



## Notes on the genus *Celotes*, with the description of a new species from Mexico (Lepidoptera: HesperIIDae: Pyrginae: Pyrgini)

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### Abstract

A new species of *Celotes* is described from central Mexico, bringing the total number of species in this genus to three. The new *Celotes* is larger and darker than its two congeners, and is immediately distinguished from them by a combination of a very long and curved projection from the valva, broad valvae, terminally narrowing less massive harpe, smaller tegumen and narrower uncus. These abundantly distinct genitalic characters, together with whitish, but rounded, scales on the dorsal surface of the male metathoracic pouch strongly argue for the species-level recognition of this seemingly allopatric *Celotes* phenotype.

**Key words:** *limpia*, *nessus*, metathoracic pouch, streaky-skipper, Querétaro

### Resumen

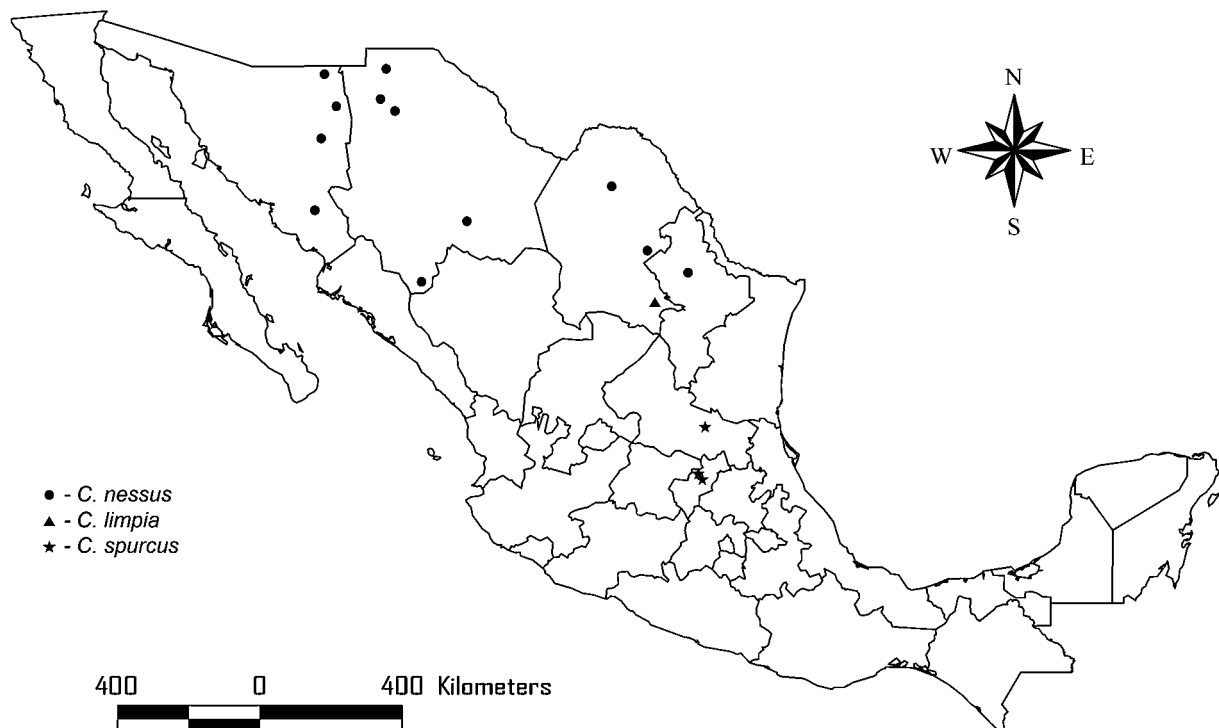
Se describe una especie nueva de *Celotes* del centro de México, la tercera conocida del género. Esta especie nueva es más grande y oscura que las otras dos, y se distingue inmediatamente de ellas por presentar un proceso muy largo y curvo en las valvas, que son anchas. Posee un harpe más pequeño y estrecho en su extremo terminal, un tegumen corto y un uncus más angosto. Estas características distintivas de las estructuras genitales, junto con las escamas blanquecinas aunque redondeadas sobre la superficie dorsal del saco metatorácico del macho, son un argumento fuerte para la distinción a nivel específico de este fenotipo de *Celotes*, especie de distribución aparentemente alopatrica.

**Palabras clave adicionales:** hespérico rayado, *limpia*, *nessus*, Querétaro, saco metatorácico

### Introduction

*Celotes* Godman & Salvin, is a small genus of pyrgine skippers (Lepidoptera: HesperIIDae: Pyrginae: Pyrgini) commonly known as streaky-skippers (Brock and Kaufman 2006), in reference to the irregular pattern of contrasting pale and darker streaks on both wing surfaces, giving adults a corrugated appearance. Godman and Salvin (1899) erected the genus *Celotes* for *Pholisora nessus* W. H. Edwards (described from San Antonio, [Bexar County], Texas), and the genus remained monotypic until Burns (1974) described *Celotes limpia* from the Davis, Chisos and Guadalupe mountains of west Texas, United States.

Species of *Celotes* are distributed from the southwestern United States (Texas, south-central Oklahoma, New Mexico, Arizona, and far eastern San Bernardino County, California; see Stanford and Opler 1993; Opler *et al.* 2008) south to Mexico's Central Plateau (Fig. 1). They generally inhabit dry areas, often deserts, but *C. nessus* occurs in wetter habitats in the eastern and northern parts of its range. In desert situations, *Celotes* adults are usually encountered along canyons, creeks, streams, and dry washes. *Celotes nessus* is a generalist with a wide distribution. *Celotes limpia* is fully sympatric with *C. nessus*, but is narrowly distributed in the trans-Pecos region of west Texas, where adults of both species can be found in sympatry and synchrony (Burns 1974, Grishin pers. obs.). Both described *Celotes* species are very similar in their biology, and a number of malvaceous plants are recorded as larval foodplants, in particular from the genera *Abutilon* P. Mill., *Sphaeralcea* St.-Hil., *Wissadula* Medik. and *Sida* L. (Kendall 1965, Burns 1974, Bailowitz and Brock 1991, Grishin pers. obs.) Apparently, *Celotes* species may utilize several *Malvaceae* genera at the same location (Grishin pers. obs.). Several annual broods may be produced throughout the local warm season (at least from March to October), and in rainy years, adults may be found continuously whenever larval foodplants are in good condition. Larvae of both described *Celotes* species construct shelters from leaves of larval foodplants, in which they pass all larval instars, hibernate, aestivate and pupate. Young larvae construct shelters by cutting a small section of a leaf and folding it over; later instar larvae, especially those on plants with narrow leaves, tie several leaves together. Pupae develop rapidly without delay.



