

The scorpion genus *Ananteris* in Colombia: comments on the taxonomy and description of two new species (Scorpiones, Buthidae)

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Abstract. Two new scorpion species are described from Colombia: *Ananteris arcadioi* sp. nov. from Meta Department and *Ananteris dorae* sp. nov. from Nariño Department. These new species raise to 62 the number of known species of *Ananteris*, eight of which are found in Colombia. Some comments on the taxonomy of Colombian *Ananteris* are included and some characters are proposed to define species whereas the usefulness of others is briefly discussed. A map with the known distribution of the different species in Colombia, a table for some characters, and a key for the identification of the Colombian species of the genus are included.

Keywords: Scorpions, taxonomy, Colombia

The genus *Ananteris* Thorell 1891 is a group of scorpions with a Gondwanan distribution (Lourenço 1985), currently known from 60 species mostly from Venezuela and Brazil (González-Sponga 2006; Kovarik 2006; Lourenço et al. 2006; Botero-Trujillo 2007; Teruel & García 2007). Until recently six species had been recorded from Colombia: *A. colombiana* Lourenço 1991, *A. ehrlichi* Lourenço 1994, *A. gorgonae* Lourenço & Flórez 1989, *A. leilae* Lourenço 1999, *A. myriamae* Botero-Trujillo 2007 and *A. tolimana* Teruel & García 2007 (Flórez 2001a; Lourenço et al. 2006; Botero-Trujillo 2007; Teruel & García 2007). Botero-Trujillo (2007) indicated that other specimens were under study, among which two new species were identified and are described in the present paper raising to eight the number of Colombian species of *Ananteris*. The results presented herein give evidence that the inventory work of this genus in Colombia is far from completed, and reveal that further collecting and exploration is needed to reach more precise approximations of the distribution and diversity of this poorly known genus in the country.

HISTORY OF COLOMBIAN *ANANTERIS*

The genus *Ananteris* was first recorded in Colombia by Hummelinck (1940), who recorded a juvenile female of *A. cussinii* Borelli 1910 in the city of Riohacha (La Guajira Department); however, only three species of *Ananteris* were known at that time, and that author did not provide enough information regarding the morphology of his specimen to reliably support its specific identity. The characters he did use are now known to be uninformative either due to their variability (i.e., number of pieces in the middle lamellae of the pectines) or because they are present in most species of the genus (i.e., five carinae in metasomal segment V). Consequently, later authors mentioned the presence of this species in Colombia (Flórez 1990; Flórez & Sánchez 1995; Fet & Lowe 2000; Prendini 2001); however, in Flórez's (2001a) recent catalogue of Colombian scorpions of the family Buthidae *A. cussinii* is not included, and Flórez (2001b) considered the specimen mentioned by Hummelinck (1940) to be probably *A. colombiana* and, therefore, indicated a need for a revision. The specimen is deposited in the Zoological Museum of the State University, Utrecht, Netherlands.

Lourenço & Flórez (1989) described *A. gorgonae* on the basis of a male from Isla Gorgona, becoming the first species to be described from Colombia. Later contributions provided descriptions of *A. colombiana* [previously thought to be *A. ashmolei* Lourenço 1981 (Lourenço 1982:138)], *A. ehrlichi*, *A. leilae*, *A. myriamae*, and *A. tolimana*. Of these, only *A. colombiana* and *A. tolimana* are known from both sexes, whereas the female of *A. gorgonae* and the male of the others remain unknown (Lourenço & Flórez 1989; Lourenço 1991, 1994, 1999a; Botero-Trujillo 2007; Teruel & García 2007).

In the original descriptions of *A. gorgonae*, *A. colombiana*, *A. ehrlichi*, and *A. leilae* the diagnoses provided are not detailed enough. In those of *A. gorgonae* and *A. leilae* it is only indicated that these species can be distinguished from their closest relative (*A. ashmolei* and *A. gorgonae*, respectively) based on the number of pectinal teeth; no other characters are provided, not even characters shared by both species (see Lourenço & Flórez 1989; Lourenço 1999a). The description of *A. ehrlichi* mentions that it can be distinguished from *A. ashmolei* due to differences in the coloration of the pedipalp chelae and different morphometric values, once more without mention of the features shared (see Lourenço 1994). Finally, the description of *A. colombiana* lacks a diagnosis or a comparative section with other species (see Lourenço 1991).

METHODS

Illustrations were prepared with the aid of a *camera lucida* mounted onto a Zeiss Stemi SV 6 stereoscope. Measurements (L = length, W = width, D = depth) are presented in millimeters and were obtained following the methodology of Sissom et al. (1990), using the program Motic Images 2000 version 1.2 through a PC connected to a Motic Digital Microscope DM-143. The distribution map was produced with the program ArcView GIS version 3.1 [Environmental Systems Research Institute (ESRI), Redlands, California]. All specimens are preserved in 70% ethanol.

General carinal terminology follows Vachon (1952), except for the mesosomal carinae that are here distinguished as follows. In the tergites: axial, dorsolateral and lateral carinae; in the sternites: paramedian and lateral carinae. Vachon's (1952:fig. 65) term ventrointernal to denote the carina that follows the dorsointernal on pedipalp femur is here replaced

for internal median, since in the specimens studied herein there is an additional and more ventral carina to which the term ventrointernal is more suitable. Trichobothrial terminology follows Vachon (1973, 1975).

The specimens examined for this study are lodged in the following museums: Museo Javeriano de Historia Natural "Lorenzo Uribe S. J.", Pontificia Universidad Javeriana, Bogotá, Colombia (MPUJ); Instituto de Ciencias Naturales, Museo de Historia Natural, Universidad Nacional de Colombia, Bogotá, Colombia (ICN-MHN); Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Villa de Leyva, Colombia (IAvH). In the course of this study, a number of specimens of *Ananteris* were examined apart from the two new species. These specimens are detailed below:

Ananteris columbiana: COLOMBIA: *Atlántico Department*: 1 ♀, Puerto Colombia, El Nisperal, 10°59'28"N, 74°57'43"W, 100 m elev., 10–15 June 2006, G. Fagua (MPUJ-SCO-334); *Bolívar Department*: 1 ♀, Cartagena, Isla Barú, 10°23'59"N, 75°30'52"W, 40 m elev., pitfall, 14 October 2006 (MPUJ-SCO-358); 1 ♂, Zambrano, Hacienda Monterrey, 09°45'N, 74°49'W, 70 m elev., 01 December 1997, F. Fernandez & G. Ulloa (ICN-MHN-As-446); 1 juvenile, Zambrano, Hacienda Monterrey, 09°45'N, 74°49'W, 120 m elev., dry forest, pitfall, August 1996, F. Escobar (ICN-MHN-As-176); 1 ♀, Zambrano, Hacienda Monterrey, 09°45'N, 74°49'W, 70 m elev., 19 October 1993, F. Fernandez (ICN-MHN-As-595); 1 ♀, Zambrano, 09°45'N, 74°49'W, 20 m elev., 25 August 1992, A. Molano (ICN-MHN-As-111); 1 juvenile, Santa Catalina, Hacienda El Ceibal, 10°36'N, 75°18'W, 20 m elev., October 1999, E. Flórez & biology students (ICN-MHN-As-294); 1 ♀, Parque Nacional Natural Colorados, La Yaya, 09°54'N, 75°07'W, 280 m elev., pitfall, 24–26 May 2001, E. Deulufeut, M. 1731 (IAvH-E 100770); 1 ♀, Parque Nacional Natural Colorados, Alto El Mirador, 09°54'N, 75°07'W, 400 m elev., pitfall, 5–9 July 2001, E. Deulufeut, M. 1956 (IAvH-E 100771); 1 ♀, Parque Nacional Natural Colorados, Alto El Mirador, 09°54'N, 75°07'W, 400 m elev., pitfall, 2–6 December 2001, E. Deulufeut, M. 2644 (IAvH-E 100772); 1 ♀, Parque Nacional Natural Colorados, La Suiris, 09°54'N, 75°07'W, 126 m elev., pitfall, 18–21 November 2000, E. Deulufeut, M. 937 (IAvH-E 100773); 1 ♀, Parque Nacional Natural Colorados, La Suiris, 09°54'N, 75°07'W, 126 m elev., pitfall, 18–20 December 2000, E. Deulufeut, M. 976 (IAvH-E 100774); 1 ♀, Parque Nacional Natural Colorados, Villa Roca, 09°54'N, 75°07'W, 180 m elev., pitfall, 19–22 August 2001, E. Deulufeut, M. 2055 (IAvH-E 100775); 1 juvenile [♂ (?)], Parque Nacional Natural Colorados, Villa Roca, 09°54'N, 75°07'W, 180 m elev., pitfall, 24–26 May 2001, E. Deulufeut, M. 1729 (IAvH-E 100776). *Córdoba Department*: 1 ♂, Pueblo Nuevo, Hacienda Toronto, 08°30'N, 75°31'W, 30 m elev., 7–13 June 2004, J. D. Lynch (ICN-MHN-As-585); *Magdalena Department*: 1 ♂, 1 ♀, Santa Marta, Parque Nacional Natural Sierra Nevada de Santa Marta, 11°15'N, 74°12'W, 120 m elev., December 2006, J. A. Noriega (MPUJ-SCO-363, 364); 1 ♀, Santa Marta, near Quebrada Minca, 11°15'N, 74°12'W, 2 m elev., November 1976 (ICN-MHN-As-121); 1 ♀, Parque Nacional Natural Tayrona, Zaino, 11°20'N, 74°02'W, 50 m elev., pitfall, 4–6 December 2000, H. Henriquez, M. 1013 (IAvH-E 100777); 1 ♀, Parque Nacional Natural Tayrona, Pueblito, 11°20'N, 74°02'W, 225 m elev., pitfall, 30 September

