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POSGRADO EN CIENCIAS BIOLÓGICAS

FACULTAD DE CIENCIAS

REVISIÓN TAXONÓMICA DEL GÉNERO *HEMIPENTHES* LOEW (DIPTERA: BOMBYLIIDAE) EN NORTEAMÉRICA

T E S I S

QUE PARA OBTENER EL GRADO ACADÉMICO DE:

MAESTRO EN CIENCIAS BIOLÓGICAS
(SISTEMÁTICA)

PRESENTA:

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Sin otro particular, me es grato enviarle un cordial saludo.

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CONTENIDO

RESUMEN

Ávalos-Hernández, O. 2008. Revisión Taxonómica del Género *Hemipenthes* Loew (Diptera: Bombyliidae) en Norteamérica. Tesis de Maestria en Ciencias Biológicas (Sistemática). Facultad de Ciencias, UNAM. México.

Se revisaron 29 especies de Norte América, en las que se incluyen dos especies nuevas (localidad tipo entre paréntesis): *Hemipenthes albus* (Mexico, Zacatecas: 25 mi NW Zacatecas) y *H. translucens* (Mexico, Morelos: Quilamula). Este estudio sugiere que *H. eumenes* (Osten Sacken) (1886) es un sinónimo de *H. seminigra* Loew (1869). La evidencia presentada revela que *H. morio* (Linnaeus) (1758) tiene una distribución paleártica, no holarctica como se había considerado. Se comenta la situación taxonómica de las especies cercanamente relacionadas: *H. celeris, H. floridiana, H. pima* y *H. sagata*. El análisis cladístico se basó en 33 carácteres morfológicos. Mediante una busqueda heurística se obtuvieron 40 cladogramas igualmente parsimoniosos de los que se calculó un cladograma de consenso estricto. Este claograma tiene una longitud de 124 pasos, un índice de consistencia de 0.46 y un índice de retención de 0.65. Del cladograma y sinapomorfías que soportan los clados se pueden formular las siguientes hipótesis: (1) *Hemipenthes* es monofilético; (2) *Paravilla* esta más relacionado con *Hemipenthes* que *Villa*; (3) las especies norteamericanas de *Hemipenthes* se acomodaron provisionalmente en cuatro linajes norteamericanos y uno sudamericano. Cada linaje norteamericano esta más relacionado con una región biogeográfica que los demás. Se presenta una clave de determinación y mapas de distribución de las especies norteamericanas de *Hemipenthes*.

ABSTRACT

Ávalos-Hernández, O. 2008. Revisión Taxonómica del Género *Hemipenthes* Loew (Diptera: Bombyliidae) en Norteamérica. Tesis de Maestria en Ciencias Biológicas (Sistemática). Facultad de Ciencias, UNAM. México.

Twenty-nine North American species are reviewed, including two new species that are described (type locality in parentheses): *Hemipenthes albus* (Mexico, Zacatecas: 25 mi NW Zacatecas) and *H. translucens* (Mexico, Morelos: Quilamula). This study suggests that *H. eumenes* (Osten Sacken) (1886) is a synonym of *H. seminigra* Loew (1869). The evidence presented here reveals that *H. morio* (Linnaeus) (1758) has a Palearctic distribution, not Holarctic as had been considered. The taxonomical situation of the closely related species *H. celeris, H. floridiana, H. pima* and *H. sagata* is commented. The cladistic analysis was based upon 33 morphological characters. An analysis using a heuristic search resulted in 40 equally parsimonious cladograms from which a strict consensus cladogram was calculated. This cladogram has a length of 124 steps, a consistency index of 0.46, and a retention index of 0.65. From the cladogram and supporting synapomorphies, the following hypotheses can be formulated: (1) *Hemipenthes* is monophyletic; (2) *Paravilla* is closer to *Hemipenthes* than *Villa*; (3) North American species of *Hemipenthes* are provisionally arrayed into four North American lineages and one South American lineage. Each North American lineage is more related with a geographical region than the others. A key and distribution maps to the North American species of *Hemipenthes* are provided.

Introducción

Bombyliidae es la séptima familia más diversa del orden Diptera, con 4574 especies descritas (Evenhuis y Greathead, 1999). Se distribuyen principalmente en zonas áridas. En México se encuentra el 8% del total de las especies del mundo (Painter *et al*., 1978; Evenhuis y Greathead, 1999). Su diversidad se concentra en ambientes áridos y semiáridos. El noroeste de México se reconoce como un centro de diversidad para esta familia (Hull, 1973).

El género *Hemipenthes* Loew se describió en 1869 y en la actualidad cuenta con 80 especies descritas, de las cuales 29 se distribuyen en la región Neártica (Evenhuis y Greathead, 1999). Por ser polinizadores son importantes en el funcionamiento de los ecosistemas. Además su ciclo de vida parasitoide les da potencial para utilizarse en control biológico de plagas, por ejemplo, *H. sinuosa* es parasitoide de *Neodiprion serifer* Geoffroy, que es una plaga del pino en Norteamérica y Europa (Hull, 1973).

La mayoría de los trabajos taxonómicos para *Hemipenthes* en Norteamérica se publicaron a finales del siglo antepasado. Las descripciones de las especies son incompletas. El trabajo taxonómico más reciente es el de Painter y Painter (1962), quienes elaboraron una clave para 12 especies de Norte y Centroamérica.

Este trabajo actualiza la información taxonómica de *Hemipenthes*. Se presentan redescripciones y diagnosis de las especies, mapas de la distribución geográfica, una clave ilustrada de determinación y una prospección de las relaciones genealógicas de las especies neárticas.

A Revision of the North American species of *Hemipenthes* Loew (Diptera: Bombyliidae)

Omar Ávalos-Hernández

Abstract

Omar Ávalos-Hernández. A Revision of North America species of *Hemipenthes* Loew (Diptera: Bombyliidae). 79 pages, 119 figures, 1 table.

Twenty-nine North American species are reviewed, including two new species that are described (type locality in parentheses): *Hemipenthes albus* (Mexico, Zacatecas: 25 mi NW Zacatecas) and *H. translucens* (Mexico, Morelos: Quilamula). This study suggests that *H. eumenes* (Osten Sacken) (1886) is a synonym of *H. seminigra* Loew (1869). The evidence presented here reveals that *H. morio* (Linnaeus) (1758) has a Palearctic distribution, not Holarctic as had been considered. The taxonomical situation of the closely related species *H. celeris, H. floridiana, H. pima* and *H. sagata* is commented. The cladistic analysis was based upon 33 morphological characters. An analysis using a heuristic search resulted in 40 equally parsimonious cladograms from which a strict consensus cladogram was calculated. This cladogram has a length of 124 steps, a consistency index of 0.46, and a retention index of 0.65. From the cladogram and supporting synapomorphies, the following hypotheses can be formulated: (1) *Hemipenthes* is monophyletic; (2) *Paravilla* is closer to *Hemipenthes* than *Villa*; (3) North American species of *Hemipenthes* are provisionally arrayed into four North American lineages and one South American lineage. Each North American lineage is more related with a geographical region than the others. A key and distribution maps to the North America species of *Hemipenthes* are provided.

Keywords: phylogenetic relations, species description, distribution analysis.

Contents

A Revision of the North American species of *Hemipenthes* Loew (Diptera: Bombyliidae)

Omar Ávalos-Hernández

Introduction

Loew (1869) described *Hemipenthes* with *H. morio* as its type species. *Hemipenthes* is derived from the Greek *hemi*, meaning half; and *penthes*, meaning mourn or grief. The name refers to the wings half-cloaked in dark (mourning) colors. Most of the taxonomic studies for Nearctic species of *Hemipenthes* were published on the XIX century (Loew, 1869, 1872; Coquillet, 1886, 1887, 1892, 1894a, b; Osten Sacken, 1886a, b, 1887). The most recent taxonomic study is from Painter and Painter (1962), whom present a key for 11 species from North and Central America. The purpose of this paper is to update the taxonomic information on this genus, redescribe the species, and elaborate a determination key and present distribution maps; also to include a prospection of their phylogenetic relationships.

Flies of the genus *Hemipenthes* are medium sized, obscure, with wings at least half pigmented. The species of this genus are parasitoid or hyperparasitoid of species of Hymenoptera and other Diptera (Hull, 1973). The parasitic relationships of the Nearctic species *H. catulina* and *H. sinuosa* have been described (Brooks, 1952; Finlayson and Finlayson, 1958). The parasitic habits of these flies make them suitable for being used on biological control. For example *H. sinuosa* is a parasite of *Neodiprion sertifer* Geoffroy (Hymenoptera: Diprionidae) which is a pine plague in North America and Europe (Hull, 1973; Virtanen *et al*., 1996).

Hemipenthes has 80 species, mainly distributed in the Palearctic, Nearctic and Neotropical regions which combined have 77 species. There is only one species from the Afrotropical region and six species from the Oriental region, four of them shared with the Palearctic region, none of the species has been described for the Autralasian region (Evenhuis and Greathead, 1999). The Nearctic region has 22 endemic species and share seven species with the Neotropical region. This revision involves the 29 species present in Canada, the USA and Mexico. Evenhuis and Greathead (1999) cite Arizona, USA as type locality of the species *Hemipenthes semifucata* Hall, but Hall (1976) in the original description reports this species only for Chile.

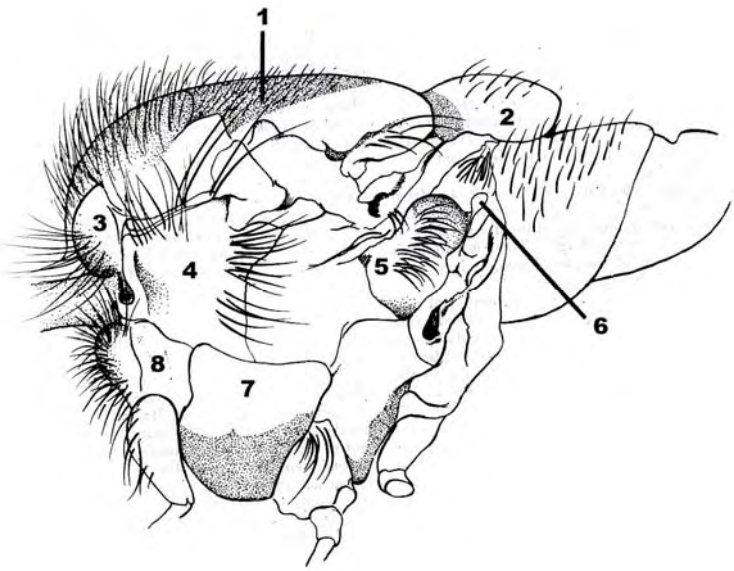
The classification of *Hemipenthes* has been unstable. It was first considered as a synonym of *Anthrax* Scopoli (Osten Sacken, 1886b) and later as a synonym of *Villa* Lioy (Coquillett, 1910). Later *Hemipenthes* became a subgenus of *Villa* (Johnson, 1919; Painter, 1933; Painter and Hall, 1960; Painter, 1962). Further comments on the classification of *Hemipenthes* are provided in the 'Taxonomic History' section. For this revision, I consider *Hemipenthes* to belong to the subfamily Antracinae, tribe Villini, following the classification of Evenhuis and Greathead (1999).

Material and methods

Terminology. The descriptive terminology follows that published in the *Manual of Nearctic Diptera* (McAlpine *et al.*, 1981). The terminology for wing venation, structures of thorax and male genitalia is provided on Figures 1-3. The species descriptions are composite, based in all specimens.

Specimen characteristics. External morphological structures were observed and recorded using a dissecting microscope. Dissections of male genitalia were performed as follow: dissection scissors were used to remove the last five abdominal segments, which were macerated for 24 hours in a 10% potassium hydroxide solution. Abdomen segments were rinsed with distilled water and genital structures were separated from the rest using a dissecting microscope. Cleared genitalia were placed in a glass microvial filled with glycerin, which was then attached to the pin supporting the reminder of the insect. Genitalia and wings photographs were taken with an Olympus® DP12 digital camera attached to an Olympus® SZX12 stereomicroscope. Photographic irregularities were modified using Adobe Photoshop®.

Geographic distribution. Label data from specimens used for descriptions were recorded and listed. As available, country, state, specific locality, collector and sex were listed. The distribution



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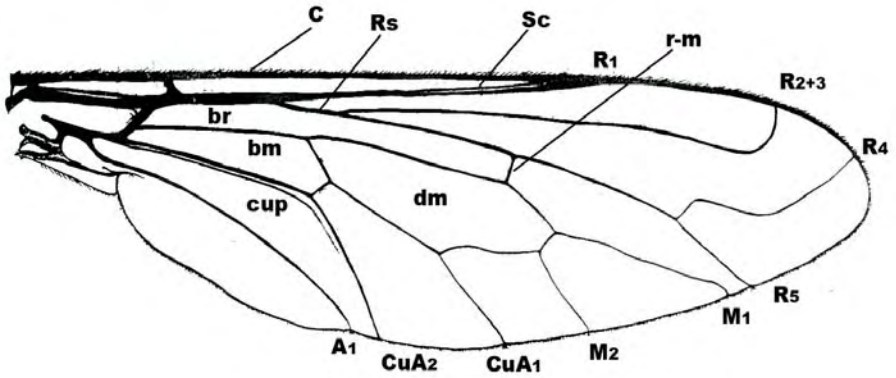

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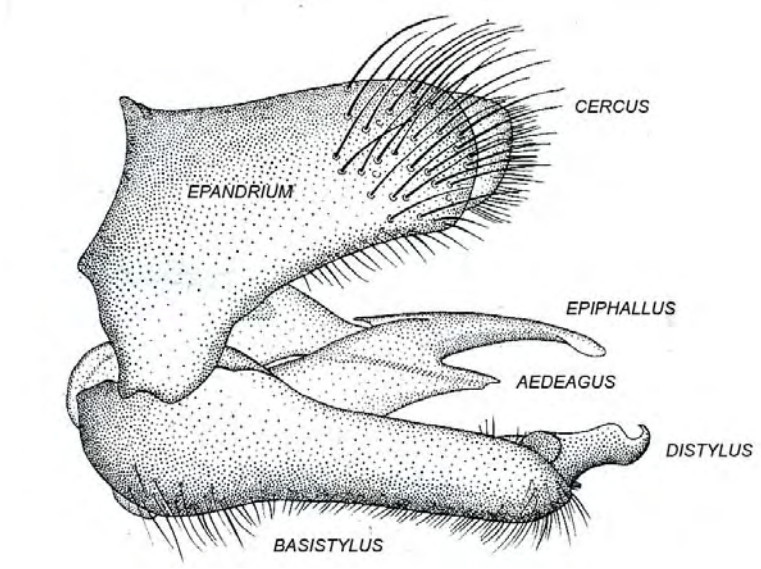

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Figures 1-3.— 1. Torax lateral view (1, mesonotum; 2, scutellum; 3, proepimeron; 4, anepisternum; 5, metapleura; 6, halter; 7, katepisternum; 8, prosternum). 2. Wing venation and cell nomenclature. 3. Male genitalia lateral view (Taken from Hull, 1973).

presented in the species descriptions is taken from literature (Evehuis and Greathead, 1999) and collection specimens; distribution maps were elaborated only with label data from specimens. Thus the reported distribution may be larger than that presented in the map. Maps were made using ESRI ArcView GIS 3.2. Longitude and latitude of 2388 specimens were entered into a Microsoft Excel spreadsheet. If available, the longitude and altitude were obtained directly from the specimen labels. For specimen labels that did not have longitude and latitude, gazetteers, maps and the software 'GEOLocate' (Rios y Bart, 2003) were used to determinate the geographical coordinates. The geographic coordinates were converted to a tab delimited text file and then imported into ESRI ArcView. The specimen locales were plotted on a North America Projection.

Distribution data and descriptions were made with specimens from the following collections:

- United States National Museum collection (USNM)
- Colección Nacional de Insectos, Instituto de Biología UNAM (CNIN).
- Colección del Museo de Zoología, Facultad de Ciencias, UNAM (MZFC)
- Museum of Entomology, Florida State Collection of Arthropods (Gainsville).

Cladistic methods. The phylogenetic analysis included 33 characters, all were treated as non-additive and equally weighted. The analysis was performed by a heuristic method with assistance of NONA and WinClada (Goloboff, 1993). Character data were polarized using *Exoprosopa minuscula* Painter as the outgroup, a closely related species, from the tribe Exoprosopini. The matrix also included the South American species *Hemipenthes differens* and *H. ditaenia* and the species *Villa lateralis* and *Paravilla consul*, which belong to the tribe Villini, to provide a broader phylogenetic perspective to the analysis.

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MZFC Museo de Zoología, Facultad de Ciencias, UNAM, Mexico, D.F. (M. Armando Luis Martínez).
USNM Collection of the former Unites States National Museum, now in the Bishop Museum, Honolulu, HI (Neal L. Evenhuis).
FSCA Florida State Collection of Arthropods, Gainesville, FL. (Gary J. Steck).

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Taxonomic History

In 1758 Linnaeus described the genus *Bombylius*. He also described some species of Bombyliidae under the genus *Musca*, one of this was *M. morio* Linnaeus (Hull, 1973). In 1763 Scopoli excluded *M. morio* from *Musca* and placed it in a new genus called *Anthrax*. The distinctive character of *Anthrax* is a tuft of hair at the tip of third flagellomere. Scopoli thought that the specimens he used to describe *Anthrax* were from *M. morio*, but they were misidentified and in fact belonged to *Musca anthrax* Schrack. This identification mistake was not known until the beginning of the XX century (Hull, 1973).

Musca anthrax and *M. morio*, among other Bombilids species described by Linnaeus, were first placed in a new family called Anthracidae, then moved to Bombyliidae because of the similarity with the species of *Bombylius* (Hull, 1973).

After the description of *A. morio*, most of the species of the current genus *Hemipenthes* were described under the genus *Anthrax*. In 1869 Loew created the genus *Hemipenthes* for the European species *Anthrax morio* (synonym of *Musca morio*) and the American species *H. seminigra*, he

considered *H. morio* as the genus type species. Loew justified the creation of a new genus by the presence of pulvilli in these two species. But Loew did not consider that *A. morio* was also the type species for the genus *Anthrax*, by then it was unknown the mistake made by Scopoli. Osten Sacken (1886b) realized that both genera were described using the same type species, which made *Hemipenthes* a synonym of *Anthrax*. Osten Sacken (1886b) placed the species of *Hemipenthes* under the subgenus *Anthrax* in the genus *Anthrax.* Osten Sacken (1886b) also remarked that the presence of pulvilli was not exclusive of *Hemipenthes* because other species of *Anthrax* also presented this structure.

In *Biologia Centrali-Americana* Osten Sacken (1886a) proposed the name *Isopenthes* for the genus including *I. jaennickeana* and *I. blanchardiana*. The author observed that these two species were very similar to *Anthrax sinuosa* but stated that could be distinguished by the presence of three submarginal cells instead of two as the rest of the *Anthrax* species.

The same way Osten Sacken (1886b) criticized the validation of *Hemipenthes* by the presence of pulvilli, Coquillett (1886, 1894a) rejected the creation of the new Osten Sacken's genera *Dipalta*, *Stonyx* and *Isopenthes*, all distinguishable by the presence of three submarginal cells. Coquillett asserted that this character was not enough to separate between genera, because some specimens of *Anthrax* present three submarginal cells.

Even when Coquillett did not accept *Isopenthes* as valid, he accepted the genus *Hemipenthes* defined by the presence of pulvilli, as part of the subfamily Antracina (Coquillett, 1886; 1887) including *H. moroides*, *H. seminigra*, and *H. sinuosa*. But still continued considering some species of *Hemipenthes* as belonging to *Anthrax*, because of the lack of pulvilli (*A. brigadata, A. celer, A. curta, A. edwarsii, A. floridiana, A. inops, A. lepidota, A. sagata*) (Coquillett, 1887; 1892; 1894b). By the end of the XIX century Coquillett (1894a) realized that Scopoli and Loew had used the same type species to describe their genera and accepted the synonymy between *Hemipenthes* and *Anthrax*.

In the beginning of the XX century, Bezzi found out that the specimens used by Scopoli to describe the genus *Anthrax* really belong to *Musca anthrax* and not to *M. morio* (Hull, 1973). With this *Hemipenthes* could be a valid genus with *H. morio* as its type species. Nevertheless *Hemipenthes* continued as an invalid name.

Coquillett in 1910 published a paper where presented *Isopenthes* and *Hemipenthes* as synonyms of *Villa* Lioy. Later other authors (Johnson, 1919; Painter, 1933, 1962; Painter & Hall, 1960) changed the corresponding species from *Anthrax* to *Hemipenthes* and placed *Hemipenthes* as a subgenus of *Villa*. Both species of *Isopenthes* (*I. jaennickeana* and *I. blanchardiana*) were considered as subspecies of *H. sinuosa*; *Isopenthes* became a synonym of *Hemipenthes*, state that still conserve (Painter & Hall, 1960; Painter *et al*., 1978).

Hull (1973) considered *Hemipenthes* as a valid genus as part of the subfamily Exoprosopinae and tribe Villini, eliminating all subgenera. Hall (1975) and Painter *et al.* (1978) however, still published papers using subgenera.

By the date *H. jaennickeana* and *H. blanchardiana* are considered different species from *H. sinuosa* (Evenhuis y Greathead, 1999). The actual classification is based on a cladistic analysis of the subfamilies of Bombyliidae (Yeates, 1994). In whish *Hemipenthes* is placed in the subfamily Antracinae and the tribe Villini.

Systematics

Subfamily Antracinae Latreille

Anthracinae Latreille, 1804 (as Anthracii) [type genus *Anthrax* Scopoli, 1763]
Spogostylinae Sack, 1909 [type genus *Spogostylum* Macquart, 1840]
Exoprosopinae Becker, 1913 [type genus *Exoprosopa* Macquart, 1840]
Aphoebantinae Becker, 1913 [type genus *Aphoebantus* Loew, 1872]

Coquillett, 1886: 157-159 [key to genera]
Hull, 1973: 435-445 [key to genera and descriptions]
Yeates, 1994: 158-161 [diagnosis, classification and phylogeny]
Evenhuis and Greathead, 1999: 290-525 [World catalog].

The species of this subfamily are recognized by the presence of a large, blind epiphallus above aedeagus (Yeates, 1994). It contains 46% the described Bombyliidae species (Evenhuis and Greathead, 1999). It is formed by the tribes Anthracini, Aphoebantini, Exosprosopini, Prorostomatini, Villini, and Xeramoebini (Evenhuis and Greathead, 1999)

Tribe Villini Hull

Villini Hull, 1973 [type genus *Villa* Lioy, 1864]

Hull, 1973: 435-445 [Key to genera and descriptions]
Yeates, 1994: 158-161 [diagnosis, classification and phylogeny]
Evenhuis and Greathead, 1999: 423-515 [World catalog].

Villini contain 31 genera and 810 species (Evenhuis and Greathead, 1999). Historically the tribes Exoprosopini, Villoestrini, and Villini formed the subfamily Exoprosopinae (Becker, 1913; Hull, 1973), separated from Anthracinae, which was composed mainly by the genus *Anthrax*, and can be distinguished by a circlet of apical hairs on antennal flagellum (Hull, 1973). Yeates (1994) included the tribes from Hull's Exoprosopinae into Anthracinae. The tribal relationships within Anthracinae remain uncertain and need more revision. Although is established that the Anthracini, Exoprosopini, and Villini form a monophyletic group characterized by wing venation, with cell R_{2+3} arising at 90° and distally, close to the r-m crossvein (Yeates, 1994).

Villini and Exoprosopini are related tribes separated from Anthracini by the lack of the mentioned circlet of apical hairs on antennal flagellum and the absence of proprecoxal bridge (Yeates, 1994). Villini is distinguished from Exoprosopini by the presence of a reduced, rounded pulvilli, meanwhile Exoprosopini have a reduced, conical pulvilli, commonly mistaken for a tooth on the tarsal claw; besides most often the Exoprosopini have two flagellomeres with an apical style and most often the Villini have one flagellomere with apical style (Yeates, 1994).

Genus *Hemipenthes* Loew

Hemipenthes Loew, 1869 [type species *Musca morio* Linnaeus, 1758]
Isopenthes Osten Sacken, 1886a [type species *Anthrax sinuosa* Wiedemann, 1921]

Painter, 1962: 89-90 [key to 12 species from the United States]
Painter *et al*., 1978: 47-50 [America South of the United States catalogue]
Evenhuis and Greathead, 1999: 441-451 [World catalog].

DIAGNOSIS: The genus *Hemipenthes* can be distinguished from other genera of Villini by the following combination of characters: small to medium size flies; face rounded or bluntly projecting; third flagellomere subconical at base, tapering to styliform apical two-thirds; wings with basal half, more than half or whole wing brown or blackish; anterior tibiae smooth, without bristles.

DESCRIPTION. Head (Fig. 5): Head hemiglobular, occiput moderately developed, same width as mesonotum between the wings, nearly circular from the anterior view. Ocellar tubercle equilateral. Gena rather narrow. Tentorial fissure conspicuously deep. Lobes of the occiput swollen postero-dorsally and consequently fissure more or less horizontal with a depression behind the ocellar column. Eyes narrowly separated, a little more in the female than in the male. Front covered with dense, black pile and in some species short scales. Antennae small and short (fig. 6) separated a little more than one-third the width of the front. First flagellomere about twice as long as wide, a little widened apically and bears bristly hair. Second flagellomere short, rounded in the middle. Third flagellomere as wide as the second segment, conical, widened at the base tapering to the apex; as long as the first two flagellomeres or slightly longer, with a minute spine at the apex. Face rounded, but in some species may be bluntly projecting. Face covered with similar pile and scales like that on the front. Oral cup rather wide, about two and a half times as long as its width. Proboscis is short and

snout; labellum is large and fleshy. Palpus slender, cylindrical, with a fringe of fine hairs centrally and laterally.

Thorax: Wider posteriosly. Brownish or blackish. In most species with scattered, fine-hairlike scales. Mesonotum anterior and lateral margins pilose, with black bristles. Pleura pilose sometime with scales. Katepisternum in most species with fine hairlike scales. Prosternum pilose. The scutellum may have bristles and scales or be denuded. Legs with anterior femur with a fringe of bristles ventrally. The anterior tibiae are nearly smooth in most species, but may have a few slender setae dorsally. Middle and hind femur with stiff bristles. Middle tibiae with a few oblique bristles. Hind tibiae with four rows of strong bristles. All femora and tibiae with scales. Tarsi slender. Claws small, sharp, nearly straight, with small pulvilli. Anterior claws very minute. Wings uniform in width, with a characteristic black or brown pattern, obliquely, but irregularly and sharply distributed on basal half of the wing. Pigment may be covering the whole wing or just the base and anterior area. In most species there are only two submarginal cells. r_{2+3} vein arises abruptly at just before or just beyond the r-m crossvein. r-m crossvein enters near the middle of the discal cell. In most species, the r_5 cell is slightly narrowed near margin of wing. Contact of discal cell with cua_1 cell usually a little longer than r-m crossvein. cup cell open. The development of alula varies.

Abdomen: Short, oval, not wider than the thorax. With seven visible terguites. Black color, with fine, not dense pile. Sides of terguites with fringe of pile, sometimes large tufts. Generally the first segment pile is pale (yellow or white) and extends entirely down the sides of second and sometimes third segments, there may be alternating tufts of black and pale pile. Females have a few slender spines along the acanthophorites. Male terminalia small, conical, and asymmetrical. From dorsal aspect (epandrium removed), basally wide, with broad, long, spatulate or tonguelike epiphallus with concave sides, very blunt at apex and the dististyli are nearly apical, as they arise from the basistylus. Basal part of the aedeagus large, short and rounded both basally and apically. From lateral view, the epiphallus has a ventral extension in the middle, the dististylus is short, basistylus long and the epandrium has a wide concave incision centrally from the anterior to posterior corners.

Key to the North American species of *Hemipenthes*

1 - Wing entirely infuscated (Fig. 53) ..... **21. *pullata*** (Coquillett, 1894a)
- Wing with at least some area hyaline 2

2 - Setulae on basicosta white and black ..... **1. *albus*, new species**
- Setulae on basicosta black 3

3 - Hind femur and tibia with abundant black, broad, flattened scales 4
- Hind femur and tibia with slender scales 5

4 - Cell bm hyaline at center (Fig. 46) ..... **14. *inops*** (Coquillett, 1887)
- Cell bm entirely infuscated (Fig. 48) ..... **16. *lepidota*** (Osten Sacken, 1886b)

5 - Cell dm entirely hyaline 6
- Cell dm infuscated at least on its base 7

6 - Cell bm entirely infuscated (Fig. 55) ..... **23. *scylla*** (Osten Sacken, 1887)
- Cell bm entirely hyaline (Fig. 58) ..... **26. *translucens*, new species**

7 - Cell r_1 and r_{2+3} entirely infuscated (Fig. 52) ..... **20. *pleuralis*** (Williston, 1901)
- Cell r_1 or cell r_{2+3} with some hyaline areas 8

8 - Cell r_1 entirely infuscated except for a hyaline area near tip; half of cell r_{2+3} infuscated with a color spot at tip (Figs. 35, 47 & 57) 9
- Pigment on cell r_1 never reaching wing margin; cell r_{2+3} with at most basal half infuscated 11

9 - Two submarginal cells (Fig. 57) ..... **25. *sinuosa*** (Wiedemann, 1821)
- Three submarginal cells (Fig. 35 & 47) 10

10 - Cell r_5 with two basal thirds infuscated (Fig. 35) ..... **3. *blanchardiana*** (Jaennicke, 1867)
- Cell r_5 infuscated at half (Fig. 47) ..... **15. *jaennickeana*** (Osten Sacken, 1886a)

11 - Third abdominal segment with a stripe of white scales ..... **29. *yaqui*** (Painter, 1962)
- Third abdominal segment without a stripe of white scales, some white scales may be present but scattered not forming a stripe 12

12 - Cell a_1 hyaline or infuscated just at base (Figs. 41, 42 & 59) 13
- Cell a_1 with at least basal half infuscated 15

13 - First abdominal segment with scattered yellow scales, not forming a band .....
..... **27. *webberi*** (Johnson, 1919)
- First abdominal segment with a thin or broad band of white scales 14

14 - Second to fourth abdominal segments with fulvous scales ... **10. *edwardsii*** (Coquillett, 1894b)
- Second to fourth abdominal segments with black scales ..... **9. *curta*** (Loew, 1869)

15 - Fourth abdominal segment with a stripe of white scales 16
- Fourth abdominal segment without a stripe of white scales, some white scales may be present but scattered not forming a stripe 18

16 - Pleura and prosternum black pilose ..... **7. *chimaera*** (Osten Sacken, 1886b)
- Pleura and prosternum black and yellow pilose 17

17 - Fifth abdominal segment with abundant white scales covering the whole segment .....
..... **8. *comanche*** (Painter, 1962)
- Fifth abdominal segment with black scales, some white scales may be present scattered at segment side ..... **2. *bigradata*** (Loew, 1869)

18 - Hyaline aureoles around bases of cells r_4, r_5, m_2 and cup (Fig. 37) .....
..... **5. *catulina*** (Coquillett, 1894a)
- Wings without aureoles 19

19 - Abdomen with black tomentum overall ..... **28. *wilcoxi*** (Painter, 1933)
- Abdomen with at least some white or pale yellow scales scattered or forming bands 20

20 - Sides of first abdominal segment black pilose 21
- Sides of first abdominal segment white or yellow pilose 22

21 - Fifth abdominal segment with white scales; pleura entirely black pilose .....
..... **17. *martinorum*** (Painter, 1962)
- Fifth abdominal segment with black scales; pleura mixed black and yellow pilose .....
..... **13. *incisiva*** (Walker, 1852)

22 - Sides of fifth to seventh abdominal segments with abundant white scales or white and yellow (*floridiana*♀); prosternum white pilose 23
- Sides of fifth to seventh abdominal segments without white scales, some pale yellow scales may be present but scattered; prosternum yellow or mixed black and yellow pilose 28

23 - Cells a_1 and cup with at most two basal thirds infuscated (Figs. 38 & 51) 24
- Cells a_1 and cup entirely infuscated or hyaline just at tip (Figs. 44 & 54) 25

24 - Body length more than 10 mm ..... **19. *pima*** (Painter, 1962)
- Body length 10 mm at most ..... **6. *celeris*** (Wiedemann, 1828)

25 - Male 26
- Female 27

26 - Sides of first abdominal segment yellow pilose ..... **12. *floridiana*** (Macquart, 1850)
- Sides of first abdominal segment white pilose ..... **22. *sagata*** (Loew, 1869)

27 - Sides of fifth and seventh abdominal segments with white and yellow scales .... **12. *floridiana*** (Macquart, 1850)
- Sides of fifth and seventh abdominal segments with white scales ..... **22. *sagata*** (Loew, 1869)

28 - Body length 10 mm at most ..... **4. *castanipes*** Bigot, 1892
- Body length more than 10 mm 29

29 - Cell r_5 not narrowed at wind margin; cells a_1 and cup entirely infuscated (Fig. 50) .... **18. *morio*** (Linnaeus, 1758)
- Cell r_5 slightly narrowed at wing margin; cells a_1 and cup entirely infuscated except tip (Figs. 43 & 56) ..... **24. *seminigra*** (Loew, 1869) [=**11. *eumenes*** (Osten Sacken, 1886b)]

1. *Hemipenthes albus,* new species

Holotype in National Museum of Natural History, Washington, D.C., USA.

Figures 4-5, 35, 64-65

DIAGNOSIS: *Hemipenthes albus* is distinguished from its congeners by the following combination of external characters: face bluntly projecting; setulae on basicosta white and black; cells dm and a_1 infuscated just at base; abdomen dorsum with scattered, yellow scales all along.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, yellowish tomentose. Face brown, bluntly projecting, with short black hair and yellowish tomentum. First flagellomere cinereous, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second segment brown, twice as wide as long, with short black hair above, bare below; third flagellomere brown, longer than two basal flagellomeres combined; base half wide, tapering toward apex to styliform two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Pulpy brown with black hair. Occipital with short white hair and white scales.
Thorax: Mesonotum anterior margin pale yellow pilose; lateral margin entirely white pilose; tomentum on disc yellowish, long, hairline, not dense, more abundant near scuttle; with black bristles. Pleura white pilose on proepimeron, anepisternum and metapleura; tomentum on katepisternum pale yellow, black pilose. Prosternum with mixed black hair below and white pile above. Mid coxa with broad black bristles, tomentum on all coxae hairlike, pale yellow. Legs brown, tibiae fulvous at base, femora black pilose, pale yellow scales present on all legs; fore tibia without bristles, fore nails smaller than mid and hind; mid and hind tibiae with black bristles. Halter steam pale yellow, knob fulvous. Scutellum brown, black pilose, and pale yellow tomentose; bristles black. Black and white setulae on basicosta. Cells c, sc, br, and bm entirely infuscated (Fig. 35); cell r_1 with two basal thirds infuscated; cell cup with basal half infuscated; cell dm, r_{2+3} and r_5 infuscated just at base; cell dm infuscated behind r-m crossvein; r-m crossvein behind middle of cell dm; two submarginal cells; cell r_5 slightly narrowed at wing margin; third section of vein CuA_1 twice as long as two basal sections

Figure 4. *Hemipenthes albus*, new species.

combined, first section twice as long as r-m crossvein, second as long as r-m crossvein; cell a_1 slightly wider than cell cup; alula poorly developed.
Abdomen: Abdominal dorsum black pilose, whitish pile on segments one and two; pale yellow tomentum overall; sides of abdomen with first and basal half of second segments with abundant white pile, rest black pilose. Venter white pilose, whitish tomentose. Genitalia brown with yellow hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view broad (Fig. 64) slightly curved, cap-shaped, apex not swollen, rounded; without a ventral extension; epiphallus in ventral view broad (Fig. 65), lateral margins straight, without spines; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle. Scales on front paler.

