

Original paper

First record of *Neurosystasis* Satchell in Mexico, with the description of one new species (Diptera, Psychodidae), and the validation of *Chuspilepia* Omad, Mangudo & Gleiser as subgenus

Primer registro de *Neurosystasis* Satchell en México, con la descripción de una nueva especie (Diptera: Psychodidae) y la validación de *Chuspilepia* Omad, Mangudo & Gleiser como subgénero

¹JUANA DURÁN-LUZ, ¹*SERGIO IBÁÑEZ-BERNAL, ²GUILLERMO HUGO OMAD

¹Red Ambiente y Sustentabilidad, Instituto de Ecología A.C., Carretera Antigua a Coatepec No. 351, Colonia El Haya, C.P. 91073, Xalapa, Veracruz, México.


²Universidad Nacional de la Patagonia San Juan Bosco, Sede Esquel. Km 16.4, Esquel, Argentina.



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*Corresponding author:

 Sergio Ibáñez-Bernal
sergio.ibanez@inecol.mx

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ABSTRACT. *Neurosystasis* Satchell is newly recorded in Mexico by means of the description of a new species. Specimens captured in a tropical deciduous forest in southern Puebla, central Mexico, were examined and determined as a species new to science. The male and female are described based on morphological characteristics. *Neurosystasis longistylis* sp. nov. is similar in appearance to *Neurosystasis saltenia* (Omad, Mangudo & Gleiser, 2015), but is readily distinguished based on characters of the head, wing, and male genitalia. In both species, R₂₊₃ is attached to vein R₄, the wing membrane is infuscate with dark spots on vein apices, and lacks sensory organs near the apex of Sc, characters not present in other species of *Neurosystasis*, and for that reasons we proposed the recovery of *Chuspilepia* from its synonym and validate it as a subgenus of *Neurosystasis* to include both continental species.



Key words: Psychodinae; Maruinini; new species; Puebla; Mexico

RESUMEN. *Neurosystasis* Satchell es registrado por primera vez en México mediante la descripción de una nueva especie. Los especímenes capturados en un bosque tropical deciduo al sur del estado de Puebla, en el centro de México, fueron examinados y determinados como una nueva especie para la ciencia. El macho y la hembra son descritos con base en las características morfológicas del macho y la hembra. *Neurosystasis longistylis* **sp. nov.** es similar a *Neurosystasis saltenia* (Omad, Mangudo & Gleiser, 2015), pero se distingue fácilmente con base en las características de la cabeza, ala y genitales del macho. En ambas especies, la vena R_{2+3} está unida a la vena R_4 , la membrana del ala es ahumada con manchas oscuras en los ápices de las venas y carecen de órganos sensoriales cerca del ápice de la vena Sc, características no presentes en otras especies de *Neurosystasis*, y por esa razón se propone recuperar *Chuspilepia* de su sinonimia para validarla como un subgénero de *Neurosystasis* para incluir ambas especies continentales.

Palabras clave: Psychodinae; Maruinini; nueva especie; Puebla; México

INTRODUCTION

Neurosystasis Satchell, 1955, was originally described as a subgenus of *Telmatoscopus* Eaton, 1904, but Duckhouse (1974) ranked *Neurosystasis* to genus status as considered that it is not related with *Telmatoscopus*, but rather with *Alepia* Enderlein, 1937. Subsequently, *Neurosystasis* and *Alepia* were placed in the tribe Maruinini Enderlein, 1937, based primarily on characters of the wing and male genitalia. Kvifte and Wagner (2017) presented the diagnosis of *Neurosystasis*, a key for the identification of the previously known species, and the description of two species. This genus currently comprises six species, one recorded in Florida, USA (Satchell, 1955), three from Cuba (Knab, 1914; Kvifte & Wagner, 2017), one from Jamaica (Wagner & Hribar, 2010), and another one described in Argentina (Omad *et al.*, 2015), far away from the Caribbean subregion where the bulk of species occur.

In this work, we present the description of a new species of *Neurosystasis* based on male and female characteristics, corresponding to the first Mexican record of this genus. This Mexican species, in addition to the Argentinean one, indicates an apparently wide distribution in the Neotropics, and probably there are other undescribed species waiting to be recorded.

