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Source: Journal of Orthoptera Research, 18(1) : 29-35

Published By: Orthopterists' Society

URL: https://doi.org/10.1665/034.018.0115

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Journal of Orthoptera Research, August 12, 2009,18(1): 29-35

# The grasshopper (Orthoptera: Acrididae) fauna of sand dunes along the Little Ohoopee River, Emanuel County, Georgia, USA

Accepted April 25, 2009

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## Abstract

Vegetated inland sand dunes occupy thousands of square kilometers on the Coastal Plain of the southeastern United States. Many of these dunes are found along rivers where during glacial times, west winds deposited sand from dry river bottoms onto eastern banks. One such dune system, known as the Ohoopee Dunes, is found along the Ohoopee and Little Ohoopee Rivers in eastern Georgia. Because the grasshopper fauna of these dunes had not been well documented, a faunal survey was initiated. Collections focused on sand dunes along the Little Ohoopee River. Twenty-two species of grasshoppers were collected in the scrub-like habitat of the dunes. Comparison of the fauna of this scrub habitat to scrub habitat in Florida revealed two different faunas. Eight species found in the dunes are typically restricted to sandy soils in the southeastern United States. Of these, several rare species including *Melanoplus bispinosus*, *M. quercicola*, (both new state records for Georgia), *M. carnegiei*, and *M. stegocercus*, were found to inhabit the Ohoopee Dunes. Diagnostic characters of the genitalia of *M. carnegiei* and *M. quercicola* are provided for the first time.

## Key words

Acrididae, Georgia, Ohoopee Dunes, scrub, *Melanoplus bispinosus*, *Melanoplus carnegiei*, *Melanoplus stegocercus*, *Melanoplus, quercicola*

## Introduction

Vegetated inland sand dunes occupy thousands of square kilometers in the Coastal Plain physiographic province of Georgia, South Carolina, and North Carolina, in the southeastern United States (Markewich & Markewich 1994). These dunes are of interest as their occurrence here is somewhat of an enigma. Sand dunes are typically thought of as occurring in arid climates, whereas the climate of the southeast is characterized as being humid to wet, warm temperate to subtropical. Indeed, the presence of these dunes indicates that the climate of the southeast was not always such.

Geological studies have documented that dunes in Georgia originated at least 120,000 years ago during the Illinoian Glaciation, with minor reworking of thicker dunes 30,000 - 15,000 years ago during the Wisconsin Glaciation (Ivester *et al.* 2001). Extended periods of drought during glacial episodes caused rivers in the Atlantic Coastal Plain to dry up, and western and southwestern winds deposited sand from the river bottoms along the eastern and northeastern banks of the rivers, thus forming the dunes. The processes that formed these dunes are currently inactive, however these dunes are located in the driest subregion of the southeastern United States, a condition that likely aids in perpetuation of their dune-like state (Markewich & Markewich 1994).

The Ohoopee Dunes, located in southeast Georgia, are a series of ovoid sand deposits found along the eastern banks of the Ohoopee and Little Ohoopee Rivers, for approximately 35 miles (56 km), occupying approximately 40,000 acres (16187 ha). These deposits consist of nutrient-poor, highly permeable, fine and medium quartz sand (Markewich & Markewich 1994). Numerous rare plant and animal species have been documented from these dunes, making them a priority for conservation.

One of their most striking features is the distinct vegetation found there. The flora of these dunes can best be described as dwarf oak-evergreen shrub forest and evergreen scrub-lichen forest (Wharton 1989) (Fig. 1). Turkey oak, *Quercus laevis* Walter, dwarf post oak, *Q. margaretta* Ashe (Fagaceae), and long-leaf pine, *Pinus palustris* Mill. (Pinaceae) are the dominant trees. Woody shrubs are abundant on the dunes and include rosemary, *Ceratiola ericoides* Michx. (Empetraceae); woody goldenrod, *Chrysoma pauciflosculosa* Michx. (Asteraceae); red flowering woody mint, *Clinopodium coccinium* (Nutt.) (Lamiaceae); blueberry, *Vaccinium* sp. (Ericaceae); and coastal sweet pepperbush, *Clethra alnifolia* L (Clethraceae). Conspicuous herbaceous plants of the dunes include gopher apple, *Licania michauxii* Prance (Chrysobalanaceae); sand chickweed, *Arenaria* sp.; nailwort *Paronychia* sp.; wire plant *Stipulicida setacea* Michx., (Caryophyllaceae); treadsoftly *Cnidoscolus stimulosus* (Michx.) (Euphorbiaceae); goat's rue, *Tephrosia virginiana* L. (Fabaceae); *Opuntia humifusa* (Raf.) (Cactaceae), and many others. Lichens are abundant on trees, and in some areas they cover the dune surface.

