

Article

First record of the tarantula genus *Euathlus* (Araneae: Theraphosidae: Theraphosinae) in Peru, with the description of a threatened new species

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ABSTRACT. A new species of *Euathlus* Ausserer, 1875 (Araneae: Theraphosidae: Theraphosinae), *Euathlus vanessae* sp. nov. is described and diagnosed. The genus is known from Chile and Argentina, and *E. vanessae* sp. nov. represents the first record for the genus in Peru, being the new northernmost limit of its known distribution. Distribution and natural history data are provided. Additionally, the conservation status of the new species is discussed and it is proposed as Endangered (EN) according to IUCN criteria.

KEYWORDS. Andes, distribution, endangered new species, Mygalomorphae, Taxonomy.

RESUMEN. Primer registro del género de tarántulas *Euathlus* (Araneae: Theraphosidae: Theraphosinae) en Perú, con la descripción de una nueva especie amenazada. Se describe y diagnostica una nueva especie de *Euathlus* Ausserer, 1875 (Araneae: Theraphosidae: Theraphosinae), *Euathlus vanessae* sp. nov. El género es conocido en Chile y Argentina, y *E. vanessae* sp. nov. representa el primer registro oficial del género para el Perú, siendo el nuevo límite más septentrional de distribución conocida. Se proporcionan datos de distribución e historia natural, adicionalmente se discute el estado de conservación de la nueva especie y se propone como En Peligro (EN) según los criterios de la UICN.

PALABRAS-CLAVE. Andes, distribución, nueva especie en peligro, Mygalomorphae, Taxonomía.

The tarantula genus *Euathlus* Ausserer, 1875 comprises medium-sized spiders distributed in Argentina and Chile (WORLD SPIDER CATALOG, 2021). These spiders are representatives of the Andean fauna, with most of the known species inhabiting high elevation environments, for example above 2000 meters altitude (PERAFÁN & PÉREZ-MILES, 2014; FERRETTI, 2015; RÍOS-TAMAYO, 2020). *Euathlus* was established on its type species, *E. truculentus* L. Koch, 1875 distributed in Argentina and Chile. To date, the genus comprises 13 described species present in Argentina and Chile (WORLD SPIDER CATALOG, 2021). In Argentina, seven species are reported: *E. diamante* Ferretti, 2015, *E. grismadoi* Ríos-Tamayo, 2020, *E. mauryi* Ríos-Tamayo, 2020, *E. pampa* Ríos-Tamayo, 2020, *E. sagei* Ferretti, 2015, *E. tenebrarum* Ferretti, 2015 and *E. truculentus* L. Koch, 1875 also present in Chile. The Chilean fauna is represented by *E. affinis* (Nicolet, 1849), *E. antai* Perafán & Pérez-Miles, 2014, *E. atacama* Perafán & Pérez-Miles, 2014, *E. condorito* Perafán & Pérez-Miles, 2014, *E. manicata* (Simon, 1892) and *E. parvulus* (Pocock, 1903).

The genus *Euathlus* is characterized by males with a copulatory bulb with two prolateral keels and the tip curved

retrolaterally, the tibial apophyses have retrolateral spines, a subapical spine on the retrolateral branch and a basal spine on the prolateral one, and the presence of an abdominal central dorsal patch of urticating setae represented mainly by type III and type IV. Females present two quadrangular spermathecal receptacles with a lateral spheroid chamber (PERAFÁN & PÉREZ-MILES, 2014; FERRETTI, 2015; RÍOS-TAMAYO, 2020).

In January 2019, during the review of material collected in the high Andean zone of Moquegua region, Peru, deposited in the arachnid collection of the Museo de Historia Natural de la Universidad Nacional de San Agustín de Arequipa (MUSA), three female specimens were located presenting morphological characteristics of the genus *Euathlus*. Recent field surveys carried out between 2019 and 2020 in southern Peru yielded more specimens and the capture of a male specimen. Thus, in the present work, the first record of the genus *Euathlus* in Peru is reported through the description of a new species that is described, diagnosed and illustrated. In addition, some aspects on the distribution and natural history are provided, allowing the assessment of the conservation status of the new species.

MATERIAL AND METHODS

The material examined is deposited in the arachnid Collection of the Museo de Historia Natural de la Universidad Nacional de San Agustín de Arequipa, Arequipa, Peru (MUSA-AR). Specimens were examined using an AmScope ZM67225NT stereomicroscope and digital images were taken with a Canon PowerShot SX530 HS digital camera directly or via eyepiece of a ZEISS Stemi 305 stereomicroscope, according to the central axis of structures. All measurements are given in millimeters and were obtained using a digital dial caliper with an error of 0.01 mm. The measurement of the total body length includes carapace and abdomen, excluding chelicerae and spinnerets. The measurements of the leg and palpal segments were taken dorsally. The eye measurements were taken from the widest spans of the lens, AME in dorsal view, ALE, PLE and PME in dorsolateral view.

The extent of tarsal and metatarsal scopulae on ventral side of both leg segments was expressed as a percentage of the total length of segment, from the apical end.

The leg spination was described using the following method: each leg segment was divided into four quadrants (ventral, prolateral, retrolateral and dorsal) and each quadrant described separately in basal, central and apical section, e.g. metatarsus I v 1-0-3 means that in the ventral plane (quadrant) there is one spine in basal section and three spines in apical section. If the bases of all three spine in apical section are located apically, then their position would be described by the term “apical” in brackets as in BERTANI (2001) and KADERKA (2015). Unequal numbers of spines on the right and left side of the same leg segment were expressed by parentheses.

The abdominal urticating setae were removed by forceps, placed in alcohol and examined by a Nikon Eclipse

E100 microscope. The terminology of urticating setae follows COOKE *et al.* (1972).