MATERIALS AND METHODS

Study area. Collections were made in the locality of Rancho El Salado (18° 20' 13" N, 98° 57' 29" W), in the municipality of Jolalpan of the State of Puebla, Mexico. This locality belongs to the physiographic province of Neovolcanic Axis and Sierra Madre del Sur, a component of Cuenca del Balsas of the biogeographic Mexican Transition Zone (Instituto Nacional de Estadística y Geografía, 2009; Morrone, 2005). In this province, the climatic conditions are warm subhumid with summer rainfalls, annual median temperature of 25.4 °C, and annual precipitation mean of 827.1 mm (Trejo-Vázquez, 1999). Vegetation consists of tropical deciduous forest with secondary shrub elements.

Due to seasonality, some arboreal deciduous species in this environment lose their foliage in the dry season for about six months (Rzedowski, 1978).

Specimen collection. Specimens were captured using Miniature CDC-UV light traps (Model 912, John W. Hock Company, Gainesville, FL.) set overnight (19:00 to 7:00 h), dry preserved, and subsequently cleared, dissected, and permanently mounted in Euparal (Bioquip Products, Inc., Rancho Dominguez, CA, USA) on slides, following the procedure outlined by Ibáñez-Bernal (2005). Specimens were examined using a Nikon Eclipse 50i phase contrast microscope. Measurements were obtained using an ocular micrometer and are given in millimeters. Drawings were rendered with the aid of a Nikon Y-IDT drawing tube, artwork completed by mixed media drawing technique using Chinese ink and charcoal, and then digitally processed with Corel Photo Paint X3 (Version 13). Specimens are deposited in IEXA: Colección de Insectos del Instituto de Ecología, A.C. (INECOL), Xalapa, Veracruz, Mexico.

Terminology. In general, we follow the morphological terminology of Cumming and Wood (2009). For male terminalia the terminology used was Curler and Moulton (2012), and Kvitte and Wagner (2017), for female postabdomen was Kotrba (2000) with some adjustments presented by Krzemińska and Gorzka (2016) made for the description of *Trichocera (Staryia)* spp. because their female genitalia are very similar to those of Psychodinae.

Measurements. Head width was measured at the widest part, whereas the length was measured from the vertex to the ventral margin of the clypeus as seen from a frontal perspective. Upper frons length is the distance from the vertex to the upper margin of the eye in frontal view. Wing length is measured from the base of Costa after the basal node to the wing tip. Genital plate width and length was taken at the widest and lengthiest part, respectively. Proportion of the palpus segments are given considering the length of palpus segment I as a unit (1.0).

RESULTS

Neurosystasis longistylis Durán-Luz, Ibáñez-Bernal & Omad, sp. nov.

<http://zoobank.org/urn:lsid:zoobank.org:act:B2EC2306-EDC1-4799-BA0B-E887DC4E7035>

(Figs. 1–14)

Diagnosis. *Neurosystasis longistylis* sp. nov. is distinguished from other *Neurosystasis* species by the following combination of characters: wing membrane homogeneously smoked with darker infuscations at vein apices; radial fork close to base of R₄, stem of CuA runs broadly separated from stem of M (Fig. 4), and hypopod composed of a lateral branch with some tenacula at apex and a truncate mesal branch which is 0.25 the length of the lateral branch (Fig. 9).

Description of male (Figs. 1–9). Head about 1.4 times wider than long; eye bridge with three rows of facets; eyes separated by less than one facet diameter; interocular suture shaped as complete, inverted "V". Frontal patch of alveoli with the ventral margin bilobed, dorsal just reaching the inferior margin of the eye; palpus reaching the level of the median portion of flagellomere 7, proportion of palp segments: 1.00: 2.70: 2.57: 2.86 (Fig. 1). Labium with inverted "Y" cibarial fork, with five small spiniform setae at each side of "Y" sclerite stem; labellum bulbous with setae on

apical half and five short spiniform setae on the internal margin (Fig. 2). Antenna incomplete (only the first ten flagellomeres observed); scape 1.5 times the length of pedicel; flagellomeres eccentric, except the first which is symmetrical, each with two rows of small alveoli, each producing a long filamentous sensillum (Fig. 3).

Wing length 2.1 times its width, with the membrane slightly smoked, with dark spots over the apex of all veins and the base of the R_5 ; Sc widened at the base, ending at level of R_5 base; radial sector pectinate; R_{2+3} fork attached to base of R_4 ; CuP wider at base (Fig. 4).