2000, H. Henriquez, M. 660 (IAvH-E 100778); 2 ♀, Parque Nacional Natural Tayrona, Pueblito, 11°20'N, 74°02'W, 225 m elev., pitfall, 29 July 2000, H. Henriquez (IAvH-E 100779, 100780); 1 juvenile [♂ (?)], Parque Nacional Natural Tayrona, Pueblito, 11°20'N, 74°02'W, 225 m elev., pitfall, 15 August 2000, H. Henriquez (IAvH-E 100781).

Ananteris ehrlichi: COLOMBIA: *Caquetá Department*: 1 ♀, La Montañita, Santuario Las Iglesias, Itarca, 01°29'N, 75°26'W, 330 m elev., 25 April 2004, M. Agudelo (ICN-MHN-As-579); 1 ♀, Parque Nacional Natural Chiribiquete, Río Mesay, 0°47'N, 72°48'W, 20 January 2000, F. Quevedo (ICN-MHN-As-361); 1 ♀, Parque Nacional Natural Chiribiquete, Río Sararamano, 0°47'N, 72°48'W, April 2000, F. Quevedo (ICN-MHN-As-342).

Ananteris gorgonae: COLOMBIA: *Cauca Department*: 1 ♂, Parque Nacional Natural Gorgona, El Mirador, 02°58'N, 78°11'W, 180 m elev., pitfall, 3–4 February 2001, R. Duque (ICN-MHN-As-427); 1 ♂, Parque Nacional Natural Gorgona, El Helechal, 02°58'N, 78°11'W, 30 m elev., 02°58'N, 78°11'W, pitfall, 17–19 July 2001, H. Torres, M. 2003 (IAvH-E 100766); 1 ♂, Parque Nacional Natural Gorgona, Alto El Mirador, 02°58'N, 78°11'W, 180 m elev., 02°58'N, 78°11'W, pitfall, 18–20 January 2001, H. Torres, M. 1245 (IAvH-E 100767); 1 ♂, Parque Nacional Natural Gorgona, El Helechal, 02°58'N, 78°11'W, 30 m elev., 02°58'N, 78°11'W, pitfall, 8–9 March 2002, H. Torres, M. 3098 (IAvH-E 100768); 1 adult [gynandromorph (?)], Parque Nacional Natural Gorgona, El Roble, 02°58'N, 78°11'W, 130 m elev., 02°58'N, 78°11'W, pitfall, 20–21 February 2001, H. Torres, M. 1369 (IAvH-E 100769).

Ananteris aff. *gorgonae*: COLOMBIA: *Valle del Cauca Department*: 1 ♀, Buenaventura, Bahía de Malaga, Base Naval, 03°54'N, 77°04'W, 5 m elev., April 1989, L. A. Millan (ICN-MHN-As-391).

Ananteris leilae: COLOMBIA: *Chocó Department*: ♀ holotype, Riosucio-La Gira, 07°26'N, 77°07'W, 20 m elev., July 1992, L. Mendoza & C. Torres (ICN-MHN-As-110); 1 ♂, Acandí, Capurganá, Los Ríos, 08°31'N, 77°16'W, 230 m elev., 25 April 2007, M. Gutierrez (MPUJ-SCO-374); 1 ♀, Acandí, Capurganá, Jardín Botánico del Darién, 08°31'N, 77°16'W, 40 m elev., Rastrojo, 11 October 2007, C. Acosta, J. Alfonso & C. Cocoma (MPUJ-SCO-377).

Ananteris myriamae: COLOMBIA: *Meta Department*: ♀ holotype, Villavicencio, Vereda El Carmen, 04°09'N, 73°38'W, 850–1000 m elev., into forest, pitfall, 23 December 2005, M. Viola (MPUJ-SCO-245); ♀ paratype, Villavicencio, Vereda El Carmen, 04°09'N, 73°38'W, 850–1000 m elev., Río Caño Blanco, under litter, ad hoc, at night, 18 April 2005, R. Botero-Trujillo (MPUJ-SCO-039).

TAXONOMY

Family Buthidae Koch 1837

Genus *Ananteris* Thorell 1891

Ananteris Thorell 1891:65.

Type species.—*Ananteris balzanii* Thorell 1891, by original designation.

Ananteris arcadii sp. nov.

Figs. 1–11; Tables 1, 2

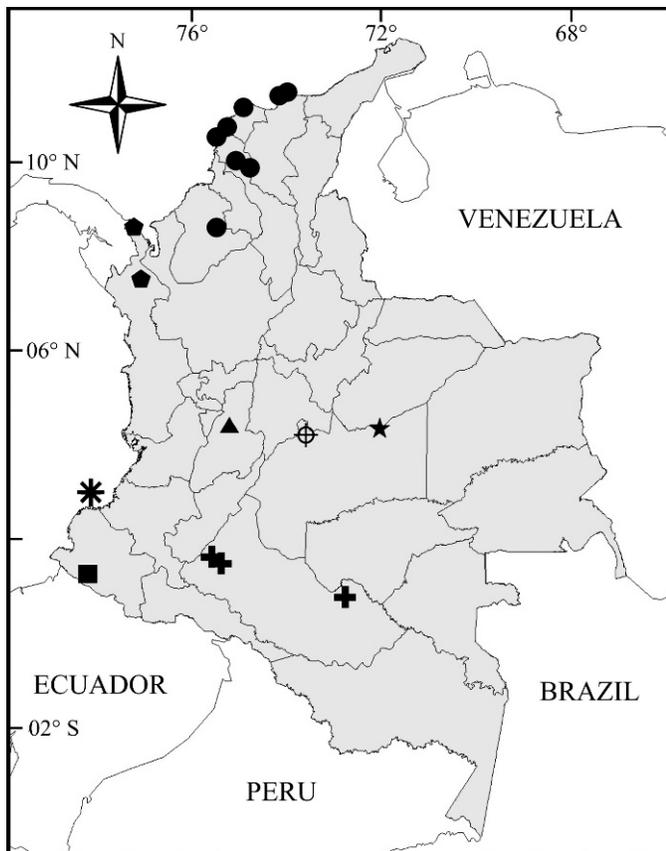


Figure 1.—Known distribution of Colombian *Ananteris*: *A. arcadioidi* sp. nov. (★); *A. colombiana* (●); *A. dorae* sp. nov. (■); *A. ehrlichii* (+); *A. gorgonae* (★); *A. leilae* (●); *A. myriamae* (⊕); *A. tolimana* (▲). Note: Flórez's (2001a, 2001b) report of *A. gorgonae* in continental Colombia (Valle del Cauca Department) is not included, since the examination of his specimen (ICN-MHN-As-391) revealed that it could actually correspond to a different species.

