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Descriptions of the male of *Acantheremus granulatus* Saussure and Pictet and a new species from Peru (Orthoptera: Tettigoniidae: Copiphorinae)

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Abstract

This paper adds to Naskrecki's (1998) revision of the neotropical katydid genus *Acantheremus*. The male of *Acantheremus granulatus* Karny is described for the first time. A newly discovered Peruvian species from the rainforest canopy—*Acantheremus arboreus* Nickle, new species—is also described.

Key words

Orthoptera, Copiphorinae, *Acantheremus*, rainforest, new species, Peru.

Introduction

Karny (1907) erected the coneheaded katydid genus *Acantheremus* to include two new species — *elegans* and *granulatus*— and the previously described species *Copiphora azteca* Saussure and Pictet 1898. Nickle (1992) indicated the presence of a fourth species in Panama, but because of insufficient numbers of specimens, he did not describe it. Naskrecki (1997) revised the genus, adding six new species (including Nickle's Panamanian species, as *A. major* Naskrecki) and reassigning *A. azteca* to *Copiphora* Serville based on its lack of synapomorphic characters for *Acantheremus*.

As part of a long-term research project investigating the biodiversity of Orthoptera of rainforests in northern Peru (Nickle & Castner 1995), the author collected a series of 20 specimens of *Acantheremus*. Sixteen of the specimens were obtained in fogging samples from mid-level canopy (10-30 m), while the remaining five were collected in night forays along forest trails. The series contains 11 specimens of *A. granulatus* (which included the previously unreported male sex) and 9 specimens of an undescribed species. In complement of Naskrecki's (1997) revision, both the male sex of *A. granulatus* and the new species, hereafter known as *A. arboreus* Nickle, new species, are described in this paper.

Key to the known species of *Acantheremus*

Males:

1 Dorsal margin of midtibia armed with 3-4 spines; apex of vertexial fastigium bifurcated 2

1′ Dorsal margin of midtibia unarmed; apex of vertexial fastigium ending in a single spine or with a median dilated keel extending ventrally 4

2 Subgenital plate with a shallow, U-shaped emargination, about 0.5 times as deep as length of style; cercus with large quadrate, median preapical lobe with rounded margins, and pointed apical lobe terminating in a sharp tooth ..... *major*

2′ Subgenital plate with a deep, U-shaped emargination, 3-8 times as deep as length of style; cercus differing from above 3

3 U-shaped emargination of cercus about 8 times as deep and 4 times as wide as length of style; cercus in dorsal view appearing bilobed, apex terminating in a sharp tooth, median preapical lobe finger-like, terminating in blunt tooth ..... *unali*

3′ U-shaped emargination of cercus about 4 times as deep and 2.5 times as wide as length of style; cercus in dorsal view appearing unilobed, apex recurved sharply ventrad, terminating in a sharp tooth, median preapical lobe finger-like, terminating in sharp tooth ..... *colwelli*

4 Vertexial fastigium with well developed ventral keel, distinctly inflated preapically; dorsal apex of fastigium black; cercus simple, untoothed, with preapical lateral dilation as seen from above ..... *cohni*

4′ Vertexial fastigium simple, apically with a sharp or blunt tooth, or with preapical nodes; dorsal apex of fastigium green; cercus differing from above 5

5 Fastigium short, narrow, < 2.2 times diameter of eye; tegmen long and narrow, 2.2-2.4 times length of hindfemur ..... *tenuis*

5′ Fastigium more elongate and broader, 2.5-3.5 times diameter of eye; tegmen shorter and broader, < 2.2 times length of hindfemur 6

6 Fastigium < 2.7 times diameter of eye; tegmen 1.4-1.8 times length of hindfemur 7

6′ Fastigium more elongate and broader, 3.0-3.5 times diameter of eye; tegmen 1.7-2.0 times length of hindfemur 8

7 Fastigium apically toothed, with preapical nodes; cercus unilobed, acutely recurved mesally, terminating in a sharp tooth; U-shaped emargination between styles on subgenital plate about as deep as length of style ....*arboreus*

7′ Fastigium apically blunt; cercus bilobed, weakly sinusoidal in dorsal view, triangulate in lateral view, with median preapical narrow lobe terminating in a sharp tooth; shallow U-shaped emargination between styles on subgenital plate, about 0.3 times as deep as length of style ..... *dominicanus*