**FIGURE 1.** Records of *Celotes* from Mexico. *Celotes nessus* – circles; *C. limpia* – triangle; *C. spurcus* – stars. See Burns (1974) for distributional records of *C. nessus* and *C. limpia* from the United States.

**FIGURE 2.** Type locality of *Celotes spurcus*, showing typical habitat and live males in natural conditions. **a),b)** The type locality, Mexico: Querétaro: Mpio. Peñamiller: 4.2 rd. mi (6.8 km) W Peñamiller on camino Peñamiller-Boquillas, 1465m, 21°04'53"N 99°50'33"W; **a)** view towards the northwest from main gulch, below road; **b)** view to the southeast from lower end of side gulch, 3-Sep-2007; **c),d),e),f)** *C. spurcus* males, perching on a possible foodplant in **c)**; photos of live adults by Wayne Colony, 14-Sep-2007.







During field surveys for butterflies in west-central Querétaro State, Mexico, in March of 2001, the senior author, accompanied by Thomas W. Ortenburger and Jose Luis Salinas Gutiérrez, encountered dry seasonal conditions at most sites, with few leafy or blooming plants encountered most days. However, on March 26<sup>th</sup>, we encountered a gulch 4.2 road miles (6.8 km) west of Peñamiller, on the road to Boquillas, that was full of leafy green annuals (largely *Malvaceae*), numerous blooming flowers, and leaves on the ocotillo (*Fouquieria*; the first time we had seen leafy ocotillo on the trip) (Fig. 2a,b). Several hours were spent surveying butterflies in this gulch, which resulted in a series of 12 male specimens of *Celotes*. Representing the southernmost known distributional record for the genus (Burns 1974, Fig. 1 herein), these specimens were carefully studied upon return to the lab, and examination of the male genitalia revealed that they represented an undescribed species.

During a visit to the McGuire Center for Lepidoptera and Biodiversity (Gainesville, Florida) in October of 2004, the senior author encountered three males of this same *Celotes* in the collection, labeled by the second author as types of an undescribed species. These specimens were collected by John Kemner in July of 1988, between Cárdenas and Ciudad del Maíz, San Luis Potosí State, Mexico, approximately 175 km N of the site near Peñamiller, Querétaro. Upon discussing the matter, the senior and second authors agreed to collaborate in the description of the new species.

In an attempt to acquire additional information on this new species, as well as more specimens for morphological study, an expedition to the same region of west-central Querétaro was conducted in September of 2007. Three days of study at and near the gulch 4.2 miles west of Peñamiller resulted in the collection of a long series of male specimens, which show considerable variation in size and coloration, and a single female. In addition, observations were made on adult habits and probable larval foodplants.

Burns (1974: 51) remarked that a detailed original description of *Celotes limpia* would be “too tedious for words” and therefore “largely visual”, and Klotz (1951: 217) said of *C. nessus*, “The pattern defies concise description.” The same holds true for the new species described below, which is superficially very much like *C. nessus* and *C. limpia*; nonetheless, a verbal description is provided.

### ***Celotes spurcus*, new species A. Warren, Steinhauser, Hernández-Mejía & Grishin**

Figs. 3–6

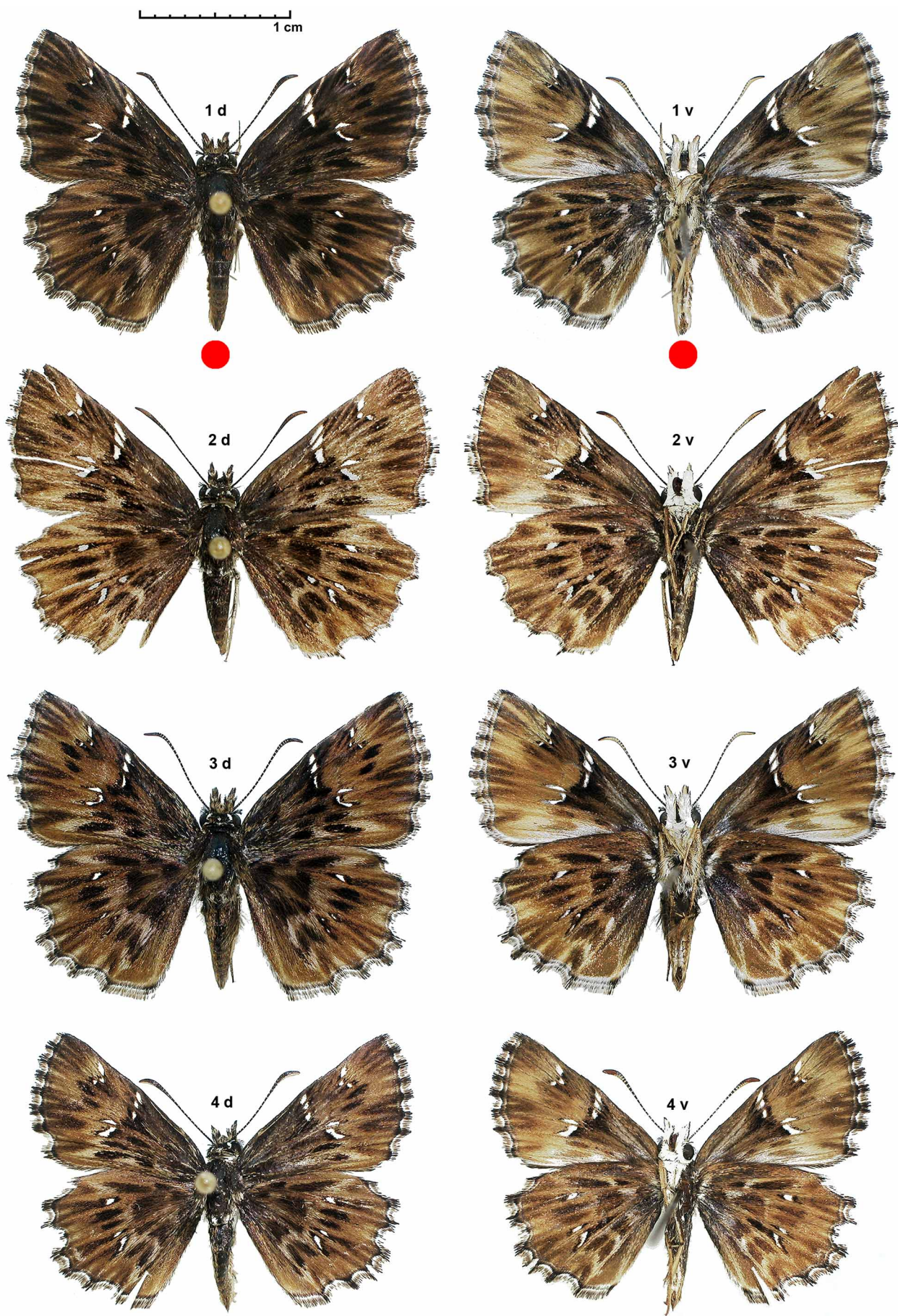
**Description. Male (Fig. 3: 1, 3–4, Fig. 4a,b):** FW length = 14.1 mm (holotype), 13.3 mm  $\pm$  2.0 mm (n=25). **Forewing** width 0.6 times length, with a prominent costal fold reaching Sc. Termen undulate, concave between veins; anal margin prominently curved, w-shaped. Ground color brown, each cell except 2A, with areas of dark-brown, almost black scales. Three opaque, white, narrow, median macules from mid-costa caudad, located in Sc, R<sub>1</sub> and discal cells (DC), with dark scaling prominent along veins separating the macules. Macules in Sc and R<sub>1</sub> usually extend from vein to vein, macule in discal cell situated in its anterior half and typically the narrowest, while macule in Sc is the broadest. Shape of macules variable, most frequently rectangular, triangular and trapezoidal for the Sc, R<sub>1</sub>, and DC macules, respectively. Apical cluster of three opaque white macules in R<sub>3</sub>, R<sub>4</sub> and R<sub>5</sub> cells, smaller than median macules, R<sub>3</sub> macule largest, R<sub>4</sub> smallest, in some specimens dot-like; macule R<sub>4</sub> offset basally and the cluster of the three macules is crescent-shaped. Finally, two postmedian opaque white macules in cells M<sub>3</sub> and CuA<sub>1</sub>. Macule M<sub>3</sub> occupies very basal area of cell between M<sub>3</sub> and CuA<sub>1</sub> and has a triangular shape similar to R<sub>1</sub> macule. Macule CuA<sub>1</sub> located at base of M<sub>3</sub> macule and oddly-shaped, varying from rectangular, to trapezoid, triangular and crescent-shaped; the two macules form a roughly C-shaped arrangement. Each of these eight opaque macules surrounded by darker, almost black scales. In addition to surrounding the macules, similarly colored dark scales form four dark patches in the median area of CuA<sub>2</sub> cell, two cephalad and two caudad, the cephalic pair sometimes fused in a

