A new species of tree cricket (Orthoptera, Gryllidae, Oecanthinae) from Chihuahuan Desert gypsum dunes in the United States and a key to the *nigricornis* species group

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Abstract

A new species of tree crickets, *Oecanthus beameri* **sp. nov.,** is described from the gypsum dunes of White Sands National Park in New Mexico, United States. The new species is currently known only from the type locality, where it appears to be specific to the gypsophile plant hoary rosemary mint (*Poliomintha incana)*. This new species has the narrowed tegmina and calling song that are found in the *nigricornis* species group. Although it has morphological similarities to *O. quadripunctatus* and *O. celerinictus*, there are differences in the subgenital plates, tegminal measurements, coloring, tibial markings, song frequency, and song pulse rate. This new species has been given the common name White Sands tree cricket. We provide a key to all species in the *nigricornis* group. Video and song recordings are available online as Suppl. materials 1–8.

Keywords

bioacoustic, biodiversity, gypsophile, *Oecanthus*, *Poliomintha incana*, White Sands National Park

Introduction

Two genera of Oecanthinae occur in the United States—*Oecanthus* Serville, 1831 and *Neoxabea* Kirby, 1906 (Cigliano et al. 2021; Singing Insects of North America (SINA) website (2021a)). Twenty-two of the species of *Oecanthus* in North America, Central America, and the Caribbean are divided into four main species groups: *nigricornis*, *niveus*, *varicornis*, and *rileyi* (Walker 1962, 1963, Walker and Collins 2010, Singing Insects of North America 2021b). These groups can be distinguished by characteristics including song type (chirping vs trilling and continuous vs intermittent); regular vs irregular pattern of pulses or chirps; coloration of the antennae, head, pronotum, and abdomen; antennal markings on the pedicel and scape; and tegminal width (Fulton 1915, Walker 1962, 1963, Walker and Collins 2010). All nine species in the *nigricornis* species group occur in North America: *O. argentinus* Saussure, 1874; *O. celerinictus* Walker, 1963; *O. forbesi* Titus, 1903; *O. laricis* Walker, 1963; *O. nigricornis* Walker, 1869; *O. pini* Beutenmüller, 1894; *O. quadripunctatus* Beutenmüller, 1894; *O. salvii* Collins, 2020; and *O. walkeri* Collins & Symes, 2012.

In 2019, two specimens examined in the collection at the Academy of Natural Sciences of Drexel University (ANSDU) led to this investigation of a new species of *Oecanthus*. Two male specimens (Fig. 1), collected by Raymond H. Beamer (University of Kansas) in 1932 (Suppl. material 1: Beamer 1932 expedition), were found in the drawer containing *O. quadripunctatus*, but were visibly smaller and paler than all other males in the drawer. Fig. 1A, B show these differences when side by side with a male *O. quadripunctatus* in the collection box. Upon closer inspection, one of the specimens could be seen to have markings similar to *O. quadripunctatus*, with the upper outer round mark on the scape very faint, but the vertical line appeared to have a slight interruption midway (Fig. 1C). *O. quadripunctatus* has a total of four (rarely two) marks on the first two antennal segments (Fulton 1915, Walker 1963). Of additional interest was the fact that both of the smaller male specimens were collected in White Sands of New Mexico. White Sands National Park (WSNP) lies within the Chihuahuan desert and is comprised of dunes of bright white gypsum crystals that support gypsophilic plants. Our investigation sought to determine whether these were *O. quadripunctatus*, but smaller and paler because of their habitat, versus a distinct and undescribed species. We conducted a special research and collecting trip to WSNP in September of 2021, with the cooperation of the National Park Service (White Sands National Park, Scientific Research and Collecting Permit# WHSA-2021-SCI-0010), to collect specimens, record songs, and evaluate the habitat characteristics of the potentially new *Oecanthus*. This article describes the new species of *Oecanthus* from White Sands National Park.

Materials and methods

Specimens.—Seven adult males and one adult female of *Oecanthus* were collected on dunes (Fig. 2) adjacent to the Interdune Boardwalk at the WSNP in New Mexico between 21h and 22h from three locations separated by less than 1300 meters. Sunset was 19h15, and the males started calling around 20h, peaking around 21h. All seven males were approximately 1 m above the ground surface, and the female was on the white sand (gypsum) surface at an oatmeal bait trail.

