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The Cicada Parasite Beetles (Coleoptera: Rhipiceridae) of Virginia

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ABSTRACT

The family Rhipiceridae is represented in Virginia by two species, *Sandalus niger* Knoch and *S. petrophya* Knoch, the latter of which is documented from the state for the first time.

Key words: cicada parasite beetle, new state record, Rhipiceridae, *Sandalus*, Virginia.

INTRODUCTION

The Rhipiceridae, also known as cicada parasite or cedar beetles, is a small family with more than 100 species in seven genera (Lawrence, 2005). The family is represented in the Nearctic region by *Sandalus* (Greek σανδαλον, or sandals), a genus proposed by Knoch (1801) to include two North American species *S. petrophya* and *S. niger*. *Sandalus* occurs in the New World, Africa, southeast Asia, China, India, and Japan (Katovich, 2002) and is in need of revision. The Nearctic fauna currently consists of five species, three of which occur in eastern North America. Of these, only two, *S. niger* Knoch and *S. petrophya* Knoch, occur in Virginia. The third species, *S. porosus* LeConte, ranges from Florida west to Colorado and Arizona (Katovich, 2002).

The common name "cedar beetle" was most likely instigated by LeConte's (1862) statement that the Rhipiceridae was "A family containing a small number of species, found on plants; *Sandalus* especially affecting various cedars…" and popularized by Blatchley (1910) and Arnett (1963). The more recent moniker "cicada parasite beetles," first coined by Downie & Arnett (1996), is more descriptive given the available information on the larval biology of *Sandalus*. As noted by Dodge (1941), the "apparent association with certain trees has no significance except as it may indicate host or oviposition preferences of the host cicada."

METHODS

This study is based on our own field work, literature records, and the examination of specimens housed in the following collections: Virginia Museum of Natural History, Martinsville, Virginia (VMNH); Virginia Polytechnic Institute and State University, Blacksburg, Virginia (VPIC); National Museum of Natural History, Smithsonian Institution, Washington, D.C. (NMNH); George Washington Memorial Parkway, Turkey Run Park, McLean, Virginia (GWMP); Arthur V. Evans, Richmond, Virginia (AVEC).

RESULTS AND DISCUSSION

Adult *Sandalus* are long (15-24 mm), convex, reddish brown or black (sometimes bicolored) and coarsely punctured beetles (Fig. 1); females are typically larger than males. The head has bulging eyes,

Fig. 1. *Sandalus petrophya* Knoch, female.

prominent hypognathous mandibles, and 11-segmented antennae that are distinctly flabellate in males and more or less serrate in females. The prothorax becomes wider posteriorly and is narrower than the base of the elytra. The long, vaguely ribbed and coarsely punctured elytra completely conceal the abdomen, which has five visible sternites. The tarsal formula is 5-5-5. Tarsomeres 1-4 are heart-shaped with membranous lobes and the claws are simple and equal in size.

Very little is known about the biology of rhipicerid beetles, with the exception of *S. niger*. Adults of this species do not feed and reach peak activity from late September through early October (Rings, 1942; Elzinga, 1977; Katovich 2002). They are found resting on tree trunks or grass, in Malaise trap samples, and are occasionally attracted to lights.

Elzinga (1977) observed mating aggregations of *S. niger* on the trunks of American Elm (*Ulmus americanus*), Shingle Oak (*Quercus imbricarius*), beech (*Fagus*), ash (*Fraxinus*), and other hardwoods. Adults emerge from their burrows in the morning and crawl up trunks to mate. Females lay large numbers of eggs in the holes and cracks of bark, preferably in areas where there are numerous cicadas. Rings (1942) noted that a single female could produce more than 16,000 eggs. Craighead (1921) proposed that the larvae of *S. niger* develop as ectoparasitoids of immature cicadas after discovering a pupa and cast larval exoskeleton of the beetle within a dead and hollowed-out cicada nymph. This assertion was later supported by descriptions of the first instar triungulin of *S. niger* (Dodge, 1941; Elzinga, 1977) that is typical of other beetle parasitoids. The larval stages between the triungulin and pupa remain unknown.

