

Rediscovering *Anhanga*: redescription and considerations on its taxonomic placement (Hemiptera: Heteroptera: Pentatomidae)

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Abstract. The genus *Anhanga* Distant, 1887 is a monotypical taxon erected for *A. modesta* Distant, 1887. Access to the photographs of the type specimen allowed us to identify three females and one male belonging to this genus. Here we redescribe the genus and the species and provide a detailed description of the genitalia of both sexes. Considering Distant's original description and based on the morphological characters of *Anhanga*, we also re-evaluate the placement of this genus within the Discocephalinae, transferring *Anhanga* to the Pentatominae. Based on the general and genital morphology, *Anhanga* seems to have affinities with *Galedanta* Amyot & Serville, 1843 (tribe Carpocorini).

Key words. Heteroptera, Pentatomidae, Discocephalinae, Pentatominae, Carpocorini, stink bug, taxonomy, Brazil, Neotropical Region

Introduction

Anhanga was described by DISTANT (1887) to include *A. modesta* Distant, 1887 probably based on a single specimen from Rio Grande (referring actually to the state of Rio Grande do Sul, Brazil, see below) in his paper entitled 'Enumeration of the Van Volxem collection of the Rhynchota contained in the Brussels Museum', and he placed it within the subfamily Discocephalinae. After the description, this genus was mentioned in the catalogues of LETHIERRY & SEVERIN (1893) and KIRKALDY (1909), and PIRÁN (1968) examined a couple of specimens of *A. modesta* from Pelotas, Rio Grande do Sul, Brazil. In a list of the types of Hemiptera deposited in the Institut Royal des Sciences Naturelles de Belgique, SYNAVE (1969) listed the type material deposited in the entomological collections of the Institut Royal des Sciences Naturelles de Belgique (IRSNB) and considered the type specimen of *A. modesta* to be a single specimen and treated it as a 'holotype'.

DISTANT (1887) indicated that *Anhanga* might be allied to *Empicoris* Hahn, 1834. *Empicoris* Hahn is a junior homonym of *Empicoris* Wolff, 1811 (Hemiptera: Heteroptera: Reduviidae) and the name has been replaced by *Dinocoris* Burmeister, 1835, the oldest available synonym (MCATEE & MALLOCH 1923, BECKER & GRAZIA 1985). Despite the superficial similarity of *A. modesta* with some species of *Dinocoris*, DISTANT (1887) did not discuss several of the characters that define the Discocephalinae, such as the origin of the labium (posterior of a transverse imaginary line across the eyes) and trichobothria placement (pair of trichobothria on VII sternite placed laterad of imaginary band connecting spiracles).

Jérôme Constant (IRSNB) provided us with photographs of the ‘holotype’ (Fig. 2). The specimen is considerably damaged, but together with the original description, we were able to identify three females and an associated male in various collections (see below) as belonging to the same species. In this paper, we provide a redescription of the genus and species. Also, the taxonomic placement of *Anhanga* is re-evaluated resulting in its transfer from the Discocephalinae to the Pentatominae.

Material and methods

The terminology of the male and female genitalia follows BAKER (1931), DUPUIS (1970), and SCHAEFER (1977). The terminology adopted for the external scent efferent system of metathoracic scent gland follows KMENT & VILÍMOVÁ (2010). The female genitalia were dissected and cleared with 10% KOH and stained with Congo red. Drawings were made using a camera lucida coupled with a stereomicroscope, lined with black pigment ink pen, digitally scanned, vectorized, and prepared digitally. Measurements (average, minimum–maximum) are given in millimeters. The pygophore was not dissected because we did not want to damage the single male specimen available.

The descriptions were based on one male and three females. The material analyzed belongs to the following collections:

AMNH American Museum of Natural History, New York, USA;

IRSNB Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium;

MCNZ Museu de Ciências Naturais da Fundação Zoobotânica do Rio Grande do Sul, Porto Alegre, Brazil;

UFRG Coleção do Departamento de Zoologia, Universidade Federal do Rio Grande do Sul, Porto Alegre, Brasil.

