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Author(s): Dawn J. Flynn
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REVIEW OF THE GENUS *UMBELLIGERUS* DEITZ WITH DESCRIPTION OF TWO NEW SPECIES FROM PANAMA AND KEY TO ADULTS (HEMIPTERA: MEMBRACIDAE)

DAWN J. FLYNN

Schiele Museum of Natural History, 1500 East Garrison Blvd., Gastonia, North Carolina 28054, (dawnf49@gmail.com)

Abstract.—A review of the genus *Umbelligerus* is presented with description of two new species from Panama. Descriptions and illustrations of all five known species: *U. peruviensis* Deitz, *U. furcillatus* Sakakibara, *U. woldai* Sakakibara, ***U. stockwelli* Flynn, n. sp.**, and ***U. convergens* Flynn, n. sp.** are presented with key to adults.

Key Words: treehoppers, *Umbelligerus convergens* n.sp., *Umbelligerus stockwelli* n.sp., key to species

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The genus *Umbelligerus* was erected by Deitz in the Tribe Stegaspidini Haupt to include a very ornate species of treehopper with an antler-like pronotum, *U. peruviensis* from Peru (Deitz 1975). Other genera in the Tribe Stegaspidini include *Bocydium* Latreille, *Lirania* Stål, *Smerdalea* Fowler, *Lycoderes* Germar, *Oeda* Amyot and Serville, *Stegaspis* Germar, *Flexocentrus* Goding, and *Stylocentrus* Stál. According to Cryan and Deitz (1999), tribal characters present in all genera, including *Umbelligerus* Deitz, are forewing with 1 r-m and 1 m-cu crossvein R_{2+3} fused basally R_{1+} and the ♂ lateral plates are either free or basally fused to the pygofer.

McKamey (1998) listed three species in the genus, all from the New World tropics: *U. peruviensis* from Peru (Deitz 1975), *U. furcillatus* from Brazil and *U. woldai* from Panama (Sakakibara 1981). *Umbelligerus* was reviewed by Cryan and Deitz (2000), covering the three known species. Included in the present paper is a description of two species, *U. stockwelli* n.sp. and *U. convergens* n.sp., both from Panama, along with illustrations and original descriptions of all species, and key to adults.

MATERIALS AND METHODS

Specimens were examined through a Wolfe binocular dissecting scope, 4.5 magnification with 20X oculars, illumination by XD-301 110V gooseneck series haploid lamp cold-light source. Illustrations were done with a combination of digital images taken with an Optio Waterproof digital 7.1 megapixal digital camera with 3X optical zoom and visual examination through the binocular scope. Paratype of *peruviensis* Deitz (NCSU) was examined and holotype photographs of *U. peruviensis* Deitz (USNM: holotype ♂; paratype ♀), *U. furillatus* Sakakibara and *U. woldai* Sakakibara (DZUP:

holotypes) were consulted. The following codens are used to designate collections where specimens or type photographs examined were located.

DZUP: Museu de Entomologia Pe. Jesus Santiago Moure, Universidade Federal do Paraná, Departmento de Zoologia, Curitiba, Paraná, Brazil.
HWIC: Henk Wolda Collection, Smithsonian Tropical Research Institute, Balboa, Panama.
NCSU: North Carolina State University Insect Collection, Department of Entomology, North Carolina State University, Raleigh, North Carolina, USA.
UDCC: University of Delaware Insect Collection, University of Delaware, Newark, Delaware, USA.
USNM: Department of Entomology, National Museum of Natural History, Smithsonian Institution, Washington, D.C., USA

Genus *Umbelligerus* Deitz 1975

Umbelligerus Deitz 1975:137. Type species: *Umbelligerus peruviensis* Deitz 1975:137 by original designation.