Type material.—*Holotype*: COLOMBIA: *Meta Department*: adult male, Puerto Gaitán, Altamira, Club Los Llaneros, 04°19'N, 72°05'W, 140 m elev., into forest, ad hoc, at night, 19 October 2006, I. Gélvez (MPUJ-SCO-356).

Etymology.—Patronym dedicated to the author's father, Arcadio Botero, in recognition of his great human quality, and acknowledgment of his unconditional support and encouragement.

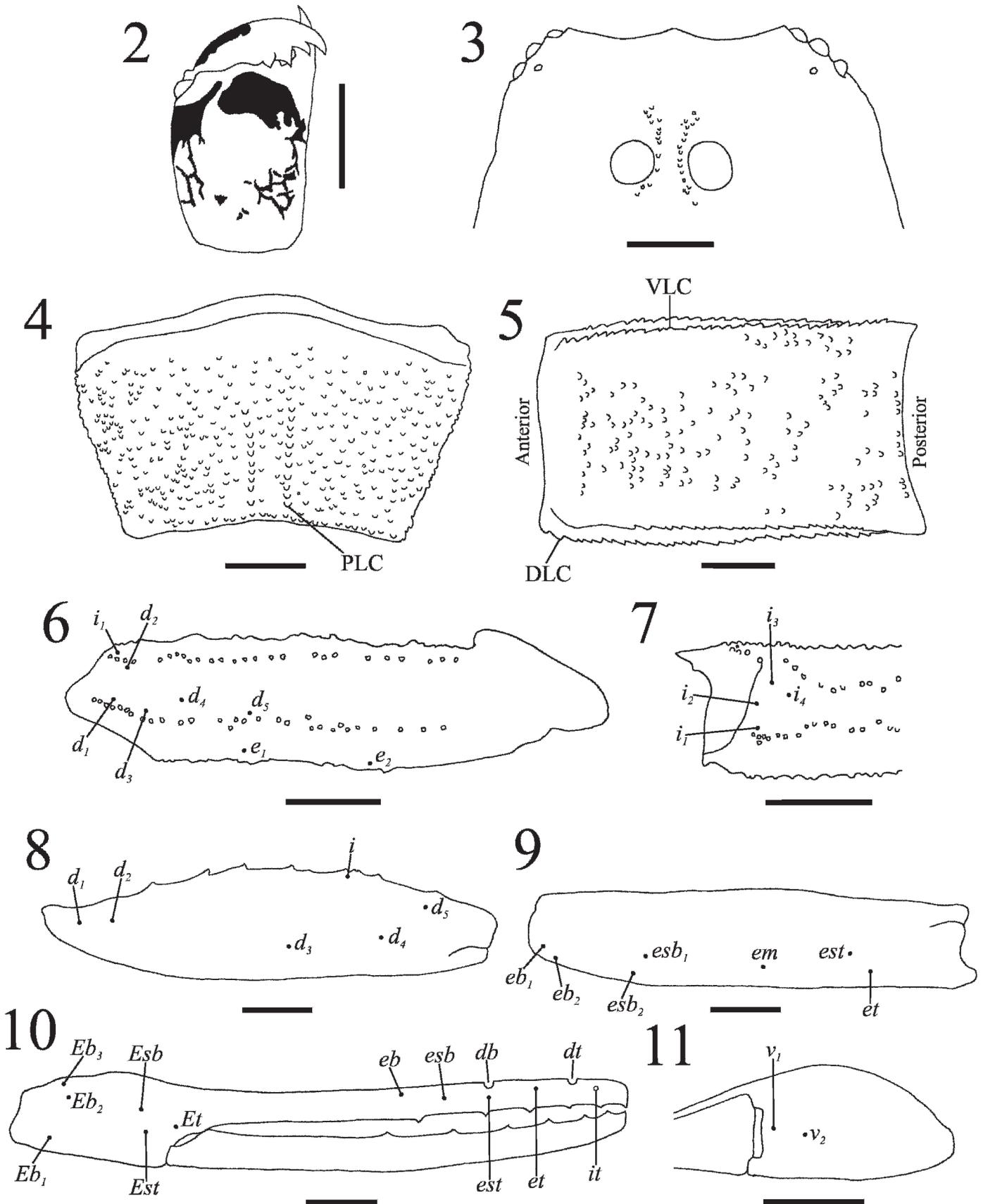
Diagnosis (based on male only).—*Ananteris arcadioidi* differs from all other species of the genus by the following unique combination of features: v_1 and v_2 trichobothria are not aligned axially but v_2 is located on an external position in relation to v_1 (Fig. 11); only *et* trichobothrium is located between *db* and *dt* on pedipalp fixed finger, and *est* is located beside *db* (Fig. 10); the carapace has a well developed anteromedian eminence (Fig. 3); the metasomal carinal formula is 10:10:10:6:5 with intermedian carinae on segment III only present anteriorly, and ventral and intermedian carinae absent on segment IV (Fig. 5); the dorsal surface of chelicerae exhibits a low degree of reticulation (Fig. 2); and pectines have 20–21 teeth.

Description based on male holotype (MPUJ-SCO-356).—**Coloration:** General coloration yellowish with variegated

pigmentation over almost the entire body and appendages. Carapace predominantly brown with some yellow spots and bands; anterior and posterior margins brown; arising posterior to the lateral eyes there are two thin and almost straight yellow lines, each directed toward the midline but ending behind the median ocular tubercle; median ocular tubercle black, surrounded on its base by thin yellow lines on the anterior, anterolateral, and posterolateral margins. Chelicerae with coxa, hand, movable finger, and fixed finger yellowish; hand with a markedly incomplete reticular pattern in dorsal view (Fig. 2); fixed finger yellow with reddish teeth; movable finger with a dorsal brown area basally, teeth reddish. Coxosternal region, genital operculum, pectinal basal piece, pectines and sternites III–VI completely yellow; sternite VII with inconspicuous brown spots between the midline and the lateral margins; sternite V with a subtriangular posterior median hyaline area. Tergites predominantly brown; two longitudinal yellow lines crossing from tergites II to VI are only evident in the posterior half of each segment beside the midline; these lines are more conspicuous in tergites II–VI and appear as rounded spots in tergite I; each side of tergites I–VI with two transverse yellow lines converging near the longitudinal lines, arrow-like; tergite VII predominantly yellow, with brownish regions dorsally and laterally; lateral margins of tergites I–VII completely yellow. Metasoma predominantly yellow; dorsal intercarinal spaces of segments I–IV with a median brown design that is wider anteriorly, triangle-like in segments I–III; segments I–IV with variegated pigmentation in dorsal and lateral surfaces, ventral surfaces predominantly yellow; segment V reddish, with variegated darker pigmentation in all views. Telson reddish, darker than segment V and with inconspicuous brownish spots ventroexternally; aculeus dark red, yellowish basally; subaculear tubercle yellowish. Pedipalps predominantly brown; coxa and trochanter with variegated pigmentation; femur brownish with yellow areas on all surfaces, predominantly yellow ventrally, insertion of all the trichobothria surrounded by a rounded yellow area; patella with variegated pigmentation in dorsal and external surfaces, predominantly yellow internally and ventrally, insertion of all the trichobothria surrounded by a rounded yellow area; hand completely yellow dorsally and externally, with dark brown spotted areas internally and ventrally; fixed and movable fingers pale brown. Legs with variegated pigmentation, brown spots in all segments except for the telotarsus that is completely yellow.

