

A new jumping spider species of the genus *Indopadilla*
Caleb et Sankaran, 2019 (Aranei: Salticidae)
from the Central Highlands, Vietnam

Новый вид пауков-скакунчиков рода *Indopadilla*
Caleb et Sankaran, 2019 (Aranei: Salticidae)
из ЦентральнЫх Высокогорий, Вьетнам

Quang D. Hoang^{1*}, Lu-Yu Wang², Thi M.H. Tran¹, Anh D. Nguyen³,
Zhi-Sheng Zhang^{2*}
Кванг Д. Хоанг^{1*}, Луи Ванг², Ти М.Х. Тран¹, Анн Д. Нгуен³,
Жисень Жанг^{2*}

¹ Faculty of Natural Science and Technology, Tay Nguyen University, 567 Le Duan, Buon Ma Thuot city, Dak Lak province, 630000, Vietnam.

² Key Laboratory of Eco-environments in Three Gorges Reservoir Region (Ministry of Education), School of Life Sciences, Southwest University, Chongqing 400715, China.

³ Institute of Ecology and Biological Resources, Vietnam Academy of Science and Technology, 18 Hoangquocviet Rd., Cau Giay, Hanoi, Vietnam.

* Corresponding authors: zhangzs327@qq.com; hqduy@ttn.edu.vn

KEY WORDS: Araneae, Baviini, Dak Lak, description, DNA barcode, new species.

КЛЮЧЕВЫЕ СЛОВА: Araneae, Baviini, Дак Лак, описание, ДНК баркод, новый вид.

ABSTRACT. *Indopadilla phantoani* Hoang et Zhang, sp.n. (♂♀) is described from the Chu Yang Sin National Park, Central Highlands, Vietnam. A detailed description, illustrations of the copulatory organs and somatic features, and a distribution map are provided. A partial mtCOI-sequence for the female of the new species is also given.

How to cite this paper: Hoang Quang D., Wang Lu-Yu, Tran Thi M.H., Nguyen Anh D., Zhang Zhi-Sheng. 2023. A new jumping spider species of the genus *Indopadilla* Caleb et Sankaran, 2019 (Aranei: Salticidae) from the Central Highlands, Vietnam // *Arthropoda Selecta*. Vol.32. No.1. P.89–93. doi: 10.15298/arthsel.32.1.08

РЕЗЮМЕ. Из ЦентральнЫх Высокогорий Вьетнама описан новый вид *Indopadilla phantoani* Hoang et Zhang, sp.n. (♂♀). Приводятся детальное описание, рисунки копулятивных органов и соматических признаков, и карта распространения. Также дана частичная последовательность mtCOI самки нового вида.

Introduction

The jumping spider genus *Indopadilla* Caleb et Sankaran, 2019, contains 14 valid species from South and South-East Asia [Maddison *et al.*, 2020; WSC, 2022]. Yet, about a half of them remains known from a

single sex only: i.e., five from the males and two from the females. To date, only one species, *Indopadilla annamita* (Simon, 1903) has been recorded from central Vietnam [Simon, 1903; Žabka, 1988; both sub *Bavia*].

Recently, we performed several surveys of the spider fauna in the Chu Yang Sin National Park, Central Highlands, Vietnam and adjacent regions. As a result, a new jumping spider species — *Indopadilla phantoani* Hoang et Zhang, sp.n. — is described from the park based on both sexes. This is the second *Indopadilla* species found in Vietnam. Thus, with the addition of a new species from Vietnam, *Indopadilla* has become the largest genus of the tribe Baviini, with 15 species described to date. We have also provided a DNA barcode for the female of the new species for further studies.

