white setae dorsally; promargin with two teeth and retromargin with one tooth. Abdomen yellow, covered with grey setae and protruding long grey setae, with yellow inverted chevrons on dorsum (Figs 9D, 10G); venter light yellow, with a longitudinal continuous band of grey setae medially. Spinnerets dark brown. Legs dark brown (except for femora which are light yellow), and covered with dense grey setae. Width of eye rows: anterior eye row 2.21; posterior medial eye row 2.11; posterior lateral eye row 2.72. Distance

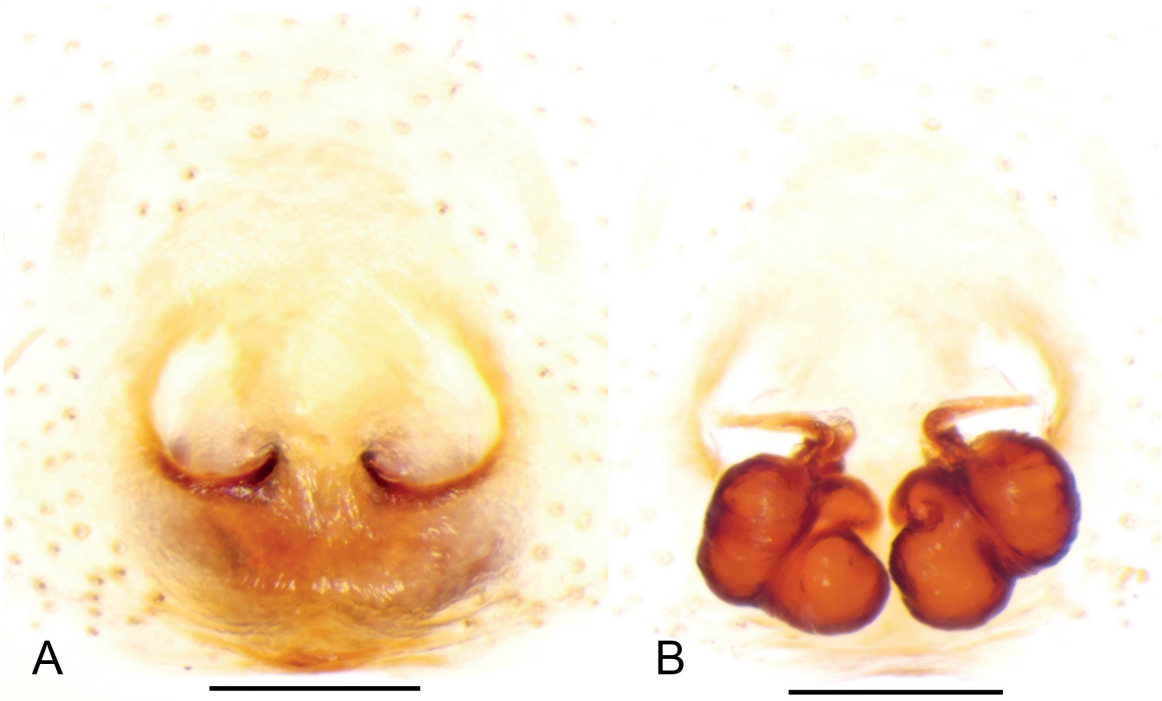

Fig. 7. *Hyllus taysonensis* sp. nov., paratype, ♀ (VNMN-SAL-529), epigyne. **A**. Ventral view. **B**. Dorsal view. Scale bars = 0.2 mm.

between ALE–PME 0.54; ALE–PLE 1.46. Diameter of eyes: AME 0.73; ALE 0.32; PME 0.08; PLE 0.33. Length of leg segments: I 1.64+1.25+1.14+0.74+0.45 (5.22); II 1.57+1.17+1.01+0.68+0.43 (4.86); III 2.02+1.12+1.04+1.09+0.56 (5.83); IV 1.83+1.03+1.28+1.33+0.58 (6.05). Leg formula IV–III–I–II.

