Cicindela

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Mating pair of *Cosmodela* sp.(?*duponti* Dejean coppery morph?) photographed in the Park of the Emperor Tu Duc, Hue City, Vietnam on 29 Sept 2011 by Alan Boba (forwarded by Don Miller).

RECENT LITERATURE

Beutel, R.G., I. Ribera, and O.R.P. Bininda-Emonds. 2008. A genus-level supertree of Adephaga (Coleoptera). *ORGANISMS, DIVERSITY & EVOLUTION* 7:255-269.

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Cassola, F. 2008. Studies of tiger beetles, CLXXVIII. A new *Lophyra* (*Lophyra*) from Somaliland (Coleoptera, Cicindelidae). *ZOOKEYS* 4:64-69.

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THE PHENOLOGY, DISTRIBUTION, HABITAT, AND STATUS OF THE TIGER BEETLES *CICINDELA NIGRIOR* SCHAUPP AND *CICINDELA SCUTELLARIS UNICOLOR* DEJEAN (COLEOPTERA: CICINDELIDAE) IN THE COASTAL PLAIN OF GEORGIA

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ABSTRACT: Field surveys conducted 2011–2012 in the Coastal Plain of southern Georgia expand the previously published range of the autumn tiger beetle (*Cicindela nigrior* Schaupp), a poorly-known species endemic to xeric sandhills. We documented *C. nigrior* from 13 sites in 10 counties; another sandhill specialist, *Cicindela scutellaris unicolor* Dejean (festive tiger beetle), was found at 30 sites in 22 counties. The two species were found in syntopy at only three sites. In Georgia, both species often inhabit riverine-dune sandhills of eolian origin that are underlain by deep, coarse, excessively well-drained sands (e.g., Kershaw and Lakeland Soils). We summarize our observations as they relate to the phenology, habitat, and distribution of these cicindelids and comment on the distribution of the morphologically identical green and black color forms of *C. nigrior*.

INTRODUCTION

Xeric sandhill habitats in the Coastal Plain of southern Georgia support a diverse tiger beetle fauna, including several species (*Cicindela nigrior* Schaupp, *C. scutellaris unicolor* Dejean, *C. abdominalis* Fabricius, and *C. hirtilabris* LeConte) that are essentially restricted to this habitat type (Beaton 2008). *Cicindela nigrior* (autumn tiger beetle) was previously considered a subspecies of *C. scutellaris* (festive tiger beetle), and they are remarkably similar in many morphological and ecological features. It has been posited that these two species are the result of a temporal separation of previously conspecific populations (Pearson and Vogler 2001, Pearson et al. 2006). The complex taxonomic history of *C. nigrior* is summarized by Vick and Roman (1985), who elevated this taxon to a full species based on morphological, behavioral and ecological data.

The distribution of *Cicindela scutellaris unicolor* includes the Coastal Plain and portions of the Piedmont, from North Carolina south to central Florida, thence west to Mississippi (Pearson et al. 2006). *C. nigrior* appears to be confined to two possibly separate discrete areas, with one somewhat continuously distributed population occurring in the Fall Line Sandhills region of extreme southern North Carolina, South Carolina and Georgia, extending southeastward into sandhill regions associated with major blackwater streams in portions of southeastern Georgia, and a second population known from the Gulf Coastal Plain of extreme southwestern Georgia into the panhandle of Florida, thence west into Alabama and southeastern Mississippi (Pearson et al. 2006).

Cicindela nigrior may be distinguished from *C. scutellaris unicolor* by the following characteristics (also see Vick and Roman [1985]): a) adults of both species are approximately the same length (11-14 mm [0.43-0.55 inches]); however, *C. nigrior* is a slightly more robust form (and is mentioned as slightly larger in some treatments [Pearson et al. 2006]); b) the "less shiny" dorsal color of adult *C. nigrior* is most commonly either dull black (Fig. 1) or dark green and lacks maculations; the dorsal color of *C. s. unicolor* is most commonly a bright green or a shiny blue-green, lacking maculations (Fig. 2), but some Georgia specimens have reduced apical lunules (Choate 2003). (Based on our observations, ca. 40% of Georgia specimens have some amount of white at the apical lunules). Brilliant blue examples of both species are occasionally encountered; c) male *C. nigrior* possess a black labrum with two cleanly separated white spots while male *C. s. unicolor* have an all-white labrum; d) in adult *C. nigrior*, the median tooth of labrum is smaller than the lateral teeth; in *C. s. unicolor*, the median tooth of labrum is larger than the lateral teeth (Vick and Roman, 1985).