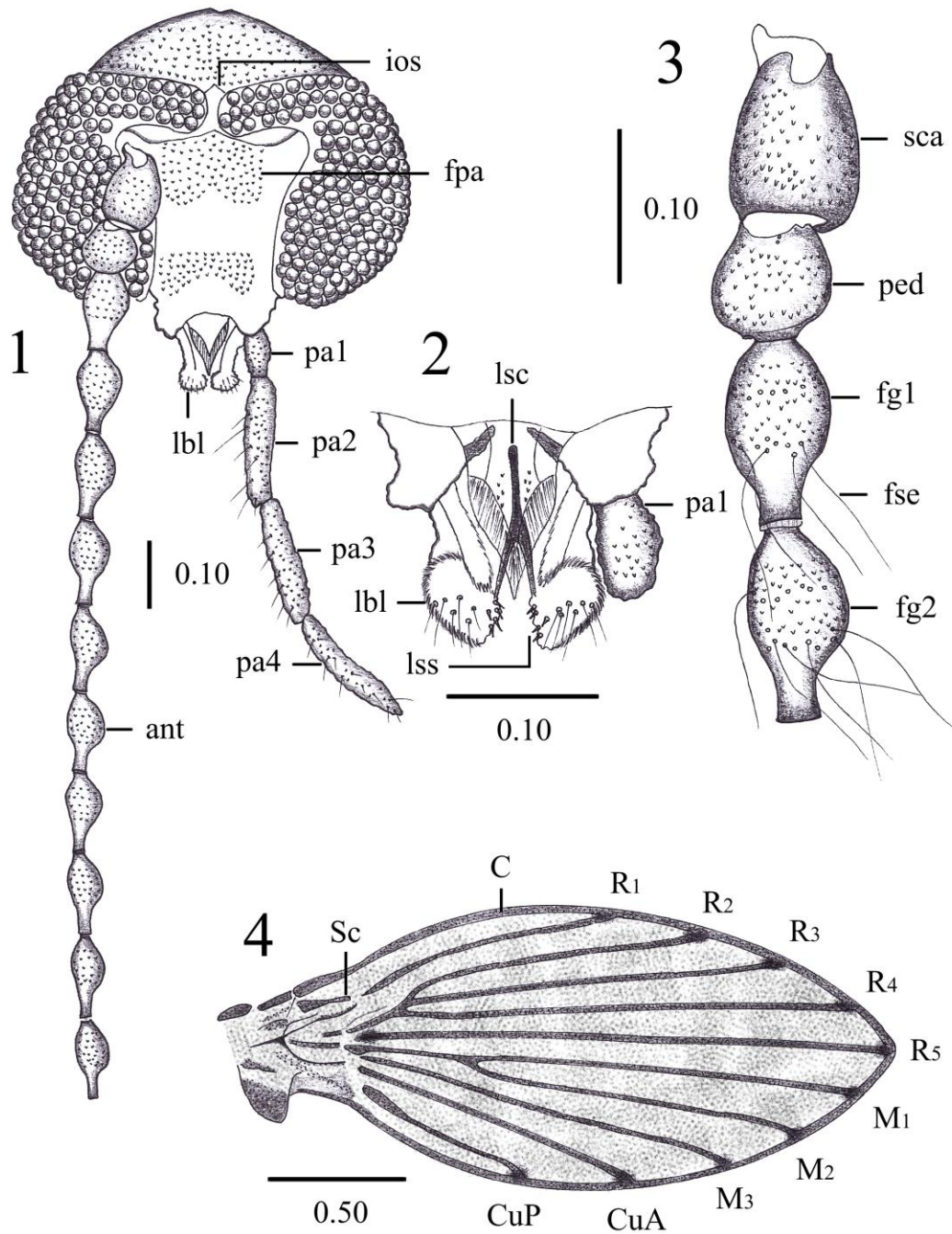
Aedeagus asymmetric with the apex like a hook, with an oval tongue-like lobe completely covered with small setae, originated at the union of aedeagal apodeme and aedeagus; aedeagal apodeme two times the length of aedeagus. Gonostyli asymmetric, longer than gonocoxites; left gonostylus curved, with apex acute, right gonostylus nearly straight, with multiple setae and with strong spines inserted at apex (Fig. 5), that if turned, seems widened distally like a golf club. Epandrium asymmetric, 2X wider than long, with two small foramina (Fig. 6, 7), internally with two sclerotized struts which are united at center and fused with the base of subepandrial sclerite with arms ending at base of epandrial lobe (Fig. 8). Epandrial lobe wider at base with a truncated medial lobe that ends in two small lobes with different size, all the medial lobe surface with many fine setae; at middle of the lateral branch, there is a neck and apically it is expanded having more than 10 cone-like setae and 2-3 terminal long thin setae (Fig. 9).