The original description of *Umbelligerus* by Deitz follows:

Description.—Head with ocelli and compound eyes stalked. Pronotum with umbellifrom process dorsally, not concealing scutellum or forewings in repose. Forewing and hindwing each with one r-m and one m-cu crossvein. Tibiae not foliaceous. Metathoracic leg with tibia bearing cucullate setae in row II but not rows I and III, first tarsomere with one cucullate seta apically. Abdomen without conspicuous punctation. Male lateral plate fused to pygofer basally, without tooth; aedeagus U-shaped, shaft with very minute teeth on anterior surface; style with beaklike apex. Female second valvulae blade shaped, relatively broad and short, curved, without dorsal teeth.

Deitz stated that the genus name, *Umbelligerus*, refers to the antler-like pronotum. He goes on to state it differs from two related genera, *Bocydium* (Amyot and Serville, 1843) and *Stylocentrus* (Stål, 1869) in that in the afore mentioned two genera "the ocelli are stalked, the metathoracic legs lack cucullate setae in row III and the female second valvulae are relatively broad and short." The genus diagnosis section in Cryan and Deitz (2000) stated the pronotal processs in *Umbelligerus* is without inflated bulbs. At the time of the Cryan and Deitz review none of the known species had inflated bulbs. Both new species described herein, *U. stockwelli* and *U. convergens,* have bulbous swellings on the directed prongs of the umbelliform pronotum which expands the generic description.

Umbelligerus convergens Flynn, new species

(Fig. 1, A–C)

Type locality.—PANAMA: Chiriqui Province, Boquete, 1250 meters, 8°48' N, 82° 26' W.

Diagnosis.—*U. convergens* is most closely allied to *U. stockwelli* as both have swellings on the paired lateral projecting posterior prongs of the pronotum. However it can be separated by its inside anterior prongs (Fig. 1B1) converging where the same prongs on *U. stockwelli* are widely separated (Fig. 2B1).

Description.—Male: unknown. Female: *Head* (Fig. 1C): Face glabrous; eyes large and bulging; ocelli stalked, closer to each other than the eyes, located near base of metopidium and above an imaginary line that passes through center of eyes; area between ocelli deeply concave. Genae slightly sinuate on edges below eyes. Clypeus triangular and rounded on