Cicindela scutellaris unicolor is a spring-fall species (i.e., adults are surface active during these seasons), mates in the spring, and has a 2-year life cycle (Pearson and Vogler 2001), while *Cicindela nigrior* is only active in the fall. We conducted the study reported herein to determine the current distribution/status of these two beetle taxa in Georgia and to elucidate habitat type preferences exhibited by the two species.

Figure 1. Black morph of *C. nigrior*, photographed September 2008 in Taylor County, Georgia.

Figure 2. *C. scutellaris unicolor* photographed October 2012 in Emanuel County, Georgia.

METHODS

The second author (GB) surveyed the tiger beetle fauna of Georgia from 2000–2012 (Beaton 2008); both GB and the senior author (DJS) intensively sampled xeric sandhill habitats throughout southern Georgia during the fall/winter/spring of 2011–2012 and 2012–2013, with a special emphasis on locating *C. nigrior* and *C. scutellaris unicolor* populations. Repeat visits were often made to known *C. nigrior* and *C. scutellaris unicolor* sites during the same year/season in an attempt to determine species abundance or continued presence. We captured beetles by hand or with insect nets and preserved specimens in 90% isopropyl alcohol. Voucher specimens (as well as digital images of adult beetles for many sites) are currently maintained in the personal collection of GB; ultimately, these will be deposited in the arthropod collection at the Georgia Museum of Natural History (GMNH) in Athens. In an effort to obtain additional Georgia locality records for *C. nigrior* and *C. scutellaris unicolor*, GB examined the personal collection of the late Paul Choate and museum specimens at the University of Georgia (Athens) Museum of Natural History (GMNH), Georgia Southern University (GSU), Georgia Southwestern State University (GSWSU), the Florida State Collection of Arthropods (FSCA, Gainesville, Florida), and the North Carolina State Museum (NCSM, Raleigh). Using the diagnostic characters mentioned in Vick and Roman (1985), inspections of 39 beetles labeled "*C. scutellaris*" at GMNH, most collected long before *C. nigrior* was considered a separate species, resulted in the redetermination of 24 specimens as *C. nigrior*.

For each of our *C. nigrior* and *C. scutellaris unicolor* collection sites we determined soil type (Natural Resources Conservation Service, United States Department of Agriculture 2012) and qualitatively classified habitat type as either: 1) intact xeric sandhill ecosystem (i.e., with longleaf pine [*Pinus palustris* Mill.], native flora including wiregrass [*Aristida stricta* Michx.] as the predominant ground cover, and a history of fire management) (Wharton 1978, Chafin 2007); 2) anthropogenic disturbance (e.g., sand road, powerline, road margin, firebrake, recent clearcut, sandpit, etc.) adjacent to intact xeric sandhill habitat; 3) anthropogenic disturbance adjacent to or within a highly disturbed former sandhill landscape.

RESULTS AND DISCUSSION

We collected *C. nigrior* at 13 sites in 10 Georgia counties and verified museum records for four additional sites (Appendix 1; Figure 3). We collected *C. scutellaris unicolor* at 30 sites in 22 Georgia counties and verified museum records for two additional sites (Appendix 1; Figure 4). For *C. nigrior*, two (15 %) of our collection sites were intact xeric sandhills; 10 (77 %) were an anthropogenic disturbance proximal to intact sandhills; and one site (8 %) was a prominent anthropogenic disturbance. For *C. scutellaris unicolor,* 10 (33 %) of our collection sites were intact xeric sandhills; 18 (60 %) were an anthropogenic disturbance proximal to intact sandhills; and two (7 %) were from a prominent anthropogenic disturbance. Below, we summarize our observations as they relate to the phenology, habitat, and the distribution and status of these tiger beetles, with a focus on *C. nigrior*. For *C. nigrior*, we discuss the distribution of the morphologically identical black and green color forms.

