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A new species and new record of *Agistemus* Summers (Acari: Stigmaeidae) associated with *Capsicum annuum* L. var. *glabriusculum* (Solanaceae) from Northeastern of Mexico

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Original research

ABSTRACT

Two mite species belonging to the genus *Agistemus* Summers (Acari: Stigmaeidae) were collected from wild plants known as "chile piquín" (*Capsicum anuumm* L. var. *glabriusculum*) in two protected naturals areas, state of Tamaulipas, Mexico. *Agistemus piquinnus* Monjarás-Barrera & Johann **n. sp.** is described and illustrated. *Agistemus brasiliensis* Matioli, Ueckermann & Oliveira, 2002 is a new record for Mexico. A key to the *Agistemus* species of Mexico is provided.

Keywords Raphignathoidea; Protected Naturals Areas; Trombidiformes; chile piquín; Tamaulipas
Zoobank http://zoobank.org/922C0CDD-E7B9-4670-8AE3-863621A79BAB

Introduction

In several ecosystems and crops, mites of the family Stigmaeidae are one of the most important predatory mites after Phytoseiidae (Santos & Laing, 1985) and are considered economically important as predators of other mites and small arthropods (Fan & Zhang, 2005; Fan & Flechtmann, 2015). Stigmaeid mites have been studied as potential predators against pestiferous mites of the families Eriophyidae, Tetranychidae, Tenuipalpidae and Tarsonemidae (Gerson *et al.*, 2003; Johann *et al.*, 2013). Therefore, its correct identification is fundamental for management programs of these mites (Zhang, 2003).

The genus *Agistemus* Summers, 1960 comprise more than 87 described species (Fan *et al.*, 2016; Paktinat-Saeij *et al.*, 2017; Rehman *et al.*, 2018); of which, seven were recorded from Mexico: *Agistemus floridanus* González-Rodríguez (González-Rodríguez, 1965), *A. longisetus* González-Rodríguez (González-Rodríguez, 1963), *A. fleschneri* Summers, *A. simplex* González-Rodríguez, *A. striolatus* González-Rodríguez (González-Rodríguez, 1965), *A. arcypaurus* González-Rodríguez and *A. terminalis* Quayle (Estrada-Venegas *et al.*, 2002).

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The present study aims to (i) described a new species of stigmaeid mites from Mexico, (ii) record of *Agistemus brasiliensis* for the first time from this country, and (iii) provide an identification key to species of *Agistemus* so far reported from Mexico.

Materials and methods

The specimens were collected on leaves of the wild plant "chile piquín" (*Capsicum annuum* L. var. *glabriusculum*) in two Protected Naturals Areas (PNA): "El Cielo" Biosphere Reserve (23°01′07′ N, 99°08′54″ W) and PNA "Altas Cumbres" (23°41′52″ N, 99°11′04″ W and 23°46′41″ N, 99°12′12″ W), located in the municipalities of Gómez Farias and Victoria in Tamaulipas, Mexico, respectively. The collected leaves were transported to the laboratory of Ecología de Poblaciones in the Instituto de Ecología Aplicada of Universidad Autónoma de Tamaulipas. Mite extraction followed Dhooria (2016) and slide preparations were carried out according to Jeppson *et al.*, (1975). The mites were observed under Phase Contrast (PH) and Differential Interference Contrast (DIC) microscope Zeiss AXIO Imager.Z2 in the Laboratory of Acarology of Universidade do Vale do Taquari - Univates, Lajeado, Rio Grande do Sul, Brazil.

The terminology and abbreviations are based on Grandjean (1944) and Kethley (1990). All measurements are given in micrometers (µm) and the measurements of the holotype are followed by ranges of the paratypes in parentheses.

Holotype female and three paratype males were deposited at Departamento de Entomologia e Acarologia, Escola Superior de Agricultura "Luiz de Queiroz", Universidade de São Paulo (ESALQ/USP), Piracicaba, São Paulo State, Brazil. Two paratypes female were deposited at "Colección Nacional de Ácaros" (CNAC) of Instituto de Biología, Universidad Nacional Autónoma de México (UNAM) in Mexico city, Mexico.

Taxonomy

Family: Stigmaeidae Oudemans, 1931

Genus: *Agistemus* Summers, 1960

Type species: *Caligonus terminalis* Quayle, 1912, by original designation. *Agistemus terminalis* (Quayle), Summers, 1960: 234.

Agistemus brasiliensis Matioli, Ueckermann & Oliveira, 2002

(Table 1)

Distribution — *Agistemus brasiliensis* was reported on *Citrus sinensis* (L.) Osbeck in São Paulo, Brazil, feeding on *Panonychus citri* (McGregor) (Tetranychidae) and *Brevipalpus phoenicis* (Geijskes) (Tenuipalpidae) (Matioli *et al.*, 2002). It is recorded from *Coffea arabica* L. and *C. canephora* P. (Mineiro *et al.*, 2010). It is the only species collected on *Vitis vinifera* L. Chardonnay and Merlot cultivar, *Vitis labrusca* L. Bordeaux cultivar and *Solanum americanum* Mill. (Johann *et al.*, 2013). *Agistemus brasiliensis* has only been recorded from two countries worldwide, Brazil (Fan *et al.*, 2019) and Mexico (present study).

Remarks — No morphological differences were observed between specimens from Mexico and those described by Matioli *et al.*, (2002). Measurements of the Mexican specimens are provided in Table 1.

