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A new species of *Carrhotus* Thorell, 1891 (Araneae: Salticidae) from India

John T.D. Caleb

Department of Anatomy, Saveetha Medical College & Hospitals, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai 602105, Tamil Nadu, India.

✉ araneae.in@gmail.comID <https://orcid.org/0000-0002-9471-9467>**Muthusamy Sampathkumar**

ICAR-National Bureau of Agricultural Insect Resources, Bengaluru 560024, Karnataka, India.

✉ m.kumar1@icar.gov.inID <https://orcid.org/0000-0001-9787-1299>**Received:**

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ABSTRACT. A new species of the jumping spider genus *Carrhotus* Thorell – *Carrhotus piperus* **sp. nov.** – is described based on the male holotype collected from Tamil Nadu, India. Detailed description and illustrations are provided. The new species can be separated from the closely related taxa by the prolateral protrusion of the bulb arising from an 8 o'clock position and directed dorsad, and the retrolaterally directed beak-shaped embolus. The number of known *Carrhotus* species reaches to 10 and 37 in India and in the world, respectively. A key to species of the genus *Carrhotus* from India is also presented.

Keywords: Jumping spiders, key, new species, Palani Hills, South Asia, Tamil Nadu

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INTRODUCTION

The jumping spider genus *Carrhotus* Thorell, 1891 encompasses 36 currently valid species (World Spider Catalog, 2024), with nine known from India (Caleb & Sankaran, 2024). Recent taxonomic studies on *Carrhotus* in India and Sri Lanka have significantly enriched our understanding of the diversity and distribution of the genus in these countries (Caleb et al., 2020; Logunov, 2021; Sudhin et al., 2021; Satkunanathan & Benjamin, 2022). During a recent survey in the lower Palani Hills of Tamil Nadu, a male specimen representing a previously undescribed species of *Carrhotus* was discovered, which is described and illustrated in this paper.

MATERIAL AND METHODS

The specimen was collected by hand and preserved in 70% ethanol. Morphological examination was carried out under a Leica® S9i stereomicroscope and photographs were taken with a Leica® DMC4500 camera mounted on a Leica® M205 A stereomicroscope. All images were processed with the aid of LAS core software (LAS version 4.3.0). All measurements are in millimeters. Leg measurements are given as: total length (femur, patella, tibia, metatarsus, tarsus). The type specimen has been deposited in the National Insect Museum (NIM), Indian Council of Agricultural Research (ICAR) – National Bureau of Agricultural Insect Resources (NBAIR), Bengaluru, India.

Abbreviations. ALE – anterior lateral eye, AME – anterior median eye, PLE – posterior lateral eye, PME – posterior median eye, RTA – retrolateral tibial apophysis.

Corresponding author: Caleb, J.T.D., ✉ araneae.in@gmail.com

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RESULTS

Taxonomic hierarchy

Family Salticidae Blackwall, 1841

Subfamily Salticinae Blackwall, 1841

Clade Salticoida Maddison & Hedin, 2003

Clade Saltafresia Bodner & Maddison, 2012

Clade Simonida Maddison, 2015

Tribe Salticini Blackwall, 1841

Genus *Carrhotus* Thorell, 1891

Type species: *Plexippus viduus* C. L. Koch, 1846

Carrhotus piperus sp. nov. (Figs 1–9)

<https://zoobank.org/urn:lsid:zoobank.org:act:976F3B66-50B8-448A-97A4-C3B081126768>

Type material. Holotype ♂ (NIM/NBAIR/SAL/CARR/H-240724), India, Tamil Nadu, Dindigul, Thadiyankudisai (10°17'33.7"N, 77°42'31.8"E) 1098 m a.s.l., 27.12.2016, coll. M. Sampathkumar.

Etymology. The specific epithet is derived from the generic name of the plant (*Piper nigrum* L.) on which the holotype was collected.

Diagnosis. The new species is similar to both *Carrhotus andhra* Caleb, 2020 and *Carrhotus spiridonovi* Logunov, 2021 in having a prolateral tegular protrusion. It can be distinguished from both species by the protrusion arising from an 8 o'clock position and directed dorsad (*vs.* arising at a 10 o'clock position and directed distad in both *C. andhra* and *C. spiridonovi*), and the embolus beak-shaped and directed retrolaterally in ventral view (*vs.* directed distad in *C. andhra* and *C. spiridonovi*) (cf. Figs 4, 5, 7, 9 with figs 6, 7, 9 in Caleb et al., 2020 and fig. 8 in Logunov, 2021).