Limited studies of the fauna of the Ohoopee Dunes have documented several endemic species of insects, including two scarab beetles (Coleoptera: Scarabaeidae), *Pollyphylla donaldsoni* Skelly and *Geopsammodius ohoopee* Skelly and a moth, *Narraga georgiana* Covell *et al*. (Geometridae). The latter feeds on *C. pauciflosculosa* and is endemic to dunes in Georgia (Adams 2008; Skelly 2003, 2006). MacGown *et al.* (in press) documented 77 species of ants (Hymenoptera: Formicidae) occurring in the dune habitat, including several rare and one undescribed species.

As dominant herbivores in open habitats, grasshoppers are often in direct competition with other herbivorous animals for plant material, and thus should be included in biological and ecological studies of these biomes (Otte 1981). Rehn and Hebard (1916) provide a broad picture of the Orthopteran fauna of the Atlantic Coastal Plain; however, specific information on many of the habitats of the region is lacking. Squitier and Capinera (2002) have documented the grasshopper fauna of similar scrub habitat in Florida, but the fauna of scrub habitat in other southeastern states is not well known. To better understand the diversity and ecology of one of the more unique habitats in the region, the grasshopper



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**Fig. 1.** Landscape view of the Ohoopee Dunes. For color version, see Plate I.

fauna of the Ohoopee Dunes was surveyed with the goal of providing baseline data for conservation efforts and for future ecological studies.

## Methods

*Study Sites.*—Collections of grasshoppers were made at five sites, four of which were Natural Area Tracts, and one of which was a Nature Conservancy Preserve (Fig. 2.). Although other habitats occur at these sites, collections were centered on sand dune habitats. All five sites are located on the east side of the Little Ohoopee River in Emanuel County, Georgia. Site 1, the McLeod Bridge Tract (lat 32°36′16″N, long 82°25′30″W), is approximately 694 acres (281 ha). It bisects McLeod Road and is approximately 5 miles (8 km) west of Swainsboro. Site 2, the Hwy 80 Tract (lat 32°34′31″N, long 82°26′30″W), occupies 792 acres (321 ha) and is located on the north side of US Hwy 80 approximately 6 miles (10 km) west of Swainsboro. Site 3, Hall's Bridge Tract (lat 32°31′51″N, long 82°27′23″W), is the largest tract at 1,018 acres (412 ha), and it bisects Hall's Bridge Road (county road 160) approximately 7.25 miles (11.6 km) southwest of Swainsboro. Site 4, the Covena Tract (lat 32°29′23″N, long 82°24′41″W), occupies approximately 190 acres (77 ha) and is located approximately 8 miles (13 km) southwest of Swainsboro on Stagecoach Road, just off of Highway 56. Site 5, the Nature Conservancy Preserve (lat 32°31′17″N, long 82°26′42″W), is about 267 acres (108 ha) and is adjacent to and just south of site 3. These are the same study sites used by MacGown *et al.* (In press).

*Sampling Methods.*—Collections were made on six separate occasions: 16-22 June 2002 (Sites 2, 3, and 5), 22-23 July 2006 (Site 3), 15-16 May 2007 (Site 3), 17-18 July 2007 (Sites 1 and 3), 5-9 October 2007 (Sites 1, 2, 3, and 5), and 21 and 26 July 2008 (Site 4). Grasshopper specimens were collected at night with a blacklight or in daylight with a net (30 cm diameter) after a collector on foot flushed them. These specimens were placed into a killing jar containing potassium cyanide and then taken to the laboratory where they were pinned and labeled with collection data including state, county, natural area, latitude and longitude, date, collector, and any pertinent biological information. They were identified by the author, and then deposited in the Mississippi Entomological Museum (MEM) and the Academy of Natural Sciences of Philadelphia.

