Revision of the genus *Salyavata* Amyot & Audinet-Serville, 1843 (Heteroptera: Reduviidae: Salyavatinae)

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The Neotropical genus *Salyavata* Amyot & Audinet-Serville, 1843 (Heteroptera: Reduviidae) is revised. Eleven species are recognized as valid, with six described as new, arranged in three species groups. The *variegata*-group comprises: *S. variegata* Amyot & Audinet-Serville, 1843; *S. dominica* spec. nov. from Dominica and Lesser Antilles; *S. macmahanae* van Doesburg & Brailovsky, 2001; *S. englemani* spec. nov. from Panamá, Colombia and Venezuela; and *S. webbi* spec. nov. from the Amazon region in Brazil. The *nigrofasciata*-group comprises: *S. nigrofasciata* Costa Lima, 1935; *S. wygodzinskyi* Maldonado, 1955; *S. alborengai* spec. nov. from Brazil; and *S. brasiensis* spec. nov. from Brazil. The *cornuta*-group is proposed for *S. cornuta* Wygodzinsky, 1943 and *S. berengeri* spec. nov. from French Guiana, Trinidad and Venezuela. The first known female specimen of *Salyavata nigrofasciata* Costa Lima is described and figured. Eggs and nymphs are documented for some species. Further, a summary of the species, a key to the species groups and to all species, and distribution maps are provided.

Introduction

Since the publication of the first “Notes on *Salyavata*” (van Doesburg & Brailovsky, 2001), we received for identification several interesting collections. Thanks to this material, our knowledge of the genus *Salyavata* and the distribution of its species have greatly increased. Several *Salyavata* species are in first appearance very alike *S. variegata* by habitus and surface pattern, the reason that most of them were named as such by several authors.

Costa Lima (1935) described *S. nigrofasciata* from Urucuia, Minas Geraes, Brazil, Wygodzinsky (1943) *S. cornuta* from Taperinha, Pará, Brazil, and Maldonado Capriles (1955) *S. wygodzinskyi* from Mt Marahuaca, Venezuela.

Van Doesburg & Brailovsky (2001) recognized and described the Middle American species *S. macmahanae*, placing the rest together under *S. variegata* as well, but noticed already (p. 388) that the Panamanian and some Colombian specimens were different from *S. variegata*, which we now consider to belong to a new species. In addition, the loaned specimens contain another six undescribed species and the female of *Salyavata nigrofasciata* Costa Lima, 1935, which is described for the first time.

Noteworthy is a collection of nymphs of *S. macmahanae* and *S. englemani* spec. nov. from a study by the late Dr Betty McMahan on termites and their *Salyavata* predators in Costa Rica (1980-1989) and Panamá (1984, 1985) respectively. The collection, mainly
in alcohol in small vials, was sent to the senior author as a gift, who incorporated it into the RMNH collection. From this material all nymphal instars of both species could be shown and even some differences between them can be determined; egg shell clusters from *S. englemani* were also present.

We base our species limits on the external morphology of the head, the colour patterns of the pronotum and abdominal spines, and the structure of the parameres and median process of the pygophore in the male genitalia. More importantly, most of the species can be unambiguously identified by the particular structure of the uninflated aedeagus, a character complex documented before in Salyavatinae (e.g., Wygodzinsky, 1943, 1948; Truong et al., 2007), but not used in a comparative way for species delimitation (see fig. 4).

All measurements are in mm; tl. = total length; in the captions of the figures, b = bar, for nymphs: 4-3/i means 4 specimens of 3rd instar. The lettering of the illustrations is adopted from the Heteroptera handbook “True Bugs of the World” (Schuh & Slater, 1995).

Systematics

**Salyavatinae Amyot & Audinet-Serville, 1843**


Diagnosis.—Reduviidae with body not flattened, antennae with 4 segments, inserted on anteriorly projecting prominent tubercles at front of head, ocelli present, scutellum spined, fore legs cursorial, fore tarsus 2-segmented, abdomen laterally frequently spined.

Weirauch (2008) suggested that Salyavatinae and Sphaeridopinae are a monophyletic group, based on the particular structure of the mouthparts, and on the ventrally directed ponticus basilaris of the male genitalia. In her analyses Salyavatinae are paraphyletic with respect to Sphaeridopinae because *Salyavata* is more closely related to *Sphaeridops* (Sphaeridopinae) than to other genera of Salyavatinae. If future phylogenetic analyses confirm Salyavatinae’s paraphyly, one of the solutions might be to synonymize Sphaeridopinae under Salyavatinae. In this scenario, the mouth parts and genitalic characters supporting the monophyly of Salyavatinae + Sphaeridopinae could be considered diagnostic for Salyavatinae as a whole.

**Genus Salyavata Amyot & Audinet-Serville, 1843**

Type species: *Salyavata variiegata* Amyot & Audinet-Serville, 1843; by monotypy (fig. 8).

*Salyavata* Amyot & Audinet-Serville, 1843: 350 (n. gen.); Stål, 1859: 191 (list); 1872: 120 (catalog); 1874: 80 (catalog); Champion, 1898: 190 (fauna C. America); Fracker & Bruner, 1924: 166 (diagnosis); Costa Lima, 1935: 24 (n. sp.); 1940: 211; Wygodzinsky, 1943: 1 (revision); 1944: 350 (diagnosis); 1948: 564

(genitalia); 1949: 64 (catalog); 1960: 310 (distribution); Brailovsky & Peláez, 1978: 173 (fauna Mexico); Maldonado, 1990: 488 (catalog); Wygodzinsky & Lodhi, 1989: 377 (antennal trichobothria); Schuh & Slater, 1996: 158 (diagnosis); Froeschner, 1999: 225 (list); van Doesburg & Brailovsky, 2001: 386 (n. sp.); Weirauch, 2006a: 4, ff (camouflage in nymphs); 2006b: 99, ff (metathoracic gland); 2007:159, ff (fossula spongiosa); 2008: 231 (phylogeny).

Diagnosis.— New World *Salyavatinae*; head with antennal base unarmed or with a single spine; pronotum with each humeral angle armed with 2 stout spines, disc of pronotum with a single central spine; fore tibia cylindrical; posterolateral angles of abdominal segments II-VII armed with a single, relatively long, sharp spine. The latter also present in nymphal instars 2-5.

The genus *Salyavata* can be easily recognized among all *Salyavatinae* in particular by the strongly spined abdominal segments. Other genera, such as *Elaphrocranus* Bergroth, *Petalocheirus* Palisot de Beauvois, and *Tragelaphodes* Bergroth, have spined abdominal segments as well, but the humeral angles in these genera have a single spine, not 2 as in *Salyavata*. Furthermore, in *Elaphrocranus* the abdominal spines are rather short and have the antennal base bifid apically, whereas *Salyavata* has just a single spine at the antennal base in some species. In *Tragelaphodes* the abdominal spines are relatively large, but the anterior lobe of the pronotum has a pair of spines, whereas in *Salyavata* there are no spines. *Petalocheirus* species have the fore tibia expanded, whereas in *Salyavata* it is cylindrical.

The eleven species of *Salyavata* which are here recognized can be divided into three species groups by the length of the scape (= first antennal segment), the setation on the pedicel (= second antennal segment), the size and position of the ocelli relative to the eye, the presence of large spines on the head, and some aspects of the colour pattern of the pronotum and abdominal spines.

In the *variegata* species group the base of the antenniferous tubercle is flat, the scape is slender and much longer than the width of the head across the eyes, the setae of the pedicel are reclined and shorter than width of the segment, the ocelli are small and placed on the flat cuticle, and the distance to the eye about the same as to the other ocellus. This species group includes the type species *Salyavata variegata* Amyot et Audinet-Serville, 1843, as well as *S. dominica* spec. nov., *S. englemani* spec. nov., *S. macmahanae* van Doesburg & Brailovsky, 2001, and *S. webbi* spec. nov.

The *nigrofasciata* species group has the base of the antenniferous tubercle flat, the scape thicker and much shorter than the width of the head over the eyes, the setae of the pedicel are erect and nearly as long as the segment width, and the ocelli are large and placed on a shared ocellar protuberance, situated close together with the distance to the eye about the same as to the other ocellus. In the female the setae of the ninth tergite and adjacent sclerites are much longer than in the *variegata*-group or the *cornuta*-group (see below). This species group contains *S. alvarengai* spec. nov., *S. brasiliensis* spec. nov., *S. nigrofasciata* Costa Lima, 1935, and *S. wygodzinskiyi* Maldonado, 1955.

The last group, the *cornuta* species group, is easily recognized by the large spines at the base of the antenniferous tubercles (fig. 16A), it also has a thick scape (similar to the *nigrofasciata* species group) but barely longer than the width of the head over the eyes, the setae of the pedicel are reclined and shorter than width of the segment, and the ocelli are large, placed on a shared ocellar protuberance, situated far apart from each
other with the distance to the eye shorter than to the other ocellus. It has a large distribution which includes the Guianas, Brazil, Venezuela, and Trinidad, and contains several forms of which the true taxonomic status at the moment is uncertain because of paucity of specimens and lack of males. This species group includes *S. berengeri* spec. nov. from French Guiana, and *S. cornuta* Wygodzinsky, 1943, from Pará, Brazil.