To make a proper examination, the female genitalia was detached from abdomen. The terminology of male palpal bulb keels follows BERTANI (2000).

The distribution map of genus *Euathlus* was prepared using Arc-GIS (version 10.3), where the records of *E. manicata* and *E. truculentus* in LEGENDRE & CALDERÓN-GONZÁLEZ (1984) were included.

Conservation assessments were made following the IUCN criteria (IUCN, 2019), the Extent of Occurrence (EOO) and Area of Occupancy (AOO) were estimated with GeoCAT software (BACHMAN *et al.*, 2011), and the AOO was estimated using 2x2 km grid cells.

Abbreviations. Eye sizes and interdistances: AME, anterior median eyes; ALE, anterior lateral eyes; OQ, ocular quadrangle (including lateral eyes); PME, posterior median eyes; PLE, posterior lateral eyes. Spination: d, dorsal; p, prolateral; r, retrolateral; v, ventral. Tibial apophysis: PB, prolateral branch; RB, retrolateral branch. Male palpal bulb: PI, prolateral inferior keel; PS, prolateral superior keel; AK, accessory keel. Cheliceral teeth pattern: v, small teeth, V, big teeth. PLS, posterior lateral spinnerets; PMS, posterior median spinnerets; m a.s.l., meters above sea level; EOO, extent of occurrence; AOO, area of occupancy.

RESULTS

Euathlus Ausserer, 1875

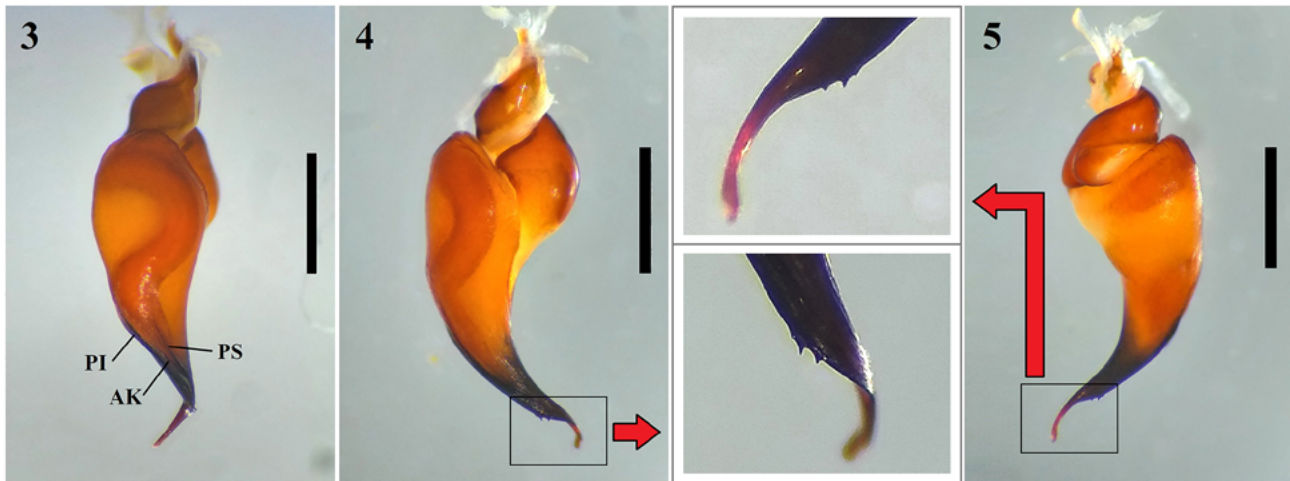
Euathlus vanessae sp. nov.

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Figs 1-19, Tabs I, II



Figs 1, 2. *Euathlus vanessae* sp. nov., *habitus*, dorsal view: 1, male holotype (MUSA-AR 234) Moquegua, Mariscal Nieto, Moquegua; 2, female paratype (MUSA-AR 228) from queñua relicts (*Polylepis bessi* Hieron), Asana, Torata, Mariscal Nieto, Moquegua. Photos by O. M. Quispe-Colca.



Figs 3-5. *Euathlus vanessae* sp. nov., male holotype (MUSA-AR 234), morphology of left palpal bulb: 3, ventral view; 4, prolateral view; 5, retrolateral view. The boxes indicate the apical embolus: serrated edge with three teeth at PI (AK, accessory keel; PI, prolateral inferior keel; PS, prolateral superior keel). Scale bar = 1 mm.

Type material. Holotype ♂, PERU: Moquegua, Mariscal Nieto, Moquegua, 17°12'33.67"S, 70°37'49.36"W, 3589 m a.s.l., 09.IX.2020, O. M. Quispe-Colca col. (MUSA-AR 234). Paratypes, PERU: Moquegua, Mariscal Nieto, Torata: ♀, Asana, in Queñua relicts and forest (*Polylepis besseri* Hieron), 17°08'56.43"S, 70°34'18.36"W, 4153 m a.s.l., 04.IX.2018, O.M. Quispe-Colca col. (MUSA-AR 227); ♀, same collection data as for preceding, 05.IX.2018, O.M. Quispe-Colca col. (MUSA-AR 228); ♀, 17°09'43.00"S, 70°43'25.37"W, 3632 m a.s.l., 07.I.2019, O.M. Quispe-Colca col. (MUSA-AR 230); ♀, 17°04'9.94"S, 70°37'36.47"W, 3855 m a.s.l., 26.II.2020, O.M. Quispe-Colca col. (MUSA-AR 231); ♀, 17°07'30.86"S, 70°42'27.78"W, 3535 m a.s.l., 03.IX.2020, O.M. Quispe-Colca col. (MUSA-AR 232).