*Illustrations.*—The previously unillustrated internal genitalia, and associated sclerites of two closely related species, *Melanoplus carnegiei* Morse and *M. quercicola* Hebard, species sympatric in the dunes, are illustrated to facilitate future identifications. Illustrations were made with a drawing tube mounted on a Leica MZ 12.5 stereomicroscope.

## Results

Twenty-two species of grasshopper were collected at the five study sites (Table 1). The most diverse subfamilies were the Melanoplinae and the Oedipodinae, each with eight species.



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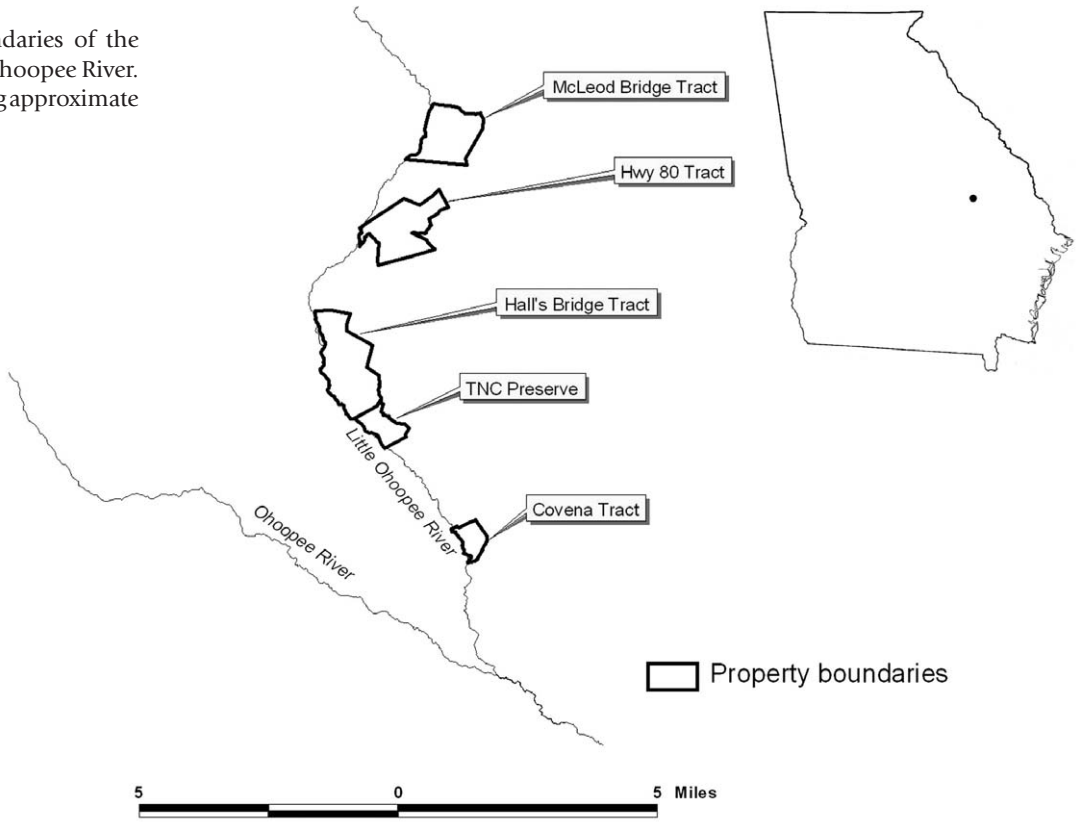



**Fig. 2.** Map showing boundaries of the study sites along the Little Ohoopee River. Inset map of Georgia showing approximate location of the sites.

*Spharagemon marmorata picta* (Scudder) was the most frequently encountered species, particularly in the more open areas. Several little known species, *Melanoplus carnegiei*, *M. quercicola*, and *M. stegocercus* Rehn & Hebard, were found during this survey. The collecting of *Melanoplus bispinosus* Scudder and *M. quercicola* represent the first known records of these species in Georgia.