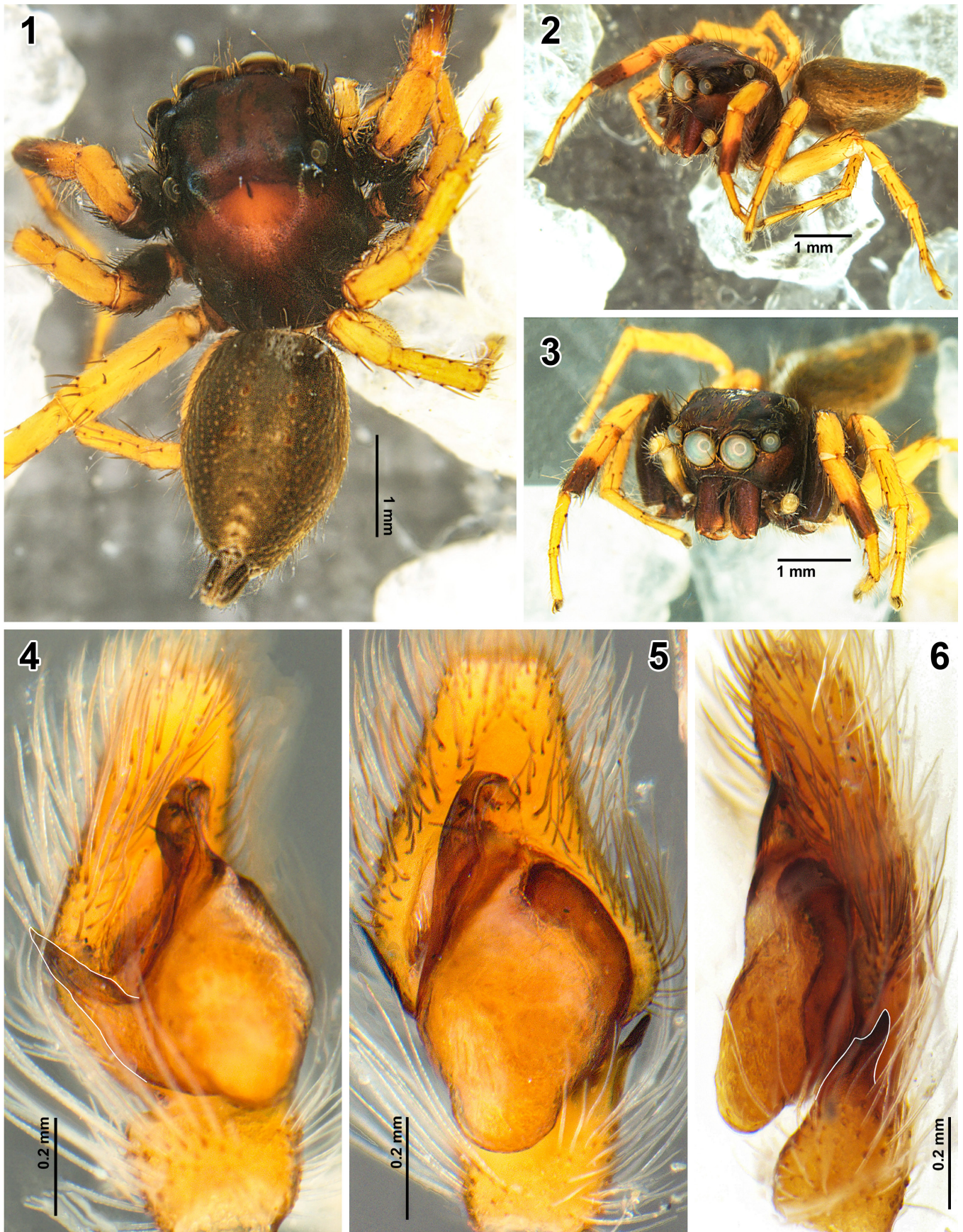
Description. — **Male.** Body length 5.10. Carapace 2.49 long; 1.33 wide. Abdomen 2.34 long; 1.57 wide. Carapace brown; light brown triangular portion from fovea and anterior thoracic region covered with sparse white scales; ocular area dark brown covered with yellow-brown scales (Fig. 1). Anterior eyes surrounded by yellow-brown orbital setae (Fig. 3). Ocular area length 2.81, width 1.76. Eye diameters and inter-distances: AME 0.55, ALE 0.33, PME 0.07, PLE 0.24. AME–ALE 0.08, PME–PME 1.47, ALE–ALE 1.18, PME–PLE 0.26, PLE–PLE 1.40, ALE–PME 0.40. Clypeus brown. Clypeus 0.10 high. Chelicerae brown, each with two promarginal and one retromarginal teeth. Length of chelicera 0.91. Sternum oval, pale brown. Maxillae dark brown with pale white margin. Labium brown. Legs yellow; femora I and II dark brown; tibia I with brown distal half (Figs 1–3). Measurement of palp and legs: palp 1.53 [0.37, 0.17, 0.3, 0.69]; leg I 4.99 [1.50, 0.73, 1.22, 0.90, 0.64]; II 4.40 [1.50, 0.76, 1.03, 0.58, 0.53]; III 2.79 [0.96, 0.26, 0.65, 0.56, 0.36]; IV 3.43 [1.19, 0.25, 0.82, 0.68, 0.49]. Leg formula: 1243. Abdomen oval, brown with light brown spots; anterior region with few white hairs; chevron-shaped marking present mid-dorsally in posterior region; mid-lateral sides with few white hairs; venter light brown. Spinnerets brown (Figs 1, 2).

