



## Two new species of the spider genus *Pholcus* Walckenaer, 1805 (Araneae: Pholcidae) from Pakistan

TIANQI LAN<sup>1,2</sup>, ZHIYUAN YAO<sup>1,3,\*</sup>, ABID ALI<sup>1,4,6</sup>, GUO ZHENG<sup>1,5,\*</sup> & SHUQIANG LI<sup>7</sup>

<sup>1</sup>College of Life Science, Shenyang Normal University, Shenyang 110034, Liaoning, China

<sup>2</sup>✉ [ltq0217@outlook.com](mailto:ltq0217@outlook.com); <https://orcid.org/0000-0002-9491-9813>

<sup>3</sup>✉ [yaozy@synu.edu.cn](mailto:yaozy@synu.edu.cn); <https://orcid.org/0000-0002-1631-0949>

<sup>4</sup>✉ [abid\\_ento74@yahoo.com](mailto:abid_ento74@yahoo.com); <https://orcid.org/0000-0003-3674-7811>

<sup>5</sup>✉ [zhengguo@synu.edu.cn](mailto:zhengguo@synu.edu.cn); <https://orcid.org/0000-0002-9735-9700>

<sup>6</sup>Department of Entomology, Faculty of Agriculture, University of Agriculture, Faisalabad-38040, Punjab, Pakistan

<sup>7</sup>Institute of Zoology, Chinese Academy of Sciences, Beijing 100101, China.

✉ [lisq@ioz.ac.cn](mailto:lisq@ioz.ac.cn); <https://orcid.org/0000-0002-3290-5416>

\*Corresponding authors: ✉ [yaozy@synu.edu.cn](mailto:yaozy@synu.edu.cn), ✉ [zhengguo@synu.edu.cn](mailto:zhengguo@synu.edu.cn)

### Abstract

The genus *Pholcus* Walckenaer, 1805 is reported from Pakistan for the first time. Two new species of the *Pholcus nenjukovi* species-group are described: *Pholcus hamuchal* Yao & Li **sp. nov.** (Gilgit Baltistan, male and female) and *Pholcus kalam* Yao & Li **sp. nov.** (Khyber Pakhtunkhwa, male and female). Type material is deposited in the Institute of Zoology, Chinese Academy of Sciences (IZCAS) in Beijing, China.

**Key words:** taxonomy, morphology, biodiversity, pholcid, Pholcinae

### Introduction

Pholcidae C.L. Koch, 1850 is the ninth largest spider family and contains 94 genera and 1736 species (Li 2020; World Spider Catalog 2020). It includes five subfamilies: Ninetinae Simon, 1890, Arteminae Simon, 1893, Modisiminae Simon, 1893, Smeringopinae Simon, 1893, and Pholcinae C.L. Koch, 1850 (Huber 2011a; Dimitrov *et al.* 2013). *Pholcus* Walckenaer, 1805 is the most species-rich genus in Pholcinae and Pholcidae, with 331 species belonging to 21 species-groups (Huber 2011b; Huber *et al.* 2018; World Spider Catalog 2020). The genus includes species from a wide range of habitats, e.g., between buttresses, in small holes or caves, among and under large rocks, or on the underside of green leaves (Huber 2011b). The survey of this genus is very uneven. For instance, the genus has not been recorded from Pakistan. The *Pholcus nenjukovi* species-group is a small species-group of this genus, with nine species in northeastern Iran, Afghanistan, Tajikistan, Russia (the record is dubious, see Huber 2011b: 339) and China (southwestern Tibet) (Huber 2011b; Dong *et al.* 2017; Xu *et al.* 2019). The species-group can be diagnosed by the combination of the following characters: eight eyes; male chelicerae with proximo-lateral, frontal, and distal apophysis; male pedipalpal trochanter with very long apophysis; opisthosoma cylindrical, without cuticular pattern; procurus with dorsal spines; appendix simple and without branch; epigynum with knob; vulva usually with distinctive anterior structures medially (Huber 2011b). In this paper, we describe two new species from northern Pakistan assigned to the *P. nenjukovi* species-group and the genus *Pholcus* is reported from Pakistan for the first time.

### Material and methods

Specimens were examined and measured with a Leica M205 C stereomicroscope. Images were captured with an Olympus C7070 wide zoom digital camera (7.1 megapixels) mounted on a Leica M205 C stereomicroscope and

assembled using Helicon Focus 3.10.3 image stacking software (Khmelik *et al.* 2006). The left male pedipalps were illustrated. Female genitalia were photographed before the dissection. Vulvae were previously treated in a 10% warm solution of potassium hydroxide (KOH) before illustration. All measurements are given in millimeters. Leg measurements are shown as: Total length (femur + patella + tibia + metatarsus + tarsus). Leg podomeres were measured on their dorsal side. Distribution map was generated with ArcView GIS 3.2 (ESRI 2002). All specimens were preserved in 75% ethanol. Type material is deposited in the Institute of Zoology, Chinese Academy of Sciences (IZCAS) in Beijing, China (curator: Jun Chen).