Materials and methods

Specimens were hand-collected from foliage in the Chu Yang Sin National Park in Central Highlands of Vietnam. Legs II and III on the right side were cut out and preserved in absolute ethanol for DNA analyses, the remaining body was preserved in 70% ethanol for morphological examination. The specimens were examined with a Zeiss Stemi 508 stereo microscope (up to 100X magnification). Photos were taken using Jenoptik ProgRes CF Scan 12.5MP camera and Jenoptik ProgRes Capture Pro 2.10.0.1 software. The male palp and the female epigyne were examined and illustrated

after dissection. The epigyne was cleared in a 10% KOH solution at room temperature for about 12 hours. Photos were stacked using the Helicon focus 7.0.2 Pro software and then modified using Adobe Photoshop CS2 9.0. All measurements are given in millimeters (mm). The leg spination system follows Ono [1988]. Leg segment lengths are given as follows: femur + patella + tibia + metatarsus + tarsus (total length). The map was created using the online mapping software SimpleMappr [Shorthouse, 2010]. The studied specimens have been deposited in the Vietnam National Museum of Nature (VNMN), Hanoi, Vietnam.

Abbreviations used are as follows: ALE — anterior lateral eye; AME — anterior median eye; PLE — posterior lateral eye; PME — posterior median eye; CO — copulatory opening; CD — copulatory duct; E — embolus; ECP — epigynal coupling pocket; FD — fertilisation duct; TmA — terminal apophysis; Fm — femur; Pt — patella; Tb — tibia; Mt — metatarsus; the number and position of spines on legs: d — dorsal; pr — prolateral; rt — retrolateral; v — ventral. Museum acronym: MNHN — Muséum National d’Histoire Naturelle, Paris, France.

The QIAamp DNA Mini Kit (Qiagen, Germany) was used to extract genomic DNA from muscle tissues of legs II, III. The partial fragment of the mitochondrial gene cytochrome c oxidase subunit I (COI) gene was amplified and sequenced by using a pair of combined primers C1-J-1718 [Simon *et al.*, 1994], and C1-N-2776 [Hedin, Maddison, 2001]. The COI sequence of the female of the new species was verified by using BLAST (<https://www.ncbi.nlm.nih.gov>) and deposited in GenBank (accession number: OP288798).

Taxonomy

Family Salticidae Blackwall, 1841

Genus *Indopadilla* Caleb et Sankaran, 2019

Indopadilla Caleb, Sankaran, 2019: 570.

Type species: *Indopadilla darjeeling* Caleb et Sankaran, 2019.

DIAGNOSIS (based on Caleb *et al.* [2019] and Maddison *et al.* [2020]). According to Maddison *et al.* [2020], three salticid genera — *Indopadilla* Caleb et Sankaran, 2019, *Bavia* Simon, 1877 and *Stagetillus* Simon, 1885 — form the *Bavia* clade. The genus *Indopadilla* can be distinguished from other *Bavia* genera by the chelicerae with a sharp ridge laterally (see fig. 5 in Maddison *et al.* [2020]; absent in others); the clypeus with the exposed arthrodistal membrane (Figs 3, 11; absent in others); a distinct bulge on the thorax in both sexes only seen in the genus *Indopadilla* (Figs 1, 9, and fig. 14 in Maddison *et al.* [2020]); male endites rounded without a lateral lobe (*Bavia* with a lateral lobe thumb-like); the tegulum with a posterior lobe directed retrolaterally (prolaterally in *Bavia*); spermatheca is situated anterior to the copulatory openings (posterior in others).

DISTRIBUTION. India, Malaysia, China, Indonesia, Singapore, Caroline Islands, and Vietnam.

