



The pygmy mole crickets (Orthoptera: Tridactylidae) of Florida, USA, with descriptions of three new species

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Abstract

The results of an intensive survey of Florida (U.S.A.) Pygmy Mole Crickets (Orthoptera: Tridactylidae) are presented. Six members of the family have been previously recorded from the state. This work describes three additional species and documents additional locality records for the other taxa, bringing the Florida total to nine species. Two-thirds of these species are narrowly endemic to small ranges within the state and are restricted to xeric sandhill or scrub habitats with bare patches of sand. Distributional patterns as well as conservation implications for the endemic species are discussed.

Key words: North American Coastal Plain, biodiversity, *Ellipes*, *Neotridactylus*

Introduction

The sandy upland habitats of Florida, U.S.A., are important regions for biodiversity and endemism. These habitats are derived from Pliocene-Pleistocene inundation cycles and persist today as a series of elevated ridges and hills throughout the Florida peninsula and along both coasts (Deyrup 1990). Two major categories of upland habitat in Florida are generally recognized: scrub and sandhill (high pine). Scrub is usually found on the higher knolls, and ranges from very dense ‘sand pine scrub’ with almost no openings or gaps, to the classic ‘rosemary bald’ habitat in which Florida rosemary shrubs (*Ceratiola ericoides* Michx.) occur on large, desert-like patches of open white sands. All scrubs are dominated by low, Evergreen Oaks (*Quercus geminata* Small, *Q. inopina* Ashe, *Q. myrtifolia* Willd, *Q. chapmanii* Sarg.), Palmettos (*Sabal etonia* Swingle ex Nash, and *Serenoa repens* (Bartram) J.K.Small), and Sand Pine (*Pinus clausa* (Chapm. ex Engelm.) Sarg.), sometimes with a sparse canopy of Slash Pine (*Pinus elliotti* var. *densa* Little & Dorman). In contrast, sandhill habitats nearly always have a canopy of Longleaf Pine (*Pinus palustris* Mill.) and Turkey Oak (*Quercus laevis* Walter), and their understories are dominated by Wiregrass (*Aristida stricta* Michx.). Sandhill may have open sand patches but are often more vegetated than scrub habitats. Both scrub and sandhill are home to many endemic plants and animals, but the arthropod fauna of these habitats has received relatively little attention. New species continue to be described from scrub and sandhill (e.g. Woller 2025), indicating that we still have much to learn about the biodiversity of this region. All upland habitats of Florida are pyrogenic communities, requiring fire at either low (scrub) or high (sandhill) frequencies for their characteristic habitat structures to persist (Myers 1985). Fire suppression efforts have resulted in many such habitats becoming very overgrown and losing the open character that is required by many scrub and sandhill species. These habitats are also under threat from continued habitat destruction throughout the state.

Pygmy Mole Crickets (Orthoptera: Tridactylidae) are a small family of burrowing insects that occur in moist sand, where they feed on detritus, cyanobacteria, or eukaryotic algae. These insects have traditionally been understood to be semiaquatic, as their preferred habitats seem to always require water, and most species have enlarged ‘swimming plates’ on their hind tibiae that help them jump from the surface of water. This idea was challenged in 1996 when Deyrup and Eisner described a new species of flightless Pygmy Mole Cricket of the genus *Neotridactylus* inhabiting the open scrub habitat of the southern Lake Wales Ridge (LWR) of Florida, a xeric ecosystem and one that is decidedly not semiaquatic. Since that time, two additional species of flightless, upland Pygmy Mole Crickets have been described, both belonging to the genus *Ellipes* (Deyrup 2005; Woo 2021), suggesting a radiation of this family

in a novel environment. Several other groups of small, flightless arthropods, including scarab beetles, *Melanoplus* grasshoppers, and sand cockroaches, possess similar distributions with isolated populations scattered across Florida's scrub environments (e.g. Deyrup 1996; Lamb *et al.* 2018; Otte 2014; Skelley 2006). Many scrub-restricted arthropods are presently known only from the LWR, which may be in part due to the old age of this ridge relative to others, but is also surely due to the fact that the majority of targeted collecting for scrub arthropods has taken place at Archbold Biological Station (located at the southern end of the LWR) and surrounding localities (Deyrup and Carrel 2011). Scrub-restricted arthropods tend to be tiny and difficult to survey, and have thus not been sought very intensively on scrub ridges more distant from the LWR.

To remedy our understanding of scrub Pygmy Mole Cricket diversity and distribution, I conducted a statewide survey of scrub and sandhill habitats over the summers of 2022 and 2023, targeting Pygmy Mole Crickets. Over the course of this work, numerous undocumented populations of the three previously described upland species were discovered. In addition, three newly discovered populations of scrub Pygmy Mole Crickets were found to be quite different from the other scrub species, and indeed from all other known species in the family.

Methods

Collection. The material upon which this work is based primarily on my collection records during the summers of 2022 and 2023, during which I completed a statewide survey for scrub-inhabiting Tridactylidae. All specimens were collected either by carefully digging up the raised burrows within a few hours after rain, or by sifting dry sand around the tumuli. Collected specimens were preserved in 100% ethanol. Additional material was collected during other, more brief field seasons in 2018, 2019, 2021, and 2025, and was also sought in several museum collections. In total, 1,052 specimens were examined from over 200 localities.

Morphology. Most morphological characters that are useful in separating species come from the male terminalia (especially the shape of the epiproct), the female subgenital plate, and color pattern. Males of all species of Pygmy Mole Crickets studied here possess a stridulatory apparatus consisting of a file on the ventral surface of the tegmina (forewings) and a scraper on abdominal tergite 4 (Günther 1975). The morphology of this apparatus is also useful taxonomically, and the descriptions below make use of this as well as the other characters listed previously. Given their obvious similarity to structures found in other singing insects, and their occurrence only in males, these structures must be related to sexual behavior, but there is currently no behavioral or experimental record of Pygmy Mole Crickets producing sound.

Measurements and terminology. Measurements were made using the two-point plane measurement option in the Keyence VHX-6000 Digital Microscope system. Terminology generally follows Deyrup (2005) and Günther (1977).

Photographs and maps. Live nymphs and adults were photographed in a whitebox studio setup using a Canon EOS Rebel T3 with an attached Canon 100 mm macro lens with the addition of Canon extension tubes (EF25 and EF12 II) to the camera, and an external flash (Sunpak Auto 383 Super connected with a CowboyStudio 4 Channel Wireless Hot Shoe Flash Trigger & Receiver). Images of the habitat and burrows were taken with an iPhone SE. Images of preserved specimens were made using two complementary imaging stations. Habitus and subgenital plate photos were produced using a Visionary Digital LK Imaging System in combination with a Canon EOS 7D camera with attached MP-E 65mm lens and 2X extender. Images were stacked using Zerene Stacker v.1.04 (Zerene Systems LLC, Richland, WA). Adobe Photoshop CS5 Extended was then used to add a scale bar, adjust light levels, and increase sharpness. Images of male terminalia and stridulatory apparatus were produced using a Keyence VHX-6000 Multi-Scan Digital Microscope, with 250–2500X zoom lens (VH-Z250R). All images were further processed using Adobe Lightroom CC 2015.8 to crop, adjust white balance, and remove sensor dust. Composite figures were created using Adobe Photoshop CC, v.14.2.1. Maps were created in Google Earth Pro, using a KMZ shapefile of the Florida sand ridges and hills combined with CSV files containing the specimen locality data. GPS data were acquired using Google Maps.

Depositories

ABS	Archbold Biological Station Arthropod Collection, Venus, FL, USA;
ANSP	Academy of Natural Sciences Philadelphia, Philadelphia, PA, USA;
CAS	California Academy of Sciences, San Francisco, CA, USA;
CMNH	Carnegie Museum of Natural History, Pittsburgh, PA, USA;
CUIC	Cornell University Insect Collection, Ithaca, NY, USA;
FSCA	Florida State Collection of Arthropods, Gainesville, FL, USA;
TAMUIC	Texas A&M University Insect Collection, College Station, TX, USA;
UGCA	University of Georgia Collection of Arthropods, Athens, GA, USA;
USNM	United States National Museum, Washington, D.C., USA

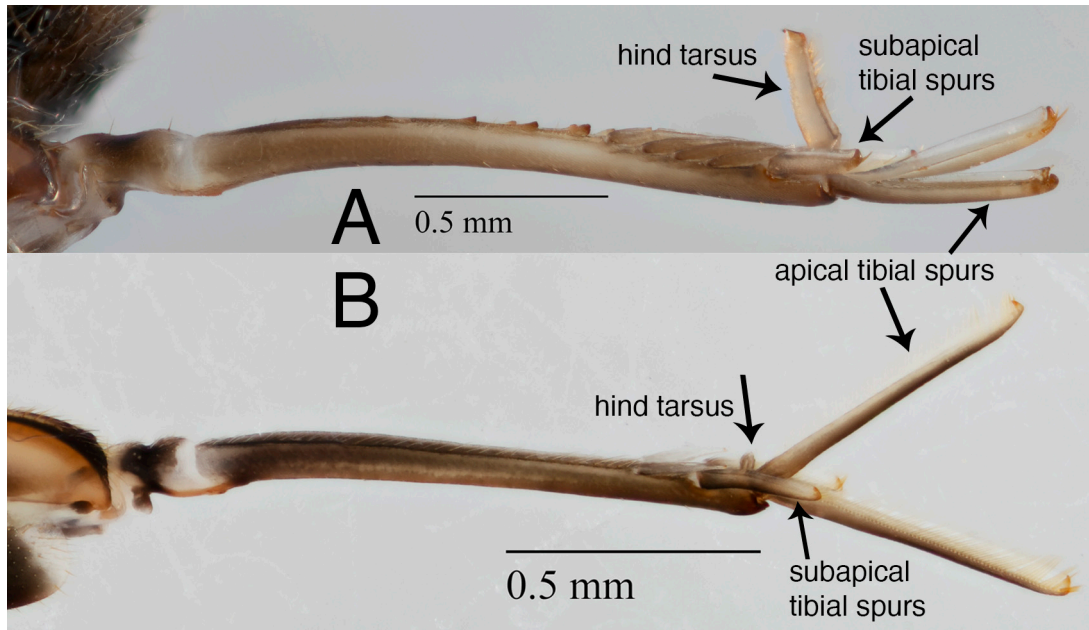


FIGURE 1. Characters used in key couplet 1.

Results

Key to the known species of Tridactylidae found in Florida (modified from Woo 2021)

1. Larger, body length 3.8–10 mm; integument smooth; hind tarsus present (Fig. 1A) 2 (*Neotridactylus*)
- 1'. Smaller, length 3–5 mm; integument usually somewhat hairy; hind tarsus reduced to a tiny flap concealed between the hind tibial spurs (Fig. 1B) 4 (*Ellipes*)
2. Larger, length 5.5–10 mm; fully winged (occasionally with reduced hind wings but hind wings always present); swimming plates on hind tibia present (Figs. 2A, 2B); color variable; usually found in sandy or muddy areas along water .. *N. apicalis*
- 2'. Smaller, length 3.8–4.9 mm; tegmina abbreviated, hind wings absent; swimming plates absent (Fig. 2C); uniformly dark colored; always found in xeric scrub habitats 3
3. Jet black overall and integument shiny; male epiproct more shallowly incised at base and with lateral lobes less sclerotized (Figs. 3A, 3C); found in scrub habitats of the Florida peninsula *N. archboldi*
- 3'. More brownish and integument matte; male epiproct deeply incised at base and with lateral lobes heavily sclerotized (Figs. 3B, 3D); restricted to coastal dune scrub of the Florida panhandle *N. insularis* **sp. nov.**
4. Fully winged (occasionally hind wings shortened); color variable but never uniformly pale (Fig. 4A); usually found in sandy or muddy areas along water 5
- 4'. Tegmina abbreviated, hind wings absent; coloration pale white with brown/red markings (Figs. 4B, 4C); always found in xeric scrub or sandhill habitats 6
5. Antennae in both sexes 10-segmented (Fig. 5A). White markings on head not as below *E. minuta*
- 5'. Antennae in the male 11-segmented, in the female 12-segmented (Fig. 5B). White rim of the eyes continuing forward to almost the anterior border of the forehead (Florida populations only) *E. gurneyi*
6. Head and pronotum brick red and unmarked; paraprot processes orange (Fig. 6A); restricted to scrub in Manatee County ..
..... *E. ignis* **sp. nov.**

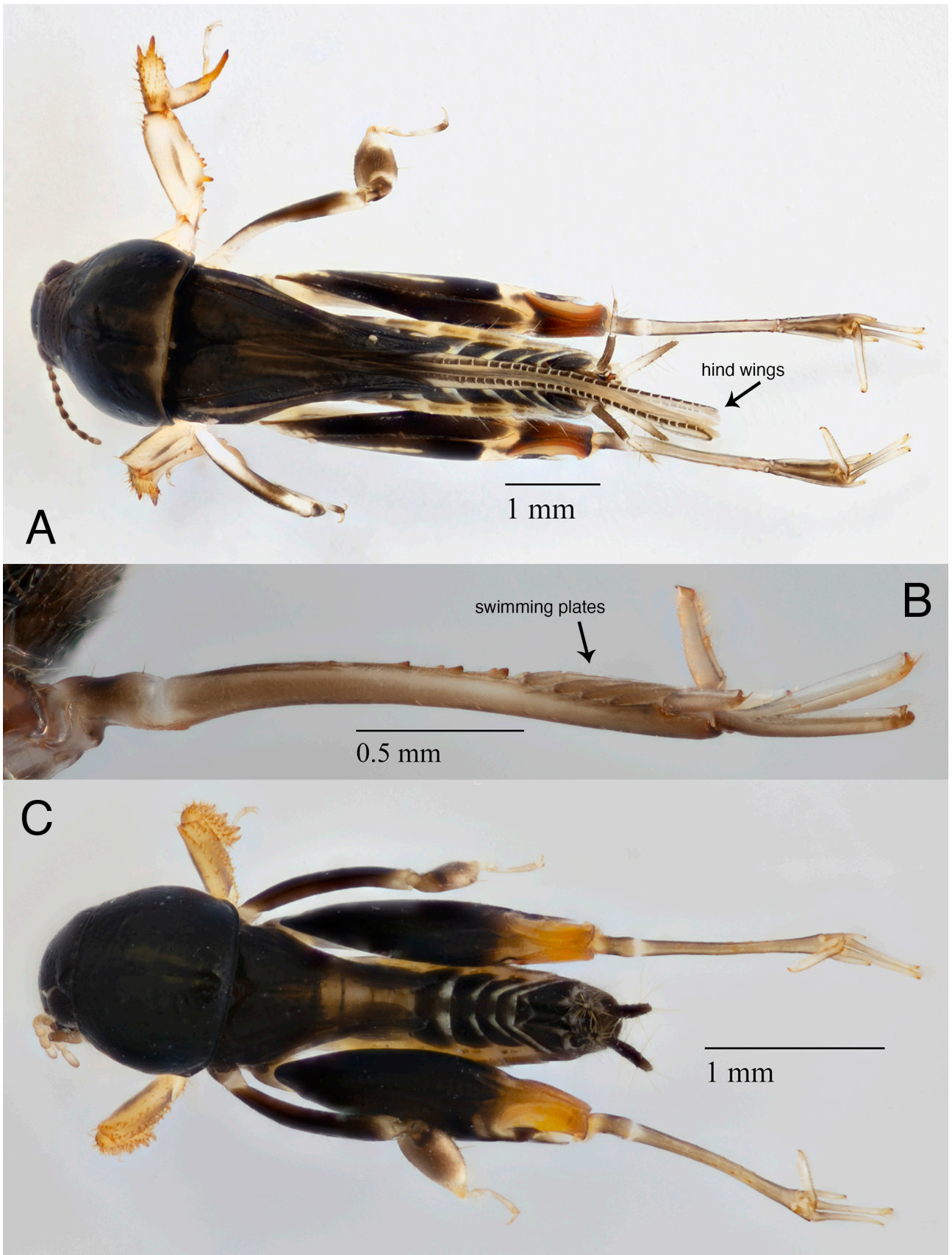


FIGURE 2. Characters used in key couplet 2.

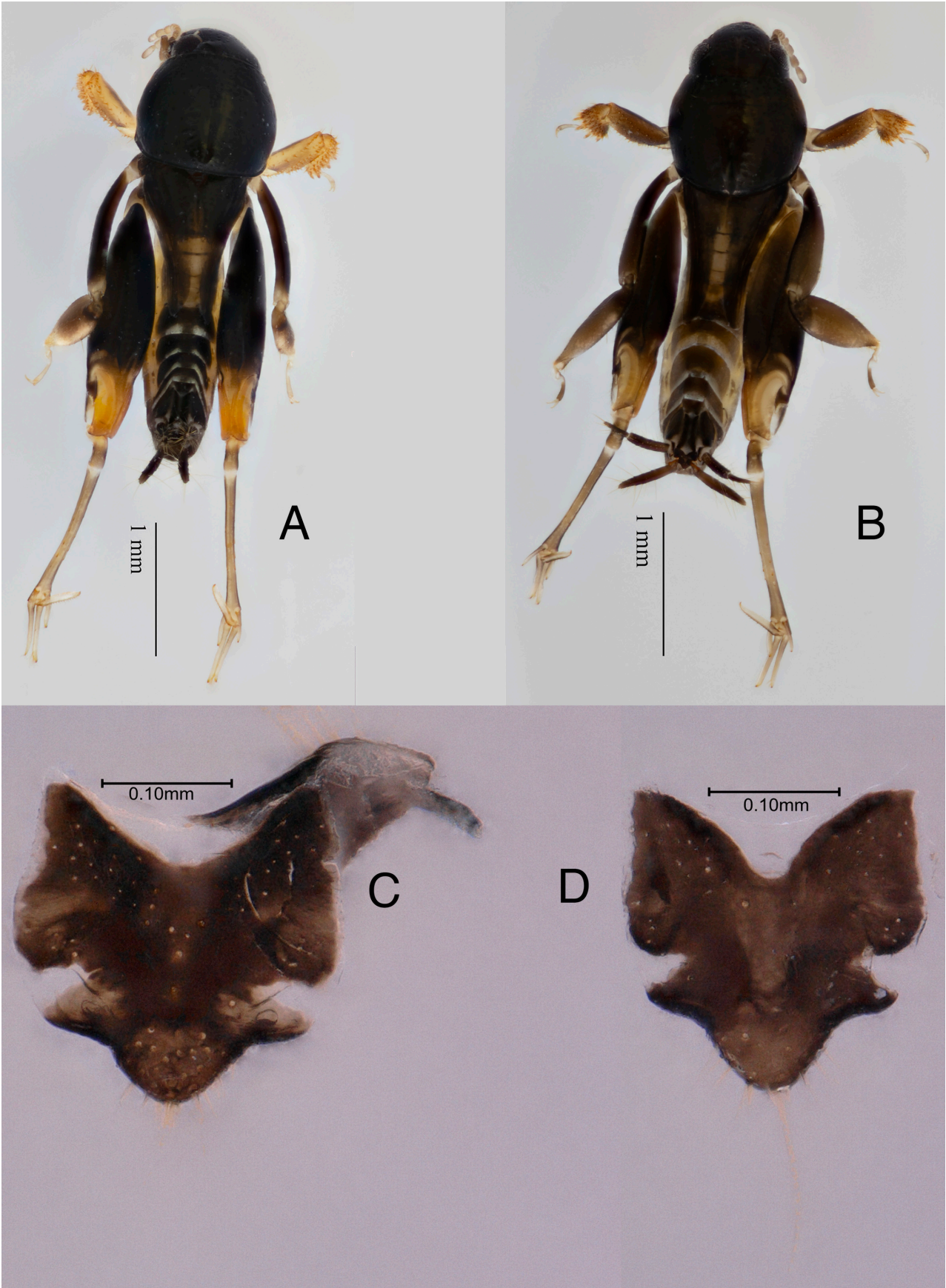


FIGURE 3. Characters used in key couplet 3.