Material examined — All specimens were found on leaves of *Capsicum annuum* L. var. *glabriusculum* at, Ojo de Agua, Gomez Farias Tamaulipas, Mexico; J. I. Monjarás B. leg.; two females; February 17, 2017; one female, March 3, 2017; one male, February 17, 2017; one male, October 13, 2017; one male, November 10, 2017.

Agistemus piquinnus Monjarás-Barrera & Johann n. sp.

Zoobank: AC9EF2C2-8565-4982-9AEB-F1DBE9BA2D88

(Figures 1-5)

Diagnosis (female) — Prodorsal and hysterosomal shields smooth; length of seta c_1 longer than the distance between the bases of c_1 and d_1; the ratio *vi/vi–vi* 2.8 (2.8-3.0); ratio $c_1/c_1–c_1$ 2.1 (2.1-2.3); ratio: *pob/eye*: 3.2 (3.0-3.2). Aggenital shield not defined, bearing two pair of setae (ag_1-ag_2); seta g_1 extending beyond the base of ps_2; setae ps_1 and ps_2 slightly barbed and more robust than ps_3; femora I–IV 5-4-2-2.

Table 1 Measurements of *Agistemus brasiliensis* Matioli, Ueckermann & Oliveira, 2002 collected in Mexico.

Character measured	Female (n=3)				Male (n=3)			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Body length	325	15.62	315	343	291	27	260	310
Idiosoma	259	21.2	244	283	239	20.5	215	251
Body width	206	22.9	190	232	173	16.8	154	184
vi	50	0.6	49	50	40	2.1	38	42
ve	71	3.8	68	75	54	2.1	52	56
sce	67	1.5	66	69	50	2.1	48	52
c_1	57	3.1	54	60	41	2.3	40	44
c_2	50	1.2	49	51	40	2.3	39	43
d_1	60	1.5	59	62	35	0.6	35	36
d_2	62	0	62	62	43	3	40	46
e_1	66	0.6	65	66	28	2.5	26	31
e_2	68	2.1	66	70	43	2.1	41	45
f	55	2.9	53	58	49	1	48	50
h_1	37	1.2	36	38	14	0.6	14	15
h_2	24	0.6	23	24	18	0.6	17	18
vi-vi	22	2.9	20	25	20	1.7	18	21
c_1-c_1	28	1.5	26	29	21	4.6	17	26
d_1-d_1	86	2.1	84	88	68	10	60	79
e_1-e_1	26	1.7	24	27	15	3.5	12	19
f-f	60	4.9	54	63	30	2.3	27	31
h_1-h_1	13	1	12	14	5	1	4	6
vi/vi-vi	2.3	0.3	2	2.5	2	0.3	1.8	2.3
c_1/c_1-c_1	2.1	0.2	1.9	2.3	2	0.4	1.5	2.4
d_1/d_1-d_1	0.7	0	0.7	0.7	1	0.1	0.5	0.6
e_1/e_1-e_1	2.5	0.2	2.4	2.7	2	0.5	1.4	2.3
f/f-f	0.9	0.1	0.8	1	2	0.1	1.5	1.8
h_1/h_1-h_1	2.8	0.2	2.7	3	3	0.5	2.5	3.5

SD= Standard Deviation

Description

Female

(n=3)

Dorsum (Figures 1A-B) — Length of idiosoma 323 (323-365); width of idiosoma 264 (264-295). Idiosoma broadly oval in dorso-ventral view. Prodorsal shield triangular, indented posteriorly and smooth. Prodorsal shield with 3 pairs of setae (*vi*, *ve* and *sci*), one pair of *eyes* 9 (9-10) in diameter and one pair of post-ocular bodies (*pob*) 29 (29-30) in diameter; humeral shields smooth, bearing c_2. Hysterosomal shield smooth, with five pairs of setae (c_1, d_1, d_2, e_1 and e_2); intercalary shields smooth, with setae f_1; suranal shield entire and smooth, with two pairs of setae, h_1 and h_2. Dorsal setae set on small tubercles, barbed, with blunt tips, h_1 and h_2 are distinctly shorter. Length of dorsal setae: *vi* 58 (58-60); *ve* 82 (82-85); *sci* 79 (73-79); c_1 73 (73-75); c_2 46 (45-50); d_1 72 (70-75); d_2 67 (67-73); e_1 73 (73-80); e_2 76 (76-80); f_1 60 (60-63); h_1 38 (38-40) and h_2 25 (25-28). Distances between dorsal setae: *vi–vi* 21 (20-21); *ve–ve* 56 (50-56); *vi–ve* 19 (18-23); *ve–sci* 47 (43-47); *sci–sci* 114 (114-118); c_1–c_1 35 (33-35); c_1–d_1 51 (51-55); c_1–c_2 83 (83-98); c_1–d_2 59 (59-63); d_1–d_1 74 (68-75); d_1–d_2 29 (25-29); d_1–e_1 59 (50-59); d_1–e_2 37 (35-40); d_2–d_2 133 (130-135); d_2–e_2 42 (42-48); e_1–e_1 30 (25-30); e_2–e_2 108 (108-115); e_1–f_1 30 (30-58); f_1–f_1 67 (63-75); f_1–h_1 38 (38-48); h_1–h_1 13 (10-13); h_1–h_2 21 (15-21); h_2–h_2 49 (25-49). Ratios*: pob/eye*: 3.2 (3.0-3.2); *vi/vi–vi* 2.8 (2.8-3.0); c_1/c_1–c_1 2.1 (2.1-2.3); d_1/d_1–d_1 1.0 (1.0); e_1/e_1–e_1 2.4 (2.4-3.2); f_1/f_1–f_1 0.9 (0.8-1.0); h_1/h_1–h_1 2.9 (2.9-4.0); c_1–c_1/ d_1–d_1 0.5 (0.4-0.5); c_1–c_1/e_1–e_1 1.2 (1.2); d_1–d_1/e_1–*e1* 2.5 (2.5-2.7); h_1/h_2 1.5 (1.4-1.5); c_1–c_1: d_1–d_1: e_1–e_1: f_1–f_1= 1.2 (1.2): 2.5 (2.5-2.7): 1.0: 2.2 (2.2-2.7).

