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A new spider species of the genus *Carrhotus* Thorell, 1891 (Aranei: Salticidae: Salticini) from Western Ghats of India

Новый вид пауков из рода *Carrhotus* Thorell, 1891 (Aranei: Salticidae: Salticini) из Западных Гат Индии

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KEY WORDS: Araneae, jumping spider, description, distribution, Wayanad Wildlife Sanctuary, Kerala.

КЛЮЧЕВЫЕ СЛОВА: Araneae, паук-скакунчик, описание, распространение, заповедник дикой природы Ваянад, Керала.

ABSTRACT: A new species of the jumping spider genus *Carrhotus* Thorell, 1891, *C. tholpettyensis* sp.n. (♂♀) is diagnosed and described from the Wayanad Wildlife Sanctuary, Western Ghats, Kerala, India. Detailed morphological descriptions, diagnoses and illustrations of the copulatory organs of both sexes are provided. A map depicting the current distribution of the genus in India is also included.

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РЕЗЮМЕ: Диагностирован и описан новый вид паука-скакунчика из рода *Carrhotus* Thorell, 1891, *C. tholpettyensis* sp.n. (♂♀) из заповедника дикой природы Ваянад, Западные Гаты, Керала, Индия. Приводятся детальные описания, диагнозы и иллюстрации копулятивных органов обоих полов. Также дана карта распространения рода в Индии.

Introduction

The genus *Carrhotus* was proposed by Thorell in 1891, with *Plexippus viduus* C.L. Koch, 1846 as the type species. Members of this genus are pale brown salticids varying in size, from stout to large, and occurring mainly in the Oriental region [Jastrzębski, 2009]. The genus currently contains 32 described species worldwide [WSC, 2021], of which six are known from India: *C. andhra* Caleb, 2020, *C. assam* Caleb, 2020, *C. sannio* (Thorell, 1877), *C. silanthi* Caleb, 2020, *C. tristis* Thorell, 1895, and *C. viduus* (C.L. Koch, 1846) [Prószyński, 1992; Caleb *et al*., 2020; WSC, 2021]. The purpose of this paper is to diagnose, describe and illustrate a new species *Carrhotus tholpettyensis* sp.n. (♂♀) collected from the moist deciduous forests of the Wayanad Wildlife Sanctuary in Kerala's Western Ghats, one of the world's biodiversity hotspots [Myers *et al*., 2000]. The current geographic distribution of all *Carrhotus* species in India is also mapped.

Materials and methods

Photographs of live specimens were taken with a Canon EOS 5D Mark-III using Canon EF 100mm f/2.8 Macro USM lens, Canon MP-E 65mm 1–5x Macro Lens and Canon MT-24EX Macro Twin Lite Flash. Spiders were collected by beating vegetation, and the collected specimens were stored in 70% ethanol. A morphological examination was undertaken under a Leica M205 C stereomicroscope. Digital images were taken by means of Leica DMC4500 digital camera attached to Leica M205 C stereomicroscope, with the software package Leica Application Suite (LAS), version 4.3.0. LAS montage facility. All measurements are in mm. Distribution maps were prepared by using the online mapping software SimpleMappr [Shorthouse, 2010]. Measurement data for palps and legs are as follows: total length [femur, patella, tibia, metatarsus (except palp), tarsus]. The terminology follows Reiskind [1969], for leg spination the system adopted follows Bossellaers & Jocque [2000]. The studied specimens are deposited in the Centre for Animal Taxonomy and Ecology (CATE), Department of Zoology, Christ College (Autonomous), Irinjalakuda, Kerala, India.

Abbreviations used in the text and figures are as follows: ALE — anterior lateral eyes, AME — anterior median eyes, C — cymbium, CO — copulatory opening, do — dorsal, E — embolus, FD — fertilization duct, pl — prolateral, PLE — posterior lateral eyes, PME — posterior median eyes, plv —

Figs 1–2. General appearance of *Carrhotus tholpettyensis* sp.n. from the Wayanad Wildlife Sanctuary, Kerala, India: 1 — female, dorsal view; 2 — male, dorsal view.