DISTRIBUTION: Mexico (Chihuahua, Durango, Zacatecas). Figure 5 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: MEXICO. Chihuahua: 5 mi E Parral, 5-IX-1962, R. H. y E. M. Painter (HOLOTYPE 1♂); 24 mi SW Chihuahua, 6-IX-1962, R. H. & E. M. Painter (PARATYPES 4♂♂ 1♀). Durango: 6 mi N Durango, 5-IX-1962, R. H. y E. M. Painter (PARATYPE 1♀). Zacatecas : 25 mi NW Zacatecas, 3-IX-1962, R. H. & E. M. Painter (PARATYPES 9♂♂ *genitalia*, 1♀).

ETYMOLOGY: The species epithet, *albus*, is derived from the Latin meaning white and refers to the white setulae on basicosta.

REMARKS: The genitalia of *Hemipenthes albus* are unlike any other found within the genus, different by a broad epiphallus in lateral view and the absence of a medial extension. Even with these genitalia peculiarities *H. albus* according to external characters, should still be classified in

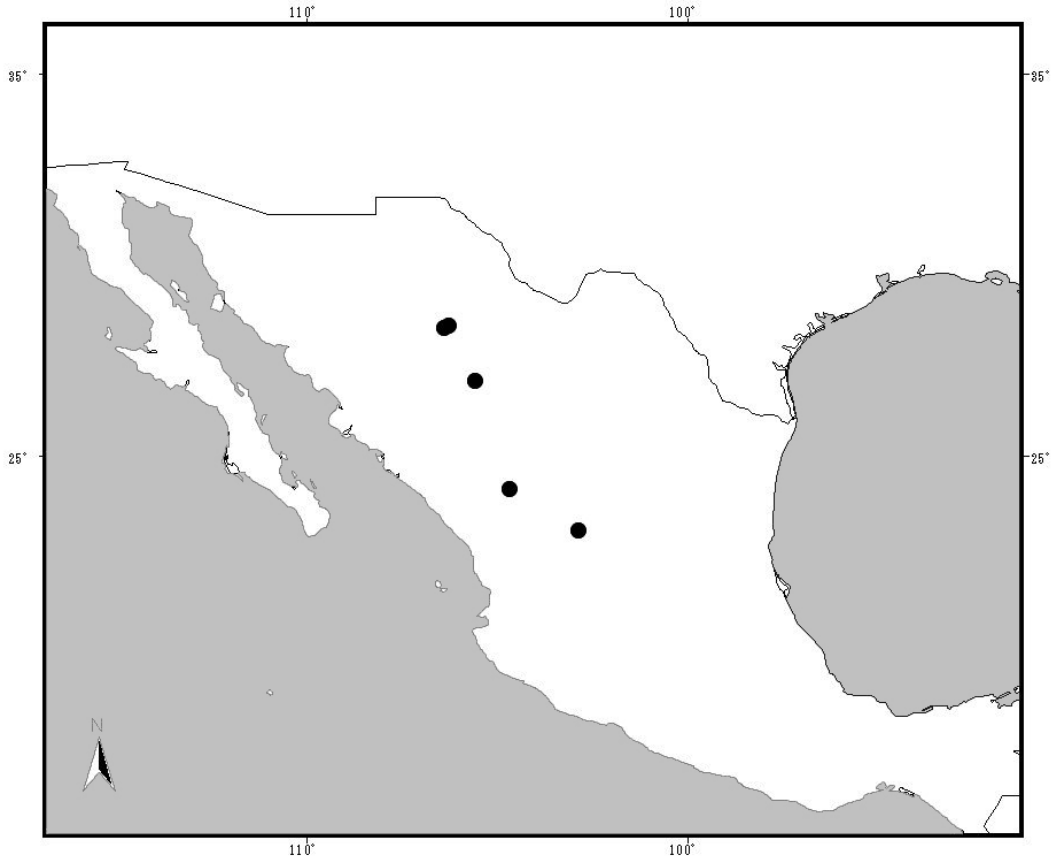


Figure 5. Collecting localities of specimens in collections reviewed of *Hemipenthes albus.*

Hemipenthes. This species has been only collected by R.H. Painter and E.M. Painter in four localities in the northern Mexico, but these localities are separated from each other and it is possible that this species has a wider distribution in the arid regions of the northern Mexico, an area which is under-collected.

2. *Hemipenthes bigradata*

Anthrax bigradata Loew, 1869

Holotype in Museum of Comparative Zoology, Cambridge, Massachusetts, USA

Placed in genus *Villa* subgenus *Hemipenthes* by Painter & Painter (1962); placed in genus *Hemipenthes* by Hull (1973).

Figures 6, 36, 66-67

DIAGNOSIS: *Hemipenthes brigadata* is distinguished from its congeners by the following combination of external characters: pleura and prosternum black and yellow pilose; cell a_1 entirely infuscated or hyaline just at tip; first and fourth abdominal segments with a stripe of white scales.

DESCRIPTION: Male. *Head*: Eyes separated by one and a half width of ocellar tubercle. Front black pilose, yellowish tomentose. Face brown, rounded, with black hair and yellowish tomentum. First flagellomere brown, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second segment brown, twice as wide as long, short black hair on the base; third

flagellomere brown on the base, testaceous on apex, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi brown with black hair. Occiput with short black and yellow hair and yellowish scales.

Thorax: Mesonotum anterior margin yellowish pilose; lateral margin white and yellowish pilose; tomentum on disc yellowish, short, hairlike, not dense; bristles black. Pleura black pilose with yellowish hair mixed in on proepimeron and anepisternum, metapleura with yellowish hair, some black hair mixed in, tomentum on katepisternum black with some yellowish scales present, hair like, not dense. Prosternum yellowish pilose, with a few black hair present. Mid coxa with black hair, tomentum on all coxae hairlike, yellow. Legs fulvous, femora black pilose, tomentum on fore and mid femora black, hind femur yellowish tomentose, black scales present on anterior surface; fore tibia with a single row of black bristles on postero-ventral surface; bristles black. Halter steam pale yellow or brown, knob yellow to white. Scutellum brown, not pilose, and pale yellow tomentose, not dense; bristles black. Black setulae on basicosta. Cells c, sc, br, and bm entirely infuscated (Fig. 36); cells cup and a_1 entirely infuscated except tip; cell r_1 with two basal thirds infuscated; cell dm with basal half infuscated; cells r_{2+3}, r_5, cua_1 and m_2 infuscated just at base; color in cell a_1 not reaching hind margin of wing; cell dm infuscated behind r-m crossvein; r-m crossvein behind middle of cell dm; two submarginal cells; cell r_5 slightly narrowed at wind margin; third section of vein CuA_1 twice as long as two basal sections combined, first and second sections, each, as long as r-m crossvein; cell a_1 slightly wider than cell cup; alula slightly developed.

Abdomen: Abdominal dorsum black pilose, some white hair on apical half of first segment; black tomentum overall except a broad crossband of white tomentum on apical half of first segment and on all fourth segment, segments six and seven with scattered white scales; sides of abdomen with first and basal half of second segments whitish pilose, rest black pilose. Venter black pilose, whitish tomentose. Genitalia brown with black hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 66) slightly curved, cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the

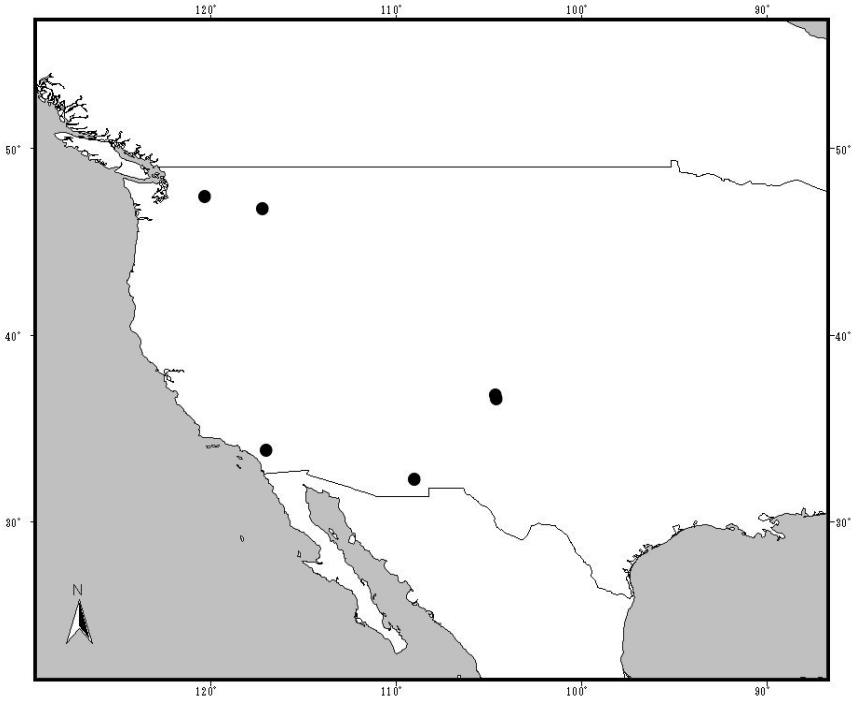


Figure 6. Collecting localities of specimens in collections reviewed of *Hemipenthes bigradata.*

epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 67), lateral margins narrowed at both sides at middle, with scattered spines all along; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle.

DISTRIBUTION: MEXICO (Distrito Federal, Guanajuato, Guerrero, México, Puebla, Sonora), USA (Arizona, California, New Mexico, Texas, Washington). Figure 6 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: USA. California: Ribbonwood San Jacinto Mts., 20-V-1939, B. Brookman (1♀); Los Angeles (2♀), S. Berdino Co., May (1♀). New Mexico: Koehler, N. R. Walton (1♂ *genitalia*). Washington: Pullman, 16-VI-1912 (1♂).

REMARKS: *Hemipenthes bigradata* is similar to *H. chimaera* but can be distinguished by the presence of yellow and black pile on pleura and prosternum. The genitalia of both species are clearly different, mainly by the presence of a ventral extension in *H. bigradata* genitalia.
The specimens examined are only from USA locales but this species has been also reported from Mexico (Evenhuis and Greathead, 1999).

3. *Hemipenthes blanchardiana*
Exoprosopa blanchardiana Jaennicke, 1867

Sintype (lost) in Hessische Landesmuseum, Darmstadt, Germany.

Placed in genus *Isopenthes* by Osten Sacken (1886a); considered as a subspecies of *Hemipenthes sinuosa* by Hull (1973); considered as a species by Evenhuis & Greathead (1999).

Figures 7, 37, 68-69

DIAGNOSIS: *Hemipenthes blanchardiana* is distinguished from its congeners by the following combination of external characters: cell r_1 entirely infuscated except for a subapical hyaline area; cell r2+3 with basal half infuscated and a color spot at tip; three submarginal cells; abdomen with black tomentum overall with a few scales scattered.

DESCRIPTION: Male. *Head*: Eyes separated by one and a half width of ocellar tubercle. Front black pilose, black tomentose, yellow scales near antenna. Face brown, rounded, with black hair and yellowish tomentum. First flagellomere fulvous, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere fulvous, twice as wide as long, black hair on the base; third flagellomere brown, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi cinereous with black hair. Occiput with short black and yellow hair and yellowish scales.
Thorax: Mesonotum anterior margin pale yellow pilose; lateral margin black and yellowish pilose; tomentum on disc entirely yellowish, long, hairlike, not dense; bristles black. Pleura black and yellow pilose; tomentum on katepisternum pale yellow. Prosternum yellowish pilose, with black hair present. Mid coxa with black hair, tomentum on all coxae hairlike, pale yellow. Legs fulvous, tarsi darker, femora black pilose, some white hair on mid femur, pale yellow tomentose, some black scales may be present; bristles black. Halter steam brownish, knob yellow to fulvous. Scutellum brown, black pilose, and yellow tomentose, a spot of black tomentum in middle at base; bristles black. Black setulae on basicosta. Cells c, sc, br, bm, r_1, cup and a_1 entirely infuscated (Fig. 37), cell r1 with a hyaline area just above R_4-R_{2+3} croosvein; cell r_{2+3} infuscated from base to R_4-R_{2+3} crossvein with a spot at tip; cells r_5 and CuA_1 entirely infuscated except tip; cell dm with two basal thirds infuscated; cell m_2 with basal half infuscated; cell dm infuscated beyond r-m crossvein; r-m crossvein behind middle of cell dm; three submarginal cells; cell r_5 slightly narrowed at wind margin; third section of

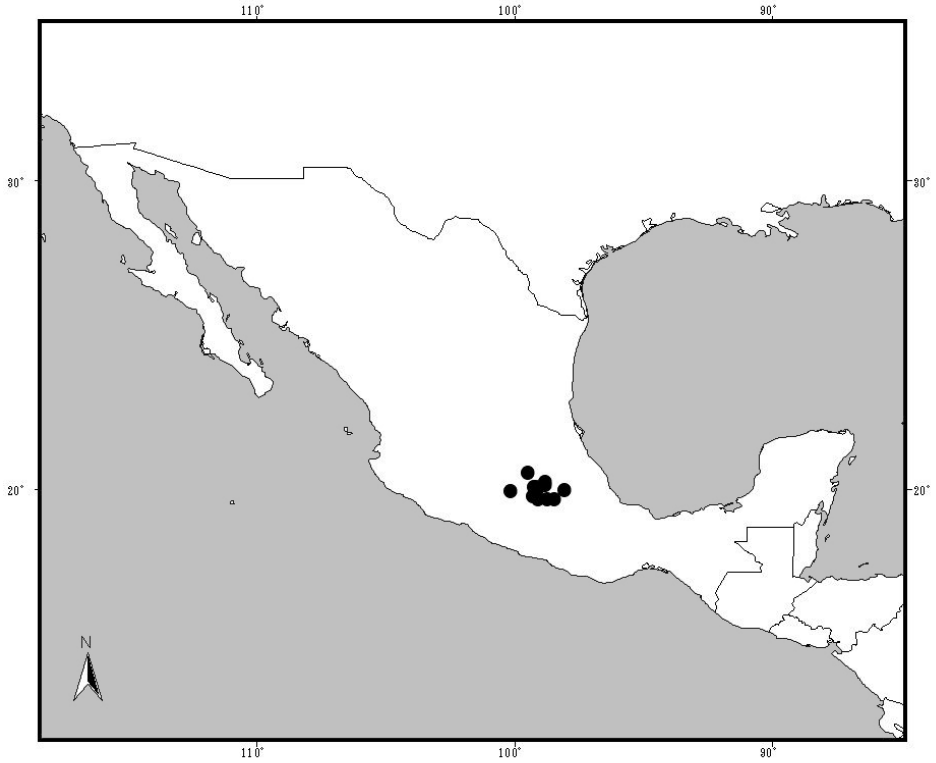


Figure 7. Collecting localities of specimens in collections reviewed of *Hemipenthes blanchardiana.*

vein CuA_1 one and a third as long as two basal sections combined, first and second sections, each, one and a half as long as r-m crossvein; cell a_1 as wide as cell cup; alula poorly developed.
Abdomen: Abdominal dorsum white pilose, black hair on fifth to seventh segments; black tomentum overall, some pale yellow scales scattered; sides of abdomen with first and basal half of second segments whitish pilose, abundant black with some yellow hair on rest. Venter white pilose, whitish tomentose. Genitalia brown with black hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 68) slightly curved, cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 69), lateral margins narrowed at both sides at middle, with scattered spines all along; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle.

DISTRIBUTION: MEXICO (Distrito Federal, Guanajuato, Guerrero, Jalisco, México, Morelos, Oaxaca, Puebla, Tlaxcala), USA (Arizona, California, Texas). Figure 7 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: MEXICO. Distrito Federal: Magdalena Contreras, Los Dinamos, 19-IV-2006, O. Ávalos-Hernández (1♂ *genitalia*); 9-VIII-1910 (1♂); Pedregal, 16-IX-1946, W. G. Downs (1♂). Guanajuato: Near Celaya, 3-XII-1932, Hobart Smith (1♂). EUA: Arizona: Cav. Chiricahua Mts., 8-VIII-1932 (1♀).

REMARKS: *Hemipenthes blanchardiana* is closely related to *H. jaennickeana* and *H. sinuosa*, but can be distinguished from the first by the pigmentation in cell r_5 which is entirely infuscated except tip and from the second by the presence of three submarginal cells. Osten Sacken (1886a) *H.*

blanchardiana and *H. jaennickeana* were placed under the genus *Isopenthes* separating them from the rest of the species by having three submarginal cells. There are other South American species of *Hemipenthes* that have three submarginal cells although the most common within the genus is to have only two. The great similarity between these three species may suggest that they are synonyms with intraspecific variation, but the genitalia of *H. blanchardiana* are different from that of *H. jaennickeana* although similar to that of *H. sinuosa*. I consider the genitalia characteristics and the presence of three submarginal cells are enough differences to separate *H. blanchardiana* from *H. jaennickeana* and *H. sinuosa*, respectly.
In difference with their relatives which are widespread, the distribution of *H. blanchardiana* appears to be disjunt, having some populations in the center of Mexico and others in the South of USA, but none in the Northern Mexico. This may be because this species likes cold-humid weather, as that present in pine forests, which are not abundant in the northern-arid regions of Mexico.

4. *Hemipenthes castanipes*

Hemipenthes castanipes Bigot, 1892

Lectotype designated by Painter and Painter (1962) in The Natural History Museum, London, UK.

Figures 38, 70-71

DIAGNOSIS: *Hemipenthes castanipes* is distinguished from its congeners by the following combination of external characters: body length 10 mm at most; coxae without tomentum; cell a_1 infuscated; pleura and sides of first abdominal segment white or pale yellow pilose.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, fulvous tomentose, tomentum not dense. Face brown, rounded, with black hair and fulvous tomentum. First flagellomere brown, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere brown, twice as wide as long, with short black hair; third flagellomere brown on base, testaceous on apex, longer than two basal flagellomere combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi black with black hair. Occiput with short black hair and yellowish scales.
Thorax: Mesonotum anterior and lateral margins yellowish pilose; tomentum on disc entirely yellowish, long, hairlike, not dense; bristles black. Pleura black pilose with yellowish hair mixed in on proepimeron and anepisternum, metapleura yellow pilose, some black hair mixed in, katepisternum without tomentum. Prosternum black pilose with some yellowish hair mixed in. Mid coxa with black hair, all coxae without tomentum. Legs fulvous, fore coxa brown, femora black and yellowish pilose, yellow tomentose, some black scales present; bristles black. Halter steam brownish, knob yellow to white. Scutellum brown, black pilose, without tomentum; bristles black. Short black setulae on basicosta. Cells c, sc, br and bm entirely infuscated (Fig. 38); cells cup a_1 entirely infuscated except tip; cell r_1 with two basal thirds infuscated; cell dm with basal half infuscated; infuscated cells r_{2+3}, r_5, m_2 and cua_1 infuscated just at base; cell dm infuscated at r-m crossvein; r-m crossvein behind middle of cell dm; two submarginal cells; cell r_5 not narrowed at wind margin; third section of vein CuA_1 one and a half as long as two basal sections combined, first section one and a half as long as r-m crossvein, second section as long as r-m crossvein; cell a_1 as wide as cell cup; alula slightly developed.
Abdomen: Abdominal dorsum black pilose, not dense, whitish pile on apical half of first segment; black tomentum overall; fourth to seventh segments with a few white scales scattered; sides of abdomen with first and basal half of second segments whitish pilose, rest black pilose. Venter white pilose, whitish tomentose. Genitalia brown or black, with black hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 70) slightly curved, cap-shaped, apex not swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 71), lateral margins narrowed at both sides at middle, with scattered spines in the middle

and dense spines at apex; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Not revised.

DISTRIBUTION: USA (California).

SPECIMENS EXAMINED: USA. California: Mt. Lowe, 3-VI-1917, J. M. Aldrich (3♂♂ *genitalia*).

REMARKS: *Hemipenthes castanipes* is similar to *H. webberi* but with cell a1 entirely infuscated except tip. The genitalia are somehow similar but not identical to that of *H. webberi* both having the same shape of epandrium in ventral view.

There were examined only three specimens from California, the Lectotype designated by Painter and Painter (1962) in the BMNH was collected by Bigot and has for locality 'Amérique du Nord'. The localities in the labels of the specimens examined can not be georreferated and no distribution map could be done for this species. It may be endemic to California but with so few specimens collected this can not be assured.

5. *Hemipenthes catulina*

Anthrax catulina Coquillett, 1894a

4 Sintypes (lost) in National Museum of Natural History, Washington, D.C., USA.

Placed in genus *Hemipenthes* by Hull (1973).

Figures 8, 39, 72-73

DIAGNOSIS: *Hemipenthes catulina* is distinguished from its congeners by the following combination of external characters: aureoles around bases of cells r_4, r_5, m_2 and cup; cell a_1 infuscated; pleura and sides of first abdominal segment white or pale yellow pilose.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, fulvous tomentose. Face brown, rounded, with black hair and fulvous tomentum. First flagellomere brown, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere brown, twice as wide as long, with short black hair; third flagellomere brown, longer than two basal segments combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi brown with black hair. Occiput with short black and yellowish hair and yellowish scales.
Thorax: Mesonotum anterior margin yellowish pilose with a few long black hair also present; lateral margin yellow and black pilose; tomentum on disc entirely yellowish, long, hairlike, not dense, with yellow hair; bristles black. Pleura black pilose with yellowish hair mixed in on proepimeron, anepisternum, and metapleura; tomentum on katepisternum pale yellow, black pilose. Prosternum with mixed black and yellowish hair. Mid coxa with mixed black and yellowish hair, tomentum on all coxae hairlike, pale yellow. Legs fulvous, femora black pilose and yellow tomentose, some black scales present; fore tibia with a single row of black bristles on postero-ventral surface; bristles black. Halter steam and knob brownish to yellowish. Scutellum brown, black pilose, and yellowish tomentose, paler along posterior margin, a spot of black tomentum in middle at base; bristles black. Black setulae on basicosta. Cells c, sc, br, and bm entirely infuscated (Fig. 39); cell a_1 entirely infuscated except tip; cells r_1 and cup with two basal thirds infuscated; cell dm with basal half infuscated; cells r_{2+3}, r_5 and cua_1 with basal third infuscated; cell m_2 infuscated just at base; color in cell a_1 not reaching hind margin of wing; aureoles around bases of cells r_4, r_5, m_2 and cup; cell dm infuscated at or slightly behind r-m crossvein; r-m crossvein at or slightly beyond middle of cell dm; two submarginal cells; cell r_5 slightly narrowed at wind margin; third section of vein CuA1 one and a half as long as two basal sections combined, first section twice as long as r-m crossvein, second

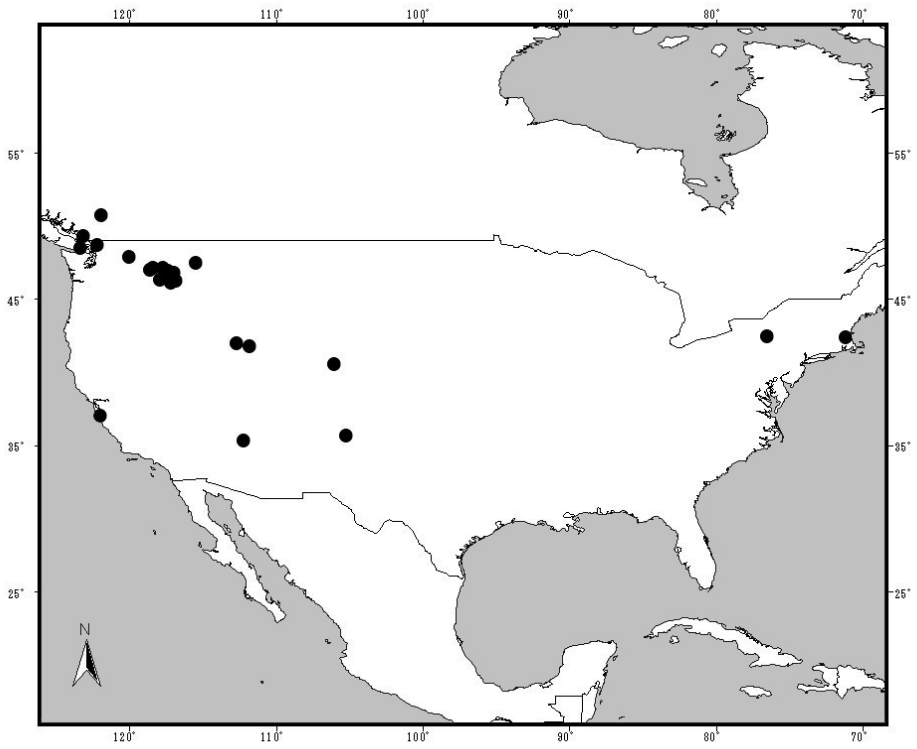


Figure 8. Collecting localities of specimens in collections reviewed of *Hemipenthes catulina.*

section about one and a half as long as r-m crossvein; cell a_1 slightly wider than cell cup; alula slightly developed.

Abdomen: Abdominal dorsum black pilose, whitish pile on segment one; black tomentum overall, fulvous scales scattered at sides; sides of abdomen with first and basal half of second segments whitish pilose, mixed abundant black and yellowish hair on rest. Venter black pilose, whitish tomentose. Genitalia black or brown with black hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 72) slightly curved, cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 73), lateral margins narrowed at both sides before apex, with scattered spines in the middle and dense spines at apex; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle. Setulae on basicosta black and yellow on base of wing.

DISTRIBUTION: CANADA (British Columbia), USA (Arizona, California, Colorado, Idaho, Illinois, Indiana, Iowa, Massachusetts, Michigan, Minnesota, Montana, New Jersey, New Mexico, New York, Ohio, Oregon, Pennsylvania, Utah, Washington, Wisconsin, Wyoming). Figure 8 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: USA. Idaho: Moscow Mt., 7-IX-1911 (1♀); Moscow M. 30-VIII-1924, A. L. Melander (1♂). Minnesota: Basswood Lake near Ely, 24-VI-1962, R. W. Dawson (1♂). Oregon: Stein Mts. Harney Co., 27-VI-1922, W.J. Chamberlin (1♂ *genitalia*). Washington: Pullman, 28-VI-1965, Roger D. Akre (1♀); Fields Spring St. Pk., 17-VI-1961, R. W. Dawson (1♂); Fields Spring St. Pk., 9-VI-1965, Roger D. Akre (1♀). Hood River, 6-II-1914, Childs (1♂).

REMARKS: *Hemipenthes catulina* shares almost all external characteristics with *H. eumenes*, *H. morio*, and *H. seminigra*, but can be easily distinguished from these species by the aureoles in the bases of cells r_4, r_5, m_2 and cup. The genitalia is different from all the other three species, having the epiphallus in ventral view narrowed at the sides as in *H. morio*, but with the base wider. *H. catulina* has a distribution limited to the USA.

This is one of the few species of *Hemipenthes* which host is known. *H. catulina* feeds on *Bessa harveyi* Townsend (Brooks, 1942) which is a parasite of the sawfly *Pristiphora* sp. (Hull, 1973).

6. *Hemipenthes celeris*

Anthrax celeris Wiedemann, 1828

Synonym: *Villa (Hemipenthes) celer* Painter *in* Painter & Painter, 1962.

2 Sintypes in Naturhistorisches Musem, Vienna, Austria.

Placed in genus *Hemipenthes* by Hull (1973).

Figures 9, 40, 74-75

DIAGNOSIS: *Hemipenthes celeris* is distinguished from its congeners by the following combination of external characters: body length 10 mm at most; pigmentation on cells cup and a_1 not reaching wing margin; cell r_1 infuscated at half; pleura and sides of first abdominal segment white pilose; fifth and sixth segments with white scales on sides, not covering the whole segment.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, black tomentose, white scales may be present in middle, near antenna. Face cinereous, rounded, with black hair and white tomentum. First flagellomere black, slightly swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere black, twice as wide as long, with short black hair above, bare below; third flagellomere black, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi black or brownish with black and white hair. Occiput with white hair and white scales, tomentum dense.

Thorax: Mesonotum anterior margin white pilose; lateral margin entirely black pilose; tomentum on disc black; bristles black. Pleura white or pale yellow pilose with black hair mixed in on anepisternum, katepisternum not tomentose, black pilose. Prosternum with white hair. Mid coxa with black hair, coxae not tomentose. Legs brown, femora black pilose black tomentose on anterior surface and white tomentose on posterior surface; bristles black. Halter steam and knob yellow. Scutellum black, black pilose and black tomentose; bristles black. Black setulae on basicosta. Cells c, sc, br, and bm entirely infuscated (Fig. 40); cells r_1, a_1 and cup with two basal thirds infuscated; cell dm with basal half infuscated; cell cua_1 with basal third infuscated; cells r_{2+3}, m_2, and r_5 infuscated just at base; color in cell a_1 not reaching hind margin of wing; cell dm infuscated at r-m crossvein; r-m crossvein at or slightly behind middle of cell dm; two submarginal cells; cell r_5 not narrowed at wind margin; third section of vein CuA_1 one and a third as long as two basal sections combined, first and second sections, each, about twice as long as r-m crossvein; cell a_1 twice wider than cell cup; alula well developed.

Abdomen: Abdominal dorsum black pilose, not dense, whitish pile on segments one; black tomentum overall, white tomentum on sides of fifth to seventh segments, segment center black tomentose with some white scales scattered; sides of abdomen with first and basal half of second segments whitish pilose, black hair on third, fourth and apical half of second segments, rest not pilose. Venter black and white pilose, whitish tomentose stripes of black tomentum. Genitalia brown with black hair. Epandrium in lateral view, triangular, lower margin straight, basal corner narrowed; basistylus broad, basal half enlarged; distylus large, as long as half the width of the basistylus, hooked apically; epiphallus in lateral view narrow (Fig. 74) slightly curved, not cap-shaped, apex not swollen, rounded; with a ventral extension broad at base with apex rounded, portion of the epiphallus behind ventral extension shorter than aedeagus; epiphallus in ventral view broad (Fig. 75), lateral margins

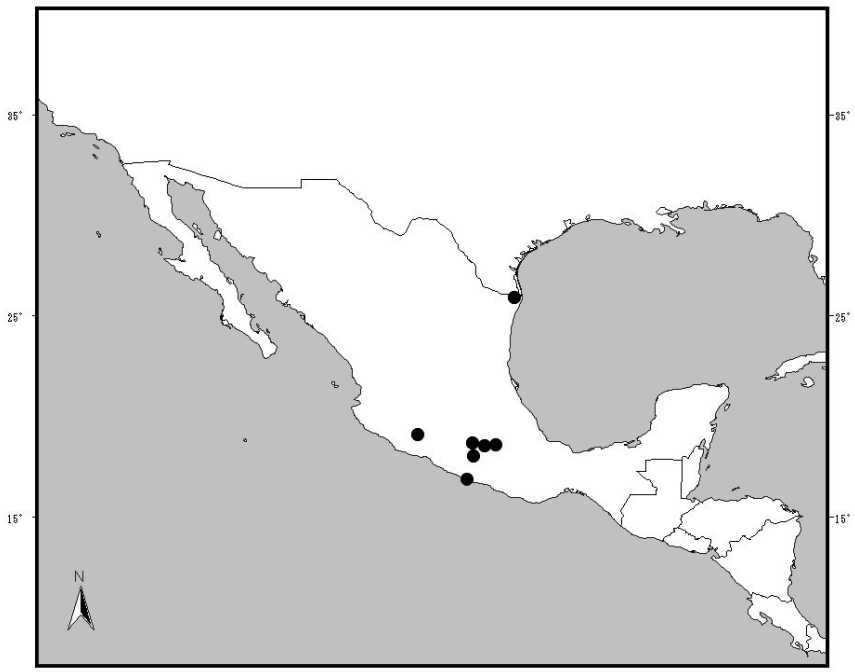


Figure 9. Collecting localities of specimens in collections reviewed of *Hemipenthes celeris.*

straight, without spines; aedeagus broad at base narrowed at apex, swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle. Mesonotum lateral margin black, white and yellowish pilose. Tomentum on disc black with a triangle of yellow scales near scutellum. Pleura entirely white pilose, tomentum and pile on katepisternum white. Scutellum yellowish tomentose along posterior margin, white tomentum on base. White scales on fifth and seventh abdominal segments least abundant than in male, not reaching the segment center.

DISTRIBUTION: MEXICO (Guerrero, Michoacán, Morelos, Puebla), USA (Florida, Kentucky, Texas). Figure 9 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: MEXICO. Guerrero: 8 mi N Taxco, 1-VI-1959, H. E. Evans (2♀♀). Michoacán: 10 mi S Apatzingán, 2-IX-1960, Chas H. Martin, (1♀). Morelos: Quilamula, 25-V-2004, O. Avalos & M. Lopez (2♂♂ 2♀♀). Puebla: 4 mi SE Matamoros, 3-IX-1959, R. H. & E. M. Painter (1♂). USA. Florida: Citrus Co., 23-VII-1956, H. V. Weems Jr. (1♀). Texas: Victoria, IX-1942, W.E. Hinds (1♂ *genitalia*).

REMARKS: *Hemipenthes celeris* is closely related with *H. floridiana, H. pima*, and *H. sagata*. It is distinguished from *H. floridiana* and *H. sagata* by the pigmentation of cells a_1 and cup, which have the tip or more hyaline, and from *H. pima* by the body size, being at most 10 mm. The characters used to identify these species present great variation and the genitalia are identical. I propose these characters to distinguish between these species, but a revision of the types and most important a complete geographical sample is needed to determine if they are one species with great variation.

Painter and Painter (1962) made a revision of the types of *H. celeris* and *H. floridiana* and comment that *H. celeris* syntypes (two females) are rubbed and greasy and *H. floridiana* type has some fungus and the head is glued. They noticed that these two species are very similar and even suggest that "[...]when specimens from intervening areas are studied, [*H. floridiana*] may be shown to

be a synonym or at least only a subspecies." (Painter and Painter, 1962). This may be also the case with *H. pima* and *H. sagata*.

The distribution of this species is disjunt being present in the center of Mexico and in Texas but not in the Northern Mexico.

7. *Hemipenthes chimaera*

Anthrax chimaera Osten Sacken, 1886b

Lectotype designated by Painter and Painter (1962) in The Natural History Museum, London, UK.

Placed in genus *Villa* subgenus *Hemipenthes* by Painter & Painter (1962); placed in genus *Hemipenthes* by Hull (1973).

Figures 10, 41, 76-77

DIAGNOSIS: *Hemipenthes chimaera* is distinguished from its congeners by the following combination of external characters: face bluntly projecting; pleura and prosternum black pilose; cell a_1 with at least basal half infuscated; fourth abdominal segment with a stripe of white scales.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, yellowish tomentose. Face brown, bluntly projecting, with black hair and yellowish tomentum. First flagellomere black, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere black, twice as wide as long, with short black hair above, bare below; third flagellomere black, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi brown, darker toward the apex with black hair. Occiput with short black and white hair and white scales.