## Discussion

### Grasshopper Fauna

Most of the grasshopper species that occur in the Ohoopee dunes can be found in a variety of habitats and/or soil types. However, many of the species present in large numbers on dunes can also be characterized as restricted to open habitats with predominantly sandy soils: *Psinidia fenestralis* (Serville), *Spharagemon cristatum* (Scudder), *S. marmorata picta* (Scudder), *Eotettix pusillus* Morse, *Melanoplus bispinosus*, *M. angustipennis* Dodge, *M. impudicus* Scudder. Another set of these abundant species are brachypterous and typically thamnophilous in nature, including *Eotettix pusillus*, *M. carnegiei*, *M. quercicola*, and *M. stegocercus*. Several species in this study were found more commonly along a grassy disturbed power-line right of way that transected the Covena Tract (Site 4), rather than in the more natural areas of the dunes: *Chortophaga australior* Rehn & Hebard, *Melanoplus angustipennis*, *M. bispinosus*, *M. impudicus*, *Psinidia fenestralis*, and *Syrbula admirabilis* (Uhler). Four species found during this survey require special note due to their poorly known biologies and distributions, including *Melanoplus bispinosus*, *M. stegocercus*, *M. carnegiei*, and *M. quercicola*.

The distribution of *M. bispinosus* is considered to be west of the Mississippi River, although scattered records exist in the southeastern United States. The first-documented occurrence of *M. bispinosus* east of the Mississippi River is from Alabama (Dakin & Hays 1970). Subsequently, *M. bispinosus* was reported from specimens collected in central Florida, where it is considered rare (Capinera *et al.* 1997, 2001). It also appears to be rare in Georgia, as only one specimen was collected during this survey and from other habitats in the eastern portion of the state.

*Melanoplus stegocercus* was originally described in 1916 from a single specimen collected along the Cannochee River near Groveland, Bryan Co., Georgia, on 28 July 1913, with no given description of the habitat (Rehn & Hebard 1916). Since its description no new information has appeared in the literature on this species.

*Melanoplus carnegiei* is known from Alabama, Georgia, and South Carolina and is typically found in the undergrowth of pine and oak woods; however little else is known (Blatchley 1920, Dakin & Hays 1970).

*Melanoplus quercicola* was described from specimens collected in areas of sandy soil among dwarf oaks (scrub) in eastern and northcentral Florida (Hebard 1918). Since its description, no new information on *M. quercicola* has appeared in the literature, including a list of Florida grasshoppers (Capinera *et al.* 2001) and a list of grasshoppers and their habitat associations in Florida (Squitier & Capinera 2002). The collections reported here represent new state records for Georgia.

Squitier and Capinera (2002) list 26 species as occurring in scrub habitat in the peninsular region of Florida. The most notable aspect of their list is that the majority of species found in the Florida scrub habitat are species primarily restricted to that state, a result of Florida's past geological history of isolation due to periods of alternate flooding and draining. The fauna of the Ohoopee Dunes contains only one species, *M. stegocercus*, that is apparently restricted to Georgia. A comparison of their list with the fauna of the Ohoopee



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**Table 1.** Comparison of grasshopper species found in Florida scrub habitat [from Squitier & Capinera (2002)] and those found on sand dunes along the Little Ohoopee River in Emanuel County, Georgia.

| Species | Florida scrub | Ohoopee Dune Scrub | Shared |
|---|---|---|---|
| *Achurum carinatum* | X | | |
| *Aptenopedes aptera* | X | | |
| *Aptenopedes sphenarioides* | X | | |
| *Arphia granulata* | X | | |
| *Arphia sulphurea* | | X | |
| *Chortophaga australior* | X | X | X |
| *Dichromorpha elegans* | X | | |
| *Eotettix pusillus* | | X | |
| *Eritettix obscurus* | X | | |
| *Eritettix simplex* | | X | |
| *Hesperotettix floridensis* | X | | |
| *Hesperotettix osceola* | X | | |
| *Melanoplus angustipennis* | | X | |
| *Melanoplus bispinosus* | X | X | X |
| *Melanoplus carnegiei* | | X | |
| *Melanoplus forcipatus* | X | | |
| *Melanoplus impiger* | | X | |
| *Melanoplus keeleri* | X | | |
| *Melanoplus propinquus* | X | X | X |
| *Melanoplus puer* | X | | |
| *Melanoplus quercicola* | | X | |
| *Melanoplus rotundipennis* | X | | |
| *Melanoplus stegocercus* | | X | |
| *Melanoplus tequestae* | X | | |
| *Orphullella pelidna* | X | X | X |
| *Pardalophora phoenicoptera* | | X | |
| *Psinidia fenestralis* | X | X | X |
| *Schistocerca alutacea* | X | X | X |
| *Schistocerca americana* | X | X | X |
| *Schistocerca ceratiola* | X | | |
| *Schistocerca damnifica* | X | X | X |
| *Spharagemon bolli* | | X | |
| *Spharagemon crepitans* | X | | |
| *Spharagemon cristatum* | X | X | X |
| *Spharagemon marmorata* | X | X | X |
| *Syrbula admirabilis* | X | X | X |
| *Trimerotropis maritima* | | X | |
| **Total** | **26** | **22** | **11** |

