The genera Haplotmarus Simon, 1909 and Indoxysticus gen. nov.: Two enigmatic genera of crab spiders from the Oriental region (Araneae: Thomisidae)

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The genera *Haplotmarus* Simon, 1909 and *Indoxysticus* gen. nov.: two enigmatic genera of crab spiders from the Oriental region (Araneae: Thomisidae)

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The genera *Haplotmarus* Simon, 1909 and *Indoxysticus* gen. nov., two enigmatic genera of crab spiders from the Oriental region (Araneae: Thomisidae). - The genus *Haplotmarus* Simon, 1909 has never been studied since its original description 100 years ago. In this paper, the type species *H. plumatilis* Simon, 1909 is redescribed and a provisional diagnosis for the genus is provided. A new genus, *Indoxysticus* gen. nov., type species *Xysticus minutus* Tikader, 1960, is proposed and diagnosed. *Haplotmarus* is distinguished by the following characters: prosoma and opisthosoma with numerous long setae, opisthosoma with dark patches in two parallel rows, epigynum with a copulatory chamber and a duct leading to multi-chambered spermathecae. *Indoxysticus minutus* females can be identified by their distinct oval spermathecae with well-defined chambers, males by their very distinct palp with a broad-based embolus.

Keywords: Systematics - taxonomy - biodiversity - India - Sri Lanka - Vietnam.

INTRODUCTION

Crab spiders (Thomisidae Sundevall, 1833) are cryptically colored sit-and-wait predators that do not build capture webs. Thomisidae is the sixth largest spider family, including 2093 described species in 173 genera (Platnick, 2009), with many more species remaining to be described. However, little progress has been made in understanding the phylogeny of this key dionychan family since Simon's seminal work almost a century ago (but see Benjamin *et al*., 2008). One of the key obstacles to understanding thomisid interrelationships is a large number of genera that remain unknown or "little known"; they have never been studied since their original descriptions. The genus *Haplotmarus* is such an instance, it has never been studied since its original description 100 years ago and no illustrations of its type species were given in Simon (1909). *Haplotmarus* is currently monotypic. The type species of the genus, *Haplotmarus plumatilis*, is here redescribed and diagnosed. Males of *H. plumatilis* remain unknown; we could not find any in major museum collections.

Indoxysticus minutus was originally placed in *Xysticus* C. L. Koch, 1835. Here it is redescribed and diagnosed on the basis of material from Sri Lanka and India. This study is part of an ongoing island-wide survey of spider diversity in Sri Lanka.

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METHODS

Methodology follows Benjamin (2004). Specimens used for habitus illustrations were placed on washed sand in 70% ethanol and photographed using a stereomicroscope (Leica MZAPO) with top illumination and a magnification of up to 50x. Digital images were taken with a Nikon DXM1200F camera. Images were edited using an Auto-Montage® software package. Left structures are depicted. Hairs and macrosetae are not depicted in the palp drawings. All measurements are given in millimeters and were taken with a compound microscope (Leica MZAPO) equipped with a 10x ocular and an ocular micrometer scale.

The following anatomical abbreviations are used in the text and figures: ALE = anterior lateral eyes; AME = anterior median eyes; CC = copulatory chamber; CD = copulatory duct; CO = copulatory opening; E = embolus; FD = fertilization duct; PLE = posterior lateral eyes; PME = posterior median eyes; RTA = retrolateral tibial apophysis; S = spermatheca; TS = subtegular prong; VTA = ventral tibial apophysis. The following institutional abbreviations are used in the text: MNHN = Muséum national d´Histoire naturelle, Paris; MHNG = Muséum d´histoire naturelle, Geneva; HECO = Hope Entomological Collection of the Oxford University, Oxford; ZSI = Zoological Survey of India, Calcutta.

TAXONOMY

FAMILY **THOMISIDAE** SUNDEVALL, 1833

Genus ***Haplotmarus*** Simon, 1909

TYPE SPECIES: *Haplotmarus plumatilis* Simon, 1909: 126, by original designation.

COMPOSITION: *Haplotmarus plumatilis* from Vietnam.

DIAGNOSIS: *Haplotmarus* is distinguished by the collective presence of the following characters. Prosoma and opisthosoma with numerous long setae, opisthosoma with two parallel longitudinal rows of dark patches (Figs 1-2). Epigynum with a copulatory chamber (CC) and a short duct (CD) which leads to a winding, elongated, multi-chambered spermatheca (S) (Figs 5-7).