Thorax: Mesonotum anterior margin pale yellowish pilose; lateral margin entirely white pilose; tomentum on disc entirely yellowish, long, hairlike, not dense; bristles black. Pleura black pilose on

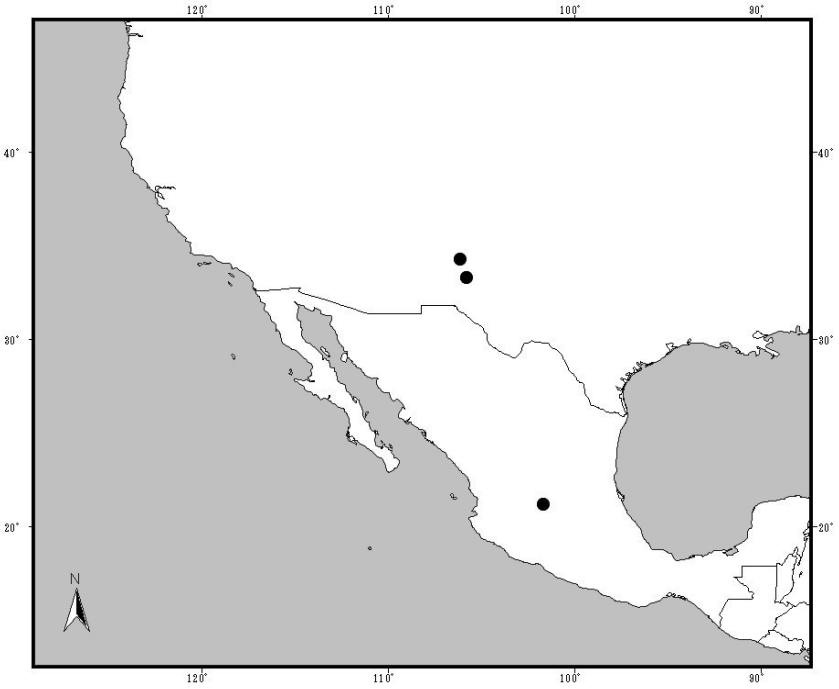


Figure 10. Collecting localities of specimens in collections reviewed of *Hemipenthes chimaera*.

proepimeron and anepisternum, metapleura sometimes with mixed black and white hair; katepisternum not tomentose, black pilose. Prosternum with black hair. Mid coxa with black hair, tomentum on all coxae hairlike, black. Legs brown, tarsi black, femora black pilose and tomentose; bristles black. Halter steam fulvous, knob yellow to white. Scutellum brown, not pilose, and white tomentose; bristles black. Black setulae on basicosta. Cells c, sc, br, and bm entirely infuscated (Fig. 41); cells cup and a_1 entirely infuscated except tip; cells r_1 and dm with basal half infuscated; cell cua_1 with basal third infuscated; cells r_{2+3}, r_5 and m_2, infuscated just at base; color in cell a_1 not reaching hind margin of wing; cell dm infuscated beyond r-m crossvein; r-m crossvein at or slightly behind middle of cell dm; two submarginal cells; cell r_5 not narrowed at wind margin; third section of vein CuA_1 twice as long as two basal sections combined, first section twice as long as r-m crossvein, second section as long as r-m crossvein; cell a_1 slightly wider than cell cup; alula well developed.
Abdomen: Abdominal dorsum black pilose, not dense, whitish pile on segment one; black tomentum overall except a broad crossband of white tomentum on fourth and seventh segments; sides of abdomen with basal half of first segment whitish pilose, rest black pilose. Venter black pilose, with black tomentum. Genitalia black with black hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 76) slightly curved, cap-shaped, apex not swollen, rounded; without a ventral extension; epiphallus in ventral view broad (Fig. 77), lateral margins narrowed at both sides at middle, without spines; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by three times width of ocellar tubercle. Femora with black and white scales.

DISTRIBUTION: MEXICO (Coahuila, Guanajuato, Guerrero, Nuevo León, Sonora), USA (Arizona, New Mexico). Figure 10 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: MEXICO. Coahuila: 41 mi S Saltillo, 7-IX-1962, N. Marston (1♂). Guanajuato: 3 mi Nuevo León, 19-IX-1959, R. H. & E. M. Painter (2♀♀). USA. New Mexico: 8 mi W Mescalero, 11-IX-1962, R. H. & E. M. Painter (1♂ *genitalia*); Gran Quivera, 11-VIII- 1931, R. H. Painter (1♀).

REMARKS: *Hemipenthes chimaera* is distinguished from *H. brigadata* by the black pile on pleura and prosternum. The genitalia of this species is rare by not having a ventral extension in epiphallus, a character only shared with *H. albus*); and the epiphallus being slender in lateral view, like in *H. yaqui*.

8. *Hemipenthes comanche*

Villa (Hemipenthes) comanche Painter *in* Painter & Painter, 1962

Holotype in National Museum of Natural History, Washington, D.C., USA

Placed in genus *Hemipenthes* by Hull (1973).

Figures 11, 42, 78-79

DIAGNOSIS: *Hemipenthes comanche* is distinguished from its congeners by the following combination of external characters: face bluntly projecting; pleura and prosternum black and yellow pilose; color of tomentum on coxae black and yellow; cell a_1 partially infuscated; first, fourth, and fifth abdominal segments with a band of white scales.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, yellowish tomentose. Face brown, bluntly projecting, with black hair and yellowish tomentum. First flagellomere black, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere black, twice as wide as long, with short black hair; third flagellomere black, longer than two basal flagellomeres combined; base subconical, tapering to

styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi brown with black hair. Occiput with short white hair and white scales.
Thorax: Mesonotum anterior margin yellowish pilose, lateral margins white pilose; tomentum on disc entirely yellowish, long, hairlike, not dense; bristles black. Pleura pale yellow pilose with black hair mixed in on proepimeron and anepisternum, tomentum on katepisternum yellow. Prosternum with mixed black and yellowish hair. Mid coxa with black hair, tomentum on all coxae yellow and black. Legs fulvous or brown, femora not pilose, black tomentose; bristles black. Halter steam yellow, knob yellow to white. Scutellum brown, not pilose, white tomentose along posterior margin, a spot of black tomentum in middle at base; bristles black. Black setulae on basicosta. Cells c, sc, br, and bm entirely infuscated (Fig. 42); cell cup entirely infuscated except tip; cells r_1, a_1 and dm with basal half infuscated; cells r_{2+3}, r_5, m_2, and cua_1 infuscated just at base; cell dm infuscated at r-m crossvein; r-m crossvein at or slightly behind middle of cell dm; two submarginal cells; cell r_5 slightly narrowed at wind margin; third section of vein CuA_1 one and a half as long as two basal sections combined, first section twice as long as r-m crossvein, second section half as long as r-m crossvein; cell a_1 one and a half wider than cell cup; alula well developed.
Abdomen: Abdominal dorsum black pilose, white hair on posterior of first segment; a band of white scales on segments first and fourth, black scales on segments two and three, fifth to seventh segments with white scales covering the whole segments, some fulvous scales may be present, tomentum long, shaggy, hair-like; sides of abdomen with first, second and basal half of third segments whitish pilose, rest black pilose. Venter black pilose, black and yellowish tomentose. Genitalia fulvous with yellowish hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 78) slightly curved, not cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 79), lateral margins narrowed at both sides at middle, with scattered spines in the middle and dense spines at apex; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle.

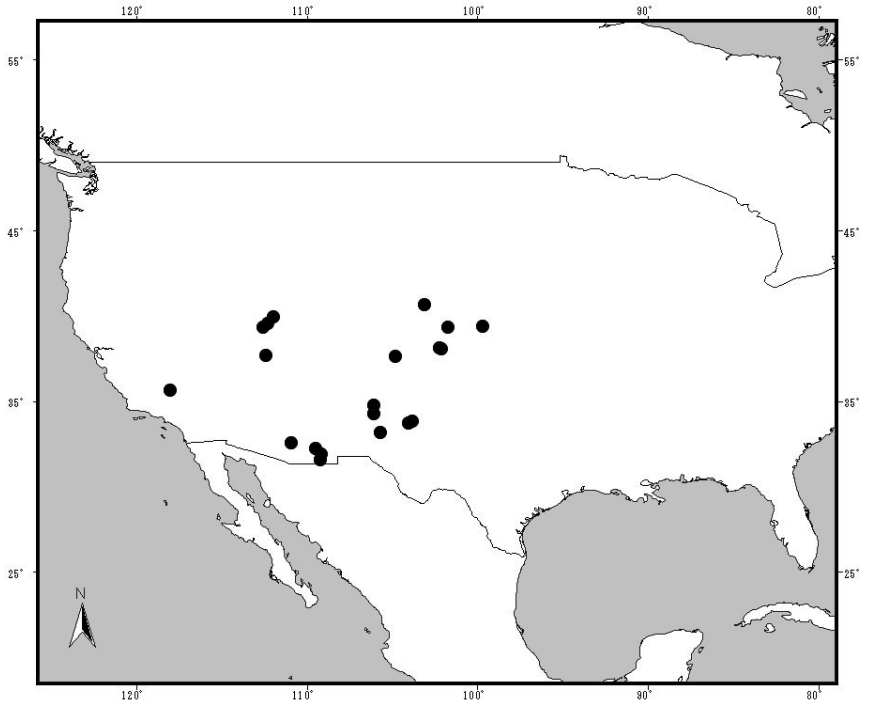


Figure 11. Collecting localities of specimens in collections reviewed of *Hemipenthes comanche*.

DISTRIBUTION: USA (Arizona, California, Colorado, Kansas, Nebraska, Nevada, New Mexico, Utah). Figure 11 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: USA. Colorado: 2 mi W Walzenburg, 24-VII-1965, R. H. & E. M. Painter (2♂♂ *genitalia*). New Mexico: Mc Kinley Co., 24-VIII-1959, N. Marston (1♂ paratype 1♀ paratype); Gran Quivera, 10-VIII-1931, R. H. Painter (1♂ paratype); Utah: 7 mi E Eureka, 1-IX-1965, R. H. & E. M. Painter (1♀).

REMARKS: *Hemipenhtes comanche* is widespread in the South of the USA and probably is also present in the Northern Mexico but this region is under-collected.

9. *Hemipenthes curta*
Anthrax curta Loew, 1869

Holotype in Museum of Comparative Zoology, Cambridge, Massachusetts, USA.

Placed in genus *Villa* subgenus *Hemipenthes* by Painter & Painter (1962); placed in genus *Hemipenthes* by Hull (1973).

Figures 12, 43, 80-81

DIAGNOSIS: *Hemipenthes curta* is distinguished from its congeners by the following combination of external characters: cell a_1 hyaline or infuscated just at base; first abdominal segment with a band of white scales; second to fourth abdominal segments with black scales; fifth abdominal segment with a band of fulvous scales.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, black tomentose. Face brown, rounded, with black hair and white tomentum. First flagellomere brown, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere brown, twice as wide as long, with short black hair above; third flagellomere black, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi brown with yellowish hair. Occiput with short white hair and white scales.
Thorax: Mesonotum anterior margin white or pale yellow pilose; lateral margin entirely white or golden-yellow; tomentum on disc entirely testaceous, yellow on posterior margin near scutellum, long, hairlike, not dense; bristles black. Proepimeron white pilose, black and ferruginous hair mixed in on anepisternum, metapleura with yellow and white hair, tomentum on katepisternum black and ferruginous mixed in. Prosternum with white hair. Mid coxa with ferruginous hair, not tomentose. Legs brown, femora not pilose and black tomentose; bristles black. Halter steam yellow, knob pale yellow. Scutellum brown, not pilose, and white or yellowish tomentose along posterior margin, black tomentum in middle at base; bristles black. Black setulae on basicosta. Cells c, sc, br, and bm entirely infuscated (Fig. 43); cell cup entirely infuscated except tip; cell r_1 with basal half infuscated; cells dm with basal third infuscated; cells r_{2+3}, r_5, and cua_1 infuscated just at base; cell dm infuscated at r-m crossvein; r-m crossvein behind middle of cell dm; two submarginal cells; cell r_5 not narrowed at wind margin; third section of vein CuA_1 one and a half as long as two basal sections combined, first and second sections, each, one and a half as long as r-m crossvein; cell a_1 twice wider than cell cup; alula well developed.
Abdomen: Abdominal dorsum not pilose, some black hair on segments six and seven; black tomentum overall, a band of white scales in first segment, a crossband of yellowish tomentum on fifth segment, not reaching segment center, that on segments sixth and most of seventh mixed black and yellow; sides of fifth to seventh segments whitish tomentose, tomentum broad, dense; sides of abdomen with first and basal half of second segments whitish pilose, black hair on third and fourth segments, rest not pilose. Venter white pilose and whitish tomentose on two basal segments, rest black pilose and ferruginous tomentose. Genitalia black with ferruginous hair. Epandrium in lateral

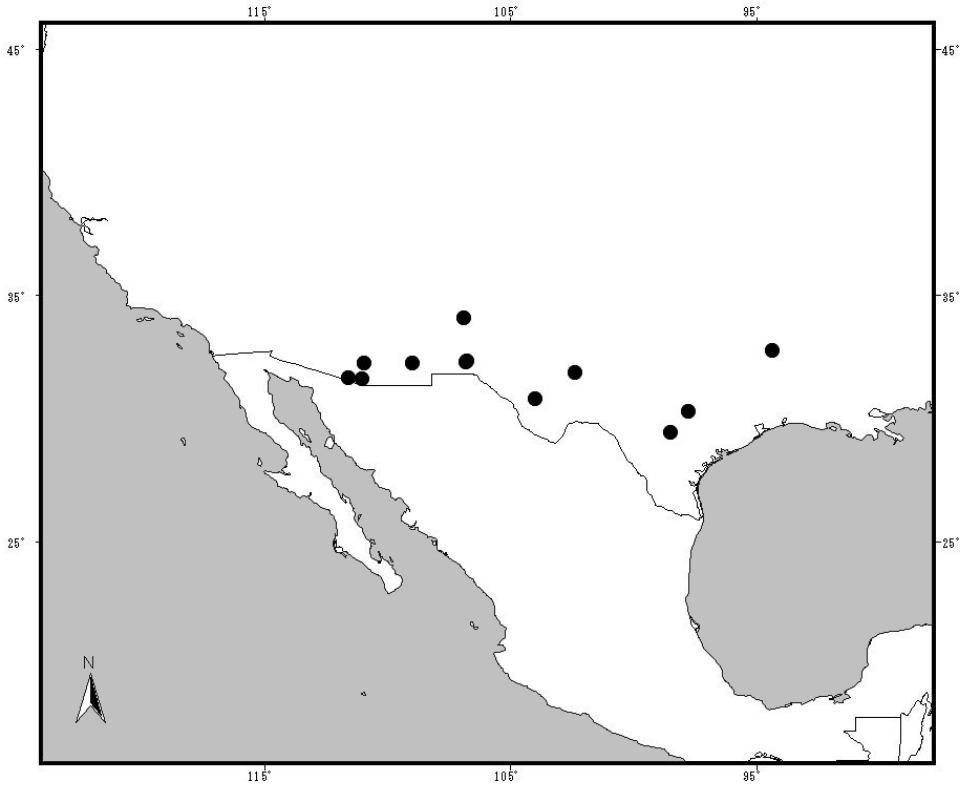


Figure 12. Collecting localities of specimens in collections reviewed of *Hemipenthes curta*.

view, rectangular and narrow, lower margin straight, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 80) slightly curved, not cap-shaped, apex not swollen, rounded; with a ventral extension broad at base with apex rounded, portion of the epiphallus behind ventral extension shorter than aedeagus; epiphallus in ventral view broad (Fig. 81), lateral margins straight, without spines; aedeagus broad at base narrowed at apex, swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle. Front black tomentose, some white scales near antenna. First flagellomere with black hair, white hair on inner margin. Pile on mesonotum lateral margin darker than male. Anepisternum white pilose; tomentum on katepisternum white. Cell dm infuscated beyond r-m crossvein; cell a_1 with basal half infuscated; cell m_2 infuscated just at base.

DISTRIBUTION: MEXICO (Colima, Guerrero, Jalisco, Morelos, Nuevo León, Oaxaca, Sinaloa, Veracruz, Yucatán), USA (Arizona, California, Florida, New Mexico, South Carolina, Texas). Figure 12 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: USA. Arizona: Tubac, 5-VII-1932, R. H. Painter (2♀♀). New Mexico: Steins, 8-VIII-1932, R. H. Painter (1♀). Texas: Odessa, 15-VI-1958, R. H. & E. M. Painter (2♂♂ *genitalia* 1♀); Jefferson Davis Co., 22-VII-1950, R. H. Painter (1♂).

REMARKS: *Hemipenthes curta* is related with *H. celeris*, *H. floridiana*, *H. martinorum*, *H. pima*, *H. pleuralis*, and *H. sagata*, all these species have the same genital structure and similar wing pigmentation, with a smooth color margin, not sinuous as in the other species in the genus. *H. curta* is separated from these species by the lack of color in cell a_1.

This species is distributed in the Nearctic and Neotropical regions, with its most northern limit in California, Arizona, New Mexico and Texas.

10. *Hemipenthes edwardsii*

Anthrax edwardsii Coquillett, 1894b

4 Sintypes in American Museum of Natural History, New York, USA; 1 Sintype in National Museum of Natural History, Washington, D.C., USA.

Placed in genus *Hemipenthes* by Hull (1973).

Figures 13, 44, 82-83

DIAGNOSIS: *Hemipenthes edwardsii* is distinguished from its congeners by the following combination of external characters: tomentum on coxae white; cell a_1 hyaline or infuscated just at base; first abdominal segment with a stripe of white or yellow scales; second, third and fourth abdominal segments with scattered, shinning fulvous and white scales.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, fulvous tomentose. Face brown, rounded, with black hair and fulvous tomentum, denser on inner margin of eyes beneath the antenna. First flagellomere black, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere black, twice as wide as long, with short black hair; third flagellomere black, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae
minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi black with black hair. Occiput with short black hair and shining fulvous scales.
Thorax: Mesonotum anterior margin yellowish pilose; lateral margin entirely yellow pilose; tomentum on disc shining fulvous, forming three longitudinal stripes, more dense near scutellum; bristles black. Pleura black pilose with yellowish hair mixed in on proepimeron and anepisternum, metapleura with yellow hair; tomentum on katepisternum yellow. Prosternum with mixed black and yellowish hair. Mid coxa with black hair, tomentum on all coxae hairlike, yellow. Legs fulvous, femora black pilose and yellowish tomentose; bristles black. Halter steam and knob brown. Scutellum brown, black pilose, shining fulvous and brown tomentose; bristles black. Black setulae on basicosta. Cells c, sc, br, and bm entirely infuscated (Fig. 44); cell r_1 with two basal thirds infuscated; cell cup with basal half infuscated; cell dm with basal third infuscated; cells r_5, r_{2+3}, a_1 and cua_1 infuscated just at base; cell dm infuscated beyond r-m crossvein; r-m crossvein at or slightly behind middle of cell dm; two submarginal cells; cell r_5 slightly narrowed at wind margin; third section of vein CuA_1 twice as long as two basal sections combined, first section twice as long as r-m crossvein, second section as long as r-m crossvein; cell a_1 one and a half wider than cell cup; alula slightly developed.
Abdomen: Abdominal dorsum black pilose, whitish pile on segment one; white, shining fulvous and white-violet tomentum mixed in on segments two to seven, darker toward apex, a crossband of white tomentum on first segment, scales on second to fourth segments not reaching segment center; sides of abdomen with first and basal half of second segments whitish pilose, mixed abundant black with some fulvous hair on rest. Venter black pilose, shining fulvous tomentose. Genitalia black with black and yellowish hair. Epandrium in lateral view, rectangular, lower margin straight, basal corner narrowed neck-like; basistylus narrow, basal half not enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 82) slightly curved, cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 83), lateral margins narrowed at both sides at base and before apex, with scattered spines in the middle and dense spines at apex; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by two and a half width of ocellar tubercle. Tomentum on front and face yellowish. Tomentum on disc yellowish. Tomentum on abdominal dorsum white, fulvous and yellow, not white-violet.

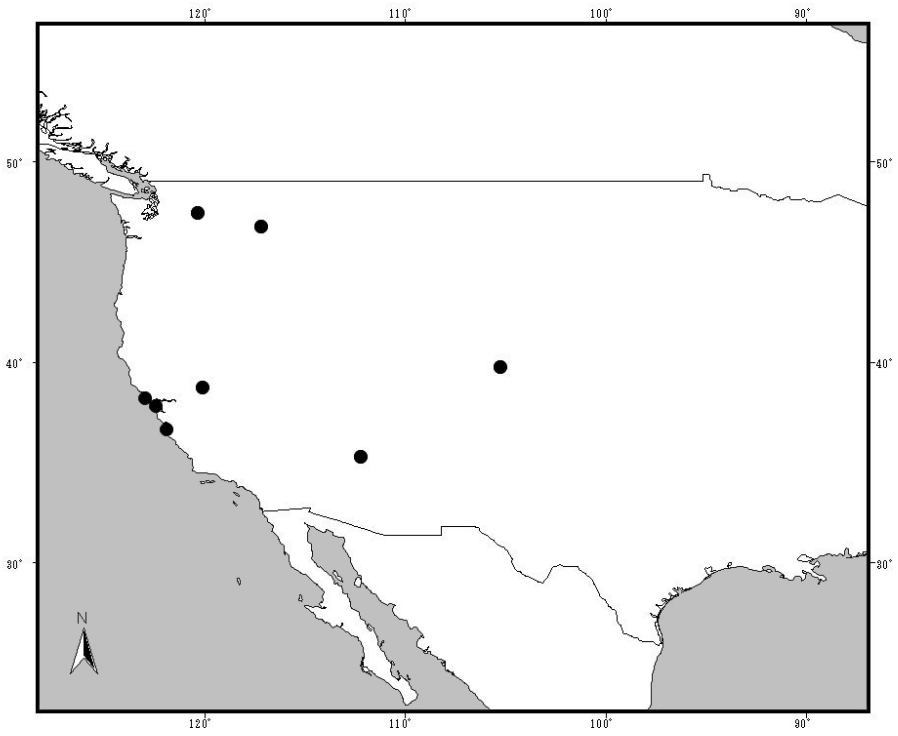


Figure 13. Collecting localities of specimens in collections reviewed of *Hemipenthes edwardsii*

DISTRIBUTION: CANADA (British Columbia), USA (Arizona, California, Colorado, Washington). Figure 13 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: USA. California: San Francisco, 24-VII-1930, R. H. Painter (1♂ *genitalia*); Seaside Monterrey Co., 23-V-1959, D. D. Linsdale (1♀); Pt. Reyes Marin Co., 11-IV-1959, G. I. Stage (1♂); Pt. Reyes Marin Co., 20-IV-1962, J. Poorbaugh (2♂♂).

REMARKS: *Hemipenthes edwardsii* is the only species in the genus with shinning fulvous scales. This species has been collected only in the West of the USA.

11. *Hemipenthes eumenes*

Anthrax eumenes Osten Sacken, 1886b

Lectotype designated by Painter and Painter (1962) in The Natural History Museum, London, UK

Placed in genus *Villa* subgenus *Hemipenthes* by Painter & Painter (1962); placed in genus *Hemipenthes* by Hull (1973).

Figures 14, 45, 84-85

DIAGNOSIS: *Hemipenthes eumenes* is distinguished from its congeners by the following combination of external characters: body length more than 10 mm; prosternum yellow or mixed black and yellow pilose; wings without aureoles; cell r_5 slightly narrowed at wing margin cell a_1 infuscated; cell r_{2+3} with basal half infuscated; cell r_1 not entirely infuscated; sides of first abdominal segment white or pale yellow pilose; first abdominal segment with a band of white scales.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, yellowish tomentose, black scales may be present in middle, tomentum not dense. Face black, rounded, with black hair and yellowish tomentum, a few black scales in middle above. First flagellomere brown, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere black, twice as wide as long, with short black hair; third flagellomere black, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi black with black hair. Occiput with short yellowish hair and yellowish scales.
Thorax: Mesonotum anterior margin yellow pilose; lateral margin white or pale yellow pilose; tomentum on disc entirely yellowish, long, hairlike, not dense; bristles black. Pleura black pilose with yellowish hair mixed in on proepimeron and anepisternum, metapleura with yellow hair, tomentum on katepisternum yellowish. Prosternum with mixed black and yellowish hair. Mid coxa with black hair, tomentum on all coxae hairlike, yellow. Legs fulvous, femora black pilose, yellow tomentose with some black scales; bristles black. Halter steam brownish, knob yellow to white. Scutellum brown, black pilose, and yellowish tomentose along posterior margin, a spot of black tomentum in middle at base; bristles black. Black setulae on basicosta. Cells c, sc, br, and bm entirely infuscated (Fig. 45); cells r_1, a_1 and cup entirely infuscated except tip; cells cua_1, r_5, and dm with basal half infuscated; cell r_{2+3} with basal third infuscated; cell m_2 infuscated just at base; cell dm infuscated beyond r-m crossvein; r-m crossvein at middle of cell dm; two submarginal cells; cell r_5 slightly narrowed at wind margin; third section of vein CuA_1 one and a half as long as two basal sections combined, first and second sections, each, as long as r-m crossvein; cell a_1 slightly wider than cell cup; alula well developed.
Abdomen: Abdominal dorsum mixed black and white pilose on segments one to four, fifth to seventh segments with black hair; black tomentum overall except for a crossband of white tomentum on posterior margin of first segment, some white or pale yellow scales scattered on lateral margin of abdomen, more abundant on sixth and seventh segments; on well preserved specimens it is distinguishable a thin band of pale yellow scales on first, second and third and two spots of pale yellow scales at center of third and fourth segments; sides of abdomen with first, second, and basal half of third segments whitish pilose, rest black pilose. Venter white pilose, whitish tomentose. Genitalia brown with black hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 84) slightly curved, cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 85), lateral margins straight, with scattered spines in the middle and dense spines at apex; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. – Nearly identical to male. Eyes separated by twice width of ocellar tubercle.

DISTRIBUTION: CANADA (Alberta), MEXICO (Sonora), USA (Arizona, California, Colorado, Idaho, Kansas, Massachusetts, Montana, Nebraska, Nevada, New Mexico, Oregon, Utah, Washington, Wyoming, Washington). Figure 14 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: CANADA. Alberta: Cowley, 26-VI-1918, R.N. Chrystal (1♂ *genitalia*); USA: Wyoming: 10 mi SW Landers, 14-VI-1963, R. H. & E. M. Painter (3♂♂, 3♀♀); 12 mi W Landers, 3-VII-1966, R. H. & E. M. Painter (1♂, 1♀).

REMARKS: *Hemipenthes eumenes* has no external or genitalia characters that distinguish it from *H. seminigra*. Both species are similar to *H. catulina* and *H. morio* but can be distinguished from the first by the lack of aureoles in the wings and from the second by having the cell r_5 narrowed at wing margin and the margin epiphallus straight in ventral view, not narrowed before apex as in *H. morio*.

Osten Sacken (1886b) separated *H. eumenes* from *H. seminigra* by the color of legs and the shape of cell r_5, being yellow and not narrowed in *H. eumenes*. Osten Sacken did not examine any

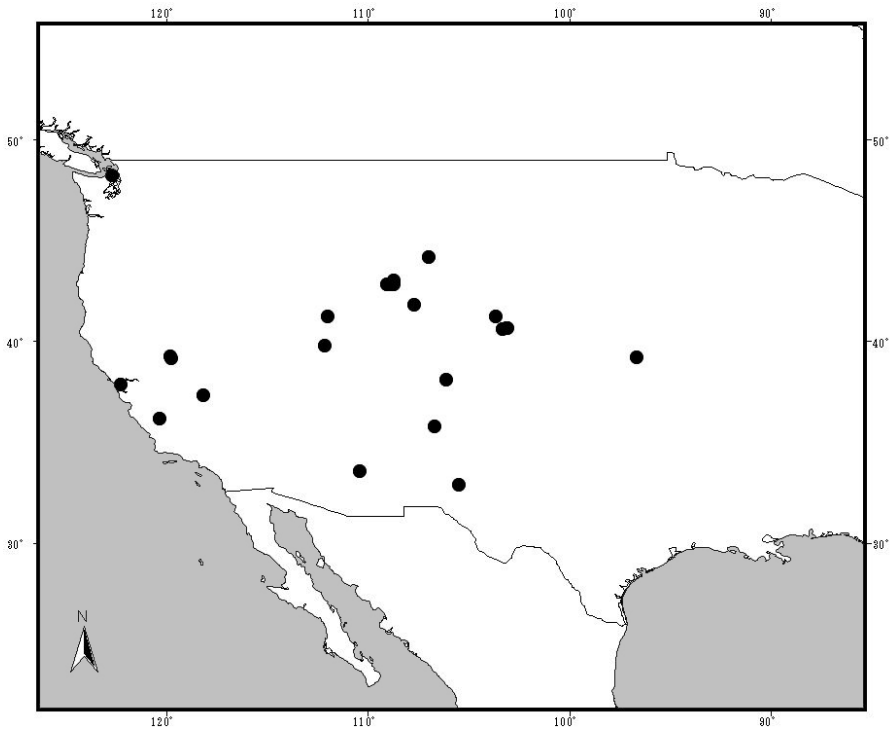


Figure 14. Collecting localities of specimens in collections reviewed of *Hemipenthes eumenes.*

specimen from *H. seminigra*, instead he relied on the original description from Loew (1869) who describe *H. seminigra* as having black legs *with white tomentum* and the cell r_5 narrowed. With respect to *H. eumenes* Osten Sacken (1886b) comments: "This is certainly not *A. morioides* Say [*H. catulina*], Compl. Wr. ii p. 58 (Missouri), because Say distinctly describes the aureoles on the cross-veins, nor can I recognize *Hemipenthes seminigra* Loew, Centur. vii no. 44 (Saskatchewan), in the present species; the description on the abdomen and of the legs ("pedes nigri" &c.) does not agree, nor the 'cellula posteriori prima anguste aperta;' the first posterior cell of *A. eumenes*, although coartate after its expansion at the end of the discal cell, has a rather broad opening; Loew's species is smaller." Probably Loew (1869) remarked the shape of cell r_5 in *H. seminigra*, which certainly is narrowed, to distinguish it from *H. morio*, the exact shape of the cell is not clearly described by Loew and can not be used to distinct *H. eumenes* from *H. seminigra*.

The specimens examined for this revision of *H. eumenes* and *H. seminigra* all have fulvous legs with mixed yellow and black tomentum, the cell r_5 narrowed at wing margin and the genitalia are identical. It is possible that *H. seminigra* and *H. eumenes* are synonyms but is necessary to examine the types of both species to probe it. *H. eumenes* is widespread thorough the West of the USA.

12. *Hemipenthes floridiana*

Anthrax floridiana Macquart, 1850

Holotype in The Natural History Museum, London, UK.

Placed in genus *Villa* subgenus *Hemipenthes* by Painter & Painter (1962); placed in genus *Hemipenthes* by Hull (1973).

Figures 15, 46, 86-87

DIAGNOSIS: *Hemipenthes floridiana* is distinguished from its congeners by the following combination of external characters: cell a_1 entirely infuscated; pleura white pilose; sides of first

abdominal segment yellow pilose; fifth abdominal segment with white scales at sides in male and yellow and white scales at sides in female.

DESCRIPTION: Male. *Head*: Eyes separated by the width of ocellar tubercle. Front black pilose, black tomentose, white scales may be present in middle, near antenna. Face cinereous, rounded, with black hair and white tomentum. First flagellomere black, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere black, twice as wide as long, without hair; third flagellomere brown, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi brown with black and yellowish hair. Occiput with short white hair and white scales.
Thorax: Mesonotum anterior margin pale yellow pilose; lateral margin entirely black pilose; tomentum on disc entirely black; bristles black. Pleura yellow pilose with black hair mixed in on anepisternum, katepisternum not tomentose, black pilose. Prosternum with white hair. Mid coxa with black hair, coxae not tomentose. Legs brown, femora black pilose black tomentose on anterior surface and white tomentose on posterior surface; bristles black. Halter steam and knob yellow. Scutellum black, not pilose, and black tomentose; bristles black. Black setulae on basicosta. Cells c, sc, br, bm, cup, and a_1 entirely infuscated (Fig. 46); cell r_1 and dm with two basal thirds infuscated; cell cua_1 with basal half infuscated; cells r_{2+3}, r_5, and m_2 infuscated just at base; cell dm infuscated beyond r-m crossvein; r-m crossvein at or slightly beyond middle of cell dm; two submarginal cells; cell r_5 not narrowed at wind margin; third section of vein CuA_1 slightly longer than two basal sections combined, first section one and a half as long as than r-m crossvein, second section twice as long as r-m crossvein; cell a_1 twice wider than cell cup; alula well developed.
Abdomen: Abdominal dorsum black pilose, not dense, yellow pile on segments one; black tomentum overall, white tomentum on sides of fifth to seventh segments, some white scales scattered at segment center; sides of abdomen with first and basal half of second segments whitish pilose, black hair on third, fourth and apical half of second segments, rest not pilose. Venter black and white pilose, whitish tomentose stripes of black tomentum. Genitalia brown with black hair. Genitalia brown with black hair. Epandrium in lateral view, triangular, lower margin straight, basal corner narrowed; basistylus broad, basal half enlarged; distylus large, as long as half the width of the basistylus, hooked apically; epiphallus in lateral view narrow (Fig. 86) slightly curved, not cap-shaped, apex not swollen, rounded; with a ventral extension broad at base with apex rounded, portion of the epiphallus behind ventral extension shorter than aedeagus; epiphallus in ventral view broad (Fig. 87), lateral margins straight, without spines; aedeagus broad at base narrowed at apex, swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by one and a half width of ocellar tubercle. Mesonotum anterior margin white, lateral margin golden-yellow pilose. Tomentum on disc black with a triangle of yellow scales near scutellum. Pleura yellow pilose on proepimeron, anepisternum and metapleura. Tomentum on katepisternum white and pale yellow. Tomentum on coxae black. Scutellum yellowish tomentose along posterior margin, black tomentum on base. Abdominal dorsum with black tomentum overall, yellowish and whitish tomentum on segments five to seven, not reaching segment center.

DISTRIBUTION: USA (Florida, Georgia). Figure 15 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: USA. Florida: Torreya State Park Liberty Co., H. V. Weems jr. (2♀♀); Matecumbe, 27-VI-1933, M. Bates (1♀). Georgia: Vidalia, 2-VIII-1937, W. Fattig (1♂ *genitalia*); Lee Co. Leesburg, 12-VIII-1932, L K. Gloyd (1♀).

REMARKS: *Hemipenthes floridiana* is closely related with *H. celeris, H. pima*, and *H. sagata*. It is distinguished from *H. celeris* and *H. pima* by the pigmentation of cells a_1 and cup, which are entirely infuscated, and from *H. sagata* by the yellow pile in the sides of the first abdominal segment (male) and by the yellow scales on the sides of the fifth to seventh abdominal segments (female). The

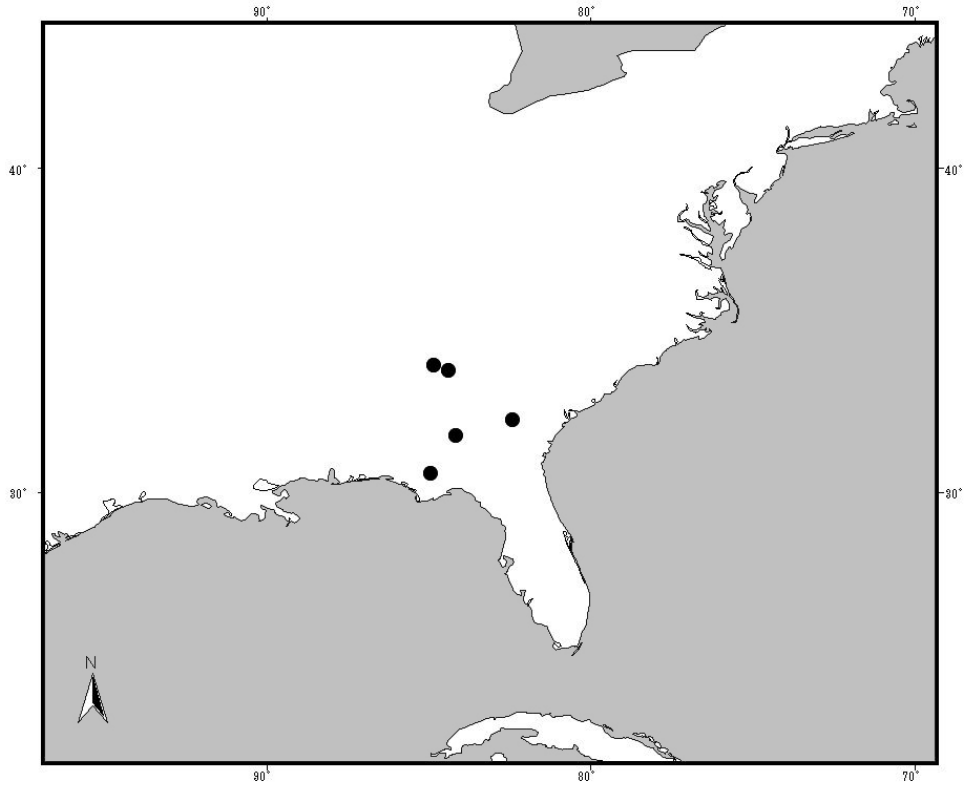


Figure 15. Collecting localities of specimens in collections reviewed of *Hemipenthes floridiana.*

genitalia of these species are identical. As suggested by Painter and Painter (1962) *H. floridiana* may be a synonym or a subspecies of *H. celeris* (see *H. celeris* description and remarks for further discussion). The distribution of H. floridiana is limited to Florida and Georgia, and may be an isolated population of *H. celeris*.