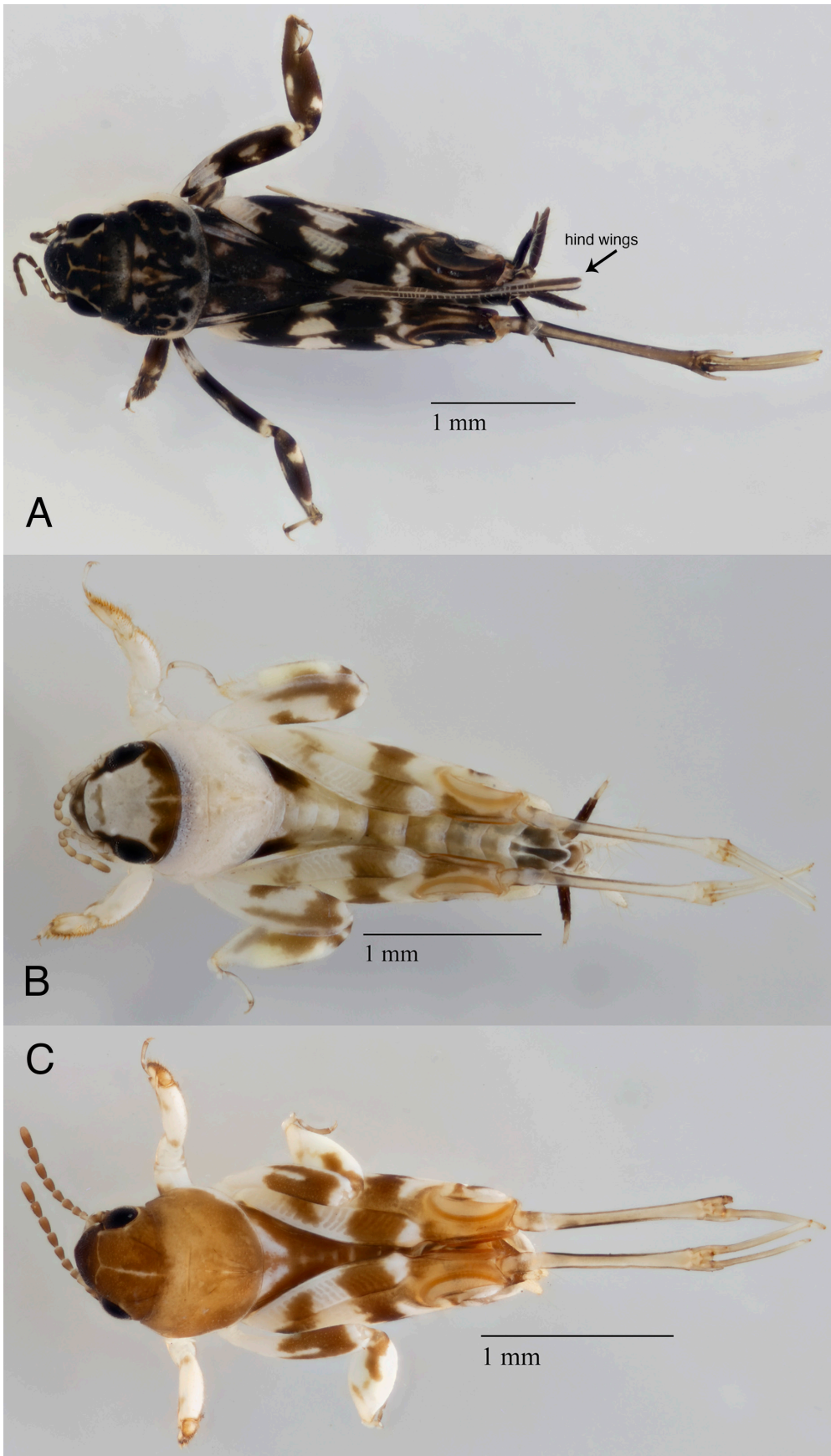


FIGURE 4. Characters used in key couplet 4.

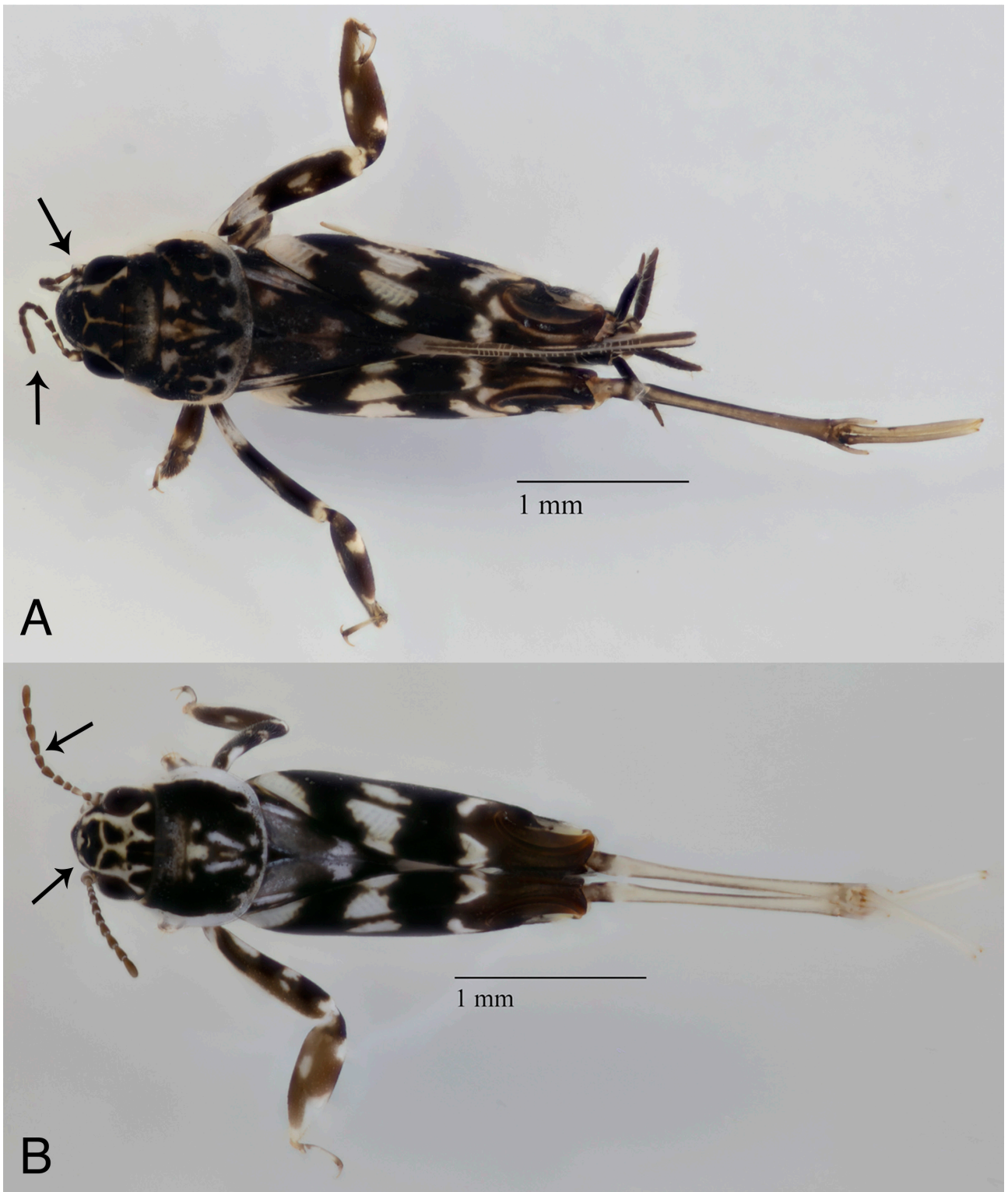


FIGURE 5. Characters used in key couplet 5.

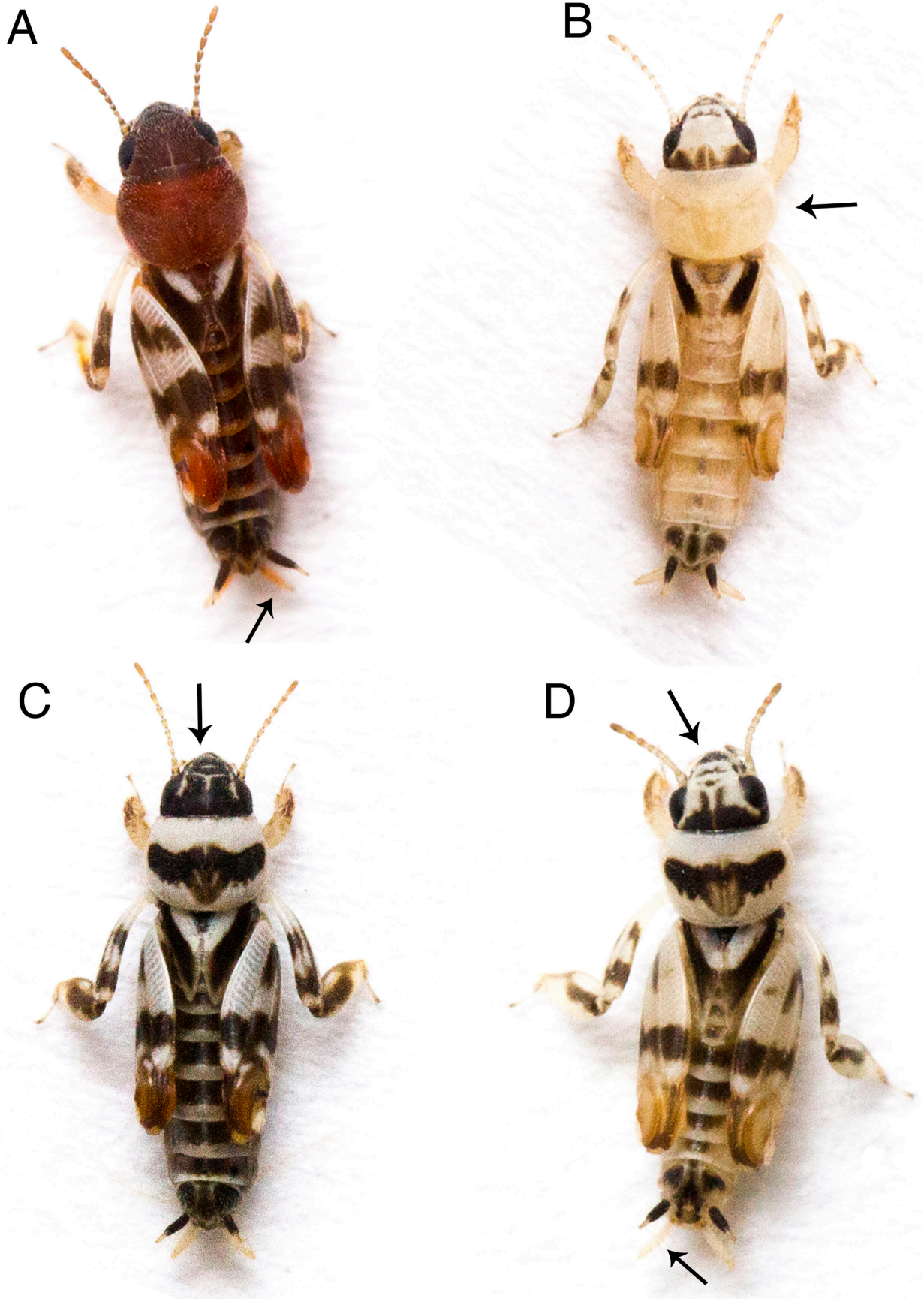


FIGURE 6. Characters used in key couplets 6, 7, and 8.

- 6'. Head and pronotum creamy white, often with black markings or even completely dark; paraproct processes white (Figs. 6B, 6C, 6D) 7
7. Pronotum creamy and unmarked (Fig. 6B); found in yellow sand scrub habitat in Polk county *E. deyrupei*
- 7'. Pronotum clearly marked with black or brown (Figs. 6C, 6D) 8
8. Head dark brown with pale Y-shaped marking (Fig. 6C) *E. eisneri*
- 8'. Head mostly creamy, with dark brown base and two dark spurs extending towards antennal bases (Fig. 6D) *E. ceratiola* **sp. nov.**

Taxonomy

Family Tridactylidae Brullé, 1835

Subfamily Tridactylinae Brullé, 1835

Genus *Ellipes* Scudder, 1902

Ellipes Scudder, 1902: 309; Günther 1977: 47.

Type species

Tridactylus minutus Scudder, 1862 (= *Ellipes minuta*), by original monotypy.

Etymology: From the Greek *Ελλιπες*, meaning ‘incomplete’, a reference to the reduced hind tarsus in members of the genus.

Ellipes ignis sp. nov.

Figs 7–9, 17

Etymology. From the Latin *ignis*, meaning fire, referring both to the bright coloration of this new species and to the fire-maintained nature of its habitat.

Proposed Common Name. Candy Cane Pygmy Mole Cricket (in reference to its red and white banding pattern)

Holotype repository. TAMUIC

Material examined ($n=39$). Holotype: USA • ♂; Florida: Manatee County: Coker Prairie Tract; 27.46395, -82.198355; 19 June 2022; B. Woo leg. (TAMUIC). Allotype: USA • ♀; Florida: Manatee County: same information as holotype (TAMUIC). Paratypes: USA • 2 ♀, 4 nymphs, Florida: Manatee County: same information as holotype (TAMUIC) • 1 ♂, 3 ♀, 5 nymphs; same locality as previous; 20 June 2022; B. Woo leg. (TAMUIC) • 1 ♂, 2 ♀, 2 nymphs, Manatee County: Duette Preserve; 27.487, -82.167; 30 May 2025; B. Woo leg. (1 ♀, ABS; others, TAMUIC) • 2 ♂, 1 ♀, 1 nymph, Manatee County: Little Manatee River Southfork tract; 27.590, -82.237; 31 May 2025; B. Woo leg. (1 ♀, ABS; others, TAMUIC) • 3 ♂, 10 ♀, Manatee County: Moody Branch WEA; 27.632, -82.235; 30 May 2025; B. Woo leg. (1 ♂, 1 ♀, ABS; others, TAMUIC)

Diagnosis. Differs from all other known species of *Ellipes* by the combination of its flightless condition, brick red coloration, lack of swimming plates, and occurrence in xeric habitat. Easily distinguished from the other upland *Ellipes* species (*E. eisneri*, *E. deyrupei*, and *E. ceratiola* **sp. nov.**) by its distinctive coloration and highly disjunct range.

Measurements (mm). Body (head to end of abdomen): ♂, 3.5–3.7; ♀, 3.8–4.5; length of pronotum: ♂, 0.8; ♀, 0.7–1.0; length of forewing: ♂, 0.8; ♀, 0.7–0.9; length of hind femur: ♂, 1.8–2.0; ♀, 1.9–2.2.

Description. **Male (holotype).** (Fig. 2). Coloration in life (Fig. 1): Head burgundy, with short pale spur derived from base and another short pale streak just below compound eye; antennae light brown; eyes black. Pronotum brick red with anterior edge burgundy; lower posterior corner of lateral lobe rusty orange. Forelegs tan, darkening to brown on tibiae and tarsi; middle legs creamy, with dark markings on femora and tibiae, and elliptical yellow mass in tibiae; hind femora creamy, with two irregular brown transverse bands; apical crescents of hind femora brick red; hind tibiae brick red but fading to cream apically. Tegmina dark brown, anal area white; abdomen dark brown, with apical borders of tergites tan; basal segment of cercus dark brown, apical segment dark cream; paraproct processes yellow. Note that coloration fades considerably in ethanol-preserved specimens, especially compared with other Florida *Ellipes* species.

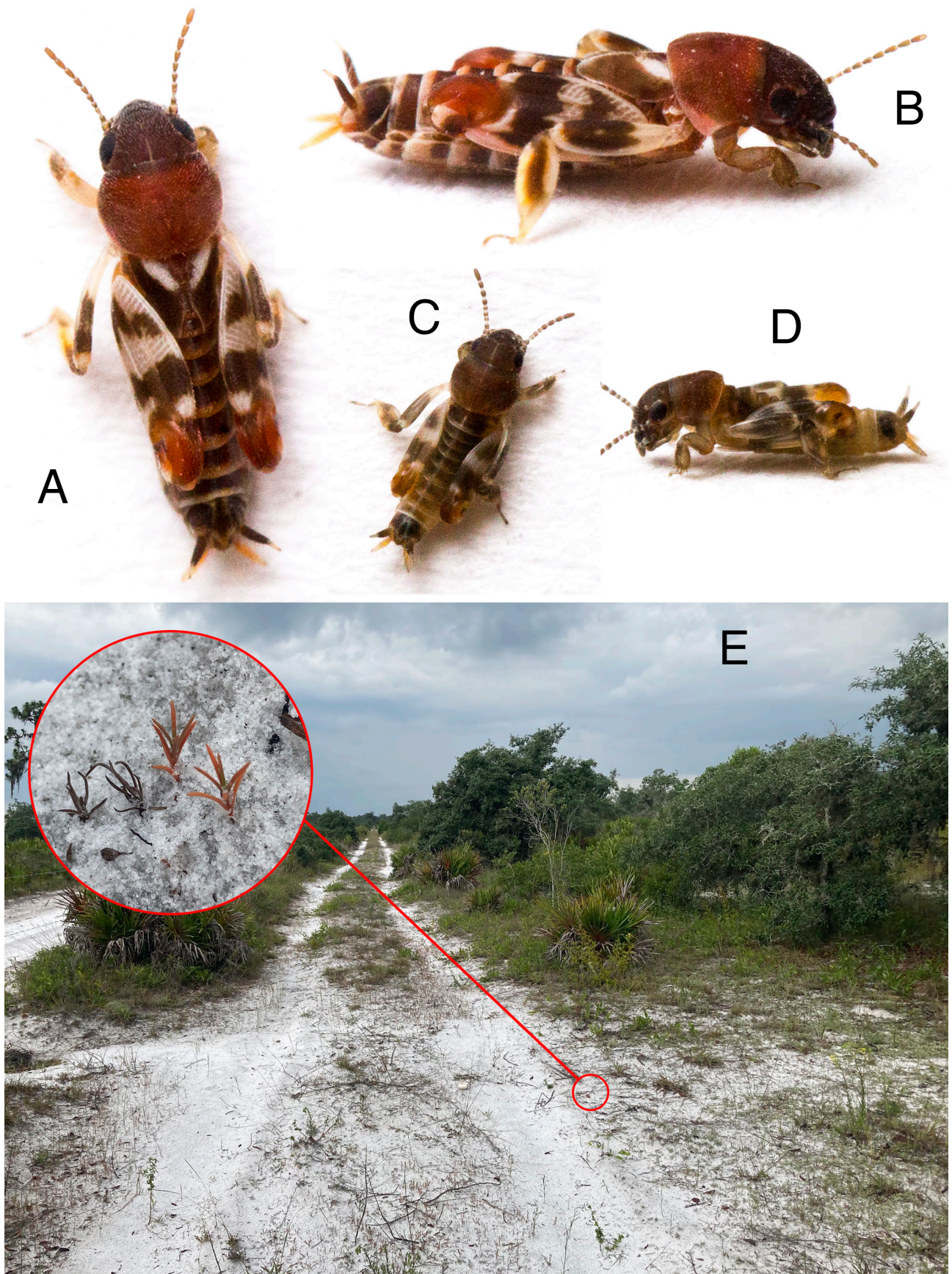


FIGURE 7. Live images and habitat of *Ellipes ignis* sp. nov. A) Dorsal view of adult. B) Lateral view of same. C) Dorsal view of nymph. D) Lateral view of same. E) Habitat at Coker Prairie; inset shows rust weed (*Polyprenum procumbens*).