dumbbell-shaped streak; a patch at base of CuA<sub>1</sub> cell; two patches, just caudad of apical macules, in median area of M<sub>1</sub> and M<sub>2</sub>, the latter patch being smaller and basad of the former; last, and smallest patch situated in R<sub>2</sub> and in some specimens occupies entire cell. Dark brown scales (intermediate in color to the dark, almost black, scales described above) and brown background are formed into streaks in the marginal area; two streaks located in each cell between veins reaching the margin, except in 2A. Streaks start from the margin, in each cell from each vein, and are directed basad and towards each other in a cell, converging in postmedial area; streaks around vein M<sub>2</sub> and caudad of CuA<sub>2</sub> not well developed and lacking in paler specimens (in particular the M<sub>2</sub> streaks), creating a paler appearance of the marginal region of M<sub>1</sub> and M<sub>2</sub> cells. Similar intermediate-color scales line up the basal area of the forewing. Ivory-colored scales, paler than the background, cover the areas distad, between, and proximad two anterior dark patches in CuA<sub>2</sub> cell, distad to the cluster of apical white macules, distad discal cell, and form streaks from the margin in the middle of each cell, in between dark streaks. The amount of ivory-colored scaling varies between individuals. Finally, somewhat yellow and longer ivory-colored scales cover the basal area of the wing (overscaling).

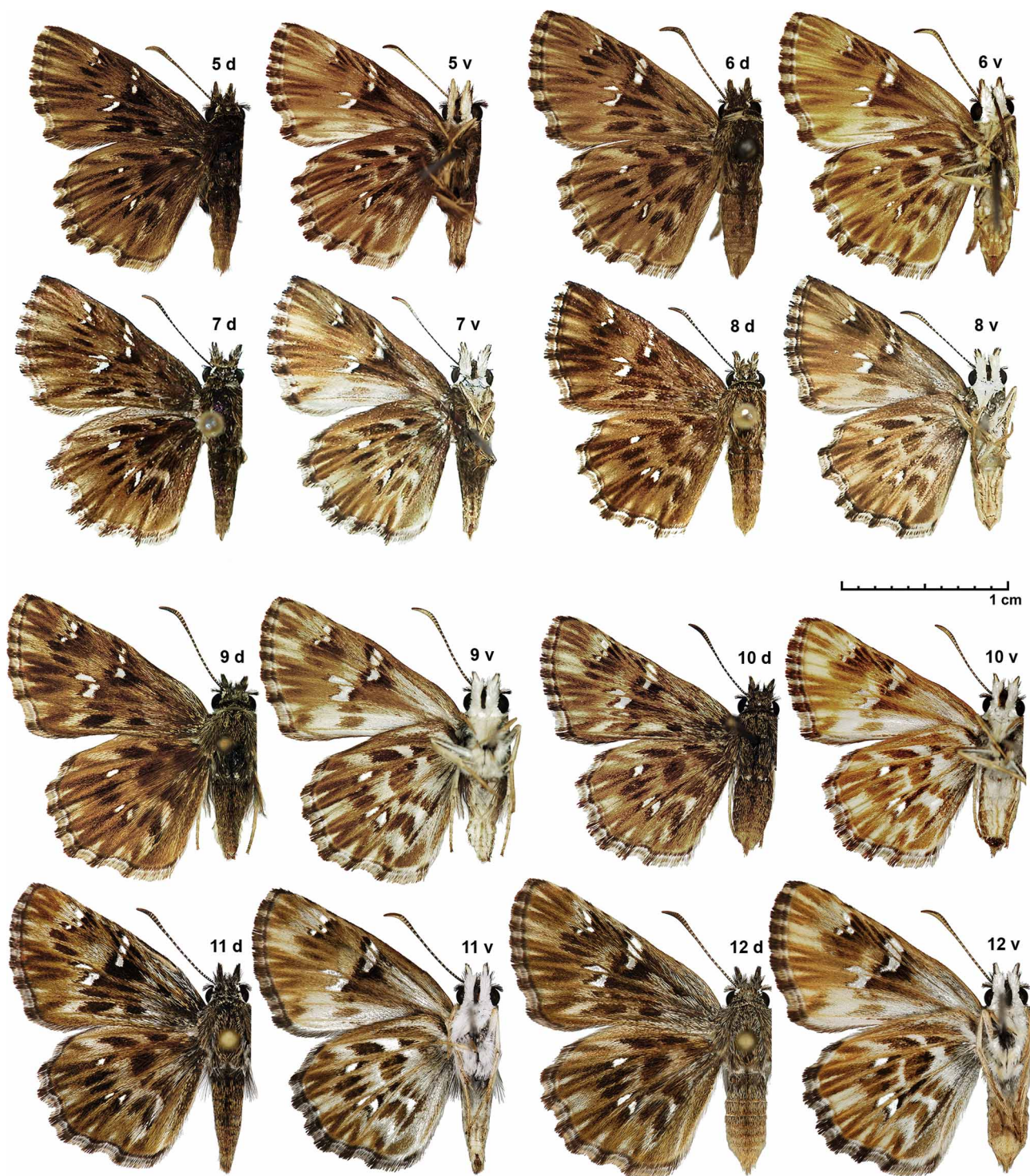
**Hindwing** termen undulate, concave between veins. Pattern similar to forewing, in particular posterior to Rs vein. Opaque macules in cells Rs, M<sub>2</sub> and CuA<sub>1</sub> homologous to macules on forewing. Main differences from forewing include absence of median row of three macules (no macules in Sc+R<sub>1</sub> and discal cells), more basal location of dark patches in M<sub>1</sub> and M<sub>2</sub> (in line with the opaque macules), separation of CuA<sub>1</sub> macule into two small macules in some specimens, and more extensive ivory-scaled areas, present between CuA<sub>1</sub> and CuA<sub>2</sub> dark patches. Cell Sc+R<sub>1</sub> with a median dark patch, median brown streak and ivory-colored area between.