8 Fastigium apically blunt; cercus gradually tapering apically, with a median, broad, recurved, apically pointed projection and smaller apicolaterally curving papilliform finger-like projection ..... *granulatus*

8′ Fastigium apically toothed; cercus concave medially, with small, apical spine and small, blunt lobe beneath it .... *elegans*

Females

1 Subgenital plate deeply incised apically, as deep as half length of plate, forming two narrow diverging lobes; ovipositor distinctly upcurved, no longer than 2/3 of length of hindfemur ..... *tenuis*
1′ Subgenital plate with apical incision at most as deep as 1/3 of length of hindfemur; ovipositor straight or weakly upcurved 2
2 Dorsal margin of midtibia armed with 3-4 spines; apex of vertexial fastigium bifurcated 3
2′ Dorsal margin of midtibia unarmed; apex of vertexial fastigium ending in a single spine or with a median dilated keel extending ventrally 5
3 Ovipositor shorter than hindfemur ..... *colwelli*
3′ Ovipositor longer than hindfemur 4
4 Subgenital plate about 1.5 times as wide as long, apex with U-shaped emargination ..... *major*
4′ Subgenital plate about twice as wide as long, apex with V-shaped emargination ..... *unali*
5 Ovipositor longer than hindfemur ..... *granulatus*
5′ Ovipositor shorter than hindfemur 6
6 Subgenital plate with deep V-shaped apical emargination; ovipositor about 15 mm in length, slightly darkened apically; stridulatory region of tegmina lacking dark bands ..... *dominicanus*
6′ Subgenital plate with shallow U-shaped apical emargination; ovipositor about 10 mm in length, apically black; stridulatory region of tegmina with dark bands ....*arboreus*

Acantheremus granulatus Karny, 1907
Figs 1, 1a, 3, 5, 7, 9, 14

Diagnosis.— **Male**: associated with the female of *A. granulatus* by shape of the vertexial fastigium, spination of middle tibia, and morphology of both head and pronotum. Distinguished from congeners by the combination of shape of the vertexial fastigium (Figs 1, 1a), unarmed dorsal margin of middle tibia (armed in *colwelli*, *unali*, and *major*), profile of the lateral lobe of the pronotum (Fig. 3), tenth tergum weakly bilobed (similar to *colwelli*, but lobes on apical margin less distinct than those of *dominicanus*, *cohni*, and *tenuis*) (Fig. 7), subgenital plate with a deep U-shaped apical emargination and two well developed papilliform styles (Figs 5, 9), and gradually tapering cercus with a median, broad, recurved, apically pointed projection and smaller apical laterally curving papilliform finger-like projection (unlike any other species) (Figs 5, 7), male stridulatory area as in Fig. 14.

Female: recognized by a combination of the shape of the vertexial fastigium (Figs 1, 1a), unarmed dorsal margin of midtibia, ovipositor longer than hindfemur, and trapezoidal subgenital plate (See Figure in Naskrecki 1997).

Specimens Examined.— 1 ♂, 4 ♀♀, 7 nymphs. PERU: Loreto Province. Explorama Inn, 3°26′S, 73°02′W, 40 km NE Iquitos on Rio Amazonas. (DA Nickle & JL Castner, colls.) 22-VI-6-VII-1991. 1 ♂. Team 12. [USNM]; VII-15-28-1987. Team 5. 1 ♀. [USNM]; VI-23-VII-7-1990. Team 9. 1 ♀. [USNM]; VII-7-21-1990. Team 10. 1 nymph. [USNM]; Explorama Lodge, 80 km NE Iquitos on Rio Yanamono (1 km upriver from Rio Amazon. 3°23′S, 72°46′W) (DA Nickle & JL Castner, colls.). VIII-9-23-1997. Team 23. Fogging Site 1. 1 ♀. [USNM]; VIII-9-23-1997. Team 23. 1 ♀. [USNM]; VII-26-VIII-9-1997. Team 22. Fogging Sites 7 (3-1), 8 (3-2), 3 (31-1). 4 nymphs. [USNM]; VII-25-VIII-5-1998. Team 24. Fogging Site 3-primary, VII-28. 1 nymph. [USNM]; ACEER, nr. Explorama Camp, 3°11′S, 72°53′W, 90 km NE Iquitos on Rio Sucusari (1 km upriver from Rio Napo) (DA Nickle & JL Castner, colls.) VII-25-VIII-5-1998. Team 24. Fogging Site 11-primary, VIII-4. 1 nymph. [USNM].