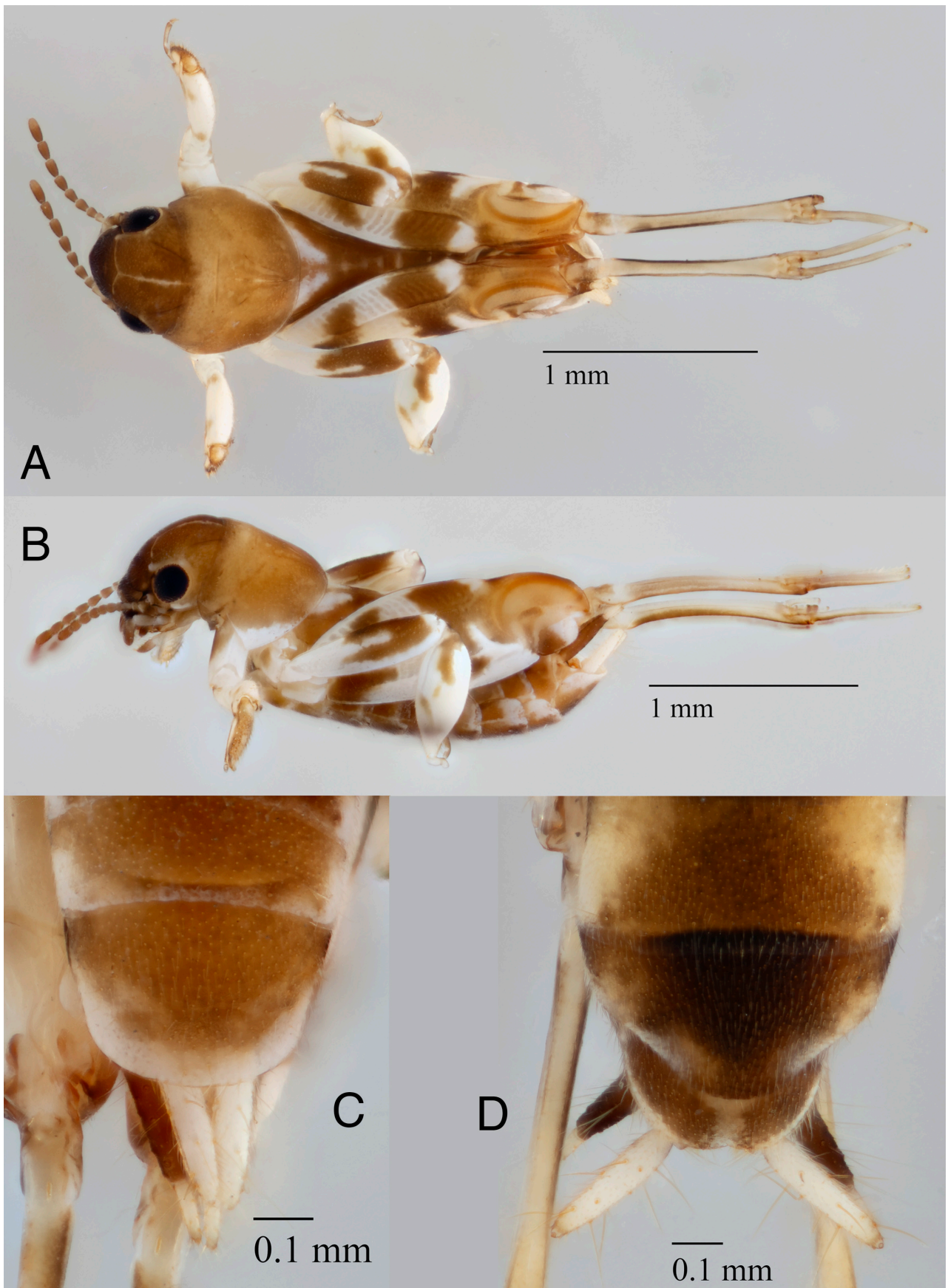


FIGURE 8. *Ellipes ignis* sp. nov. A) Holotype male dorsal. B) Lateral view of same. C) Male subgenital plate. D) Female subgenital plate.

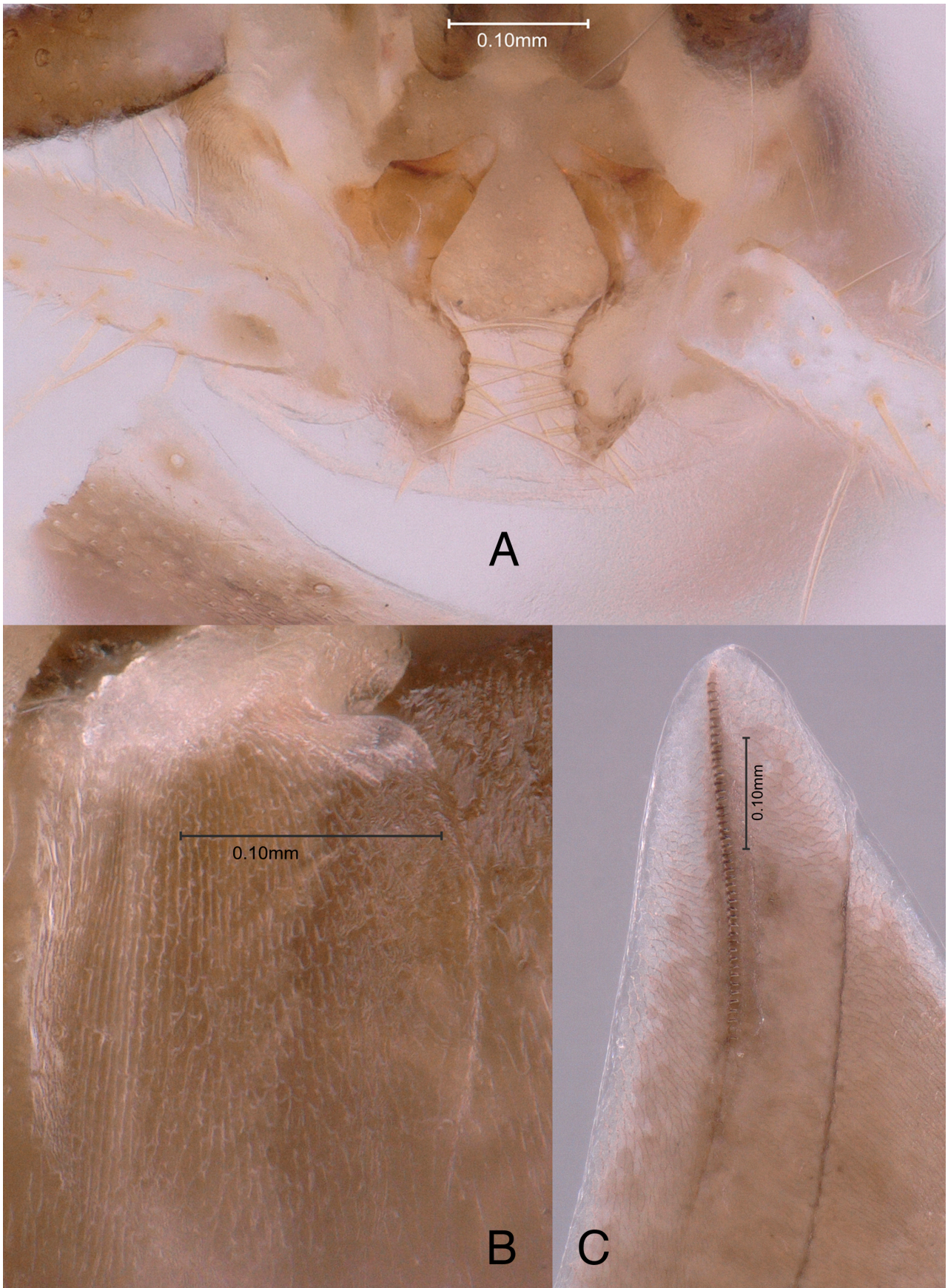


FIGURE 9. *Ellipes ignis* sp. nov. A) Male epiproct and paraproct hooks. B) Male scraper on abdominal tergite 4. C) Male stridulatory file on underside of tegmen.

Antennae 10-segmented; head and pronotum with sparse covering of short pale setae. Forewings about as long as pronotum; hind wings absent. Male stridulatory file (Fig. 3C) 0.4 mm in length, with about 44 teeth. Swimming plates of hind tibia absent. Male epiproct (Fig. 3A) about as wide as long; shallowly indented basally, convex apically, with long apical bristle about $\frac{3}{4}$ its length. Paraproct hooks strongly sclerotized, rounded apically and greatly widened at middle. Male subgenital plate (Fig. 2C) unspecialized, broadly rounded. Female subgenital plate (Fig. 2D) tapered apically, with rounded apex.

Habitat. The type locality (Fig. 1E) is xeric Florida scrub habitat dominated by Florida scrub oak (*Quercus inopina*). Other plants present at the locality include hog plum (*Ximenia americana* L.), candyroot (*Senega nana* (Michx.) J.F.B.Pastore & J.R.Abbott), lesser Florida spurge (*Euphorbia polyphylla* Engelm. ex Chapm.), nodding pinweed (*Lechea cernua* Small), sand spikemoss (*Selaginella arenicola* Underw.), and rust weed (*Polypremum procumbens* L.). Open sand gaps that harbored Pygmy Mole Crickets were mostly restricted to the sand road edges. Broken or dead pieces of rust weed, which have similar coloration to *E. ignis*, were common in these gaps, providing a possible source of crypsis for these insects. All specimens of *E. ignis* were collected within an hour or two of rain. Other Orthopterans present at the type locality included *Chortophaga australior* (Rehn & Hebard), *Trimerotropis maritima* (Harris), *Spharagemon marmoratum pictum* (Scudder), *Melanoplus spiracor* Woller & Kelly, and *Pictonemobius* sp. Other localities in Manatee County where *E. ignis* was collected were nearly identical in habitat to the type locality.

Distribution. Restricted to appropriate habitat in Manatee County, Florida.

***Ellipes ceratiola* sp. nov.**

Figs 10–12, 17

Etymology. Named after the monotypic shrub *Ceratiola ericoides* (Florida rosemary), a distinctive plant which appears to function as a keystone species in many locations where it grows. Although there is little to no *Ceratiola* within the habitats of the other Florida upland *Ellipes* species (*E. eisneri*, *E. deyrupi*, and *E. ignis* sp. nov.), *Ceratiola* occurs at three out of the four known localities for this new species, and may be responsible for maintaining, through allelopathy, the open sand gaps which are required by the new species.

Proposed Common Name. Rosemary Pygmy Mole Cricket

Holotype repository. TAMUIC

Material examined ($n=50$). Holotype: USA • ♂; Florida: Gilchrist County: Fort White WEA; 29.904, -82.788; 03 July 2022; B. Woo, A. Dunn leg.; sandhill with bare patches (TAMUIC). Allotype: USA • ♀; Florida: Gilchrist County: same information as holotype (TAMUIC). Paratypes: USA, Florida • 1 ♂, Alachua County: Goethe SF—Watermelon Pond Tract; 29.561, -82.632; 16 July 2022; B. Woo, L. Chen leg.; *Ceratiola* bald near wetlands (TAMUIC) • 15 ♀, Gilchrist County: same information as holotype (TAMUIC) • 9 ♀, 2 nymphs; Levy County: Goethe SF—Bailey Trail; 29.443, -82.544; 02 July 2022; B. Woo leg.; open sandhill with *Ceratiola* (TAMUIC) • 4 ♂, 17 ♀, Taylor County: SR-51, about 2 mi N Steinhatchee; 29.713, -83.357; 03 July 2022; B. Woo, A. Dunn leg.; sandhill with bare patches (TAMUIC).

Diagnosis. Differs from most other known species of *Ellipes* by the combination of its flightless condition, lack of swimming plates, and occurrence in xeric habitat. Distinguished from the other Florida upland *Ellipes* species (*E. eisneri*, *E. deyrupi*, and *E. ignis* sp. nov.) by its distinctive coloration and disjunct range. In the field, it may be distinguished from its closest congener, *E. eisneri*, by head pattern.

Measurements (mm). Body (head to end of abdomen): ♂, 3.0–3.6; ♀, 3.7–4.9; length of pronotum: ♂, 0.6–0.8; ♀, 0.7–1.0; length of forewing: ♂, 0.6–0.9; ♀, 0.7–1.0; length of hind femur: ♂, 1.7–2.0; ♀, 1.8–2.3.

Description. Male (holotype). (Fig. 5). Coloration in life (Fig. 4): *Head* mostly creamy, with dark brown base and two dark spurs extending towards antennal bases; two brown marks between antennal bases; antennae creamy with tan apices; eyes black. *Pronotum* creamy overall; dorsum with large dark brown spot, symmetrical and becoming rounded on lateral lobes; posterior edge of spot poorly defined. *Forelegs* creamy, darkening to tan on tibiae; middle legs creamy, with dark markings on femora and tibiae, and elliptical white mass in tibiae; hind femora creamy, with two irregular brown transverse bands; apical crescents of hind femora light brown; hind tibiae creamy. *Tegmina* dark brown, anal area and apices white. *Abdomen* dark brown, tergites with irregular dark brown median spots; basal segment of cercus dark brown, apical segment cream; paraproctal processes white.

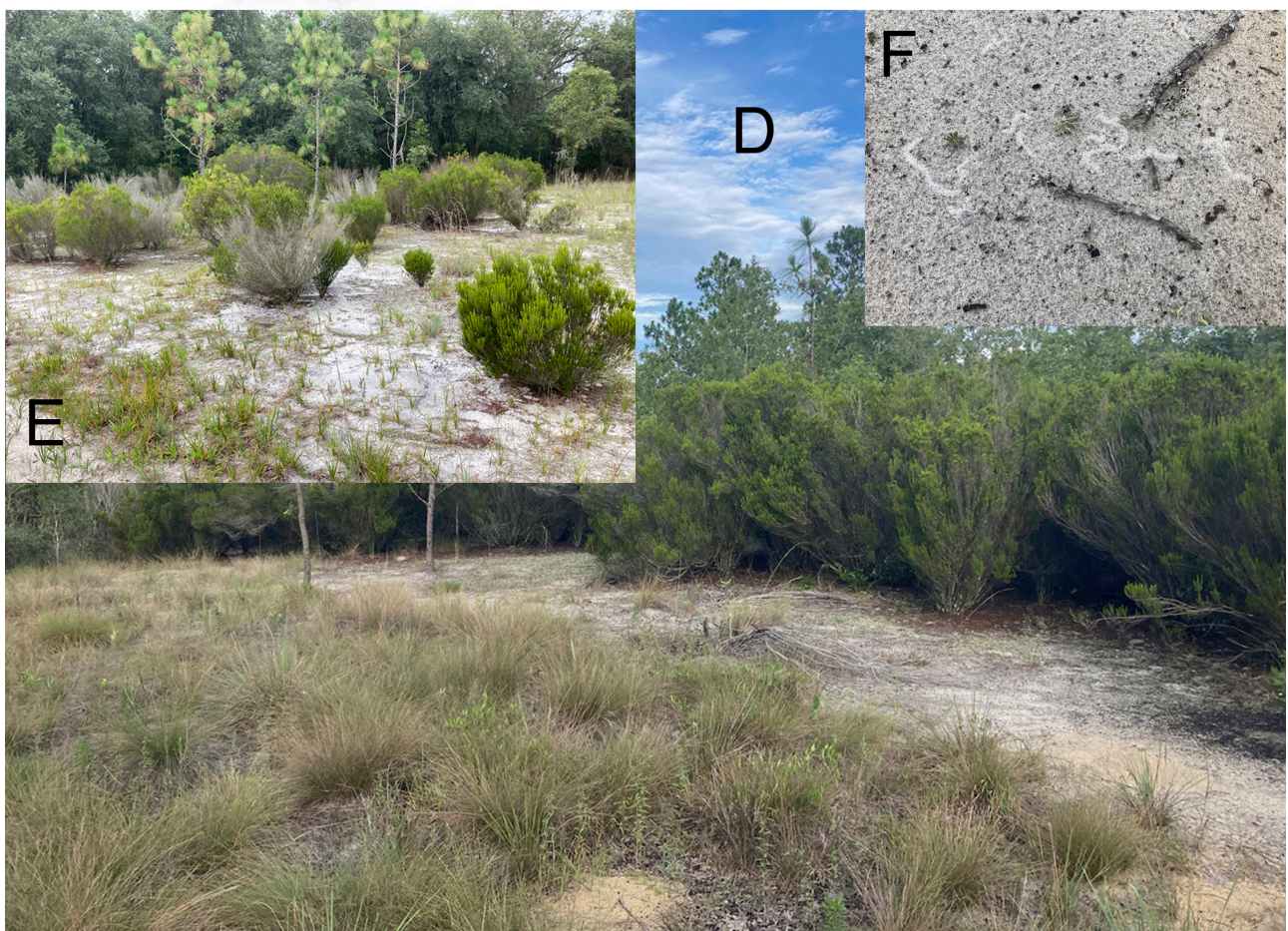
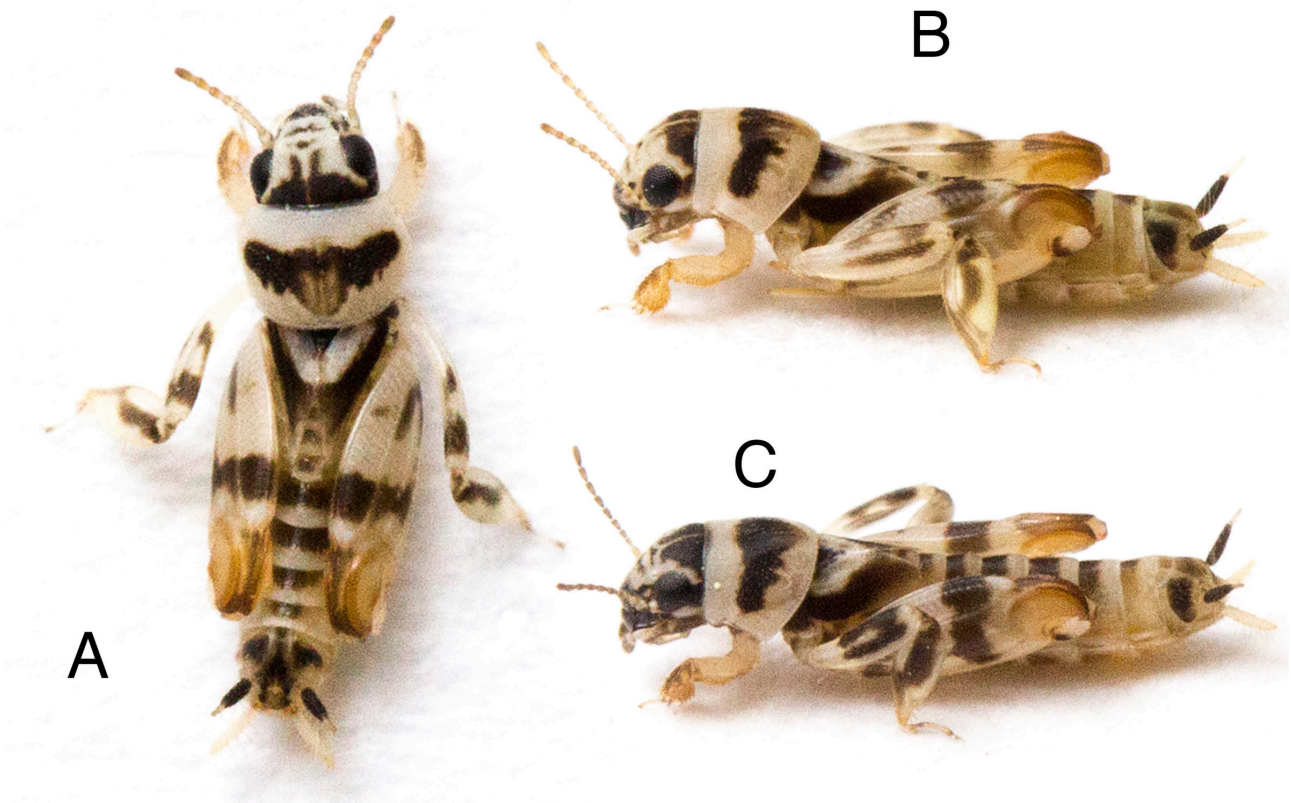


FIGURE 10. Live images and habitat of *Ellipes ceratiola* sp. nov. A) Dorsal view of adult from Watermelon Pond. B) Lateral view of adult from Goethe SF. C) Lateral view of adult from Steinhatchee. D) Habitat at Goethe SF. E) Habitat at Watermelon Pond. F) Raised feeding burrows.