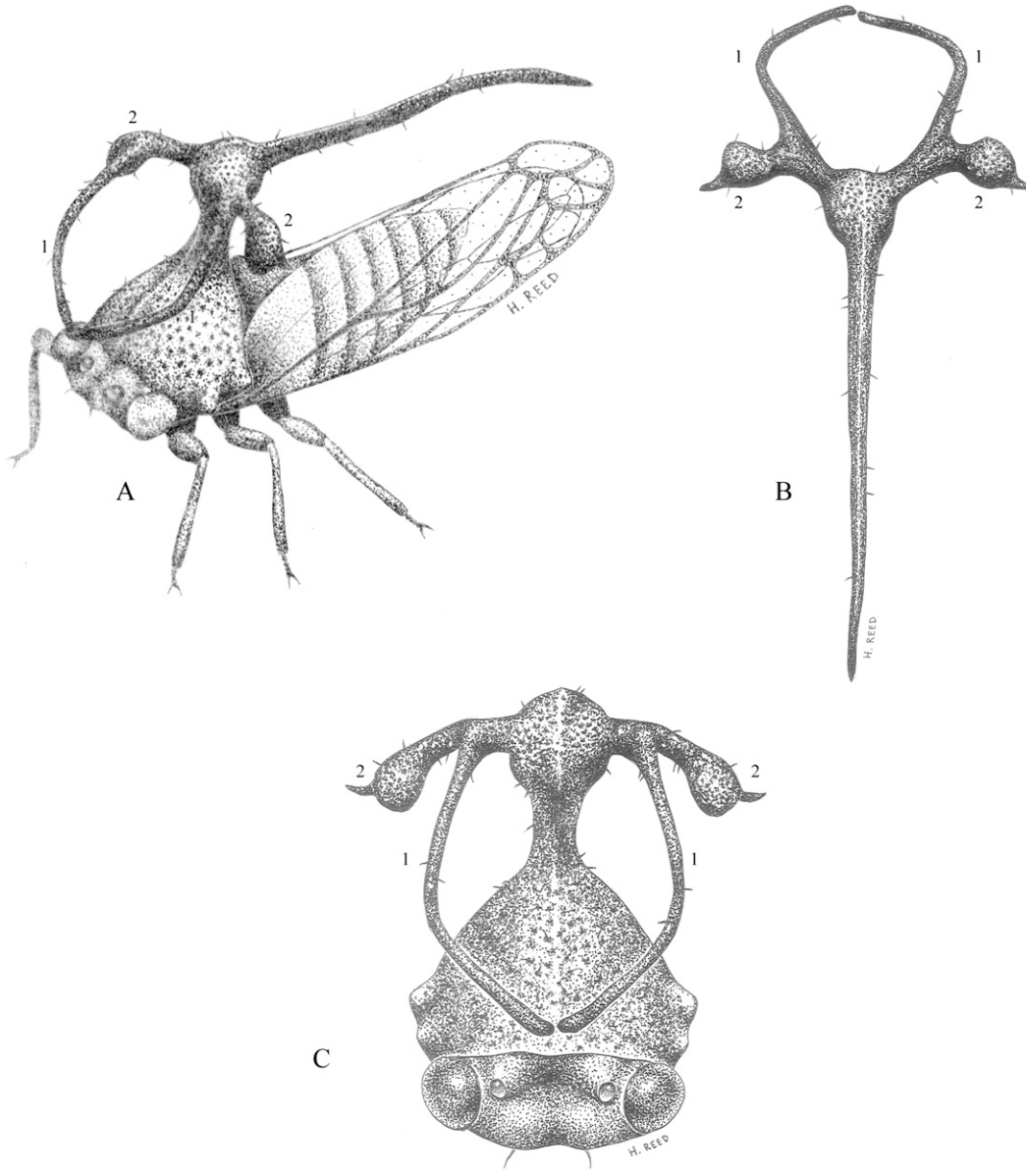

Fig. 1. *Umbelligerus convergens,* n. sp. A. 3/4 view; B. top view; C. front view.

posterior half. *Thorax* (Fig. 1A & C): Humeral angles small, slightly protruding. Metopidium and pronotum with coarse thick punctures and sparsely pubescent. Pronotal process umbelliform, upward directed stalk from top of head ends in central inflated ball; directed laterally from central ball, paired on each side, are twice-branched antler-like prongs; initial lateral branch is thick and short before producing a lateral prong extension followed by an ovoid swelling that ends in a short downward pointed extension directed posteriorly (Fig. 1B2). Extending from the central inflated ball is a forward directed thin prong, bending