Taxonomy

Anhanga Distant, 1887

Anhanga Distant, 1887: lx (original description). Type species: *Anhanga modesta* Distant, 1887, by monotypy

Ahanga (incorrect subsequent spelling): LETHIERRY & SEVERIN (1893): 89 (catalogue).

Anhanga: KIRKALDY (1909): 221 (catalogue).

Diagnosis. In addition to DISTANT’s (1887) original description, the following features are highlighted. Antennae 5-segmented; first antennal segment reaching but never surpassing anterior margin of head. Head somewhat long, narrowed and rounded in front; mandibular plates reflexed, convergent at apex and much longer than clypeus. Basal segment of rostrum

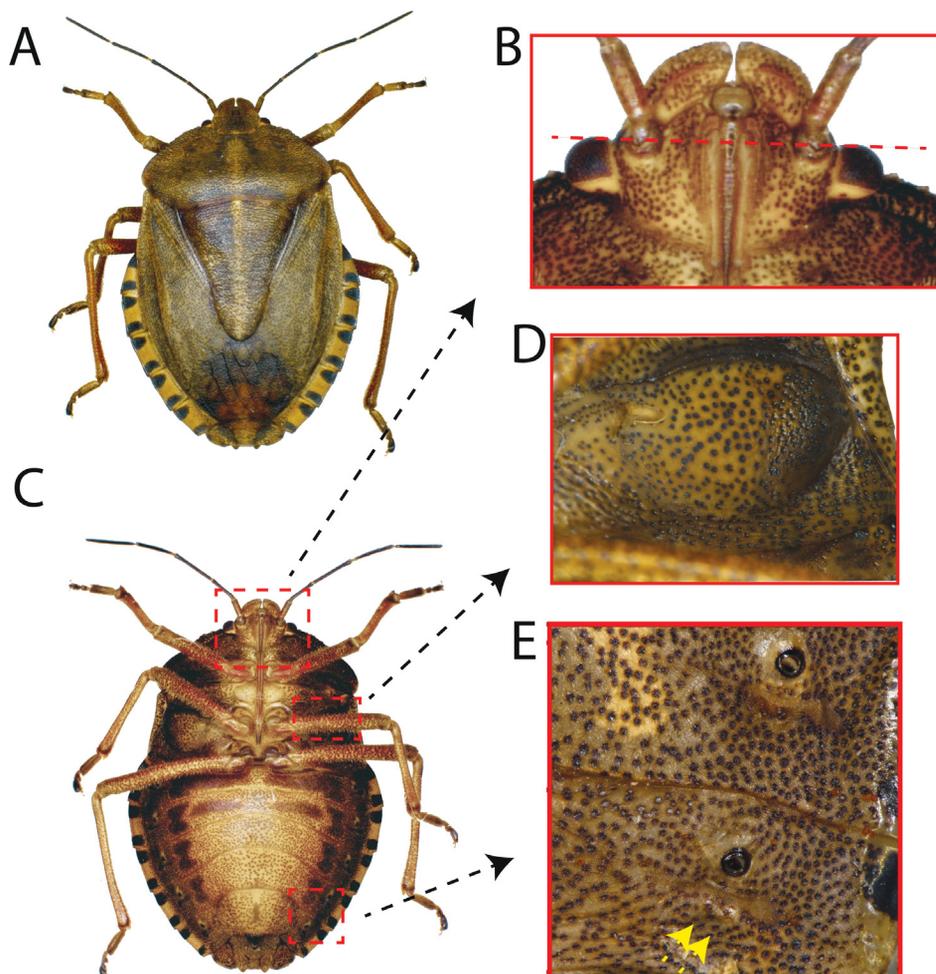


Fig. 1. *Anhanga modesta* Distant, 1887. A – dorsal view; B – magnification of the head in ventral view, dashed line highlighting the basal segment of labium arising anteriorly to the imaginary line traversing head at anterior margin of eyes; C – ventral view; D – magnification of external scent efferent system of metathoracic scent glands; E – magnification of abdomen, highlighting the placement of the pair of trichobothria (arrows) along the imaginary line of spiracles on urosternites VI and VII. Scale bar: 5 mm.