Epigyne (Fig. 7A–B). Longer than wide; the copulatory openings located in the middle, narrower than median septum; insemination ducts membranous and short, largely covered by spermathecae (in dorsal view); spermathecae sclerotized, two-chambered and separated.

Fig. 8. Habitus of *Hyllus* spp., in life. **A**. *Hyllus diardi* (Walckenaer, 1837, ♂. **B**. *Hyllus diardi* (Walckenaer, 1837), ♀. **C**. *Hyllus vietnamensis* sp. nov., ♂. **D**. *Hyllus vietnamensis* sp. nov., ♀.

Distribution

Known only from the type locality (Fig. 11).

Discussion

Unpublished molecular data based on a partial fragment of the mitochondrial cytochrome c oxidase subunit I (COI) gene from three of the four species of *Hyllus* reported from Vietnam (except for *H. zabkai* sp. nov.) strongly support the matching of the males and females as well as the distinction of the species in the present study. A broader context of the COI sequences for Vietnamese salticids will be provided elsewhere.

Northern Vietnam is divided into three subregions: North-West, North-East, and Red River Delta (Averyanov *et al.* 2003; Sterling *et al.* 2006; Hoang *et al.* 2023b). The Red River serves as a boundary between the North-West and North-East (Fig. 11), acting as a natural barrier limiting the dispersal of certain groups between the two sides (Averyanov *et al.* 2003; Bain & Hurley 2011; Yuan *et al.* 2016; Bernstein *et al.* 2024). The biota of northeastern Vietnam closely resemble that of southern China, and fundamentally differ from those of the North-West and southern regions of Vietnam (Averyanov *et al.* 2003; Sterling *et al.* 2006; Bain & Hurley 2011; Yuan *et al.* 2016; Bernstein *et al.* 2024).