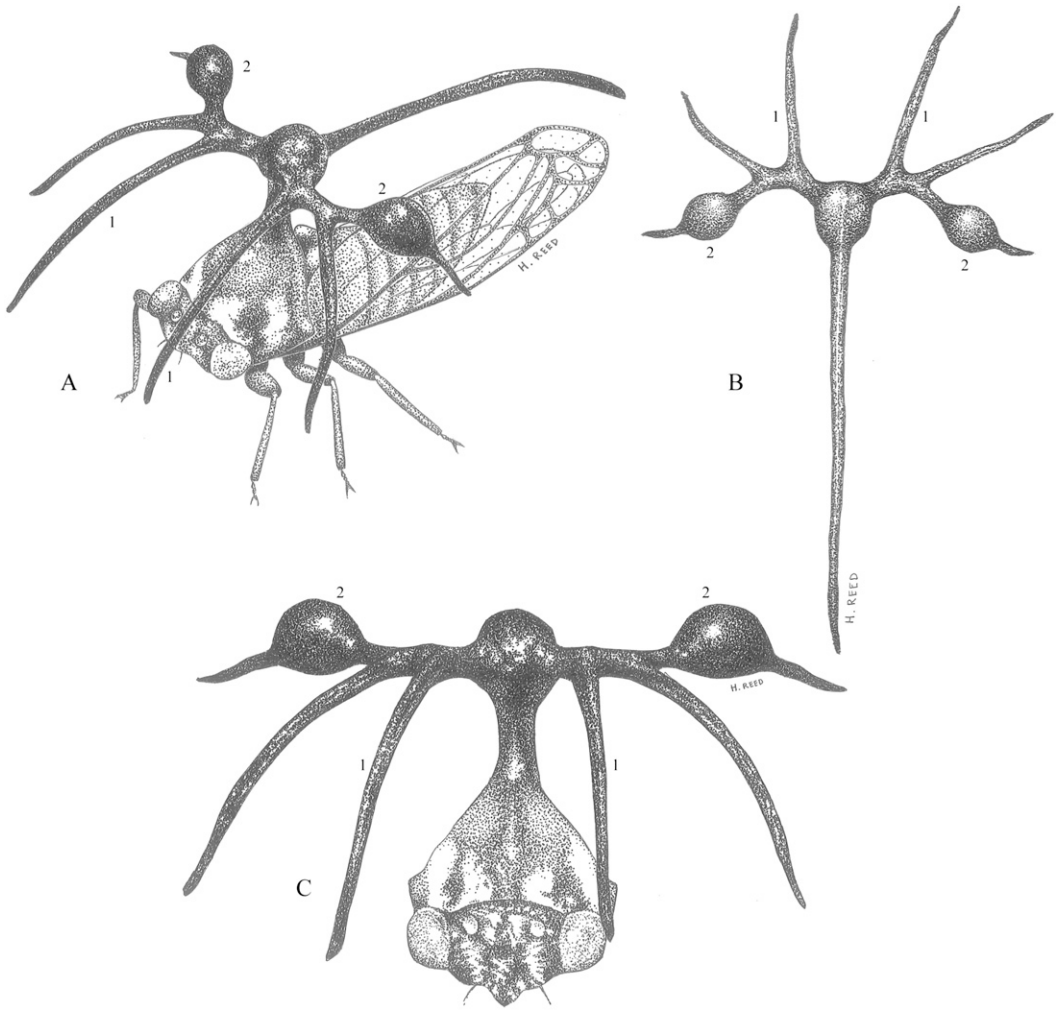

Fig. 2. *Umbelligerus stockwelli,* n. sp. A. 3/4 view; B. top view; C. front view.

downward and inward, converging toward a paired thin prong from the other side of the pronotum. These two prongs converge but do not touch (Fig. 1B1). Posterior process tricarinate, arching downward, reaching to internal angle of tegmina. Pronotum with scattered pubescence. Median carina percurrent. Scutellum inflated at base, then flat and acuminate apically. *Forewing* (Fig. 1A). Veins thin; tegmina opaque, base coriaceous with large punctures. *Color*: General overall color reddish-brown with no other distinct color markings.

Dimensions (mm).—Length from head to tip of wings: 6; length between anterior most directed pronotal extensions: 2; length from tip of anterior most directed extension to tip of posterior process: 5.

Material examined.—Holotype female examined from Henk Wolda Collection, Smithsonian Tropical Research Institute, Balboa, PANAMA, labeled: "PANAMA: Chiriqui, Boquete, 1250 m, 8°48' N, 82° 26' W, 28-X-1975, Coll. H. Wolda/1098" and additional red label "HOLOTYPE/Umbelligerus/convergens Flynn". Female Holotype location: HWIC.

Distribution.—Known only from Panama.

Etymology.—Named for the inner most converging anterior prongs of the pronotum.

Discussion.—The holotype was covered in moth scales indicating it was probably caught in a UV light trap.

Umbelligerus furcillatus Sakakibara 1981

(Fig. 3A)

Type Locality.—BRAZIL: Pernambuco, Caruaru.

Diagnosis.—*U. furcillatus* is most closely allied to *U. peruviensis* and can be separated by longer interior-most pair of anterior pronotal prongs (Fig. 3A1) and no antler-like projection attached to posterior most directed prong on each side (Fig. 3A2).