The classification into the three species groups is also manifest in the colour pattern of the posterior pronotal lobe (fig. 1A-L). Basically the dorsal surface of the lobe shows two transverse rows of six light coloured spots, in an anterior and a posterior row, a constellation best to see in *S. brasiliensis* (fig. 1I). In the *variegata*-group the outermost spots of both rows are united to form an arc around the base of each anterior humeral spine (fig. 1A-E). In the *cornuta*-group this fusion apparently took place as well, but no arc has been formed and a central longitudinal spot proceeds backwards from the base of the central spine (fig. 1F, G). In the *nigrofasciata*-group, the species
S. nigrofasciata and S. wygodzinskyi (fig. 1J-L) apparently forms an exception, because the white spots are expanded to such an extent that the pattern of the anterior row is largely dissolved. The posterior row of spots is, however, although more or less united with each other, still clearly recognizable. In S. alborengai the outermost two spots of both rows are united (fig. 1H).

Wygodzinsky (1944: 350) mentioned a species specific character in the forewing: the presence or absence of a cell basad to the internal [= posterior] discoidal cell, separated by a transverse vein from the discoidal cell, and the relative size of it. Our interpretation is that the ‘crossvein’ illustrated by Wygodzinsky is in fact part of the blackish surface pattern following the forewing veins, which gives the impression of a crossvein, but observing the wing microscopically in backlighting, no trace of a crossvein is visible.

Eggs.— Studied in S. englemani only, described under the respective species.

Nymphs.— First instar shining, smooth around, sparingly set with simple short trichomes; further instars with abdominal segments II-VII each with a posterolateral spine and densely set with short and long projection trichomes; nymphs of S. englemani are described in detail below.

Etymology.— According to Amyot & Audinet-Serville (1843: 350), the name comes from Sanscrit: salya (porcupine) and vata (like).

Key to the species groups of Salyavata Amyot & Audinet-Serville

1. Head with a large spine on each antennal base ........................................ S. cornuta-group
2. Scape 1.4-1.5 times longer than width of head (measured over eyes); ocelli small, and not situated on a raised part of head ......................................... S. variegata-group

The Salyavata variegata species group

Diagnosis.— Antenniferous tubercle long or short, basally flat without protuberances, its lateral margin with a small tuft of setae; scape long and slender, its length 1.4-1.5 times width of head (measured over eyes); pedicel about two times as long as scape, setae short, dense, semi-decumbent, scattered with long, fine trichobothria; eyes not very large, their diameter in lateral view smaller than height of head; ventral distance between eyes wider than diameter of labium; head dorsally behind the eyes flat, ocelli small, set apart at least 1.5 times the diameter of an ocellus, distance to eye about same as distance to other ocellus; labium stout; mandibular and maxillary plates well developed; lateral postcephalic tubercles well developed; antero-lateral process of prosternum small; forewing smooth and without setation.

Distribution.— Widely distributed in Central and South America, with one occurrence in the Lesser Antilles: Mexico, Belize, Guatemala, Nicaragua, Honduras, Costa Rica, Panamá, Colombia, Venezuela, Ecuador, Peru, Bolivia, Brazil (Amazonas, Mato Grosso, Pará), French Guiana, Suriname, Trinidad, and Dominica.
Fig. 3. Dorsal views of heads to demonstrate the difference in the transverse dorsal furrow of: A. *Salyavata webbi* spec. nov. and: B. *S. macmahanae* D. & B.

Key to species of the *Salyavata variegata*-group

1. Base of pedicel yellow ................................................................................................................................... 2
   - Base of pedicel black ................................................................................................................................... 4
2. Bases of abdominal spines black (fig. 2D); bases of tibiae usually black, but yellow in some specimens .................................................. *S. englemansi* spec. nov.
   - Yellow of abdominal spines prolonged downward into black of the abdominal margin (fig. 2H), sometimes halfway darkened (fig. 2E, I); bases of tibiae yellow .......... 3
3. Median process of the pygophore narrowing towards the apex (fig. 9C) .................................................. *S. variegata* Amyot & Audinet-Serville, 1843
   - Median process of the pygophore with apex broadly rounded (fig. 6C) .................................................. *S. dominica* spec. nov.
4. Antenniferous tubercles short, about half the length of an eye in dorsal view; dorsal transverse furrow of head curved (fig. 3A); lateral parts of abdominal sternites densely microsetose ................................................................. *S. webbi* spec. nov.
   - Antenniferous tubercles long, more than half the width of an eye in dorsal view; dorsal transverse furrow of head almost straight (fig. 3B); lateral parts of abdominal sternites glossy, not densely setose ........................................................................................................................................ *S. macmahanae* van Doesburg & Brailovsky, 2001
Salyavata englemani spec. nov.  
(figs 1C, 2D, 4E, 5A-E, 17F, 18D, 19C-H, 20, 21, 23) 
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Salyavata variegata (non Amyot &Audinet-Serville, 1843); Champion, 1898: 190 (in part: Panama (Boucard), Bugaba (Champion)); Lubin, 1983: 745 (Panama); Maldonado, 1955 (Panama); Puchkov & Puchkov, 1987 (Panamá); Sehnal, 2000: 113; van Doesburg & Brailovsky, 2001 (in part: Panama (Colombia); Forero, 2006 (in part: Colombia). Misidentifications.


Description.— Holotype δ (AMNH), Panamá, C.Z., Coco Solo Hosp. (fig. 17F). This species is very alike *S. variegata* in habitat and colour pattern, but could easily be distinguished by the abdominal spines which are proximally black around and by the black or yellow bases of the tibiae, and by the following characteristics:

Head (fig. 5A).— Posterior part of head behind eyes dorsally and ventrally black laterally yellow (in *variegata* some yellow laterad of ocelli); upper side of neck with a yellow longitudinal spot; ocelli small (0.12 × 0.14), round to a little oval, on a little raised vertex; antenniferous tubercle long; scape 1.5 times as long as width of head over eyes; base of pedicel yellow (in *S. macmahanae* black); eye relatively small; buccula broad; maxillary plate large; mandibular plate small.
Fig. 5. *Salyvata englemani* spec. nov., ♂ holotype. A. Head from left, b = 1.0. B. Postero-ventral aspect of pygophore, b = 1.0. C. Median process of pygophore, b = 1.0. D-E. Right paramere. D. Anterior aspect, b = 0.2. E. Tip enlarged, posterior aspect, b = 0.1.
Thorax.— Prosternal antero-lateral process of pronotum short, a little pointed, black; dorsal pronotal pattern as in fig. 1C, almost the same pattern as in S. variegata; the costal loop of the light patch on the fore wings, faint or missing; the bases of the tibiae black; middle annulus of femora as long as distal annulus (in S. variegata shorter).

Abdomen.— Lateral spines yellow annulated, wholly black at base and with black points (fig. 2D), spine on segment VII in ♀ very short, at base broad, yellow, apically black; posterior margin of tergite VII clothed with short curled, brown setae; underside brown with yellowish markings, sternites anteriorly with a transverse yellow band and three yellow patches at the sides; underside densely set with extremely short light setae giving it a semi matt appearance except the posterior brown middle part of the sternites that are bare and glossy; hind margin of sternite VIII evenly rounded.

Genitalia.— Posterior margin of pygophore less deeply sinuate than in S. variegata; row of setae on each latero-posterior margin directed dorsally along the parameres; median process of the pygophore with apex strongly acuminate; flaps of parameres in situ more shallowly rounded than in S. variegata; aedeagus with dorsal phallothecal sclerite (dps) with apex narrow and rounded; lateral ventral sclerotizations of endosomal stout, about as long as wide (lvs); ventral endosomal process (vep) with medial margins parallel to each other (fig. 4E).

Female.— Similar to the male, somewhat larger. Terminalia (fig. 18D): posterior margin of tergite 7 brown, medially yellow, straight in dorsal view; tergite 8 medially blackish, laterally yellow, narrow and strongly curved downward; tergite 9 with lateral yellow swellings rather broad (compared to S. variegata) and protruding, central sulcus black, subbasally narrowed; tergite 10 reddish yellow; gonocoxa 8 oval, short rounding more anteriorly; gonapophysis 8 yellowish; gonoplac acute, protruding; ventral projection of the gonoplac (Wygodzinsky, 1943: 18, fig. 6, gonapófise mediana; see Weirauch, 2008: 254, fig. 19) very small, with long setae.

Eggs.— (fig. 21A). Eggs of S. englemani spec. nov. were collected and subsequently hatched in vitro by McMahan in Gamboa, Panamá. The eggs were laid in batches consisting of two alternate rows of suberect eggs, more or less glued together basally. The three batches examined contain 14, 9 and 11 eggs. Eggs of S. englemani resemble those of S. variegata as depicted by Wygodzinsky (1943: 20, fig. 9A): ovoid, brown to dark brown, smooth subshining chorion, apically ending into a thickened, narrowly folded-back neck, covert by a white ring; operculum white with a dark central area fits exactly in the white ring giving the size of the opening which is 0.36 mm; eggs are 1.2 mm long (from batch 1).

Having eggs of S. englemani laid in batches is remarkable, because as far as is known in Salyavatinae from the Old World, as in species of Lisarda and Petalocheirus, they lay single, loose eggs (Ambrose et al., 2007; Miller, 1953; Cobben, 1968; Haridass, 1985; Haridass et al., 1987).