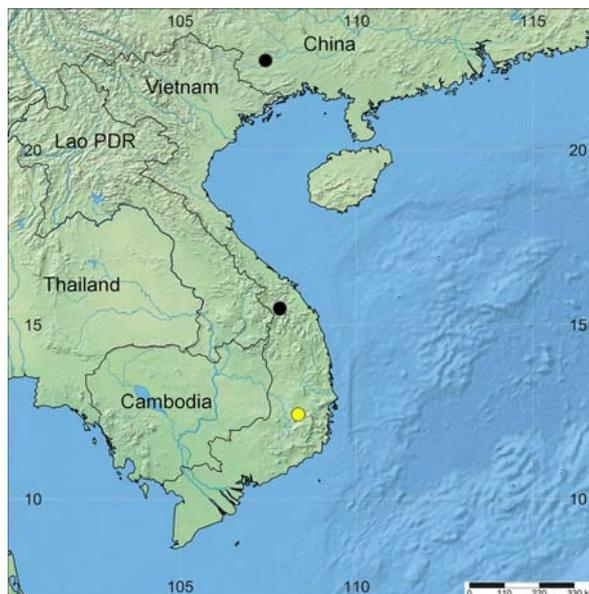
Indopadilla annamita (Simon, 1903)

Map.

Bavia annamita Simon, 1903: 730 (♂♀).

“*Bavia*” *annamita*: Żabka, 1988: 438, figs 46–51 (♂♀).

Bavia annamita: Wang, Zhang, 2020: 5, figs 1A–G, 2A–E (♂, D♀).



Map. Distribution of *Indopadilla annamita* (Simon, 1903) (black circle) and *Indopadilla phantoani* Hoang et Zhang, sp.n. (yellow circle).

Карта. Распространение *Indopadilla annamita* (Simon, 1903) (чёрные кружок) и *Indopadilla phantoani* Hoang et Zhang, sp.n. (желтый кружок).

Indopadilla annamita: Maddison *et al.*, 2020: 47 (transferred from *Bavia*).

TYPES. 1♂ and 1♀, “*Bavia annamita* Simon, Annam, Phuc Son”, MNHN 22131 (see Żabka [1988]: p. 438); not examined.

DISTRIBUTION. China (Guangxi) [Wang, Zhang 2020], Vietnam (Phuoc Son District, Quang Nam Prov.) [Simon, 1903; Żabka, 1988].

NOTE. Simon [1903] devoted a large part of his volume to describing the spider collection collected by the German naturalist Hans Fruhstorfer in November and December 1899 from “Phuc-Son, An Nam” of Vietnam. Actually, it seems to be mislabelled for the locality. Recently, the locality was corrected to be as follows: Phuoc Son District, Quang Nam Province [Poyarkov *et al.*, 2019]. Thus, all specimens collected by Hans Fruhstorfer in 1899 from Vietnam and described with the type locality from “Phuc-Son, An Nam”, as of now, should be formally recognized as Phuoc Son District, Quang Nam Province, in central Vietnam.