Phenology

Cicindela nigrior is unusual among northern Nearctic cicindelids in having only a "fall" (actually late summer-fall-early winter, *see below*) activity period. In southern Georgia, the first adults emerge during late August or early September, with peak numbers present from mid-September to late November. In warm years, adults have been found surface-active as late as early January (e.g., 1 January 2012; 4 January 2013, *this study*). *C. scutellaris* exhibits a spring-fall activity period, with adults emerging as early as late January (our earliest collection dates are 29 January [2013] and 1 February [2012], both dates during abnormally warm winters), with an early March appearance being the norm in

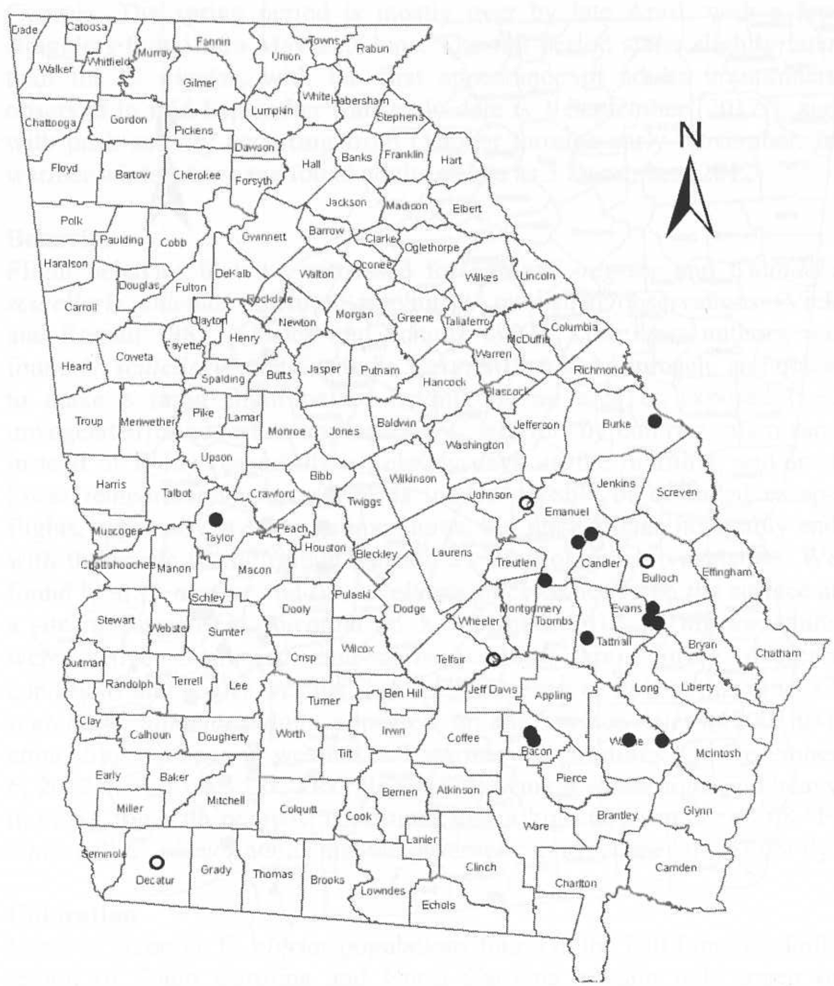

Figure 3. Locality records for *Cicindela nigrior* in Georgia.
● *C. nigrior* records documented by this study
○ Other *C. nigrior* museum records

