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MARYLAND

ENTOMOLOGIST

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The purpose of the Maryland Entomological Society, which was formed in November, 1971, is to promote the science of entomology in all its branches, to provide a meeting place for professional and amateur entomologists residing in Maryland and the District of Columbia, to issue a periodical and other publications dealing with entomology and to facilitate the exchange of ideas and information through its meetings and publications.

Membership in the Society is open to all persons interested in the study of entomology. All members receive the journal, Maryland Entomologist, and monthly newsletters, Phaeton. Institutions may subscribe to the Maryland Entomologist but may not become members. Prospective members should send to the Treasurer full dues for the current year, together with their full name, address, telephone number, and special entomological interests.

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Back issues of the Maryland Entomologist and recent issues of Phaeton are available, to members, from the Treasurer. Phaeton is .25¢ per number and the Maryland Entomologist is \$1.25 per copy.

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The Maryland Entomological Society is a non-profit, scientific organization. Meetings are held on the third Friday of every month (from October to May) at 8:00 p.m., in Lecture Hall #120 of the Biological Sciences Building, University of Maryland Baltimore County.

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Cover illustration: The logo of the Maryland Entomological Society features the Maryland Shield and a specimen of Euphydryas phaeton (Drury), the Baltimore checkerspot, which became the official insect for the state of Maryland through the efforts of many of the members of this Society.

## THE CICINDELIDAE (COLEOPTERA) OF MARYLAND

John D. Glaser

Tiger beetles have always enjoyed considerable popularity with collectors for aesthetic reasons, chief among which are vivid colors and bold patterns. But the appeal is also founded on the detective work often required to find those species with a very specialized habitat. The successful search for such beetles usually depends upon locating a specific habitat which is narrowly defined in terms of soil type, moisture, vegetation, and slope. Good examples of restricted species in Maryland are Cicindela lepida Dej., C. puritana Horn, and C. scutellaris Say. In contrast, other cicindelids, for example C. repanda Dej. and C. punctulata Oliv., are able to succeed in a broad range of habitats in which specific environmental parameters are less important. These generalized species are usually numerous and easy to find. It is the restricted habitat forms which pose the challenge and provide the thrill of the hunt for the collector.

Both larvae and adults of the Cicindelidae are active predators, feeding upon a variety of smaller insects which share their environment. Adult beetles spend most of their time searching for food, and will attack anything in motion, regardless of size. Cicindelid larvae dwell in smooth-walled, generally vertical burrows which range from a few centimeters to a meter or more in depth, and are similarly voracious feeders. Movement up and down the burrow is accomplished with a series of abdominal hooks which enable the larva to climb rapidly to the surface, seize a passing insect, and drag it to the bottom.

All Cicindela species are essentially diurnal, in contrast to Megacephala which is nocturnal. Further, tiger beetles are swift runners and most species will take flight when disturbed. Escape flights generally extend only a few tens of feet, but in the case of large western species such as C. obsoleta Say and C. pulchra Say, single flights of 300 feet or more are not uncommon. Nearly all native Maryland species of Cicindela spend the daylight hours moving about on open ground. When motionless, however, tiger beetles are remarkably well camouflaged and are not easily detected. Several species are also active at night and are attracted to light.

Most of the observations included here on habits and habitat are my own, accumulated during the past ten years of observing and collecting these interesting beetles. Similarly, the Maryland distribution data for most of the common species were compiled from my own collection. However, I have also included data gathered from the literature, from many of the regional museum collections, and records solicited from the collections of fellow cicindelophiles.

Sixteen species of Cicindela and one Megacephala are known to occur in Maryland, and six others may ultimately be found within our borders. For convenience, all 22 have been included in the accompanying key.

Megacephala

Two species of this largely Neotropical genus inhabit the eastern United States, but only one reaches Maryland. Both are relatively large conspicuous insects, 18 to 24 mm. in length, with nocturnal habits. Megacephala are commonly attracted in numbers to storefront and highway lights in the southern states, where they run about busily engaged in attacking and eating other insects.

M. carolina (Linne) is dark metallic green with a pronounced coppery or reddish cast to the elytra and a large yellow apical lunule. It ranges north to North Carolina and probably tidewater Virginia. The second species, M. virginica (Linne), averages slightly larger in size and exhibits a uniform blackish-green color with the elytral disk nearly black. In contrast to the dorsum, the underside and legs of both species are yellow-brown.

Megacephala virginica Linne

In Maryland, this species ranges across the Coastal Plain and neighboring Piedmont, but is apparently absent from the western portion of the state. It is of frequent occurrence but never common, and further, cannot be associated with any particular soil-vegetation habitat. The beetles are solitary and most often encountered hiding under boards, cardboard, or other debris during the day, or at lights after dark. I have records of M. virginica from St. Marys Co. (Leonardtown), Calvert Co. (Calvert Cliffs State Park), Prince Georges Co. (Croom, Laurel),

Baltimore Co., and Cecil Co. (Conowingo). This is a summer species with an activity peak in July and August.

# Key to the *Cicindela* of Maryland

1. Front trochanters with one (rarely two) subapical seta.....5
- Front trochanters without subapical setae.....2
2. Elytra white with or without dark pattern.....*dorsalis*
- Elytra brown to black.....3
3. Pronotum smooth. Labrum long.....*abdominalis*<sup>1</sup>
- Pronotum alutaceous. Labrum medium or short.....4
4. Elytral markings connected at margin. Elytra not micro-serrulate.....*marginipennis*<sup>1</sup>
- Elytral markings not connected at margin. Elytra micro-serrulate.....*rufiventris*
5. Clypeus clothed with decumbent setae.....6
- Clypeus glabrous or with a few erect setae.....8
6. Prosternum glabrous.....7
- Prosternum clothed with dense decumbent setae.....*marginata*
7. Elytra white. Appendages unpigmented.....*lepida*
- Elytra dark with normal white pattern. Appendages pigmented.....*puritana*
8. Frons with erect setae.....9
- Frons glabrous or with a few decumbent setae.....18
9. Genae with setae.....10
- Genae glabrous.....16
10. Labrum unidentate or non-dentate.....11
- Labrum with three or more teeth.....12
11. Elytral markings generally complete; humeral lunule connected to marginal line.....*repanda*
- Elytral markings narrow or broken; humeral lunule widely separated from marginal line (marginal line usually obsolete).....*duodecimguttata*
12. Elytra red, green, or purple.....14
- Elytra brown or black.....13
13. Elytral markings connected along margin.....*formosa*<sup>1</sup>
- Elytral markings not connected along margin.....*ancociscensis*<sup>1</sup>
14. Head and pronotum green; elytra red or greenish-red.....*splendida*
- Head, pronotum, and elytra about same color.....15
15. Middle band short, oblique, slightly sinuate; humeral lunule absent.....*purpurea*
- Middle band longer, sinuate, extending to margin; humeral lunule present as one or two dots.....*limbalis*<sup>1</sup>
16. Elytra impunctate. Markings reduced to humeral dot, marginal triangular spot, and apical lunule.....*scutellaris*
- Elytra punctate or granulate. Markings complete.....17
17. Elytra punctate.....*hirticollis*
- Elytra granulate.....*tranquebarica*
18. Proepisternum with setae.....19
- Proepisternum glabrous.....*unipunctata*
19. First antennal segment with one sensory seta<sup>2</sup>.....20
- First antennal segment with three or four sensory setae.....21
20. Labrum with more than eight setae.....*trifasciata*<sup>1</sup>
- Labrum with fewer than eight setae.....*punctulata*
21. Elytra granulate.....*patruela*
- Elytra punctate.....*sexguttata*

<sup>1</sup> not presently recorded from Maryland, but may occur here

<sup>2</sup> located at apex of first antennal segment

## *Cicindela*

### *Cicindela dorsalis* Say

*C. dorsalis* is a polytypic species which inhabits the coastal strip from Massachusetts into Mexico. Four subspecies make up the complex, two of which inhabit Maryland. The nominate form finds its southern limit along the Chesapeake Bay shore, whereas subspecies *media* LeC. ranges northward from Florida to New Jersey. Size constitutes the chief distinction between the two forms. In fact, *dorsalis* appears to undergo a progressive diminution in size southward along the Atlantic coast and around the Gulf into Mexico with the result that *C. dorsalis venusta* Laferte-Senectere in southern Texas is barely one-half the dimensions of nominate *dorsalis*. This may constitute a true cline rather

than a series of subspecific steps but in Maryland, the two populations, *dorsalis dorsalis* Say and *dorsalis media* LeC., appear to be allopatric. Nominat *dorsalis* occurs on the bay beaches of Calvert County and has not been recorded elsewhere in the state. Further, large established populations are confined to beaches with a broad backshore such as exist at Cove Point and Flag ponds, because the backshore, or portion of the beach lying between high water and fast land, is the probable site for larval development in this species. For this reason, most of the Calvert County shoreline, which consists of narrow intertidal beaches backed by high bluffs, is not a suitable habitat for *dorsalis*, although strays are found here regularly. I have records on hand extending from Camp Roosevelt on the north to Cove Point near the southern end of the county.

The second Maryland population of this species is *dorsalis media* on Assateague Island. Presumably, Fenwick Island to the north was once home to *dorsalis* as well, but development has long since eradicated this insect from Ocean City north. The Assateague population is similarly threatened with extinction beneath the wheels of the vehicular traffic allowed on the backshore because larval development is inhibited.

Adult *dorsalis* frequent the water's edge and are exceedingly wary, keeping just out of reach of the swash and the collector's net. This is a midsummer species throughout its range with an activity peak in July and early August. My records extend from July 4th through August 22nd.

*C. dorsalis* is easily recognized as the only white tiger beetle in Maryland, excepting *C. lepida* Dej. which inhabits a different environmental niche. *C. dorsalis dorsalis* measures 12-15 mm. in length, in contrast to the smaller *media* which is 11-13 mm. long. An equally important distinction, at least insofar as the Maryland populations are concerned, is the degree of maculation present on the elytra. The dark markings are faint to obsolete in specimens from Calvert County, in contrast to specimens from Assateague Island which are heavily marked. In fact, the loss of maculation in the bay population is more pronounced than in any other Atlantic coast *dorsalis* and suggests a character accentuated by isolation. I have searched a number of seemingly suitable beaches bordering the Maryland portion of the bay below Cove Point and found no additional specimens. Boyd and Rust (1982), however, have recently reported on several more Chesapeake Bay populations of this subspecies, three along the western bay shore and one on the east side of the estuary, all in Virginia.

### *Cicindela abdominalis* Fab.

This is essentially a southern insect which is common in dry sandy areas of the Coastal Plain from Florida west to Louisiana and north to the Carolinas. It has not been collected in Maryland, nor have I seen published records from Virginia. However, the presence of a large established population in the New Jersey Pine Barrens suggests that *abdominalis* may be present but undetected in Maryland. Habitat suitable for this species exists in limited areas of the Delmarva Peninsula, chiefly in Wicomico and Worcester Counties where extensive sandy terraces flank the Nanticoke and Pocomoke Rivers. Clearings and wood roads in the open oak-pine forests so typical of these areas hold the most promise of yielding *abdominalis*.

*C. abdominalis* is an easily recognized, small (8-10 mm.), shiny black tiger beetle with inconspicuous white markings consisting of three white dots and a narrow apical lunule on each elytron. It is further distinguished by a reddish-brown abdomen, a character shared with *C. rufiventris* Dej. This small beetle flies in short weak hops and is easily netted once flushed. Most records for *abdominalis* in New Jersey are in July and August.

### *Cicindela marginipennis* LeC.

*C. marginipennis* exhibits a spotty distribution through the eastern half of the United States suggestive of a relict species. It is associated with several major river systems including the Connecticut, the Delaware, the Susquehanna, and the Ohio, and although not known from Maryland, its presence in Pennsylvania downstream from Harrisburg along the Susquehanna holds out the possibility that *marginipennis* may be found here. It must be noted, however, that the Pennsylvania records are very old ones, and the current status of this colony is unknown.

This species is found in as narrow an environmental niche as any



other U.S. cicindelid - it occurs chiefly on cobblestone bars located at the upstream ends of river islands. Such bars usually consist of closely packed cobbles and boulders upon which the beetles perch, flying readily from one rock to the next when startled. The presence of cobblestone bars in the Susquehanna of Maryland is unlikely upstream of Conowingo Dam because of high water, but islands dot the river below the dam and should be investigated for C. marginipennis. Similarly, islands in the Potomac River from Montgomery to Allegany Counties need to be checked for the presence of this beetle.