Terminology and taxonomic descriptions follow Huber (2011b) and Yao *et al.* (2015). The following abbreviations are used in the descriptions: ALE = anterior lateral eye, AME = anterior median eye, PME = posterior median eye, L/d = length/diameter; used in the illustrations: a = appendix, b = bulb, da = distal apophysis, e = embolus, fa = frontal apophysis, pa = proximo-lateral apophysis, pp = pore plate, pr = procurus, u = uncus.

## Taxonomy

### Family Pholcidae C.L. Koch, 1850

### Subfamily Pholcinae C.L. Koch, 1850

### Genus *Pholcus* Walckenaer, 1805

Type species: *Pholcus phalangoides* (Fuesslin, 1775)

**Diagnosis and description.** See Huber (2011b).

### *Pholcus nenjukovi* species-group

#### *Pholcus hamuchal* Yao & Li sp. nov.

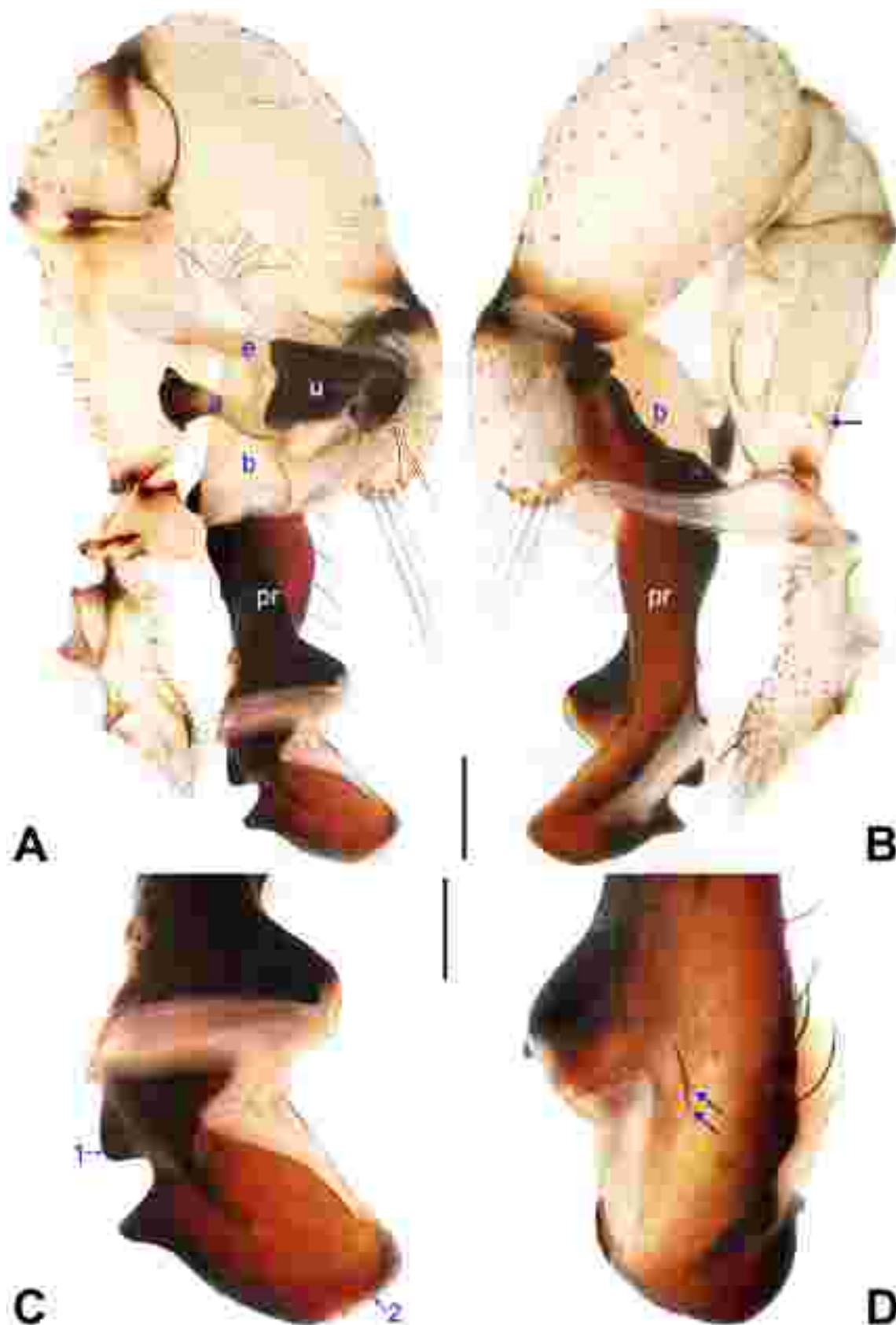
Figs 1–2

**Type material. Holotype:** male (IZCAS-Ar39780), Hamuchal (36°5'36.24"N, 73°59'52.44"E, elevation 1738 ± 6 m), Gilgit Baltistan, Pakistan, 29 May 2019, A. Ali leg. **Paratypes:** 2 males (IZCAS-Ar39781–Ar39782), 3 females (IZCAS-Ar39783–Ar39785), same data as holotype.

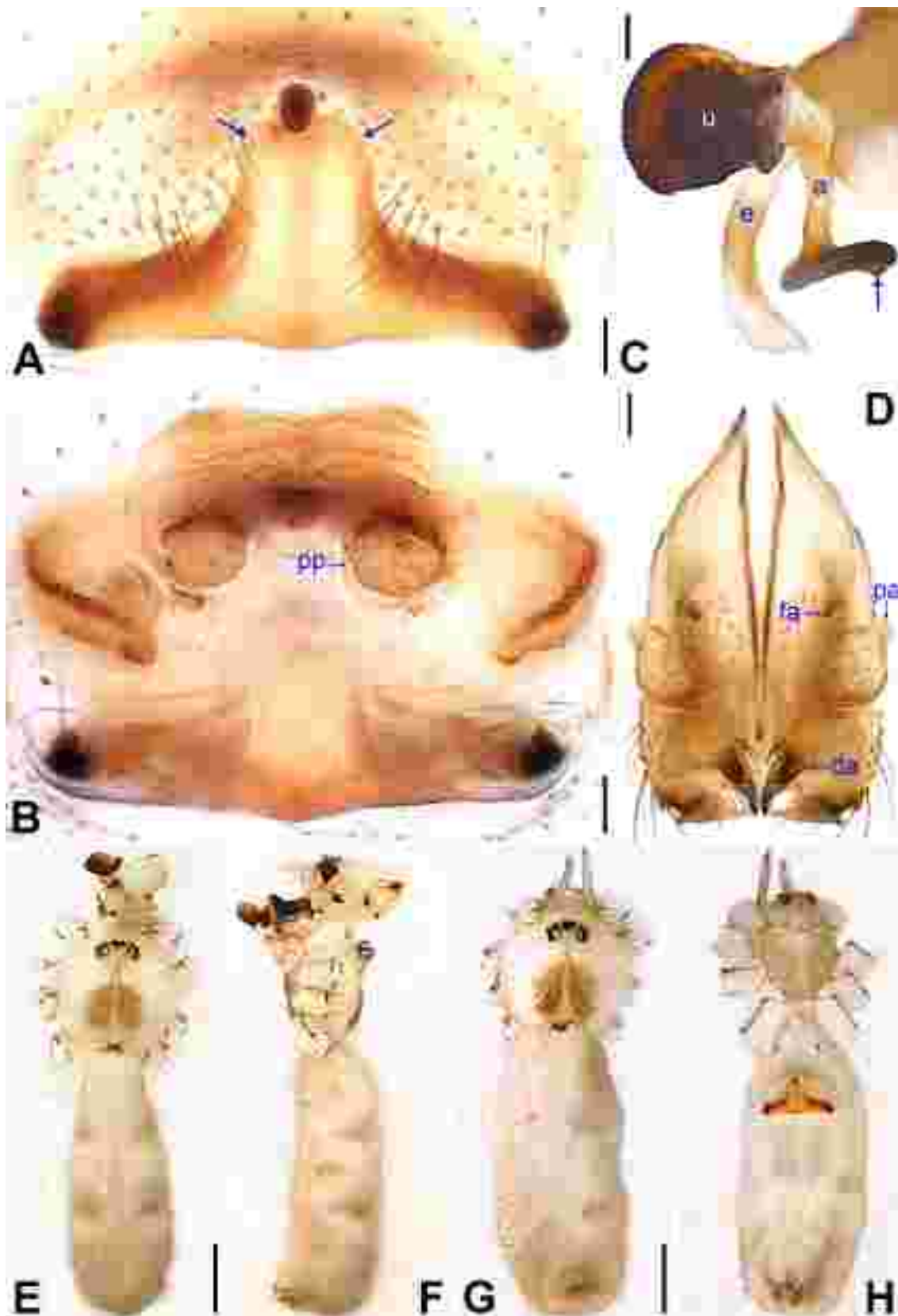
**Etymology.** The specific name refers to the type locality and is a noun in apposition.