Nymphs.— (figs 19C-H, 20A-B, 21B-F). First instar smooth around (figs 20A, 21B), the whole body lavishly set with glandular trichomes; further instars mat, greyish brown, densely set with very short setae intermixed with long (0.08-0.12 mm) trichomes; lateral abdominal spines short (fig. 21G), wing pads of instars 3 and 4 with apices rounded, margins closely fringed by long trichomes.

Biology.— Dr E.A. McMahan (pers. comm.) studied termite species belonging to the genus Nasutitermes in Panamá (Balboa, Smithsonian Tropical Research Institute) and...
found *Salyavata* specimens, mostly nymphs of *N. corniger* and *N. ephratae*, on the nests. (For the distribution of these termite species, see Araujo, 1977).

Measurements. — Holotype, δ, total length 13.4; scape, 2.5; pedicel, 4.5; basiflagellomere, 2.0; distiflagellomere missing [1.05]. 8 δ, gem. 13.5 mm; 4 ♀♂, 14.3 mm.

Distribution. — (fig. 23). Ecuador, Colombia, Venezuela, Panamá, and Costa Rica.


Etymology. — The species is named after our friend Dr Dodge Engleman, Miami, U.S.A., who collected many specimens during his stay in Panamá.

Notes. — Most of the specimens from Panamá and Colombia meet the description, even genitalic characters, but about 40% of these specimens have the bases of the tibiae more or less yellow, whilst no other differences can be found. This can be interpreted as intraspecific variation: the Coco Solo series shows no variation, but the Venezuelan series are variable. It is possible that different populations exist, perhaps predating on two related *Nasutitermes* species. We exclude them from the type series. It concerns the following specimens:


*Salyavata dominica* spec. nov.

(figs 1B, 2E, 4D, 6A-E, 17E, 18C, 19A-E, 23).

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Material. — Holotype, δ (USNM), *Dominica*, Springfield, 1.vi.1965, D.R. Davis / Bredin-Archbold-Smithsonian Survey / *Salyavata dominica* van Doesburg & Forero, sp. nov. 6 Paratypes: 1 δ (USNM),
Fig. 6. *Salyavata dominica* spec. nov. ♂. A. Postero-ventral aspect of pygophore, b = 0.5. B. Lateral view of median process on posterior margin of pygophore, b = 0.1. C. Median process in postero-ventral view, b = 0.1. D. External view of right paramere, b = 0.1. E. Top of right paramere, internal view, enlarged, b = 0.1.

Description.— Holotype ♂ (USNM), Dominica, Springfield. Very similar to S. variegata due to the colour pattern of the abdominal spines (fig. 2E), the yellow base of the pedicel, and the colour pattern, incl. of the pronotum (fig. 1B). Salyavata dominica also shares with S. variegata a similar structure of the parameres (fig. 6D-E) and aedeagus (fig. 4D). It differs from S. englemani by having the anterolateral prosternal process yellowish, not black. The aedeagus although very similar between S. variegata and S. dominica, bear discrete differences such as the more divergent medial ventral endosomal processes, and the narrower lateral ventral sclerotizations (fig. 4D). Females of S. dominica differ from S. variegata in the shape of the posterior margin of the seventh tergite: in S. variegata it is slightly protruding posteriorly and broadly cleft medially, whereas in S. dominica it is strongly produced posteriorly, nearly rounded, and more strongly cleft. Females of S. dominica can be distinguished from those of S. englemani by the straight seventh tergite of the latter.

Head.— Overall colour dark brown, dorsally a pale brown area next to the eyes and a small pale yellow spot next to the ocelli; laterally with a very small pale brown longitudinal stripe including neck tubercle; postcephalic tubercle protuberant; ocelli small, smaller than in S. englemani, ocellar tubercle slightly raised over vertex, not completely flat; antenniferous tubercle large; scape about 1.3 times as long as head width across the eyes; base of pedicel yellow; eyes hemispherical in dorsal view, not reaching neither the dorsal or ventral margin of the head, and about the same size as in S. englemani; buccula broad; mandibular and maxillary plates of similar height, maxillary plate protruding.

Thorax.— Prosternal antero-lateral processes of pronotum very short, blunt, apically yellowish; in dorsal pronotal pattern (fig. 1B), the light arcs around the anterior pronotal spines are large, but narrow; costal loop of the light patch on the forewing contrasting with adjacent darker areas; all dark and yellow annuli of femora of equal width, end black with a faint yellow margin; bases of tibiae with a small yellow ring.

Abdomen.— Abdominal spines (fig. 2E) black with a yellow annulus, bases black with a faint small yellowish spot located posteriorly to the insertion of each spine, adjacent to the laterotergite suture, more or less connecting with the yellow annulus; spines of segment VII with the yellow annulus continuing broadly to the base; posterior margin of tergite VII slightly protruding and rounded in dorsal view, with numerous short curled, whitish setae; underside dark brown, each sternite with a medial pair of anterior oval yellow spots, and three to four irregular smaller ones close to the lateral margin; surface of sternites shiny, covered with evenly spaced, long setae, anterior half of each sternite with very short setae; hind margin of sternite VIII medially excavated.

Genitalia.— Parameres with a strong apical notch (similar to S. variegata), median process of pygophore with lateral margins parallel, apex broadly rounded (fig. 6C) (more acute in S. variegata), in lateral view nearly straight (fig. 6B) (sinuate in S. englemani); flaps
of the parameres (fig. 6D, E) broad; in repose not parallel, somewhat inclined; aedeagus with dorsal phallothecal sclerite with lateral margins nearly parallel and broad round margin; medial ventral endosomal process with medial margins divergent and apically gently convergent; lateral ventral sclerotizations narrow and long (fig. 4D).

Female.— Very similar to the male in colour and structure, but slightly larger; spine of segment VII short, yellow with dark apex. Terminalia (fig. 18C): tergite 7 dark brown, medially yellow, dorsally densely beset with small reclined setae, posterior margin strongly produced caudally, nearly hemispherical in dorsal view, notched medially; tergite 8 yellow with paired lateral small black areas, narrow and nearly straight; tergite 9 with lateral yellow swellings broad (compared to S. variegata) and not as swollen as in S. englemani or S. variegata, central sulcus black with a faint medial pale line which is basally narrow; tergite 10 pale yellow; gonocoxa 8 oval, more angulate on its posterior margin than in S. englemani; gonapophysis 8 yellow with apex dark; gonoplac acute, protruding, ventral process very small, not noticeable.

Nymph.— Fifth instar (fig. 19A, B) brownish grey, rather smooth, wing pads clean, without fringe, femora and tibiae each with two white bands; lateral abdominal spines very short.

Measurements.— Holotype, ♂, total length 12.13; scape, 2.05; pedicel, 3.8; basiflagellomere, 1.6; distiflagellomere, 0.76.

Distribution (fig. 23).— Salyavata dominica is known exclusively from Dominica, in the Lesser Antilles. Remarkably, it is the only species of Salyavata known from the Caribbean, except Trinidad.

Etymology.— This species is named after the island where it occurs, Dominica, in the Lesser Antilles. A noun in apposition.

Salyavata macmahanae van Doesburg & Brailovsky, 2001


Diagnosis. — Species characterized by the black base of the pedicle, the black apex of the femora, the black basal portion of the tibiae, the large black abdominal spines with a yellow annulus in the middle (fig. 2F), in the female very short, strongly curved and the abdominal sternites shining, without microsetation. Male with the posterior ventral lobes of the parameres prolonged (fig. 7C), median process of the pygophore with margins gently converging to the apex which is rounded (fig. 7B), aedeagus with...
dorsal phallothecal sclerite narrow and apex rounded; ventral endosomal process with medial margins more sclerotized anteriorly, adjacent to each other, and strongly convergent apically; lateral ventral sclerotizations small, inconspicuous (fig. 4F). Female (fig. 18G) with posterior margin of tergite 7 straight in dorsal view; gonocoxa 8 rounded on its posterior margin; ventral process of the gonoplac visible and acute. For more detailed description, see van Doesburg & Brailovsky (2001: 388).
Nymphs (fig. 22).— E.A. McMahan preserved in alcohol nymphs from Costa Rica (La Selva Biological Station) in 23 vials containing 4-1/i, 5-2/i, 3-3/i, 3-4/i, 5-5/i whose preservation condition is moderate. First instar (fig. 22A) as in S. englemani, second to fifth instar (fig. 22B-F) largely smooth, rather shining, abdominal spines very long; wing pads, especially the mesonotal of instars 3 and 4, laterally extended into a sharp spine (fig. 22B, E), all abdominal spines with trichomes (fig. 22G).

Weirauch (2006a: 4) mentioned and depicted (fig. 19I) a 5th instar nymph of Salyavata sp. from Guatemala (Tikal, Dec. 29, 1973, leg. D.H., A.C., and K.M.C. Mistner, ex termite nest T 820 [AMNH]). This specimen belongs almost surely to S. macmahanae.

Biology.— In Costa Rica S. macmahanae predates especially Nasutitermes corniger (Motschulsky) in the rain forests. All five nymphal instars are found on the carton nests of the termites where they capture workers at repair sites using “angling” behaviour (McMahan, 1982, 1983a, 1983b, 2005).

Measurements.— Total length (average) 8 ♂♂, 14.6 mm, 20 ♀ ♀, 15.9 mm.