Рис. 1–2. Общий вид *Carrhotus tholpettyensis* sp.n. заповедника дикой природы Ваянад, Западные Гаты, Керала, Индия: 1 — самка, вид сверху; 2 — самец, вид снизу.

prolateral-ventral, rl — retrolateral, RTA — retrolateral tibial apophysis, rlv — retrolateral-ventral, v — ventral.

Taxonomy

Carrhotus Thorell, 1891

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

Carrhotus tholpettyensis **sp.n.**
Figs 1–17, Map.

Carrhotus viduus (nec C.L. Koch, 1846; misidentified): Prószyński, 2009: 158, figs 19–23 (♂♀), the specimens from the Museum für Naturkunde, Leibniz Institute for Research on Evolution and Biodiversity at the Humboldt University Berlin, Germany; not examined.

TYPE. Holotype ♂ (CATE, 8711A) from India, Kerala, Wayanad District, Tholpetty Range, the Wayanad Wildlife Sanctuary (11°95'17.23"N, 76°05'94.9"E), 838 m a.s.l., 21.01.2016, P.P. Sudhin & K.S. Nafin. Paratype: INDIA: 1 ♀ (CATE, 8711B), together with the holotype.

ETYMOLOGY. The specific epithet is an adjective derived from the name of the forest range (Tholpetty) from where the type series was collected.

DIAGNOSIS. *C. tholpettyensis* sp.n. is most similar to *C. viduus* (C.L. Koch, 1846), from which it can be distinguished by the following combination of characters: male abdomen without longitudinal stripes (a pair of white longitudinal stripes in *C. viduus*); embolus with a pointed tip directed at 11 o'clock position (blunt tip directed at 12 o'clock in *C. viduus*); RTA curved (broad and slightly bent in *C. viduus*); the laterally diverging copulatory ducts in the female (shorter and sub-parallel in *C. viduus*) (cf. Figs 3, 5, 9–17 with figs. 57, 61–64, 77, 78, 82 in Caleb *et al*., [2020]).

COMMENTS. Prószyński [2009] illustrated the specimens collected apparently from Sri Lanka, from the Museum für Naturkunde, the Leibniz Institute for Research on Evolution and Biodiversity at the Humboldt University (Berlin, Germany), which were incorrectly identified as *Eugasmia barbata* Karsch, 1880 (now *Carrhotus b*.). Yet, he mentioned that the studied male resembles that of *C. viduus*, with minor differences in the proportions of palpal organ, and also pointed out that the female has a distinct epigynal structure. Freshly collected specimens from the Wayanad Wildlife Sanctuary are identical to those studied by Proszsynski in having the similar abdominal pattern, the pointed embolus, short and curved RTA in the male, and the copulatory openings placed along the medial axis and the length and conformation of the copulatory ducts in the female to those illustrated by Prószyński [2009], indicating that both sets of specimens are indeed conspecific (cf. Figs 9–17 with figs 19–23 in Prószyński [2009]). Specimens from India and China seem to have also been misidentified as *C. viduus*. The illustrations by Peng *et al*. [1993] show a close similarity with those described here (cf. Figs 9–17 with figs 75, 76, 78, 79, 81–83 in Peng *et al.* [1993]). Yet, the illustrations of *C. viduus* from Maharashtra, India appear to be rather similar to those of *C. silanthi* Caleb, 2020 (cf. fig. 7 in Prószyński [1992] with figs 44, 48 in Caleb *et al*. [2020]). These problems require special attention in the future and can be resolved by a re-examination of the pertinent material.

DISTRIBUTION. Only the type locality (Map).