Venter (Figures 1C-D) — Ventral surface ornamented with striations; bearing three pairs of setae (*1a*, *3a* and *4a*). Aggenital shield not defined, bearing two pairs of setae (ag_1 and ag_2). Anogenital valves with one pair of genital (g_1) setae and three pairs of pseudanal setae (ps_1–ps_3). Seta g_1 reaching to base of seta ps_2. Setae ps_1 and ps_2 slightly barbed and more robust than ps_3. Measurements of setae: *1a* 31 (25-31); *3a* 28 (23-28); *4a* 23 (20-23); ag_1 16 (13-16); ag_2 15 (13-15); g_1 26 (20-26); ps_1 14 (13-14); ps_2 16 (15-16); ps_3 13 (13-15); g_1-ps_3 29 (28-29).

Gnathosoma (Figure 2A) — Gnathosoma (including palp) 143 (143-150); subcapitulum 84 (80-84); palp 101 (100-103); chelicera 99 (93-105). Subcapitulum bearing subcapitular setae *m* 32 (30-33) and *n* 48 (48) and adoral setae or_1 18 (18-19) and or_2 19 (18-23). Distance *m–m* 44 (43-45), *n–n* 36 (30-36) and *m–n* 7 (7-8). Palp five segmented; palptrochanter without setae; palpfemur with two smooth and one barbed setae; palpgenu with one seta; palptibia with two tactile setae + one well-developed claw + one spine-like accessory claw; palptarsus with four tactile setae + one solenidion (ω), one subapical eupathidium and one distal trifurcate eupathidium.

Legs (Figures 3A-D) — Length of legs I–IV: 297 (297-325); 264 (264-293); 253 (250-275); 277 (275-290). Femur I 77 (77-85), genu I 27 (27-28), tibia I 55 (55-57), tarsus I 75 (70-83). Dorsal most seta on femur I (*dFI*) barbed 41 (41-45), longer than h_1, 1.1 (1.1-1.2) times length of h_1; dorsal most seta on genu I (*dGI*) barbed 36 (35-38). Chaetotaxy: coxae (excluding *1a*, *3a* and *4a*) 2(+1elcl)-1-2-2, trochanters 1-1-1-1, femora 5-4-2-2, genua 3(+1κ)-1-0-0, tibiae 5(+1φp)-5(+1φp)-5(+1φp)-5(+1φp), tarsi 12(+1ω)-9(+1ω)-7(+1ω)-7. Length of solenidia: ωI 27 (25-27); ωII 26 (23-26); ωIII 16 (15-18).

Male

(n=3)

Dorsum (Figures 4A-B) — Length of idiosoma 266 (220-266); width of idiosoma 200 (177-200); idiosoma broadly oval in dorso-ventral view. Prodorsal shield triangular, indented posteriorly and smooth. Prodorsal shield with 3 pairs of setae (*vi*, *ve* and *sci*), one pair of *eyes* 8 (8-10) in diameter and one pair of post-ocular bodies (*pob*) 23 (22-23) in diameter; humeral shields smooth, bearing c_2. Hysterosomal shield smooth, with six pairs of setae (c_1, d_1, d_2, e_1, e_2, and f_1); suranal shield entire and smooth, with two pairs of setae, h_1 and h_2. Dorsal setae set on small tubercles, short and barbed, with blunt tips, e_1, h_1 and h_2 are distinctly shorter. Length