C. marginipennis is easily recognized as an opaque olive-green beetle with a continuous white marginal band and a red abdomen. It is a midsummer-active species.

#### Cicindela rufiventris Dej.

This is one of the common tiger beetles of Maryland, to be expected in any physiographic region of the state. I have no records from the lower Eastern Shore, but this reflects lack of collecting rather than absence, and the species doubtless occurs there. C. rufiventris appears in midsummer but its activity extends into the autumn months; my earliest collection date is July 12th and the latest October 3rd.

Although rufiventris may be found in a variety of habitats, they are rarely in wholly open areas or within forests but rather in the transition zone between forest and field. Typical situations include paths along the edges of woods, railway embankments, little-used dirt roads, small sparsely vegetated clearings, and overgrown gravel pits or strip mines. Most areas where I have collected rufiventris show clayey soils with at least some gravel or rock debris. The species is not particularly wary and flies in short, rather weak spurts. It is generally one of the more easily captured Maryland tiger beetles.

C. rufiventris is immediately recognizable as the only Cicindela definitely known from our state which has a red abdomen. The elytral maculation is subject to considerable variation; all intermediates between nearly complete markings (all lunules complete, however faint), and a barely discernible series of dots, can be found. Several subspecies of this species have been described, but in Maryland, we have only the stem form, rufiventris rufiventris.

#### Cicindela marginata Fab.

This is a coastal species with breeding populations pretty nearly confined to tidal mud flats bordering the Atlantic and the lower bay. The beetles never seem numerous on any given mud flat, but rather occur as solitary individuals. A typical marginata habitat lies on either side of the bridge causeway on Assateague Island. Here smooth patches of bare grayish mud alternate with dense salt marsh grasses. C. marginata inhabits the open mud surface and the winding pathways between the bare patches. Presumably, this species frequents similar habitats around the bay margin, although the very few marginata I have collected there were running on muddy sand beaches near the water's edge. I have seen Maryland records for Hays Beach and Franklin Manor in Anne Arundel County; Chesapeake Beach in Calvert County; Pt. Lookout, Piney Pt., and St. George Island in St. Marys County; Barren Island in Dorchester County; and Assateague in Worcester County. C. marginata is another of our midsummer forms, active in late June, July, and August.

There is some similarity in color and pattern between this species and other coastal species such as hirticollis Say and repanda Dej. but the highly irregular and confused middle band of marginata immediately sets it apart from these others. A somewhat closer resemblance exists between marginata and puritana Horn, also with an irregular middle band. In puritana, however, the middle band is not broken and interrupted to the degree shown in marginata, nor are their respective shoreline habitats the same.

#### Cicindela lepida Dej.

C. lepida ranks among the rarest of Maryland tiger beetles. I have unearthed only a single record - a specimen in the AMNH labeled "Ocean City, Md.". This species is scattered across much of the U.S. east of the Rocky Mountains, but along the Atlantic seaboard, the cited specimen appears to be the most southerly record.

C. lepida, throughout its range, appears restricted to areas of deep dry sand supporting little or no vegetation, a habitat most frequently found in a dune environment. The fairly numerous New Jersey occurrences are, with few exceptions, in coastal dunes. Moreover, most

of the inland records across the U.S. are from fossil dune fields. All this would suggest that the most promising spot in Maryland to search for lepida is among the coastal dunes on Assateague Island.\*

Collection dates for this species in New Jersey (Boyd, 1978) range from June 15th through August 27th, and similar dates typify captures throughout the range of lepida. It is apparently a midsummer insect which should be sought in July and early August.

C. lepida is quite distinct in appearance and is unlikely to be confused with any other Maryland tiger beetle. It is small (9-10 mm), wholly white but for a few vague dark markings on the elytra, and has pale legs and antennae. It has been aptly described as ghostlike in appearance as well as marvelously camouflaged, and so is rarely seen unless specifically sought.

\* According to D. Brzoska (pers. comm.), several specimens of lepida were recently collected among the dunes on Assateague.

#### Cicindela puritana Horn

This tiger beetle is narrowly restricted, in terms of both habitat and range, and must be considered one of our state's entomological treasures. In fact, Maryland may well be the home of the only remaining C. puritana population of any substantial size. The species was described by Horn in 1871 from specimens collected along the Connecticut River in southern New Hampshire and northern Connecticut. For 40 years, this was the only known population of puritana, until 1911 when W.T. Davis discovered the species along the Chesapeake Bay shore in Calvert County. Although puritana has been reported from New York(?) and southern Quebec, the Chesapeake Bay population remains paramount, in view of the fact that no specimens have been taken from the type locality since 1939 (Dunn, 1981). C. puritana belongs to a group of closely related fluvial species which includes blanda Dej., isolated in the southeastern states, and two sympatric forms, cuprascens LeC. and macra LeC., scattered along the rivers of the central states and the Great Plains. It seems likely that the present distribution of these species is an artifact arising from the fragmentation of a single widespread form during the late Pleistocene.

C. puritana is found along the Calvert County shoreline from Chesapeake Beach to Solomons. It inhabits the narrow intertidal beaches which characteristically lie at the foot of the high clay-sand bluffs forming most of the bay shore in that county. The bluffs are presumably the site of larval burrows for this species. Strays are encountered from time to time on the intervening sand barriers bordering the marsh fronts or on sand spits, but it is clear that the immediate proximity of the bluffs is necessary to sustain any sizeable populations of puritana. The beetles are active from late June through the first week or so in August, with peak populations present during the first three weeks in July. At times, this beetle can be very numerous.... I took 58 specimens in less than an hour on July 4, 1973, at Calvert Beach.

In general appearance, C. puritana is superficially similar to C. repanda, hirticollis, and marginata, any one of which may be found sharing the same Calvert County beaches. Both repanda and hirticollis, however, are more robust beetles with sharp clearly-defined elytral markings which are subject to little if any variation in our geographic area. In contrast, C. puritana is a more slender insect, with a middle band which shows considerable variation ranging from wholly intact to nearly absent. Moreover, the edges of the middle band are always eroded and minutely broken. This latter characteristic is shared with C. marginata as is the slender form, but in the case of marginata, the middle band is far more diffuse and clearly broken into many small patches.

C. puritana flies weakly in short spurts and is an easy capture.

#### Cicindela repanda Dej.

This is doubtless the most frequently encountered tiger beetle in the state. It has a fairly broad habitat tolerance, and although most numerous on sand bars and the sandy banks of streams and rivers, it can also be found in such diverse habitats as gravel pits, sandy woodland clearings and paths, road cuts, lake shores, tilled fields, and the bay beaches. C. repanda apparently requires sandy soils which are at least damp, this being the common denominator in all of these cited habitats. Sandy soils are common throughout the Coastal Plain and along many rivers and streams in the eastern Piedmont, and repanda can be found in abundance throughout this region. In contrast, sandy soils become con-



siderably less prevalent in the western Piedmont and decidedly rare through the mountains of western Maryland. There, repanda is uncommon. My records extend west to Allegany County, but only in scattered colonies along the Potomac River upstream from Catoctin Mountain.

C. repanda, under optimum environmental conditions, can be present in astonishing numbers. I have walked across sand bars in southern Maryland streams where these beetles swarmed in the hundreds. Their escape flights are characteristically short and weak, often just sufficient to keep ahead of a pursuer.

C. repanda is active from late March through mid-November in our area. Peak activity occurs in spring and fall, but some beetles are present during every summer month.

The identification of this species is generally straightforward, although it is superficially similar to C. duodecimguttata Dej. and C. hirticollis Say. From hirticollis, it can be distinguished by the shorter descending arm of the middle band, the more narrow marginal band, and the absence of a sharp hook at the terminus of the humeral lunule. C. duodecimguttata has narrower markings with a generally broken middle band, and no marginal line. Moreover, repanda and duodecimguttata are largely allopatric in Maryland.

#### Cicindela duodecimguttata Dej.

In Maryland, C. duodecimguttata is apparently confined to the western portion of the state where it replaces C. repanda in much of the riparian habitat. A small series collected along the Monocacy River near Taneytown in Carroll County represents the most easterly record known to me. The species cannot be considered common like repanda, but individual populations can be quite large. These populations are widely scattered along both major and minor watercourses in the mountainous sections of the state where the beetles inhabit dark muddy silt stream edges and channel bars, often strewn with rock chips. This habitat contrasts with the light colored quartz sand generally populated by repanda. Larval burrows of C. duodecimguttata are typically excavated in the steeply-sloping earthen banks flanking most of the streams of the area.

I have records of this species from several localities in Garrett and Allegany Counties as well as Carroll County, and it should also be expected in Washington and Frederick Counties. A large breeding population of duodecimguttata, the largest that I have encountered, was located in 1977 along the Casselman River at Md. 495 in Garrett County. This is essentially a spring-fall species, but I have only seen it during the late summer-early fall period in Maryland. Most of my records fall between August 25th and September 20th.

C. duodecimguttata most resembles C. repanda among the Maryland species, but can be distinguished by its more narrow, generally incomplete markings, contrasting habitat preferences, and near allopatry with repanda.

#### Cicindela formosa Say

Although this species has never been collected in Maryland, it is common in southern New Jersey. Moreover, there is a small series of formosa in the USNM collection from Campbell County in south-central Virginia. If these Virginia specimens are accurately labeled, then Maryland lies within the range of the species, and the probability that it will ultimately be found here is considerably enhanced.

C. formosa is known from much of the northeast, the upper midwest, and the Great Plains south to Texas and New Mexico, but it is absent from the southeastern U.S. At least five subspecies are recognized, but only one, formosa generosa Dej., inhabits the eastern U.S. In habitat, it is narrowly restricted to dry, open sand such as dunes, river terraces, glacial outwash, or deep Coastal Plain deposits as in the New Jersey Pine Barrens. Such environments exist in Maryland in places on the lower Eastern Shore, and to a lesser extent in southern Maryland. I have investigated nearly all such areas west of the bay and many on the Eastern Shore without finding formosa, but several deep sand habitats in Somerset, Dorchester, and Worcester Counties still hold promise. Further searching should focus there.

This is a large and boldly marked tiger beetle, much like hirticollis in maculation. However, the maculation of formosa is still broader and widely connected along the margins. In hirticollis, the connections are narrow. Further, the humeral lunule of formosa is open and C-shaped, whereas in hirticollis, it is G-shaped.

#### Cicindela ancocisconensis Harris

This species has never, to my knowledge, been collected in Maryland, but its occurrence in the Pennsylvania, Virginia, and West Virginia Appalachians raises the distinct possibility that it may be found here. C. ancocisconensis, like C. marginipennis, is distributed through the eastern half of the United States in small disjunct colonies which inhabit open sandy or silty tracts bordering streams. I have collected this species along the Saco River in New Hampshire where the beetles are common over an acre or so of sparsely vegetated, flood deposited silty sand bordering the watercourse. Closer to home, there is a colony along the North River in Hampshire County, West Virginia, just 12 miles south of the Potomac River. Here the habitat consists of small patches of similarly silty sand scattered along the river bank. Similar habitats are present in western Maryland which might harbor ancocisconensis.

This species is rather similar to repanda in form and color, but averages larger and bears different markings. The most obvious difference is in the form of the middle band which in ancocisconensis lacks the terminal hook of repanda, showing instead a simple descending arm which is expanded at the margin. The beetles are active in May and early June, and again in August and September.

#### Cicindela splendida Hentz

This species must be considered among the rarest of the Maryland tiger beetles. I have found only two valid records, one at Solomons, Calvert Co., collected on 20 April 1948, and the other from Fort Washington, Prince Georges Co., 9 April 1948. Maryland lies on the northeastern fringe of the range of C. splendida; I have seen two D.C. records and a number in northern Virginia. The range extends from there through the southern Appalachians and into the mid-section of the country. The species is absent in both the northeastern and southeastern states.

C. splendida has a preference for moist clayey soils, often red, and further, it seems most at home on sloping ground. These habitat requirements presumably also hold for the larvae, and as such define a rather limited niche which is not common in Maryland. In fact, red clay banks and gullies are frequently encountered only in the Baltimore-Washington corridor and south along the Potomac for a short distance from D.C. Similar habitats can be found on the opposite shore of the river in Virginia where many old records of splendida exist. It seems likely then, that this beetle will be found in the vicinity of Washington or along the Potomac in southern Maryland, if it is to be found at all. Unfortunately, this area has become so urbanized in recent years with accompanying habitat destruction that C. splendida may prove extinct in Maryland.