Measurements of male (mm).— [measurements of females are consistent with Naskrecki's 1997 measurements]. Total length, 40.9. Length pronotal disc, 6.6. Width of pronotum, 3.5. Depth lateral lobe of pronotum, 3.8. Length hindfemur, 13.9. Width hindfemur, 2.8. Length tegmen, 23.3. Width tegmen, 4.3.

Numbers of spines on legs.— [both sexes]. Ventral margins, forefemur: inner (anterior) 4; outer (posterior) 0; midfemur inner (posterior) 0; outer (anterior) 5; hind femur inner (posterior) 0; outer (anterior) 11. Ventral margins, foretibia: inner (anterior) 5; outer (posterior) 4; midtibia inner (posterior) 3-4; outer (anterior) 6; hind tibia inner (posterior) 7; outer (anterior); 10-11. Dorsal margins, foretibia: inner (anterior) 0; outer (posterior) 0; midtibia inner (posterior) 0; outer (anterior) 0; hind tibia inner (posterior) 10; outer (anterior); 8.

Acantheremus arboreus Nickle, new species
Figs 2, 2a, 2b, 4, 6, 8, 10, 11, 12, 13

Diagnosis.— **Male**: distinguished from congeners by the combination of unarmed dorsal margin of middle tibia (armed in *colwelli*, *unali*, and *major*), tenth tergum distinctly bilobed (closer to *dominicanus*, *cohni*, and *tenuis* than to *colwelli* and *granulatus*), cercus acutely recurved medially, tapering apically to a point, and subgenital plate trapezoidal with a deep U-shaped apical emargination and two well developed papilliform styles.
Female: recognized by a combination of the shape of the vertexial fastigium (Figs 2, 2a), short ovipositor subequal in length to combined length of head from tip of vertexial fastigium to posterior margin of pronotum, and trapezoidal subgenital plate (Fig. 12).

Holotype.— ♂. PERU: Loreto Prov. ACEER, nr. Explornapo Camp, 90 km NE Iquitos on Rio Sucusari (2 km upriver from

Rio Napo. 3°11′S, 72°33′W). VIII-9-23-1997. Team 23. Fogging Site 20, VIII-18 (18-2). (DA Nickle & JL Castner, colls.).[USNM].

Allotype.— ♀. Loreto Prov. Explorama Lodge, 80 km NE Iquitos on Rio Yanamono (1 km upriver from Rio Amazon. 3°23′S, 72°46′W). Team 21. VIII-31-IX-14-1996. Fogging Site 1, Lake Trail. (DA Nickle & JL Castner, colls.). [USNM].

Description.— Head: fastigium of vertex > 3x diameter of eye; apex with a sharp moderately recurved hook and preapical frontal node; base of fastigium with a more well developed node (Figs 2, 2a); frontal surface of fastigium with 20-30 randomly spaced small but well defined raised granulae, each bearing a single setum (Fig. 2b); granulae extending to front of face but becoming less distinct near clypeus.
Thorax: pronotum rugulose, anterior margin weakly concave, posterior margin truncate; lateral lobe of pronotum *ca* 1.70 times longer than deep, humeral sinus obsolete (Fig. 4).
Wings: tegmen *ca* 1.50 times as long as hindfemur. Stridulatory file straight, 2.34 mm in length, with 163 teeth, 69.6 teeth / mm. Stridulatory area of left tegmen as in Fig. 13.
Legs: hindfemur *ca* 5.4 times longer than wide. Forefemur with 4 spines on inner ventral margin, 0 spines on outer ventral margin; foretibia with 5-7 spines on inner ventral margin, 3-4 spines on outer ventral margin. Midfemur with 4-5 spines on outer ventral margin, 0 spines on inner ventral margin; midtibia with 3-4 spines on inner ventral margin, 6 spines on outer ventral margin; dorsal margins of midtibia unarmed. Hindfemur with 10-11 elongated, straight to weakly curved spines on outer ventral margin, 0 spines on inner ventral margin; hindtibia with 8-10 spines on outer ventral margin, 5-6 spines on inner ventral margin, 7-8 spines on outer dorsal margin, and 8-10 spines on inner dorsal margin.
Abdomen: **Male**. Tenth tergum distinctly bilobed, with lobes separated by a deep U-shaped emargination (Fig. 8). Subgenital plate spatulate, trapezoidal, with a deep U-shaped apical emargination separating two well developed articulating styles; styles 2 times as long as wide (Fig. 10). Cercus cylindrical, acutely recurved medially and gradually tapering distally into a sharp apical point (Figs 6, 8). **Female**. Ovipositor comparatively short for genus, less than 2/3 length of hindfemur, apically unpigmented (Fig. 11). Subgenital plate trapezoidal, medially carinate; apex narrowing to 1/3 of basal width, with a shallow V-shaped emargination (Fig. 12).