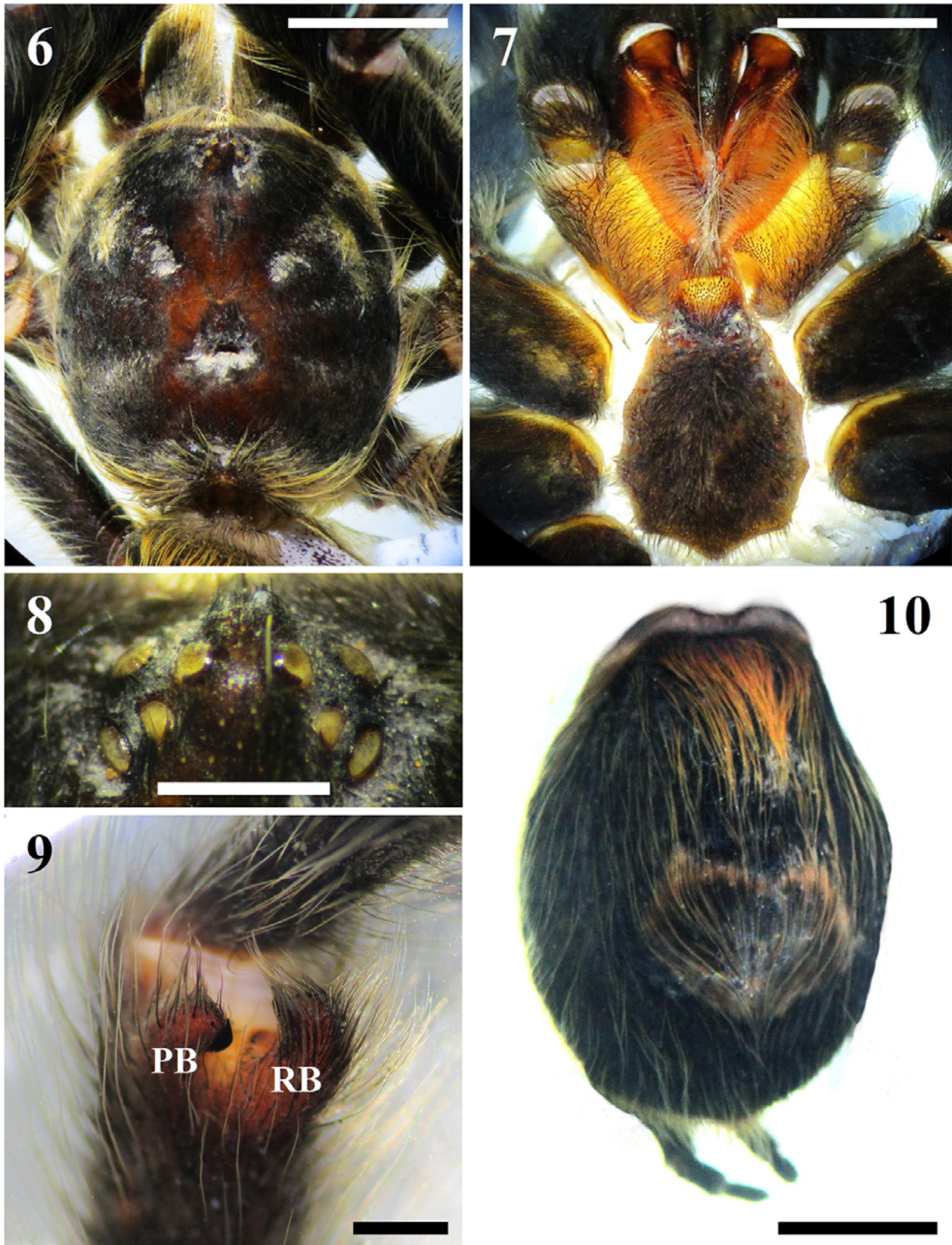
Additional material examined. PERU: Moquegua, Mariscal Nieto, Torata: 3 juveniles, Asana, in Queñua relicts and forest (*Polylepis besseri* Hieron), 17°08'56.43"S, 70°34'18.36"W, 4153 m a.s.l., 05.IX.2018, O.M. Quispe-Colca col. (MUSA-AR 229); ♂ juvenile, same collection data as holotype (MUSA-AR 233).

Etmology. This species is named in honor of Vanessa Quequejana Puma, first author's great friend, who collected the first specimen and for her great assistance during the fieldwork.