Distribution.— Panamá (new record), Costa Rica, Nicaragua, Guatemala, Belize, Mexico.

Notes.— The presence of S. macmahanae in Almirante, prov. Bocas del Toro is a new record for Panamá. Because this locality is very close to the Costa Rican border, it fits very well the known distribution of the species.

About San Carlos [1 ♀ (HNHM), Costa Rica]: this name refers probably to the river at the north border, a large area, not far from the south border of Nicaragua, at the Nicaraguan lake. Paul Schild (Pablo) collected especially near Turrialba, now and then together with Burgdorf (Carlos). This H.K.K. Burgdorf collected in Costa Rica predominantly near San Mateo, sometimes with P. Schild (Horn & Kahle, 1936: 243; 1937: 325).

Salyavata variegata Amyot & Audinet-Serville, 1843
(figs 1A, 2A, 3A, 8A, B, 9A-E, 17I, J, 18J, 23)


Fig. 8. Salyavata variegata Amyot et Audinet-Serville, 1843, A. Holotype (NHMW). B. The labels. Total length ex spines is 15.1 mm.
For the redescription and illustrations of this species we may largely refer to Wygodzinsky (1943: 7 [female], 1948: 564 [male]) and additional notes by van Doesburg & Brailovsky (2001: 386) and fig. 9. We mention here a taxonomically important character, well illustrated by Wygodzinsky (1943, fig. 1), but not mentioned by him in the description. It concerns the yellow colour of the abdominal spines (fig. 2H, I) that mesially continues far down into the black of the abdominal margin. *Salyavata variegata* shares this character only with *S. cornuta*, and is not found in the other species of the genus. So, *S. variegata* is characterized by the colour of the abdominal spines in combination with the unarmed antennal bases. Although this colour of the abdominal spines is very constant throughout the distribution of the species, in some specimens from French Guiana, Suriname (Albina), and Ecuador (1 ♀ (AMNH), Sucumbios) the yellow connection downwards tend to be almost interrupted subbasally by a black surrounding, a tendency beginning at the anterior spines and progressing backwards, resulting in a very similar pattern to that exhibited by *S. dominica*. The spines on segment VII are shorter than the foregoing and somewhat broader at base, in females even very short, broad and almost entirely yellow. Head behind the eyes and lateral of the ocelli is usually yellowish red, except in a male from Trinidad. In the male, the hind margin of sternite 8 is shallowly excavated in the middle.

Male genitalia.— Hind margin of the pygophore bisinuate, lateral parts rounded; row of setae on dorsal edge of both lateral parts of the border directed dorso-centrally over the parameres, centrally directed edges of the parameres in situ almost straight; median process of the pygophore narrowing apically with apex rounded (more acute in *S. englemani*); aedeagus (fig. 4H) with dorsal phallothecal sclerite broadly rounded apically; ventral endosomal process with medial margins strongly convergent apically; ventrolateral sclerotizations wider than in *S. dominica*.

Female.— Terminalia (fig. 18J): posterior border of tergite 7 brown, medially yellow, barely produced, broadly cleft medially, and with a fringe of small curled, posteriorly directed setae (fig. 18J); tergite 8 yellow with paired large black areas, broad and nearly straight; tergite 9 with lateral yellow swellings narrower than in *S. englemani*, protruding, central sulcus black; tergite 10 pale brown; gonocoxa 8 curved on its margin; gonoplac prominent, its ventral projection conspicuous, triangular. The egg of *S. variegata* was described and figured by Wygodzinsky (1943: 7, fig. 9).

Distribution.— The distribution of the species is mainly restricted to the Amazon basin, including the Guianas and Trinidad, but also to the Orinoco region in the savannas of
Fig. 9. *Salyavata variegata* Am. & Aud.-Serv., 1843. ♂. A. Male from Colombia, drawing from DF, b = 1.0. B. Postero-ventral view of pygophore, b = 1.0. C. Median process of pygophore, b = 0.2. D. Right paramere, anterior aspect, b = 0.2. E. Posterior aspect of tip, b = 0.1.
Colombia and Venezuela. It occurs as well in dryer habitats such as the Cerrado in Mato Grosso in Brazil.

Notes.— Amyot et Audinet-Serville (1843: 350) did not mention the gender of the specimen they described from Cayenne, and gave for its length 0.015 which may be interpreted as 15 mm.

A suitable specimen was not found in MNHN, but in the NMHW collection a specimen is present, suspected to be the type, a female, is 15.1 mm long and bears handwritten labels: “Cayenne Coll. Signoret.” and “variegata det. Signoret”. As it is known that the Hemiptera collection of Audinet-Serville was bought by Signoret, and that this collection finally came to the Vienna Museum (Horn & Kahle, 1935: 8: “Hemipt. via V. Signoret an Naturhist. Mus., Wien”), there is no doubt that this is the specimen, described by Amyot et Audinet-Serville. The mentioned two handwritten labels are probably from the hand of Anton Handlirsch who rearranged the old Serville collection into new boxes (pers. comm. by Dr D. Pluot-Sigwalt, quoting Daniele Matile). Moreover, this specimen which originally was glued on cardboard, shows remains of glue on underside of prothorax, abdomen and legs, and obviously has been reprepared in a way as to fulfill the posture to be figured as is presented in pl. 6 fig. 6 of the mentioned work of Amyot et Audinet-Serville. We therefore regarded this female specimen (fig. 8) to be the holotype of *Salyavata variegata* Amyot & Audinet-Serville, 1843.

The foregoing implies that the neotype designation by Wygodzinsky (1943: 6) becomes invalid. Because of the war he was not in the opportunity to see, or even to trace the type specimen, and supposed that it did no longer exist. Judging his excellent drawing of this neotype (female, 16 mm), which we compared with the holotype from Cayenne, it is obvious that he had the right species, although the neotype locality is Rio Javari, Benjamin Constant, Est. do Amazonas, Brazil, near the border of Peru.

The male specimen from Rio Autaz, from NHRS was inspected and its identity confirmed by means of photographs kindly submitted by Dr Bert Gustafsson, one of them presented here in fig. 17).

Wygodzinsky (1959: 310) mentioned a specimen of *Salyavata variegata* (det. Wygodzinsky) from Bolivia (Buena Vista, Ichilo, Santa Cruz, 400 m, xi.1933, Steinbach [♀, Steinbach]), which we have not examined.

*Salyavata webbi* spec. nov.

(figs 1E, 2J, 3A, 10A-F, 17K, 18H, 23)


Description.— Holotype ♀, length 13.4 mm, related to *S. macmahanae* but smaller, antennal processes shorter, underside and lateral areas silvery setose; median process of the pygidophore apically widened, arrow-shaped.

Head.— Transverse dorsal furrow from middle to sides obliquely anteriorly directed (figs 3A, 10A); eyes moderately large, width as seen from above, a little smaller than $1/2$ of synthlipsis; ocelli on slightly raised vertex, small, round, diameter about 0.11 mm; antennae long and slender, scape 0.92 mm, 1.5 times as long as head inclusive antennal
Fig. 10. *Salyavata* webbi spec. nov. A. Paratype ♀, head from left, b = 0.5. B-F. Holotype ♂. B. Posterior view of pygophore, b = 0.5. C. Median process of pygophore, b = 0.25. D. idem, lateral view, b = 0.2. E. Right paramere, anterior view, b = 0.2. F. Tip of paramere, enlarged, posterior view.
processes, brown with a white annulus from ¼ to ½ of its length, basal 2/5 of pedicel, 1/10 of basiflagellomere and extreme base of distiflagellomere, brown, other parts white, length 8.5 mm, ratio of parts: 4:6:3:0.8; posterior part of head yellow with brown around and anterior of the ocelli; ocelli barely lifted-up; gena and gula brown, neck yellow, gular tubercle round; frons and anterior parts of head yellow, maxillary plate greatly inflated, top of clypeus light brown, widened, anteriorly cut-off, laterally with rounded white margins; buccula long, light brown, anteriorly darker; labium large, setose, first (visible) segment yellow, second and third (visible) brown, base of former yellow, ratio I:II = 11:7.7; buccula well developed, dark brown, finely setose; underside blackish. Anterior part of head including the antennal processes yellow, inner sides of the processes and frons dark grey, sides of head blackish, posterior part dark brown with laterally a slanting blackish streak from eye to occiput, lower part of sides of head yellow, underside black.

Thorax.— Pronotum wider than long, about 23:20, anterior margin deeply excavated, collar as a small erect margin, at the sides continued into the swollen anterior angles; calli large, globular, grooved and yellow with brown mottled; posterior lobe yellow with dark grey-brown markings (fig. 1E), posterior of the calli, a band along the median and two longitudinal bands lateral of the central spine, dark greyish brown; spines moderately long, lateral spines white, basal half and around base, dark brown; postero-lateral spines white, only extreme base dark; central spine light brown, middle part white and basal 1/3 dark brown; scutellum triangular, blackish, sides a little inflated, dark yellow, posterior angle continued into a long, slanting, brown spine; metasternum antero-lateral process prominent, rounded, dark greyish black; underside of thorax dark grey, pleura dirty yellow, epicoxal lobes yellow; sides finely microtrichose. Legs brown, femora and tibiae each with two yellowish white annuli, end of femora black, middle and hind tibiae with a yellow spot proximo-dorsally, fore tibiae apically strikingly swollen, containing apico-ventrally oblong egg-shaped, light reddish brown fossula spongiosa each, those of the middle tibiae are insignificant; tarsi yellow, first segment very light brown, darkened apically, claws dark brown. Forewings very pale, still strongly teneral, crumpled, yellowish white with yellow veins and some greyish brown spots; hind wings normally developed although teneral as well.

