

Hybosorus illigeri Reiche Confirmed as Part of the Virginia Beetle Fauna, With Notes on *Germarostes* (Coleoptera: Hybosoridae)

Arthur V. Evans¹

Virginia Department of Conservation and Recreation
Division of Natural Heritage
217 Governor Street
Richmond, Virginia 23219

ABSTRACT

Hybosorus illigeri Reiche is confirmed as part of the Virginia beetle fauna. A brief overview of the current taxonomic status of the subfamilies Ceratocanthinae and Hybosorinae is presented, along with new Virginia county records and natural history notes for *Germarostes aphodioides* (Illiger) and *G. globosus* (Say).

Key words: arboreal, Ceratocanthinae, *Ceratocanthus*, *Germarostes*, Hybosoridae, *Hybosorus*, saproxylic, tree canopy, Virginia.

INTRODUCTION

Hybosorus illigeri Reiche is recorded from Alabama, Arizona, Arkansas, Florida, Georgia, Kansas, Kentucky, Louisiana, Mississippi, Missouri, New Mexico, North Carolina, Oklahoma, South Carolina, Tennessee, and Texas (Ocampo, 2002). Ocampo also listed one specimen from Virginia without any further locality information. A single specimen of this species was located among unidentified beetles in the insect collection of the Virginia Museum of Natural History (VMNH), Martinsville, VA, with the following label data: City of Chesapeake, Northwest River Park, ca. 5 mi. SE Hickory, 18-25 July 2005, R. Vigneault.

Hybosorus illigeri is an Old World species native to “temperate Europe, all of Africa except the Sahara desert, and from the Middle East to Viet Nam and China . . . at altitudes from sea level to nearly 2,000 m” (Ocampo, 2002). They were apparently introduced into the New World in the 19th century via the slave trade, or through some other type of commerce (Ocampo, 2002). In the New World, *H. illigeri* is found across the entire southern third of the United States (including California), Mexico, Central America, Venezuela, and several islands of the Caribbean (Ocampo, 2002;

California Beetle Project, 2008).

Adults of *Hybosorus illigeri* are collected at light, and in carrion and dung (Ocampo, 2002). This species also scavenges dead beetles at lights, suggesting that they are present in dung and carrion as insect predators rather than dung or carrion feeders (Woodruff, 1973; Ocampo, 2006). Adults are active from February through December, with the vast majority of specimens collected in June and July (Ocampo, 2002, 2006). Buss (2006) trapped individuals from April through December in Gainesville, Florida, and nearly year-round in Fort Lauderdale. She noted that peak adult activity at both sites was in May and June, with a second, smaller peak in August and September, suggesting that at least part of the Florida population is double-brooded. Adults were observed emerging from burrows in golf courses. Although they do not harm turf, their abundance and the small mounds they make are considered nuisances by golfers and greens keepers (Buss, 2006).

The larvae of *H. illigeri* develop in the soil and have been collected among the roots of fennel (*Foeniculum* sp.) in Georgia, and Bermuda grass turf (*Cynodon dactylon* (L.) Pers.) in Texas (Grebennikov et al., 2004).

¹Current address: 1600 Nottoway Avenue, Richmond, Virginia 23227; arthurevans@verizon.net

NOTES ON OTHER VIRGINIA
HYBOSORID BEETLES

The ceratocanthines have been treated as a tribe of the Trogidae (Martinez, 1968), a family of the Scarabaeoidea (Lawrence & Newton, 1995; Jameson, 2002; Smith, 2006; Ratcliffe & Paulsen, 2008), a subfamily of the Scarabaeidae (Woodruff, 1973; Hoffman, 2006), or as a subfamily of the Hybosoridae (Ocampo & Ballerio, 2006). Based on the strong evidence provided by phylogenetic analyses of molecular and larval data presented by Grebennikov et al. (2004) and Ocampo & Hawks (2006), Ocampo (2006) treated them as a subfamily of the Hybosoridae. Four of the five North American species of Hybosoridae occur in Virginia: *Hybosorus illigeri* Reiche, 1853 (Hybosorinae), and *Ceratocanthus aeneus* (MacLeay) 1819, *Germarostes aphodioides* (Illiger, 1800), and *Germarostes globosus* (Say, 1835) (Ceratocanthinae) (see Hoffman, 2006).

Germarostes aphodioides was recorded from Buckingham County by Robinson (1918), while Hoffman (2006) added Dickenson and Lee counties. To these I add Caroline, Fairfax, Madison, and Prince William counties. Most of the specimens were collected in June and July at UV light traps. Robinson (1918) collected three specimens under the bark of a recently killed black oak, *Quercus velutina* Lam. I found the Prince William County specimens at night about a meter high or more on the standing bole of a dying, fungus-ridden American tulip tree (*Liriodendron tulipifera* L.) near Mountain House in the Bull Run Mountains Natural Area Preserve at the end of May.