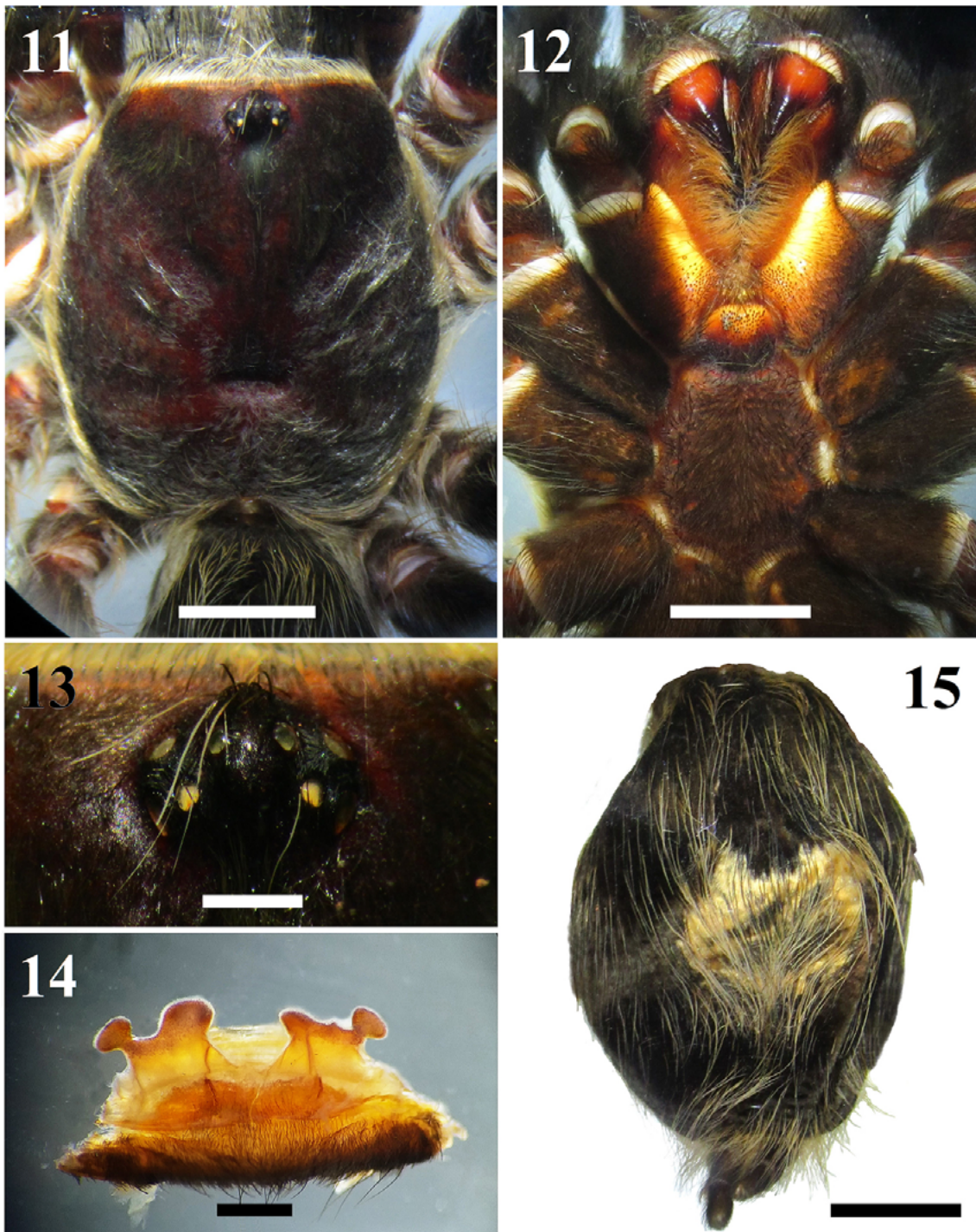
Diagnosis. Male (Fig. 1) differs from all the known *Euathlus* species (excepting *E. grismadoi* and *E. manicata*) by the copulatory bulb with a well-developed prolateral AK (Fig. 3). Additionally, male differs from *E. manicata* by the absence of spiniform setae on the first coxae and maxillae (Fig. 7), and from *E. grismadoi* by the presence of a serrated PI having three teeth (Figs 4, 5) and a higher number of labial cuspules (more than 70 in *E. vanessae* sp. nov. and 24 in *E. grismadoi*). Male copulatory bulb resembles that of *E. truculentus* by the serrated PI (PERAFÁN & PÉREZ-MILES, 2014, Fig. 8B) but differs by the slender embolus, the presence of an AK and the more distance between PI and PS (PI and PS very close to each other in *E. truculentus*, PERAFÁN & PÉREZ-MILES, 2014, Fig. 8B). Female (Fig. 2) differs from

congeners by the shape of the spermathecae (Fig. 14), with two wide seminal receptacles (shorter than in *E. grismadoi* and *E. tenebrarum*) with a semi-spheroid chamber joined by a very short duct (longer duct in *E. grismadoi*).

Description. Male holotype (MUSA-AR 234). Total length: 26.36. Carapace (Fig. 6): length 11.10, width 10.61. Chelicerae with 6-7 teeth on promargin, with granulation near last two basal teeth; cheliceral teeth pattern from the basal end: right side: VVVVVVV, left side: VVVVVV. Anterior eye row slightly procurved, posterior eye row recurved. Eye sizes and interdistances: AME 0.26, ALE 0.28, PME 0.24, PLE 0.30, AME-AME 0.34, AME-ALE 0.17, PME-PME 0.79, PME-PLE 0.13, ALE-PLE 0.23, AME-PME 0.15, OQ length 0.74, width 1.60. Ocular tubercle oval and slightly elevated (Fig. 8), length 1.13, width 1.60, clypeus 0.22. Fovea transverse, deep, recurved (Fig. 6), width 2.40. Labium length 1.50, width 1.70, anterior third with 76 cuspules, maxillae right/left with 99/98 cuspules. Sternum (Fig. 7): length 5.48, width 4.74. Abdomen (Fig. 10): length 14.95, width 10.95. PLS three-segmented, length 5.04, basal segment 2.04, middle segment 1.56, apical segment 1.44, all digitiform. PMS (one segment), length 1.06. Abdomen with type III urticating setae located in a medial dorsal patch (Fig. 10). Urticating setae patch: length 4.23, width 6.65. Leg pattern: IV>I>II>III (Tab. I). Scopulae: all tarsi, 100% scopulated. Metatarsi I 70% scopulated, metatarsi II 40% scopulated, metatarsi III 25% scopulated and metatarsi IV 20% scopulated. Tarsi I-II with complete scopula, divided with a thin longitudinal row of short setae, tarsi III-IV with scopula entire. Tibial apophysis (Fig. 9) with two branches with retrolateral branch slightly longer than prolateral, both branches with a subapical internal short spine. Retrolateral branch with subapical external short spine (only at right tibial apophysis). Metatarsus I slightly curved. Flexion of metatarsus I retrolateral to the tibial apophysis. Cymbium with lobes of similar sizes. Palpal bulb (Figs 3-5) with unequal prolateral keels, PS and PI well-development, PI has serrated edge with three teeth, presence of prolateral AK.