13. *Hemipenthes incisiva*

Anthrax incisa Walker, 1852

Synonyms: *Villa incisiva* Painter *in* Painter & Painter (1962)

2 Sintypes in The Natural History Museum, London, UK.

Placed in genus *Villa* subgenus *Hemipenthes* by Painter & Painter (1962); placed in genus *Hemipenthes* by Hull (1973).

Figures 16, 47, 88-89

DIAGNOSIS: *Hemipenthes incisiva* is distinguished from its congeners by the following combination of external characters: face bluntly projecting; prosternum pilosity black; pleura mixed black and yellow pilose; sides of first abdominal segment black pilose; fifth abdominal segment with black scales; white tomentum on dorsum and sides of sixth and seventh segments.

DESCRIPTION: Male. – *Head*: Eyes separated by twice width of ocellar tubercle. Front black pilose, fulvous tomentose. Face fulvous, bluntly projecting, with black hair and fulvous tomentum. First flagellomere fulvous, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere brown, twice as wide as long, with short black hair above, bare below; third flagellomere brown, longer than two basal flagellomeres combined; base subconical,

tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi brown with black hair. Occiput with short yellowish hair and yellowish scales.

Thorax: Mesonotum anterior margin yellowish pilose; lateral margin entirely black pilose; tomentum on disc whitish and black; bristles black. Pleura black pilose with yellowish hair mixed in on proepimeron and anepisternum, metapleura with white and black hair, katepisternum not tomentose, black pilose. Prosternum with black hair. Mid coxa with mixed black and ferruginous hair, coxae not tomentose. Legs fulvous, femora black pilose and tomentose; bristles black. Halter steam and knob yellow. Scutellum brown, black pilose, and black tomentose; bristles black. Black setulae on basicosta. Cells c, br, bm and a_1 entirely infuscated (Fig. 47); cells sc and cup entirely infuscated except tip; cell $r_1$with basal half infuscated; cells dm and cua_1 with basal third infuscated; cells r_{2+3}, r_5 and m_2 infuscated just at base; cell dm infuscated at r-m crossvein; r-m crossvein at or slightly behind middle of cell dm; two submarginal cells; cell r_5 not narrowed at wing margin; third section of vein CuA_1 twice as long as two basal sections combined, first section twice as long as r-m crossvein, second section short, about half as long as r-m crossvein; cell a_1 slightly wider than cell cup; alula slightly developed.

Abdomen: Abdominal dorsum black pilose; black tomentum overall, white tomentum on dorsum and sides of sixth and seventh segments; sides of abdomen with first to fifth segments with black hair, rest not pilose. Venter black pilose, black tomentose with white scales on seventh segment. Genitalia cinereous, fulvous at apex, with white hair. Epandrium in lateral view, rectangular, lower apical margin prolonged posteriorly, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged, apex prolonged ventrally; distylus large, as long as half the width of the basistylus, hooked apically; epiphallus in lateral view broad (Fig. 88) slightly curved, cap-shaped, apex not swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension as long as aedeagus; epiphallus in ventral view broad (Fig. 89), lateral margins straight, with scattered spines all along; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

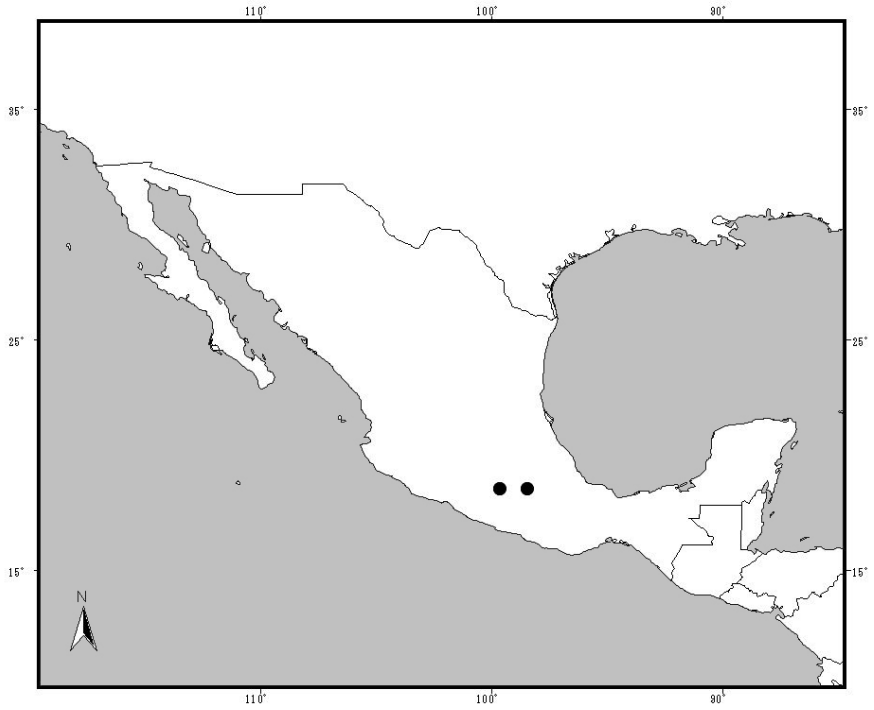


Figure 16. Collecting localities of specimens in collections reviewed of *Hemipenthes incisiva.*

Female. Not reviewed.

DISTRIBUTION: MEXICO (Guerrero, Puebla). Figure 16 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: MEXICO: Guerrero: Taxco, 10-X-1936, H. D. Thomas (1♂ *genitalia*).

REMARKS: Only one male from *Hemipenthes incisiva* were examined. The genitalia has a broad ephipallus in lateral view, a characteristic only shared with *H. albus*.

This may be one of the less common species within the genus. *H. incisiva* has a disjunt distribution being present in Puebla and Guerrero in Mexico. I can not say if this disjunt distribution is real or an effect of the rarity or difficulty to collect this species. Only with intensive collection in the center of Mexico the distribution of this species will become known.

14. *Hemipenthes inops*

Anthrax inops Coquillett, 1887

Holotype in National Museum of Natural History, Washington, D.C., USA.

Placed in genus *Hemipenthes* by Hull (1973).

Figures 17, 48, 90-91

DIAGNOSIS: *Hemipenthes inops* is distinguished from its congeners by the following combination of external characters: prosternum pilosity black; coxae with black tomentum; hind femur and tibia with abundant black, broad, flattened scales; dm and a_1 cells hyaline or infuscated just at base; r_1 cell hyaline; bm cell hyaline at center; postalar bristles black; first, second and fourth abdominal segments with a band of white scales; third and fifth abdominal segment with a band of fulvous scales.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, yellowish tomentose, tomentum not dense. Face brown, rounded, with black hair and yellowish tomentum. First flagellomere black, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere black, twice as wide as long, with short black hair; third flagellomere black, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi black with black hair. Occiput with short yellowish hair and white scales.
Thorax: Mesonotum anterior margin yellowish pilose; lateral margin pale yellow or white pilose; tomentum on disc entirely yellowish, long, hairlike; bristles black. Pleura pale yellow pilose on proepimeron, anepisternum, and metapleura, tomentum on katepisternum black-violet. Prosternum with black hair. Mid coxa with black hair, tomentum on all coxae hairlike, black. Legs black, femora black pilose and tomentose, broad scales on hind femur and tibia; bristles black. Halter steam brownish to yellowish, knob yellow. Scutellum brown, black pilose and yellowish tomentose; bristles black. Black setulae on basicosta. Wing mostly hyaline, faint pigment on cells c, sc, br; cell r_1 with basal half infuscated (Fig. 48); cells cua_1 and dm infuscated just at base; cell dm infuscated behind r-m crossvein; r-m crossvein at basal third of cell dm; two submarginal cells; cell r_5 slightly narrowed at wind margin; vein CuA_1 just with two sections, contact of cell dm and cua_1 puntiform; cell a_1 slightly wider than cell cup; alula well developed.
Abdomen: Abdominal dorsum black pilose, whitish pile on segment one; abdominal dorsum with a crossband of white tomentum on apical half of first segment, segments two and three with black tomentum on apical half and fulvous and white scales mixed in on basal half, broad crossband of white tomentum on fourth and seventh segments, that on five and six fulvous; some black scales on sides of third to seventh segments; sides of abdomen with first, second and basal half of third segments whitish pilose, rest black pilose. Venter black pilose, black tomentose with white scales mixed in. Genitalia brown with black hair. Epandrium in lateral view, rectangular, lower apical margin prolonged posteriorly, lower margin clearly concave in middle, basal corner narrowed;

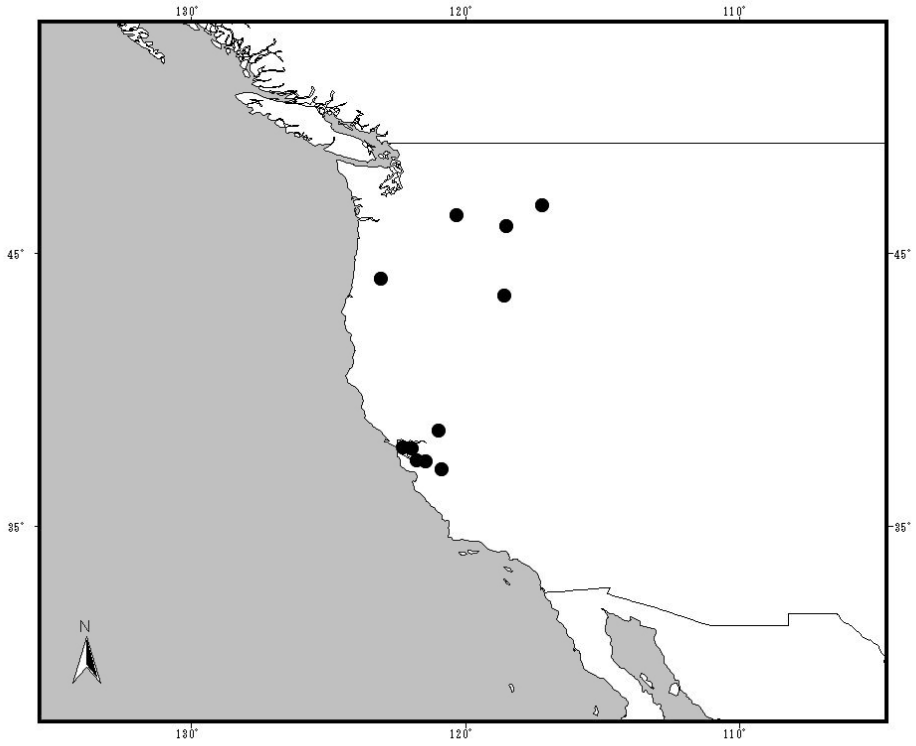


Figure 17. Collecting localities of specimens in collections reviewed of *Hemipenthes inops.*

basistylus broad, basal half enlarged, apex swollen; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 90) clearly curved, not cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension as long as aedeagus; epiphallus in ventral view broad (Fig. 91), lateral margins straight, with dense spines at apex; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle.

DISTRIBUTION: USA (Arizona, California, Colorado, Oregon, Utah, Washington). Figure 17 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: USA. California: Forest Home, 23-VIII-1944, A. L. Melander (2♂♂ *genitalia*); Sacramento Co. (1♂); Calaveras Co. (1♂); Sonoma Co. (1♂); Berkeley, 11-VI-1933 (1♀); Arroyo Mocho 20 mi S Livermore, 5-VII-1958 (1♀).

REMARKS: *Hemipenthes inops* may be one of the most distinct species within the genus. There are two external characteristics that are unique to this species: (1) the shape of the CuA_1 vein, only with two sections; and (2) the wing pigmentation, mostly hyaline. The genitalia is also different to any other, the epiphallus is short and broad in ventral view, but with a ventral extension. The broad black scales in the hind tibiae in *H. inops* and *H. lepidota* may be homologous structures. The distribution of this species is limited to the East of the USA.

15. *Hemipenthes jaennickeana*

Isopenthes jaennickeana Osten Sacken, 1886a

Lectotype designated by Painter and Painter (1962) in The Natural History Museum, London, UK.

Considered as a subspecies of *Villa (Hemipenthes) sinuosa* by Painter & Painter (1962); considered as a subspecies of *Hemipenthes sinuosa* by Hull (1973); considered as a species by Evenhuis & Greathead (1999).

Figures 18, 49, 92-93

DIAGNOSIS: *Hemipenthes jaennickeana* is distinguished from its congeners by the following combination of external characters: three submarginal cells; cell r_1 entirely infuscated except for a subapical hyaline area; cell r_{2+3} cell with basal half infuscated with a spot at tip; r_5 cell infuscated at half.

DESCRIPTIONS: Male. *Head*: Eyes separated by one and a half width of ocellar tubercle. Front black pilose, yellowish tomentose. Face brown, rounded, with black hair and yellowish tomentum. First flagellomere fulvous, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere fulvous, twice as wide as long, short black hair on the base; third flagellomere brown, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi cinereous with black hair. Occiput with short black and yellow hair and yellowish scales.
Thorax: Mesonotum anterior margin pale yellow pilose; lateral margin black and whitish pilose; tomentum on disc entirely yellowish, long, hairlike, not dense; bristles black. Pleura black and yellow pilose; tomentum on katepisternum pale yellow. Prosternum yellowish pilose with some black hair present. Mid coxa with black hair, tomentum on all coxae hairlike, pale yellow. Legs fulvous, tarsi black, femora black pilose, yellow tomentose, some black scales may be present; bristles black. Halter steam brown, knob yellow. Scutellum brown, not pilose, and yellow tomentose, a spot of black tomentum in middle at base; bristles black. Black setulae on basicosta. Cells c, sc, br, bm and $r_1$entirely infuscated, cell r_1 with a hyaline spot near tip (Fig. 49); cells a_1 and cup entirely infuscated except tip; cells r_5, cua_1 and dm with two basal thirds infuscated; cells r_{2+3} with basal half infuscated, with a spot at tip; cells m_2 infuscated just at base; cell dm infuscated beyond r-m crossvein; r-m crossvein behind middle of cell dm; three submarginal cells; cell r_5 slightly narrowed at wind margin; third section of vein CuA_1 one and a third as long as two basal sections combined, first and second sections, each, as long as r-m crossvein; cell a_1 slightly wider then cell cup; alula poorly developed.
Abdomen: Abdominal dorsum white pilose on first to fourth segments, black hair on fifth to seventh segments; black tomentum overall; some pale yellow scales scattered on sides of abdomen; sides of abdomen with first and basal half of second segments yellowish or white pilose, mixed abundant black with some yellowish hair on rest. Venter white pilose, whitish tomentose. Genitalia brown with black hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 92) slightly curved, cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 93), lateral margins narrowed at both sides at middle, with scattered spines all along; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. – Nearly identical to male. Eyes separated by twice width of ocellar tubercle.

DISTRIBUTION: MEXICO (Aguascalientes, Chiapas, Coahuila, Durango, Guanajuato, Guerrero, Hidalgo, Mexico, Morelos, Nuevo Leon, Oaxaca, Puebla, Sonora), USA (Alabama, Arkansas, Arizona, California, Colorado, Florida, Idaho, Illinois, Kansas, Massachusetts, Michigan, Montana, Nebraska, Nevada, New Jersey, New Mexico, New York, Ohio, Oregon, Texas, Utah, Wyoming). Figure 18 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: MEXICO. Morelos: Quilamula, 24-IV-2004 (1♀), 25-V-2004 (1♀), 10-VIII-2003 (1♂), 24-II-2004 (1♂), O. Ávalos & M. López. USA. Colorado: Jackson Co., 11-VIII-1959, N. Marston (1♂). Florida: Lake Worth, 11-XI-1925 (1♀). Kansas: Riley Co., 24-V-1964, N.

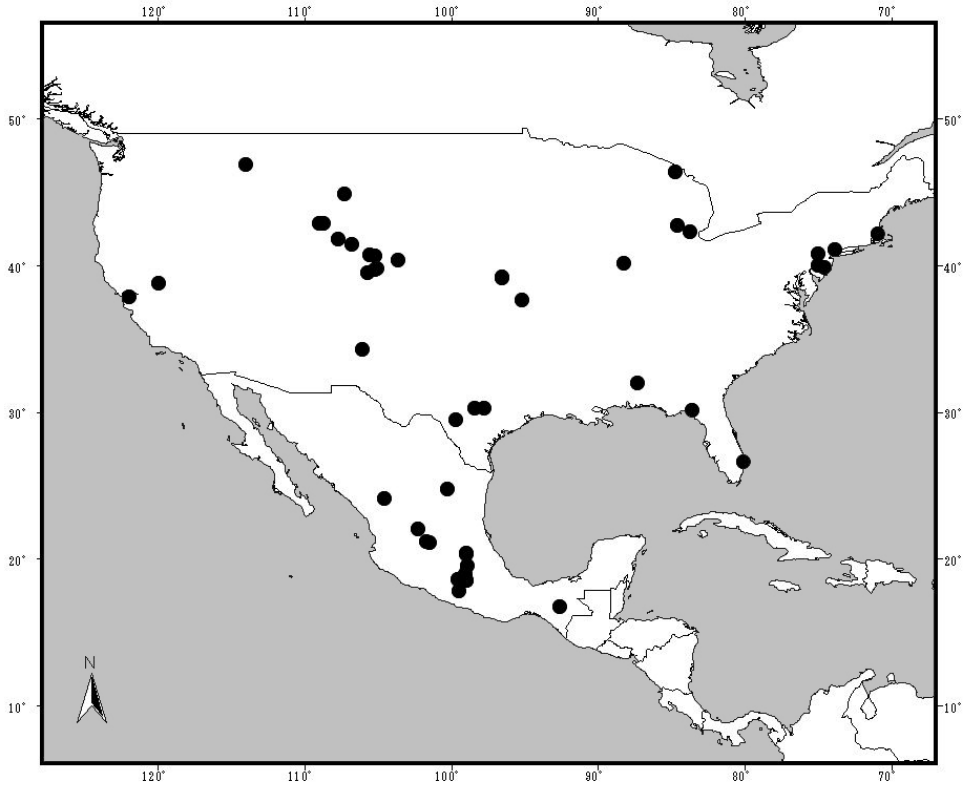


Figure 18. Collecting localities of specimens in collections reviewed of *Hemipenthes jaennickeana.*

Marston (1♂ *genitalia*); Riley Co., 30-V-1949, James B. King (1♀); Manhattan, 19-VI-1959, N. Marston (1♂); Manhattan Riley Co., 19-VI-1962, N. Marston (1♂).

REMARKS: *Hemipenthes jaennickeana* is similar to *H. sinuosa* and *H. blanchardiana* but can be distinguished from the first by the presence of three submarginal cells and by the second by the pigmentation of the r_5 cell, infuscated just at half. Osten Sacken (1889) placed *H. jaennickeana* and *H. blanchardiana* under the genus *Isopenthes* separating them from the rest of the species by having three submarginal cells. There are other South American species of *Hemipenthes* that have three submarginal cells although the most common within the genus is to have only two. The genitalia of *H. jaennickeana* has a wider epiphallus in lateral view than *H. sinuosa* and *H. blanchardiana.*

H. jaennickena has a widespread distribution in North America, as does the related species *H. sinuosa*.

16. *Hemipenthes lepidota*

Anthrax lepidota Osten Sacken, 1886b

Type (lost) in The Natural History Museum, London, UK.

Placed in genus *Villa* subgenus *Hemipenthes* by Painter & Painter (1962); placed in genus *Hemipenthes* by Hull (1973).

Figures 19, 50, 94-95

DIAGNOSIS: *Hemipenthes lepidota* is distinguished from its congeners by the following combination of external characters: prosternum pilosity black; coxae with black tomentum; hind femur and tibia with abundant black, broad, flattened scales; dm and a_1 cells hyaline or infuscated just

at base; bm cell completely infuscated; postalar bristles black; first, and fourth abdominal segments with a band of white scales; fifth abdominal segment with a band of fulvous scales.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, whitish tomentose. Face black, rounded, with black hair and white tomentum. First flagellomere black, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere black above, twice as wide as long, with black hair; third flagellomere black, as long as two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi black with black hair. Occiput with short white hair and white scales.
Thorax: Mesonotum anterior margin yellowish pilose; lateral margin entirely white tomentose, without pile; tomentum on disc entirely white-violet, long, hairlike, denser near scutellum; bristles black. Pleura black pilose, metapleura with white and black hair mixed in, tomentum on katepisternum black. Prosternum with black hair. Mid coxa with black hair, tomentum on all coxae black. Legs black, femora black pilose, with shinny black scales, hind femur and tibia with broad black scales; tibiae with black bristles. Halter steam brown, knob yellow. Scutellum brown, not pilose, and white-violet tomentose on posterior margin, black tomentum on basal half; bristles black. Black setulae on basicosta. Cells c, br, and bm entirely infuscated (Fig. 50); cell sc entirely infuscated except tip; cells r_1 and cup with basal half infuscated; cells r_{2+3}, r_5 and dm infuscated just at base; cell dm infuscated behind r-m crossvein; r-m crossvein at basal third of cell dm; two submarginal cells; cell r_5 slightly narrowed at wind margin; third section of vein CuA_1 twice as long as two basal sections combined, second section short, about half as long as r-m crossvein; cell a_1 twice wider than cell cup; alula well developed.
Abdomen: Abdominal dorsum not pilose, just whitish pile on apical half of segment one; black tomentum overall, except a broad crossband of white tomentum on fourth segment, that on segment five and most of six mixed black and fulvous scales scattered, a band of white and yellowish tomentum on apical half of first segment, all seventh segment covered with white scales; sides of third, fifth, and sixth segments black tomentose, fourth and seventh segments whitish tomentose,

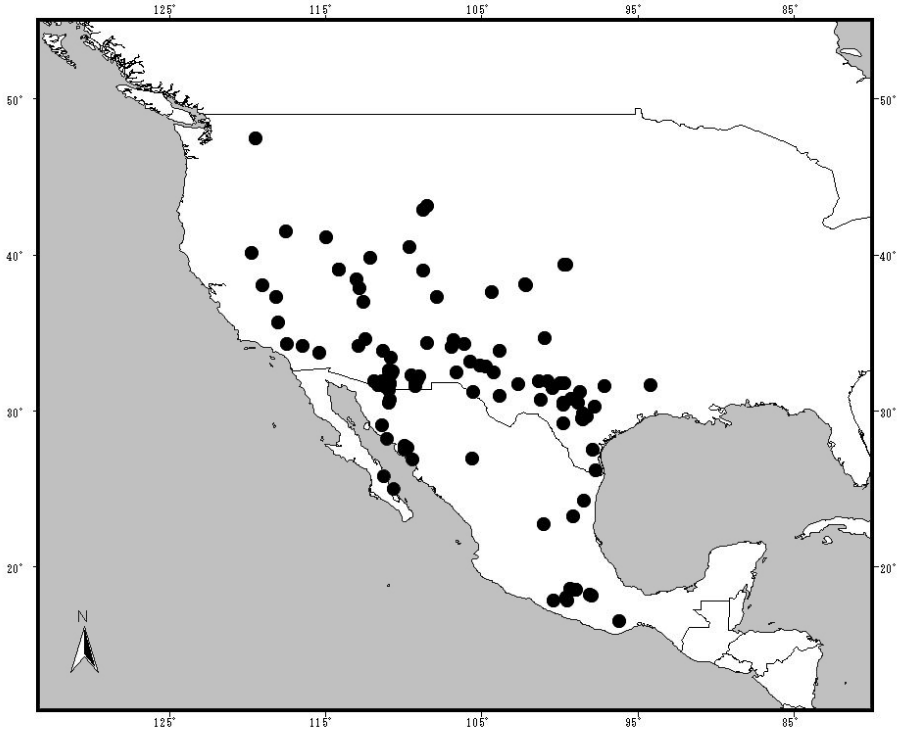


Figure 19. Collecting localities of specimens in collections reviewed of *Hemipenthes lepidota.*

tomentum long, shaggy, hair-like; sides of abdomen with first and apical half of second segment whitish pilose, black hair on rest. Venter black pilose, black tomentose. Genitalia black with black hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 94) clearly curved, cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 95), lateral margins narrowed at both sides at middle, with scattered spines all along; aedeagus slender not broad at base, not swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle.

DISTRIBUTION: CANADA (Alberta), MEXICO (Baja California Norte, Baja California Sur, Chihuahua, Guerrero, Morelos, Oaxaca, Puebla, San Luis Potosí, Sonora, Tamaulipas), USA (Arizona, California, Colorado, Idaho, Kansas, Louisiana, Nevada, New Mexico, Texas, Utah, Washington, Wyoming). Figure 19 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: MEXICO. Chihuahua: 5 mi E Porral, 5-IX-1962, R. H & E. M. Painter (1♀). Morelos: Quilamula, 9-VIII-2003 (2♂♂), 15-VI-2003 (2♂), 7-XII-2003 (1♀), 28-VI-2003 (1♀), O. Ávalos & M. López. USA. Arizona: Tubac, 5-VIII-1932, R. H. Painter (1♂ *genitalia*); 25 mi SE Sells, 1-VIII-1932, R. H. Painter (1♂); 10 mi NW Nogales, 27-IV-1961, R.H. & E. M. Painter (1♀). Nevada: Douglas Co., 15-VIII-1958, R. H. y E. M. Painter (1♀); Paradise Valley, 11-VIII-1958, R. H. & E. M. Painter (1♀); Lehman Creek, 21-VIII-1957, R. H. & E. M. Painter (1♀). Texas: Metz, 12-VIII-1930, Winburn & R. H. Painter (1♀).

REMARKS: *Hemipenthes lepidota* has similar wing pigmentation to that of *H. albus*, *H. scylla*, *H. translucens*, and *H. webberi*. The cell a_1 is hyaline, the margin of color sinuous and the color limited to the base and anterior margin of the wing. *H. lepidota* is apparently related with *H. inops*. The broad black scales in the hind tibiae in *H. inops* and *H. lepidota* may be homologous structures. The genitalia of this species has a medial extension in the epiphallus longer and slender than those in other species, a unique characteristic of *H. lepidota*.

H. lepidota has been reported to have territorial behavior (Ávalos-Hernández, 2007). This species has a widespread distribution along all Mexico and the West half of the USA.

17. *Hemipenthes martinorum*

Villa (Hemipenthes) martinorum Painter *in* Painter & Painter, 1962

Holotype in National Museum of Natural History, Washington, D.C., USA.

Placed in genus *Hemipenthes* by Evenhuis & Greathead (1999).

Figures 20, 51, 96-97

DIAGNOSIS: *Hemipenthes martinorum* is distinguished from its congeners by the following combination of external characters: mesonotum anterior margin, pleura and sides of first abdominal segment black pilose; fifth abdominal segment with abundant white scales on the side or covering the whole segment.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, black tomentose, white scales may be present in middle near antenna. Face black, rounded, with black hair and whitish tomentum. First flagellomere black, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere black, twice as wide as long, with short black hair above, bare below; third flagellomere black, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute,

terminal. Proboscis short, not projecting beyond oral margin. Palpi black with black hair. Occiput with short white and black hair and white scales.

Thorax: Mesonotum anterior and lateral margin black pilose; tomentum on disc entirely black; bristles black. Pleura black pilose, katepisternum not tomentose, black pilose. Prosternum with black hair. Mid coxa with black hair, coxae not tomentose. Legs black, femora without pile and black tomentose; bristles black. Halter steam brown, knob fulvous. Scutellum black, black pilose, and black tomentose; bristles black. Black setulae on basicosta. Cells c, sc, br and bm entirely infuscated (Fig. 51); cells a_1 and cup entirely infuscated except tip; cells r_1 with basal half infuscated; cells cua_1 and dm with basal third infuscated; cell r_{2+3}, infuscated just at base; cell dm infuscated behind r-m crossvein; r-m crossvein at or slightly behind middle of cell dm; two submarginal cells; cell r_5 not narrowed at wing margin; third section of vein CuA_1 one and a half as long as two basal sections combined, first and second sections, each, twice as long as r-m crossvein; cell a_1 twice wider than cell cup; alula well developed.

Abdomen: Abdominal dorsum black pilose; black tomentum on first to fourth segments; sides of fifth to seventh segments whitish tomentose, scales not reaching segment center; sides of abdomen black pilose. Venter black pilose, black tomentose. Genitalia black with black hair. Epandrium in lateral view, rectangular, lower apical margin prolonged posteriorly, lower margin concave in middle, basal corner broadly blunt; basistylus broad, basal half enlarged; distylus large, as long as half the width of the basistylus; epiphallus in lateral view narrow (Fig. 96) slightly curved, not cap-shaped, apex not swollen, rounded; with a ventral extension broad at base with apex rounded, portion of the epiphallus behind ventral extension shorter than aedeagus; epiphallus in ventral view broad (Fig. 97), lateral margins narrowed at both sides at middle, without spines; aedeagus broad at base narrowed at apex, swollen dorsally; gonopore terminal.

Female. Not revised.

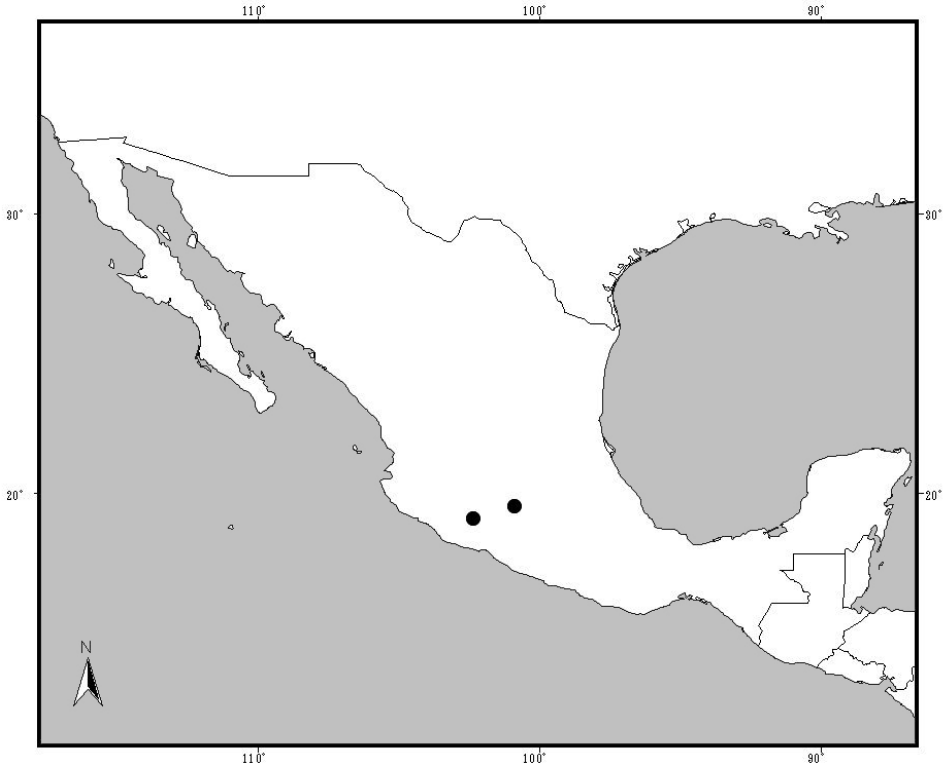


Figure 20. Collecting localities of specimens in collections reviewed of *Hemipenthes martinorum.*

DISTRIBUTION: MEXICO (Guerrero, Michoacán, Quintana Roo). Figure 20 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: MEXICO. Michoacán: 2 mi SE Tzitzio, 29-VI-1962, N. Marston (1♂ *genitalia*); 10 mi S Apatzingán, 2-IX-1960, Chas H. Martin (1♂ paratype).

REMARKS: Externally *Hemipenthes martinorum* is similar to *H. wilcoxi* but can be distinguished by the white scales on the fifth and seventh abdominal segments and the smooth color margin in wing. The smooth color margin and the identical shape of the genitalia relates *H. martinorum* with *H. celeris, H. curta, H. floridiana, H. pima, H. pleuralis* and *H. sagata*.

This species is only known from Michoacán and just two specimens are in the revised collections.

18. *Hemipenthes morio*

Musca morio Linnaeus, 1758

Synonyms: *Nemotelus septimus* Schaeffer, 1768; *Musca bicolora* Sulzer, 1776; *Anthrax semiatra* Hoffmansegg *in* Wiedemann, 1818; *Anthrax moroides* Say, 1823.

Lectotype designated by Evehuis and Greathead (1999) in Linnaean Society, London, UK.

Placed in genus *Villa* subgenus *Hemipenthes* by Painter & Painter (1962); placed in genus *Hemipenthes* by Hull (1973).

Figures 21, 52, 98-99

DIAGNOSIS: *Hemipenthes morio* is distinguished from its congeners by the following combination of external characters: body length more than 10 mm; pleura and sides of first abdominal segment white or pale yellow pilose; wings without aureoles; cell a_1 and cup entirely infuscated; cell r_1 not entirely infuscated; r2+3 cell with basal half infuscated; dm cell infuscated at least on its basal third; cell r_5 not narrowed at wing margin; first abdominal segment with bands of white scales.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, yellowish tomentose. Face black, rounded, with black hair and yellowish tomentum. First flagellomere black, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere black, twice as wide as long, with short black hair; third flagellomere black, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi black with black hair. Occiput with short black and yellow hair and yellowish scales.
Abdomen: Mesonotum anterior margin yellowish pilose; lateral margin entirely yellowish pilose; tomentum on disc entirely yellowish, long, hairlike, not dense; bristles black. Pleura black pilose with yellowish hair mixed in on proepimeron and anepisternum, metapleura yellow pilose; tomentum on katepisternum pale yellow. Prosternum with black and yellow hair. Mid coxa with black hair, tomentum on all coxae hairlike, yellowish. Legs brown, tarsi fulvous, femora black pilose, white hair on mid femur, black and yellow tomentose; bristles black. Halter steam brownish, knob yellow. Scutellum brown, black pilose, and yellowish tomentose along posterior margin, a spot of black tomentum in middle at base; bristles mixed yellowish and black. Black setulae on basicosta. Cells c, sc, br, bm, cup and a_1 entirely infuscated (Fig. 52); cells r_1 with two basal thirds infuscated; cells cua_1 and dm with basal half infuscated; cells r_{2+3}, r_5 and m_2 with basal third infuscated; cell dm infuscated beyond r-m crossvein; r-m crossvein at or slightly beyond middle of cell dm; two submarginal cells; cell r_5 not narrowed at wind margin; third section of vein CuA_1 one and a third as long as two basal sections combined, first section one and a half as long as r-m crossvein, second as long as r-m crossvein; cell a_1 as wide as cell cup; alula slightly developed.

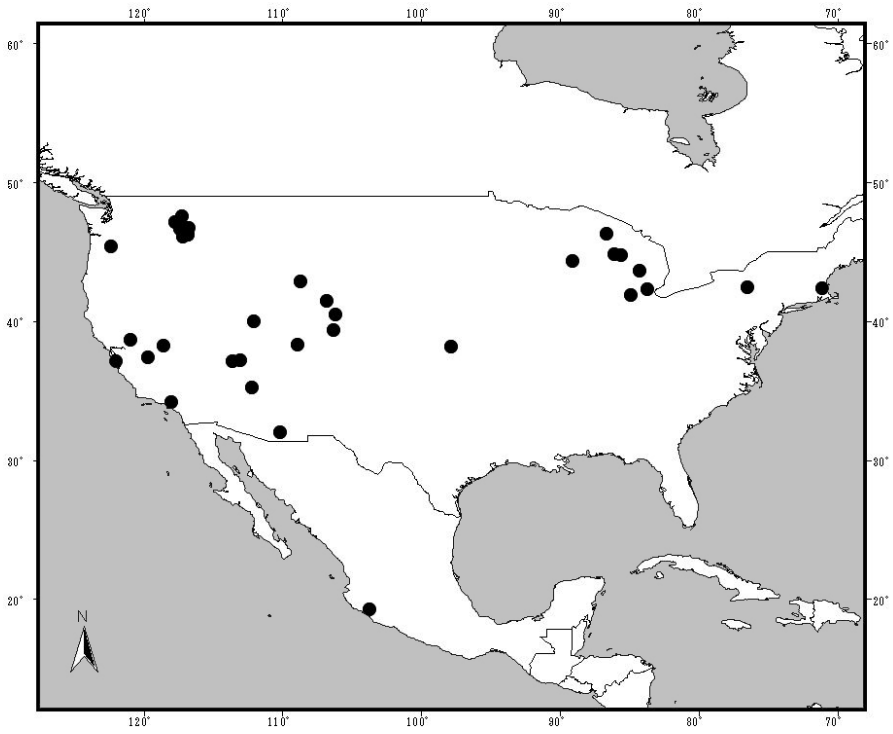


Figure 21. Collecting localities of specimens in collections reviewed of *Hemipenthes morio*.