Measurements. Head width: 0.587 (0.57–0.60) $n=7$; head length: 0.411 (0.39–0.44) $n=7$; length from vertex to dorsal margin of the eye: 0.097 (0.09–0.11) $n=7$; labrum length: 0.118 (0.11–0.13) $n=8$; proboscis length: 0.144 (0.13–0.15) $n=8$; palpus length: 0.610 (0.58–0.64) $n=8$; wing length: 2.014 (1.98–2.13) $n=7$; wing width: 0.931 (0.90–1.00) $n=7$; epandrial lobe length: 0.366 (0.35–0.38) $n=8$; aedeagus length: 0.514 (0.49–0.53) $n=8$.

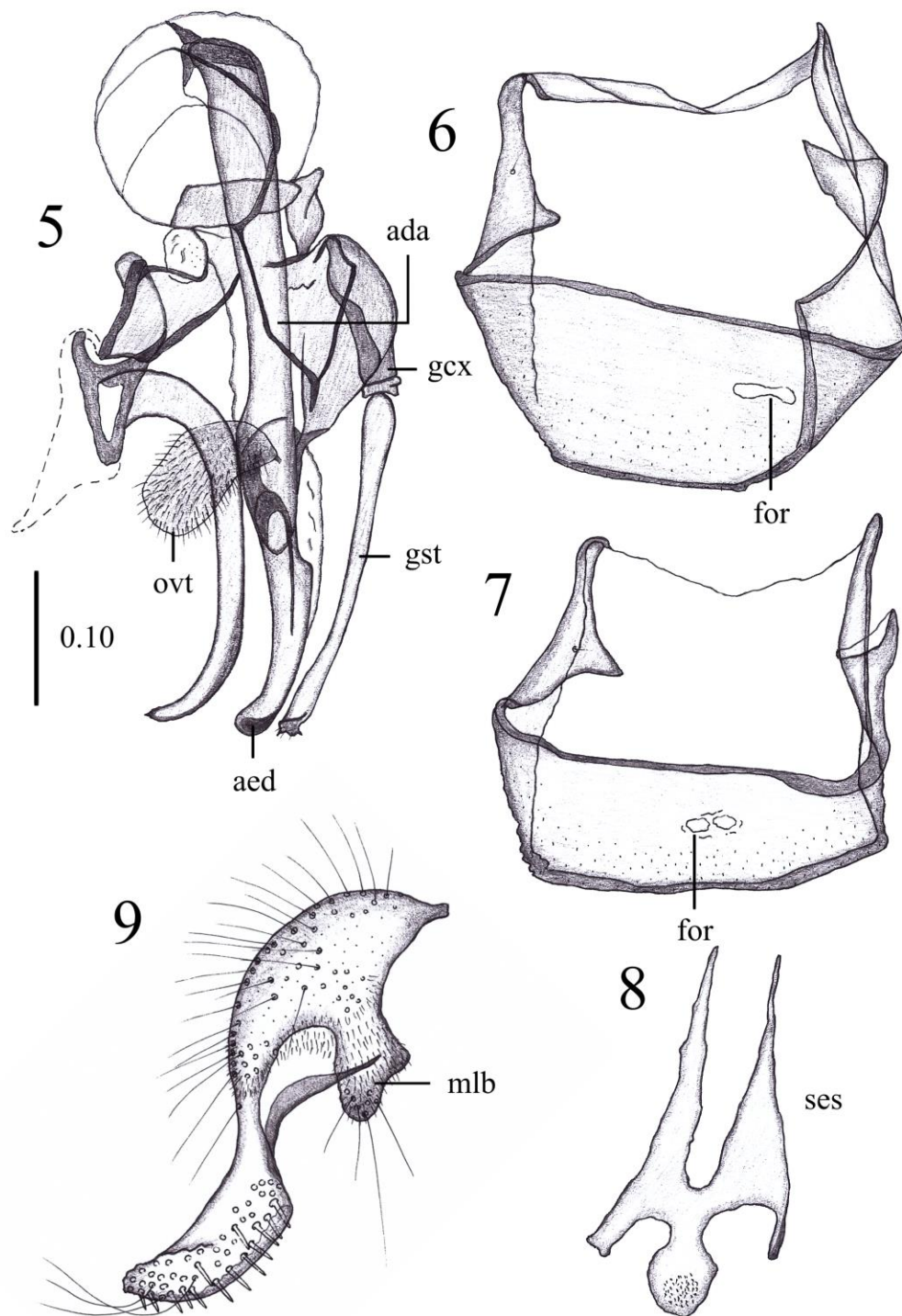
Description of female (Figs. 10–14). Head as in male, except by the following characteristics: Proportion of palp segments: 1.0: 2.71: 2.43: 2.71 (Fig. 10). Antennae incomplete (only six flagellomeres were observed in one specimen); ascoids not seen, but the basal two flagellomeres with one large circular alveolus (Fig. 11).