Figs 6-10. *Euathlus vanessae* sp. nov., male holotype (MUSA-AR 234): 6, carapace, dorsal view; 7, sternum, labium, maxillae and coxae, ventral view; 8, ocular tubercle, dorsal view; 9, left tibial apophysis, ventral view; 10, abdomen, dorsal view (PB, prolateral branch; RB, retrolateral branch). Scale bar = 1 mm (Figs 8, 9), 5 mm (Figs 6, 7, 10).



Figs 11-15. *Euathlus vanessae* sp. nov., female paratype (MUSA-AR 230): 11, carapace, dorsal view; 12, sternum, labium, maxillae and coxae, ventral view; 13, ocular tubercle, dorsal view; 14, spermathecae, ventral view; 15, abdomen, dorsal view. Scale bar = 1 mm (Figs 13, 14), 5 mm (Figs 11, 12, 15).

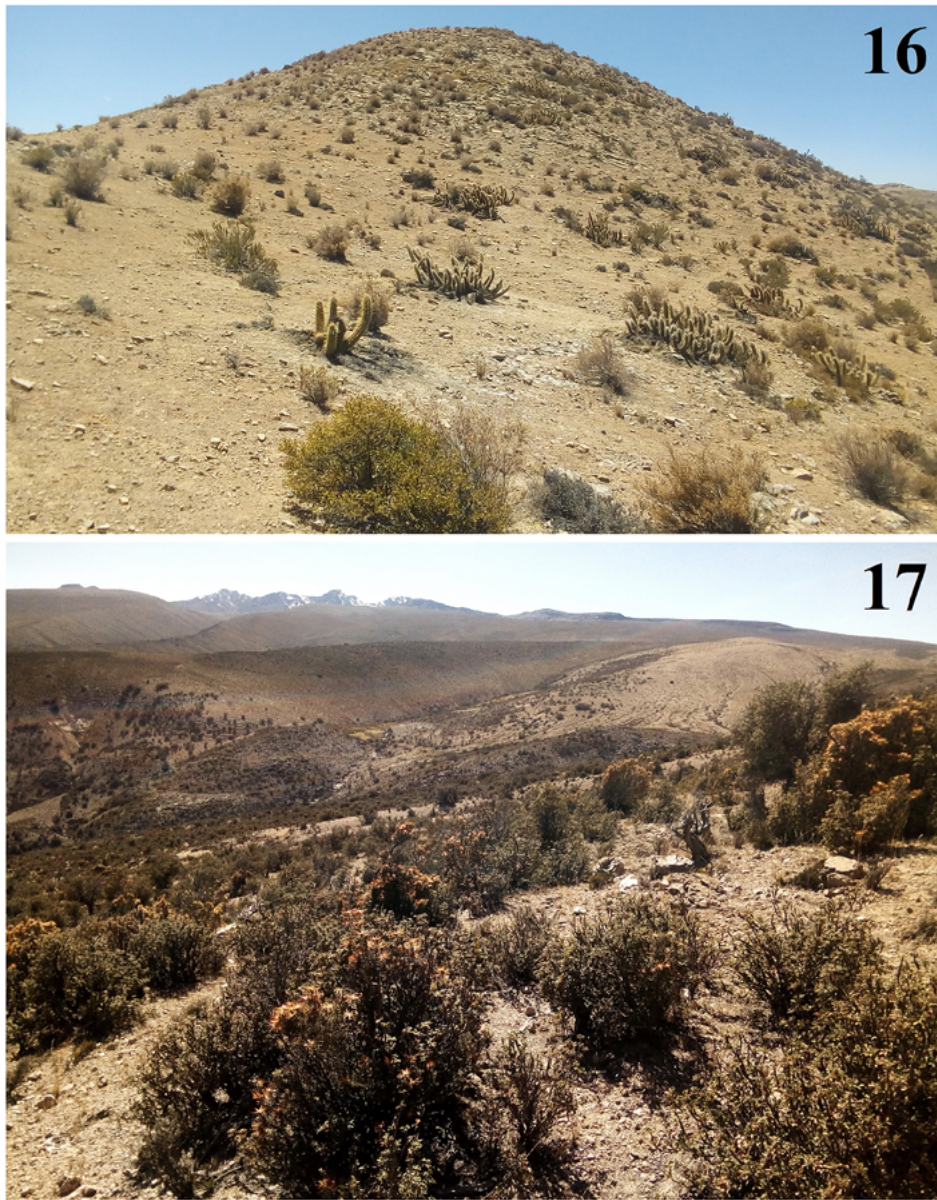
Spination: femora I p 0-0-2, r 0-0-(1-0); II p 0-(1-0)-2, r 0-0-1; III p (1-0)-0-(2-1), r 0-(0-1)-(2-1); IV p 0-1-(1-2), r 0-0-(2-1) and femora of palps p 0-0-1. Patellae I p 1-(0-2)-1; II 0; III p 0-0-(1-0); IV 0 and patellae of palps 0. Tibiae I v 3-(2-3)-1 (apical), p (0-1)-1-(1-2), r (3-2)-(0-2)-(2-1); II v (4-3)-4-3, p (1-2)-(0-1)-1, r 1-0-(1-0); III v 1-2-3 (apical), p (1-2)-(2-1)-2, r (3-2)-0-(0-1); IV v 2-2-3 (apical), p (1-0)-