Palp as in Figs 4–9; yellow-brown, proximal half of femur brown; RTA conical with tip directed apically, ventral margin with ridge sub-apically; cymbium simple; bulb with posterior lobe; tegulum with dagger-shaped prolateral process arising from prolateral base and directed dorsally in prolateral view; embolus broad, bent and directed retrolaterally.

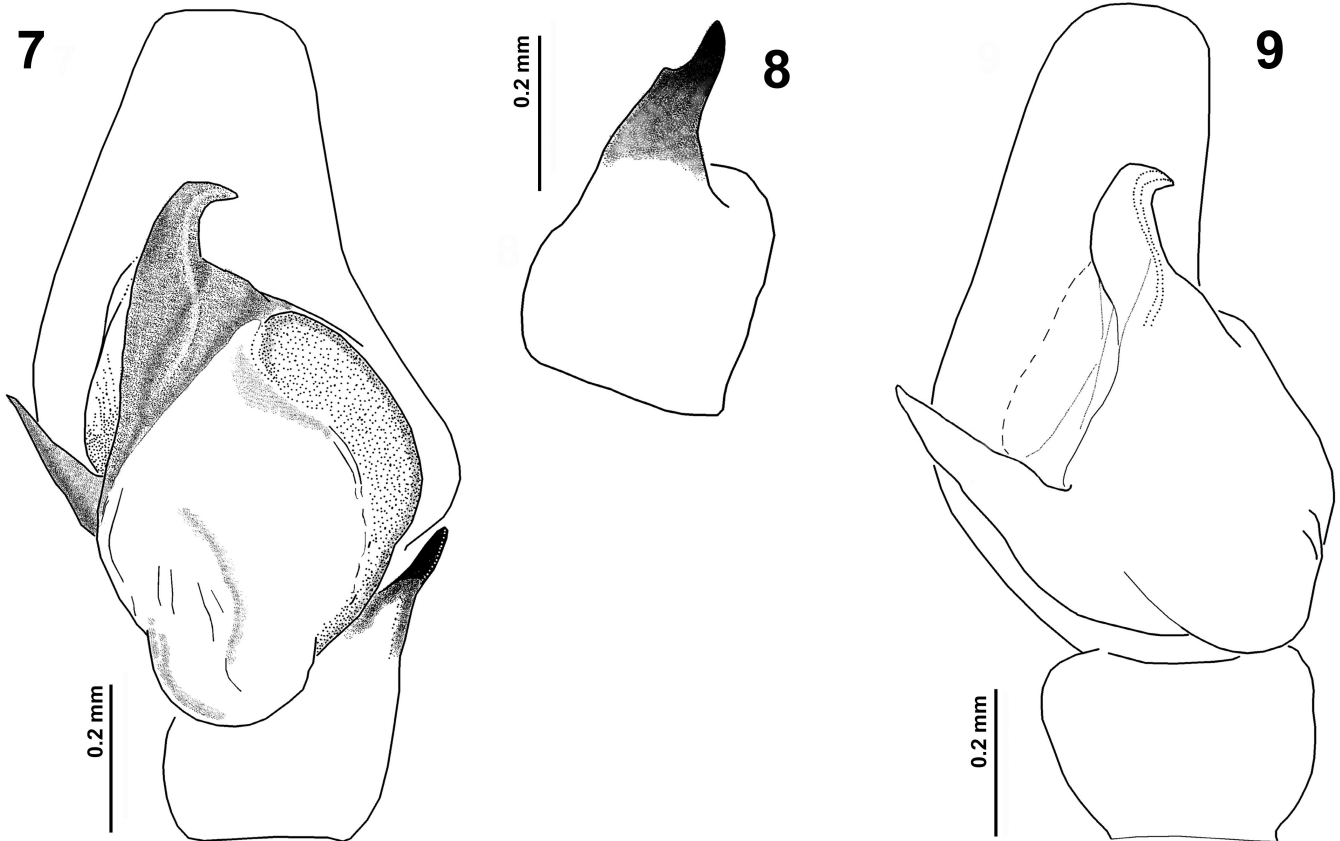
Female. Unknown

Distribution. Known only from the type locality in Tamil Nadu, India.

Natural history. The holotype was collected from lower Palani hills while beating *Piper nigrum* plants at a height of about 2 meters.



Figures 1–6. *Carrhotus piperus* sp. nov. (holotype male). **1.** Habitus, dorsal view; **2.** Same, lateral view; **3.** Same, frontal view; **4.** Left palp, proventral view; **5.** Same, ventral view; **6.** Same, retrolateral view.



Figures 7–9. *Carrhotus piperus* sp. nov., left palp (holotype male). **7, 9.** Ventral and proventral views; **8.** Tibia, retrolateral view.

Updated key to the Indian *Carrhotus* species (modified after Caleb et al., 2020)

- | | | |
|---|---|--|
| 1 | Male. | 2 |
| – | Female. | 11 |
| 2 | Tegulum with a prolateral protrusion. | 3 |
| – | Tegulum without a prolateral protrusion. | 5 |
| 3 | Protrusion cone-shaped. | <i>C. spiridonovi</i> Logunov, 2021 |
| – | Protrusion blade-shaped. | 4 |
| 4 | Protrusion directed distad, embolus directed distad. | <i>C. andhra</i> Caleb, 2020 |
| – | Protrusion directed dorsad, embolus pointing retrolaterad. | <i>C. piperus</i> sp. nov. |