Wing as described for male (Fig. 12).

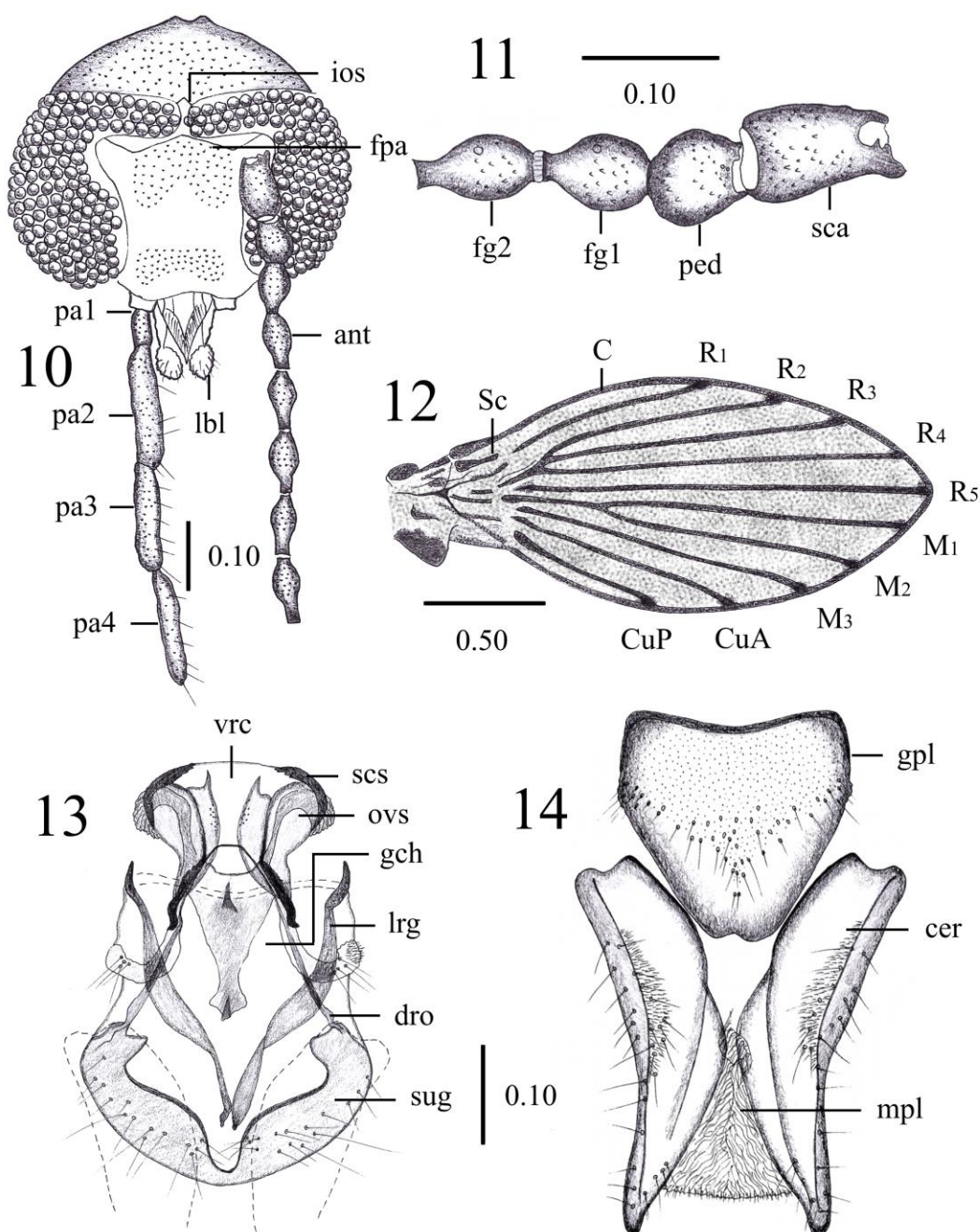
Genital plate longer than wide; with a slightly concavity on the distal margin, with long setae on the medial region, scattered centrally towards the apex; with a membranous plate on internal surface (Fig. 14). Ventral receptacle with a pair of oval structures with lateral margin rugose and internally with a patch of microsetae, each reinforced by a semicircular sclerotization, with two sclerotized rods that are angularly directed laterally from middle to the posterior portion, and genital chamber with two lateral rods which converge posteriorly, and other pair of diverging rods which ends in a supragenital plate that has a rounded posterior margin and some large sensilla (Fig. 13). Cerci wide with about 0.33 its length, with multiple setae, 1.7 times the length of the genital plate (Fig. 14).