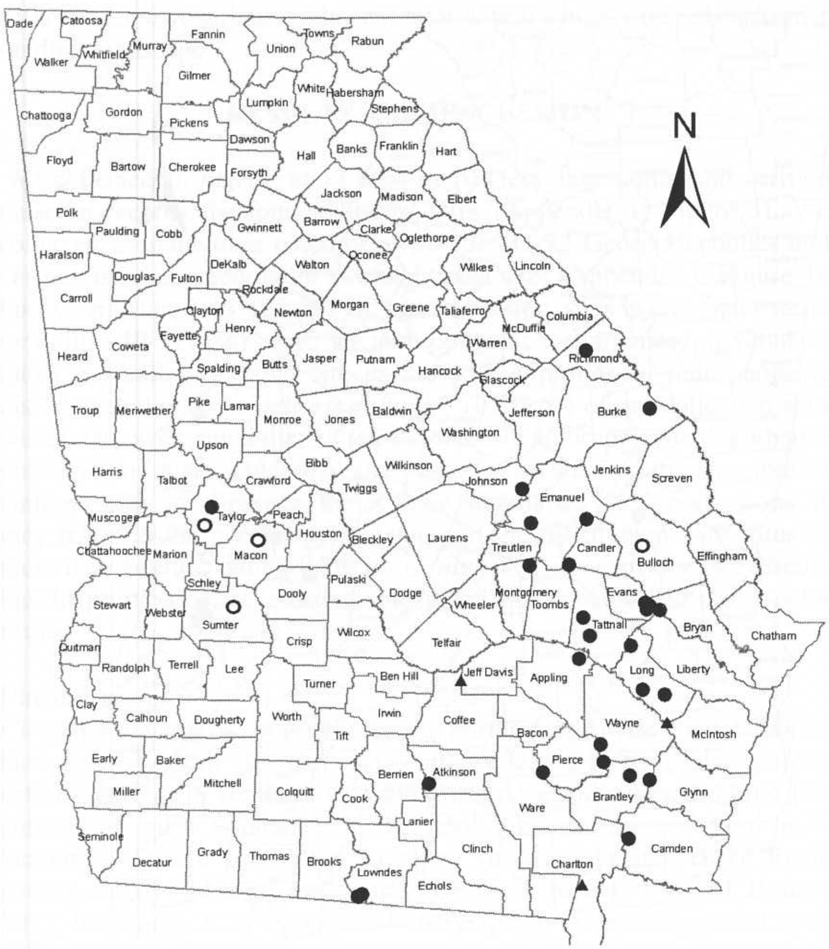

Figure 4. Locality records for *Cicindela scutellaris unicolor* in Georgia.
● *C. scutellaris unicolor* records documented by this study.
○ Other *C. scutellaris unicolor* museum records.
▲ *C. scutellaris unicolor* observed by authors (no voucher specimens)

Georgia. The spring period is mostly over by late April, with a few stragglers found into May and June. The fall period starts slightly later than for *C. nigrior*, with the first appearance of adults in numbers observed in mid-September (our early date is 1 September [2012]), and with peak activity occurring from October through early November. In warmer winters we have found adults as late as 3 December (2012).

Behavior

Flight behavior that we witnessed for adult *C. nigrior* and *Cicindela scutellaris unicolor* mirrored previously published observations (Vick and Roman 1985, Knisley and Schultz 1997). Like these authors, we found *C. scutellaris unicolor* to be wary, difficult to approach, and quick to make a rapid flight before landing on an area of exposed (i.e., unvegetated) sand; when approached, *C. nigrior*, by contrast, often runs instead of flying (especially on cloudy days, in the morning, and/or at lower temperatures). *C. nigrior* is indeed capable of extended escape flights, especially at warm temperatures, but these flights invariably end with the beetle taking refuge beneath a clump of grassy vegetation. We found both *C. nigrior* and *C. scutellaris unicolor* active on the surface at a site in Tattnall Co., Georgia on 3 December 2012. *C. nigrior* adults were active beginning mid-morning (1030 hrs) during overcast conditions and cooler weather; beetles ran but never flew at this time; *C. scutellaris unicolor* adults appeared on the surface later (1200 hrs), coinciding with sunny weather and warmer temperatures. On December 6, 2012 at an Evans Co., Georgia site following a warm night and heavy morning fog with overcast conditions and a high temperature of 68 °F, almost all *C. nigrior* adults that we observed ran to escape but did not fly.

Coloration

North of Georgia, *C. nigrior* populations found in the Fall Line Sandhills region of South Carolina and North Carolina contain only green or Prussian blue-colored beetles. In Georgia, all populations known from the southeast part (i.e., Atlantic Coastal Plain) of the state are comprised of both black and green forms, except for three extant sites south of the Altamaha River (in Bacon and Wayne Counties) and one historic site north of and near the Ocmulgee River (Telfair County) where beetles are exclusively green. (Note: this is based on only six specimens from the Bacon County site and five museum specimens from the Telfair County site, all of which were green; several dozen beetles, all green, were found at the Wayne County sites). A well-collected Fall Line sandhills population in southwestern Georgia (Taylor County) is represented solely by black forms. Museum specimens from extreme southwestern Georgia (*n*=10, Decatur County) are all green. Paul Choate (pers. comm.) mentioned collecting a single green form from a site east of the Apalachicola River in Liberty County, Florida. In the remainder of the species' range (i.e., the Gulf Coastal Plain west of the Apalachicola River, including the Florida Panhandle, southern Alabama, and extreme southeastern Mississippi) only black forms are present. The Apalachicola River is a significant biogeographical barrier that has played an important role in structuring genetic diversity (Soltis et al. 2006).