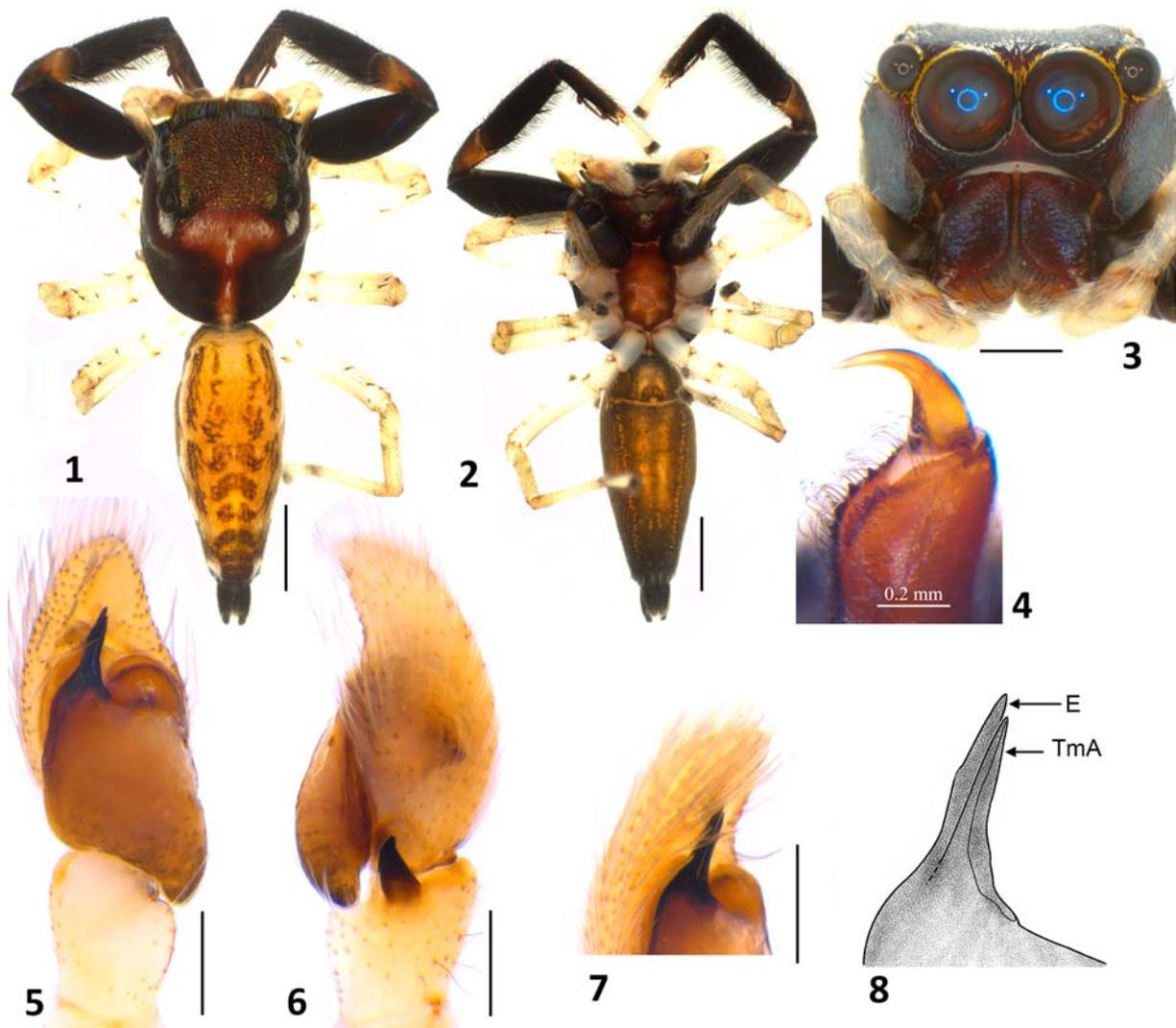
Indopadilla phantoani Hoang et Zhang, sp.n.

Figs 1–14, Map.

TYPES. HOLOTYPE ♂ (VNMN-ARA-SAL-244.1), Vietnam, Dak Lak Prov., Krong Bong District, Chu Yang Sin National Park (12.42405°N, 108.3476°E), 806 m a.s.l., 7.04.2022, Q.D. Hoang. PARATYPE: 3♀♀ (VNMN-ARA-SAL-156.1-3), 1♂ (VNMN-ARA-SAL-244.2), together with the holotype.

NAME. This specific epithet is taken to honor Dr Phan Quoc Toan of the Duy Tan University (Da Nang, Vietnam), a well-known Vietnamese researcher on dragonflies who has enthusiastically been supporting the first author to conduct field surveys in Vietnam.

DIAGNOSIS. The male of *I. phantoani* sp.n. can be easily distinguished from those of other congeners by a combination of the following characters: the embolus short,