arising anteriorly to imaginary line crossing head at anterior margin of eyes (Fig. 1B); first rostral segment surpassing posterior limits of bucculae; apex of rostrum surpassing mesocoxae. Anterolateral margins of pronotum slightly reflexed, crenulate along anterior half; lateral angles rounded and not projecting. Scutellum not exceeding posterior margin of connexival segment V. Prosternum slightly projected. Peritreme spout-shaped, very short, about three

times diameter of ostiole; evaporatorium covering 2/3 of metapleuron. Hemelytra not covering connexivum. Tarsi 3-segmented. Abdominal venter not tuberculated, without median sulcus or spine. Spiracles placed on callus. Pair of trichobothria present on urosternites III–VII along imaginary line connecting the spiracles.

Male genitalia. Pygophore globose, posterolateral angles projected, spatulate, convergent. Dorsal rim concave and slightly projected over segment X. Ventral rim with open V-shaped excavation, bearing 1+1 acute projections close to posterolateral angles. Superior layer of ventral rim well developed, with 1+1 blunt and hairy projections directed dorsad. Parameres paddle-like. Segment X lozenge-shaped; posterior half grooved and hairy.

Female genitalia. Gonocoxites VIII quadrangular; anterolateral margin rounded and posterior margin emarginated. Gonocoxites IX trapezoidal. Laterotergites VIII presenting spiracles. Laterotergite VIII and IX similar in length. Laterotergites IX rounded at apex, not surpassing transverse band linking laterotergites VIII. Ring sclerites present. Vesicular area of receptaculum seminis well developed. Capsula seminalis with finger-like process.

Anhanga modesta Distant, 1887

(Fig. 1)

Anhanga modesta Distant, 1887: lx (original description).

Anhanga modesta: LETHIERRY & SEVERIN (1893): 89 (catalogue).

Anhanga modesta: KIRKALDY (1909): 221 (catalogue); PIRÁN (1968): 18 (record); SYNAVE (1969): 15 (list of types, inadvertent lectotype designation).

Type material. LECTOTYPE (designated by assumption of holotype by SYNAVE 1969): ♀ (badly damaged, see Figs 2A–C), bearing the following labels (Fig. 2D): a) Rio grande do Sul [black text on green label], b) Coll. Camille Van Volxem, c) M.R. Belg., d) 1875, e) *Anhanga modesta* Dist., f) HOLOTYPE, and g) *Anhanga modesta* Distant (SYNAVE 1969).

Material examined. BRAZIL: RIO GRANDE DO SUL: São Francisco de Paula (Pró-Mata), 16.–17.iii.2012, 1 ♀, M. Pinkoski & J.K. Carvalho (MCNZ); no data, 1 ♀ (AMNH); Mato Catelhano – RS – BR, Flona de Passo Fundo, Estrada principal, 13.xii.2012, 1 ♂ 1 ♀, Bottega C. col. (UFRG).

Redescription. Moderate to large size (17.5–19 mm), wide ovoid. General color yellowish brown, black punctures on dorsal and ventral surfaces; antennae and legs with similar color pattern (Fig. 1A).

Head almost as long as wide across eyes, densely punctured on vertex. Mandibular plates rounded and convergent, sometimes contiguous apically; lateral margins slightly deflected. First antennal segment nearly reaching apex of head, but not surpassing it; proportion of antennal segments: I < II < III < IV < V. Rostrum reaching metasternum.

Thorax. Pronotum wider than long; anterolateral margins slightly crenulate; humeri rounded, slightly prominent. Scutellum subtriangular, with black punctures, foveae present at basal angles. Peritreme spout-shaped, very short, about 1/6 of distance from ostiole to lateral margin of metapleuron (Fig. 1D). Legs with black punctures; tibiae dorsally sulcate (Fig. 1C). Corium surpassing scutellum and almost reaching posterior margin of tergite VI. Membrane translucent and with five parallel longitudinal veins.