1-1, r 1-1-2 and tibiae of palps v (2-1)-1-0, p 1-(3-2)-(2-1). Metatarsi I v 1-0-1 (apical), p 1-0-0; II v (3-2)-(1-0)-2 (apical); III v (3-2)-2-3 (apical), p 1-(0-1)-1, r 1-(2-1)-1; IV v 3-(3-2)-3 (apical), p 1-1-1, r 2-(1-2)-2. Tarsi I-IV and tarsi of palps 0. Coloration (in life): carapace dark brown, widely covered with light brown setae from the anterior edge of ocular tubercle to the fovea, and light brown setae on the margins

and dorsal chelicerae. Legs dark brown, with abundant long golden-brown setae. Femora with three parallel longitudinal stripes (two dorsal and one retrolateral); patellae and tibiae with two parallel longitudinal stripes; and one longitudinal stripe reaching the third part of the metatarsi I-II, and the fourth part in the metatarsi III-IV. Abdomen dark brown, with abundant coppery setae on the base, with a large patch of golden-brown urticating setae.

Female paratype (MUSA-AR 230). Total length: 33.40. Carapace (Fig. 11): length 14.70, width 13.76. Chelicerae with 7 teeth on promargin, with granulation near last two basal teeth; cheliceral teeth pattern from the basal end: right side: VVVVVVv, left side: VVVVVVv. Anterior eye row procurved, posterior eye row recurved. Eye sizes

and interdistances: AME 0.33, ALE 0.44, PME 0.29, PLE 0.45, AME-AME 0.47, AME-ALE 0.32, PME-PME 1.02, PME-PLE 0.17, ALE-PLE 0.27, AME-PME 0.30, OQ length 1.16, width 2.21. Ocular tubercle oval and slightly elevated (Fig. 13), length 1.64, width 2.21, clypeus 0.45. Fovea transverse, straight (Fig. 11), width 2.65. Labium length 2.32, width 2.56, anterior third with 76 cuspules, maxillae right/left with 98/103 cuspules. Sternum (Fig. 12): length 6.88, width 6.25. Abdomen (Fig. 15): length 16.75, width 12.40. PLS three-segmented, length 6.46, basal segment 2.61, middle segment 1.88 apical segment 1.97, all digitiform. PMS (one segment), length 1.86. Abdomen with type III urticating setae located in a medial dorsal patch (Fig. 15). Urticating setae patch: length 4.64, width 6.48.



Figs 16, 17. Different habitats where *Euathlus vanessae* sp. nov. has been collected: 16, cacti and scrubs, approximately at 3500 m a.s.l.; 17, low shrubs, perennial herbageous plants and queñua relicts (*Polylepis berterii* Hieron) approximately at 4100 m a.s.l. Photos by O. M. Quispe-Colca.

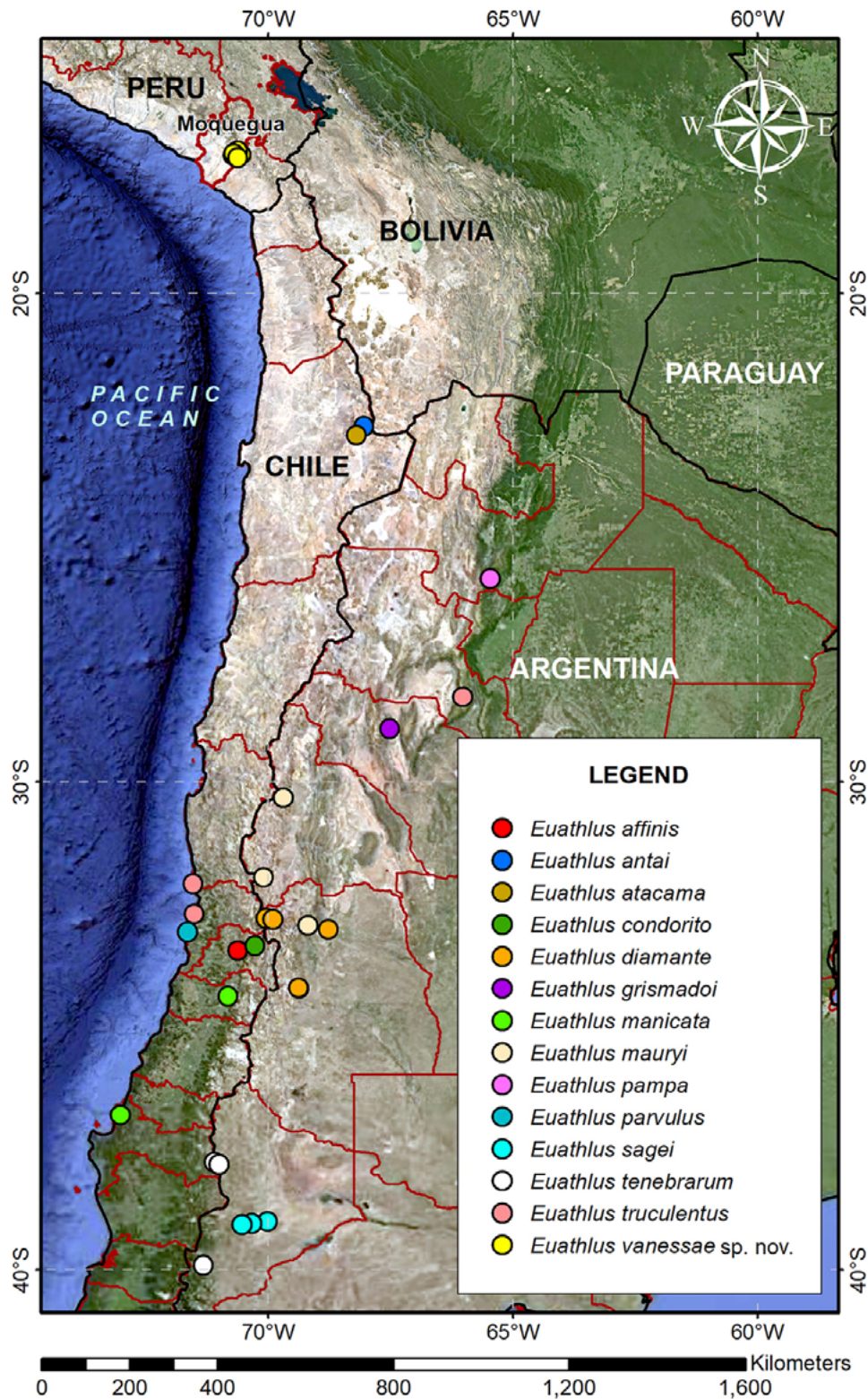


Fig. 18. Distribution map of the known species of *Euathlus*.