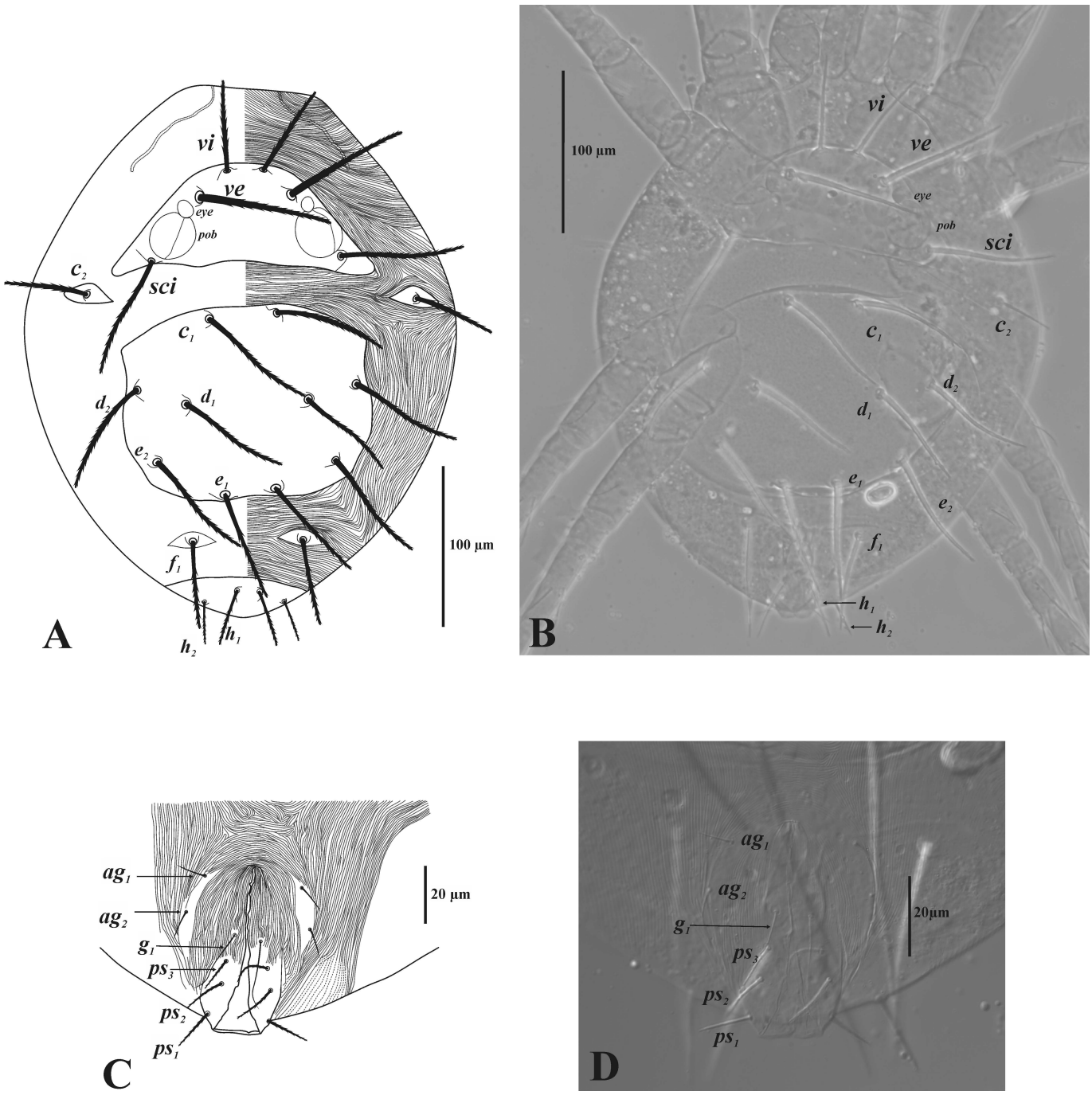


Figure 1 *Agistemus piquinnus* n. sp. (female); A – Dorsum, B – Dorsum (PH), C – Anogenital area, D – Anogenital area (DIC).

of dorsal setae: *vi* 45 (45-54); *ve* 67 (67-68); *sci* 63 (60-65); c_1 61 (57-61); c_2 37 (37-40); d_1 50 (47-52); d_2 57 (48-59); e_1 21 (21-28); e_2 60 (56-60); f_1 56 (54-61); h_1 13 (13-15) and h_2 19 (18-20). Distances between dorsal setae: *vi–vi* 20 (17-20); *ve–ve* 51 (46-51); *vi–ve* 18 (18-20); *ve–sci* 41 (36-41); *sci–sci* 102 (92-102); c_1–c_1 28 (28-35); c_1–d_1 44 (41-44); c_1–c_2 78 (63-78); c_1–d_2 51 (46-51); d_1–d_1 63 (60-63); d_1–d_2 21 (19-21); d_1–e_1 41 (39-41); d_1–e_2 26 (24-28); d_2–d_2 107 (91-107); d_2–e_2 31 (29-31); e_1–e_1 23 (23); e_2–e_2 87 (81-90); e_1–f_1 15 (14-16); f_1–f_1 30 (30-33); f_1–h_1 42 (24-42); h_1–h_1 7 (5-7); h_1–h_2 11 (10-11); h_2–h_2 34 (28-34). Ratios: *pob/eye*: 2.9 (2.2-2.9); *vi/vi–vi* 2.3 (2.3-3.2); c_1/c_1–c_1 1.4 (1.4); d_1/d_1–d_1 0.8 (0.8-0.9);