**Diagnosis.** This species resembles *P. mixiaoqii* Xu, Zhang & Yao, 2019 (see Xu *et al.* 2019: 385, figs 2A–D, 3A–H) with similar vulva (Fig. 2B) but can be distinguished by presence of ventral apophysis subdistally on procurus (arrow 1 in Fig. 1C; absent in *P. mixiaoqii*), by distally wide apophysis on distal part of procurus (arrow 2 in Fig. 1C; distally narrow in *P. mixiaoqii*), by proximo-lateral apophyses and frontal apophyses on median part of male chelicerae (Fig. 2D; two pairs of apophyses close to proximal part of male chelicerae in *P. mixiaoqii*), by presence of small apophysis distally on appendix (arrow in Fig. 2C; absent in *P. mixiaoqii*) and by width ratio of anterior and posterior epigynum about 1/4 (Fig. 2A; about 1/3 in *P. mixiaoqii*).

**Description. Male (holotype, IZCAS-Ar39780):** Total length 5.66 (5.89 with clypeus), carapace 1.74 long, 1.81 wide, opisthosoma 3.92 long, 1.63 wide. Leg I: 46.30 (12.07 + 0.86 + 12.01 + 19.13 + 2.23), leg II: 30.31 (8.22 + 0.75 + 7.87 + 12.23 + 1.24), leg III: 23.23 (6.74 + 0.70 + 5.98 + 8.78 + 1.03), leg IV: 29.03 (8.53 + 0.70 + 7.26 + 11.21 + 1.33); tibia I L/d: 55. Distance PME-PME 0.28, diameter PME 0.15, distance PME-ALE 0.04, distance AME-AME 0.06, diameter AME 0.08. Sternum wider than long (1.14/0.98). Habitus as in Figs 2E–F. Carapace yellowish, with brown marks medially; ocular area yellowish, with brownish stripe medially; clypeus yellowish; sternum yellowish, with brownish marks. Legs yellowish, but brown on patellae and whitish on distal parts of femora and tibiae, without darker rings. Opisthosoma yellowish, without spots. Ocular area elevated, each eye triad on top of short laterally directed eye-stalk. Thoracic furrow absent. Chelicerae as in Fig. 2D, with pair of large proximo-lateral apophyses, pair of distal apophyses provided with two teeth each, and pair of frontal apophyses.



**FIGURE 1.** *Pholcus hamuchal* sp. nov., holotype male. A–B. Pedipalp (A. Prolateral view; B. Retrolateral view, arrow points at dorsal apophysis); C–D. Distal part of procurus (C. Prolateral view, arrow 1 points at subdistal apophysis, arrow 2 points at wide apophysis distally; D. Dorsal view, arrows point at two prolatero-dorsal spines). a = appendix, b = bulb, e = embolus, pr = procurus, u = uncus. Scale bars: 0.20 (A–B), 0.10 (C–D).



**FIGURE 2.** *Pholcus hamuchal* sp. nov., holotype male (C–F) and paratype female (A–B, G–H). A. Epigynum, ventral view, arrows point at pair of lateral apophyses anteriorly; B. Vulva, dorsal view; C. Bulbal apophyses, prolateral view, arrow points at small distal apophysis; D. Chelicerae, frontal view; E–H. Habitus (E, G. Dorsal view; F. Lateral view; H. Ventral view). a = appendix, da = distal apophysis, e = embolus, fa = frontal apophysis, pa = proximo-lateral apophysis, pp = pore plate, u = uncus. Scale bars: 0.10 (A–D), 1.00 (E–H).



Pedipalps as in Figs 1A–B; trochanter with long ventral apophysis; femur with small dorsal apophysis proximally (arrow in Fig. 1B) and distinct ventral protuberance; procurus simple, with two prolatero-dorsal spines (arrows in Fig. 1D); uncus with scaly edge (Fig. 2C); appendix L-shaped, with small apophysis distally (arrow in Fig. 2C); embolus weakly sclerotized, with some transparent projections distally (Fig. 2C). Retrolateral trichobothrium of tibia I at 5% proximally; legs with short vertical setae on tibiae, metatarsi and tarsi, without spines and curved setae; tarsus I with 27 distinct pseudosegments.

**Female (paratype, IZCAS-Ar39783):** Similar to male, habitus as in Figs 2G–H. Total length 5.73 (5.96 with clypeus), carapace 1.54 long, 1.77 wide, opisthosoma 4.19 long, 1.80 wide; tibia I: 9.91; tibia I L/d: 45. Distance PME-PME 0.22, diameter PME 0.14, distance PME-ALE 0.04, distance AME-AME 0.05, diameter AME 0.08. Sternum wider than long (1.10/0.96). Epigynum (Fig. 2A) with knob and pair of lateral apophyses anteriorly (arrows in Fig. 2A). Vulva (Fig. 2B) with sclerotized anterior arch and pair of nearly rounded pore plates.