Pattern is largely repeated on **ventral** surface of **wings**, but background is lighter, yellowish. Cells CuA<sub>2</sub> and 2A mostly covered in whitish, ivory-colored scales between the darker patches and streaks, which are composed of much paler scales, as the dorsal background. Dark scales, matching those of dark patches on dorsal surface, are present basad of opaque macules, frequently reaching the base of each cell, and distad of the macules, reaching the costa in cells Sc and R<sub>1</sub>, and forming an edge to each macule in other cells; also filling basal half of cell R<sub>2</sub>. Hindwing ventral pattern more similar to that of dorsal surface than on forewing, except prominent white scaling at wing base, and areas of white scales in basal half of DC. **Fringes** on both wings light-gray, checkered dark, with darker scales at vein termini, dark-scaled intervals about 1/3–1/2 length of light-scaled intervals.

**Head** dark-brown, white between antennae and dorsad of mid-eyes. Caudal portion of collar black, with white scales cephalad, extending behind eyes. Eyes black. **Palpi** brown with white scales present between the segments dorsad, and white ventrad. **Antennae** about half length of costa, reaching end of Sc, black dorsad, with prominent white scales between segments, paler ventrad, in particular around the club and apiculus, with many white scales; club about half of shaft length, apiculus pale brown ventrad, poorly differentiated from club, nudum of 11 segments in holotype (varies from 10 (n = 1) to 12 (n = 7) among 25 specimens counted). **Thorax** and **abdomen** dark-brown with light overscaling dorsad, white and ivory ventrad. Dorsal surface of **metathoracic pouch** (Fig. 4a,b) covered with flat, rounded shingle-like scales, whitish to cream-colored, linear scales present proximally, cream-colored. **Legs** light brown to ivory-colored, externally scaled whitish. Forecoxae white, foretibiae with slender pale brown epiphyses reaching tarsus; midtibiae smooth with single pair of spurs, hindtibiae with two pairs. Hindlegs each with two tufts of long, setiform scales, associated with metathoracic pouch, as follows; dark gray scales originating at proximal end of femur, just over 1 mm in length, extending to distal end of femur; pale brown scales, almost 2 mm in length, originating at proximal end of tibia, extending beyond distal end of tibia to overlap proximal margin of tarsi.