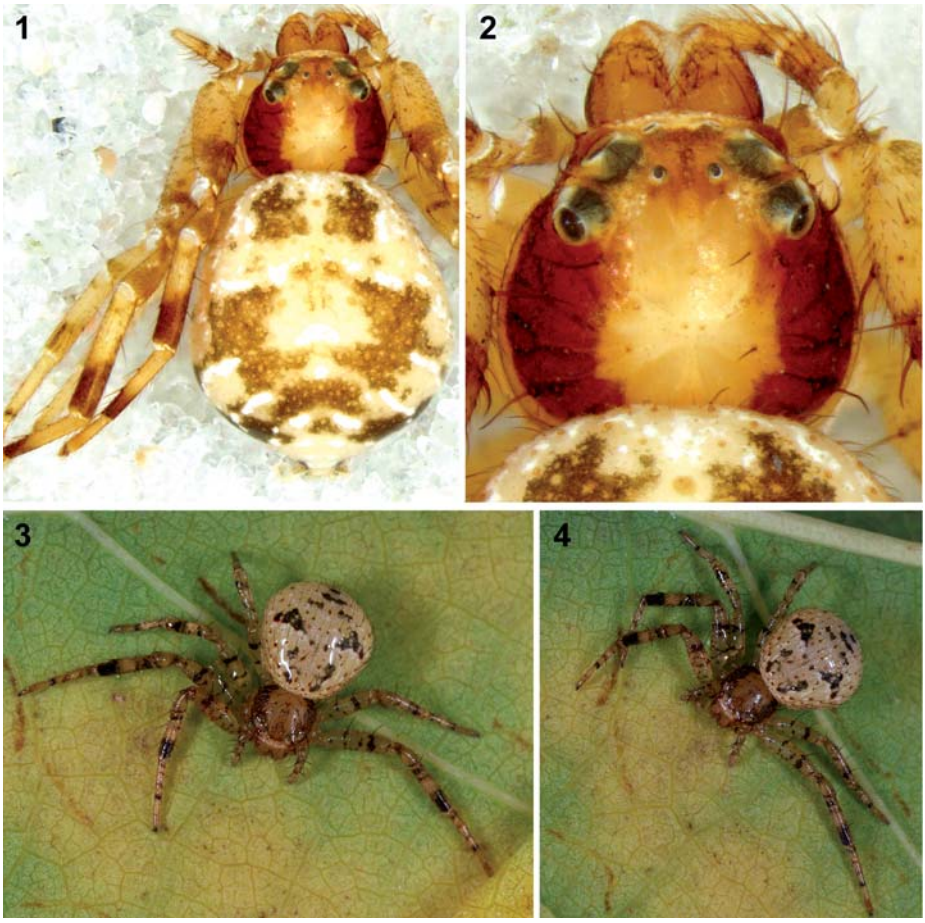
REMARKS: *Haplotmarus* might turn out to be a junior synonym of *Philodamia* Thorell, 1894 and a senior synonymy of *Sinothomisus* Tang *et al*., 2006. *Sinothomisus* falls well within the limits of the genus *Philodamia*. However, any further nomenclatural changes and clarifications of its place on the phylogenetic tree of the Thomisidae must await the discovery of the male of the type species of *Haplotmarus* and that of *Philodamia*, *P. hilaris* Thorell, 1894, as well as a phylogenetic study that includes these and a large number of other thomisid genera.

DESCRIPTION: See description of the type species below.

Haplotmarus plumatilis Simon, 1909 Figs 1-2, 5-7

Haplotmarus plumatilis Simon, 1909: 126.

MATERIAL: The examined type series (MNHN 23205) consist of a single adult female and 4 juvenile specimens, all from Vietnam (label: Tonkin, which is now northern Vietnam). The adult female is here designated as the lectotype to better define the species.



FIGS 1-4

Photographs of *Haplotmarus plumatilis* (1-2) and of *Indoxysticus minutus* (3-4) from the Ethagala Mountains, Sri Lanka. (1-2) Female lectotype (MNHN 23205), dorsal view. (3-4) Live female, dorsal view.