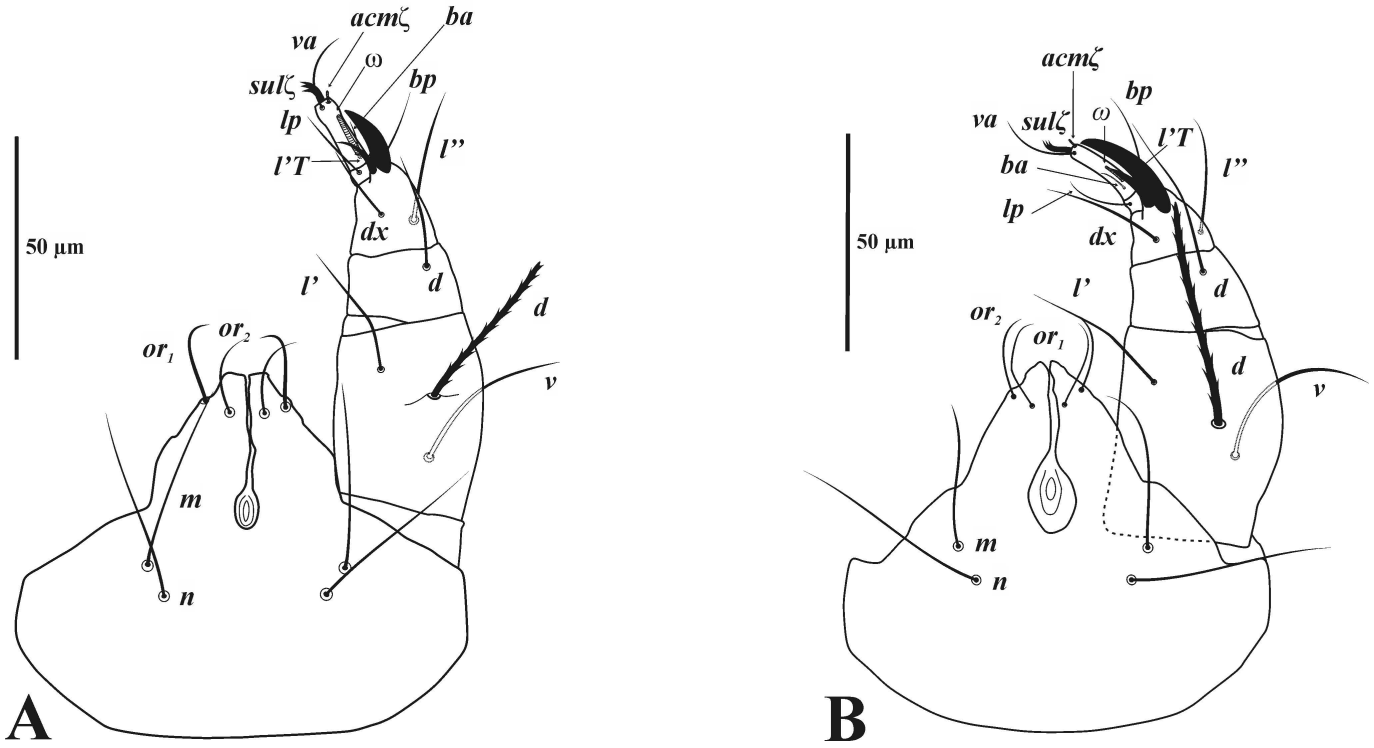


Figure 2 *Agistemus piquinnus* n. sp. Gnathosoma; A – Female, B – Male.

e_1/e_1–e_1 0.9 (0.9-1.2); f_1/f_1–f_1 1.9 (1.6-2.0); h_1/h_1–h_1 1.9 (1.9-3.0); c_1–c_1/ d_1–d_1 0.4 (0.4-0.6); c_1–c_1/e_1–e_1 1.2 (1.2-1.5); d_1–d_1/e_1–$e1$ 2.7 (2.6-2.7); h_1/h_2 0.7 (0.7-0.8); c_1–c_1: d_1–d_1: e_1–e_1: f_1–f_1 = 1.2 (1.2-1.5): 2.7 (2.6-2.7): 1.0: 1.3 (1.3-1.4)

Venter (Figures 4C-D) — Ventral surface ornamented with striations; bearing three pairs of setae (*1a*, *3a* and *4a*). Aggenital shield defined, with one pair of setae (g_1). Anogenital valves with three pairs of pseudanal setae ($ps_{1–3}$), ps_1 smaller than ps_2 and ps_3. Measurements of setae: *1a* 29 (28-31); *3a* 22 (22-34); *4a* 24 (24-25); ag_1 14 (14-15); ps_1 5 (5-10); ps_2 12 (11-12); ps_3 11 (11-12).

Gnathosoma (Figure 2B) — Gnathosoma (including palp) 127 (127-143); subcapitulum 79 (77-85); palp 93 (93-96); chelicera 95 (84-95). Subcapitulum bearing subcapitular setae *m* 20 (20-37) and *n* 42 (42-48) and adoral setae or_1 18 (16-23) and or_2 21 (20-21). Distance *m*–*m* 42 (35-42), *n*–*n* 31 (25-34) and *m*–*n* 8 (6-8). Palp five segmented; palptrochanter without setae; palpfemur with two barbed and one smooth seta; palpgenu with one seta; palptibia with two tactile setae + one well-developed claw + one spine-like accessory claw; palptarsus with four tactile setae + one solenidion (ω), one subapical eupathidium and one distal trifid eupathidium.

Legs (Figures 5A-D) — Length of legs I–IV: 288 (288-300); 240 (239-246); 219 (219-236); 247 (243-258). Femur I 76 (75-77), genu I 22 (22-24), tibia I 49 (49-51), tarsus I 69 (69-74). Dorsal most seta on femur I (*dFI*) barbed 49 (49-53), longer than h_1, 3.8 (3.5-4.1) times length of h_1; dorsal most seta on genu I (*dGI*) barbed 36 (36-39). Chaetotaxy: coxae (excluding *1a*, *3a* and *4a*) 2(+1elcl)-1-2-2, trochanters 1-1-1-1, femora 5-4-2-2, genua 3(+1κ)-1-0-0, tibiae 5(+1φp)-5(+1φp)-5(+1φp)-5(+1φp), tarsi 12(+2ω)-9(+2ω)-7(+1ω)-7(+1ω). Length of solenidia: Tarsus I ωI 37 (34-37), ωII 26 (25-26); Tarsus II ωI 36 (32-36), ωII 32 (27-32); Tarsus III ωI 15 (15); Tarsus IV ωI 19 (19-20).