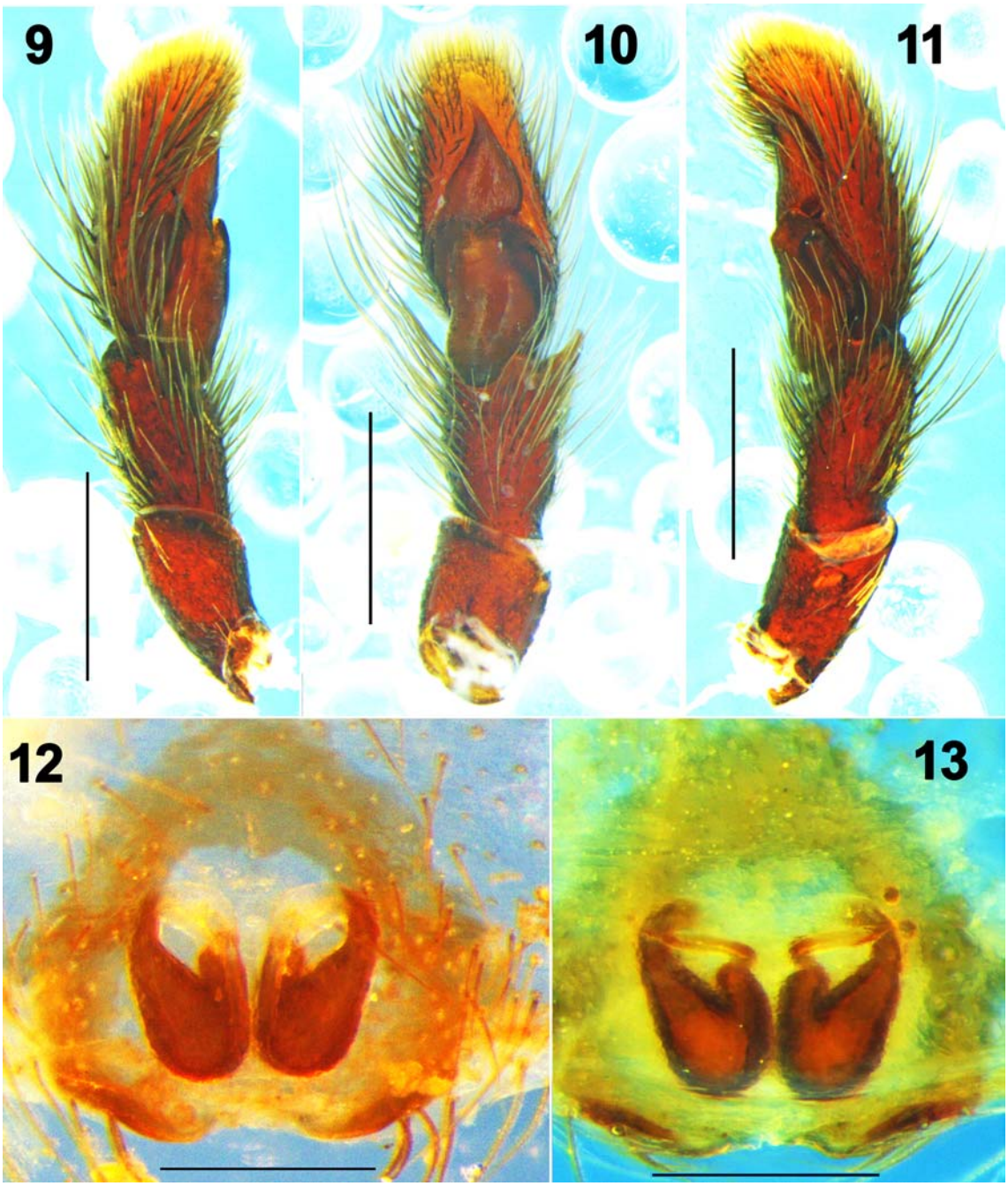
DESCRIPTION. MALE. (Holotype, CATE 8711A) (Figs 2, 3–5, 9–11, 14–15): Measurements. Body length 5.97. Carapace length 3.04, width (at the middle) 2.37. Abdomen length 2.80, width (at the middle) 2.10. Ocular area length 1.25, width 1.85. Eye diameters: AME 0.52, ALE 0.25, PME 0.05, PLE 0.20. Eye interdistances: AME–ALE 0.12, PME–PME 1.63, ALE–ALE 1.40, PME–PLE 0.32, PLE–PLE 1.59, ALE–PLE 0.76, AME–AME 0.05. Clypeus height 0.21. Length of chelicera 1.72. Measurement of palp and legs: palp 2.48 [1.00, 0.37, 0.38, 0.73], leg I 7.94 [2.10, 1.14, 2.05, 1.38, 0.82], II 5.17 [1.68, 0.81, 1.12, 0.91, 0.65], III 5.41 [1.89, 0.78, 1.11, 0.96, 0.67], IV 5.23 [1.66, 0.78, 1.07, 1.07, 0.65]. Leg formula: 1342. Leg spination: femur I pl 1 rl 1 do 1, II pl 2 rl 2 do 1, III–IV pl 3 rl 2 do 1; patella I plv 1 rlv 1, II–IV rl 1 pl 1; tibia I pl 2 rl 2 plv 2 rlv 2, II pl 3 rl 2 do 1 rlv 3 plv 3, III–IV pl 3 rl 3 do 1 plv 2 rlv 2; metatarsus I–II pl 2 rl 2 rlv 2 plv 2, III pl 2 rl 2 do 1 plv 2 rlv 2, IV pl 3 rl 3 do 1 plv 2 rlv 2; tarsus I–IV spineless. General appearance as in Figs 1, 3–5. Carapace reddish brown, covered with white hairs, lateral margin with narrow dark brown lines (Figs 3, 5); eye field dark brown, darker around eyes except for AMEs; anterior eyes surrounded by chocolate