Germarostes globosus is known from the Virginia counties of Appomattox, Bath, Brunswick, Buckingham, Dickenson, Dinwiddie, Essex, Fairfax, Greensville, Halifax, Isle of Wight, Lee, and Prince William, and the cities of Suffolk and Virginia Beach (Robinson, 1918; Hoffman, 2006). To these I add Caroline, Chesterfield, Hanover, and Powhatan counties, and the City of Richmond. Most of these specimens were collected in May and June in UV light traps. The Powhatan County record was taken in an unbaited Lindgren funnel trap (C. Wirth, pers. comm.). The City of Richmond specimen was collected in July about midbole under the loose bark on a recently downed oak (*Quercus* sp.) tree. Robinson (1918) collected four specimens under the bark of a recently killed black oak.

Adults of North American ceratocanthines are collected at light, under bark, beating dead limbs and vines, and at carcasses (*Germarostes*) (Blatchley, 1910; Woodruff, 1973). They probably feed on fungi (Ratcliffe & Paulsen, 2008), a hypothesis that appears

to have been borne out by gut content analyses on adults of all three species in Florida (D. Almquist, pers. comm.).

The larva of *G. aphodioides* was collected under the bark of a standing oak in Maryland (Ritcher, 1966). Woodruff (1973) reared *G. globosus* from frass collected in the burrows of bess beetles, *Odontotaenius disjunctus* (Illiger) (Passalidae).

A recent study in Africa suggests that some ceratocanthines are arboreal. In western Uganda, Ballerio & Wagner (2005) reported that nearly 700 individuals representing five species of ceratocanthine scarabs in four genera were collected from the canopy of understory trees in a semi-deciduous rainforest during a fogging study using an insecticide.

The North American ceratocanthine fauna may also be decidedly arboreal in habit. In Florida, Choate (1987) found both adults and larvae of *Ceratocanthus aeneus* (MacLeay) in a tree hole about 1.5 feet (0.5 m) above the ground, while D. Almquist (pers. comm.) collected a small series of *C. aeneus* in a window trap suspended about 15 feet (5 m) in the tree canopy.

In a study on habitat associations of saproxylic beetles in South Carolina, Ulyshen & Hanula (2008) found both *G. aphodioides* and *G. globosus* on standing dead water oak (*Quercus nigra* L.) and sweetgum (*Liquidambar styraciflua* L.) at mid-bole, or higher, including the crown. In Florida, Almquist (pers. comm.) has found both species of *Germarostes* relatively common in Lindgren funnel traps, set at ground level and baited with moist sawdust.

It is entirely possible that the fungal-ridden cavities in the boles of living trees and snags in the deciduous woodlands of eastern North America, especially in the Southeast, may harbor all stages of ceratocanthines in abundance. Direct investigations and specialized trapping methods that target this niche at various heights may be the first step toward a better understanding of this poorly known segment of the North American beetle fauna.

ACKNOWLEDGEMENTS

The beetle survey of the Bull Run Mountains Natural Area Preserve was funded by the Bull Run Mountains Conservancy and the Virginia Department of Conservation and Recreation, Division of Natural Heritage (DCR-DNH). I thank Michael Kieffer and Jennifer Helwig (Bull Run Mountains Conservancy) for providing access and logistical support during the survey. I am indebted to Faye McKinney (DCR-DNH) for her able assistance with administrative matters related to the survey. Paula Evans reviewed an early draft of the manuscript. Paul Bedell (Richmond, VA),

Anne Chazal (DCR-DNH), and Chris Wirth (Powhatan, VA) provided specimens of *Germarostes* used in this study. Alberto Ballerio (Brescia, Italy) promptly provided pertinent literature and offered helpful suggestions. Dave Almquist (Florida Natural Areas Inventory, Gainesville, FL) generously shared unpublished data from his work in preparation on ceratocanthines in Florida. Bruce Gill (Canadian Food Inspection Agency, Ottawa, ON) and Federico Ocampo (Instituto de Investigaciones de las Zonas Aridas, Mendoza, Argentina) graciously reviewed this manuscript to improve its accuracy and readability. I also thank Steve Roble and two anonymous reviewers for their comments on the manuscripts. Finally, I thank Richard Hoffman (VMNH) for granting me access to the museum collection and his generous hospitality while working at the museum.