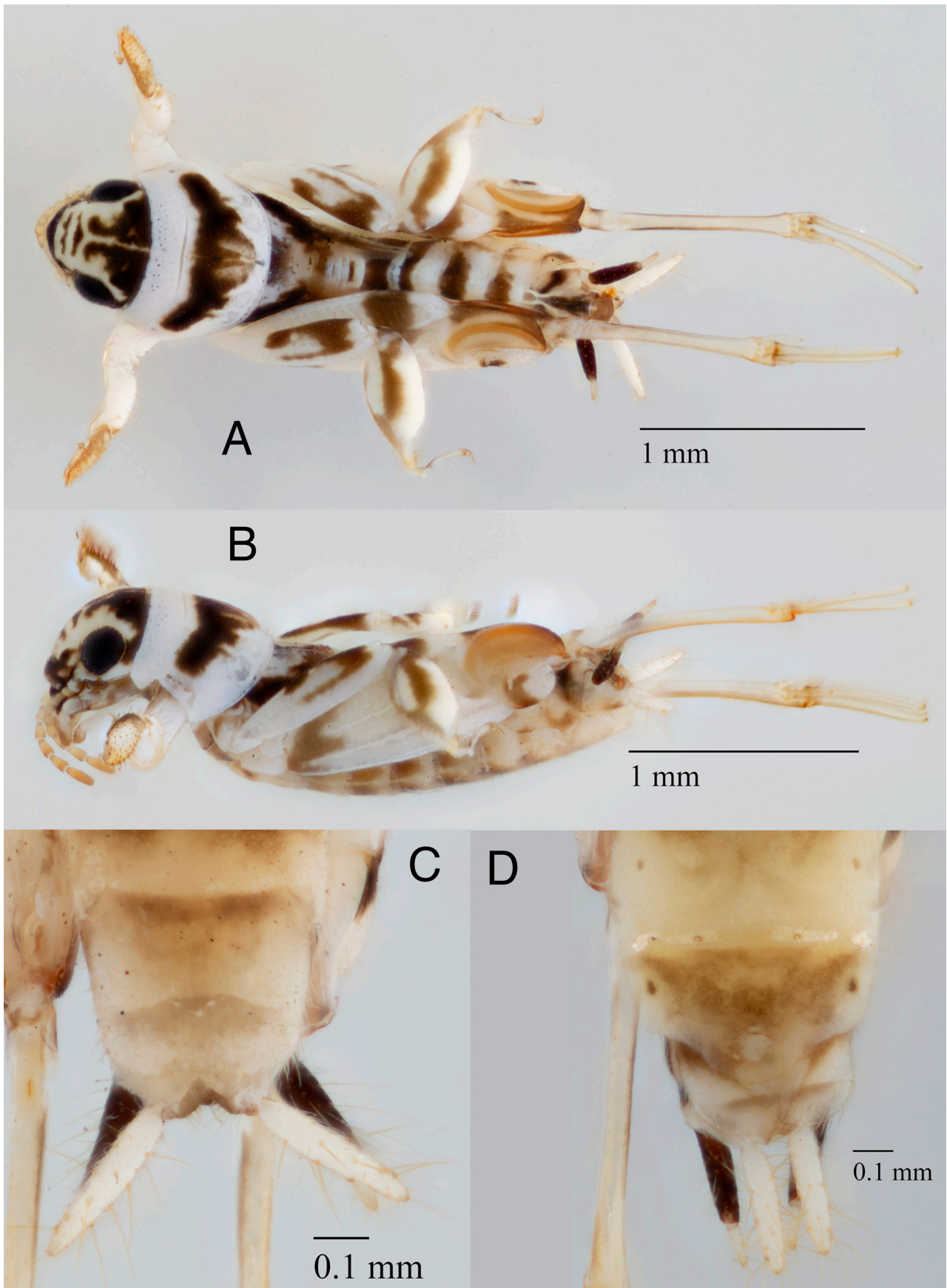


FIGURE 11. *Ellipes ceratiola* sp. nov. A) Holotype male dorsal. B) Lateral view of same. C) Male subgenital plate. D) Female subgenital plate.

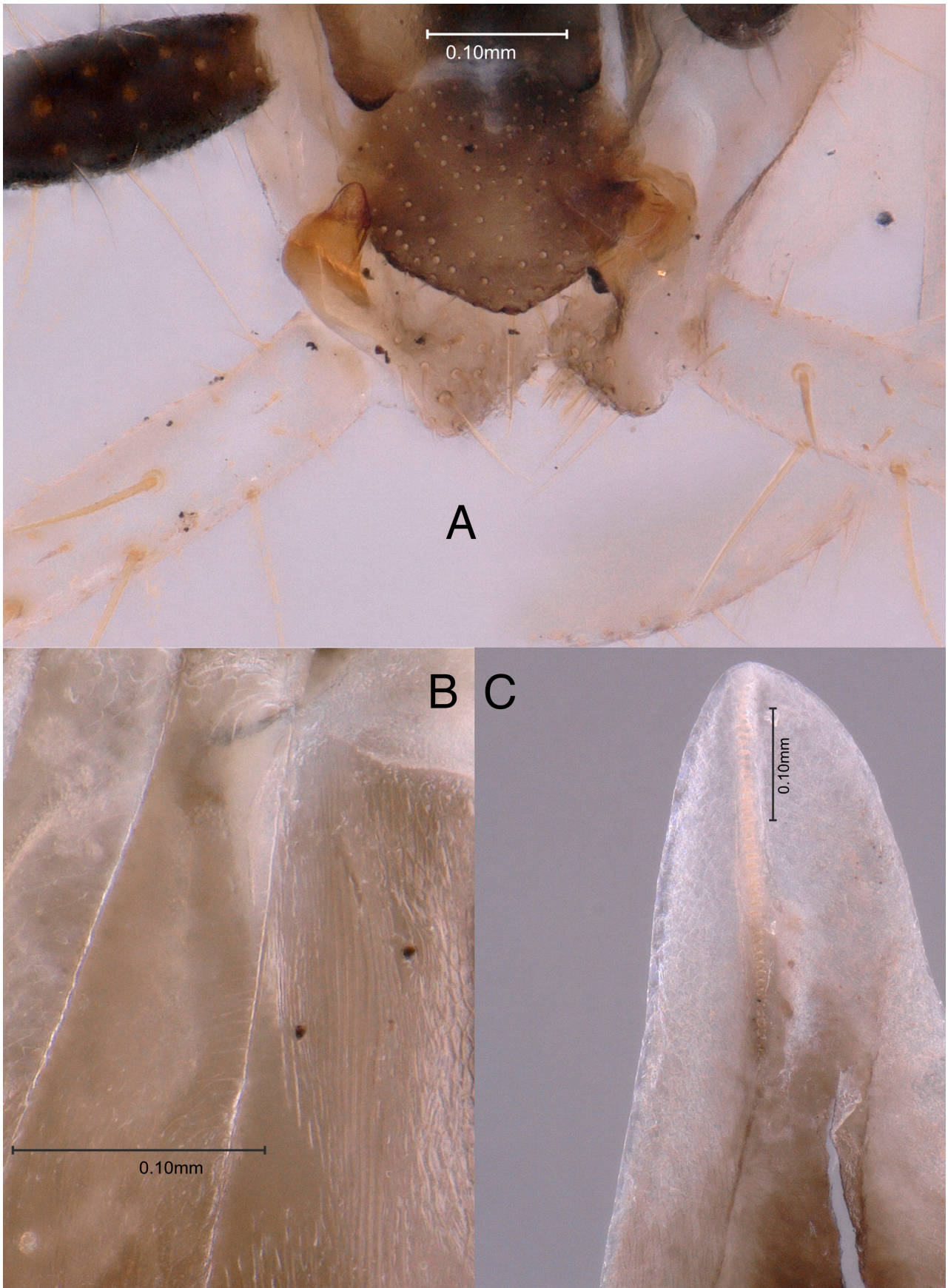


FIGURE 12. *Ellipes ceratiola* sp. nov. A) Male epiproct and paraproct hooks. B) Male scraper on abdominal tergite 4. C) Male stridulatory file on underside of tegmen.

Antennae 10-segmented. *Forewings* about as long as pronotum; hind wings absent. Male stridulatory file (Fig. 6C) 0.33 mm in length, with about 38 teeth. Swimming plates of hind tibia absent. Male epiproct (Fig. 6A) about as wide as long; very shallowly indented basally, convex apically, with long apical bristle about $\frac{3}{4}$ its length. Paraproct hooks strongly sclerotized, rounded apically and widened at middle. Male subgenital plate (Fig. 5C) truncated. Female subgenital plate (Fig. 5D) tapered apically, pinched laterally and rounded at apex.

Habitat. All localities where *E. ceratiola* **sp. nov.** has been found are open sandhill with large bare sand gaps (Fig. 4D–E). In Goethe SF, it occurred in the large sand gaps created by Florida rosemary colonies that were situated within more typical ‘high pine’ habitat with a dense groundcover, where *E. ceratiola* **sp. nov.** was not found. At Watermelon Pond, the species was again associated closely with barren sand gaps in the immediate vicinity of Florida Rosemary populations, which were present along small ridges around the edge of a wetland. At Fort White, *E. ceratiola* **sp. nov.** was common in gaps along a sand road in overgrown sandhill. At Steinhatchee, it was found in what appeared to be a naturally open sandhill habitat composed mostly of small saplings of Sand Post Oak (*Quercus margaretiae* (Ashe) Small). Turkey Oak (*Quercus laevis*) was present at all localities, and Florida rosemary (*Ceratiola ericoides*) was found at three out of four localities; other typical plants found at two or more of the sites included Sandhill Milkweed (*Asclepias humistrata* Walter), Sand Live Oak (*Quercus geminata*), Shiny Blueberry (*Vaccinium myrsinites* Lam.), and Florida Scrub Frostweed (*Crocanthemum nashii* (Britton) Barnhart). Typical Orthopterans present at these localities included *Spharagemon marmoratum pictum*, *Psinidia fenestralis* (Serville), *Melanoplus rotundipennis* (Scudder), *Schistocerca ceratiola* Hubbell & Walker (a hostplant specialist on Florida Rosemary), *Odontoxiphidium apterum* Morse, and *Pictonemobius* sp.

Distribution. Found on the Northern Brooksville Ridge in Alachua and Levy Counties, the Bell Ridge in Gilchrist County, and an unnamed upland near Steinhatchee in Taylor County. **Note:** The record in Woo (2021) of *E. eisneri* from Bronson (Levy County) actually refers to *E. ceratiola* **sp. nov.**

***Ellipes minuta* (Scudder 1862)**

Figs. 13A–B, 14A, 17

Type locality. USA: Illinois; Thomas leg.

Holotype repository. ANSP

Etymology. From Latin ‘minutus’ = very small in size; tiny; minute.

Distribution. Günther (1977) describes this as the most wide-ranging of all members of the genus, with specimens recorded from Brazil to southern Canada and throughout the Caribbean. He distinguished Florida material as *E. minuta* variety *floridana*, due to their lack of hind tibial lamellae. Apparently, all Florida specimens were assignable to this variety, as well as a few specimens from Georgia, South Carolina, Maryland, and Pennsylvania (although most material from these states was of the ‘typical form’).

Material examined ($n=43$). USA, Florida • 1 ♀, Alachua County: 02 October 1964; EG Farnworth leg. (UGCA) • 1 ♀; Citrus County: Homosassa Tract; 19 Oct 2002; J. Mosley leg.; sandhill community (ABS) • 1 ♀; Highlands County: Archbold Biological Station; 27.183, -81.351; 03–07 vii 2023; B. Woo leg. (TAMUIC) • 1 ♀, Liberty County: Torreya SP; 30.569, -84.939; 22 July 2022; B. Woo leg. (TAMUIC) • 1 ♀, Martin County: Jonathan Dickinson SP; 27.011, -80.125; 12 June 2022; B. Woo leg. (TAMUIC) • 1 ♂, Pasco County: Withlacoochee State Forest Richloam tract; 10 April 1980; CL Smith leg. (UGCA) • USA, Georgia • 1 ♂, 1 ♀, Clarke County: Sycamore Dr., border Oconee River; 10 September 2002; JB Torres and C. Torres leg. (UGCA) • 1 ♂, Clarke County: Whitehall Forest; 12 April 1972; R. Turnbow leg. (UGCA) • 1 ♀, Clarke County: Athens; 2 May 1971; R and J Matthews leg. (UGCA) • 1 ♂, same locality as previous; 02 November 1997; W.B. Sikora leg. (UGCA) • 1 ♀, Clarke County: Horseshoe Bend; 07 September 1976; R. Turnbow leg. (UGCA) • 1 ♂, Clarke County: Barnett Shoals power plant vicinity; 01 May 1984; R. Morris leg. (UGCA) • 1 ♀, Clarke County: Georgia State Botanical Gardens, along bank of Oconee River; 15 September 2005; JA Robertson leg. (UGCA) • 1 ♂, 2 ♀, 4 nymphs, Clinch County: 15 October 1966; RJ Beshear leg. (UGCA) • 1 ♂, 3 ♀, Crawford County: Roberta; 04 May 1939; PW Fattig leg. (UGCA) • 1 ♀, Ware County: 17 April 1985; RJ Beshearr leg. (UGCA) • USA, Louisiana • 2 ♂, 1 ♀, St. Martin Parish: Atchafalaya River at Route 1–10; 08 June 1975; CL Smith and R. Turnbow leg. (UGCA) • USA, Ohio • 5 ♂, Ross County: Rt 50 at Scioto River; 21 April 1988; RA Androw leg. (CMNH) • USA, Pennsylvania • 1 nymph, Allegheny County: 17 May 1906 (CMNH) • 1 ♀, Beaver County: Raccoon Creek Park; 31 May 1969; RW Surdick leg. (CMNH) • 1 ♀, Hills

Station; 30 August 1905 (CMNH) • 1 ♂, Washington County: 31 May 1953; RW Surdick leg. (CMNH) • USA, West Virginia • 1 ♂, 1 ♀, 2 nymphs, Clay County: Clay; 06–12 September 1938; GE Wallace leg. (CMNH) • 1 ♀, Putnam County: 3.2kSSW Buffalo: 38.590, -81.994, 173m; 17 September 2013; D. Pickens leg. (CMNH)

Ellipes gurneyi Günther 1977

Figs. 13C–E, 14C, 17

Type locality. USA: California: Mendocino County, Hansen; 10 June 1959, D.C. Rentz leg.

Holotype repository. CAS

Etymology. Named after Ashley B. Gurney (1911–1988).

Distribution. Günther (1977) examined specimens from Mexico (Baja California, Sinaloa, Sonora), California, Arizona, Oregon, Florida, Illinois, Michigan, Indiana, and Pennsylvania. He assigned Florida material as *E. gurneyi* variety *alamellata*, due to their lack of hind tibial lamellae and slightly different color pattern. The records below confirm its presence across nearly the entire state of Florida, in habitats ranging from wet roadside ditches to xeric scrub. The species is also herein newly recorded from Georgia, Kentucky, Louisiana, and Texas.

Material examined ($n=78$). USA, Florida • 1 ♂, 1 ♀, 1 nymph; Brevard County: Merritt Island NWR-scrub trail: 28.692, -80.714; 05 June 2022; B. Woo; overgrown coastal scrub (TAMUIC) • 2 ♂, 1 ♀, 2 nymphs, Brevard County: Malabar Scrub sanctuary, along Malabar Rd; 05 October 1999; Z. Prusak leg.; xeric oak scrub in open firelanes (ABS) • 4 ♂, 5 ♀, 1 nymph; Escambia County: Big Lagoon SP; 30.311, -87.406; 19 June 2023; B. Woo leg.; coastal dune scrub (TAMUIC) • 1 ♀, 1 nymph; Escambia County: Perdido Key SP; 30.293, -87.468; 16 June 2023; B. Woo leg.; coastal dune scrub (TAMUIC) • 1 ♂, 2 ♀; Franklin County: Bald Point SP; 29.915, -84.338; 21 July 2022; B. Woo, L. Chen leg.; coastal dune scrub (TAMUIC) • 1 ♂, 2 ♀; Franklin County: Tate's Hell SF—High Bluff Coastal Trail West; 29.791, -84.768; 21 July 2022; B. Woo, L. Chen leg.; coastal dune scrub (TAMUIC) • 1 ♀; Glades County: Fisheating Creek WMA-Fisheating Creek Outpost; 26.941, -81.320; 20 June 2022; B. Woo leg. (TAMUIC) • 3 ♂, 1 ♀; Gulf County: St. Joseph Bay State Buffer Preserve; 29.695, -85.298; 24 July 2022; B. Woo, L. Chen leg.; coastal dune scrub (TAMUIC) • 2 ♀; Hernando County: Weeki Wachee Springs SP; 28.527, -82.590; 07 June 2022; B. Woo leg.; open *Ceratiola* scrub with sandhill close by (TAMUIC) • 2 ♂, Highlands County: Archbold Bio. Sta.; 17 March 2016; J. Frank leg.; yellow bowl trap in fireland near seasonal pond S. of main grounds (ABS) • 1 ♀, Highlands County: Archbold Bio. Sta.; 14 March 2016; M. Deyrup leg.; wet area near Lake Annie (ABS) • 1 ♀, Highlands County: Lake Placid; 10 Oct 1996; M. Deyrup leg. (ABS) • 1 ♂, Highlands County: Archbold Biol. Sta.; 02 July 1986; M. Deyrup leg.; Malaise trap, trail 2 SSo (ABS) • 1 ♂, Highlands County: Archbold Biol. Sta.; 12 Feb 1983; M. Deyrup leg.; on *Hypericum edisonianum* (ABS) • 1 ♂, Highlands County: Archbold Biol. Sta.; 08 Nov 1982; M. Deyrup leg.; W. Bayhead, moist depression (ABS) • 1 ♂, Highlands County: Kissimmee River boat launch: 27.379, -81.097; 04 June 2025; B. Woo leg. (TAMUIC) • 1 ♂, Highlands County: Platt Branch WEA: 27.041, -81.396; 05 June 2025; B. Woo leg. (TAMUIC) • 1 ♀, Osceola County: Herky Huffman Bull Creek WMA; 28.026, -80.949; 14 July 2022; B. Woo, L. Chen leg. (TAMUIC) • 1 ♂, 1 nymph, Polk County: Tiger Creek Preserve; 27.817, -81.477; 24 May 2025; B. Woo leg. (ABS) • 1 ♀, Seminole County: Chuluota Wilderness Area; 28.620, -81.059; 14 July 2022; B. Woo leg. (TAMUIC) • 1 ♀; Taylor County: SR-51, about 2 mi N Steinhatchee; 29.713, -83.357; 03 July 2022; B. Woo, A. Dunn leg. (TAMUIC) • 3 ♂, 9 ♀; Washington County: Chipley Whitewater Lakes; 30.483, -85.552; 17 June 2023; B. Woo leg.; white sand rim of karst lake (TAMUIC) • USA, Georgia • 1 ♀, Clarke County: Athens, 1 km south of Hwy 78 and Whitehall; 28 September 2002; J Whitman leg. (UGCA) • 1 ♂, Clinch County: 31 March 1968; RJ Beshear leg. (UGCA) • 1 ♀; Emanuel County: Old Hwy 46 scrub: 32.396, -82.308; 19 July 2022; B. Woo leg. (TAMUIC) • 1 ♀, McIntosh County: Sapelo Island, near gator pond; 20 October 2002; EG Reese leg. (UGCA) • USA, Kentucky • 2 ♀, Whitley County: Cumberland Falls; 30 July 2012; M. Deyrup leg.; in shallow sand at edge of Cumberland River (ABS) • USA, Louisiana • 5 ♂, 6 ♀, St. Martin Parish: Atchafalaya River at Route 1–10; 08 June 1975; R. Turnbow leg. (UGCA) • USA, Texas • 1 ♂, 1 ♀; Brazos County: Carters Creek at William D. Fitch Pkwy: 30.586, -96.222; 22 April 2023; B. Woo leg. (TAMUIC) • 1 ♀, Hardin County: Roy Larsen Sandyland Sanctuary: 30.349, -94.238; 07 April 2024; B. Woo leg. (TAMUIC).