Abdomen: Abdominal dorsum white pilose, black hair on segments five to seven; black tomentum overall except a crossband of white tomentum on apical half of first segment, scattered whitish and yellowish scales on sides; sides of abdomen with first, second and basal half of third segments whitish pilose, rest black pilose. Venter white pilose on segments one to four, rest black pilose, whitish tomentose. Genitalia brown with yellowish hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 98) slightly curved, not cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad

DISTRIBUTION: CANADA (British Columbia), USA (Arizona, California, Colorado, Idaho, Illinois, Indiana, Iowa, Kansas, Maine, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, Nevada, New Mexico, New York, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Utah, Washington, Wisconsin, Wyoming). Figure 21 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: CANADA. Quebec: Mt. St. Hilaire, June, G. Chagnon (1♂ *genitalia*). USA: Arizona: State Mtn. Loop Rd. 20 mi NW Flagstaff Coconino Co., 18-VI-1964, Franciemont & Poole (1♀). Idaho: Craters of the Moon Nat. Mon., 19-VI-1965 (1♀). Utah: Dividend, VII-1911, Tom Spalding (1♂). Washington: Fields Spring St. Pk. 9-VI-1965, Roger D. Akre (2♀♀). GERMANY. (1♀ 1♀). HUNGARY. (1♀). FRANCE. (1♀).

REMARKS: *Hemipenthes morio* is similar to *H. catulina*, *H. eumenes*, and *H. seminigra*. Can be distinguished from *H. catulina* by the lack of aureoles in the wings. The European specimens of *H. morio* can be distinguished from *H. seminigra* and *H. eumenes* by having the cell r_5 not narrowed at wing margin and the margin epiphallus narrowed before apex in ventral view. But the specimens identified as *H. morio* from North America are identical to those from *H. seminigra* and *H. eumenes* even in its genital characters.

H. morio has been considered to be Holartic in distribution but the evidence shown here indicates that *H. morio* is in fact Palearctic; and the specimens determined as *H. morio* in North America are really specimens from *H. seminigra*.

19. *Hemipenthes pima*

Villa (Hemipenthes) pima Painter *in* Painter & Painter, 1962

Holotype in National Museum of Natural History, Washington, D.C., USA.

Placed in genus *Hemipenthes* by Hull (1973).

Figures 22, 53, 100-101

DIAGNOSIS: *Hemipenthes pima* is distinguished from its congeners by the following combination of external characters: body length more than 10 mm; pleura, prosternum, and sides of first abdominal segment white pilose; cells cup and a_1 not reaching wing margin; r_1 cell infuscated at half; fifth abdominal segment with abundant white scales on the side or covering the whole segment; fifth and sixth segments with yellow scales (female); fifth and sixth segments with a stripe of white scales covering the whole segment (male).

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, black tomentose, white scales present near antenna. Face cinereous, rounded, with black hair and white tomentum. First flagellomere black, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere black, twice as wide as long, with short black hair above, bare below; third flagellomere black, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi black with black hair. Occiput with short yellowish or white hair and white scales.
Thorax: Mesonotum anterior margin white or yellow pilose; lateral margin entirely black pilose; tomentum on disc entirely black, long, hairlike, not dense; bristles black. Proepimeron white pilose, anepisternum with black hair, and metapleura yellow pilose, katepisternum not tomentose, black pilose. Prosternum with white hair. Mid coxa with black hair, coxae without tomentum. Legs brown, femora black pilose black tomentose on anterior surface and white tomentose on posterior surface; bristles black. Halter steam and knob yellow. Scutellum black, not pilose, and black tomentose; bristles black. Black setulae on basicosta. Cells c, br, and bm entirely infuscated (Fig. 53); cell sc entirely infuscated except tip; cells a_1 and cup with two basal thirds infuscated; cells r_1 and dm with basal half infuscated; cells r_5, cua_1 and r_{2+3} infuscated just at base; color in cell a_1 not reaching hind margin of wing; cell dm infuscated at r-m crossvein; r-m crossvein at or slightly behind middle of cell dm; two submarginal cells; cell r_5 not narrowed at wind margin; third section of vein CuA_1 one and a third as long as two basal sections combined, first and second sections, each, twice as long as r-m crossvein; cell a_1 twice wider than cell cup; alula well developed.
Abdomen: Abdominal dorsum black pilose, yellowish or whitish pile on segment one; black tomentum overall, white scales on sides of fifth to seventh segments, some white scales scattered at segment center; sides of abdomen with first and basal half of second segments whitish pilose, black hair on third, fourth and apical half of second segment, rest not pilose. Venter white pilose on first to third segments, rest black pilose, with stripes of white and black scales. Genitalia brown with black hair. Epandrium in lateral view, triangular, lower margin straight, basal corner narrowed; basistylus broad, basal half enlarged; distylus large, as long as half the width of the basistylus, hooked apically; epiphallus in lateral view narrow (Fig. 100) slightly curved, not cap-shaped, apex not swollen, rounded; with a ventral extension broad at base with apex rounded, portion of the epiphallus behind ventral extension shorter than aedeagus; epiphallus in ventral view broad (Fig. 101), lateral margins straight, without spines; aedeagus broad at base narrowed at apex, swollen dorsally; gonopore terminal.

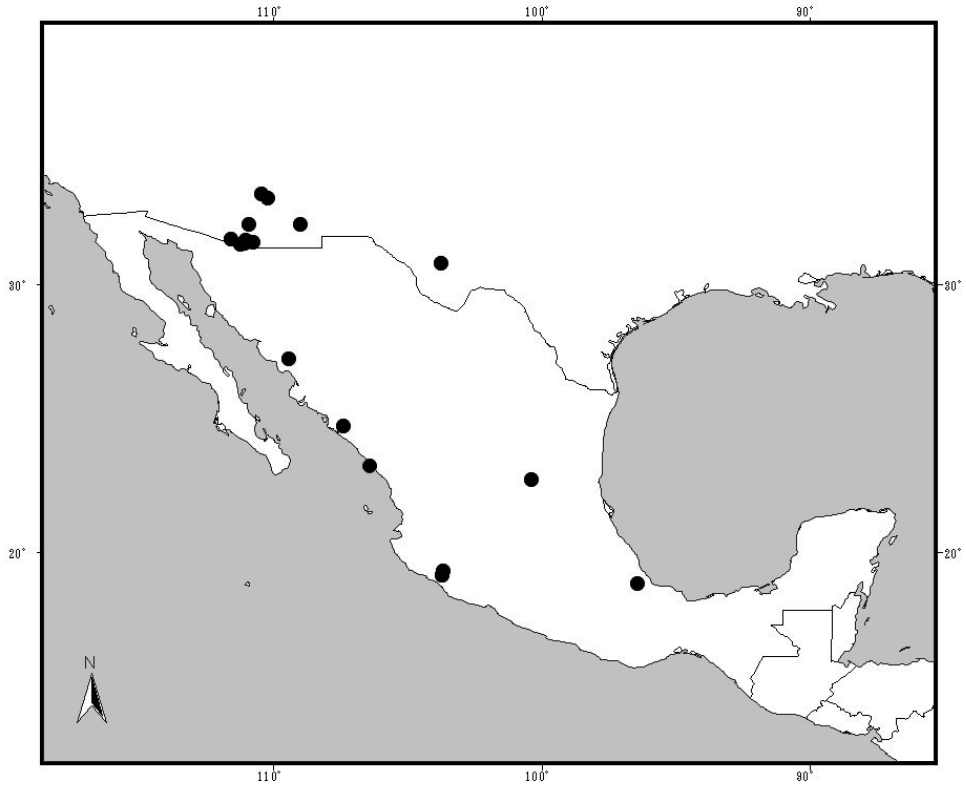


Figure 22. Collecting localities of specimens in collections reviewed of *Hemipenthes pima.*

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle. Mesonotum lateral margin yellowish pilose, tomentum on disc black, with a triangle of yellow scales near scutellum. Proepimeron and anepisternum white pilose, metapleura yellow pilose; katepisternum white tomentose. Tomentum in coxae white. Scutellum yellow tomentose along posterior margin, black tomentum on base. Fifth to seventh abdominal segments with least abundant white scales than male, seventh segment without white scales on segment center.

DISTRIBUTION: MEXICO (Colima, Morelos, San Luis Potosi, Sinaloa, Sonora, Veracruz), USA (Arizona, New Mexico, Texas). Figure 22 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: MEXICO. Colima: 5 mi S Colima, 27-VII-1962, R. H. & E. M. Painter (2♀♀). San Luis Potosí: El Salto, 27-VII-1962, R. H. y E. M. Painter (1♀). USA: Arizona: Tucson, 9-VIII-1930, R. H. Painter (1♂ paratype *genitalia*); Patagonia St. Cruz Co., 24-VII-1958, C.W. O'Brien (1♂); 6 mi N Pearce, 6-VIII-1955, G. Butler & Z. Noon (1♂ paratype); San Carlos Lake, August, D. K. Duncan (1♀ paratype). NICARAGUA. 24 mi NE Managua, 13-VIII-1967, R. H. & E. M. Painter (1♂).

REMARKS: *Hemipenthes pima* is closely related with *H. celeris, H. floridiana,* and *H. sagata*. It is distinguished from *H. floridiana* and *H. sagata* by the pigmentation of cells a_1 and cup, which have the tip or more hyaline, and from *H. celeris* by the body size, being larger than 10 mm. Painter and Painter (1962) described *H. pima* and distinguish it from other species by the pigmentation on cell a_1, half or more hyaline, a character also present in *H. celeris*. About *H. pima*, Painter and Painter (1962) comment: "There is considerable variation in the amount of the anal angle that is hyaline. Sometimes this hyaline part is reduced to a narrow margin along the posterior border." I used the pigmentation on cell a_1 and body size to distinguish between *H. pima* from *H. sagata* and *H. celeris*, but a revision of

the types and a complete geographical sample is needed to determine if they are one species with great variation. *H pima* is distributed in most of Mexico and has it most northern distribution in New Mexico.

20. *Hemipenthes pleuralis*

Anthrax pleuralis Williston, 1901

Holotype in The Natural History Museum, London, UK.

Placed in genus *Villa* subgenus *Hemipenthes* by Painter & Painter (1962); placed in genus *Hemipenthes* by Hull (1973).

Figures 23, 54, 102-103

DIAGNOSIS: *Hemipenthes pleuralis* is distinguished from its congeners by the following combination of external characters: cell r_1, r_{2+3}, dm, and a_1 entirely infuscated or just hyaline at tip; pleura and sides of first abdominal segment white or yellow pilose; fifth abdominal segment with a band of white scales covering the whole segment.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, black tomentose. Face cinereous, rounded, with black hair and white tomentum. First flagellomere black, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere black, twice as wide as long, with short black hair above, bare below; third flagellomere black, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi black with black hair. Occiput with short yellowish hair and white scales.
Thorax: Mesonotum anterior margin yellowish pilose; lateral margin entirely black pilose; tomentum on disc black, yellow near scutellum; bristles black. Pleura yellow pilose on proepimeron and metapleura, anepisternum with black hair, katepisternum not tomentose, black pilose. Prosternum with white hair. Mid coxa with black hair, coxae without tomentum. Legs brown, tarsi black, femora black pilose black tomentose on anterior surface and white tomentose on posterior surface; bristles black. Halter steam and knob yellow. Scutellum brown, not pilose, black tomentose; bristles black.

Black setulae on basicosta. Cells c, sc, br, bm, and r_1 entirely infuscated (Fig. 54); cells r_{2+3}, dm, a_1, and cup entirely infuscated except tip; cells r_5 and cua_1 with basal half infuscated; cells m_2 and r_4 infuscated just at base; cell dm infuscated beyond r-m crossvein; r-m crossvein at or slightly behind middle of cell dm; two submarginal cells; cell r_5 slightly narrowed at wind margin; third section of vein CuA_1 one and a third as long as two basal sections combined, first section twice as long as r-m crossvein, second section as long as r-m crossvein; cell a_1 twice wider than cell cup; alula well developed.
Abdomen: Abdominal dorsum black pilose, yellowish pile on segment one; black tomentum overall, white scales on fifth to seventh segments covering the whole segment; sides of abdomen with first and basal half of second segments yellowish pilose, black hair on third, fourth and apical half of second segments, rest not pilose. Venter white pilose on first to third segments, rest black pilose, with stripes of white and black tomentum. Genitalia brown with black hair. Epandrium in lateral view, triangular, lower margin straight, basal corner narrowed; basistylus broad, basal half enlarged; distylus large, as long as half the width of the basistylus, hooked apically; epiphallus in lateral view narrow (Fig. 102) slightly curved, not cap-shaped, apex not swollen, rounded; with a ventral extension broad at base with apex rounded, portion of the epiphallus behind ventral extension shorter than aedeagus; epiphallus in ventral view broad (Fig. 103), lateral margins straight, without spines; aedeagus broad at base narrowed at apex, swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle. Mesonotum lateral margin yellow pilose. Anepisternum with white hair. Tomentum on katepisternum white. Tomentum on coxae white. Scutellum black tomentose, yellow scales along posterior margin. Cell r_5 not narrowed at wing margin. Abdominal dorsum with a crossband of yellowish tomentum on apical

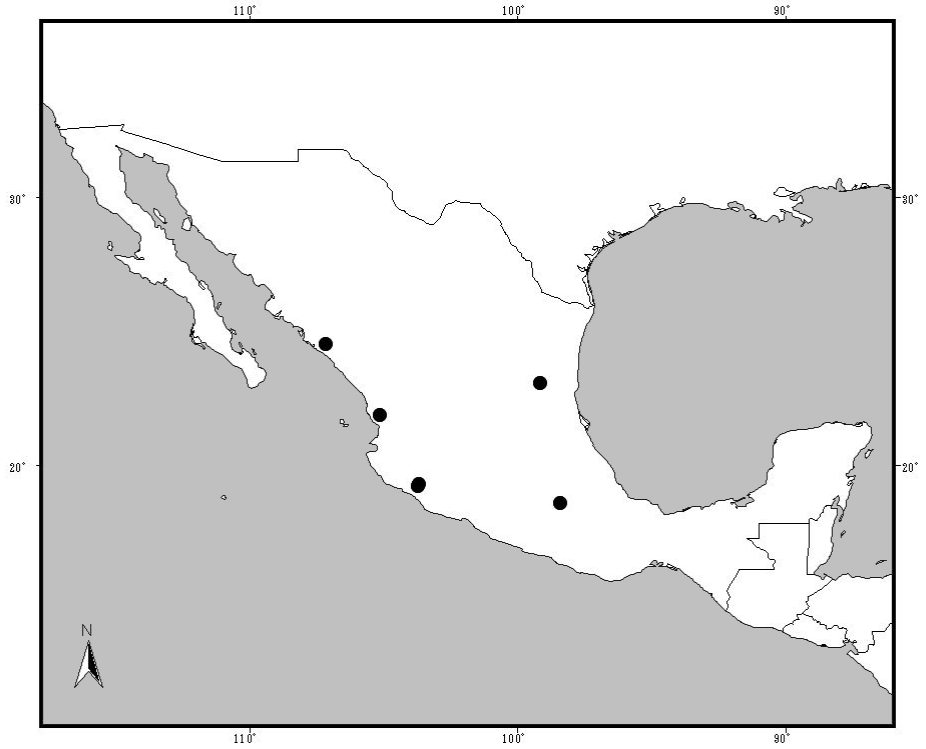


Figure 23. Collecting localities of specimens in collections reviewed of *Hemipenthes pleuralis.*

half of first segment, fifth to seventh abdominal segments with yellow and white scales on sides, not reaching segment center.

DISTRIBUTION: MEXICO (Chiapas, Colima, Guerrero, Morelos, Nayarit, Puebla, Sinaloa, Tamaulipas). Figure 23 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: MEXICO. Colima: 5 mi E Colima Hy 110 km 212, 27-VIII-1962, C. H. Martin (1 ♂ *genitalia*); 1 mi S Colima, 25-VIII-1962 (3♂♂). Tamaulipas: Gomez Farías y Vic., 20-24-VI-1965 Cornell Univ. Mexico Field Party (3♀♀).

REMARKS: *Hemipenthes pleuralis* is related with *H. celeris, H. curta, H. floridiana, H. martinorum, H. pima,* and *H. sagata*, all these species have the same genital structure and similar wing pigmentation, with a smooth color margin, not sinuous as other species in the genus. *H. pleuralis* is distinguished from these species by the pigmentation on cells r_1, r_{2+3}, dm, and a_1 which are entirely infuscated or just hyaline at tip.

As mentioned *H. celeris, H. curta, H. floridiana, H. martinorum, H. pima,* and *H. sagata* are related with *H. pleuralis.* But *H. pleuralis* is the only species of this group that is entirely Nearctic, being present only in Mexico, although *H. pleuralis* is similar to the South America species *H. galathea* which is distributed in Costa Rica. Externally *H. pleuralis* and *H. galathea* are almost identical and may be synonyms, but genitalia and type revisions of both species are necessary to clarify the relationship.

21. *Hemipenthes pullata*

Anthrax pullata Coquillett, 1894a

Holotype in National Museum of Natural History, Washington, D.C., USA.

Placed in genus *Hemipenthes* by Hull (1973).

Figures 24, 55, 104-105

DIAGNOSIS: *Hemipenthes pullata* is distinguished from its congeners by the wing entirely infuscated.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, yellowish tomentose. Face brown, rounded, with black hair and yellowish tomentum. First flagellomere fulvous, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere brown, twice as wide as long, with short black hair above, bare below; third flagellomere brown, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi cinereous with black hair. Occiput with short yellowish hair and pale yellow scales.
Thorax: Mesonotum anterior and lateral margins yellowish pilose; tomentum on disc entirely yellowish, long, hairlike, not dense; bristles black. Pleura yellow pilose with black hair mixed in on proepimeron and anepisternum, metapleura with yellow hair, tomentum on katepisternum pale yellow. Prosternum with yellowish hair. Mid coxa with mixed black and yellowish hair, tomentum on all coxae hairlike, pale yellow. Legs fulvous, tarsi black, femora black pilose and yellowish tomentose, black scales may be present on inner surface; bristles black. Halter steam brown, knob yellow. Scutellum brown, black pilose, and yellowish tomentose, a spot of black tomentum in middle at base; bristles black. Black setulae on basicosta. Wing entirely infuscated (Fig. 55); r-m crossvein at or slightly behind middle of cell dm; two submarginal cells; cell r_5 slightly narrowed at wing margin; third section of vein CuA_1 one and a third as long as two basal sections combined, first section as long as r-m crossvein, second section one and a half as long as r-m crossvein; cell a_1 as wide as cell cup; alula poorly developed.
Abdomen: Abdominal dorsum black pilose, whitish pile on segment one; black tomentum overall

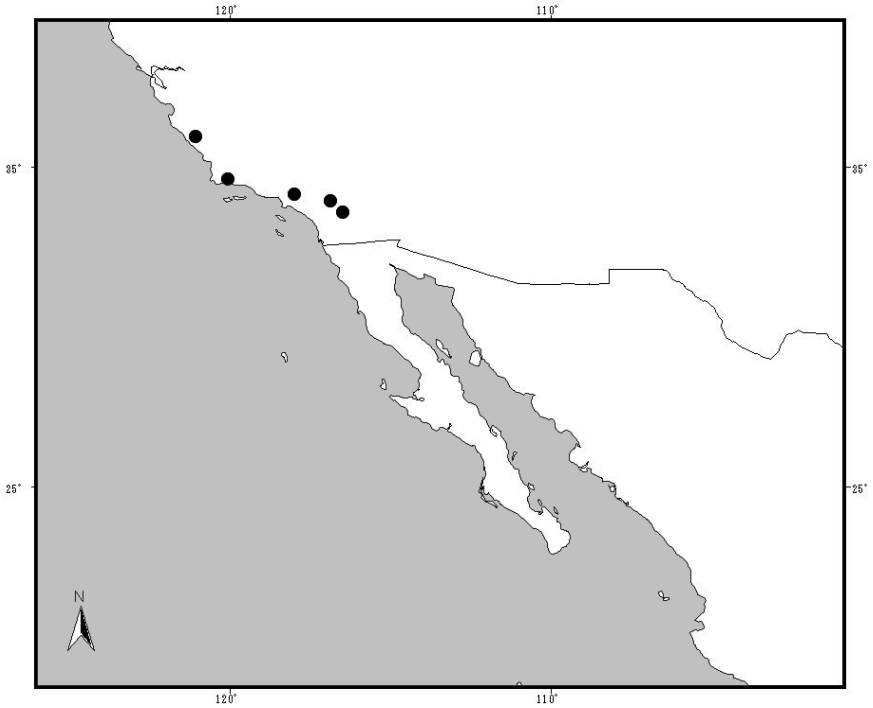


Figure 24. Collecting localities of specimens in collections reviewed of *Hemipenthes pullata.*

except, some yellowish scales on apical half of sixth and seventh segments; sides of abdomen with first and basal half of second segments whitish pilose, rest yellowish pilose. Venter yellowish pilose, whitish tomentose. Genitalia brown with black hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 104) slightly curved, cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 105), lateral margins not narrowed, with scattered spines all along; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle.

DISTRIBUTION: USA (Arizona, California). Figure 24 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: USA. California: Lockwood, 24-VII-1935, Jack Beamer (1♂ *genitalia*); Ribbonwood San Jacinto Mts., 20-V-1939, B. Brookman (1♂); Vandevanter Flat San Jacinto Mts, 11-VI-1939, E. S. Ross (1♀); Santa Ynez Mts S. Bar. Co., 24-V-1959, T. T. Wong (1♂).

REMARKS: *Hemipenthes pullata* has the whole wing pigmented, a unique characteristic within the genus. The rounded shape of the face and the genitalia structures place *H. pullata* within *Hemipenthes*. This species is founded only in California and Arizona.

22. *Hemipenthes sagata*

Anthrax sagata Loew, 1869
Synonym: *Anthrax orbitalis* Williston, 1901.

Lectotype designated by Evenhuis (1982) in Museum of Comparative Zoology, Cambridge, Massachusetts, USA.

Placed in genus *Villa* subgenus *Hemipenthes* by Painter & Painter (1962); placed in genus *Hemipenthes* by Hull (1973).

Figures 25, 56, 106-107

DIAGNOSIS: *Hemipenthes sagata* is distinguished from its congeners by the following combination of external characters: cells cup and a_1 entirely infuscated; cell r_1 infuscated at half; pleura and sides of first abdominal segment white pilose; fifth abdominal segment with abundant white scales on segment sides.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, black tomentose. Face cinereous, rounded, with black hair and white tomentum. First flagellomere black, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere black, twice as wide as long, with short black hair above, bare below; third flagellomere black, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi black or brown with yellow hair. Occiput with short yellow hair and white scales.
Thorax: Mesonotum anterior margin pale yellow or white pilose; lateral margin entirely black pilose; tomentum on disc entirely black; bristles black. Pleura white pilose on proepimeron and metapleura, anepisternum with black hair, katepisternum not tomentose, black pilose. Prosternum with white hair. Mid coxa with black hair, coxae without tomentum. Legs black or brown, femora black pilose black tomentose on anterior surface and white tomentose on posterior surface; bristles black. Halter steam and knob yellow. Scutellum black, black pilose and black tomentose; bristles black. Black setulae on basicosta. Cells c, sc, br, and bm entirely infuscated (Fig. 56); cells cup and a_1 entirely infuscated

except tip; cells r_1 and dm with basal half infuscated; cell cua_1 with basal third infuscated; cells r_{2+3}, r_5 and m_2 infuscated just at base; cell dm infuscated at or behind r-m crossvein; r-m crossvein at or slightly behind middle of cell dm; two submarginal cells; cell r_5 not narrowed at wing margin; third section of vein CuA_1 one and a half as long as two basal sections combined, second section short, about half as long as r-m crossvein; cell a_1 twice wider than cell cup; alula well developed.
Abdomen: Abdominal dorsum black pilose; black tomentum overall, white tomentum on fifth to seventh segments, not covering the whole segment, segment center entirely black tomentose or with just a few white scales scattered; sides of abdomen with first segment pale yellow pilose, black hair on second to fourth segments, rest not pilose. Venter with first three segments white pilose, rest black pilose, stripes of black and white tomentum. Genitalia black with black hair. Epandrium in lateral view, triangular, lower margin straight, basal corner narrowed; basistylus broad, basal half enlarged; distylus large, as long as half the width of the basistylus, hooked apically; epiphallus in lateral view narrow (Fig. 106) slightly curved, not cap-shaped, apex not swollen, rounded; with a ventral extension broad at base with apex rounded, portion of the epiphallus behind ventral extension shorter than aedeagus; epiphallus in ventral view broad (Fig. 107), lateral margins straight, without spines; aedeagus broad at base narrowed at apex, swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle. First flagellomere with black hair, white hair on inner margin. Tomentum on disc black with a triangle of yellow scales near scutellum. Pleura white pilose, tomentum on katepisternum white. Tomentum on coxae white. Scutellum yellow tomentose along posterior margin, black tomentum on base. Sides of abdomen with first and basal half of second segments white pilose. Fifth to seventh abdominal segments with white scales least abundant than male, seventh segment without white scales on segment center.

DISTRIBUTION: MEXICO (Durango, Guerrero, Michoacán, Morelos, Puebla, San Luis Potosí, Sinaloa, Tamaulipas), USA (Arizona, Mississippi, Missouri, Montana, Texas). Figure 25 shows the collecting localities of the specimens in the collections reviewed.

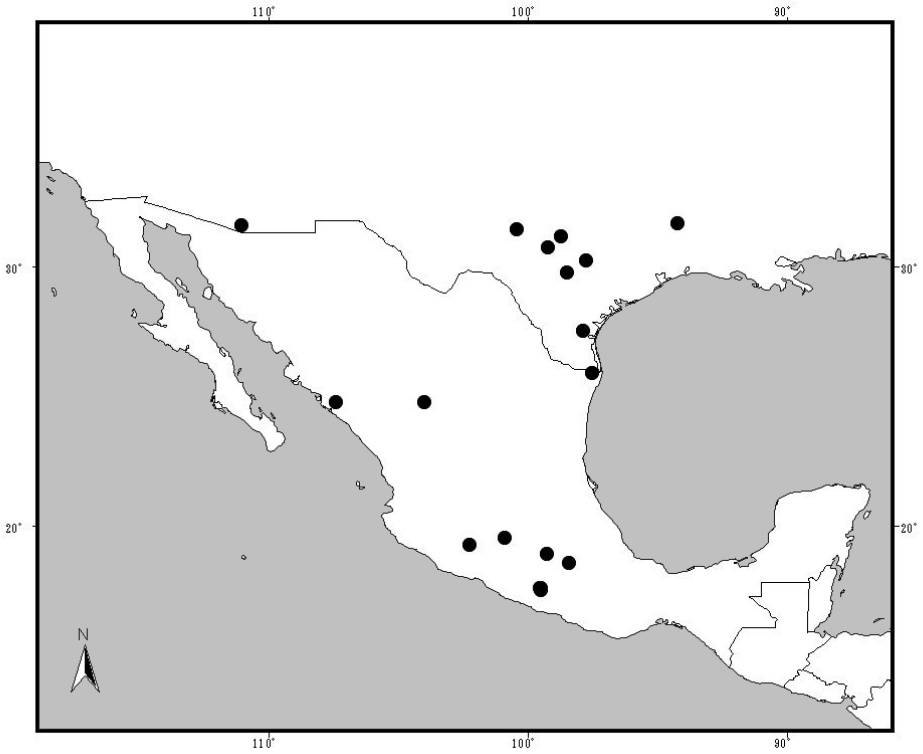


Figure 25. Collecting localities of specimens in collections reviewed of *Hemipenthes sagata*.

SPECIMENS EXAMINED: MEXICO. Guerrero: 3 mi N Chilpancingo, 31-VIII-1939, R. H. & E. M. Painter (1♂ 1♀); 4 mi N Chilpancingo, 28-VIII-1959, R. H. & E. M. Painter (1♂). Puebla: 4 mi SE Matamoros, 3-IX-1959, R. H. & E. M. Painter (2♂♂ 3♀♀). USA. Texas: Edwards Co., 20-VII-1939, R. H. Painter (1♂ *genitalia*); Brownsville, 8-V-1935, J. N. Knull (1♂). Figure 25 shows the collecting localities of the specimens in the collections reviewed.

REMARKS: *Hemipenthes sagata* is closely related with *H. celeris*, *H. floridiana*, and *H. pima*. It is distinguished from *H. celeris* and *H. pima* by the pigmentation of cells a_1 and cup, which are entirely infuscated, and from *H. floridiana* by the white pile on the sides of the first abdominal segment (male) and the white scales on the sides of the fifth to seventh abdominal segments. The characters used to identify these species present great variation and the genitalia are identical. Painter y Painter (1962) used the white pile on the sides of the first abdominal segment to distinguish *H. sagata* from *H. celeris* and *H. floridiana*, but *H. celeris* present the same characteristic. I use the pigmentation on cells a_1 and cup to distinguish *H. sagata* from *H. celeris* because the pile on first segment side is white in both species. These four species may be one species with great variation.

H. sagata has a wide distribution being present in the Nearctic and Neotropical regions.

23. *Hemipenthes scylla*

Anthrax scylla Osten Sacken, 1887
Synonym: *Argyramoeba succincta* Coquillett, 1894a.

Lectotype designated by Painter and Painter (1962) in The Natural History Museum, London, UK.

Placed in genus *Villa* subgenus *Hemipenthes* by Painter & Painter (1962); placed in genus *Hemipenthes* by Hull (1973).

Figures 26, 57, 108-109

DIAGNOSIS: *Hemipenthes scylla* is distinguished from its congeners by the following combination of external characters: cell r_1 with basal half infuscated and a color spot at tip; cell r_{2+3} infuscated just at base; cells bm and dm hyaline.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, black and fulvous tomentose. Face black, rounded, with black hair and fulvous tomentum. First flagellomere brown, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere brown, twice as wide as long, with black hair; third flagellomere black, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi brown or cinereous with black hair. Occiput with short black hair and yellowish scales.
Thorax: Mesonotum anterior margin yellowish pilose; lateral margin entirely white pilose; tomentum on disc yellowish, long, hairlike, not dense, more abundant on anterior margin and region before scutellum; bristles black. Pleura yellowish pilose with black hair mixed in on proepimeron, anepisternum, and sometimes metapleura, tomentum on katepisternum yellowish. Prosternum with black and yellowish hair. Mid coxa with black hair, tomentum on all coxae hairlike, yellow. Legs yellow, tarsi black, femora black pilose, yellow tomentose, femora with some black scales; fore tibia without bristles, mid and hind tibiae with black bristles. Halter steam brow, knob yellow. Scutellum brown, not pilose, yellow tomentose, paler along posterior margin, a spot of black tomentum in middle at base; bristles black. Black setulae on basicosta. Cells c, sc, br, and bm entirely infuscated (Fig. 57); cell r_1 with two basal thirds infuscated, with a spot at tip; cell cup with basal half infuscated; cells r_{2+3}, r_5 and a_1 infuscated just at base; r-m crossvein at basal third of cell dm; two submarginal cells; cell r_5 slightly narrowed at wind margin; third section of vein CuA_1 twice as long as two basal sections combined, second section short, about half as long as r-m crossvein; cell a_1 as wide as cell cup; alula poorly developed.
Abdomen: Abdominal dorsum white pilose, more dense in segments five to seven; black tomentum overall, some white scales scattered on segments fifth to seventh; sides of abdomen with first and

basal half of second segment whitish pilose with a tuft of black hair on first segment, rest with abundant black pile. Venter white pilose, yellowish tomentose. Genitalia brown with black and yellow hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 108) slightly curved, cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 109), lateral margins narrowed at middle, with scattered spines all along; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Not reviewed.

DISTRIBUTION: MEXICO (Aguascalientes, Chiapas, Distrito Federal, Durango, Guanajuato, Guerrero, Hidalgo, Jalisco, Michoacán, Morelos, Nuevo León, Oaxaca, Puebla, Queretaro, San Luis Potosí, Sonora, Zacatecas), USA (Arizona, Texas). Figure 26 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: MEXICO. Michoacán: 12 mi W Morelia, 24-VIII-1968, R. H. & E. M. Painter (1♂). Morelos: Quilamula, 8-II-2004, O. Ávalos y M. López (1♂ *genitalia*); 15 mi E Cuernavaca, 17-IX-1963, R. H. & E. M. Painter (1♂); 13 mi E Cuernavaca Lobo Cn., 15- VIII-1962, R. H. & E. M. Painter (1♂); 11 mi E Cuernavaca Lobo Cn., 15-VII-1962, R. H. & E. M. Painter (1♂); 12 mi E Cuernavaca Lobo Cn., 13-IV-1966, R. H. & E. M. Painter (1♂).

REMARKS: Only male specimens have been collected from *Hemipenthes scylla*. Externally is distinguished by the reduced pigmentation of wing, limited to the base and anterior margin of wing,

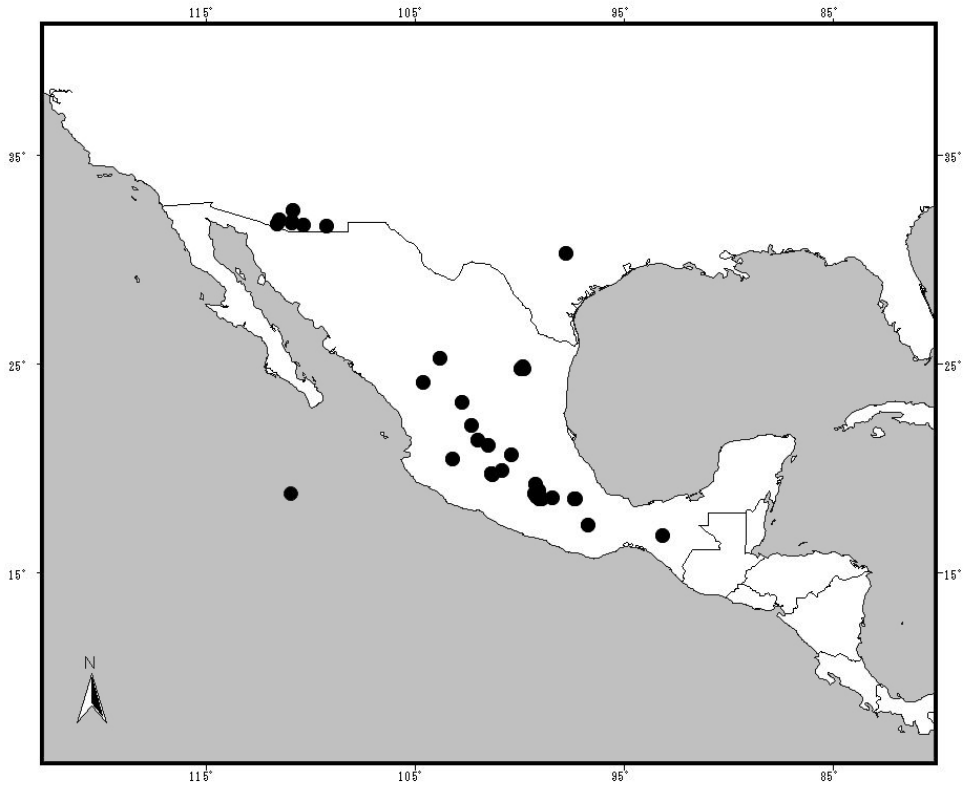


Figure 26. Collecting localities of specimens in collections reviewed of *Hemipenthes scylla.*

like in *H. albus, H. lepidota, H. translucens*, and *H. webberi*, but in contrast with these species *H. scylla* has a characteristic pigmentation on cell r_1.