LITERATURE CITED

- Ballerio, A., & T. Wagner. 2005. Ecology and diversity of canopy associated Ceratocanthidae (Insecta: Coleoptera, Scarabaeoidea) in an Afrotropical rainforest. Pp. 125-132 *In* B.A. Huber, B.J. Sinclair, & K.-H. Lampe (eds.), African Biodiversity. Molecules, Organisms, Ecosystems. Springer, New York, NY.
- Blatchley, W. S., 1910. An illustrated descriptive catalogue of the Coleoptera or Beetles (exclusive of the Rhynchophora) known to occur in Indiana, with bibliography and descriptions of new species. Indiana Department of Geology and Natural Resources Bulletin 1: 1-1386.
- Buss, E. A. 2006. Flight activity and relative abundance of phytophagous scarabs (Coleoptera: Scarabaeoidea) from two locations in Florida. *Florida Entomologist* 89: 32-39.
- California Beetle Project, 2008. <http://www.sbnature.org/collections/invert/entom/cbphomepage.php>. Accessed 30 December 2008.
- Choate, P. M. 1987. Biology of *Ceratocanthus aeneus* (Coleoptera: Scarabaeidae: Ceratocanthinae). *Florida Entomologist* 70: 301-305.
- Grebennikov, V.V., A. Ballerio, F. C. Ocampo, & C. H. Scholtz. 2004. Larvae of Ceratocanthidae and Hybosoridae (Coleoptera: Scarabaeoidea): study of morphology, phylogenetic analysis and evidence of paraphyly of Hybosoridae. *Systematic Entomology* 29: 524-543.
- Hoffman, R. L. 2006. The volvating scarabaeid beetles of Virginia (Coleoptera: Scarabaeidae: Ceratocanthinae). *Banisteria* 28: 49-52.
- Jameson, M. L. 2002. Chapter 32. Ceratocanthidae Martínez, 1968. Pp. 34-36 *In* R. H. Arnett, Jr., M. C. Thomas, P. E. Skelley, & J. H. Frank (eds.), American Beetles. Volume 2. Polyphaga: Scarabaeoidea through Curculionoidea. CRC Press, Boca Raton, FL.
- Lawrence, J. F., & A. F. Newton, Jr. 1995. Families and subfamilies of Coleoptera (with selected genera, notes, and references and data on family-group names). Pp. 779-1,006 *In* J. Pakaluk & S. A. Slipinski (eds.), Biology, Phylogeny, and Classification of Coleoptera. Papers Celebrating the 80th Birthday of Roy A. Crowson. Muzeum i Instytut Zoologii PAN, Warszawa, Poland.
- Martinez, A. 1968. Insectos nuevos o poco conocidos XIII. Ceratocanthini nom. nov. para Acanthocerini (Coleoptera, Scarabaeidae, Troginae). *Revista de la Sociedad Entomológica Argentina* 30: 9-16.
- Ocampo, F. C. 2002. Hybosorids of the United States and expanding distribution of the introduced species *Hybosorus illigeri* (Coleoptera: Scarabaeoidea: Hybosoridae). *Annals of the Entomological Society of America* 95: 316-322.
- Ocampo, F. C. 2006. Phylogenetic analysis of the scarab family Hybosoridae and monographic revision of the New World subfamily Anaidinae (Coleoptera: Scarabaeoidea). 1. Introduction to the scarab family Hybosoridae (Coleoptera: Scarabaeoidea). *Bulletin of the University of Nebraska State Museum* 19: 3-6.
- Ocampo, F. C., & A. Ballerio. 2006. Catalog of the subfamilies Anaidinae, Ceratocanthinae, Hybosorinae, Liparochrinae, and Pachyplectrinae (Scarabaeoidea: Hybosoridae). *Bulletin of the University of Nebraska State Museum* 19: 178-209.
- Ocampo, F. C., & D. C. Hawks. 2006. Phylogenetic analysis of the scarab family Hybosoridae and monographic revision of the New World subfamily Anaidinae (Coleoptera: Scarabaeoidea). 2. Molecular phylogenetics and systematic placement of the family Hybosoridae (Coleoptera: Scarabaeoidea). *Bulletin of the University of Nebraska State Museum* 19: 7-12.
- Ratcliffe, B. C., & M. J. Paulsen. 2008. The scarabaeoid beetles of Nebraska. *Bulletin of the University of Nebraska State Museum* 22. 570 pp.

- Ritcher, P. O. 1966. White Grubs and Their Allies. A Study of North America Scarabaeoid Larvae. Oregon State University Press, Corvallis, OR. 219 pp.
- Robinson, W. 1918. Beetles collected on a dead black oak in Virginia. *Journal of the New York Entomological Society* 26: 30-33.
- Smith, A. B. T. 2006. A review of the family-group names for the superfamily Scarabaeoidea (Coleoptera) with corrections to nomenclature and a current classification. *Coleopterists Society Monograph* 5: 144-204.
- Ulyshen, M. D., & J. L. Hanula. 2008. Habitat associations of saproxylic beetles in the southeastern United States: a comparison of forest types, tree species and wood postures. *Forest Ecology & Management* 257: 653-664.
- Woodruff, R. E. 1973. The scarab beetles of Florida (Coleoptera: Scarabaeidae). Part 1. The Laparosticti. *Arthropods of Florida and Neighboring Land Areas* 8. 220 pp.