Color.— Light green, becoming discolored pale green to yellow when dry preserved. Base of mandibles bluish green, molar edges shiny black; labrum yellow. All femoral spines reddish, those on forefemur apically black. Reddish or brownish-red markings on margins of tympanal shield, base of mid- and hindtibia, genal carina of face and with small patches randomly dispersed on legs, pronotum, and face. Two distinct dark brown bands enclosing stridulatory file region (for both sexes) on tegmina in repose. Ovipositor uniform green, without apical dark pigmentation found in other *Acantheremus* species.

Measurements.— Means, (range) in mm, based on 2 ♂♂ and 4 ♀♀. Total length, ♂: 25.5 (25.3-25.7); ♀: (28.3-29.8). Length pronotum, ♂: 4.8 (4.8-4.9); ♀: 5.2 (5.1-5.3). Width pronotum, ♂: 2.7 (2.6-2.8); ♀: 2.9 (2.6-3.2). Depth lateral lobe of pronotum, ♂: 2.8 (2.8-2.9); ♀: 3.0 (2.8-3.4). Length hindfemur, ♂: 13.3 (11.2-15.5); ♀: 12.6 (11.7-12.9). Width hindfemur, ♂: 2.3 (2.2-2.4); ♀: 2.4 (2.3-2.5). Length tegmen, ♂: 18.3 (16.2-20.7); ♀: 19.0 (18.3-19.5). Width tegmen, ♂: 3.2 (3.1-3.3); ♀: 3.8 (3.6-4.1). Length ovipositor, ♀ 10.3 (10.1-10.4).

Numbers of spines on legs.— [both sexes]. Ventral margins, forefemur: inner (anterior) 4; outer (posterior) 0; midfemur inner (posterior) 0; outer (anterior) 4-5; hind femur inner (posterior) 0; outer (anterior) 10-11. Ventral margins, foretibia: inner (anterior) 5-7; outer (posterior) 3-4; midtibia inner (posterior) 3-4; outer (anterior) 6; hind tibia inner (posterior) 7-10; outer (anterior); 5-6. Dorsal margins, foretibia: inner (anterior) 0; outer (posterior) 0; midtibia inner (posterior) 0; outer (anterior) 0; hind tibia inner (posterior) 8-10; outer (anterior); 7-8.

Paratypes.— 1 ♂, 4 ♀♀, 2 nymphs. PERU: Explorama Lodge, 80 km NE Iquitos on Rio Yanamono (1 km upriver from Rio Amazon. 3°23′S, 72°46′W). VII-25-VIII-8-1998. Team 24. Fogging Site 1-primary, secondary, VII-28. 1 ♂, 1 ♀. [USNM]; ACEER, nr. Explornapo Camp, 90 km NE Iquitos on Rio Sucusari (2 km upriver from Rio Napo. 3°11′S, 72°33′W). VII-25-VIII-8-1998. Team 24. Fogging Site 11-primary. 1 ♀ [USNM]; ACEER. VIII-9-23-1997. Team 23. Fogging Site 19, VIII-18. 1 ♀. [USNM]; Explorama Lodge. VII-26-VIII-9-1997. Team 22. Fogging Site 5, VIII-2. 1 ♀. [USNM]; Explorama Lodge. VIII-31-IX-14-1996. Team 21. Fogging Site 1, Lake Trail. 1 nymph. [USNM]; ACEER. VII-25-VIII-8-1998. Team 24. Fogging Site 9-primary, VIII-2. 1nymph. [USNM].