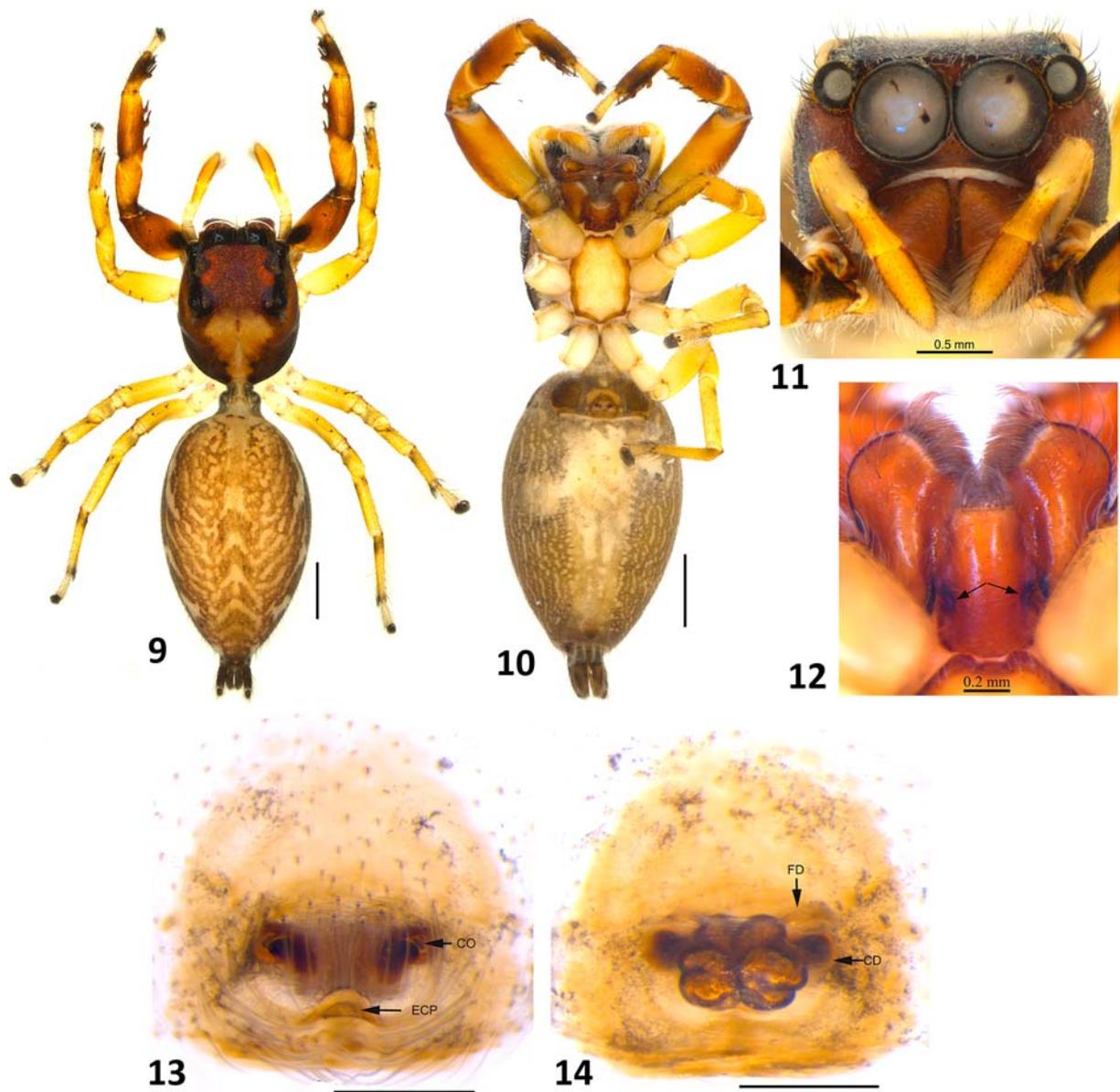
Figs 1–8. *Indopadilla phantoani* Hoang et Zhang, sp.n., male holotype. 1 — habitus, dorsal view; 2 — same, ventral view; 3 — carapace, frontal view; 4 — left chelicera, ventral view; 5 — palp, ventral view; 6 — same, retrolateral view; 7 — same, prolateral view (paratype, VNMN-ARA-SAL-244.2); 8 — embolus in detail (without scale). Scale bars: (1, 2) 1 mm, (3) 0.5 mm, (4, 5, 7, 8) 0.2 mm.

