

ARTHROPOD FAUNA USING MARBLESEED IN WISCONSIN

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Abstract: Many different arthropods use marbleseed (*Onosmodium molle* A. Michaux), in a variety of ways, and several arthropods are restricted to this plant. Surely this is true for other prairie plants as well. The patterns of use of marbleseed by arthropods with special reference to particular species and relationships are presented. Invertebrates comprise the majority of prairie biodiversity. To foster prairie biodiversity, we must accommodate the invertebrate fauna, particularly the specialists that most sharply define a prairie as worthy of our conservation concern. This can best be done by moderating our application of any of the tools of prairie management, spreading the risk inherent in anything we do across time and space.

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Central to my graduate research (Williams 1996) was marbleseed (*Onosmodium molle* A. Michaux), a prairie plant, and the leaf beetle (*Longitarsus subrufus* LeConte). The study required repeated visits to marbleseed sites and repeated close inspection of marbleseed plants, providing an ideal opportunity to study other fauna using this plant. The results of this corollary research are presented here.

This is not a definitive study of marbleseed's fauna, but simply what was chanced upon in the field and to some extent sorted out in the lab, the library, the museum, and through cooperation with experts in various taxa. Research was conducted in Wisconsin, but marbleseed is widely distributed between the Rocky Mountains and the Appalachian Mountains. The fauna using this plant surely varies from place to place, so this study is incomplete. Another weakness of the present work is that marbleseed's subterranean associated fauna was largely ignored.

Research of this type, even though focused on 1 native prairie plant, can reveal much faunal diversity. This sort of research shows how, from a single organism, relationships quickly ramify out within an ecosystem. It should give pause to those who would depend on the simplicity of mathematical models as a shortcut to understanding. This should awaken prairie conservationists, who tend to think of biodiversity in terms of plants, to the much greater biodiversity present in the invertebrate fauna of prairies, and to the importance of accommodating the needs of the fauna in appropriate and effective land management. The survival of prairie plants does not assure that their suites of specialist invertebrates are also surviving.

Unlike plants, which are fewer in number and much better known, most arthropods cannot be identified in the field. One must collect and curate

specimens and then elicit the help of various experts, without whose assistance a study like this is simply not possible. Specimens collected in this study were deposited in the Insect Research Collection at University of Wisconsin—Madison.

Several patterns of use emerge from these data, and some taxa fall into more than 1 category.

FLOWER VISITORS

Arthropods that visited marbleseed are shown in Table 1. Pollination of marbleseed is effected by bees, largely by bumblebees: 6 species were found in this study. Surely other species of bumblebees use these flowers elsewhere. Four species of small halictid bees used these flowers. A single honey bee (*Apis mellifera* Linnaeus) was seen visiting these flowers.

The sole lepidopteran found nectaring at these flowers was the silver spotted skipper (*Epargyreus clarus* Cramer).

The beetle *Meligethes saevus* LeConte is restricted to marbleseed and was found on 30 of the 59 Wisconsin sites in this study. In this genus, larvae develop in flowers, feeding on pollen.

MERISTEMATIC TISSUE VISITORS

Arthropods that used meristematic tissue of marbleseed are shown in Table 2. Meristematic tissue is the tender growing tips of shoots and budding flowers. Typically this part of any plant is more nutritious than older tissue, and these parts are softer. It is not surprising that many fauna were found here. Agromyzid and chloropid flies were abundant. Agromyzid flies of the genus *Melanagromyza* are typically stem miners, so these flies may be reproducing in these stems. The

Table 1. Arthropod visitors to marbleseed flowers, by Order, Family and Species.

Order	Family	Name
Coleoptera	Cleridae	<i>Phyllobaenus pubescens</i>
Coleoptera	Nitidulidae	<i>Meligethes saevus</i>
Hemiptera	Miridae	<i>Adelphocoris lineolatus</i>
Hemiptera	Miridae	<i>Plagiognathus obscurus</i>
Hemiptera	Miridae	<i>Plagiognathus politus</i>
Hemiptera	Miridae	<i>Rhinocapsus vanduzeei</i>
Hymenoptera		unidentified species
Hymenoptera	Apidae	<i>Apis mellifera</i>
Hymenoptera	Apidae	<i>Bombus affinis</i>
Hymenoptera	Apidae	<i>Bombus bimaculatus</i>
Hymenoptera	Apidae	<i>Bombus fervidus</i>
Hymenoptera	Apidae	<i>Bombus griseocollis</i>
Hymenoptera	Apidae	<i>Bombus impatiens</i>
Hymenoptera	Apidae	<i>Bombus vagans</i>
Hymenoptera	Formicidae	several unidentified species
Hymenoptera	Halictidae	<i>Augochlorella striata</i>
Hymenoptera	Halictidae	<i>Augochloropsis metallica</i>
Hymenoptera	Halictidae	<i>Dialictus achilleae</i>
Hymenoptera	Halictidae	<i>Dialictus admirandus</i>
Lepidoptera	Hesperiidae	<i>Epargyreus clarus</i>