Dunes (Table 1.) reveals similar diversity (26 *vs* 22 species), but only 11 shared species (30%). All of the species shared between the two faunas, with the exception of *M. bispinosus*, can be considered common with relatively large geographic ranges. The similarity of species richness is impressive, given the larger geographic area covered by scrub in Florida compared to that in Georgia; this further indicates that the Ohoopee Dunes grasshopper fauna is both rich and unique, giving land managers another reason for conserving this unique ecosystem.

In conclusion, this study provides baseline data of the grasshopper fauna of dune habitats in Georgia for current and future conservation efforts, while shedding more light on the interesting fauna of the Atlantic Coastal Plain. The grasshoppers of the dunes along the Little Ohoopee River is relatively diverse and quite different from that of a similar habitat in Florida; however, there are dune systems along other rivers in Georgia that require further investigation. Future studies will focus on the fauna of these other dunes and the biogeographic relationships among the dunes of the Atlantic Coastal Plain and their relationship to other open habitats in the southeastern United States.

**Differentiation of *Melanoplus carnegiei* and *M. quercicola***

Two species very similar in appearance, *M. carnegiei* and *M. quercicola,* inhabit the Ohoopee dunes. Both belong to the *Melanoplus scudderi* species group; they are sympatric and synchronic, which presents identification difficulties, especially for nontaxonomic oriented scientists/conservationists. The two species are nearly identical; however, *M. carnegiei* may be distinguished from *M quercicola* by the shape of the male and female cerci and male supra-anal plate (Fig. 3 A, B, E, F, I, and J.). Upon review of the literature it was discovered that the internal genitalia of both species had not been illustrated. Given the local overlap in occurrence of these closely related species, the internal genitalia were examined to ensure that both were valid species. Examination of the internal male genitalia revealed that both species possessed aedeagi with distinctly different configurations (Fig. 3, C, D, G, and H). To facilitate future identifications, the diagnostic genitalic characteristics of each species are described below.

***Melanoplus carnegiei*.—**Male cerci broadly triangular, with all sides somewhat equal. Aedeagus with ramus of endo-apophyses occurring only basally, more globular in shape from caudal view. Ventral lobes of aedeagus with constant width throughout most of their length. Parameres longer than dorsal and ventral lobes, with apical fourth curved. Ventral lobes of aedeagus with basal half thicker than terminal half. Dorsal lobes of aedeagus appearing linear from lateral view. Female cerci similar to male's, being triangular with all sides sub equal.

***Melanoplus quercicola*.—**Male cercus triangular in shape, but with its sides nearly twice as long as its base, dorsal edge with concave curvature. Apical fourth of cercus curved inward. Aedeagus triangular in shape from caudal view, with ramus of the endo-apophyses encasing all but terminal portion. Parameres shorter than and primarily obscured from view by dorsal and ventral lobes. Dorsal lobes of aedeagus appearing triangular in shape from lateral view. Female cercus similar to male, being triangular, but with its sides nearly twice as long as its base.

**Species Notes**

The following list is annotated with behavior, microhabitats, and site records. Temporal occurrence is also noted. This annotated list is arranged alphabetically by species. Site records are numbered as follows: 1. McLeod Bridge Tract , 2. Hwy 80 Tract, 3. Hall's Bridge Tract, 4. Covena Tract, 5. Nature Conservancy Preserve.

***Arphia sulphurea* Fabricius:** this species was collected at only one site where it could be considered rare. Adults were collected on 16 May. Site 3.