H. scylla is a common species and has been reported as territorial (Ávalos-Hernández, 2007). It is distributed through all Mexico having its most northern limit in Arizona and Texas.

24. *Hemipenthes seminigra*

Hemipenthes seminigra Loew, 1869

Holotype in Museum of Comparative Zoology, Cambridge, Massachusetts, USA.

Figures 27, 58, 110-111

DIAGNOSIS: *Hemipenthes seminigra* is distinguished from its congeners by the following combination of external characters: body length more than 10 mm; pleura and sides of first abdominal segment white or pale yellow pilose; cell r_1 not entirely infuscated; cell r_{2+3} with basal half infuscated; cell dm infuscated at least on its basal third; cell a_1 not entirely infuscated; cell r_5 slightly narrowed at wing margin; first abdominal segment with a band of white scales.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, black and yellow tomentose. Face brown, rounded, with black hair and yellowish tomentum, a few black scales in middle above. First flagellomere brown, swollen on inner apical margin, with long black hair, twice as long as second flagellomere; second flagellomere black, twice as wide as long, with short black hair above, bare below; third flagellomere brown, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi black with black hair. Occiput with short black and yellowish hair and yellowish scales.
Thorax: Mesonotum anterior margin pale yellow pilose; lateral margin entirely white pilose; tomentum on disc entirely yellowish, long, hairlike, not dense; bristles black. Pleura black pilose above, yellowish hair below on proepimeron and anepisternum, metapleura with white hair, tomentum on katepisternum pale yellow. Prosternum with mixed black and yellowish hair. Mid coxa with black hair, tomentum on all coxae hairlike, pale yellow. Legs fulvous, tarsi brown, tibiae yellow tomentose, fore and mid femora with black scales on anterior surface and yellow scales on posterior surface, hind femur with yellow scales; bristles black. Halter steam brownish, knob yellow to white. Scutellum brown, black pilose, and yellowish tomentose, a spot of black tomentum in middle at base; bristles black. Black setulae on basicosta. Cells c, sc, br, and bm entirely infuscated (Fig. 58); cells cup and a_1 entirely infuscated except tip; cell r_1 with two basal thirds infuscated; cell dm with basal half infuscated; cells r_{2+3}, r_5 and cua_1 with basal third infuscated; cell m_2 infuscated just at base; color in cell a_1 not reaching hind margin of wing; cell dm infuscated at r-m crossvein; r-m crossvein at or slightly beyond middle of cell dm; two submarginal cells; cell r_5 slightly narrowed at wing margin; third section of vein CuA_1 one and a half as long as two basal sections combined, first section one and a half as long as r-m crossvein, second section as long as r-m crossvein; cell a_1 as wide as cell cup; alula well developed.
Abdomen: Abdominal dorsum black and white pilose on segments one to four, rest black pilose; black tomentum overall except for a crossband of white tomentum on posterior margin of first segment, some white or pale yellow scales scattered on lateral margin of abdomen, more abundant on sixth and seventh segments; on well preserved specimens it is distinguishable a thin band of pale yellow scales on first, second and third and two spots of pale yellow scales at center of third and fourth segments; sides of abdomen with first, second and basal half of third segments whitish pilose, abundant black mix with some yellow hair on rest. Venter black and white pilose, whitish tomentose. Genitalia brown with black hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 110) slightly curved, cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 111), lateral margins straight, with scattered spines in

the middle and dense spines at apex; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle.

DISTRIBUTION: CANADA (British Columbia, Quebec, Saskatchewan), USA (California, Idaho, Montana, Oregon, Utah, Vermont, Washington, Wyoming). Figure 27 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: USA. Idaho: Moscow Mt., 5-VII-1919 (1♀), 8-VII-1919 (1♂ *genitalia*), A. L. Melander; Moscow Mt., 9-VII-1911 (1♀). Utah: Miners Peak Iron Co., 9-VII-1919 (1♂, 1♀), 2-VII-1919 (1♀); Maple Canyon San Pope Co., 24-VIII-1923, Shaler Aldous (1♂). Washington: Tellgate RS Blue Mt., 26-VIII-1922, V. N. Argo (1♀); Pullman, 11-VII-1912 (1♀).

REMARKS: *Hemipenthes seminigra* has no external or genitalia characters that distinguish it from *H. eumenes.* Both species are similar to *H. catulina* and *H. morio* but can be distinguished from the first by the lack of aureoles in the wings and from the second by having the cell r_5 narrowed at wing margin and the margin epiphallus straight in ventral view, not narrowed before apex as in *H. morio*.

Osten Sacken (1886b) used the black legs and narrowed shape of cell r_5 in *H. seminigra*, to separate this species from *H. eumenes*, but these characters and the genitalia are the same for both species. *H. eumenes* may be a synonym of *H. seminigra* (for further discussion see the description and remarks of *H. eumenes*).

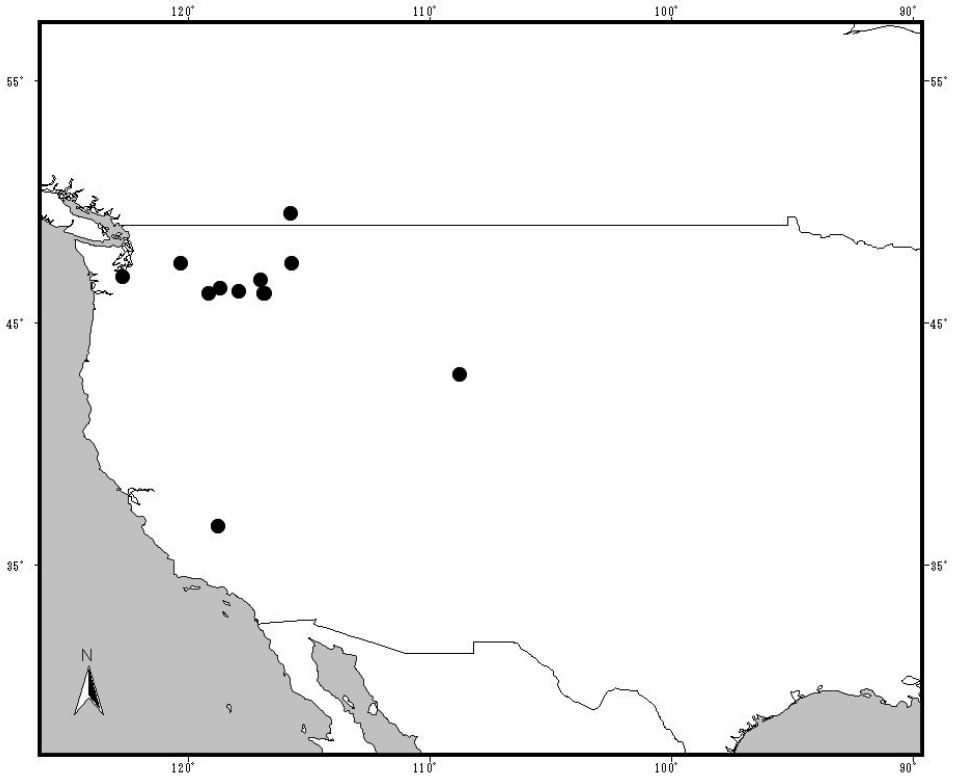


Figure 27. Collecting localities of specimens in collections reviewed of *Hemipenthes seminigra.*

H. seminigra has been collected in the Northwest of the USA having a distribution similar to that of *H. eumenes.* But if *H. eumenes* is a synonym of *H. seminigra* and the North America specimens of *H. morio* are in fact specimens of *H. seminigra* (see *H. morio* remarks) the distribution of this species is widespread in all the USA.

25. *Hemipenthes sinuosa*

Anthrax sinuosa Wiedemann, 1821

Synonyms: *Anthrax nycthemera* Macquart, 1840; *Anthrax concisa* Macquart, 1840; *Anthrax assimilis* Macquart, 1846.

Holotype in Naturhistorisches Museum, Vienna, Austria.

Placed in genus *Villa* subgenus *Hemipenthes* by Painter & Painter (1962); placed in genus *Hemipenthes* by Hull (1973).

Figures 28, 59, 112-113

DIAGNOSIS: *Hemipenthes sinuosa* is distinguished from its congeners by the following combination of external characters: two submarginal cells; cell r_1 entirely infuscated except for a subapical hyaline area; cell r_{2+3} with basal half infuscated with a spot at tip.

DESCRIPTION: Male. *Head*: Eyes separated by one and a half the width of ocellar tubercle. Front black pilose, black tomentose, yellowish scales near antenna. Face brown, rounded, with black hair and yellowish tomentum. First flagellomere fulvous, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere fulvous, twice as wide as long, short black hair on the base; third flagellomere brown, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi cinereous with black hair. Occiput with short black and yellow hair and yellowish scales.

Thorax: Mesonotum anterior margin pale yellow pilose; lateral margin black and whitish pilose; tomentum on disc entirely yellowish on anterior half, long, hairlike, not dense; bristles black. Pleura black pilose with yellowish hair mixed in on proepimeron, anepisternum, and metapleura, tomentum on katepisternum pale yellow. Prosternum yellowish pilose with some black hair present. Mid coxa with black hair, tomentum on all coxae hairlike, pale yellow. Legs fulvous, tarsi black, femora black pilose, pale yellow tomentose, some black scales may be present; bristles black. Halter steam brown, knob yellow. Scutellum brown, not pilose, and yellow tomentose, a spot of black tomentum in middle at base; bristles black. Black setulae on basicosta. Cells c, sc, br, bm and r_1 entirely infuscated (Fig. 59), cell r_1 with a hyaline spot near tip; cells a_1 and cup entirely infuscated except tip; cell dm with two basal thirds infuscated; cells r_5 and cua_1 with basal half infuscated; cell r2+3 with basal half infuscated with a spot at tip; cell m_2 infuscated just at base; cell dm infuscated beyond r-m crossvein; r-m crossvein behind middle of cell dm; two submarginal cells; cell r_5 slightly narrowed at wind margin; third section of vein CuA_1 one and a third as long as two basal sections combined, first and second sections, each, as long as r-m crossvein; cell a_1 slightly wider then cell cup; alula poorly developed.

Abdomen: Abdominal dorsum white pilose on first to fourth segments, black hair on fifth to seventh segments; black tomentum overall; some pale yellow scales scattered on sides of abdomen; sides of abdomen with first and basal half of second segments whitish pilose, some black hair in apical half of first segment, mixed black and yellowish hair on third to seventh segments. Venter white pilose, yellowish tomentose. Genitalia brown with black hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 112) slightly curved, cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 113), lateral margins narrowed at both sides at middle, with scattered spines all along; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle.

DISTRIBUTION: MEXICO (Distrito Federal, Durango, Guerrero, Hidalgo, Mexico, Michoacán, Morelos, Nuevo León, Oaxaca, Puebla. San Luis Potosí, Sonora, Tlaxcala), USA (Alabama, Arizona, Arkansas, California, Colorado, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Nebraska, Nevada, New Jersey, New York, North Carolina, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin, Wyoming). Figure 28 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: MEXICO. Michoacán: 3 mi W Morelia, 20-IX-1963, R. H. & E. M. Painter (1♂). Puebla: 7 mi E Puebla, 21-IX-1968, R. H. & E. M. Painter (1♂ *genitalia*). USA. Colorado: Jackson Co. 13 mi SE Walden, 13-VIII-1963, N. & B. Marston (1♂); Jefferson Co. Lookout Mt., 9-VIII-1964, L. R. Ertle (1♀). Maryland: Beltsville, 26-VI-1961, J. L. Herring (1♀). Utah: Wasatch Co., 18-VIII-1957, R. H. & E. M. Painter (1♀).

REMARKS *Hemipenthes sinuosa* is similar to *H. blanchardiana* and *H. jaennickeana* but can be distinguished from both by having just two submarginal cells. The genitalia is similar to *H. blanchardiana* but different from *H. jaennickeana*.

H. sinuosa is one of the few species of *Hemipenthes* from which its host is known. Finlayson and Finlayson (1958) reports *H. sinuosa* as a parasite of *Neodiprion sertifer* Geoffroy (Hymenoptera: Diprionidae). *H. sinuosa* has a widespread distribution in North America, as does the related species *H .jaennickeana*.

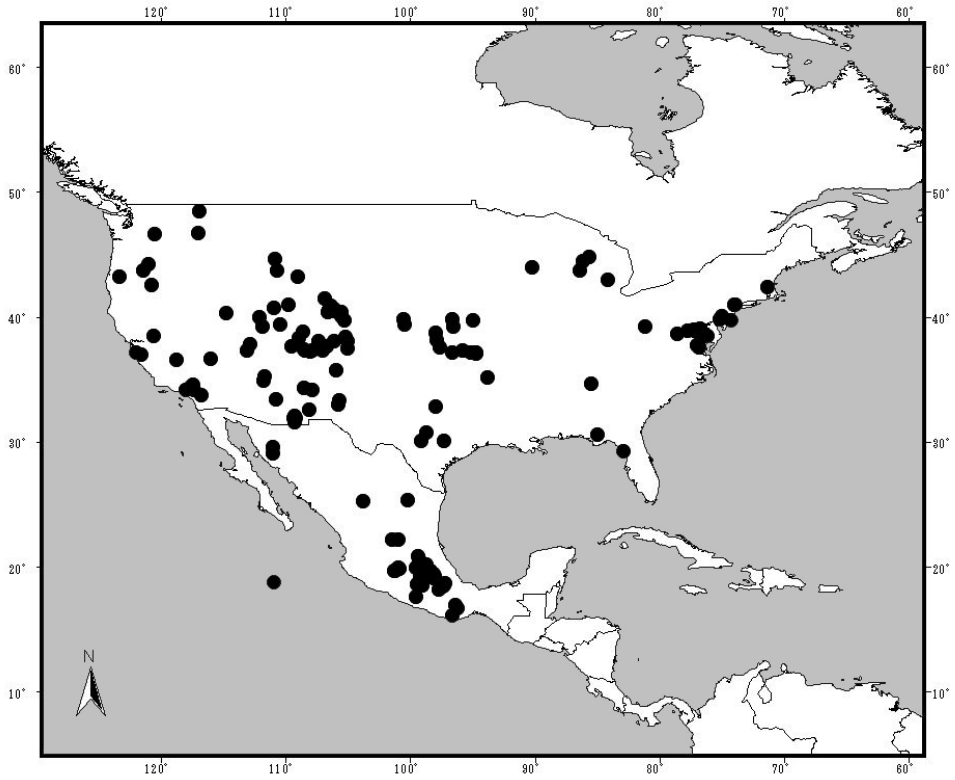


Figure 28. Collecting localities of specimens in collections reviewed of *Hemipenthes sinuosa.*

26. *Hemipenthes translucens*, new species

Holotype in Museo de Zoología, Facultad de Ciencias, UNAM, Mexico.

Figures 29-30, 60

DIAGNOSIS: *Hemipenthes translucens* is distinguished from its congeners by the following combination of external characters: cell r_1 entirely infuscated; cell r_{2+3} with basal half infuscated; cells dm, bm and a_1 entirely hyaline; postalar bristles yellow.

DESCRIPTION: Female. *Head*: Eyes separated by twice the width of ocellar tubercle. Front black pilose, yellowish tomentose, black scales above. Face black, rounded, with black hair and yellow tomentum. First flagellomere black, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere black, twice as wide as long, with short black hair above, bare below; third flagellomere black, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi black with black hair. Occiput with short white hair and yellowish scales, a few black scales present.
Thorax: Mesonotum anterior and lateral margins yellow pilose; tomentum on disc black, long, hairlike, not dense, yellow near scutellum; bristles yellow. Pleura yellow pilose on proepimeron, anepisternum, and metapleura, katepisternum not tomentose, yellow pilose. Prosternum with yellowish hair. Mid coxa with black hair, tomentum on all coxae hairlike, yellow. Legs black, femora black pilose, pile not dense, abundant yellow tomentum covering the whole legs, hind tibiae with broad yellow scales on anterior surface and black scales on posterior surface; bristles black. Halter steam brown, knob white. Scutellum black, not pilose, and black tomentose, yellow scales along posterior margin; without bristles. Black setulae on basicosta. Cells c, sc, and br entirely infuscated; cell r_1 entirely infuscated except a hyaline spot near margin (Fig. 60); cell r_{2+3} with basal half infuscated; cell r_5, with two basal third infuscated, cell bm infuscated just at base; r-m crossvein behind middle of cell dm; two submarginal cells; cell cup narrowed at wing margin; spur at base of vein R_{2+3}; cell r_5 slightly narrowed at wing margin; third section of vein CuA_1 one and a half as long as two basal sections combined, first and second sections as long as r-m crossvein; cell a_1 as wide as cell cup; alula well developed.
Abdomen: Abdominal dorsum white pilose on segments one to three, rest black pilose, pile not dense; black tomentum overall with some fulvous scales scattered, fourth and seventh segments with a broad crossband of fulvous tomentum in center and white tomentum on sides; sides of abdomen with first and basal half of second segments pale yellow pilose, mixed black and white hair on third and fourth segments, fifth and sixth black pilose, seventh not pilose. Venter pale yellow pilose, yellow tomentose. Genitalia black with black hair.

Male. Not revised.

DISTRIBUTION: MEXICO (Morelos). Figure 30 shows the collecting locality for this species.

SPECIMENS EXAMINED: MEXICO. Morelos: Quilamula, 6-XII-2003, O. Ávalos & M. López (HOLOTYPE 1♀, PARATYPES 2♀♀).

ETYMOLOGY: The species epithet, *translucens*, is derived from the Latin meaning transparent and refers to the cell bm entirely hyaline.

REMARKS: *Hemipenthes translucens* is clearly different from other species in the wing pigmentation and abdominal pile and tomentum. Only two female specimens has been collected from this species both from the same date. These female specimens represent a new species even though males are unavailable as additional confirmation. This is a quite conspicuous species not to be collected earlier so must be a rare species.

Figure 29. *Hemipenthes translucens*, new species.

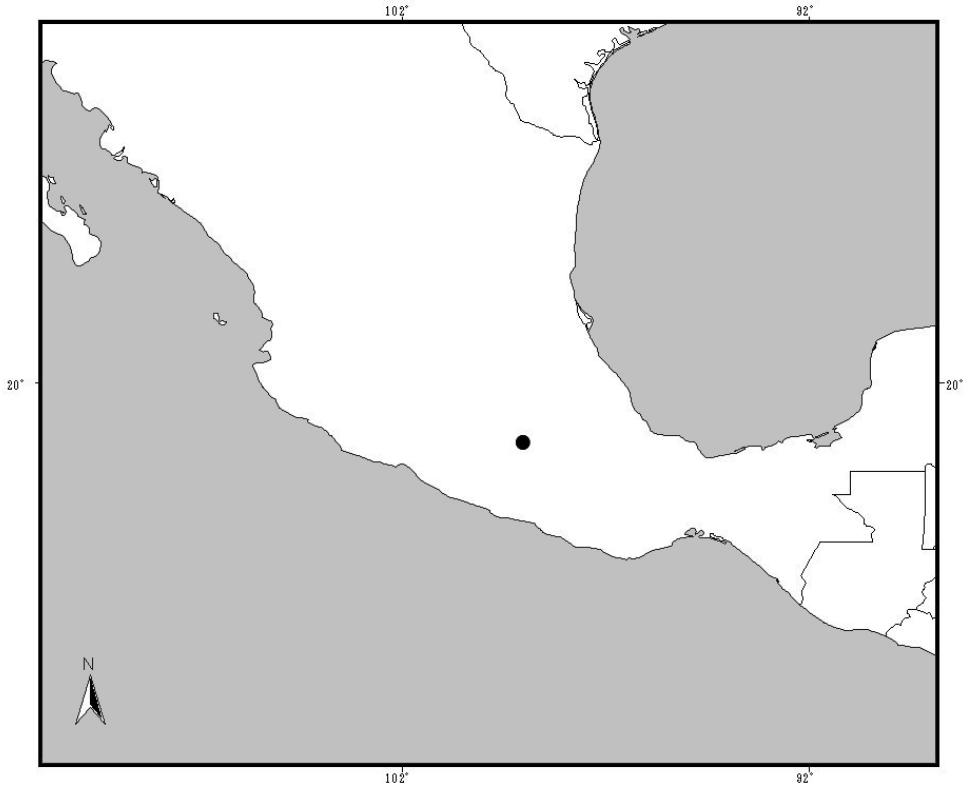


Figure 30. Collecting locality of the specimens of *Hemipenthes translucens.*

27. *Hemipenthes webberi*

Villa webberi Johnson, 1919

Holotype in Museum of Comparative Zoology, Cambridge, Massachusetts, USA.

Placed in genus *Hemipenthes* by Hull (1973).

Figures 31, 61, 114-115

DIAGNOSIS: *Hemipenthes webberi* is distinguished from its congeners by the following combination of external characters: cell a_1 entirely hyaline; pleura and sides of first abdominal segment white or pale yellow pilose; first abdominal segment with scattered, yellow scales, not forming a band.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, yellowish tomentose, black scales may be present in middle, tomentum not dense. Face brown, rounded, with black hair and yellowish tomentum, a few black scales in middle above. First flagellomere brown, swollen on inner apical margin, with black hair, twice as long as second flagellomere; second flagellomere brown, twice as wide as long, with short black hair above, bare below; third flagellomere brown, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi black with black hair. Occiput with short white hair and yellowish scales.
Thorax: Mesonotum anterior margin yellowish pilose; lateral margin yellow and black pilose; tomentum on disc entirely yellowish, long, hairlike, not dense; bristles black. Pleura black pilose with yellowish hair mixed in on proepimeron and anepisternum, metapleura with black and white hair, katepisternum not tomentose, black pilose. Prosternum with mixed black and pale yellow hair. Mid coxa with mixed black and yellow hair, tomentum on all coxae hairlike, pale yellow. Legs fulvous, femora black pilose and yellow tomentose; bristles black. Halter steam brownish, knob fulvous. Scutellum brown, black pilose and yellowish tomentose; bristles black. Black setulae on basicosta. Cells c, sc, br, and bm entirely infuscated (Fig. 61); cell r_1 with two basal thirds infuscated; cell cup with basal half infuscated; cell dm with basal third infuscated; cells r_{2+3}, r_5 and cua_1 infuscated just at base; cell dm infuscated behind r-m crossvein; r-m crossvein at or slightly beyond middle of cell dm; two submarginal cells; cell r_5 not narrowed at wing margin; third section of vein CuA_1 twice as long as two basal sections combined, first and second sections, each, as long as r-m crossvein; cell a_1 one and a half wider than cell cup; alula poorly developed.
Abdomen: Abdominal dorsum black and white pilose on segments one to five, rest black pilose; black tomentum overall, a few yellow scales scattered; sides of abdomen with first, sixth, seventh, and basal half of second segments whitish pilose, rest black pilose. Venter white pilose, whitish tomentose. Genitalia brown with black and yellow hair. Epandrium in lateral view, rectangular, lower apical margin prolonged posteriorly, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 114) slightly curved, cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 115), lateral margins narrowed before apex, with scattered spines at apex; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle.

DISTRIBUTION: CANADA (Ontario, Quebec), USA (Connecticut, Kansas, Kentucky, Massachusetts, Michigan, New York, Vermont, Wyoming). Figure 31 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: USA. Kansas: Manhattan, 23-IV-1934, R. H. Painter (1♂); Riley Co. Manhattan, 14-V-1960, J. Pooreaugh (1♂). Massachusetts: Blue Hills Res., 19-VI-1911 (1♂

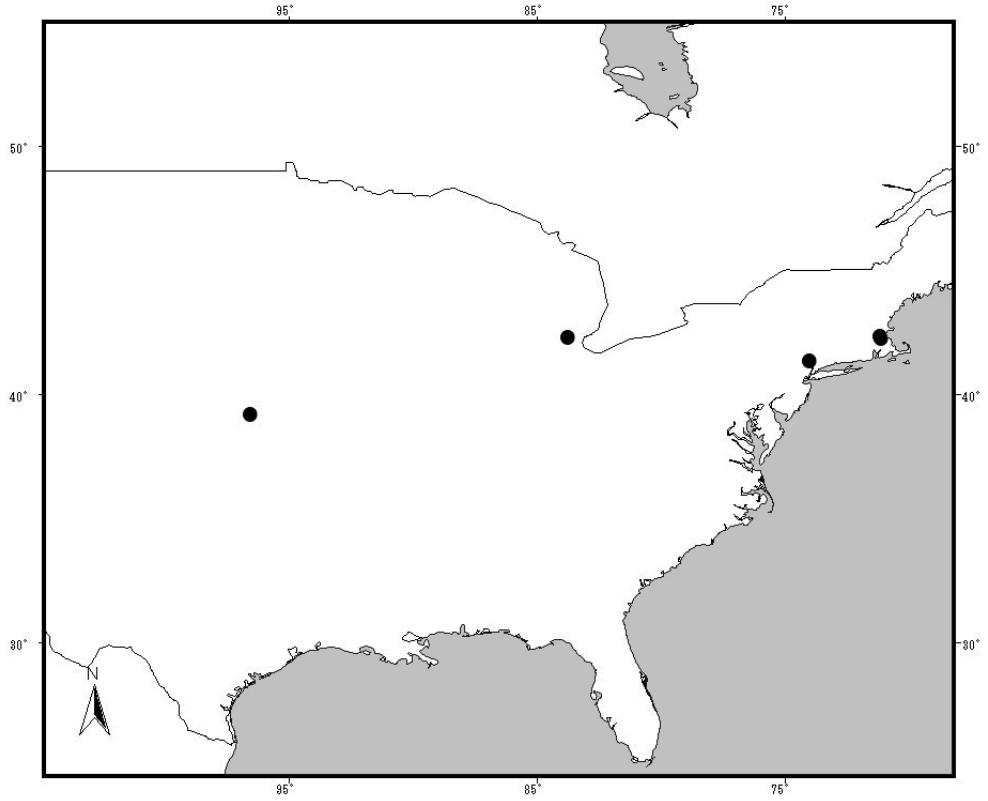


Figure 31. Collecting localities of specimens in collections reviewed of *Hemipenthes webberi.*

genitalia). Michigan: Cheboygen Co. Biology Station, 28-VII-1930 (1♂); Wright Park, 6-VI-1912 (1♂); Washtenaw Co. Ann Arbor, 27-VI-1927, N. K. Bigelow (1♀).

REMARKS: *Hemipenthes webberi* is similar to *H. castanipes* but can be distinguished by having the cell a_1 hyaline. The genitalia is also similar but with spines in epiphallus less dense in *H. webberi* than in *H. castanipes*. This species is distributed in the East of the USA.

28. *Hemipenthes wilcoxi*

Villa (Hemipenthes) wilcoxi Painter, 1933

Holotype in National Museum of Natural History, Washington, D.C., USA.

Placed in genus *Hemipenthes* by Hull (1973).

Figures 32, 62, 116-117

DIAGNOSIS: *Hemipenthes wilcoxi* is distinguished from its congeners by the following combination of external characters: mesonotum anterior, pleura, and prosternum black pilose; sides of first abdominal segment black pilose (male) or orange yellow pilose (female); abdomen dorsum with black tomentum overall.

DESCRIPTION: Male. *Head*: Eyes separated by a little more than width of ocellar tubercle. Front black pilose, yellowish tomentose, black scales may be present in middle, tomentum not dense. Face brown, rounded, with black hair and yellowish tomentum, a few black scales in middle above. First flagellomere black, swollen on inner apical margin, with black hair, twice as long as second

flagellomere; second flagellomere black, twice as wide as long, with short black hair above, bare below; third flagellomere black, longer than two basal flagellomeres combined; base subconical, tapering to styliform apical two-thirds; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi black with black hair. Occiput with short black and white hair and white scales.

Thorax: Mesonotum anterior and lateral margin black pilose; disc not tomentose, black pilose; bristles black. Pleura black pilose on proepimeron, anepisternum, and metapleura, katepisternum not tomentose, black pilose. Prosternum with black hair. Mid coxa with black hair, all coxae without tomentum. Legs black, femora black pilose and tomentose; bristles black. Halter steam brownish, knob white. Scutellum black, black pilose, not tomentose; bristles black. Black setulae on basicosta. Cells c, sc, br, bm and cell a_1 entirely infuscated (Fig. 62); cell cup entirely infuscated except tip; cells r_1 and dm with basal half infuscated; cells r_{2+3}, r_5, m_2, and cua_1 infuscated just at base; cell dm infuscated behind r-m crossvein; r-m crossvein behind middle of cell dm; two submarginal cells; cell r_5 not narrowed at wing margin; third section of vein CuA_1 one and a half as long as two basal sections combined, first and second sections, each, one and a half as long as r-m crossvein; cell a_1 as wide as cell cup; alula well developed.

Abdomen: Abdominal dorsum black pilose; black tomentum overall, not dense; sides of abdomen black pilose. Venter black pilose, black tomentose. Genitalia black with black hair. Epandrium in lateral view, rectangular, lower margin concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus small, hooked apically; epiphallus in lateral view narrow (Fig. 116) slightly curved, cap-shaped, apex swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 117), lateral margins straight, with scattered spines in the middle and dense spines at apex; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle. Mesonotum anterior margin yellow pilose; lateral margin with black and yellow hair. Tomentum on disc yellowish. Scutellum yellowish tomentose.

DISTRIBUTION: MEXICO (Jalisco, Michoacan), USA (California, Kansas, Nebraska, Utah, Washington). Figure 32 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: USA. Kansas: Pottawatomie Co., 12-V-1963, E. M. Painter (1♂). Nebraska: 19 mi NE Kimball, 6-VI-1963, R. H. & E. M. Painter (1♂ *genitalia*). Utah: Utah Co. Mt. Timpanogos, 4-VIII-1956, D. E. Johnson (1♂ 1♀); Utah Co. Emerold Lake, 23-VII-1955, D. E. Johnson (1♂).

REMARKS: Although externally *Hemipenthes wilcoxi* is similar to *H. martinorum*, can be distinguished by the absence of scales in the abdomen and by the sinuous color margin on wing in *H. wilcoxi*. The genitalia is quite different between these species. *H. wilcoxi* is the only North America species completely lacking of light colored scales in the abdomen.

Just a few specimens have been collected from this species but the collection localities are spread from the center of Mexico to the Northwest of the USA. This species may be distributed in Mexico and the whole West of USA, having a distribution similar to that of *H. lepidota*.

29. *Hemipenthes yaqui*

Villa (Hemipenthes) yaqui Painter *in* Painter & Painter, 1962

Holotype in National Museum of Natural History, Washington, D.C., USA.

Placed in genus *Hemipenthes* by Hull (1973).

Figures 33, 63, 118-119

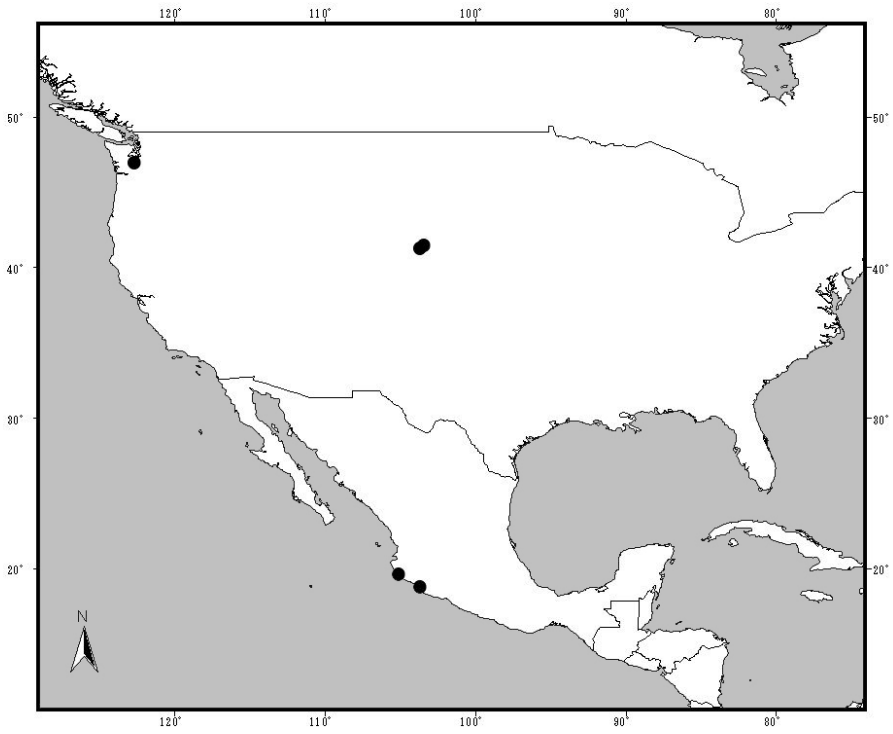


Figure 32. Collecting localities of specimens in collections reviewed of *Hemipenthes wilcoxi.*

DIAGNOSIS: *Hemipenthes yaqui* is distinguished from its congeners by the following combination of external characters: first flagellomere as long as second segment; third flagellomere with basal half wide, apical half slender, not styliform; third abdominal segment with a stripe of white scales.

DESCRIPTION: Male. *Head*: Eyes separated by one and a half width of ocellar tubercle. Front black pilose, yellowish tomentose. Face brown, bluntly projecting, with black hair and yellowish tomentum. First flagellomere fulvous, swollen on inner apical margin, with black hair, as long as second flagellomere; second flagellomere brown, twice as wide as long, with long black hair above, bare below; third flagellomere brown, longer than two basal flagellomeres combined; basal half wide, apical half slender, not styliform; aristae minute, terminal. Proboscis short, not projecting beyond oral margin. Palpi black with black hair. Occiput with short whitish hair and yellowish scales.
Thorax: Mesonotum anterior and lateral margin pale yellow pilose; tomentum on disc entirely yellowish, long, hairlike, dense; bristles black. Pleura pale yellow pilose on proepimeron and anepisternum, metapleura with white hair, tomentum on katepisternum white-violet. Prosternum with yellowish hair above and black hair below. Mid coxa with black hair, tomentum on all coxae hairlike, black. Legs black, femora black pilose and tomentose; bristles black. Halter steam yellow, knob white. Scutellum black, not pilose, and yellowish tomentose; bristles black. Black setulae on basicosta. Color on wing faint, forming a triangle with base on anterior margin of wing (Fig. 63); cells c, sc, br, bm, and a_1 entirely infuscated; cell cup entirely infuscated except tip; cells cua_1 and dm with basal half infuscated; cell r_1 with basal third infuscated; cells r_{2+3}, m_2 and r_5 infuscated just at base; cell dm infuscated beyond r-m crossvein; r-m crossvein behind middle of cell dm; two submarginal cells; cell r_5 slightly narrowed at wing margin; third section of vein CuA_1 one and a half as long as two basal sections combined, first section twice as long as r-m crossvein, second section short, about half as long as r-m crossvein; cell a_1 one and a half wider than cell cup; alula well developed.
Abdomen: Abdominal dorsum black pilose; black tomentum overall except a broad crossband of white tomentum on third segment, white scales covering all seventh segment; sides of third to sixth segments with black scales, white scales on sides of seventh segment; sides of abdomen with first and

basal half of second segments whitish pilose, rest black pilose. Venter black pilose, stripes of white and black scales on first three segments. Genitalia fulvous with white hair. Epandrium in lateral view, rectangular, lower apical margin prolonged posteriorly, lower margin clearly concave in middle, basal corner narrowed; basistylus narrow, basal half enlarged; distylus large, as long as half the width of the basistylus, hooked apically; epiphallus in lateral view narrow (Fig. 118) slightly curved, cap-shaped, apex not swollen, rounded; with a ventral extension broad at base with apex acuminate, portion of the epiphallus behind ventral extension longer than aedeagus; epiphallus in ventral view broad (Fig. 119), lateral margins narrowed at middle, without spines; aedeagus broad at base narrowed at apex, not swollen dorsally; gonopore terminal.