Carapace: With very fine granulation throughout, and densely covered with greater but weak rounded granules especially in the brown areas; lateral margins not parallel; anterior margin with a well developed eminence (Fig. 3); ocular carinae evident, others inconspicuous; a median depression anterior to the ocular tubercle and a posterior median longitudinal furrow are evident; median ocular tubercle low, located in the posterior half of the anterior third of the carapace, with dense thin granulation and few greater granules; lateral ocular tubercles each with four ocelli, the posterior most is very reduced and unaligned with the remaining three pairs (Fig. 3).

Chelicerae: With abundant fine white setae on the internal and ventral surfaces; cheliceral dentition characteristic of the family Buthidae (Vachon 1963). Movable finger externally



Figures 2–11.—*Ananteris arcadii* sp. nov., male holotype (MPUJ-SCO-356). 2. Dorsal view of the left chelicera; 3. Anterior margin of the

Table 1.—Variation of the pectinal teeth number in all species of Colombian *Ananteris*. Data of type specimens not studied were taken from the original descriptions and are included. N = number of pectines.

Species	Sex	N	Pectinal teeth number											Mean	Mode	
			13	15	16	17	18	19	20	21	22	23	24			25
<i>A. arcadioi</i>	♂	2							1	1					20.5	—
<i>A. columbiana</i>	♀	34		2	5	15	11	1							17.12	17
	♂	8			2	1	5								17.38	18
<i>A. dorae</i>	♀	2	2												13	—
<i>A. ehrlichi</i>	♀	8								3	4	1			21.75	22
<i>A. gorgonae</i>	♂	14								2	3	7	2		22.64	23
<i>A. leilae</i>	♀	4		1	3										15.75	16
	♂	2			2										16	—
<i>A. myriamae</i>	♀	4		2	2										15.5	—
<i>A. tolimana</i>	♂	2									1	1			22.5	—
	♀	2								1	1				21.5	—

with two small basal teeth, one median pronounced, one subdistal slightly shorter than the median, and one distal tooth. Internally with two strong teeth, one basal and one median, and one distal tooth that is larger than its external counterpart. Fixed finger externally with one basal and one median tooth mounted onto a bicuspid, one subdistal, and one distal tooth. Internally with only one tooth located slightly basal in respect to the external subdistal.

Coxosternal region: Sternum subtriangular, with a deep median depression and two anterolateral furrows; all the components of this region smooth, with few sparse setae; coxapophyses I–II with dense pilosity anteriorly.

Genital operculum and pectines: Genital operculum divided longitudinally; pectinal basal piece longer than wide; pectines long, surpassing the lateral margins of sternite III; count of pieces on the pectines: basal lamellae 3:3, middle lamellae 9:9, teeth 20:21, fulcra absent.

Sternites: III–IV completely smooth; V–VI with sparse weak granulation; VII densely granulose and with incomplete, parallel and vestigial paramedian carinae, lateral carinae completely absent (Fig. 4); sternites III–VII with abundant setae; sternite V with subtriangular posterior median smooth area; spiracles oval elongate.

Tergites: With similar granulation to that of the carapace; axial carina only evident in the posterior half of tergites II–VI; vestigial dorsolateral carinae also present in these tergites, represented by two or three slightly larger granules; tergite VII tetracarinate (paired dorsolateral and lateral carinae, incomplete), a median elevation is present in the position of the axial carina.

Metasoma: With few long setae; segments I–III with ten carinae (paired ventral, ventrolateral, intermedian, dorsolateral and dorsal carinae); segment IV with six (ventral and intermedian carinae absent) (Fig. 5); segment V with five

(axial, paired ventrolateral and dorsolateral carinae); ventrolateral and intermedian carinae converge distally in segments I–II; ventral and ventrolateral carinae are connected anteriorly by a transverse row of granules in segments II–III; intermedian carinae on segment III are only present anteriorly; all carinae serrulose; intercarinal spaces with abundant weak granulation. Telson almost completely smooth, except for some granules located on the position of the axial carina; subaculear tubercle strong and spine-like; aculeus long and curved.

Pedipalps: With very fine granulation throughout; femur with five longitudinal carinae (dorsoexternal, dorsointernal, ventroexternal, ventrointernal and internal median carinae), with sparse weak rounded granules dorsally and internally; patella without distinct carinae but with few granules on the position of the dorsointernal and ventrointernal carinae; chela acarinate; fixed finger with six almost linear rows of granules (including the short apical row), the basal the longest; movable finger with seven rows. Trichobothriotaxy type A, femur with β configuration (Vachon 1973, 1975) (Figs. 6–11).

Legs: Tibia, basitarsus and telotarsus with numerous ventral setae; tibial spur present in legs III–IV; prolateral pedal spur single in legs I–II, bifid in legs III–IV; retrolateral pedal spur present in all the legs.

Measurements (mm).—Total L (excluding telson) 18.25; carapace L 2.46; carapace anterior W 1.51; carapace posterior W 2.28; interocular distance 0.15; ocular diameter 0.24. Mesosoma L 5.09. Metasoma L (including telson) 13.82; segments: I L/W/D 1.40/1.59/1.38; II L/W/D 1.59/1.47/1.38; III L/W/D 1.74/1.44/1.40; IV L/W/D 2.29/1.42/1.46; V L/W/D 3.68/1.54/1.36. Telson L 3.12; vesicle W/D 0.72/0.71. Pedipalps: total L 8.29; femur L/W 2.27/0.58; patella L/W 2.74/0.74; chela L/W/D 3.28/0.55/0.54; movable finger L 2.55; palm L 0.85.

←

carapace (only granulation of the ocular carinae is included); 4. Sternite VII; 5. Ventral view of metasomal segment IV; 6–11. Distribution of the trichobothria (illustrated from the right pedipalp); 6. Femur, dorsoexternal view; 7. Femur, internal view; 8. Patella, dorsointernal view; 9. Patella, external view; 10. Chela, external view; 11. Chela, ventral view. Abbreviations: PLC = paramedian longitudinal carina; VLC = ventrolateral carina; DLC = dorsolateral carina. Scale bars = 0.5 mm.

Table 2.—States for some taxonomically useful characters in all species of Colombian *Ananteris*. SAMC = Shape of the anterior margin of the carapace; TOC = Texture of the ocular carinae; RP $v_1 - v_2$ = Relative position of v_1 and v_2 trichobothria; RP Ext. – Dor. = Relative position of the external and dorsal trichobothria on pedipalp fixed finger (beginning from the base; “/” symbol indicates trichobothria at the same level); C St. VII = Carination of sternite VII; MCF = Metasomal carinal formula (* indicates that the intermedian carinae on segment III are vestigial and only present anteriorly). Data for *A. tolimana* are based on Teruel & García (2007).

Species	SAMC	TOC	RP $v_1 - v_2$	RP Ext. – Dor.	C St. VII	MCF
<i>A. arcadioi</i>	With anteromedian eminence	Granulose	Unaligned axially	<i>eb:esb:est/db:et:dt</i>	Paramedian present	10:10:10:6:5*
<i>A. columbiana</i>	With anteromedian eminence to slightly bi-concave	Granulose	Aligned axially	<i>eb:esb:db:est:et:dt</i>	Paramedian present	10:10:10:8:5*
<i>A. dorae</i>	Slightly concave	Granulose	Unaligned axially	<i>eb:esb:db:est:et:dt</i>	Acarinate	10:10:10:6:3
<i>A. ehrlichi</i>	Slightly concave	Granulose	Aligned axially	<i>eb:esb:est/db:et:dt</i>	Paramedian present	10:10:8:8:5
<i>A. gorgonae</i>	Slightly concave	Smooth	Aligned axially	<i>eb:esb:est/db:et:dt</i>	Paramedian present	10:10:10:8:5*
<i>A. leilae</i>	Slightly concave	Granulose	Aligned axially	<i>eb:esb:db:est:et:dt</i>	Paramedian present	10:10:8:8:5
<i>A. myriamae</i>	With anteromedian eminence	Granulose	Unaligned axially	<i>eb:esb:est/db:et:dt</i>	Paramedian present	10:10:10:6:5
<i>A. tolimana</i>	Slightly concave (see Teruel & García 2007: fig. 2a)	Granulose (see Teruel & García 2007: fig. 2a)	—	<i>...est/db...</i>	Paramedian present	10:10:10:8:5*

Female.—Unknown.