Immature stages — unknown

Remarks — The new species resembles *Agistemus longisetus* González-Rodríguez, 1963 and *A. brasiliensis* Matioli *et al.*, 2002; but *Agistemus piquinnus* **n. sp.** can be distinguished

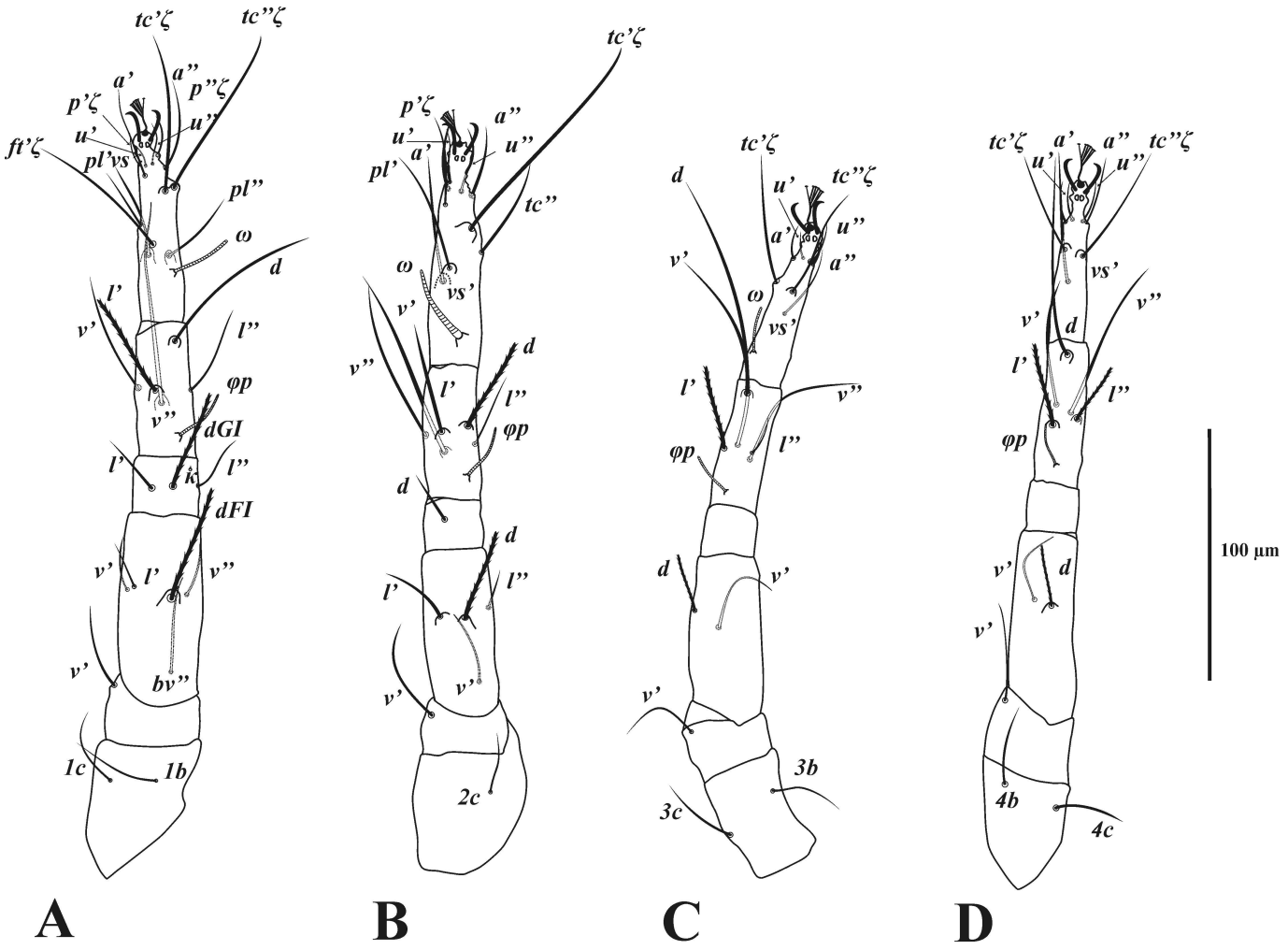


Figure 3 *Agistemus piquinnus* n. sp. (female); A – Leg I, B Leg II, C – Leg III, D – Leg IV.

from *A. longisetus* by a) lengths of median hysterosomal setae c_1 (73), d_1 (72) and e_1 (73) are shorter (vs 104, 103 and 115, respectively); b) ventral setae *1a* (29), *3a* (22) and *4a* (24) are shorter (vs 41, 39 and 39, respectively) c) the ratio *pob/eye* (3.2), *sci/pob* (2.7), *vi/vi-vi* (2.8), c_1/c_1-c_1 (2.1) and e_1/e_1-e_1 (2.4) are different (vs 4.1, 2.2, 2.6, 2.8 and 2.8, respectively); d) aggenital shield not horseshoe-shape and g_1 (26) twice longer than ps_3 (13) [vs aggenital shield in horseshoe-shape and g_1 (23) slightly longer than ps_3 (20)]. *Agistemus piquinnus* **n. sp.** can be distinguished from *A. brasiliensis* by a) setae *vi* (58), *ve* (82) and *sci* (79) are longer (vs 47, 77 and 72, respectively); b) ratio *pob/eye* (3.2), *vi/vi-vi* (2.8), c_1/c_1-c_1 (2.1), d_1/d_1-d_1 (1.0), e_1/e_1-e_1 (2.4) are greater (vs 2.0, 2.5, 1.7, 0.8 and 1.9, respectively), h_1/h_1-h_1 (2.9) and h_1/h_2 (1.5) are less (vs 5.6 and 1.9, respectively); c) aggenital shield not horseshoe-shape and seta g_1 extending beyond the base of ps_2 (vs aggenital shield in horseshoe-shape and setae g_1 reach just past ps_3).

Etymology —The new species is named after the regional name of host plant "piquín".