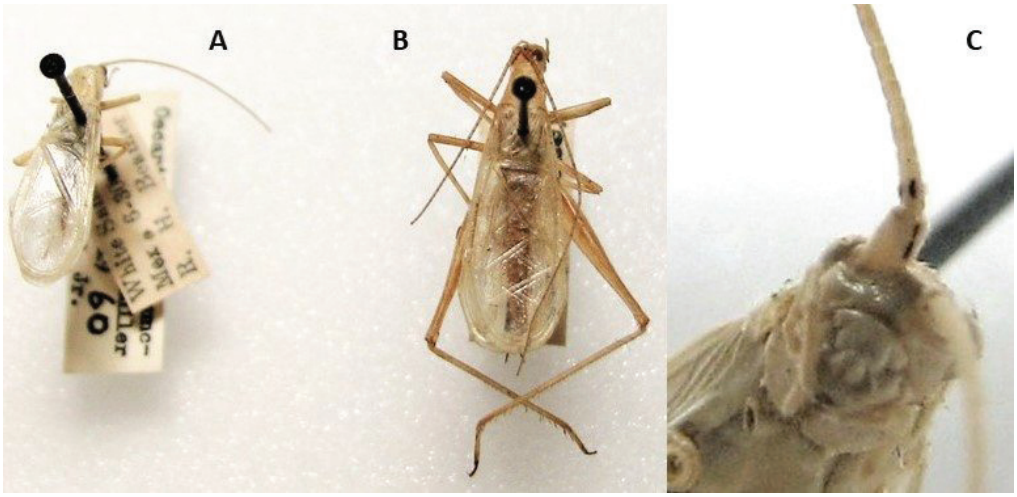

Fig. 1. *Oecanthus* specimens found in a box of *O. quadripunctatus* specimens in the ANSDU collection. **A.** Dorsal view of *O. beameri* sp. nov.; **B.** Dorsal view of *O. quadripunctatus*; **C.** Markings on pedicel and scape of specimen of *O. beameri* sp. nov.

Specimens were located by the calling song of the males and collected manually within two hours of dusk. One female was collected from an oatmeal trail laid on the sand surface at dusk among shrubs of *Poliomintha incana* Gray, 1870, with singing males. No other *Oecanthus* species were heard singing in the area. Four of the eight tree crickets were brought indoors, kept alive, and separated to be recorded, and then preserved in 91% ethyl alcohol for morphological studies. Photographs were made with Canon S5 IS and Canon SX70 cameras. Measurements of the alcohol-preserved specimens were made with a Fischer spindle ruler.

Pinned specimens were dried in a moisture-extracting refrigerator to preserve their delicate greenish-white color. Measurements of the dried specimens, including the holotype, were made with an American Optical binocular dissecting scope and ocular micrometer, with magnification ranging from 10X to 50X. Measurements of alcohol preserved (n=3) and dry pinned specimens (n=3) are presented here as ranges and individually in Suppl. material 2 due to the contraction of dry membranous and some sclerotized tissues of dry pinned specimens.

Genus determination was made with keys from Walker (1967) and SINA (2021a) and review of taxa of *Oecanthus* in the Orthoptera Species File (Cigliano et al. 2021). Along with coloration, body length, antennal markings, cerci length and shape, subgenital plate details, and the female ovipositor, the male characters considered for description included tegmina length and width, stridulatory file length and number of teeth, metanotal gland features, and internal genitalia (focused on copulatory blades).

The following measurements were made: body length (from the tip of the labrum to the apex of the subgenital plate), pronotum length (from anterior to posterior margin along midline), pronotum width (at the widest distal portion in dorsal view), tegminal length (from the thorax joining point to distal end of tegmina along midline), tegminal width (measured at the widest section of the tegmina at rest or the maximum width of the dorsal surface of each tegmen excluding the lateral folds), hind femur length, and cerci length. The male stridulatory file length was measured along the ventral surface of the left tegmen A1 vein (Desutter-Grandcolas et al. 2017), from the first tooth at the A1 vein file lobe, toward the lateral margin of the A1 vein, to the last lateral tooth of the file on the A1 vein. The female ovipositor was measured from the base (originating from the abdomen) to the distal tip.

Online photographic material.—Additional materials examined were photographs posted on iNaturalist: figs 3C, F by James Bailey (https://www.inaturalist.org/observations/102287655); fig. 3D by Jared Shorma (https://www.inaturalist.org/observations/98434363).

Climate and habitat.—White Sands National Park daytime temperatures average from 35°C June through August to 16°C December through February. Night temperatures range from 10–18°C June through August and average -5°C December through February (National Park Service 2021).

The dominant shrub in the area of collection was hoary rosemary mint, *Poliomintha incana*, which is a gypsophile with whitish-green leaves and stems and a very pronounced and unique aromatic fragrance from plant defense chemicals. Many singing males were heard in the area but were not collected, and all were exclusively singing from *P. incana*.

Calling song recording and analyses.—The thermometer was held at the location on the plants where the males were calling immediately after capture on site, and within 10 cm from the indoor containers.

Temperatures of the perch sites of the males singing from the shrubs on site were measured using a hand-held Taylor mercury thermometer. An Accu-rite digital thermometer and an Accu-rite mercury thermometer were used to measure the temperature of the captive singing males.

The male acoustic signals that were recorded in the field at the collection site were recorded using an I-phone 11 held approximately 0.5 m from each calling male. Captive males were recorded with a Canon SX20S that was tested for calibration by recording a reference time audio file with reference tones and comparing the results to the original file. The camera was kept at a distance of less than 10 cm from the individual. Three male tree crickets were kept in large glass vases with mesh tops for observation and recordings. Video recording of a singing male can be viewed in Suppl. material 3. Analyses of audio waveforms and spectrograms were made with the Raven Lite 2.0 program (Cornell Lab 2021b). Additional recordings (Suppl. material 4) from the Macaulay Library of Cornell Lab (2021a) and data from the Singing Insects of North America website (SINA 2021c) were used for the preparation of two graphs