Distribution.—This species is known only from the type locality: Altamira, Puerto Gaitán, Meta Department (Fig. 1). It inhabits the Llanos ecoregion, which extends from the foothills of the Eastern Andes of Colombia through almost the entire course of the Orinoco River. It has a typical savanna climate, with wet and dry season and high temperatures all over the year. Besides the savanna areas, this ecoregion gathers a variety of forests in which most of its biodiversity is found (National Geographic Society 2001).

Affinities with other Colombian species.—*Ananteris arcadioi* is most similar to *A. myriamae*, with which it shares the anterior margin of the carapace with a well developed median eminence (Fig. 3; Botero-Trujillo 2007:fig. 6), the carinal formula of metasoma 10:10:10:6:5 with ventral and intermedian carinae absent on segment IV (Fig. 5), and that v_1 and v_2 trichobothria are not aligned axially (Fig. 11; Botero-Trujillo 2007:fig. 13). *Ananteris arcadioi* can be readily distinguished by the greater number of pectinal teeth (20–21), the low degree of reticulation on dorsal surface of chelicerae (Fig. 2), the intermedian carinae on metasomal segment III that are only present anteriorly, and the vestigial paramedian carinae of sternite VII that are parallel and formed by many granules (Fig. 4). In contrast, in *A. myriamae* the pectines have 15–16 teeth, the chelicerae are densely reticulated (Botero-Trujillo 2007: fig. 3), intermedian carinae are complete on metasomal segment III; and the vestigial paramedian carinae of sternite VII are not parallel (being separated from each other by a greater distance anteriorly than posteriorly) and are formed by two to four granules.

Ananteris dorae sp. nov.
Figs. 1, 12–21; Tables 1, 2

Type material.—*Holotype*: COLOMBIA: *Nariño Department*: adult female, Reserva Natural La Planada, permanent plot, 01°15'N, 78°15'W, 1885 m elev., pitfall, 2–4 May 2001, G. Oliva, M. 2369 (IAvH-E 100763).

Etymology.—Patronym dedicated to the memory of Dora Elizabeth Mendoza. It celebrates the lives of Dora and her family, who filled each other with support, encouragement, and inspiration.

Diagnosis (based on female only).—*Ananteris dorae* differs from all other species of the genus due to its unique metasomal carinal formula 10:10:10:6:3, with ventral and intermedian carinae absent on segment IV (Fig. 14) and ventrolateral carinae absent on segment V (Fig. 15). Other interesting and useful characters of the new species are: v_1 and v_2 trichobothria are not aligned axially but v_2 is located on an external position in relation to v_1 (Fig. 21); *est* and *et* trichobothria are located between *db* and *dt* on pedipalp fixed finger, and *esb* is basal to *db* (Fig. 20); the anterior margin of the carapace is weakly, evenly concave and lacking median eminence (Fig. 12); the dorsal surface of chelicerae exhibits a complete and very reticulated pattern; pectines have 13:13 teeth; sternite VII lacks any vestige of paramedian carinae (Fig. 13); metasomal segments present abundant and strong granulation, especially on segment V where the carinae are difficult to distinguish from the remaining granules of the tegument (Figs. 14, 15); and metasomal carinae are formed by unconnected granules (except for dorsolateral and dorsal carinae).

Description based on female holotype (IAvH-E 100763).—*Coloration*: General coloration dark brown over almost the entire body and appendages. Carapace predominantly dark brown with some lighter spots and bands; anterior and posterior margins dark brown; arising posterior to the lateral eyes there are two thin and almost straight light-brown lines, each directed toward the midline that do not reach it but end behind and beside the median ocular tubercle; median ocular tubercle black. Chelicerae dark brown, hand with a densely reticulated pattern in dorsal view; fixed and movable fingers almost black, teeth yellowish. Coxosternal region light brown; genital operculum, pectinal basal piece, pectines and sternites III–VI completely dark yellow; sternite VII brownish laterally;

sternite V with a much reduced posterior median hyaline area, a narrow transverse. Tergites predominantly dark brown; each side of tergites II–VI with two transverse yellow lines converging near the midline, arrow-like; tergite VII predominantly dark brown. Metasoma predominantly dark brown to reddish; dorsal intercarinal spaces of segments I–IV with a median dark brown design that is wider anteriorly, triangle-like in segments I–III; segments I–V with some dark red regions on all surfaces. Telson reddish, lighter than segment V, with inconspicuous brownish spots ventroexternally; aculeus reddish, lighter basally; subaculear tubercle brownish. Pedipalps predominantly dark brown; femur and patella with few regions slightly lighter externally and ventrally, insertion of all the trichobothria yellow in both segments; hand completely yellow; fixed and movable fingers dark brown, yellowish basally. Legs predominantly dark brown, except for the telotarsus that is completely yellow.

Carapace: With very fine granulation throughout, and densely covered with greater but weak rounded granules especially in the dark brown areas; lateral margins not parallel; anterior margin weakly, evenly concave and lacking median eminence (Fig. 12); ocular carinae evident, others inconspicuous; a median depression anterior to the ocular tubercle and a posterior median longitudinal furrow are evident; median ocular tubercle low, located in the posterior half of the anterior third of the carapace, with dense thin granulation and few greater granules in the ocular carinae; lateral ocular tubercles each with four ocelli, the posterior-most is very reduced and unaligned with the remaining three pairs (Fig. 12).

Chelicerae: With abundant fine white setae on the internal and ventral surfaces; cheliceral dentition characteristic of the family Buthidae (Vachon 1963). Movable finger externally with two small basal teeth, one median pronounced, one subdistal slightly shorter than the median, and one distal tooth. Internally with two strong and pronounced teeth, one basal and one median, and one distal tooth that is larger than its external counterpart. Fixed finger externally with one basal and one median tooth mounted onto a bicuspid, one subdistal, and one distal tooth. Internally with only one tooth located slightly basal in respect to the external subdistal.

Coxosternal region: Sternum subtriangular, with a deep median depression and two anterolateral furrows; all the components of this region smooth, with abundant setae; coxapophyses I–II with dense pilosity anteriorly.

Genital operculum and pectines: Genital operculum divided longitudinally; pectinal basal piece wider than long; pectines densely hirsute, surpassing the lateral margins of sternite III; count of pieces on the pectines: basal lamellae 3:3, middle lamellae 7:7, teeth 13:13, fulcra absent.

Sternites: III–IV completely smooth; V–VI with few weak granulations on the posterior border; VII densely granulose and without any vestige of paramedian or lateral carinae (Fig. 13); sternite IV bilobate posteriorly; sternites III–IV, VI–VII with very few setae; sternite V densely hirsute medially, with a much reduced posterior median smooth area, a narrow transverse; spiracles linear.

Tergites: With similar granulation to that of the carapace; axial carina only evident in the posterior half of tergites III–VI; dorsolateral and lateral carinae completely absent in

tergites I–VI; tergite VII tetracarinate (paired dorsolateral and lateral carinae, incomplete), a median elevation is present in the position of the axial carina.

Metasoma: With few setae; segments I–III with ten carinae (paired ventral, ventrolateral, intermedian, dorsolateral, and dorsal carinae); segment IV with six (ventral and intermedian carinae absent) (Fig. 14); segment V with three (axial, paired dorsolateral carinae) (Fig. 15); ventrolateral and intermedian carinae converge distally in segments I–II; ventral carinae are not parallel in segment I but arranged into S-shape, separated from each other by a greater distance anteriorly than posteriorly; ventral carinae are connected to each other and to ventrolateral carinae by a transverse row of granules in segments II–III; all carinae granulose, formed by unconnected granules (except for dorsolateral and dorsal carinae in segments I–IV whose granules are very close together); intercarinal spaces with abundant strong granulation (Figs. 14, 15). Telson bulbous, densely granulose ventrally and externally, smooth dorsally, with vestigial axial and ventrolateral carinae; subaculear tubercle strong and spine-like; aculeus short and curved.