DESCRIPTION FEMALE (male unknown): Total length 4.0; prosoma length 1.8, width 1.7. Leg I: femur 1.0, patella 0.5, tibia 0.8, metatarsus 0.6, tarsus 0.6. Prosoma with numerous long setae (Figs 1-2), dark red-brown in color, sides darker, with white patches around the eyes. Eyes in two recurved rows, PLE > ALE > AME > PME. Opisthosoma round, with numerous long setae, light brown-yellow, dorsally with very characteristic black and white markings as in Figs 1-2. Legs I-IV dorsally with black and white markings as in Fig. 1. Chelicerae, labium and ventral parts lighter than dorsal parts. Leg formula (from longest to shortest) 2143. Epigynum and vulva as in Figs 5-7. Spermathecae distinctively tubular in shape.

Indoxysticus gen. nov.

TYPE SPECIES: *Xysticus minutus* Tikader, 1960.

ETYMOLOGY: The masculine generic name is derived from the name of the country (India) where the type species was first described and from the generic name *Xysticus*.

DIAGNOSIS AND DESCRIPTION: See species section below.

REMARKS: The establishment of a monotypic genus is controversial. However, it is necessary in this case to maintain the monophyly of Xysticus. Molecular data lends support to the removal of *I. minutus* (Tikader, 1960) comb. nov. from *Xysticus*. *Indoxysticus* is not sister to or closely related to *Xysticus* (see Benjamin *et al*., 2008: figs 3-7). Several species currently described in Xysticus from India may be misplaced and should be transferred to *Indoxysticus*.

COMPOSITION: Only one species, *Indoxysticus minutus* (Tikader, 1960) comb. nov.

DISTRIBUTION: India and Sri Lanka.

Indoxysticus minutus (Tikader, 1960) comb. nov. Figs 3-4, 8-15

Xysticus minutus Tikader, 1960: 1-2, fig. 1a, b; male holotype from Calcutta in ZSI, not examined; see remarks below. – Tikader, 1968: 113, figs 18-20; first description of female. – Tikader, 1971: 50: fig. 14k-m. – Tikader, 1980: 120, figs 165-167; male, probably misidentified. – Tikader & Biswas, 1981: 80, figs 143-144.

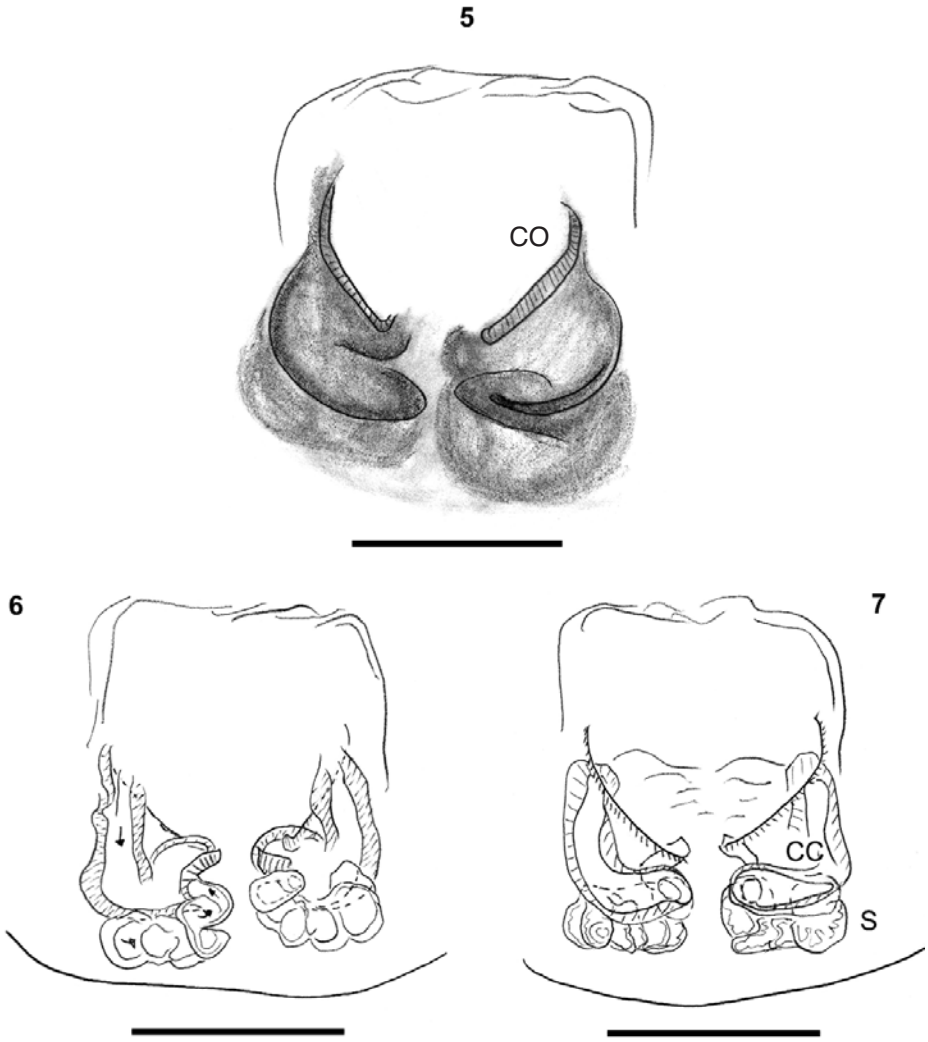
Xysticus minutes: Gajbe, 2007: 444, figs 44-46; lapsus calami.