Figs 3–8. Habitus of *Carrhotus tholpettyensis* sp.n., holotype male (3–5), paratype female (6–8): 3, 6 — dorsal view; 4, 7 — ventral view; 5 — lateral view; 8 — carapace, frontal view. Scale bars: 2 mm.

Рис. 3–8. Габитус *Carrhotus tholpettyensis* sp.n., голотип-самец (3–5), паратип-самка (6–8): 3, 6 — вид сверху; 4, 7 — вид снизу; 5 — вид сбоку; 8 — головогрудь, вид спереди. Масштаб: 2 мм.

white setae (Fig 3). Clypeus low, light reddish brown, covered with long white setae. Chelicerae long, robust, dark reddish brown (Fig 5), promargin with two teeth and retromargin with a single tooth. Labium and endites reddish brown, with paler tips (Fig 4). Sternum yellowish brown, covered with grey hairs (Fig 4). Abdomen elongate, ovoid, brownish, with numerous pale yellowish speckles; anterior region with a pale yellow streak, medially with four pale yellowish transversely arranged patches, and its posterior half with a pair of yellowish round lateral conspicuous patches (Figs 3, 5); venter brownish, with two lateral broad creamy white longitudinal stripes that run from epigastric furrow to posterior end (Fig 4). Legs reddish brown, covered with numerous bristles, hairs and spines (Figs 3, 4). Spinnerets light brown, covered with hairs (Figs 4, 5). Palp elongate, dark reddish brown, tibia and cymbium with long dark brown bristles; RTA short, claw-like with curved tip; tegulum elongate with a posterior lobe; embolus nearly cone-shaped, situated anteriorly on bulbus, with a pointed tip directed at 11 o' clock (Figs 9–11, 14–15).