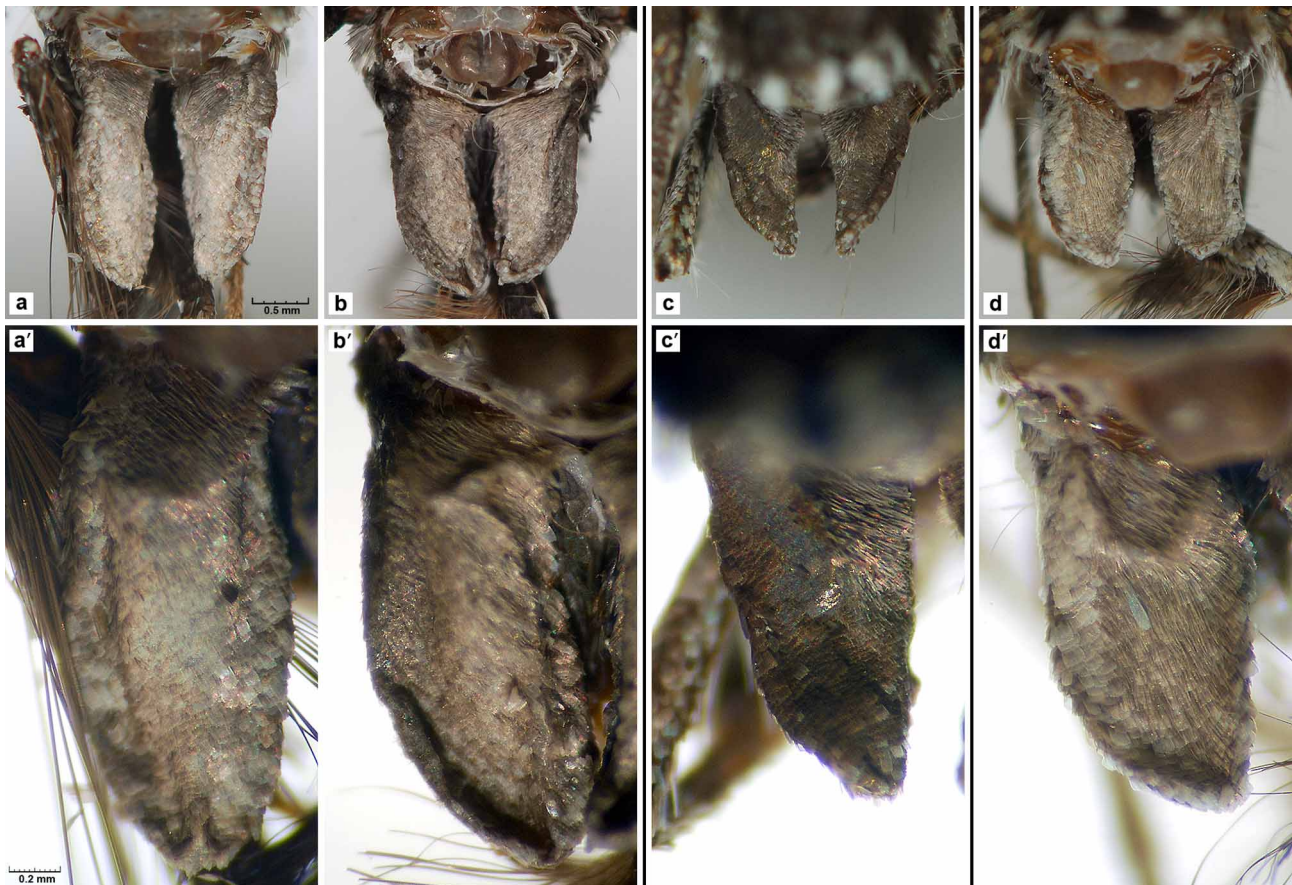






**FIGURE 3.** Specimens of *Celotes*. 1–4 *C. spurgus*, all from Mexico: Querétaro: Mpio. Peñamiller: 4.2 rd. mi (6.8 km) W Peñamiller on camino Peñamiller-Boquillas; 5–8 *C. nessus* and 9–12 *C. limpia*; d and v denote dorsal and ventral views, respectively. 1. Holotype ♂, 3-Sep-2007; 2. Allotype ♀, 2-Sep-2007; 3. Paratype ♂, paler specimen 2-Sep-2007; 4. Paratype ♂, smaller specimen 26-Mar-2001; 5. ♂ TX: Val Verde Co. 7 mi (11.3 km) E Del Rio, el (ex larva) 23-Dec-1966, larval foodplant *Abutilon fruticosum*, leg. R.O. & C.A. Kendall; 6. Topotype ♀, TX: Bexar Co. San Antonio, NE Preserve, el 18-Sep-1960, larval foodplant *Abutilon incanum*, leg. R.O. & C.A. Kendall; 7. ♂ AZ: Pima Co. Molino Basin, 31-Mar-1978, leg. J.P. Brock; 8. ♀ AZ: Pima Co. Molino Basin, el 22-Jun-1990, larval foodplant *Ayenia compacta*, emerged 26-Jul-1990, leg. J.P. Brock; 9. Paratype ♂ TX: Presidio Co. SH170 ca. 10–15 mi (16.1–24.1 km) SE Redford, el 31-Aug-1966, larval foodplant *Abutilon malacum*, leg. R.O. & C.A. Kendall; 10. Paratype ♀ TX: Jeff Davis Co. Musquiz Cyn SH118, el 14-Apr-1967, had larval diapause, larval foodplant *Allowissadula holosericea*, leg. R.O. & C.A. Kendall; 11. ♂, 12. ♀, both TX: Brewster Co. Big Bend National Park, E of Chisos Basin Campground, el 16-Sep-2005, larval foodplant *Sphaeralcea angustifolia*, leg. N.V. Grishin.





**FIGURE 4.** Metathoracic pouch of *Celotes* males. Abdomen removed, dorso-posterior view. **a,b)** *C. spursus*; **c)** *C. nessus*; **d)** *C. limpia*; top row (**a, b, c, d**) is the entire view of the two “formations”; bottom row (denoted by prime, **a’, b’, c’, d’**) is the left “formation” magnified, of the specimen shown in the same column above. **a,b)** Paratypes, MX: Querétaro: Mpio. Peñamiller: sandy gulch 4.2 rd. mi (6.8 km) W Peñamiller on camino Peñamiller-Boquillas, 3-Sep-2007, leg. A.D. Warren; **c)** TX: El Paso Co. Franklin Mountains State Park, Cottonwood Spring Trail, 16-Apr-2007, leg. N.V. Grishin; **d)** Topotype, TX: Jeff Davis Co. Davis Mountains State Park, Indian Lodge, 14-Apr-2007, leg. N.V. Grishin. The scale is the same in each row, bottom row is magnified 2.25× compared to the top row.

**Genitalia (Fig. 5a–j):** Tegumen short as in *C. nessus*, not projecting prominently cephalad as in *C. limpia*. Uncus divided as deeply as *C. nessus*, but arms more divergent. Gnathos and saccus as in both *C. nessus* and *C. limpia*. Valvae similar to *C. nessus*, broad, but the long caudo-dorsal projection, which is as in *C. limpia* but thinner, more curved, extends further dorsad and widely separated from the harpe, rather than overlapping as in *C. limpia*. Harpe similar to *C. nessus*, narrows terminally, not as broad and robust as in *C. limpia*. The ampulla of *C. spursus* protrudes further distad and dorsad than in *C. limpia*, thus slightly overlaps the harpe rather than being separated as in *C. limpia*. Penis long and slender with single tooth on left side near distal end, longer than *C. limpia*, but shorter than *C. nessus*; ratio of penis length to length of right valva from cephalic end to caudal end of harpe is 1.38 in *C. spursus*, 1.51 in *C. nessus* and 1.18 in *C. limpia*. Juxta simple, U-shaped sclerotized yoke, transtilla very weakly sclerotized, bearing long, distally directed hairs.

**Female (Fig. 3: 2):** FW length = 14.1 mm (allotype) (n = 1). **Forewing** and **hindwing** pattern, **dorsal** and **ventral**, as in male, but lacking extensive pale overscaling at bases of wings above, presumably due to flight-worn condition; wings slightly broader than in male. Female differs from male in lacking secondary sexual characters (forewing costal fold, metathoracic pouch, and tufts of hair-like scales on hindleg).

**Genitalia (Fig. 6a–e):** Sterigma in ventral view about as long as wide, strongly narrowing caudad, terminally about 1/2 its basal width. Posterior half of sterigma with sides almost parallel to the body axis; anterior half trapezoidal, sides at an angle of about 30° with body axis. Caudal margin of lamella postvaginalis con-



cave in middle, with asymmetric sides and irregular margin, heavily sclerotized terminal section bean-shaped, about 1/3 of sterigma length. Ostium bursae wide, as in *C. nessus*.