Abdomen. Connexivum broadly exposed, with black stripes at posterior and anterior outer angles of segments. Anterior margin of abdominal segment VII, in males, deeply concave, V-shaped, resulting in segment VI being quite narrow medially; in females, anterior margin is U-shaped, not so markedly excavate. Posterior margin of segment VII black and bearing short and close wrinkles. Spiracles black, each on yellowish callus (Fig. 1E).

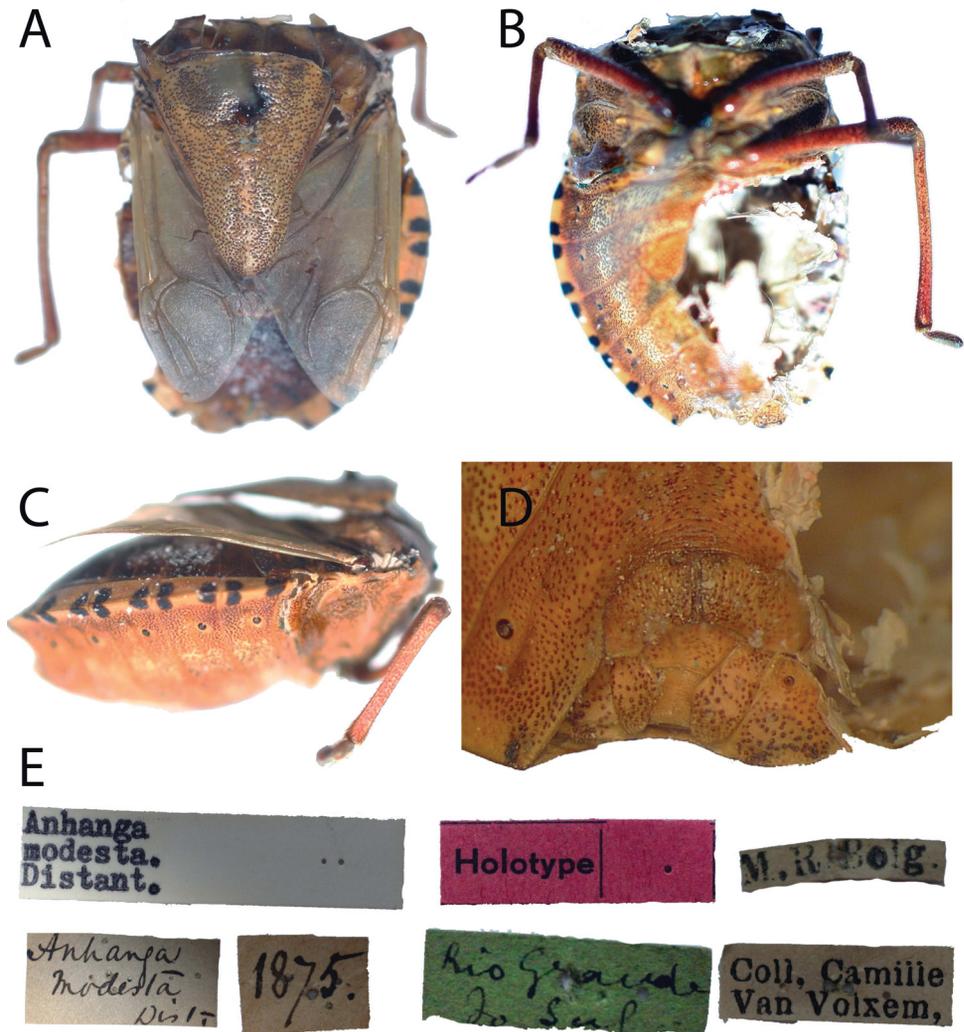


Fig. 2. Lectotype of *Anhangia modesta* Distant, 1887. A – dorsal view; B – ventral view; C – lateral view; D – genital plates in postero-ventral view; E – labels. Scale not provided.