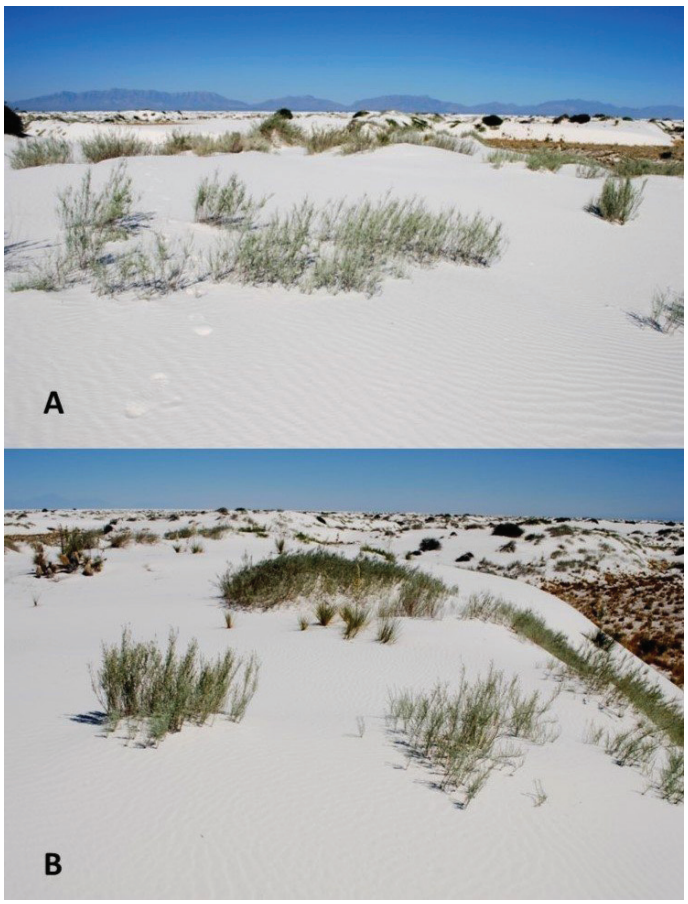

Fig. 2. Habitat photos. **A.** Collection site near Interdune Boardwalk; **B.** White gypsum crystals dune with hoary rosemary mint shrubs (*Poliomintha incana*).

to compare song pulses per second vs temperature and carrier frequency vs temperature with species in the *nigricornis* group.

Depositories.— **MSBA** Museum of Southwestern Biology, Division of Arthropods, University of New Mexico, Albuquerque, USA; **ANSDU** The Academy of Natural Sciences of Drexel University, Philadelphia, USA; **FSCA** Florida State Collection of Arthropods, Gainesville, USA; **CAS** California Academy of Sciences, San Francisco, USA; **TAMU** Texas A & M University, Houston, USA.

Results

Taxonomy

Family Gryllidae Laicharting, 1781
Subfamily Oecanthinae Blanchard, 1845
Tribe Oecanthini Blanchard, 1845
Genus *Oecanthus* Serville, 1831

***Oecanthus beameri* sp. nov.**
https://zoobank.org/95CA19BE-72DB-41C7-915F-CE6AA5D5C9C1
Figs 3A–F, 4A–D, 5A, C, 6A–F

Diagnosis.—The antennal markings of *O. beameri* sp. nov. can total two, three, or four, with the medial mark on the scape usually broken into two pieces (Figs 3C, 4), while *O. quadripunctatus* has either two or four marks with the medial mark on the scape being a solid post, and *O. celerinictus* always has a solid medial mark on the scape and never lacks the upper outer mark on the scape and is never round. The two antennal marks on the pedicel of *O. walkeri* (Collins and Symes 2012) touch, and those of *O. argentinus* touch or nearly touch, while the marks on *O. beameri* sp. nov. do not.

The male and female subgenital plates of *O. beameri* sp. nov. (female: wide shallow notch as in Fig. 5A; male: rounded end as in Fig. 5C) can be distinguished from *O. quadripunctatus* (female: deep narrow notch as in Fig. 5B; male: tapered to a rounded tip as in Fig. 5D). When next to each other, a male *O. beameri* sp. nov. has a lighter coloring and smaller proportion of tegmen width to abdomen width than a male *O. quadripunctatus* (Suppl. material 5). *Oecanthus beameri* sp. nov. lacks the dark black lines across the proximal portion of the hind tibiae that are very common on *O. celerinictus*, but faint lines can be present (Fig. 3F). The deep black setae on the hind femora of *O. salvii* (Collins and Schneider 2020) are not present in *O. beameri* sp. nov. See below for more detailed diagnostic information.

Description.—Face, pronotum, abdomen, and wings pale greenish-white (Fig. 3A–D), color number 97 (Köhler 2012). Eye color pale green. Palpi pale whitish green. Tympanal membrane on fore tibiae whitish green. Tarsi, tibiae, and femora translucent pale mint green. Tibiae without black setae or lateral black lines. Cerci straight and translucent pale green. Scape and pedicel translucent whitish, and remainder of antennomeres translucent whitish. Ventral face of pedicel and scape each with black marks on pale whitish field (Fig. 3C). See examples of antennal marking variations in Fig. 4.