Рис. 1–8. *Indopadilla phantoani* Hoang et Zhang, sp.n., голотип-самец. 1 — габитус, вид сверху; 2 — то же, вид снизу; 3 — карапакс, вид спереди; 4 — левая хелицера, вид снизу; 5 — пальпа, вид снизу; 6 — то же, вид сбоку-сзади; 7 — то же, вид сбоку-сзади (паратип, VNMN-ARA-SAL-244.2); 8 — детали эмболоса (без масштаба). Масштаб: (1, 2) 1 мм, (3) 0,5 мм, (4, 5, 7, 8) 0,2 мм.

thin, almost straight, tapering, thorn-shaped (Figs 5, 7–8); TmA straight, tapering, thorn-shaped, located in front of the embolus, and is a little shorter than and parallel with the embolus (Figs 5, 7–8) (TmA of other *Indopadilla* species curved or membranous) (see Metzner [2022] for comparative illustrations), and the retrolateral tibial apophysis tapering, curved directed dorsad in the retrolateral view (Fig. 6). The female resembles that of *I. redunca* Maddison, 2020 in having a curved ridge surrounded opening anteriorly and the presence of the epigynal coupling pocket (ECP), but can be distinguished by the small and shallow ECP situated far away from the epigastric furrow (Fig. 13) (cavernous ECP, contiguous to the epigastric furrow in *I. redunca* [Maddison *et al.*, 2020: figs 107–108]) and the copulatory ducts coiled.

DESCRIPTION. MALE (holotype): Measurements: Carapace length 2.27, width 1.96; Abdomen length 3.05, width 1.27. Clypeus height 0.04. Carapace reddish brown, with a

hammer-shaped pale extending from behind PLE row to posterior margin, clothed with sparse white hairs (Fig. 1); around eye region surrounded by a long white hair line and iridescent rough surface (Fig. 1). Anterior eyes surrounded by yellow-orange orbital setae (Fig. 3). Clypeus dark brown, very narrow medially, white arthroal membrane visible (Fig. 3). Sternum dark yellowish brown (Fig. 2). Endites and labium darker than sternum (Fig. 2), medial labium with a dent laterally as in female (Fig. 12). Chelicerae reddish brown; promargin with four teeth, one retromarginal tooth with six cusps (Fig. 4). Abdomen yellowish brown, with dark brown inverted chevrons in the posterior half of dorsum (Fig. 1); venter yellowish brown, with some pale spots (Fig. 2). Lateral sides of the abdomen with a longitudinal discontinuous band of white hairs (Fig. 2). Spinnerets dark. Leg I dark (except patellae lighter than others, and tarsi with pale yellow), covered with densely grey hairs, robust and



Figs 9–14. *Indopadilla phantoani* Hoang et Zhang, sp.n., female paratype (VNMN-ARA-SAL-156.1). 9 — habitus, dorsal view; 10 — same, ventral view; 11 — carapace, frontal view; 12 — endites and labium, ventral view; 13 — epigyne, ventral view; 14 — vulva, dorsal view. Scale bars: (9, 10) 1 mm, (11) 0.5 mm, (12–14) 0.2 mm.

Рис. 9–14. *Indopadilla phantoani* Hoang et Zhang, sp.n., парагип-самка (VNMN-ARA-SAL-156.1). 9 — габитус, вид сверху; 10 — то же, вид снизу; 11 — карапакс, вид спереди; 12 — эндиты и лабиум, вид снизу; 13 — эпигина, вид снизу; 14 — вульва, вид сверху. Масштаб: (9, 10) 1 мм, (11) 0,5 мм, (12–14) 0,2 мм.