The adults of *Sandalus* in Virginia are distinguished by the characters in the key below.

Key to the Adult *Sandalus* of Virginia
(after Staines, 1982)

Sides of prothorax uniformly narrowed from posterior to anterior (Fig. 2), keel weakly developed, especially at basal third (Fig. 3) (17-25 mm)……
.....*Sandalus niger* Knoch

Sides of prothorax subangulate behind middle (Fig. 4), and distinctly keeled throughout (Fig. 5) (12-18 mm)…….…….....*Sandalus petrophya* Knoch

Sandalus niger Knoch

This species is known from southern Ontario to Florida, west to Colorado and Texas. **Canada:** Ontario (Hicks, 1942). **United States:** Alabama, Colorado, District of Columbia, Florida, Georgia, Indiana, Illinois, Iowa, Kansas, Kentucky, Maryland, Michigan, Missouri, Nebraska, New Jersey, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Virginia, West Virginia, and Wisconsin (Brimley, 1938; Downey & Arnett, 1996; Dury, 1879, Elzinga, 1977, Craighead, 1921, Young & Katovich, 2002; Kirk, 1969, 1970; Leng, 1928; Manee, 1908; Rings, 1942; Skelley, pers. comm.; Staines, 1982; Ulke, 1902; Young, 2002). Specimens have been examined from the following counties and cities in **Virginia**: Alexandria (City), Chesapeake (City), Fairfax, Franklin, Montgomery, Richmond (City), Scott, and Shenandoah. (AVEC, GWMP, NMNH, VMNH, VPIC). In Virginia, individuals of *S. niger* have been found from July through November. This species is widespread in Virginia (Fig. 6) and has been collected in the Coastal Plain, Piedmont, Appalachian Plateau, and Valley and Ridge physiographic regions.

Sandalus petrophya Knoch
NEW STATE RECORD

This species occurs from New York to Florida, west to Indiana, Missouri, and Alabama, but has not been reported from Virginia previously. **United States:** Alabama, District of Columbia, Florida, Georgia, Illinois, Indiana, Kentucky, Louisiana, Maryland, Missouri, New Jersey, New York, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, and West Virginia (Blatchley, 1910; Carlton, pers. comm.; Downie & Arnett, 1996; Dury, 1882; Leng, 1928; Say, 1835; Peck & Thomas, 1998; Smith, 1900; Staines, 1982; Ulke, 1902).

Fig. 2. Dorsal view of prothorax of *Sandalus niger* Knoch, male (top) and female (bottom).

Fig. 4. Dorsal view of prothorax of *Sandalus petrophya* Knoch, male (top) and female (bottom).

Fig. 3. Lateral prothoracic margin of *Sandalus niger* Knoch.

Fig. 5. Lateral prothoracic margin of *Sandalus petrophya* Knoch.

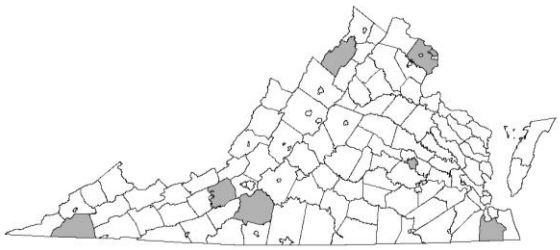

Fig. 6. County and city distribution map for *Sandalus niger* Knoch based on specimens examined from Virginia.