Abdomen.— Oblong oval, tergites II-VII dirty yellow with brown patches marbled, semi matt by very fine transversely striate and finely setose; connexivum dirty yellow alternated with black bearing the lateral spines II-VI (fig. 2J), these basally half blackish and apically light dirty yellow with the extreme tip black, the spines on segment VII smaller, flattened and completely yellow; ventral surface rather glossy, widely setose by long, erect, fine setae and very fine short, decumbent microtrichae, brown with irregular yellowish pattern, sternite VIII light brown, posterior margin medially shallowly excavated.

Genitalia.— Pygophore (fig. 10B) light brown, posterior margin medially bulging bearing the median process (fig. 10C, D) which is widened apically, arrow-shaped; posterior margin of the pygophore, lateral to the median process, situated to harbour the parameres (fig. 10E, F); ventral surface set with fine, long, yellow curled setae of 0.3-0.4 mm; parameres light brown, with a wide triangular medial extension (fig. 10E, F) and apically hooked. Aedeagus not examined.
Female.— Paratype, ♀ (BMNH) (fig. 17K), length 15.4 mm, of ‘variegata’ appearance, the pattern of the wings a bit paler; otherwise structurally similar to the male and to S. macmahanae but with the lateral portions of the abdominal sternites densely microsetose.

Head.— Transverse dorsal furrow from middle to sides obliquely anteriorly directed (fig. 3A); silvery eyes rather small, width of an eye in dorsal aspect less than half of synthlipsis; ocelli small, somewhat oval, 0.12 × 0.14 mm, far apart (at least two times the width of an ocellus) on moderately raised vertex; frons yellow, antenniferous tubercles shorter (0.3) than in S. macmahanae (0.5), yellow at the sides, dark brown medially; length of scape 1.31 times the width of head measured over eyes; length of pedicel 1.8 times that of scape, other segments missing; maxillary lobes large, bulging; underside of head including bucculae blackish, sides behind eyes including postcephalic tubercle yellow, upper posterior part blackish brown, some yellow around ocelli and a yellow median stripe towards neck, anterior part yellow; labium stout, relative lengths of the segments about 11:8.5, first (visible) segment yellow, second (visible) apical ¾ dark, last one brown; bucculae rather broad, dark, set with small silvery setation; lateral postcephalic tubercle large and mostly yellow.

Thorax.— Anterior pronotal angles well-developed, inflated, centrally pitted; calli of anterior lobe large; spines all stout, but shorter than in S. macmahanae; yellow patches of posterior lobe (fig. 1E) large, leaving narrow black stripe in between, meso-lateral patches connected with the lateral; antero-lateral processes of prosternum large, apically bluntly rounded; legs with black annuli of fore and middle tibia small, the former even largely interrupted ventrally; fore wings not surpassing abdomen, white middle patches heavy but lack the anterior (costal) streak.

Abdomen.— Spines (fig. 2J) well-developed, proximally black all around, distally yellow, blackish tipped, last pair only a little shorter, proximally dorso-ventrally flattened; ventral surface, except brown medial posterior parts of sternites and lateral yellow patches, densely set with very short yellow setation and remotely with long fine white setae.

Female terminalia (fig. 18H): tergite 9 with a shallow median suture laterally bound by moderately convergent, yellow callosities with parallel borders; tergite 10 visible as a wall posteriad to the gonoplac; underneath (topographically anteriorly) the gonapophysis 8; the whole laterally enclosed by the gonocoxa 8 whose margin is rounded; between these and the gonapophysis 8 at both sides there is a small, mostly white, triangular sclerite which is the ventral projection of the gonoplac.

Measurements.— Holotype male, tl, 13.3; l/w, ± 9; w/abd, 4.2; w/pron, 3.7; l/pron, 2.9-3.3; w/head, 1.6, l/ant I, 2.4, II, ± 3.6, III, 1.85, IV, 0.5. Paratype female, tl, 15.4, l/w, 11.1, w/abd, 4.6, w/pron, 4.0, l/pron, 3.3, w/head, 1.9, l/ant I, 2.5, II, 4.3.

Distribution.— “Amazonas”, Brazil (Pará).

Etymology.— The species is named in honor of Mr M.D. (“Mick”) Webb, Collection Manager Entomology of the Natural History Museum, London, who provided the first author countless times with specimens on loan and otherwise turned out to be very helpful and patient too!

Notes.— The holotype is still a bit teneral and although most of the body and appendages are rather fully coloured, especially the fore wings are still pale, the cuticle is soft and a little curled. The apically whitish spines may be not yet fully stretched and coloured. The British Museum obtained the female specimen from W.W. Saunders who
sold the Hemiptera in 1865. The label gives only “Amaz”, presumably in Saunders’ own handwriting. Although it is clear that Amazon or Amazonia is meant, it is a very vague indication.

The *Salyavata nigrofasciata* species group

**Diagnosis.** — Antenniferous tubercle very short, basally flat without protuberances, on its lateral margin a small tuft of setae; scape stout, shorter than width of head across eyes; pedicel four to five times as long as scape, with numerous fine, erect, long setae, in the male longer and denser than in the female; eyes large, reaching dorsal and ventral margin of head in lateral view; ventral distance between eyes not more than width of labium; ocelli very large, dome-shaped, close to each other, situated on a common elevation behind the eyes; labium narrower than in the *variegata*-group, length of first (visible) labial segment at least three times its width in the middle; labrum, mandibular and maxillary plates smaller than in the *variegata*-group; lateral postcephalic tubercles vestigial; antero-lateral process of prosternum moderately developed; subbasal black annulus of forelegs ventrally interrupted; abdominal spines black around at base, black parts of lateral abdominal margins behind the spines interrupted by a small yellowish white, more or less transverse spot; abdominal spines on segment VII very short, especially in the female; setation somewhat denser, including the forewing (except the membrane) than in the other species groups.

**Distribution.** — Brazil, Venezuela, French Guiana.

**Note.** — Wygodzinsky (1943: 3) while comparing *S. variegata* and *S. cornuta* against *S. nigrofasciata*, suspected already at least two different groups within *Salyavata*.

**Key to the species of the *Salyavata nigrofasciata*-group**

1. Posterior lobe of pronotum with two transverse series of yellow patches, anterior part mostly black (fig. 1H, I) .................................................................................................................. 2
   - Posterior lobe of pronotum without this pattern, anterior part mostly yellow, posterior row of yellow patches laterally united to one transverse yellow band (fig. 1J-L) ........................................................................................................................................ 3
2. Base of pedicel black ................................................................. *S. alvarengai* spec. nov.
   - Base of pedicel yellow ............................................................. *S. brasiliensis* spec. nov.
3. Posterior lobe of pronotum with a black transverse, subbasal streak (fig. 1J), femora mostly yellow, without a subbasal black annulus, abdominal segment II with a posterolateral spine ................................................................. *S. nigrofasciata* Costa Lima, 1935
   - Pronotum without such streak (fig. 1K, L), femora at least with a black subbasal annulus, abdominal segment II with a tubercle anterior to posterolateral spine...............
     ........................................................................................................... *S. wygodzinskyi* Maldonado, 1955

*Salyavata alvarengai* spec. nov.
(figs 1H, 2A, 4A, 11A-E, 17A, 18E, 24)
urn:lsid:zoobank.org:act:7F1F4AA0-8BCA-497D-89CD-7E2FF4B7C0D8

**Material.** — Holotype, ♂ (AMNH), [Brazil], Mato Grosso, Sinop, 11°51'S-55°27'W, x.1974, M. Alvarenga; paratype, ♀ (AMNH), same locality and date.
Description.— Holotype ♂ (AMNH), length 15.2 mm (fig. 17A). Resembling the colour pattern of S. variegata, but a little darker.

Head (fig. 11A).— Eyes very large, spherical, silvery, vertex between eyes black, behind eyes red with black medial line; frons blackish brown, clypeus yellow, apically bifurcate, labrum light brown; antenniferous tubercles very short, black, anteriorly pointing; scape stout, shorter than width of head across eyes (2:3), black, basal 2/5 red; pedicel much longer and thinner, well over five times as long as first, black with a white subapical annulus, set with numerous suberect, long, fine setae of 0.2-0.25 mm, other segments missing; ocelli large, diameter 0.24 mm, white rimmed, situated on a large orange, dorsally black tubercle; labium dark reddish brown, first (visible) segment dorsally blackish, second (visible) black, third (visible) reddish; lateral postcephalic tubercle hardly developed.