Figures 1–4. Male of *Neurosystasis longistylis* sp. nov. **1.** Head in frontal view, showing incomplete antenna and palpus. **2.** Mouthparts and first palpus segment. **3.** Scape, pedicel and two first flagellomeres. **4.** Wing. Scale in millimeters. Abbreviations: ant: antenna; fg1: flagellomere one; fg2: flagellomere two; fpa: frontal patch of alveoli; fse: flagellomere filamentous sensilla; ios: interocular suture; lbl: labellum; lsc: cibarial fork; lss: labellum spiniform setae; pa1: palpus segment one; pa2: palpus segment two; pa3: palpus segment three; pa4: palpus segment four; ped: pedicel; sca: scape.



Figures 5–9. Male terminalia of *Neurosystasis longistylis* **sp. nov.** **5.** Aedeagus and gonopods in dorso-ventral view. **6–7.** Epandrium. **8.** Subepandrial sclerite. **9.** Epandrial lobe. Scale in millimeters, all figures at same scale. Abbreviations: ada: aedeagal apodeme; aed: aedeagus; for: foramina; gcx: gonocoxite; gst: gonostylus; ovt: oval tongue like lobe of aedeagus; ses: subepandrial sclerite; mlb: mesal lobe of hypopodium.



Figures 10–14. Female of *Neurosystasis longistylis* sp. nov. **10.** Head in frontal view with incomplete antenna and palpus. **11.** Scape, pedicel and first two flagellomeres. **12.** Wing. **13.** Genital chamber and ventral receptacle. **14.** Genital plate and cerci. Scale in millimeters, figures 13 and 14 at same scale. Abbreviations: ant: antenna; cer: cercus; dro: divergent rods; fg1: flagellomere one; fg2: flagellomere 2; gch: genital chamber; gpl: genital plate; ios: interocular suture; lbl: labellum; lrg: lateral rods of genital chamber; mpl: membranous plate; ovs: oval structures; pa1: palpus segment one; pa2: palpus segment two; pa3: palpus segment three; pa4: palpus segment four; ped: pedicel; sca: scape; scs: semicircular sclerotization; sug: supragenital plate; vrc: ventral receptacle.

Measurements (n= 1). Head width: 0.55; head length: 0.41; length from vertex to dorsal margin of the eye: 0.12; labrum length: 0.12; proboscis length: 0.15; palpus length: 0.62; wing length: 2.0; wing width: 0.96; width of genital plate: 0.24; total length of genital plate: 0.23; cerci length: 0.38.

Material examined. Holotype (♂). MEXICO: Puebla, Jolalpan, Rancho El Salado (18° 20' 08.7" N, 98° 57' 28" W, altitude 929 m), CDC light trap, J. Durán-Luz, col. 23–vii–2015, 1 ♂. Paratypes 7 ♂, 1 ♀: same data as holotype, except: 16–x–2014, 1 ♂; 02–v–2015, 2 ♂; 23–vii–2015, 4 ♂, 1 ♀. Deposited in IEXA: Colección de Insectos del Instituto de Ecología, A.C. (INECOL), Xalapa, Veracruz, Mexico.