This species is active during the period March through June, and again in late August and September, and is essentially solitary. As the name implies, splendida is richly colored with a metallic green to blue-green head and pronotum, and brick-red elytra margined with green. Markings generally consist of a short straight dash at the mid-margin of the elytra, but this may be absent in some examples. C. splendida is closely related to C. limbalis and C. purpurea, but both of these are uniformly dull-green or purple in color over both the elytra and pronotum.

#### Cicindela purpurea Oliv.

This is another of Maryland's scarce Cicindela, represented by a number of old records concentrated in the greater Washington, D.C. area, and by a few recent ones in western Maryland. The older captures, specimens from Laurel, Contee, Beltsville, and Cheverly, all in Prince Georges County, date back 40 years or more. I suspect that the lack of modern records from the Baltimore-Washington area points to the local extinction of purpurea due to pervasive urbanization. The recent discovery of this species in the Green Ridge State Forest by Phil Kean, and by myself in Dans Mountain WMA in 1983, both in Allegany County, indicates that purpurea is more widespread in the Appalachians of Maryland than heretofore suspected.

Most reports of C. purpurea associate the beetle with clay or silty clay soils, and in contrast to C. splendida, with level ground. Typical habitats might be dirt roads through lightly-forested or open areas, clearings, and power transmission or gas line cuts. For example, a large and thriving population of purpurea occurs on red silt-clay soils underlying the Quantico Marine Base in northern Virginia, not far

from the Maryland line. The beetles are most common along dirt roads and a gas pipeline cut which transects the area. Similar soils, developed on the very same red shale of Triassic age, extend north into western Montgomery, eastern Frederick, and western Carroll Counties, and may harbor *purpurea*, but if so, the beetles remain to be discovered. Although generally associated with clayey soils, the species is not restricted to them; *purpurea* is in fact fairly common on deep sand in parts of the New Jersey Pine Barrens.

This species is another of the spring-fall forms, with recorded activity in late March through May, and again in September and early October. It is cupreous red or purple in color, often overlaid with dull green, and shows bright green pronotal margins, elytral margins, and suture. The maculation is fairly constant, consisting of a short oblique middle band and apical dot.

#### Cicindela limbalis Klug

The occurrence of *C. limbalis* in Maryland is problematic. The species ranges over the northeastern, midwestern, and upper Great Plains states, and might be found in the Appalachians of Maryland, a supposition based on a specimen in the USNM collection from northern Virginia (Skyland, Page Co., 12 Sep.). However, there are no additional Virginia records, nor have I seen any from West Virginia or Pennsylvania.

*C. limbalis* is generally associated with sloping ground and clayey soils. It is reportedly common on clay banks flanking some of the Great Lakes, and similarly, on highway cuts and bare clay slopes through much of the upper Midwest. I have collected this species in large numbers on large sloping rock outcrops and intervening bare spots in steep hillsides in southeastern New York. If it occurs in Maryland, it might be expected in similar situations.

*C. limbalis*, like its close relatives *C. purpurea* and *C. splendida*, is a spring-fall species, most abundant in April and September. It is superficially similar to *purpurea* in color and markings but differs consistently in the shape of the middle band, and in having one or two humeral spots not present in *purpurea*. The middle band in *limbalis* is crank-shaped with a clearly defined angle at the midpoint, and further, it extends to or nearly to the lateral margin of the elytra.

#### Cicindela scutellaris Say

In Maryland, *C. scutellaris* is confined to the Coastal Plain where it occurs in disjunct colonies on open dry sand. This need for a dry sand habitat, presumably for optimal larval growth, is a major limiting factor in the distribution of *scutellaris*. I have collected the species in old upland sand pits, along power transmission or gas line cuts, on sandy wood roads, road cuts, and less often, on sandy river banks. The sites of *scutellaris* colonies are most often open with sparse grasses and scattered bushes or small trees. Although these beetles can be abundant at a given locality, often numbering in the hundreds, the colonies themselves are usually widely disjunct. Despite intensive search, I have located only sixteen such colonies in Maryland during the past decade.

*C. scutellaris* occurs in nearly every state east of the Rockies and breaks up into eight subspecies, only one of which, *rugifrons* Dej., inhabits Maryland. This race ranges along the Atlantic seaboard from Massachusetts to Virginia, and is typically bluish-green to yellowish-green with a post-humeral dot, a triangular marking at mid-margin, and an apical lunule. Between Long Island and Maryland, however, *rugifrons* colonies are dominated by a melanic form named *modesta* Dej. which is black both dorsally and ventrally with the same maculation as the green morph. In Maryland, *modesta* makes up 90 to 100% of *scutellaris* in colonies located northeast of a line drawn from northern Somerset County eastward through northern Anne Arundel County. For a few miles north and south of the line, mixed populations occur, whereas in southern Maryland (and in Virginia), only green *rugifrons* can be found. I have not seen *scutellaris* from the lower Eastern Shore, but I would expect only green beetles in that area. It is difficult to account for the dominance of melanic *scutellaris* in northeastern Maryland and on into New Jersey by invoking climatic or substrate differences. Any hypothesis based on environmental factors should also explain the presence of colonies of melanic *scutellaris* in Georgia and some other southeastern states, areas with environmental differences from Maryland certainly greater than those between Maryland and Virginia. It seems a more likely hypothesis that *modesta* developed in isolation during the latest Tertiary or Pleistocene, perhaps in the New Jersey Pine Barrens, and

only subsequently spread southward into Maryland.

*C. scutellaris* emerges early in the spring, remains active through May, and disappears early in June. A new generation is abroad by the first or second week in September and remains so until mid-October when the beetles go into hibernation.

This is an easily recognized species. It is similar only to *C. sexguttata*, but the six elytral spots of the latter immediately distinguish it from *scutellaris* with its broader marginal markings.

#### Cicindela hirticollis Say

*C. hirticollis* is a shoreline species which, like *dorsalis*, has two distinct populations in Maryland, one occurring around the periphery of the bay, and the other on the Atlantic beaches of Worcester County. The bay population, which can be found as far north in the estuary as Baltimore as well as along the tidal portions of major tributaries, is made up of large (11-14 mm.), broad, deep-brown beetles with wide maculation. In contrast, the *hirticollis* population on Assateague Island and formerly on Fenwick Island to the north averages smaller (10-13 mm.) slimmer, and is colored brown to muddy green with some deep blue-green individuals. The most striking difference, however, is the uniformly narrow maculation of the coastal population. Both forms are presently grouped under nominate *hirticollis*, but future study of the species as it occurs throughout the eastern United States may show two subspecies involved.

The preferred habitat of *C. hirticollis* is the upper strand, especially where the beach is broad and coupled with a flat sandy back-shore or a dune field. Because of this preference, the beetles are rare on the narrow intertidal beaches accompanying the high banks or bluffs which fringe much of the bay. Large *hirticollis* colonies, on the other hand, populate the intervening sand spits, barrier beaches, and sandy points. Good examples are Cove Point and Flag Ponds in Calvert County. Along the Atlantic coast, *hirticollis* is scattered over the sand flats behind the first line of dunes.

This species emerges early in May and remains active into the autumn months, with a population peak in July and August. The beetles are extremely wary and difficult to net, particularly when the sand is heated.

*C. hirticollis* can be superficially confused with *C. repanda*, with which it often intermingles on the beaches. However, *repanda* has a distinctly C-shaped humeral lunule, whereas the corresponding lunule in *hirticollis* is G-shaped and clearly connected to the middle band along the elytral margin, a connection commonly lacking in *repanda*. Although *C. tranquebarica* Herbst and *duodecimguttata* are somewhat similar in color and maculation, these two species are isolated from *hirticollis* by habitat preference.

#### Cicindela tranquebarica Herbst

This insect is a very common spring-fall species throughout the Maryland Coastal Plain and in scattered colonies in the Appalachian province. It is one of the first tiger beetles to make an appearance in the spring, often seen abroad on sunny days in early March. Similarly, it is one of the last to hibernate in the autumn months when its activity may range into mid-November.

*C. tranquebarica* is likely to be found in any open sandy spot. All types of clearings seem suitable, as long as the soil contains some sand and is not wholly saturated. It has been collected in virtually every Coastal Plain county. It is not surprising, however, that *tranquebarica* is considerably less common in the Piedmont and Appalachian areas of the state where sandy terrain is at a premium. I have no records from the Piedmont, Blue Ridge, or Ridge and Valley provinces, but have collected the species at half a dozen localities west of Cumberland, all but one on the Allegheny Plateau, and associated with areas of decomposing sandstone. Interestingly, in this regard, the most populous *tranquebarica* colony which I have thus far encountered in Maryland inhabits a few hundred square feet of residual sand atop Eagle Rock (3100 ft.) on Backbone Mountain in Garrett County.

*C. tranquebarica* is large, as tiger beetles go, and more wary than most, capable of long soaring flights of hundreds of feet; consequently, it is difficult to capture and requires repeated stalking. Small colonies or solitary beetles are the rule with this species, but exceptionally, colonies may number in the hundreds of beetles, as is the case with the Eagle Rock population.

The range of *C. tranquebarica* spans nearly the entire U.S., but



it is generally divided into a dozen or so races based largely on color and maculation. Maryland is home only to the nominate form which is typically deep-brown to nearly black in color with generally complete but narrow markings. Recognition of tranquebarica is usually easy, since it only superficially resembles C. hirticollis or C. repanda. It is consistently larger and darker than repanda as well as dissimilar in the shape of both humeral lunule and middle band. Some hirticollis approach tranquebarica in size, but again the shapes of both the humeral lunule and middle band differ.

#### Cicindela unipunctata Fab.

This large, dull brown tiger beetle is generally regarded as uncommon throughout its range and is viewed by some as a species well along the road to extinction (Graves and Pearson, 1973). Although most of the published records from Maryland are forty or more years old, and few recent collections have been reported, my experience with pitfall trap captures of unipunctata suggests that the scarcity is more apparent than real. A series of unbaited pitfalls set out for carabids along a wood road in the Douglas Point area of Charles County during the 1984 season produced an unexpected bonus of 24 C. unipunctata. My conclusion is that this species is not rare but merely secretive and may be distributed in isolated colonies. Moreover, it may be chiefly crepuscular. It has been most often collected on shaded woodland paths or on the forest floor, as well as under rocks. When disturbed, unipunctata rarely attempts flight although fully winged, and it can usually be captured by hand. The few specimens which I have taken by sight collecting were either motionless on bare ground or running swiftly along the tracks of dirt roads through forested areas. Habits so generalized make deliberate searching for this beetle difficult, and it is doubtless best taken in pitfalls or similar traps. It appears to be an early summer form with most records in May and June, but my pitfalls picked up stragglers until September.

C. unipunctata is basically southern in distribution, ranging through the Appalachians as well as parts of the Mississippi Valley and the lower Midwest. It has been collected as far north as New Jersey and may reach a northern limit there. Maryland records include Plummers Island in Montgomery County, Cheverly in Prince Georges County, Dans Mt. WMA in Allegany County, and Douglas Point as earlier noted, but I have also seen half a dozen others from D.C. and northern Virginia.

Among Maryland tiger beetles, C. unipunctata is distinctive in appearance and is unlikely to be confounded with any other resident species. It is large, 16-18 mm. long, with flattened and irregularly pitted elytra bearing greenish punctures. Elytral markings are restricted to a triangular white dot midway on each elytron at the margin.

#### Cicindela trifasciata Dej.

C. trifasciata ascendens LeC. ranges along the Atlantic coast from Florida north to at least South Carolina, based on published records. It is not at all unlikely that it occurs in North Carolina as well, but permanent breeding populations north of the Carolinas are speculative. The only justification for including this species among the "possibles" for Maryland is the presence of several old records from southern New Jersey. Boyd (1978) regards these data as valid but has considerable doubt that a permanent population exists. Perhaps trifasciata is able to extend its range northward under favorable conditions as do other southern insects, but only on a temporary basis.