Fig. 11. Salyvata alvarengai spec. nov. holotype ♂. A. Head from left, b = 1.0. B. Postero-ventral aspect of terminalia, b = 1.0. C. Median process of pygophore, b = 1.0. D. Right paramere, anterior aspect, b = 0.2. E. Top of right paramere, posterior aspect.
Thorax. — Pronotum shorter than broad (3:4), anterior collar only dorsally developed, ending laterally in inflated anterior angles, each bearing an antero-lateral papilla; colour of pronotum blackish brown with pale brown markings (fig. 1H); spines well developed, blackish, central spine erect with a vague light brown annulus, lateral spines blackish with orange apex, postero-lateral spines black, somewhat posteriorly curved; prosternum medially yellowish brown, sides black, antero-lateral tubercle of prosternum very small in female, vestigial in male; propleura black but anterior corner and posterior border yellow, anterior corner with a yellow-orange tubercle, epicoxal lobes yellow; scutellum pale brown with three connected blackish spots arranged in v-form of which the posterior one bears a large erect black spine with a white annulus midway; spine of postscutellum black on a yellow base, posteriorly inclined; meso and metasternum brownish, pleura black, laterally with a white patch, yellow epicoxal lobes and yellowish posterior corner; mesopleura laterally somewhat inflated, smooth; metasternum medially weakly carinate; pleura densely setose. Forewings dirty yellow marbled with brown and blackish brown, exocorium with light yellow markings, medially a double dot and near costal margin a round dot whitish (fig. 17A); base, costa and tips of exocorium very scanty set with small, decumbent setae. Legs with coxa blackish brown, trochanter orange, femur orange with three black annuli, the third distal, so apices black; tibia with three black annuli, bases and apices black with an orange sub-basal dorsal dot; tarsi yellow, claws brown.

Abdomen. — Upper side reddish-orange, underside lengthwise carinate medially, yellow with brown irregular markings; lateral margins yellowish with black sections underneath spines; behind these, black more or less interrupted by a yellow marking; spines (fig. 2A) rather long, posteriorly bent, black with 1/4-1/3 apical part yellowish-orange, tips darkened, spines of segment VII short with a broad base, orange with small black lateral basal part; underside clear yellow with irregular blackish to brown markings, glossy, sides faintly transversely ridgy, remotely set with long, white declining setae; sternites III-VI longitudinally faintly keeled.

Genitalia. — Pygophore (visible ventral part (fig. 11B)) light brown, sides yellowish brown, posterior corners dark brown, posterior margin centrally deeply emarginate, median process lanceolate (fig. 11C); parameres (fig. 11D, E) apically widened and set with many setae, apex curved into a small hook; aedeagus (fig. 4A) basal plate extension strongly expanded laterally towards the dorsally strongly sclerotized phallotheca; anterior margin of dorsal phallothecal sclerite rounded; posterior margin (apex) of dorsal phallothecal sclerite expanded posteriorly, nearly truncate at apex; ventral endosomal processes small, nearly rounded basally, apex divergent; ventrolateral sclerotizations inconspicuous.

Female. — Very similar to the male; remarkable is the difference in the rather dense setation of the pedicel which length is about 0.12 mm, intermingled with longer trichobothria of 0.19 mm; in the male these setae are respectively 0.19 and 0.24 long; sternites, except basal half of third, not keeled, yellow, posterior margins bordered with brown; spines on abdominal segment VII extremely short. Terminalia (fig. 18E): last abdominal tergites clothed with fine silvery setae; posterior margin of tergite 7 brown above, white underneath; tergite 8 yellow laterally, centrally small reddish, blackish between; central furrow of tergite 9 black, posteriorly yellowish tumid, lateral swellings yellow; tergite 10 dirty yellow; gonocoxa 8 brown, oval, curving posteriorly, free margins lighter.
Measurements.— Holotype: total length 15.2; width of head over eyes, 2.1; width between eyes (at vertex) 0.65; 1 of head 1.6; width of pronotum 3.8; length of pronotum 2.7; Antennae: scape, 1.2; pedicel, 7.0; labium: II, 0.7; III, 0.55; IV, 0.55.

Paratype ♂, total length 15.6; scape, 1.5; pedicel, 6.0 (four times the first); basiflagellomere, 1.75; distiflagellomere, 0.9; width over eyes, 1.9; width between eyes, 0.6; width of pronotum, 3.8; length of pronotum, 2.8; labium II, 0.8; III, 0.6; IV, 0.6.

Distribution.— Only known from Sinop, Mato Grosso, Brazil.

Etymology.— Named after its collector, Mr M. Alvarenga.

Notes.— This species is in first appearance alike a somewhat darker S. variegata but differs in the following characters. Scape much shorter than width of head across eyes, ocelli large, situated on a common elevation, bases of abdominal spines all round black; sternites pale yellow. Salyavata alvarengai differs from S. brasiliensis in that the latter has the base of pedicel yellow, scutellar spine short, apices of femora red, abdominal spines for greater part yellow/orange, and the abdominal sternites brown, in addition to the different structure of the male genitalia.

Description.— Holotype ♂ (RMNH), length 15.3 mm. Close to S. alvarengai but differing in the following characteristics: base of pedicel yellow, scutellar and abdominal spines short, abdominal sternites brown, and having the median process of the pygo- phore much longer (fig. 17C).

Head.— Frons and central part of clypeus reddish brown, base and apex of clypeus, apices of maxillary plates and labrum blackish; antenniferous tubercles dorsally red, antero-lateral setae on a small protuberance; pedicel proximally yellow; apex of clypeus strongly broadened and medially deeply excavated, both parts surrounding base of labrum, anteriorly black.

Thorax.— Inflated anterior angles of pronotum smooth, without a superimposed small papilla; spines smaller, orange-yellow markings dominates (fig. 1I), somewhat smaller than in S. alvarengai; prosternal antero-lateral process small; apices of femora red; meso- and metapleura laterally black, mesopleura laterally not inflated, rugose, lateral margin of metapleura posteriorly continued.

Abdomen.— Sternites, including pygophore brown to dark brown, sides of sternites on large patches set with very short, fine setae, near lateral margin with a round yellow patch around each spiracle and a connected yellow patch on each laterotergite; fourth (third visible) sternite with two yellowish shady markings; abdominal spines (fig. 2C) small, apical half orange-yellow with dark bases.

Genitalia.— Posterior margin of pygophore (fig. 12A) deeply excavated, openings barred with fringes of setae; median process (fig. 12B) very long and more curved antero-dorsally; paramere (fig. 12C-E) with a gently S-curved shaft, apically with a large hook; aedeagus (fig. 4C): basal plate extension expandend laterally toward the phallobase (less so than in S. alvarengai); phallotheca strongly sclerotized dorsally; narrow less than 1/3 of length of phallosoma, anterior angles of dorsal phallothecal sclerite protruding laterally, apex of sclerite rounded and narrow; ventral endosomal processes small, apex divergent (longer than in S. alvarengai); ventrolateral sclerotizations inconspicuous.

Female.— Terminalia (fig. 18F): posterior margin of tergite 7 brown, centrally yellow; tergite 8 blackish centrally, sides yellow; tergite 9 with lateral yellow swellings, central part blackish, posteriorly with a yellow, Λ-formed tumescence; gonocoxa 8 brown, curving anteriorly; gonapophysis 8 brown, medially and apically white rimmed; latero-ventral projection of gonoplac white, rounded.

Distribution. — Brazil: Maranhão, Minas Gerais, Mato Grosso, Distrito Federal (fig. 24).

Etymology. — Named after the country of origin.

*Salyavata nigrofasciata* Costa Lima, 1935
(figs 1J, 2G, 4G, 13, 14A-E, 17H, 18I, 24)

*Salyavata nigrofasciata* Costa Lima, 1935: 25, fig. 2; 1940: 211, 215, fig. 391; Wygodzinsky, 1943: 8-10, figs 14-19; 1944: 350, fig. 4B; 1948: 564; 1949: 64; Maldonado, 1955: 109, comparison with *S. wygodzinskyi*; 1990: 488 (catalogue); Brailovsky & Paláez, 1978: 173; Puchkov & Puchkov, 1987: 175 (catalogue); Wygodzinsky & Lodhi, 1989: 382 (trichobothria); Weirauch, 2007: 159, 162, 165, fig. 3G.

Material. — Holotype, ♂ (IOC # 1873), [Brazil], *Minas Gerais*, Urucuia, C. Chagas (fig. 13); 1 ♂ (IOC), Brazil, Baía, Vila Nova, 1908, E. Garbe, ex coll. Museu Paulista, # 18.476, det. H. Lent, described in Wygodzinsky, 1943: 8 (not seen); 2 ♂ (AMNH), 1 ♂ (RMNH), Brazil, Minas Gerais, Pedra Azul, xi.1970, F.M. Oliveira; 1 ♂ (AMNH), Brazil, Minas Gerais, Pedra Azul, 900 m, xi.1972, M. Alvarenga; Bahia: 22 ♂, 4 ♀ (AMNH), 4 ♂, 1 ♀ (RMNH), Brazil, Bahia, Encruzilhada, 960 m, xi.1972, M. Alvarenga; 8 ♂ (AMNH), id., id., 980 m, xi.1974; 1 ♂ (IOC, not seen), Baía [Bahia], Vila Nova, 1908, E. Garbe (Wygodzinsky, 1943: 10); 1 ♀ (AMNH), Brazil, Bahia, Nova Conquista, 800 m, xii.1969, F.M. Oliveira; 1 ♂ (AMNH), Brazil, Bahia, Divisa km 965 road Est.Rio to Bahia, xi 1971, C.A.C. Seabra; 1 ♂ (MBC), Rio San Francisco, Sobradinho, Bahia, Brasil, 3[19]86, L.S.W. Terra / *Salyavata nigrofasciata* Costa Lima, Maldonado C. det. [19]90; 1 ♂ (NHMW), Bahia, Brasilia, Fruhstorfer; 1 ♂ (AMNH), Brazil, Paraíba, Sole- dade, Coleção Campos Seabra Juazeirinho, 22.iii.1956, A.G.A. Silva.