largest; legs II, III and IV pale yellow. Width of eye rows: anterior eye row 1.73; posterior medial eye row 1.53; posterior lateral eye row 1.66. Distance between ALE-PME 0.62; ALE-PLE 1.16. Diameter of eyes: AME 0.66; ALE 0.33; PME 0.06; PLE 0.28. Length of leg segments: I 1.75 + 1.04 + 1.40 + 1.10 + 0.43 (5.72); II 1.29 + 0.75 + 0.79 + 0.80 + 0.35 (3.98); III 1.18 + 0.62 + 0.55 + 0.87 + 0.37 (3.59); IV 1.41 + 0.67 + 0.97 + 1.22 + 0.42 (4.69). Leg formula I–IV–II–III. Leg spination: I: Fm d 1–1, pr 1; Ti v 2–2–2; Mt v 2–2. II: Fm d 1–1, pr 1; Tb Pr 2, v 1; Mt v 2–2. III: Fm d 1–1, pr and rt 1; Tb rt 1. and IV: Fm d 1–1, pr and rt 1. Palp (Figs 5–6, 8) pale yellow (except reddish brown femur); tibia

short, with a bulge retrolaterally (Figs 5–6); retrolateral tibial apophysis strong, tapering, curved tip and directed ventrad in retrolateral view (Fig. 6). Posterior lobe directed retrolaterally (Figs 5–6). Embolus short, thin, strongly sclerotized, straight, tapering, located behind TmA, a little higher, closely adpressed and parallel with TmA (Figs 5, 8).

FEMALE: Measurements: Carapace length 2.51, width 2.13; Abdomen length 4.11, width 2.53. Clypeus height 0.05. Width of eye rows: anterior eye row 1.83; posterior medial eye row 1.65; posterior lateral eye row 1.82. Distance between ALE-PME 0.57; ALE-PLE 1.24. Diameter of eyes: AME 0.68; ALE 0.33; PME 0.07; PLE 0.28. Endites

and labium as holotype, medial labium with a dent laterally (Fig. 11). Chelicerae as in the holotype, promargin with four teeth, and one retromarginal tooth with six cusps. Length of leg segments: I 1.47 + 0.88 + 1.18 + 0.94 + 0.38 (4.85); II 1.27 + 0.69 + 0.79 + 0.79 + 0.36 (3.90); III 1.01 + 0.65 + 0.54 + 0.86 + 0.36 (3.42); IV 1.36 + 0.74 + 1.06 + 1.25 + 0.43 (4.84). Leg formula I–IV–II–III. Leg spination: I: Fm d 1, pr 1; Ti v 2–2–2; Mt v 2–2. II: Fm d 1–1; Tb Pr 2, vt 1; Mt v 2–2. III Fm d 1, pr 1. IV d 1–1. Body colour (Figs 9–10) lighter than that of the male holotype, almost similar to that of the holotype. Epigyne (Figs 13–14) strongly sclerotized. Copulatory openings slit-shaped. Epigynal coupling pocket (ECP) very shallow, delicate, and curved upwards. Copulatory ducts coiled, relatively narrow, and accompanied by the short accessory glands that obscured by the copulatory ducts. Receptacles simple with strongly sclerotized walls.

VARIATION. The male paratype showed the following variations in comparison to the holotype: (1) a dorsal spine present on femur I; (2) the retromarginal tooth on chelicerae with five cusps; (3) the embolus and TmA clearly separated in the paratype (Fig. 7).

DISTRIBUTION. Known only from Dak Lak Province (Map).

NATURAL HISTORY. The first author observed that spiders weave a retreat of dense silk making a safe shelter on foliage undersides. Thus, this could partly explain why it is so difficult to collect *Indopadilla* specimens by beating trays. In addition, the retreat has two small openings on opposite sides, which allow spiders to quickly escape danger.

NOTE. As the male and female specimens were collected together (see above) and their general appearances are also similar, we have treated them as belonging to the same species. Unfortunately, a DNA sequence from the males to finally verify the matching was impossible to obtain.