Materials examined.—**Holotype**: USA • ♂; New Mexico, Otero County, White Sands National Park; 32.793055, -106.233611; 10 September 2021; D. Lightfoot leg.; on *Poliomintha incana*; MSBA 74580. Paratypes: Same information as holotype: USA • 1♂; MSBA 74579 • 1♀ (dry pinned), 1♂ (in alcohol); MSBA • 1 ♂ (dry pinned); ANSDU • 1♂ (dry pinned); CAS • 1♂ (in alcohol); FSCA • 1♂ (in alcohol for DNA research); TAMU

Etymology.—Specific epithet in recognition of Raymond Beamer who collected the specimens in 1932 that were discovered in the ANSDU collection in 2019. The common name, White Sands tree cricket, is for the location where this species was discovered with high potential for endemism.

Holotype measurements (mm).—Body length 11.7; tegminal length 9.0, tegminal width 20.0; pronotal length 2.3, distal pronotal width 2.0; hind femur length 9.0; cercus length 2.8; stridulatory file length 2.3; stridulatory teeth number 48.

Male paratypes.—(n=6) Body length (mm) 10.8–13.3; tegminal length 8.5–9.8; tegminal width 3.3–3.9; pronotal length 2.2–2.4; distal pronotal width 1.8–2.2; hind femur length 8.5–9.8; cerci length 2.7–3.1; stridulatory file length (n=5) 1.2–1.5. Right tegminal stridulatory teeth (as in Fig. 6A) number (n=5) 45–49. Tegmina with veins as in Fig. 3A. Subgenital plate with a rounded end (Fig. 5C). Copulatory blades thin with a deep notch separating them fairly equal to the width of one blade (Fig. 6B, C), and a slight indentation at the medial side of the distal end of each blade (6D). The metanotal gland with a rounded triangular

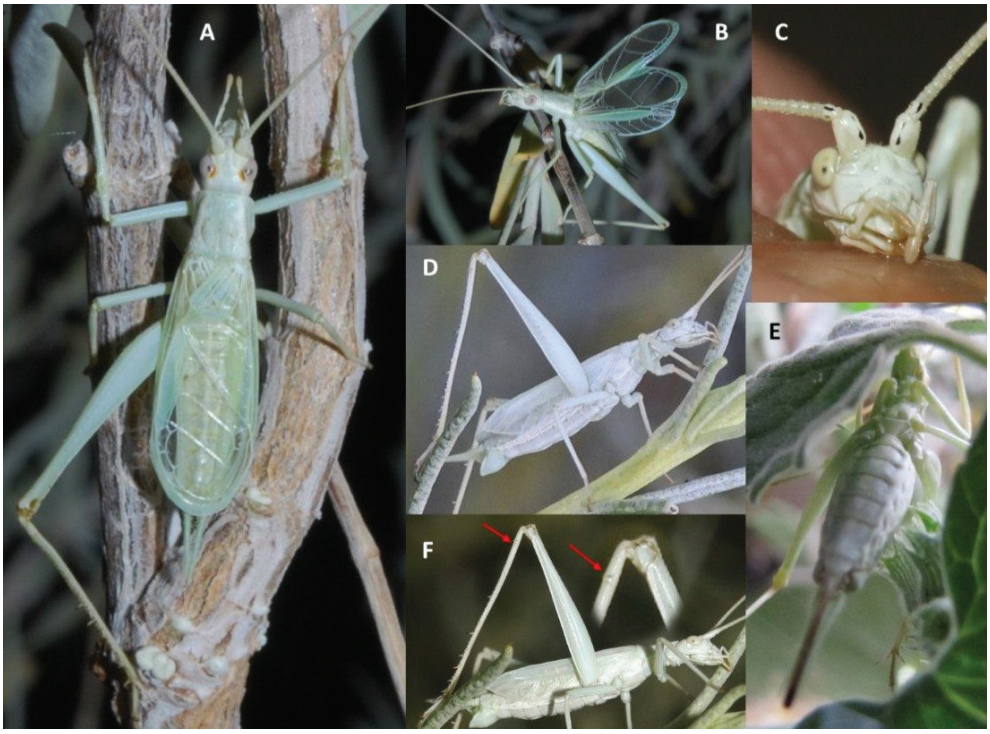

Fig. 3. *Oecanthus beameri* sp. nov. **A.** Male habitus, dorsal view; **B.** Front view of a singing male; **C.** Antennal markings. Photo credit James Bailey, iNaturalist; **D.** Ventral abdomen color of adult male. Photo credit Jared Shorma, iNaturalist; **E.** Ventral abdomen color of adult female; **F.** Faint horizontal lines on proximal portion of hind femora. Photo credit James Bailey, iNaturalist.