**Type material.** Holotype male bearing the following labels: printed white label / MEXICO: QUERÉTARO: / Mpio. Peñamiller: sandy gulch / 4.2 rd. mi (6.8 km) W Peñamiller on / camino Peñamiller-Boquillas / 21°04'53"N 99°50'33"W / 1465m, 3-IX-2007 / Andrew D. Warren /. Hand printed red label / HOLOTYPE male / *Celotes spurcus* / A. Warren, Steinhauser / C. Hernández-Mejía & Grishin/. Allotype female is from the same locality as the holotype male, 2-IX-2007. There are 91 male paratypes: 39 males same locality and date as holotype, Andrew D. Warren and John Kemner; 32 males from same locality as holotype, 2-IX-2007, Andrew D. Warren and John Kemner; 12 males same locality as holotype, 26-III-2001, Andrew D. Warren, Thomas W. Ortenburger and Jose Luis Salinas-Gutierrez; 5 males, MEXICO: QUERÉTARO: Mpio. Cadereyta de Montes: sandy gulch SE Río Mezquitillo, just NE of Hwy. 120 vic. Puente Mezquitillo, 9.2 rd. mi (14.8 km) N Vizarrón de Montes, 1460m, 20°56'23"N 99°44'13"W, 1-IX-2007, Andrew D. Warren and John Kemner; 3 males, MEXICO: SAN LUIS POTOSÍ, between Cárdenas and Ciudad del Maíz, 8-VII-1988, John Kemner.

The holotype and various paratypes are deposited in the Museo de Zoología "Alfonso L. Herrera", Facultad de Ciencias, Universidad Nacional Autónoma de México, Mexico City. Additional paratypes are deposited in the McGuire Center for Lepidoptera and Biodiversity, Florida Museum of Natural History, University of Florida, and other collections.

**Type Locality (Fig. 2a,b).** MEXICO: QUERÉTARO: Mpio. Peñamiller: 4.2 rd. mi (6.8 km) W Peñamiller on camino Peñamiller-Boquillas, 1465m, 21°04'53"N 99°50'33"W. The site where the holotype and most paratypes were collected is a dry sandy wash in desert thornscrub habitat. Prominent plants in the habitat include various cacti, ocotillo (*Fouquieria* Kunth), *Celtis* L., and several species of malvaceous plants, possibly *Abutilon*. Adult males are most frequently encountered in sandy or rocky areas in the bottom of dry gullies, and males visit moist patches of sand and gravel. Males are typically nervous, and generally remain perched only for a few short moments (Fig. 2c–f).

**Distribution and phenology.** *Celotes spurcus* is currently known from desert thornscrub habitats in central Querétaro State, Mexico, north to east-central San Luis Potosí State, Mexico (Fig. 1). The species is not likely to occur far to the south of central Querétaro, since apparently appropriate habitats are eliminated by the rise in elevation of the Eje Neovolcánico of central Mexico. The northern distributional limits of *C. spurcus* remain conjectural, and will be determined only through future fieldwork. Burns (1974) reported *C. limpia* from southeastern Coahuila State, Mexico, from a single male taken 25 miles north of Saltillo. Considering the existence of *C. spurcus*, this specimen requires re-examination. If this specimen was determined only by dry examination of the valvae (by removing a few anal scales; Burns (1974) did not provide details), confusion with (the then unknown) *C. spurcus* cannot yet be ruled out.

**Biogeography.** While *Celotes* is seemingly adapted to dry and seasonally hot conditions, the genus is characterized by an austral Nearctic distribution (sensu Halffter 1987). The Sonoran and Chihuahuan deserts appear to represent the center of *Celotes* distribution, although the genus extends onto the southern Great Plains of North America in New Mexico, Texas and Oklahoma (Burns 1974, Stanford & Opler 1993), and into the Sierra Madre Occidental and Sierra Madre Oriental in Mexico, almost to the Eje Neovolcánico of southern Mexico (Fig. 1). *Celotes spurcus* occupies a region at the transition between the eastern edge of the Mexican Altiplano and the Sierra Madre Oriental. Its habitat can be considered an ancient southeastern extension of the Chihuahuan Desert, with faunal and floral influences extending south to the Tehuacán-Cuicatlán area of endemism in Puebla-Oaxaca (Espínosa *et al.* 2006).

**Larval foodplants and early stages.** Intensive searches for immature stages of *C. spurcus* were not conducted, but several malvaceous plants at the type locality were identified as potential larval foodplants, such as *Abutilon*. As a result, life history details for *C. spurcus* remain unknown, but should be similar to those of *C. nessus* and *C. limpia* (briefly described in the introduction).

**Etymology.** Burns (1974) named *C. limpia* for the locality, Limpia Canyon, where the holotype was taken. Since “limpia” translates from Spanish as “clean”, and *limpia* is indeed the palest and most contrastingly-marked *Celotes*, it seemed appropriate to name this generally darker taxon “spurcus”, Latin for “dirty.”

**Diagnosis and discussion.** Superficially, *Celotes spurcus* (Fig. 3: 1–4) looks very much like *C. nessus* (Fig. 3: 5–8) and *C. limpia* (Fig. 3: 9–12), but averages slightly larger and darker than both, with somewhat smaller opaque white wing macules. Burns (1974) was unable to identify wing pattern characters to separate *C. limpia* from *C. nessus*. Similarly, we were unable to discern reliable superficial wing markings that could be used to identify *C. spurcus*, largely due to similarity in wing patterns between all *Celotes* species, and because of great individual variation in the size and shape of macules, patches and streaks on all three species. Therefore, *C. spurcus* becomes yet another pyrgine that can be reliably determined only through genitalic examination (e.g., see Steinhauser 1989, Burns 2000).