| 5 | Embolus filiform, longer than cymbium. | <i>C. tristis</i> Thorell, 1895 |
| – | Embolus otherwise. | 6 |
| 6 | Embolus directed prolaterally. | 7 |
| – | Embolus directed distad or retrolaterally. | 8 |
| 7 | Embolus conical apically, narrow tip. | <i>C. tholpattyensis</i> Sudhin, Nafin, Caleb & Sudhikumar, 2021 |
| – | Embolus beak-shaped, broad, tip distinctly bent. | <i>C. erus</i> Jastrzębski, 1999 |
| 8 | Embolus hook-shaped; RTA straight, directed distad. | 9 |
| – | Embolus straight and thick, conical apically; RTA hook-shaped or bent ventrad. | 10 |

- 9 Dorsum brownish, without a white colour pattern. *C. assam* Caleb, 2020
 – Dorsum dark brown, with two pairs of white spots. *C. sannio* (Thorell, 1877)
- 10 RTA markedly hook-shaped, bent ventrad. *C. silanthi* Caleb, 2020
 – RTA only slightly bent ventro-distad. *C. viduus* (C.L. Koch, 1846)
- 11 Copulatory openings placed anteriorly. 12
 – Copulatory openings placed posteriorly. 13
- 12 Insemination ducts comparatively shorter, subparallel. *C. viduus* (C.L. Koch, 1846)
 – Insemination ducts comparatively long, aligned laterally.
 *C. tholpettyensis* Sudhin, Nafin, Caleb & Sudhikumar, 2021
- 13 Insemination ducts comparatively long and loop anteriorly. *C. sannio* (Thorell, 1877)
 – Insemination ducts comparatively short and diverge laterally. *C. silanthi* Caleb, 2020

Note. Females of *C. andhra*, *C. assam*, *C. erus*, *C. piperus* **sp. nov.**, *C. spiridonovi*, and *C. tristis* are unknown.