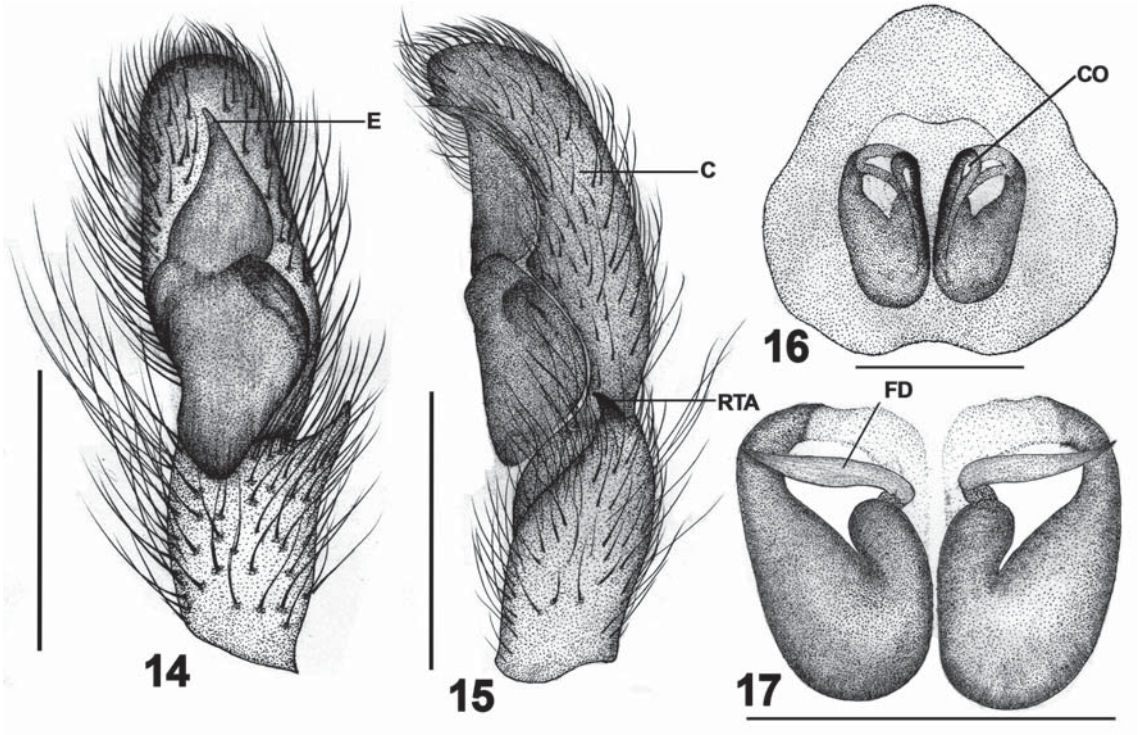
FEMALE (paratype; Figs 1, 6–8, 12–13, 16–17): Measurements. Body length 5.37. Carapace length 2.50, width (at the middle) 1.98. Abdomen length 3.01, width (at the middle) 1.91. Ocular area length 1.19, width 1.77. Eye diameters: AME 0.51, ALE 0.26, PME 0.05, PLE 0.24. Eye interdistances: AME–ALE 0.09, PME–PME 1.60, ALE–ALE 1.19, PME–PLE 0.27, PLE–PLE 1.50, ALE–PLE 0.73, AME–AME 0.05. Clypeus height 0.16. Length of chelicera 1.07. Measurement of palp and legs: palp 2.00 [0.76, 0.26, 0.39, 0.59], leg I 4.29 [1.37, 0.64, 1.01, 0.76, 0.51], II 3.75 [1.27, 0.60, 0.79, 0.53, 0.56], III 4.33 [1.58, 0.60, 0.82, 0.71, 0.62], IV 4.35 [1.45, 0.61, 0.92, 0.79, 0.58]. Leg



Figs 9–13. Copulatory organs of *Carrhotus tholpettyensis* sp.n.: 9 — left male palp, prolateral view; 10 — ditto, ventral view, 11 — ditto, retrolateral view; 12 — epigyne ventral view; 13 — vulva, dorsal view. Scale bars: 0.5 mm (9–11), 0.2 mm (12–13).

Рис. 9–13. Копулятивные органы *Carrhotus tholpettyensis* sp.n.: 9 — левая пальпа самца, вид сбоку-спереди; 10 — то же, вид снизу, 11 — то же, вид сбоку-сзади; 12 — эпигина, вид снизу; 13 — вульва, вид сверху. Масштаб: 0,5 мм (9–11), 0,2 мм (12–13).

formula: 4312. Leg spination: femur I–IV pl 2 rl 2 do 3; patella I–IV pl 1 rl 1; tibia I–II pl 3 rl 3 plv 3 rlv 3, III–IV pl 3 rl 3 rlv 2 plv 2; metatarsus I–IV pl 2 rl 2 rlv 2 plv 2; tarsus I–IV spineless. In all respects as the male except as follows: slightly smaller than the male; carapace dark reddish brown; chelicerae shorter; abdomen dark brown, its anterior margin with a conspicuous yellow stripe, medial transverse patches are better visible, posterior middle region with pairs of long and short transversely arranged stripes, and posterior tip with a pair of lateral yellow spots. Venter creamy white, with medial longitudinal broad dark brown stripes. Legs reddish orange. Palp yellowish brown. Epigyne simple, covered with long light brown hairs; copulatory openings located almost in the middle, region near the opening weakly sclerotized; copulatory ducts diverging laterally; spermathecae nearly as hockey stick heads, close to each other; fertilization ducts long, oriented laterally, situated at the anterior region of spermathecae (Figs 12–13, 16–17).