Habitat

The xeric sandhill habitats required by *C. nigrior* and *C. scutellaris unicolor*, austere environments underlain by deep, coarse sands, are easily recognized by patches of bare sand and an abundance of turkey oaks (*Quercus laevis* Walter) and other xerophytic oaks (sand post oak [*Quercus margarettae* Ashe ex Small], bluejack oak [*Q. incana* Bartram], and sand live oak [*Q. geminata* Small]). In southeastern Georgia, dune-like ridges composed of deep (2.4–9.1 m [8–30 feet]), excessively well-drained sands (Kershaw, Lakeland Soils) of eolian origin line the northeastern sides of many SE-trending blackwater streams (e.g., Canoochee River, Ohoopee River, and Little Ocmulgee River) (Wharton 1978, Markewich and Markewich 1994, Ivester and Leigh 2003). These fascinating natural communities, classified as "Atlantic Coastal Plain Xeric River Dune" by NatureServe (2012), support endemic plants specific to droughty sands including sandhills rosemary (*Ceratiola ericoides* Michx.), woody mints (*Clinopodium coccineum* [Nutt.] Kuntze, *C. ashei* [Weatherby] Small), and woody goldenrod (*Chrysoma pauciflosculosa* [Michx.] Greene) and provide excellent habitat for sand-loving tiger beetles like *C. nigrior* and *C. scutellaris unicolor*. Such "riverine dune" habitats are somewhat topographically isolated and extremely nutrient-limited, thus having a lower fire return interval than other pine upland habitats native to

southern Georgia (Wharton 1978, NatureServe 2012). While we commonly collected *C. scutellaris unicolor* from the barren, sandy floors of xeric river dune sandhills (commonly observing them on the aprons of gopher tortoise [*Gopherus polyphemus* Daudin] burrows), the *C. nigrior* populations that we documented from these habitats were limited to obvious anthropogenic disturbances (road margins, powerlines, unimproved sand roads) where the soil was compacted and lightly vegetated with grasses.

Other xeric sandhill habitats inhabited by *C. nigrior* and *C. scutellaris unicolor*, also underlain by well-drained or excessively well-drained sands (e.g., Bonifay, Albany, and Blanton soils), lack the plant specialists listed above and typically support a more diverse ground cover. Naturally-functioning examples of the sandhill ecosystems inhabited by *Cicindela nigrior* (Fig. 5) and *C. scutellaris unicolor* (Fig. 6) are forested with an open canopy of scattered longleaf pine and are pyric, fire-controlled communities with biotas that have evolved in response to frequent, low-intensity surface fires (Wharton 1978, Myers 1990). The effects of fire (e.g., prescribed fires conducted during the dormant season vs. the growing season), or lack thereof, on the arthropod faunas native to these communities, including tiger beetles, is poorly studied (Folkerts et al. 1993). However, regular fire events increase biomass and species richness of herbs/grasses and thus promote greater diversity and biomass of arthropods (see discussion in Folkerts et al. 1993), which is probably important for tiger beetle populations indigenous to xeric sandhills.

Native longleaf pine habitats (including xeric sandhills) have declined dramatically (reduced to less than 2% of their original coverage by the end of the 20th century) in the Coastal Plain of the southeastern United States due to historic (from ca. 1880s–1930s) large-scale industrial logging, fire suppression or interruption of natural fire cycles, agriculture, urbanization, and commercial silviculture (Platt 1999, Earley 2004, Van Lear et al. 2005).

Vick and Roman (1985) reported that although *C. s. unicolor* is widely distributed and common in "loose sand" habitats close to *C. nigrior* sites, the two species typically are not found in syntopy. Our observations support this statement: we invariably found *C. scutellaris*

