

The Forest Caterpillar Hunter, *Calosoma sycophanta*, An Old World Species Confirmed as Part of the Virginia Beetle Fauna (Coleoptera: Carabidae)

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ABSTRACT

The presence of the predatory forest caterpillar hunter, *Calosoma sycophanta* (Linnaeus), is confirmed in Virginia. A native of Europe, this species was purposefully introduced into North America early in the 20th Century as part of a biological control project to control the gypsy moth, *Lymantria dispar* (Linnaeus) and browntail moth, *Euproctis chrysorrhoea* (Linnaeus) in New England. A brief review of the distribution and natural history of *C. sycophanta* in North America is presented, along with a key to the species of *Calosoma* in Virginia.

Key words: Bull Run Mountains, *Calosoma*, Carabidae, Coleoptera, forest caterpillar hunter, Virginia.

INTRODUCTION

In July of 2008, while conducting a beetle survey of the Bull Run Mountains Natural Area Preserve in Fauquier and Prince William counties in Virginia, I found numerous metallic green elytra scattered along a foot trail winding through an oak woodland on a west-facing slope. The area had been heavily infested with the larvae of the gypsy moth, *Lymantria dispar* (Linnaeus), as evidenced by thousands of larval exuviae and pupal cases that festooned the trunks of oaks and other hardwood trees.

At first glance, I thought the beetle remains were those of the indigenous caterpillar hunter or fiery searcher, *Calosoma scrutator* (Fabricius), a common, brightly colored, and widespread carabid beetle found in the mountains and lowlands of Virginia. Closer inspection revealed that the elytra were much brighter and more yellow than those of *C. scrutator* and lacked the characteristic coppery red border along the lateral and apical margins.

Further searching in the area produced an extremely fragile, yet nearly intact specimen ensnared in an

abandoned spider web. The pronotum of this specimen was mostly black with metallic blue along the margins, rather than bluish with violet or coppery yellow-green borders typical of *C. scrutator*. Of the five other species of *Calosoma* known in Virginia (*C. calidum* [Fabricius], *C. externum* [Say], *C. frigidum* Kirby, *C. sayi* Dejean, and *C. wilcoxi* LeConte), only *C. wilcoxi* has entirely metallic green elytra, but it is smaller and much duller than either *C. scrutator* or the silk-wrapped remains in question. All seven species of *Calosoma* in Virginia are shown in Figure 1.

With the aid of Gidaspow's (1959) monograph on the *Calosoma* of North America, I identified the Bull Run Mountains corpse as the European forest caterpillar hunter, *C. sycophanta* (Linnaeus). The label data for this specimen and a single elytron are as follows: USA: VA, Fauquier Co., Bull Run Mountains NAP, W of Bull Run Mountain Estates, N38.87875 W77.68927, 20 August 2008, A.V. Evans. Both specimens are housed in my collection.

Gidaspow (1959) provides a brief history of the initial introduction of *C. sycophanta* into the United States. Already known as an important predator of gypsy moth larvae in France, 4,046 beetles were imported into the United States between 1905 and 1910, most of which were released in New England to

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combat outbreaks of two European species of lymantriids: the gypsy moth, *Lymantria dispar* (Linnaeus), and the browntail moth, *Euproctis chrysorrhoea* (Linnaeus). For a more complete overview of the life history, behavior, and introduction of *C. sycophanta* in New England, see Burgess (1911) and Burgess & Collins (1915).

DISTRIBUTION IN NORTH AMERICA

Bousquet & Laroche (1993) record *C. sycophanta* in the United States from Connecticut, Maine, Massachusetts, Michigan, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and Washington. Weseloh et al. (1995) note releases in Delaware, Michigan, and West Virginia, adding that the species was already established in the latter. Schaefer et al. (1999) added Maryland to the list, but did not find recent records of the beetle in Michigan or Washington that were not associated with releases and concluded that *C. sycophanta* is not yet established in these states. In spite of releases on Vancouver Island, British Columbia, Quebec, New Brunswick, and Nova Scotia, *C. sycophanta* is not known to be established in Canada (Bousquet, 1991; Schaefer et al., 1999).

Schaefer et al. (1999) provide an informative overview of historical range expansion of *C. sycophanta* in North America from 1905 to 1994, including a state and county map showing intentional release sites. They note a single record from Winchester, Virginia, collected on 9 July 1915 by O.I. Shapp in the collection of the National Museum of Natural History (NMNH), Smithsonian Institution, Washington, DC. However, Schaefer et al. (1999) state that the "...specimen probably resulted from an intentional release made just prior to its collection" and that "no population persisted in Virginia in subsequent years." A second Virginia record from 1974 was reported by Thiele (1977), but this was disputed by Schaefer et al. (1999), who could not locate the specimen in the NMNH collection. They believe that Thiele's record was erroneous and intended to refer to the 1915 specimen.