Acknowledgements. The authors thank Dr John T.D. Caleb (India), and Dr Katsuyuki Eguchi (Tokyo Metropolitan University, Japan) for their valuable comments and suggestions on the draft. We would like to thank Dr Phan Quoc Toan (Duy Tan University, Da Nang, Vietnam) for his support to the first author to conduct field surveys in Vietnam, Prof Nguyen Anh Dung and Dr Tran Minh Dinh (Institute of Biotechnology and Environment, Tay Nguyen University) for kindly allowed the first author to use the molecular laboratory equipment at the Institute of Biotechnology and Environment (Tay Nguyen University, Vietnam), and the directorates of the Chu Yang Sin National Park for their help in the field. The study was mainly funded by a grant from the Tay Nguyen University (T2022-43CBTD) to Q.D. Hoang, and partly supported by the Tokyo Metropolitan University Fund for TMU Strategic Research (Leader: Noriaki Murakami; FY2020–FY2022). Finally, we thank the

editor, Dr Dmitri V. Logunov (Manchester, UK), for critical suggestions and editing the ms.

Compliance with ethical standards

Conflict of interest: The authors declare that they have no conflict of interest.

Ethical approval: No ethical issues were raised during our research.

References

- Caleb J.T.D., Sankaran P.M., Nafin K.S., Acharya S. 2019. *Indopadilla*, a new jumping spider genus from India (Araneae: Salticidae) // *Arthropoda Selecta*. Vol.28. No.4. P.567–574.
- Hedin M.C., Maddison W.P. 2001. A combined molecular approach to phylogeny of the jumping spider subfamily Dendryphantinae (Araneae: Salticidae) // *Molecular Phylogenetics and Evolution*. Vol.18. No.3. P.386–403.
- Maddison W.P., Beattie I., Marathe K., Ng P.Y.C., Kanesharatnam N., Benjamin S.P., Kunte K. 2020. A phylogenetic and taxonomic review of baviine jumping spiders (Araneae, Salticidae, Baviini) // *ZooKeys*. Vol.1004. P.27–97.
- Metzner H. 2022. Jumping spiders (Arachnida: Araneae: Salticidae) of the world. Available from <https://www.jumping-spiders.com> (accessed 12 August 2022).
- Ono H. 1988. A revisional study of the spider family Thomisidae (Arachnida, Araneae) of Japan. Tokyo: National Science Museum. 252 pp.
- Poyarkov A.P., Jr., Geissler, P., Gorin V.A., Dunayev E.A., Hartmann T., Suwannapoom C. 2019. Counting stripes: revision of the *Lipinia vittigera* complex (Reptilia, Squamata, Scincidae) with description of two new species from Indochina // *Zoological Research*. Vol.40. No.5. P.358–393.
- Shorthouse D.P. 2010. SimpleMappr, an online tool to produce publication-quality point maps. Available from <https://www.simplemappr.net>. (accessed 21 August 2022).
- Simon C., Frati F., Beckenbach A., Crespi B., Liu H., Flook P. 1994. Evolution, weighting, and phylogenetic utility of mitochondrial gene sequences and a compilation of conserved polymerase chain reaction primers // *Annals of the entomological Society of America*. Vol.87. No.6. P.651–701.
- Simon E. 1903. Etudes arachnologiques. 33e Mémoire. LIII. Arachnides recueillis à Phuc-Son (Annam) par M. H. Fruhstorfer (nov-dec. 1899) // *Annales de la Société Entomologique de France*. Vol.71. No. 4. P.725–736.
- Wang H., Zhang F. 2020. The first recorded of the species *Bavia annamita* from China (Araneae: Salticidae) // *Acta Arachnologica Sinica*. Vol.29. No.1. P.5–8.
- WSC. 2022. World Spider Catalog. Natural History Museum Bern, Version 23.0. Available from <http://wsc.nmbe.ch>. (accessed 12 August 2022).
- Żabka M. 1988. Salticidae (Araneae) of Oriental, Australian and Pacific regions, III // *Annales Zoologici, Warszawa*. Vol.41. No.14. P.421–479.

Responsible editor D.V. Logunov