English translation of original Portuguese description, dimensions, and discussion of *U. furcillatus* by Sakakibara (1981:67) follows:

Description.—Overall black coloration. Ovoid eyes, outwardly projected but not to the point of being pedunculated. Normal ocelli, situated much closer to the eyes than to each other, and, in terms of the elevation in which they are placed, slightly accentuated in spite of the depression that exists in the middle of the vertex. Clypeus terminated in a small conical tip next to the anteclypeus. Pronotum with simple posterior sub-branches; the posterior branch terminating between the internal angle and the apex of the tegmina (Fig. 3A2). Hyaline tegmina, nut-brown on the apical margin and black on the portion of the coriaceous base and also in the veins in the patch that precedes the apical cells. Yellow-brown legs. Abdomen is yellow ventrally and darkens dorsally.

Dimensions (in mm).—Female holotype. Length (from the front to the apex of the tegmina), 6.80; total length of the pronotum, 7.50; maximum width of the head, 1.76; distance between the humeral angles, 1.72.

Material Examined.—Photographic images of the Holotype of *U. furcillatus* (DZUP) taken by Dr. Olivia Evangelista, were examined. Top illustration of *U. furcillatus* was redrawn from Sakakibara (1981:65).

Distribution.—Known only from Brazil.

Discussion.—This species is slightly smaller than *U. peruviensis* Deitz; it is distinguished by the black coloration of the pronotum, non-pedunculated eyes, the wider white stripes, posterior sub-branches of the pronotum without denticles, and the posterior branch shorter than the tegmina. The anterior femora are devoid of spines.

Umbelligerus peruviensis Deitz 1975

(Fig. 3C)

Type Locality.—PERU: Cusco, Rio Cosñipata, Hacienda Maria.

Diagnosis.—*U. peruviensis* is most closely allied to *U. furcillatus* and can be separated by shorter interior-most anterior pronotal prongs (Fig. 3C1) and presence of small antler-like projection attached to posterior most directed prong on each side (Fig. 3C3).

Original description and type information of *U. peruviensis* by Deitz (1975:137) follows:

Description.—Length of body 4.5-5 mm., of pronotum 9.5-10 mm. Head with tan vertex bearing ocelli on dark elevated nodules, compound eyes dark. Pronotum tan laterally, with white longitudinal band on each side, with black umbrelliform process dorsally; elevated central stalk of umbel bearing an elongate, simple posterior branch and two