Male genitalia (Figs 3C–H). Pygophore globose, dorsal rim tumid over segment X, with flat expansion lateral to segment X. Posterolateral angles acute, convergent and surpassing ventral rim. Superior layer of ventral rim with 1+1 dorsoventrally depressed processes lateral to the apex of segment X and rounded at apex. Dorsal rim uniformly concave between lateral emarginations. Parameres spatulate, laterally compressed, parallel to lateral walls of segment X. Segment X wider in middle, narrowing toward apex; portion posterior to this enlargement with subparallel margins, its width equal to about half the width of portion anterior to enlargement. Setae densely distributed on dorsal rim, dorsum and apex of posterolateral angles,

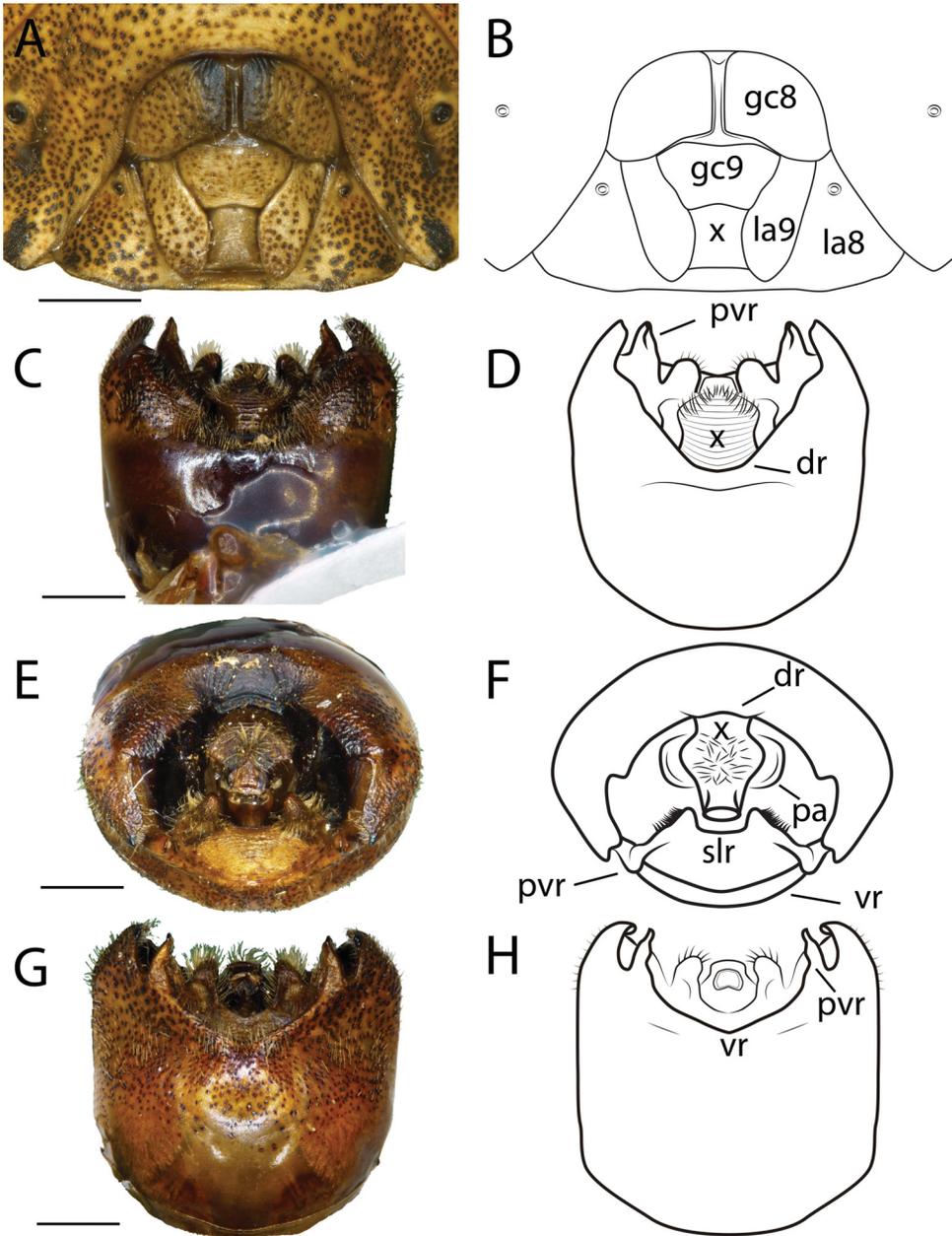


Fig. 3. *Anhanga modesta* Distant, 1887, external genitalia. A–B – genital plates in postero-ventral view; C–H – pygophore; C–D – dorsal view; E–F – posterior view; G–H – ventral view. Abbreviations: dr – dorsal rim; gc8 – gonocoxites VIII; gc9 – gonocoxites IX; la8 – laterotergites VIII; la9 – laterotergites IX; pa – paramere; pvr – process of ventral rim; slr – superior layer of ventral rim; vr – ventral rim; X – tenth segment. Scale bar: 1 mm.

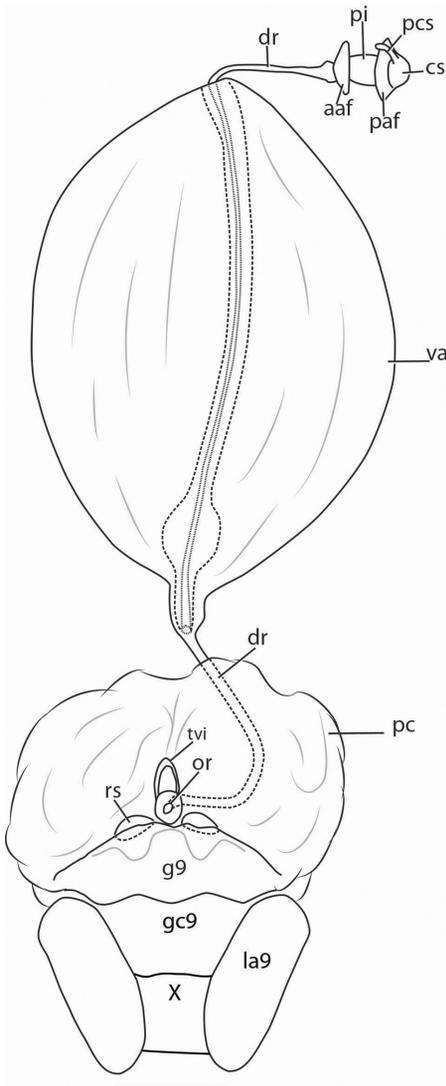