This tiger beetle is an inhabitant of coastal mud flats and the muddy sand banks of tidal estuaries. It is apparently restricted to the margins of saline water bodies. The beetles are well camouflaged in this environment, and although weak fliers, they are often difficult to stalk. C. trifasciata is a summer species appearing in late May or early June and persisting into the early fall months.

C. trifasciata ascendens is immediately recognizable by its distinctive S-shaped middle band which is unlike the corresponding lunule in any other eastern tiger beetle. Moreover, the elytral lunules of trifasciata are generally narrow and obscure, appearing greasy.

#### Cicindela punctulata Oliv.

C. punctulata is common and widespread in Maryland as it is throughout the eastern two-thirds of the U.S. It is, in fact, an enormously adaptable species which is at home on bare ground ranging from sand to clay in such diverse habitats as gravel pits, cultivated fields,

woodland paths, and river banks. It shuns only very wet soil and dry loose sand. Like C. sexguttata Fab. and rufiventris Dej., this species occurs throughout the state, and moreover, it is essentially solitary, being generally encountered singly or in small numbers. Once spotted, punctulata is easily captured since it is not especially wary. The species is unique among our tiger beetles in producing an apple-like odor when handled. It is also unusual in being nocturnal as well as diurnal, and comes readily to light.

C. punctulata is dark-brown to black with inconspicuous markings which vary from nearly complete (broken humeral lunule, broken middle band joined with a short marginal band, and complete apical lunule) to a series of disconnected dots. In color and markings, this insect is reminiscent of C. rufiventris, but the latter can always be recognized by its bright red abdomen. Further, punctulata bears a row of large green fovea on each elytron.

This is a summer species not generally seen before early June, but it persists through most of September, with a population peak in mid to late July.

#### Cicindela patruela Dejean

C. patruela, like splendida and to a lesser extent purpurea, is quite an elusive species in Maryland. It has not been recently collected, to my knowledge, and I have located only eight records, the most recent of which is 40 years old. The species ranges from the midwest east to the mid-Atlantic region, and thence down the Appalachian chain to North Carolina, as well as north in isolated colonies to southern Ontario. Two subspecies are known. C. patruela patruela is green or bluish-green with a humeral and a post-humeral dot, a narrow but complete middle band, and two apical dots. It bears a first-glance resemblance to C. sexguttata, but the complete middle band of patruela is always distinct. All of the Maryland records, which extend from the Piedmont west to South Mountain, refer to the nominate race. C. patruela consentanea, black with elytral markings as in the nominate form, is the melanic race which is confined to the New Jersey Pine Barrens. There is an isolated record of this subspecies from Milford, Sussex Co., Delaware (B. Pagac, pers. comm.), but this locality needs confirmation.

C. patruela, in areas where it is fairly common such as the upper midwest and in New Jersey, is found on semi-open dry sand with sparse grasses and scattered shrubs, usually in upland situations. In Maryland such habitats are spotted throughout the Coastal Plain, but are generally very limited in extent. Certainly nothing as extensive as the Jersey Pine Barrens exists here, but sizable patches of pine-oak sandy scrub are developed on ancient sand dunes on the east sides of the Nanticoke and Pocomoke Rivers in Wicomico and Worcester Counties. Many of these areas remain unexplored for C. patruela. In contrast, the few captures of this species in Maryland were made in Piedmont and Appalachian terrain where such sandy areas are very scarce. The lack of suitable habitat may be one factor limiting the spread of patruela in our state.

The best prospects for finding this beetle in western Maryland rest with investigating a series of old sand pits dug in decomposing sandstones in parts of Garrett County. Similar pits in nearby West Virginia have recently yielded patruela (R. Acciavatti, pers. comm.). I have visited a few pits (Eagle Rock, 1 mile SW Savage River Dam, Silver Knob Road) without success, but several others remain to be explored.

The Maryland records of this species fall in April, May, and September, suggesting another spring-fall form, and indeed, patruela activity elsewhere does follow this pattern. In more northerly areas, there is considerable early to mid-June activity as well.

#### Cicindela sexguttata Fab.

C. sexguttata is a common and characteristic woodland species in Maryland and it is a rare collector indeed who has not observed these conspicuous green beetles flying along a forest path or alighting on a fallen log. The beetle is nearly ubiquitous in our area, ranging from the mountain crests of Garrett Co. to the flatlands of the lower Eastern Shore. They are most at home in the deciduous woodlands of central Maryland and least common in the pinelands of the outer Coastal Plain, but are rarely absent from any wooded area. C. sexguttata occurs through nearly all of the eastern half of the nation, breaking up into several subspecies along the northern and western fringes of its distribution.



*C. sexguttata* is typically brilliant green or bluish-green with three white dots on each elytron. These markings, however, can be variable in number, ranging from none to as many as eight. Viewed at low angles, the beetles often appear deep blue in color. The same deep blue is also characteristic of old museum specimens. Other variants include specimens with an overall olive-green hue and greasy luster, originally described as *sexguttata harrisi* Leng, but now regarded as a color variety apt to occur in any population.

*C. sexguttata* emerges early in the spring, usually in March, and reaches a population peak in early summer (June). Abundance declines slowly, and by midsummer, the beetles are relatively scarce. A few stragglers persist into September. During cool or cloudy weather, these insects can frequently be found under the loose bark of fallen trees.

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#### SPRING OCCURRENCE OF THE MONARCH BUTTERFLY IN MARYLAND \*

John H. Fales

There are numerous published records concerning the annual southward flight of the Monarch butterfly, *Danaus plexippus* (L.) in the fall of the year in the United States. These date back into the last century. One of the earliest reports, is in Maryland, by Ellzey (1889). These yearly flights have continued to attract observers in nearly all parts of the country. Various workers have made efforts to study these migrations by marking the insects in some manner.

One of the earliest at Piney Point, Md. was Cory (1937), who "sprayed (roosting Monarchs) with a green dye in hope that they may be recorded from this cluster at points in their southern travel." Later, Urquhart (1957) reported that two specimens marked in Canada with gummed tags were captured after flights of over 1000 miles. Urquhart (1960) reported on the successful tagging of Monarchs during the 1950's, and discussed the development of the gummed-label technique.

Adults of the Monarch butterfly have long been known to spend the winter in southern areas. Beall (1952) reported evidence, "that the Monarch is constantly in migration (in winter) although only at certain seasons does this migration attract popular attention because of the number of the butterflies involved."

Urquhart (1976) reported on the discovery of the long-sought winter home of the Monarch in the Sierra Madre mountain range in the state of Michoacan, Mexico. This event has triggered much research on the behavior of the millions of semi-hibernating Monarchs during the winter months as well as the break-up of these vast congregations prior to the return flight to the north. The missing link now remaining in the life-cycle of the Monarch is the exact method of the return flight.

Early in this century Comstock (1904) stated that, "The mother butterfly follows the spring northward as it advances as far as she finds milkweed sprouting. Then she deposits her eggs, from which hatch individuals that carry on the journey and in their turn lay eggs as far north as possible. Thus generation after generation pushes on until late in the season we hear of them as far north as Hudson Bay." However, Williams (1930) quoted C.V. Riley, another early entomologist, who said, "on the contrary,.....that the northward spring flight is accomplished generally by isolated individuals before the food plant has appeared above the ground. He has repeatedly observed the butterflies

going against the wind in the spring, and always northward or north-west." Williams (1930) commented that, "Actual demonstration of the northward spring flight is difficult, as all the evidence shows that it is performed individually by the butterflies without any of the gregarious instinct that characterizes the autumn flight and the hibernating period."

Years later, Urquhart (1960) discussed the theory that the return flight is by succeeding generations and stated that, "If such were the case, we would expect to find a large population of larvae in the southern parts of the continent in early spring, and we would expect to find fresh, brightly coloured specimens in the central and northern parts of the continent in spring and early summer. However, only a few larvae have been reported for the southern localities, particularly southern Texas, in spring, and the adults found in central and northern localities in May and early June are obviously old and worn, and in colour are the same as those found in the overwintering localities in late winter. Finally, the time taken for the complete development of a Monarch butterfly from egg to adult would not be sufficient to account for the presence of faded specimens found in northern localities in early May. It would appear therefore that some, if not all, migrants return to the breeding grounds in spring and early summer, followed by first generation butterflies in June and early July."

Urquhart (1976) made the following interesting comments: "As daylight lengthens in the wintering area, the monarchs - now sexually mature - feel the urge to mate and fly north, breeding new generations along the way." Also, "We learned...., that almost all males die on the way north from the wintering grounds." In addition, "Others may well appear as far north as Canada. Such an event would resolve one uncertainty: whether any monarchs from central Mexico make it back to the northern limits of the species' range."

Williams (1958) made the following comments on the spring migration: "....the Monarch moves to the south in the autumn gregariously in large bands, which are conspicuous, but that the insects of the return flight in the spring are nearly always widely scattered." He stated that, "This is the only butterfly in which it is known that the same individuals make the autumn flight in one year and the spring of the following year." Also, "It has been stated that only the females fly north and the males remain behind and die; this is not correct and, even in my own limited experience, the first I caught in Minnesota in the spring of 1932 - on the 30th May - was a male."

Presented here are the writer's records of the occurrence of the Monarch butterfly in Maryland in spring over a 46-year period starting in 1938. It should be noted that Clark (1932) reported a Monarch on 28/IV/31 along the Virginia shore of the Potomac River, and another on 9/V/31 at Great Falls, Maryland. Also of interest is Edwards' report (1878) that in West Virginia the first Monarchs are seen at the end of March. Shannon (1954) reported on his observations of 12/V/16 on the northern coast of New Jersey where faded and torn Monarch butterflies were seen migrating from the south and some were resting on bushes. He also stated that, "The sexes seem to return in about equal numbers."

In Table I are given the spring records of the Monarch in Maryland. These were obtained in the following counties: Allegany, Anne Arundel, Calvert, Dorchester, Frederick, Howard, Montgomery, Prince Georges, Queen Annes, Talbot, Wicomico and Washington, D.C. There were 13 years in which no early spring records were obtained. The average date of arrival based on 32 years of records between 13/IV and 25/V was 1/V.

One can recognize Monarchs migrating from their winter home by the faded, worn, ragged or torn appearance. The writer listed all records when specimens with these conditions were noted, which was not always done. However, there were 22 such records between 24/IV and 24/V, plus a late record on 3/VII. This later record poses the question - How long do the spring migrants live after arriving in the north?

Other information showed that fresh specimens might be first found between 11/V and 2/VI.

Approximately 260 records of spring Monarchs were noted, including those in early June, over the period from 1938-1984. During this period, Monarchs were observed on all days between 13/IV and 30/VI except on 15/IV, 20/V, 4/VI and 26/VI.

Based on the observed specimens that were sexed between 20/IV and 30/V, only two, or five percent, were males. Also, based on worn and faded specimens collected between 22/IV and 21/V, only one, or three percent were males.

\* Presented in part at the Annual Meeting of The Lepidopterists' Society in Washington, D.C. December 1957.

Table I. Some records of the first spring occurrence of the Monarch butterfly in the Maryland area.

Year	Date	Location	Sex		
			Male	Female	Unknown
1938	14/IV	National Airport, D.C.			X
1942	25/IV	Silver Spring, Montgomery Co.	X		
1944	10/V	Beltsville, Prince Georges Co.	X		
1945	13/IV	Silver Spring, Montgomery Co.			X
1946	21/V	Beltsville, Prince Georges Co.			X
1948	11/V	Silver Spring, Montgomery Co.			X
1949	28/IV	Beltsville, Prince Georges Co.			X
1950	26/IV	" " " "	X		
1951	21/V	" " " "			X
1952	22/IV	Washington, D.C.			X
1953	10/V	Plum Point, Calvert Co.	X		
1954	3/VI	Beltsville, Prince Georges Co.			X
1955	19/V	" " " "			X
1956	29/IV	Plum Point, Calvert Co.			X
1957	25/V	" " " "	X		
1959	21/V	Beltsville, Prince Georges Co.			X
1962	28/IV	Plum Point, Calvert Co.			X
1963	21/IV	Hallowing Point, Calvert Co.			X
1965	13/V	Beltsville, Prince Georges Co.			X
1967	2/V	" " " "			X
1968	4/V	Plum Point, Calvert Co.		X	
1970	13/V	Beltsville, Prince Georges Co.	X		
1971	9/V	Plum Point, Calvert Co.	X		
1972	6/V	" " " "			X
1974	15/IV	" " " "			X
1975	3/V	" " " "			X
1976	20/IV	" " " "		X	
1977	18/IV	" " " "			X
1978	13/IV	Lusby, Calvert Co.			X
1979	2/V	Sunderland, Calvert Co.			X
1980	5/V	Plum Point, Calvert Co.	X		
1981	29/IV	" " " "			X
1982	25/IV	" " " "			X

Brower (1977) wrote that, "Whether wild birds eat Monarch butterflies was hotly debated earlier in this century. There is no doubt they do." Concerning this behavior, Mrs. D.L. Reed brought the writer the wings from a male Monarch that she saw a Northern Cardinal, *Cardinalis cardinalis* (L.), catch and eat, at Plum Point, Calvert Co. on 7/VI/77.

