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Two new species of *Thrixopelma* Schmidt, 1994 from Peru (Araneae: Theraphosidae)

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ABSTRACT

Two new species of *Thrixopelma* Schmidt, 1994 are described from Peru based on historic male specimens: *Thrixopelma christineae* **sp. nov.** and *Thrixopelma eliseanneae* **sp. nov.**, both deposited in the Muséum national d'histoire naturelle, Paris. This work increases the diversity of this genus to ten, and the total number of congeners known from Peru to nine.

Key words: taxonomy, morphology, tarantula, museums, palpal bulb

INTRODUCTION

The genus *Thrixopelma* Schmidt, 1994 currently contains eight species (World Spider Catalog, 2024), namely: *T. aymara* (Chamberlin, 1916), *T. cyaneolum* Schmidt, Friebolin & Friebolin, 2005, *T. lagunas* Schmidt & Rudloff, 2010, *T. longicolli* (Schmidt, 2003), *T. nadineae* Sherwood & Gabriel, 2022, *T. ockerti* Schmidt, 1994 (type species), *T. peruvianum* (Schmidt, 2007), and *T. pruriens* Schmidt, 1998; and recently underwent revision (Sherwood *et al.*, 2021a). Currently, five species are known from Peru exclusively (*T. aymara*, *T. cyaneolum*, *T. lagunas*, *T. ockerti*, *T. peruvianum*), whereas *T. longicolli* is known from both Ecuador and Peru, *T. ockerti* allegedly from both Peru and Chile, and *T. nadineae* is known only from Ecuador.

Of the seven species found in Peru, *T. aymara* and *T. peruvianum* are known only from the female, while *T. cyaneolum*, *T. lagunas*, *T. longicolli*, *T. ockerti*, and *T. pruriens* are known from both sexes (but see comments about the male of *T. cyaneolum* in Sherwood *et al*., 2021a). Recently, RG located two undetermined male Peruvian *Thrixopelma* specimens whilst continuing our work in the collections at the Muséum national d'histoire naturelle, Paris. We placed them in the genus *Thrixopelma* based on the elongate and two-crested prolateral inferior keel of the palpal bulb, a distinctive character for this group (Sherwood *et al*., 2021a).

In this work, two new species of *Thrixopelma* are described based on distinctive palpal bulb morphology. We thereby expand the number of known species to ten and raise the number of *Thrixopelma* known to occur in Peru to nine.

MATERIALS AND METHODS

Specimens were examined under binocular microscopes. Photographs of palpal bulbs and tibial apophyses were made using a Leica M125C, those of habitus with an Olympus TG5. Description style follows Sherwood *et al*. (2020). Abbreviations – Institutes: MNHN = Muséum national d'histoire naturelle, Paris, France; SMF = Senckenberg Forschungsinstitut und Naturmuseum, Frankfurt am Main, Germany; ZMH = Zoologisches Museum, Universität Hamburg, Germany. Structures: ALE = anterior lateral eyes, AME = anterior median eyes, PLE = posterior lateral eyes, PME = posterior median eyes; PB = prolateral branch (of tibial apophysis), RB = retrolateral branch (of tibial apophysis). Other: coll. = collector; colln. = collection; det. = determined by. Leg spine terminology follows Petrunkevitch (1925) with the modifications proposed by Bertani (2001): d = dorsal, v = ventral, r = retrolateral, p = prolateral. Palpal bulb terminology follows Bertani (2000) with modifications for the retrolateral keel: A = apical keel, PAc = prolateral accessory keel; PI = prolateral inferior keel, PS = prolateral superior keel, RS = retrolateral superior keel, SA = subapical keel, TH = tegular heel; with the additions proposed by Gabriel & Sherwood (2020): ER = embolic ridge, PR = prolateral ridge, PAR = prolateral apical ridge, PC = prolateral crease. Leg formulae start

with the longest leg to the shortest in order of decreasing size, e.g. 4,1,2,3. Urticating setae terminology follows Cooke, Roth & Miller (1972). All measurements are in mm. Data labels are transcribed verbatim. The numbers "4424" and "19921" in the label data of the respective species descriptions refer to the Eugène Simon collection numbers and are not to be confused with modern MNHN accession numbers (see Sherwood *et al*., 2021b). Geographic coordinates were approximated for the type localities in the distribution section by inputting the locality names into Google Earth™.