For a more extensive description and a fine drawing (of the male) we could refer to Wygodzinsky (1943: 8). The following can be added: eyes of female smaller than in the male (fig. 14A, B) but smaller than in *S. alvarengai*; the pedicel is black with a narrow yellow annulus at base and near the apex; anterior apex of clypeus strongly broadened and medially lightly excavated; the pronotum (fig. 1J) is somewhat different from the other species: the central spine is much closer to the posterior border than in the other species and the lateral spines are shorter and broad at base. Abdominal spines as in fig. 2G. Male genitalia as in fig. 14.C-E; aedaegus as in fig. 4.Gd, Gv and in Wygodzinsky (1943, figs 19A-C).

A striking character of this species, not mentioned by Wygodzinsky, is the extremely rich setation of body and legs with fine, long, white, erect setae, especially on the posterior part of the head and anterior part of the pronotum and even

Fig. 13. *Salyavata nigrofasciata* Costa Lima, 1935, ♂, holotype in the collection of IOC. tl = 15.5 mm. Photo: D. Forero.
Fig. 14. Salyvata nigrofasciata Costa Lima, 1935, from Bahia, Brazil. A. Head of female from left, b = 0.5. B-E. Male. B. Head from left, b = 0.5. C. Postero-ventral view of median process of pygophore, b = 0.5. D. Right paramere, anterior aspect, b = 0.2. E. Idem, top, in posterior aspect, b = 0.1.
sparsely on the fore wings. The latter in addition, set with numerous very short decumbent yellow setae strewn over the margins, veins and some surfaces, especially on the base and the top section of the exocorium; the membranes are bare; the fine setation is also present on the abdominal connexiva; the sternites are brown and glossy and bear only the long fine setae. Apices of femora black.

Female.— Five specimens were available from Bahia with total lengths (in mm) of: 16.1, 14.4, 15.8, 15.9, 15.9, mean 15.6. Overall appearance is the same as in the male with minor differences; the pedicel is shorter, the ratio to the scape is about 4, whereas in the male it is 4.5 to 5; the setation is much shorter and more decumbent. Eyes are somewhat smaller: ratio of width of head over eyes to synthlipsis is 2.36; in the male 2.8 measured from five specimens each; prosternum antero-laterally rounded, without an antero-lateral process; posterior margin of abdominal tergite VII straight between the very short, triangular spines. Terminalia (fig. 18I): tergites 8 and 9 densely covered with a long curled silvery setation.

Distribution (fig. 24).— Brazil: Bahia, Minas Gerais, Paraiba.

Notes.— Costa Lima (1935) did not mention the gender of the holotype but in his figure 2, the form of the last visible (seventh) abdominal tergite clearly shows that it is a male. Dr. H. Lent of the Instituto Oswaldo Cruz stated (in: Wygodzinsky 1943: 10) that the type is a male, but slightly mutilated, an observation which was confirmed by the junior author when examining the Costa Lima collection. Costa Lima mentioned the type locality being Urucuia (Minas Gerais), but there are two places in Minas Gerais with that name. A photograph of this specimen is shown in fig. 13.

This species and the following are very distinct in colour pattern from all other Salyavata species with more or less common “variegata” pattern (fig. 17H, L). Yet, based on their morphology they clearly form a monophyletic group with S. alvarengai and S. brasiliensis.

Salyavata wygodzynski Maldonado, 1955
(figs 1L, 2K, 4I, 15A-C, 17L, 24)


The male specimens from French Guiana and Urucu (Brazil) fit reasonably well Maldonado's (1955) original description; head, pronotum and scutellum densely set with short, curled, white setae; frons black, base of clypeus yellow to brown, apex of clypeus black, broadened and medially excavated, labrum partly black; in the Urucu specimen the dark body parts are black; labium black; antero-lateral prominences of prosternum present as small papillae; pronotal spines (figs 1L, 17L) extremely long and sharp; legs shiny black with redish to yellow annuli; annuli of femora 1 and 2 smaller than shown in Maldonado’s figure a, apices of femora yellow; abdominal spines (fig. 2K) long, anterior to the first spine (on tergite 2), there is an extra small
spine; pygophore blackish brown with yellow side markings and three ill-defined lighter patches near the posterior margin which is roundly produced at both sides of the median process (fig. 15C); this process is brown, dorso-ventrally somewhat flattened and lanceolate in contrary with Maldonado’s statement; parameres (fig. 15C, D) distinctly S-shaped, black, apically a little flattened and club shaped; aedeagus as in fig. 4I.

Notes.— According to Maldonado, this species is close to S. nigrofasciata Costa Lima but recognizable by the absence of the pronotal black fascia (fig. 1L), the well developed anterolateral processes of the prosternum, and the length of the scape which is given as less than one-fifth of the pedicel. But there are additional differences such as the pronotum and its spines: in S. nigrofasciata they are different from the other Salyavata species in that the central and the lateral spines are much more posteriorly situated, the posterior and abdominal spines are very short, and the ocellar protuberance lower. Nevertheless, S. wygodzinskyi fits well in the nigrofasciata species group by the very short scape, the typical setation of the second segment and the large ocelli on a considerable protuberance. The anterior angle of the second abdominal connexivum has a short spine whereas in all other species there is only a small hump. The female is unknown.

Measurements.— ♂ from French Guiana (fig. 17L): Total length, 14.9, l/wing, 11, w/abd, 4.4, w/pron, 4.1, l/pron, 3.2, l/head, 1.5, w/head, 1.9, scape, 1.0, pedicel, 6.2; ♂ from Urucu: tl, 15.5;

Distribution (fig. 24).— Known from the type locality in Venezuela, and additionally from Brazil (Amazonas) and French Guiana.
The *Salyavata cornuta* species group
(figs 16, 17B, D)

Diagnosis.— Specimens somewhat larger than in the other two species groups, the colour pattern resembles that of the *variegata* species group. Head with a strong spine laterally at each antennal base; scape about as long as the width of the head measured over the eyes; pedicel length relative to scape between 2.5 to 4.5 times as long; pedicel with dense, decumbent setae, shorter than diameter of segment; eyes larger than in the *variegata* group, nearly reaching the ventral margin of the head but not reaching or surpassing the dorsal margin; ocelli large, on a somewhat raised vertex behind the eyes, each ocellus closer to the eye than to other ocellus; labium stout; mandibular plate smaller than maxillary plate, the latter slightly enlarged; lateral postcephalic tubercles well developed; antero-lateral process of prosternum well developed; forewing without setae; central pronotal spine with a yellow base, continued posteriorly into a yellow longitudinal streak on the pronotal hind lobe; yellow annuli of abdominal spines medially continued into the black bases; the postscutellar spine and the abdominal spine on segment II are very short, abdominal spines on segment VII are larger than the foregoing.

Distribution.— French Guiana; Venezuela; Brazil (Amazonas, Mato Grosso, Pará); Trinidad.

Key to the species of the *Salyavata cornuta* species-group

1. Area lateral to ocelli dark; buccula dark; pronotal spots 2 and 3 of posterior row not or almost not united with central spot of anterior row (fig. 2F); ninth tergite of female very broad basally, ventral extension of gonoplac white, rounded ................................................................. *S. cornuta* Wygodzinsky, 1943

Area lateral to ocelli and buccula red; pronotal spots 2 and 3 of posterior row united with central spot of anterior row (fig. 2G); ninth tergite of female basally narrower, ventral extension of gonoplac triangular .................................................. *S. berengeri* spec. nov.

*Salyavata cornuta* Wygodzinsky, 1943
(figs 1F, 2L, 17D, 18A, 25)


Material.— Holotype, ♀ (MNRJ), [Brazil], Taperinha, Est. do Pará, 0°51'S-47°49'W, G. Hagemann col. n.04/916 [iv.1916] (not seen); 1 ♀ (AMNH), Sinop, Mato Grosso, Brazil, Lat.12°31' & Long.55°37', x.1974, M. Alvarenga; 1 ♀ (USNM), Amazonas, Rio Taruma Mirin, 2 km from Rio Negro, 3°2'S-60°17'W, 27. vii.1979, Igapo, black water inundation, forest canopy, fogged with pyrethrin, Canopy Fogging Project, FRS #01, Tray #050, A., E. Montgomery et al. [Guyana]: 1 ♀ (USNM), Kartabo, Bartica Distr., 4.iv.1926. [Venezuela], 1 ♀ (USNM), (fig. 17D), T.F.Amaz. Cerro de la Neblina, 0°50'N-66°17'W, 155 m, canopy, 1-10.iii.1984, D. Davis & T. McCabe.

We refer to the description and figures by Wygodzinsky (1943, 1944), but the following can be added: scape as long as width of head measured across eyes, black with a
more or less distinct red spot anteriorly near base, pedicel dark brown; gena lateral of the ocelli with a blackish streak reaching eye, buccula blackish; central pronotal light spot behind the central spine not united with the two spots behind (fig. 1F); black middle annuli of the tibiae wide; abdominal spines (fig. 2L) as in *S. variegata*; knotty apex of central keel of second abdominal sternite raised. Female terminalia: (fig. 18A) tergite 9 of female basally, lateral yellow swellings broad, strongly diverging.