Pedipalps: With very fine granulation throughout; femur with five vestigial longitudinal carinae (dorsoexternal, dorsointernal, ventroexternal, ventrointernal and internal median carinae); patella without distinct carinae but with few greater granules on the position of the dorsointernal and ventrointernal carinae; chela acarinate; fixed finger with six almost linear rows of granules (including the short apical row), the basal the longest; movable finger with seven rows. Trichobothriotypy type A, femur with β configuration (Vachon 1973, 1975) (Figs. 16–21).

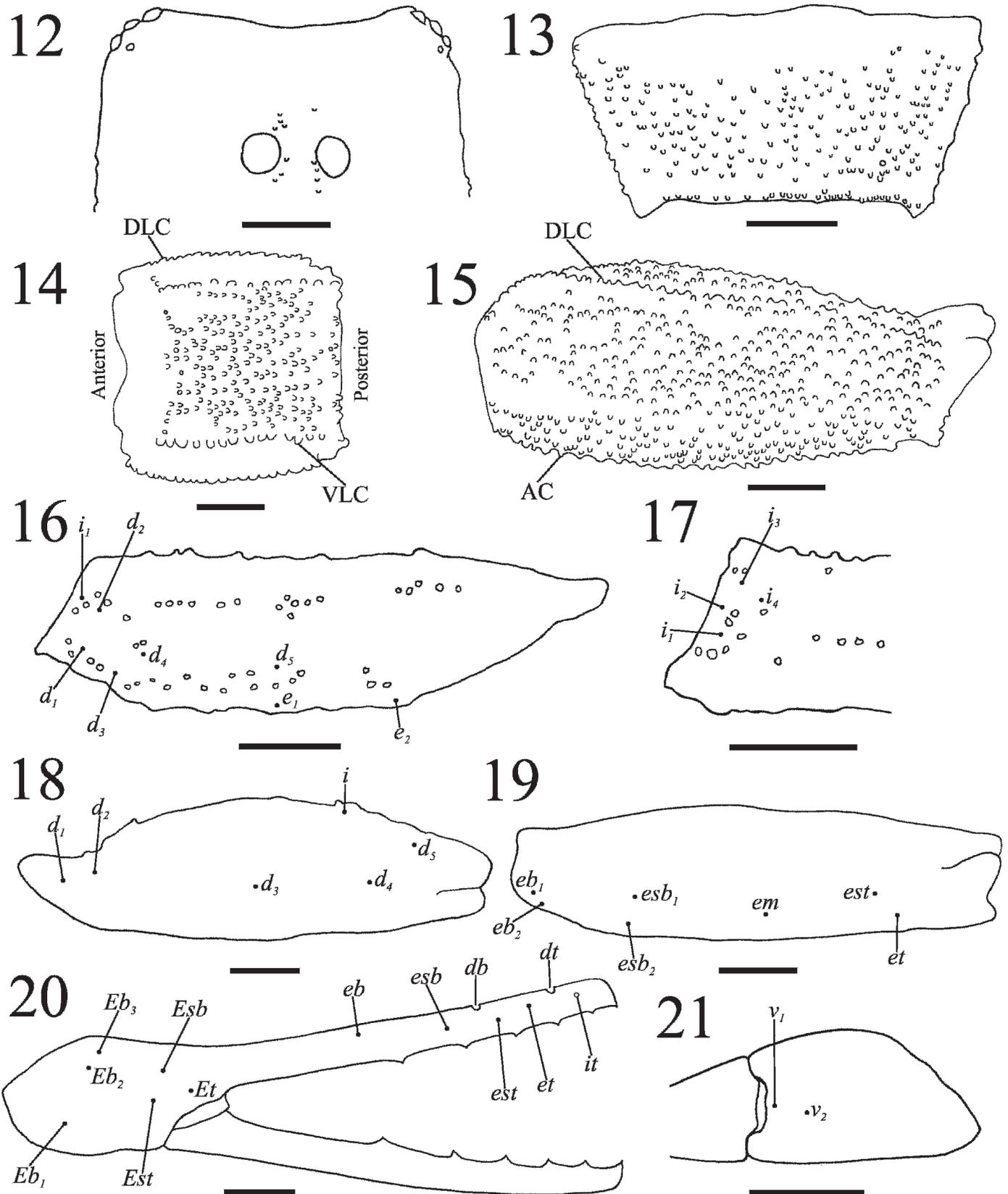
Legs: Basitarsus and telotarsus with numerous ventral setae; tibial spur present in legs III–IV; prolateral pedal spur single in legs I–II, bifid in legs III–IV; retrolateral pedal spur present in all the legs; tarsal claws long and curved, exceeding the depth of the telotarsus.

Measurements (mm).—Total L (excluding telson) 16.20; carapace L 2.20; carapace anterior W 1.58; carapace posterior W 2.46; interocular distance 0.20; ocular diameter 0.20. Mesosoma L 5.27. Metasoma L (including telson) 11.65; segments: I L/W/D 1.16/1.46/1.09; II L/W/D 1.28/1.42/1.10; III L/W/D 1.37/1.33/1.20; IV L/W/D 1.89/1.35/1.32; V L/W/D 3.03/1.39/1.28. Telson L 2.92; vesicle W/D 1.06/1.00. Pedipalps: total L 8.29; femur L/W 2.21/0.60; patella L/W 2.68/0.79; chela L/W/D 3.40/0.53/0.58; movable finger L 2.56; palm L 0.86.

Male.—Unknown.

Distribution.—This species is known only from the type locality: Reserva Natural La Planada, Nariño Department (Fig. 1). It inhabits the Northwestern Andean Montane Forests ecoregion, which is among the most diverse ecoregions on the planet. Due to Andean topography and pronounced glacial period of isolation, the ecosystems present in this region exhibit a diverse array of distinctive communities with unusual high levels of species endemism (National Geographic Society 2001).

Affinities with other Colombian species.—*Ananteris dorae* is most similar to *A. myriamae* and *A. arcadioi*, with which it shares the presence of six carinae in metasomal segment IV with ventral and intermedian carinae absent (Figs. 5, 14), and



Figures 12–21.—*Ananteris dorae* sp. nov., female holotype (IAvH-E 100763): 12. Anterior margin of the carapace (only granulation of the ocular carinae is included); 13. Sternite VII; 14. Ventral view of metasomal segment IV; 15. Lateral view of metasomal segment V; 16–21. Distribution of the trichobothria (illustrated from the right pedipalp); 16. Femur, dorsoexternal view; 17. Femur, internal view; 18. Patella,

that v_1 and v_2 trichobothria are not aligned axially (Figs. 11, 21; Botero-Trujillo 2007:fig. 13). *Ananteris dorae* can be readily distinguished from both species since in the former the anterior margin of the carapace is weakly, evenly concave and lacking median eminence (Fig. 12), sternite VII lacks any vestige of paramedian carinae (Fig. 13), metasomal segment V is tricarinate with ventrolateral carinae absent (Fig. 15), metasomal segments have abundant and strong granulation, especially on segment V where the carinae are difficult to distinguish from the remaining granules of the tegument (Figs. 14, 15), metasomal carinae are formed by unconnected granules (except for dorsolateral and dorsal carinae), the pectinal teeth number is lower (13:13), and *db* trichobothrium is considerably basal to *est* on pedipalp fixed finger (Fig. 20). In contrast, in *A. myriamae* and *A. arcadioi* the carapace has a well developed anteromedian eminence (Fig. 3; Botero-Trujillo 2007:fig. 6), sternite VII bears vestigial paramedian carinae (Fig. 4), metasomal segment V is pentacarinata, the granulation of metasomal segments is less abundant and weaker, metasomal carinae are formed by connected granules, the pectinal teeth number is greater (*A. myriamae*: female 15–16; *A. arcadioi*: male 20–21), and *db* is located beside *est* (Figs. 10; Botero-Trujillo 2007:fig. 12).