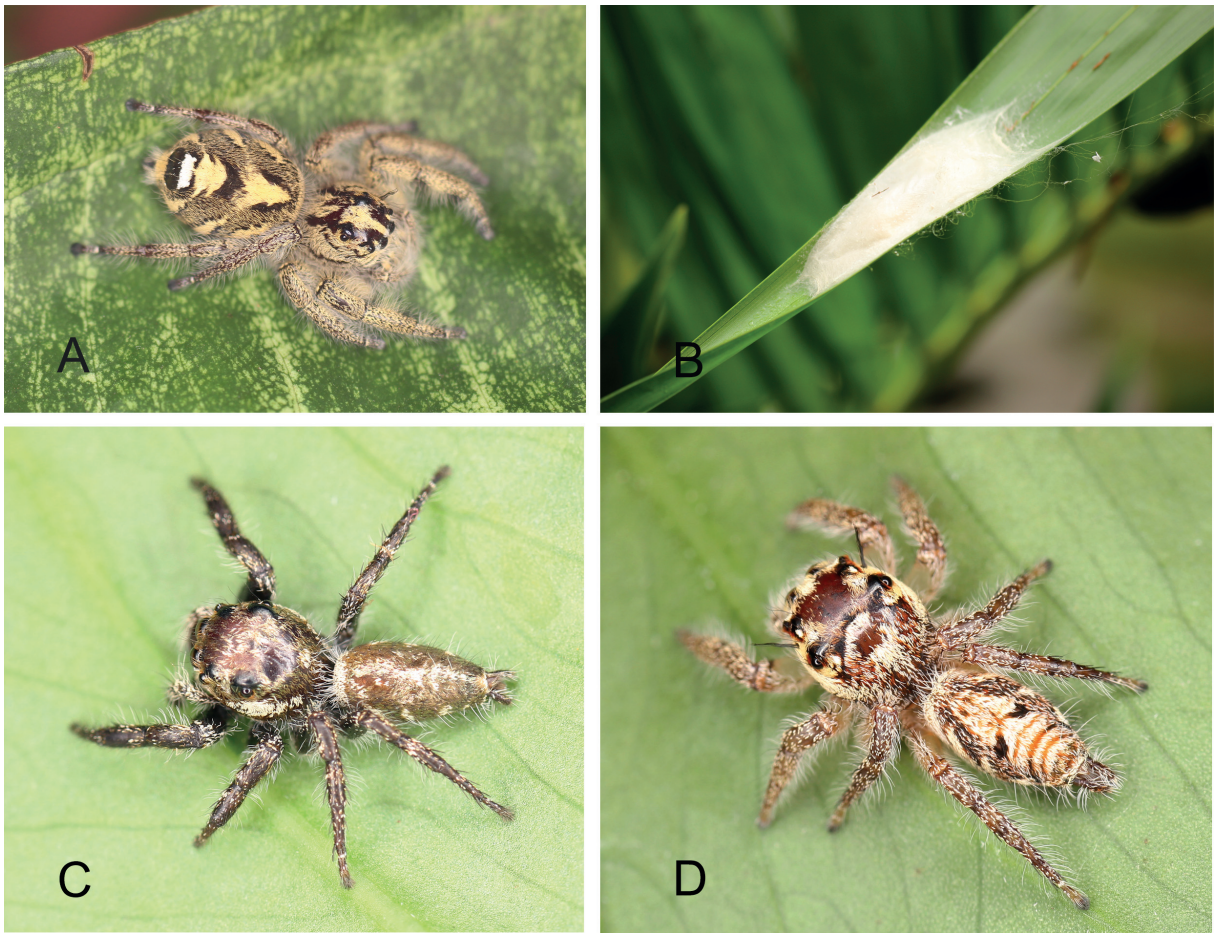

Fig. 9. Habitus of *Hyllus* spp., in life. **A**. *Hyllus zabkai* sp. nov., ♀. **B**. Retreat of *Hyllus zabkai* sp. nov. from Yok Don NP. **C**. *Hyllus taysonensis* sp. nov., ♂. **D**. *Hyllus taysonensis* sp. nov., ♀.

Recent findings suggest that the Red River may also act as a natural barrier for the jumping spiders in northern Vietnam. For instance, 'true' *H. diardi* is found exclusively on the western side of the river, while the new species *H. vietnamensis* sp. nov. is restricted to the east (Fig. 11). Additionally, the species *Langerra oculina* Żabka, 1985 has only been recorded from southern China and the areas east of the river (Żabka 1985; Song & Chai 1991; Logunov 2021). However, further studies of the Vietnamese spider fauna across these two subregions are necessary to confirm this distribution pattern.

Although numerous new species and records of jumping spiders from Vietnam have recently been documented (Hoang *et al.* 2022, 2023a, 2023b, 2024a, 2024b, 2024c; Wang *et al.* 2023; Logunov 2021, 2024; Yang *et al.* 2024), the overall diversity remains poorly understood, with most genera represented by only one or two species (World Spider Catalog 2024). The true diversity of species is likely to still remain largely undiscovered, awaiting further investigation. Therefore, expanding research in various regions of Vietnam is essential to increase our knowledge of the country's jumping spider fauna.