RESULTS

Taxonomy

***Thrixopelma christineae* sp. nov.**
(Figs. 1–2, 5G)

LSID: urn:lsid:zoobank.org:act:249AED36-53C0-4E8E-9CAD-54E338211FB9

Type material: Holotype ♂ (MNHN AR–4846), Lima, Peru, coll. Brol, 4424, E. Simon colln.

Diagnosis: *Thrixopelma christineae* **sp. nov.** is readily distinguished from *T. ockerti* by the non-spatulate embolus (embolus spatulate in *T. ockerti*), and from all other properly known male congeners (Figs. 3A–I, 4, 5A–F, H–I) by the basal and medial crests of the PI both being weakly developed (crests not both weakly developed in all known congeners), and the weakly developed PI itself (PI developed in *T. lagunas* and *T. nadineae*; well-developed in *T. eliseanneae* **sp. nov.** and *T. longicolli*). Further distinguished from *T. eliseanneae* **sp. nov.** and *T. nadineae* by the weakly developed PS (developed in *T. eliseanneae* **sp. nov.** and *T. nadineae*), and from *T. lagunas*, *T. longicolli*, and *T. nadineae* by presence of an RS (absent in *T. lagunas*, *T. longicolli*, and *T. nadineae*).

Etymology: The specific epithet is a matronym in honour of our friend and colleague Christine Rollard (Curator of Araneae, Muséum national d'histoire naturelle, Paris) in recognition of her decades of service as curator of one of the greatest arachnological collections in the world. We are most grateful to her for hosting us each year, and for countless loans during our careers.

Description of holotype male: Total length including chelicerae: 52.9. Carapace: length 22.9, width 20.4. Caput: slightly raised. Ocular tubercle: raised, length 1.4, width 2.7. Eyes: AME > ALE, ALE > PLE, PLE > PME, anterior eye row procurved, posterior row slightly recurved. Clypeus: narrow; clypeal fringe: long. Fovea: uninterpretable due to damage. Chelicera: length 8.2, width 3.8. Abdomen: length 21.8, width 12.5. Maxilla with 110–120 cuspules covering approximately 36% of the proximal edge. Labium: length 1.9, width 2.2, with 60–65 cuspules most separated by 0.5–1.0 times the width of a single cuspule. Labio-sternal mounds: separate. Sternum: length 9.8, width 8.3, with three pairs of sigillae. Tarsi I–IV fully scopulate. Metatarsal scopulae: I 100%; II 70%; III 30%; IV 10%. Lengths of legs and palpal segments: see table 1, legs 4,1,2,3. Spination: femur III d 0–0–2, IV d 0–0–2, tibia I d 2–2–1, v 1–1–1, II d 1–0–0, v 2–2–5, III d 2–2–1, v 1–2–3, IV d 1–2–2, v 2–2–3, palp p 1–0–0, metatarsus I v 0–1–1 (apical), II v 2–2–1 (apical), III d 2–2–2, v 1–3–4 (3 apical), IV d 2–2–2, v 1–5–4 (3 apical). Tibia I with paired tibial apophysis, RB longer than PB, each with a single megaspine on the prolateral face, PB megaspine distinctly flattened and wide (Fig. 1 F–H). Femur III: incrassate. Palpal tibia: with retrolateral apophysis weakly developed (Fig. 1I–J). Palpal cymbium: unmodified. Metatarsus I: slightly curved, closes on apex of RB (Fig. 5G). Posterior lateral spinnerets with three segments, basal 2.2, median 1.7, digitiform apical 2.8. Posterior median spinnerets with one segment. Palpal bulb with TH developed; embolus moderately thick, tapering towards apex; PS and A weakly developed, RS developed; PI weakly developed, elongate, disjunct, originating ventrally at the base of the bulb and running prolaterally towards the apex of the embolus, with a weakly developed basal crest and weakly developed medial crest; PC present and constricted

in distal half (Figs. 1A–E; see also table 3). Urticating setae: Type III present dorsally. Colour: alcohol preserved brown; abdomen covered densely in long red setae (Fig. 2).