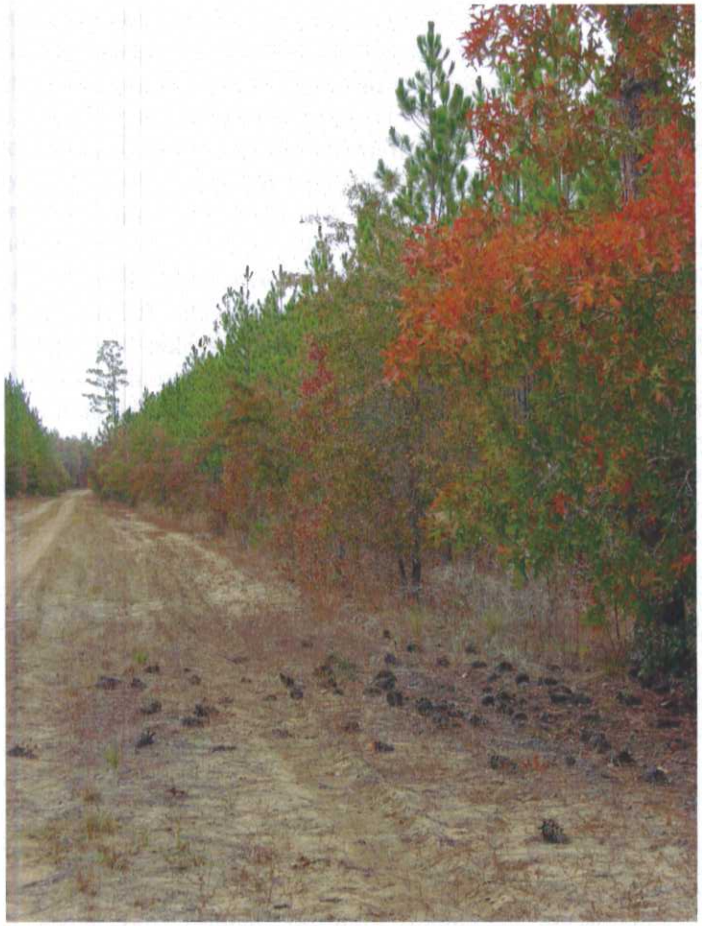

Figure 5. This aeolian sandhill (Lakeland soil type) in Bryan County, Georgia, supports a population of *C. nigrior*. Native longleaf pines here have been replaced by planted slash pine, and beetles seem confined to the sparse grasses along the margin of this primitive road.

Figure 6. A xeric sandhill of aeolian origin (Kershaw soil type), inhabited by *C. scutellaris unicolor*, in Bryan County, Georgia.

unicolor associated with soft ("sugar-like" or powdery), unvegetated sands, while *C. nigrior* were characteristically found on well-packed sands at sites with moderate amounts of grassy vegetation (including disturbed roadsides where sands were stabilized by non-native grasses). We found the two species syntopically at only three sites; at these, a juxtaposition of the representative habitats of both species resulted from anthropogenic disturbance. We believe that both *C. nigrior* and *C. scutellaris unicolor* are good examples of tiger beetle species which are becoming increasingly dependent on open patches of habitat created via anthropogenic disturbances (Knisley 2011).

The methods that we used in an attempt to discern habitat differences between *C. nigrior* and *C. scutellaris unicolor* (determining soil type per NRCS and qualitatively evaluating habitat characteristics) were unsuccessful, as many soil and habitat types were common to both species (Appendix 1). The fact that many *Cicindela nigrior* populations in Georgia (and in other states) inhabit sites that have experienced significant anthropogenic disturbance spurs the question, "What exactly is the archetypal habitat for *C. nigrior*?" We encourage future investigators to quantitatively examine a myriad of soil characteristics (i.e., soil moisture, soil particle size, degree of compaction, etc.) at known *C. nigrior* and *C. scutellaris unicolor* sites, as we suspect this might elucidate differences between the two species. At several of the Georgia *C. nigrior* sites reported herein, noticeable relief (i.e., slopes) was present on that area of the sandhill where beetles occurred. Several other *C. nigrior* sites were associated with the edges of paved roads through sandhills, close to man-made embankments that sloped gently to small, sandy ditches.

Distribution and Status

Cicindela scutellaris unicolor records obtained by this study indicate that this species is common and generally distributed throughout much of the Coastal Plain of southeastern and southcentral Georgia (Fig. 4). Although undocumented by our study, the species may be expected to occur in sandhills associated with the Flint-Chattahoochee River drainage in extreme southwestern Georgia, given its presence just south of the state line in Florida (Choate 2003). In Figure 4, we did not map two museum records for the Piedmont region of Georgia (Clarke and Morgan Counties, GMNH specimens).