With relatively recent recoveries of beetles in West Virginia (1994) and Maryland (1998), combined with its dispersal abilities (see Doane & Schaefer, 1971), Schaefer et al. (1999) concluded that *C. sycophanta* was very likely to occur in northern Virginia. They included the region in their 1994 distribution map with a question mark, and noted that the next Virginia occurrence would establish a renewed state record. The aforementioned discovery of numerous elytra and an intact specimen in the Bull Run Mountains does indeed establish the presence of *C. sycophanta* in the

Commonwealth.

I located the 1915 Virginia specimen of *C. sycophanta* in the insect collection of the NMNH, but no subsequent Virginia records were found. Nor were specimens located in the collection at Virginia Polytechnic Institute & State University. However, at the Virginia Museum of Natural History, I found one specimen of *C. sycophanta* amongst a series of *C. scrutator* with the following locality data: VA, Prince William Co., Prince William Forest Park, June 8, 1992, J.C. Killian, uv light trap. It is not known if this specimen represents an established population.

NATURAL HISTORY

Both the adult and larval *C. sycophanta* climb trees to attack and eat caterpillars and pupae of gypsy moths and other species (Gidaspow, 1959). Adult males are more likely to be found on tree trunks, while females tend to remain on the ground (Weseloh, 1993). Based on observations in the laboratory and in the field (Weseloh, 1993), both males and females are active day and night. Males tend to be more active and conspicuous, spending most of their time searching for mates, while the more secretive females spend much of their time buried in the soil and hidden among leaf litter to feed and lay eggs.

Adult activity coincides with the larval activity of the gypsy moth. Adults emerge from their overwintering sites in June to search for prey and mates, although some beetles may remain dormant for up to two years (Laroche & Larivière, 2003). Although adults are strong and agile fliers and capable of leaving their overwintering sites behind to search for high populations of caterpillars, their appearance at new outbreaks of gypsy moths is by no means certain (Doane & Schaefer, 1971). Released beetles often remain near the release site (Weseloh et al., 1995).

They will attack a variety of other caterpillar species, but they are most abundant where populations of gypsy moth caterpillars are high, especially at sites two or three years after an outbreak (Weseloh, 1985; Weseloh et al., 1995). Adults are active for only about a month and re-enter the soil in July and remain there until the following spring (Weseloh et al., 1995).

Weseloh (1993) suggests that adult *C. sycophanta* predation alone is not the beetle's primary impact on gypsy moth populations. Instead, the forest caterpillar hunter's greatest impact is through larval production and the voracious appetites of the larvae for mature caterpillars and pupae. The ability of adult beetles to reproduce is directly dependent upon the availability of high densities of gypsy moth caterpillars, especially since females require sufficient protein to ensure