Haplotmarus sp.: Benjamin *et al*., 2008: table 1; provisional placement to facilitate molecular characterization.

MATERIAL EXAMINED: Sri Lanka, Western Province, Colombo, Thimbirigasyaya, 2♂, 3♀, 21.02.1998, leg. S. P. Benjamin; Sri Lanka, Western Province, Colombo, Bellanwila-Attidiya, 0.6 m, 1♀, 8.03.1998, leg. S. P. Benjamin. – Sri Lanka, North Western Province, Kurunegala District, Kurunegala, Ethagala Mountains, 7°45′00″N, 80°15′00″E, 300 m, 28.02.2007, leg. Ziyard Jaleel, 1♀. – Same locality as previous, 5.02.2008, leg. Ziyard Jaleel, 1♀. All above mentioned material deposited in MHNG. – India, Bombay, 1♂, 1♀, collection date and collector unknown, HECO.

DIAGNOSIS: Females can be distinguished by the distinct oval spermathecae (Figs 13-15) which have well-defined chambers. Males of *I. minutus* have a very distinct palp with a broad-based embolus and a subtegular prong (TS) that originates behind the embolus (Figs 10-12). Distinguished from *Xysticus* by the lack of the following characters diagnostic for *Xysticus*: cymbium modified with guide pockets for the embolus, tegulum with several spine-like tegular apophyses, epigynum with a median septum. *Xysticus* spp. live on the ground, whereas *Indoxysticus minutus* lives in the vegetation. *Indoxysticus* gen. nov. can be distinguished from *Haplotmarus* by the anterior hoods of the epigynum, copulatory chamber (CC) and oval spermathecae (S).

DESCRIPTION MALE: Total length 2.1; prosoma length 1.0, width 1.0. Leg I: femur 0.6, patella 0.4, tibia 0.6, metatarsus 0.5, tarsus 0.4. Prosoma round, red-brown colored, lateral parts darker, markings as in Fig. 9. Eyes in two recurved rows, PLE > ALE > AME > PME. Chelicera, labium and dorsal parts lighter in colour. Opisthosoma oval, tapering towards the rear end, yellow-brown colored, with markings as in Fig. 9. Legs I-IV yellow to shades of brown, with black rings throughout. Leg formula (from longest to shortest) 2143. Palp: tibia short, VTA and RTA present, RTA long and broad-