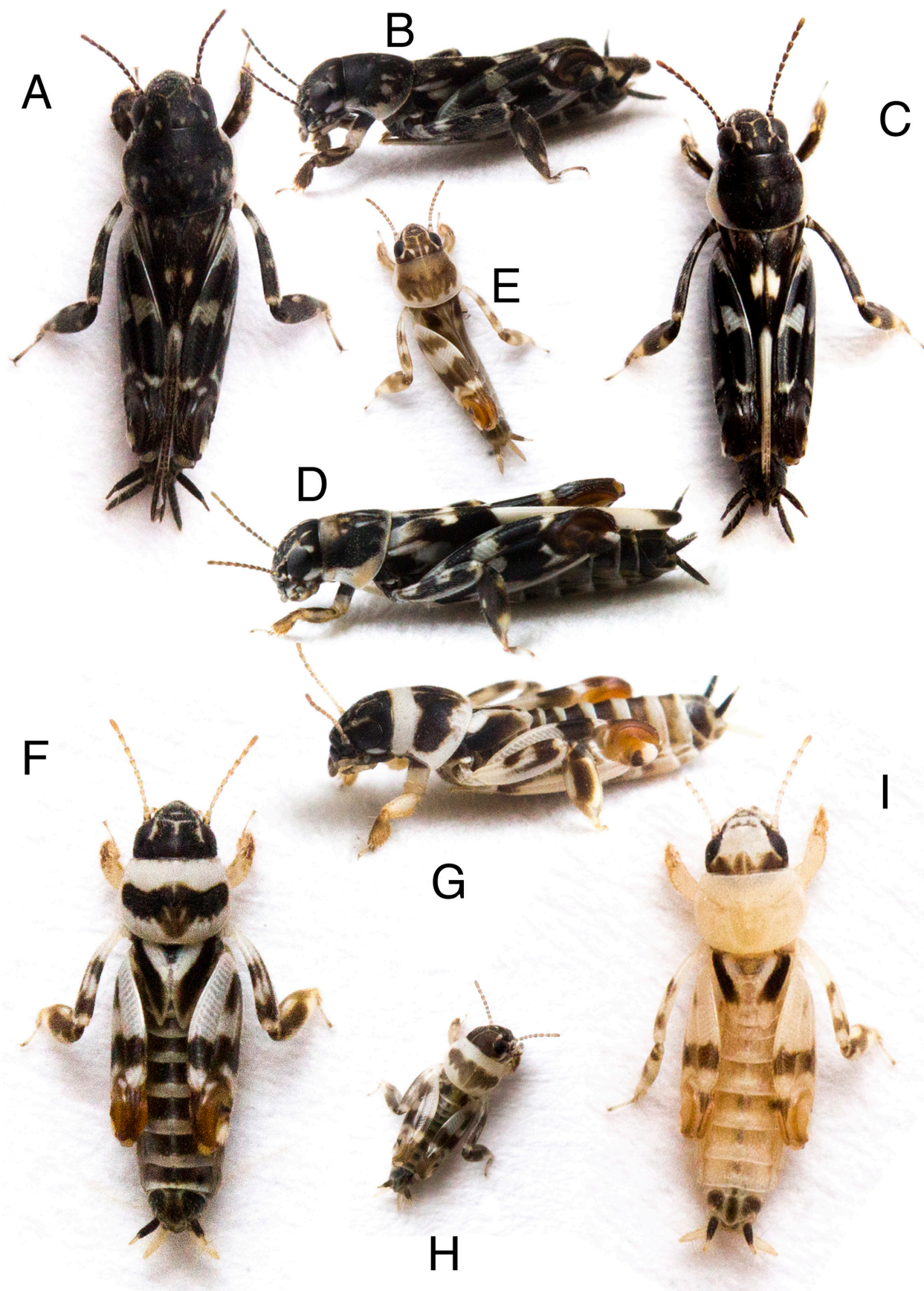


FIGURE 13. Live images of other Florida *Ellipes* spp. A–B) *E. minuta* from Jonathan Dickinson SP. C–E) *E. gurneyi* from Whitewater Lakes (C), Chuluota (D), and Merrit Island (nymph; E). F–H) *E. eisneri* from Weeki Wachee (F–G) and Lakeland Highlands (nymph; H). I) *E. deyrupei* from Catfish Creek.

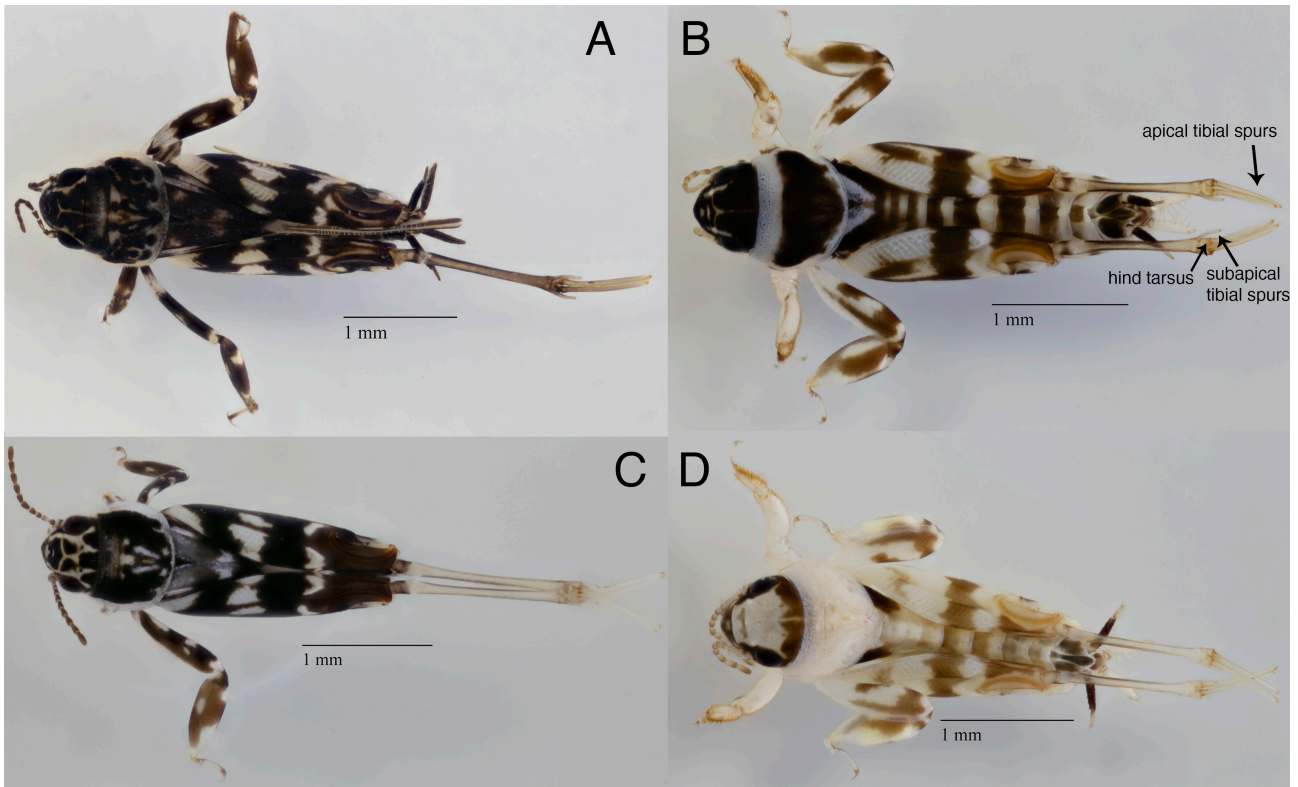


FIGURE 14. Specimen habitus images of other Florida *Ellipes* spp. A) *Ellipes minuta*. B) *E. eisneri*. C) *E. gurneyi*. D) *E. deyrupi*.

***Ellipes eisneri* Deyrup 2005**

Figs. 13F–H, 14B, 15, 17

Type locality. USA: Florida: Citrus County: near Inverness, Withlacoochee Forest, Citrus Area, Forest Road 13, 1.3 mi. south State Road 44; 03 April 1995; sandhill habitat with bare sand, M. Deyrup leg.

Holotype repository. FSCA

Etymology. Named after Thomas Eisner (1929–2011).

Description of male characters. Male stridulatory file (Fig. 9C) 0.42 mm in length, with about 51 teeth. Male epiproct (Fig. 9A) slightly wider than long; shallowly indented basally, convex apically, with apical bristle about 1/2 its length. Paraproct hooks strongly sclerotized, rounded apically and widened at middle.

Distribution. Previously known from the Brooksville Ridge in Levy, Marion, and Citrus Counties, Florida (Woo 2021). The records below extend its Brooksville Ridge distribution southward into Hernando County and newly document its occurrence on the Cotton Plant and Lakeland Ridges as well as the isolated Cedar Key scrub.

Material examined ($n=92$). USA, Florida • 2 ♂, 3 ♀, 1 nymph, Citrus County: Citrus WMA—Oak Park North Trailhead: 28.719, -82.493; 27 June 2022; B. Woo leg.; open sandhill (TAMUIC) • 5 ♂, 7 ♀, Hernando County: Weeki Wachee Springs SP; 28.527, -82.590; 07 June 2022; B. Woo leg.; open *Ceratiola* scrub with sandhill close by (TAMUIC) • 1 ♂, 1 ♀, 4 nymphs, Hernando County: Suncoast Trail (Chassahowitzka WMA); 28.689, -82.501; 07 July 2022; B. Woo leg.; open sandhill (TAMUIC) • 5 ♂, 9 ♀, Levy County: Cedar Key Scrub: 29.213, -83.018; 13 July 2022; B. Woo, L. Chen leg.; open scrub with *Ceratiola* (TAMUIC) • 16 ♀, 3 nymphs, Levy County: Goethe SF—rosemary bald area on Co Rd 337; 29.357, -82.602; 02 July 2022; B. Woo leg.; open sandhill with *Ceratiola* (TAMUIC) • 1 ♀, Marion County: Cross-Florida Greenway Triangle; 29.062, -82.181; 01 July 2022; B. Woo leg.; overgrown scrub (TAMUIC) • 2 ♂, 3 ♀, 2 nymphs, same locality and collector as previous; 09 July 2022 (TAMUIC) • 6 ♂, 4 ♀, 2 nymphs, Marion County: Indian Hill Dr., Dunnellon: 29.169, -82.531; 08 July 2022; B. Woo leg.; open sandhill (TAMUIC) • 8 ♂, 7 ♀, Polk County: Lakeland Highlands Scrub: 27.930, -81.930; 18 June 2022; B. Woo leg.; open scrub (TAMUIC).

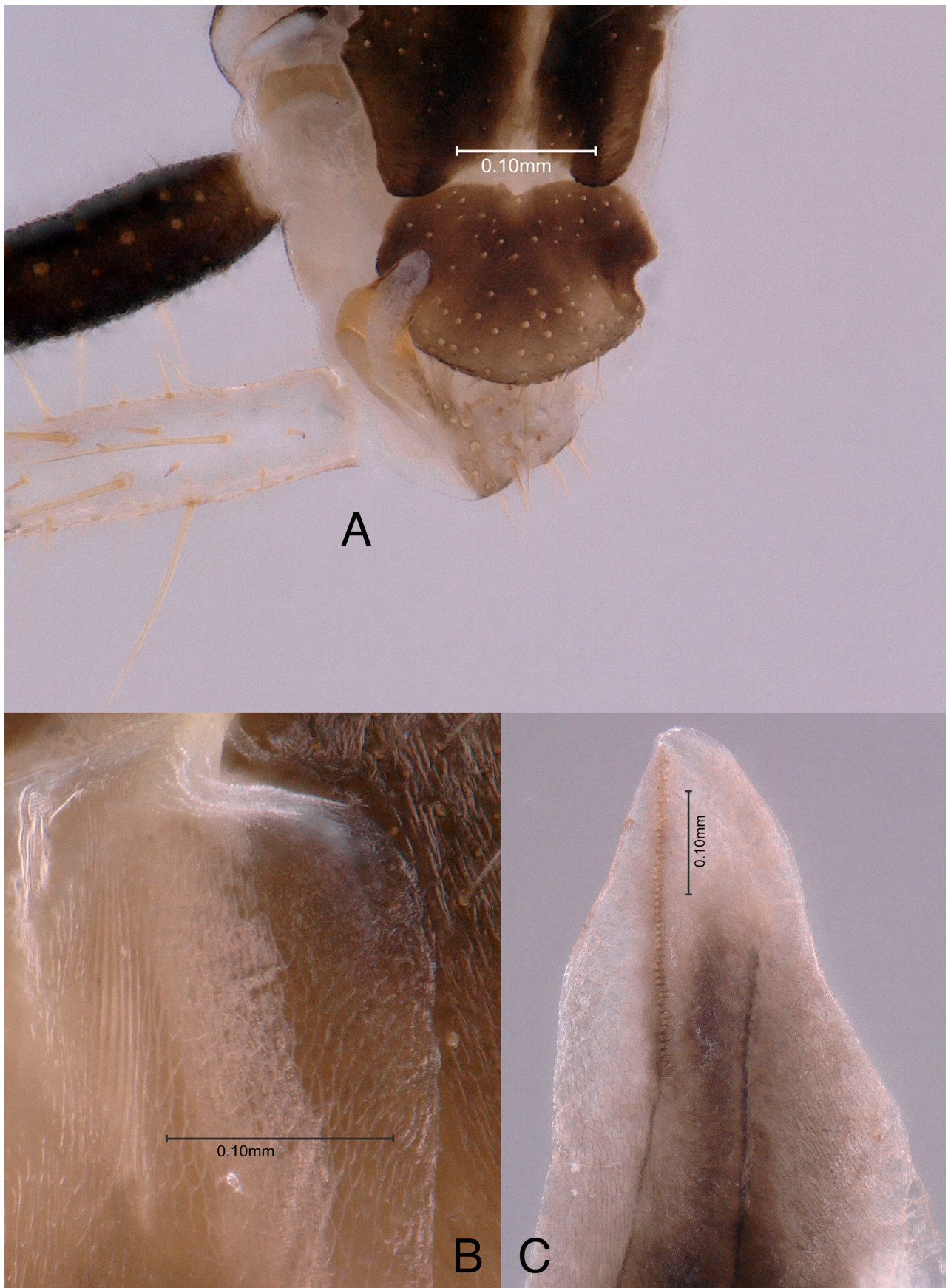


FIGURE 15. *Ellipes eisneri*. A) Male epiproct and paraproct hooks. B) Male scraper on abdominal tergite 4. C) Male stridulatory file on underside of tegmen.

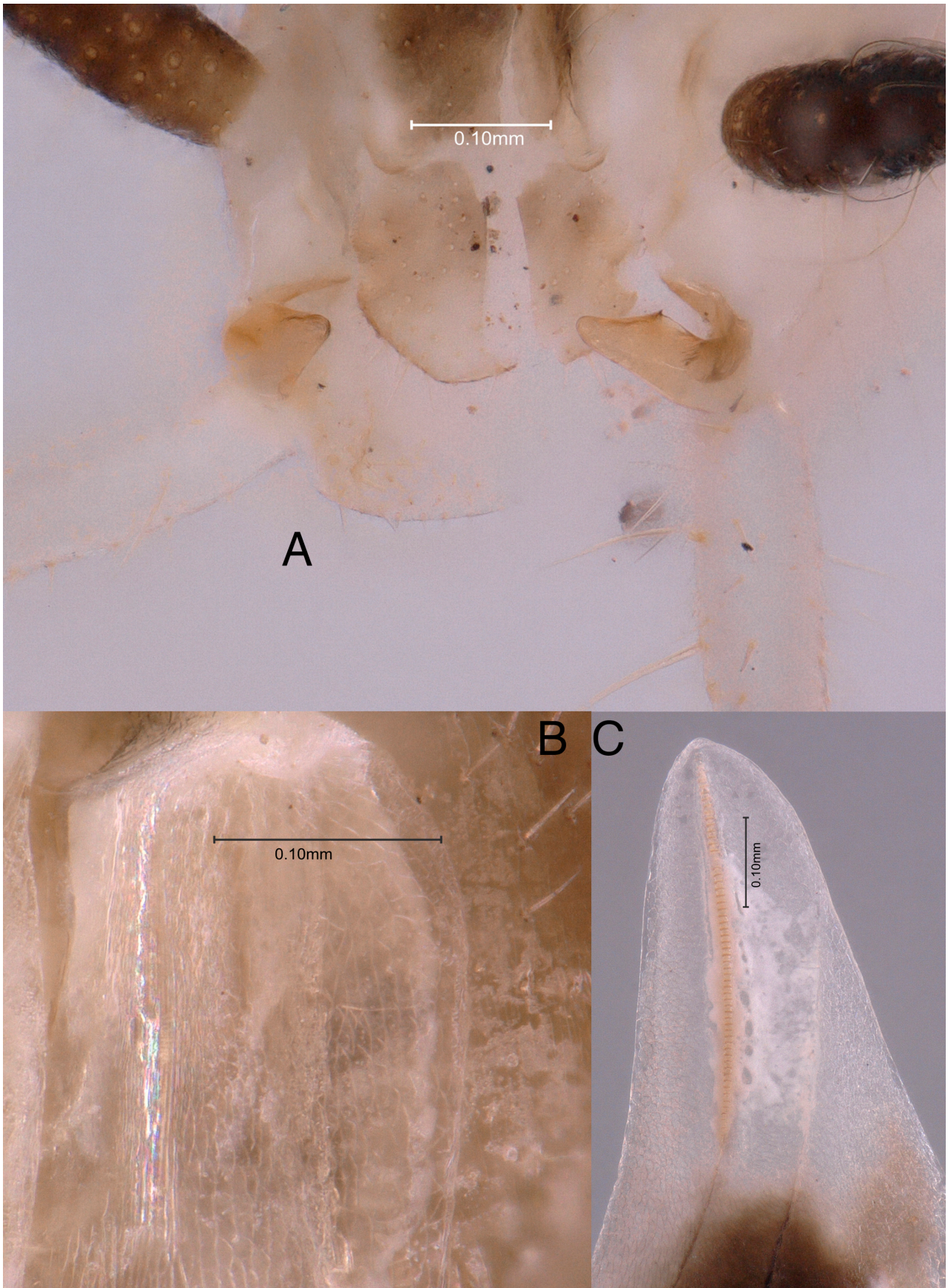


FIGURE 16. *Ellipes deyrupei*. A) Male epiproct (broken down the middle) and paraproct hooks. B) Male scraper on abdominal tergite 4. C) Male stridulatory file on underside of tegmen.

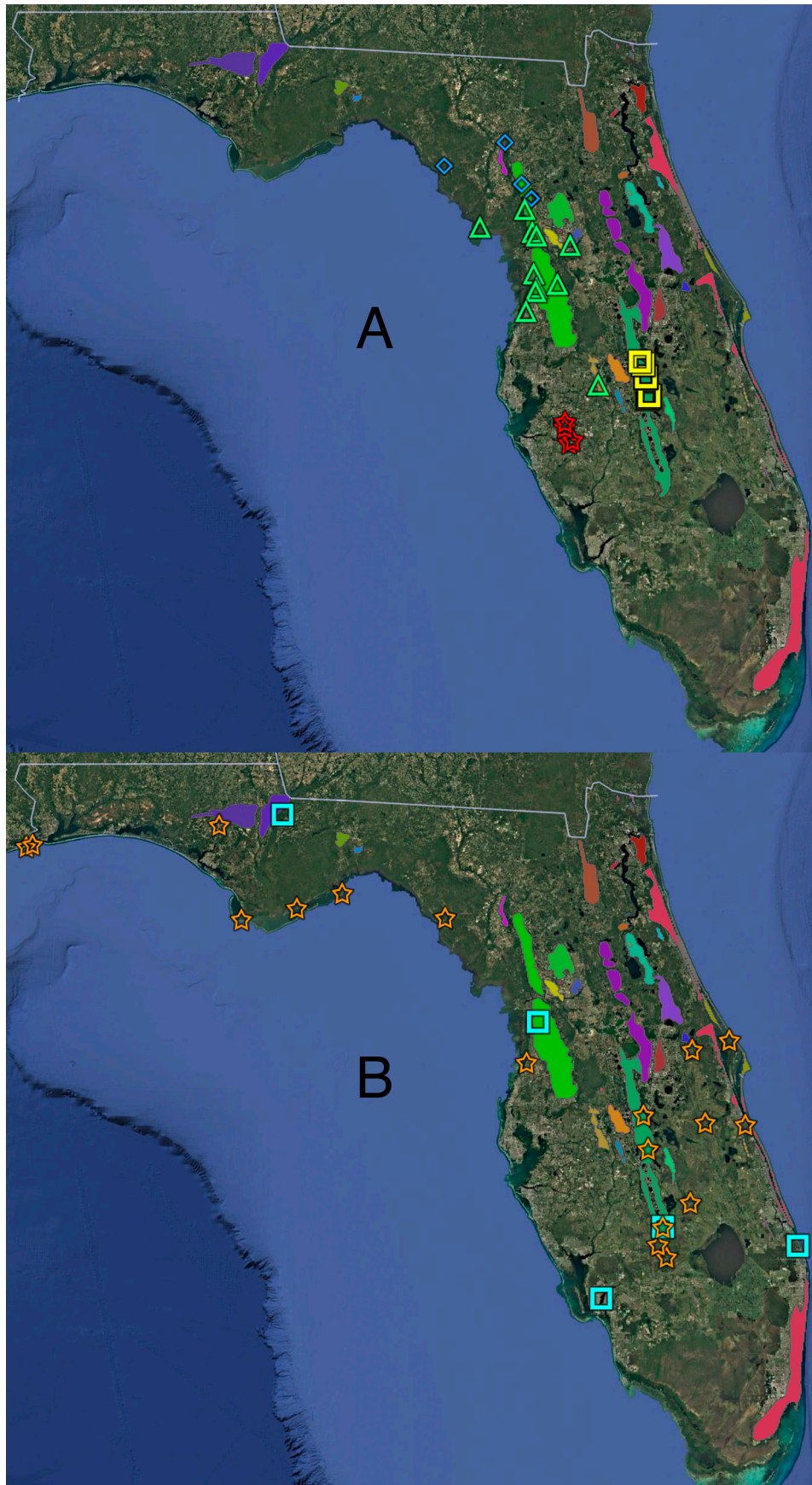


FIGURE 17. Distribution maps of Florida *Ellipes* species, overlaid on the major Florida sand ridges. A) Florida endemic *Ellipes* spp. Blue diamonds=*E. ceratiola* **sp. nov.**; green triangles=*E. eisneri*; yellow squares=*E. deyrupi*; red stars=*E. ignis* **sp. nov.** B) Non-Florida endemic *Ellipes* spp. Blue squares=*E. minuta*; orange stars=*E. gurneyi*.