It has been shown here that the arrival in Maryland of the first Monarch in spring may be as early as 13/IV. Eggs laid here by this date, due to coolness, may take as long as 12 days to hatch. The larval period may be 14 days, and the pupal stage may last seven days. Thus, fresh adults could possibly be on the wing by May 16. The average date of arrival from the data given here as mentioned was established as 1/V. June 3 would be the expected date for the first generation to appear. Fresh specimens have been recorded here on 21, 28, 31/V and 1, 2, 5, 9/VI. Clark (1932) reported that, "Fresh butterflies are first seen early in June."

As to overwintering migrants and fresh specimens being found together, Urquhart (1960) stated, "Thus there is a mixed population in a given area during the month of June which consists of late migrants, newly emerged first generation, and immigrants of the first generation from further south. In any given field in the breeding area brightly colored first generation butterflies mingle with migrants and immigrants." He also stated that, "A few of the original millions that journeyed southward complete the round trip and return to their northern breeding grounds."

Beall (1941) in referring to the spring migration in southern Ontario said, "....the earliest Monarchs were usually seen during the first week in June, but in 1940 they appeared on May 16."

Brewer (1982) reported on observing the start of the spring migration from the over-wintering site in Mexico on March 14. This means that four to six weeks may be the time required for the Monarch to reach the Maryland area considering the 1/V average arrival date established here.

The author saw egg-laying on 17/V/78 in Calvert County, and a full-grown larva was observed in Prince Georges County on 28/VI/48.

The forewing lengths of 22 spring Monarchs (females) were between 47-59 mm. and averaged 52 mm. A single male measured 52 mm.

In conclusion, it should be mentioned that the writer has studied butterfly migration for many years. Some notes on the Monarch in southern Maryland were given by Fales (1977). It is hoped that the information given here may be useful in helping to resolve some of the remaining controversy surrounding the interesting flight behavior of the Monarch butterfly.

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#### AN ANNOTATED CHECKLIST OF THE SCARABAEOIDEA (COLEOPTERA) OF MARYLAND

C. L. Staines, Jr.

The Scarabaeoidea have historically been favored by collectors. In spite of their popularity and economic importance there has been no comprehensive work on the superfamily. The following checklist of 266 species and subspecies is intended to stimulate interest in and publication of collection records for Scarabaeoidea in Maryland.

The checklist was compiled by a literature review and examination of the following collections: E.J. Ford; Maryland Department of Agriculture; C.L. Staines; W.E. Steiner; University of Maryland; and the U.S. National Museum. Species followed by an asterisk (\*) are ones where specimens from Maryland have not been seen but occur in at least two surrounding states. For each species the counties from which it has been reported are listed, followed by the months in which specimens have been collected. Also included are any notes on habitat or host.

#### LUCANIDAE

#### Lucaninae

*Lucanus elaphus* Fabricius. St. Marys, Somerset. June. Oak stumps; light.

Pseudolucanus capreolus (L.). Anne Arundel, Baltimore, Garrett, Montgomery, Prince Georges, Queen Annes, Talbot, Washington, Worcester. June to August. Decaying stumps; light.

## Dorcinae

Dorcus brevis (Say)\*. Listed in Leng (1920) from New Jersey and Virginia. Oak logs.

D. parallelus (Say). Baltimore, Montgomery, Prince Georges, Somerset. May to August. Oak, linden, and maple logs; light.

## Platyserinae

Platyserus virescens (Fabricius). Anne Arundel, Montgomery, St. Marys. April to October. Decaying logs; blackberry flowers.

P. piceus (Kirby). State label only.

## Aesalinae

Ceruchus piceus (Weber). Anne Arundel, Baltimore, Montgomery, Prince Georges, Washington, Worcester. March to December. Logs; light.

Nicagus obscurus (LeConte). Montgomery, Prince Georges. April to June. Damp debris in sandy areas.

## PASSALIDAE

Popilius disjunctus (Illiger). Anne Arundel, Baltimore, Carroll, Cecil, Harford, Montgomery, Prince Georges, Somerset, Worcester. April to November. Decaying logs.

## SCARABAEIDAE

## Scarabaeinae

## Scarabaeini

Canthon chalcites (Haldeman). Allegany, Washington, Worcester. September to October. Dung; road kill.

C. vigilans LeConte. District of Columbia. February to July. Dung; light.

C. pilularius (L.). Anne Arundel, Howard, Worcester. June to July. Cow, horse, human, and sheep dung.

Glaphyrocantion viridis viridis (Beauvois). Baltimore, Harford, Montgomery. June to September. Mammal and bird dung in densely wooded areas.

Melanocantion bispinatus (Robinson). Anne Arundel. August. Dung; dry fungi; dead animals.

Boreocantion probus (Germar). Anne Arundel, Prince Georges. May to August. Deer, rabbit, and cow dung in sandy, wooded areas.

## Coprini

Ateuchus histeroides histeroides Weber. Anne Arundel, Baltimore, Montgomery, Prince Georges, Wicomico. May to September. Dung; fungi; dead fish; light. Most abundant in wooded areas.

A. lecontei (Harold). Listed from Maryland in Woodruff (1973). Cow dung; light.

Dichotomius carolinus (L.). Anne Arundel, Baltimore, Montgomery, Prince Georges, St. Marys, Talbot. June to October. Cow dung; light.

Phanaeus vindex vindex MacLeay. Anne Arundel, Baltimore, Charles, Montgomery, Prince Georges. May to October. Cow dung.

Copris minutus (Drury). Anne Arundel, Baltimore, Charles, Montgomery, Prince Georges, Somerset. April to December. Dung; carrion; light.

C. fricator (Fabricius). Frederick, Montgomery, Prince Georges. May.

## Onthophagini

Onthophagus orpheus orpheus (Panzer). Anne Arundel, Baltimore, Carroll, Garrett, Howard, Montgomery, Prince Georges, Wicomico. May to October. Dung; bird and mammal nests; malt traps.

O. orpheus canadensis (Fabricius). Baltimore, Charles, Howard, Montgomery, Prince Georges. May to October. Cow dung; carrion; mammal nests.

O. pennsylvanicus Harold. Baltimore, Howard, Montgomery, Prince Georges, Talbot. May to September. Dung; carrion; fungi.

O. tuberculifrons Harold. Anne Arundel, Charles, Montgomery, Prince

Georges, St. Marys. March to August. Dung; fungi; rotten vegetables. More common in sandy locations.

O. hecate hecate (Panzer). Anne Arundel, Baltimore, Carroll, Garrett, Harford, Howard, Montgomery, Prince Georges, Somerset. April to October. Dung; fungi; carrion; rotten vegetables; malt traps; light.

O. striatulus striatulus (Beauvois). Anne Arundel, Baltimore, Calvert, Cecil, Frederick, Howard, Montgomery, Prince Georges, Talbot. April to October. Dung; fungi; carrion; sugar lure.

O. subaeneus (Beauvois). Charles, Montgomery, Prince Georges. June to October. Fungi; dung; debris; carrion; moist woodlands.

O. concinnus Laporte. Worcester. May to October. Dung of small mammals.

O. nuchicornis (L.). Anne Arundel, Caroline, Dorchester, Worcester. April to August. Cow and horse dung.

## Aphodiinae

## Aphodiini

Aphodius bicolor Say. Baltimore, Charles, Montgomery, Prince Georges, Talbot. August to October. Dung in wooded areas.

A. granarius (L.). Allegany, Anne Arundel, Baltimore, Carroll, Charles, Frederick, Garrett, Montgomery, Prince Georges, Somerset, Talbot. March to November. Fungi; cow dung; grass; light.

A. lentus Horn\*. Specimens seen from New Jersey and Virginia. June to September. Deer dung.

A. rubeolus Beauvois. Montgomery, Prince Georges. July to September. Dung; sandy soils.

A. stupidus Horn. Anne Arundel, Baltimore, Calvert, Charles, Harford, Prince Georges, St. Marys. March to October. Dung along wood margin.

A. erraticus (L.). Baltimore, Caroline, Frederick, Garrett, Prince Georges. April to June. Cow dung.

A. tenellus Say. Listed in Horn (1887) as A. foetidus Fabricius.

A. terminalis Say. Garrett, Prince Georges. April to November.

A. femoralis Say. Anne Arundel, Montgomery, Prince Georges. March to May. Kent, Montgomery, Prince Georges, Worcester. March to Novem. Dung.

A. badicinus Melsheimer. Baltimore, Frederick, Garrett, Howard, Montgomery, Prince Georges. January to October. Red squirrel carcass; light.

A. rufipes (L.). Garrett. September. Light.

A. campestris Blatchley. Listed in Woodruff (1973). Dung; light.

A. fimetarius (L.). Baltimore, Charles, Garrett, Harford, Prince Georges, Washington, Wicomico. March to October. Horse and cow dung; under logs; Taxus. Sandy areas.

A. haemorrhoidalis (L.). Carroll, Garrett, Prince Georges, Washington. May to October. Cow dung.

A. lividus (Olivier). Anne Arundel, Baltimore, Prince Georges, Talbot. June to October. Cow dung; light.

A. ruficollis Melsheimer. Anne Arundel, Baltimore, Carroll, Charles, Frederick, Garrett, Montgomery, Prince Georges, Somerset, Talbot. March to October. Dung; light.

A. serval Say. Harford, Wicomico. April to June. Beneath leaves and rubbish.

A. leopardus Horn. Charles, Frederick, Garrett. September to October. Deer dung.

A. rubripennis Horn. Frederick, Garrett. May to September. Deer dung.

A. fossor (L.). Baltimore, Caroline, Garrett, Montgomery. May. Cow dung.

A. silvanicus Cartwright. Somerset, Talbot. February to April. Deer dung.

A. parvus Horn\*. Listed in Fall (1932) from New Jersey to South Carolina along the coast.

A. manitobensis Brown. Garrett. May. Deer Dung.

A. luteolus Haldeman. Prince Georges. October.

A. stercorosus Melsheimer. Anne Arundel, Baltimore, Garrett, Montgomery, Prince Georges, Talbot, Worcester. May to August. Dung; light.

A. phaleroides Horn\*. Assateague Island, Virginia. July. Light.

A. robinsoni Cartwright\*. Specimens seen from New Jersey and West Virginia. September to October. Cow dung.

A. prodromus (Brahm). Baltimore, Charles, Garrett, Harford, Montgomery, Prince Georges, Queen Annes, St. Marys. March to October. Horse dung.

A. vittatus Say. Baltimore. June. Cow dung; light.

Oxvomus silvestris (Scopoli)\*. Listed in Horn (1887) from Philadelphia.

## Aegialiini

Aegialia (Leptaegialia) humeralis Brown\*. Hardy (1981) lists from New



- Jersey to South Carolina.  
 A. (*Aegialia*) *blanchardi* Horn\*. Listed in Horn (1887) from Massachusetts and North Carolina. Sandy beaches beneath vegetation.