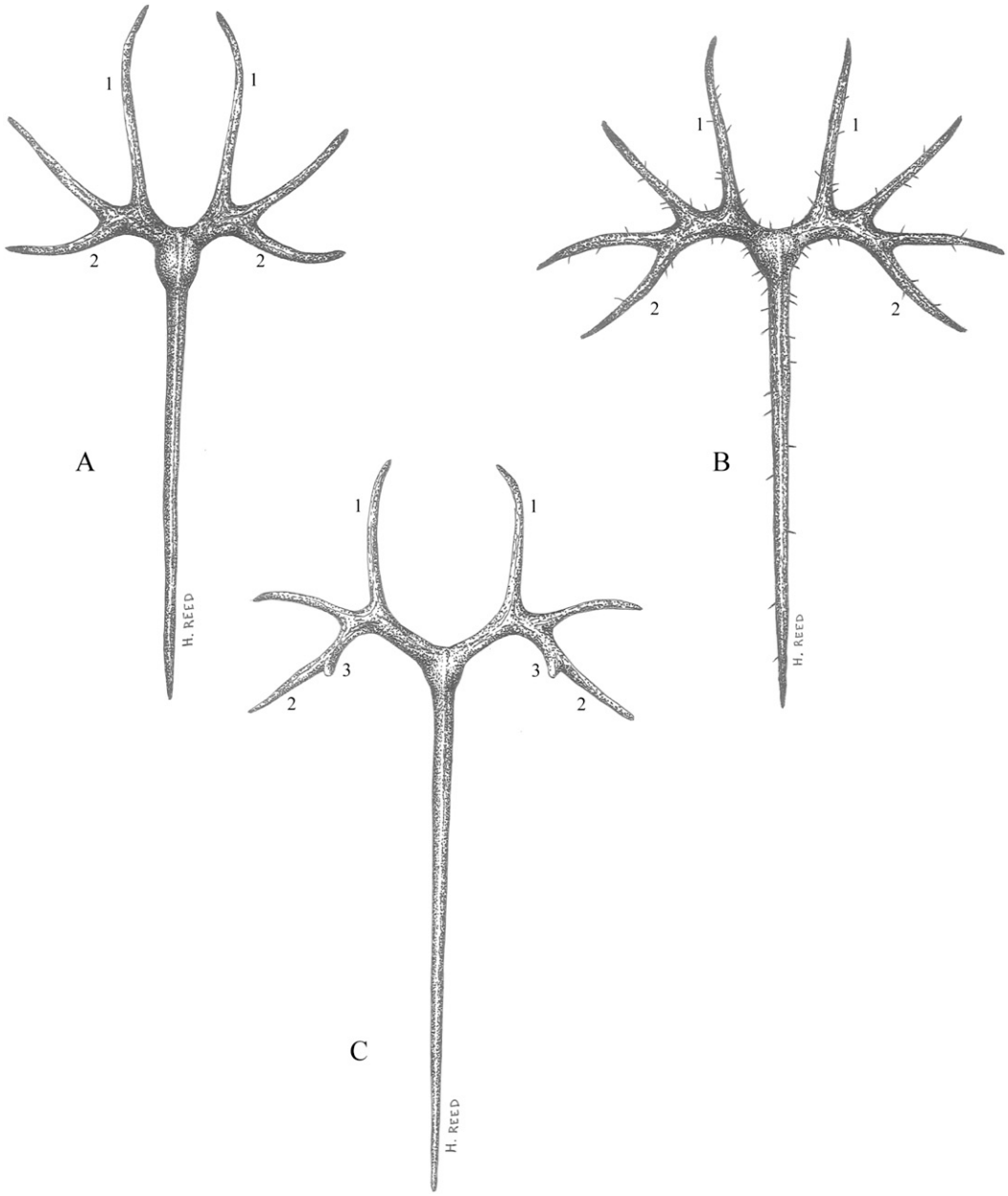

Fig. 3. Top Views: A. *Umbelligerus furcillatus* Sakakibara (redrawn from Sakakibara 1981); B. *U. woldai* Sakakibara; C. *U. peruviensis* Deitz.

anterolateral branches each of which has three secondary branches (Fig. 3C). Scutellum exposed, black anteriorly with white areas laterally and tan posteriorly. Legs tan but slightly darker distally. Abdomen tan with black apex dorsally.

Types.—Holotype, Deitz Research #70-211f ♀, and two paratypes, Deitz Research #70-211g ♀ and #71-13a (♂), respectively collected March 12,21, and 19, 1952 by F. L. Woytkowski along Cosñipata River, Hacienda Maria, Cusco,

PERU (tropical jungle, 900 meters above sea level). Type locations: Holotype ♂ and paratype ♀ (USNM), paratype ♂ (NCSU).

Material Examined.—BRAZIL: Rondônia, 62 km SW Ariquemes, nr Fzda. Rancho Grande, J.E. Eger coll., collected at mercury vapor black lights (USNM: 1♂, 30-III-10-IV-1992; 1♀, 5-17-X-1993); PERU: Madre de Dios: Rio Patuyacu, La Viuda Camp, 12°47'43"S 68°58'03"W, blacklight, 240m, T. Larsen, IX-10. 1999 (USNM: 1♂, 1♀); Cusco, Rio Cosñipata, Hacienda Maria (NCSU: PARATYPE ♂), VENEZUELA: T.F. Amaz. Cerro de la Neblina Basecamp, 0°50'N 66°9'44"W, 140 m, 21-29 Feb. 1984, D. Davis & T. McCabe (USNM: 1♂). Photographs of holotype ♂ (USNM) and paratype ♀ (USNM) taken by Florence Stevenson were examined.