Type material —Holotype, 2 females paratypes and 3 paratypes males were collected on leaves of *Capsicum annuum* L. var. *glabriusculum* (Solanaceae), Ciudad Victoria, Tamaulipas, Mexico. Holotype, female on leaf of *Capsicum annuum* L. var. *glabriusculum* (Solanaceae), Cañón de la Peregrina, Ciudad Victoria, Tamaulipas. November 12, 2017. J. I. Monjarás B. leg.; two females collected on leaves of *Capsicum annuum* L. var. *glabriusculum* (Solanaceae).

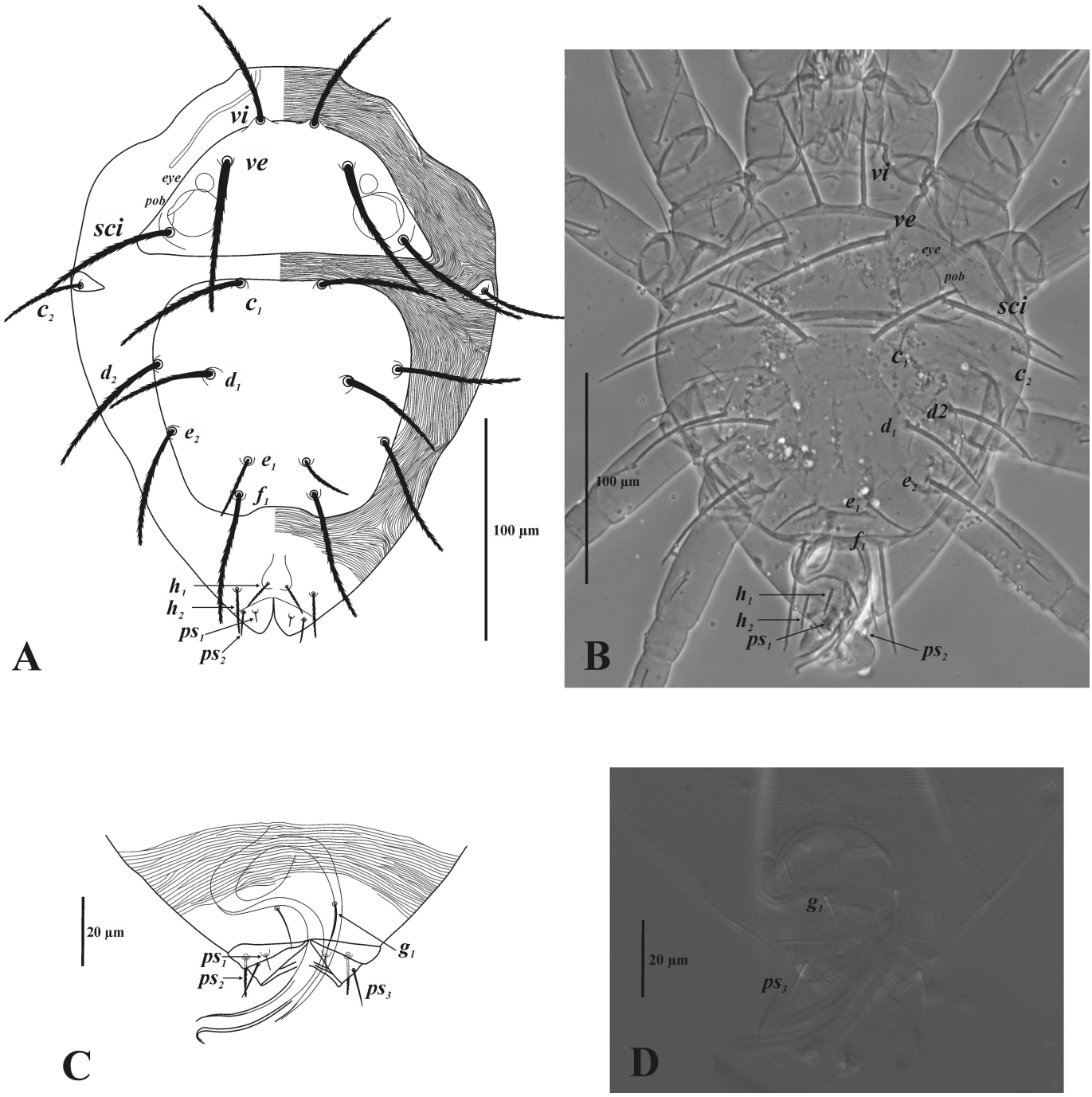


Figure 4 *Agistemus piquinnus* n. sp. (male); A – Dorsum, B – Dorsum (PH), C – Anogenital area, D – Anogenital area (DIC).

Cañón de la Peregrina, Ciudad Victoria, Tamaulipas. July 10, 2019. J. I. Monjarás B. One male collected on leaf of *Capsicum annuum* L. var. *glabriusculum* (Solanaceae), Cañón de la Peregrina, Ciudad Victoria, Tamaulipas. April 28, 2017. J. I. Monjarás B. leg. Two males collected on leaves of *Capsicum annuum* L. var. *glabriusculum* (Solanaceae). Cañón de la Peregrina, Ciudad Victoria, Tamaulipas. November 12, 2017. J. I. Monjarás B. leg.