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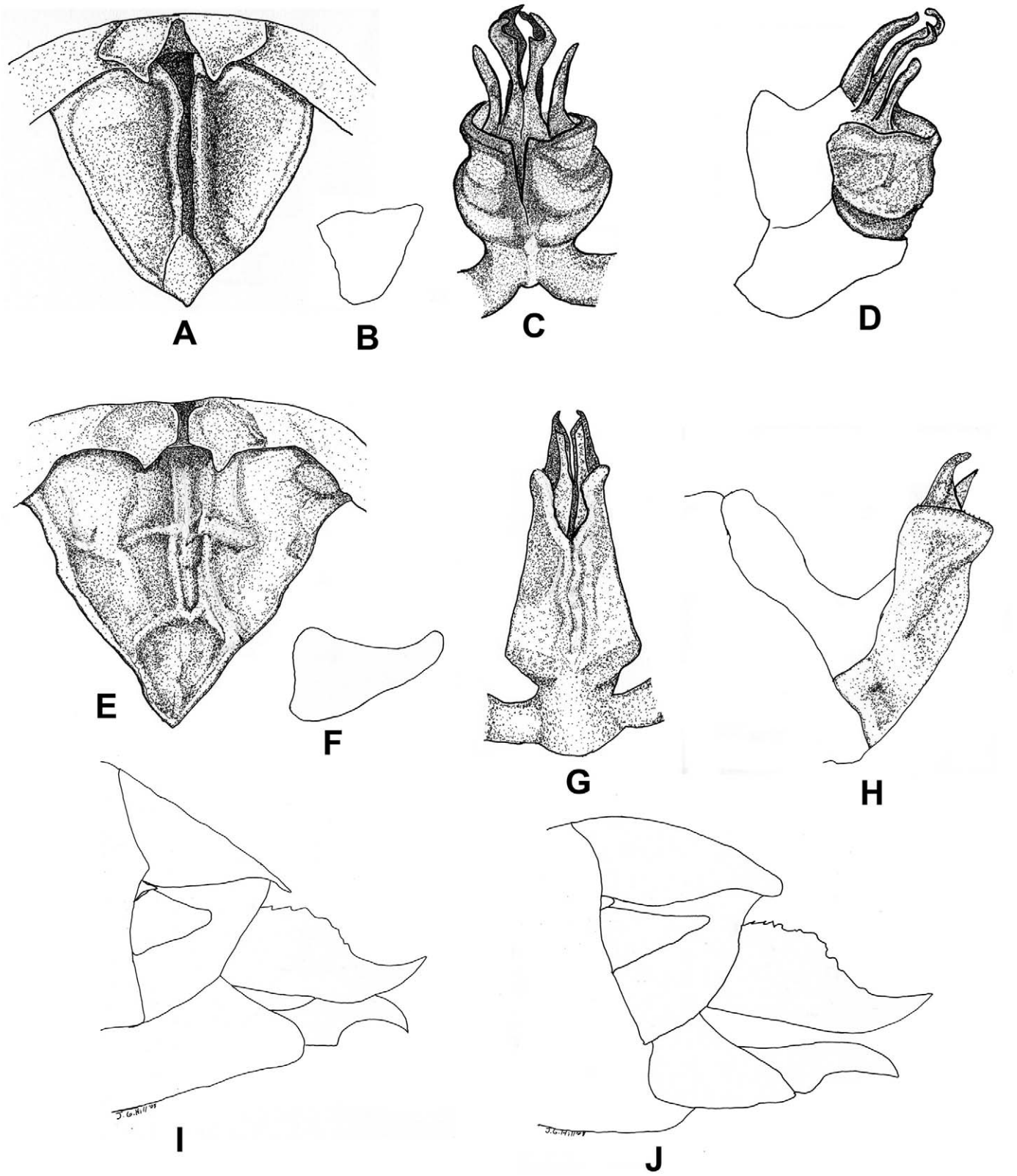



**Fig. 3.** Internal genitalia and associated sclerites of *Melanoplus carnegiei* and *M. quercicola*. A-D *M. carnegiei*: A. Male supra-anal plate. B. Male cerci. C. Aedeagus (rear view). D. Aedeagus (lateral view). E-H. *M. quercicola*: E. Male supra-anal plate. F. Male cercus. G. Aedeagus (rear view). H. Aedeagus (lateral view). I. Terminal portion of abdomen of female *M. carnegiei*. J. Terminal portion of abdomen of female *M. quercicola*.



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***Chortophaga australior* Rehn and Hebard**: this species was found at only one site; it was rare there except on the more disturbed areas of a treeless, somewhat grassier, power-line right of way that ran through the site. Adults were collected on 21 July and 26 July. Site 4.

***Eotettix pusillus* Morse:** this species was collected at only one site where it was rare. Only two individuals were seen/collected. Adults were collected 17 and 22 July. Site 3.