Figs 14–17. Copulatory organs of *Carrhotus tholpettyensis* sp.n.: 14 — left male palp, ventral view; 15 — ditto, retrolateral view; 16 — epigyne, ventral view; 17 — vulva, dorsal view. Scale bars: 0.5 mm (14–15), 0.2 mm (16–17).

Рис. 14–17. Копулятивные органы *Carrhotus tholpettyensis* sp.n.: 14 — левая пальпа самца, вид снизу; 15 — то же, вид сбоку-сзади; 16 — эпигина, вид снизу; 17 — вульва, вид сверху. Масштаб: 0,5 мм (14–15), 0,2 мм (16–17).

DISTRIBUTION. India (Kerala) and Sri Lanka [Prószyński, 2009: sub: *C. viduus*; present data].

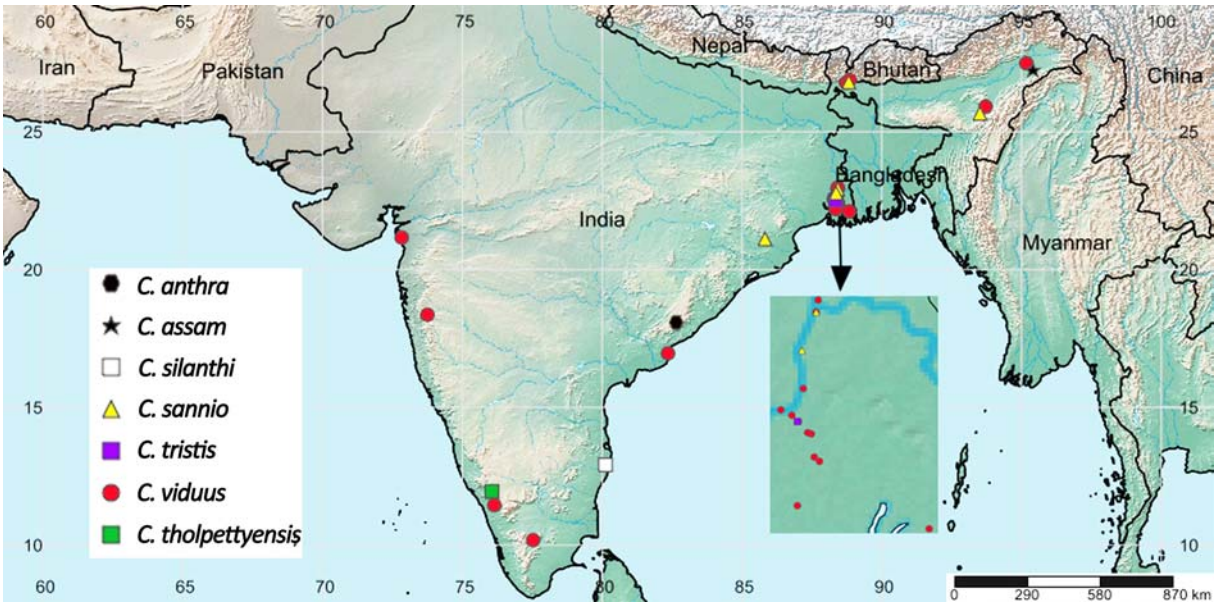
Carrhotus viduus (C.L. Koch, 1846)
Map.

Plexippus viduus C.L. Koch, 1846: 104, fig. 1166

Carrhotus viduus: Caleb *et al*., 2020: 61, figs 57–73, 76–78, 80–82.

For a complete list of taxonomic references see WSC [2021].

MATERIAL. INDIA: 2 ♂♂, 1 ♀ (CATE, 8712), Kerala, Wayanad District, Sulthan Bathery Range, the Wayanad Wildlife Sanctuary (11°43’54.5"N, 76°20’18.5"E), 896 m a.s.l., 14.03.2017, P.P. Sudhin & K.S. Nafin.



Map. Collecting localities of the Indian *Carrhotus* species.

Карта. Точки находок индийских видов *Carrhotus*.

DISTRIBUTION. Iran, India to China [WSC, 2021], Kerala (a new regional record) (Map).

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