## Eupariini

- Ataenius alternatus* (Melsheimer)\*. Listed in Cartwright (1974) from Pennsylvania and North Carolina. Light.  
 A. *fattigi* Cartwright. Anne Arundel, Harford, Somerset. Woodland debris; light.  
 A. *imbricatus* (Melsheimer). Anne Arundel, Baltimore, Montgomery, Prince Georges. May to August. Light.  
 A. *miamii* Cartwright. Anne Arundel, Baltimore, Calvert, Carroll, Charles, Harford, Howard, Montgomery, Prince Georges, St. Marys. Sandy areas; light.  
 A. *simulator* Harold. Anne Arundel, Calvert, Charles, Dorchester, Prince Georges, St. Marys, Somerset, Wicomico, Worcester. Dung; light.  
 A. *cylindrus* Horn. Prince Georges, Somerset. Dung.  
 A. *gracilis* (Melsheimer). Anne Arundel, Baltimore, Charles, Montgomery, Prince Georges, Somerset, Washington. April to August. Light.  
 A. *insculptus* Horn\*. Listed in Cartwright (1974) from New Jersey and South Carolina. Dung.  
 A. *ovatus* Horn. Anne Arundel, Montgomery, Prince Georges. Debris; litter.  
 A. *abditus* (Haldeman). Anne Arundel, Baltimore, Charles, Montgomery, Prince Georges. July. Light.  
 A. *spretulus* (Haldeman). Anne Arundel, Baltimore, Carroll, Frederick, Harford, Prince Georges, Queen Annes, St. Marys, Somerset, Washington, Wicomico, Worcester. April to September. Dung; fungi; dead cicada; light.  
 A. *strigatus* (Say). Anne Arundel, Baltimore, Calvert, Frederick, Garrett, Harford, Montgomery, Prince Georges, St. Marys, Somerset, Talbot, Washington, Wicomico. February to October. Dung; carrion.  
 A. *wenzelii* Horn. Calvert, Dorchester. Light.  
 A. *figulator* Harold. Anne Arundel, Baltimore, Frederick, Harford, Prince Georges, Somerset. July to August.  
 A. *glaseri* Cartwright. Cecil, Charles, Prince Georges. Under logs and debris on sandy shores.  
 A. *apicalis* Hinton. Harford, Prince Georges, Washington.  
 A. *brevis* Fall. Anne Arundel, Calvert.  
 A. *exiguus* Brown. Baltimore. May. Under debris on beach.  
*Pseudoataenius waltherhorni* (Balthasar)\*. Listed in Cartwright (1974) from Pennsylvania and Florida.  
 P. *contorus* Cartwright\*. Listed in Cartwright (1974) from New Jersey, Delaware, and Virginia. June to July.  
*Dialytes ulkei* (Horn). Baltimore, Frederick, Garrett, Talbot. June to September. Deer dung.  
 D. *truncatus* (Melsheimer). Baltimore, Frederick, Garrett. August to September. Light.  
 D. *striatulus* (Say). Baltimore, Garrett, Prince Georges. June to August. Deer dung; carrion.  
*Dialytellus dialytoides* (Fall). Garrett. May to June. Deer dung.  
 D. *humeralis* (LeConte). Garrett. June. Deer dung.

## Psammodiini

- Psammodius bidens* Horn. Anne Arundel, Somerset. July. Grass roots in sandy soils; light.  
 P. *basalis* (Mulsant and Rey). Anne Arundel. August to September. Grass roots; debris; sandy areas.  
 P. *laevipennis* A. Costa. Anne Arundel. April to September.  
 P. *interruptus* Say. State label only.  
 P. *sulcicollis* (Illiger)\*. Listed in Cartwright (1955) from south Philadelphia and New Jersey.  
*Rhyssalus scaber* Haldeman. Baltimore. Under stones in moist areas.  
*Saprosites ventralis* Horn. Montgomery, Prince Georges. May.  
*Pleurophorus caesus* (Creutzer). Anne Arundel, Baltimore, Montgomery. May to June. Potato tubers; zinniz (sic) roots; under cantaloupes; light.  
 P. *atlanticus* Cartwright\*. Listed by Cartwright (1948) from New Jersey and Virginia. Sandy areas along rivers.  
*Aphotaenius carolinus* (Van Dyke). Prince Georges. Dung in forest areas.

## Geotrupinae

- Bolbocerosoma farctum* (Fabricius). Anne Arundel, Baltimore, Calvert, Frederick, Harford, Montgomery, Prince Georges. June to October. Pine woods; sandy areas; light.  
 B. *tumefactum* (Beauvois). Charles, Garrett, Montgomery, Prince Georges. May to October. Turf; sandy roadways; light.  
*Geotrupes blackburnii blackburnii* (Fabricius). Allegany, Baltimore, Charles, Harford, Prince Georges, Wicomico. March to November. Dung; carrion; decaying fungi; chicken feathers; malt trap; light.  
 G. *egeriei* Germar. Prince Georges. April to September. Dung; fungi; rotten fruit; malt traps.  
 G. *hornii* Blanchard. Montgomery, Prince Georges, Talbot. July to October. Fungi; dung; light.  
 G. *splendidus splendidus* (Fabricius). Baltimore, Caroline, Garrett, Montgomery, Prince Georges. May to October. Fungi; dung; carrion.  
 G. *balyi* Jekel. Anne Arundel, Baltimore, Somerset. July to September. Fungi in wooded areas.  
 G. *semiopacus* Jekel. Frederick, Garrett, Montgomery, Prince Georges, Talbot, Washington, Wicomico. April to October. Fungi in wooded areas.  
 G. *ulkei* Blanchard\*. Listed in Howden (1955) from Hillsboro, Virginia. September. Decomposing leaves; fungi.  
*Eucanthus lazarus* (Fabricius). Anne Arundel, Baltimore, Harford, Prince Georges. June to August. Pasture; light.  
 E. *subtropicus* Howden. Anne Arundel, Baltimore, Calvert, Charles, Harford, Prince Georges, St. Marys, Wicomico, Worcester. June to August. Sandy open areas; light.  
 E. *impressus* Howden. Anne Arundel, Baltimore, Calvert, Charles, Dorchester, Harford, Prince Georges, St. Marys. July. Light.  
*Bolboceras thoracicornis* (Wallis)\*. Listed in Howden (1955) from Pennsylvania and Virginia.  
 B. *cornigerus* Melsheimer. Listed in Wallis (1928) from Maryland.  
 B. *liebecki* (Wallis). Baltimore, Garrett, Prince Georges, Talbot. May to September. Well shaded hillsides.  
 B. *darlingtoni* (Wallis). Prince Georges. October. Burned over sandy areas.  
 B. *falli* (Wallis). Baltimore. August. Light.

## Glaphyrinae

- Lichnanthe vulpina* (Hentz). Anne Arundel, Prince Georges. June. Along streams.

## Ceratocanthinae

- Cloetous aphodioides* (Illiger). Anne Arundel, Baltimore, Montgomery, Prince Georges, Talbot. March to September. Under bark; light.  
 C. *globosus* Say. Anne Arundel, Talbot. June to July. Under bark; light.

## Troginae

- Trox scaber* (L.). Anne Arundel, Baltimore, Frederick, Montgomery, Prince Georges, Somerset. March to August. Bird and mammal nests; owl pellet; chicken feathers; carrion; light.  
 T. *hamatus* Robinson. Anne Arundel, Baltimore, Frederick, Prince Georges, Somerset, Worcester. April to June. Carrion; mammal nests; feathers; light.  
 T. *tuberculatus* (DeGeer). Prince Georges, Somerset, Washington. February to May. Owl pellet; carrion.  
 T. *unistriatus* Beauvois. Baltimore, Prince Georges, Somerset. May to August. Carrion; deerhide; light.  
 T. *monachus* Herbst. Prince Georges, Somerset. May to August. Carrion; buzzard nest; feathers; malt trap; light.  
 T. *laticollis* LeConte. Baltimore. October. Fox and woodchuck nests.  
 T. *terrestris* Say. Baltimore, Prince Georges. April. Carrion; light.  
 T. *capillaris* Say. Baltimore, Prince Georges. August. Carrion; deerhide; fox den.  
 T. *scabrosus* Beauvois\*. Listed in Vaurie (1955) from New Jersey and North Carolina. Carrion; sandy areas.  
 T. *affinis* Robinson. Baltimore, Montgomery. May to June. Bird nests; light.  
 T. *aqualis* Say. Listed in Vaurie (1955) from Maryland. Bird and mammal nests.  
 T. *foveicollis* Harold. Anne Arundel, Baltimore, Frederick, Prince

- Georges, Somerset, Worcester. March to August. Dung; carrion; owl pellet; birds nests; feathers; light.
- T. variolatus* Melsheimer. Baltimore, Frederick, Garrett. April to October. Carrion; dung; owl pellet; light.
- T. suberosus* Fabricius. Baltimore, Montgomery, Prince Georges, Worcester. April to September. Carrion; feathers; dung; light.
- T. striatus* Melsheimer\*. Listed in Vaurie (1955) from New Jersey and Pennsylvania. Owl nests and pellets.
- T. spinulosus* Simi Robinson. Baltimore, Montgomery, Somerset, Wicomico. May to August. Carrion; owl pellets; light.
- T. sordidus* LeConte. Baltimore, Montgomery. May to June. Carrion; fox den; light.
- T. tytus* Robinson. Washington. Barn owl nest and pellets.
- T. asper* (LeConte). Montgomery. June. Carrion.

## Melolonthinae

## Melolonthini

- Phyllophaga hirticula* (Knoch). Baltimore, Prince Georges. May to June. Leaves of beech, birch, elm, honeysuckle, magnolia, rose, willow.
- P. hirsuta* (Knoch). Anne Arundel, Baltimore, Somerset. April to June. Leaves of beech, dogwood, maple, rose, walnut.
- P. vilifrons* (LeConte). Listed from Maryland by Luginbill and Painter (1953). Leaves of beech, birch, dogwood, walnut, willow.
- P. aemula* (Horn). Wicomico, Worcester. July to August. Leaves of beech, rose, willow; light.
- P. ilicis* (Knoch). Montgomery. Leaves of beech, dogwood, elm, maple, mulberry, sycamore, walnut, willow; light.
- P. crenulata* (Froelich). Anne Arundel, Baltimore, Montgomery, Prince Georges, Somerset. May to September. Leaves of beech, birch, dogwood, maple, mulberry, sycamore, willow.
- P. subtonsa* (LeConte). Anne Arundel. July. Leaves of beech, walnut.
- P. tristis* (Fabricius). Anne Arundel, Baltimore, Prince Georges. April to June. Leaves of beech, birch, dogwood, elm, maple, sycamore, walnut, willow.
- P. latifrons* (LeConte). Baltimore. Leaves of beech, walnut; Japanese beetle trap.
- P. prununculina* (Burmeister)\*. Listed in Luginbill and Painter (1953) from New Jersey and North Carolina. Leaves of beech, rose; Japanese beetle trap; light.
- P. quercus* (Knoch). Anne Arundel, Baltimore. June to August. Leaves of beech, elm, magnolia, walnut, willow.
- P. micans* (Knoch). Anne Arundel, Baltimore, Prince Georges, Talbot. April to June. Leaves of beech, birch, dogwood, elm, maple, walnut, willow.
- P. diffinis* (Blanchard). Talbot. March to April. Leaves of beech, elm, dogwood, maple, walnut; dung.
- P. balia* (Say). Montgomery. April to June. Leaves of beech, walnut.
- P. implicita* (Horn)\*. Listed by Luginbill and Painter (1953) from New Jersey and Georgia. Leaves of beech, dogwood, elm, sycamore, walnut, willow.
- P. enphilita* (Say). Baltimore, Prince Georges, St. Marys. July to August. Leaves of beech, birch, dogwood, elm, sycamore, walnut, willow.
- P. inversa* (Horn). Baltimore, Montgomery, Prince Georges. May. Leaves of beech, birch, elm, walnut, willow.
- P. luctuosa* (Horn). Montgomery. July. Leaves of beech, birch, elm, mulberry, walnut, willow, oak, hickory; Japanese beetle trap; light.
- P. futilis* (LeConte). Baltimore. June. Leaves of beech, birch, elm, maple, mulberry, walnut, willow.
- P. fusca* (Froelich). Anne Arundel, Baltimore, Frederick, Prince Georges. April to June. Leaves of beech, birch, dogwood, elm, maple, walnut, willow.
- P. sylvatica* Sanderson. Caroline. June. Leaves of beech, elm, walnut.
- P. elaberrima* (Blanchard)\*. Listed by Luginbill and Painter (1953) from New Jersey and South Carolina. Leaves of beech, rose, walnut.
- P. anxia* (LeConte). Anne Arundel, Garrett, Prince Georges, St. Marys. April to June. Leaves of beech, birch, dogwood, elm, walnut, willow.
- P. hornii* Smith. Montgomery. April to June. Leaves of beech, birch, elm, sycamore, walnut, willow; Japanese beetle trap; light.
- P. rugosa* (Melsheimer). Listed from Maryland by Luginbill and Painter (1953). June. Leaves of beech, birch, dogwood, elm, sycamore, walnut, willow; light.