Type locality. Mexico, Puebla, Jolalpan, Rancho El Salado.

Etymology. From Latin *longus*, long; *stylis*, referring to gonostylus; as the male genitalia have long gonostyli.

DISCUSSION

This species is considered a member of the genus *Neurosystasis* because it exhibits asymmetric aedeagus and gonopods in addition to all other characteristics reviewed by Kvitte and Wagner (2017). According to the identification key of Kvitte and Wagner (2017), *N. longistylis* **sp. nov.** is easily separated from the other known species because wing membrane is homogeneously infuscate with dark spots at vein apices, the radial fork is attached to the R₄, the stem of CuA runs broadly separated from stem of M, and the epandrial lobe presents a truncate medial lobe 0.25 the length of the lateral branch.

This new species appears similar to *Neurosystasis saltenia* (Omad, Mangudo & Gleiser, 2015) because R₂₊₃ is attached to vein R₄, the wing membrane is infuscate with dark spots on vein apices, and lacks sensory organs near the apex of Sc. Also, the male genitalia has the epandrial lobe with a wide base from which a short median branch originates, and no apical retinaculum, but has more than ten cone shaped setae in the apical third and 2-3 long curved setae at apex. *Neurosystasis longistylis* is differentiated from *N. saltenia* by the former having a head capsule with the interocular suture complete and V-shaped, frontal alveoli patch undivided at midline, and a wing with CuA₂ widened at base and lacking white spots between vein apices. The female genitalia of this species are completely different to *N. saltenia* because the last has the genital plate nearly triangular with truncate apex.

Neurosystasis saltenia was described as the type species of *Chuspilepia* Omad, Mangudo & Gleiser (= *Neurosystasis*), who recognized some differences in the wing and male genitalia; it was later determined that some of the characters perceived as unique are also found in other genera of Maruinini. Nonetheless, *Neurosystasis saltenia* and *N. longistylis* **sp. nov.** are the only two species of the genus that do not have a wing with sensory organs (or scent organs) near the apex of Sc, both have dark spots on vein apices, and R₂₊₃ fork attached to base of R₄. These differences distinguish the Neotropical continental species from the Circum-Caribbean species. For those reasons, we propose tentatively to recover from its synonym *Chuspilepia* to be considered a subgenus of *Neurosystasis*.

Neurosystasis (Chuspilepia) Omad, Mangudo & Gleiser, status novo

<http://zoobank.org/urn:lsid:zoobank.org:act:0E1A7F5D-04ED-4E5F-9D9D-2EE7B942D230>

Chuspilepia Omad, Mangudo & Gleiser, 2015: 500 (as genus). Type species: *Chuspilepia saltenia* Omad, Mangudo & Gleiser, by original designation. Additional references: Kvitte & Wagner, 2017: 87 (synonym).

Diagnosis. Wing sensory organs near the apex of Sc absent; vein apices with dark spots; R_{2+3} fork attached to base of R_4 .

Species included. *Neurosystasis saltenia* Omad, Mangudo & Gleiser, 2015; *Neurosystasis longistylis* Durán-Luz, Ibáñez-Bernal & Omad, **sp. nov.**

Known distribution. Continental America.

Neurosystasis (Neurosystasis) Satchell, 1955

<http://zoobank.org/urn:lsid:zoobank.org:act:E7004536-8697-4A8B-8A48-2D83DEC015B2>

Telmatoscopus (Neurosystasis) Satchell, 1955: 86. Type species: *Telmatoscopus terminalis* Satchell, 1955, by original designation.

Neurosystasis Satchell: Duckhouse, 1974: 142 (as genus). Additional references: Kvitte & Wagner, 2017: 82.

Diagnosis. Wing sensory organs near the apex of Sc present; vein apices without dark spots; R_{2+3} fork not attached to base of R_4 .

Species included. *Neurosystasis amplipenna* (Knab, 1914); *Neurosystasis bromeliphila* Wagner & Hribar, 2010; *Neurosystasis mira* Wagner & Kvitte, 2017; *Neurosystasis starki* Wagner, 2017; *Neurosystasis terminalis* (Satchell, 1955) (Kvitte & Wagner 2017).

Known distribution. Circum-Caribbean.

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