**Variation:** Tibia I in male paratypes (n = 2): 11.79 (IZCAS-Ar39781), 11.92 (IZCAS-Ar39782). Tibia I in the other female paratypes (n = 2): 9.61 (IZCAS-Ar39784), 10.51 (IZCAS-Ar39785).

**Distribution.** Pakistan (Gilgit Baltistan, type locality; Fig. 5).

**Natural history.** The species was found on the rock walls.

### *Pholcus kalam* Yao & Li sp. nov.

Figs 3–4

**Type material. Holotype:** male (IZCAS-Ar39786), near river (35°32'51.72"N, 72°34'9.12"E, elevation 2520 ± 12 m), Ankra Village, Kalam, Swat, **Khyber Pakhtunkhwa, Pakistan**, 3 June 2019, A. Ali leg. **Paratype:** 1 female (IZCAS-Ar39787), same data as holotype.

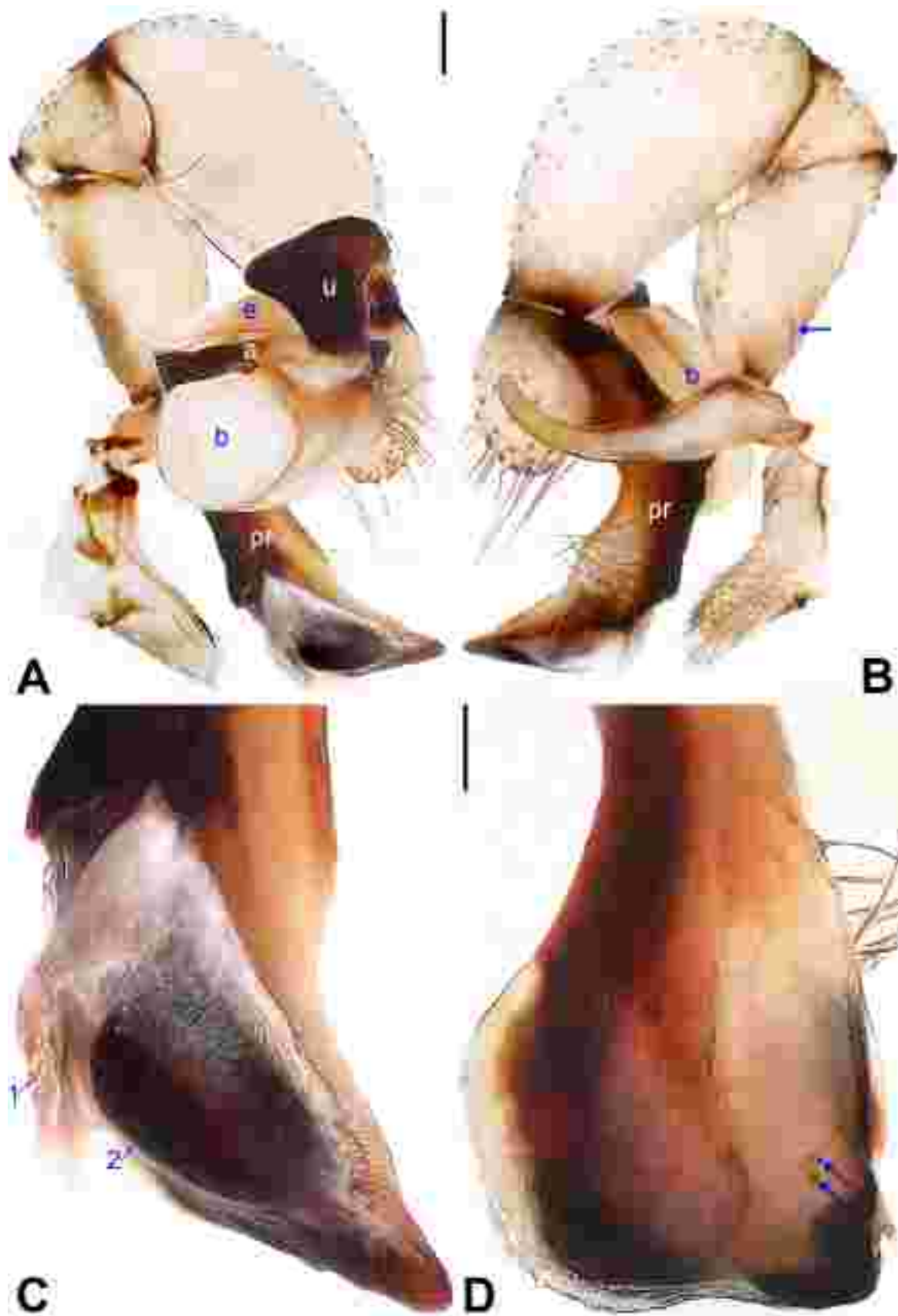
**Etymology.** The specific name refers to the type locality and is a noun in apposition.