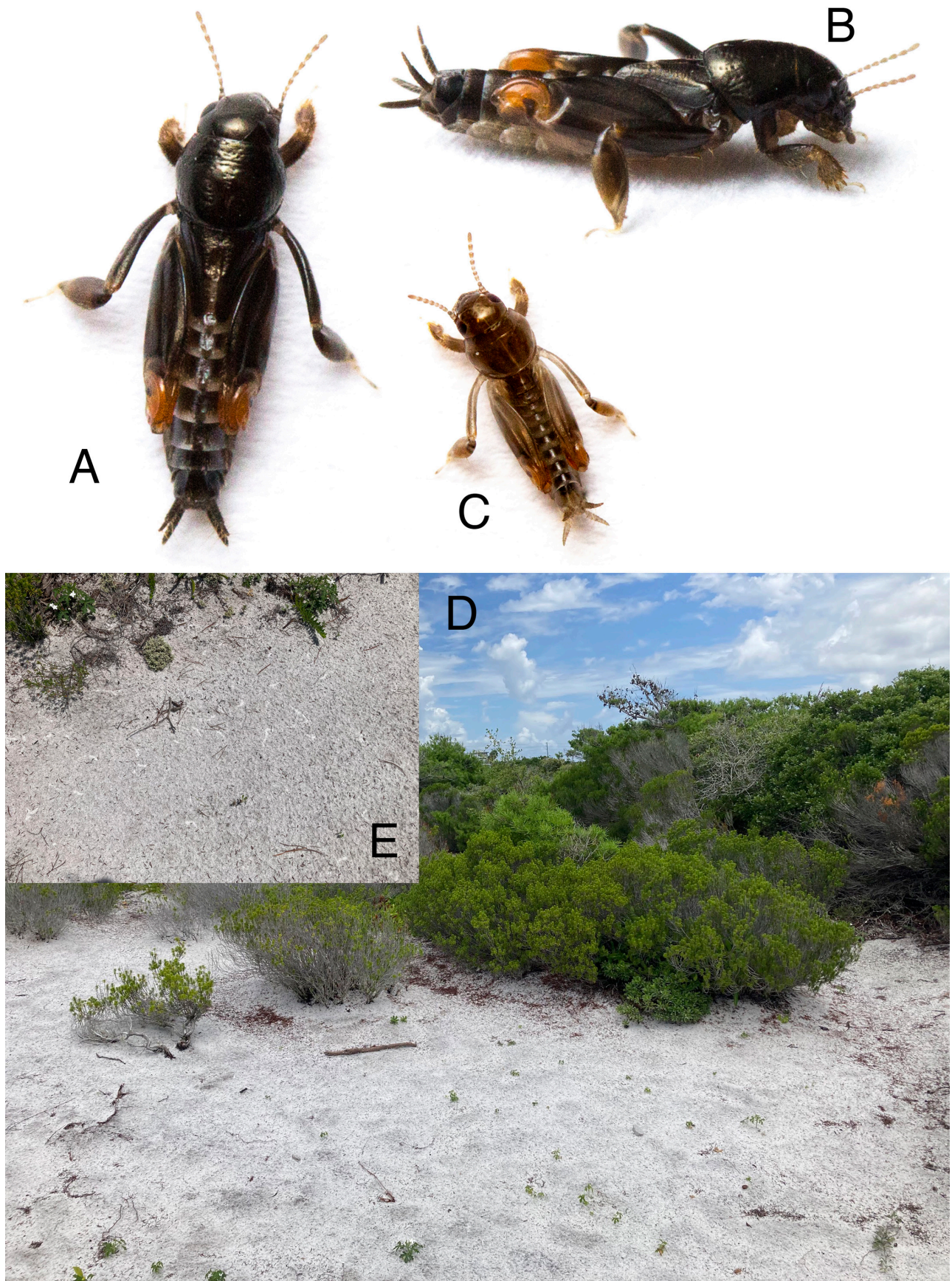


FIGURE 18. Live images and habitat of *Neotridactylus insularis* sp. nov. A) Dorsal view of adult. B) Lateral view of same. C) Dorsal view of nymph. D) Habitat at Henderson Beach. E) Raised feeding burrows.

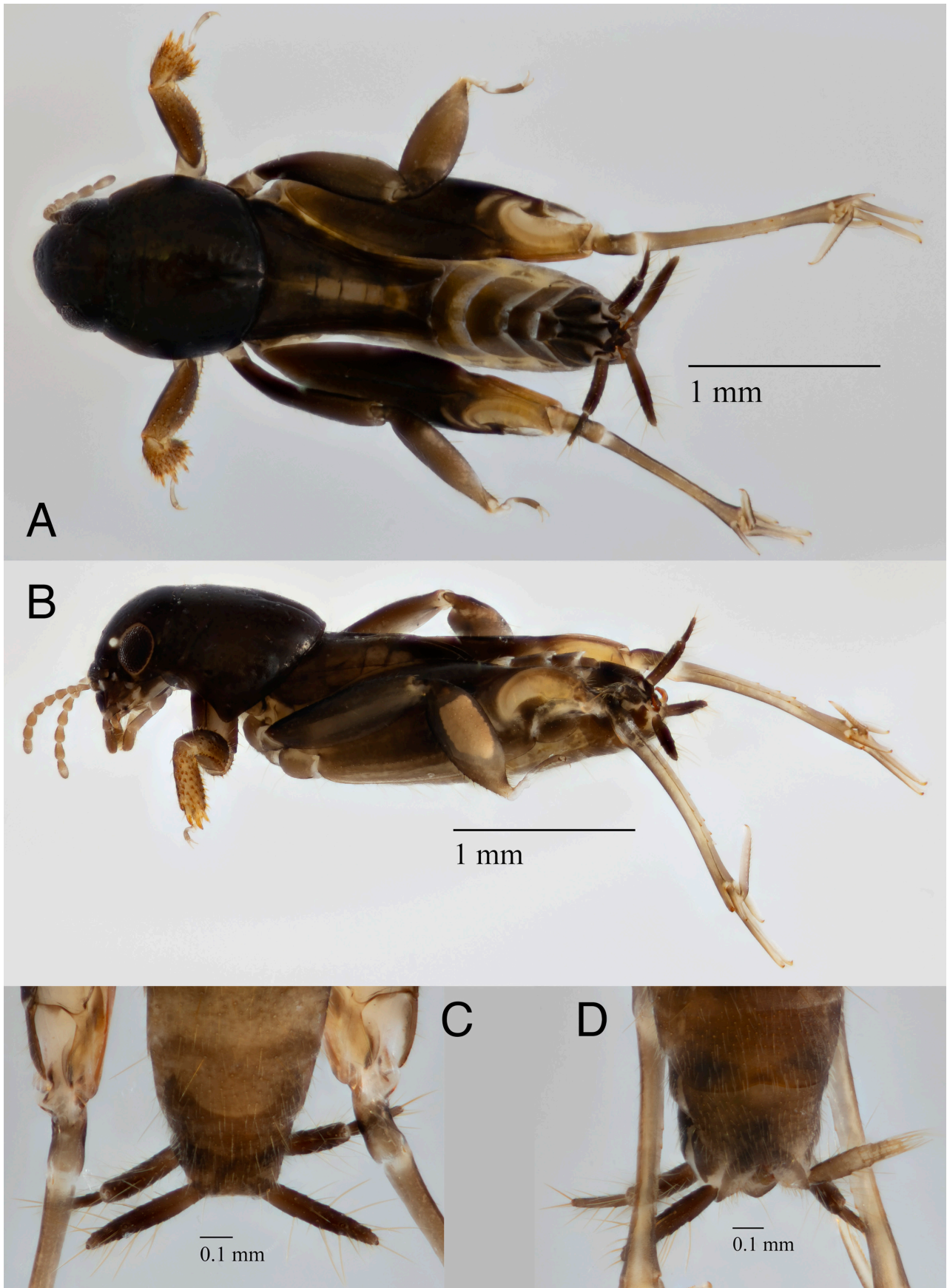


FIGURE 19. *Neotridactylus insularis* sp. nov. A) Holotype male dorsal. B) Lateral view of same. C) Male subgenital plate. D) Female subgenital plate.

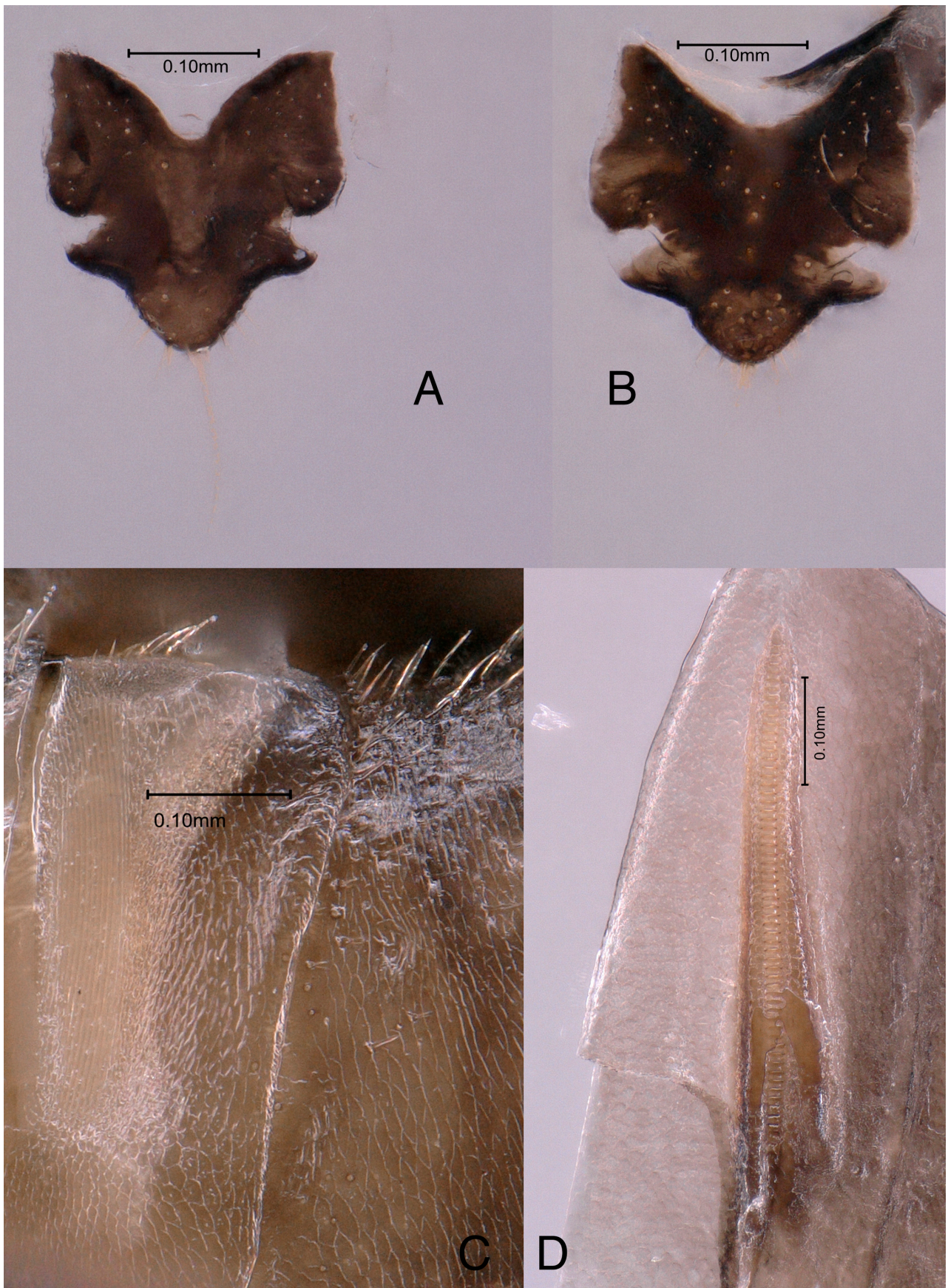


FIGURE 20. *Neotridactylus insularis* sp. nov. A) Male epiproct. B) Male epiproct of *N. archboldi* from Seabrook. C) Male scraper on abdominal tergite 4. D) Male stridulatory file on underside of tegmen.

***Ellipes deyrupi* Woo 2021**

Figs. 13I, 14D, 16, 17

Type locality. USA: Florida: Polk County: Sarasota Court, east of Lake Marion; 28.084972, -81.514889; 07 Aug. 2019; B. Woo leg.

Holotype repository. CUIC

Etymology. Named after Mark Deyrup.

Description of male characters. Male stridulatory file (Fig. 10C) 0.4 mm in length, with about 56 teeth. Male epiproct (Fig. 10A) about as wide as long; shallowly indented basally, convex apically, with apical bristle about 1/2 its length. Paraproct hooks strongly sclerotized, rounded apically and widened at middle.

Distribution. Known only from the north-central Lake Wales Ridge in Polk County, Florida. The records below add one additional locality to those listed in Woo (2021), which is about 4 km north of the type locality.

Material examined ($n=22$). USA, Florida • 5 ♂, 5 ♀, Polk County: Allen David Broussard Catfish Creek Preserve SP: 27.983, -81.495; 21 June 2022; B. Woo leg.; yellow sand scrub (TAMUIC) • 1 ♀, Polk County: Lake Marion Creek: 28.113, -81.550; 26 June 2023; B. Woo leg.; yellow sand scrub (TAMUIC) • 6 ♂, 5 ♀, Polk County: Tiger Ck. Preserve: 27.822, -81.477; 24 May 2025; B. Woo leg. (TAMUIC)

Genus *Neotridactylus* Günther 1972

Type species

Neotridactylus carbonelli Günther 1972, by original monotypy.

Etymology: This genus was designated by Günther as encompassing all New World Tridactylidae that were previously described under the genus *Tridactylus* Olivier 1789, except those he placed under *Ellipes*. ‘Neo’ means new, and *Tridactylus* comes from the Latin ‘tri’, three; ‘dactyl’ foot, referring to the distinctive ‘three-footed’ appearance of the hind tarsus and two elongated apical hind tibial spurs present in all members of this family.

***Neotridactylus apicalis* (Say 1825)**

Figs. 21A–D, 22A, 23

Type locality. USA: Florida: St. John’s River, and Iowa: Council Bluff, on Missouri River.

Holotype repository. The type material is lost according to Günther (1975).

Etymology. Presumably *apicalis* refers to the apical edges of the wings; in the original description, Say (1825) describes “...wings edged and tipped with blackish”.

Distribution. Günther (1975) describes this as the most wide-ranging species of the genus, with specimens recorded from Peru to southern Canada. All the Florida material examined by Günther, as well as all material collected during the present study, is from the northern 2/3 of the state (as far south as Lakeland), although we note that there is a single iNaturalist record of a nymph from Miami-Dade county, indicating that it likely occurs sporadically across the entire state.

Variation. Günther (1975) indicated that there is considerable variation in several morphological characters across the wide range of this species, including coloration, overall body size, wing length, and shape/spination of the foretibia, but that characters of the male and female terminalia were uniform throughout. He did not describe subspecies within *N. apicalis*. Perhaps most striking and noticeable among these variable morphological characters is the shape of the foretibia. As described by Günther (1975), “...the central notch between the digging spines at the distal edge can be more or less deep, and the two forked branches can be asymmetrically shaped”. Examples of this latter variation can be seen in Fig. 21C and 22A. The only specimens I have seen which possess these striking forelimbs are from northern Florida and Georgia, and in all other respects they matched the description of typical *apicalis*. Notably, *N. archboldi* and *N. insularis* **sp. nov.** never have foretibia with asymmetrically shaped lobes as in these individuals. Interestingly, all the specimens examined with this morphology are males, suggesting some sort of sexual selective pressure at work, but there is too little evidence to say anything for certain.



FIGURE 21. Live images of other Florida *Neotridactylus* spp. A–D) *N. apicalis* from Whitewater Lakes (A, C) and Bristol Landing (B, D). E–J) *N. archboldi* from Homosassa Ln (E), Cedar Key (F), Camp Blanding (G–H), Rookery Bay (I), and Ocala (J).



FIGURE 22. Specimen habitus images of other Florida *Neotridactylus* spp. A) *N. apicalis*. B–D) *N. archboldi* from Seabranck (B), Catfish Creek (C), and Goldhead (D).

Material examined ($n=94$). USA, Alabama • 1 ♂, Clarke County: Silver Creek Campground, 10km N Gosport; 29 May 1991; Davidson, Zanol, Acciavatti leg. (CMNH) • USA, Florida • 1 ♀, Leon County: Rock Bluff, Apalachicola NF; 02 July 1994; M. and S. Deyrup leg.; mesic hardwoods (ABS) • 2 ♀, Liberty County: Torreya St Pk.; 21 April 1984; R. Turnbow leg. (UGCA) • 2 ♂, 2 nymphs, Liberty County: Bristol Landing Park: 30.440, -84.986; 22 July 2022; B. Woo leg. (TAMUIC) • 1 ♀, Madison County: Jct. 53 and I-10; 08 July 1992; M. Deyrup leg. (ABS) • 3 ♂, 7 ♀, 11 nymphs, Washington County: Chipley Whitewater Lakes: 30.483, -85.551; 17 June 2023; B. Woo leg. (TAMUIC) • USA, Georgia • 1 ♀, Effingham County; 28 April 1984; R. Morris leg. (UGCA) • 1 ♂, Montgomery County: 3 mi. N. Uvalda; 13–14 July 1985; R. Morris leg.; blacklight (UGCA) • 1 ♀, Oconee County: Oconee Forest near lake; 18 September 2008; SY Lim leg. (UGCA) • 9 ♂, 9 ♀, Wheeler County: 2.2 km NNE Lumber City, Alligator Creek WMA: 31.945, -82.666; 21–24 June 2020; UV light trap in sandhills; JK Adams leg. (CMNH) • 1 ♂, 3 ♀, Wheeler County: same location and dates as previous: 31.949, -82.674; UV light trap in sandhills; JK Adams leg. (CMNH) • 5 ♂, 4 ♀, Wheeler County: same location and dates as previous: 31.947, -82.670; UV light trap in sandhills; JK Adams leg. (CMNH) • 1 ♂, Wheeler County: same location as previous: 31.948, -82.677; 13 June 2021; R Androw and K. Karns leg.; UV/MV light (CMNH) • 1 ♂, 2 ♀, Wheeler County: 3.4 km NNE Lumber City, Alligator Creek WMA: 31.956, -82.665; 21–24 June 2020; UV light trap in woodland habitat; JK Adams leg. (CMNH) • 6 ♂, 5 ♀, Wheeler County: 3.7 km NNE Lumber City: Alligator Creek WMA: 31.963, -82.679; 21–24 June 2020; JK Adams leg; UV light trap in cypress-sandhills-woodland ecotone (CMNH) • USA, Illinois • 1 ♀, St. Clair County: 2.2km WNW East St. Louis: 38.630, -90.175; 121m; 25 May–08 June 2018; S. Mills leg. (CMNH) • USA, Michigan • 1 ♀, Washtenaw County: Whitmore Lake; October 04, 1949; H. Clench leg. (CMNH) • USA, North Carolina • 1 ♀, Dare County: Buxton, Cape Hatteras; 23 July 1975; SM Gifford leg. (CMNH) • 1 ♀, Dare County: Roanoke Island; 14 July 1976; SM Gifford leg. (CMNH) • 1 ♂, Dare County: Manteo; 20 July 1980; SM Gifford leg. (CMNH) • USA, Ohio • 1 ♀, Butler County: 2 km NE Port Union: 39.342, -84.444; 185m; 14–28 August 2017; E. Larue leg.; blacklight (CMNH) • USA, Tennessee • 6 ♀, Shelby County: Willington; 04–05 July 1986; WH Yackley leg. (CMNH) • USA, Texas • 3 ♀, Gonzales County: Palmetto State Park; 13 October 1983; J. Rawlins and R. Davidson leg. (CMNH).