Leg pattern: IV>I>II>III (Tab. II). Scopulae: all tarsi, 100% scopulated. Metatarsi I 60% scopulated, metatarsi II 50% scopulated, metatarsi III 40% scopulated and metatarsi IV 20% scopulated. Tarsi I-IV with complete scopula, divided with a thin longitudinal row of short setae. Spination: femora

I p 0-0-1; II p 0-0-0-1; III p 0-0-1, r 0-0-(0-1); IV r 0-0-1 and femora of palps p 0-0-1. Patellae I - IV 0 and patellae of palps v 0-0-1 apical. Tibiae I v 1-(2-1)-3 apical); II v 1-(2-1)-3 apical, p 0-(0-1)-0; III v (1-2)-(2-1)-(2-3) apical, p 1-1-0, r (1-0)-(1-0)-(0-1); IV v 0-2-3 apical, p 0-1-0,

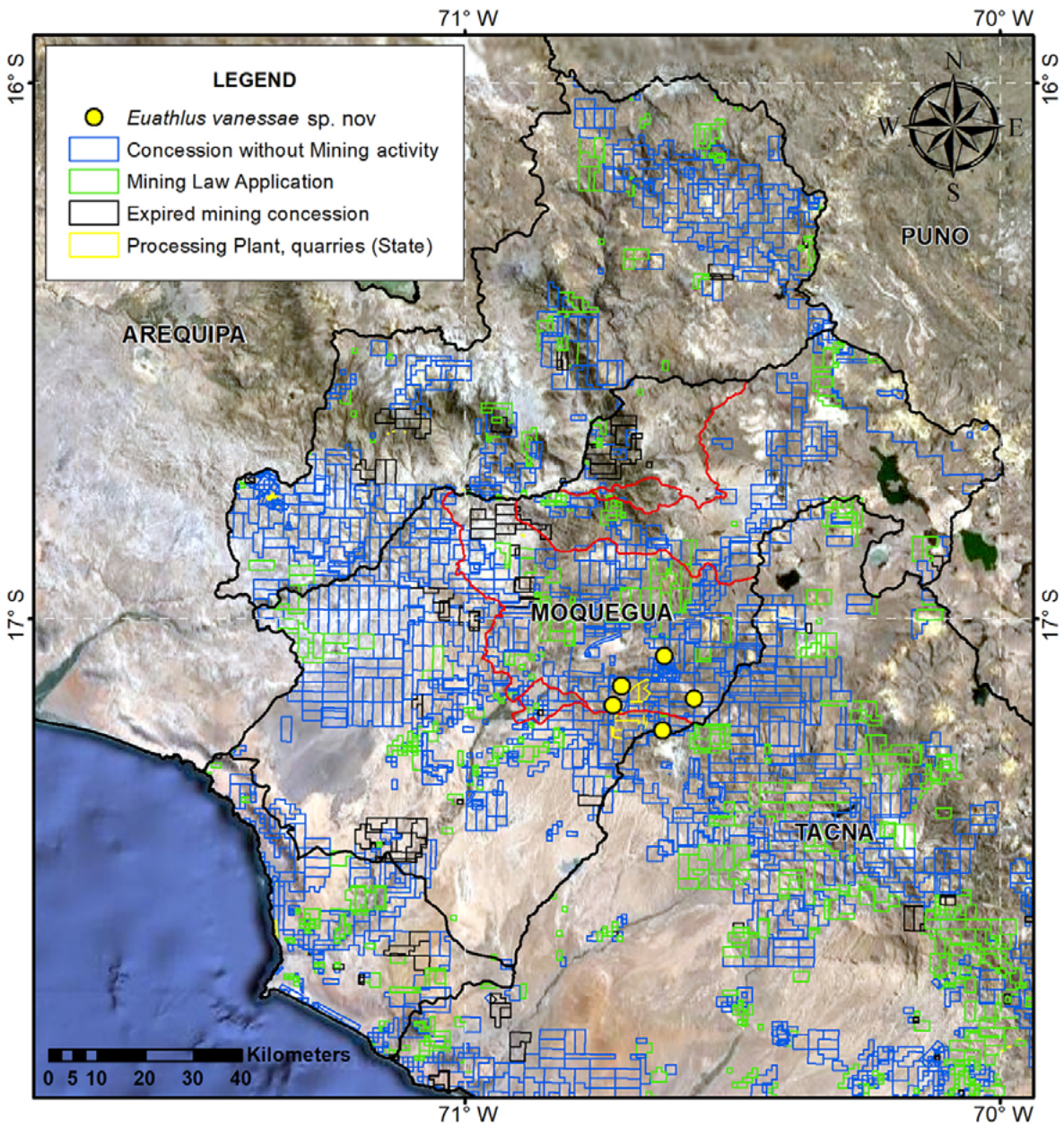


Fig. 19. Mining concessions in southern Peru, Moquegua and Tacna regions. Yellow circles represent the record of *Euathlus vanessae* sp. nov.