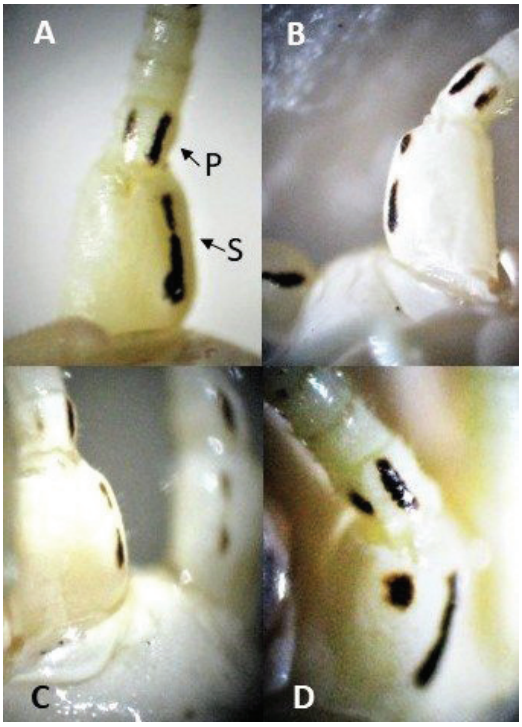

Fig. 4. Variable configurations of black markings on pedicel (P) and scape (S) of *Oecanthus beameri* sp. nov. **A.** Medial mark on scape nearly separated into two sections, with no lateral mark on scape; **B.** Two marks on pedicel, no lateral mark on scape, and medial mark on scape has clear separation into two sections; **C.** Faint lateral mark on pedicel, no lateral mark on scape, and medial mark on scape has clear separation into two sections; **D.** Lateral mark on scape round, and medial mark solidly one line.

depression, bristles running horizontally across the upper edge of the cavity, and no posterior medial lobe (Fig. 6E). These key out and match the diagram in Walker and Gurney (1967) for a member of the *nigricornis* species group. As pointed out by Walker and Gurney (1967), species within a group are difficult to separate based on the metanotal gland.

Female paratype description.—(n=1) Latticed vein pattern on translucent greenish-white wings. Abdomen pale white (Fig. 3E). Body length 11.5 mm; pronotal length 2.0, distal pronotal width 2.0; hind femur length 7.0; cerci 4.5; ovipositor length 3.5. The tip of the ovipositor flared (Fig. 6F) and extending just beyond the tips of the cerci. Distal end of subgenital plate with a wide, shallow notch (Fig. 5A). The only female collected (Fig. 3E) was missing the distal ends of the wings, thus dorsal photos not included.

Oviposition.—The female mated while in captivity and oviposited approximately 24 times into stems of an undetermined species of sage in both nodal and internodal areas (Fig. 7A, B). Species in the *varicornis* and *nigricornis* groups of *Oecanthus* generally oviposit within the stem internodal areas, while species in the *niveus* group prefer to oviposit in the nodal areas (Fulton 1915). Photographs of some *nigricornis* species group members' oviposition marks can be viewed on the Orthoptera Species File website (Cigliano 2021), including *O. quadripunctatus*. It is unknown whether being in captivity affected the locations of oviposition by this *O. beameri* sp. nov. female.

Climate and habitat.—On the day the tree crickets were collected, daytime temperatures reached 32–37°C, and cooled off to 26–31°C in the evening. Males were calling exclusively on hoary rosemary mint, *P. incana*, and were generally restricted to the tops of the gypsum dunes.

Fig. 5. Adult *Oecanthus* female and male subgenital plates. **A.** Female of *O. beameri* sp. nov.; **B.** Female of *O. quadripunctatus*; **C.** Male of *O. beameri* sp. nov.; **D.** Male of *O. quadripunctatus*

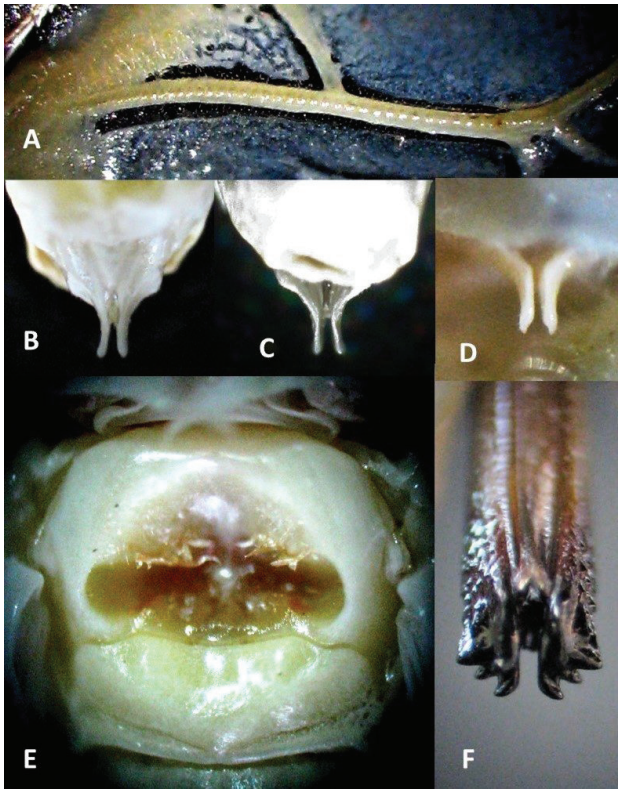

Fig. 6. Structures of adult male and female *Oecanthus beameri* sp. nov. **A.** Male stridulatory file and teeth; **B.** Dorsal view of male internal genitalia; **C.** Ventral view of male internal genitalia; **D.** Ventral view of in situ copulatory blades; **E.** Male metanotal gland; **F.** Female ovipositor.