Fig. 4. Internal female genitalia of *Anhangia modesta* Distant, 1887. Abbreviations: aaf – anterior annular flange; cs – capsula seminalis; dr – ductus receptaculi; g9 – gonapophyses IX; gc9 – gonocoxites IX; la8 – laterotergites VIII; la9 – laterotergites IX; or – orificium receptaculi; paf – posterior annular flange; pc – pars communis; pcs – finger-like process of capsula seminalis; pi – pars intermedialis; rs – ring sclerites; tv – thickening of vaginal intima; va – vesicular area; X – tenth segment). Scale bar: 1 mm.

projections of superior layer of ventral rim and enlarged portion of segment X, longer on the last two structures.

Female genitalia (Figs 3A–B and 4). Gonocoxites VIII somewhat quadrangular; sutural margins parallel, not contiguous; anterolateral margin rounded and posterior margin slightly concave on area adjacent to gonocoxites IX. Gonocoxites IX trapezoidal, anterior and posterior margins concave medially. Arms of gonocoxites IX slightly curved, about half of anterior width of the plate. Laterotergites IX each with rounded apex, not surpassing transverse band linking laterotergites VIII. Segment X with thin transverse striae. Gonapophyses IX with secondary thickenings – one oblong, more sclerotized, in middle, and 1+1 before each ring sclerite. Thickening of vaginal intima in two portions, the anterior globose, with opening of ductus receptaculi, and the posterior conical. Vesicular area expanded, median wall with conspicuous enlargement at base. Ductus receptaculi proximalis as long as ductus receptaculi distalis. Capsula seminalis with finger-like process; anterior and posterior flanges convergent to each other; pars intermedialis slightly enlarged.