Distribution.—Brazil, Peru, Venezuela.

Discussion.—A small denticle is present in each of the paired posterior subbranches which helps separate this species from its congeners. The borrowed specimens from NCSU and USNM were used for the top illustration.

Umbelligerus stockwelli Flynn, new species

(Fig. 2, A–C)

Type locality.—PANAMA: Panama Province, Cerro Jefe, EL. 900 m, 9°14'N, 79°22.5′ W.

Diagnosis.—*U. stockwelli* is most closely allied to *U. convergens* as both have swellings on the paired lateral projecting posterior prongs. However, it can be separated by its inner most anterior directed prongs are widely separated (Fig. 2B1) where the same prongs on *U. convergens* are converging (Fig. 1B1).

Description.—Male: unknown. Female: *Head* (Fig. 2C): Glabrous; Ocelli and eyes pedunculated; ocelli much closer to the eyes than each other, directed outward and toward eyes, located well above an imaginary line that passes through center of eyes; area between ocelli deeply concave. Clypeus longer than wide. *Thorax* (Fig. 2A): Humeral angles prominent and rounded; metopidium and pronotum shiny and punctate. Pronotal process umbelliform with upward directed stalk from top of pronotum ending in central inflated ball (Fig. 3A). Directed laterally from central ball, paired on each side, are branches, each with three antler-like prongs (Fig. 2B). Center of each posterior-most prong swollen and bulbous (Fig. 2B2). Posterior directed process tricarinate, arching downward, reaching, but not touching, apex of tegmina with end acute. Median carina percurrent. Scutellum inflated at base, flat and acuminate apically. *Forewing* (Fig. 2A): Veins thick and dark; basal third of forewing and along basal third of marginal cell coriaceous; remainder of tegmina clear. *Color*: Face black with white tomentose patches in concave spaces of face, along sides of clypeus, genae, labrum, sides of thorax, anterior of humeral angles, metopidium above anterior border of face, each side of scutellum inflation. Thorax reddish-brown with wide black vertical line extending from posterior border of metopidium to umbelliform pronotal stalk. Umbelliform pronotal stalk and pronotum black with light reddish-brown tinge on antler-like extensions. Forewing veins black; basal coriaceous area reddish-brown, basal coriaceous third of marginal cell black. Abdomen reddish-orange. Genitalia black. Beak yellowish-orange. Legs: coxae, trochanters, and femora yellowish-orange; tibiae, tarsi, reddish-brown; last segments of tarsi and claws darker.

Dimensions (mm).—Length from head to tip of wings: 7; length across bulbous inflations on pronotal process upward

extension: 4; length from tip of anterior most directed antler-like prong to tip of posterior process: 8.

Material examined.—Holotype female examined from D. Flynn Collection labeled: "PANAMA: Pma. Prov., Cerro Jefe, el. 900m, 9°14'N, 79°22.5'W, 12 Mar '08, Stockwell" and additional red label "HOLOTYPE/Umbelligerus/ stockwelli Flynn." Female holotype location: USNM.

Distribution.—Costa Rica, Panama

Etymology.—Named in honor of Dr. Henry Stockwell, coleopterist and friend, who has given me hundreds of treehoppers over the years and much sage professional advice.

Discussion.—Photograph of unnamed Costa Rican species of *Umbelligerus* in Godoy et al. (2006: 311) is *U. stockwelli*.

Umbelligerus woldai Sakakibara 1981
(Fig. 3B)

Type Locality.—PANAMA: Bocas del Toro Prov, Miramar.

Diagnosis.—*U. woldai* can be recognized by having major lateral prongs on each side and no swellings (Fig. 3B).