DISCUSSION

The genus *Carrhotus* Thorell, 1891 comprises 36 species, with 16 described based on both sexes, 11 on males alone, and nine on females alone (World Spider Catalog, 2024). In India, no *Carrhotus* species are known solely from females. However, there are several species from neighbouring countries such as Nepal, Bhutan, and Sri Lanka known only from female specimens. These include *C. albosetosus* Satkunanathan & Benjamin, 2022 (Sri Lanka), *C. catagraphus* Jastrzębski, 1999 (Nepal), *C. operosus* Jastrzębski, 1999 (Nepal), *C. kamjeensis* Jastrzębski, 1999 (Bhutan), and *C. samcheinsis* Jastrzębski, 1999 (Bhutan). These species are potentially conspecific with males-only species such as *Carrhotus s-bulbosus* Jastrzębski, 2009 (Nepal), *Carrhotus erus* Jastrzębski, 1999 (Nepal), and *Carrhotus sarahcrewsae* Cao & Li, 2016 (China). Particularly, the female of *C. albosetosus* resembles that of *C. silanthi* in both colouration and genital morphology, suggesting that the male might exhibit similar characteristics to *C. silanthi*. Thus, it is plausible to assert that the newly described species in this study does not share conspecificity with the female-only described species from the surrounding regions.

Two species, *Carrhotus andhra* Caleb, 2020 and *Carrhotus spiridonovi* Logunov, 2021, exhibit unique palpal morphology (Caleb et al., 2020; Logunov, 2021). The males of these species have a distinct process on the prolateral region of the tegulum, a characteristic shared with the new species described in this paper. While this prolateral bulge is a common feature in several *Carrhotus* species, including the type species *C. viduus*, as well as *C. silanthi*, the degree of elaboration in *C. andhra*, *C. spiridonovi*, and *C. piperus* **sp. nov.** is significantly more pronounced, with well-defined shapes and orientations. This shared trait suggests a potential grouping within the genus, yet it necessitates further examination of female specimens to determine if a separate generic status is warranted (Logunov, 2021). The functional role of this unique structure during copulation remains undetermined. Additionally, a tegular apophysis near the embolus, aligned horizontally and pointing retrolaterally, is observed in members of the genus *Evalba* Prószyński, 2018, indicating a possible homologous feature.

AUTHOR'S CONTRIBUTION

The authors confirm their contribution to the paper as follows: J. Caleb: conceptualization, identification, preparation of illustrations, writing, review and editing; M. Sampathkumar: conceptualization, collected the specimen, carried out the morphological examination, morphometry, photography, writing and review; The authors read and approved the final version of the manuscript.

FUNDING

This research received no specific grant from any funding agencies.

AVAILABILITY OF DATA AND MATERIAL

The examined material is deposited in the National Insect Museum (NIM), Indian Council of Agricultural Research (ICAR) – National Bureau of Agricultural Insect Resources (NBAIR), Bengaluru, India and is available from the curator, upon request.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study only included plants and arthropod material, and all required ethical guidelines for the treatment and use of animals were strictly adhered to in accordance with international, national, and institutional regulations. No human participants were involved in any studies conducted by the authors for this article.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTERESTS

The authors declare that there is no conflict of interest regarding the publication of this paper.

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یک گونه جدید از جنس *Carrhotus* Thorell, 1891 (Araneae: Salticidae) از هند

جان تی. دی. کالب^{۱*}، موثوسامی سامپاتکومار^۲

گروه آناتومی، کالج و بیمارستان‌های پزشکی ساویتا، مرکز مطالعات علوم پزشکی و فنی، دانشگاه ساویتا، تامیل نادو، هند
دفتر ملی منابع حشره‌شناسی کشاورزی، هیات تحقیقات کشاورزی هند، بنگلور، کارناتاکا، هند.

* پست الکترونیک نویسنده مسئول مکاتبه: araneae.in@gmail.com

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چکیده: یک گونه جدید از عنکبوت‌های جهنده در جنس *Carrhotus* به نام *Carrhotus piperus* sp. nov. بر اساس نمونه هولوتیپ نر جمع‌آوری شده از تامیل نادو، هند توصیف و تصاویری دقیقی از آن ارائه شد. این گونه جدید بر اساس برآمدگی پیش‌کنار بالشتک که از موقعیت ساعت ۸ خارج و به سمت پشت هدایت شده، و همچنین امبولوس منقاری شکل که به سمت عقب هدایت شده، از گروه‌های مرتبط و نزدیک قابل شناسایی و تفکیک است. با احتساب این گونه جدید، تعداد گونه‌های شناخته شده *Carrhotus* به ۱۰ و ۳۷ در هند و در جهان می‌رسد. کلید شناسایی گونه‌های شناخته شده متعلق به جنس *Carrhotus* از هند نیز ارائه شد.

واژگان کلیدی: عنکبوت‌های جهنده، کلیدشناسایی، گونه جدید، تپه‌های پالانی، جنوب آسیا، تامیل نادو