Tab. I. *Euathlus vanessae* sp. nov., male holotype (MUSA-AR 234). Lengths of palpal and leg segments.

	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Palp	6.33	4.61	5.34	-	2.04	18.32
Leg I	10.32	6.57	7.84	8.07	5.55	38.35
Leg II	10.41	5.10	7.83	8.32	4.76	36.42
Leg III	8.74	4.47	6.84	7.68	4.55	32.28
Leg IV	10.19	5.18	8.62	10.16	5.05	39.20

Tab. II. *Euathlus vanessae* sp. nov., female paratype (MUSA-AR 230). Lengths of palpal and leg segments.

	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
Palp	7.84	5.42	5.76	-	4.38	23.4
Leg I	11.55	7.15	8.93	7.86	4.25	39.74
Leg II	11.10	6.22	7.80	7.38	4.81	37.31
Leg III	10.34	6.28	7.68	7.85	4.95	37.10
Leg IV	11.58	6.54	8.78	11.06	4.37	42.33

r 1-1-2 and tibiae of palps v 1-1-3 apical, p 1-(1-2)-0, r 0-0-1. Metatarsi I v (1-0)-0-2 apical; II v 1-(1-0)-(2-3) apical; III v 2-(2-1)-3 apical, p (1-0)-1-(1-0), r 0-1-1; IV v 1-2-(2-3) apical, p 0-1-1, r (2-1)-(2-3)-1. Tarsi I - IV and tarsi of palps 0. Spermatheca: with two wide seminal receptacles, each with an oval chamber pointing laterally and two ventral projections (Fig. 14). Coloration (in alcohol): carapace reddish brown, covered with light brown setae on the margins and dorsal chelicerae. Legs reddish brown, with abundant long golden-brown setae. Femora with three parallel longitudinal stripes (two dorsal and one retrolateral); patellae and tibiae with two parallel longitudinal stripes; one longitudinal stripe reaching the third part of the metatarsi I-II, and the fourth part in the metatarsi III-IV; and one longitudinal stripe reaching the third part of tarsi of palps. Abdomen dark brown, with light coppery setae on the base, with a large patch of golden-brown urticating setae.

Distribution. *Euathlus vanessae* sp. nov. is found along the high Andean zone from Mariscal Nieto province, Moquegua region, Peru, approximately in altitudes between 3100 and 4200 m a.s.l. (Fig. 18).

Natural history. The habitat of the new species is characterized by a cold and arid environment of stony soils, typical of the dry puna. The vegetation comprises mainly scrub (low shrubs, perennial herbaceous plants), cacti, as well as “queñua” relicts and forest (*Polylepis besseri* Hieron) (Figs 16, 17). The mean annual temperature is about 9-12.5°C, with the mean annual precipitation of approximately 169 mm, being December to March the wettest months, while the relative humidity is about 40.7% (KNIGHT PIESOLD CONSULTING, 2008). The male holotype was found in September 2020 (ending winter in the southern hemisphere) under a stone without any apparent shelter. The female paratype was found in January 2019 (summer) inside a tubular burrow under a stone.

Conservation status. *Euathlus vanessae* sp. nov. has an area of occupancy (AOO) of less than 500 km² and is currently known from less than five locations, including a *Polylepis besseri* forest, categorized in Peru as Vulnerable (MINAG, 2006). Based on the IUCN (2019) categories and criteria, we suggest Endangered (EN): B1ab (iii) + 2ab (iii) as a conservation category for *E. vanessae* sp. nov.

DISCUSSION

Euathlus vanessae sp. nov. represents the first official record for the genus in Peru, being the new northernmost limit of the known distribution. Our work also represents the first record of Theraphosidae in the Moquegua region (Fig. 18).

The main threat to *E. vanessae* sp. nov. is the habitat loss. Indeed, major part of the Moquegua region territory is under mining concessions, however, only a small part of the area is currently being explored or mined (INGEMMET, 2019) (Fig. 19). The exploration phase, the vegetation removal and ground disturbance led to an immediate impact on the local biodiversity (FARREL & KRATZING, 1996), consequently the areas with intensive mining, habitat destruction and contamination can be drastic and threaten endemic species (LEHR *et al.*, 2021). Considering that theraphosids have sedentary habits, limited dispersal mechanisms due their poor vagility (FERRETTI *et al.*, 2014) and very long reproductive periods because of their great longevity, habitat disturbance could contribute to the decreasing population densities of *E. vanessae* sp. nov.

Although the impact of large-scale mining on this species is still unknown, the Anglo American Quellaveco project is currently in construction phase and represents a direct threat because it is within the distribution range of this new species. However, in relation to arachnids, only the record of the family Theridiidae is highlighted in the mine closure plan update (KNIGHT PIESOLD CONSULTING, 2016). Moreover, Southern Peru Copper Corporation has two older large-scale mining projects: Cuajone and Toquepala, which have been operating since 1976 and 1960, respectively; the Cuajone mine is located approximately 6.5 km from the northernmost record of the known distribution area of *E. vanessae* sp. nov., while the Toquepala mine is almost 2 km from the southernmost record of *E. vanessae* sp. nov. Due to the extreme closeness of the records in both projects, the presence of populations of this tarantula cannot be ruled out.

Currently, four species of *Euathlus* in Chile were classified according to their conservation status (MMA, 2017): *E. antai*, *E. atacama* and *E. condorito* as Critically Endangered (CR) and *E. manicata*, as Near Threatened (NT). *Euathlus vanessae* sp. nov. could be considered as another tarantula species facing serious threats related to the

habitat loss due to mining activities, which could severely reduce its population. Thus, potential conservation actions are needed to preserve not only this species but also their threatened habitat.

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