Table 2. Arthropods that used marbleseed meristematic tissue, by Order, Family and Species.

Order	Family	Name
Coleoptera	Cantharidae	<i>Podabrus tomentosus</i>
Coleoptera	Cleridae	<i>Phyllobaenus pubescens</i>
Coleoptera	Coccinellidae	<i>Brachiacantha ursina</i>
Coleoptera	Curculionidae	<i>Otiorhynchus ovatus</i>
Coleoptera	Curculionidae	<i>Gymnetrum tetrum</i>
Coleoptera	Elateridae	<i>Ctenicera inflata</i>
Coleoptera	Elateridae	<i>Limonium griseus</i>
Coleoptera	Elateridae	<i>Melanotus hyslopi</i>
Coleoptera	Elateridae	<i>Melanotus morosus</i>
Coleoptera	Nitidulidae	<i>Meligethes saevus</i>
Diptera	Agromyzidae	<i>Melanagromyza</i> sp.
Diptera	Chloropidae	unidentified species
Hemiptera	Aphididae	<i>Brachycaudus cardui</i>
Hemiptera	Cercopidae	<i>Clastoptera proteus</i>
Hemiptera	Miridae	<i>Plagiognathus obscurus</i>
Hemiptera	Miridae	<i>Plagiognathus politus</i>
Hemiptera	Reduviidae	<i>Phymata</i> sp.
Hymenoptera	Formicidae	several unidentified species
Lepidoptera		unidentified species
Lepidoptera	Arctiidae	<i>Cisseps fulvicollis</i>
Lepidoptera	Arctiidae	<i>Ctenucha virginica</i>
Lepidoptera	Arctiidae	<i>Halysidota tessellaris</i>
Lepidoptera	Arctiidae	<i>Haploa contigua</i>
Lepidoptera	Arctiidae	<i>Haploa reversa</i>
Lepidoptera	Nymphalidae	<i>Danaus plexippus</i>
Lepidoptera	Pyralidae	<i>Herpetogramma</i> sp.

chloropid flies were feeding on damaged tissue, caterpillar frass, and dead insects.

Lepidoptera include 4 species feeding as caterpillars on this tissue. The most common was *Haploa reversa* (Stretch), which can become so numerous as to preclude seed production in marbleseed by consuming all of the flowers.

The 4 beetle species in Elateridae were attracted to the exudate on these hairy young stems, as they are to exudates produced by many plants. Probably other species of click beetle, not chanced upon in this study, also use marbleseed in this way.

The most interesting story among these particular animals again centers on the exudate produced by these young tissues. Four species of Lepidoptera visit these shoot tips and inflorescences before, during and after flowering to run their probosces over the slightly sticky hairs. Three of these are arctiid moths: *Cisseps fulvicollis* (Hubner) and *Ctenucha virginica* (Esper) are common day-flying moths, the former is very common about marbleseed. *Cisseps fulvicollis* moths are also attracted to necrotic plant tissue and they are active at night, to a lesser degree, as well. *Halysidota tessellaris* (James E. Smith) flies only at night. Monarch butterflies (*Danaus plexippus* (Linnaeus)) are often on marbleseed running their probosces over these hairy young tissues. These animals may be gleaning some chemical other than simply sugar to sustain themselves; they may be finding a chemical they can use in their pheromone communication with

potential mates, for example. This would be an excellent study for a chemical ecologist.