COMMENTS ON THE TAXONOMY OF COLOMBIAN *ANANTERIS*

The examination of several specimens of this genus belonging to various species—and others that do not fit into any of the known species and thus remain under study—from many Colombian localities, highlighted that the genus *Ananteris* provides few taxonomically useful characters. The widely used pectinal teeth number and coloration pattern, despite being useful, ideally should not be used alone to identify species because specimens belonging to different species may overlap in the number of teeth (Table 1) and in general color patterns. In review of the morphological characters used to diagnose species within the genus *Ananteris* the usefulness of some was confirmed and others never previously used appeared to be useful, whereas others exhibited intraspecific variability and therefore their use to define species should be avoided. Below, these characters are organized in three sections depending on their usefulness. Authors are strongly encouraged to include in their contributions to the genus *Ananteris* detailed descriptions and/or illustrations of these features, in order to better ascertain their taxonomic value.

Taxonomically useful characters (variable among species, easily defined).—*Shape of the anterior margin of the carapace:* This has been only previously used to assist the diagnosis of a species of *Ananteris* by Botero-Trujillo (2007). Two states have been identified for this character: *i*) straight or with a slight concavity; *ii*) not straight, with anteromedian eminence whose strength appears to also be useful. Even though some individual variations in the strength of the pronouncement have been observed in *A. columbiana*, it is the same among the

two known specimens of *A. myriamae* and is invariable in a different species that remains under study of which several specimens are available.

Texture of the ocular carinae: This has never been used previously in *Ananteris*, but is herein used to distinguish *A. gorgonae* from all other Colombian species (Table 2). Two states have been identified for this character: *i*) with granules in the interocular region similar to granules of the carapace; *ii*) smooth.

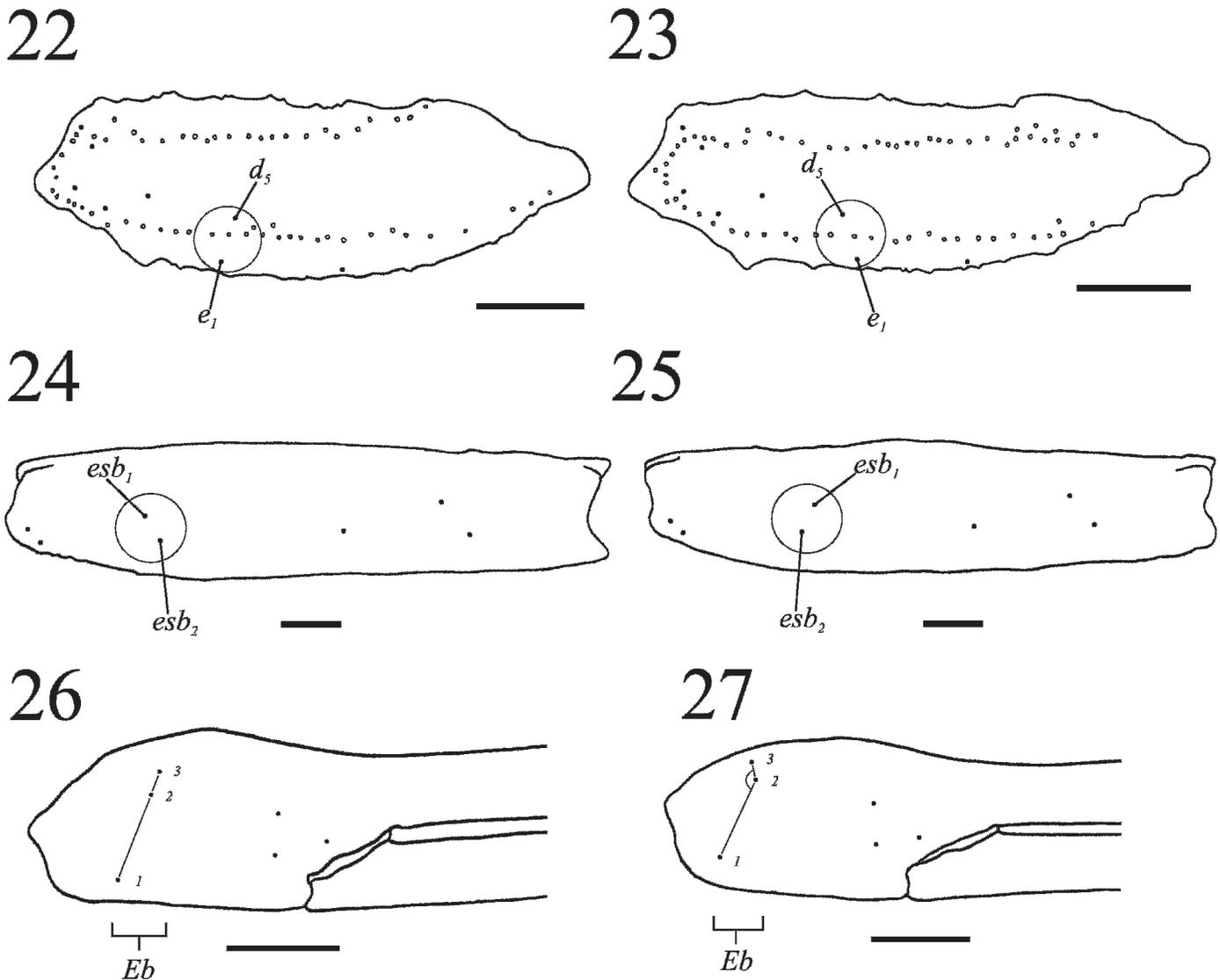
Relative position of “ v_1 ” and “ v_2 ” trichobothria on pedipalp chela: This has been only previously used by Botero-Trujillo (2007). Two states have been identified for this character: *i*) these are arranged linearly parallel to the external surface of the pedipalp chela (aligned axially); *ii*) the resulting line is not parallel to the external surface, with v_2 located on an external position in relation to v_1 (unaligned axially). It is important to note that, even though Lourenço’s (1999a:fig. 2) illustration of the arrangement of these trichobothria in the female holotype of *A. leilae* shows these unaligned, examination of this scorpion (ICN-MHN-As-110) revealed that these are actually aligned axially, as in the other two specimens available of this species.

*Position of “*db*” trichobothrium with respect to “*est*” on pedipalp fixed finger:* This has been mentioned to be useful in several studies (Lourenço 1982, 1984, 1999b, 2002a, 2002b; González-Sponga 2006; Teruel & García 2007). Two states have been identified for this character: *i*) *db* beside *est* or nearly so; *ii*) *db* basal to *est*. It is important to note that in a few specimens, particularly *A. columbiana*, the position of *db* with respect to *est* presents slight differences between both chelae, which does not necessitate the need to abandon the system. In addition to the relative position of these two trichobothria, it is noteworthy that several different arrangements of the dorsal and external trichobothria on pedipalp fixed finger have been identified in the entire genus (i.e., *eb:esb:est|db:et:dt*, *eb:esb:db:est:et:dt*, *eb:esb:est:db:et:dt*, *eb:esb:db:est:dt|et*, *eb:db:esb:est:db:et*, *eb:db:esb:est:et:dt*, beginning from the basal most and the “|” symbol indicating trichobothria at the same level), thus appearing to be a very useful taxonomic character.

Carination of sternite VII: This has never been used previously in *Ananteris*, but is herein used to assist the diagnosis of *A. dorae*. Two states have been identified for this character: *i*) without any vestige of paramedian carinae; *ii*) with vestiges of such carinae, whose length and arrangement appears to also be useful.