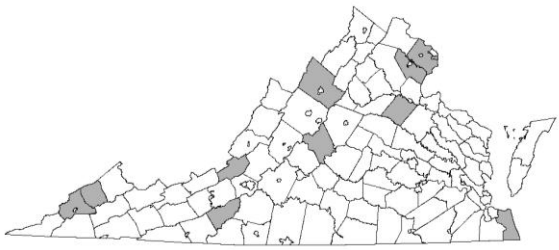

Fig. 7. County and city distribution map for *Sandalus petrophya* Knoch based on specimens examined from Virginia.

Sandalus petrophya has been found in the following counties and cities in **Virginia**: **Alexandria (City):** Del Ray, 27 October 2000, R. B. & A. Faden (1); Washington Golf Club, Jewell, 16 August 1925, L.L. Buchanan (1). **Craig Co.:** Jefferson National Forest, FR 620, 12 August 1997, M. W. Donahue (1). **Dickenson Co.:** Breaks Interstate Park, 1-14 July 2000, R. Vigneault (1). **Fairfax Co.:** parking lot, Turkey Run Park Headquarters, McLean, 20 July 2006, B. W. Steury (1); same data, except 28 July 2009 (1); 2 mi. SW Vienna, 30 July 1932, J. C. Bridwell (1); Vienna, 23 July 1913, R. A. Cushman (1); W Falls Church, VI-28-1917, on oak tree, J. L. Wrenn (1); Falls Church, 18 July 1914, H. B. Kirk; same data except 13 August 1914, G. M. Greene (1); same data except 14 August 1914 (2); same data except 7 August 1914 (1); same data except 26 August 1917 (1); Springfield, 26-29 July 1968, Joseph W. Adams (2); Black Pond, 29 June 1914, E. Shoemaker (1); Dead Run, 6 August 1915, R. C. Shannon (1); Great Falls, VII.4 [no year] (1). **Floyd Co.:** county only, 23 August 1982, M. W. Allen (2). **Nelson Co.:** county only, 1 August 1917, W. Robinson (14). **Prince William Co.:** Bull Run Mountains Natural Area Preserve, Little Ridge Loop Trail at Catlett Crk., N38.82642º W077.70203º, 28 July 2008, A.V. Evans, flying/woods AM (1); Occoquan, VIII.1919, Wickham (1). **Rockingham Co.:** Rader Mountain, FR 597, 7 October 1997, M. Donahue (1). **Spotsylvania Co.:** Fredericksburg, 11 August 1897, E. A. Schwarz (1). **Virginia Beach (City):** Camp Pendleton Annex, vic. NW jct. S. Birdneck & Washington Rds., N36.81383º W075.97079º, Malaise trap, 22 July-19 August 2009, A. V. Evans (1). **Wise Co.:** Powell Mountain Karst Preserve, Cedar Ridge Malaise trap, ca. 1.3 km E Cracker Neck Church, N36.8538533º W082.6998265º, 29 July-20 August 2009, C. S. Hobson (1); same data except 20 August-21 September 2009 (1). (AVEC, GWMP, NMNH, VMNH, VPIC).

Little has been published on this species. Say (1835) frequently observed this species on the flowers of "a resinous plant common on the prairies of Missouri." Wenzel (1886) observed *S. petrophya* near Philadelphia during the summer, mostly in mid-July. Dirt encrusted adults, mostly females, were found emerging from the ground in the morning and crawling up the trunks of American Beech (*Fagus grandiflora*). They have also been found under bark or on trunks of trees (Blatchley, 1910).

In Virginia, *S. petrophya* is widespread (Fig. 7) and found in the Coastal Plain, Piedmont, Appalachian Plateau, and Ridge and Valley physiographic regions. Habitat at the Turkey Run Park collection site is successional Tulip-tree (*Liriodendron tulipifera*) forest with nearby mature stands of mesic mixed hardwood forest consisting of oaks (*Quercus* spp.), hickory (*Carya* spp.) and Sugar Maple (*Acer saccharum*). Evans observed and collected a single female flying next to a stream through a wooded area about 1000 h in July in the Bull Run Mountains Natural Area Preserve in Prince William County.

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