Character comparisons among species of the nigricornis species group

Colors, patterns and morphology—The antennal markings of *O. beameri* sp. nov. can total two, three, or four, with the medial mark on the scape usually broken into two pieces (Figs 3C, 4A–C), while *O. quadripunctatus* has either two or four marks with the medial mark on the scape being a solid post (SINA 2021c). The male and female subgenital plates of *O. beameri* sp. nov. (male: rounded end as in Fig. 5C; female: wide shallow notch as in Fig. 5A) can be distinguished from *O. quadripunctatus* (male: tapered to a rounded tip as in Fig. 5D; female: deep narrow notch as in Fig. 5B). When next to each other, a male *O. beameri* sp. nov. has a lighter coloring and smaller proportion of tegmen width to abdomen width than a male *O. quadripunctatus* (Suppl. material 5). *O. celerinictus* always has a solid medial mark on the scape and never lacks the upper outer mark on the scape, which is never round. *O. beameri* sp. nov. lacks the dark black lines across the proximal portion of the hind tibiae that are very common on *O. celerinictus*, but faint lines can be present (Fig. 3F). The deep black setae on the hind femora of *O. salvii* (Collins and Schneider 2020) are not present in *O. beameri* sp. nov. The two antennal marks on the pedicel of *O. walkeri* (Collins and Symes 2012) touch, while the marks on *O. beameri* sp. nov. do not.

Song pulse patterns.—The *O. beameri* sp. nov. male calling song is a continuous trill, often lasting 5–9 seconds with pauses of similar lengths, which increases in rate as the ambient temperature rises (Figs 8, 9). Captive males often trilled for up to 30 seconds. Recordings of *O. beameri* sp. nov. were made in the field and in captivity. An onsite recording can be heard in Suppl. material 6, and a captive song sample at a similar temperature can be heard in Suppl. material 7. Recording of side-by-side captive *O. beameri* sp. nov. and *O. quadripunctatus* males at 23.8 °C can be heard in Suppl. material 8. Pulse rate and frequency graphs provide comparisons to other species with similarities in the *nigricornis* group (Figs 9, 10). Four species were not included due to never being totally pale mint green and having black, dark brown, rust, or mahogany color on the ventral surfaces of the abdominal tergites: *O. forbesi*, *O. laricis*, *O. nigricornis*, and *O. pini*.

Dichotomous key for the nigricornis species group—Since *O. beameri* sp. nov., *O. celerinictus*, and *O. quadripunctatus* are members of the *nigricornis* species group, it is not unexpected that no profound differences were evident in the following characters: number of stridulatory teeth number, tegmen configuration, and metanotal gland. The similarities of metanotal glands among species in the *nigricornis* species group can be viewed in Collins and Schneider (2020). The antennal markings of *O. beameri* sp. nov. can match (Fig. 4D) those of *O. quadripunctatus* but are variable in number and configuration (Figs 3C, 4A–C). The distal tip of the subgenital plate of the male *O. beameri* sp. nov. is rounded, while the tip of *O. quadripunctatus* is pointed. The notch in the subgenital plate of the female *O. beameri* sp. nov. is wide and shallow, while the notch in the plate of the female *O. quadripunctatus* is narrow and deeper. Tegminal length and width as well as stridulatory teeth number are similar to *O. celerinictus*, but *O. celerinictus* consistently has a solid medial line on the scape. The antennal markings on the

Fig. 7. Oviposition marks of *O. beameri* sp. nov. female on sage plants provided in captivity. (Red arrows indicate some of the oviposition sites; yellow arrows indicate nodes.) **A.** Internodal placement of eggs; **B.** Nodal placement of eggs.

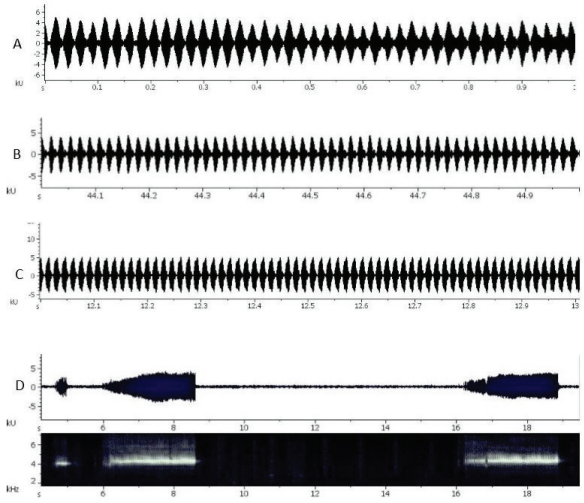

Fig. 8. Waveforms of the calling song of *Oecanthus beameri* sp. nov.; **A.** 43 pulses per second, 20.0°C; **B.** 56 pulses per second, 23.9°C; **C.** 64 pulses per second, 26.1°C; **D.** 15 seconds of trilling at 23.9°C, carrier frequency 4.4 kHz.

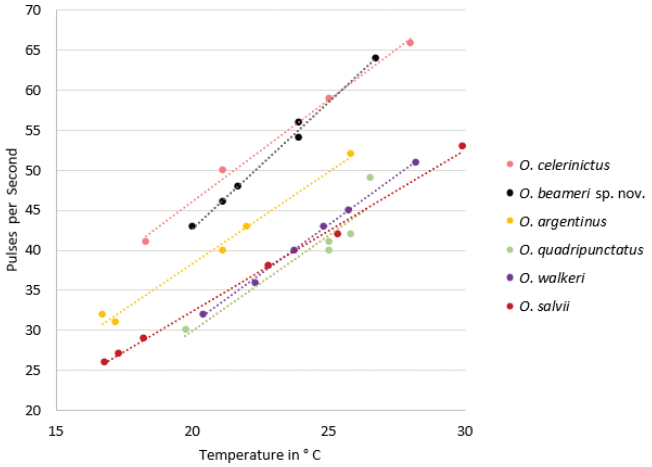

Fig. 9. Song pulses per second by temperature of *Oecanthus beameri* sp. nov., *O. argentinus*, *O. celerinictus*, *O. quadripunctatus*, *O. salvii*, and *O. walkeri*. Data for recordings in Suppl. material 3.