***Eritettix simplex* (Scudder):** this species was collected at only one site where it could be considered rare. It was found in small isolated patches of grass, and when disturbed would leap and hide in leaf litter on the ground. Adults were collected on 15 May and 17 July. Site 3.

***Melanoplus angustipennis* Dodge:** this species was collected at two sites. At site 4 it was common along a treeless/somewhat grassier power-line right of way that ran through the site. At site 5 it was common in areas of taller grass. Adults were collected on 21 July, 26 July, and 5 October. Sites 4 and 5.

***Melanoplus bispinosus* Scudder:** a single specimen of this species was collected along a treeless/somewhat grassier power-line right of way that ran through Site 4 on 21 July. See Discussion for more information. Site 4.

***Melanoplus carnegiei* Morse:** this species was collected at two sites where it was common. Individuals were observed roosting on dwarf oaks (*Quercus* spp.) at night in the dunes. Adults were collected 5-9 October. See Discussion and Fig. 2 for more information. Sites 1 and 3.

***Melanoplus impudicus* Scudder:** this species was collected at two sites where it could be considered rare. At site 3 it was found in small isolated patches of grass, and at Site 4 it was found along a treeless/somewhat grassier power-line right of way. Adults were collected on 16 May, 16 June, and July 21. Sites 3 and 4.

***Melanoplus propinquus* Scudder:** this species was collected at two sites where it could be considered rare. Only two individuals were seen. Adults were collected 25 July. Sites 1 and 4.

***Melanoplus quercicola* Hebard:** this species was collected at three sites where it could be considered common. Several pairs were seen *in copula* on 9 October 2007. Individuals of this species were observed roosting at night on dwarf oaks in the dunes. Adults were collected 6-9 October. See Discussion and Fig. 2 for more information. Sites 1, 2, and 3.

***Melanoplus stegocercus* Rehn and Hebard:** this species was collected at all sites, and was common at all of them. Nymphs of this species were observed during the May sampling period, and adults were first collected in mid-June. Several pairs of *M. stegocercus* were observed mating during the October visit to the dunes. These observations suggest that this species overwinters in the egg stage, emerges in spring, and then matures in early summer. Individuals were observed roosting on low-growing vegetation, such as the lower limbs of small oak trees during the night. See Discussion for more information. Sites 1, 2, 3, 4, and 5.

***Orphullela pelidna* Burmeister:** this species was collected at two sites where it was not very common. Later instar nymphs and one adult were collected on 18-22 June. Sites 3 and 5.

***Pardalophora phoenicoptera* (Burmeister):** this species was collected at three sites where it was relatively common. Adults were collected 15 May, 19 June and 25 July. Sites 3, 4, and 5.

***Psinidia fenestralis* (Serville):** this species was collected at two sites. At site 1, this species was not common, with only one individual seen/collected, whereas at Site 4 it was relatively common on the more disturbed area of the power-line right of way. It was not seen otherwise at site 4. Adults were collected 18 June and 21 July. Sites 1 and 4.

***Schistocerca americana* (Drury):** this species was collected at one site where it was common. Adults were collected both at blacklight and with a net, and were typically found inhabiting the canopy of the dwarf oaks. Adults were seen on all collecting visits (May-October), but were most common during the October visit. Site 3.

***Schistocerca alutacea* (Harris):** this species was collected at only one site where it was rare. Only one individual was taken. It flew across the trail in front of the collector and landed in the upper foliage of a turkey oak (*Q. laevis*). The lone specimen was collected on 8 October. Site 3.

***Schistocerca damnifica* (Saussure):** this species was collected at only one site where it was rare. The single individual collected appeared to be sunning on leaves of turkey oak (*Q. laevis*). Site 2.

***Spharagemon bolli* Scudder:** this species was found at four sites and was common at all of them. Adults were collected from 17 July to 8 October. Sites 1, 2, 3, and 4.

***Spharagemon cristatum* (Scudder):** this species was found at three sites where it was not common. It typically inhabited the more open areas of the dune-scrub habitat. Sites 1, 3, and 4.

***Spharagemon marmorata picta* (Scudder):** this species was collected at all sites and was very common. On 5 October 2008, adults of this species were observed drumming. The same day, one individual was seen chewing and possibly consuming dead oak (*Quercus* spp.) leaves on the ground, while another was seen consuming leaves of wire grass (*Aristida* spp.). Adults were collected from 15 June to 8 October. Sites 1, 2, 3, 4, and 5.