GENERAL LEAF FEEDERS

Arthropods that feed on leaves of marbleseed are shown in Table 3. The most interesting story among the general leaf feeders centers on the leaf beetles of the genus *Longitarsus*. In Wisconsin, *Longitarsus subrufus* feeds and develops only on marbleseed, and was present at 55 of the 59 Wisconsin sites studied. Some of these marbleseed populations consist of a single plant, yet this beetle is present. *Longitarsus melanurus* LeConte also feeds and develops on marbleseed, but this beetle also feeds and/or develops on two alien members of this plant family: hound's tongue (*Cynoglossum officinale* L.) and blueweed (*Echium vulgare* L.), both of which grow in the same habitat as does marbleseed. *Longitarsus melanurus* was found on 45 of the 59 Wisconsin sites in this study. Two other species of *Longitarsus* beetles were found on marbleseed, one of which may be an undescribed species. Each was found on a single site.

Several species of ants patrol the foliage of marbleseed. Their effects are probably substantial. They no doubt serve, at times, as predators and scavengers. They routinely startle *Longitarsus* beetles from their feeding, and then the ants plunge their faces into the moist leaf tissue, whether for moisture or for some more nutritive substance is unknown.

Table 3: General leaf feeders, by Order, Family and Species.

Order	Family	Name
Coleoptera	Chrysomelidae	<i>Chaetocnema confinis</i> , perhaps
Coleoptera	Chrysomelidae	<i>Epitrix</i> spp.
Coleoptera	Chrysomelidae	<i>Longitarsus</i> spp. 2 species
Coleoptera	Chrysomelidae	<i>Longitarsus melanurus</i>
Coleoptera	Chrysomelidae	<i>Longitarsus subrufus</i>
Hemiptera	Acanaloniidae	<i>Acanalonia bivittata</i>
Hemiptera	Cercopidae	<i>Philaenus spumarius</i>
Hemiptera	Cicadellidae	<i>Aphrodes bicincta</i>
Hemiptera	Cicadellidae	<i>Graphocephala teliformis</i>
Hymenoptera	Formicidae	several species
Hymenoptera	Tenthredinidae	<i>Dolerus asper</i>
Lepidoptera		three unidentified species
Lepidoptera	Arctiidae	unidentified species
Lepidoptera	Arctiidae	<i>Estigmene acraea</i>
Lepidoptera	Arctiidae	<i>Grammia virgo</i>
Lepidoptera	Arctiidae	<i>Haploa contigua</i>
Lepidoptera	Arctiidae	<i>Haploa reversa</i>
Lepidoptera	Nymphalidae	<i>Vanessa cardui</i>
Lepidoptera	Pyralidae	<i>Herpetogramma</i> spp., perhaps

GENERAL STEM FEEDERS

Arthropods that feed on stems of marbleseed are shown in Table 4. Except for *Longitarsus subrufus*, which feeds on stem tissue primarily in fall when the leaves are dying, these others tend to feed on younger stem tissue throughout the summer. All Hemiptera have piercing-sucking mouthparts. They feed on plant fluids.

LEAF MINERS

Marbleseed leaf miners are shown in Table 5. Leaf miners feed within a leaf, in the soft interior between the tough upper and lower surface layers. An attempt to rear the fly larvae found mining these leaves failed. The moth *Acrocercops pnosmodiella* (Busck) is a tiny animal that is restricted to marbleseed, or at least to the genus *Onosmodium*. When ready to pupate, it induces the leaf to balloon out, making a small bubble in the leaf. Within this bubble, the tiny caterpillar suspends itself as on a hammock with silk cords, then pupates in midair. This animal was found on very few sites.

STEM MINERS

Marbleseed stem miners are shown in Table 6. The cecidomyiid fly larvae developing in the pith of

these stems were reared out, producing large numbers of an undescribed species of *Neolasioptera*; something never before studied. These may well be restricted to marbleseed. The wasps certainly develop within these stems, but whether they are herbivores, or parasitoids, or both is unclear.

ROOT FEEDERS

Marbleseed root feeders are shown in Table 7. These *Longitarsus* beetles feed on marbleseed roots as larvae. This short list reflects the limits of the study, rather than the limits of the root fauna.

PARASITOIDS

Arthropods that are parasitoids and found on marbleseed are shown in Table 8. Parasitoids are animals that develop within the body of another animal, consuming that host animal in the process. The tachinid fly parasitized one of the arctiid moth caterpillars that was taken to rear out. A cocoon of an arctiid moth that was affixed to marbleseed yielded the wasp *Pediobius eubius* (Walker). The braconid wasp emerged from the pupa of 1 of the tiny, leaf mining moths. This wasp was another undescribed species. It may be that this wasp is restricted to this moth, which is restricted to marbleseed or to the

Table 4: General stem feeders, by Order, Family and Species.