**Diagnosis.** This species resembles *P. arsacius* Senglet, 2008 (see Senglet 2008: 363, figs 40–46, 55–56) with similar bulbal apophyses (Fig. 4C), male chelicerae (Fig. 4D) and epigynum (Fig. 4A) but can be distinguished by subdistal membranous process of procurus not extending to distal part (arrow 1 in Fig. 3C), by presence of swollen prolateral apophysis distally on procurus (arrow 2 in Fig. 3C) and by inverted 'w'-shaped vulval anterior arch (Fig. 4B).

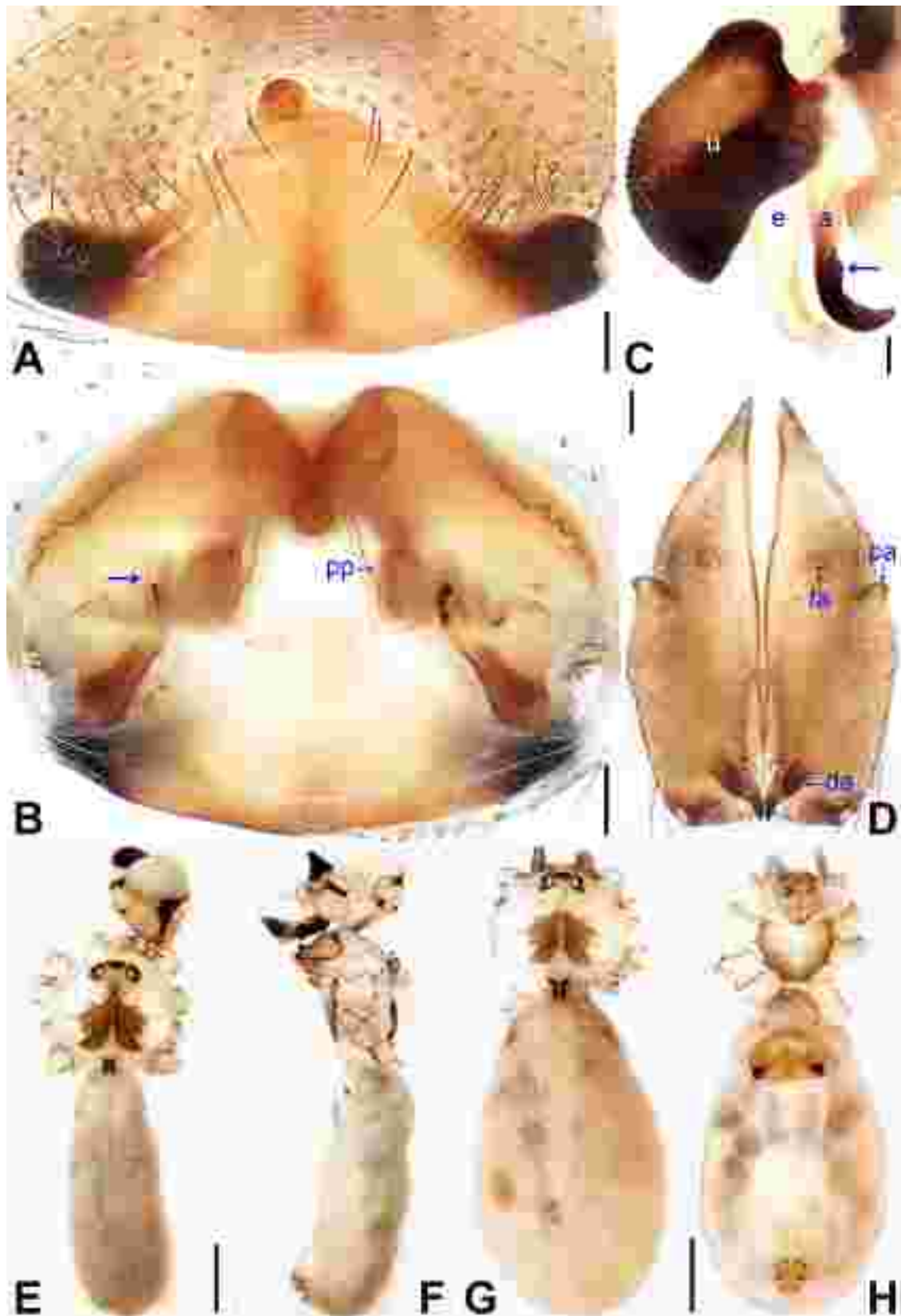
**Description. Male (holotype, IZCAS-Ar39786):** Total length 5.65 (5.85 with clypeus), carapace 1.71 long, 1.90 wide, opisthosoma 3.94 long, 1.66 wide. Leg I: 45.92 (11.86 + 0.83 + 12.00 + 18.49 + 2.74), leg II: 30.64 (8.73 + 0.78 + 7.86 + 11.64 + 1.63), leg III: 22.91 (6.67 + 0.76 + 6.01 + 8.33 + 1.14), leg IV: 28.46 (8.52 + 0.76 + 7.23 + 10.61 + 1.34); tibia I L/d: 48. Distance PME-PME 0.35, diameter PME 0.16, distance PME-ALE 0.05, distance AME-AME 0.06, diameter AME 0.07. Sternum wider than long (1.24/0.82). Habitus as in Figs 4E–F. Carapace yellowish, with brown marks medially; ocular area brownish, with brown marks posteriorly; clypeus and sternum yellowish, with brown marks. Legs yellowish, but brown on patellae and whitish on distal parts of femora and tibiae, without darker rings. Opisthosoma yellowish, without spots. Ocular area elevated, each eye triad on top of short laterally directed eye-stalk. Thoracic furrow absent. Chelicerae as in Fig. 4D, with pair of proximo-lateral apophyses, pair of distal apophyses provided with two teeth each, and pair of frontal apophyses. Pedipalps as in Figs 3A–B; trochanter with long curved ventral apophysis; femur with small dorsal apophysis proximally (arrow in Fig. 3B) and distinct ventral protuberance; procurus simple, with two prolatero-dorsal spines (arrows in Fig. 3D) and swollen prolateral apophysis distally (arrow 2 in Fig. 3C); uncus with scaly edge (Fig. 4C); appendix hooked, with indistinct angular apophysis medially (arrow in Fig. 4C); embolus weakly sclerotized, with some transparent projections distally (Fig. 4C). Retrolateral trichobothrium of tibia I at 5% proximally; legs with short vertical setae on tibiae, metatarsi and tarsi, without spines and curved setae; tarsus I with 30 distinct pseudosegments.