However, male genitalic differences between species of *Celotes* are so profound and so numerous that no doubt remains in the specific distinction of *C. spurcus*. Males of *C. spurcus* are immediately separated from the other two *Celotes* species by the distinctive long curved process (= projection, = prong, = style) from the ampulla, which can be seen by brushing away some anal scales from the abdomen (Fig. 5a,d,i). This process is particularly well developed on *C. spurcus*, claw-like, and armed with several terminal teeth, at least some teeth being longer than wide (Fig. 5d). Although *C. limpia* has a homologous process, it is less-developed and less curved (Fig. 5m). More precisely, the following features of male genitalia separate *C. spurcus* from *C. limpia*: 1) The process on the valva is more curved, C-shaped, in *C. spurcus*, and this in lateral view does not overlay the harpe; process is armed with larger terminal teeth. A homologous process in *C. limpia* is straighter, smaller, in lateral view (unless intentionally twisted and moved away) typically overlays the harpe and passes distad from it, teeth are less developed. 2) The valva is broader in *C. spurcus* than in *C. limpia*, and is strongly concave cephalad of the process (Fig. 5d,i). Valva is flatter cephalad of the process in *C. limpia*, and is narrower (Fig. 5m). Width of valva (measured at the widest section, which is around the middle of the valva) is less than 0.5 times its length (not including the harpe, from the base to the end of ampulla, at which point harpe protrudes caudad) in *C. limpia*, and larger than 0.5 in *C. spurcus*. 3) The ampulla of *C. spurcus* protrudes farther distad and dorsad than in *C. limpia*, thus almost or slightly overlapping the harpe, rather than being far apart as in *C. limpia*. In other words, the ampulla looks “cut” at around 30 degrees in *C. limpia*, and it appears “cut” almost vertically in *C. spurcus*. Due to this feature, the origin of the process in *C. spurcus* is well ventrad of the dorsal margin of valva, while the process originates very close to the dorsal margin in *C. limpia*. 4) The harpe narrows gradually towards the terminus in *C. spurcus*, whereas the harpe of *C. limpia* is more robust and follows a nearly constant width almost until the very terminus, where it rounds off; thus being broader just near the terminus than the harpe of *C. spurcus*. 5) The tegumen is short in *C. spurcus* (Fig. 5e,j), as in *C. nessus*, not projecting prominently cephalad as in *C. limpia*. 6) The uncus is narrower than the tegumen in *C. spurcus* (Fig. 5e,j), whereas the uncus is broad, about the same width as the tegumen in *C. limpia* (Fig. 5n). 7) The penis is longer in *C. spurcus* than in *C. limpia*; ratio of penis length to length of right valva from cephalic end to caudal end of harpe is about 1.4 in *C. spurcus*, and about 1.2 in *C. limpia*. Features 2 and 4 may be the easiest to observe when differentiating between long-pronged species of *Celotes*, do not require full genitalic preparation, and may be visible after brushing some scales off the distal tip of the abdomen.

The following features of the male genitalia separate *C. spurcus* from *C. nessus*: 1) The process on the valva is very short and spike-like in *C. nessus*, projecting dorsad, with no more than four terminal teeth (Fig. 5k). The process does not curve caudad terminally in any significant way. 2) The harpe is better developed in *C. spurcus*, further separated from the ampulla; its section that is directed cephalad is longer and less concave at the distal margin (Fig. 5d,i). The harpe in *C. nessus* is smaller, almost touching the ampulla by its cephalic-pointing section, which is less clearly separated from the caudal-directed section, and is shorter and somewhat concave at the distal margin near the terminus (Fig. 5e,j). 3) The penis is usually slightly shorter in *C. spurcus*



than in *C. nessus*; the ratio of penis length to length of right valva from cephalic end to caudal end of harpe is about 1.4 in *C. spurcus*, and about 1.5 in *C. nessus*.

Interestingly, the list of prominent differences between *C. nessus* and *C. spurcus* is shorter than that between *C. limpia* and *C. spurcus*, despite the presence of a long valval process in both *C. limpia* and *C. spurcus*. In fact, it appears that *C. spurcus* could essentially be considered a “long-pronged” version of *C. nessus*, however, this pronounced feature itself should be enough to warrant species-level status. Such long-prong/short-prong species pairs are well known in other genera, for instance, *Staphylus* Godman & Salvin (*S. hayhurstii* (W. H. Edwards) vs. *S. mazans* (Reakirt)) and *Systasea* W. H. Edwards (*S. pulverulenta* (R. Felder) vs. *S. zampa* (W. H. Edwards)); see Steinhauser (1989) and Miller (1970), respectively.

Although it is premature to reach a definitive conclusion from a single specimen, it is not clear at present whether it is possible to distinguish females of *C. spurcus* from those of *C. nessus* using genitalic characters. Females of *C. limpia* can be easily separated from the other two species by: 1) the sterigma appears more square-shaped ventrally in *C. limpia* and more trapezoidal in the other two species (Fig. 6g); and 2) the ostium bursae is narrower in *C. limpia* than in the other two species. A potential difference between *C. spurcus* and *C. nessus* that needs to be substantiated through the collection and genitalic examination of many more females of *C. spurcus*, is the shape of sterigma, which narrows caudad more strongly in the single *C. spurcus* female (Fig. 6e) than that in *C. nessus* (Fig. 6f,f’), and the section of the lamella postvaginalis with the margins more or less parallel to the body axis (caudal section) is about half the length of the sterigma in *C. spurcus*, but is only about one third the length in *C. nessus*. We have illustrated dry as well as traditional wet mounts of female *Celotes* genitalia in order to facilitate *in situ* genitalic examination in the lab or field.

