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## Chrysomelidae or Leaf Beetles (Insecta: Coleoptera) of Plummers Island, Maryland

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*Abstract.*—The Chrysomelidae fauna of Plummers Island, Maryland consists of 161 species. This represents 43% of the known Maryland fauna. Work conducted in 1997 and 1998 showed a species turnover rate of 72.6% but a decline in species richness of only 2.1%. Nine species have been collected nowhere else in Maryland. *Tricholochmaea decora decora* (Say) is reported from Maryland for the first time.

*Key words.*—Species turnover, new state record, inventory, historical records.

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The Chrysomelidae (leaf beetles) is the second largest family of beetles with approximately 50,000 described species worldwide (Lopatin 1977). Most chrysomelids live on terrestrial, aquatic, or subaquatic plants both as larvae and adults as root feeders, leaf, flower or pollen feeders, while stem boring, leaf mining, detritus feeding, and ant nest associates are found among relatively few species. Chrysomelids are usually thought of as plant pests, both through direct plant feeding and through transmission of plant viruses (Selman 1988). The genus *Diabrotica* costs U.S. farmers one billion dollars annually in corn alone (Metcalf 1986). However, others perform useful roles in biological control of weeds; the number being evaluated is increasing throughout the world (White 1996). Chrysomelids are also the target of biochemical prospecting. Many species sequester or modify plant chemicals while other species apparently manufacture a unique chemistry against predators. Some of these compounds may be useful to humans (Pasteels et al. 1988, 1994). This family may be a good indicator of overall biodiversity (Staines & Staines 2001).

There are 1700 species known from North America (Riley et al. 2002). Cavey & Staines (pers. obs.) record 372 species from Maryland. Adults may be collected with a variety of methods including sweeping and beating foliage and flowers; using Malaise traps, flight intercept traps, and blacklight traps; and by headlamping food plants at night. While many of Maryland's chrysomelids are common, *Diabrotica cristata* (Harris) is a state of Maryland species of concern (Anonymous 2003).

A number of North American chrysomelid genera are in need of revision. Until revisions are completed for these groups, some identifications should be con-

sidered tentative. The genera most in need of revision are discussed below.

*Pachybrachis* was last revised by Fall (1915), and few new species have been described since then. The keys in Fall (1915) are difficult to use because of the lack of consideration of variation within species, making individual specimens in this large genus especially difficult to distinguish.

Two papers include keys to North American species of the genus *Paria*: Wilcox (1957) and Balsbaugh (1970). However, these keys are difficult to use and do not allow definitive species identification for many specimens.

*Tymnes* is a small genus of three described species last revised by Horn (1892). Horn's key is difficult to use, and there are several undescribed species in the genus.

*Altica* is a large genus which was last revised by Horn (1889). A number of species have been described since, but there are no amended keys. Laurent LeSage, Agriculture Canada, currently is working on revising this genus.

Blake (1943) revised the species of *Distigmoptera* but did not provide genitalic characters. Species identification based on external morphology alone is difficult for some members of this genus. This group also may contain new species.

*Glyptina* was last revised by Horn (1889). Specimens and series of *Glyptina* collected by the author vary from known species descriptions, suggesting that undescribed species exist.

*Longitarsus* is a large, difficult genus which was last revised by Horn (1889). Identification of North American species is complicated by the similarity of taxa, small size of specimens, and the presence of introduced European species that may have been treated as endemic taxa in the literature.

*Phyllotreta* is another genus with a number of introduced species. Chittenden (1927) last revised the North American species. Smith (1985) reviewed the vittate species, but the nonvittate species have not been revised. In addition, there is at least one species from Plummers Island which Chittenden examined but did not determine to species.

The insect collection at the National Museum of Natural History (USNM), Smithsonian Institution, Washington, D.C., was examined for specimens collected on Plummers Island. This collection is the major repository for specimens from Plummers Island since most of the entomologists who worked on the Island were affiliated with the USNM. Species identifications were confirmed, and label data were recorded for specimens. Literature on various genera was examined for additional Plummers Island records.

Twenty-two days were spent collecting chrysomelids on Plummers Island and its vicinity. Field work was conducted between 26 April and 13 October 1997 and 7 April and 2 November 1998. Beetles were collected by sweeping and beating vegetation, blacklighting, and visual examination of known chrysomelid host plants both during the day and at night using a headlamp. All material collected is deposited in the USNM.

Examination of the USNM collection resulted in 1345 records for 141 species of Chrysomelidae from Plummers Island. Records for five species were found in the literature. The 1997–1998 inventory results in 1700 specimens representing 47 species, 15 of which previously were not collected on, or reported from Plummers Island. The Plummers Island chrysomelid fauna is 161 species or 43% of the Maryland fauna (see Appendix for list of species).

A detailed discussion and an analysis of the Plummers Island chrysomelid data are found in Staines & Staines (2001) and Staines (2004), and this information is summarized below. From 1901 to 1998 species turnover was 72.6%. This is higher than that reported for carabid beetles (45%; Erwin 1981) or tortricid moths (54%; Brown 2001) for Plummers Island. There was a 2.1% decline in species richness which is much lower than that reported for carabids (43%; Erwin 1981) and tortricids (17%; Brown 2001). An analysis of the feeding preferences of the chrysomelids on Plummers Island indicates there is a decrease in the number of polyphagous and broadly oligophagous species accompanied by an increase in the number of narrowly oligophagous and monophagous species. Staines (2004) postulated that the continued edge effect from periodic flooding allowed the survival of a wider diversity of chrysomelid species.