Order	Family	Name
Coleoptera	Chrysomelidae	<i>Longitarsus subrufus</i>
Hemiptera	Acanaloniidae	<i>Acanalonia bivittata</i>
Hemiptera	Cercopidae	<i>Clastoptera proteus</i>
Hemiptera	Pentatomidae	<i>Coenus delius</i>
Hemiptera	Pentatomidae	<i>Euschistus servus</i>
Hemiptera	Pentatomidae	<i>Euschistus tristigmus</i>
Hemiptera	Pentatomidae	<i>Euschistus variolarius</i>

Table 5: Leaf miners, by Order, Family and Species.

Order	Family	Name
Diptera		unidentified species
Lepidoptera	Gracillariidae	<i>Acrocercops pnosmodiella</i>

Table 6: Stem miners, by Order, Family and Species.

Order	Family	Name
Diptera	Agromyzidae	<i>Melanagromyza</i> spp., perhaps
Diptera	Cecidomyiidae	<i>Neolasioptera</i> spp.
Hymenoptera	Eurytomidae	<i>Eurytoma</i> sp., perhaps
Hymenoptera	Eurytomidae	<i>Eurytoma vernonia</i> , perhaps

Table 7: Root feeders, by Order, Family and Species.

Order	Family	Name
Coleoptera	Chrysomelidae	<i>Longitarsus</i> spp. 2 species
Coleoptera	Chrysomelidae	<i>Longitarsus melanurus</i>
Coleoptera	Chrysomelidae	<i>Longitarsus subrufus</i>

Table 8: Parasitoids, by Order, Family and Species

Order	Family	Name
Diptera	Tachinidae	unidentified species
Hymenoptera	Braconidae	<i>Apanteles</i> sp.
Hymenoptera	Elasmidae	<i>Elasmus</i> sp.
Hymenoptera	Eulophidae	<i>Pediobius eubius</i>
Hymenoptera	Eulophidae	<i>Tetrastichus</i> sp.
Hymenoptera	Eurytomidae	<i>Eurytoma</i> sp., perhaps
Hymenoptera	Eurytomidae	<i>Eurytoma vernonia</i> , perhaps
Hymenoptera	Platygastridae	unidentified species

genus *Onosmodium*. The elasmid wasp, the *Tetrastichus* wasp, and the platygastrid wasps emerged from stem rearing containers. Platygastrid wasps often parasitize cecidomyiid flies. That the rearing chambers produced many of these flies and many of these wasps and, given that the fly was an undescribed species, it may be that this wasp is also an undescribed species.

Again, the parasitoid may be restricted to 1 host that is itself restricted to 1 plant; this is not an uncommon pattern. Some parasitoids parasitize other parasitoids, so figuring out which tiny wasp is

feeding on the plant itself, on some herbivore, or on some other parasitoid, or a combination of these, is a very complicated problem.

PREDATORS

Arthropods that are predators and found on marbleseed are shown in Table 9. Many different spiders were found on marbleseed, some of which were preying on some of the animals previously listed. Some predators hunted over the entire plant, others typically hunted at the shoot tips and about the flowers, where insect activity was usually greatest.

Table 9: Predators, by Order, Family and Species

Order	Family	Name
Araneae		many unidentified species of spiders
Coleoptera	Cleridae	<i>Phyllobaenus pubescens</i> , perhaps
Coleoptera	Coccinellidae	<i>Brachiacantha ursina</i> , perhaps
Diptera	Asilidae	<i>Holopogon snowi</i>
Diptera	Dolichopodidae	<i>Condylostylus caudatus</i>
Diptera	Dolichopodidae	<i>Condylostylus</i> sp.
Hemiptera	Miridae	<i>Plagiognathus obscurus</i> , perhaps
Hemiptera	Miridae	<i>Plagiognathus politus</i> , perhaps
Hemiptera	Miridae	<i>Rhinocapsus vanduzeei</i> , perhaps
Hemiptera	Nabidae	<i>Nabicula subcoleoprata</i>
Hemiptera	Nabidae	<i>Nabis</i> sp.
Hemiptera	Pentatomidae	<i>Podisus maculiventris</i>
Hemiptera	Reduviidae	<i>Phymata</i> sp.
Hemiptera	Reduviidae	<i>Sinea diadema</i>
Hymenoptera	Formicidae	many unidentified species, perhaps
Odonata	Coenagrionidae	<i>Enallagma carunculatum</i>