Measurements. See Table 1.

Distribution. Brazil: Rio Grande do Sul, biome Atlantic Rain forest (Distant 1887, PIRAN 1968, this paper).

Comment. Describing *Anhangia modesta*, Distant (1887) did not indicate the sex or the number of specimens he used, but provided only a single measurement, while he frequently provided length span for other species in the same paper. Based on the original description SYNAVE (1969) considered the single specimen deposited in IRSNB the holotype. As we cannot be absolutely sure how many specimens the original description was based on, we consider SYNAVE's (1969) action an inadvertent designation of lectotype by assumption of holotype (ICZN 1999: Article 74.6).

Table 1. Measures in millimeters (average, minimum–maximum) of *Anhanga modesta* Distant, 1887.

Measurement	Male (n = 1)	Female (n = 3)
Total body length	15.13	17.73 (16.69–19.00)
Head length	3.12	2.89 (2.70–3.00)
Anteocular length	1.48	1.62 (1.50–1.80)
Interocular distance	2.20	2.19 (2.18–2.20)
Length of antennal segment I	0.85	0.92 (0.90–0.94)
Length of antennal segment II	1.49	1.22 (1.10–1.30)
Length of antennal segment III	1.85	2.01 (1.90–2.10)
Length of antennal segment IV	2.13	2.01 (2.00–2.03)
Length of antennal segment V	2.91	2.96 (2.96)
Pronotum length	3.02	3.51 (3.12–3.70)
Pronotum width	9.52	9.22 (9.05–9.30)
Scutellum length	6.55	6.53 (6.40–6.60)
Scutellum width	5.11	5.82 (5.70–6.60)
Abdomen width	10.76	11.67 (11.54–11.80)

Discussion

Currently, nine subfamilies are included in Pentatomidae (GRAZIA et al. 2008, RIDER 2016). ROLSTON & McDONALD (1979) provided a key to the identification of the families of Western Hemisphere Pentatomoidea, the subfamilies of the Pentatomidae and the tribes of the Pentatominae. Those keys diagnose the main subfamilies of Pentatomidae. *Anhanga* has never been evaluated after the original description by DISTANT (1887) and the taxon seems to be rare in museums. ROLSTON & McDONALD (1979) established the following diagnostic characters of the Discocephalinae: the labial insertion arising on or posterior to an imaginary line traversing head across the anterior limits of the compound eyes; and on sternite VII the trichobothrium closest to the spiracle positioned laterally to an imaginary line connecting spiracles on sternites VI and VII by distance at least equal or greater than the diameter of spiracular opening; if the labium arose on the imaginary line then the distance between the nearest trichobothrium and the spiracle might be less than the diameter of the spiracle.

In *Anhanga modesta*, the metasternum is not produced toward the mesosternum; the scutellum does not reach the apex of the abdomen; trichobothria are placed along the imaginary line of spiracles; the rostrum reaches the metasternum; the basal segment of the labium arises anterior to the transversal imaginary line between the anterior margins of the compound eyes and surpasses the posterior limit of the bucculae; and frenum extends beyond 1/3 of scutellum length. These characters fit the genus *Anhanga* within Pentatominae. **Therefore we transfer *Anhanga* from the Discocephalinae to the Pentatominae.**

The general and genital morphology of *Anhanga* is similar to that found in species of *Galedanta* Amyot & Serville, 1843 (Pentatominae: Carpocorini). *Galedanta* presently contains five species, all distributed in the Neotropical Region: *G. bituberculata* Amyot & Serville, 1843 (type species), *G. compastoides* Breddin, 1906, *G. myops* (Fabricius, 1803), *G. cornuta* Grazia, 1981, and *G. rotundicornis* Grazia, 1981 (the genus is currently under

revision by A.B. and J.G.). Among general morphological features we can highlight the following similarities: body moderate to large in size, homogeneously covered in punctures; mandibular plates rounded at apex, convergent and longer than clypeus; scutellum bearing foveae. Both *Anhanga* and *Galedanta* share the following genital characters: in females, the gonocoxites VIII are subquadrangular, not overlapping at mesial margins, gonocoxites IX broadly exposed, enlarged vesicular area and inner wall with a conspicuous enlargement at base, pars intermedialis straight, capsula seminalis globose, bearing finger-like processes, and in males, the ventral rim of the pygophore is excavated in a 'V-shape', and the superior layer of the ventral rim is well projected.