- P. fraterna* Harris. Anne Arundel, Baltimore, Montgomery, Prince Georges. May to September. Leaves of beech, dogwood, elm, sycamore, walnut, willow.
- P. knochii* (Schoenherr and Gyllenhal). Caroline, Prince Georges, Worcester. April to August. Leaves of beech, elm, maple, sycamore, walnut.
- P. barda* (Horn). District of Columbia. May. Leaves of beech, walnut; light.
- P. forsteri* (Burmeister). Prince Georges. April. Leaves of birch, elm, maple, walnut.
- P. marginalis* (LeConte). Frederick. July. Leaves of beech, walnut.
- P. drakii* (Kirby). Anne Arundel, Baltimore, Prince Georges. March to May. Leaves of beech, birch, dogwood, maple.
- P. foxii* Davis. Prince Georges, Somerset. May to June. Leaves of beech, birch, elm, willow.
- P. fervida* (Fabricius). Baltimore, Frederick, Prince Georges. April to June. Leaves of beech, elm, maple, walnut, willow.
- P. gracilis* (Burmeister). Dorchester, St. Marys. June to July. Leaves of beech, elm, sycamore, walnut, willow.
- P. gracilis angulata* Glasgow. Baltimore, Worcester. July to August. Leaves of beech, walnut.
- Polyphylla variolosa* Hentz. Prince Georges, Worcester. July to September. Shrub and tree roots; light.
- Diplotaxis sordida* (Say). Anne Arundel, Baltimore, Montgomery, Prince Georges. June to August. Spruce and pine roots; light.
- D. atlantis* Fall. Baltimore, Calvert, Carroll, Cecil, Montgomery, Prince Georges, Somerset, Washington, Worcester. May to September. Light.
- D. liberta* (Germar). Anne Arundel, Baltimore, Montgomery, Prince Georges, Talbot, Worcester. June to November. Poplar roots; light.
- D. frondicola* (Say). Baltimore, Dorchester, Prince Georges. May to August. Beneath logs and stones; pecan and walnut foliage.
- D. harperi* Blanchard. Baltimore, Frederick, Kent, Montgomery. May to August. Oak, hickory; light.
- D. fulva* (LeConte). Baltimore.
- D. punctatorugosa* Blanchard\*. Vaurie (1960) lists from Seaford, Delaware.
- D. subcostata* Blanchard\*. Vaurie (1960) lists from New Jersey to Florida. Pine; light.
- D. bidentata* LeConte\*. Vaurie (1960) lists from New Jersey to Florida.
- D. tristis* Kirby. Garrett, Prince Georges. March to September.

## Sericini

- Maladera castanea* (Arrow). Anne Arundel, Baltimore, Cecil, Montgomery, Prince Georges, Worcester. April to September. Foliage of many plants; light.
- Serica georgiana lecontei* Dawson. Baltimore, Montgomery. April to July. Light.
- S. georgiana georgiana* Leng. Frederick, Montgomery, Prince Georges. April to July.
- S. sericea* (Illiger). Anne Arundel, Baltimore, Calvert, Montgomery, Prince Georges. March to July. Light.
- S. parallela* Casey. Baltimore, Montgomery, Prince Georges, Worcester. May to June. *Pinus virginiana*.
- S. mystica* Dawson. Montgomery, Washington. April.
- S. intermixta* Blatchley. Baltimore, Calvert, Dorchester, Frederick, Montgomery, Prince Georges. March to June. Decaying logs; leaf mold; light.
- S. atricapilla* Kirby. Baltimore, Howard, Montgomery, Prince Georges. April to July.
- S. blatchleyi* Dawson. Anne Arundel, Prince Georges, Worcester. May to June. Oak leaves; lespedeza; strawberry.
- S. imitans* Chapin. Prince Georges. April.
- S. iricolor* (Say). Anne Arundel, Prince Georges. April to June.
- S. vespertina* (Gyllenhal). Allegany, Baltimore, Caroline, Dorchester, Garrett, Montgomery, Prince Georges. May to June. Under leaves; light.
- S. peregrina* Chapin. Baltimore, Harford, Montgomery, Prince Georges. May to June. Light.
- S. floridana* Dawson\*. Dawson (1967) lists from New Jersey and North Carolina.
- S. loxia* Dawson. Listed from Maryland in Dawson (1952).
- S. opposita* Dawson. Listed from Maryland in Dawson (1952).

## Macroductylini

- Dichelonyx diluta (Fall). Listed from Maryland in Brown (1946).  
D. fuscata (LeConte). Frederick, Montgomery, Prince Georges. April to May.  
D. albicollis (Burmeister). Anne Arundel, Baltimore, Garrett. May to June. Pine foliage; light.  
D. elongata (Fabricius). Baltimore, Carroll, Garrett, Prince Georges. June. Flowers of rose, plum; leaves of oak, willow; light.  
D. subvittata (LeConte). Anne Arundel, Garrett, Prince Georges. April to June. Leaves of oak, witch hazel.  
Macroductylus angustatus Beauvois. Montgomery, Prince Georges. June to July. Light.  
M. subspinosus (Fabricius). Anne Arundel, Baltimore, Frederick, Kent, Montgomery, Prince Georges, Queen Annes, Worcester. May to August. Crabapple, rose, peach, cherry, pear, raspberry, viburnum.

## Hopliini

- Hoplia trifasciata Say. Allegany, Anne Arundel, Baltimore, Charles, Montgomery, Prince Georges, St. Marys. April to May. Willow, honeysuckle, oak; roseaceous flowers.  
H. trivialis Harold. Anne Arundel, Baltimore, Cecil, Harford, Montgomery, Prince Georges, Worcester. April to August. Foliage of hickory, pecan, dogwood, oak, junberry; beneath boards, stones, and rubbish in sandy areas near water; light.  
H. modesta Haldeman. Montgomery, Prince Georges, Talbot. May to June. Viburnum flowers; tulip poplar; beach.  
H. equina LeConte. Anne Arundel, Prince Georges, Wicomico. June. Blueberry; grass.

## Rutelinae

## Anomalini

- Anomala binotata (Gyllenhal). Anne Arundel, Carroll, Dorchester, Frederick, Prince Georges, Queen Annes, Somerset, Talbot. May to August. Light.  
A. semilivida LeConte. Wicomico. July.  
A. orientalis (Fabricius). Baltimore, Montgomery. July. Flowers; turf.  
A. flavipennis (Fabricius). Montgomery, Prince Georges, Talbot, Worcester. April to May. Pasture land; Japanese beetle trap.  
A. flavipennis subquadrata Casey. State label only.  
A. innuba (Fabricius). Talbot. June to July. Flowers; heads of timothy and wheat; light.  
A. lucicola (Fabricius). Anne Arundel, Kent, Prince Georges, St. Marys, Worcester. June to July. Foliage; tree roots.  
A. marginata (Fabricius). Anne Arundel, Baltimore, Harford, Prince Georges, Somerset, Talbot. May to August. Pastures.  
A. obliqua Horn. Anne Arundel, Charles, Kent, St. Marys, Worcester. June to July. Pines.  
A. umbra Casey. Anne Arundel, Montgomery, Worcester. April to June. Light.  
A. undulata Melsheimer. Anne Arundel, Baltimore, Prince Georges, St. Marys, Talbot, Wicomico, Worcester. April to July. Flowers; foliage; light.  
Popillia japonica Newman. All counties. June to November. Foliage of numerous plants.  
Strigoderma arboricola (Fabricius). Anne Arundel, Baltimore, Caroline, Dorchester, Montgomery, Prince Georges, Somerset, Talbot, Worcester. June to October. Flowers of rose, waterwillow, blackberry.  
S. pygmaea (Fabricius). Anne Arundel, Prince Georges, St. Marys, Worcester. July. Low vegetation in sandy areas; light.

## Rutelini

- Pelidnota punctata (L.). Anne Arundel, Baltimore, Cecil, Harford, Kent, Frederick, Prince Georges, Talbot, Worcester. June to September. Grape; light.  
Cotalpa lanigera lanigera (L.). Baltimore, Prince Georges. May. Leaves of pear, oak, poplar, hickory, maple, cottonwood, willow; light.  
Parastasia brevis (LeConte). Baltimore, Talbot. April to August. Decaying wood; light.

## Dynastinae

## Oryctini

- Strategus antaeus (Drury). Prince Georges, Worcester. June. Chicken feathers; light.  
Ligyrrus gibbosus gibbosus (DeGeer). Anne Arundel, Baltimore, Calvert, Carroll, Howard, Montgomery, Prince Georges, Queen Annes, Washington, Worcester. May to September. Plant roots; light.  
L. morio LeConte. Anne Arundel, Dorchester, Prince Georges, Talbot. April to September. Light.  
L. relictus (Say). Anne Arundel, Cecil, Dorchester, Talbot. July to August. Under rubbish; light.  
Xyloryctes jamaicensis (Drury). Anne Arundel, Baltimore, Dorchester, Montgomery, Prince Georges, St. Marys, Wicomico, Worcester. July to September. Leaf mold; light.  
Aphonus castaneus (Melsheimer). Anne Arundel, Prince Georges, St. Marys. July. Sandy soil; turf.  
A. densicauda Casey\*. Casey (1915) lists from Pennsylvania. Turf.  
Euethela rugiceps LeConte. Anne Arundel, Baltimore, Queen Annes, Somerset. April to August. Corn; soil.

## Dynastini

- Dynastes titvus (L.). Anne Arundel, Baltimore, Calvert, Caroline, Carroll, Charles, Dorchester, Frederick, Harford, Howard, Kent, Montgomery, Prince Georges, Queen Annes, St. Marys, Somerset, Talbot, Worcester. April to August. Decaying logs; light.

## Cyclocephalini

- Cyclocephala borealis Arrow. Anne Arundel, Baltimore, Prince Georges, Talbot, Washington. April to July. Turf; pigweed; light.  
C. immaculata (Olivier). Baltimore, Prince Georges, Talbot. June to July. Turf; Japanese beetle trap; light.  
Dyscinetus trachypygus (Burmeister). Prince Georges. May to October. Light.  
D. morator (Fabricius). Anne Arundel, Baltimore, Prince Georges, Somerset, Talbot. April to September. Turf; near pig pens.

## Phileurini

- Phileurus castaneus Haldeman. Charles. Holes in oak trees; light.

## Cetoniinae

## Gymnetini

- Cotinis nitida (L.). Anne Arundel, Baltimore, Caroline, Cecil, Frederick, Kent, Montgomery, Prince Georges, Queen Annes, St. Marys, Talbot, Wicomico, Worcester. May to September. Light; ripening fruit.

## Cetoniini

- Euphoria fulgida (Fabricius). Allegany, Anne Arundel, Baltimore, Carroll, Montgomery, Prince Georges. June. Thistle flowers.  
E. herbacea (Olivier). Anne Arundel, Baltimore, Kent, Prince Georges, St. Marys, Talbot, Washington. June to September. Flowers of yarrow, milkweed; ripening fruit.  
E. inda (L.). Allegany, Baltimore, Calvert, Dorchester, Frederick, Montgomery, Prince Georges. March to November. Flowers of dahlia, lilac; fruit of peach, grape, apple.  
E. sepulchralis (Fabricius). Anne Arundel, Baltimore, Carroll, Charles, Dorchester, Frederick, Kent, Montgomery, Prince Georges, Queen Annes, St. Marys, Washington. May to October. Flowers of goldenrod, apple, thistle, viburnum, milkweed; ripe fruit.  
Stephanucha areata (Fabricius). Anne Arundel. April.

## Cremastocheilini

- Cremastocheilus harrisii Kirby. Calvert, Montgomery, Prince Georges. April to June. Beach.  
C. canaliculatus Kirby. Baltimore, Montgomery. March to September.  
C. castaneae Knoch. Anne Arundel, Charles, Montgomery, Prince Georges. May.  
C. variolosus Kirby. State label only. April to June.



Psilocnemis leucosticta Burmeister. Listed from Maryland by Potts (1945).