Distribution: Known only from the type locality, Lima, Peru (12°03'S, 77°02'W).

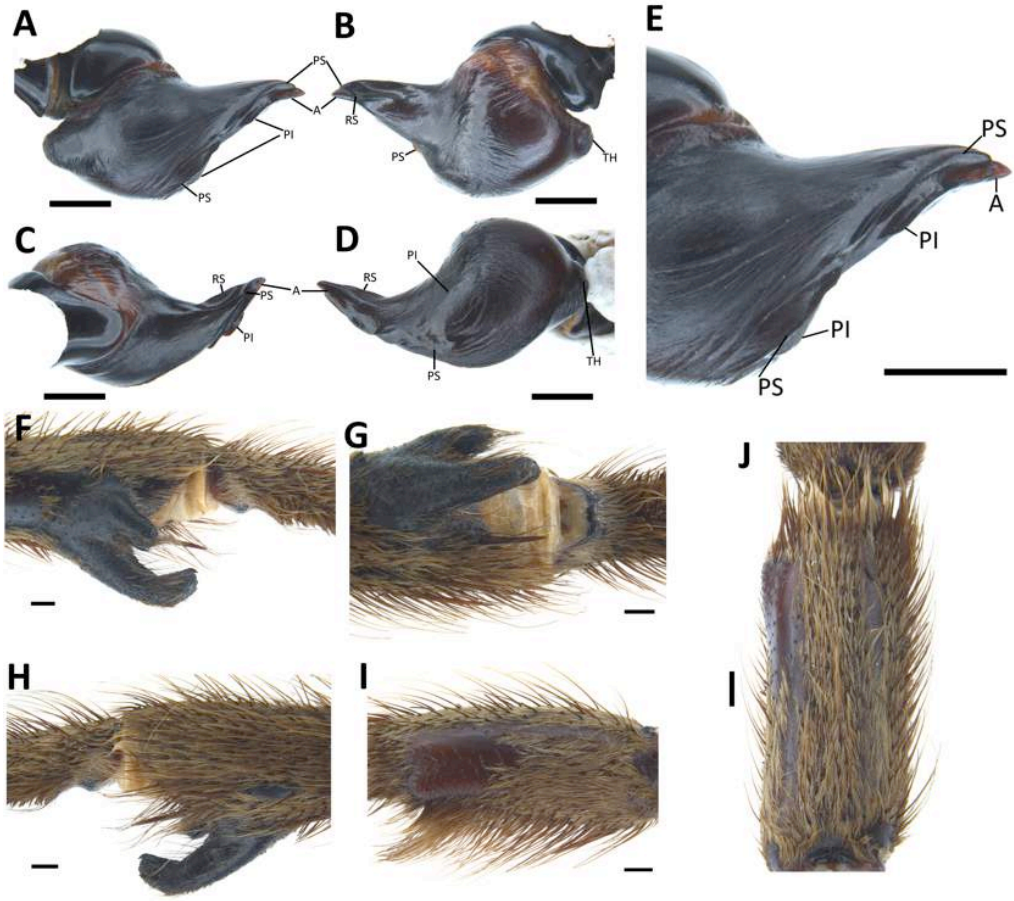

Fig. 1: *Thrixopelma christineae* **sp. nov.** holotype male (MNHN AR–4846), A–E palpal bulb (left-hand side), F–H tibial apophysis (left-hand side), I–J palpal tibia (left-hand side). A prolateral view, B retrolateral view, C dorsal view, D ventral view, E close-up of embolus in prolateral view, F prolateral view, G ventral view, H retrolateral view, I retrolateral view, J dorsal view. Scale bars = 1mm.

Fig. 2: *Thrixopelma christineae* **sp. nov.** holotype male (MNHN AR–4846), habitus of specimen with modern data label. Scale bar = 20mm.