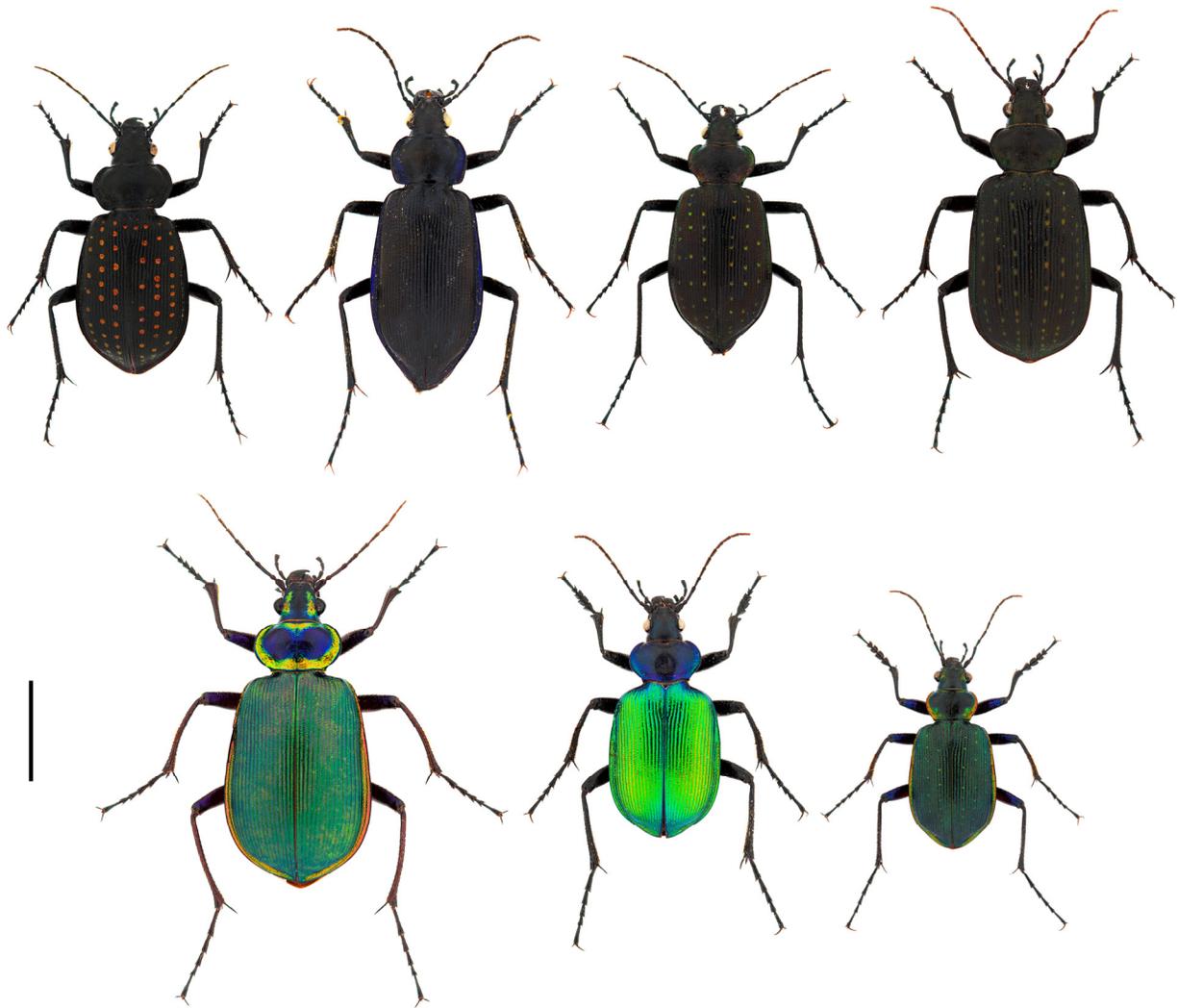


Fig. 1. The Virginia species of *Calosoma* include, from top to bottom, left to right: *C. calidum* (Fabricius), *C. externum* (Say), *C. frigidum* Kirby, *C. sayi* Dejean, *C. scrutator* (Fabricius), *C. sycophanta* (Linnaeus), and *C. wilcoxi* LeConte. The scale bar equals 5.0 mm. Photos © 2009, Chris Wirth.

successful oviposition (Spieles & David, 1998).

Eggs are laid in the soil beginning in early July and hatch in 4-7 days. The larvae climb trees in search of caterpillars and pupae. The remains of pupae attacked by beetle larvae have characteristically large and jagged holes (Weseloh et al., 1995). Mature beetle larvae seek pupation sites in the soil. The entire life cycle, from egg to adult, takes about seven weeks. In Connecticut, adults are known to live 3-4 years (Weseloh, 1990).

Anecdotal evidence suggests that forest caterpillar hunters are potentially important predators of gypsy moth larvae and pupae, but there is still much to learn (Weseloh, 1985). Nearly all of the information on the ecology and behavior of *C. sycophanta* was gathered

during the brief period of adult activity that coincides with gypsy moth outbreaks, but little is known about the ecology of this species between outbreaks (Weseloh, 1990).

IDENTIFICATION OF *CALOSOMA* SPECIES IN VIRGINIA

The genus *Calosoma* is distinguished from other Virginia carabids by the following combination of characters: large size (19-35 mm); head wider than half the width of the pronotum; antennal segments 5-10 pubescent with large glabrous spots; large mandibles lack teeth near the apex, but have distinct or indistinct

ridges across the base; last segment of maxillary palp larger and broader than the penultimate segment; elytra with distinctly impressed grooves; flight wings well-developed; front tarsi expanded in males (Ciegler, 2000). The genus contains the largest and most brilliantly colored ground beetle in Virginia, *C. scrutator*.

Key to the *Calosoma* of Virginia
(modified from Gidaspow, 1959)

1. Pronotum without basal setae 2
- 1'. Pronotum with basal setae close to hind angles.....
..... *C. sayi* Dejean
- 2(1). Last segment of maxillary palpi distinctly wider
and often shorter than preceding segment; tooth
of mentum almost always long and pointed;
underside with little or no metallic luster 3
- 2'. Last segment of maxillary palpi of the same length
and hardly wider than penultimate segment; tooth
of mentum small and blunt; underside metallic
green or with distinct bluish or greenish luster..... 4
- 3(2). Head sparsely covered with large punctures;
antennal segments 5-11 are uniformly pubescent
..... *C. externum* (Say)
- 3'. Head densely covered with small punctures;
antennal segments 5 and 6 with long, glabrous
spots..... *C. calidum* (Fabricius)
- 4(2). Femora dark brown or black, without metallic
blue, green, or violet luster 5
- 4'. Femora reddish or dark brown, with metallic
blue, green, or violet luster 6
- 5(4). Elytra golden green, sometimes with reddish
luster on sides; pronotum black with metallic
blue toward sides; 22-25 mm
..... *C. sycophanta* (Linnaeus)
- 5'. Elytra dark brown, bronze, or black, with large
green, coppery, or golden pits; 19-27 mm
..... *C. frigidum* Kirby
- 6(4'). Larger (23-35 mm); pronotum dark blue or violet
with broad purple or golden green margin; middle
tibiae of male strongly curved with brush of
reddish setae at tip..... *C. scrutator* (Fabricius)
- 6'. Smaller (17-22 mm); pronotum black or dark
olive green, with bluish luster; pronotal margin
purple or golden green; middle tibiae of male
straight, or only slightly curved, without reddish
setae on tip *C. wilcoxi* LeConte

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