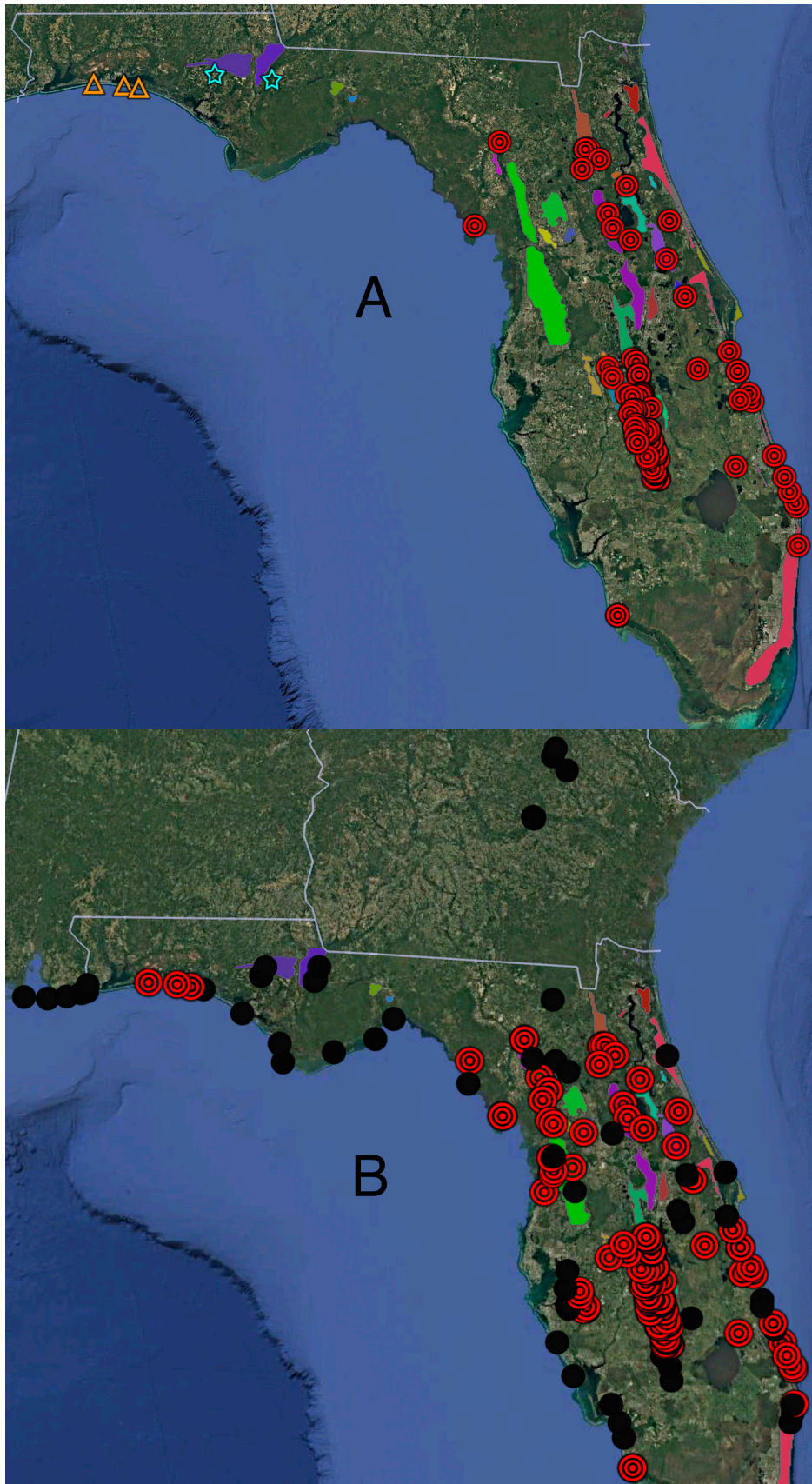


FIGURE 23. Distribution maps, overlaid on the major Florida sand ridges. A) Florida *Neotridactylus* spp. Red circles=*N. archboldi*; blue stars=*N. apicalis*; orange triangles=*N. insularis* **sp. nov.** B) Composite map of all sites surveyed for scrub Tridactylidae during the present study. Red circles=at least one Florida endemic Pygmy Mole Cricket species found; black circles=localities surveyed with no Florida endemic Pygmy Mole Crickets found.

Neotridactylus archboldi Deyrup & Eisner 1996

Figs. 20B, 21E–J, 22B–D, 23

Type locality. USA: Florida: Highlands County: Archbold Biological Station; 16 June 1994; M. Deyrup leg.

Holotype repository. USNM

Etymology. Named after Richard Archbold (1907–1976).

Distribution. Initially described from the Lake Wales Ridge in Highlands County, Florida. The records below extend its range to the Atlantic Coastal, Bombing Range, Crescent City, Deland, Mt. Dora, Orlando, Trail, and Winter Haven ridges, as well as the southwestern Gulf coastal and Cedar Key scrubs.

Variation. Within and between the 11 isolated sand ridge habitats occupied by this species, morphological and coloration differences are generally negligible, with the following exceptions. Adult females from the Mt. Dora, Trail, and Atlantic Coastal ridges have much paler middle and hind legs (Fig. 21H, 21J) relative to those found in other regions. Their abdominal segments may also appear rather pale, especially when distended with eggs. Adult males from these three ridges (Fig. 21G) are identical to those found elsewhere. Individuals from the southwestern Gulf coastal scrub (Collier County) have pale tan to yellow tegmina instead (Fig. 21I). These color variations initially made me suspect the presence of 2–3 additional species within *N. archboldi*, but examination of male epiprocts as well as molecular data (to be published in a forthcoming paper) have convinced me that there is only one species involved, albeit with multiple isolated populations that may be in the process of incipient speciation. Tooth counts for the male stridulatory file seem to decrease from north to south, ranging from a low of 57 at Cedar Key (Levy County), to 62 at Gold Head Branch State Park (Clay County), to 63 at Catfish Creek Preserve State Park (Polk County) to a high count of 72 at Seabranche Preserve (Martin County).

Material examined ($n=579$).—USA, Florida • 2 ♂, 1 nymph, Brevard County: Malabar Scrub Sanctuary, 28.00475, -80.581194; 09 August 2019; B. Woo leg. (TAMUIC) • 2 ♂, 1 nymph, Brevard County: Malabar Scrub Sanctuary, along Malabar Rd; 05 October 1999; Z. Prusak leg.; xeric oak scrub, in open firelanes (ABS) • 4 ♂, 4 ♀, 12 nymphs, Brevard County: Malabar Scrub Sanctuary: 28.002, -80.581; 06 June 2022; B. Woo leg.; open Atlantic Coastal Ridge scrub (TAMUIC) • 6 ♂, 7 ♀, Brevard County: Wickham Park: 28.166, -80.658; 06 June 2022; B. Woo leg.; open Atlantic Coastal Ridge scrub (TAMUIC) • 4 ♂, 7 ♀, Clay County: Camp Blanding, rosemary scrub area close to SR 21 trailhead: 29.841139, -81.976528; 29 August 2019; B. Woo leg. (TAMUIC) • 5 ♂, 2 ♀, 10 nymphs, Clay County: Camp Blanding: 29.841, -81.976; 10 July 2022; B. Woo leg.; open scrub w/ *Ceratiola*, surrounded by sandhill (TAMUIC) • 10 ♂, 11 ♀, 3 nymphs, Clay County: Gold Head Branch SP: 29.844422, -81.947517; 22 June 2023; B. Woo leg.; scrub habitat (TAMUIC) • 1 ♀, Collier County: Rookery Bay NERR—Briggs Boardwalk: 26.022, -81.711; 16 June 2022; B. Woo leg.; isolated scrub w/ *Lyonia* and *Quercus geminata* (TAMUIC) • 3 ♂, 4 ♀, 13 nymphs, Collier County: Rookery Bay NERR—Shell Island Rd. uplands: 26.02293, -81.711023; 27 June 2023; B. Woo; scrub habitat (TAMUIC) • 6 ♂, 4 ♀, Highlands County: Archbold Biological Station: 27.181, -81.350; 22 May 2025; B. Woo leg. (TAMUIC) • 11 nymphs, Highlands County: Archbold Biol. Station; 27.181, -81.349; 26 June 2022; B. Woo leg.; scrubby flatwoods near cottages (TAMUIC) • 1 nymph, Highlands County: Archbold Biological Station (ABS): 27.184556, -81.349472; 9 August 2018; B. Woo leg. (CUIC) • 1 ♀, Highlands County: ABS: 27.192, -81.358; 03–06 April 2017; B. Woo leg. (CUIC) • 1 ♀, Highlands County: ABS: 27.181, -81.350; 14 June 2018; B. Woo leg. (CUIC) • 2 ♀, Highlands County: ABS: 27.184, -81.349; 09 August 2018; B. Woo leg. (CUIC) • 1 ♀, Highlands County: ABS: 27.184, -81.349; 12 August 2019; B. Woo leg. (CUIC) • 1 nymph, Highlands County: ABS: 27.146111, -81.364639; 25 July 2019; B. Woo leg. (CUIC) • 1 ♂, 2 ♀, Highlands County: ABS: 27.189, -81.351; 02 June 2018; B. Woo leg. (CUIC) • 1 ♂, Highlands County: ABS: 27.184, -81.349; 08 July 2018; B. Woo leg. (CUIC) • 1 ♀, Highlands County: ABS: 27.184556, -81.349472; 22 December 2019; B. Woo leg. (CUIC) • 3 ♂, Highlands County: ABS Reserve, Bald#150: 27.133528, -81.371306; 27 December 2019; B. Woo leg. (CUIC) • 1 ♂, Highlands County: Sebring, Sun 'N Lake Developments, Columbus Blvd: 27.555444, -81.53875; 22 December 2019; B. Woo leg. (CUIC) • 2 ♂, 2 ♀, 1 nymph, Highlands County: Sebring, Carter Creek South: 27.520806, -81.408389; 22 December 2019; B. Woo leg. (CUIC) • 2 ♂ paratypes, Highlands County: ABS: NE firelane NE tract; 28 March 1983; M. Deyrup leg. (ABS) • 7 ♂ paratypes, Highlands County: ABS; 25 April 1992; M. Deyrup leg. (ABS) • 7 ♂ paratypes, 2 ♀ paratypes, Highlands County: ABS; 05 May 1995; M. Deyrup leg.; in open damp sand, scrub habitat (ABS) • 1 ♂ paratype, Highlands County: ABS; 16 June 1992; M. Deyrup leg.; *inopina* scrub, line rd (ABS) • 8 adults, Highlands County: ABS; 22 June 1995; M. Deyrup leg.; in firelane in sand pine scrub habitat (ABS) • 4 adults, Highlands County: ABS; 10 August 1995; M. Deyrup leg.; moist sand, fire lane (ABS) • 2 adults,

Highlands County: ABS; 11 August 1995; M. Deyrup leg.; moist sand, fire lane (ABS) • 2 adults, Highlands County: ABS; 17 August 1995; M. Deyrup leg.; moist open sand, fire lane (ABS) • 2 ♂, 3 ♀, Highlands County: Archbold Biol. Station, Hickory Branch: 27.128, -81.326; 05 June 2025. B. Woo leg. (TAMUIC) • 1 adult, Highlands County: Carter Creek NWR: 27.52081, -81.44079; 25 June 2009; M. Deyrup leg.; flight trap, yellow sand scrub (ABS) • 2 adults, Highlands County: Carter Creek North: 27.53362, -81.4072; 25 April 2009; M. Deyrup, H. Otte, A. May leg.; yellow sand scrub, pan trap below Townes trap (ABS) • 1 adult, Highlands County: same locality as previous: 27.53319, -81.41289; 18 April 2009; M. Deyrup, H. Otte, A. May leg.; scrub habitat, flight trap (ABS) • 1 adult, Highlands County: Carter Creek South: 27.51925, -81.40756; 01 April 2009; M. Deyrup, H. Otte, A. May leg.; sandhill/scrub habitat (ABS) • 1 adult, Highlands County: same locality as previous: 27.518, -81.409; 06 April 2009; M. Deyrup, H. Otte, A. May leg.; sandhill/scrub habitat (ABS) • 1 adult, Highlands County: Carter Creek North: 27.53668, -81.41464; 25 June 2009; M. Deyrup, H. Otte, A. May leg.; flight trap w/pan, scrub habitat (ABS) • 1 adult, Highlands County: Carter Creek South: 27.53134, -81.40828; 22 June 2009; M. Deyrup, H. Otte, A. May leg.; flight trap w/ pan, scrub habitat (ABS) • 2 ♂, Highlands County: Carter Creek N.: 27.529, -81.406; 01 June 2025; B. Woo leg. (TAMUIC) • 1 adult, Highlands County: Flamingo Villas: 27.446, -81.376; 26 March 2009; M. Deyrup, H. Otte, A. May leg.; *Ceratiola*/oak scrub, on yellow sand; flight & bowl traps (ABS) • 1 adult, Highlands County: same locality as previous: 27.44228, -81.38276; 22 May 2009; M. Deyrup, H. Otte, A. May leg.; scrub habitat, Townes trap (ABS) • 2 adults, Highlands County: same locality as previous: 27.57671, -81.52828; 29 May 2009; M. Deyrup, H. Otte, A. May leg.; yellow bowl trap, scrub habitat (ABS) • 1 adult, Highlands County: Highland Park Estates: 27.33668, -81.35187; 14 August 2009; M. Deyrup, H. Otte, A. May leg.; scrub habitat, flight trap (ABS) • 2 adults, Highlands County: same locality and collectors as previous; 17 August 2009; scrub habitat, flight trap with pan (ABS) • 1 adult, Highlands County: same locality as previous: 27.33864, -81.35071; 14 August 2009; M. Deyrup, H. Otte, A. May leg.; scrub habitat, flight trap (ABS) • 1 adult, Highlands County: same locality as previous: 27.33952, -81.34516; 19 August 2009; M. Deyrup, H. Otte, A. May leg.; flight trap w/ pan, scrub habitat (ABS) • 2 adults, Highlands County: Highlands Hammock State Park: 27.43378, -81.51613; 27 May 2009; M. Deyrup, H. Otte, A. May leg.; scrub habitat, flight trap with pan (ABS) • 1 adult, Highlands County: same locality and collectors as previous: 27.43213, -81.51671; 26 May 2009; flight trap w/ pan, scrub habitat (ABS) • 1 adult, Highlands County: same locality and collectors as previous: 27.48192, -81.52861; 07 August 2009; scrub habitat, flight trap (ABS) • 1 adult, Highlands County: Holmes Avenue Preserve: 27.29879, -81.32384; 12 August 2009; M. Deyrup, H. Otte, A. May leg.; flight trap w/ pan, scrub habitat (ABS) • 1 ♀, Highlands County: Jerome Ave rosemary scrub: 27.317, -81.426; 05 June 2025; B. Woo leg. (TAMUIC) • 1 adult, Highlands County: Lake June State Park: 27.30001, -81.42403; 03 June 2009; M. Deyrup, H. Otte, A. May leg.; flight trap w/ pan, scrub habitat (ABS) • 1 adult, Highlands County: same locality and collectors as previous: 27.29982, -81.42441; 28 May 2009; Townes trap, scrub habitat (ABS) • 2 male paratypes, Highlands County: 5.5 mi S Lake Placid, Lake Placid Scrub preserve, on Jeff. Ave, just N of 70; 07 June 1994; M. Deyrup leg. (ABS) • 2 ♂, 2 ♀, Highlands County: Lake Placid Scrub: 27.220, -81.381; 05 June 2025; B. Woo leg. (TAMUIC) • 2 adults, Highlands County: FWC Royce Ranch: 27.35967, -81.34855; 17 March 2009; M. Deyrup, H. Otte, A. May leg.; bowl traps, scrub habitat (ABS) • 1 ♂, Highlands County: Minorca Dr: 27.552, -81.518; 05 June 2025; B. Woo leg. (TAMUIC) • 5 adults, Highlands County: Placid Lakes Developments, Adams Ave NE; 13 July 1994; M. Deyrup leg.; sand pine scrub habitat (ABS) • 1 adult, Highlands County: Silver Lake: 27.57671, -81.52828; 30 June 2009; M. Deyrup, H. Otte, A. May leg.; flight trap w/ pan, scrub habitat (ABS) • 1 adult, Highlands County: Gould Rd. Preserve: 27.13657, -81.32495; 15 March 2009; M. Deyrup, H. Otte, A. May leg.; Townes trap and bowl traps, *Ceratiola* scrub (ABS) • 1 adult, Highlands County: same locality and collectors as previous: 27.13364, -81.32558; 13 May 2009; Townes trap, scrub habitat (ABS) • 4 ♂, 3 ♀, 1 nymph, Indian River County: North Sebastian Conservation Area: 27.818, -80.480; 07 June 2022; B. Woo leg.; open Atlantic Coastal Ridge scrub w/ *Ceratiola* (TAMUIC) • 3 ♂, 6 nymphs, Indian River County: St. Sebastian River Pres., Red Trail: 27.769, -80.565; 07 June 2022; B. Woo leg.; open Atlantic Coastal Ridge scrub (TAMUIC) • 1 nymph, Indian River County: Wabasso Scrub Conservation Area: 27.755, -80.452; 07 June 2022; B. Woo leg.; open Atlantic Coastal Ridge scrub (TAMUIC) • 4 ♂, 20 ♀, 6 nymphs, Lake County: Rd. 445, E. of Alexander Springs Creek; 03 September 1995; M. Deyrup leg.; white sand scrub at edge of road (ABS) • 2 ♂, 2 ♀, 5 nymphs, Levy County: Cedar Key Scrub: 29.213, -83.018; 13 July 2022; B. Woo, L. Chen leg.; open scrub with *Ceratiola* (TAMUIC) • 4 ♀, Marion County: Ocala National Forest, trail off FR 33, open sand: 29.189778, -81.724278; 13 August 2019; B. Woo leg. (CUIC) • 2 ♀, 8 nymphs, Martin County: Jonathan Dickinson SP: 27.011, -80.125; 11 June 2022; B. Woo leg.; open Atlantic Coastal Ridge scrub w/ *Ceratiola* (TAMUIC) • 13 ♂, 7 ♀, 1