Female. Nearly identical to male. Eyes separated by twice width of ocellar tubercle.

DISTRIBUTION: MEXICO (Sonora), USA (Arizona). Figure 33 shows the collecting localities of the specimens in the collections reviewed.

SPECIMENS EXAMINED: MEXICO. Sonora: 4 mi S Magdalena, 19-IX-1961, R. H: & E. M. Painter (1♂ paratype *genitalia*); 4 mi S Imuris, 19-IV-1961, R. H & E. M. Painter (1♂ paratype); 37 mi N Hermosillo, 26-IV-1961, R. H. & E. M. Painter (1♀ paratype). USA. Arizona: Chiricahua Mts., 17-V-1961, R. H. & E. M. Painter (1♂ paratype 1♀ paratype).

REMARKS: *Hemipenthes yaqui* has three characteristics uncommon within the genus: (1) face bluntly projecting; (2) wing pigmentation faint; and (3) the third flagellomere with basal half wide, apical half slender, not styliform. The genitalia is similar to that of *H. chimaera* but with a ventral extension in the epiphallus. Even with this differences *H. yaqui* does have the characteristics of other Villini genus, so according to the general characteristics this species should still be classified in *Hemipenthes*. Its distribution is limited to the Northwest of Mexico.

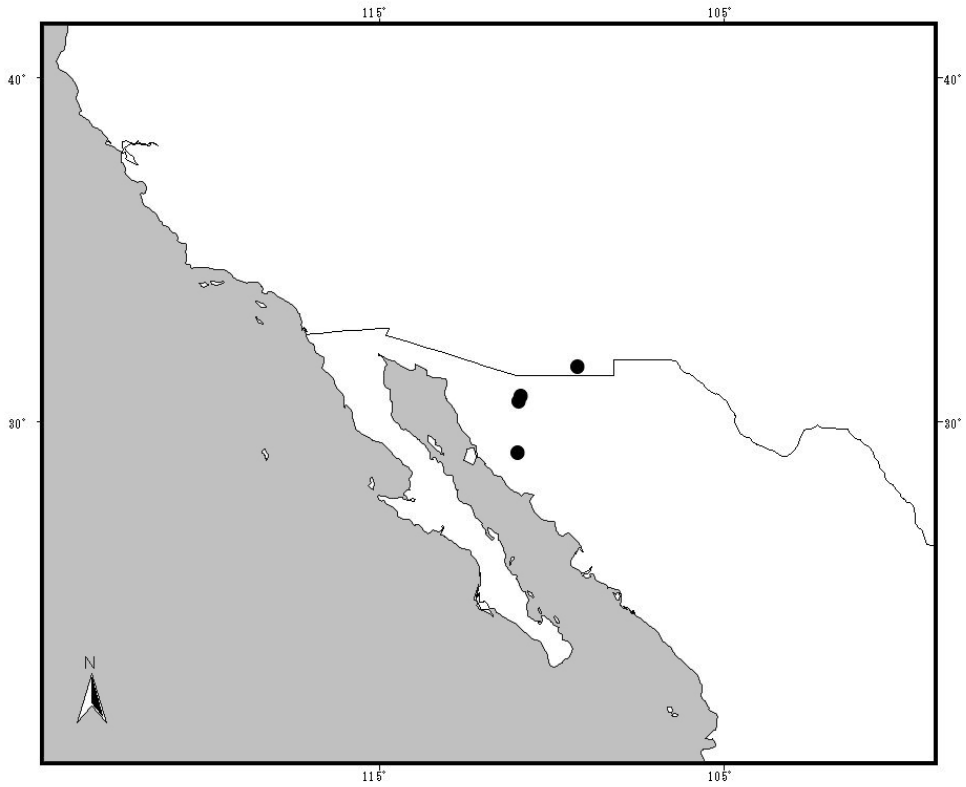


Figure 33. Collecting localities of specimens in collections reviewed of *Hemipenthes yaqui.*

Phylogenetic considerations

This is the first attempt to recognize the phylogenetic relationships of the genus *Hemipenthes*. The cladistic analysis includes the 29 North American species of *Hemipenthes*. Character polarities were determined by treating the closely related species *Exoprosopa minuscula* Painter as outgroup. The analysis also includes two species from tribe Villini, *Villa lateralis* Say and *Paravilla consul* Osten Sacken, to test *Hemipenthes* monophyly as genus and two species from South America, *Hemipenthes differens* Hall and *Hemipenthes ditaenia* Wiedemann, to test the North America species monophyly.

In the character list that follows, a zero (0) indicates the plesiomorphic state; one through five (1-5) are derived states. The male genitalic structures are considered to be phylogenetically significant in our analysis and are represented by 13 characters. A matrix of characters (Table 1) was constructed for the 34 species.

Characters and character states used for phylogenetic analysis.

Head

1. Face shape on lateral view: (0) bluntly projecting; (1) rounded; (2) clearly projected.
2. Size of first flagellomere: (0) twice as long as second segment; (1) as long as second flagellomere; (2) twice and a half as long as second flagellomere.
3. Size of third flagellomere: (0) as long as two basal flagellomeres combined; (1) longer than two basal flagellomeres combined.
4. Shape of third flagellomere: (0) basal half wide, apical half slender, not styliform; (1) base subconical, tapering to styliform apical two-thirds.

Thorax

5. Color of mesonotum anterior margin pilosity: (0) yellow or yellow and black; (1) black.
6. Presence of tomentum on coxae: (0) with tomentum; (1) without tomentum.
7. Color of tomentum on coxae: (0) black; (1) yellow; (2) white; (3) black and yellow.
8. Shape of scales on hind tibiae: (0) slender; (1) broad.

Wings

9. Number of submarginal cells: (0) three; (1) two
10. Color of scales on basicosta: (0) white; (1) black
11. Pigmentation of r_1 cell: (0) partially infuscated; (1) hyaline; (2) entirely infuscated or just hyaline at tip; (3) entirely infuscated with a subapical hyaline area; (4) basal half infuscated with a color spot at tip.
12. Pigmentation of r_{2+3} cell: (0) infuscated just at base; (1) hyaline; (2) basal half infuscated; (3) entirely infuscated or just tip hyaline; (4) basal half infuscated with a spot at tip.
13. Pigmentation of bm cell: (0) entirely infuscated; (1) hyaline.
14. Pigmentation of dm cell: (0) infuscated just at base or hyaline; (1) partially infuscated, at least one third; (2) entirely infuscated or just hyaline at tip.
15. Pigmentation of a_1 cell: (0) hyaline or infuscated just at base; (1) partially infuscated, at least one third; (2) entirely infuscated or just hyaline at tip.

Abdomen

16. Scales on first abdominal segment: (0) black; (1) white, forming a band; (2) yellow, scattered.
17. Scales on second abdominal segment: (0) white, forming a band; (1) black; (2) Fulvous and white, scattered; (3) yellow, scattered.
18. Scales on third abdominal segment: (0) white, forming a band; (1) black; (2) fulvous, forming a band; (3) fulvous and white, scattered; (4) yellow, scattered.
19. Scales on fifth abdominal segment: (0) black; (1) white, forming a band; (2) white, at segment sides; (3) fulvous, forming a band; (4) fulvous and white, scattered; (5) yellow, scattered.
20. Pilosity color on sides of first abdominal segment: (0) white or yellowish; (1) black.

Table 1. Matrix of characters and their states used in the cladistic analysis of the North America species of *Hemipenthes*. Number of characters and character states correspond with those used in the text. *Exoprosopa minuscula* is the outgroup.

	Characters																																
	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3
Taxa	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0	1	2	3
E. minuscula	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	0	-	0	-	-	0	-	0	-	-	0
V. lateralis	1	0	0	0	0	0	2	0	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	0	-	-	0	0	0	-	0	0
P. consul	2	1	0	0	0	0	0	0	1	1	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	-	-	1	0	0	-	0	0
H. albus, sp. n	0	0	1	1	0	0	1	0	1	0	0	0	0	0	0	2	3	4	5	0	0	0	0	1	0	-	-	0	2	0	-	0	1
H. bigradata	1	0	1	1	0	0	1	0	1	1	0	0	0	1	2	1	1	1	0	0	1	0	0	0	1	2	0	0	0	1	0	0	1
H. blanchardiana	1	0	1	1	0	0	1	0	0	1	3	4	0	1	2	0	1	1	0	0	1	0	0	0	1	2	0	0	0	1	0	0	1
H. castanipes	1	0	1	1	0	1	-	0	1	1	0	0	0	1	2	0	1	1	0	0	1	0	0	1	1	2	0	0	0	1	1	0	1
H. catulina	1	0	1	1	0	0	1	0	1	1	0	2	0	1	2	0	1	1	0	0	1	0	0	0	1	2	0	0	1	1	1	0	1
H. celeris	1	0	1	1	0	1	-	0	1	1	0	0	0	1	1	0	1	1	2	0	1	0	1	1	1	0	1	0	2	0	-	1	0
H. chimaera	0	0	1	1	0	0	0	0	1	1	0	0	0	1	2	0	1	1	0	0	1	0	0	1	0	-	-	0	0	0	-	0	1
H. comanche	0	0	1	1	0	0	3	0	1	1	0	0	0	1	1	1	1	1	1	0	1	0	1	0	1	2	0	0	0	1	1	0	1
H. curta	1	0	1	1	0	1	-	0	1	1	0	0	0	1	0	1	1	1	3	0	1	0	1	1	1	0	1	0	2	0	-	1	1
H. differens	1	2	1	1	0	1	-	0	1	1	0	0	0	1	0	0	1	1	0	0	1	0	1	1	1	1	0	0	2	0	-	0	1
H. ditaenia	1	2	1	1	0	1	-	0	0	1	2	0	0	1	1	0	1	1	0	0	1	0	1	1	0	-	-	0	2	0	-	0	1
H. edwardsii	1	0	1	1	0	0	2	0	1	1	0	0	0	1	0	1	2	3	4	0	1	0	0	0	1	2	0	0	1	1	1	0	1
H. eumenes	1	0	1	1	0	0	1	0	1	1	0	2	0	1	2	1	1	1	0	0	1	0	0	0	1	2	0	0	2	1	1	0	1
H. floridiana	1	0	1	1	0	1	-	0	1	1	0	0	0	1	2	0	1	1	2	0	1	0	1	1	1	0	1	0	2	0	-	1	0
H. incisiva	0	0	1	1	0	1	-	0	1	1	0	0	0	1	2	0	1	1	0	1	0	0	0	1	1	2	0	0	2	1	0	0	0
H. inops	1	0	1	1	0	0	0	1	1	1	0	1	1	0	0	1	0	2	3	0	1	1	1	0	1	1	0	0	2	1	2	0	1
H. jaennickeana	1	0	1	1	0	0	1	0	0	1	3	4	0	1	2	0	1	1	0	0	1	0	0	0	1	2	0	0	0	1	0	0	1
H. lepidota	1	0	1	1	0	0	0	1	1	1	0	0	0	0	0	1	1	1	3	0	1	1	0	0	1	2	0	0	0	1	0	0	1
H. martinorum	1	0	1	1	1	1	-	0	1	1	0	0	0	1	2	0	1	1	1	1	1	0	1	1	1	0	1	0	0	0	-	1	0
H. morio	1	0	1	1	0	0	1	0	1	1	0	2	0	1	2	1	1	1	0	0	1	0	1	0	1	2	0	0	0	1	1	0	1
H. pima	1	0	1	1	0	1	-	0	1	1	0	0	0	1	1	0	1	1	2	0	1	0	1	1	1	0	1	0	2	0	-	1	0
H. pleuralis	1	0	1	1	0	1	-	0	1	1	2	3	0	2	2	0	1	1	1	0	1	0	1	1	1	0	1	0	2	0	-	1	0
H. pullata	1	0	1	1	0	0	1	0	1	1	2	3	0	2	2	0	1	1	0	0	1	0	0	0	1	2	0	0	2	1	0	0	1
H. sagata	1	0	1	1	0	1	-	0	1	1	0	0	0	1	2	0	1	1	2	0	1	0	1	1	1	0	1	0	2	0	-	1	0
H. scylla	1	0	1	1	0	0	1	0	1	1	4	0	0	0	0	0	1	1	0	0	1	0	0	0	1	2	0	0	0	1	0	0	1
H. seminigra	1	0	1	1	0	0	1	0	1	1	0	2	0	1	2	1	1	1	0	0	1	0	0	0	1	2	0	0	2	1	1	0	1
H. sinuosa	1	0	1	1	0	0	1	0	1	1	3	4	0	1	2	0	1	1	0	0	1	0	0	0	1	2	0	0	0	1	0	0	1
H. translucens, sp. n	1	0	1	1	0	0	1	0	1	1	2	2	1	0	0	0	1	1	0	0	-	-	-	-	-	-	-	-	-	-	-	-	-
H. webberi	1	0	1	1	0	0	1	0	1	1	0	0	0	1	0	0	1	1	0	0	1	0	0	0	1	2	0	0	1	1	2	0	1
H. wilcoxi	1	0	1	1	1	1	-	0	1	1	0	0	0	1	2	0	1	1	0	1	1	0	0	0	1	2	0	0	2	1	1	0	1
H. yaqui	0	1	1	0	0	0	0	0	1	1	0	0	0	1	2	0	1	0	0	0	1	0	0	1	1	2	0	0	0	0	-	0	0

Male genitalia

21. Size of epiphallus in lateral view: (0) slender; (1) broad.
22. Shape of epiphallus in lateral view: (0) slightly curved; (1) clearly curved.
23. Shape of apex of the epiphallus in lateral view: (0) cap-shaped; (1) not cap-shaped.
24. Size of apex of epiphallus according to the rest in lateral view: (0) swollen; (1) not swollen.
25. Ventral medial extension in the epiphallus: (0) absent; (1) present.
26. Portion of epiphallus behind the ventral medial extension: (0) shorter than aedeagus; (1) as long as aedeagus; (2) longer than aedeagus.
27. Shape of the apex of the ventral medial extension of the epiphallus: (0) acuminate; (1) rounded
28. Size of epiphallus in ventral view: (0) slender; (1) broad.
29. Shape of lateral margins of epiphallus in ventral view: (0) narrowed at middle; (1) narrowed before apex; (2) straight.
30. Spines on epiphallus: (0) absent; (1) present.
31. Abundance and distribution of spines on epiphallus: (0) scattered all along; (1) scattered at middle, abundant on apex; (2) abundant on apex.

32. Shape of *aedeagus*: (0) not swollen dorsally; (1) swollen dorsally
33. Size of distylus in relation to basistylus: (0) as long as or longer than half the width of basistylus; (1) shorter than half the width of basistylus.

A cladogram (Fig. 34) is used to convey hypothetical relationships; the discussion is to supplement the cladogram and is intended only to complement the latter. The heuristic search produced 40 trees equally parsimonious, the cladogram presented here is the strict consensus (Length: 124; consistency index: 0.46; retention index: 0.65). The great amount of trees is due the low number of characters used in the analysis. There was not an exhaustive search for characters to clarify the relationships between species because the purpose of this analysis is just to present a prospection of the phylogeny of this species. A complete phylogenetic analysis of *Hemipenthes* including all the species is yet necessary.

***Hemipenthes* phylogeny**

Within *Hemipenthes*, *H. yaqui* is the most plesiomorphic species. This species shares some characters with the outgroup, being more evident the shape of face (character 1) and third flagellomere (character 4). Although *H. yaqui* is different from the other species of *Hemipenthes*, still shares one synapomorphy with them. Besides does not share synapomorphies with other genus and is not different enough for being considered a new genus. So I consider it to belong to *Hemipenthes*.

The other two plesiomorphic species are *H. chimaera* and *H. albus*, these two species share at least three sinapomorphies with the rest: the shape of third flagellomere (character 4), the scales on the third abdominal segment (character 18), and the size of distylus in relation to basistylus (character 33). Even when they have some plesiomorphic characters clearly belong to the genus. The other 28 species represent the species that have: the face rounded in lateral view (character 1), expect *H. comanche* and *H. incisiva*; a ventral medial extension on epiphallus (character 26), which is absent in *H. ditaenia* and very reduced in *H. differens*; and spines on the epiphallus (character 31), which are lost in the South American species and their North American relatives: *H. curta, H. celeris, H. floridiana, H. martinorum, H. pima, H. pleuralis*, and *H. sagata*.

I propose five lineages of species. The relationships between these lineages and *H. castanipes, H. incisiva, H. pullata* and *H. wilcoxi* are uncertain.

THE *differens* AND *curta* LINEAGES. The *differens* and *curta* lineages considered together represent the species that have the apex of the epiphallus not cap-shaped in lateral view (character 23) and the epiphallus without spines (character 30). The South American species *H. differens* and *H. ditaenia* are grouped by the size of the first flagellomere (character 2). The *curta* lineage have two sinapomorphies, namely, the apex of the ventral medial extension of the epiphallus rounded (character 27) and the aedeagus swollen dorsally (character 32). The genitalia of the species in this lineage are identical. The smooth color margin on wing is also distinctive of this lineage.

THE *catulina* LINEAGE. These four species have the basal half of cell r_{2+3} infuscated (character 12). Externally the species can be distinguished only by a few characters. *H. seminigra* and *H. eumenes* may be synonyms.

THE *sinuosa* AND *bigradata* LINEAGES. The *sinuosa* and *bigradata* lineages have the lateral margins of the epiphallus narrowed at middle in ventral view (character 29). The synapomorphies of the *sinuosa* lineage are the pigmentation on cell r_1 (character 11) and cell r_{2+3} (character 12). *H. blanchardiana* is grouped with *H. jaennickeana* by having three submarginal cells (character 9). The species of the *bigradata* lineage have white scales on the first abdominal segment (character 16).

Biogeographic considerations

The distribution of the North American species of *Hemipenthes*, analyzed from the perspective of the proposed phylogenetic lineages, provides preliminary information about biogeographical patterns. The South American species *H. differens* and *H. ditaenia* as well as *H. morio*, presumably an European species, are grouped with the North America species of *Hemipenthes.* So the Nearctic

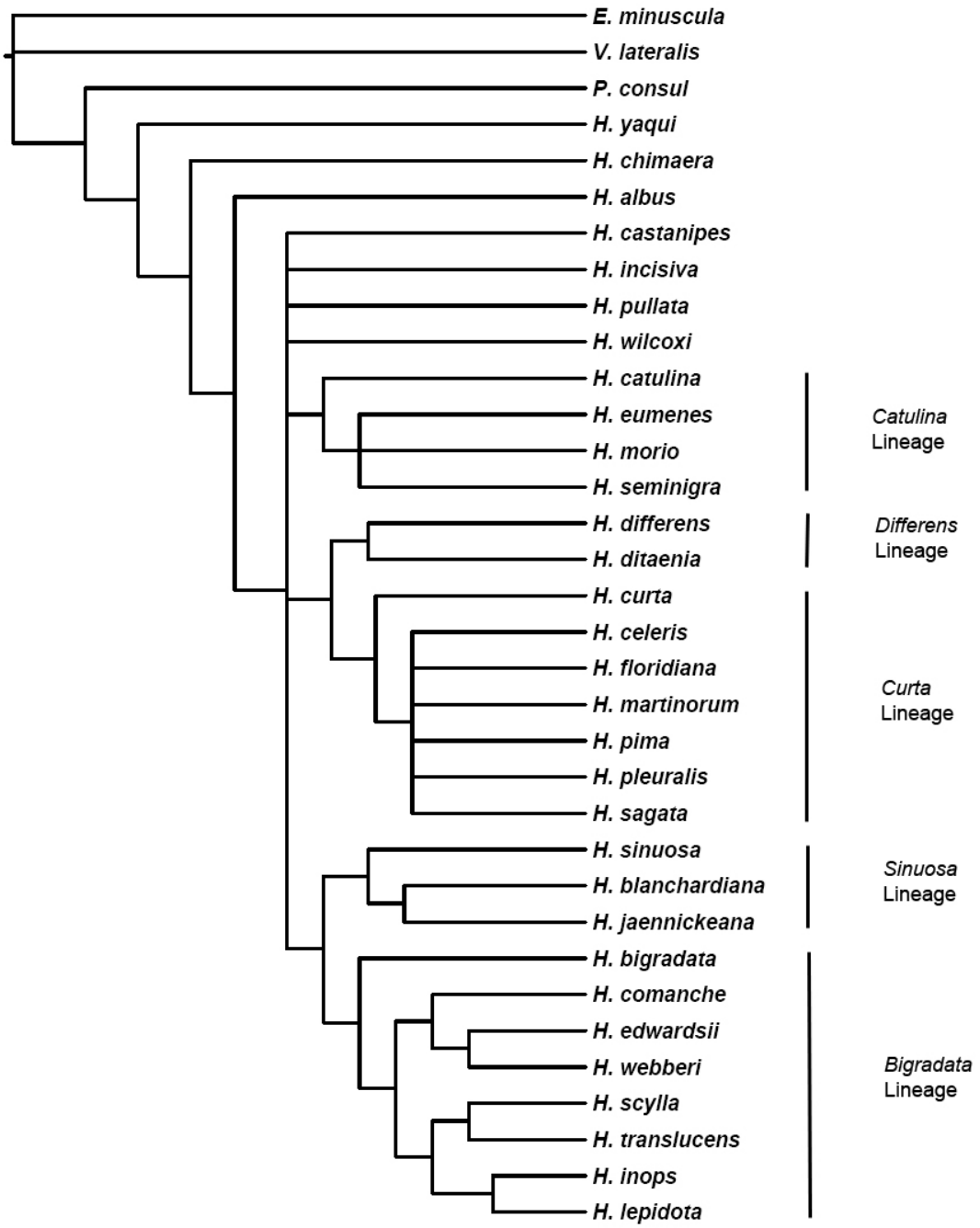


Figure 34. Cladogram depicting hypothetical cladistic relationships among the North American species of *Hemipenthes* (124 steps, consistency index 0.46, retention index 0.65).

species of this genus do not form a monophyletic group. Some species have a restringed distribution. Although these distributions probably represent real patterns, collecting biased are also reflected. Of the 3496 collecting data used for this revision, 2232 (63%) were from specimens collected in the USA which is better collected than Mexico. The limited distribution of the species, especially those restricted to Mexico, may be the result of sampling error. Assuming these limited distributions represent a real pattern, there are species that may exemplify divergence and speciation after isolation. Each lineage presents a Nearctic, Neotropical or Palearctic affinity.

The *catulina* lineage distributions. *Hemipenthes catulina*, *H. seminigra* and *H. eumenes* are widespread distributed throughout North America and *H. morio* is a Palearctic species.

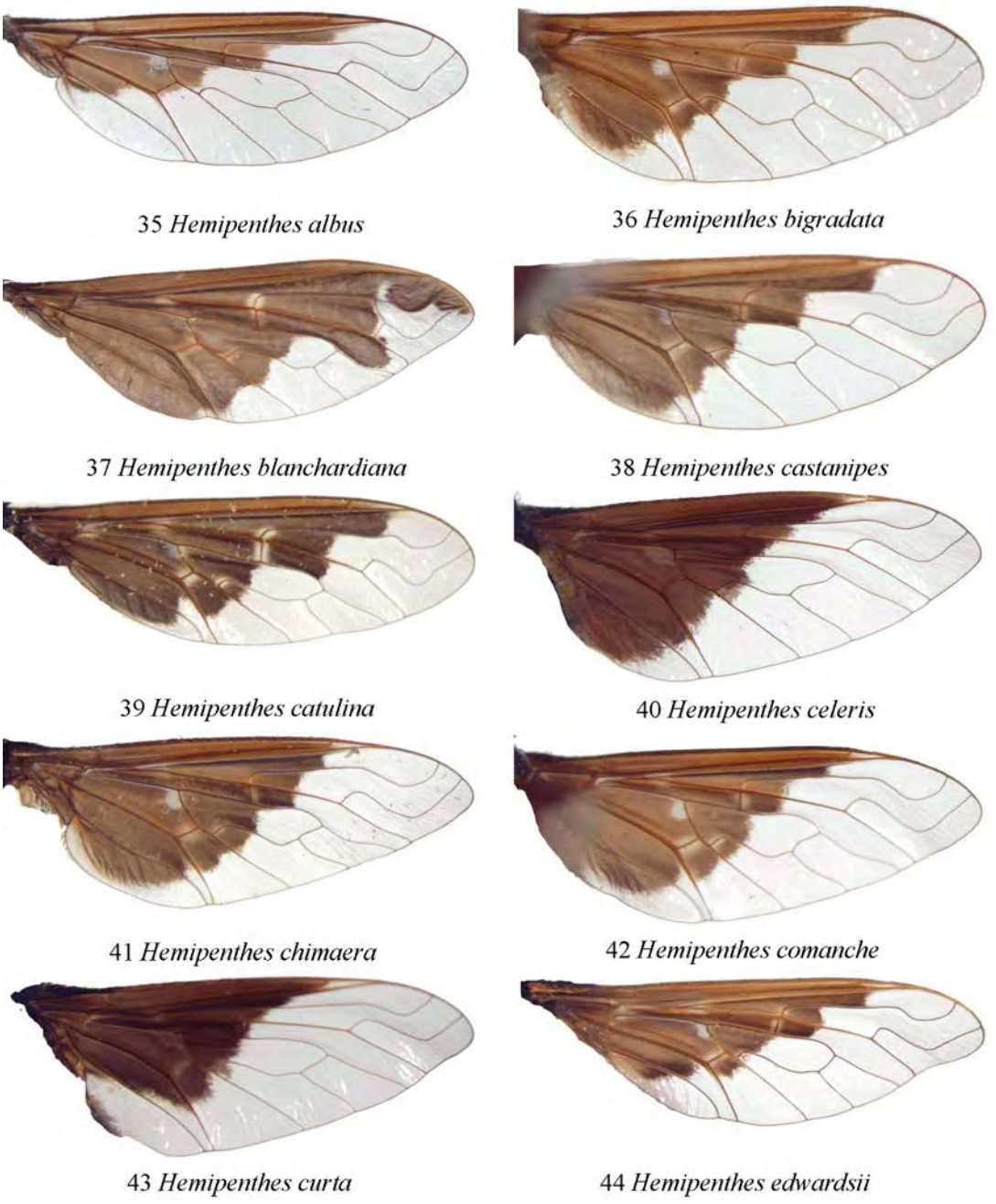
The *curta* lineage distributions. This lineage has a Nearctic and Neotropical mixed distribution pattern. Within this lineage *Hemipenthes curta*, *H. martinorum*, *H. pleuralis*, and *H. sagata* are distributed in the Nearctic and Neotropical regions. The South of the USA is the northernmost collection site for any species within this lineage. In the phylogenetic analysis the species of the *curta* lineage are grouped with the South American species. Besides *H. pleuralis* is closely related with the Neotropical species *H. galathea*. The limited distribution of *H. floridana*, which is found in Florida and Georgia, USA, represents the possibility that speciation has occurred within isolated populations.

The *sinuosa* and *bigradata* lineages distributions. These lineages represent the exclusively Nearctic species. Within the *sinuosa* lineage *Hemipenthes sinuosa* and *H. jaennickeana* occur throughout North America. In contrast *H. blanchardiana* has a disjunt more limited distribution. The species within the *bigradata* lineage are distributed in the Nearctic part of Mexico (center and northern the country) and the west of the USA. Only *H. webberi* is present in the East of the USA. *H. scylla* is the only species distributed in the Neotropical region being present in Chiapas, Mexico. This species is also cited to have been collected in Venezuela (Evenhuis and Greathead, 1999), but this is doubtful.

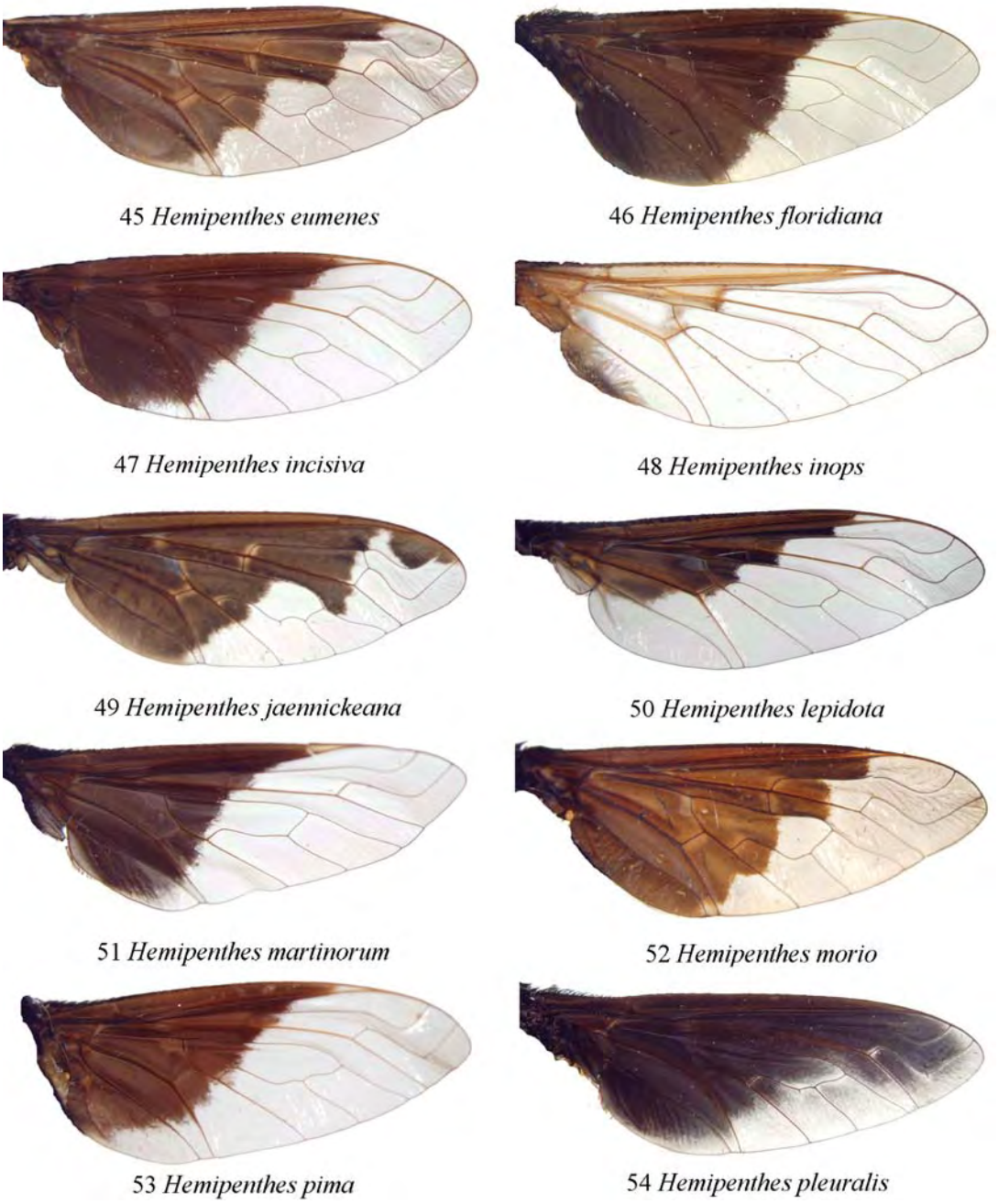
Figures 35 - 119

Wings

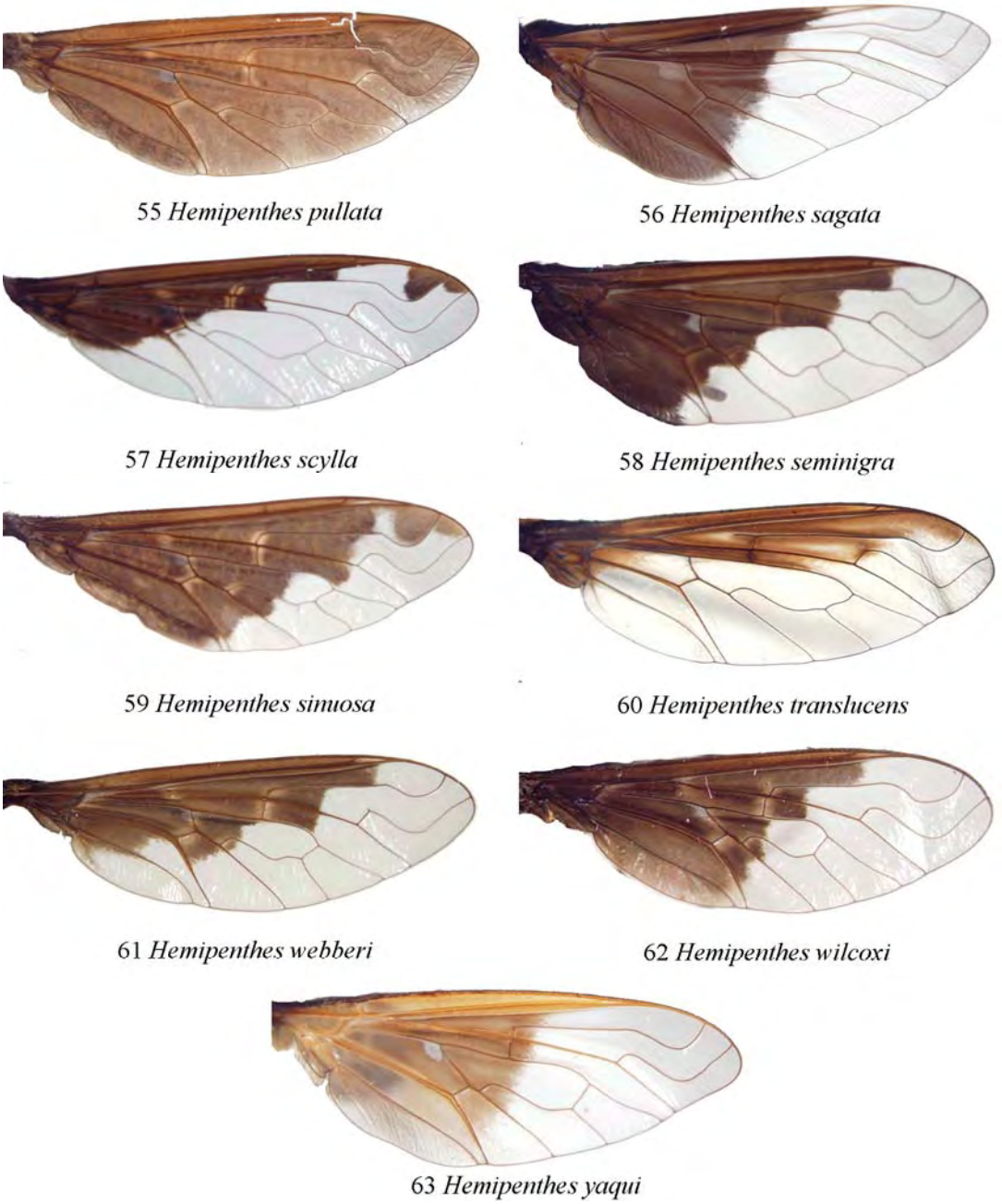
Male Genitalia



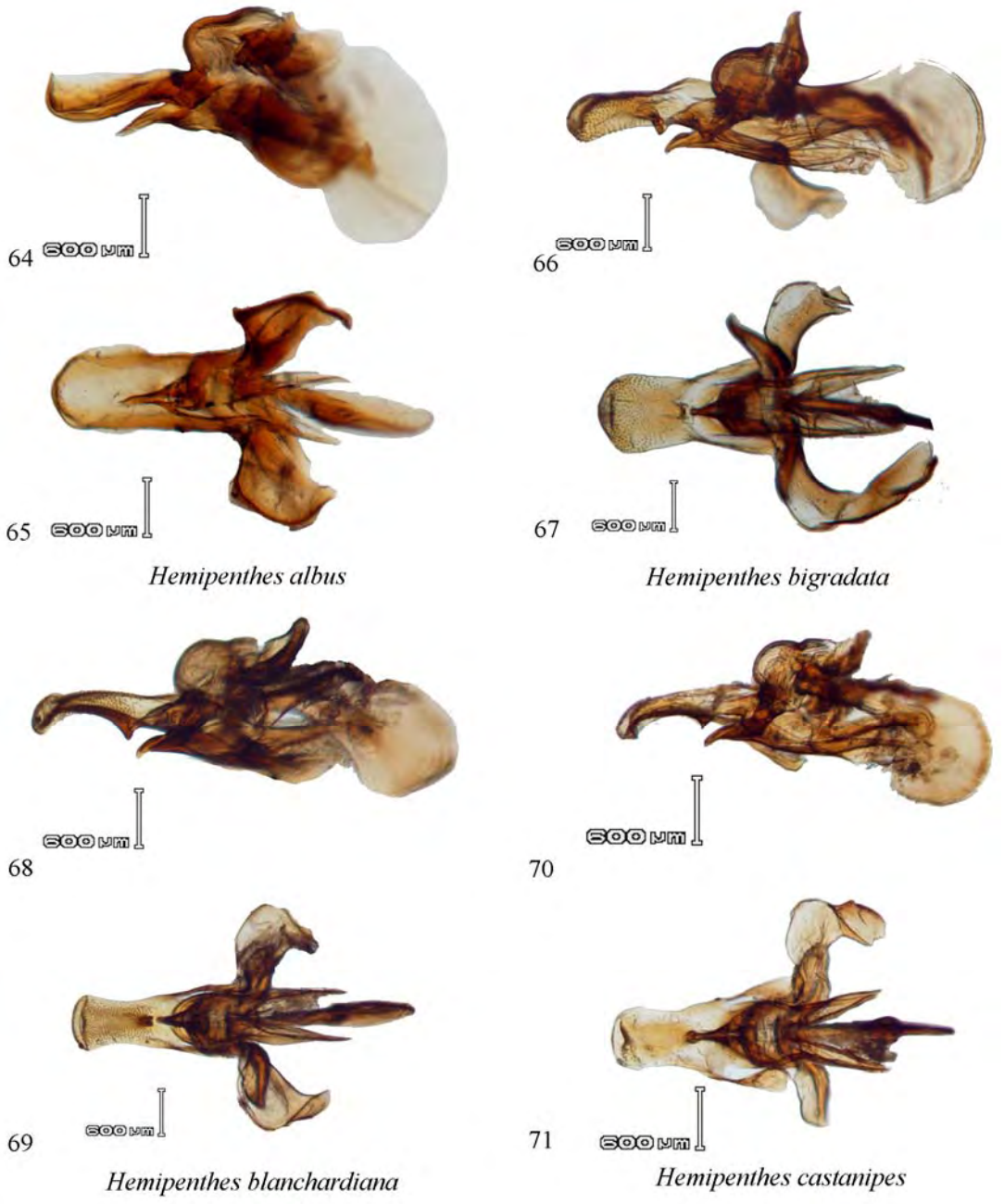
Figures 35-44.— Wings: 35, *Hemipenthes albus*; 36, *H. bigradata*; 37, *H. blanchardiana*; 38, *H. castanipes*; 39, *H. catulina*; 40, *H. celeris*; 41, *H. chimaera*; 42, *H. comanche*; 43, *H. curta*; 44, *H. edwardsii*.