***Syrbula admirabilis* (Uhler):** this species was collected at two sites where it could be considered rare. At site 3, it was found in small isolated patches of grass, whereas at site 4 it was found along a treeless/somewhat grassier power-line right of way that ran through the site. Late-instar nymphs were observed on 17 July 2006 and adults were collected on 21 July2008. Sites 3 and 4.

***Trimerotropis maritima* (Harris):** this species was collected at one site where it was not common. Only one individual was taken. Site 3.

## Acknowledgements

I thank Matt Elliot of the Georgia Department of Natural Resources and Malcolm Hodges of the Georgia Nature Conservancy for allowing access to the study sites and for their interest in this project. Thanks to Matt Dakin for aiding with the determination of *M. stegocercus*. Thanks to Joe MacGown for providing instructions on scientific illustration, critique of the figure and manuscript, providing the photograph, comradery in the field and collecting several specimens. Thanks also to Richard Brown, Terry Schiefer, Sang Mi Lee, Mark Deyrup, Edda Martinez, and Xu Xhang for their comradery in the field. Figure 2 was primarily produced by Matt Elliot. Thanks also to Savannah Duckworth and Kristen Sauby for their assistance with specimen preparation. This project was funded by the William H. Cross Collecting Expedition Fund and a grant from the Georgia Department of Natural Resources, J. G. Hill and J. A. MacGown Co-PIs. This is publication J-11496 of the Mississippi Agricultural and Forestry Experiment Station.



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## References

Adams J.K. 2008. Moths and butterflies of Georgia and the southeastern United States. http://www.daltonstate.edu/galeps/ Accessed September 2008.

Blatchley W.S. 1920. Orthoptera of Northeastern America. The Nature Publishing Company, Indianapolis.

Capinera J.L., Scherer C.W., Simkins J.B. 1997. Habitat associations of grasshoppers at the Macarthur Agro-Ecology Research Center, Lake Placid, Florida. Florida Entomologist 80: 253-261.

Capinera J.L., Scherer C.W., Squitier J.M. 2001. Grasshoppers of Florida. University of Florida Press, Gainesville.

Dakin M.E. Hays K.L. 1970. A synopsis of Orthoptera (*Sensu Lato*) of Alabama. Auburn University Agricultural Experiment Station Bulletin 404: 1-118.

Hebard M. 1918. New genera and species of the Melanopli found within the United States. Transactions American Entomological Society. 44: 141-169.

Ivester A.H., Leigh D.S., Godfrey-Smith D.I. 2001. Chronology of inland eolian dunes on the coastal plain of Georgia, USA. Quaternary Research 55: 293-302.

Markewich H.W. Markewich W. 1994. An Overview of Pleistocene and Holocene inland Dunes in Georgia and the Carolinas—Morphology, Distribution, Age and Paleoclimate pp. 1-32. U.S. Geological Survey Bulletin 2069.

MacGown J.A., Hill J.G., Deyrup M. In Press. Ants (Hymenoptera: Formicidae) of the Little Ohoopee River Dunes, Emanuel County, Georgia. Journal of Entomological Science.

Otte D. 1981. The North American Grasshoppers Volume I: Acrididae: Gomphocerinae and Acrididae. Harvard University Press, Cambridge.

Rehn J.A.G. Hebard M. 1916. Studies in the Dermaptera and Orthoptera of the Coastal Plain and Piedmont region of the southeastern United States. Proceedings Academy of Natural Sciences of Philadelphia. 68: 87-314.

Skelly P.E. 2003. Review of the tribe Melolonthini in the southeastern United States (Coleoptera: Scarabaeidae: Melolonthinae). Insecta Mundi 17: 129-156.

Skelly P.E. 2006. A revision of the genus *Geopsammodius* Gordon and Pittino, 1992 (Scarabaeidae: Aphodiinae: Psammodiini). Insecta Mundi 20: 101-112.

Squitier J.M., Capinera J.L. 2002. Habitat associations of Florida grasshoppers. (Orthoptera: Acrididae). Florida Entomologist 85: 235-244.

Wharton C.H. 1989. The natural environments of Georgia. Georgia Department of Natural Resources Bulletin 114. pp. 1-227.



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