**Female (paratype, IZCAS-Ar39787):** Similar to male, habitus as in Figs 4G–H. Total length 6.26 (6.40 with clypeus), carapace 1.67 long, 1.81 wide, opisthosoma 4.59 long, 2.89 wide; tibia I: 9.91; tibia I L/d: 45. Distance PME-PME 0.27, diameter PME 0.16, distance PME-ALE 0.04, distance AME-AME 0.05, diameter AME 0.07. Sternum wider than long (1.08/0.80). Ocular area without brown patch posteriorly. Epigynum (Fig. 4A) with knob. Vulva (Fig. 4B) with inverted 'w'-shaped sclerotized anterior arch, pair of sclerites, and pair of elliptic pore plates (posterior covered by sclerite, arrow in Fig. 4B).

**Variation:** Right procurus of holotype with only one prolatero-dorsal spine.



**FIGURE 3.** *Pholcus kalam* sp. nov., holotype male. A–B. Pedipalp (A. Prolateral view; B. Retrolateral view, arrow points at dorsal apophysis); C–D. Distal part of procurus (C. Prolateral view, arrow 1 points at subdistal membranous process, arrow 2 points at swollen prolateral apophysis distally; D. Dorsal view, arrows point at two prolatero-dorsal spines). a = appendix, b = bulb, e = embolus, pr = procurus, u = unculus. Scale bars: 0.20 (A–B), 0.10 (C–D).



**FIGURE 4.** *Pholcus kalam* sp. nov., holotype male (C–F) and paratype female (A–B, G–H). A. Epigynum, ventral view; B. Vulva, dorsal view, arrow points at sclerite covering posterior of pore plate; C. Bulbal apophyses, prolateral view, arrow points at indistinct angular apophysis medially; D. Chelicerae, frontal view; E–H. Habitus (E, G. Dorsal view; F. Lateral view; H. Ventral view). a = appendix, da = distal apophysis, e = embolus, fa = frontal apophysis, pa = proximo-lateral apophysis, pp = pore plate, u = uncus. Scale bars: 0.10 (A–D), 1.00 (E–H).



FIGURE 5. Distribution records of new *Pholcus* species from Pakistan. 1 *Pholcus hamuchal* sp. nov., 2 *Pholcus kalam* sp. nov.