Remarks: Whilst undertaking this work, we considered whether the (holotype) male could instead be the undescribed male of *T. aymara* or *T. peruvianum*. However, we rule this out for *T. aymara* because the type locality of *T. aymara* is Aymas, a village situated high in the Andes, significantly disjunct from the type locality of *T. christineae* **sp. nov.** As evidenced by many recent publications (Ferretti *et al*., 2018; Sherwood *et al*., 2021b; Kaderka *et al*., 2021), Peruvian theraphosids are highly diverse in comparatively short distances between ecoregions and even neighbouring valleys. The type locality of *T. peruvianum*, a species described from an exuvia, is unknown. However, *T. peruvianum* has a much smaller number of labial cuspules (n = 40 per Schmidt, 2007). Based on our examination of other *Thrixopelma* material, including all types, we have not seen distinct intraspecific sexual dimorphism in the number of labial cuspules and thus consider this to be sufficient evidence to rule out conspecifity between *T. peruvianum* and *T. christineae* **sp. nov.** Furthermore, we suspect *T. peruvianum* is in any case a synonym of *T. longicolli*, given the spermathecal morphology matches with one spermathecae found in the type series of the latter species. However, collection of further material is required to be certain of this, given problems associated with the paratypes of the latter which contain a mix of spermathecae from different species (see Sherwood *et al*., 2021a).

***Thrixopelma eliseanneae* sp. nov.**
(Figs. 3–4, 5H)
LSID: urn:lsid:zoobank.org:act:FEFC75A1-F3BD-446A-A778-E22A6D19EC5A

Type material: Holotype ♂ (MNHN AR–4852), Grao Tumbez, Peru, coll. Baer, 19921, E. Simon colln.; paratypes 2 ♂♂ (MNHN AR–4852), same data (separate tube).

Diagnosis: *Thrixopelma eliseanneae* **sp. nov.** is readily distinguished from *T. ockerti* by the non-spatulate embolus (embolus spatulate in *T. ockerti*), and from all other properly known male congeners (Figs. 1A–I, 2, 5A–G, I) by the presence of both a weakly developed basal crest and a well-developed distal crest on the PS (crests absent on PS in *T. christineae* **sp. nov.,** *T. lagunas* and *T. longicolli*; basal crest developed and distal crest absent on PS in *T. nadineae*), PI with basal and medial crests both well-developed (crests not both well-developed in all known congeners), and by the thick embolus, barely tapering at apex (embolus not so in all known congeners). Further distinguished from *T. christineae* **sp. nov.**, *T. lagunas*, and *T. longicolli* by the developed and elongate PS (PS weakly developed and non-elongate in *T. christineae* **sp. nov.**, *T. lagunas*, and *T. longicolli*), and from *T. christineae* **sp. nov.**, *T. lagunas* and *T. nadineae* by the well-developed PI (PI weakly developed in *T. christineae* **sp. nov.**; developed in *T. lagunas* and *T. nadineae*). Additionally distinguished from *T. lagunas*, *T. longicolli*, and *T. nadineae* by presence of an RS (absent in *T. lagunas*, *T. longicolli* and *T. nadineae*).

Etymology: The specific epithet is a matronym in honour of our friend and colleague Elise-Anne Leguin (Collection Manager, Muséum national d'histoire naturelle, Paris) in recognition of her years of service caring for the arachnid collection of the museum. We are most grateful to her for support during our visits, promptly sending images when requested, and for arranging our many loans over the years.

Description of holotype male: Total length including chelicerae: 37.0. Carapace: length 15.9, width 13.8. Caput: slightly raised. Ocular tubercle: raised, length 1.3, width 2.2. Eyes: AME > ALE, ALE > PLE, PLE > PME, anterior eye row procurved, posterior row slightly recurved. Clypeus: narrow; clypeal fringe: long. Fovea: (damaged) deep, slightly recurved. Chelicera: length 6.0, width 3.3. Abdomen: length 15.1, width 8.2. Maxilla with 100–120 cuspules covering approximately 46% of the proximal edge. Labium: length 1.7, width 2.3, with 65–70 cuspules most separated by 0.5–1.0 times the width of a single cuspule. Labio-sternal mounds: separate. Sternum: length 6.5, width 6.4, with three pairs of sigillae. Tarsi I–IV fully scopulate. Metatarsal scopulae: I 100%; II 45%; III 44%; IV 18%. Lengths of legs and palpal segments: see table 2, legs 4,1,2,3. Spination: femur III d 0–0–1,