nymph, Martin County: Seabranche Preserve SP: 27.131, -80.169; 11 June 2022; B. Woo leg.; open Atlantic Coastal Ridge scrub w/ *Ceratiola* (TAMUIC) • 1 ♀, Osceola County: Herky Huffman Bull Creek WMA; 28.026, -80.949; 14 July 2022; B. Woo, L. Chen leg.; open scrub (TAMUIC) • 3 ♂, 4 ♀, 3 nymphs, Palm Beach County: Hypoluxo Scrub Natural Area: 26.570, -80.056; 13 June 2022; B. Woo and M. Green leg.; open Atlantic Coastal Ridge scrub w/ *Ceratiola* (TAMUIC) • 9 ♂, 3 ♀, 2 nymphs, Palm Beach County: Juno Dunes Natural Area: 26.887, -80.059; 11 June 2022; B. Woo leg.; small open sand patch in overgrown Atlantic Coastal Ridge scrub (TAMUIC) • 5 ♂, 5 nymphs, Palm Beach County: Jupiter Ridge Natural Area: 26.917, -80.073; 11 June 2022; B. Woo leg.; open Atlantic Coastal Ridge scrub (TAMUIC) • 18 ♂, 9 ♀, 3 nymphs, Polk County: Allen David Broussard Catfish Creek Preserve SP: 27.983, -81.495; 21 June 2022; B. Woo leg.; yellow sand scrub (TAMUIC) • 2 adults, Polk County: same locality as previous: 27.98457, 081.49606; 05 June 2009; M. Deyrup, H. Otte, A. May; scrub habitat, Townes trap (ABS) • 2 adults, Polk County: same date, locality, and collectors as previous; 27.98598, -81.49663 (ABS) • 1 adult, Polk County: same date, locality, and collectors as previous; 27.98542, -81.49517 (ABS) • 2 adults, Polk County: same locality and collectors as previous: 27.98531, -81.49645; 06 June 2009; flight trap w/ pan, FL scrub habitat (ABS) • 1 ♀, Polk County: Avon Park Air Force Base, Arnold Hammock: 27.712917, -91.386278; 16 June 2018; B. Woo leg. (CUIC) • 3 ♀, Polk County: Avon Park Bombing Range, S. Fence Foxtrot; 15 June 1994; L. Riopelle leg.; *Quercus* sp. scrub w/ *Lyonia lucida*, some distance (meters) from fence line (ABS) • 2 ♂, 1 nymph; Polk County: Crooked Lake Prairie: 27.806, -81.559; 04 June 2025; B. Woo leg. (TAMUIC) • 2 ♂, 1 ♀, 3 nymphs, Polk County: Hickory Lake Scrub: 27.697139, -81.537528; 24 December 2019; B. Woo leg. (CUIC) • 2 ♂, 1 ♀, Polk County: Hickory Lake Scrub: 27.697, -81.537; 04 June 2025; B. Woo leg. (TAMUIC) • 3 ♀, 2 nymphs, Polk County: Homosassa Lane, east of Lake Marion: 28.089583, -81.519583; 07 August 2019; B. Woo leg. (CUIC) • 4 ♂, 2 ♀, 4 nymphs, Polk County: Homosassa Lane, east of Lake Marion: 28.089, -81.519; 21 June 2022; B. Woo leg.; yellow sand scrub (TAMUIC) • 1 adult, Polk County: FWC Sunray Preserve: 27.69139, -81.56202; 18 May 2009; M. Deyrup, H. Otte, A. May leg.; scrub habitat, Townes trap (ABS) • 2 adults, Polk County: same locality and collectors as previous: 27.69152, -81.56191; 18 June 2009; scrub habitat, Townes trap (ABS) • 1 adult, Polk County: Lake Blue Scrub Preserve; 24 June 2003; T. Palmer leg. (ABS) • 5 ♂, 5 ♀, 2 nymphs, Polk County: LWR WEA—Lake Blue scrub: 28.046822, -81.78167; 24 June 2023; B. Woo leg.; overgrown scrub habitat (TAMUIC) • 1 ♀, Polk County: Lake Marion Creek: 28.113, -81.550; 26 June 2023; B. Woo leg.; yellow sand scrub (TAMUIC) • 4 ♂, 2 ♀, 4 nymphs, Polk County: LWR NWR—Lake McLeod Unit: 27.963292, -81.741813; 24 June 2023; B. Woo; open scrub habitat (TAMUIC) • 2 adults, Polk County: Lake Wales Ridge State Forest: 27.68668, -81.49616; 14 July 2009; M. Deyrup, H. Otte, A. May leg.; flight trap w/ pan, scrub habitat (ABS) • 1 adult, Polk County: Lake Wales Flaming Arrow Scout camp; 28 June 1995; M. Deyrup leg.; Florida scrub habitat (ABS) • 1 adult, Polk County: 4 miles south of Lake Wales; 18 June 1994; M. Deyrup leg.; sand pine scrub habitat (ABS) • 1 adult, Polk County: Saddleblanket Lakes: 27.66481, -81.57844; 28 July 2009; M. Deyrup leg.; open scrub with sand pine and oaks (ABS) • 4 ♂, 2 ♀, 2 nymphs, Polk County: Tiger Creek Preserve: 27.809, -81.483; 05 August 2018; B. Woo leg. (CUIC) • 1 ♂, 1 ♀, Polk County: same locality as previous: 27.809278, 81.490889; 24 August 2019; B. Woo leg. (CUIC) • 2 adults, Polk County: Tiger Creek Preserve: 27.82158, -81.47717; 10 July 2009; M. Deyrup, H. Otte, A. May; scrub habitat, flight trap w/ pan (ABS) • 1 adult, Polk County: same locality and collectors as previous: 27.82795, -81.4672; 10 July 2009; Townes trap w/ pan, scrub habitat (ABS) • 1 adult, Polk County: same locality and collectors as previous: 27.83353, -81.46695; 10 July 2009; yellow bowl trap, scrub habitat (ABS) • 1 adult, Polk County: same locality and collectors as previous: 27.83383, -81.46682; 08 July 2009; flight trap w/ pan, scrub habitat (ABS) • 2 ♀, 1 nymphs; Polk County: Tiger Ck. Preserve: 27.822, -81.477; 24 May 2025; B. Woo leg. (TAMUIC) • 2 ♂, 2 ♀, Polk County: Warner University scrub: 27.825, -81.607; 04 June 2025. B. Woo leg. (TAMUIC) • 1 ♂, 8 nymphs, Putnam County: Dunns Creek SP: 29.538, -81.590; 10 July 2022; B. Woo leg.; open scrub w/ *Conradina cygniflora* (TAMUIC) • 6 ♂, 1 ♀, 10 nymphs, Putnam County: Etoniah Creek SF; 29.757, -81.844; 09 July 2022; B. Woo leg.; open scrub w/ *Ceratiola* (TAMUIC) • 4 ♂, 2 ♀, 1 nymph, Putnam County: Ordway Preserve, 3 miles E. of Melrose; 15 June 1997; Lloyd R. Davis, Jr leg.; sandhill habitat, old pocket gopher push-up, yellow sand (ABS) • 4 ♂, 9 ♀, Seminole County: Chuluota Wilderness Area: 28.620, -81.059; 14 July 2022; B. Woo leg.; overgrown *Ceratiola* scrub (TAMUIC) • 2 ♂, St. Lucie County: Bluefield Ranch Preserve: 27.227, -80.616; 09 June 2022; B. Woo leg.; isolated scrub w/ *Ceratiola* (TAMUIC) • 5 ♂, 5 ♀, St. Lucie County: Walton Scrub Preserve: 27.308, -80.260; 09 June 2022; B. Woo leg.; open Atlantic Coastal Ridge scrub (TAMUIC) • 3 ♂, 2 ♀, 21 nymphs, Volusia County: Lyonia Preserve: 28.929, -81.225; 10 July 2022; B. Woo leg.; open scrub w/ *Ceratiola* (TAMUIC) • 6 ♂, 2 ♀ Volusia County: Tiger Bay SF: 29.243, -81.194; 05 June 2022; B. Woo leg.; *Ceratiola* scrub (TAMUIC).

Neotridactylus insularis sp. nov.

Figs. 18–20, 23

Etymology. From the Latin *insula*, meaning island, referring both to the isolated nature of this species relative to the similar-appearing *N. archboldi*, and to its occurrence on barrier islands of the Florida panhandle Gulf coast.

Proposed Common Name. Florida panhandle Pygmy Mole Cricket.

Holotype repository. TAMUIC

Material examined ($n=55$). Holotype: USA • ♂; Florida: Okaloosa County: Henderson Beach SP: 30.385, -86.448; 25 July 2022; B. Woo leg. (TAMUIC). Allotype: USA • ♀; Florida: Okaloosa County: same information as holotype (TAMUIC). Paratypes: USA • 4 ♂, 4 ♀, 21 nymphs, Florida: Okaloosa County: same information as holotype (TAMUIC) • 4 ♀, 2 nymphs, Santa Rosa County: Santa Rosa Island, Eglin Air Force Base, coastal dune scrub, white sand; 09 November 1996; C. Casado, R. Yahr leg. (ABS) • 5 ♂, 7 ♀, 6 nymphs, Walton County: Topsail Hill Preserve SP: 30.365, -86.298; B. Woo leg. (TAMUIC)

Diagnosis. Differs from most other species of *Neotridactylus* by its flightless condition, lack of swimming plates, and occurrence in xeric habitat. Distinguished from *N. archboldi* by its overall more dark brown coloration and more matte texture, as well as the shape of the male epiproct and disjunct distribution.

Measurements (mm). Body (head to end of abdomen): ♂, 3.9–5.1; ♀, 4.8–5.7; length of pronotum: ♂, 1.1–1.4; ♀, 1.2–1.6; length of forewing: ♂, 0.9–1.2; ♀, 1.0–1.4; length of hind femur: ♂, 2.1–2.7; ♀, 2.3–3.1.

Description. Male (holotype) (Fig. 13). Coloration in life (Fig. 11): generally like that of *N. archboldi*: Head black; antennae mostly light brown, basal segments black; eyes black; maxillary and labial palpi brown. Pronotum black. Forelegs dark brown; middle femora black with paler apices; middle tibiae and tarsi dark brown; hind femora black dorsally and dark brown laterally; apical crescents of hind femora orange; hind tibiae light brown. Tegmina black; abdomen black, apical borders of tergites creamy; basal segment of cercus dark brown, apical segment light brown; paraproct processes dark brown. Note that ethanol-preserved specimens fade to a lighter shade of brown overall than do specimens of *N. archboldi*.

Antennae 10-segmented. Pronotum densely punctured. Forewings slightly longer than pronotum; hind wings absent. Male stridulatory file (Fig. 14D) 0.6 mm in length, with about 58 teeth. Swimming plates of hind tibia absent. Male epiproct (Fig. 14A) about as wide as long; deeply indented basally and with large basal lobes; laterally incised with pointed, heavily sclerotized lobes; apex projecting forwards, rounded at tip, with long apical bristle about $\frac{3}{4}$ its length. Male subgenital plate (Fig. 13C) unspecialized, broadly rounded. Female subgenital plate (Fig. 13D) wider than long, caudal margin indented in middle.

Habitat. All specimens have been collected in coastal dune scrub habitat (within 100m of the coast) with open sand gaps (Fig. 11D). Vegetation at both Henderson Beach and Topsail Hill was very similar and was comprised primarily of: Florida Rosemary (*Ceratiola ericoides*), Sand Pine (*Pinus clausa*), Sand Live Oak (*Quercus geminata*), Myrtle Oak (*Quercus myrtifolia*), Woody Goldenrod (*Chrysoma pauciflosculosa* (Michx.)Greene), False Rosemary (*Conradina canescens* A.Gray), and Squareflower (*Paronychia erecta* (Chapm.)Shinners). The Orthopteran fauna of both sites was also rather similar and included: *Spharagemon marmoratum pictum*, *Melanoplus gurneyi* Strohecker, and *Odontoxiphidium apterum*.

Distribution. Found in appropriate habitats of Walton, Santa Rosa, and Okaloosa counties, Florida.

Discussion

The 2022–2023 fieldwork represented the first concerted effort to exhaustively survey Florida's uplands for Tridactylidae. It was suggested by Deyrup (2005) and Woo (2021) that undescribed Tridactylidae would be found with such an effort, and thus the discovery of *Ellipes ignis* sp. nov., *E. ceratiola* sp. nov., and *Neotridactylus insularis* sp. nov. vindicates these authors' predictions and increases the known biodiversity of central Florida, as well as that of the North American Coastal Plain, the most recently recognized global biodiversity hotspot (Noss *et al.* 2015). All six of the Florida endemic Tridactylidae can be quite abundant in appropriate habitat, but it can still be challenging to collect a proper series since they are most easily collected within an hour or two of rain. In drier conditions, an occasional specimen can be located by digging in the vicinity of tumuli, but this is an inefficient method to capture them. It is unlikely that additional undescribed Tridactylidae occur within the xeric sandy uplands

of peninsular Florida, since every major ridge system, as well as most minor ridges and unnamed uplands in the state, have now been surveyed. Similar habitats outside of Florida, such as the Fall Line Sandhills of North and South Carolina, could harbor Tridactylidae, although during the present survey no upland Tridactylidae were found in the Ochopee Dunes of Georgia. However, the Florida ‘varieties’ of *E. minuta* and *E. gurneyi* deserve more scrutiny. It is interesting to note that both ‘varieties’ differ from the ‘typical’ forms primarily in their lack of hind tibial lamellae, a feature that has also been lost in all four of the Florida upland *Ellipes*. Morphological variation within *N. apicalis* and *N. archboldi* should also be investigated.

Since this work was focused on discovering populations of scrub and sandhill endemics, our search for *Ellipes minuta*, *E. gurneyi*, and *Neotridactylus apicalis*, the widespread generalist taxa, was not very extensive, and undoubtedly many more localities for these species could have been added if riparian habitats had been more thoroughly surveyed. Many sites with seemingly suitable open scrub or sandhill habitat yielded either only *E. gurneyi*, or no Tridactylidae at all. Figure 23B shows every single location surveyed during this study (over 200 total localities), and highlights both the extent of the present fieldwork, and the number of sites with no scrub Pygmy Mole Crickets found. Ordinarily, this type of negative data would probably not be reported; however, an effort was made to visit each site during appropriate conditions (e.g. within a few hours of rain at the correct time of year), such that flightless Pygmy Mole Crickets would have been detected if they occurred there. It is thus reasonable to conclude that the absence of Pygmy Mole Crickets collected at these localities reflects a true lack of scrub Pygmy Mole Cricket populations.

Each of the four Florida endemic *Ellipes* species appears to have a small, well-defined range comprising anywhere from 1–3 ridge systems. In contrast, the Florida endemic *Neotridactylus* are comprised of one variable species distributed across 11 ridge systems, as well as the tiny population of *N. insularis* in its highly disjunct range. The distributions of Florida *Ellipes* thus more closely resemble those of scrub-inhabiting *Melanoplus* grasshoppers (Deyrup 1996) or *Geopsammodius* scarab beetles (Skelley 2008), while the distribution of Florida *Neotridactylus* bears striking similarities to several plant taxa such as *Paronychia chartacea* Fernald. Understanding these distributional patterns will require a well-resolved phylogeny and biogeographic analysis; this work is currently underway.

The discovery of *Ellipes ignis*, **sp. nov.**, suggests that special attention should be paid to the upland habitats of Manatee County. Scrub in this region is not on any named ridge and appears to be relatively understudied. Only two other described species appear to be endemic to the Manatee County scrubs: the plant *Asimina manasota* DeLaney, and the recently described grasshopper *Melanoplus spiracor* Woller & Kelly. However, since Orthopterans are excellent indicators of small relict areas of habitat (Deyrup 1996), continued surveying for endemic organisms in Manatee County scrub habitats is warranted, as well as a more careful investigation of the numerous more widespread scrub taxa that occur in this region, as these could represent cryptic species.

The three widespread, non-Florida endemic Tridactylidae (*Ellipes minuta*, *E. gurneyi*, and *Neotridactylus apicalis*) can occur in many types of habitats, including disturbed environments such as roadside ditches and retention ponds; they seem quite able to cope with increased human pressure on the land. However, the conservation statuses of the six Florida endemic Tridactylidae deserve consideration, due to their status as small, flightless organisms restricted to globally rare habitats. Most scrub habitats have already been destroyed, primarily for suburban development and citrus agriculture. Portions of habitat that are protected may not be adequately managed to conserve the special properties of scrub, particularly those related to fire. The scrub Pygmy Mole Crickets depend on a subsurface layer of algae which is only present in open sand gaps within scrub and sandhill habitats. These open gaps were traditionally maintained by fire, and in some cases by the allelopathic effects of scrub rosemary (*Ceratiola*). In many scrub areas that have been long-unburned, most of the natural open sand gaps have been overgrown by vegetation, and Pygmy Mole Crickets persist only along the margins of sand roads. The diversity and density of the various algae and cyanobacteria that make up the biological soil crust in scrub is correlated with the open structure and time since fire, with decreased density close to shrubs, and reaching peak densities in areas 10–15 years post-fire with decreasing density afterwards (Hawkes & Flechtner 2002). The six species of Pygmy Mole Crickets that are specialists in open scrub and sandhill habitats are flightless, and thus quite unlikely to be able to colonize new habitats if their food source is depleted. Each of these species faces special challenges related to their specific ranges and habitats.

Neotridactylus archboldi is provisionally the most secure of the scrub endemic Pygmy Mole Crickets, with a comparatively wide range throughout Florida’s scrub habitats, and with large populations occurring within dozens

of protected natural areas, including several that are actively managed with prescribed fires. However, isolated populations of this species, including those on disjunct ridge habitats that are genetically divergent from other populations, may be in jeopardy from improper habitat management. Some areas, such as the southwestern Gulf Coastal scrubs, have only one or two protected populations. To adequately preserve genetic diversity within this species, populations from the 11 different ridges and hills where it occurs must be protected.

Neotridactylus insularis **sp. nov.** occurs in large numbers at two protected sites, yet it was absent from many apparently suitable habitats along the Florida panhandle Gulf coast. Whether this reflects a historically tiny range or more recent extirpation of populations is not known. Much of the coastal dune scrub habitat that is required by this species has been destroyed for housing developments, so its continued survival depends on the proper management of scrub habitat at Henderson Beach and Topsail Hill Preserve State Parks.

During the present study, *Ellipes eisneri* has been found in a wider range than was previously thought. First discovered on the Brooksville Ridge, it is now known to occur on two additional ridges as well as the Cedar Key scrub. While this is encouraging, the range of *E. eisneri* is still much smaller than that of *N. archboldi*, and many of the known sites are roadside areas that are open to destruction. In addition, the open sandhill habitat that it requires is easily overgrown with vegetation, and some of the protected areas where it occurs are not adequately managed with fire. Without proper management, this species could disappear from several areas where it currently still occurs.

Ellipes ceratiola **sp. nov.** is known to occur at five locations (across two ridges and one unnamed upland), four of which are protected. The bare sand gaps that it requires seem to be primarily maintained by the presence of the shrub *Ceratiola ericoides*, a species whose management is still not fully worked out. However, *E. ceratiola* **sp. nov.** appears to occur in large numbers at all known sites, so it seems to be provisionally secure for the time being. Its known range is still rather small, and many areas where it likely occurs are not protected and thus vulnerable to destruction.

Ellipes deyrupi is found in large numbers at two protected sites, but in other respects, its prospects are far more dire than the preceding two species. Its known range is very limited, only about 20 miles in its north to south axis and 2 miles from east to west, and almost all the suitable habitat in this area has already been destroyed. The type locality and several surrounding areas of habitat, a small sand ridge east of Lake Marion, is now primarily composed of housing developments which are rapidly being converted into neighborhoods dominated by lawns and exotic plants. The yellow sand scrub that is required by *E. deyrupi* is prone to overgrowth by vegetation, but too frequent fires can convert it into sandhill. The long-term survival of this species is dependent on the proper management of yellow sand scrub habitat at Tiger Creek Preserve and the Allen David Broussard Catfish Creek Preserve State Park.

By far the most restricted of the scrub endemics is *Ellipes ignis* **sp. nov.**, which has so far only been found in four protected areas in Manatee County. Some of these areas are contiguous, such that there are only two known populations. Several other scrub areas in the county were checked with no success, and it does not occur on any of the major ridge systems elsewhere in the state. Luckily, the conservation lands on which this species resides are actively managed for Florida Scrub-Jays, so the open sand gaps required by this species should continue to be maintained. The conservation prospects of this species are roughly like those of *E. deyrupi*.

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