Measurements of total length of the specimens: ♀ (MNRJ) holotype from Brazil, 18.5 mm (Wygodzinsky, 1943: 7); 1 ♀ (AMNH) from Brazil, Sinop, Mato Grosso, 20.3 mm; 1 ♀ (USNM) from Brazil, Rio Taruma, 17.3 mm. Rondônia, [Reserva Biologica Jaru?]; 1 ♀ (USNM) from Kartabo, Bartica Distr., 18.4 mm; 1 ♀ (USNM) from Venezuela, Cerro de la Neblina, 20.3 mm.

Distribution.— Brazil, Guyana and Venezuela.

Notes.— Wygodzinsky (1943) gave an excellent description and figures (figs 10-13) of the female holotype: length 18.5 mm, posterior spots 2 and 3 on pronotum not united with anterior central spot; black middle annuli of tibiae long, and a figure of the dissected united eighth and ninth tergites (fig. 13A). No males are known for this species so far.

Fig. 16. *Salyavata berengeri* spec. nov. ♂ paratype from Kourou, French Guiana. A. Head, left lateral aspect, b = 0.5. B Postero-ventral view of pygophore, b = 1.0. C. Median process of pygophore, b = 0.2. D-E. Right paramere. D. Anterior aspect, b = 0.2. E. Tip enlarged, posterior aspect.
Salyavata berengeri spec. nov.


Description.— Holotype ♂, (MNHN) length 16 mm, regions lateral of ocelli and buccula reddish; scape slightly longer than width of head measured across the eyes (ratio 8:7), black; pedicel dark brown to black; the ratio of the antennal segments for a male from Kwata (French Guiana) is (in mm): 2.3:6:2:1, for a female from Mt de Kaw (French Guiana): 2.34:5.7:1.85:0.92; pronotal spots 2 and 3 united with the central spot of the anterior row (fig. 1G); middle black annuli of tibiae shorter; knotty apex of central keel of second abdominal sternite low, small; seventh sternite, especially ventrally, much shorter than in the female, postero-ventrally widely open to receive the ring-like eighth segment and the large spherical pygophore (fig. 16B).

Genitalia.— Pygophore shining brown and yellow, posterior marging slightly bisinuate, median process (fig. 16C) slender with rounded tip; row of long stiff setae on each lateral part of posterior margin directed dorsally as if veiling the parameres in rest position; paramere (fig. 16D) lightly curved, apically hooked, with a subapical triangular blunt protuberance, set with many setae, tip of the hook rounded (fig. 16E); aedagus as in fig. 4B.

Female.— Basal part of ninth abdominal tergite of female terminalia (fig. 16B) not broadened, yellow lateral swellings narrower, almost parallel to each other, not as swollen as in S. cornuta.

Measurements.— 1 ♂, tl. 15.7 mm, ant. I, 2.27 mm, II, 5.76 mm, III, 1.85 mm, IV missing. Ratio of ant. segments I-III roughly: 10:25:8; IV missing; 6 ♂♂ (JMBC): 15.9, 15.9, 15.8, 15.4, no head, 14.8; mean, incl. ht (16 mm), = 15.66 mm; 1 ♀ (JMBC): 14.7; 1 ♂ from French Guiana (MNHN), 16.2 mm; 4 ♀♀ from French Guiana (MNHN), 17.3, 17.6, 17.6, 18 mm; mean 17.6 mm; ♀ Kartabo, Bartica Distr. (AMNH), 19.0 mm-AA; 1 ♀ from Venezuela (USNM), Mt. Marahuca, 17.6 mm. Lengths of the Trinidad specimens: 1 ♀ Trinidad, (AMNH), Maracas Valley, 17 mm; 1 ♀ Trinidad, Meyers (BMNH), 17.8 mm; 1 ♂ (USNM) Trinidad, W. I. Pruhler coll., 16.5 mm.

Distribution (fig. 25).— French Guiana, Guyana, Venezuela and Trinidad.

Etymology.— Named after its collector, Dr Jean-Michel Bérenger.
Fig. 18. Female terminalia. A. *Salyavata cornuta* group B. *Salyavata berengeri* spec. nov. paratype from Kourou, French Guiana. C. *Salyavata dominica* spec. nov., paratype, Dominica, Cabrits National Park. D. *Salyavata englemani* spec. nov., E. *Salyavata alvarengai* spec. nov. paratype Brazil, Mato Grosso, Sinop.
Notes.— We had the opportunity to study several males from French Guiana. The differences in length of these specimens are remarkable just as several other aspects seem somewhat variable. Nonetheless, we consider all the material before us to belong only to two species: *S. berengeri* and *S. cornuta*. The females of *S. cornuta* can be separated into three groups by the characteristics of the terminalia. Two specimens from Brazil and two from Venezuela share a broadened base of the eighth tergite, included the broadened bases of the lateral swellings, while the middle annuli of the tibiae are long. One female from Kartabo, Bartica District (Guyana) has the same kind of ninth tergite, but the middle black annuli of the tibiae are very short. The other female from Kartabo, Bartica District has these annuli of normal length, but the eighth tergite is not
broadened basally, and the swellings are more or less linear, a feature that it shares with the two females from the Trinidad Island. Additional males of *S. cornuta* might help to sort out the differences found in the females.

**Biology**

It has been shown that species of *Salyavata* are predators of termites, especially of species of *Nasutitermes* (Isoptera: Termitidae), in such an extent that one may speak of an obligatory relationship. Lubin (1983: 745) mentions among “Major predators of *Nasutitermes* […] several reduviid bugs (Hemiptera) that specialize on *Nasutitermes*, (e.g., *Salyavata variegata* in Panama).”

Pioneering were the studies of Dr E.A. McMahan (1982, 1983a, 1983b, 2005) in which she investigated the biology and behaviour of *Salyavata* in Costa Rica and Panama. She discovered and observed a most striking way in which the nymphs of the bugs (*S. macmahanae*) with sucked-out carcasses angled new victims mostly workers, one by one through a breach of the skin of the termite nest of *Nasutitermes corniger* (Motschulsky) in Costa Rica. On nests of *Nasutitermes ephratae* (Holmgren) the nymphs were seldom found (determination of the termites by Dr Kumar Krishna). In Panamá (*S. englemani*) the nymphs did not show the angling behaviour (McMahan, 2005: 206).
Fig. 21. *Salyavata englemani* spec. nov. from Gamboa, Panama. A. Two clusters of egg shells, b = 1 mm. B.-E. Nymphal instars. B. 1st instar, newly hatched, tl.: 2 mm. C. 2nd instar, tl.: 3.3 mm. D. 3rd instar, tl.: 4.7 mm. E. 4th instar, tl.: 6.25 mm. F. 5th instar, tl.: 9.2 mm. Figures not at the same scale. G. Abdominal spine of a 3rd instar nymph showing long projection trichomes and one short projection trichome, b = 0.1 mm. H. A long projection trichome enlarged, b = 0.01 mm.
Fig. 22. Salyavata macmahanae van Doesburg & Brailovsky, nymphaal instars from La Selva, Costa Rica. 

A. 1st instar, tl.: 2.5 mm.  
B. 2nd instar, tl.: 3.65 mm.  
C. 3rd instar, tl.: 5.8 mm.  
D. 4th instar, tl.: 6.8 mm.  
E. 4th instar, tl.: 7.0 mm.  
F. 5th instar, tl.: 8.9 mm. Figures not at the same scale.  
G. Abdominal spine of a 2nd instar nymph, b = 0.1 mm.  
H. One long projection trichome enlarged, b = 0.01 mm.
The dull dark gray nymphs live on the termite nest and are extremely well camouflaged in depressions and crevices at the region of the nest attachment (McMahan, 1982), covering themselves with debris (Weirauch, 2006a). In the 1st instar, the body and appendages are already set with numerous glandular trichome projections (Weirauch, 2006a: 3) (fig. 20B), to pick-up fine debris particles (fig. 20A).

The lateral abdominal “spines” of the nymphs are nipple-shaped projections of the integument set with several trichomes from which many are composed of a long projection trichome and an associate seta in a special close arrangement (figs 21G, 22G), just as on the whole dorsum of the abdomen. The associate seta may have a mechanosensory function to trigger a sticky substance from the trichome.

Adult specimens are seldom collected from termite nests. Most of the specimens in the museum collections were caught in light traps, Malaise traps, or by fogging canopies. During his stay in Suriname (1959-1963) the senior author collected S. variegata on light and found only one male against about one hundred females. Nymphs and adult of S. englemani spec. nov. were found on nests of Nasutitermes guayanae (Holmgren, 1910), by R. Cambra et al. in Darien (Panama) and named by R. Constantino.

**Distribution maps**

Fig. 23. Distribution of *Salyvata englemani*, *S. dominica*, *S. macmahanae*, *S. variegata* and *S. webbi*.

Fig. 24. Distribution of Salavata alvarengai, S. brasiliensis, S. nigrofasciata and S. wygodzinskyi.
Fig. 25. Distribution of Salyvata berengeri and S. cornuta.

S. berengeri
S. cornuta
Abbreviations of the depositories

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<th>Description</th>
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