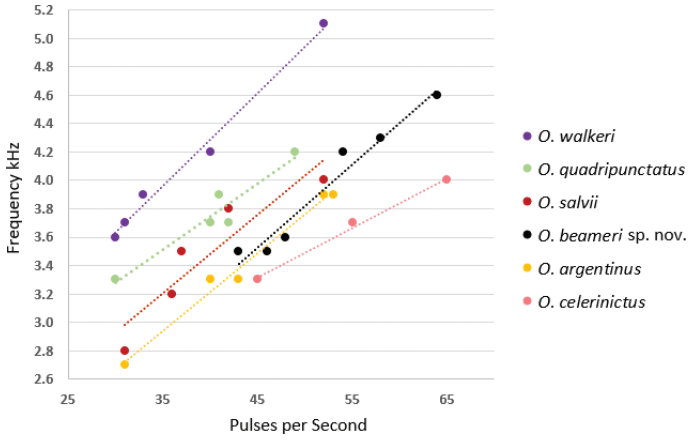

Fig. 10. Change in carrier frequency with pulses per second of *Oecanthus beameri* sp. nov., *O. argentinus*, *O. celerinictus*, *O. quadripunctatus*, *O. salvii*, and *O. walkeri*. Data for recordings in Suppl. material 3.

pedicel of *O. walkeri* touch (Collins and Symes 2012), while those of *O. beameri* sp. nov. do not. A key to species in the *nigricornis* species group is presented below.

Key to the *nigricornis* species group of *Oecanthus*

1 Sternites with dark black, brown, rust, or burgundy 2
– Sternites white/cream/pale green or with very pale reddish brown blocks 5
2 Pronotum mostly brown/rust 3
– Pronotum green, mostly black, or greenish with prominent dark strip/s 4
3 Antennae, head, pronotum, and sternites dark brown color; hosts tamarack and hemlock; length of tegmina < 12 mm ..... *O. laricis*
– Antennae, head, pronotum, and sternites rust color; hosts are most conifers; length of tegmina > 12 mm ..... *O. pini*
4 Song pulse rate > 70 pulses per second at 77°F/25°C; frequency > 4.1 kHz at 55 pulses per second; buzzy trilling song; usually with one or two lateral lines on hind tibiae; may be all green, but sternite still black or burgundy; generally in or west of Ohio ..... *O. forbesi*
– Song pulse rate < 65 pulses per second at 77°F/25°C; frequency < 4.0 kHz at 55 pulses per second; usually with one or two lateral lines on hind tibiae; may be all green, but sternites still black or burgundy; generally in or east of Ohio ..... *O. nigricornis*
5 Overall light or medium green color, but not pale greenish-white .. 6
– Overall pale greenish-white color 9
6 Lateral mark on scape round or with a slight outward point (may be absent); frequency > 4.2 kHz at 55 pulses per second; male tegminal length > 10 mm; male subgenital plate tapers to a wide point; female subgenital plate with a deep narrow notch; no dark lateral lines on hind tibiae; flute-like trilling song ..... *O. quadripunctatus*
– Lateral mark on scape elongated with outward point 7
7 Black marks on pedicel of equal lengths and widths and touch each other 8
– Black marks on pedicel of different lengths and widths and do not touch each other 9

8 Marks on pedicel touch at bottom to form a V; black rings on antennal segments beyond pedicel; eyes yellow; lateral borders of pronotum always white; prefer narrow-leafed trees and shrubs (e.g., willow, tepejuage)..... *O. walkeri*

– Marks on pedicel touch in center; all four antennal markings thick and dark black; antennal segments beyond pedicel with or without black rings; eye color varies; generally not found in trees..... ..... *O. argentinus*

9 Antennal segments beyond pedicel with black or dark grey rings beyond pedicel; male tegminal length > 10 mm; hind femora with numerous dark black setae.....*O. salvii*

– Antennal segments beyond pedicel without rings or with light brown, pale green or greenish-white rings beyond pedicel; male tegminal length < 10 mm; no dark black setae on hind femora 10

10 Medial mark on scape a solid vertical line; always has lateral antennal markings on both pedicel and scape; one or two lateral lines on tibiae (two hind tibiae most common, but can be four or all six); pale green..... *O. celerinictus*

– Medial mark on scape usually an interrupted vertical line; outer marks on pedicel and scape usually absent or very faint (some individuals match four antennal markings of *O. quadripunctatus)*; lateral tibial lines usually not present or barely visible; pale greenish-white .....*O. beameri* sp. nov.

The known members of the *niveus*, *rileyi*, and *varicornis* species groups can be ruled out with non-matching song types, tegminal widths, antennal markings, or head and antennal coloring. Other western hemisphere species of *Oecanthus* (not found in the United States) can be ruled out for non-matching characters as in Table 1.

Table 1. Non-matching characters of western hemisphere *Oecanthus* species not placed in a group.