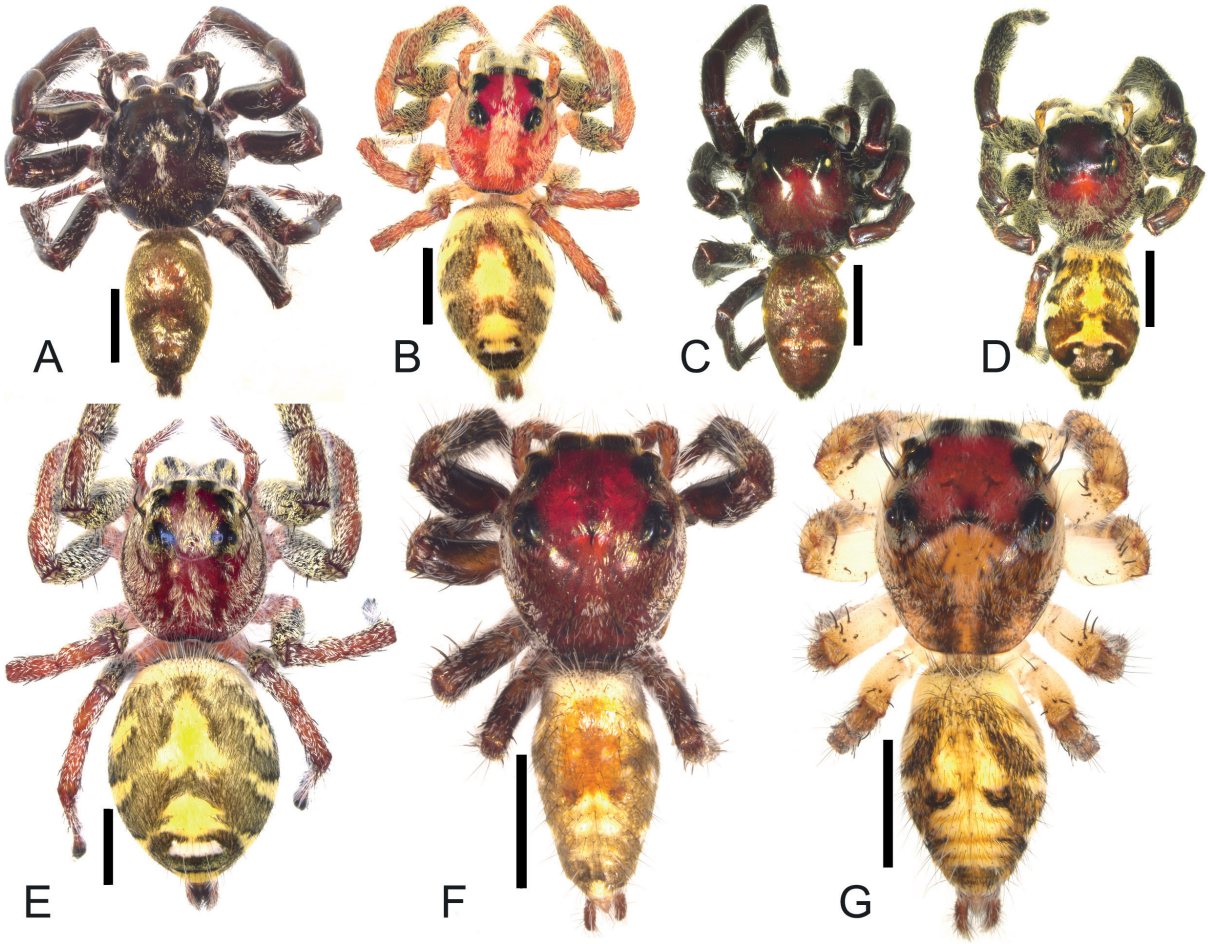

Fig. 10. Habitus of *Hyllus* spp., in alcohol. **A**. *Hyllus diardi* (Walckenaer, 1837), ♂. **B**. *Hyllus diardi* (Walckenaer, 1837), ♀. **C**. *Hyllus vietnamensis* sp. nov., ♂. **D**. *Hyllus vietnamensis* sp. nov., ♀. **E**. *Hyllus zabkai* sp. nov., ♀. **F**. *Hyllus taysonensis* sp. nov., ♂. **G**. *Hyllus taysonensis* sp. nov., ♀. Scale bars: A–B = 3 mm; C–D = 4 mm; E = 3 mm; F–G = 2 mm.

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Fig. 11. Distributional records of the species *Hyllus diardi* (Walckenaer, 1837) (white dots), *Hyllus vietnamensis* sp. nov. (purple stars), *Hyllus zabkai* sp. nov. (red hexagon), and *Hyllus taysonensis* sp. nov. (yellow quadrangle).

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