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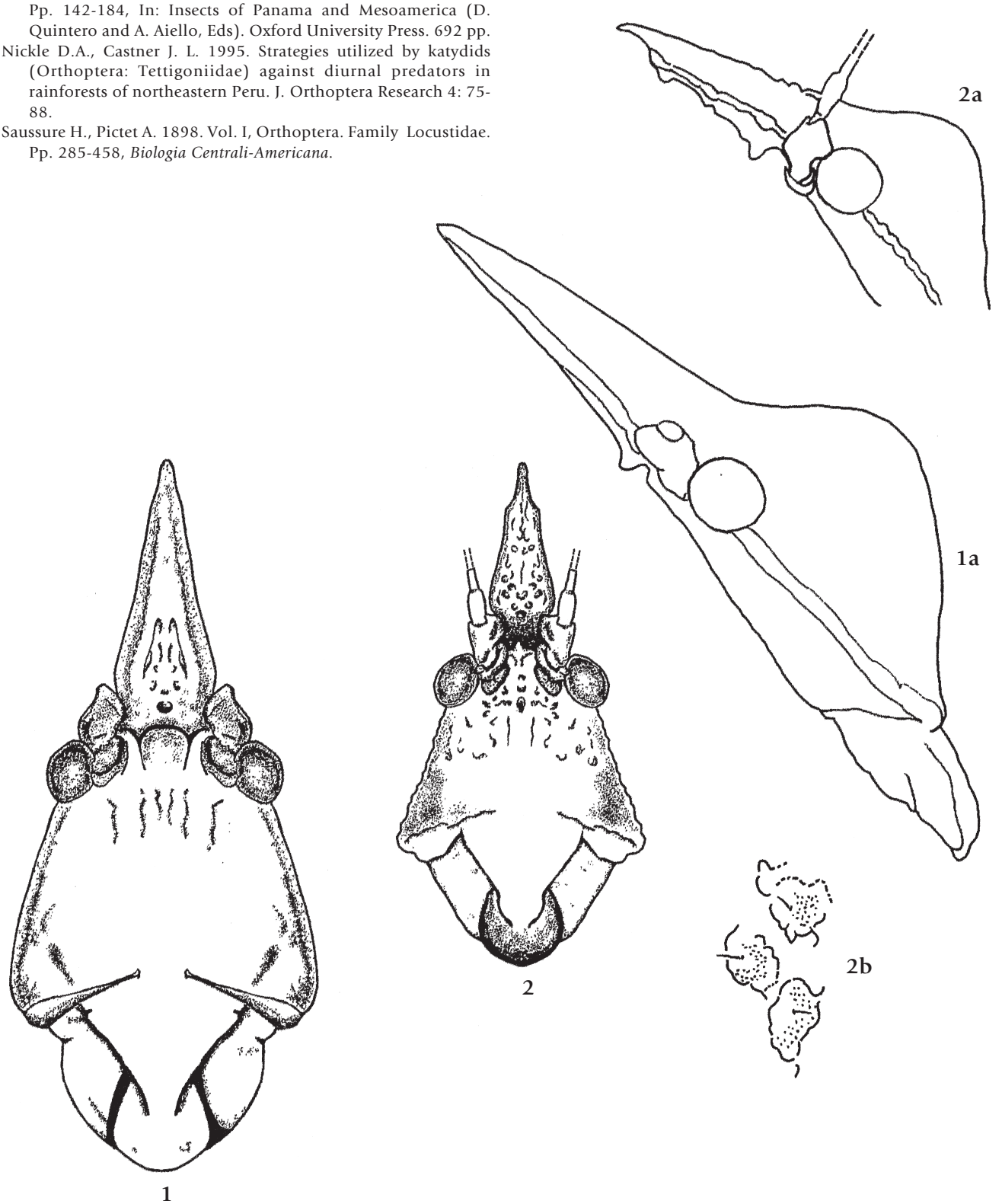
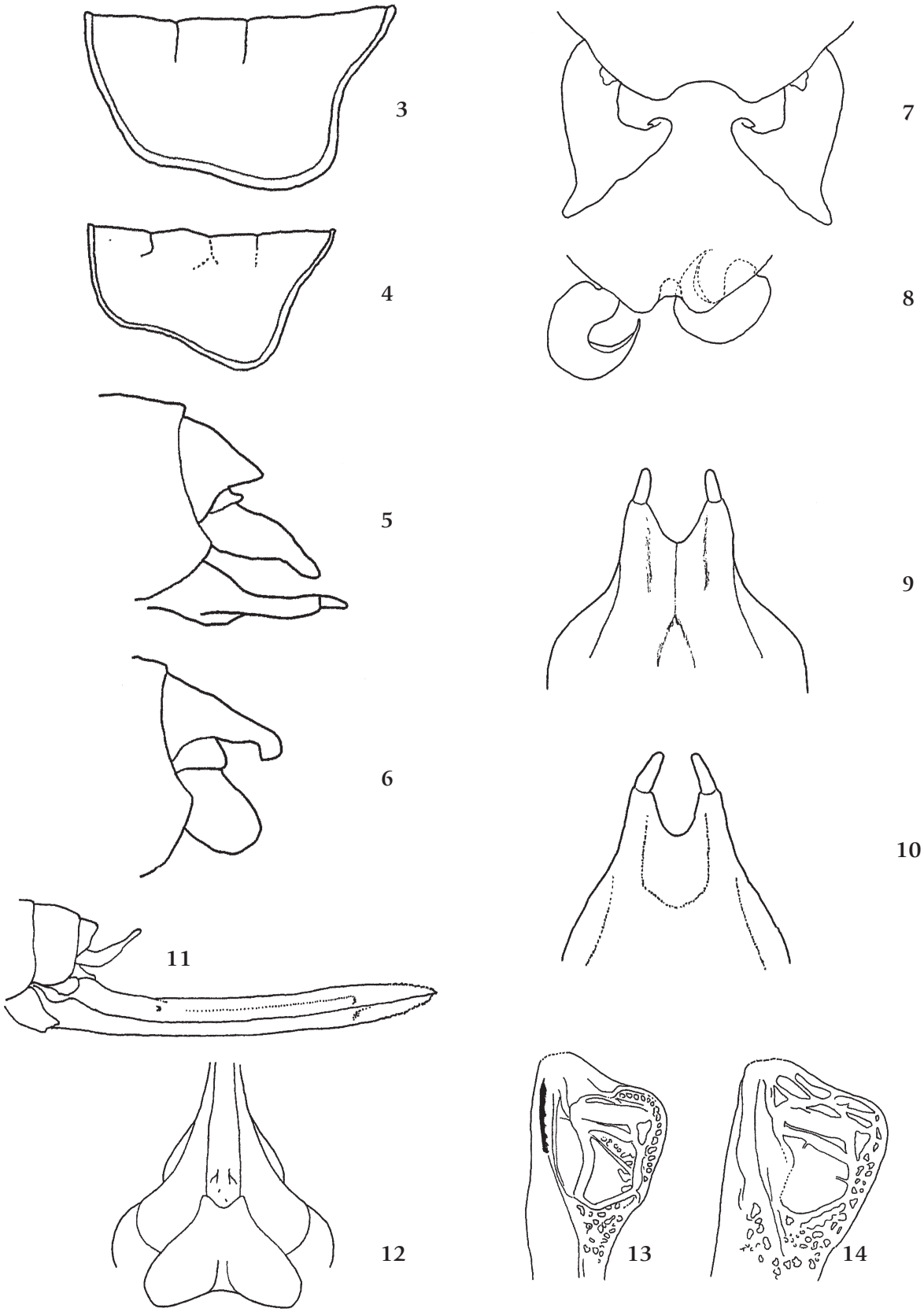


Figs 1-14. Morphological features of *Acantheremus* species in Peru. Figs 1, 1a, 3, 5, 7, 9, and 14 depict *Acantheremus granulatus* male; Figs 2, 2a, 2b, 4, 6, 8, 10, and 13 depict *A. arboreus*, male holotype, 11 and 12, female allotype. **1, 2**. Face, frontal view (10x). **1a, 2a**. Fastigium, left lateral view (12x). **2b**. Insert, showing texture of exoskeleton of fastigium, frontal view (43x).



Figs 3, 4. Left lateral lobe of pronotum (10x). **5, 6**. Male tenth tergum and cercus, left lateral view (10x). **7, 8.** Male tenth tergum and cerci, dorsal view (7x). **9, 10**. Male subgenital plate, ventral view (8x). **11**. Female abdomen, left lateral view. **12**. Apex of female abdomen, ventral view (7x). **13, 14**. Male left stridulatory area.