In contrast, the rather limited records for *C. nigrior* suggest that this species is rare and locally distributed (Fig. 3). The *C. nigrior* collections reported herein, including new records for xeric sandhills within the Altamaha, Canoochee, Ohoopee, and Satilla River drainages, document this species to be more widely distributed in the lower and middle Coastal Plain of southern Georgia than previously recognized.

Currently, neither *C. scutellaris unicolor* nor *C. nigrior* are federally- or state-listed in any states within their respective ranges. *Cicindela nigrior* is tracked by the Natural Heritage Programs in Florida, Georgia, Alabama, and Mississippi and is under review for possible tracking in North Carolina (Jeff Hall pers. comm., 2012). It is likely that both *C. nigrior* and *C. scutellaris unicolor* have experienced significant population declines in Georgia and range-wide due to habitat loss and habitat degradation. Even so, the ability of *C. nigrior* (and *C. scutellaris unicolor*) populations to persevere or even thrive in disturbed habitats, especially along unimproved sand roads, may bode well for the long-term conservation of these beetles (Knisley 2011). Five of the 13 *C. nigrior* sites currently known for Georgia are on public lands or conservation easements.

A *C. nigrior* population from near Kite, Johnson County, Georgia, has apparently been extirpated (P. Choate, pers. comm., 2008), and the current status of *C. nigrior* in southwest Georgia is poorly known. Some of the *C. nigrior* sites that we discovered in Georgia seem to be highly localized, relatively small populations that are potentially vulnerable to overcollection.

We recommend continued inventories across its range in an effort to document new *C. nigrior* populations, as well as periodic monitoring of known *C. nigrior* sites. The species has yet to be recorded from sandhills along the Alapaha and Withlacoochee Rivers in south-central Georgia (both regions still with large areas of potential habitat), and our collection from a Satilla River sandhill (Bacon Co., Georgia) hint that the species may occur further downstream (southeast) in this watershed. Two notable public lands located in the Fall Line Sandhills region of Georgia (Fort Benning and Fort Gordon), and Fort Stewart, situated in the lower

Atlantic Coastal Plain, all have extensive areas of suitable habitat for *C. nigrior*, although as of yet beetle populations have not been verified from any of these sites.

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APPENDIX. Habitat classification: 1) intact xeric sandhill ecosystem (i.e., with longleaf pine [*Pinus palustris*], native flora including wiregrass [*Aristida stricta*] as the predominant ground cover, and a history of fire management)(Wharton 1978, Chafin 2007); 2) anthropogenic disturbance (e.g., sand road, powerline, road margin, firebreak, recent clearcut, sandpit, etc.) adjacent to intact xeric sandhill habitat; 3) anthropogenic disturbance adjacent to or within a highly disturbed former sandhill landscape. (see next page).

Appendix. Habitat characteristics of *Cicindela nigrior* and *C. scutellaris unicolor* sites in Georgia.