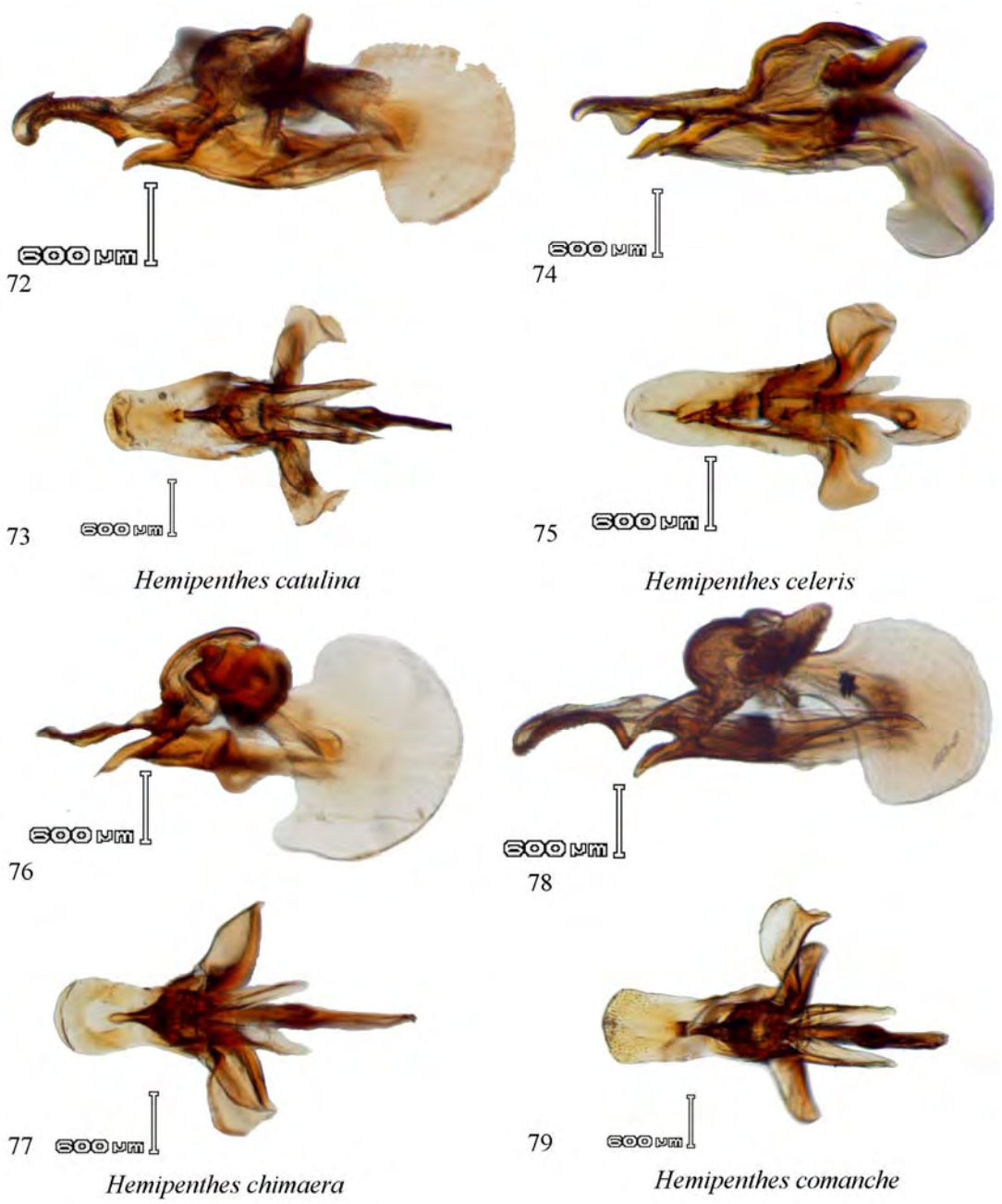
Figures 45-54.— Wings: 45, *Hemipenthes eumenes*; 46, *H. floridiana*; 47, *H. incisa*; 48, *H. inops*; 49, *H. jaennickeana*; 50, *H. lepidota*; 51, *H. martinorum*; 52, *H. morio*; 53, *H. pima*; 54, *H. pleuralis*.



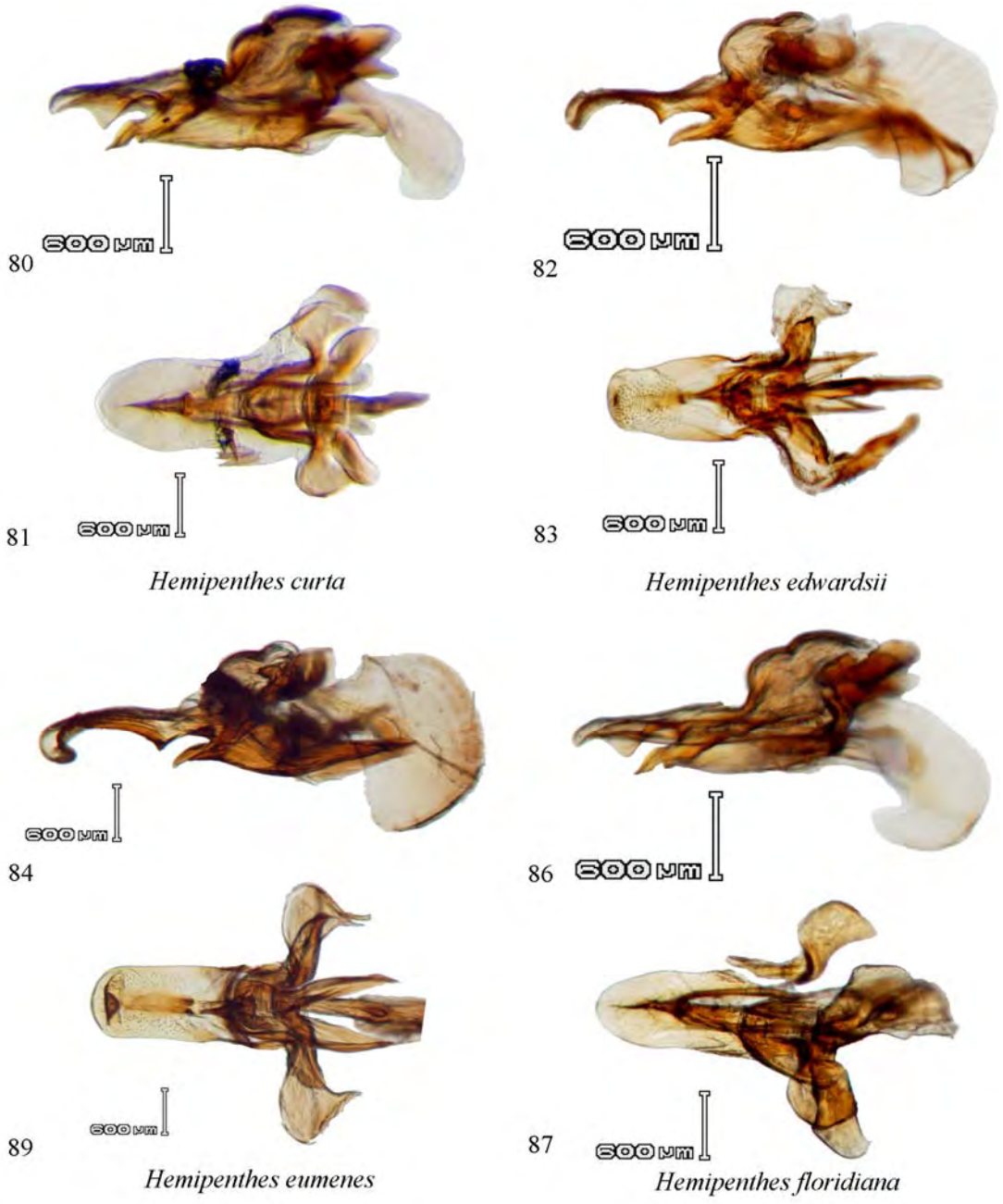
Figures 55-63.— Wings: 55, *Hemipenthes pullata*; 56, *H. sagata*; 57, *H. scylla*; 58, *H. seminigra*; 59, *H. sinuosa*; 60, *H. translucens*; 61, *H. webberi*; 62, *H. wilcoxi*; 63, *H. yaqui*.



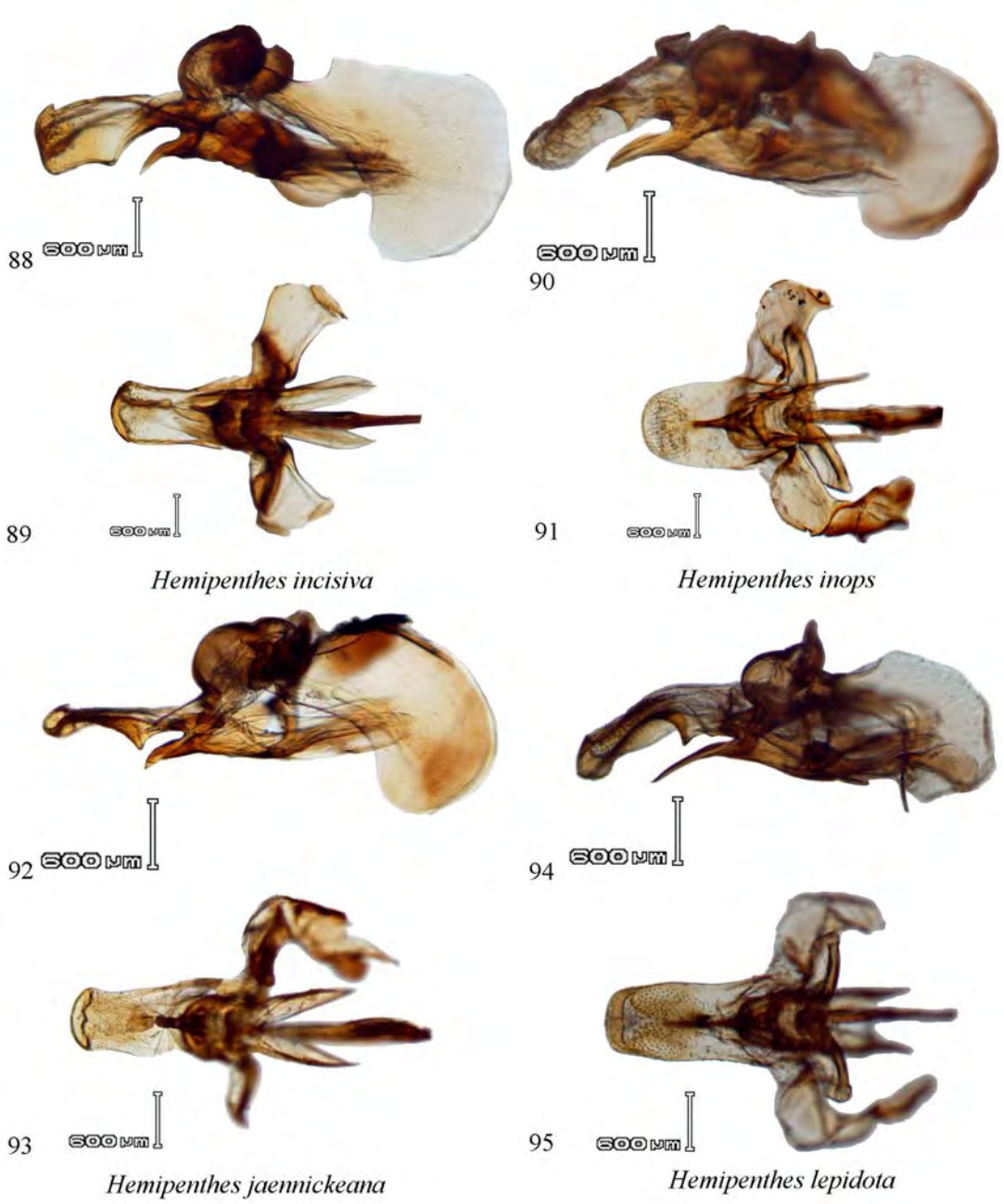
Figures 64-65.— Male genitalia: 64, *Hemipenthes albus*, lateral view; 65, *H. albus*, ventral view; 66, *H. bigradata*, lateral view; 67, *H. bigradata*, ventral view; 68, *H. blanchardiana*, lateral view; 69, *H. blanchardiana*, ventral view; 70, *H. castanipes*, lateral view; 71, *H. castanipes*, ventral view.



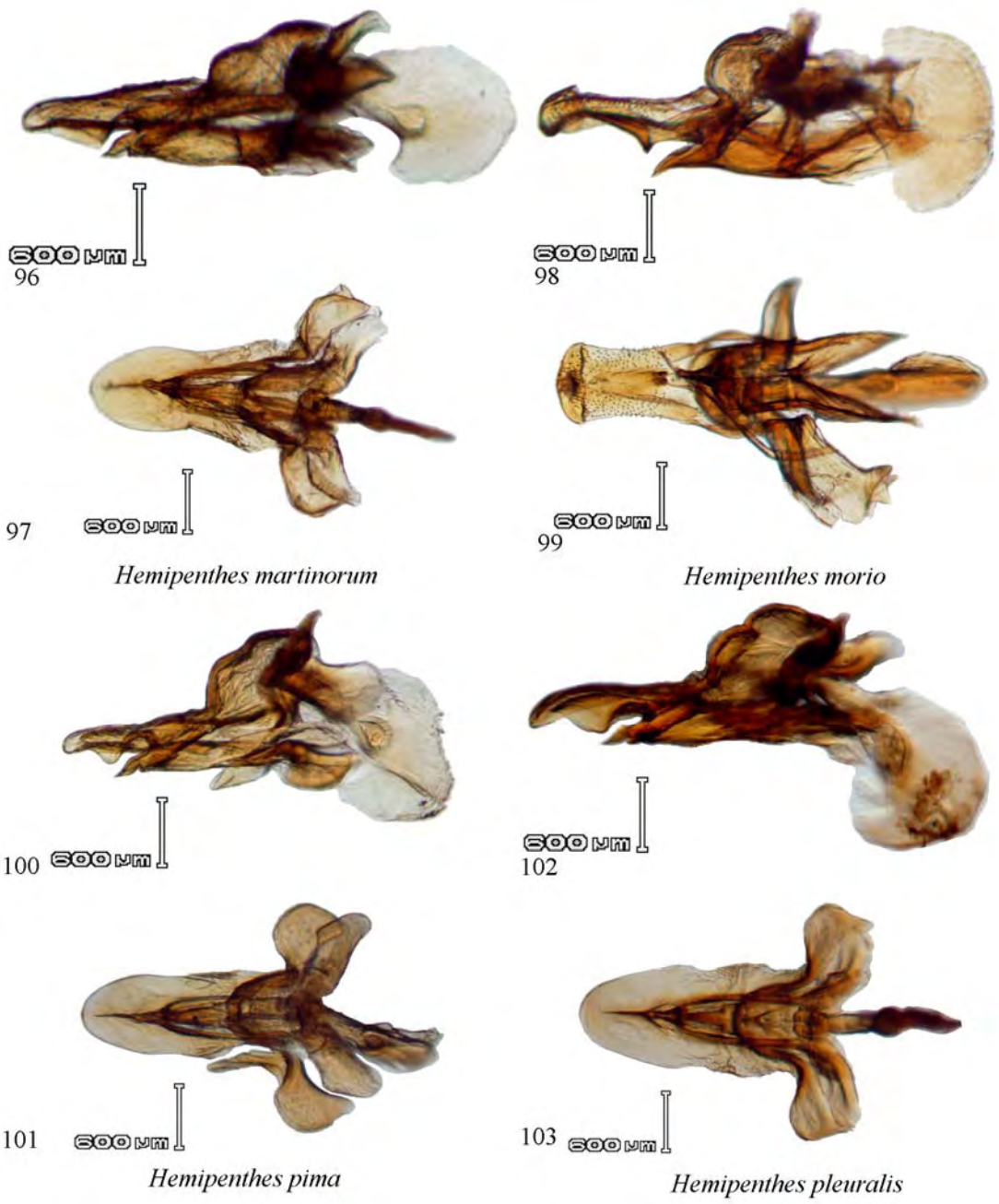
Figures 72-79.— Male genitalia: 72, *Hemipenthes catulina*, lateral view; 73, *H. catulina*, ventral view; 74, *H. celeris*, lateral view; 75, *H. celeris*, ventral view; 76, *H. chimaera*, lateral view; 77, *H. chimaera*, ventral view; 78, *H. comanche*, lateral view; 79, *H. comanche*, ventral view.



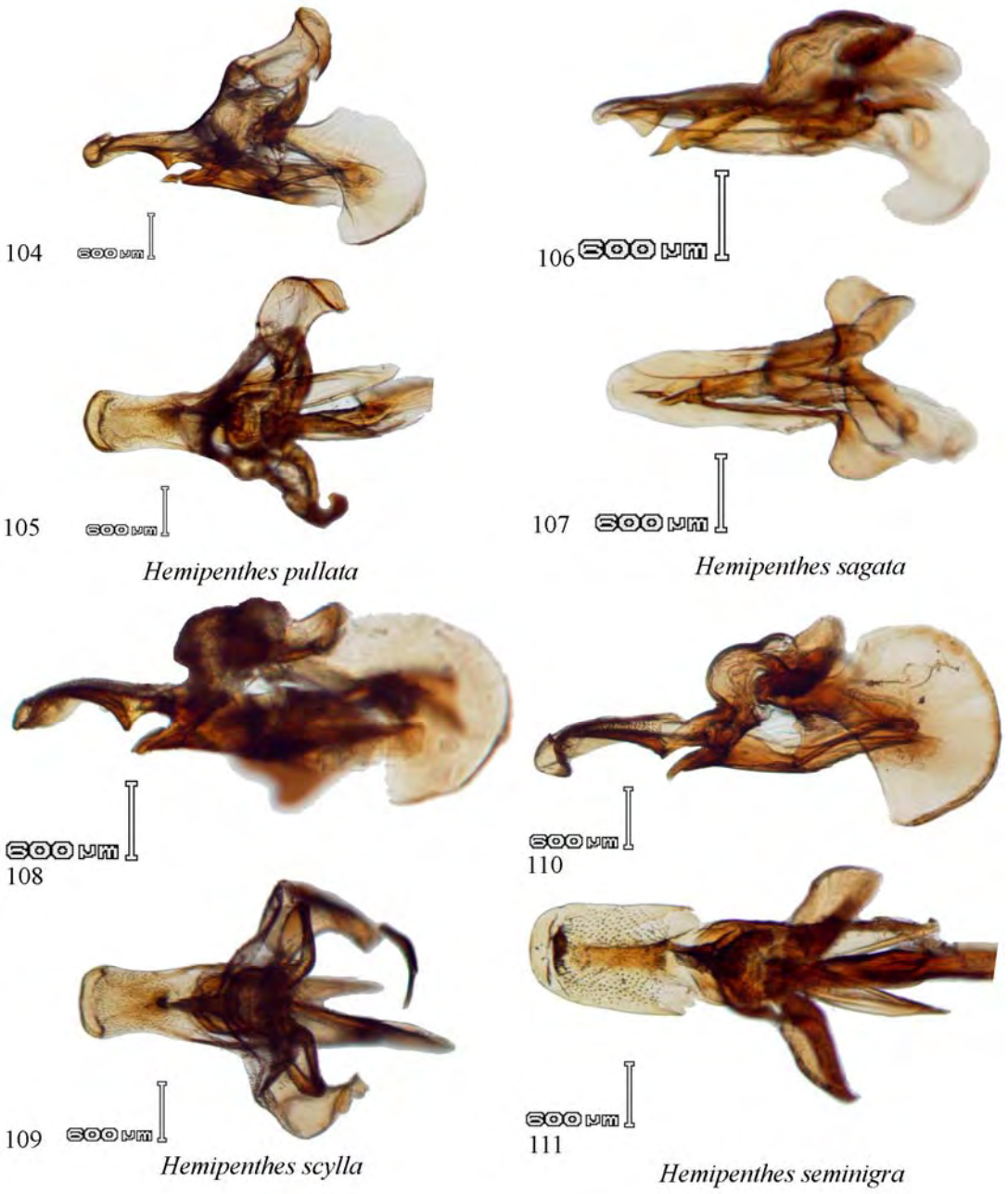
Figures 80-87.— Male genitalia: 80, *Hemipenthes curta*, lateral view; 81, *H. curta*, ventral view; 82, *H. edwardsii*, lateral view; 83, *H. edwardsii*, ventral view; 84, *H. eumenes*, lateral view; 85, *H. eumenes*, ventral view; 86, *H. floridiana*, lateral view; 87, *H. floridiana*, ventral view.



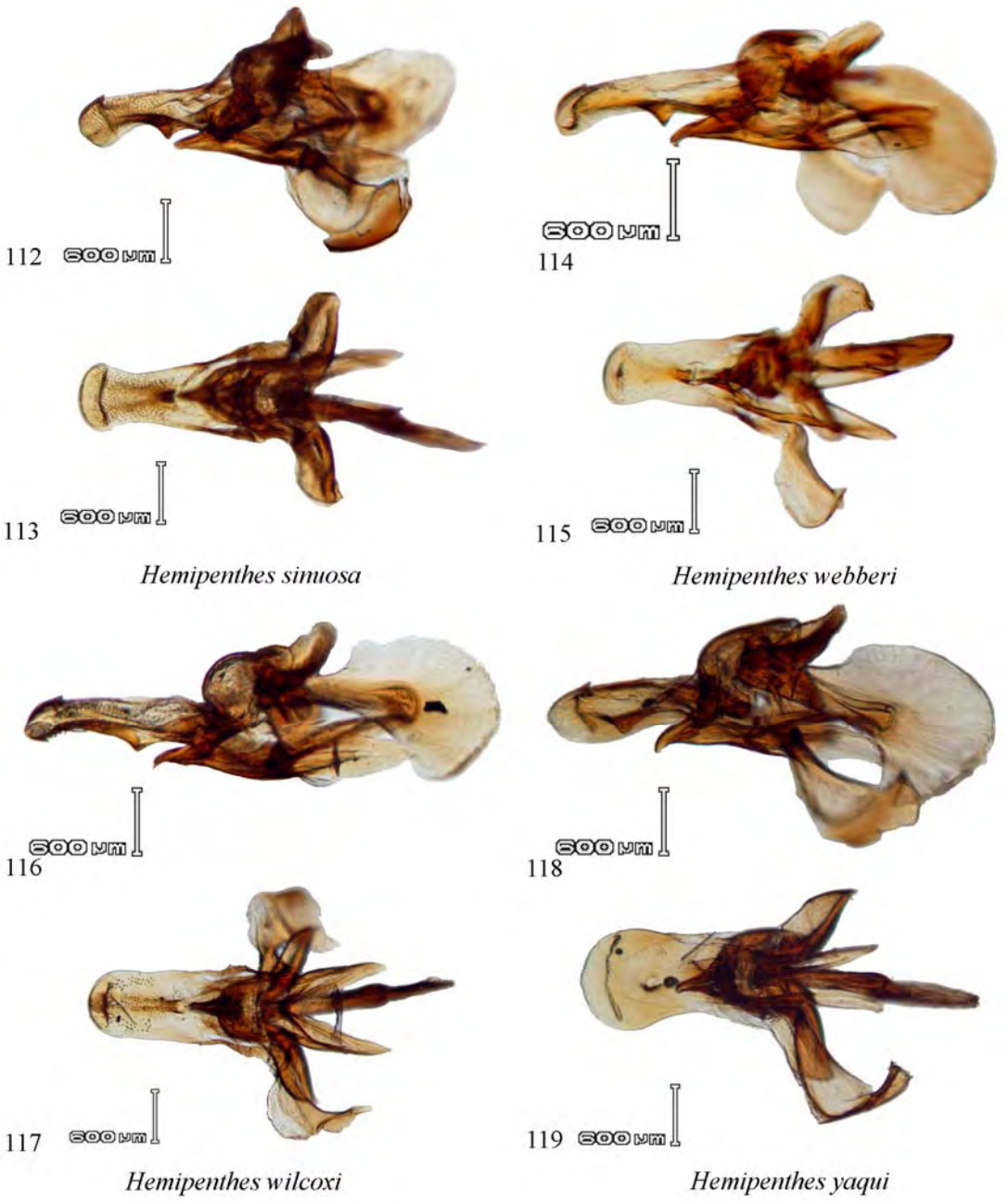
Figures 88-95.— Male genitalia: 88, *Hemipenthes incisa*, lateral view; 89, *H. incisa*, ventral view; 90, *H. inops*, lateral view; 91, *H. inops*, ventral view; 92, *H. jaennickeana*, lateral view; 93, *H. jaennickeana*, ventral view; 94, *H. lepidota*, lateral view; 95, *H. lepidota*, ventral view.



Figures 96-103.— Male genitalia: 96, *Hemipenthes martinorum*, lateral view; 97, *H. martinorum*, ventral view; 98, *H. morio*, lateral view; 99, *H. morio*, ventral view; 100, *H. pima*, lateral view; 101, *H. pima*, ventral view; 102, *H. pleuralis*, lateral view; 103, *H. pleuralis*, ventral view.



Figures 104-111.— Male genitalia: 104, *Hemipenthes pullata*, lateral view; 105, *H. pullata*, ventral view; 106, *H. sagata*, lateral view; 107, *H. sagata*, ventral view; 108, *H. scylla*, lateral view; 109, *H. scylla*, ventral view; 110, *H. seminigra*, lateral view; 111, *H. seminigra*, ventral view.



Figures 112-119.— Male genitalia: 112, *Hemipenthes sinuosa*, lateral view; 113, *H. sinuosa*, ventral view; 114, *H. webberi*, lateral view; 115, *H. webberi*, ventral view; 116, *H. wilcoxi*, lateral view; 117, *H. wilcoxi*, ventral view; 118, *H. yaqui*, lateral view; 119, *H. yaqui*, ventral view.

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Discusión

Estado actual del conocimiento sobre el género

Las descripciones originales de la mayoría de las especies son breves e insuficientes para reconocer a las especies, además de las dificultades que generan por estar en latín. *H. morio* se describió en el siglo XVIII, seis especies se describieron en el siglo XX (*H. martinorum, H. pima, H. semifucata, H. webberi, H. wilcoxi* y *H. yaqui*), el resto se describió en el siglo XIX. Painter y Painter (1962) hicieron una revisión de los tipos contenidos en colecciones europeas. En su trabajo redescriben algunas especies, describen algunas nuevas especies y presentan una clave parcial para éstas. Hasta la presente revisión no existía clave que incluyera a todas las especies de Norteamérica, así como sus redescripciones.

Las recolectas de ejemplares de este género en EUA se hicieron en los primeros dos tercios del siglo XX. En México no se recolectó en ese periodo. Después de la década de 1960 se dejó de incorporar material nuevo a la colección de USNM, quizá esto se deba a que se dejó de llevar material a los grandes museos para empezar a formar colecciones más pequeñas en diferentes instituciones. Fue en esa misma década (1960) que comenzaron las recolectas de este taxón en México. Sin embargo, existe un rezago de 40 años en el estudio de esta familia en México. En la actualidad en México no hay investigadores especialistas para la superfamilia Asiloidea (a la que pertenece Bombyliidae), aun cuando es uno de los grupos de animales más diversos.

Sinonimias

Las especies de este género son fáciles de distinguir entre sí con dos excepciones: el grupo formado por *H. celeris, H. floridiana, H. pima* y *H. sagata*, y el grupo formado por *H. eumenes, H. morio* y *H. seminigra*. Los caracteres usados para distinguir estas especies son ambiguos y variables.

En el caso de *H. seminigra* y *H. eumenes*, hasta ahora los caracteres los hacen indistinguibles, por lo que propongo que se trata de una sinonimia. Osten Sacken (1886) describió a *H. eumenes*, argumentó su separación de *H. seminigra* porque la segunda especie presenta las patas negras y porque la celda r_5 está adelgazada en el margen del ala. Osten Sacken no revisó ejemplares de *H. seminigra*, sino que se basó en la descripción original de Loew (1869), quien dice que esta especie tiene patas negras *con tomento blanco*. En el material revisado de ambas especies el color de las patas es variable, con un intervalo de castaño oscuro a amarillo, de la misma forma el color y la cantidad de las escamas en las patas va desde negro a blanco en diferentes abundancias. Por otro lado, cuando Loew (1869) describió a *H. seminigra* hizo especial referencia a la forma de la celda r_5 para diferenciar esta especie de *H. morio*, pero tanto *H. eumenes* como *H. seminigra* presentan la celda r_5 adelgazada en el margen del ala, lo mismo que los ejemplares de *H. morio* de Norteamérica. Por ello esta característica no puede usarse para diferenciar estas especies. Sin embargo, no se revisaron los tipos de estas especies y no se puede asegurar fehacientemente que *H. seminigra* y *H. eumenes* sean sinónimos.

Painter y Painter (1962) describieron a *H. pima* y revisaron los tipos de *H. celeris, H. floridiana* y *H. sagata*. Ellos consideraron que se trataba de cuatro especies distintas. Este grupo requiere de un examen detallado de los tipos y de una muestra geográfica representativa para elucidar sus relaciones y validar los nombres. Al no contar con estas dos condiciones, en este trabajo se consideran como especies diferentes, pero es posible que sean variaciones geográficas, como mencionan Painter y Painter (1962): "*Villa (Hemipenthes) floridiana* es bastante similar [a *H. celeris*] y cuando especímenes de áreas intermedias sean estudiados podría mostrarse como un sinónimo o por lo menos una subespecie."

Distribución geográfica

Con base en las distribuciones geográficas de las especies se puede decir que el suroeste de EUA con las zonas áridas del norte de México integran un centro de diversidad para este género, como ocurre para otros grupos de Bombyliidae.

Las especies de *Hemipenthes* en Norteamérica forman grupos según su afinidad biogeográfica. El linaje *catulina* tiene afinidad paleártica, que incluye a *H. morio*, la cual se encuentra en Europa y Asia; el linaje *curta* contiene especies con afinidad neotropical y se relaciona con especies de Sudamérica; y los linajes *sinuosa* y *bigradata* tiene representantes con afinidad neártica.

La distribución de *H. morio* se consideraba holártica. Painter y Painter (1962), al hacer la redescripción del tipo de *H. morio*, comentan al respecto: "*Villa (Hemipenthes) morio* ha sido considerada con distribución holártica, pero no se ha realizado estudio alguno con especímenes suficientes de varias localidades. Hasta que esto sea realizado no es seguro que las poblaciones de Europa y Norteamérica sean coespecíficas". Al analizar los ejemplares de esta especie de Norteamérica y de Europa se distinguen diferencias, principalmente en los genitales masculinos y en la forma de la vena r_5. Además, los ejemplares de Norteamérica determinados como *H. morio* presentan las mismas características que *H. seminigra*. Esta evidencia sugiere que los ejemplares determinados como *H. morio* de Norteamérica en realidad pertenecen a *H. seminigra*. Si los ejemplares de *H. morio* de Norteamérica en realidad son de *H. seminigra*, *H. morio* tiene una distribución paleártica y no holártica.

Relaciones filogenéticas

El objetivo principal de este estudio no es proponer las relaciones filogenéticas de las especies de *Hemipenthes* en Norteamérica, sino dar una prospección general de las relaciones filogenéticas de este género. Considero que los ejemplares usados en el análisis son una

representación limitada geográfica y temporalmente de las especies del género. No se revisaron todos los tipos de las especies y la búsqueda de caracteres no fue exhaustiva por eso es que no se proponen grupos de especies, solo linajes posibles.

Aun cuando el análisis de las relaciones no está completo es posible sustentar algunas hipótesis. El género *Hemipenthes* se encontró como monofilético con respecto a los tres grupos externos que se usaron (*Exosprosopa, Paravilla* y *Villa*). Las especies *H. yaqui*, *H. chimaera* y *H. albus* son las más plesiomórficas de las especies analizadas. Se identificaron cinco linajes: *catulina, differens, curta, sinuosa* y *brigadata*. El linaje *differens* corresponde a especies de Sudamérica.

Las relaciones de las especies *H. castanipes, H. incisiva, H. pullata* y *H. wilcoxi* quedaron sin resolverse completamente, al igual que las relaciones de las especies del linaje *curta*. Es necesario hacer un análisis completo de las especies de *Hemipenthes*, que incluya a las especies de todo el mundo y que implique la revisión de los tipos y una muestra significativa de las variaciones geográficas y temporales de las especies.

Conclusiones

- Se reconocieron dos nuevas especies para Norteamérica: *H. albus y H. translucens*, y se corrigió la distribución de *H. semifucata*, por lo que el total de especies para esta región es de 29.

- Se identificaron sinonimias posibles que, para confirmarlas, es necesario examinar detalladamente los tipos de las especies.

- Las especies de *Hemipenthes* que se incluyeron en el análisis filogenético forman un grupo monofilético.

- Es necesario realizar un análisis filogenético para todas las especies de *Hemipenthes*, con una muestra representativa geográfica y temporalmente.

- Hay escasez de ejemplares recolectados para el norte de México, una región que es muy diversa para este grupo.

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