IV d 0–0–1, tibia II d 0–0–1, v 3–1–2, III d 2–0–2, v 1–1–2, IV d 2–2–0, v 1–1–2, palp p 0–1–0, metatarsus I v 0–0–1 (apical), II v 1–1–3 (apical), III d 2–0–2, v 2–2–4 (3 apical), IV d 2–2–2, v 2–3–5 (3 apical). Tibia I with paired tibial apophysis, RB longer than PB, each with a single megaspine on the prolateral face, PB megaspine distinctly flattened and wide (Figs. 2F–H). Femur III: incrassate. Palpal tibia: with retrolateral apophysis developed (Figs. 2I–J). Palpal cymbium: unmodified. Metatarsus I: curved, closes on apex of RB (Fig. 5H). Posterior lateral spinnerets with three segments, basal 2.2, median 1.3, digitiform apical 2.8. Posterior median spinnerets with one segment. Palpal bulb with TH developed; embolus very thick, barely tapering at apex; A, and RS weakly developed; PS developed, elongate, disjunct, originating prolaterally at base of bulb and running prolaterally towards apex of embolus with weakly developed basal crest and well-developed distal crest; PI well-developed, elongate, disjunct, originating ventrally at the base of the bulb and running prolaterally towards the apex of the embolus, with well-developed basal crest and well-developed medial crest; RS elongate; PC present and constricted in distal quarter (Figs. 2A–E; see also table 3). Urticating setae: Type III present dorsally. Colour: alcohol preserved brown, carapace clothed in beige pubescence, abdomen covered densely in long red setae (Fig. 4).

Distribution: Known only from the type locality, Tumbes, Peru (03°34′15″S, 80°27′35″W).

Remarks: As per the remarks for *T. christineae* **sp. nov.**, we considered the possibility that the holotype of *T. eliseanneae* **sp. nov.** may be the undescribed male of *T. aymara* or *T. peruvianum*. We ruled out both, based on the significantly disjunct localities, and greater number of labial cuspules, respectively. There are also two immature specimens in the second tube alongside the paratype males. As we cannot be entirely sure they are conspecific, being non-adult (cases of sympatric congeners are known for other theraphosines in Ecuador), the immature specimens are hereby explicitly not included in the type series.