Anhanga can be easily distinguished by the anterolateral margin of pronotum crenulate along the anterior half and by the rounded lateral angles, while in *Galedanta* the anterolateral pronotal margins are roughly serrate, and the lateral angles of pronotum are at least slightly projected, emarginated, and/or ornamented.

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References

- BAKER A. D. 1931: A study of the male genitalia of Canadian species of Pentatomidae. *Canadian Journal of Research* **4**: 148–220.
- BECKER M. & GRAZIA J. 1985: Revisão do gênero *Dinocoris* Burmeister, 1835 (Heteroptera: Pentatomidae: Discocephalinae). *Revista Brasileira de Zoologia* **3**(2): 65–108.
- DISTANT W. L. 1887: Enumeration of the Van Volxem collection of Rhynchota contained in the Brussels Museum. Part I. *Annales de la Société Entomologique de Belgique* **31**(3): lvi–lxvi.
- DUPUIS C. 1970: Heteroptera. Pp. 190–209. In: TUXEN S. L. (ed.): *Taxonomist's glossary of genitalia in insects*. Munksgaard, Copenhagen, 359 pp.
- GRAZIA J., SCHUH R. T. & WHEELER W. C. 2008: Phylogenetic relationships of family groups in Pentatomoidea based on morphology and DNA sequences (Insecta: Heteroptera). *Cladistics* **24**: 1–45.
- ICZN 1999: *International Code of Zoological Nomenclature. Fourth Edition*. The International Trust for Zoological Nomenclature, London, 306 pp.
- KIRKALDY G. W. 1909: *Catalogue of the Hemiptera (Heteroptera) with biological and anatomical references, lists of foodplants and parasites, etc. Vol. I. Cimicidae*. Berlin, xi + 392 pp.
- KMENT P. & VILÍMOVÁ J. 2010: Thoracic scent efferent system of Pentatomoidea (Hemiptera: Heteroptera): a review of terminology. *Zootaxa* **2706**: 1–77.
- LETHIERRY L. & SEVERIN G. 1893. *Catalogue général des Hémiptères. Vol. I. Pentatomidae*. Bruxelles, x + 286 pp.
- MCATEE W. L. & MALLOCH J. R. 1923. Further notes on names of Emesinae and other Rhynchota. *Proceedings of the Biological Society of Washington* **36**: 161–163.
- PIRÁN A. A. 1968: Hemiptera neotropica. XI. *Revista de la Sociedad Entomológica Argentina* **30** (1967): 17–25.

- RIDER D. A. 2016: Pentatomoidea Home Page. North Dakota State University. <https://www.ndsu.edu/faculty/rider/Pentatomoidea/> (accessed 07 June, 2016).
- ROLSTON L. H. & McDONALD F. J. D. 1979. Keys and diagnosis for the families of Western Hemisphere Pentatomoidea, subfamilies of Pentatomidae and tribes of Pentatominae (Hemiptera). *Journal of the New York Entomological Society* **87**: 189–207.
- SCHAEFER C. W. 1977. Genital capsule of the trichophoran male (Hemiptera: Heteroptera: Geocorisae). *International Journal of Insect Morphology and Embryology* **6**: 277–301.
- SYNAVE H. 1969: Liste du materiel typique conserve dans les collections entomologiques de l'Institut Royal des Sciences Naturelles de Belgique. Hemiptera – 23 – 25 – Cydnidae, Pentatomidae, Gelastocoridae. *Bulletin de l'Institut Royal des Sciences Naturelles de Belgique* **45(37)**: 1–21.