Oecanthus species	Characters not matching *O. beameri* sp. nov.	Sources
O. pictipes	L-shaped mark on pedicel	Rehn 1917
O. comma	Comma-shaped mark on pedicel	Walker 1967
O. prolatus	Black teardrop on pedicel	Walker 1967
O. tenuis	Slightly bowed fine line on pedicel	Walker 1967
O. valensis	Thin black line on bright white field	Milach et al. 2016
O. minutus	Dark line on white field	Walker 1967
O. immaculatus	No antennal markings	Walker 1967
O. mhatreae	Long chirps	Collins et al. 2019
O. allardi	Slow chirp rate	Walker and Gurney 1960
O. pallidus	Bursts of trilling	Zefa et al. 2012
O. pictus	Black rings up antennae	Milach et al. 2015
O. jamaicensis	Line behind eye	Walker 1969
O. belti	Red on head	Collins et al. 2014
O. symesi	Yellow color	Collins et al. 2014
O. bakeri	Wide tegmina	Collins et al. 2014
O. nanus	>50 stridulatory teeth	Walker 1967
O. peruvianus	Tegminal length > 10 mm	Walker 1967
O. lineloatus	South of Amazon basin	Walker 1967

Discussion

We describe a new species of *Oecanthus* that belongs to the *nigricornis* species group. This small *Oecanthus* species has a very pale greenish-white color that helps it blend in well with the similar pale whitish-green pastel color of the stem and leaf foliage of hoary rosemary mint, *P. incana*, shrubs growing on the white gypsum dunes. Although morphologically similar to *O. quadripunctatus* in some respects, several characters were distinctly different: the subgenital plates of both males and females, the song pulse rate and frequency, and male tegmen width and length. A potential dwarf species of *O. quadripunctatus*, found in coastal central California on tarweed, was studied by Walker and Rentz (1967) and found to have the same song characters as full-sized *O. quadripunctatus*. Since the only difference found was its size, we ruled it out as being *O. beameri* sp. nov. The lack of dark lateral lines on the tibiae, and the commonly interrupted medial line on the scape rule out *O. celerinictus*.

We were able to separate *O. beameri* sp. nov. from other species in the *nigricornis* group by the following characters: the lack of black setae that are found on *O. salvii*; the antennal markings of *O. argentinus* and *O. walkeri*; and the lack of black, dark brown, rust, or mahogany color on the sternites of *O. forbesi*, *O. laricis*, *O. nigricornis*, *and O. pini*.

O. beameri sp. nov. may be endemic to the gypsum dunes of White Sands, New Mexico (White Sands National Park, and likely also the gypsum dunes of White Sands Missile Range). *O. beameri* sp. nov. also appears to be specialized to live on hoary rosemary mint, based on occurrence and color matching. While *O. beameri* sp. nov. was common at White Sands on hoary rosemary mint, no individuals were heard singing from any of the other plants present. *O. quadripunctatus* is known to occur throughout New Mexico (SCAN 2021; search for *O. quadripunctatus* from the collections of the Museum of Southwestern Biology, University of New Mexico, and from the Insect Collection, New Mexico State University). Additionally, field collecting at White Sands revealed that *O. quadripunctatus* was not found there, and *O. beameri* sp. nov. was not found in locations adjacent to White Sands.

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Supplementary material 1

Author: University of Kansas
Data type: images
Explanation note: Raymond H. Beamer explored the White Sands area in 1932, and collected specimens of Oecanthus. Two specimens were donated to the Academy of Natural Sciences Philadelphia.

Link: https://doi.org/10.3897/jor.31.79036.suppl1

Supplementary material 2

Author: Nancy Collins, David Lightfoot
Data type: Excel spreadsheet
Explanation note: Table showing measurements provided in description of six male paratypes - 3 pinned and 3 from alcohol.

Link: https://doi.org/10.3897/jor.31.79036.suppl2

Supplementary material 3

Author: Nancy Collins
Data type: Video
Explanation note: Captive male *O. beameri* sp. nov. singing.

Link: https://doi.org/10.3897/jor.31.79036.suppl3

Supplementary material 4

Author: Nancy Collins
Data type: Excel workbook
Explanation note: Source recordings data for creation of graphs showing male song rates and frequency.

Link: https://doi.org/10.3897/jor.31.79036.suppl4

Supplementary material 5

Author: Nancy Collins
Data type: Image
Explanation note: Photograph showing an adult male *O. beameri* sp. nov. next to an adult male *O. quadripunctatus*.

Link: https://doi.org/10.3897/jor.31.79036.suppl5

Supplementary material 6

Author: David Lightfoot
Data type: Audio recording
Explanation note: Singing male recorded September 2021 at White Sands National Park - temperature 81-82 F.

Link: https://doi.org/10.3897/jor.31.79036.suppl6

Supplementary material 7

Author: Nancy Collins
Data type: Audio
Explanation note: Captive male *O. beameri* sp. nov. singing - temperature 80 F.

Link: https://doi.org/10.3897/jor.31.79036.suppl7

Supplementary material 8

Author: Nancy Collins
Data type: Audio
Explanation note: Adult males of *O. beameri* sp. nov. and *O. quadripunctatus* are recorded singing to compare the difference in tone.

Link: https://doi.org/10.3897/jor.31.79036.suppl8