**Distribution.** Pakistan (Khyber Pakhtunkhwa, type locality; Fig. 5).

**Natural history.** The species was found on the rock walls near the river.

### Acknowledgments

The manuscript benefited greatly from comments by Facundo M. Labarque and anonymous reviewer. This study was supported by the National Natural Science Foundation of China (NSFC-31970410, 31530067, 31872193) and the Liaoning Revitalization Talents Program (XLYC1907150). Part of the laboratory work was supported by the Shenyang Youth Science and Technology Project (RC200183).

### References

- Dimitrov, D., Astrin, J.J. & Huber, B.A. (2013) Pholcid spider molecular systematics revisited, with new insights into the biogeography and the evolution of the group. *Cladistics*, 29, 132–146.  
<https://doi.org/10.1111/j.1096-0031.2012.00419.x>
- Dong, T., Zheng, G., Davlatov, A., Yao, Z. & Li, S. (2017) Two new species of the spider genus *Pholcus* Walckenaer, 1805 (Araneae, Pholcidae) from Tajikistan, with the first description of female *Pholcus sidorenkoi* Dunin, 1994. *European Journal of Taxonomy*, 301, 1–14.  
<https://doi.org/10.5852/ejt.2017.301>
- ESRI (2002) ArcView GIS 3.2. Environmental Systems Research Institute, Redlands, California. Available from: <http://www.esri.com/software/arcgis/arcview/> (accessed 25 November 2019)
- Fuesslin, J.C. (1775) *Verzeichnis der ihm bekannten schweizerischen Insekten, mit einer ausgemahlten Kupfertafel: nebst der Ankündigung eines neuen Insekten Werkes*. H. Steiner, Zürich and Winterthur, 62 pp. [Araneae, pp. 60–61]
- Huber, B.A. (2011a) Phylogeny and classification of Pholcidae (Araneae): an update. *Journal of Arachnology*, 39, 211–222.



<https://doi.org/10.1636/CA10-57.1>

- Huber, B.A. (2011b) Revision and cladistic analysis of *Pholcus* and closely related taxa (Araneae, Pholcidae). *Bonner Zoologische Monographien*, 58, 1–509.
- Huber, B.A., Eberle, J. & Dimitrov, D. (2018) The phylogeny of pholcid spiders: a critical evaluation of relationships suggested by molecular data (Araneae, Pholcidae). *ZooKeys*, 789, 51–101.  
<https://doi.org/10.3897/zookeys.789.2278>
- Khmelik, V.V., Kozub, D. & Glazunov, A. (2006) Helicon Focus 3.10.3. Available from: <http://www.heliconsoft.com/helicon-focus.html> (accessed 10 November 2019)
- Koch, C.L. (1850) *Übersicht des Arachnidensystems. Heft 5*. J.L. Lotzbeck, Nürnberg, 77 pp.
- Li, S. (2020) Spider taxonomy for an advanced China. *Zoological Systematics*, 45 (2), 73–77.  
<https://doi.org/10.1186/zs.202011>
- Senglet, A. (2008) New species of *Pholcus* and *Spermophora* (Pholcidae, Araneae) from Iran and Afghanistan, with notes on mating mechanisms. *Revue Suisse de Zoologie*, 115, 355–376.
- Simon, E. (1890) Études Arachnologiques. 22e Mémoire. XXXIV. Étude sur les arachnides de l'Yemen. *Annales de la Société Entomologique de France, Series 6*, 10, 77–124.
- Simon, E. (1893) *Histoire Naturelle des Araignées. 1 (2). 2e Edition*. Roret, Paris, 233 pp. [pp. 256–488]
- Walckenaer, C.A. (1805) *Tableau des Aranéides ou Caractères Essentiels des Tribus, Genres, Familles et Races que Renferme le Genre Aranea de Linné, Avec la Désignation des Espèces Comprises dans Chacune de ces Divisions*. de l'imprimerie de Dentu, Paris, 88 pp.
- World Spider Catalog (2020) World Spider Catalog. Version 21.0. Natural History Museum Bern. Available from: <http://wsc.nmbe.ch> (accessed 24 June 2020)
- Xu, H., Zhang, C. & Yao, Z. (2019) *Pholcus mixiaoqii* sp. nov., one new spider species from Tibet, China (Araneae: Pholcidae). *Zootaxa*, 4656 (2), 484–488.  
<https://doi.org/10.11646/zootaxa.4656.2.11>
- Yao, Z., Pham, D.S. & Li, S. (2015) Pholcid spiders (Araneae: Pholcidae) from northern Vietnam, with descriptions of nineteen new species. *Zootaxa*, 3909 (1), 1–82.  
<https://doi.org/10.11646/zootaxa.3909.1.1>