English translation of original Portuguese description, dimensions, and discussion of *U. woldai* (1981:67-68) follows:

Description.—Overall nut-brown coloration. Ovoid eyes, distinctly pedunculated from a superior view point as observed from above. Protuberant ocelli, situated closer to the eyes than to each other. Pronotum with lateral branches provided with four spines, or better, with medium and simple sub-branches (Fig. 3B). The long and very curved posterior branch almost touches the apical margin of the tegmina. Hyaline tegmina, darkened only along the anal, apical and costal borders. Nut-brown legs. Anterior femora with a short spine in the inferior portion, next to the apical third. Nut-brown abdomen.

Dimensions (in mm).—Female holotype. Length (from the front to the apex of the tegmina, 6.40; total length of the pronotum, 7.40; maximum width of head, 7.70; distance between the humeral angles, 1.78.

Discussion.—This species, although smaller, is very similar to *U. peruviensis* Deitz. It is distinguished by the presence of more than one spine on the lateral branches of the pronoutm, or, in other words, the posterior sub-branches are distinctly bifurcated. In *U. peruviensis*, the posterior sub-branches have only one denticle in the posterior portion (Fig. 3C3) while in this one [*U. woldai*], instead of a denticle, a well-developed spine appears (Fig. 3B2). As to its coloration, the exemplar presents only a black pronotal process; the remainder of the pronotum is a pale nut-brown. The termina also with the coriaceous portion almost all nut-brown but with a darker narrow band along the costal margin. The normal coloration of the species, I suppose, must be predominantly black. The white bands, from the head, pronotum, and pleura, that appear in other species must occur in the same way, although absent in the exemplar-type.

Material Examined.—COSTA RICA: Herrera, La Selva Biological Station nr Puerto Viejo, C.R. Barlett (UDCC: 1♀, 23-24 Feb 2004; 1♀, 27 Feb 2004; 1♀, 28 Feb 2004; 1♀, 1 Mar 2004; 1♂, 25-26 Feb 2004); PANAMA**:** Bocas del Toro, Miramar, 9°N 82°15'W, 12-VIII-1979, Henk Wolda, (HWIC: 1♀, Flynn Panama Research wo01); San Blas, nr. Punta Escoces, 40m, 77°42W 8°48'N, Caroline Ash (HWIC: 1♀, trap 1, 27-I-1979, Flynn Panama Research wo02; 1♀, Flynn Panama Research wo03 and 1♂, Flynn Panama Research wo04, I-IV, 31-I-1979; 1♀, I-IV, 1-II-1979, Flynn Panama Research wo05; 1♀, 1-IV-1978, Flynn Panama

Research wo06). Female holotype location: DZUP.

Distribution.—Costa Rica, Panama.

Discussion.—Photographic images of the holotype of *U. woldai* (DZUP), taken by Dr. Olivia Evangelista, were examined. Borrowed specimens were used for the top illustration.

Key to species of Adult *Umbelligerus*

1. Posterior most directed prongs of the pronotum on each side has a bulbous swelling (Fig. 1B2, Fig. 2B2) 2
– No pronotal horn prong swelling (Fig. 3A2, Fig. 3B2, Fig. 3C2) 3
2. Inside anterior prongs converging, almost touching at tips (Fig. 1B1) . . . . . *convergens,* n. sp. (Panama)
– Inside anterior prongs directed forward (Fig. 2A1, Fig. 2B1, Fig. 2C1) . . . . . *stockwelli,* n. sp. (Costa Rica, Panama)
3. The umbelliform pronotum has four major lateral prongs on each side (Fig. 3B) . . . . . *woldai* Sakakibara (Panama)
– The umbelliform pronotum has three major lateral prongs on each side. (Fig. 3A & Fig. 3C) 4
4. A small antler-like projection, attached to the posterior most directed prong on each side (Fig. 3C2) . . . *peruviensis* Deitz (Brazil, Peru, Venezuela)
– Posterior most directed prongs on each side simple with no projections (Fig. 3A2, Fig. 3B2) . . . . . *furcillatus* Sakakibara (Brazil)

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