Biogeographically, the largest number of species are found in eastern North America; fewer species are found throughout much of the United States,

northern North America, or southern North America. This is quite different from Erwin's (1981) analysis of the Carabidae, the only other family of Coleoptera examined individually for Plummers Island. A much larger percentage of chrysomelids are widespread species—66% versus 44% in Carabidae. The northern and southern species are nearly equal in number for the Chrysomelidae. Erwin (1981) found the northern element to be twice as large as the southern element for Carabidae.

The historic species collected in 1997–1998 fall into three categories. First are the woods-edge species, such as *Tymnes tricolor* (Fabricius) and *Rhabdopterus picipes* (Olivier). The second is open-field species which still persist in the sunnier locations on the Island where their host plant occurs. Examples are *Systema hudsonias* (Forster), *Epitrix cucumeris* (Harris), and *Disonycha glabrata* (Fabricius). The third category contains the generalists such as *Acalymma vittatum* (Fabricius) and *Diabrotica undecimpunctata howardi* Barber, which were collected feeding on pollen of various flowers.

Twelve of the fifteen species collected for the first time on the Island are relatively common species that previously avoided detection on Plummers Island. The other three species are recent adventives. *Oulema melanopus* (L.) was first found in Maryland in 1969 and now occurs throughout the state (Staines 1997). *Chrysolina quadrigemina* (Suffrian) was introduced into Ontario, Canada, in the 1950s for the biological control of *Hypericum* (St. Johns Wort, Clusizaceae). The first specimens were found in Maryland in 1991 (Hoebeke 1993). *Diabrotica virgifera virgifera* LeConte expanded its range from the central and western United States to the East Coast between 1940 and 1983 (Krysan 1983).

Vegetational changes on the Island have affected the composition of the chrysomelid community. Several host plants not found during the 1997–1998 survey reduced the number of species collected. The major deletion was *Salix* spp. (Salicaceae), which supported seven chrysomelid species: *Calligrapha multipunctata* (Say), *Chrysomela scripta* (Fabricius), *Crepidodera browni* Parry, *Crepidodera nana* (Say), *Phratora americana* (Schaeffer), *Strabala rufa rufa* (Illiger), and *Tricholochmaea tuberculata* (Say). Another chrysomelid host plant not found was *Ambrosia artemisiifolia* L. (Asteraceae), which supported four species: *Calligrapha bidenticola* Brown, *Ophraella communis* LeSage, *Systema blanda* Melsheimer, and *Zygogramma suturalis* (Fabricius).

The host plants of most historically-recorded species that were not collected in the 1997–1998 survey are still present on the Island. These species may not have been collected because the host plant was in the first 5–10 m of woods, in localities that lack direct sunlight. Species such as *Chrysochus auratus* (Fa-

bricius) and *Brachypnoea puncticollis* (Say) appear on their host plant only when the plant is in direct sunlight.

A potential shortcoming in the analysis of the data by Staines (2004) is that not all Plummerville Island material is deposited in the USNM. Records for *Plateumaris metallica* Ahrens, *Exema elliptica* Karren, *Phyllobrotica circumdata* (Say), *P. limbata* (Fabricius), and *P. sternidia* Schaeffer were obtained from the literature. Additional material is probably present in museums throughout the United States; I have seen specimens in the University of Kansas, Academy of Natural Sciences in Philadelphia, and Louisiana State University. Some of the records presented as new to the Island may have been collected earlier but were not reported in the literature. These holdings also may contain additional historical records that may raise the total number of species from the Island and may affect the analysis of the number of species found each year.

LeSage & Zmudzinska (2005) reported that the specimens identified as *Altica ignita* Illiger in Staines & Staines (2001) and Staines (2004) were a combination of *A. woodsii* Isley and *A. near kalmiae* Melsheimer. Since the second species was not identified to species, the mention of *A. ignita* should be treated as *Altica* sp. However, this does not change the number of species known from Plummerville Island.

A number of rare and unusual species have been collected at Plummerville Island over the years: *Altica woodsii*, *Aphthona insolita* Melsheimer, *Capraita quercata* (Fab.), *Distigmoptera pilosa* (Illiger), *Exema elliptica* Karren, *Oulema conota* (Fab.), *Pachybrachis cephalicus* Fall, and *Xenochalepus potamacus* Butte have been found nowhere else in Maryland.

During recent curation of the USNM chrysomelid collection, eleven specimens of *Tricholochmaea decora decora* (Say) from Plummerville Island were found. All eleven specimens were collected on 16 July 1918 by J. L. Wrenn. This species was not reported from Plummerville Island by Staines & Staines (2001) or Staines (2004). It feeds on various species of *Salix* (Salicaceae) (Clark et al. 2004). Riley et al. (2003) report the species from across Canada and the northern United States, south to New Jersey, West Virginia, Kansas, southwest to New Mexico. This is a new record for Maryland.

With the amount of work already done on the chrysomelid fauna of Plummerville Island, this family would be an excellent one to continue monitoring to document faunal changes.

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