### Trichiini

- Trigonopeltastes delta (Foster). Baltimore, Dorchester, Wicomico. July to August. Flowers; Japanese beetle trap; oak stump.  
Osmoderma scabra (Beauvois). Baltimore, Carroll, Frederick, Garrett, Montgomery, Prince Georges. June to August. Rotten logs.  
Q. eremicola (Knoch). Anne Arundel, Baltimore, Cecil, Dorchester, Frederick, Garrett, Howard, Montgomery, Prince Georges, Talbot, Washington, Worcester. February to August. Rotten logs; light.  
Gnorimella maculosa (Knoch). Charles, Howard, Montgomery, Prince Georges. March to June. Dead red maple, redbud; dogwood flowers.  
Trichiotinus piger (Fabricius). Baltimore, Charles, Frederick, Garrett, Montgomery, Prince Georges, Talbot, Washington. May to August. Flowers of rose, iris, lilac, dogwood, dogbane; decaying oak.  
T. affinis (Gory and Percheron). Baltimore, Carroll, Frederick, Montgomery, Prince Georges, Worcester. May to October. Flowers of raspberry, blackberry, daisy; decaying stumps.  
T. bibens (Fabricius). Prince Georges. June. Flowers of dogwood, viburnum, Queen Annes lace; decaying logs.  
T. lunulatus (Fabricius). Charles, Dorchester, Worcester. June to July. Dead oak.

### Valgini

- Valgus squamiger (Beauvois). Baltimore, Prince Georges. March to November. Wood infested with termites.  
V. canaliculatus (Fabricius). Baltimore, Cecil, Kent, Montgomery, Prince Georges, Queen Annes, Worcester. March to October. Flowers of mockorange, linden, dogwood, viburnum; decaying logs; under bark; termite nest.

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# A PRODUCTIVE BUTTERFLY SURVEY ALONG A LOCAL POWERLINE IN NORTHERN PRINCE GEORGES COUNTY, MARYLAND

Richard H. Smith, Jr.

The amateur naturalist may make a significant contribution to local natural history as well as partake of many enjoyable midday breaks in routine by accumulating data toward a local faunal survey. The area to be covered by the survey could be a nearby park or land plot or, more favorably, a naturally unique locality or topographic formation. In Maryland, extremely dry outcroppings resembling serpentine and shale barrens occur locally. Since these represent uncommon geological conditions, they often harbor an unusual assortment of plants and insects and thereby offer attractive survey opportunities. Entry onto many of the local and easily accessible dry outcroppings, however, may pose somewhat of a problem because they often do not coincide with park areas. Permissions of many private landowners must usually be secured to conduct a representative survey. This task may be considerably simplified if a trail under single ownership runs through the area of interest. Such a trail feature is ideally provided when an electric powerline traverses the area of interest.

Powerline right-of-ways typically provide an ample assortment of local habitats (dry hillides, meadow marshes, woods trails, etc.), are easy to enter, are not generally subject to insecticide applications, and allow a single point of contact for securing permission to enter an essentially large land cross section. Many segments of right-of-ways are periodically cleared, thus providing a distinctive grassy to brush habitat. Insects as well as other fauna from the usually wooded surroundings tend to congregate along the powerline clearing edges. This, of course, facilitates survey efforts. Although additional permissions must be obtained to enter industrial, crop, and grazing areas and any state or federal lands in the right-of-way, the powerline trails usually still pass through a plentiful supply of wild areas managed exclusively by the power companies. Power companies, in fact, encourage responsible secondary uses of their right-of-ways (PEPCO, 1981), but permission must be obtained in writing from the power company offices.

Since I spend most of my automobile driving time on the main highways in the Baltimore-Washington corridor, I have become well-acquainted with the natural features in this particular area. In the land tract from Burtonsville to Bowie in the northern Prince Georges County segment, I observed stretches of very dry, stony or sandy, and generally infertile soil conditions. This became increasingly intriguing to me because the plants in this area appeared to be limited to those found commonly only in serpentine barrens. Several oak and wild grass species as well as scrub pine (*Pinus virginiana* Mill.) dominate the landscape. As this area was conveniently near to work and was also traversed by a PEPCO right-of-way, I eventually proceeded to acquire a permit and conduct a survey along this powerline right-of-way during the period from mid-1980 through 1983.

During the first year of the survey effort, most areas of the powerline span from Burtonsville to Bowie (except obvious industrial, agricultural, and government properties) were hiked and evaluated for survey potential. Characteristics such as easy access and the variety of plant species were noted. Five specific locations along the right-of-way were eventually chosen as survey sites and are listed below along with their distinctive plant species and resident observed uncommon butterfly species. These areas were visited on a regular basis at midday during each of the spring and summer months over the subsequent three-year period. Notable insect species (primarily butterflies) identified during each visit were recorded. The final list of insect species and time period during which they were observed is presented below. Lepidopterists especially will note from the lists that many uncommon butterfly species which do not all ordinarily occur at a single location did, nevertheless, turn up along this particular powerline span during the course of the survey.

## SITE 1. From Route 198 south to Old Gunpowder Road.

DISTINCTIVE PLANTS: oaks (*Quercus* spp.), highbush blueberry (*Vaccinium corymbosum* L.), greenbrier (*Smilax rotundifolia* L.), sheep laurel (*Kalmia angustifolia* L.), winged sumac (*Rhus copallina* L.), mountain laurel (*Kalmia latifolia* L.), and wild azalea (*Rhododendron* spp.).

RESIDENT UNCOMMON BUTTERFLIES: *Atrytonopsis hianna* (Scudder), *Incisalia augustus croesoides* Scudder, and *Incisalia*

*henrici* (Grote & Robinson).

## SITE 2. Aitcheson Road off Old Gunpowder Road.

DISTINCTIVE PLANTS: scrub pine, chestnut oak (*Quercus prinus* L.), blackjack oak (*Quercus marilandica* Muench.), beardgrass (*Andropogon* spp.), slender bushclover (*Lespedeza virginica* L.), wild indigo (*Baptisia tinctoria* L.), and plentiful tickseed sunflowers (*Bidens* spp.) in low spots.

RESIDENT UNCOMMON BUTTERFLIES: *Hesperia metea* Scudder, *Hesperia leonardus* Harris, *Euptoieta claudia* (Cramer), and possibly *Thorybes confusus* Bell.

## SITE 3. Van Dusen Road just west of Interstate 95.

DISTINCTIVE PLANTS: abundant common milkweed (*Asclepias syriaca* L.), Indian hemp (*Apocynum cannabinum* L.), and red clover (*Trifolium pratense* L.) in an abandoned cloverfield.

RESIDENT UNCOMMON BUTTERFLIES: *Thymelicus lineola* (Ochsenheimer).

## SITE 4. East end of Muirkirk Road.

DISTINCTIVE PLANTS: oaks, common milkweed, Indian hemp, wild indigo, and tick trefoil (*Desmodium* spp.).

RESIDENT UNCOMMON BUTTERFLIES: *Erynnis baptisiae* (Forbes), *Satyrus libarops strigosus* (Harris), *Harknessclenus titus mopsus* (Hubner), *Incisalia nippon* (Hubner), and *Euristromy ontario* (W.H. Edwards).

## SITE 5. From Thomkins Lane (north of Bowie) north to Route 197.

DISTINCTIVE PLANTS: American holly (*Ilex opaca* Ait.), sheep laurel, hawthorn (*Crataegus* spp.), *Viburnum* spp., wild azalea, and in acidic, boggy areas were highbush blueberry, sweet pepperbush (*Clethra alnifolia* L.), and sphagnum moss.

RESIDENT UNCOMMON BUTTERFLIES: *Staphylus hayhurstii* (W.H. Edwards), *Incisalia henrici*, *Incisalia augustus croesoides*, *Incisalia nippon*, *Parrhasius m-album* (Boisduval & LeConte), and *Libytheana bachmanii* (Kirtland).

## FINAL BUTTERFLY SURVEY LIST

*Evergryus clarus* (Cramer) -- May to August  
*Achalarus lycaides* (Geyer) -- early June to early July  
*Thorybes bathyllus* (J.E. Smith) -- early to mid June, late July to early August  
*Thorybes pylades* (Scudder) -- early June  
*Thorybes confusus* (Bell) -- mid June  
*Staphylus hayhurstii* (W.H. Edwards) -- late July  
*Erynnis icelus* (Scudder & Burgess) -- early May to early June  
*Erynnis juvenalis* (Fabricius) -- late April to early May  
*Erynnis horatius* (Scudder & Burgess) -- late June to early August, early September  
*Erynnis baptisiae* (Forbes) -- mid to late July  
*Pyrgus communis* (Grote) -- mid September  
*Pholisora catullus* (Fabricius) -- early to late July  
*Nastra lherminier* (Latreille) -- early June, early July, early August  
*Ancylorhiza numitor* (Fabricius) -- late July to early August  
*Thymelicus lineola* (Ochsenheimer) -- mid June  
*Hesperia leonardus* Harris -- early to mid September  
*Hesperia metea* Scudder -- early May  
*Polites coras* (Cramer) -- early to mid June, late July to mid August  
*Polites origines* (Fabricius) -- early June, late August to early September  
*Wallengrenia egeremet* (Scudder) -- mid June to early July, late July to early August, early September  
*Pompeius verna* (W.H. Edwards) -- mid to late June  
*Atalopedes campestris* (Boisduval) -- mid to late July, late August to mid September  
*Poanes hobomok* (Harris) -- early June  
*Poanes zabulon* (Boisduval & LeConte) -- early June, early to mid August  
*Atrytonopsis hianna* (Scudder) -- late May  
*Eurytides marcellus* (Cramer) -- mid June  
*Papilio polyxenes asterius* Stoll -- late June to mid August  
*Pterourus glaucus* (Linnaeus) -- mid April to mid August  
*Pterourus troilus* (Linnaeus) -- late May to early August  
*Artogeia rapae* (Linnaeus) -- mid to late April, early to mid June, early August

Falcatrica midea (Hubner) -- early May  
Colias philodice Godart -- late April to early May, mid to late June, early September  
Colias eurytheme Boisduval -- early to mid June, August, September  
Pyrisitia lisa (Boisduval & LeConte) -- early September  
Lycaena phlaeas americana Harris -- late April, mid June, early July, early August, early September  
Harkencienus titus mopsus (Hubner) -- late June to mid July  
Satyrus calanus falacer (Godart) -- early June to early July  
Satyrus liparops strigosus (Harris) -- early to mid June, primarily on Indian hemp  
Calycopis cecrops (Fabricius) -- late May to mid June, late July to mid August  
Incisalia augustus croesoides Scudder -- early April to late May  
Incisalia henrici (Grote & Robinson) -- early April to early May, primarily on American holly  
Incisalia nippon (Hubner) -- mid April to late June  
Euristromon ontario (W.H. Edwards) -- late June  
Parrhasius m-album (Boisduval & LeConte) -- early August, primarily on sweet pepperbush  
Strymon melinus humuli (Harris) -- early April to early May, mid to late June, late July to early August, early September  
Everes comyntas (Godart) -- late April, early August, early September  
Celastrina ladon (Cramer) -- mid April to early May, June, late July to early August  
Libytheana bachmanii (Kirtland) -- late July to early August  
Eupioieta claudia (Cramer) -- early September  
Speyeria cybele (Cramer) -- June to early July, early September (one specimen)  
Phyciodes tharos (Drury) -- early May, late June to early July, late July to early August, early September  
Polygonia interrogationis (Fabricius) -- late April, mid June  
Polygonia comma (Harris) -- late April  
Nymphalis antionia (Linnaeus) -- late April, early to mid June  
Vanessa virginiensis (Drury) -- mid April, June to early July, late July to early August  
Vanessa cardui (Linnaeus) -- early to mid June  
Vanessa atalanta rubria (Fruhstorfer) -- early to mid June, late July  
Junonia coenia (Hubner) -- early June, late July to early August, early September  
Basilarchia arthemis astyanax (Fabricius) -- early to mid June, late July to early August, early September  
Basilarchia archippus (Cramer) -- early June, July to early August  
Megisto cymela (Cramer) -- early June to late July  
Cercyonis pegala alope (Fabricius) -- early July to mid August  
Danaus plexippus (Linnaeus) -- mid June, late July, early August, early September

## PREVALENT DIURNAL MOTHS

Argyrostroma quadrifilaris (Hubner) -- late April to early May, early June  
Metarranthia obfirmaria (Hubner) -- early May

Other field entomologists are encouraged to acquire a permit and conduct more general entomological surveys on this and other power company right-of-ways.

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## Literature Cited

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R.H.S., 5213 Eliot's Oak Rd., Columbia, Md. 21044

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