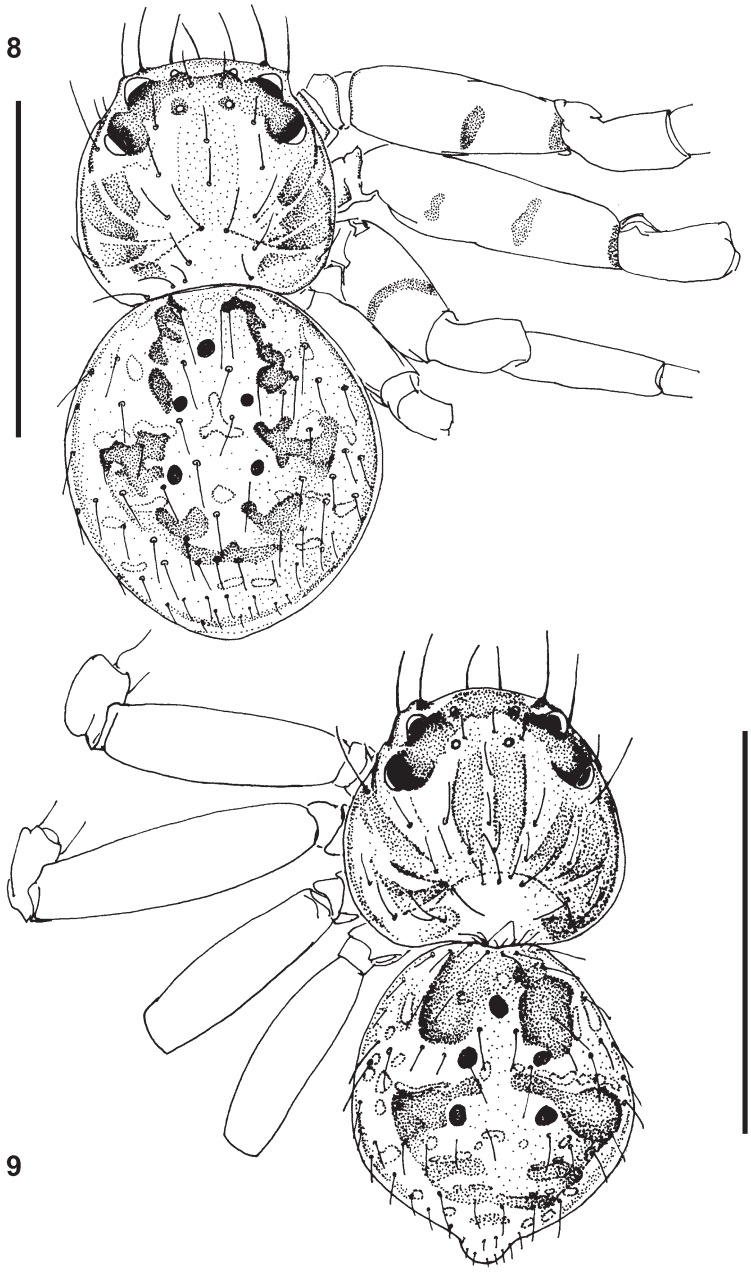


FIGS 5-7

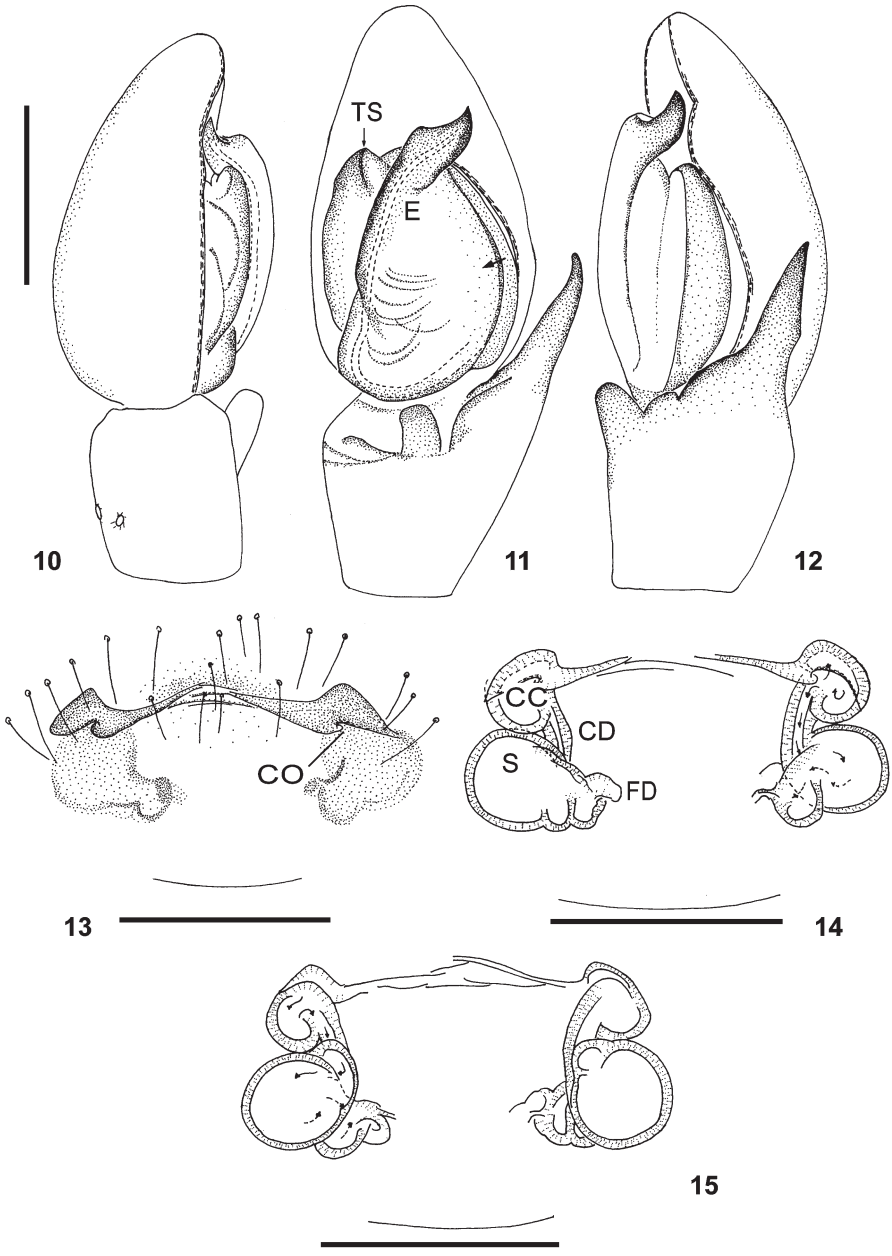
Haplotmarus plumatilis, female lectotype (MNHN 23205). (5) Epigynum, ventral view. (6) Vulva, ventral view. (7) Ditto, dorsal view. Scale lines = 0.2 mm.