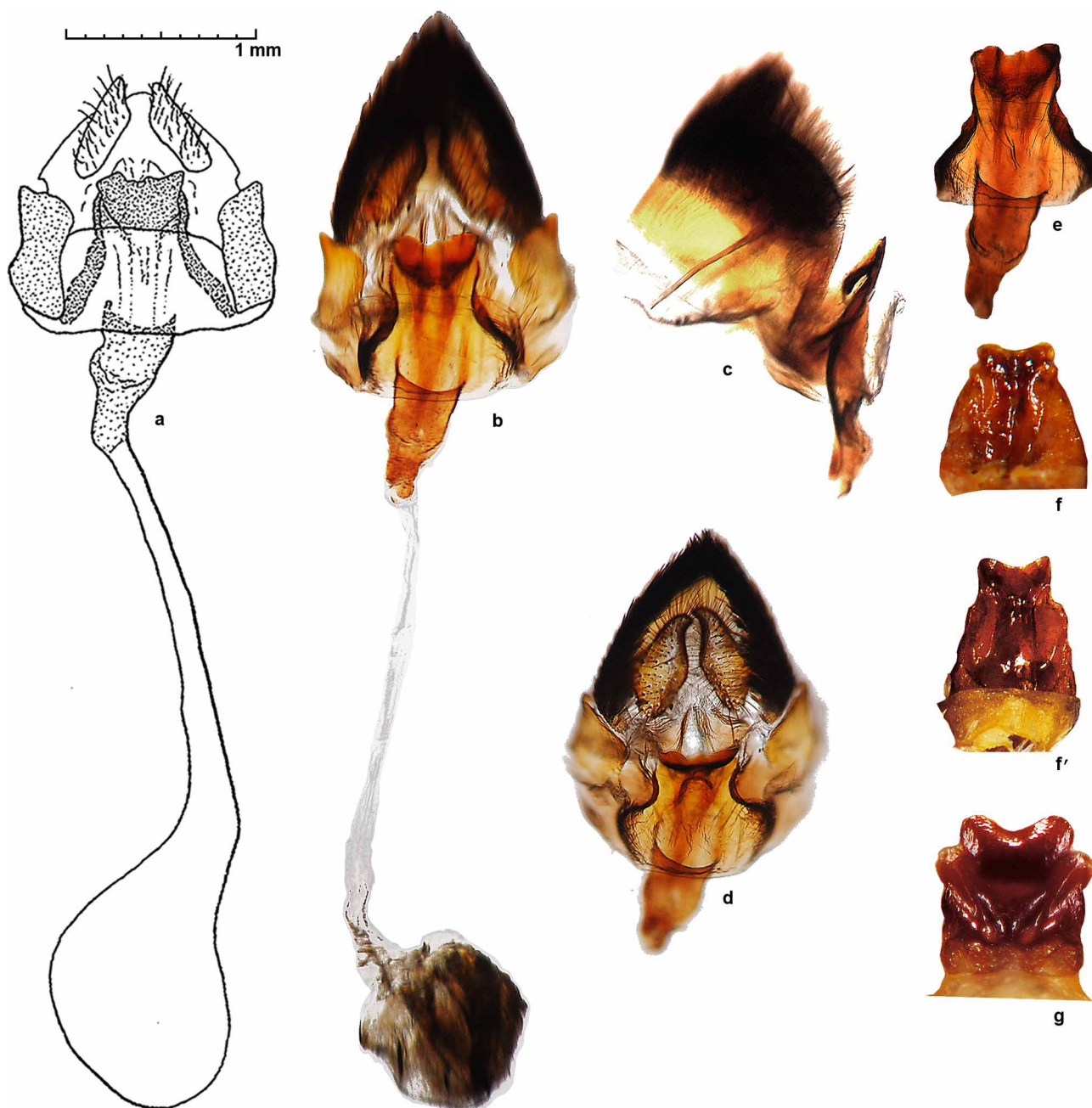
Additional support for the species-level status of all three *Celotes* taxa is provided by features of the metathoracic pouch of males (Fig. 4). As discussed by Burns (1974), in *C. limpia*, the metathoracic pouch is dorsally covered with very thin, linear, pale scales (Fig. 4d); in *C. nessus* these scales are round and gray, with linear scales, if present, restricted to the proximal area (Fig. 5c). Although *C. spurcus* shares the lack of linear scales (except proximally) and presence of shingle-like, round scales with *C. nessus*, these scales are light and cream-colored (not gray as in *C. nessus*), which in conjunction with the darker aspect of *C. spurcus* (compared to *C. nessus*) is unexpected and appears to be indicative of a species-level difference from *C. nessus* (Fig. 5a,b). The color of the pouch scales in *C. spurcus* is more like that seen in *C. limpia* than in *C. nessus*. In summary, characters of the genitalia (long prong, shape of the harpe) and metathoracic pouch of *C. spurcus* are strong indicators of specific distinction between *C. spurcus* and *C. nessus* and leave no doubt that possibly allopatric populations of *C. spurcus* constitute a separate species-level taxon.

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**FIGURE 5.** Male genitalia of *Celotes*. **a)-j)** *C. spurcus*; **k),l)** *C. nessus*; **m), n)** *C. limpia*; **a)-h’)**, above the line, “wet” genitalia parts of a paratype, photographed using Nikon D200 camera through a “light-through” microscope; **i)-n)**, below the line, “dry” *in-situ* genitalia, photographed using Nikon D200 through a 105mm f/2.8G AF-S VR Micro-Nikkor lens with a 2× teleconverter TC-20E. Genital capsule: **a)** left lateral and **a’)** dorsal views. Genital ring - uncus, tegumen, gnathos, saccus and associated structures: **b)** dorsal, **b’)** ventral and **b’’) right lateral views. Valvae: c)** separated from the genital capsule, dorsal view; **c’)** dorsal view, left and right valvae on the right and left, respectively; **d)** interior and **d’)** exterior lateral views, left and right valvae on the left and right, respectively. Tegumen, uncus and gnathos: **e)** dorsal and **e’)** ventral views; **f)** saccus, ventral view; **g)** juxta. Aedeagus: **h)** dorsal, and **h’)** left lateral views. **i),k),m)** Left valva, lateral view, exterior above, interior below. **j),l),n)** Uncus with a caudal part of tegumen, dorsal view. **a)-j)** Paratypes, MX: Querétaro: Mpio. Peñamiller: sandy gulch 4.2 rd. mi (6.8 km) W Peñamiller on camino Peñamiller-Boquillas, 3-Sep-2007, leg. A.D. Warren; **k),l)** TX: El Paso Co. Franklin Mountains State Park, Cottonwood Spring, 16-Apr-2007, leg. N.V. Grishin; **m),n)** Topotype, TX: Jeff Davis Co. Davis Mountains State Park, Indian Lodge, 14-Apr-2007, leg. N.V. Grishin. The scale is the same for all images.







**FIGURE 6.** Female genitalia of *Celotes*. **a)-e)** *C. spurus*; **f),f')** *C. nessus*; **g)** *C. limpia*. **a),b)** Ventral view of ovipositor lobes, sterigma and bursa copulatrix; **c)** left lateral and **d)** ventro-posterior view, bursa copulatrix not shown; **e)-g)** ventral view of sterigma, the same orientation as in a) and b). **a)-e)** Allotype, MX: Querétaro: Mpio. Peñamiller: sandy gulch 4.2 rd. mi (6.8 km) W Peñamiller on camino Peñamiller-Boquillas, 2-Sep-2007 leg. A.D. Warren, genitalia ADW 08-14. **f)** Topotype, TX: Bexar Co. San Antonio, 422 W Kings Hwy, 1961, leg. R.W. Quillin & E.S. Quillin; **f')** TX: Tarrant Co. Benbrook Reservoir, Holiday Park, 5-Sep-1976, leg. R.O. Kendall & C.A. Kendall; **g)** TX: Brewster Co. Big Bend National Park, road to Boquillas Canyon, near Barker house, larva found 15-Sep-2007, had larval diapause, emerged 1-Jan-2008, leg. N.V. Grishin. The scale is the same for all images.

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