Metasomal carinal formula: This refers to the number of carinae that are present on the metasomal segments. It is frequently expressed in the way of Arabic numerals separated by a colon, beginning from segment I. The number of carinae on metasomal segments has been widely used to distinguish species (Lourenço 1982, 2002b, 2004a; Rojas-Runjaic 2005; González-Sponga 1972, 1980, 1996, 2006; Kovařík 2006; Botero-Trujillo 2007), and several different combinations have been observed in the entire genus (i.e., 10:10:10:10:5,

←



Figures 22–27.—Characters that are variable within species of *Ananteris*. Some segments are inverted for easier comparisons. 22, 23. Position of femoral “ d_5 ” trichobothrium with respect to “ e_1 ”; example from *A. colombiana*: 22. Right femur of an adult female (ICN-MHN-As-121); 23. Left femur of an adult female (ICN-MHN-As-111). 24, 25. Position of patellar “ esb_1 ” with respect to “ esb_2 ”; example from *A. ehrlichi*: 24. Right patella of an adult female (ICN-MHN-As-361); 25. Left patella of an adult female (ICN-MHN-As-342). 26, 27. Position of “ Eb_1 ”, “ Eb_2 ” and “ Eb_3 ” on chela; example from *A. colombiana*: 26. Right chela of a female (ICN-MHN-As-111); 27. Right chela of a female (ICN-MHN-As-121). Scale bars = 0.5 mm.

10:10:10:6:2, 10:10:10:6:3, 10:10:10:6:5, 10:10:10:8:5, 10:10:8:8:5, 10:8:8:8:5 among others). The carination of segments IV–V appears the most useful for the identification of Colombian species. Two states have been identified in segment IV: *i*) eight carinae, with only intermedian absent; *ii*) six carinae, with ventral and intermedian absent. Two states have been identified in segment V: *i*) five carinae; *ii*) three carinae, with ventrolateral absent. Caution should be taken in the assignment of state to segment III, since the intermedian carinae may be weakly developed and only present anteriorly. In such a case, it is recommended that these be included in the formula but its condition indicated as in Table 2, since the length of this particular pair of carinae has been shown to also be useful.

Taxonomic characters of restricted usefulness (variable among species, difficult to define).—These characters are useful

to diagnose species provided that additional characters are considered. *Cheliceral reticulation*: the degree and pattern of reticulation on the dorsal surface of the chelicerae have been observed to be almost always constant within species, virtually invariable among sexes and maturity, thus having been mentioned as taxonomically useful in many studies (Lourenço 1982, 1987, 1997, 1999c, 2001, 2002a, 2002b, 2003, 2004b; Kovařík 2006; Teruel & García 2007). Only very few specimens with slight variations have been found, which does not render this character useless.

Pectinal teeth number: Perhaps one of the most frequently used characters to assist the diagnosis of scorpion species. In *Ananteris* it has been widely used previously (Lourenço 1981, 1982, 1999a, 2002a, 2002b; Lourenço & Flórez 1989; González-Sponga 2006; Kovařík 2006; Botero-Trujillo 2007;

Teruel & García 2007). This character should not be used alone since the ranges overlap among many species and it is sex-dependent in many cases (Table 1).

Shape of the posterior median hyaline and smooth area on sternite V: This area has only been previously used to assist the diagnosis of a species of *Ananteris* by Teruel & García (2007). Even though it has been observed that the shape of this structure is almost invariable within species, it is not easy to define character states since it would depend on each author's perceptions. In addition, it has been observed that the degree of development of this structure may be sex-dependent [as noted by Teruel & García (2007) for *A. tolimana*] and is absent or very difficult to identify in juveniles.

Pilosity of the sternites and metasomal segments (size and density); granulation of metasomal segments (strength and density): These have never been used previously in *Ananteris*, except for the later that is herein used to assist the diagnosis of *A. dorae*. Even though it has been observed

that the size and density of setae on the sternites, and the strength and density of the granulation on metasomal segments may vary depending on the species, it is not recommended that these be used alone to define species given that they present gradual variation, thus being difficult to define character states.

Taxonomic characters that are not useful (variable within species).—*Position of femoral “d₅” trichobothrium with respect to “e₁”; of patellar “esb₁” to “esb₂”; and of “Eb₁”, “Eb₂” and “Eb₃” to each other on chela:* Of these, only the relative position of femoral *d₅* and *e₁* trichobothria has been used to distinguish species of *Ananteris* (Lourenço 1984, 2002a, 2002b). Even though these were first thought to be useful for the identification of Colombian species when differences were observed among them, examination of as many specimens as possible revealed that, although one or another arrangement may tend to be more common on each species, the relative position of these trichobothria is variable (Figs. 22–27).

KEY FOR THE IDENTIFICATION OF COLOMBIAN *ANANTERIS*

Users of this key should be aware that the genus *Ananteris* has recently shown a notorious increase in the number of known species; thus, it is likely that many other species that have not yet been described may fit in the key, leading to erroneous conclusions on their taxonomic identity. Besides this, many species of *Ananteris* are based upon few taxonomic characters, making their identification even more difficult. Therefore, it is strongly recommended that any conclusion be tested *a posteriori* with the aid of the original descriptions and supported by the information on the geographic distribution of each species since most have exhibited restricted distribution patterns.

1. Metasomal segment IV with six complete carinae (paired dorsal, dorsolateral and ventrolateral carinae) and ventral and intermedian carinae absent (Figs. 5, 14); *v₁* and *v₂* trichobothria unaligned axially, with *v₂* located on an external position in relation to *v₁* (Figs. 11, 21; Botero-Trujillo 2007:fig. 13) 2
 Metasomal segment IV with eight complete carinae (only intermedian carinae absent); *v₁* and *v₂* trichobothria aligned axially 4
2. Metasomal carinal formula 10:10:10:6:3 with all carinae complete and ventrolateral carinae absent on segment V (Fig. 15); sternite VII without paramedian carinae (Fig. 13); carapace slightly concave anteriorly and lacking anteromedian eminence (Fig. 12) *Ananteris dorae*
 Metasomal carinal formula 10:10:10:6:5, with intermedian carinae on segment III either complete or only present anteriorly; sternite VII with incomplete paramedian carinae (Fig. 4); carapace with anteromedian eminence (Fig. 3; Botero-Trujillo 2007: fig. 6) 3
3. Intermedian carinae on metasomal segment III only present anteriorly; chelicerae with an incomplete reticular pattern on dorsal surface (Fig. 2); paramedian carinae on sternite VII parallel and formed by many granules (Fig. 4) *Ananteris arcadioi*
 Intermedian carinae on metasomal segment III complete; chelicerae with a complete reticular pattern on dorsal surface (Botero-Trujillo 2007:fig. 3); paramedian carinae on sternite VII separated by a greater distance anteriorly than posteriorly and formed by no more than four granules *Ananteris myriamae*
4. Metasomal carinal formula 10:10:10:8:5 with intermedian carinae on segment III only present anteriorly 5
 Metasomal carinal formula 10:10:8:8:5 with intermedian carinae completely absent on segment III 7
5. Ocular carinae smooth; male pectines with 21–24 teeth *Ananteris gorgonae*
 Ocular carinae granulose; male pectines with 16–18 or 22–23 teeth 6
6. Trichobothrium *est* located beside *db* on pedipalp fixed finger (as in Fig. 10); pectines with 22–23 teeth in males, 21–22 in females; sternites III–V with conspicuous brown regions (Teruel & García 2007: fig. 2c, 2b) *Ananteris tolimana*
 Trichobothria *est* and *et* located between *db* and *dt* on pedipalp fixed finger (as in Fig. 20); pectines with 16–18 teeth in males, 15–19 in females; sternites III–V completely yellow or, if any spots, then these are minute and inconspicuous *Ananteris columbiana*
7. Trichobothria *est* and *et* located between *db* and *dt* on pedipalp fixed finger (as in Fig. 20); female pectines with 15–16 teeth; pedipalp hand completely yellow *Ananteris leilae*
 Trichobothrium *est* slightly basal to *db* or beside it on pedipalp fixed finger; female pectines with 21–23 teeth; pedipalp hand with conspicuous brown areas in all surfaces *Ananteris ehrlichi*

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