based. Bulb longer than wide, without tegular ridges, with a projecting subtegular prong at its inner side (TS in Fig. 9), embolus strongly developed, with an outwards projecting terminal hook, basally broad, membranous on the outsides (see arrow in Fig. 11).

DESCRIPTION FEMALE: Total length 3.5; prosoma length 1.1, width 1.2. Legs I: femur 0.9, patella 0.5, tibia 0.7, metatarsus 0.5, tarsus 0.5. Markings as in Figs 3-4, 8. Prosoma dark black-brown, sides darker, with red patches in front and around AME.



FIGS 8-9
Habitus of *Indoxysticus minutus*. (8) Female. (9) Male. Scale lines = 2 mm.



FIGS 10-15

Details of *Indoxysticus minutus* genitalia. (10) Left male palp, prolateral view. (11) Ditto, ventral view. (12) Ditto, retrolateral view; note the broad-based embolus. (13) Epigynum, ventral view. (14) Vulva, ventral view. (15) Ditto, ventral view. Scale lines = 0.2 mm.

Opisthosoma round, light reddish brown, dorsally with very characteristic white markings as in Figs 3-4. Legs I-IV dorsally with white markings as in Figs 3-4, 8. Eyes as in male. Chelicera and labium ventrally lighter in color than dorsally. Leg formula 2143. Leg spination as in male. Epigynum and vulva as in Figs 13-15. Copulatory openings widely separated, with distinct sclerotized margins. Copulatory ducts parallel to each other, leading to chambered spermathecae.

NATURAL HISTORY: Specimens were collected by beating dry parts of shrubs and flowering plants. Spiders, at least during the day, seem to hide in dry parts of plants, their brown color and markings serving well to camouflage them. They were conspicuously absent on flowers.

DISTRIBUTION: Known from Sri Lanka and India. This species is widespread in Sri Lanka and probably also in India. Tikader (1980: 121) lists the species distribution as follows: West Bengal, Poona, Shillong, Gujarat. We have seen material from Tamil Nadu and Bombay.

REMARKS: We have been unable to examine the holotype. It is generally thought that Tikader's collections are deposited in the ZSI (Tikader, 1980). Unfortunately, our repeated attempts to contact personal there have so far been unsuccessful.

Our identification of newly collected material is based solely on Tikader's illustrations of the holotype (Tikader, 1960: figs 1-2). He later published several other taxonomic accounts on *X. minutus* (Tikader, 1968; 1971; 1980; Tikader & Biswas, 1981). Some of them seem to be based on misidentification, for example, Tikader (1980: figs 166-167) provides the redescription of putative *X. minutus* specimens. Judging from his illustrations, the female seems to be correctly identified, but the illustrated male seems to be misidentified as it differs completely from the description and illustrations of the holotype. Such issues are not uncommon in Tikader's publications.

Although Tikader's (1960: figs 1-2) illustrations are not quite accurate, the following characters of the very distinct male palp of this species are recognizable in his drawings and are sufficient for identification: (1) the shape of the RTA; (2) the subtegular prong (TS) which is visible as a hump on the anterior-prolateral side of the palp illustrated in fig. 1b; (3) the unique, slightly bifurcate tip or terminal hook of the embolus (E) is clearly recognizable in fig. 1b; (4) the unique broad-based embolus (E) which is shown as a dark line crossing the tegulum in fig. 1b.

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