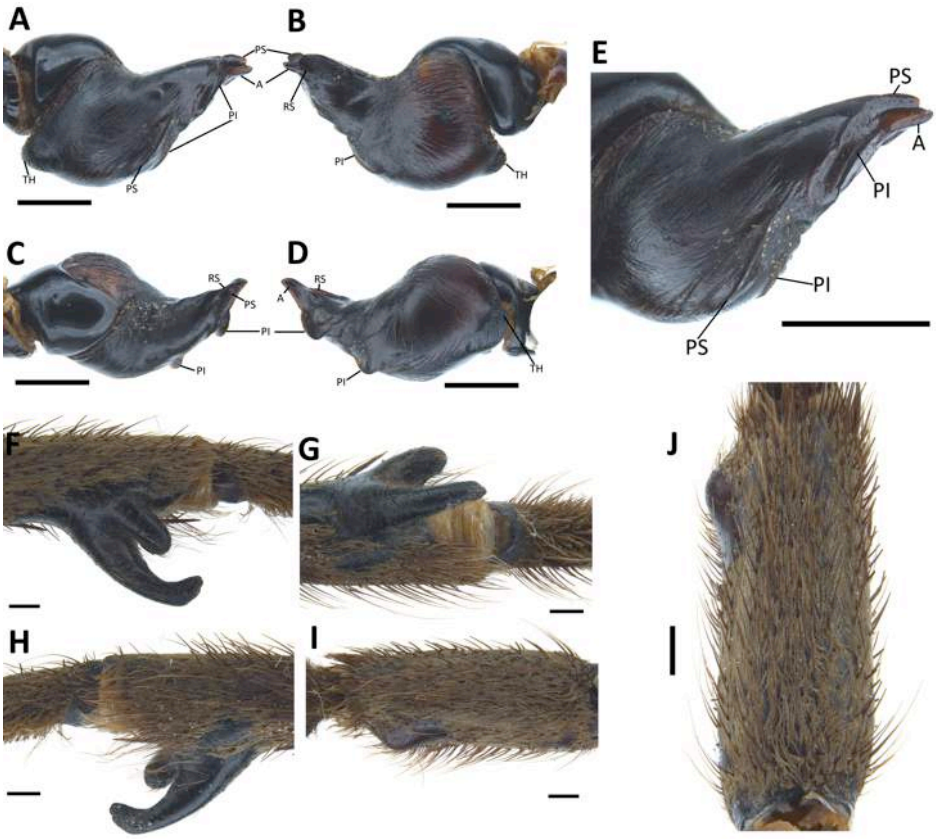

Fig. 3: *Thrixopelma eliseanneae* **sp. nov.** holotype male (MNHN AR–4852), A–E palpal bulb (left-hand side), F–H tibial apophysis (left-hand side), I–J palpal tibia (left-hand side). A prolateral view, B retrolateral view, C dorsal view, D ventral view, E close-up of embolus in prolateral view, F prolateral view, G ventral view, H retrolateral view, I retrolateral view, J dorsal view. Scale bars = 1mm.

Table 1: *Thrixopelma christineae* **sp. nov.**

(MNHN AR–4846) holotype male, podomere lengths.

	I	II	III	IV	Palp
Femur	19.9	17.2	16.2	20.6	11.2
Patella	10.7	8.6	8.8	9.4	6.6
Tibia	15.5	15.7	14.0	16.6	10.1
Metatarsus	15.4	14.5	16.4	22.4	–
Tarsus	11.2	10.0	10.5	11.3	3.4
Total	72.7	66.0	65.9	80.3	31.3

Table 2: *Thrixopelma eliseanneae* **sp. nov.**

(MNHN AR–4852) holotype male, podomere lengths.

	I	II	III	IV	Palp
Femur	14.9	15.0	12.1	16.4	8.5
Patella	7.7	6.6	5.6	6.6	5.0
Tibia	13.4	12.6	10.3	13.5	7.7
Metatarsus	11.7	12.1	12.5	18.2	–
Tarsus	8.3	7.7	7.3	7.2	2.6
Total	56.0	54.0	47.8	61.9	23.8

Table 3: Bulb keel morphology of *Thrixopelma* Schmidt, 1994 species where males are properly described. Adapted and updated from Sherwood & Gabriel (2022). Homologous keels present: weakly developed (+), developed (++), well-developed (+++), or absent (–).

Taxon	PS	PI	A	SA	RS	RI	Additional Comments
Thrixopelma christineae **sp. nov.**	+	+	+	–	++	–	PS non-elongate, disjunct, without crest; PI elongate, basal and medial crests weakly developed, ER, PR, and PAR absent, PC present, constricted in distal quarter.
Thrixopelma eliseanneae **sp. nov.**	++	+++	+	–	+	–	PS elongate, disjunct, with weakly developed basal crest and well-developed distal crest, PI elongate, basal and medial crests well-developed, ER, PR, and PAR absent, PC present, constricted in distal half.
Thrixopelma lagunas Schmidt & Rudloff, 2010	+	++	+	–	–	–	PS non-elongate, without crest, PI elongate, medial crest well-developed, basal crest developed, ER, PR and PAR absent, PC present, somewhat widened in posterior third, constricted in distal third.
Thrixopelma longicolli (Schmidt, 2003)	+	+++	+	–	–	–	PS non-elongate, without crest, PI elongate, medial crest developed, basal crest well-developed, ER, PR and PAR absent, PC present, somewhat widened in posterior third, constricted in distal third.
Thrixopelma nadineae Sherwood & Gabriel, 2022	++	++	+	–	–	–	PS elongate, disjunct, with developed basal crest, PI elongate, disjunct, medial crest developed, basal crest absent, ER, PR and PA absent, PC present, somewhat widened in posterior third, constricted in distal third.

Fig. 4: *Thrixopelma eliseanneae* **sp. nov.** holotype male (MNHN AR–4852), habitus of specimen with modern data label. Scale bar = 20mm.