Table 10: Species using marbleseed for its structural properties, by Order, Family and Species

Order	Family	Name
Araneae		many unidentified species of spiders
Diptera	Asilidae	<i>Holopogon snowi</i>
Diptera	Dolichopodidae	<i>Condylostylus caudatus</i>
Diptera	Dolichopodidae	<i>Condylostylus</i> sp.
Hymenoptera	Vespidae	<i>Polistes fuscatus</i>
Lepidoptera		unidentified species
Lepidoptera	Arctiidae	unidentified species

SPECIES USING MARBLESEED FOR ITS STRUCTURAL PROPERTIES

Arthropods that use marbleseed for its structural properties are shown in Table 10. Many spiders build webs in marbleseed to capture prey, to shelter themselves during rest and during molting, and to shelter their eggs and young.

The tiny robber fly (*Holopogon snowi* Back) was using dead stems as lookout posts from which to sortie out after flying prey, just as a kingbird does from a telephone wire. That marbleseed provides vertical structure in prairie throughout the year is another way in which this plant participates in the prairie community. This example shows why it is important not to mow or burn most of a prairie at 1 time, for to do so strips away much of the diversity of microsite and of vertical structure.

Dolichopodid flies typically use leaves as perches from which to sortie out after flying prey.

The common paper wasp (*Polistes fuscatus* Fabricius) used marbleseed to support its nest, as did the only vertebrate found using this plant, a song sparrow (*Melospiza melodia* Wilson). In each case, a single nest was found.

The lepidopteran species were 2 larvae found spinning silk platforms slung below individual marbleseed leaves. Whether they were preparing to

pupate or to feed is unknown. The arctiid species was a single cocoon, found affixed to marbleseed, from which emerged 77 tiny parasitic wasps, *Pediobius eubius*. These lepidopterans may not feed on marbleseed. All that can be said is that they appreciated this plant for its structural properties.

TAXA SPECIFIC TO MARBLESEED

Table 11 summarizes information on these taxa presented above.

CONCLUSION

Many different arthropods use this 1 prairie plant, and this is certainly true of other prairie plants as well. Several arthropods are restricted to this 1 prairie plant. This is probably true of other prairie plants as well.

In our past efforts to conserve prairies, we generally focused our attention on the flora, which still serves as a useful indicator of biodiversity. But the diversity of invertebrate fauna is much greater than that of the flora on any given prairie. The survival of prairie plants may not mean that their suites of specialist invertebrates are also surviving.

In our management of prairies, we would be wise to moderate our activities to lessen the possibility that in our enthusiasm we eradicate some of the invertebrate species present, particularly the

Table 11: Taxa specific to marbleseed

Order	Name
Coleoptera	<i>Longitarsus</i> spp., leaf beetles, 2 species, perhaps
Coleoptera	<i>Longitarsus subrufus</i> , leaf beetle
Coleoptera	<i>Longitarsus melanurus</i> , leaf beetle, using 2 aliens also
Coleoptera	<i>Meligethes saevus</i> , flower beetle
Lepidoptera	<i>Acrocercops pnosmodiella</i> , leaf mining moth
Hymenoptera	<i>Apanteles</i> sp., parasitoid of above moth, perhaps
Diptera	<i>Neolasioptera</i> sp., stem mining fly, perhaps
Hymenoptera	<i>Platygastridae</i> sp., parasitoid of above fly, perhaps
Diptera	<i>Melanagromyza</i> sp., stem mining fly, perhaps

specialists that most sharply define a given prairie as worthy of our conservation concern. Through immoderate application of haying, grazing and especially fire, we may be actively damaging prairies by simplifying their biodiversity. It is prudent to spread the risk inherent in any management practice across space and time.

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AWAKENING

Come out on the prairie, come walk with me;
 I'll show you the light in the wings of a bee.
 We'll study the flowers, both grasses and forbs,
 And encounter more beauty than our souls can absorb.
 Focus and rest, focus and rest,
 We'll walk 'til we tire, then nap fully dressed,
 To dream of the wind, the light, and the sun,
Anemone, Geum, Andropogon,
 To witness our neighbors, commune with our peers,
 And awaken refreshed, at peace, without fears.

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