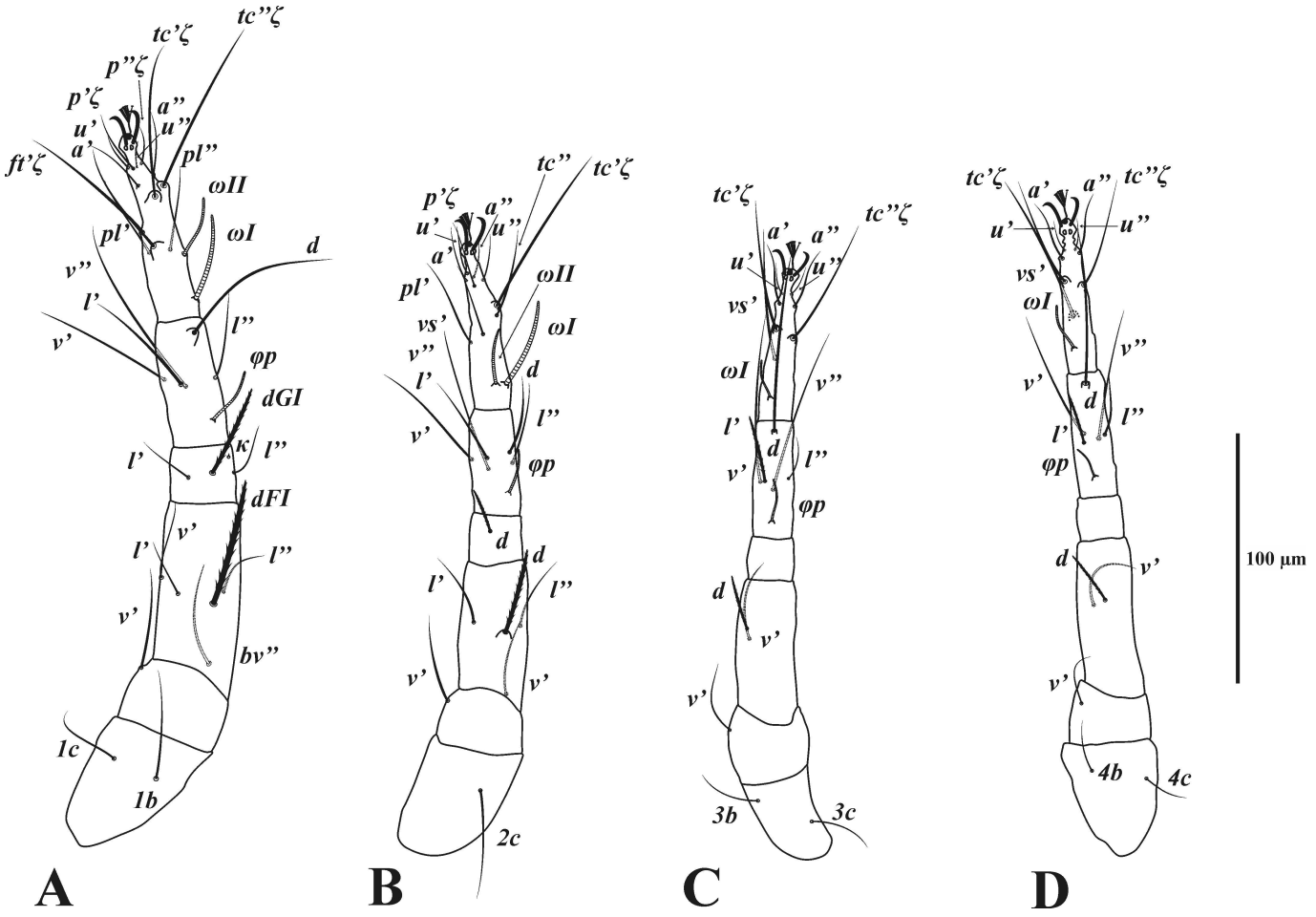


Figure 5 *Agistemus piquinnus* n. sp. (male); A – Leg I, B – Leg II, C – Leg III, D – Leg IV.

Key to females of *Agistemus* from Mexico

(modified from Paktinat-Saeij *et al.*, 2016)

1. One pair of aggenital setae (species group *fleschneri*) 2
— Two pairs of aggenital setae (species group *terminalis*) 3

2. Dorsal shield reticulated; ratios *vi/vi-vi* 2.6, c_1/c_1-c_1 1.0, e_1/e_1-e_1 1.8 . . . . . *A. fleschneri* Summers
— Dorsal shield smooth; ratios *vi/vi-vi* 2.0, c_1/c_1-c_1 1.0, e_1/e_1-e_1 1.2 . . . . . *A. striolatus* González-Rodríguez

3. Dorsal shield ornamented with small alveoli; ratios *vi/vi-vi* 2.6, e_1/e_1-e_1 2.2 . . *A. arcypaurus* González-Rodríguez
— Dorsal shield smooth 4

4. Setae c_1 shorter than distance between the bases of c_1-d_1 5
— Setae c_1 equal or longer than distance between the bases of c_1-d_1 7

5. Setae g_1 reach to the base of setae ps_3; ratios *vi/vi-vi* 2.4, c_1/c_1-c_1 0.6 . . . . . *A. simplex* González-Rodríguez

— Setae g_1 reach to the base of setae ps_2 6

6. Ratios *vi/vi-vi* 1.0, c_1/c_1-c_1 0.6 ..... *A. terminalis* (Quayle)
— Ratio *vi/vi-vi* 1.5-1.7, c_1/c_1-c_1 1.5–1.6 ..... *A. floridanus* González-Rodríguez

7. Length of medial hysterosomal setae > 100µm ..... *A. longisetus* González-Rodríguez
— Length of medial hysterosomal setae < 100µm 8

8. Ratios *pob/eye* 3.1, d_1/d_1-d_1 1.0, h_1/h_2 1.4 ..... ***A. piquinnus* n. sp.**
— Ratios *pob/eye* 2.0, d_1/d_1-d_1 0.8, h_1/h_2 1.9 ..... *A. brasiliensis* Matioli *et al.*

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