Taxon	County	River Basin	Soil Type NRCS	Hab-itat	Mo/Yr	Syn-topic	Color	Remarks
nigrior	Bacon	Satilla	Kershaw	3	Dec-12	no	grn	
nigrior	Bacon	Satilla	Kershaw	2	Dec-12	no	grn	
nigrior	Bryan	Canoochee (Ogeechee)	Lakeland	2	Nov-11, Dec-11, Sep-12	no	grn/blk	
nigrior	Bulloch	Canoochee (Ogeechee)	Kershaw	2	Nov-11	no	grn/blk	
nigrior	Burke	Savannah	Lakeland	1	Oct-12	yes	grn/blk	
nigrior	Emanuel	Canoochee (Ogeechee)	Kershaw	2	Nov-10	no	grn/blk	
nigrior	Emanuel	Canoochee (Ogeechee)	Kershaw	2	Sep-12, Oct-12	yes	grn/blk	
nigrior	Evans	Canoochee (Ogeechee)	Bonifay	1	Dec-11, Jan-12, Sep-12, Nov-12, Dec-12, Jan-13	no	grn/blk	
nigrior	Tattnall	Ohoopee (Altamaha)	Bonifay, Pelham	2	Dec-12	yes	grn/blk	
nigrior	Taylor	Flint	Lakeland	2	Oct-07, Sep-08, Oct-12	no	blk	
nigrior	Toombs	Ohoopee (Altamaha)	Lakeland & Troup	2	Oct-11	no	grn/blk	
nigrior	Wayne	Altamaha	Lakeland	2	Oct-12	no	grn	
nigrior	Wayne	Altamaha	Lakeland	2	Oct-12	no	grn	
nigrior	Bulloch	Ogeechee			Sep1991, Oct1991		grn/blk	"Statesboro" GSU colln
nigrior	Decatur	Flint			Sep1910		grn	"Bainbridge" GMNH colln
nigrior	Decatur	Flint			Sep1941		grn	"Bainbridge" GMNH colln
nigrior	Johnson	Ohoopee (Altamaha)			fall 1984		grn/blk	"ca. 1.0 km E Kite"
nigrior	Telfair	Ocmulgee			Sep1941		grn	"Lumber City" GMNH colln
unicolor	Appling	Altamaha	Kershaw	2	Sep-12	no		
unicolor	Atkinson	Alapaha	Blanton	2	Oct-12	no		
unicolor	Brantley	Satilla	n/a	2	Oct-12	no		
unicolor	Brantley	Satilla	n/a	2	Oct-12	no		
unicolor	Brooks	Withlacoochee (Suwannee)	Lakeland	2	Nov-06, Sep-08	no		
unicolor	Bryan	Canoochee (Ogeechee)	Kershaw	2	Nov-11	no		
unicolor	Bryan	Canoochee (Ogeechee)	Kershaw	1	Nov-11	no		
unicolor	Burke	Savannah	Lakeland	1	Oct-04, Oct-12	yes		

Appendix (cont.)

Taxon	County	River Basin	Soil Type NRCS	Hab	Mo/Yr	Syn-topic	Color	Remarks
unicolor	Camden	Satilla	Pottsburg Sand	2	Oct-12	no		
unicolor	Candler	Ohoopee (Altamaha)	Kershaw	1	Oct-11	no		
unicolor	Charlton	Suwannee	n/a	2	Oct-12	no		sight record
unicolor	Coffee	Ocmulgee (Altamaha)	Bonifay	2	Oct-11	no		sight record
unicolor	Emanuel	Canoochee (Ogeechee)	Kershaw	1	Nov-10	yes		
unicolor	Emanuel	Ohoopee (Altamaha)	Kershaw	1	Sep-04	no		
unicolor	Evans	Canoochee (Ogeechee)	Bonifay	1	Feb-12	no		
unicolor	Evans	Canoochee (Ogeechee)	Bonifay	2	Nov-11	no		
unicolor	Glynn	Satilla	Pottsburg Sand	3	Oct-12	no		
unicolor	Johnson	Ohoopee (Altamaha)	Lakeland	3	Oct-06	no		
unicolor	Long	Altamaha	Blanton	1	Sep-12	no		
unicolor	Long	Altamaha	Kershaw	2	Jun-07, Nov-11, Nov-12	no		
unicolor	Long	Altamaha	Kershaw	2	Oct-12	no		sight record
unicolor	Long	Altamaha	Echaw & Centernary	2	Nov-12, Jan-13	no		
unicolor	Lowndes	Withlacoochee (Suwannee)	Lakeland	2	Nov-06	no		
unicolor	Montgomery	Ohoopee (Altamaha)	Kershaw	1	Sep-12	no		
unicolor	Pierce	Satilla	Lakeland	1	Feb-12	no		
unicolor	Richmond	Savannah	Ailey	2	Oct-06	no		
unicolor	Tattnall	Ohoopee (Altamaha)	Kershaw	2	Nov-11	no		
unicolor	Tattnall	Ohoopee (Altamaha)	Kershaw	1	Nov-11, Dec-12	yes		
unicolor	Taylor	Flint	Lakeland	2	Oct-07, Oct-10	no		
unicolor	Wayne	Satilla	Lakeland	2	Oct-12	no		
unicolor	Bulloch	Ogeechee			Oct			"Bulloch County State Forest" GSU colln
unicolor	Macon	Flint			April			GSWSU colln
unicolor	Sumter	Flint			April			GSWSU colln
unicolor	Taylor	Flint			Apr1980			GMNH colln
unicolor	Taylor	Flint			May1987			"7.0 mi SW Butler" FSCA colln

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Author's name, upper/lower case, centered
12-point "Arial" font

Author's address, upper/lower case
10-point "Times" font
(Use footnotes for multiple addresses)

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