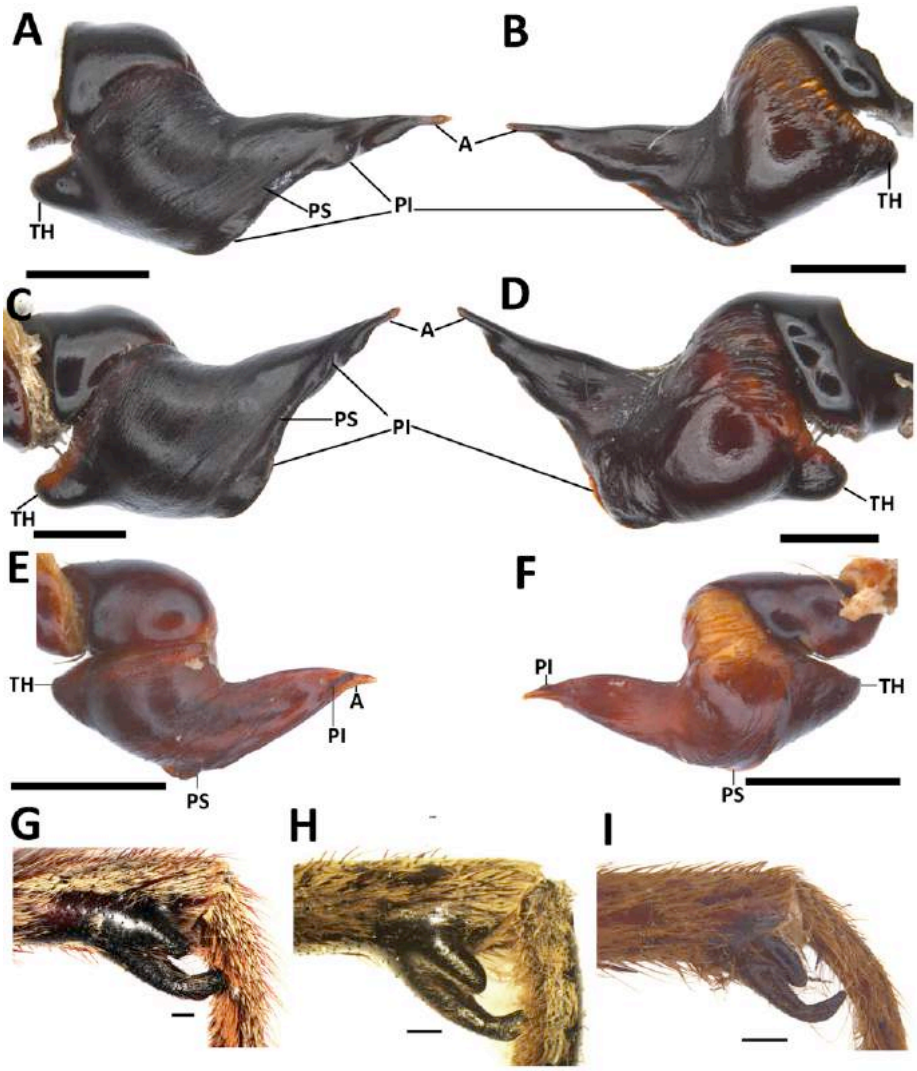

Fig. 5: Comparison of some *Thrixopelma* species. A–F palpal bulbs (all left-hand side except *T. lagunas*, where the right-hand side bulb was imaged and has been flipped horizontally to enable better comparison) in prolateral and retrolateral views. A–B Holotype male of *Thrixopelma lagunas* Schmidt & Rudloff, 2010 (SMF 66757-84). C–D Holotype male of *Thrixopelma longicolli* (Schmidt, 2003) (SMF 40565-84), E–F Holotype male of *Thrixopelma nadineae* Sherwood & Gabriel, 2022 (ZMH 0000888). G–I tibial apophysis closure position against metatarsus I (left-hand side), G *T. christineae* **sp. nov.** holotype male (MNHN AR–4846), H *T. eliseanneae* **sp. nov.** holotype male (MNHN AR–4852), I *T. nadineae* holotype male (ZMH 0000888). Figures E, F and I modified from Sherwood & Gabriel (2022). Scale bars = 1mm.

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